Georgetown Mobility Study
A Health Impact Assessment

SEATTLE, WASHINGTON | JUNE 2017

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Suggested citation:
Bali, C., Friedmann, J., Rivera, D. M., Stampfer, O., & Turner, A. (2017). *Georgetown Mobility Study: A Health Impact Assessment - Seattle, Washington*. University of Washington.

ACKNOWLEDGEMENTS

We would like to thank the authors from University of Washington for their contribution to this health impact assessment:

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This report was written by students as a class project for UW EnvH/UrbDP 536 Health Impact Assessment in Spring Quarter 2017.

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We would also like to thank the following people and organizations for their guidance, leadership, and time that have been a crucial part of this project:

Andrew L. Dannenberg, University of Washington, Primary course instructor for ENV H / UDP 536: Health Impact Assessment
Edmund Seto, University of Washington
Arthur M. Wendel, Agency for Toxic Substances and Disease Registry
Diane Wiatr, City of Seattle Department of Transportation
Ian Macek, City of Seattle Department of Transportation

PHOTO AND MAP CREDITS
Unless otherwise noted, photo sources from the HIA team.

EXECUTIVE SUMMARY

PROJECT BACKGROUND

Students in the University of Washington Department of Urban Design and Planning, and Environmental and Occupational Health Sciences Health Impact Assessment (HIA) course conducted an HIA in Spring of 2017 of the Seattle Department of Transportation (SDOT) Mobility Study in Georgetown, Seattle. The purpose of this study was to promote safety, access, health, and mobility. This report complements SDOT's existing mobility study in Georgetown by providing information on broader health implications including mental health, stress, chronic disease, transportation-related injury, and obesity.

GEORGETOWN HISTORY AND BACKGROUND

Georgetown is an industrial neighborhood in the southern part of Seattle, along the Duwamish River. Georgetown is known for its residents' artwork and craftsmanship, and its lively restaurant, bar, retail, and art scene has made the neighborhood an up-and-coming visitor destination. While freight, rail, and airport activity has been essential in generating jobs and revenue for the City and County, it also poses health and safety risks to employers, workers, residents, and visitors traveling to and from Georgetown. Increased industrial, economic, and freight activity polluted the neighborhood as a whole, and the Duwamish River was declared an EPA superfund site in 2001. With lower housing prices than the rest of Seattle, new developments and townhomes have started to populate the area.

GEORGETOWN DEMOGRAPHICS

Georgetown's total population is 1,295 (Seattle Office of Economic Development, 2016) and in 2010 approximately 29.8% were people of color (Seattle Parks Foundation, 2017). Hispanic/Latino, African American, and Asian residents tended to have larger resident representation in comparison to other racial minorities. In general, much of the population in Georgetown are working-age adults. According to the Georgetown Open Space Vision Framework (GOSVF), the average per capita income of residents was $23,936. Approximately 37.5% of the residents were living below the poverty line, which is double the average of both King County and the City of Seattle (Seattle Parks Foundation, 2017).

ABOUT HEALTH IMPACT ASSESSMENTS

Health Impact Assessments do not only measure physical health, but are meant to assess the overall quality of life as it relates to current and future policy changes. The World Health Organization (WHO) views health as a combination of physical, mental, and social measures rather than relying on the more traditional US approach of measuring health outcomes like morbidity and mortality. The purpose of this assessment is to examine the potential health impacts of policy change and to make evidence-based recommendations.

HIA utilizes qualitative and quantitative research methods, along with community and stakeholder feedback to investigate the current health of the community and potential effects of a proposal. The goal of an HIA is to provide decision-makers with the information and recommendations necessary to implement informed policy, with a special emphasis on mitigating the health impacts felt by vulnerable populations. The HIA process has six steps: Screening, Scoping, Assessment, Recommendations, Reporting, and Monitoring.

KEY FINDINGS

MOBILITY IN GEORGETOWN

» **There is a need for improved connectivity**, both within Georgetown, to adjacent neighborhoods, and to other destinations in Seattle. Because many services are not located within Georgetown itself, Georgetown residents need to access these in other neighborhoods such as South Park and Beacon Hill. There are few access points to penetrate the borders created by highways, King County International Airport, and the Duwamish River.

» **There is a lack of adequate sidewalks and safe crossings**. There is a dearth of safe crossings on busy roads such as Airport Way South. Many sidewalks are incomplete, dilapidated, or nonexistent in many places. Installing sidewalks has been shown to decrease pedestrian-related crashes by almost 90%, and even a minimum of a paved shoulder can improve walking conditions and decrease crashes.

» **Crosswalks alone do not significantly improve safety**. Crosswalks could be installed in tandem with other intersection improvements such as traffic calming leading up to intersections and crossings, pedestrian hybrid beacons, intersection or road-segment lighting, and improved car signal and pedestrian cross timing.

» **Better pedestrian lighting** can reduce injuries, improve perceptions of safety, provide visibility and security during night hours, keep businesses open longer, improve access to services, and encourage residents and visitors to walk, benefitting physical health. Crashes are 3 times more likely on unlit roads at night.

» **A high percentage of people in Georgetown commute alone** by car and spend a high percentage of income on transportation: between 15–25% (Community Indicators Consortium, Determinants of Equity Report, 2015). This contributes to both congested roadways and poor physical health. Georgetown serves as a main thoroughfare for commuters who drive through the neighborhood without stopping.

» **There is poor transit accessibility**: Bus stops are typically located on busy arterials with limited shelter from weather or exhaust, and ridership may be low due to concerns about safety. Depending on the route, the time of day, and whether it is the weekend, the wait time can be 15–30 minutes in between buses. With Seattle's growing population and traffic issues, waiting for a bus can take longer.

» **There is a lack of safe bicycling infrastructure**: Most streets lack sufficient safety measures for bicyclists, including street surfaces such as uneven pavement, gravel, and railroad tracks. Bicyclists share many roads with busses and freight without adequate bike lanes or sharrows and many intersections have dangerous left-hand turns.

» **Routes to schools need improvement**. Active transport to school leads to better health outcomes for kids. For students of schools in Beacon Hill, traffic at dropoff and pickup has become very congested since start times were changed this year. For these residents, walking and biking to school is much faster and could also be an opportunity for these students to be active. However, lack of safe pedestrian infrastructure west of the Lucille Street Bridge is prohibitive.

» **Residents report low levels of physical activity**. 18% of adults in the 98108 zip code do not engage in exercise (worst quartile nation-wide). The built environment is an important determinant of recreational physical activity. Parks and trails are used when they have amenities, when they are safe, and when they are maintained.

» **Access to parks need improvements**. Oxbow Park is the most utilized park because it is easier and safer to access than others, being located within the residential area. Improving access to the other parks would increase their utilization.

NEIGHBORHOOD AND COMMUNITY DEVELOPMENT

» **Georgetown residents are deeply concerned about gentrification**. Data from Seattle's construction and permitting office shows that many permits for redevelopment issued in the Georgetown area aim to create higher density, improve design esthetics, and provide more housing options. Unfortunately, these first two focus points are making it more difficult to provide appropriate, affordable housing in this community.

» **Existing housing stock** consists of smaller scale single family homes with historically low vacancy. In many instances, health disparities in this neighborhood are fueled by dilapidates housing conditions, which can contribute to a variety of serious health conditions.

» Tree canopy and park space areas are lower in Georgetown compared to average numbers for the city.

» Neighborhood greening can lead to accelerated gentrification and environmental injustice.

» There are only two designated historic sites while over 25 sites are eligible.

» Georgetown has a history of having a **strong arts community** that continues today. Several performing, fine, and heavy art galleries, studios, event spaces, and art education exist in the neighborhood, much of which highlight the industrial history of the district.

» Organized community groups for residents, people of color, and immigrant groups are under-recognized.

POPULATION HEALTH AND SOCIAL SERVICES ACCESS

» Though they are available in the South Seattle area, **health services take considerably longer to access via public transportation** (up to an hour or more,) which may prevent Georgetown residents from accessing these crucial services.

» **Despite the dearth of social services, alcohol is readily available**. There are about 25 bars and breweries, six liquor stores, and four wineries in Georgetown, and only four grocery stores.

» **Georgetown residents as a whole have little income variability**. Because a large proportion of Georgetown residents are single-person households, and there is a large artists' community in the neighborhood, there is little income variability within the neighborhood. Therefore, the effects of gentrification and displacement of the artists' community could seriously damage current residents' livelihoods.

» **Health insurance enrollment is low**. Compared to the City of Seattle, the proportion of uninsured adults is higher in Georgetown. Lack of health insurance coverage is associated with increased utilization of emergency departments and lower rates of receiving preventative medical care (Abdullah, F. et al., 2010). This can contribute to the disparity in hypertension, diabetes (Anonymous, 2011) and undiagnosed late stage cancers (Rhodes, 2012).

ENVIRONMENTAL CONDITIONS

» Georgetown has consistently higher levels of particulate matter than other areas of King Country which are linked with respiratory disease, cardiovascular disease, and cancer.

» Diesel, gas vehicles, and industry contribute to over 50% of Georgetown's air pollution particularly during peak traffic periods.

» Community noise pollution particularly from commercial transportation tends to be higher in Georgetown than other neighborhoods.

» Public outreach programs could be designed to educate the public about environmental conditions of the Georgetown neighborhood along with emergency preparedness.

» Neighborhood greening and additional natural barriers can help mitigate air and noise pollution.

ECONOMIC DEVELOPMENT

» **Georgetown is home to a diverse amount of economic activites** including: light industry, heavy manufacturing, hospitality, retail, nightlife, and cultural development. These businesses and organizations employ approximately 10,000 workers (City of Seattle Office of Economic Development, 2016). With approximately 60 member organizations, much of Georgetown is part of the Duwamish Industrial/ Manufacturing Center. Some of these employers include Boeing, Sur La Table, and the King County International airport (Linscott, 2016).

» **Georgetown's economic vitality depends on tourism**. The Georgetown Merchants Association states that 75% of visitor activity accounts for the neighborhood's $41 million annual restaurant sales and $67 million annual retail sales (City of Seattle Office of Economic Development). Georgetown's annual festivals and neighborhood events attract at least 100,000 visitors alone. Revenue in the retail, restaurant, and hospitality industries continues to rise, indicating that tourists from other neighborhoods are increasingly coming to Georgetown for leisure.

» **Strong connections exist between health, tourism, and thriving businesses**. In lower socio-economic neighborhoods, shorter life expectancy and worse mental health and physical health outcomes exists. Small business growth is also associated with lower mortality, obesity, diabetes, improved neighborhood-based collective efficacy (Blanchard, Tolbert and Mencken, 2011). Access to stores, full-service restaurants and shops is associated with lower rates of obesity (Leal and Choix, 2010). Growth in tourism stimulates economic growth, with particular benefits for people of color and low-income populations (Zaei & Zaei, 2013).

» **Workplace safety is a concern for workers in Georgetown**. Since the number of employees in Georgetown has increased over the past several years, unsafe work conditions, especially for truck drivers has emerged as a health hazard. Recent data cites that a handful of companies in Georgetown have been cited for failing to provide a workplace that is free from hazards, failing to provide personal protective equipment, and failing to provide readily avail-

able emergency wash facilities. Poor working conditions could lead to injuries, which could also lead to reduced working hours and increased health care costs. In the worst cases, long term disability and death can result from unsafe working conditions. In Georgetown, major freight routes contribute to a broad variety of traffic-related injuries. Thus, a general lack of traffic safety impacts those who work, live, and visit the neighborhood.

KEY RECOMMENDATIONS

Recommendations are organized by primary theme. Note: these recommendations will be separated out by chapter topic elsewhere throughout the document.

GREEN SPACE & PUBLIC ART

» **Increase the amount of greenery and green barriers** that help improve air quality and reduce community noise pollution. Also include more greenery throughout the neighborhood, particularly on rooftops and walls.

» **Develop partnerships with private property owners to incentivize greening** when jurisdiction and space become a limiting factor. Community programs developed with residents, community members, and local organizations can help abate pollution effects on human health.

» **Create community and art development programs** such as the King County's Bus Shelter Mural Program and other similar community programs that help protect neighborhood culture and identity.

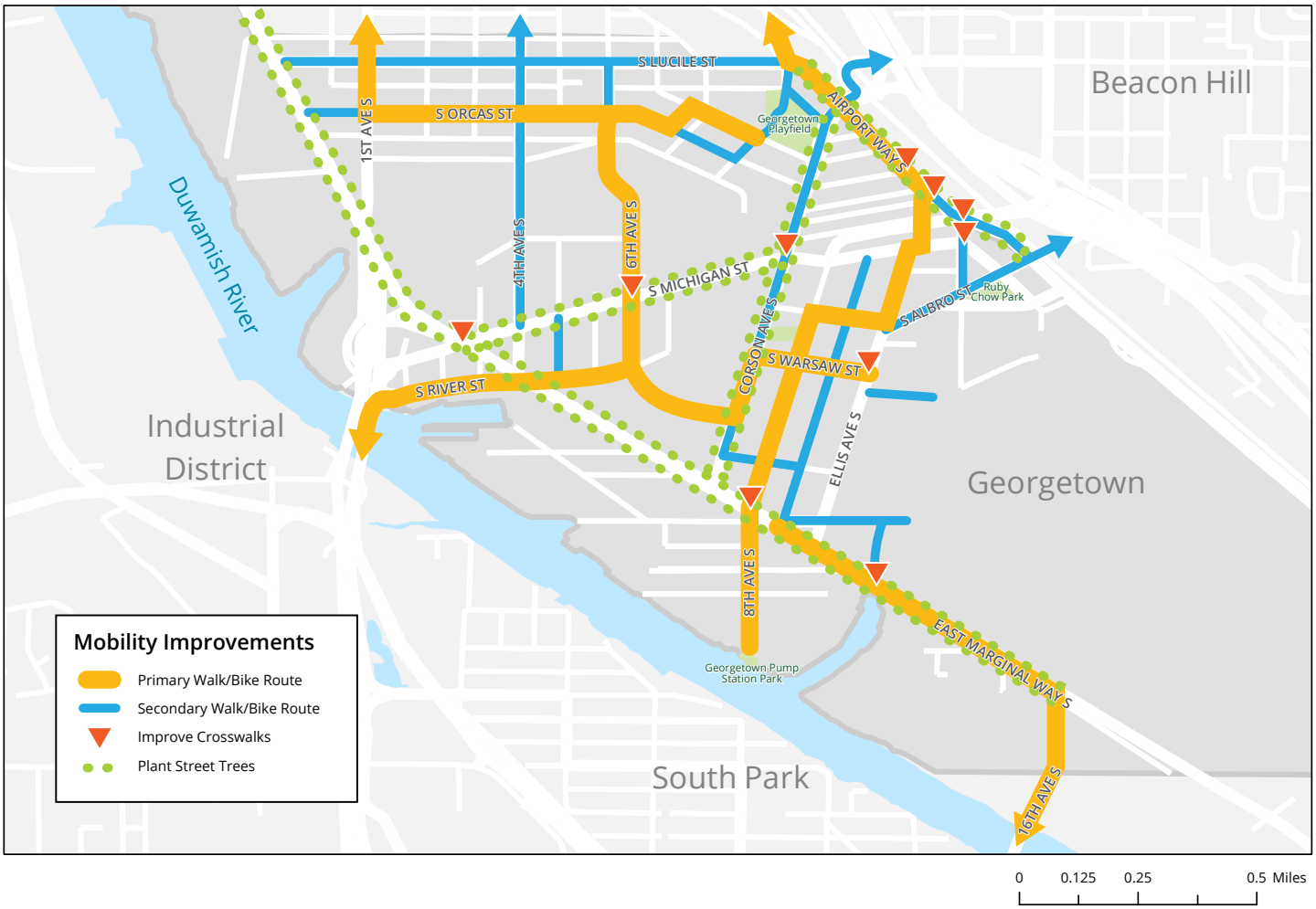
PARTNERSHIPS

» Partner with the **Department of Planning and Development** in creating a historic preservation overlay district protecting key buildings that add to the historic character of the Georgetown neighborhood.

» Work with **Seattle City Light** to complete an inventory of and improve existing light fixtures, as well as add more street lighting along Airport Way South and along major thoroughfares to increase perceptions of safety, and to

GEORGETOWN MOBILITY STUDY HIA RECOMMENDATIONS

Created by Alison Turner on May 29, 2017



Map I-1. HIA Priority Locations

encourage walking to Georgetown's retail core and parks. (SDOT can also collaborate with local businesses to apply for grants from the **Office of Economic Development** for improved lighting.)

» Partner with **Seattle Neighborhood Farmers Markets or local grocery stores** to increase the access to market and vendors for a variety of fresh and affordable food sources. For example, survey residents about a possible grocery shuttle, or a regular farmers market for fresh vegetables and local organic food.

COMMUNITY

» Survey Georgetown residents on the best ways to increase access to health care providers on First Hill.

» Refurbish dilapidated warehouse spaces to be artist work/live homes. This contributes to the goal of increasing density while continuing to foster the creative culture that is at the heart of Georgetown.

» Advocate for city-wide affordable housing development and gentrification mitigation policies such as programs that help residents rehab older buildings or buy their rental properties.

CITYWIDE

» **Implement an air quality monitoring and warning system**. Install and maintain a continuous, real-time, emissions monitoring system that warns residents when outside levels of air pollution are too high. The monitoring system could have a smartphone application that warns its user to stay indoors. This monitoring system could be a joint effort with Puget Sound Clean Air Agency and mapping efforts by Western Washington University.

» **Create alternate routes for freight trucks**. Discourage freight trucks from using the South Michigan Street I-5 on-ramp, and Corson Avenue South I-5 off-ramp. Reroute trucks to the Spokane Viaduct I-5 ramp. Update the Transportation Master Plan and Freight Master Plan to exclude Michigan Street, Corson Avenue South, and the Georgetown I-5 ramps.

PEDESTRIAN & CYCLIST SAFETY

» **Investigate public transportation options** from central restaurant locations to nearby Link Light Rail or bus stops to ensure that those drinking will be able to travel home without driving or cycling.

» **Prioritize improvements along Walk/Bike routes** outlined in the HIA Recommendations Map (Map I-1). For example, prioritize 6th Avenue South pedestrian improvements (over 4th) as a connection between the northern residential area and the rest of the neighborhood.

» **Inventory, build, and maintain sidewalks and crosswalks**. Along with adding crosswalks, also utilize traffic-calming measures, install pedestrian hybrid beacons at crosswalks, high-visibility crosswalks, and improve car signal and pedestrian crossing timing. Prioritize crosswalks along Airport Way South. Prioritize sidewalks on East Marginal Way South between 14th Avenue South and 16th Avenue South and on 6th Avenue South.

» **Utilize traffic-calming measures** such as planting street trees near the curb, signage instructing drivers to slow down, and instituting road diets along busy roads leading up to intersections and pedestrian crossings. Priority intersections include South Michigan Street and Corson Avenue South, and South Michigan Street and East Marginal Way South.

» **Publicize a simplified School Walk Route Plan** with distinct, designated routes. Install dedicated signage and in-ground medallions or wayfinding markers along the route.

» **Improve wayfinding with pedestrian-oriented signage** especially along Airport Way South, at South Bailey Street and 13th Avenue South, and at South Michigan Street and East Marginal Way South.

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INTRODUCTION

PROJECT BACKGROUND

The Seattle Department of Transportation (SDOT) conducted a mobility study in Georgetown in 2017. The purpose of this study was to promote safety, access, health, and mobility. The mobility study was informed by initiatives such as Bicycle, Pedestrian, Freight, and Transit Master Plans, Age Friendly Seattle, Vision Zero, and the Georgetown Open Space Vision Framework. To further build on this study, SDOT approached University of Washington Professor Andrew Dannenberg, MD, MPH to suggest this topic for his Health Impact Assessment (HIA) course in the Departments of Urban Design and Planning and Environmental and Occupational Health Sciences.

The 23 students in this course, representing disciplines including urban planning, public health, social work, nursing, global health, real estate, civil engineering, and environmental quality, compiled this report over 10 weeks from March 30th to June 6th, 2017. This report complements SDOT's existing mobility study in Georgetown by providing information on broader health implications including mental health, stress, chronic disease, transportation-related injury, and obesity. This report also considers the following topics in addition to Mobility: Neighborhood and Community Development, Population Health and Social Services Access, Environmental Conditions, and Economic Development. Each of these topics makes up a chapter in this report.

GEORGETOWN HISTORY AND BACKGROUND

Located along the Duwamish River and south of SoDo, Georgetown has the distinction of being Seattle's oldest neighborhood. Native Americans already lived on Duwamish tribal land when white pioneers first settled in the area in 1852. The development of Georgetown into an industrial hub began in the early 1900s as brewing, saloon, and railroad industries employed approximately 7,000 of the area's residents (Seattle Parks Foundation, 2017). In 1910, Georgetown officially became part of the City of Seattle. The City officially declared Georgetown as an industrial zone in 1923 (Seattle Parks Foundation, 2017). That, coupled with the construction of I-5, the development of King County Airport, and the growth of Boeing increased economic and freight activity throughout the area. This industrial growth also drove out Georgetown's resident population and local businesses until the zoning code was changed to reinstate residential areas in 1942 (Seattle Parks Foundation, 2017). Industrial growth also changed the landscape of the area as the Duwamish River was straightened and dredged to enable industries to transport commodities up and down the river. Unfortunately, this activity also polluted the river, and it was declared an EPA superfund site in 2001.

Today, Georgetown is still home to Seattle's industrial activity and a small proportion of the City's residents. In addition, its lively restaurant, bar, retail, and art scene has made the neighborhood an up-and-coming visitor destination. Many of these residential and commercial areas lie close to the east end of Georgetown and on Airport Way S. With lower housing prices than the rest of Seattle, new developments and townhomes have started to populate the area. Larger industrial activity occurs along the north and western edges of the neighborhood along E. Marginal Way S., as well as on the south edge where the King County Airport is located. While freight, rail, and airport activity has been essential in generating jobs and revenue for the City and County, it also poses health and safety risks to employers, workers, residents, and visitors traveling to and from Georgetown. As such, there has been a push to improve the walkability and accessibility of Georgetown in recent years.

GEORGETOWN DEMOGRAPHICS

The residents of Georgetown make up a small proportion

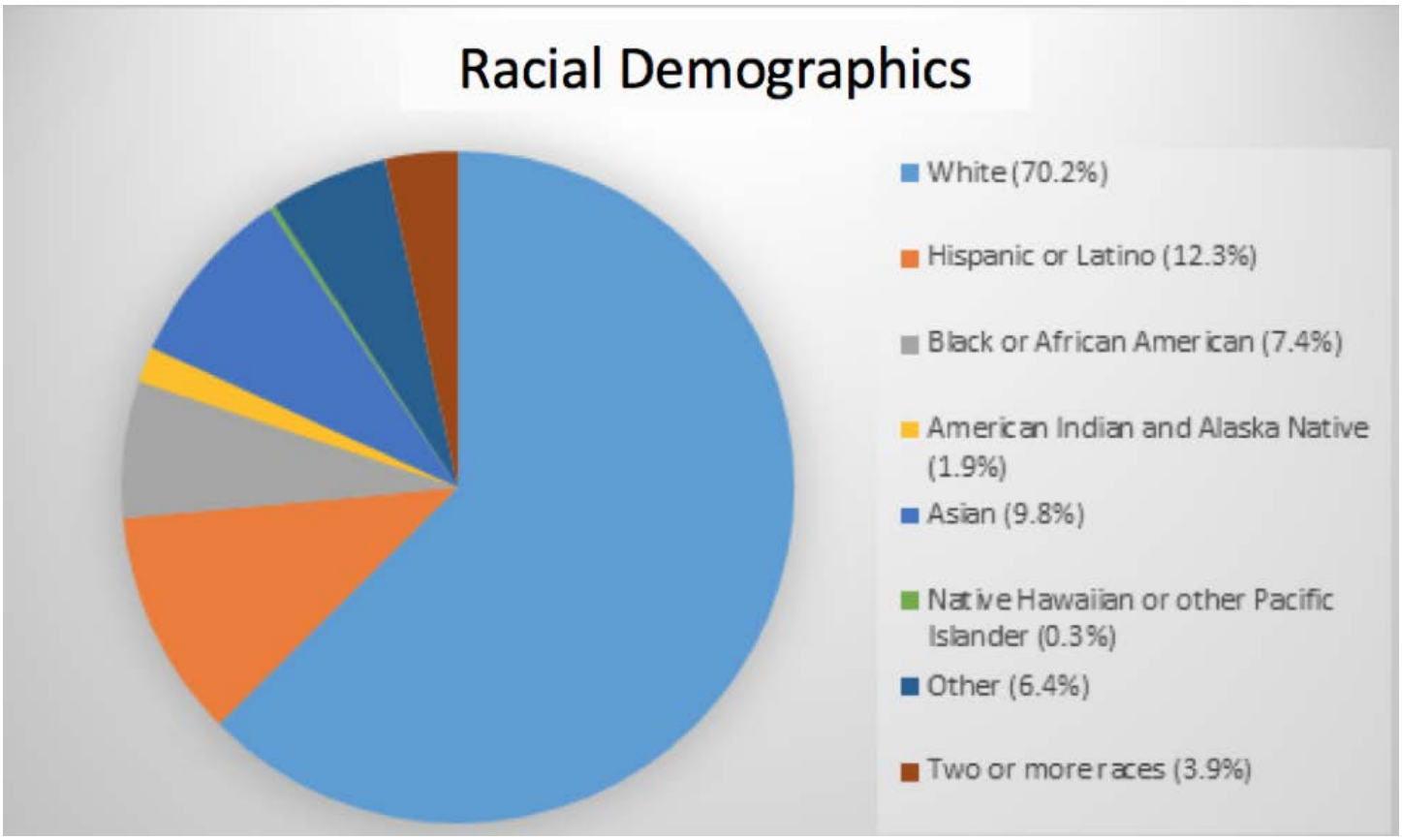


Figure A-1. Demographic data from the Georgetown Open Space Vision Framework.

of Seattle's total population. While the City's population is growing rapidly, Georgetown has only experienced slight increases in its number of residents. Recent data from Seattle's Office of Economic Development estimates that Georgetown's total population is 1,295 (Seattle Office of Economic Development, 2016). According to 2010 Census information, Georgetown had a population of 1,287 residents. Of those residents, approximately 29.8 percent were people of color (Seattle Parks Foundation, 2017). Hispanic/Latino, African American, and Asian residents tended to have larger resident representation in comparison to other racial minorities. Figure A-1 further details the racial and ethnic composition of the neighborhood.

In general, much of the population in Georgetown are working-age adults. In 2010, the median age for men and women residing in Georgetown was 37.8 and 35.4, respectively (US Census Bureau, 2010). According to the Georgetown Open Space Vision Framework, the average per capita income of residents was $23,936. Approximately 37.5 percent of the residents were living below the poverty line, which is double the average of King County and the City of Seattle itself. (Seattle Parks Foundation, 2017).

WHAT IS HEALTH IMPACT ASSESSMENT?

Health Impact Assessment is a process conducted to analyze the health effects of a proposed policy, project, or program. HIA utilizes qualitative and quantitative research methods, along with community and stakeholder feedback to investigate the current health of the community, and estimate the "health hazards, risks, and opportunities," (Quigley, 2006) the proposal would have.

WHAT IS THE HIA PROCESS?

The HIA process has six steps: Screening, Scoping, Assessment, Recommendations, Reporting, and Monitoring.

> *"Health Impact Assessment is a systematic process that uses an array of data sources and analytic methods and considers input from stakeholders to determine the potential effects of a proposed policy, plan, program, or project on the health of a population and the distribution of those effects within the population. HIA provides recommendations on monitoring and managing those effects." [National Research Council 2011].*

PURPOSE OF HIAS

Health Impact Assessments do not only measure physical health, but are meant to assess the overall quality of life as it relates to current and future policy changes. The World Health Organization (WHO) views health as a combination of physical, mental, and social measures rather than relying on the more traditional US approach of measuring health outcomes like morbidity and mortality.

The reason for taking a more holistic approach toward human health is to better understand how management and policy affect residents and visitors. Factors like the overall neighborhood economy, mobility, availability of health services, environmental conditions, and social services all influence the overall quality of life. The WHO refers to the "social and environmental determinants of health" as the root cause of overall health and disease. Policy decisions lead to immediate and intermediate outcomes ultimately resulting in human health impacts. The purpose of this assessment is to examine the potential health impacts of policy change and to make evidence-based recommendations. The goal of an HIA is to provide decision-makers with the information and recommendations necessary to implement informed policy, with a special emphasis on mitigating the health impacts felt by vulnerable populations.

