

UCLA

Capstone Projects

Title

Mapping Equity: A Geospatial Evaluation of the Accessibility and Quality of Transportation Infrastructure in Oakland, CA

Permalink

<https://escholarship.org/uc/item/9cc670pb>

Author

Yau, Laura

Publication Date

2025-06-13

DOI

10.17610/T6X026

Mapping Equity

A Geospatial Evaluation of the
Accessibility and Quality of
Transportation Infrastructure in Oakland,
CA

Project Lead: Laura Yau

Faculty Advisor: Evelyn Blumenberg

Client: Oakland Department of Transportation

Technical Report Documentation Page

1. Report No. N/A	2. Government Accession No. N/A	3. Recipient's Catalog No. N/A	
4. Title and Subtitle Mapping Equity: A Geospatial Evaluation of the Accessibility and Quality of Transportation Infrastructure in Oakland, CA		5. Report Date June 2025	
		6. Performing Organization Code UCLA-ITS	
7. Author(s) Laura Yau		8. Performing Organization Report No. LAS2508	
9. Performing Organization Name and Address Institute of Transportation Studies, UCLA 3320 Public Affairs Building Los Angeles, CA 90095-1656		10. Work Unit No. N/A	
		11. Contract or Grant No. N/A	
12. Sponsoring Agency Name and Address UCLA Institute of Transportation Studies www.its.ucla.edu		13. Type of Report and Period Covered Final	
		14. Sponsoring Agency Code UC ITS	
15. Supplementary Notes DOI:10.17610/T6X026			
16. Abstract This research assesses how the City of Oakland is meeting the basic transportation needs of its residents, defined by their ability to safely and comfortably use critical infrastructure such as sidewalks, roads, street lighting, street trees, and curb ramps. The study investigates the relationship between neighborhood demographic and socioeconomic characteristics and the quality and availability of transportation assets, aiming to determine if these resources are distributed equitably. The analysis utilized geospatial datasets on pavement condition, curb ramp ADA compliance, sidewalk integrity, and street tree conditions. These factors were mapped and compared against OakDOT's Priority Neighborhoods dataset, which assigns each of the City's 116 census tracts an equity priority designation. Findings reveal inequities in infrastructure quality. Issues like deteriorating pavement, non-ADA-compliant curb ramps, and severe sidewalk damage are disproportionately distributed, with many lower equity priority neighborhoods unexpectedly displaying higher maintenance needs. However, closer examination showed that these issues in lower equity priority areas, particularly in the hilly neighborhoods northeast of the I-580 freeway, are significantly influenced by environmental factors such as steep and uneven slopes. Higher equity priority neighborhoods face compounded disadvantages, including higher pollution exposure, increased ambulatory disability rates, and limited street tree coverage. These overlapping vulnerabilities highlight the need for continued targeted investment in high equity priority neighborhoods. The study recommends expanding asset data collection, developing tailored performance metrics, integrating these metrics into prioritization frameworks, and collaborating closely with community organizations. These measures aim to foster transparency and equity in Oakland's transportation infrastructure planning and investments.			
17. Key Words equity analysis, transportation.		18. Distribution Statement No restrictions.	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 79	22. Price N/A

Acknowledgments

The Institute of Transportation Studies at UCLA acknowledges the Gabrielino/Tongva peoples as the traditional land caretakers of Tovaangar (the Los Angeles basin and So. Channel Islands). As a land grant institution, we pay our respects to the Honuukvetam (Ancestors), 'Ahihirom (Elders) and 'Eyoohiinkem (our relatives/relations) past, present and emerging.

I would like to express my deepest gratitude to my advisor, Dr. Evelyn Blumenberg, and to my client, Ruth Meza, transportation planner and co-chair of the Race and Equity Team at the Oakland Department of Transportation, for their insight, support, guidance, and patience throughout the development of this report. Thank you as well to the Major Projects Division at OakDOT. To Audrey, Acacia, Ruth, Celina, Jane, and Manuel—it has been a true privilege to learn from and work with you all. I am so grateful to have interned with a team that not only talks about equity but fully embodies it by intentionally weaving it into every aspect of their planning work. Getting to witness how race and equity are prioritized in real, tangible ways has been deeply inspiring. Your commitment to making Oakland a more just, inclusive, and livable city sets the gold standard for what equitable planning should look like. I also want to thank Nataly Rios Gutierrez for her guidance and encouragement, and Annie Chan for always cheering me on. Finally, I am so thankful to my friends and family for their unwavering support throughout this journey in graduate school and for always pushing me to keep going.

Disclaimer

This report was prepared in partial fulfillment of the requirements for the Master in Urban and Regional Planning degree in the Department of Urban Planning at the University of California, Los Angeles. It was prepared at the direction of the Oakland Department of Transportation (OakDOT) as a planning client. The views expressed herein are those of the authors and not necessarily those of the Department, the UCLA Luskin School of Public Affairs, UCLA as a whole, or the planning client.



Mapping Equity: A Geospatial Evaluation of the Accessibility and Quality of Transportation Infrastructure in Oakland, CA

UCLA Institute of Transportation Studies

A comprehensive project submitted in partial satisfaction of the requirements for the degree
Master of Urban and Regional Planning.

Table of Contents

Executive Summary	7
1. Introduction	8
2. Literature Review	10
2.1 Disparities in the distribution and quality of infrastructure	10
2.2 Implications of disparities in access to good quality infrastructure	12
2.3 Current state of equity considerations in transportation infrastructure management	13
2.4 Conclusion	14
3. Data and Methodology	15
4. Findings	19
4.1 Pavement Assessment	19
4.2 Sidewalk Assessment	22
4.3 Curb Ramp Assessment	29
5.4 Street Tree Assessment	31
4.5 Active Transportation (Bikeways)	37
4.6 Streetlights	39
4.7 Pedestrian Crosswalks and Traffic Controls	40
5. Analysis	43
5.1 Summary of Findings	43
5.2 Implications	47
6. Conclusion and Policy Recommendations	57
7. References	60
8. Appendix	67

List of Tables and Figures

3. Data and Methodology	17
Table 1. Asset data availability	17
Table 2. Weighting of demographic factors used in priority neighborhood designation	19
Map 1. OakDOT Priority Neighborhoods and Planning Areas (2024)	20
4. Findings	21
Map 2. Weighted Pavement Condition Index by census tract	22
Figure 1. Census tracts with at-risk pavement, by equity priority area	23
Map 3. Street Network and Roadway Classification Map (Source: Oakland Map Atlas)	24
Map 4. Sidewalk network	25
Map 5. Number of damage points per 1,000 feet of sidewalk	27
Table 3. Sidewalk damage by equity priority	27
Map 6. Number of high maintenance priority damage points per 1,000 feet of sidewalk	29
Map 7. Sidewalk gaps and sidewalk gaps (feet) per mile of sidewalk	30
Map 7. Total number of curb ramps that are not ADA-compliant per census tract	32
Map 8. Percent of curb ramps within each census tract that are not ADA-compliant	32
Figure 2. Percent non-compliant curb ramps within each equity priority designation	33
Figure 3. Top 20% of census tracts with the most non-compliant curb ramps, by equity priority	33
Map 9. Distribution of City-owned street trees	35
Map 10. Tree canopy coverage by neighborhood (Davey Resource Group)	36
Figure 4. Tree condition by equity priority	37
Map 11. Trees in poor, dead or stump condition	38
Map 12. Percent of City-owned trees within census tract that are in poor, dead, or stump condition	39
Map 13. Percent of public street trees that do not provide shade, categorized as a stump or dead	40
Map 14. Existing bikeways	41
Figure 5. Bikeway classification breakdown	41
Figure 6. Miles of bikeways by equity priority	42
Map 14. Streetlights by ownership	43
Image 1. Snapshot of crosswalk and traffic control symbology	44
Map 15. Crosswalks and percentage of continental crosswalks by census tract	45
Figure 7. Percentage breakdown of crosswalk type for each equity priority	45
5. Analysis	46
Figure 8. Number of census tracts with at-risk or poor pavement condition, by equity	