TABLE A-1. HIA PROCESS

STEPS	ACTIVITIES
1. Screening	Determine whether HIA is feasible, timely, and would add value to the decision-making process
2. Scoping	Create a plan and timeline for conducting HIA that defines: a. The priority issues b. Research question and methods, and c. Participants roles
3. Assessment	1. Create an existing conditions profile 2. Evaluate potential health impacts
4. Recommendations	Determine how the project, plan, or policy can be improved, and how it can mitigate projected negative health impacts.
5. Reporting	1. Create written or visual presentation of the HIA. 2. Communicate the results within the decision-making process.
6. Monitoring	1. Track the impacts of the HIA on decision-making process, decision and implementation. 2. Track the effect of the decision on health determinants.

Source: Human Impact Partners, 2011.

CHAPTER 1: MOBILITY IN GEORGETOWN

An important determinant of both physical and mental health is one's ability to access destinations safely and conveniently. By improving the mobility characteristics of Georgetown, the Georgetown Mobility Project may decrease rates of obesity, cardiovascular disease, diabetes, and poor mental health, as well as premature death. This chapter focuses on four aspects of mobility: walkability, multimodal transportation, single-occupancy vehicles, and recreational physical activity.

> *"The goal of transportation is mobility that connects people with opportunities. Whether it is to school, work or play, the ability to safely and efficiently navigate King County is critical for creating an environment for people to thrive."—King County Determinants of Equity Baseline Project*

WALKABILITY

OVERVIEW

Walkability is a qualitative assessment of how pleasant and safe an area is for pedestrians. Areas with greater walkability have mixed land use, connected streets, pedestrian infrastructure such as sidewalks and crosswalks in good condition, street designs that protect pedestrians from traffic, and pleasant scenery. In walkable communities, residents can walk to nearby destinations, and the built environment encourages walking as a means of transportation. A walkable built environment is important for health because walking is an activity that most people can and do participate in, particularly for transportation. Whether walking to a local store, bus stop, or a car, every trip begins and ends with walking.

CURRENT CONDITIONS

The character and strong sense of place present in Georgetown is an asset to walkability. Distances between many destinations in Georgetown are short enough to make by foot, however sections along many routes suffer from undesirable conditions such as inadequate sidewalks or fast-moving traffic. Georgetown lacks greenspace and tree cover, and pedestrian comfort is hindered by the noise of low-flying airplanes and traffic. Altogether this makes for treacherous pedestrian infrastructure.

Walkscore.com has devised a quantitative metric to assess walkability by analyzing proximity to amenities, with routes within a 5-minute walk contributing the most. The metric also considers population density, block length, and intersection density. According to Walkscore.com, Georgetown is the 47th most walkable neighborhood in Seattle (out of 86 neighborhoods), with a Walk Score of 68, meaning that it is "Somewhat Walkable." Georgetown is less walkable than Seattle as a whole (73, or "Very Walkable"). However, because Walk Score does not consider inadequate sidewalks, lack of crosswalks or traffic speeds, walkability is probably worse than the Walk

Image 1-1. View of 8th Ave S from Georgetown Pump Station Park showing puddles and lack of sidewalks.

Score indicates.

Because Georgetown is an older neighborhood built before zoning encouraged car-oriented development, sections of it are built to human scale. These sections include the commercial area with shops near Airport Way South (but not along the road itself) and the residential blocks between Corson Avenue S and Ellis Avenue South. However, these sections are islands in a network of industrial uses and high-speed traffic and freight routes.

There is a dearth of safe crossings on busy roads such as Airport Way South. Many sidewalks are incomplete, dilapidated, or nonexistent in many places (Image 1-1). It is common for a sidewalk to turn a corner, cut out, and require the pedestrian to walk into the street to get around parked cars (Image 1-1). On many walking routes throughout the neighborhood, there are sections lacking improved sidewalks that are gravel paths or paved shoulders, in varying condition. When it rains, puddles form in the potholes of unmaintained asphalt. The true state of sidewalks is currently unknown as the last assessment of sidewalks in Seattle is ten years old (2007 SDOT Sidewalk Asset Inventory project). An updated assessment is currently being done, and the data should be available in 2017.

Image 1-3. View of S Nebraska St from Airport Way S showing lack of pedestrian infrastructure.

CONNECTIVITY WITH ADJACENT NEIGHBORHOODS

Georgetown's connectivity with adjacent neighborhoods, such as Beacon Hill and South Park, is an important aspect of walkability. Because many services, such a grocery stores, health clinics, and schools are not located within Georgetown itself, Georgetown residents often traverse between neighborhoods. I-5 currently cuts a harsh border between the Georgetown and Beacon Hill neighborhoods, which discourages moving between them by foot. There are few access

Image 1-2. South Park Bridge on 16th Ave S.

Image 1-4. Gravel path next to railroad at E Marginal Way S and 16th Ave S.

points to cross the highway, and pedestrians can perceive the area to be less safe as a result of the auto-oriented built environment (Villaveces, 2012).

A high-quality multi-modal bridge over the Duwamish River connects the neighborhood to South Park (see Image 1-2). However, the route leading to the bridge goes along Marginal Way, a heavy-traffic street, which has only a gravel pathway for pedestrians (Image 1-3).

The South Lucille Street Bridge over the rail yard and under I-5 provides a protected sidewalk for walking (Image 1-5). Walking across this bridge is the fastest way for children to get to schools located in Beacon Hill, since traffic jams in the morning with parents driving kids across the highway.

Image 1-5. View of S Lucille St from Airport Way S.

Image 1-6. Pedestrian walkway on South Lucille Street Bridge.

Image 1-7. Sign to 1st Avenue South Bridge on S Michigan St.

Image 1-8. Underneath WA-509 on S Front St.

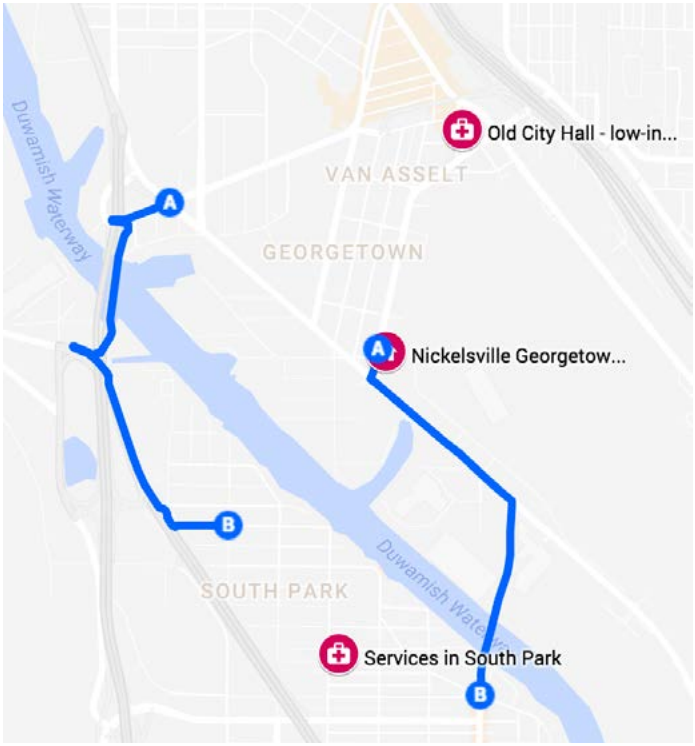
Image 1-9. Entrance to 1st Avenue South Bridge underneath WA-509 on S Front St.

The First Avenue South Bridge is a small pedestrian bridge over the Duwamish River to the north end of South Park. Getting to this bridge can require navigating what locals call "the worst intersection in all of Seattle," at East Marginal Way South and South Michigan Street, and going underneath the raised highway along an area that shows signs of camping and contains litter (Image 1-7).

VULNERABLE POPULATIONS

Vulnerable populations, such as children, elderly, disabled, homeless or low-income persons, are particularly in need of a hospitable walking environment. Georgetown has a high%age of seniors living alone: 56.9% of people aged 65+, higher than 90% of census tracts in Washington (Washington Tracking Network, 2015). So it is important that the built environment be accessible, allowing these residents to maintain their health and daily lives. Walkability is especially important for the elderly because of their aversion toward using public transportation, as a result of safety concerns and access issues (Rosenbloom, 2009).

A large population of unhoused residents reside in Georgetown, living out of vehicles parked throughout the neighborhood, in the Nickelsville Georgetown Tiny House Village, and camping under highways. For this population, accessing services in South Park by foot is essential, since, for many, walking is the only mode of transportation available. Getting to South Park requires crossing East Marginal Way South, and then crossing the Duwamish River at either the South Park Bridge or the 1st Avenue South Bridge (Map 1-1). Residents have requested that services be provided for this population, as they have been a long-time part of the community (Georgetown Open Space Vision Framework, 2017). Providing garbage collection and other services would help mitigate the hardships of living without adequate shelter, help clean up litter, and improve perceptions of safety for everyone.



Map 1-1. Walking routes used by unhoused people in Georgetown.

HEALTH OUTCOMES AND CAUSAL PATHWAYS

The built environment can directly and indirectly affect health by influencing behavioral choices. People living in mixed-use communities with walkable destinations are more physically active than those living in residential-only neighborhoods (Dannenberg, Frumkin, & Jackson, 2011). Inhabitants of communities that incorporate design features to increase walkability benefit from increased opportunities for physical activity, potential reduction of lifestyle-related illnesses, and increased perceptions of safety (Mahmoudi Farahani, 2016). Walkable neighborhoods may help increase social capital (Leyden, 2003) and individuals who are socially engaged and involved in their communities tend to be healthier and live longer (Kaplan, 1988).

Although walking is associated with health benefits, it can also pose risks, especially when street conditions are not pedestrian-friendly. Georgetown has a rate of fatal and serious crashes involving a pedestrian or bicyclist (17.68 per 100,000) that is higher than 90% of census tracts in Washington (Washington Tracking Network, 2016). Installing sidewalks has been shown to decrease pedestrian-related crashes by almost 90%, and even a minimum of a paved shoulder can improve walking conditions and decrease crashes (FHA, 2013). In general, most pedestrian-involved crashes occur at intersections.

PEDESTRIAN LIGHTING

Adding additional pedestrian lights has multiple impacts on health. Research has revealed that crashes are three times more likely on unlit roads at night (Alan, Dipetrillo, Robins, & Pearlman, 2007). Roadways or pathways that are not well-lit decrease pedestrian visibility for drivers. It also detracts from the walkability of the neighborhood, as people may not feel safe walking in the dark. Installing lighting along key roadways or intersections has been used in Delaware in efforts to decrease pedestrian-related crashes and increase

perceived pedestrian safety (Donnell, Patterson, & Gillespie, 2011). If more lighting facilitated decreased injuries or safety concerns, then more people would have been able to use sidewalks and other pedestrian paths more frequently. A systematic review of active travel in the elderly further revealed that the presence of streetlights was positively associated with more walking in older adults (Cerin, Nathan, Van Cauwenberg, Barnett, & Barnett, 2017).

While perceived safety would increase with more pedestrian lights, mixed evidence has been found regarding improved street lighting and crime prevention. The results of systematic review on the relationship of street lighting and crime rates in America found that half the studies saw reductions in crime rates with improved lighting, while the other half found that it was not effective (Farrington & Welsh, 2002). On the other hand, studies in Britain found that improved lighting led to a 29% decrease in crime, and that if targeted to high-crime areas, improved street lighting can be an effective, feasible, and inexpensive way to reduce crime (Farrington & Welsh, 2002).

If crime rates decrease and perceptions of safety increase with more pedestrian lighting, benefits to physical health are also impacted. Rather than using cars, providing lit paths and sidewalks would encourage the general population to walk to destinations. Walking or being active has been linked to the prevention of obesity, as well as less time and money spent on treating other chronic health issues (Bauman, 2004). Additionally, properly lit pathways also affect the economic health and social capital of a region. Groups of people, particularly tourists, are more likely to explore an area, visit businesses or restaurants, and interact with others when they feel it is safe to do so (Mahmoudi Farahani, 2016). The provision of more pedestrian lights would especially benefit neighborhoods in Washington where the sun can set at 4:30 PM during the winter.

ASSESSMENT

This HIA considers plans put forth in the Georgetown Open Space Vision Framework and other planning documents, as well as ideas gathered on field visits to Georgetown. Access to transit, improved pedestrian connectivity, and streets designed for walkability are negatively associated with collision injury (Miranda-Moreno et. al., 2011). Reducing traffic volume can lower crash rates, since traffic volume is a main determinant of traffic conflicts, crashes and fatalities (Litman & Fitzroy, 2005; Ewing & Dumbaugh, 2009). Reducing traffic speed can lower crash and injury rates. Methods of lowering traffic speed include putting streets on "road diets" (so that streets have fewer and narrower lanes), placing street trees near the curb, and utilizing traffic-calming measures such as traffic circles and speed bumps. These measures heighten awareness of possible conflicts for drivers, causing them to slow down (Dannenberg, Frumkin, & Jackson, 2011).

INTERSECTIONS AND CROSSWALKS

Both the SDOT Pedestrian Master Plan (PMP) and the Georgetown Open Space Vision Framework (GOSVF) discuss the importance of crosswalks and pedestrian visibility. With a rise in pedestrian crashes between 2013 and 2015, many concerns have been voiced about pedestrian safety at intersections (SDOT, 2010). Elderly pedestrians and people with disabilities are particularly vulnerable to pedestrian fatalities. Between 2009 and 2015, 60% of pedestrian fatalities involved the elderly (SDOT, 2010). SDOT's Pedestrian Master Plan (PMP) provided specific recommendations on how to improve safety at intersections. Included among their recommendations were: improve pedestrian visibility at crosswalks, optimize crossing times for pedestrians, and increase opportunities for controlled crossings on arterials (SDOT, 2010).

While the addition of marked crosswalks provides a better way for pedestrians to cross intersections and busy roads, most research states that crosswalks alone do not significantly improve safety. A review of pedestrian safety research found that the presence of marked crosswalks alone was associated with no difference in the pedestrian crash rate compared to unmarked crosswalks (Campbell, Zegeer, Huang, & Cynecki, 2004; Koepsell et al., 2002; Zegeer, Stewart, Huang, & Lagerwey, 2001). Additionally, the US Department of Transportation also found that high-traffic multi-lane roads with marked crosswalks alone was associated with a higher pedestrian crash rate than unmarked crosswalks (Campbell et al., 2004). Based on existing evidence, installing crosswalks alone would have little to no effect on decreasing pedestrian injuries and fatalities.

The Federal Highway Administration (FHA) has developed recommendations for intersection improvements that have been shown to reduce crashes involving pedestrians. The most effective improvements are related to increasing the awareness of drivers to pedestrians and maximizing pedestrian visibility. Some of the countermeasures that have been shown to be particularly successful are the following:

» Install pedestrian hybrid beacons at crosswalks, which can decrease pedestrian injuries by almost 70%. This improvement shows the largest impacts on pedestrian injuries,

but it is also the most expensive, with an estimated cost of $50,000–60,000 (FHA, 2013; PedSafe, n.d.).

» Ensure that crosswalk markings are ladder-style markings and repaint markings if necessary. High-visibility crosswalks (which have clear paint and signage) can decrease pedestrian injuries by almost 50% (FHA, 2013).

» Add intersection or road-segment lighting, which decreases over 20% of crashes involving pedestrians (FHA, 2013).

» Improve car signal and pedestrian crossing timing, which can decrease crashes involving pedestrians by up to 50% (FHA, 2013).

Other improvements which require larger construction projects or are specific to certain types of intersections are listed in the FHA publication "Toolbox of Countermeasures and Their Potential Effectiveness for Pedestrian Crashes" (FHA, 2013). These recommendations have successfully addressed pedestrian safety issues in many settings, for example in Toronto, where marked crosswalks in combination with signs, lighting, and flashing beacons showed a decline in pedestrian fatalities (Campbell et al., 2004). Similar findings were shown when crosswalk flashers and flashing beacons were installed in Kirkland, Washington, and San Jose, California (NYC Department of City Planning, 2011).

We suggest that SDOT implement the most applicable of these improvements at the following target intersections and crosswalks:

» Airport Way South/13th Avenue South and South Bailey Street/13th Avenue South (to promote accessibility of community centers and safety of school walking path)

» South Michigan Street/Corson Avenue South/South Bailey Street (important connectivity between residential area and economic centers, Georgetown Playfield, schools, and other businesses; also an intersection with high rates of crashes)

» Airport Way South, from South Albro Place to South Lucile Street (accessibility of economic centers, community priority)

» Ellis Avenue South/South Warsaw Street (safe access to school bus stops and eastern part of neighborhood)

» 6th Avenue South/South Michigan Street (connectivity between northern residential area and art district, South Seattle College)

» East Marginal Way South/Carleton Avenue South (safe crossing of East Marginal Way to access southern neighborhoods and Gateway Park North)

» East Marginal Way/South Michigan Street (location of many traffic incidents; improved access to pedestrian bridge)

Improving these intersections would have a significant impact on health. It would lead to decreased injuries from vehicle-vehicle, vehicle-bicycle, and vehicle-pedestrian crashes. It would also increase the walkability of the neighborhood, encouraging residents and visitors to walk more, and resulting in decreased levels of chronic disease and stress. Improved walkability would also encourage people to walk to stores, restaurants, parks, and other attractions. As a result, economic growth and social cohesion would improve.

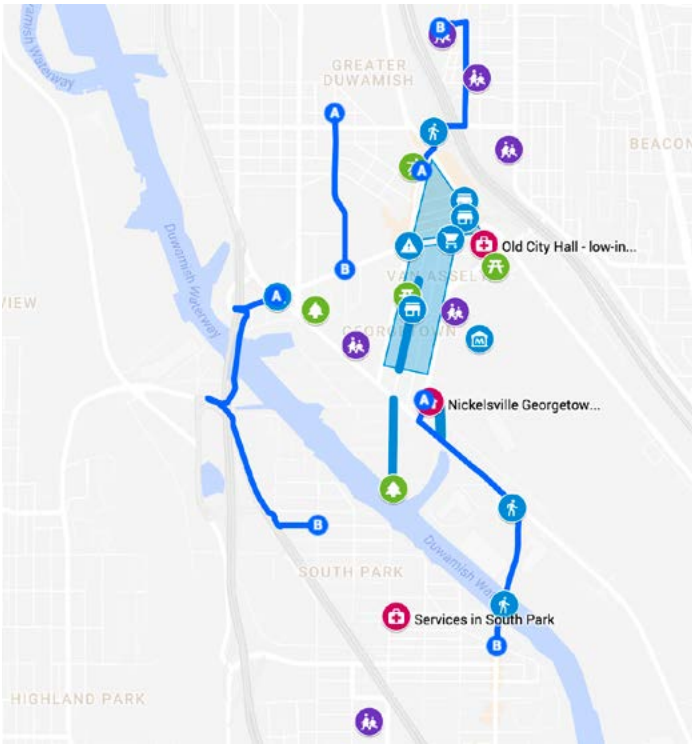
PEDESTRIAN LIGHTING

Along with crosswalk improvements, Seattle's Pedestrian Lighting Plan (PLP) and the GOSVF recommend the addition of more pedestrian street lights. The PLP defines pedestrian lighting as any lighting source that provides lighting for public pathways and gathering areas (SDOT, 2012a). Proper pedestrian lighting can help pedestrians navigate sidewalks, provide visibility and security during night hours, keep businesses open longer, encourage physical activity, and improve access to different social and health services (SDOT, 2012a).

Seattle does not have citywide pedestrian lighting requirements, but PLP recommends that the City prioritize installing street lights in areas that have been indicated as high priority. Specifically, pedestrian lights have been prioritized at pedestrian crossings, transit zones, and areas where there are concerns about security (SDOT, 2012a). Since Airport Way is the primary destination for tourists and visitors, pedestrian lights have been prioritized at Airport Way intersections, along the railroad spurs, and between buildings (Seattle Parks Foundation, 2017). Additional lights are also suggested at the intersection of South Michigan Street/South Corson Avenue/South Bailey Street, as this intersection is an important neighborhood connectivity point. Better lighting in these areas will improve the walkability of Georgetown, likely leading to increased physical activity and associated health benefits, and will also increase the economic health of the neighborhood as decreased safety concerns will encourage more people to visit local retailers and restaurants in evening hours.

PEDESTRIAN-FRIENDLY LAWS

Lowering speed limits can create safety benefits, but motorists must comply for them to have an effect. Evidence suggests that driver perceptions of safe speed are influenced by their expectation of what speed above the limit would trigger a ticket. Therefore, lower tolerances of speeding would help to increase the perception of risk of exceeding limits by even small amounts (Goodwin, 2015, p. 3–16).



Map 1-2. Interactive map of sites of interest to mobility in Georgetown. Click here to view in browser.

INTERFACE WITH I-5 HIGHWAY

Though this would be near-impossible for many reasons, the removal or redesign of the I-5 highway would have positive benefits for connectivity and walkability in Georgetown. Highway removal would improve connectivity between Georgetown and Beacon Hill, and could improve perceptions of safety in this area (City of Seattle, 2008). It would reduce noise and air pollution, making for a more pleasant walking environment in Georgetown, and it would discourage commuters from driving single-occupancy vehicles into the city, thus limiting traffic volumes on the streets of Seattle (City of Seattle, 2008). In addition, highway removal would create excess right-of-way which could be used as open space and/or a city greenway (City of Seattle, 2008), therefore transforming the infrastructure's currently detrimental environmental impacts into positive environmental impacts (Shin, 2006).

RECOMMENDATIONS

» **Build, maintain, and inventory sidewalks and crosswalks.** Complete sidewalk inventory by working with Department of Neighborhoods and the Department of Planning and Community Development to update their inventory of existing sidewalks and crosswalks in Georgetown, including a complete survey of BPSA priority intersections. Priority areas include

- East Marginal Way South between 14th Avenue South
- 16th Avenue South, 6th Avenue South

» **Prioritize 6th Avenue South** over 4th Avenue for pedestrian and bicycle improvements as a connection between the northern residential area to the rest of the neighborhood (see Map I-1 on page v). 4th Avenue is a freight route and is a busier road for traffic than 6th.

» **Plant street trees** near the curb to slow traffic, mitigate air pollution, and create a more pleasant walking environment. Priority areas include:

- East Marginal Way
- Airport Way South
- South Michigan Street

» **Crosswalk and intersection improvements**: Add pedestrian activated crosswalks and improve intersections to allow for high visibility of pedestrians (see previous page for priority locations). Add crosswalks at intersections where truncated ADA domes already exist.

» **Include vulnerable populations** such as unhoused residents, seniors, children and other persons in a participatory planning process. Survey these populations to determine desired mobility and connectivity improvements. Prioritize making the built environment accessible and friendly for children to encourage healthy lifestyles.

» **Clean up litter**. Work with city garbage collector company to determine feasible locations for garbage collection and other services to unhoused residents. Specifically underneath the roadways along the pedestrian/bicycle route to the 1st Avenue South bridge to South Park.

Image 1-10. An exampe of wayfinding painted on the ground.

» **Add and improve pedestrian-oriented signage and wayfinding.** (See Chapter 2 and "Image 2-4. Wayfinding example from walkyourcity.org." on page 38 for more.) For example, to improve access from the Marginal Way and Michigan Street intersection to the 1st Avenue South Bridge, wayfinding painted on the ground could guide pedestrians to the bridge (Image 1-10).

» **Create official pedestrian and bicycle connections** with wayfinding proposed in the GOSVF. Priority connections include:

- between Equinox and South Seattle College to South River Street
- 8th Avenue South to Georgetown Pump Station Park
- "The Flume" connection to Marginal Way South (Image 1-10)

» **Improve pedestrian and street lighting**. Work with Seattle City Light to take inventory of existing light fixtures and to add more street lighting along Airport Way and major thoroughfares to increase perceptions of safety, and to encourage walking to Georgetown's retail core and parks. (SDOT can also collaborate with local businesses to apply for grants from the Office of Economic Development for improved lighting.)

» **Enforce pedestrian-friendly laws** such as setting and enforcing rational speed limits, automated enforcement, and prosecuting DWIs. Identify opportunities to reduce speeding to the speed limit near Bicycle and Pedestrian Safety Analysis (BPSA) priority intersections and interstate and highway exit ramps, including posting visible speed limit signs and additional traffic slowing measures.

» **Improve safety at the intersections** of South Michigan Street between East Marginal Way and Corson Avenue South, especially at the intersection with Corson Avenue South. Explore engineering improvements to the intersection at Corson Ave South, particularly looking at how to reduce running red lights while turning left.

» **Consider advocating for alternatives to replacing I-5** as it ages and reaches the end of its life cycle. While this is a complex and long-term recommendation that would require collaboration between many stakeholders, any solution (including replacement) will be costly and have long-term impacts on health for generations to come. Research ways that a new design could contain and mitigate air pollution, and allow for improved connectivity between neighborhoods.

Image 1-11. "The Flume" walking path between S Myrtle St and E Marginal Way S.

MULTIMODAL TRANSPORTATION

OVERVIEW

The project goals for the Georgetown Mobility Study, as outlined by Diane Wiatr at Seattle Department of Transportation, include safety, access, community health, and mobility. Multimodal transportation impacts each of these areas. When adequately planned, maintained, and managed, multimodal transportation can minimize the amount of people that travel by roadway, help ease congestion, improve passenger safety, reduce travel times, and increase mobility options. Having movement options that support and interconnect with each other reduces congestion and traveler stress and improves residents' and visitors' quality of life.

We looked at transportation safety and access for riders of public transit, bicyclists, and students, what current health outcomes are, and how they might be improved.

CURRENT CONDITIONS

According to the United States Census Bureau, American Community Survey (ACS) 2015, 8% of Georgetown residents are under age 18, about half as many as Seattle in general. 86% of Georgetown residents are ages 18–64, about 20% higher than Seattle. This represents a high number of working-age adults, many of whom commute to work or school.

COMMUTERS

Only 125 people both live and work in Georgetown, but 82% of Georgetown residents work within 10 miles of home (Duwamish Wayfinding and CTR Report, 2012). This represents a much shorter commute than the citywide average for Seattle workers of more than 15 miles one way. 43% of Georgetown workers live 10–24 miles outside the community (Duwamish Wayfinding and CTR Report, 2012). Yet the mean travel time to work for this census tract is 28.3 minutes, compared with 28.1 average minutes for King County (ACS, 2015). Short distances take longer to travel. This could be from traffic congestion. Additionally, since Georgetown is home to 1,300 people and employs 10,000 workers, public transit becomes an essential mode of travel for people commuting to work in Georgetown.

Georgetown has low numbers of active commuters: 48% drive alone, 6% carpool, 26% take public transit, 4% bike, 8% walk, 2% list "other," and 6% work from home (ACS, 2015). According to the Washington Tracking Network (WTN) 2014, a high percentage of people in Georgetown commute alone by car and spend a high amount of income on transportation, between 15-25%. (Community Indicators Consortium, Determinants of Equity Report, 2015)

Image 1-12. Bus stop at 13th Ave S and S Bailey St.

PUBLIC TRANSPORTATION

Currently, there are several King County bus routes that serve the Georgetown neighborhood: route numbers 124, 60, 131, 132, and 154. Routes 124 and 60 primarily serve the east end of Georgetown along or close to Airport Way South. Routes 131, 132, and 154 run along the west end of Georgetown along East Marginal Way South. Depending on the route, the time of day, and whether it is the weekend, the wait time can be 15–30 minutes in between buses. With Seattle's growing population and traffic issues, waiting for a bus can take longer. Slow movement on Carleton Avenue South from navigating around traffic circles results in travel delays and extended exposure of residential areas to exhaust. Bus route 106 used to run through Georgetown, but was re-routed. Additionally, route 124's proposition 1 funding is set to expire within the year.

Bus stops are typically located on busy arterials with limited shelter from weather elements or exhaust. According to the 2007 Urban Transportation Accessibility in Seattle report, the Community Reporting Area of Georgetown rated as "poor transit accessibility." It scored lowest in bus stop density, number of destinations, variety of services and businesses within ¼ mile of bus stops, and sidewalk to street ratio. In addition, ridership may be low due to concerns about safety. Low-income people and people of color are more likely than higher income and white riders to say they avoid riding the bus due to concerns about personal safety (Community Indicators Consortium, Determinants of Equity, 2015).

Increasing bus and other public transportation services through Georgetown would ensure that residents and employees can effectively travel between their homes, jobs, and other areas of Seattle/King County. It provides safe access to social and health care services, including mental health and substance abuse clinics in neighboring areas of South Park and SODO. Further, from a tourism perspective, public transit provides a way for visitors to contribute to the local economy by having them pay for bus fare, as well as having them spend additional money on activities in Georgetown. In this way, they allow for the maintenance and expansion of businesses, and the provision of more jobs. Therefore, the continued maintenance and possible addition of future bus routes through Georgetown can contribute significantly to the physical, mental, social, and socio-economic health of the area.

Figure 1-1. Ellis Ave S and S Myrtle St.

Image 1-13. An example of bicycle parking infrastructure.

BICYCLISTS

In Georgetown, most streets have potential hazards for bicyclists, such as uneven pavement, gravel, and railroad tracks. Bicyclists share many roads with busses and freight without adequate bike lanes or sharrows. Many intersections have dangerous left-hand turns, namely South Lucile Street/Airport Way South and Homer/Corson Avenue South.

Bicycle commuters typically access South Park via East Marginal Way, then cross the river via the South Park Bridge or 1st Ave South Bridge. This route is popular among bicycle commuters to Boeing. Beacon Hill is accessed by crossing I-5 at the Lucille Street Bridge (north) or South Albro Place (south).

Bicycle parking is also an area of concern. For short-term parking defined as less than 2 hours, there is high reliance on personal locking devices and passive surveillance (commercial/retail, medical/healthcare, parks and recreation areas, community centers, libraries). Long-term parking ideally provides lockers or secure racks with restricted access or active supervision (workplace, transit, schools). Currently, there is limited bicycle parking outside of retail establishments and the post office, but none at any of the local parks.

STUDENTS

The Georgetown residential area feeds into Maple Elementary, Mercer Middle School, and Cleveland STEM High School. St. George is a private K-8 school nearby. Seattle Public Schools Walk Route includes neighborhoods east of I-5 (seattleschools.org). Traffic at dropoff and pickup has become very congested since start times were changed this year, so for Georgetown residents, walking and biking to school is much faster and would also be an opportunity for these students to be active (GOSVF, 2017). However, lack of safe infrastructure is prohibitive. Residents must navigate areas with heavy vehicular traffic, inadequate sidewalks, crossing over the interstate, and no alternate walk/bike pathways. According to the Urban Transportation Report, the area ranks among the lowest for sidewalk and crosswalk density. Nationally, it is estimated that less than 16% of students ages 5–15 walk or bike to school (United States Environmental Protection Agency, 2003). More than 50% are driven in private vehicles (Nation-

wide Personal Transportation Survey, 1997).

Students who live outside the 2-mile boundary of the public schools are eligible for bus transportation. Elementary students are transported by yellow school bus. Elementary school bus stop locations this year are at Ellis Avenue South/ South Warsaw Street, South Michigan Street/4th Avenue South, and 5th Avenue South/South Lucille Street. These locations are subject to change based on residents enrolled in the school.

The Lucille Street Bridge has a dedicated walk path on the north side, separated from traffic by a short concrete wall. At Maple Elementary, there is a Safety Patrol station directly in front of the school. There are 2 crossing guard assignments, one at 15th Avenue South/South Shelton Street and one at 15th Avenue South/South Dawson Street. These are located just outside the radius delineating a 10-minute walk, 5-minute bike ride (seattleschools.org).

Middle school and high school students are eligible for an ORCA pass which can be used on Metro busses (ORCA.com). There is a Metro bus stop directly in front of Mercer Middle School on South Columbian Way and in front of Cleveland High School on 15th Avenue South (King County Metro Transit, 2015). Seattle Metro Bus Route 60 adds an additional after school stop at South Bailey Street and 13th Avenue South when Cleveland High School is in session. Low-income students who live within the 2-mile boundary of their attendance area school and are therefore not eligible for the ORCA pass through the school district can apply for one through the City of Seattle's Regional Reduced Fare Program (SDOT).

HEALTH OUTCOMES AND CAUSAL PATHWAYS

According to King County Health Profile for the 98108 Health Reporting Area, the most prevalent poor health outcomes include frequent mental distress (worse than Seattle as a whole), no physical activity (much worse than Seattle), high cholesterol, motor vehicle collisions, obesity, diabetes, lung cancer, hospitalization for heart disease, COPD, and asthma, and lower life expectancy (BRFSS, 2009-2013; PHSKC, 2016; PSCAA Community Air Tool, 2012). Life expectancy for Georgetown and South Park residents was eight years less that residents of Seattle (Gould & Cummings, 2013). Active commuters experience lower BMI, lower risk for developing diabetes, obesity, and heart disease, and lower stress.

BICYCLISTS

Bicycle riders feel unsafe while sharing the road without protected lanes, particularly in heavy traffic areas. Concerns over safety are a major reason why people do not bike (Teshke, 2009). In the US, bicyclists accounted for 2% of all traffic deaths and 2% of all crash-related injuries in 2014. (National Highway Traffic Safety Administration) In a 2015 study, light trucks were the most frequently involved vehicle in motor vehicle crashes in which a pedalcyclist was killed. 45% (352 of the 783) of the pedalcyclists killed were struck by light trucks (National data, DOT Traffic Safety Facts, 2015).

Poor air quality is also a major concern for this area. The Chronic Obstructive Pulmonary Disease hospitalization rate, adult asthma prevalence, and adult asthma hospitalization rate is much higher than that in Seattle. In Upstream Reports, the respiratory hazard index was higher than 97% of American neighborhoods. The risk of getting cancer from air pollution was much higher than for Seattle residents in general (PSCAA Community Air Tool 2012).

PUBLIC TRANSPORTATION

Many elements of being a transit rider are stressful. Because there is a low density of bus stops, it takes time to walk to them. People walking to and from bus stops and waiting at bus stops may be targets for violence. The 2013 King County Rider/Non Rider Survey reveals that personal safety is an area that customers rank as a high priority but one that has below average satisfaction. Low diversity of businesses and services within ¼ mile of bus stops limits access to recreational opportunities and other resources.

However, there are also many health benefits from using public transportation. People using public transportation are two times more likely to meet recommended exercise levels (more than 30 minutes walking per day) because of walking between bus stops and destinations (Lachapelle & Frank, 2009). Connectivity can provide stress relief by improving access to destinations.

STUDENTS

Adolescent obesity is a major concern for this community. According to the Washington Tracking Network, the average body mass index (BMI) for this age group is 24.36 which is higher than 90% of census tracts in Washington State (WTN, 2015). The long-term sequelae of childhood obesity include increased risk of developing hypertension, diabetes, cancer, asthma, depression, and premature death (Johnston, 2008).

Active transport to school leads to better health outcomes for kids. McDonald (2008) found that active transportation to school may be an important strategy to increase and maintain physical activity levels for low-income youth and youth

of color. Children who walk or bike to school arrive ready to learn, have fewer behavioral issues during the school day, and tend to be more physically active (Cooper, 2003; Alexander, 2005). Landsberg (2008) found that actively commuting adolescent boys were less likely to smoke. Increased physical activity lowers BMI, improves mental stress and alertness and may protect against developing chronic disease later in life (Hume, 2009). It promotes mental health and well-being by allowing opportunity for social exchange, community experience, and environmental interaction that inspires curiosity and a sense of adventure (Wender, 2003; Galea, 2005; Guite, 2006).

High traffic volumes combine with unsafe infrastructure to increase risk of traffic-related crashes for children walking or biking. Children 14 and younger accounted for 5% of all pedalcyclists killed and 12% of those injured in traffic crashes in 2015 (National data, DOT Traffic Safety Facts, 2015). Motor vehicle trauma is the leading cause of death among children after infancy. Child pedestrians represent 25% of these fatalities (Grossman, 2000).

ASSESSMENT

BICYCLISTS

The Georgetown Mobility Study proposes significant road surface improvements, including paving, resurfacing railroad tracks, delineating bike lanes, and installing cycle tracks. These improvements will improve the flow of traffic and the safety of walkers and cyclists, and reduce the potential for traffic crashes. Teschke et al. (2012) found that there are higher odds of injuries when there are train tracks and downhill road grades, and the odds of injury are lowest for cycle tracks, but also lower on roads without parked cars and with bike lanes. Pucher, Dill, & Handy (2009) found that colored lanes, lane markings, and bike boxes increase safety as cars are more likely to yield to bikes.

For commuters especially, road surface improvements along Airport Way South, Ellis Avenue South, and the proposed multiuse trail along East Marginal Way will improve safety for bicyclists on these high-use roadways. This may then translate to more commuters choosing active transport. Dill & Carr found that adding a mile of bike lane per square mile increased the number of workers commuting by bike by 1% (2003).

PUBLIC TRANSPORTATION

The SDOT Transit Master plan lists Georgetown/South Park as a priority area for expanding public transportation services, however, there is no specific detail or action listed to do so in the following years (Seattle Department of Transportation, 2012). Additionally, route 124's proposition 1 funding is set to expire within the year. Losing route 124, a route that runs through Georgetown's retail and restaurant core, would devastate the economic vitality and health of the area.

The Georgetown Open Space Vision Framework suggests installing an Intelligent Transportation System along South Michigan Street and South Bailey Street from East Marginal Way South to Corson Avnuee South, which will have a significant impact on traffic flow and reliability of busses. Improvements to streets that house bus stops improve safety and accessibility for walkers and cyclists, increasing mobility options.

These improvements combine to potentially convert single-occupancy drivers and carpoolers to use public transportation and increase their physical activity, leading to health benefits. Georgetown residents have also suggested incorporating a Georgetown stop on route 101, which will potentially increase the community's access to health services in Renton and Downtown Seattle.

Bus stop shelters (Image 1-14) provide protection from the weather elements, an improved perception of safety from trucks and freight traffic, and can deter crime. Increasing the number of shelters and quality of shelters would improve rider experience.

ACCESS TO SCHOOLS

According to the Seattle Schools Transportation and Safety Standards 2016–2017, the District Transportation Department works with the City of Seattle School Traffic Safety Committee to improve traffic safety, improve student health and

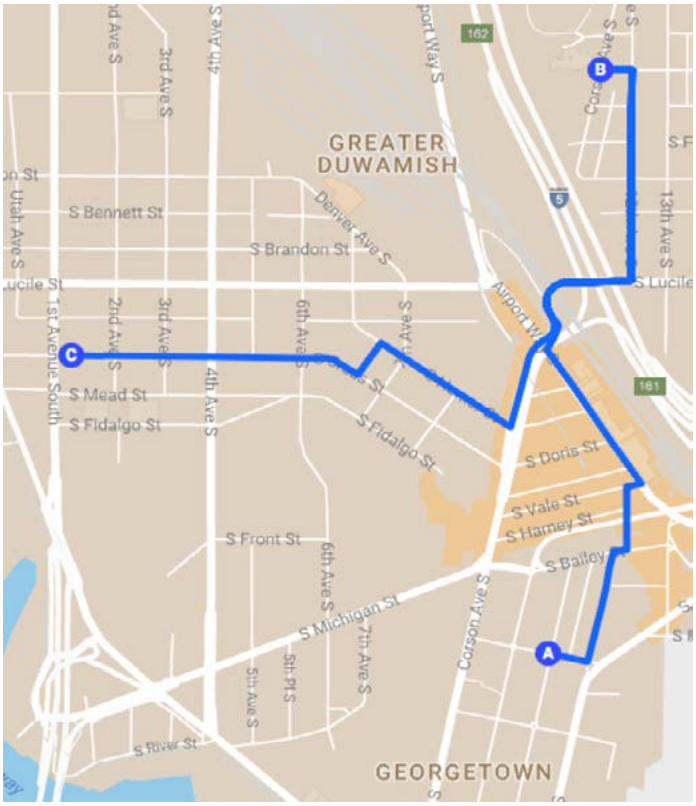
Image 1-14. An example of a bus shelter.

wellness, and reduce the District's carbon footprint by: (1) reviewing adult crossing guard placement to support the recommended one-mile walk boundary; (2) administering the Safe Routes to School Center mode choice survey every June; (3) establishing a Walking School Bus route at all K-8 schools in partnership with the Transportation Department, City of Seattle Traffic Safety Committee, and school principals.

Improving the perception of safety is a key factor in inspiring more children and parents to support walking and biking to school (Hume, 2009). Adolescents whose parents were satisfied with traffic lights and crossings were twice as likely to walk or bike to school. Visible safety interventions such as signage for safe pedestrian crossing, flashing yellow beacon lights, safety patrol attendants, and a School Walk Route Plan can improve parents' perception of safety and will likely inspire greater participation in active commuting.

A School Walk Route Plan is usually a map or written document to inform parents and school children about walking routes within a one-mile walking distance of the school and a plan to make safety improvements as needed. It recommends a walking route to school based on considerations of traffic patterns and existing traffic controls such as crosswalks, traffic lights, or school safety patrol posts. The chosen route should seek to limit the number of school zone crossings in a way that encourages students to cross streets in groups. In addition, it should seek those routes that provide the greatest physical separation between walking children and traffic, expose children to the lowest speeds and volumes of moving vehicles, and have the fewest number of road or rail crossings (Washington Administrative Code (WAC), 392-151-025). Schools are responsible for distributing walk route maps to parents and students each year.

Maple Elementary has such a route plan, but it is not known whether it has been circulated among school attendees and their families (Seattleschools.org). The map currently published by SDOT includes many details, such as the locations of traffic signals, designated school crossings, and which streets have sidewalks. A simpler map with designated routes for each of the two residential areas would be easier to use. Also, by encouraging walkers to take only one route out of the neighborhood, it is more likely there will be safer groups of walkers, rather than children walking alone. For example, the south residential area would funnel toward Ellis Avenue South via South Eddy Street or South Bailey Street to South Bailey Street and 12th Avenue South, then north to South Vale Street and cross Airport Way South here, at an improved pedestrian crossing, and follow north toward the South Lucille Street Bridge. The north neighborhood would funnel toward the Georgetown Playfield via South Homer Street and turn north onto Corson Avenue South toward the South Lucille Street Bridge. Both paths would follow the bridge path over the interstate and turn north on 12th Avenue South, a designated neighborhood greenway that leads directly past St George School on 13th Avenue South and Maple Elementary on Corson Avenue South. This route could be designated with dedicated signs and inground medallions/wayfinding markers to follow.



Map 1-3. Proposed Maple Elementary School Walk Route Plan.

Many of the improved walk/bike paths as proposed by the GOSVF would be utilized by this improved Walk Route Plan. These locations include Ellis Avenue South, Carleton Avenue South, South Orcas Street, River Walk, and Airport Way South, and additional safe crossings on Corson Avnuee South at South Lucile Street and Airport Way South/South Vale Street. Flashing yellow beacons could be added to intersections near the schools. A study completed by the Washington Traffic Safety Commission has identified these as one of the most effective ways to reduce speeds of vehicles in school zones.

The Walking School Bus is a concept that has become popular internationally. This program designates parent chaperones to lead walking groups of children to school along their pub-

lished school walk route plan. Roberts (1995) found that walking with an adult reduced the risk of child pedestrian injury by at least 70%. Johnston (2006) found that a Walking School Bus Program increased the number of walkers by 25%. The program also reawakened a sense of school community and trust among families from housing developments and low-income neighborhoods. This social connection translates to greater participation. Hume (2009) found that children whose parents knew many people in their neighborhood or whose parents reported their child had many friends in the neighborhood were more likely to be active commuters. Encouraging groups of friends to commute together may be an effective strategy to increase active commuting. In Auckland, New Zealand, as of November 2007, one hundred schools run 230 Walking School Buses with over 4,000 children and 1,500 adults participating.

For children who will continue to use school bus transport, recommendations from the proposed Georgetown Open Space Vision Framework study will improve safety for child pedestrians en route to and from current school bus stop locations. Key intersections are outlined in the GOSVF Connectivity Plan:

- Ellis Avenue South/South Warsaw Street: primary and secondary improved walking and bike route
- South Michigan Street/4th Avenue South: secondary improved walking and bike route, adds a safe crossing at bus stop location.
- 5th Avenue South/South Lucille Street: primary and secondary improved walking/bike route, River Walk will be adjacent to the bus stop, adds a safe crossing at bus stop location.

The state's Safe Routes to School Program funds these types of interventions. This program is application-based and serves to aid public agencies in funding projects that increase the number of children using active transport to get to and from school. Funding is also provided for infrastructure projects within 2 miles of a school, educational activities, and encouragement activities. In 2005, Boarnet found that children who would pass these improvement projects were more likely to convert to walking or biking to school. In Marin County, California, a Safe Routes to School Program increased walking to school by 64% and increased biking to school by 119%. Improvements to infrastructure addressed bike paths, crosswalks, traffic signals, and sidewalks. In addition, there was extensive planning and strategy to support education, enforcement, strong community partnerships, and financial support (Boarnet, 2005).

RECOMMENDATIONS

BICYCLISTS

» **Implement infrastructure improvements** as outlined in the GOSVF Connectivity Plan, including off-street trails, cycle tracks/protected bike lanes, and neighborhood greenways. These projects could be funded through WSDOT's Pedestrian and Bicyclists Program.

» **Install bike corrals** at Georgetown Playfield, Ruby Chow Park, and Oxbow Park, and Neighborcare Health which is also adjacent to a main transit hub area at South Bailey Street and 13th Avenue Street. Work with local businesses to evaluate the option of installing bike corrals in public right-of-ways and where vehicular parking is prohibited.

» If **bike share** comes back to Seattle, including Georgetown in the service area would benefit walkability in the neighborhood and connectivity to other locations throughout the city. An equitably implemented bike share program could improve mobility, especially for low-income persons. Following NACTO's Design Guide, installing bike share near bus stops, and ensuring walkable station spacing are key to a successful and equitable program (NACTO, 2015). Implementing bike share could also improve safety and lower injury rates for cyclists and pedestrians in Georgetown. Since a motorist is less likely to collide with a person walking or bicycling when more people walk or bicycle, policies such as bike share that increase the numbers of people walking and bicycling can be an effective route to improving safety (Jacobsen, 2015). Additionally, bike share users may be at lowered risk of injury compared to bicyclists riding personal bikes (Fishman & Schepers, 2016).

PUBLIC TRANSPORTATION

» **Implement the Intelligent Transportation System** as described in the GOSVF to improve traffic flow along South Michigan Street and bus transit reliability.

» **Improve bus stop amenities**, including enclosed shelter, seating, lighting, trash receptacles, and route timetables. Work with local police department to evaluate feasibility of monitoring emergency call boxes.

» **Move bus route 60** away from some of the residential areas it currently travels. Move the route off of residential Carleton Avenue South to cross along Corson Avenue South and South Lucille Street between East Marginal Way South and 15th Avenue South. This route would serve a larger walkshed in Georgetown and improve service to South Seattle College and Cleveland High School. This change would reduce air and noise pollution for residents, increase amenities near the bus stop, and allow for trees to be planted

along Carleton Avenue South, as mentioned in the GOSVF (White, 2015).

» **Renew Proposition 1 funding** to pay for King County Metro Transit's Route #124 that runs through Georgetown.

» **Reroute King County Metro Transit's Route #101** to go through Georgetown to increase bus service to the area.

STUDENTS

» **Publicize a simplified School Walk Route Plan** with distinct, designated routes. Install dedicated signage and in-ground medallions or wayfinding markers along the route.

» **Improve infrastructure**:

- Install flashing yellow beacons/ lights at key school intersections: South Shelton Street/12th Avenue South and Corson Avenue South (Maple Elementary), South Dawson Street/13th Avenue South (St George), South Columbia Way/South Oregon Street (Mercer Middle School) and South Lucille Street/15th Avenue South (Cleveland High School).
- Consider moving the bus stop at Ellis Avenue South/Warsaw to Carleton/Warsaw to divert students away from border freight streets and allow access to the interpretive River Walk path, as proposed by GOSVF.
- Install electronic, driver speed feedback signs at intersections near schools. This may also be used to display the school speed limit during the time periods it is in effect.
- Reduce speed limit to 20 mph when children are present on non-arterial streets along walk path.
- Develop Neighborhood Greenway formation on South Orcas Street, as outlined in the Seattle Bicycle Master Plan. These roadways lead toward the Lucille Street Bridge connecting the residential areas to the schools.
- Additional safe crossing at Ellis Avenue South/South Warsaw Street to allow safe pedestrian access to the Opportunity Skyway High School.

» Encourage school districts to implement Safe Routes to Schools programs in their schools, specifically, a **Walking School Bus program for Maple Elementary**. Many program resources are available to school principals, teachers, and parent volunteers.

SINGLE-OCCUPANCY VEHICULAR TRANSIT

OVERVIEW

Single-occupancy vehicular transit (or SOV) is common in the Georgetown neighborhood of Seattle, especially for commuters to the industrial properties. Its adverse effects on the health and well-being of Georgetown residents include increased stress and air pollution, leading to poor cardiovascular and respiratory health.

CURRENT CONDITIONS

Georgetown currently boasts a unique mix of industrial, commercial, and residential properties scattered throughout the entire neighborhood. This creates a challenge when trying to figure out how to combat the problem of overusing SOV vehicles. Most residents in Georgetown commute to and from work by driving alone in a car, which contributes to both congested roadways and poor physical health. However, this is not the only problem the neighborhood has with SOV vehicles daily.

Due to Georgetown's location, it serves as a main thoroughfare for commuters who drive through the neighborhood without stopping. This is often done recklessly and at extremely fast speeds due to most of the main arterial roads being straight. Our initial findings of the neighborhood after walking throughout it extensively show that the neighborhood struggles in controlling its volume of vehicles during commuting hours of the day. During the AM/PM rush hours, it is not uncommon to see not a single pedestrian walking on the street.

The abundance of travelling cars creates a cloud of both air and noise pollution, which is expelled onto Georgetown residents. Both SOV cars and freight trucks contribute to this problem. Freight trucks represent a third of vehicles traveling on Georgetown streets on a given weekday, creating another unique set of adverse health problems that are experienced by Georgetown residents.

Trucks exiting on Corson Ave follow the street through the residential area of the neighborhood to more easily get to E. Marginal Ave, an artery that is much more accommodating for freight. No street restrictions and lack of speed limits create a dangerous environment for residents of this area. This results in many traffic injuries which significantly impact the health of Georgetown residents. Map 1-4 indicates locations

Image 1-15. 8th Ave S and E Marginal Way S.

Image 1-16. 4th Ave S and S Michigan St.

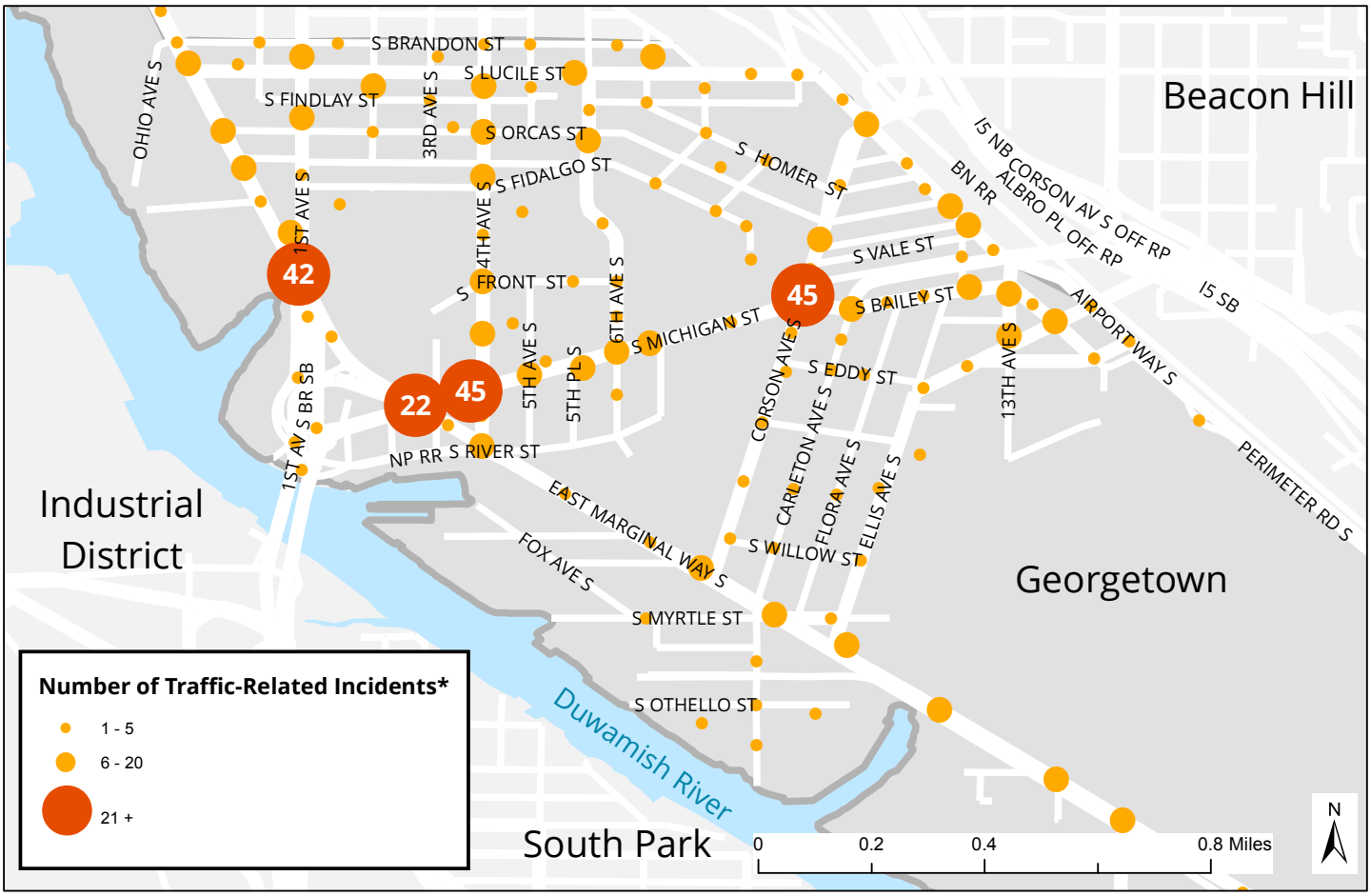
where the majority of traffic incidences in Georgetown happen.

The Port of Seattle predicts that activity around the port will increase over the next 20 years as our region grows, pushing an increased strain of freight into the Georgetown community. Along with this growth comes the growth of even more adverse health effects, such as increased air pollution, lessened pedestrian safety, and increased traffic congestion.

HEALTH OUTCOMES AND CAUSAL PATHWAYS

Through controlling the volume, speed, and location of various SOV's, residents of Georgetown are more able to live healthier lifestyles. The EPA discusses the negative externalities associated with smog contributed by SOV's in their 2002 publication on ozone, and many of their findings suggest a strong linkage between SOV's and public health (EPA, 2002). On any given weekday, the number of stagnant vehicles (primarily at stoplights) in Georgetown is likely greater

TRAFFIC INCIDENT HOTSPOTS IN GEORGETOWN, SEATTLE Created by Alison Turner on April 25, 2017



*911 traffic incidents occuring in 2016 including abandoned vehicles, blocking vehicles, driving while under the influence (DUI), motor vehicle collisions, and traffic (moving) violations

Sources: Seattle Police Department 911 Incident Response 2017, Neighborhoods 2014, Street Network Database 2017, King County

Map 1-4. Traffic incident hotspots.

than those in more suburban neighborhoods to the north. The EPA also provides findings that vehicles that are moving as opposed to idling, produce a much lower rate of CO_2 in the air around the roads. In areas where higher amounts of traffic are more common, traffic signal coordination becomes a much clearer pathway for increased public health. Many of the issues associated with SOVs in and around Georgetown can continually be remedied through both the addition and increased provision of multimodal transportation (a factor discussed earlier in this chapter).

ASSESSMENT

Numerous problem spots and projects have been addressed by SDOT in the Freight Master Plan, along within the Georgetown Open Space Vision Framework. SDOT has already identified the main arteries connected to SOV's (freight trucks included), and has discussed the plan to develop those further into an even more comprehensive freight network. The Freight Master Plan also suggests the ideas surrounding the development of more highly efficient delivery freight vehicles.