priority	46
Figure 9. Number of census tracts that fall in worst 20% of sidewalk damage counts, by equity priority	47
Figure 10. Number of census tracts that fall in worst 20% of sidewalk discontinuity measures, by equity priority	48
Figure 11. Number of census tracts that fall in top 20% of most total non-compliant curb ramps and census tracts with more than 50% of curb ramps non-compliant, by equity priority	49
Figure 12. Number of census tracts that fall in 20% of tree maintenance and planting needs, by equity priority	50
Figure 13. Funding for Great Pave by Planning Area (Source: OakDOT)	51
Figure 14. Comparing Weighted Pavement Condition Index (PCI) before and after the Great Pave	52
Table 4. Poor condition pavement mileage by equity priority	52
Map 16. Topography and Slope (Source: Oakland 2045 Map Atlas)	53
Map 17. Percent of population with ambulatory disability	54
Table 5. Highest rates of ambulatory disability, curb ramp compliance, and sidewalk issues.	55
Map 18. CalEnviroScreen 4.0 Pollution Burden Percentile	57
Map 19. Heat Vulnerability in Alameda County (Source: Alameda County)	57
Map 20. Canopy coverage and City-owned street trees (Source: Oakland 2045 Map Atlas)	58
6. Conclusion and Policy Recommendations	60
Table 6. Examples of potential metrics	60
8. Appendix	70
Figure 8 Data Table. Census Tracts with at-risk Pavement	70
Figure 8 Data Table: Census tracts with poor condition pavement	72
Figure 9 Data Table: Top 20% of census tracts with poorest condition sidewalks	73
Figure 9 Data Table. Top 20% of census tracts with highest number of severe damage points and urgent repair maintenance per 1,000 feet of sidewalk	74
Figure 10 Data Table. Top 20% of tracts with greatest sidewalk gap mileage	75
Figure 10 Data Table. Top 20% of tracts with greatest gaps (ft) / sidewalk (mi)	75
Figure 11 Data Table. Top 20% Census Tracts with the most non-compliant curb ramps	76
Figure 11 Data Table. Census Tracts with >50% non-compliant curb ramps	77
Figure 12 Data Table. Top 20% of census tracts with the most dead trees and stumps	77
Figure 12 Data Table. Top 20% of census tracts with the most trees that need maintenance (Poor condition)	78

Executive Summary

In this report, *Mapping Equity: A Geospatial Evaluation of the Accessibility and Quality of Transportation Infrastructure in Oakland, CA*, I evaluate how the City of Oakland is meeting the basic transportation needs of its residents through the distribution and condition of its transportation infrastructure. Conducted in partnership with the Oakland Department of Transportation (OakDOT), the project uses geospatial analysis to examine infrastructure equity across the City's 116 census tracts.

The research analyzes the availability and quality of key transportation assets, including pavement, sidewalks, curb ramps, street trees, bikeways, crosswalks, and street lighting, and compares these conditions to neighborhood demographic, socioeconomic indicators, and equity priority designation as defined by OakDOT's Priority Neighborhoods dataset. The findings show that infrastructure challenges such as poor pavement, non-Americans with Disability Act (ADA)-compliant curb ramps, and severe sidewalk damage are not evenly distributed. While some lower equity priority areas in the hillside neighborhoods of Oakland (north of I-580 freeway) show significant maintenance needs due to environmental factors like steep terrain and dense tree coverage, higher equity priority neighborhoods continue to face compounding disadvantages, including greater pollution burden, higher disability rates, and lower access to street trees and shade.

Equity-focused initiatives, such as OakDOT's Great Pave program, have led to significant improvements in pavement condition in the High and Highest equity priority areas. However, the presence of overlapping vulnerabilities, including high rates of ambulatory disability, high rates of walking dependence, lower vehicle access, and environmental health burdens, underscore the need for continued and targeted investment in these neighborhoods.

To advance equitable outcomes, the report recommends that OakDOT: (1) maintain and expand its transportation asset data collection, (2) develop clear performance metrics tailored to each asset type, (3) integrate performance metrics into project prioritization and funding and resource allocation, and (4) partner with trusted community-based organizations in data collection and metric development to increase trust and relevance.

Ultimately, this project aims to support OakDOT in making more transparent and more equitable decisions about where and how to invest in the City's transportation infrastructure.

1. Introduction

Infrastructure is the physical framework upon which the US economy operates and our standard of living depends (ASCE, 2021). When infrastructure is available and well-maintained, it can provide better access to jobs, healthcare, education, and more. Historically, policymakers and government institutions have engaged in unequal investment and intentional disinvestment in infrastructure as a deliberate strategy to privilege some communities over others (Norwood, 2021).

While a substantial body of research has examined the equity implications of access to transportation (or lack thereof) on individual outcomes and livelihoods (Shen, 2001; King et al., 2022; Jeon et al., 2018; Ong & Miller, 2005; Blumenberg, 2017), somewhat less research addresses the equity dimensions of access to the infrastructure that supports transportation itself (Giovannettone et al., 2024; Coleman et al., 2023). This infrastructure includes the physical systems that facilitate the movement of people and goods, including roads, bridges, ports, airports, transit networks, and active transportation facilities like bike lanes and sidewalks (Taylor, 2021).

Furthermore, planners and engineers all too infrequently approach the management and maintenance of transportation infrastructure assets, also known as Transportation Asset Management (TAM), through the lens of social equity. Given limited time, funding, and resources, planners should prioritize equity considerations as they are critical to meaningfully meeting people's mobility and accessibility needs and appropriately prioritizing infrastructure projects.

Established in 2017, the Oakland Department of Transportation (OakDOT) manages the public right-of-way to support and maintain the City's transportation system and assure safe, equitable, and sustainable access to mobility for residents, businesses, and visitors. The agency delivers capital projects and oversees transportation-related infrastructure, programs, and policies. By the numbers, the Department is responsible for managing and maintaining over 800 miles of city-owned streets including 1,100 miles of sidewalks, more than 18,000 accessible pedestrian ramps, nearly 700 signalized intersections, 37,000 streetlights, 200,000 signs, over 15,000 on-street and off-street parking spaces, and over 300 miles of bike facilities.

My research project focuses on evaluating transportation equity and understanding basic transportation needs in Oakland. Specifically, it seeks to answer the following questions:

- Do some neighborhoods have more outstanding maintenance or capital needs than others?

- What is the relationship between the demographic and socioeconomic characteristics of neighborhoods and the availability and quality of transportation infrastructure? In other words, are the basic transportation needs of Oakland residents being met equitably?
- What are the existing conditions of the transportation infrastructure in any given area of the City?

I define basic transportation needs as the ability to access and safely and comfortably use the City's transportation infrastructure, namely active transportation facilities, sidewalks and crosswalks, roads and pavement, street lighting, street trees, and curb ramps.

To answer these questions, I took inventory and assessed the quality and maintenance needs of the City's above-mentioned transportation infrastructure assets. OakDOT maintains some publicly-available infrastructure data; however, at the beginning of the project in Fall 2024, my client was not aware of the availability and maintenance needs of most of the city's infrastructure assets. My initial research approach was to gather the data myself on-the-ground in four sample neighborhoods with contrasting demographic and socioeconomic characteristics and to conduct geospatial analysis to understand how the availability and quality of infrastructure varied across these select neighborhoods. However, informational interviews with various staff revealed that data on the location and availability of the City's core transportation assets existed; it was just unknown and not distributed or publicized to the Department as a whole. Some data were collected by consultants while others were maintained within teams at OakDOT. Given the discovery of extensive datasets, I shifted my approach to conducting a geospatial analysis of the distribution and quality of transportation infrastructure citywide.

To broaden my understanding, I examined how other municipalities across the country managed and maintained their transportation infrastructure. I paid specific attention to whether and how city planners incorporated equity into project prioritization and resource allocation. In particular, I benefited from case studies of the efforts of planners in Departments of Transportation in Seattle, Los Angeles, Minneapolis, and Atlanta.

This report provides a description and analysis of how transportation assets in the City of Oakland are distributed across neighborhoods. I dive further into the data by analyzing and identifying the relationship between the availability and quality of infrastructure and the demographic and socioeconomic characteristics of neighborhoods. I then draw on my findings to provide the City with a set of recommendations on how to prioritize maintenance and improvements and how to leverage their data. Ultimately, the objective of this report and the accompanying data analysis and maps is to provide OakDOT staff with a general understanding of which transportation needs are/are not being met in any given area to inform future project outreach, infrastructure maintenance plans, and project prioritization.

2. Literature Review

The goal of this literature review is to illustrate the importance of transportation infrastructure and highlight why equity is a worthwhile consideration. I first summarize the research on the distribution and quality of infrastructure. I then review the implications of these disparities, particularly why access to good quality infrastructure is important. Finally, I explore whether or not cities currently consider equity in transportation infrastructure management.

2.1 Disparities in the distribution and quality of infrastructure

Scholarship has shown that by and large, disparities exist in the distribution and quality of virtually every kind of transportation-related infrastructure (Li et al., 2022). Such disparities are evident in large scale transportation infrastructure such as highway pavement and bridges. In 2022, the U.S. Government Accountability Office (U.S. GAO) analyzed the pavement condition of national highways. While most of the pavement is in relatively good condition, there is significant variation across the country and within states. Specifically, even when controlling for such factors as climate and traffic density, the U.S. GAO found that highway pavement is less likely to be in good condition in urban areas, places with higher family poverty rates, and areas with higher percentages of underserved and communities of color. Moreover, in 2023 the National Bureau of Economic Research found that road conditions are worse in coastal areas and in poorer towns and poorer neighborhoods (NBER, 2023). In a national study, researchers found links between pavement condition and demographic characteristics. Even after controlling for factors such as region, road type, and traffic, areas that have a higher proportion of African Americans, greater linguistic isolation, and limited access to affordable housing and transportation options, are less likely to have access to high-quality pavement (Erfani et al., 2024). This disparity along demographic and socioeconomic lines underscores the need to incorporate equity considerations in pavement maintenance and infrastructure planning.