SDOT's classification of arteries (limited access, major truck streets, minor truck streets, and first/last mile connections) allows for more analysis and policy to be made on roadways that might be experiencing above-average SOV traffic. The Freight Master Plan serves as an incredible guide and resource for how future plans can combat the abundant negative externalities surrounding public health in Georgetown. By focusing on traffic volume in the neighborhood, we are allowing ourselves the means of calculating and addressing which streets could use built additions, such as speed limit signs or speed control devices (speed bumps). However, this

plan could be improved. The addition of signs limiting which vehicles were allowed on specific roadways would allow for even more control of vehicular speeds and pollution, and create a sense of "neighborhood traffic mitigation" that allows for a healthier, more pedestrian-friendly residential neighborhood. Possible signs, which have been used in other locations, are:

- "Slow, children at play" with symbols of children playing with ball or on a teeter totter (for use near parks)
- "State law: 'Yield' (as symbol) to 'pedestrians' (as symbol) within crosswalk"
- "SLOW: Pedestrian crosswalk"
- "SLOW: Residential area"

RECOMMENDATIONS

» **Add speed bumps** to limit the tendency of commuters to speed down Corson Avenue. The direct access from I-5 to Corson creates a path of least resistance for truckers attempting to bypass congested Michigan Street.

» **Add speed limit signs** in/around residential and industrial areas to better control speedy commuters. These signs could be placed immediately off of I-5 and throughout Corson Avenue, Carleton Avenue South, Flora Avenue South, and Ellis Avenue South.

» **Add signs that alert freight trucks of "residential roads."** This would allow for a clearer understanding of where to be increasingly alert for children, pedestrians, and bicyclists.

» **Changing current parking laws** in Georgetown to prevent freight drivers from parking trailers overnight on Georgetown roads. This is primarily done after 6pm on Airport Way South, and South Albro Place.

» **Increasing (or maintaining) faster speed limits** on roads you would like SOV vehicles and freight trucks to use as arteries such as East Marginal Way and Michigan Avenue.

» **Traffic Signal Coordination** on areas around Michigan Ave or East Marginal Way during peak commute times.

PHYSICAL ACTIVITY & RECREATION

OVERVIEW

Physical activity is an important determinant of health and has been linked to many health outcomes, including obesity, cardiovascular disease, diabetes, hypertension, mental health, and premature death (Warburton, Nicol, & Bredin, 2006). The built environment is an important determinant of daily life activity, including exercise. Parks, trails, and easy walkability all contribute to an atmosphere that encourages and enables physical activity, which can lead to decreased levels of chronic health conditions, as well as create social cohesion and community vitality.

CURRENT CONDITIONS

Compared to Seattle as a whole, Georgetown has relatively little green space, trails, and other physical activity facilities. The amount of green space in Georgetown is 20% lower than the city average, and less than half of the residential areas are within ¼ miles of a park (GOSVF, 2017). The most utilized park is Oxbow Park, as it is located within the residential area. Oxbow boasts the famous Hat and Boots sculptures, as well as a kids' play area and the Georgetown P-patch (Image 1-17). It is an important destination for Georgetown residents of all ages. However, residents have expressed concerns over the proximity of Corson Avenue South, a busy street to the west of the park, which is a safety concern for children playing at the park. Georgetown Playfield is a park in northern Georgetown that provides many facilities that encourage physical activity: soccer and baseball fields, a kids' play area, picnic benches, and a water play area. The park is currently under renovation to increase its utility and attractiveness for visitors. However, community members prefer to visit Oxbow Park, which is easier and safer to access. Of specific concern is the need to cross Michigan Avenue South when travelling to the park from the residential area. Ruby Chow Park, owned and currently being redeveloped by King County International Airport, also provides some green space, although it is not well utilized by community members. Additionally, Gateway Park North, commonly referred to as the "Pump Station," is used by residents as an access-point to the Duwamish River (Image 1-18 and Image 1-19). Although the area is still under review for designation as a street end, the community has improved the area and hopes to be able to invest more in this river access point. The path between the residential area and Gateway Park North requires crossing East Marginal Way.

Image 1-17. Oxbow Park, located at 6430 Corson Ave S.

There is no pedestrian crosswalk at East Marginal Way/Carleton Avenue S, and the west edge of East Marginal Way does not have adequate sidewalks or space for pedestrians to walk if they were to cross at a different intersection. Additionally, 8th Avenue South is in very poor condition, with many potholes and absent sidewalks. These conditions represent a high risk of injury when travelling to Gateway Park North and may deter people from traveling to the park by foot.

No current trails exist in Georgetown, however there is a connection to the Duwamish Trail in South Park over the 1st Avenue North Bridge. Georgetown residents tend not to use this trail because of safety concerns over illicit practices that take place on the trail. Additionally, although Georgetown is small enough that distances do not deter people from walking, the streets with heavy traffic and poor pedestrian and bicycle infrastructure prevent residents from choosing active means of transportation.

HEALTH OUTCOMES AND CAUSAL PATHWAYS

Physical activity has many health benefits. It is effective at both preventing chronic diseases and treating or managing health problems. These benefits extend across a lifetime (Sallis et al. 2012; Frank, Engelke, & Schmid, 2003). Inactivity is an important contributor to obesity, especially in combination with other risk factors, such as poor diet (Frank, Engelke, & Schmid, 2003). Recreation can also reduce cardiovascular disease, type 2 diabetes, hypertension, cancers, and arthritis. Physical activity also contributes to decreased stress levels and better mental health (Frank, Engelke, & Schmid, 2003; Warburton, Nicol, & Bredin, 2006; TRB, 2005).

Currently, about 18% of adults in Georgetown do not en-

gage in exercise, which is higher than the Seattle average of 13% and in the worst quartile nation-wide (GOSVF, 2017; BRFSS, 2009). 7.5% of the residents walk to work and 6.4% bike, whereas more than half of the residents commute to work by car (WTN, 2016). This lack of physical activity is likely one contributor to some of the health problems faced by Georgetown residents. The adolescent obesity rate is high in Georgetown, with a mean body mass index (BMI) of 24.36 kg/m2, compared to a statewide mean BMI of 22.94 kg/m2 (WTN, 2015). The rate of hospitalization due to heart diseases is also much higher in the 98108 zip code area (which includes Georgetown, South Park, and some of Beacon Hill) compared to the Seattle average, and the prevalence of frequent mental distress is 11%, which is in the worst quartile nationwide and lower than the Seattle average of 14% (PHSKC 2016; BRFSS 2009). The lack of physical activity can contribute to each of these health outcomes.

The built environment is an important determinant of physical activity, especially for low-income urban residents (Parks, Housemann, & Brownson, 2003). However, the presence of a recreational facility does not guarantee that people will use it and gain better health. Communities are more likely to utilize these facilities when they are well maintained, separated from busy roads, equipped with amenities (such as restrooms and trash bins), and aesthetically pleasing (McCormack, Rock, Toohey, & Hignell, 2010; Reynolds et al., 2007; Troped et al., 2001; Starnes, Troped, Klenosky, & Doehring, 2011). Although the associations between parks and trails and increased physical activity are not clear, in general, recreation is increased more by investing in parks than in trails (Librett, Yore, & Schmid, 2006; Huston, Evenson, Bors, & Gizlice, 2003; Parks, Housemann, & Brownson, 2003). Additionally, for youth and children, it is especially important that playgrounds are stimulating for all ages and that sport fields are available (McCormack, Rock, Toohey, & Hignell, 2010). Communities are more likely to utilize these facilities when they are well maintained, separated from busy roads, equipped with amenities (such as restrooms and trash bins), and aesthetically pleasing (McCormack, Rock, Toohey, & Hignell, 2010; Reynolds et al., 2007; Troped et al., 2001; Starnes, Troped, Klenosky, & Doehring, 2011). A community is also more likely to use a park that has safety features, such as lighting, surveillance, and safety from road crashes (McCormack, Rock, Toohey, & Hignell, 2010; Ries et al., 2008; TRB, 2005). When designing a park with the intention of increasing physical activity, it is important to incorporate these features. This will benefit the health of the community not only by increasing recreation, but also by providing increased contact with nature and other community members, which decreases stress levels and increases general well-being.

Another important consideration is the level of air pollution in the urban setting that Georgetown is part of. Compared to normal activity levels, exercising increases respiratory rates and causes breathing to shift to predominantly the oral pathway. This leads to more pollutants reaching the lungs than would otherwise. However, the health benefits of physical activity exceed the harms caused by increased exposure to air pollution while exercising (Andersen et al, 2015). Parks and trails should be designed to minimize exposure to traffic and industrial pollution, especially for children (Giles & Koehle, 2013).

Image 1-18. Entrance to Georgetown Steampump Park.

Image 1-19. View of the Duwamish River from Georgetown Steampump Park.

ASSESSMENT

Several projects proposed by the Georgetown Mobility Study are related to recreational physical activity. The GOSVF has proposed adding many parks and trails to the neighborhood. A site to the south of Fire Station 21 may be redesigned as a dog park, which would also benefit workers who bring their dogs to work. A dog park could significantly contribute to mental health, as it would provide access to green space and interactions with pets and other community members. It may also encourage workers and resident dog-owners to walk more, but would not likely increase physical activity levels while at the park (Evenson et al, 2016). Another benefit of this park would be increased community surveillance in an area of the neighborhood that some Georgetown residents are hesitant to visit because of safety concerns.

Another site that has been proposed for park development is Gateway Park North. Because the community is very invested in this site, it is likely to be an important neighborhood destination, and walking to the park would provide good opportunities for physical activity. Designating this property as a street end and designing a park with recreational considerations is likely to increase physical activity. However, because the road conditions between the residential area and Gateway Park North may contribute to a larger number of traffic-related injuries for people traveling to the riverside park, the park development should be accompanied by improvements on 8th Avenue South (installing and improving current sidewalks and clearly designating parking spaces) and a pedestrian-activated crosswalk at East Marginal Way South/Carleton Avenue South.

In addition to increasing the number of parks, the Georgetown Open Space Framework suggests creating a neighborhood greenway (2016). The trail may be used for jogging and recreational biking and provide better access to parks, which would increase physical activity and the associated health benefits. In order to ensure trail use, the design and location of the neighborhood greenway should incorporate community input about the destinations that they would use the trail to access and trail amenities that would encourage its use. The GOSVF identified Airport Way South, Oxbow Park, and Georgetown Playfield as important destinations, however the trail may also be used to access South Seattle College or the St. Vincent de Paul Food Bank. The neighborhood greenway could also be an improvement that increases the connectivity and walkability of the neighborhood.

Projects that are most likely to provide health benefits are those that improve the safety and accessibility of current parks. The intersection at South Michigan Street, Corson Avenue South, and South Bailey Street is a key intersection in enabling families to travel from the residential area to the Georgetown Playfield. By improving this intersection, the Playfield will be more accessible and fewer injuries will occur while traveling there. Street art could also be added to the intersection to make the walk to the Playfield more attractive, and thus increase physical activity. Additionally, Corson Avenue South is located just west of Oxbow Park, and trucks often use this route as a shortcut through the neighborhood. The suggestion to improve the walkability of Corson Avenue South is likely to contribute to increased use and safer use of Oxbow Park, especially if the park is taken into consideration during the design of the street changes. Specifically, calmer traffic on Corson Avenue South will prevent crashes if children run into to street and will decrease stress for parents and older adults when visiting the park. Additionally, planting bushes along the west border of the park will block noise and air pollution, as well as create a physical barrier between playing children and the street traffic.

RECOMMENDATIONS

- **Implement traffic calming** on Corson Avenue South between South Warsaw Street and South Eddy Street (install speed limit signs, park signs, and a speed bump) and create separation between Oxbow Park and the road (plant bushes that will block noise and air pollution)
- **Improve safety** of South Michigan Street, Corson Avenue South, and South Bailey Street intersection according to improvement recommendations stated in Walkability section.
- **Designate Gateway Park North as a street end and improve 8th Avenue South walkability** by installing and improving current sidewalks, clearly designating parking spaces, and installing a pedestrian-activated crosswalk at East Marginal Way South.
- **Use children- and adolescent-oriented designs** in walkability improvements and park features in order to increase physical activity among youth.
- **Incorporate community feedback** into design of neighborhood greenway.

CONCLUSION

Implementing safer and more active transportation options in Georgetown would have positive impacts on reducing negative health determinants and increasing positive health determinants. These impacts as various magnitudes and severities, as shown in Table 1-1.

TABLE 1-1. POTENTIAL HEALTH IMPACTS IF MOBILITY CHAPTER RECOMMENDATIONS ARE ADOPTED

HEALTH DETERMINANTS	IMPACT	MAGNITUDE	SEVERITY
Injury/death from collision	✚	• • •	▲
Chronic disease (cardiovascular disease, obesity, diabetes, respiratory disease)	✚	• • •	▲
Poor mental health	✚	• • •	▲
Premature death	✚	• •	▲
# people getting 30 minutes of daily exercise	✚	• • •	▲
Air pollution	✚	• •	▲
Feeling safe while using public transportation	✚	• •	▲
Feeling safe while walking outdoors	✚	• • •	▲
Life expectancy	✚	• • •	▲
Level of stress experienced	✚	• • •	▲
Access to health services among vulnerable populations	✚	• •	▲
Access to healthy foods	✚	• •	▲

✚ = Changes that may improve health
━ = Changes that may detract from health
? = Unknown how health will be impacted
● = No effect on health

• = Causes impacts to no or very few people
• • = Causes impacts to wider number of people
• • • = Causes impacts to many people
= No Data
Note that this is relative to population size

▲ = Causes impacts that can be quickly and easily managed or do not require treatment
▲ = Causes impacts that necessitate treatment or medical management and are reversible
▲ = Causes impacts that are chronic, irreversible or fatal
= No Data

CHAPTER 2: NEIGHBORHOOD AND COMMUNITY DEVELOPMENT

Development has gripped the Pacific Northwest, and Seattle is well on its way to becoming a global metropolitan hub. Seattle's history as a center for innovation propelled the development of an aerospace industry leader, Boeing, that is now recognized as a commercial giant throughout the world. Similarly, the dot-com bubble and subsequent tech boom created myriad entrepreneurship opportunities that continue to drive economic development. Growth within the region has provided much desired revitalization of some neighborhoods, though not without costs to communities.

To date, Georgetown has seen comparably slow rates of growth and gentrification. However, as growth limitations curtail development opportunities in other parts of the city, Georgetown looks to be the perfect market for urban development. Older housing stock, poor health conditions, and isolated residential areas perpetuate the perception that Georgetown is in need of a makeover. In reality, there are many strengths of the community which can and should be harnessed in creating a healthier neighborhood for all. Georgetown has the unique opportunity to embrace its character—both historical and current—while evolving to meet the needs of the greater Seattle region. As we consider the health impact areas related to neighborhood health and community development in Georgetown, we will examine three aspects: (1) housing and community dynamics, (2) green space, and (3) historic and cultural preservation.

HOUSING AND COMMUNITY DYNAMICS

OVERVIEW

One of the greatest concerns expressed by Georgetown residents, community advocates, and developers alike lies around the issues of gentrification, housing, and community health. As seen in Table 2-1, from 1990-2010, the demographics of Georgetown residents have held relatively steady, though the fluctuations among self-identified people of color indicates an interesting shift (Department of Planning and Development, 2011). Seattle already stands as the ninth least diverse city in the US, and Georgetown in particular saw the highest decline in diversity from 2010-2015 due to a significant out-migration of the Latino population (Balk, 2016).

Residents in Georgetown recognize many of the challenges they will face as development continues to expand; however, they choose to face adversities as a collective unit while staunchly adhering to their stance that solutions do not necessitate losing community character.

CURRENT CONDITIONS

Georgetown's location has played a vital role in creating its unique community culture. Situated on the south end of Seattle city limits along the banks of the Duwamish River, Georgetown is positioned in the middle of a major regional industrial zone. Since the early 20th century, manufacturing and labor markets have been key employers for many residents and symbiotic relationships have been built between residents and businesses in Georgetown. The nature of these economic drivers contributed to the birth of a unified "industrious" community that is ready to put in the work needed to achieve their goals (Department of Planning and Development, 2014). Many would describe the residents as "blue collar" workers: factory workers, machine operators, equipment repair operators, laborers, and specific arts and craft producers all call Georgetown home.

Large warehouse spaces have been turned into a multitude of retail establishments, including bars, restaurants, cafés, breweries, game rooms, record stores, art galleries, and even a chocolate factory! Although smaller in scale than what may have been produced before (e.g., an airplane part) these industries still focus on items that are produced by the local

TABLE 2-1. DECENNIAL CENSUS DATA FOR GEORGETOWN (TRACT 109)

YEAR	1990	2000	2010
Population	1,238	1,181	1,287
Persons of Color	430	514	445
Occupied Housing Units	611/671	585/667	619/675

community. This aligns with the goals in the neighborhood comprehensive plan which wish to preserve the "industrial artistic character" that has become a hallmark of Georgetown.

Currently, smaller residential zones (see Appendix A: Zoning Map of Georgetown on page 81) are encapsulated by larger manufacturing sectors. The majority of homes in Georgetown's residential core were built prior to 1930 (see Appendix B: Age of Structures in Georgetown on page 82), which have historically served as ideal accommodations for families working along the Duwamish industrial corridor. Homes were isolated into a residential community but were still connected to arterial roads, providing mobility to and from work. As industries grew, however, what seemed like a convenient arterial corridor transformed into walls of automobile traffic, slicing the residential community from many of its access points and making it difficult for pedestrians to walk around and access communal spaces like parks and recreational/play spaces.

Most homes are located within low density residential zones, which generally contain smaller homes that would accommodate a single family (Seattle Office of Planning and Community Development, n.d.). As Seattle faces tremendous growth pressure and home prices become increasingly unaffordable for low- to middle-income populations, Georgetown remains one of the few existing neighborhoods with comparatively low mortgage and rent prices within city limits. The housing stock consisting of mostly older homes on smaller lots, lack of connectivity via safe alternative transit modes, and the heavy industrial land use contribute to this slow uptick in home prices (Department of Planning and Development, 2014). As further development is integrated into this community, the housing stock is, in turn, trending in a direction that will no longer accommodate Georgetown's current residents.

Data from Seattle's construction and permitting office shows that many permits for redevelopment issued in the Georgetown area aim to create higher density, improve design esthetics, and provide more housing options (Seattle Department of Construction and Inspections, n.d.). Unfortunately, these first two focus points are making it more difficult to provide appropriate, affordable housing in this community. Permits issued are for work that includes demolition of single family homes in favor of constructing townhomes and condos. The remaining larger single family homes are priced at market or higher value, making it a difficult investment to make for many of the lower- and middle-income families currently residing in these zones. Based on the nature of these permits, it seems that the goal of increasing density will inevitably price out current Georgetown residents. The new design and associated pricing structures of homes are attracting a different community, which subsequently puts many residents at risk of displacement.

Lastly, a newly opened homeless encampment exists (Image 2-1) in Georgetown, serving nearly 70 people while more permanent shelters are built. Long-time residents in Georgetown have expressed concern over this site because there are not enough services and resources to effectively serve this large of an unhoused population.

HEALTH OUTCOMES AND CAUSAL PATHWAYS

The Georgetown plan in the Neighborhood Planning Element of the City of Seattle's 2005 Comprehensive Plan includes policies that relate to maintaining housing affordability for working class residents through employment opportunities for local residents and economic development that caters to the existing community. Beyond the physical lack of affordable housing options for low- and middle-income households, the issue of housing quality—including factors like air quality, exposure to contaminants, pests, and thermal control—is also significant in influencing overall health (National Center for Healthy Housing, 2010).

Currently, the housing stock consists of smaller-scale single-family homes with historically low vacancy (Table 2-1). In many instances, health disparities in this neighborhood

are fueled by dilapidated housing conditions, which can contribute to the acquisition of diseases like asthma, allergies, depression, cardiovascular disease, and lead poisoning (Dannenberg, Frumkin & Jackson, 2011). This combination has likely contributed to significant health disparities and an eight-year average shortened life span among long-standing Georgetown residents when compared to the average Seattle resident life expectancy (Mapes, 2013; Gould & Cummings, 2013). The City of Seattle is working to combat this through new residential developments. These new units will mostly consist of condos or townhomes to mitigate the residential growth strains that the entire city is facing (Seattle Department of Construction and Inspections, n.d.). These updated housing developments paired with other efforts such as the Seattle Department of Transportation's Georgetown Mobility Study and the Duwamish River Cleanup Coalition will aid in mitigating the harmful effects that industrialization has on health outcomes.

The Centers for Disease Control and Prevention (CDC) have identified a multitude of health outcomes that are potentially linked with gentrification and displacement, including issues related to stress, mental health, and physical well-being (CDC, 2013). Gentrification has been shown to cause heightened stress in incumbent residents, due to the fear of being "pushed out"—this stress, in turn, has been linked to adverse health outcomes such as increased mortality and preterm births in affected individuals (Causa Justa, 2014; Huynh and Maroko, 2014). Additionally, in a study looking at the effects of gentrification on health disparities found that gentrification led to worse health outcomes for black residents despite having a marginally positive effect on self-rated health of the neighborhood overall (Gibbons and Barton, 2016).

ASSESSMENT

Georgetown has an opportunity to proactively shape the development approach in order to negate displacement within the community. Currently, Georgetown has identified the need to protect its community as a priority issue. The Neighborhood Comprehensive Plan outlines Georgetown as "a residential community that recognizes, preserves, and enhances Georgetown's area as a viable place where people live, raise families, enjoy open spaces, and celebrate its unique historic character and buildings" (Seattle Office of Planning and Community Development, n.d.). This includes a thriving retail segment—a key contributor to the vibrant community Georgetown residents hope to preserve—drawing a crowd of workers coming from both the neighborhood itself and across Seattle. The Fran's production factory, located in a refurbished historical warehouse, is a prime example of how development can occur while still preserving the cultural significance of the neighborhood. New industry has also helped Fran's create an additional retail market by renting out the space for events, which helps market Georgetown as more than just an industrial zone. Improved transportation networks will further help activate this space, as new day visitors can gain easy access to the Georgetown neighborhood.

Image 2-1. Nickelsville Tiny House Village, an encampment located at 1000 S Myrtle St.

Georgetown has not done enough in protecting its housing market. Not only do projected housing prices make it difficult for current residents to physically remain in the community, modern design elements are eroding the character of this historical district. Flush facade designs mixed with modern materials are a stark contrast to the red brick and dimensions of the historical buildings, and this mismatch of housing designs highlights the contextual dissonance of the newer development. As the trend continues, we will see that modern homes may soon become the majority of the housing stock; however, the aesthetic remains inconsistent with the overall industrial feel of Georgetown.

RECOMMENDATIONS

As the Seattle Department of Transportation looks at increasing mobility in Georgetown, our recommendations will align with the overall neighborhood plan the community wishes to implement. Although mobility may not be a key factor of gentrification, it plays a role in creating communities, and, in turn, connects Georgetown to the larger growth of the Seattle area. Our recommendations include:

» Refurbish dilapidated warehouse spaces to be artist work/live homes. This contributes to the goal of increasing density while continuing to foster the creative culture that is at the heart of Georgetown.

» Pursue further development of green spaces, including rooftop gardens to get residents outside and activate spaces that may have been previously used for industrial use. An example could be turning abandoned alleys and railway tracks into green spaces.

» Include explicit policies within the Georgetown neighborhood plan to mitigate displacement of current residents as new residential developments are woven into the existing older single-family housing stock.

» Seek to retain Georgetown's residentially zoned lands as a means of providing affordable homeownership opportunities.

» Work with the community to explore ways of marketing Georgetown's commercial zones for commercial use, to help preserve industrial zones for industrial use, and to help encourage shopping opportunities for local residents in the commercial zones.

» Advocate for city-wide affordable housing development and gentrification mitigation policies such as programs that help residents rehab older buildings or buy their rental properties.

» Implement zoning ordinances that allow for residential, commercial and light industrial use; preserving industries within this area. Similar ordinances can been found in neighboring municipalities (Tukwila Municipal Code, 18.28.030).

GREEN SPACE

OVERVIEW

Access to nature and green space is an important contributor to health and well-being. At the same time, neighborhood greening can lead to accelerated gentrification and environmental injustice (Wolch et al, 2014). SDOT can promote the thoughtful expansion of green areas through intentional truck routes, green streets, partnerships with existing private property owners, and depaving.

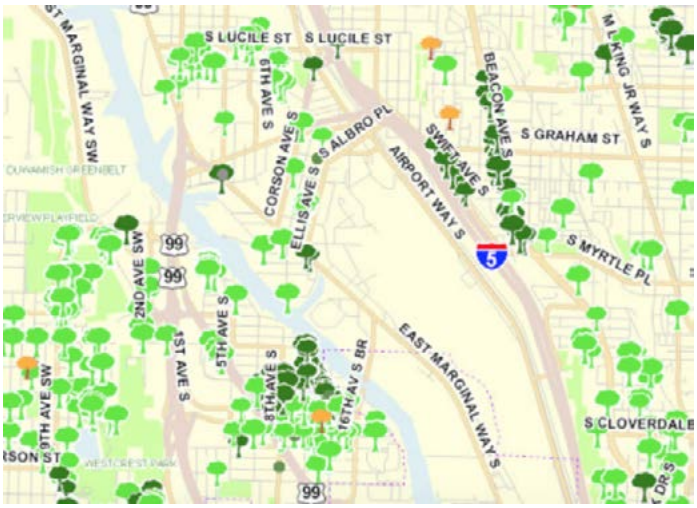
CURRENT CONDITIONS

Compared to the rest of the city, Georgetown has few trees and open green areas. According to the 2009 Seattle Tree Canopy Assessment, tree canopies can be found in less than 15% of the Georgetown neighborhood. For comparison, the city-wide tree canopy cover was 23% in 2007 (Seattle City Council, 2009). Most of the trees in the neighborhood are concentrated in the main residential areas (Map 2-1). Tree plantings are somewhat restricted by the heavy truck use in the neighborhood, and the airport requirements. In terms of current open green space, Georgetown has just two sizable parks, the Georgetown Playfield and Ruby Chow Park, though Oxbow Park and the Georgetown Pump Station offer small green areas. Note the difference in amount of park spaces between Georgetown and surrounding neighborhoods in Figure 2.3 (Seattle Parks and Recreation, 2017). Due to zoning restrictions, it is challenging for the city to purchase large amounts of land to turn into parks. Therefore, though Georgetown is a high priority area for green space, improvements to date have been lacking. This suggests that it may be more effective to partner with existing private property owners.

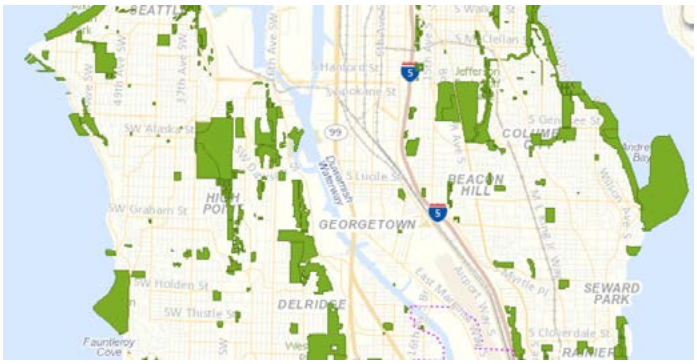
In the recent Georgetown Open Space Vision Framework, the authors provided a summary of community input related to green space in their neighborhood. Community members emphasized their desire for river access, street greening, an off-leash dog park, and green improvements—with a clear caveat to adapt these changes in a way that will not lead to gentrification and the destruction of the neighborhood (Seattle Parks Foundation, 2017).

HEALTH OUTCOMES AND CAUSAL PATHWAYS

Green space promotes biking, walking, and other physical activity, social cohesion, and stress reduction (Hartig et al, 2014). Active transport and physical activity have countless benefits including obesity reduction and protection against heart disease and stroke (Bauman, 2004). Social cohesion and stress reduction contribute to improved mental health outcomes (Kim and Kawachi, 2006 and Chuang et al, 2013).



Map 2-1. Tree cover in Georgetown (SDOT, 2015).



Map 2-2. Seattle City Park spaces (Seattle Parks and Recreation, 2017).

ASSESSMENT

Due to the existing lack of green space, a desire from community members for increased green space, and important health outcomes related to green space, expanding parks, open spaces, tree planting, gardens, and other green areas would be a welcome change in Georgetown. However, any movements should bear in mind the challenges of industrial zoning and airport related restrictions, and strive to mitigate potential negative effects of gentrification on overall community health.