There are similar disparities in the condition of bridges. A social equity assessment of the National Bridge Inventory (NBI) demonstrated that even when controlling for differences in deterioration due to age, traffic type and volume, bridge materials, and climate, bridge condition was not equitably distributed across the country (Gandy et al., 2023). Bridges located in census tracts that were lower-income, disadvantaged, and/or majority Black were more likely to be in poor condition than other bridges (Gandy et al., 2023). In addition to bridge condition, researchers also found variation in the number and type of bridge based on demographic and socioeconomic characteristics. An analysis of the Pennsylvania bridge system showed that communities with a higher proportion of minorities and single-parent families tended to have

fewer bridges. Moreover, the bridges that did exist in those areas were more likely to be low-clearance and considered restrictive (Jones & Armanios, 2020).

Sidewalks are of particular relevance to my project. Research on sidewalks has consistently revealed disparities in sidewalk quality and connectivity and built environment characteristics that factor into walkability. Studies generally show variation in sidewalk quality and connectivity by income and race/ethnicity. For example, an extensive sidewalk quality assessment in the urban community of Pontiac, Michigan revealed that worse overall sidewalk quality was associated with census block groups with a higher proportion of people living below the poverty line and a higher proportion of Black and Latinx/Hispanic residents (Rajaei et al., 2021). Lowe (2016) also found a relationship between income, race and sidewalk connectivity in New Orleans, Louisiana. Kelly et al. (2007) found sidewalk unevenness and the number of sidewalk obstructions to be greater in predominantly Black neighborhoods in the St. Louis metropolitan area. Finally, a study in Albuquerque, New Mexico revealed greater sidewalk maintenance needs in lower income and minority neighborhoods than other neighborhoods (Corning-Padilla & Rowangould, 2020).

Similarly, other built environment characteristics that shape the walkability of an environment varied by income and race/ethnicity as well. Physical disorder as exhibited by such features as graffiti, litter, and poorly maintained buildings is greater in neighborhoods that are lower income or predominantly non-White (Kelly et al., 2007; Thornton et al., 2016). Researchers found that disadvantaged areas—residents with low socioeconomic status near parks, schools with higher student poverty rates, and higher-poverty neighborhoods—had fewer amenities that improved the microscale features of walkability like street lighting and overhead coverage compared to other neighborhoods to be lesser in (Rigolon et al., 2017; Zhu & Lee, 2008; Rajaei et al., 2021; Bereitschaft, 2017). Street trees are an important component of walkability; they enhance pedestrians' feelings of comfort, safety, and attractiveness. Sidewalk amenities also are distributed inequitably. Tree canopy cover is directly correlated with income (Brooks et al., 2016; Landry & Chakraborty, 2009; Schwarz et al., 2015).

In aggregate, these studies provide convincing evidence that disparities in the quality and distribution of transportation-related infrastructure fall along demographic and socioeconomic lines. A few factors may help explain these patterns. Wealthier and more politically connected communities historically have greater influence over planning and investment decisions, leading to better infrastructure in those areas (Bogart, 2022; Gilens & Page, 2014; DeGood, 2020). Lower-income and marginalized communities often face underinvestment because they are concentrated in particular cities and, therefore, generate too little tax revenue to address their infrastructure needs (Rigolon et al., 2019; Nicoletti et al., 2022; DuPuis & McFarland 2016; Le & Young 2022). Or they live in large cities, like Los Angeles, but lack the resources or political power to advocate effectively for infrastructure improvements (Rigolon et al., 2019; McGahey et al., 2023; Nicoletti et al., 2022). Additionally, past policies and planning decisions such as redlining, exclusionary zoning, and freeway siting, have systematically disadvantaged certain groups, resulting in long-term infrastructure neglect (Self, 2023; Lens, 2022; Gonzalez et al.,

2023; Nelson et al., 2023; Lane et al., 2023; Nardone et al., 2021). These factors, combined with ongoing institutional biases and unequal access to decision-making processes, contribute to persistent inequities along demographic and socioeconomic lines.

2.2 Implications of disparities in access to good quality infrastructure

Socioeconomic

In their report series “Failure to Act,” the American Society of Civil Engineers (ASCE) quantifies the financial impacts of failing to meet investment gaps in the country’s aging infrastructure. Less reliable water and electricity services and unmet maintenance and upgrade needs for transportation infrastructure results in significant national economic losses estimated to amount to an average of \$3,300 lost in disposable household income every year from 2020 to 2039 (ASCE, 2021). These financial losses can materialize in different ways.

For example, poor or unavailable transportation infrastructure creates difficulties in mobility and accessibility that makes it harder for lower-income individuals to reach jobs, resulting in lost earning potential (Bastiaanssen et al., 2020). Furthermore, it can limit access to educational opportunities as well as healthcare and other essential services (Chingos & Blass, 2017; Syed et al., 2013).

Potholes and other imperfections in the road can result in blown tires, broken axles, worn out shock absorbers, and suspension damage (AAA SoCal, 2016). In California, driving on compromised pavement conditions costs drivers \$24.2 billion a year or \$878 per driver in the form of additional vehicle repairs and maintenance, accelerated vehicle depreciation, and higher fuel consumption (TRIP, 2025). Furthermore, pavement roughness has been shown to lead to ballooning vehicle operating costs in the form of increased fuel consumption, accelerated tire degradation, more frequent maintenance and repair, and consequently overall vehicle depreciation (Robbins & Tran, 2015; ASCE, 2025). Such costs disproportionately burden lower-income drivers, underscoring persistent inequities in the design, maintenance, and accessibility of transportation systems. In a survey, the majority of respondents earning less than \$75,000 expressed deep concern over damaged roadways, due to the potential financial cost they might incur (AAA SoCal, 2016).

It is also worth noting that lower-income road users are also more likely to rely on certain types of infrastructure than higher-income travelers. According to the 2022 National Household Travel Survey (NHTS), 18.6% of all trips taken by individuals in households earning less than \$15,000 are made on foot, with an additional 10% using public transit. In contrast, walking accounts for only 6.9% of trips across all income groups, and public transit just 1.5%. Given these differences in travel behavior, the provision of high-quality sidewalks, crosswalks, street lighting, and transit-supporting infrastructure is essential to fostering a more equitable built environment.

Environmental

Poorly maintained infrastructure can mean higher levels of greenhouse gas emissions and pollution, increased traffic and congestion, and decreased safety and livability (Litman, 2018). Decisions around maintenance affect safety, accessibility, and future costs for infrastructure (Tao et al., 2021; Chen & Wang, 2020; Coleman et al., 2020; Howe et al., 2016). Absence of street trees and permeable sidewalks in underserved areas limits local adaptation to heat waves and flooding.

Safety

Research has shown that there is a causal relationship between road damage and traffic safety. Deteriorated and not up to standard roads have been shown to lead to statistically and economically significant increases in vehicle crash rates (Bock et al., 2021; Huynh et al., 2025). Poor pavement condition not only compromises road safety but also exacerbates the severity of crashes on high-speed roads and multiple-vehicle crashes on all roads (Lee et al., 2015). BIPOC communities and low-income neighborhoods experience higher pedestrian death rates, often due to infrastructure deficits and high-speed road designs. Poor lighting, broken sidewalks, and absence of crosswalks can create environments perceived as unsafe, deterring use and compounding exclusion (Thornton et al., 2016; Hossain et al., 2022; Addas, 2025; Dubey et al., 2025;).

Public health, physical activity, livelihood

Sidewalks and roads are the backbone of transportation infrastructure. Usable sidewalks are important because they encourage walking and other physical activity which has been shown to have positive benefits on community health, reducing mortality, and lowering body mass index (Lopez & Hynes, 2006; Patel et al., 2018; Lovasi et al., 2009; Rundle et al., 2008). Furthermore, sidewalks encourage walking which can heighten an individual's sense of belonging and promote community cohesion (Jun & Hur, 2015). Walkability is also tied to safety for pedestrians and other activity transportation users (Yin & Zhang, 2021). Access to walkable neighborhoods is therefore important for promoting physical activity and reducing mortality (Patel et al., 2018).