RECOMMENDATIONS

The city should continue to develop plans for river access and an off-leash dog park as outlined in the Georgetown Open Space Vision Framework. Additionally, we suggest the following:

» Work with Sustainable Seattle to replace unnecessary pavement with green areas. More information about ongoing efforts to depave areas near the Duwamish is available here: sustainableseattle.org/depave-the-duwamish. This not only enhances water quality, but it also promotes social cohesion through volunteerism and will add green space to the neighborhood in a dispersed way.

» Designate a number of Green Streets in the Georgetown neighborhood, including the implementation of intersection roundabouts. Green street designation should be prioritized for safe routes to school, access to South Park, and access to transit.

» Augment green areas through the addition of bioswales, green roofs, and green walls, such as the Green Wall already in Georgetown (Bernard, 2016).

» Encourage **existing** private property owners to increase green space by providing incentives, such as:

- Discount stormwater utility fees
- Property tax abatement
- Low interest loans
- Awards/community recognition (Kramer, 2014)
- Connect with the Georgetown Garden Walk private property owner participants

HISTORIC AND CULTURAL PRESERVATION

OVERVIEW

Historic and cultural preservation plays a large role in the social capital and social inclusion of Georgetown. While culture is not easily defined or measured, it often features physical and social mainstays that draw people to live in, work in, and visit the neighborhood. This section focuses specifically on three points of history and culture in Georgetown: historical community resonance in the built environment, the artisan community, and the social organizations that connect the community to shared spaces and activities.

CURRENT CONDITIONS

As mentioned, the boundaries of Georgetown limit the free movement between Georgetown and its neighbors. It is geographically encased by I-5, Highway 99, Boeing Field Airport, and an industrial district. These physical barriers both create risks and protective factors for the community members, which has helped shape the community's sense of identity and character.

HISTORICAL SIGNIFICANCE

Georgetown's historic character clearly manifests through the existing built environment. This neighborhood carries two landmarks on the National Register of Historic Places: the Georgetown Steam Plant and the Old Georgetown City Hall (National Park Service, 2009). The Georgetown Steam Plant has been repurposed as a museum and the Old Georgetown City Hall serves as a community space for events (National Park Service, n. d.). The Old Georgetown City Hall is located at the south end of Airport Way, on Stanley Avenue and 13th, next to a transit stop for bus routes 60, 107, and 124. By contrast, the Georgetown Steam Plant museum is located on Ellis Avenue near one of the residential areas, with limited accessibility and located approximately 0.6 miles away from the Airport Way commercial corridor. According to the Washington Information System for Architectural and Archaeological Records Data (WISAARD), there are at least 25 buildings that are eligible for historic registration as one or more of the following: Seattle Landmark, Washington State Historic Landmarks, National Historic Landmark, and/or the National Register of Historic Districts (WISAARD, n.d.). One notable eligible building is Carlton Grocery (nee Carlton Inn), which

Image 2-2. Carlton Grocery, built in 1904 (WISAARD).

was built in 1904 and carries a historically significant story about Georgetown (Image 2-2). Additionally, historic designations on the local, state and national level are constantly changing as buildings become eligible once they reached their 50-year mark. The eligible sites are mainly in the central residential part of the neighborhood, along Airport Way, and east of Corson Avenue (WISAARD, n.d.). Historic designation brings a certain level of protection for federally funded mitigation projects and provides the community and property owner a sense of community pride and identity. However, it does not necessarily limit or direct the private development side of real estate, ultimately private property owners make determinations on the outcome of their properties. A benefit to historic designations is that property owners receive tax breaks and are open to funding opportunities for structural and façade improvements.

ARTS DISTRICT

Georgetown has a history of having a strong art community that continues today. Several performing, fine, and heavy art galleries, studios, event spaces, and art education exist in the neighborhood, much of which highlight the industrial history of the district (an introductory list of businesses is listed in Appendix C). One of the more notable studios is Equinox, a community based art gallery, studio, and event space housed in three World War II era factories, and later a machine shop (Equinox Studios, n.d.) (Image 2-3). Many of the studios featured here revolve around the heavy arts, specifically blacksmithing and welding. Beyond Equinox, the art spaces typically fall along Michigan Street and Airport Way, and the community has a variety of events (such as Georgetown Art Attack) to draw these spaces together. The distance

between Equinox and the Airport way art spaces is around 0.7 miles along Michigan Avenue, the most direct route. Typically people walk, bike, or take complimentary shuttles to these spaces during event nights (Georgetown Community Council, n.d).

COMMUNITY ORGANIZATIONS AND EVENTS

The organizing factors of historic and cultural preservation are the neighborhood groups that work to organize and connect people to place-keeping and place-making spaces. One organization which has been an organizing factor is the Georgetown Community Council, a resident governed non-profit (Georgetown Community Council, n.d.). They organize, advertise, and market specific stakeholder groups and community events including the monthly Georgetown Art Attack!, the annual Georgetown Garden Walk and Georgetown Carnival, and walking tours that highlight the neighborhood (Georgetown Community Council, n.d.).

Under-recognized groups are Georgetown's self-identified residents of color and recent immigrants, including a relatively large Hispanic/Latino population of 12.3%, and 9.8% Asian-Pacific Islander (most of whom are Chinese) (Seattle Parks Foundation, 2017). These residents have community organizations and events that are often advertised primarily within their networks and not to the broader public. As a result, they are under-represented in this portion of the chapter. The former Korean Central Baptist Church (now Iglesia Christiana Vida Abudante, a Hispanic church) and the Maruta Shogen Grocer are but a few examples of how community groups are present and carry their own social networks.

Image 2-3. Equinox Studios, Art Gallery (Georgetown Community Council).

HEALTH OUTCOMES AND CAUSAL PATHWAYS

Social capital and social inclusion are the health considerations that house these three subgroups of historic and cultural preservation. Opportunities for a community identity through both the built environment and its social spaces can increase individual health as it facilitates participation in economic, social and political activities (Chuang, 2013). Communities that have a stronger sense of place and community attachment are more likely to connect to address perceived problems and to find ways to celebrate strengths of the neighborhood (Marshall, A., Hoelscher, D., & Spring. D., 2015). Historic and cultural preservation, which draw together the spatial and social elements of human living, are indicators of place and community attachment. Furthermore, providing opportunities to preserve shared spaces and maintain historic icons in the community brings a sense of stability in a rapidly changing city like Seattle.

ASSESSMENT

As mentioned, there is a strong sense of historical and cultural pride and character in the community. As a result, changes in the community should keep in mind preservation and strengthening tools of existing legacies so that these social activities foster social cohesion. Improvements in the community should keep historic and cultural preservation techniques at the forefront, ensuring that neighborhood plans are community-driven and indicate how community members have worked to connect with each other.

RECOMMENDATIONS

HISTORIC:

» Unintended consequences: this could both add to gentrification and detract from gentrification. Preserve the historic and the industrial character of the neighborhood: work with University of Washington Urban Planning Historic Preservation students and the appropriate Parks Departments to

survey and apply for local, state, and national historic landmark designations to preserve iconic buildings in the neighborhood. This helps protect community identity and the historical significance of the neighborhood.

» Partner with the Department of Planning and Development in creating a **historic preservation overlay district** protecting key buildings that add to the historic character of the Georgetown neighborhood.

ART CONNECTIVITY:

» Preserve and strengthen artisan spaces: work with the Georgetown art community and Office of Arts and Culture to determine the feasibility of becoming a **Seattle Arts District**, specifically to create granting opportunities that highlight the heavy arts.

» Create a financial incentive program for developers that choose to **preserve the architectural and historic character** of structures in Georgetown.

» **Strengthen cyclist and pedestrian-based connectivity**: Create walkable, accessible, and attractive access to artistic and historic touchpoints in the neighborhood, specifically for walking tours and neighborhood run events. Specifically, if adding bike lanes, consider creating bike paths that link art hubs together for events like Georgetown Art Attack. This includes re-routing cyclists off of Michigan Street, looping them on Corson Avenue, around South Seattle Community College-Georgetown. Consider creating a green buffer between sidewalks and the street on Michigan to enhance pedestrian aesthetics and safety when walking between art spaces.

» **Wayfinding between community spaces, events, and open spaces**: create pedestrian wayfinding along Airport Way to encourage pedestrians to venture outside of the community and economic spine of Airport Way (Image 2-4). Include wayfinding signage for Equinox Studios, South Seattle Community College-Georgetown, Georgetown Steamplant Museum, Oxbow Park, waterway access, and other Georgetown spaces that connect pedestrians with nature, community spaces, and the arts.

» **Encourage place-making projects in public spaces**: Commission local artists to participate in designing utility wraps, bus shelters, bus benches, and painting with NeverWet, invisible paint that becomes visible when it rains. When creating bus stop benches and bus shelters at transit hubs, SDOT could partner with King County Metro Transit to provide beautification opportunities for Georgetown artists to commission their work through the Bus Shelter Mural Program. Similarly, the two stops closest to the historically designed buildings could be educational material introducing the significance of these historic sites. More specifically, the bus stop at Ellis Avenue South/South Warsaw Street, is the closest stop to the Georgetown Steam Plant and the bus stop at 13th Avenue South & South Bailey Street is the closest stop for the Old Georgetown City Hall.

Image 2-4. Wayfinding example from walkyourcity.org.

COMMUNITY ORGANIZATIONS:

» **Rely on community leaders and community-based organizations** when making programmatic and policy decisions.

» **Inclusionary place-keeping and place-making**: ensure that any changes administered by SDOT are inclusive to English Language Learners and that future outreach opportunities include surveying the needs and assets of under-represented community groups, specifically the relatively large Hispanic/Latino and Asian-Pacific Islander population. When implementing new signage for mobility, make sure the signs are translated to reflect the languages spoken in the neighborhood.

» **De-Duplication**: use the Seattle Comprehensive Plan's Cultural Resource Element section as well as the Georgetown Neighborhood Plan as guides to make informed decisions.

CONCLUSION

There are many opportunities to improve health in Georgetown through Neighborhood and Community Development. A summary is provided in Table 2-2 of the potential impacts on health determinants if suggested recommendations in the Neighborhood and Community Development chapter are adopted. Impacts on social cohesion and mental health are uncertain because they depend on the level of gentrification that might result from neighborhood improvements.

TABLE 2-2. POTENTIAL HEALTH IMPACTS IF NEIGHBORHOOD AND COMMUNITY DEVELOPMENT CHAPTER RECOMMENDATIONS ARE ADOPTED

HEALTH DETERMINANTS	IMPACT	MAGNITUDE	SEVERITY
Obesity	✚	• • •	▲
Stress	✚	• • •	▲
Mental health	?	• • •	▲
Social cohesion	?	• •	▲
Social capital	✚	• •	▲
Social inclusion	✚	• •	▲

✚ = Changes that may improve health

━ = Changes that may detract from health

? = Unknown how health will be impacted

● = No effect on health

• = Causes impacts to no or very few people

• • = Causes impacts to wider number of people

• • • = Causes impacts to many people

= No Data

Note that this is relative to population size

▲ = Causes impacts that can be quickly and easily managed or do not require treatment

▲ = Causes impacts that necessitate treatment or medical management and are reversible

▲ = Causes impacts that are chronic, irreversible or fatal

CHAPTER 3: POPULATION HEALTH AND SOCIAL SERVICE ACCESS

Social services are basic services provided to a community by government and private agencies. These services can include physical and mental health care, educational services, family support, affordable housing, job training, and case management. In this section, we will discuss the needs for and availability of social services for residents in the Georgetown neighborhood.

In any discussion of social service accessibility, it is crucial to first determine the needs of the community. Anderson, Liu, Gao, and Xiang (2016) propose that we can analyze needs by estimating the characteristics that indicate a need for care, including demographic or social characteristics; ties to selected social statuses; diagnoses; and financial means. In analyzing the accessibility of services for individuals in Georgetown, we will begin by giving a demographic overview of the current conditions found in the community.

Next, we will investigate the proximity and accessibility of social services to the Georgetown community. Previous research demonstrates that there is a strong correlation between the proximity of service providers to community and service utilization (Allard, 2004).

Per our findings, we will conclude by offering recommendations for future practice and policy.

POPULATION HEALTH

CURRENT CONDITIONS

Compared to the City of Seattle, fewer children and youth live in Georgetown. The median age of Georgetown residents is 39 years compared to 36 years for the city of Seattle. Proportionally, more Georgetown residents identified as non-Latino white, American Indian or Latino compared to the city of Seattle as a whole.

To describe the demographic and socio-economic characteristics of Georgetown, we relied on American Community Survey 5-year Estimates for Census Tract 109 (a proxy for the Georgetown neighborhood.)

VULNERABLE POPULATIONS

The median family income is lower among Georgetown residents compared to the city overall ($81,442 vs. $102,832). More drastically, nearly 42% of Georgetown residents live in non-family homes, compared to 25% across the city. The median income among these single residents is $32,917, compared to $50,203 across the city.

As previously mentioned, Georgetown is currently hosting Georgetown Village, a Nickelsville homeless encampment that includes 40 Tiny Houses, a counseling office, a kitchen, and an emergency overflow shelter. Georgetown Village was opened in early 2017 as part of mayor Ed Murray's response to the crisis levels of homelessness throughout Seattle. The encampment is projected to house 60–70 houseless individuals at any given time.

Four percent of Georgetown residents are unemployed compared to 6% across the city of Seattle. Fewer Georgetown residents have health insurance compared to the City of Seattle (13% vs. 9%). Fewer residents of Georgetown reported having physical activity during leisure time, compared to the rest of the City of Seattle (30% vs. 12%). The rate of hospitalization for assault injury and childhood asthma were both significantly higher among residents of Georgetown compared to the city of Seattle.

PUBLIC SAFETY

In 2016, 452 Seattle police incidents were reported by Seattle Police Officers in Georgetown (Seattle Police Dept., 2016). 67% of founded offenses were for larceny, theft or vehicle theft incidents. Person-based crimes (rape, robbery, or ag-

gravated assault) accounted for 10% of incidents.

Based on 2015 American Community Survey 5-year estimates, the rate of reported criminal incidents in the 109-census tract (a proxy for the Georgetown neighborhood) was 428 per 1,000 residents compared to 65 per 1,000 residents in the City of Seattle. From police incident data and reviewing news reports, it is apparent that criminal activity in Georgetown has historically been a concern.

The difference in rates of crime between Georgetown and the City of Seattle may be artificially high because residents of Georgetown may not reflect who is committing crimes in Georgetown. Regardless, the rate of crime appears to have increased in Georgetown in recent years. In 2010, the crime rate was 289 incidents per 1,000 Georgetown residents, compared to 62 incidents per 1,000 among all Seattle residents (Seattle Police Dept., 2016). This constitutes a more than 360% increase.

The top five safety concerns among Georgetown residents that were identified from the 2015 Seattle Public Safety Survey were car prowls, auto theft, graffiti, littering/dumping, and car/RV camping. The survey was repeated in the fall of 2016 and results were disseminated at the precinct level.

Georgetown is included in the South police precinct that encompasses 15 racial and ethnic diverse neighborhoods (Helfgott & Parkin, 2017).

ACCESS TO SERVICES

CURRENT CONDITIONS

MEDICAL

While there are many medical facilities in Seattle, there are currently no hospitals, health clinics, private family doctors in Georgetown. Harborview Medical Center on First Hill is the closest hospital and is approximately five miles away, or 35 minutes by bus (number 60). Veterans may utilize the VA Puget Sound Health Care System (Beacon Hill) which is only two miles away, or twenty minutes by bus (number 60). An array of SeaMar health facilities are less than two miles away in South Park and are accessible within twenty minutes by bus (number 60). NeighborCare operates a community medical clinic in Rainier Beach five miles from Georgetown which is reachable within approximately 50 minutes by bus (numbers 60 and either 107 or 148). NeighborCare offers primary care for children and adults with pre-arranged and walk-in medical appointments offered Monday through Saturday.

Through King County's Healthcare for the Homeless Network (HCHN), a mobile medical van is dispatched to locations throughout the region. Service is intended for unhoused individuals. The mobile medical team offers services including primary care for acute and chronic conditions and referrals to other community services. The van is next scheduled to serve the St. Vincent De Paul food bank site on June 16th, 2017, and has served this location previously (King County Public Health, 2017).

Local comment: After a recent bicycle injury, a Georgetown business owner reports that to receive medical care, checkups, and affordable therapy, she has to leave the neighborhood, which is further complicated by no longer being able to ride her bicycle.

DENTAL

Currently, there is one dental facility, NeighborCare Health at Georgetown. NeighborCare provides urgent and ongoing dental care for patients regardless of insurance status and is open Monday through Friday for prearranged and walk-in appointments.

MENTAL HEALTH

The Seattle office of Alcoholics Anonymous sits within the neighborhood boundaries and two groups meet there each week. There is a short list of private counselors and psychotherapists practicing in Georgetown. Navos Mental Health Solutions is five miles from Georgetown, but takes almost an hour to reach by bus (number 60). Sound Mental Health is seven miles away, and takes about an hour to reach by bus (number 60, then Link light rail).

EMERGENCY

Seattle installed Fire Station 27 in 1970 in Georgetown and remodeled the facility in 2013.

OTHER SOCIAL SERVICES

The nearest office of the Department of Social & Health Services (DSHS) is only two miles away in Rainier Valley but takes about 50 minutes and may require three bus transfers (numbers 60, 50, and 106).

The nearest Medication Assisted Treatment (methadone, buprenorphine, etc.) for opiate/opioid addiction is offered by Evergreen Treatment Services in the SoDo neighborhood, three miles away, reachable from a variety of bus routes with-

in twenty minutes.

The closest **needle exchanges** are both about six miles from Georgetown, located downtown and on Capitol Hill and are open Monday through Saturday. Neither King County nor Peoples Harm Reduction Alliance extend mobile services within Seattle. The Hepatitis Education Project will be launching a needle exchange on Thursdays in their International District Office, which is accessible by bus #60.

St. Vincent DePaul's Georgetown chapter hosts a food bank every Monday, Tuesday, Thursday, and Friday and serves approximately 64,000 people each year. Friday's offerings are reserved for homeless neighbors only. On Tuesdays and Thursdays, volunteer nurses with the King County Public Health Reserve Corps offer free health checks including blood pressure monitoring and referrals to other services.

South Seattle College Georgetown Campus hosts a WorkSource Connection site which serves as a hub for employment resources and offers human and technological resources to students and community members.

Healthy food: Food insecurity is defined as "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways" (USDA, 2016). In 2010, there were more than 13% residents in King County reported food insecure, which is lower than the overall food insecurity rate in Washington State (15%) and in the United States (17%) (Communities Count, 2017). Seattle and the southern region in King County reported a higher rate of people who couldn't afford enough food (7%, 15%) and went hungry (6%, 8%) than east King County (6%, 1%) and north King County (3%, 2%) (Ibid).

Local comment: "We end up driving further out to get good variety, solid quality, and fair prices."

Another indicator of healthy food access is the Retail Food Environment Index (RFEI). RFEI counts the number of fast food and convenience stores, divided by the number of supermarkets, small grocery, and produce vendors. The RFEI ranges from 0 (best) to 10 (worst). Georgetown is located in the health reporting area with the lowest RFEI (0.5 - 1.3) in King County, which indicates that at the time of survey, there was more access to healthy food rather than unhealthy food (King County Assessment, Policy Dev. & Evaluation Unit, 2012). The average RFEI score for King County is 2.4.

There are four grocery stores in Georgetown: **Affordable Kosher, Carleton Avenue Grocery, and Airport Way Market, and Maruta Shoten**. The supermarket sells Japanese food, fruits and vegetables and is open until 6:00 p.m daily. Residents can buy fresh food and groceries at these local stores, or go to the nearest large retailer in the Beacon Hill neighborhood, or go to another chain supermarket approximately four to five miles away.

Georgetown has many American **restaurants** as well as other selections including Mexican, Japanese, Thai, Chinese, Vietnamese, and Hawaiian. Most restaurants are located along Airport Way South.

The Oxbow Park **P Patch Community Garden** is centrally located in Georgetown. The Pea Patch has 23 plots, and currently has a one to two year wait-time to gain a plot.

ALCOHOL RETAILERS

There are about 25 bars and breweries, six liquor stores, and four wineries in Georgetown.

TOBACCO RETAILERS

There are thirteen tobacco retailers and one tobacco shop (Rain City Cigar) (WA Dept. of Health, 2015).

HEALTH OUTCOMES AND CAUSAL PATHWAYS

POPULATION HEALTH

The geographic distribution of people foregoing health care because of cost and the rate of hospitalizations for complications of diabetes are highest in the at□risk neighborhoods of Downtown Seattle, Central and Southeast Seattle, and Georgetown/South Park. Nearly half of providers surveyed in South King County identified access to health care as the top health need for the populations they served.

HEALTHY FOOD

Many organizations such as the Centers for Disease Control and Prevention (CDC), the Institute of Medicine (IOM), and the American Heart Association (AHA) promote the idea of increasing access to healthy food to reduce obesity and improve population health. Healthy food accessibility can be

linked to healthy eating behavior, nutrition, and further influence the prevalence of obesity, and other diet-related diseases (Bell, Mora, Hagan, Rubin, & Karpyn, 2010). According to 2005 Dietary Guidelines for Americans, eating habits to prevent obesity mandate having a variety of fruits and vegetables, low-fat dairy and meats, whole grains, and healthy fats within caloric needs. These can also reduce the risk of chronic diseases like diabetes, hypertension and other cardiovascular diseases.

The low RFEI score in Georgetown is promising. Bicycle and pedestrian pathways should seek to increase the accessibility of farmers markets and other sellers of produce and healthy food. A study by the Journal for Environmental Health found that the transportation options to diverse food resources like restaurants, supermarket, farmers' market are associated with the accessibility of healthy food (National Center for Environmental Health, 2014). This indicates that the Georgetown Mobility Plan may be beneficial in increasing access to healthy foods for Georgetown residents.

ALCOHOL RETAILERS

Total densities and residential exposure to alcohol outlets is strongly associated with harmful consumption of alcohol, and increased risk of neuropsychiatric disorders (anxiety, stress, and depression), premature deaths and disability, and non-communicable disease, such as cardiovascular diseases, liver cirrhosis, and cancers (Pereira, Wood, Foster & Hagar, 2013; WHO, 2011). Past studies have demonstrated that the presence of at least one alcohol outlet in a census tract increased the risk of a pedestrian or bicyclist being struck by a car by 47%. The fact that there are over 30 alcohol retailers in the Georgetown area should be considered when promoting increased cycling in Georgetown (DiMaggio, Mooney, Frangos, & Wall, 2016).

TOBACCO RETAILERS

Areas with a higher density of tobacco retailers are linked to higher rates of tobacco use. Many chronic diseases can be attributed to smoking, including obstructive pulmonary disease (COPD), lung cancer, cardiovascular diseases, and perinatal conditions, such as sudden infant death syndrome, low birth weight births, and preterm births (Washington State Department of Health, 2015).

It should be noted that there are the fourteen tobacco retailers in Georgetown. This level of access to tobacco retailers should be considered in efforts to improve the health of this community.

ASSESSMENT

INCOME INEQUALITY

Because a large proportion of Georgetown residents are single-person households, and there is a large artists' community in the neighborhood, there is little income variability within the neighborhood. Therefore, the effects of gentrification and displacement of the artists' community could seriously damage current residents' livelihoods.

LACK OF HEALTH INSURANCE

Compared to the City of Seattle, the proportion of uninsured adults is higher in Georgetown. Lack of health insurance coverage is associated with increased utilization of emergency departments and lower rates of receiving preventative medical care (Abdullah et al., 2010), This can contribute to the disparity in hypertension, diabetes (Anonymous, 2011) and undiagnosed late stage cancers (Rhodes, 2012).

PUBLIC SAFETY & CRIME

If the bicycle master plan and the Georgetown Mobility Plan include well-lit corridors, this could minimize illicit activity, as there will be less area to conceal committing crimes. Still, with promoting use of sidewalks and bicycle paths, residents will be in more contact with litter and homeless encampments (potential sites of injection drug use). Therefore, it is imperative to support efforts that routinely clean bicycle/multipurpose paths to decrease exposure to used needles and other hazardous materials.

PREVALENCE OF ALCOHOL

Alcohol is widely accessible in Georgetown. Future efforts to develop the area should be cognizant of the impact that alcohol consumption has on driver, pedestrian, and cyclist safety.

RECOMMENDATIONS

COMMUNITY BUY-IN

» Survey Georgetown residents on the best way to increase access to health care providers on First Hill.

» Continue existing partnerships with community members to ensure the mobility plan limits its gentrifying effects.

» Work with the community to destigmatize and promote the use of services that are already available in Georgetown.

PARTNERSHIPS

» Work with the King County Department of Health to increase the frequency of mobile medical clinic visits.

» Partner with King County Department of Health to invite Peoples Harm Reduction Alliance to bring a mobile Needle Exchange to Georgetown.

» Partner with Seattle Neighborhood Farmer's Markets or local grocery stores to increase the access to market and vendors for variety fresh and affordable food source. For example, survey residents about a possible grocery shuttle, or a regular farmer's market for fresh vegetable and local organic food

GREEN SPACE

» Continue to devote resources to cleaning and maintaining pedestrian and bicycle paths.

PEDESTRIAN & CYCLIST SAFETY

» Investigate public transportation options from central restaurant locations to nearby Link light rail or bus stops to ensure that those drinking will be able to travel home without driving or cycling.

» Survey Georgetown residents and patrons from central restaurant locations to nearby Link Light Rail or bus stops to ensure that those drinking will be able to travel home without driving or cycling.

» Enhance pedestrian and bicycle paths to connect Georgetown to nearby health providers in South Park and Beacon Hill.