2.3 Current state of equity considerations in transportation infrastructure management

Based on a content analysis of 2019 Transportation Asset Management (TAM) plans from all fifty states, D.C., and Puerto Rico, researchers found that state Departments of Transportation largely omitted or marginalized equity considerations (Khalife et al., 2023). However, the need to incorporate equity in the transportation sector gained more recognition at higher institutional levels. In January 2021, President Biden signed Executive Order 13985—Advancing Racial Equity and Support for Underserved Communities Through the Federal Government—which calls for the incorporation of equity in agency practices to include those who have been

historically underserved. In August 2021, the TRB 13th National Conference on Transportation Asset Management identified the need for performance measures that relate to equity and for better ways of engaging communities to identify benefits in TAM. In January 2022, the U.S. Department of Transportation (US DOT) published its first Equity Action Plan and set equity as a strategic goal in their Fiscal Year 2022-2026 Strategic Plan. However, at the time of this report, the current presidential administration had rolled back and frozen funding for equity-focused infrastructure policies like US DOT's Reconnecting Communities Institute and the Justice40 Initiative which had ensured that 40% of the benefits from federal investments in climate, clean energy, and infrastructure flowed to historically disadvantaged communities (Salerno, 2025).

While there are an increasing number of initiatives to enhance affordable and equitable access to transportation options, not much has been done to assess how equity should be accounted for in asset management evaluations and investment decisions (Zimmerman & Allen, 2023). The Federal Highway Administration's (FHWA) Transportation Asset Management Expert Task Group (TAM ETG) conducted a search of TAM plans and concluded that agencies had done little to operationalize equity in their plans; they asserted that organizations should consider equity when it comes to creating evaluation metrics and prioritizing projects (Zimmerman & Allen, 2023). Other researchers have suggested exploring funding allocation and mechanisms like need-based funding allocation or gross receipts taxes as methods to incorporate equity considerations in asset management (Bonilla et al., 2022; Corning-Padilla & Rowangould, 2020).

The literature on equity in the management and maintenance of transportation infrastructure is sparse; moreover, the adoption of standardized processes that meaningfully incorporate equity is still in the early stages (Khalife et al., 2023).

2.4 Conclusion

Researchers have documented disparities in the distribution and quality of infrastructure across neighborhoods that vary by income and race/ethnicity. These disparities have significant negative implications for the quality of life among residents in low-income neighborhoods and communities of color. However, there remain gaps in understanding how transportation management bodies can address such disparities through the planning and implementation process. My research contributes to each of these areas.

3. Data and Methodology

This report presents information and analysis on the availability and quality of OakDOT's transportation infrastructure assets. Prior to this project, the City did not have a centralized source of information on their transportation assets. A primary deliverable to the City, therefore, is a map which provides a snapshot of the asset inventory in any given area within the City. Like a "census" of the built environment, this map will help planners at OakDOT understand the transportation needs within proposed project areas and provide information to assist the Funding Strategy Team in scoring potential projects and allocating resources.

A secondary purpose of the geospatial data analysis is to assess the distribution and quality of transportation infrastructure across neighborhoods that vary by demographic and socioeconomic characteristics. The City has long committed to centering equity in its governance and planning efforts. In 2015, City Council established the [Department of Race and Equity](#) (DRE) and in 2018, the DRE published the [Oakland Equity Indicators Report](#) which established a quantitative framework from which to "better understand the impacts of race, measure inequities, and track changes in the disparities for different groups over time" (City of Oakland, 2018). In 2021, through [Administrative Instruction 580](#), the City mandated that all departments integrate equity principles into their strategic planning, budgeting, and service delivery, supported by the DRE's training and technical assistance (City of Oakland, 2021). This comprehensive approach aims to transform institutional practices to ensure fair and just opportunities for all Oakland residents. OakDOT's inaugural strategic plan committed to furthering a core goal of providing access to equitable jobs and housing through equitable transportation decision-making frameworks and just distribution of resources and investment (Oakland Department of Transportation, 2016). OakDOT's [Universal Basic Mobility Pilot](#), [West Oakland Sustainable Transportation Equity Project](#), and [low-income property owner sidewalk repair program](#) are just a few examples of how the department centers equity in its work.

Table 1 summarizes the geospatial data available for this analysis. While the City has mapped some of these data and made them publicly available ([Existing and Proposed Bikeways](#), [Public Tree Map](#), and [Pavement Condition Index \(2016-2021\)](#)), I identified and accessed the majority of the raw data through informal interviews with staff during the information-gathering phase of the project. In the [Findings](#) section of the report, I provide greater detail on how I use and map each of these assets.

Table 1. Asset data availability

ASSET	AVAILABILITY OF ASSET	QUALITY OF ASSET	MEASURE(S)
-------	--------------------------	---------------------	------------

Pavement	X	X	Pavement Condition Index (PCI) from 2012 to 2024, segment length, road type, number of lanes, year of construction
Sidewalks	X	X	Damage points, repair priority, segment length, network gaps
Curb ramps	X	X	ADA compliance, repair type, curb type
Public street trees	X	X	Condition (Dead - Very Good), maintenance need priority, species, diameter at breast height, defect type, valuation
Streetlights	X		Installation date, characteristics (LED wattage, material, height, arm length), ownership (city-owned or PG&E owned)
Pedestrian crosswalks	X		Striping type and color, traffic control, intersection type
Active transportation facilities (bikeways)	X		Existing bike class

I used ArcGIS as the primary tool for geospatial and statistical analysis of how OakDOT's assets are distributed across neighborhoods and how the availability and quality of assets varies across neighborhood equity priority levels. For the purposes of this analysis, neighborhoods are census tracts, relatively small areas (between 2,500-8,000 residents) defined by the U.S. Census Bureau. There are 116 census tracts in the City.

OakDOT had already assembled data to identify equity communities. In 2020, [OakDOT's Race and Equity Team](#) (RET) Data Analytics Committee first published a [Geographic Equity Toolbox](#). In an effort to further the Department and City's joint goals of advancing equity, the Geographic Equity Toolbox maps demographic data to illustrate how disparities play out spatially across Oakland (City of Oakland, 2024). The toolbox includes five datasets, mapping out: Priority Neighborhoods, Race and Ethnicity, Limited English Ability, Displacement and Gentrification, and Pollution Burden.

In this report, I use the Priority Neighborhoods dataset as the primary measure of equity and need. Each census tract in the City is scored and assigned one of five equity priority levels from Lowest to Highest based on the weighting of the seven demographic factors included in **Table 2**. *Low*, *Medium*, *High*, and *Highest* equity designations contain 23 census tracts and the *Lowest*

equity designation contains 22 census tracts. Of the 116 census tracts in the City, two tracts (981900 and 982000) have either unavailable or unreliable census data and are omitted from the Geographic Equity Toolbox.¹ A high equity priority neighborhood is one where there is a relatively high proportion of residents representing demographic groups that have been historically overlooked or harmed by planning processes (OakDOT Racial Equity Team, 2022).

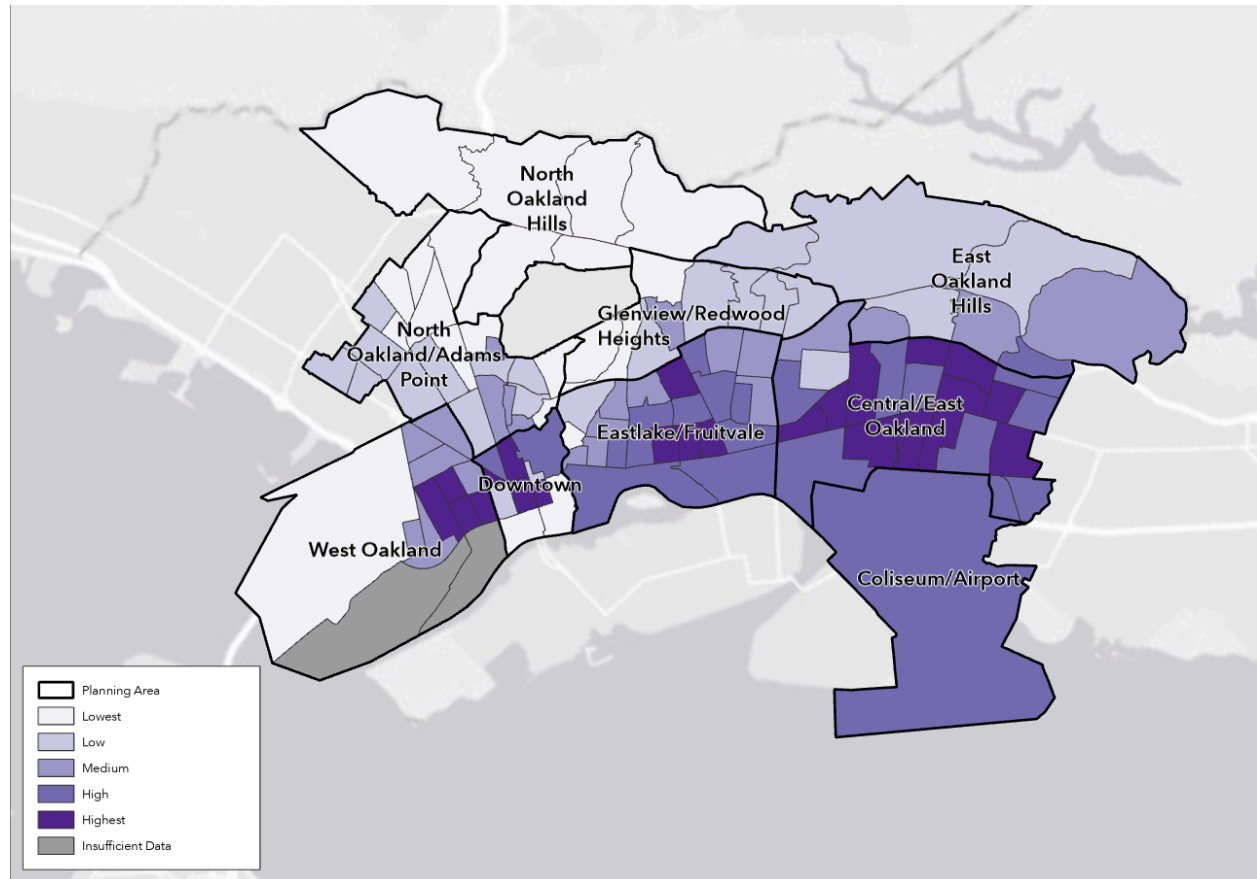
Planners at OakDOT reference the Priority Neighborhoods dataset to prioritize policies, programs, projects, and funding equitably. The City earmarks higher equity priority neighborhoods for additional, in-depth outreach efforts to take into account the fact that these communities include a high percentage of residents whose demographic and socioeconomic characteristics indicate a greater likelihood of experiencing historic and current inequities. **Map 1** shows each census tract by its equity priority designation and their location in the City's nine Planning Areas. A spatial pattern is evident as neighborhoods in the flatlands (southwest of I-580 freeway) of the City tend to be in higher equity priority neighborhoods than the neighborhoods in the hills (northeast of I-580 freeway).