TABLE 3-1. POTENTIAL HEALTH IMPACTS IF POPULATION HEALTH AND SOCIAL SERVICE ACCESS CHAPTER RECOMMENDATIONS ARE ADOPTED

HEALTH DETERMINANTS	IMPACT	MAGNITUDE	SEVERITY
Income Inequality	?		▲
Public Safety & Crime	✚	• •	▲
Housing	?		▲
Access to Physical Activity	✚	• •	▲
Food Inequality	✚	• •	▲
Alcohol Related Illness/Death	✚	• •	▲
Tobacco Use	●		▲

✚ = Changes that may improve health
━ = Changes that may detract from health
? = Unknown how health will be impacted
● = No effect on health

• = Causes impacts to no or very few people
• • = Causes impacts to wider number of people
• • • = Causes impacts to many people
= No Data
Note that this is relative to population size

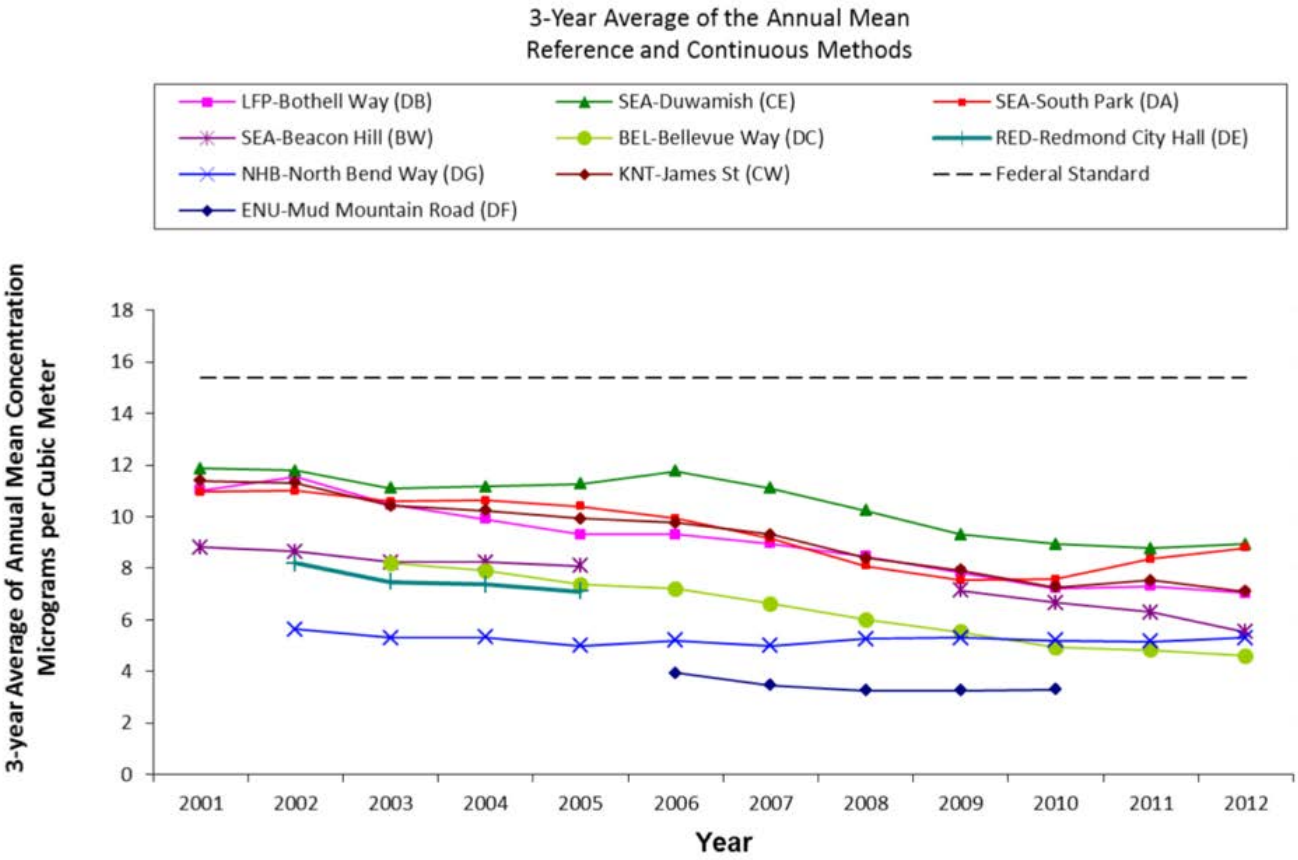
▲ = Causes impacts that can be quickly and easily managed or do not require treatment
▲ = Causes impacts that necessitate treatment or medical management and are reversible
▲ = Causes impacts that are chronic, irreversible or fatal

CHAPTER 4: ENVIRONMENTAL CONDITIONS

AIR QUALITY

OVERVIEW

Air pollution is associated with many adverse health effects (Spickett, Brown, & Rumchev, 2011). Pollutants of particular concern within the Duwamish Valley are fine particles, including dust, soot, and smoke. These are mostly attributed to gas vehicles, diesel exhaust, industrial processes, and wood smoke from residences. Particulates are associated with heart attack, stroke, lung disease, and increased cancer risk (Puget Sound Clean Air Agency, 2016). Particulates from diesel exhaust are especially harmful due to their carcinogenic nature. It is estimated that diesel exhaust contributes over



Note: Lake Forest Park (DB) data are FRM from 1999-2007, nephelometer in 2008-2012. Beacon Hill (BW) data are FRM from 1999-2012. Duwamish (CE) data are FRM from 1999-2009, nephelometer 2010, TEOM-FEM 2011-2012. South Park (DA) data are FRM from 1999-2002, nephelometer from 2003-2012. Redmond (DE) data are FRM from 2000-2002, nephelometer from 2003-2005. Bellevue Way (DC) data are FRM from 2001-2003, nephelometer from 2004-2012. Kent (CW) data are FRM from 1999-2003, nephelometer 2004-2010,TEOM-FEM 2011-2012. North Bend (DG) data are FRM 2000-2004, nephelometer in 2005. Enumclaw data are FRM in 2004, nephelometer in 2005-2012.

Figure 4-1. Annual $PM_{2.5}$ Concentrations for King County From 2001 to 2012 (Puget Sound Clean Air Agency, 2012).

70% of total potential cancer risk from air pollution (Puget Sound Clean Air Agency, 2011).

This Health Impact Assessment aims to address these concerns while in consideration of the Georgetown Mobility Plan (currently in progress). The following sections will outline the current conditions of air quality in Georgetown, an assessment of the mobility plan, and recommendations to mitigate exposure to air pollutants.

CURRENT CONDITIONS

The Duwamish Valley, which includes Georgetown, has poorer air quality than other areas of King County. Much of the increased air pollution in the Duwamish Valley can be attributed to its land use: industrial point sources, mobile source emissions from heavy duty diesel engines, locomotives, and other vehicles, residential wood smoke, and aircraft emissions. The pollutant of greatest concern is particulate matter (PM) because of its numerous adverse health effects and because it is the primary cause of "unhealthy air quality" according to the Puget Sound Clean Air Agency (PSCAA) (2012). The image below shows that Georgetown (labeled as SEA-Duwamish) has consistently higher levels of PM than other areas of King County, closely followed by South Park, a neighborhood southwest of Georgetown.

Particulate Matter (PM) is a criteria air pollutant under the national ambient air quality standards (NAAQS) as regulated by the US Environmental Protection Agency (EPA). Particulate matter is suspended in the air, and is composed of a mixture of solid particles and liquid droplets with a variety of shapes, sizes, and chemical compositions. Regulations differentiate between coarse particulate matter, those with mean aerodynamic diameter of 10 μm or less (PM_{10}), and fine particulate matter, those with mean aerodynamic diameter of 2.5 μm or less ($PM_{2.5}$). Recent research has also shown that ultrafine particulate matter (UFP), those less than 0.1 μm, can also cause adverse health effects and are in higher number concentrations downwind from an airport (Hudda et al., 2014). Other major regulated air pollutants with known adverse health effects are nitrogen oxides (NO_x), ozone (O_3) and sulphur oxides (SO_x), all primarily derived from fossil fuel combustion and industrial processes (Guarnieri & Balmes, 2014; Kelly & Fussell, 2015).

Concentrations of these air pollutants are higher near major roads, industrial areas, airports, and railways, negatively affecting the health of residents in these areas (Cohen, Bronzaft, Heikkinen, Goodman, & Nadas, 2008; Hu et al., 2016). The Georgetown neighborhood is bordered by the I-5 and BNSF and Union Pacific rail corridors to the east, East Marginal Way (a regular freight truck path) to the west, and King County International Airport to the south. Surrounding and within Georgetown is a host of industrial activity. Diesel, gas vehicles, and industry, contribute to over 50% of Georgetown's air pollution (Duwamish River Cleanup Coalition, 2015). As a result, Georgetown residents are exposed to one of the poorest levels of air quality in Seattle (Washington State Depart-

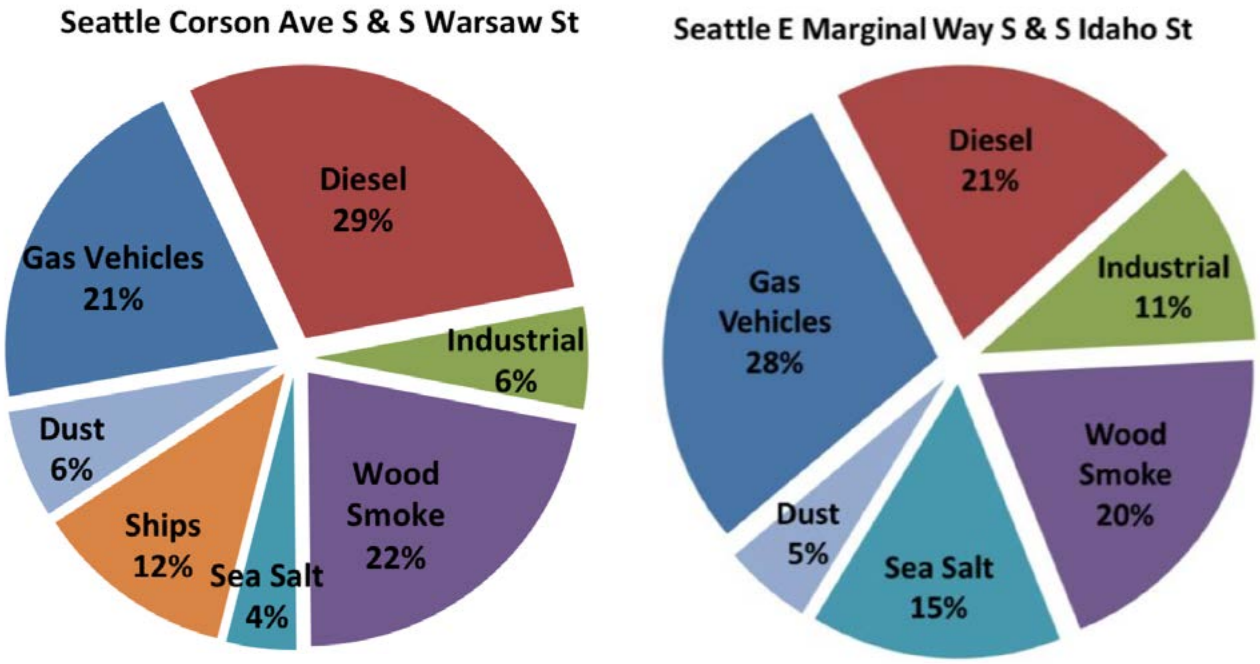


Figure 4-2. Air pollution sources at different intersections at Georgetown (Duwamish River Cleanup Coalition, 2015).

ment of Health, 2008).

It is also important to note that air quality is poorer during peak traffic periods: the early morning rush hours and the early evening commute. Exposure is especially greatest in the early morning when there is less atmospheric mixing and when people commonly walk or ride to and work or school (Spira-Cohen et al., 2010). This is a more significant problem in Georgetown because of its proximity to the I-5 and because of its role as a both a funnel point for I-5 access and an alternate route to the I-5. Commuter use is heavy along South Michigan Street, Airport Way South, South Bailey Street, and Corson Avenue South. Commuters from South Park and the Delridge area, as well as heavy diesel trucks, use South Michigan Street to access the on-ramp of the I-5 and when exiting the I-5 off-ramp from Corson Avenue South. Bailey Street also connects to the I-5 on- and off-ramps and can be heavily used during traffic hour peaks. Also, commuters use Airport Way as an alternate route when I-5 is jammed, creating traffic along Airport Way during traffic hour peaks.

HEALTH OUTCOMES AND CAUSAL PATHWAYS

Exposure from air pollutants occurs through three pathways: inhalation, ingestion (deposition onto soil/food sources), and dermal contact. The type of pollutant and degree of exposure both factor into the level of danger any one individual can experience. The immunity of the receptor can also affect level of health risk. In general, exposure to air pollution can exacerbate respiratory diseases, cardiovascular disease, and increase cancer risk.

RESPIRATORY DISEASES

Respiratory diseases are exacerbated by air pollution because pollutants deposit directly along the respiratory tract. Coarser particles and pollutants do not travel further into the respiratory tract. $PM_{2.5}$ and UFP are able to travel into the alveoli of the lungs and even enter the bloodstream directly where they cause inflammation of the tissue. Evidence is well established that air pollution exacerbates asthma and chronic obstructive pulmonary disease (COPD).

Asthma is a chronic inflammatory condition of the airways and substantial studies support the idea that air pollution relates to exacerbations of pre-existing asthma (Ji et al., 2016; Li & Lin, 2014; Weinmayr, Romeo, De Sario, Weiland, & Forastiere, 2010) and new onset of asthma as well (Jacquemin et al., 2009). The airways in individuals with asthma are susceptible to a wide range of stimuli such as allergens (Gowers et al., 2012). It is not surprising that highly concentrated air pollutants act as a direct irritant inducing inflammatory effects on the airway and leads to the exacerbation of pre-existing asthma (Guarnieri & Balmes, 2014). In addition, air pollutants may directly damage airways as oxidative stressors; cause structural changes in airways; and increase respiratory sensitization to allergens by carrying allergens or enhancing epithelial permeability (Gowers et al., 2012). Children are especially susceptible because their lungs are still in developmental stages. Air pollution may also increase the new incidence of asthma (Jacquemin et al., 2015). Although there is insufficient evidence to corroborate the causality, substantial studies and plausible biological hypotheses support the association between air pollution and asthma incidence. In summary, air pollution exacerbates existing asthma symptoms, and is more hazardous for children who are chronically exposed to unhealthy air. A 2013 Community Health Impact Analysis has shown that children in South Park and Georgetown were more frequently hospitalized due to asthma conditions (Cummings & Gould, 2013).

COPD is a condition in which lungs have difficulty exhaling due to narrowed airways (Dean, 2017). Exposure to air pollution is a significant trigger for acute exacerbation of COPD leading to hospitalization and even mortality (Ko & Hui, 2012). PM10 levels are significantly associated with increased emergency room visits, hospitalizations, and mortality due to COPD (Song, Christiani, Xiaorong, Wang, & Ren, 2014; Santurtun, Rasilla, Riancho, & Zarrabeitia, 2017). Other pollutants such as: $PM_{2.5}$, O_3, and SO_2, are linked to an increment of emergency department visits associated with COPD (Ding et al, 2017). PM_{10}, $PM_{2.5}$, SO_2, NO_2 are positively associated with an increased risk for incidence of COPD (Atkinson et al, 2015). Although there is still insufficient evidence to prove a causality between air pollutants and the development of COPD, substantial studies support the association between air pollutants and COPD exacerbation/development. Air pollutants, especially coarse and fine PM exacerbate COPD symptoms, posing an increased hazard for adults with COPD who are exposed to unhealthy air.

CARDIOVASCULAR DISEASE

A large body of research has provided compelling evidence that exposure to air pollutants is related to CVD morbidity and mortality. Specifically, $PM_{2.5}$ was associated with increases in ischemic heart disease (IHD) morbidity and mortality (Xie et al., 2015). $PM_{2.5}$ derived from traffic emission is also linked to inflammation markers, such as the C-reactive protein, which may have an important role in developing IHD by increasing the vulnerability of atherosclerotic plaque (Brook

et al, 2010; Siponen et al., 2015). Substantial studies have reported consistent findings and there is plausible biological mechanism. Exposure to $PM_{2.5}$ may have a causal relationship with cardiovascular morbidity and mortality (Brook et al, 2010).

CANCER

A health assessment of the Duwamish Valley found that theoretical cancer risk is higher in Georgetown and South Park due to: diesel particulate matter, benzene, and 1,3-butadiene. Non-cancer risks come from mobile sources of: acrolein, formaldehyde, diesel engine exhaust, particulate matter, and nitrogen dioxide. This study is an underestimate as it failed to include emissions from the ports, railways, and the airport, and because there is evidence that the Port of Seattle under-reported diesel exhaust emissions from heavy duty trucks for 5 years (Puget Sound Sage, 2012). These show that the primary cause of adverse health outcomes from air pollution are caused by diesel particulate matter (Washington Department of Health, 2008).

OTHER HEALTH OUTCOMES

Recent studies report air pollution's possible impact on mental health, cognitive function, and infertility. In a longitudinal study with 552,221 children and adolescents, participants living in areas with higher air pollution (specifically NO_2) were more likely to have a dispensed psychiatric medication including sedative medications, sleeping pills, and antipsychotic medications (Oudin, Braback, Astrom, Stromgren, & Forsberg, 2016). The higher amount of dispensed psychiatric medication indirectly indicates poorer mental health status in children and adolescents living in areas with higher air pollution. In addition, there is evidence that exposure to $PM_{2.5}$ and NO_2 were associated with cognitive function decline in older adults (Tallon, Manjourides, Pun, Salhi, & Suh, 2017). Lastly, nurses living near major roads (less than 200m) were more likely to report infertility compared to those not living near roads (Mahalingaiah et al., 2016). Although there is limited evidence to prove those causal relationships between air pollution and mental health, cognitive function, and infertility, these studies indicated possible adverse health impacts due to air pollution in addition to respiratory disease, cardiovascular disease, and cancer.

ASSESSMENT

This assessment and corresponding recommendations are focused on the GOSVF, which is informing the Georgetown Mobility Plan.

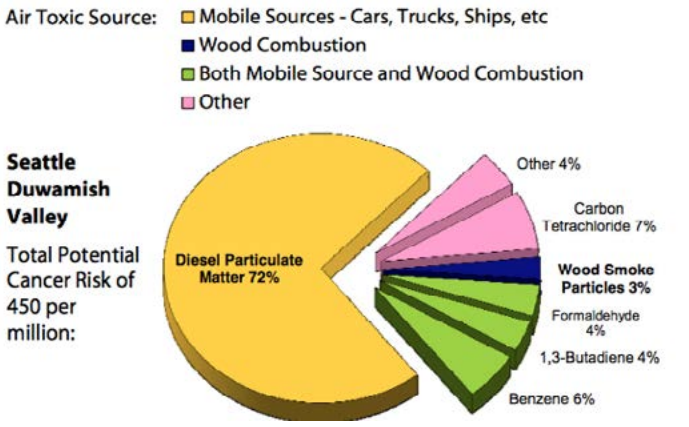


Figure 4-3. The potential cancer risk from different sources in the Duwamish Valley (Puget Sound Clean Air Agency, 2016).

FREIGHT TRUCK NETWORK

The freight truck network incorporates a commonly used route along South Michigan Street, Corson Avenue South, and Airport Way South. In both Seattle's Transportation Master Plan and Freight Master Plan, these streets are classified as 2005 Major Truck Streets and most of Georgetown is zoned as a manufacturing industrial center. These routes are of particular concern because they are near to Georgetown residences, workplaces, and retail and commercial centers. People along these routes experience more exposure to diesel engine emissions. The freight truck network also incorporates Airport Way South and East Marginal Way. Pedestrians, residents, and cyclists along these roads experience increased exposures to air pollution.

BNSF AND UNION PACIFIC RAIL CORRIDORS

Locomotives are less efficient diesel engines, emitting the same type of exhaust as heavy duty diesel trucks at higher rates. The BNSF and Union Pacific Rail corridor along Airport Way South houses multiple tracks. There is a single track that travels along East Marginal Way South. Both these corridors are frequently used, emitting diesel exhaust along these routes. Residents, pedestrians, and cyclists, along these routes experience increased exposure to air pollution.

BICYCLE FACILITIES

Cyclists use can use East Marginal Way South, and occasionally Airport Way South, as a connector to the Industrial District and Downtown Seattle. Cyclists respire more, breathing in air pollution at higher rates than pedestrians, and therefore receive higher doses of air pollutants than others. Cyclists are significantly exposed to more air pollution along these corridors, inhaling air pollution from commuters, aircraft, locomotives, and heavy diesel trucks.

RECOMMENDATIONS

Air pollution is a long standing problem for the Georgetown community and has been addressed multiple times before by various organizations, of which the Duwamish River Clean-up Coalition (DRCC/TAG) is a leader. Previous efforts of the DRCC/TAG include the installation of a green wall along East Marginal Way, local air quality monitoring events, and Take Action for Clean Air Workshops in Georgetown and South Park. These efforts were made possible by a US EPA grant, labor from the Duwamish Valley Youth Corps, and assistance from the American Lung Association, PSCAA, and Just Health Action. Ongoing efforts include the mapping of air quality and toxic releases in the Duwamish Valley, the Duwamish Community Air Watch Map, created by Western Washington University and PSCAA, and the opportunity for free Healthy Home Assessments conducted by the American Lung Association.

Our recommendations focus on improving air pollution in respect to the Georgetown Mobility Plan and aim to decrease pollution sources, mitigate pollution effects, and empower residents to make healthier decisions.

» **Discourage outside activity during peak traffic hours.** Implement an awareness campaign for Georgetown residents, pedestrians, and cyclists about the dangers of air pollution exposure during peak traffic hours. Suggest that pedestrians and cyclists travel before or after such times. This information can be included in Take Action for Clean Air Workshops or discussed during home health assessments.

» **Implement an air quality monitoring and warning system.** Install and maintain a continuous, real-time, emissions monitoring system that warns residents when outside levels of air pollution are too high. The monitoring system could have a smartphone application that warns its user to stay indoors. This monitoring system could be a joint effort with PSCAA and mapping efforts by Western Washington University.

» **Create alternate routes for freight trucks.** Discourage freight trucks from using the South Michigan Street on-ramp, and Corson Ave South off-ramp of the I-5. Reroute trucks to the Spokane Viaduct I-5 ramp. Update the Transportation Master Plan and Freight Master Plan to exclude Michigan Street, Corson Ave South, and the Georgetown I-5 ramps.

» **Mitigate air pollution with trees.** Trees improve air quality by lowering air temperatures and removing air pollutants through their foliage. Trees could be planted between the BNSF and Union Pacific Rail Corridors and Airport Way South. Plant trees in between the railroad tracks and East Marginal Way. Trees must be short-growing, and non-flowering, so that they do not disrupt airport activity. Monopodial trees may also interfere less with rail activity.

  • Consider another green wall along Airport Way South and around the tracks just west of Airport Way South. Green walls can be considered throughout the residential community as well.

Figure 4-4. UW HIA Course Potential Bicycle Lane. Shows location of a possible two-way bike lane on E Marginal Way.

» **Renovate bike lanes along East Marginal Way.** Create a separated two-way bike lane along the east side of East Marginal Way and remove the center turning lane (Figure 4-4). Incorporate appropriate plants and trees into the design. Discourage cycling along Airport Way South. Placement along the east side of East Marginal Way creates more distance between riders and the harmful effects (air pollution and noise) of the rail corridor along the west side of the street. The separation allows for room for flora that mitigate air pollution. Location on East Marginal Way as opposed to Airport Way South is preferred because Airport Way is located closer to I-5 and is nestled between a rail corridor and the airport.

WATER QUALITY AND TOXIC WASTE EXPOSURE

OVERVIEW

The five-mile stretch of the Duwamish river from the southern tip of Harbor Island to Tukwila was designated as a Superfund site in 2014. A century of waste from industries such as materials production (wood, cement, steel, chemicals) and manufacturing (e.g the Boeing plant), as well as use of land near the waterway as landfills and the direct disposal of sewage into the river, has led to high levels of pollution. Contamination occurs today through run-off, spills, pollution of the groundwater, and erosion. Contaminants hazardous to human health found in river include polychlorinated biphenyls (PCBs), arsenic, polyaromatic hydrocarbons (PAHs), and dioxins (ROD, 2014).

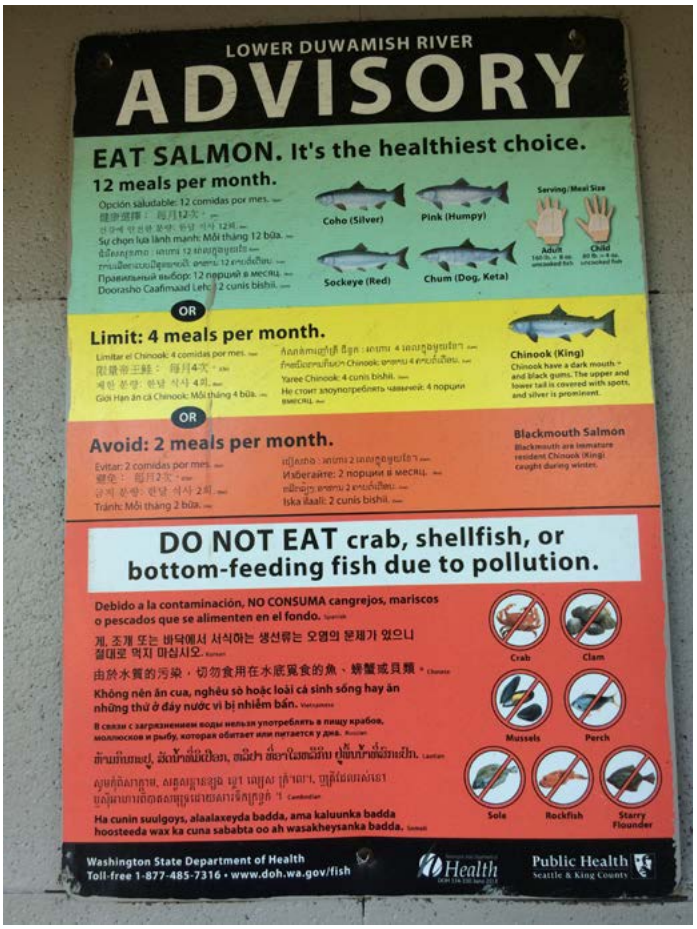


Image 4-1. Sign warning of danger of seafood consumption posted at Georgetown Pump Station Park.

Image 4-2. Georgetown Pump Station Park.

Potential exposure to waste in the water comes from two main sources: contact with water or beach areas and eating fish that live in the contaminated water. The primary Duwamish access point in Georgetown is the Georgetown Pump Station park, a small underdeveloped park without a beach area. Though there are advisories posted to not eat fish or crab from the Lower Duwamish, fishing still occurs. Some Native American tribes use the river for fishing, and other low-income people participate in subsistence fishing. The EPA is conducting a survey of people who fish in the Duwamish, but results are not yet available (EPA, 2014) . Because water in Seattle is drawn from the Cedar River and Tolt River watersheds, Georgetown residents are not at risk for exposure through drinking or bathing (Seattle Public Utilities, 2017).

CURRENT CONDITIONS

The EPA plan for the Lower Duwamish Cleanup extends until 2037, and includes dredging of contaminated sediment, capping with layers of sand, and sand cover for less contaminated areas (Duwamish River Cleanup Coalition, 2017). Monitoring will continue for another 100 years. The most contaminated areas of the river begin just south of Georgetown and the Georgetown pump station park.

HEALTH OUTCOMES AND CAUSAL PATHWAYS

The four main hazardous contaminants are associated with a slew of negative health outcomes. PCB's and dioxins are chemically related persistent organic pollutants that are produced as outputs of industrial processes including smelting and incomplete incineration (WHO, 2016). PCB's were also

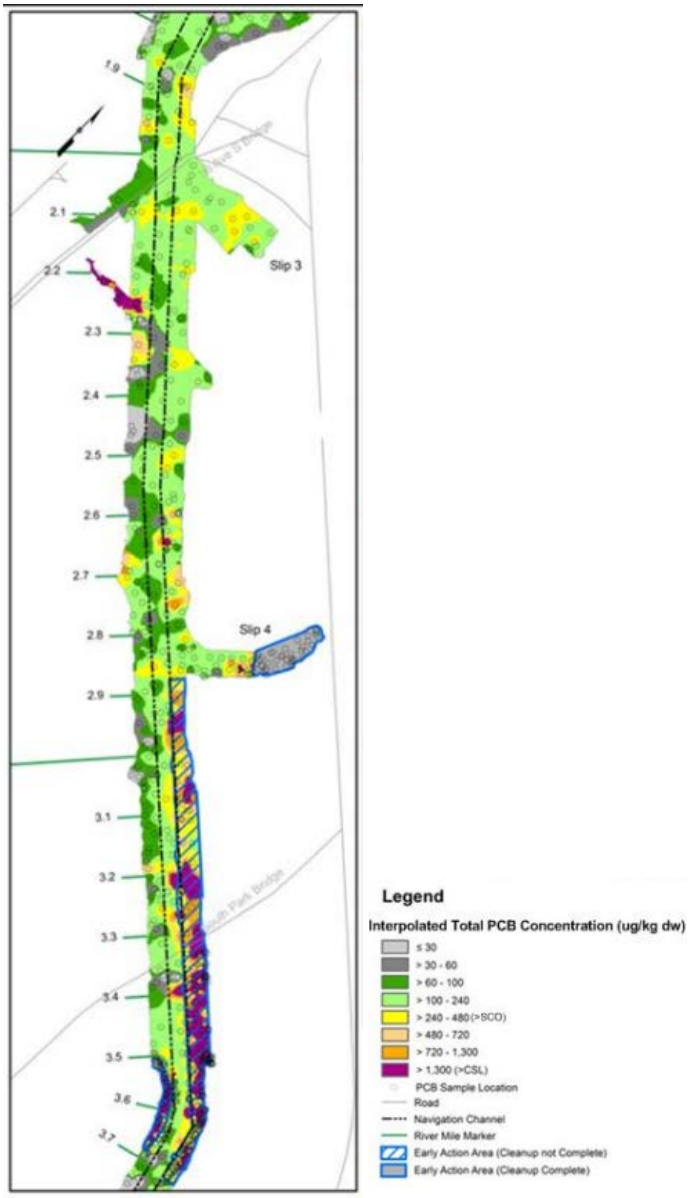


Figure 4-5. PCB concentration in surface sediment (figure from ROD).

once used in electrical systems, but their production has since been banned (WHO, 2010). Because these chemicals accumulate in fatty tissues, 90% of human exposure occurs through consumption. However, industrial emissions can also cause direct exposure. There is some evidence that exposure to airborne PCBs aerosolized from water or soil can cause health effects as well (Carpenter, 2015). Health outcomes stemming from chronic exposure include increased cancer risk and problems with the immune, nervous, endocrine, and reproductive systems (WHO web).