Table 2. Weighting of demographic factors used in priority neighborhood designation

FACTOR	PERCENT OF SCORE
% People of Color (non-White alone)	25%
% Low-Income Households (<50% Area Median Household Income)	25%
% People with Disability	10%
% Seniors 65 Years and Over	10%
% Single-Parent Households	10%
% Severely Rent-Burdened Households (>50% of household income dedicated to rent)	10%
% Low Educational Attainment (less than a bachelor's degree)	10%

¹ These two census tracts are by the port and zoned General and Heavy Industrial. The population is very low and, therefore, the margin of error for demographic data is very high. In this report, I omit these tracts when analyzing data in relation to the Priority Neighborhoods dataset.

Map 1. OakDOT Priority Neighborhoods and Planning Areas (2024)²



I use the Priority Neighborhoods dataset as the basis for evaluating the equity implications of the distribution of OakDOT's assets and identifying the maintenance needs and quality of the City's existing assets. I also use Planning Areas, groups of neighborhoods that are smaller than council districts, as another spatial lens from which to view and understand the distribution of assets and as units by which to distribute City resources. OakDOT uses Planning Areas to align transportation investments with neighborhood boundaries and community contexts, prioritizing localized needs over broader political boundaries to support more consistent and equitable service delivery (Gardner, 2021).

² A live version of the map can be seen [here](#).

4. Findings

In the following sections, I focus on each of OakDOT's transportation infrastructure assets. First, I provide a brief background on the data including who collected the data, when the data were collected, and the information available for analysis. Then, I focus on the characteristics of each asset and perform geospatial analysis in ArcGIS in order to understand how these attributes vary geographically and correlate with demographic and socioeconomic characteristics and the equity indicators. I dedicate a large portion of data analysis to pavement, sidewalks, curb ramps, and publicly-owned trees as the City has more robust data on these assets that include information not only on location but also quality status and maintenance needs. I then provide brief descriptions of the current conditions of active transportation facilities, street lights, and pedestrian crosswalks and traffic controls.

4.1 Pavement Assessment

Background

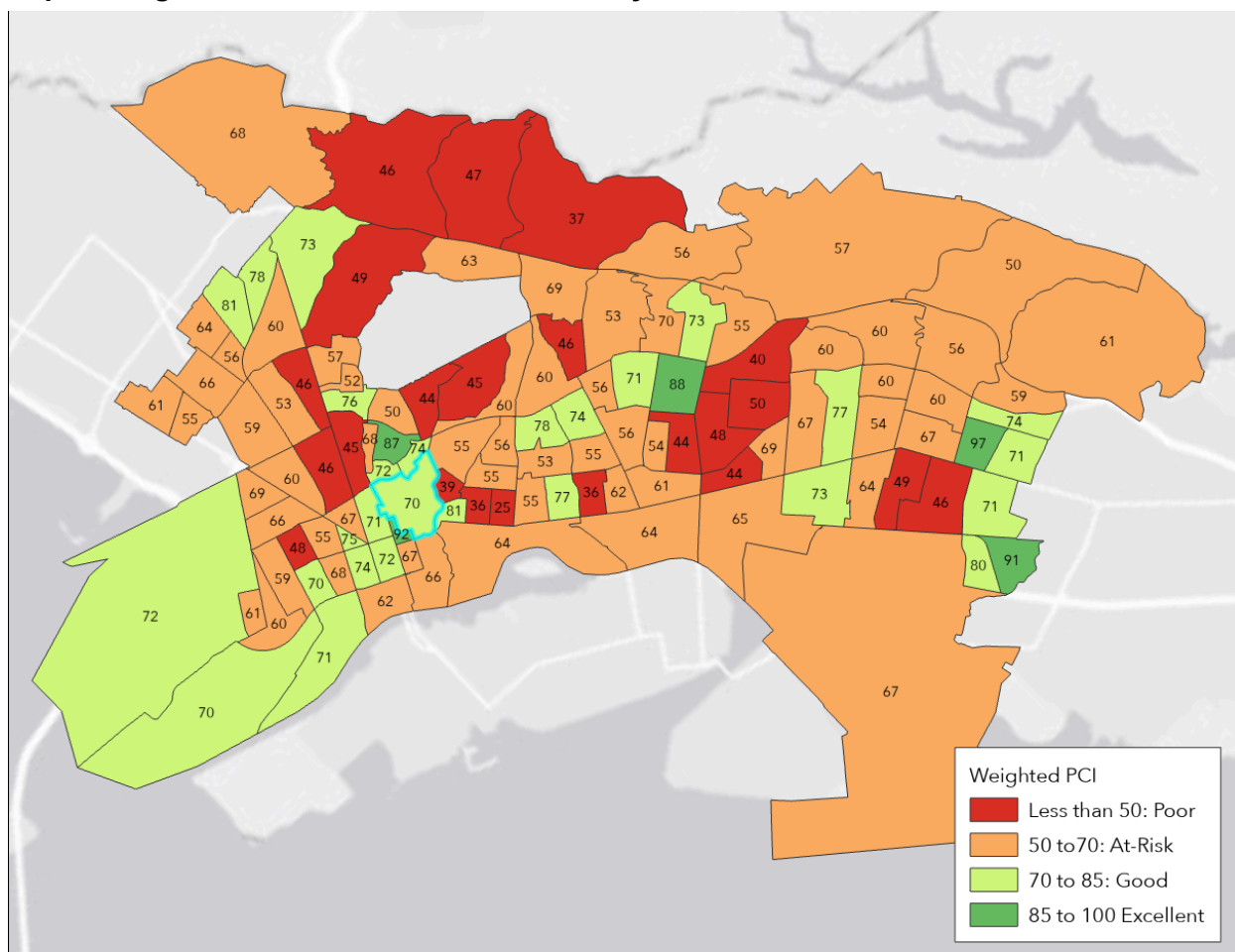
OakDOT measures the Pavement Condition Index (PCI) of 3,963 paving segments, covering over 830 miles of City streets every few years. PCI is a composite numeric score that ranges from a minimum of 0 to a maximum of 100. This report looks at the most recent data collected in 2024.