PAHs, a result of incomplete combustion, can also be carcinogenic . Like dioxins and PCBs they can also affect many different systems within the body, including the immune system, the pulmonary system, the liver and kidneys, and the eyes (Abdel-Shafy and Mansour, 2016). Arsenic exposure can also cause a wide variety of negative health outcomes, including skin lesions, diabetes, bone marrow depression, and damage to the liver, kidneys, and nervous system (Abdel-Shafy and Mansour, 2016). All of these compounds can have heightened effects when exposure occurs in utero. The record of decision from the EPA shows an excess cancer risk to be 4 in 1000 for someone who eats 13 meals of contaminated fish per month (ROD, 2014).

ASSESSMENT

Though water contamination, pollution, and exposure to toxic substances from industry are important in Georgetown, it is unlikely to change substantially due to actions that can be taken by SDOT. The most important pathway for intervention is to make sure that people do not consume fish from the river, which has only a tenuous relationship to mobility changes.

RECOMMENDATIONS

» **Improve signage:** Place permanent signs at river access points to alert residents to the danger of swimming or fishing in the Duwamish. Some of these signs already exist.

» **Invest in food security:** Invest in food programs, such as the St. Vincent de Paul Food Bank, to reduce the need for subsistence fishing.

» **Discourage fishing/swimming with design:** When the Georgetown Pump Station Park is renovated, implement design features to discourage entry into the water.

NOISE

OVERVIEW

Noise pollution or 'community noise' is considered to be any noise that does not originate from industrial activity according to the World Health Organization. While few assessments of noise have been conducted domestically, it remains a growing environmental concern to human health. Studies suggest that noise affects individuals psychologically, and may lead to health hazards that include hearing loss along with with annoyance, high blood pressure, heart attacks, and sleep deprivation; it is also linked with slowing education development of children particularly in cognitive and language skills (Stansfeld et al., 1996; Babisch et al., 1999; Knipschild, 1977; Seto et al., 2007)

The World Health Organization (WHO) and Environmental Protection Agency (EPA) recommends that noise exposure levels should not exceed 70 dB over a 24-hour period, and 85 dB over a 1-hour period to avoid hearing impairment. The EPA identified 55 dB indoors and 45 dB outdoor as the maximum noise averages that permit conversation, sleeping, working, and recreation. The CDC also states that local ordinances usually relate to noise annoyance rather than to hearing-hazard risks.

CURRENT CONDITIONS

While there is no neighborhood data currently available for noise in Seattle, it is reasonable to assume that Georgetown experiences more noise pollution relative to residents in other neighborhood. Noise pollution in the neighborhood is influenced by locomotive engines and horns, high levels of commercial vehicle traffic, and aircraft operations; many other neighborhoods in King County are not in close proximity to any of these major commercial noise generating operations.

Additionally, little has been done to help abate noise pollution, and little has been done to ensure residents have properly insulated their homes to improve overall health. Transportation planning and partnerships that include more noise abatement techniques can be implemented to help mitigate noise impacts that would require little effort or capital. According the Georgia Forestry Commission's Green Buffers For Screening Noise Reduction, certain types of trees and plants can help "attenuate sound and calm the noise."

Noise Source	Intensity of sound (db)	Human perception
Threshold of hearing	0	Threshold of hearing
Breathing	10	Just audible
Sound of leaves in trees	20	Very quiet
Whispering	30	Very quiet
Normal conversation	30-40	Quiet
Homes and Restaurent	45-50	Quiet
Loud conversation	65	Moderately loud
Lawn mower	60-80	Moderately loud
Vacuum cleaner	80	Moderately loud
Traffic noise	60-90	Loud
Heavy trucks	90-100	Very loud
Thunderstorm	110	Very loud
Rock music	120	Uncomfortably loud
Jet take off (100 m distance)'	120	Uncomfortably loud
Jet engine (at 25 m distance)	140	Painfully loud
Rocket engine	170-180	Painfully loud

Table 4-1. Intensity of noise sources and human perception (Table from Essay On Noise Pollution, 2016).

HEALTH OUTCOMES AND CAUSAL PATHWAYS

The measurement for noise is in decibels (dB). A human voice creates up to 60 dB at a normal conversational level; automobile noise and trains can generate approximately 70-80 dB while planes can generate 140 dB (Hammer, 2014). Currently, there is no public data available for any noise monitored from Boeing Field nor is there any data for rail track noise. There are four noise monitoring stations surrounding the airport, and the airport webpage does provide a link for residents to file complaints against operators for conducting low altitude operations; however, there is no actual public log of these complaints nor is there any indication that these complaints will change the airport flight operations mitigating aircraft noise. The monitoring systems mentioned are connected to the King County International Airport's flight tracking system, and it is these systems that exist in order to ensure that operators are complying with regulations.

Quality of life is suggested to be influenced by chronic noise pollution; however, research remains limited (Dratva et al, 2010). Evidence currently suggests that noise pollution effects are strongest for annoyance, sleep, and cognitive performance particularly for children in developmental learning stages (Stansfeld & Matheson, 2003; Stansfeld et al., 2005; Bronzaft & McCarthy, 1975).

Noise induced hearing loss occurs when individuals are subjected to continuous noise of 85-90 dB (Stansfeld & Matheson, 2003). Long term studies of cardiovascular health effects on people exposed to chronic noise at a minimum of 85 dB suggest that individuals are more likely to have higher blood pressure than individuals who are not exposed to noise (Stansfeld & Matheson, 2003).

The combination of chronic high volume traffic, rail activi-

ty, and aircraft operations likely all contribute to hazardous health impacts.

ASSESSMENT

King County International Airport, better known as Boeing Field, averages approximately 200,000 take offs and landings annually (King County International Airport/Boeing Field). As a result of the neighborhood's close proximity to the Boeing Airfield, residents of the Georgetown are chronically subjected to a high volume of low altitude flight operations- take offs and landings, and reductions to current operations are unlikely to occur based on noise pollution.

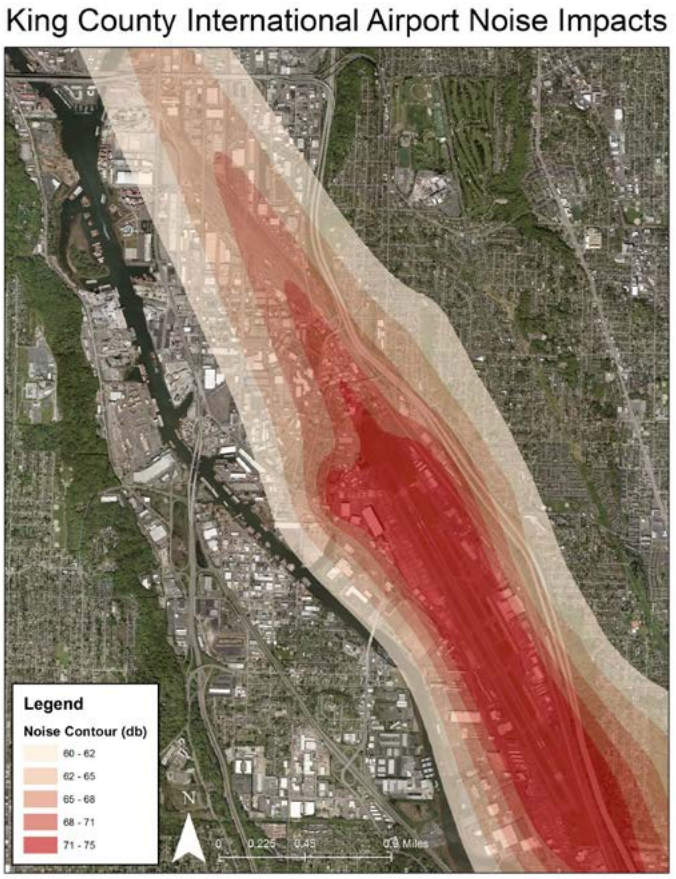
The BNSF and Union Pacific Rail Corridors that run along Airport Way South and East Marginal Way South force residents to endure noise pollution from trains, and reports also indicate that it is even affecting residents outside of the neighborhood.

Because Georgetown's role as the center of the industrial manufacturing and its strategic location for freight movement, the area's residents are victims of an increased amount of vehicle noise pollution from both commercial vehicles as well as passenger vehicle noise relative to other more established residential neighborhoods in King County. The Freight Truck Network as previously mentioned in the Air Quality section has commonly used routes along South Michigan Street, Corson Avenue South, Airport Way South, and East Marginal Way which exposes any residents, pedestrians, or small business to increased noise pollution.

Georgetown's chronic exposure to the King County International Airport (Boeing Field), BRB Rail Track, and multiple industrial locations in and around the neighborhood are likely to have a causal relationship to the noise pollution that negatively affects the quality of life of the residents. The lack of public monitoring and data collection suggest that greater attention should be directed toward noise monitoring and mitigation strategies.

RECOMMENDATIONS

- **Increase noise abatement and mitigations programs:** Additional noise abatement programs could be implemented with the King County International Airport in order to help mitigate aircraft noise. Programs that contribute to residential sound insulation could also be developed
- **Develop residential partnerships plans that helps them mitigate noise pollution:** By communicating directly with residents about what types of greenery they can plant on their own property, it is possible to reduce some of the reduce some of the pollution.
- **Start community monitoring and noise programs:** These will help residents and policy makers better understand the effects of rail noise in the Georgetown neighborhood.
- **Work on developing green programs:** City planning strategies and zoning ordinances could reflect the use of environmental techniques that will increase tree and plant growth, creating natural barriers to absorb noise pollution.
- **Increase data collection:** Based on the industrial history and geographic location of Georgetown within King County, it is likely that that residents are subject to chronic noise pollution from all three types of commercial transport- aircraft, trains, and vehicles which poses a public health concern. More community noise data is required for an in depth analysis for community noise in the Georgetown neighborhood.
- **Develop education and outreach programs:** Public outreach and education programs should be developed to better inform residents, workers, and visitors of Georgetown about environmental conditions.



Map 4-1. An illustration of noise impacts of the surrounding area (King County international Airport/Boeing Airfield).

CLIMATE CHANGE AND EMERGENCY PREPAREDNESS

OVERVIEW

The Georgetown neighborhood lies at the northern end of the Green/Duwamish watershed, along the Duwamish River, with an elevation ranging from 10–20 feet above sea level. Even with expansive global initiatives to reduce greenhouse gas emissions and move towards sustainable energy practices, historic and current human activity will continue to affect our climate. Among the most common effects of climate change will be heat waves, flooding, higher tides, and more unpredictable and dramatic weather patterns. The City of Seattle identifies the most significant effects for the Pacific Northwest as sea level increases, temperature volatility, decreased mountain snowpack, and more extreme precipitation events. Although the Puget Sound region has dealt with all these phenomena before, the severity and frequency of such events will most certainly increase.

The City of Seattle has developed a Disaster Readiness and Response Plan that explains how the City will confront a major natural disaster or event, and has also taken steps to mitigate the effects of climate change through proactive initiatives to limit greenhouse gases. Further, the Pacific Northwest is perched atop the Cascadia Subduction Zone, thus the region is under constant threat of minor to possibly catastrophic earthquakes. While recognizing that climate change and natural disaster preparedness are an essential factor in a community's long term health, the effects and consequences of these events are difficult to predict at a neighborhood level. The most dire predictions for sea level rise model possible flooding along the western edge of the Georgetown neighborhood in the next 40 years, but the extent to which Georgetown residents mobility and health would be affected is exceedingly difficult to extrapolate. And while we want to give credence to these issues, we instead will focus in more detail on the immediate health impacts facing Georgetown as the relate more closely to the scope of this report.

ASSESSMENT

A finding that would be of use to planning efforts is that communities with more social capital are better able to survive and bounce back after disaster. Neighbors, not trained professionals, are typically the first responders after disaster and they have the local knowledge that allows them to check for people in need of rescue. Interventions to encourage social capital include time banking, focus groups, social events, and redesign of physical and architectural structures to maximize social interactions (Aldrich & Meyer, 2014).

RECOMMENDATIONS

» **Develop neighborhood readiness plan** based on potential environmental hazards and catastrophes.

» **Implement environmental monitoring programs** that provide baseline data for current conditions in Georgetown.

» **Plan for worst-case scenarios**. Ensure that any mitigation and adaptation strategies in city planning are based on worst case scenario conditions.

TABLE 4-2. POTENTIAL HEALTH IMPACTS IF ENVIRONMENTAL CONDITIONS CHAPTER RECOMMENDATIONS ARE ADOPTED

HEALTH DETERMINANTS	IMPACT	MAGNITUDE	SEVERITY
Air Quality - Commercial vehicles and locomotives	✚	• • •	▲
Water Quality - Pollutants	✚	•	▲
Noise Pollution - Based on airport, commercial vehicle traffic, and railway noise	✚	• •	▲
Climate Change and Emergency Preparedness	✚		

✚ = Changes that may improve health

━ = Changes that may detract from health

? = Unknown how health will be impacted

● = No effect on health

• = Causes impacts to no or very few people

• • = Causes impacts to wider number of people

• • • = Causes impacts to many people

= No Data

Note that this is relative to population size

▲ = Causes impacts that can be quickly and easily managed or do not require treatment

▲ = Causes impacts that necessitate treatment or medical management and are reversible

▲ = Causes impacts that are chronic, irreversible or fatal

= No Data

CHAPTER 5: ECONOMIC DEVELOPMENT

Seattle is a burgeoning city; in 2016 it was ranked number one in the US for job growth and wages (Torres, 2017). Seattle is now the crane capital of the nation, with a booming construction industry building new skyscrapers downtown and a host of new buildings throughout the city making room for thousands of new jobs and an increased population. As parts of Seattle grow, other areas are trying to keep up with the surge of population growth. Georgetown, an area about five miles south of Seattle's center has nearly a household income and a 5% higher poverty rate than the rest of Seattle and King County (Census Reporter, 2015). With such stark differences in income compared to the rest of King County, Georgetown resident's health is declining. Georgetown is considered one of Seattle's most industrialized neighborhoods; with the King County Airport in such close proximity and heavy traffic of commercial goods, Georgetown residents are at increased risk of vehicle-related injuries and having poor access to healthy foods with limited options for large grocery retailers. Improved access to small businesses and greater environmental walkability has the potential to spur economic opportunity and growth in Georgetown and foster a change for improved health of its residents.

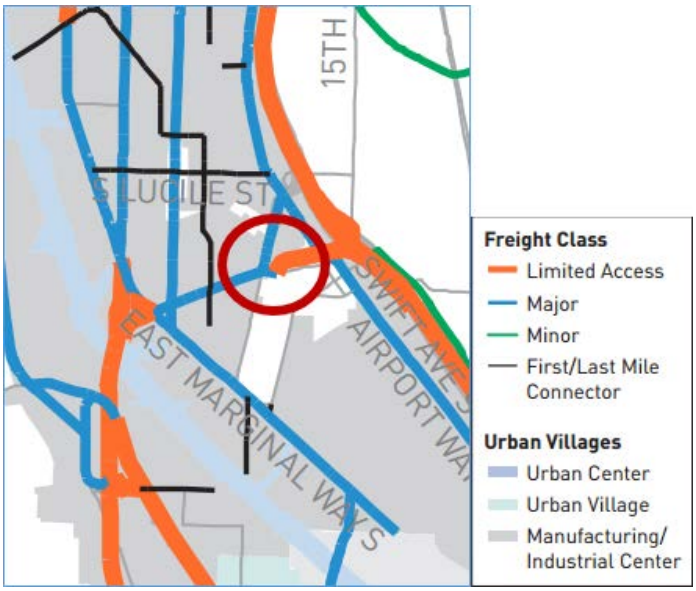
OVERVIEW

A strong association between lower socioeconomic neighborhood context and worse health for neighborhood residents, including premature mortality, has been demonstrated in many studies (Doubeni et al, 2012). This association persists across multiple health indicators. For example, Robinette, Charles, and Gruenewald's 2016 longitudinal study found that residents of lower income neighborhoods were more likely to have worse health outcomes than in wealthier areas, including measurements for mental health, such as anxiety, depression, and physical health such as cardiovascular health.

In the context of neighborhood economic environment, small business growth has been associated with lower mortality, obesity, and diabetes (Blanchard, Tolbert and Mencken, 2011). The health improvements based on small business vitality were linked to not only economic or wage growth but also improvement in collective efficacy and a commitment to community wellbeing, such as walkability, and problem-solving among entrepreneurs (Blanchard, Tolbert and Mencken, 2011). One example of small businesses having a positive impact on neighborhood-level health includes the sponsorship of youth sports teams, which increase physical activity among youth (Suminski and Ding, 2012). Additionally, access to stores (particularly grocery stores), full-service restaurants and shops, facilitated by neighborhood economic vitality has been found to be associated with lower rates of obesity (Leal and Choix, 2010).

Georgetown is an industrial center of Seattle, and as such, many of the people who interact with the neighborhood are employees. It is important to consider the health of this group of people as well as the residents of Georgetown. Two major pathways that can affect worker health in Georgetown are traffic conditions and workplace safety. Georgetown holds several routes that are part of the freight master plan and which serve the many industries in Georgetown (Map 5-1). With these major freight lines running through it, traffic conditions become dangerous for both commuters and the freight drivers themselves. Freight driving can be a particularly dangerous occupation due to long hours and the hazards of freeway driving.

Employer sponsored alternative transit options can be a good way to encourage employees to cut down on single driver commutes. In Seattle, the Commute Trip Reduction program compiles a variety of alternative commute options for employers to encourage employees to take alternate transportation to work. This program found a reduction from a 34% drive alone rate in 2012 to 31% drive alone rate in 2014 by focusing on location specific goals to reduce drive alone rates (SDOT, 2015). Options currently available to employers



Map 5-1. Subset of the Seattle Freight master plan showing the intersection of S Michigan St and Corson Ave S (circled).

include subsidized Orca cards and organizing vanpools or carpools. The correct alternatives will vary widely by employer type and employer size.

CURRENT CONDITIONS

Georgetown, Seattle's oldest neighborhood, is home to a population of 1,295 residents (City of Seattle Office of Economic Development, 2016). Seattle's Georgetown neighborhood has a median household income of $42,159 (US Census Bureau, 2015). This is below the City of Seattle's median household income ($70,594), as well as King County's median household income ($75,302) (US Census Bureau, 2015). The poverty rate in Georgetown, 16%, is above both the broader city's poverty rate (13.5%) and the county's (11.2%) (US Census Bureau, 2015). Georgetown is also home to a diverse amount of economic interests including: light industry, heavy manufacturing, hospitality, retail, nightlife, and cultural development. Unique to the Georgetown area are large portions of land zoned for industrial use, and the neighborhood has historically and continues to be home to significant manufacturing and warehousing industries. These businesses and organizations employ approximately 10,000 workers (City of Seattle Office of Economic Development, 2016). Much of Georgetown is part of the Duwamish Industrial/Manufacturing Center. The Manufacturing Industrial Council, which has approximately 60 member organizations from the industrial sector in the region, has its office in Georgetown (Manufacturing Industrial Council, 2009). In addition to many smaller companies, major employers in Georgetown include Boeing, Sur La Table, and King County International Airport (Linscott, 2016).

With a small resident population, restaurants, shops and other establishments must attract visitors and workers to maintain operation. Tourism has become one of the major drivers of economic activity in Seattle-King County. In 2016, the Seattle-King County region attracted approximately 39 million visitors (Visit Seattle, 2017). Tourist activity accounted for $7 billion in visitor expenditures, contributed to $718 million in tax revenues, and supported 74,000 jobs (Visit Seattle, 2017). While many of these numbers can be attributed to activity in Downtown Seattle, tourists and locals flock to other areas of the region to explore sights, eat at world renowned restaurants, and escape from city.

The Georgetown Merchants Association (GMA) states that 75% of visitor activity account for the neighborhood's $41 million annual restaurant sales and $67 million annual retail sales (City of Seattle Office of Economic Development, 2016). Per the GMA, Georgetown's annual festivals and neighborhood events such as the Georgetown Carnival, Georgetown Bites, and The Second Saturday Art Attack attract at least 100,000 visitors alone. Data on business licenses awarded in the neighborhood show a nearly five-fold increase in licenses for the arts and entertainment industry over the past several years while new manufacturing licenses have remained steady, as has the population. This has led to low retail and restaurant vacancy rates, but revenue in this industry continues to rise, indicating that tourists from other neighborhoods are increasingly coming to Georgetown for leisure.

Much of this economic activity in Georgetown centers near Airport Way South between Corson Avenue South and South Albro Place. More than 40 businesses are members of the Georgetown's Merchants Association (Georgetown Merchant's Association, 2017). Georgetown also has two small grocers, Maruta Shoten and Carleton Avenue Grocery. Assessment of the bicycle and pedestrian safety analysis (BPSA) priority intersections in the Georgetown neighborhood show that these intersections are located near economic centers. The City of Seattle has identified these intersections as among the most dangerous for pedestrians and bicyclists and targeted them for improvements to reduce fatalities and injuries as part of its Vision Zero initiative (Seattle Department of Transportation, 2016). Data from this initiative has shown as many as thirty crashes at one intersection in a year. An analysis of select intersections of interest to this Health Impact Assessment is contained in Map 5-2 and Map 5-3. Not

Map 5-2. Traffic collisions at S Michigan St and Corson Ave S.

Map 5-3. Traffic collisions along S Michigan St between E Marginal Way S and Corson Ave S.

only do unsafe intersections increase the number of injuries and health problems, they also limit economic development, as they deter customers from visiting businesses. Therefore, the intersection and crosswalk improvements addressed in the Mobility section of this HIA are also important for the economic development of Georgetown.

To examine the hazards that workers face in Georgetown, we used the Occupational Safety and Health Administration (OSHA) establishment inspection search tool. By searching for several employers located in the Georgetown neighborhood, we found two companies that had recent inspection violations.

It is unclear how many employers currently encourage alternative transportation, however, a study in 2016 found that nearly half of employers in the Seattle city center, Fremont, Ballard, and the University District offered transit passes or subsidies to employees (EMC Research, 2016). The proportion of employers offering transportation benefits varied by industry type and location. For example, worksites outside of the city center had a much lower proportion of subsidies, around 20 percent. Also, larger companies and business and technology companies were more likely to offer subsidies. For these reasons, we suspect that the proportion of employers in Georgetown offering transit subsidies or passes is lower, probably closer to the 20% figure.

HEALTH OUTCOMES AND CAUSAL PATHWAYS

Individual and neighborhood economic status, as measured by income and poverty rate, and business environment, have been shown to have an impact on health (Doubeni et al, 2012). The key health outcomes considered for this health impact assessment that are related to economic status are: life expectancy, mental health (specifically depression and anxiety), and physical health (specifically, obesity and traffic collision-related injuries). Changes most directly related to economic growth for residents include: vehicle-related collisions, social cohesion and physical activity.

TOURISM

Tourism and the availability of retail, restaurant, and community activities plays an important role in the existing conditions and development of a region. Tourism influences the economic and social makeup of cities and neighborhoods which, in turn, directly impacts the health outcomes of populations who live or work in the area.

A major benefit of tourism is how it impacts the economic health of a region. When visitors travel to a destination, they tend to spend money on activities, food, lodging, transportation, and commodities. These expenditures can result in a "multiplier effect" as it stimulates business enterprises and generates revenue on the local and regional level (Zaei & Zaei, 2013). Since the tourism industry is labor intensive, increased job opportunities may arise in hospitality, retail, restaurant, and transportation industries. These jobs can employ a variety of workers, which can influence unemployment rates, increase the standard of living, and facilitate a reduction in poverty (Zaei & Zaei, 2013). Since economic conditions can

drive the health of individuals and populations, tourism and the activities related to tourism can lead to positive health outcomes, especially for people of color and low-income communities.

Tourism also impacts the development of the social and cultural health of a region. Interaction between the host community and outside visitors facilitates social capital. Social capital can be defined as the degree of social connectedness in a community, as well as the accumulation of resources accessed through those community relationships (Eicher & Kawachi, 2011; UCLA-HIA, n.d.). Numerous studies have made positive associations between social capital, health, and tourism (Andereck et al, 2005; Baumstarck et al, 2015; Zaei & Zaei, 2013).

The interaction of residents and workers with tourists can facilitate network building which can uplift infrastructure in the region and can lead to improved access to education, healthcare, recreation, and economic opportunity (Zaei & Zaei, 2013). These socio-economic improvements directly impact the physical and mental health outcomes of communities in the area. For instance, research has found that lower rates of BMI are associated with neighborhoods that have higher levels of social capital and extensive social networks (Mackenbach et al., 2016). While there can be negative effects of tourism, including gentrification of the host community, careful planning between the community and other stakeholders can mitigate any poor impact on workers and residents of the area.

WORKPLACE SAFETY

For those who work in Georgetown, unsafe workplace conditions can lead to adverse health outcomes that depend largely on the industry. In the worst cases, long term disability and death can result from preventable, poor working conditions. OSHA inspections are a good tool for improving workplace conditions, and in the cases outline above, identified violations and fined the companies. In neighborhoods like Georgetown, where there are many industrial jobs, it is important to support OSHA inspections and make sure that companies respond to violations. Additionally, workers may become more aware of violations within their own workplace if information flyers were posted around workplaces in the community.

Traffic collisions are a major cause of death in the United States, especially for working aged people. Ten percent of all middle-aged deaths (ages 15-49) were due to traffic collisions. These collisions also cause a large amount of injuries, which could lead to reduced working hours and increased health care costs. Besides immediate physical injury or death, freight drivers who get into a crash may have their trucks disabled, leading to missed hours of work and maintenance costs.

The immediate outcomes that are influenced by encouraging alternative transportation are that the drive alone rate will drop. This will impact health because the air quality in the neighborhood will improve. Employees who also switch to biking or walking to work will also lead more active lives, which can lead to a range of better health outcomes. Working with employers to increase bike and transit use by employees will also increase the pressure to improve transit and bike lanes in the neighborhood for use by residents, which will further improve the health of those living in Georgetown.

ASSESSMENT

TOURISM ACTIVITIES AND COMMUNITY EVENTS

Along with being an industrial hub, Georgetown is home to a lively cultural and art community. Georgetown welcomes visitors and locals to explore their galleries, diners, night clubs, art studios, and bookstores. To celebrate their creative diversity, the neighborhood hosts annual and monthly festivals. Georgetown is known for the Georgetown Art Attack!, Carnival, and Georgetown Bites. The Georgetown Merchants Association estimates that these events bring in upwards of 100,000 visitors to the neighborhood.

There are several documented health benefits of community events. On the individual level, direct involvement in community events or the arts builds physical, social, and economic health. Participating in festivals or attending shows can relieve stress and improve self-esteem and efficacy (Guetzkow, 2002). It also builds social networks, increases a sense of collective identity, and builds social capital by connecting different people and organizations to one another (Guetzkow, 2002). Further, when visitors spend money at community events, it benefits local businesses as employers are able to provide job opportunities, provide decent wages for their employees, and invest in the community itself.

The Georgetown Open Space Vision Framework (GOSVF) makes recommendations for facilitating the creation of more event spaces along Airport Way South. In particular, it suggests utilizing the space behind the Old City Hall building as a

multi-use plaza or place that can hold diverse programming. The GOSVF also recommends the improvement of pedestrian access to Airport Way South and the rest of the neighborhood using the River Walk. The River Walk would link different resources in the neighborhood together such as industrial sites, residential areas, schools, and businesses. This would likely increase physical activity, social cohesion, and the economic vitality of the region.

Current examples of popular neighborhood and city history walks include the Freedom Trail in Boston and Washington DC's Neighborhood Heritage Trails. These walks attract millions of tourists and locals alike. It promotes physical activity and interaction with different people and businesses in the neighborhood. When paired with signage to areas of interest a net-positive change on the socio-economic health of Georgetown residents, visitors, workers, and businesses could occur.

WORKPLACE AND WORKER SAFETY

The existing conditions for workplace and worker safety in Georgetown are good. Major industrial areas will always have risks for workers, but the routine OSHA inspections that currently take place can find and address areas that are not up to standard. That said, a handful of specific companies such as Seattle Iron and Metal Corp, were recently fined for a "failure to provide a workplace free from known hazards". Seattle Iron and Metal Corp was also fined in 2014 for not providing personal protective equipment to workers. Another company, Morel Industries, was fined in 2013 for not providing readily available emergency wash facilities, a violation that OSHA categorizes as serious. Workplace safety in large industrial settings is likely outside the purview of the Seattle Department of Transportation. That said, the OSHA has offices in Seattle/King County, and can educate more employers on workplace safety standards.

Similarly, a report published by the Institute of Transportation Engineers stated that many traffic collisions are the result of motorists, including freight drivers, running red lights (McGee, 2003). This report highlights several interventions to improve safety including improving signal visibility, increasing the likelihood of stopping, and addressing intentional violations. Another section of the freight route which has many crashes is the section of South Michigan Street between East Marginal Way South and the intersection at Corson Avenue South. This section of road had many crashes in 2016 and steps should be made to improve safety. Improvements in this area would especially benefit freight drivers in Georgetown because of the major freight routes that run through the neighborhood.

RECOMMENDATIONS

To **support the economic vitality and social growth of Georgetown**, the City of Seattle and various stakeholders should consider the following strategies:

» The Seattle Department of Transportation could consider **improving traffic and pedestrian safety**, particularly around Georgetown retail and restaurant businesses by:

» Working with Department of Neighborhoods and the Department of Planning and Community Development to update their **inventory of existing sidewalks and crosswalks** in Georgetown, including a complete survey of BPSA priority intersections.

» **Adding more pedestrian activated crosswalks with beacons**, specifically at Airport Way South and South Doris Street.

» Working with Seattle City Light to take inventory of existing light fixtures and to **add more street lighting** along Airport Way and along major thoroughfares to increase perceptions of safety, and to encourage walking to Georgetown's retail and restaurant core.

The City's Economic Development Council, Visit Seattle, and the Georgetown Merchant's Association should consider collaborating to **increase tourism to Georgetown** by:

» Working with Seattle Department of Neighborhoods to **install more signage** at entrances to Georgetown, as well as directional signage to Georgetown's retail/restaurant core along Airport Way South between Corson and Michigan.

» Conducting an **economic impact analysis on the contribution of tourism activities** to the economy of the region. This analysis traces the spending associated with tourism activity to identify changes in sales, tax revenues, income and jobs using surveys, secondary data, and input-output models.

» **Coordinating more events** that emphasize the culture of the neighborhood.

» **Developing promotional materials** (i.e. television, radio, internet, and social media ads) to attract more tourists and locals to Georgetown.

The City and employers of Georgetown could **decrease work related injuries and fatalities** by:

» Working with OSHA to survey and identify employers who violate or are at risk of violating OSHA guidelines and workers' rights.

» Educating businesses, industries, and other employers of workers' rights and the need to abide by workplace safety standards

» Working with businesses and other employers to create workplace safety plans

» Enforcing punishments for employers who violate OSHA standards

The City and employers of Georgetown could work to **promote public transportation to Georgetown** by:

» Incentivizing employees of the area to take public transportation to work such as a discounted Orca cards or monetary raffles

» Conducting or funding a survey of Georgetown to find out how many employers are currently offering transit passes or subsidies and how many employers would be interested

CONCLUSION

Health improvements for communities start from a variety of sources. Improving access for physical activity, making walkable areas safer for pedestrians and bikes, and utilizing local food markets and other small businesses drives health behavior change for sustainable health outcomes at the community level. Georgetown's industrialized environment with large commercial vehicle traffic, few local food markets, and unsafe walking and biking areas decreases the opportunity for community health and cohesion. Using community-level data from the BPSA, our team identified Georgetown intersections with prioritized need for improvement for safety of pedestrians and bicyclists. Greater walkability and bikeability in Georgetown has the potential to promote economic growth through healthier residents who walk and bike more through the town and increase consumerism of small businesses that are a staple of Georgetown's community.

TABLE 5-1. POTENTIAL HEALTH IMPACTS IF ECONOMIC DEVELOPMENT CHAPTER RECOMMENDATIONS ARE ADOPTED

HEALTH DETERMINANTS	IMPACT	MAGNITUDE	SEVERITY
Traffic and Pedestrian Safety	✚	• • •	▲
Socioeconomic Status	✚ ━	• • •	▲
Chronic Disease	✚	• •	▲
Physical Activity	✚	• • •	▲
Social Cohesion	✚	• • •	▲
Access to Small Business	✚	• •	▲
Workplace Safety	✚	• • •	▲

✚ = Changes that may improve health

━ = Changes that may detract from health

? = Unknown how health will be impacted

● = No effect on health

• = Causes impacts to no or very few people

• • = Causes impacts to wider number of people

• • • = Causes impacts to many people

= No Data

Note that this is relative to population size

▲ = Causes impacts that can be quickly and easily managed or do not require treatment

▲ = Causes impacts that necessitate treatment or medical management and are reversible

▲ = Causes impacts that are chronic, irreversible or fatal

= No Data

HIA LIMITATIONS

There are several limitations that are worth mentioning for this class-based HIA project. The students themselves represent a diverse range of backgrounds that extend beyond urban planning and public health. Since this was the first time the students conducted an HIA, there is definitely room for further development. Furthermore, the time constraint of only having less than ten weeks to produce this document did not allow for in-depth research, interviews, and surveys. As stakeholder and community engagement is a crucial step in the development of an HIA, the limited timeframe also did not allow for the level of professional and community feedback desired.

Other factors that limited the HIA process also include a lack of specific data to Georgetown. Without any resources to conduct primary data collection, many of the recommendations provided are based on literature reviews, available public data, and some interviews, but there are still knowledge gaps about the community that should still be addressed. Despite the limitations, this HIA still provides a practical framework for how to address many of the issues that Georgetown is currently facing and will face in the future.

CONCLUSION

The findings in this Health Impact Assessment indicate that many of the issues Georgetown is facing are complex and intertwined. The authors of this document understand that many of the issues discovered in Georgetown cannot be directly addressed by the Seattle Department of Transportation (SDOT), but have proposed recommendations to improve health outcomes and community wellbeing for SDOT, other government agencies, businesses, and residents. The strong community engagement of Georgetown residents in the planning process is key to ensuring that Georgetown remains a healthy and safe neighborhood for residents, workers, and visitors alike.

Recommendations from this document focus on increased greening both on the ground and in structures, particularly rooftops. Several mobility issues could also be improved. These improvements include taking inventory of and updating signage, routing, lighting, sidewalks, and crosswalks. In addition, recommendations of increasing public transportation options ensures easy access to basic services, all of which can be achieved through inter-agency collaboration. Other findings suggest that improved environmental monitoring and public outreach programs should be developed for residents. While many of these recommendations require time and planning, the hope of this HIA is that many of the small-scale recommendations such as signage, lighting, community development programs, and green planting programs that can happen in a relatively short amount of time and with relatively few resources will contribute a larger effect to the overall improvement to neighborhood quality.

MONITORING PLAN

We suggest the following 5-year plan to begin implementation of the key recommendations in this report. This plan prioritizes actions to mitigate gentrification for earlier years.

TABLE B-1. MONITORING PLAN

RECOMMENDATION	PARTNER AGENCY	YEAR TO BEGIN IMPLEMENTATION
GREEN SPACE AND PUBLIC ART		
Increase the amount of greenery and green barriers that help improve air quality and reduce community noise pollution. Also include more greenery throughout the neighborhood, particularly on rooftops and walls.	Trees for Seattle seattle.gov/trees Seattle Department of Construction and Inspections seattle.gov/dpd/codesrules/changestocode/greenfactor/whatwhy	2021

Develop partnerships with private property owners to incentivize greening when jurisdiction and space become a limiting factor. Community programs developed with residents, community members, and local organizations can help abate pollution effects on human health.	Seattle Department of Construction and Inspections seattle.gov/dpd/codesrules/changestocode/greenfactor/whatwhy	2019
Create community and art development programs such as the King County's Bus Shelter Mural Program and other similar community programs that help protect neighborhood culture and identity.	King County Bus Shelter Mural Program metro.kingcounty.gov/prog/sheltermural	2017
PARTNERSHIPS		
Partner with the **Department of Planning and Development** in creating a historic preservation overlay district protecting key buildings that add to the historic character of the Georgetown neighborhood	Seattle Office of Planning and Community Development seattle.gov/dpd/cityplanning/completeprojectslist/pikepine/background/default.htm Seattle Department of Neighborhoods seattle.gov/neighborhoods/programs-and-services/historic-preservation	2018
Work with **Seattle City Light** to complete an inventory of and improve existing light fixtures, as well as add more street lighting along Airport Way South and along major thoroughfares to increase perceptions of safety, and to encourage walking to Georgetown's retail core and parks. (SDOT can also collaborate with local businesses to apply for grants from the **Office of Economic Development** for improved lighting.)	Seattle City Light Seattle Office of Economic Development	2019
Partner with **Seattle Neighborhood Farmers Markets or local grocery stores** to increase access to market and vendors for a variety of fresh and affordable food sources. For example, survey residents about a possible grocery shuttle, or a regular farmers market for fresh vegetables and local organic food.	Seattle Neighborhood Farmers Markets seattlefarmersmarkets.org	2021
COMMUNITY		
Survey Georgetown residents on the best ways to increase access to health care providers on First Hill.	SDOT	2017
Refurbish dilapidated warehouse spaces to be artist work/live homes. This contributes to the goal of increasing density while continuing to foster the creative culture that is at the heart of Georgetown.	Seattle Department of Neighborhoods	2018

Advocate for affordable housing development and gentrification mitigation policies such as programs that help residents rehab older buildings or buy their rental properties.	Seattle Housing Affordability and Livability seattle.gov/hala	2017
CITYWIDE		
Implement an air quality monitoring and warning system. Install and maintain a continuous, real-time, emissions monitoring system that warns residents when outside levels of air pollution are too high. The monitoring system could have a smartphone application that warns its user to stay indoors. This monitoring system could be a joint effort with Puget Sound Clean Air Agency and mapping efforts by Western Washington University.	Puget Sound Clean Air Agency	2020
Create alternate routes for freight trucks. Discourage freight trucks from using the South Michigan Street I-5 on-ramp, and Corson Avenue South I-5 off-ramp. Reroute trucks to the Spokane Viaduct I-5 ramp. Update the Transportation Master Plan and Freight Master Plan to exclude Michigan Street, Corson Avenue South, and the Georgetown I-5 ramps.	SDOT	2019
PEDESTRIAN AND CYCLIST SAFETY		
Investigate public transportation options from central restaurant locations to nearby Link Light Rail or bus stops to ensure that those drinking will be able to travel home without driving or cycling.	SDOT and King County Metro	2020
Prioritize improvements along Walk/Bike routes identified in HIA Recommendations Map (Map I-1 on page v). For example, prioritize 6th Avenue South pedestrian improvements (over 4th) as a connection between the northern residential area and the rest of the neighborhood.	SDOT	2017
Inventory, build, and maintain sidewalks and crosswalks. Along with adding crosswalks, also utilize traffic-calming measures, install pedestrian hybrid beacons at crosswalks, high-visibility crosswalks, and improve car signal and pedestrian crossing timing. Prioritize crosswalks along Airport Way South. Prioritize sidewalks on East Marginal Way South between 14th Avenue South and 16th Avenue South and on 6th Avenue South.	SDOT	2017

Utilize traffic-calming measures such as planting street trees near the curb, signage instructing drivers to slow down, and instituting road diets along busy roads leading up to intersections and pedestrian crossings. Priority intersections include South Michigan Street and Corson Avenue South, and South Michigan Street and East Marginal Way South.	SDOT	2018
Publicize a simplified School Walk Route Plan with distinct, designated routes. Install dedicated signage and inground medallions or wayfinding markers along the route.	SDOT and Seattle Department of Construction and Inspections seattle.gov/dpd/codesrules/codes/signs	2018
Improve wayfinding with pedestrian-oriented signage especially along Airport Way South, at South Bailey Street and 13th Avenue South, and at South Michigan Street and East Marginal Way South.	SDOT and Seattle Department of Construction and Inspections seattle.gov/dpd/codesrules/codes/signs	2018

GLOSSARY OF TERMS

Accessible: easy for persons of all abilities to approach, enter, operate, participate in, and/or use safely and with dignity. For example, a site, facility, work environment, service, or program may be accessible.

Active Transportation: physical activity that is done primarily for the purpose of moving from one destination to another, including walking, bicycling, running, using a non-mechanized wheelchair, rollerblading, skateboarding, as well as walking to bus stops.

Automated Enforcement: at intersections with traffic lights, automated cameras take photographs of vehicles entering the intersection on a red light. Citations are sent to the vehicle's registered owner. (NHTSA, 2015)

Best practice: a program, policy, activity, or strategy that has evidence of impact in multiple settings, is based on objective data, has been successfully replicated, and has been research validated or field tested.

Body mass index (BMI): a measure used to define obesity, calculated as weight (in kilograms) divided by height (in meters) squared (kg/m2).

Built environment: setting designed, created, modified, and maintained by human efforts, such as homes, schools, workplaces, neighborhoods, parks, roadways, and transit systems.

Community engagement: a process that involves engaging members of a community in activities that affect them, including identifying local problems and projects and requesting their input into decisions about these problems or projects.

Complete streets: streets designed and operated so that all users, including pedestrians, bicyclists, motorists, and transit riders of all ages and abilities, can safely move along and across the streets.

Connectivity: the directness or ease of travel on sidewalks, paths, and streets between two points: an essential component of walkability.

Density: the number of people, jobs, or dwellings per unit area.

Design: the act of imagining and specifying how things are made.

Disability: a dynamic interaction between health conditions and contextual factors, such as community design, age, and legal and social structures, that may or may not lead to activity limitations and participation restrictions.

Environmental barriers: elements of the built environment that limit accessibility to or use of the built environment.

Environmental health: aspects of human health, disease, and injury determined or influenced by environmental factors, including the direct pathological effects of various chemical, physical, and biological agents, and the health effects of the broad physical and social environments, such as housing, urban development, land use, and transportation

Fresh food access: the ongoing opportunity to procure fresh fruits and vegetables and other nutritious foods within one's community.

Gentrification: a sociocultural phenomenon in which older, declining neighborhoods are renovated, property taxes rise, and lower-income residents are displaced because they can no longer afford to live there.

Greenspace: undeveloped space designed for parks or natural areas, or land set aside to protect undeveloped landscapes.

Hazard: a situation that poses a level of threat to life, health, property, or environment.

Health: a state of complete physical, mental, and social

well-being and not merely the absence of disease or infirmity.

Health disparities: differences among specific population groups in their burden of adverse health conditions and their access to health protective factors.

Incidence: the rate of onset of new cases of a disease per unit of time.

Injury: unintentional or intentional damage to the body resulting from acute exposure to kinetic, thermal, mechanical, electrical, or chemical energy or from the absence of such essentials as heat or oxygen.

Land-use mix: the different types of uses for physical space, including residential, office, retail/commercial, and public space.

Life cycle: a continuum for a product ("cradle to grave") from raw materials extraction through manufacturing, consumer use, transport, and disposal.

Livable communities: well designed communities, where housing, schools, jobs, and parks are within easy walking distance and user-friendly transportation options linking residents to food, clothing, health, and support services are available.

Mental health: a state of well-being in which the individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community.

Mixed land use: co-location of diverse land uses, such as residential, commercial, recreational, and retail.

Mobility: the ability to move freely and easily between destinations

Multimodal transportation: travel including more than one mode of transportation such as automobile, transit, bicycle, or pedestrian modes on urban streets, especially paying respect to the interaction among the modes.

Noise Pollution: harmful or annoying levels of noise, as from airplanes, industry, etc.

Obesity: defined for adults as having a BMI of 30 or greater, and defined for children and adolescents (two to nineteen years old) as having a BMI at or above the age-and sex-specific ninety-fifth percentile on CDC growth charts.

Particulate Matter (PM): is suspended in the air, and is composed of a mixture of solid particles and liquid droplets with a variety of shapes, sizes, and chemical compositions.

Physical activity: any bodily movement produced by skeletal muscles that increases energy expenditure above the basal level.

Place attachment: the emotional bonds that people develop with places that are the sites of memorable experiences.

Policy: a guiding principle upon which governments, businesses, organizations, or other entities develop plans or courses of action, or that is intended to influence and determine decisions, actions, and other matters.

Prevalence: the proportion of a population suffering from a condition at a given point in time, defined as the number of cases of disease per unit of population.

Public health: the science and art of promoting health and preventing disease in populations

Quality of life: an individual's perceptions of his or her position in life in the context of the culture and value system where the individual lives, and in relation to his or her goals, expectations, standards, and concerns.

Rational speed limits: a speed that is appropriate for normal traffic, weather and roadway conditions. Traffic engineers and safety officials determine rational speed limits by analyzing traffic flow, roadway design, local development, and crash information.

Recreational physical activity: physical activity that is done for recreation, enjoyment, sports, hobbies, health, or exercise during leisure time.

Resilience: the ability of a system to respond to and bounce back from a disturbance or crisis.

Road diet: the narrowing of a road or calming of traffic on a road by various means, including removing traffic lanes, reducing traffic speed, widening sidewalks, and adding bike lanes.

Safe Routes to School: a program of the US Department of Transportation that supports infrastructure improvements and education and enforcement efforts to enable and encourage children to walk or bicycle to school.

Sense of place: characteristics or perceptions of such characteristics of a place that make it special to people.

Sharrows: painted street markings that guide bicyclists to share the road with drivers.

Social capital: the processes between people that establish networks, norms, and social trust and facilitate coordination and cooperation for mutual benefit.

Social determinants of health: life-enhancing resources, such as a food supply, housing, economic and social relationships, transportation, and health care, whose distribution across populations effectively determines length and quality of life.

Social equity: the fair management and distribution of public services.

Sustainability: the ability to meet the needs of the present without compromising the ability of future generations to meet their needs.

Traffic calming: a term that describes the purpose of strategies, such as speed humps and roundabouts, that reduce traffic speeds, alter driver behavior, and improve conditions for pedestrians and bicyclists.

Transportation-related physical activity: physical activity that is done for the purpose of traveling from one destination to another, usually by walking or bicycling.

Urban planning: the design profession dedicated to envisioning, designing, and monitoring the development and redevelopment of towns, cities, and entire regions, especially for land use, transportation, and environmental decisions.

Vulnerable population: a group put at risk of adverse health effects by circumstances involving such factors as lack of income, place of residence, health, age, functional or developmental status, ability to communicate effectively, presence of chronic illness or disability, or personal characteristics.

Walkability: how pleasant and safe an area is to walk in, including pedestrian infrastructure such as sidewalks and crosswalks, driver behavior, aesthetics, and proximity to destinations such as stores, parks, and jobs. In walkable communities, residents can walk to nearby destinations and the built environment encourages walking as a means of transportation. Areas with greater walkability have mixed land use, connected streets, sidewalks in good condition, street designs that protect pedestrians from traffic, and pleasant scenery.

Walkable community: a community in which it is easy and safe for all people to walk to access goods and services or to walk for recreation or to employment.

Walk Score: an index based on Google Maps that measures distances from a specific location to stores, parks, schools, and other destinations and provides a walkability score ranging from 0 (car-dependent) to 100 ("walker's paradise").

Wellness: optimal state of health of individuals and groups where each person can realize his or her fullest potential physically, psychologically, socially, spiritually, and economically, and fulfill his or her role expectations in the family, community, and workplace.

ACRONYMS

BPSA: Bicycle and Pedestrian Safety Analysis

CDC: Center for Disease Control

COPD: Chronic Obstructive Pulmonary Disease

DRCC/TAG: Duwamish River Cleanup Coalition

EPA: Environmental Protection Agency

FHA: Federal Highway Administration

GMA: Georgetown Merchants Association

GOSVF: Georgetown Open Space Vision Framework

HIA: Health Impact Assessment

IHD: Ischemic Heart Disease

NACTO: National Association of City Transportation Officials

NO_x: Nitrogen Oxides (NO_x),

O_3: Ozone

OSHA: Occupational Health and Safety Administration

PAHs: Polyaromatic Hydrocarbons

PCBs: Polychlorinated Biphenyls

PSCAA: Puget Sound Clean Air Agency

SDOT: Seattle Department of Transportation

SO: Sulphur Oxides

UFP: Ultrafine Particulate Matter

UW: University of Washington

WHO: World Health Organization

WISAARD: Washington Information System for Architectural and Archeological Records Data

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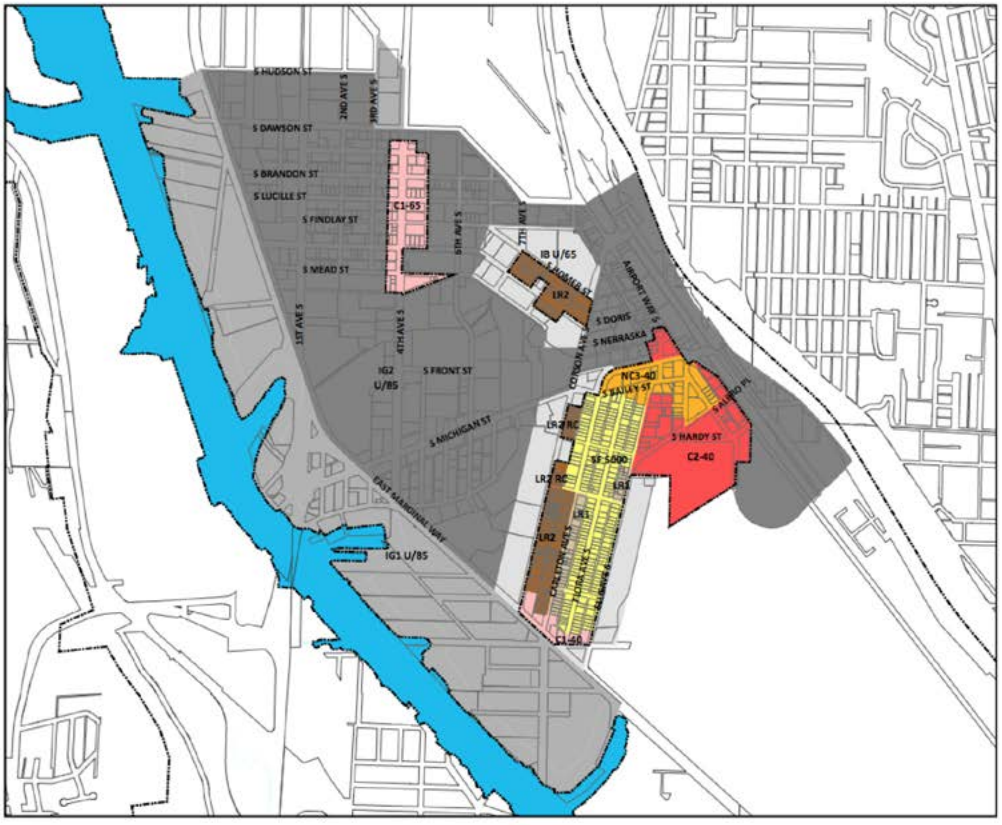
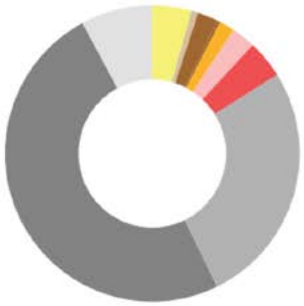
APPENDIX A: ZONING MAP OF GEORGETOWN

DRAFT - Nov 2014

Existing Zoning





- Residential, Single-family 5,000 (SF 5000): 4.3%
- Residential, Multifamily, Lowrise 1 (LR1): 0.8%
- Residential, Multifamily, Lowrise 2 (LR2): 2.3%
- Residential-Commercial (LR2 RC): 0.3%
- Neighborhood Commercial 3 (NC3-40): 1.7%
- Commercial 1 (C1-40; C1-65): 2.6%
- Commercial 2 (C2-40): 4.2%
- General Industrial 1 (IG1 U/85): 26.7%
- General Industrial 2 (IG2 U/85): 49.4%
- Industrial Buffer (IB U/65): 7.8%

A summary of the different zones is available online at: http://www.seattle.gov/dpd/codesrules/codes/zoning/default.htm:

- » Single-Family Zoning Summary
- » Multifamily Zoning Summary
- » Industrial Zoning Summary
- » Commercial Zoning Summary

Residential Zones: 7.6%

Commercial Zones: 8.5%

Industrial Zones: 83.9%

Source: City of Seattle DPD GIS data (accessed November 2014) 4

City of Seattle
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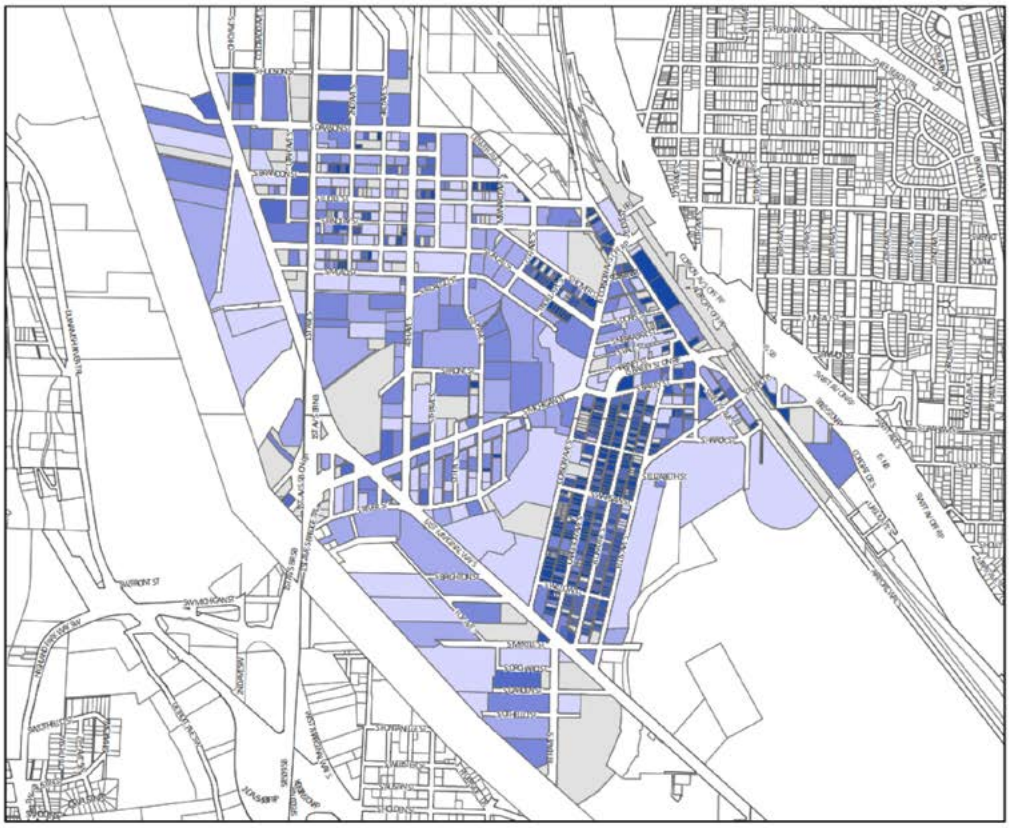
APPENDIX B: AGE OF STRUCTURES IN GEORGETOWN

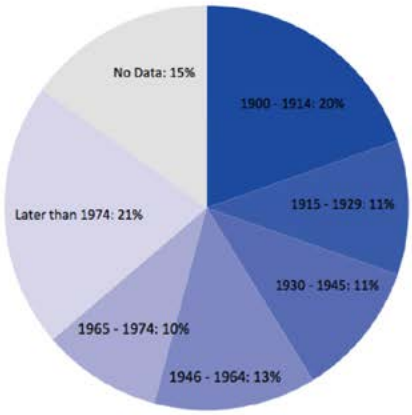
DRAFT - Nov 2014

Age of Structures



Year Built

- 1900 - 1914
- 1915 - 1929
- 1930- 1945
- 1946 - 1964
- 1965 - 1974
- Later than 1974
- No data



Source: City of Seattle DPD GIS data (accessed November 2014)

6

City of Seattle
Department of Planning and Development

APPENDIX C: EXAMPLES OF ART-ORIENTED ORGANIZATIONS IN GEORGETOWN

Base: Experimental Arts + Space

Bridge Productions

Equinox Studios

Fantagraphics Bookstore and Gallery

Georgetown Arts and Cultural Center

Georgetown Trailer Park Mall

Kyoto Arts and Antiques

Oxbow Gallery

Praxis Arts LLC

Puget Sound Group of Northwest Artists

Rainier Glass Studio

Seattle Drum School

Tammy Spears Paintings

The Miller School of Art

Totally Blown Glassworks Inc.

Georgetown Mobility Study
A Health Impact Assessment

SEATTLE, WASHINGTON | JUNE 2017

Editors: Chrisha Bali, Jessie Friedmann, David M. Rivera,
Orly Stampfer, and Alison Turner

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