Analysis

To provide an overview of general pavement condition within each census tract, I calculated a weighted PCI by summing together the product of a segment's PCI and segment length, then dividing that sum by the total pavement mileage within a census tract. Pavement segments that cut across census tracts were split at the census tract boundaries.

$$\text{Weighted PCI for Census Tract} = \frac{\Sigma(\text{PCI} \times \text{length of pavement segment})}{\text{Total mileage of pavement}}$$

Map 2. Weighted Pavement Condition Index by census tract

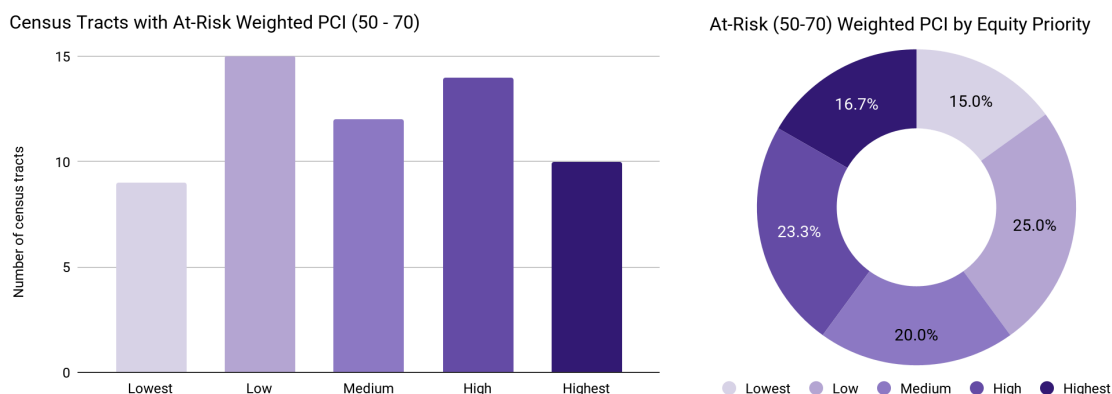


Map 2 presents the quality of the pavement by census tract as a Weighted Pavement Condition Index. I calculated the weighted PCI by finding the weighted average of PCI over the total mileage of pavement within each census tract. Pavement is classified based on standards set by the Metropolitan Transportation Commission (MTC). PCI below 50 is considered Poor, between 50 to 69 is At-Risk, 70 to 84 is Good, and 85 to 100 is considered Excellent.

The Department considers a PCI below 50 to be pavement in poor condition as it indicates that the segment may need significant repair, if not full reconstruction. This number is used as a threshold for quality and usability. Almost nineteen percent (22 tracts) of the City's 116 census tracts have a weighted average PCI below 50. These tracts are shown as red in **Map 2**. While research indicates that pavement condition tends to be worse in areas that are more urban, have a higher proportion of non-White populations, and higher poverty rates (in other words, higher equity priority), half of the City's census tracts with poor condition pavement are in the *Lowest* or *Low* equity priority category (US GAO, 2022; Erfani et al., 2024). When looking at this information by population, 25.5% of the lower priority equity population lives in a neighborhood with poor pavement, compared to 16.5% of the higher priority equity population.

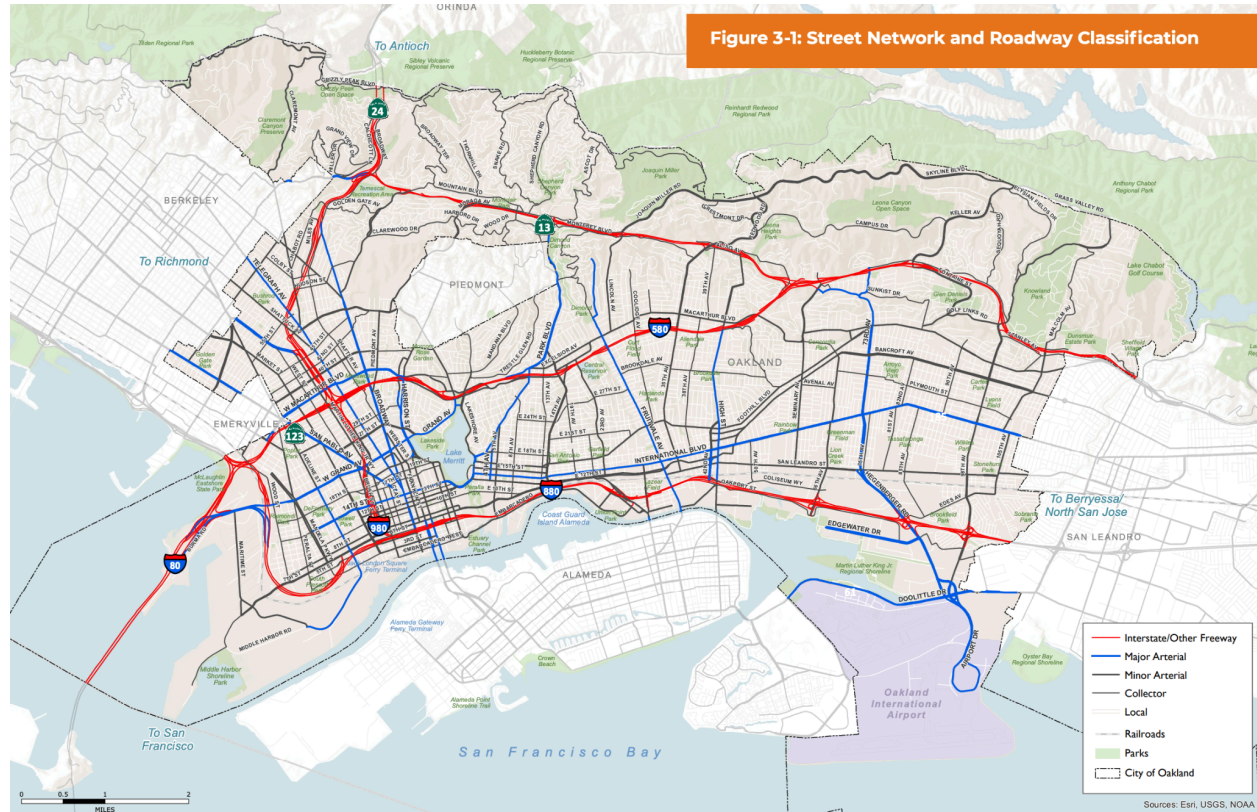
From a maintenance perspective, PCI values between 50 to 70 are generally considered at-risk as those segments need rehabilitation to prevent further decline (SF.gov, n.d.; City of Dublin, n.d.). These census tracts are represented in orange in **Map 2**. Sixty (51%) of the City’s census tracts have a weighted PCI that is at-risk. **Figure 1** shows how these census tracts sort by equity priority.

Figure 1. Census tracts with at-risk pavement, by equity priority area



That being said, the pavement is likely used and experienced by more road users in higher equity priority areas as those areas have more arterial roads with higher levels of traffic. And, higher equity priority areas include zoning for mixed use, higher density, and commercial areas whereas lower equity priority areas are largely zoned single family (Dyett & Bhatia Urban and Regional Planners, 2024). **Map 3** shows that the major arterial streets (blue) and minor arterial streets (dark gray) are more prevalent in areas *Medium*, *High*, and *Highest* equity priority. Arterial streets carry higher traffic volumes and also serve pedestrians, bicyclists, and transit riders. Northeast of I-580 demarcates where most of the *Low* and *Lowest* equity priority neighborhoods are. The majority of the roads in those areas are local and collector.

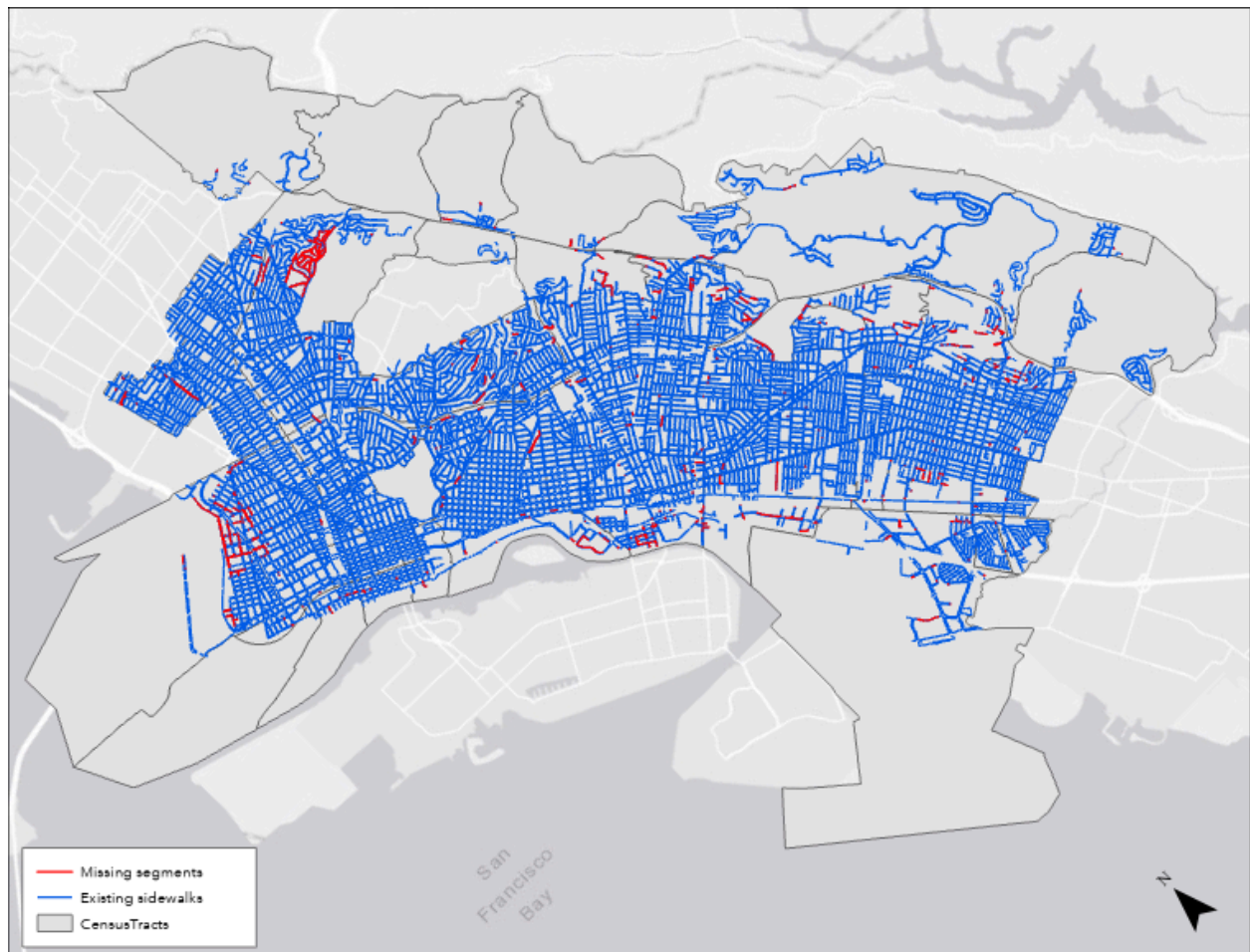
Map 3. Street Network and Roadway Classification Map (Source: [Oakland Map Atlas](#))



4.2 Sidewalk Assessment

There are 101,437 existing sidewalk segments, totaling 1,126 miles. Six hundred and ninety-five segments are missing, resulting in approximately 25 miles of gaps in the sidewalk network (**Map 4**).

Map 4. Sidewalk network



In 2021, the civil engineering and planning firm NCE inventoried the City's sidewalks, cataloguing information such as geographic location, distress type, measurements, photographs, and repair priority. This report draws on those data and references NCE's final report.

In collaboration with the City, NCE identified six types of sidewalk distresses that could pose tripping hazards: cracking or shattered slabs, patching, vaulting, faulting, spalling, and holes. In addition to measurements and photo documentation, NCE consultants assigned each sidewalk distress or damage point a maintenance priority value from 1 to 4 with Priority 1 damage points described as severe and requiring immediate attention and Priority 4 rated least severe.

Across the 1,126 miles of sidewalks that they surveyed, NCE recorded 78,531 damage points. The most common types were faulting (45.7%) and shattered slabs (38.8%). While NCE's final report provides a detailed breakdown of damage types, locations, and treatment costs, this analysis focuses on the spatial distribution of sidewalk damage in relation to OakDOT's Priority Neighborhoods.

Analysis

To provide a general snapshot of how the overall quality of existing sidewalks varies across the City, I calculated the number of damage points per 1,000 feet of sidewalk. To do so, I split sidewalk segments across census tract lines, and divided the number of damage points by the total feet of sidewalks within the census tract. **Map 5** illustrates the variation in these values by census tract. Among the bottom 20% of census tracts with the highest frequency of damage points per 1,000 feet, equity disparities are not evident. By this definition, the “poorest condition” sidewalks in the City are clustered evenly across equity priority (7 census tracts are *Highest* or *High* equity priority, 7 census tracts are *Medium*, and 8 census tracts are in the *Low* or *Lowest* equity priority).

Table 3 similarly shows that, counter to the research that points to lower quality sidewalk infrastructure associated with areas of lower socioeconomic status and higher non-White populations, areas of higher equity priority in the City do not necessarily have lower quality sidewalk infrastructure (Rajaei et al., 2021). In fact, the *Medium* equity priority neighborhoods have the greatest number of damage points per 1,000 feet at 15. Lower equity priority (*Lowest* and *Low* equity priority designation) neighborhoods have a combined 12 damage points per 1,000 feet as do Higher equity priority (*Highest* and *High*) neighborhoods.

Map 5. Number of damage points per 1,000 feet of sidewalk

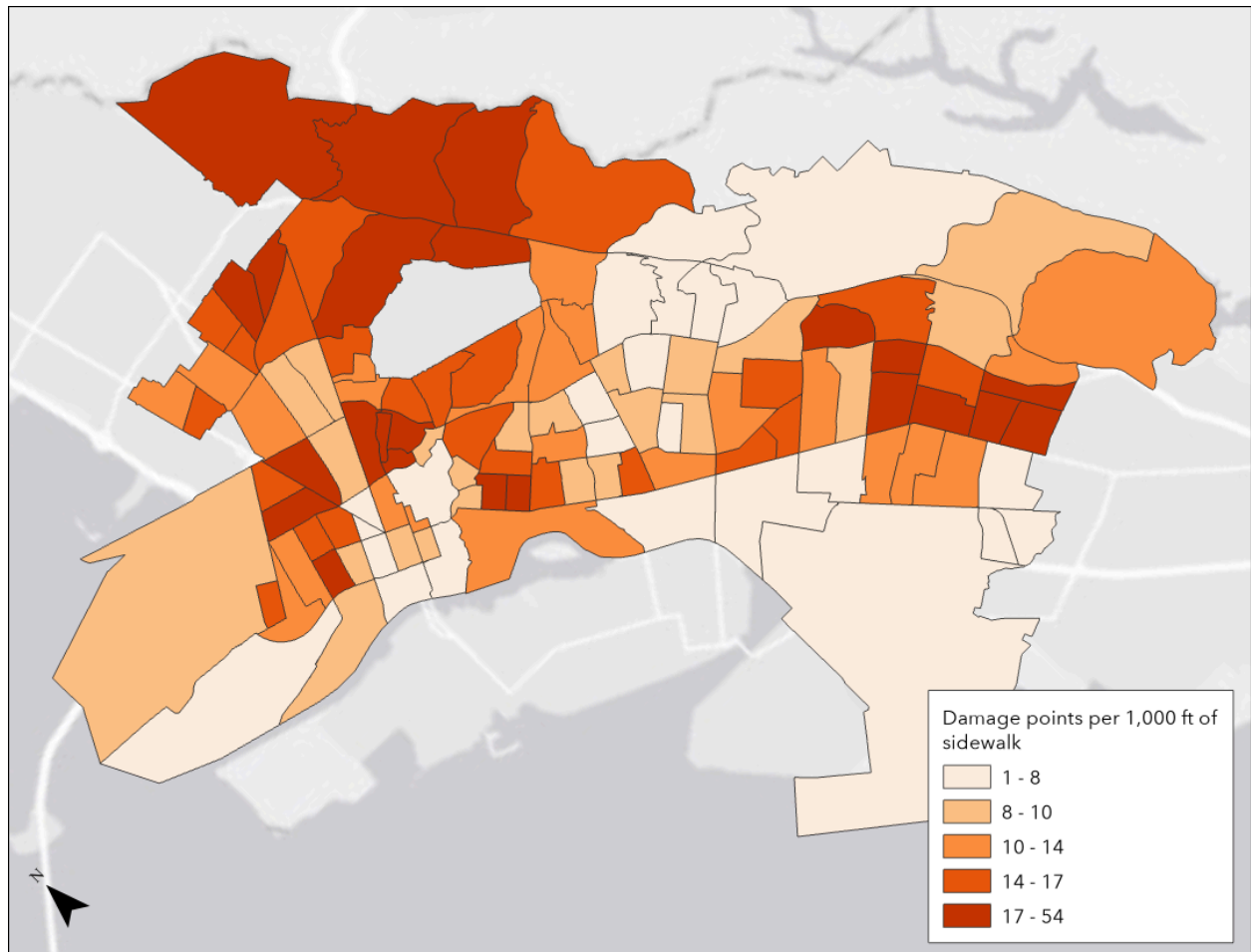


Table 3. Sidewalk damage by equity priority

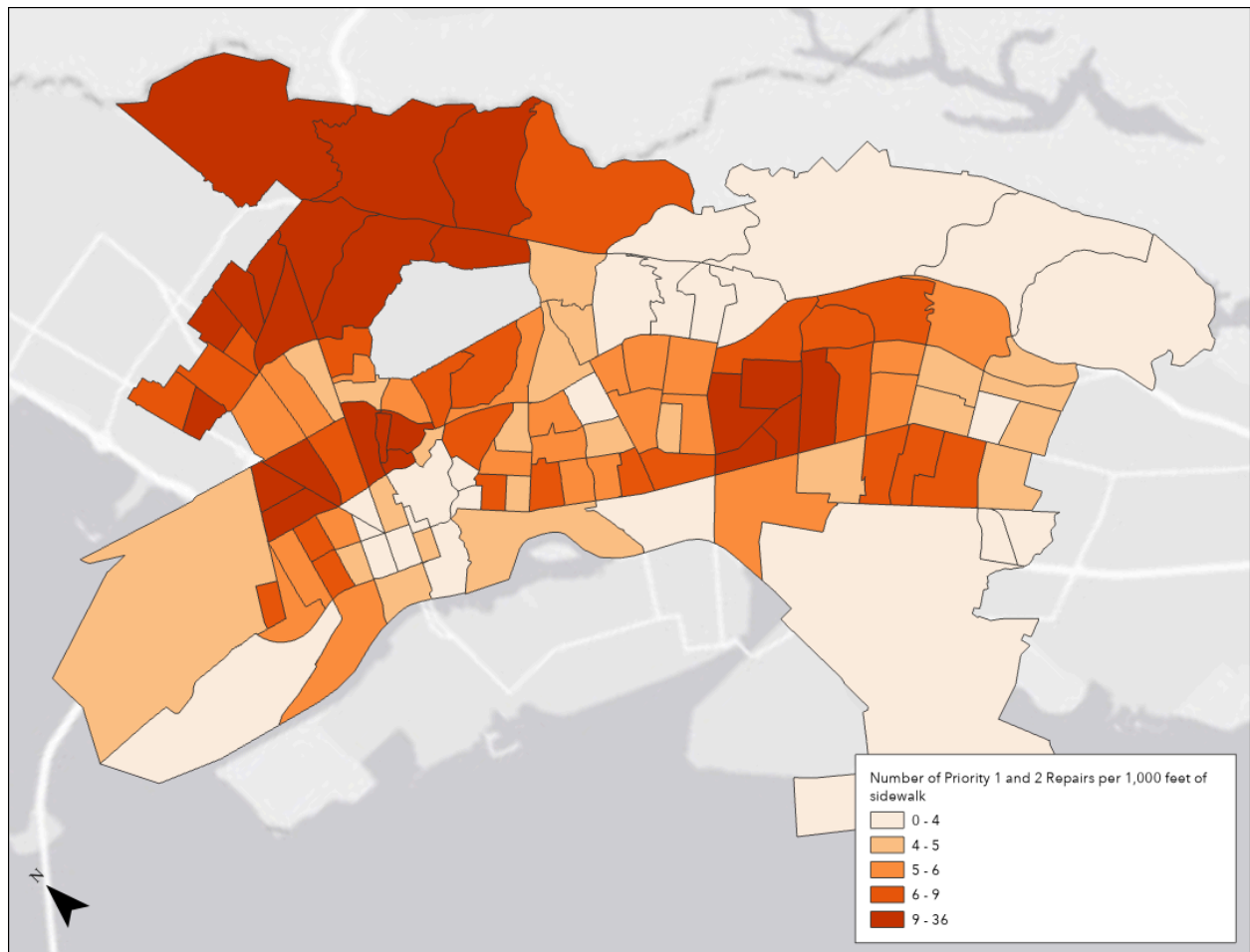
EQUITY PRIORITY	TOTAL SIDEWALK LENGTH (MI)	NUMBER OF DAMAGE POINTS	NUMBER OF DAMAGE POINTS PER 1,000 FT
Lowest	210.26	16,315	15
Low	285.79	16,111	11
Medium	198.09	16,021	15
High	273.43	15,429	11
Highest	208.39	14,368	13

Maintenance

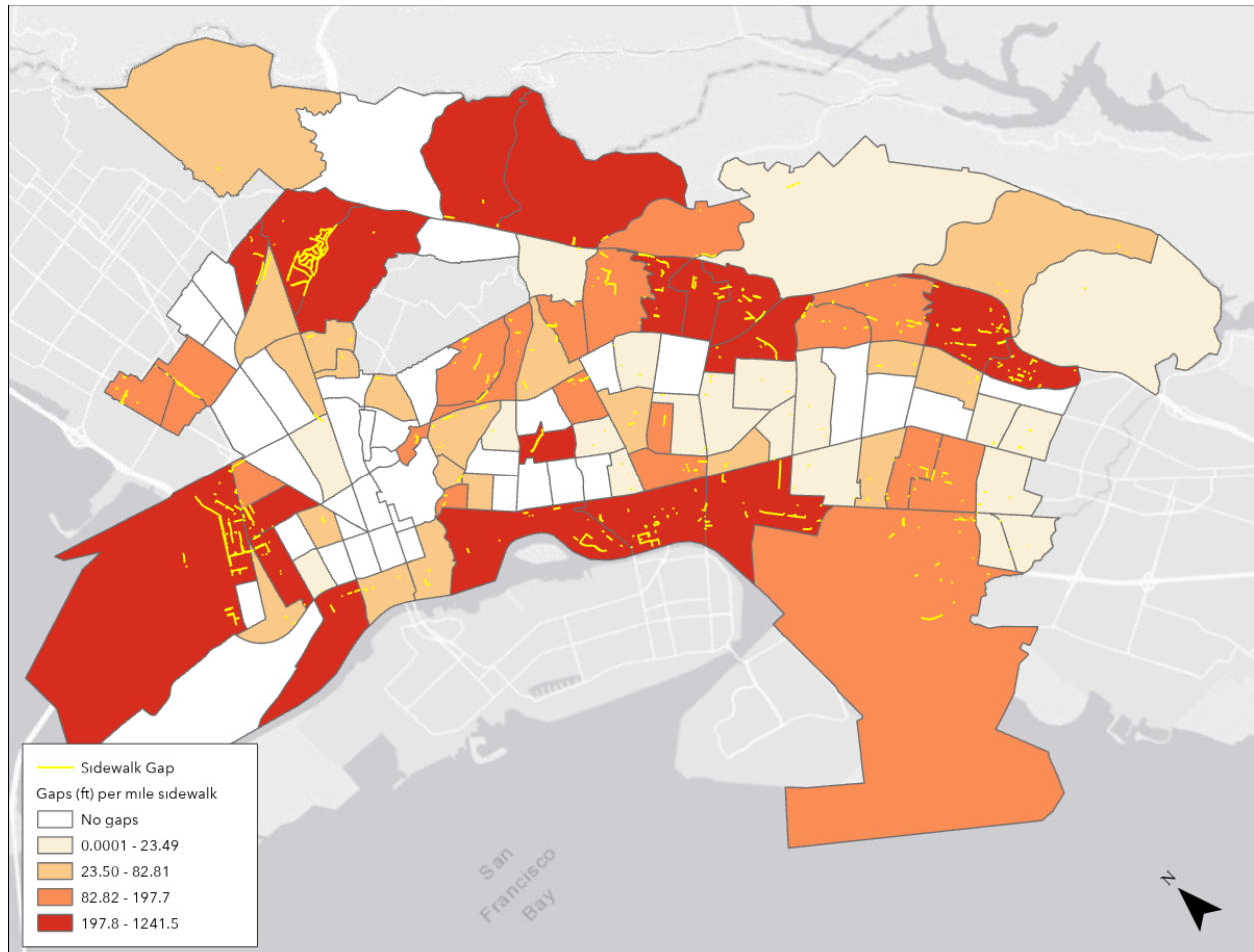
The majority of sidewalks in the City are adjacent to private property. In Oakland, as in many cities across the country, maintenance of sidewalks adjacent to private property are the responsibility of the property owner. As seen in **Map 5**, some of the areas with the greatest maintenance needs are in the lowest equity priority areas, clustering in the North Oakland Hills and North Oakland/Adams Point planning areas.

For each damage point, NCE assigned a maintenance priority level from 1 to 4. They considered Priority 1 the most severe type of distress, requiring urgent attention while Priority 4 was the least severe. Examples of Priority 1 repairs include fault heights greater than two inches, vault heights greater than two inches, shattered slabs with faulting greater than a half inch, and badly deteriorated patches. Repair priority can be used as an expression of maintenance needs and as a proxy for the severity of sidewalk damage. To understand how these aspects varied spatially, I counted the number of Priority 1 and Priority 2 damage points per census tract and normalized that number across every 1,000 feet of sidewalk within each census tract (**Map 6**).

Map 6. Number of high maintenance priority damage points per 1,000 feet of sidewalk



Map 7. Sidewalk gaps and sidewalk gaps (feet) per mile of sidewalk



Map 7 illustrates gaps in the network overlaid on the density of gaps measured in gap footage per mile of sidewalk, across census tracts. With a few exceptions, such as select tracts in West Oakland and the southern parts of the Eastlake/Fruitvale and Central/East Oakland planning areas, most neighborhoods classified as *High* or *Highest* equity priority show minimal or no sidewalk gaps, often ranking in the lowest quintiles.

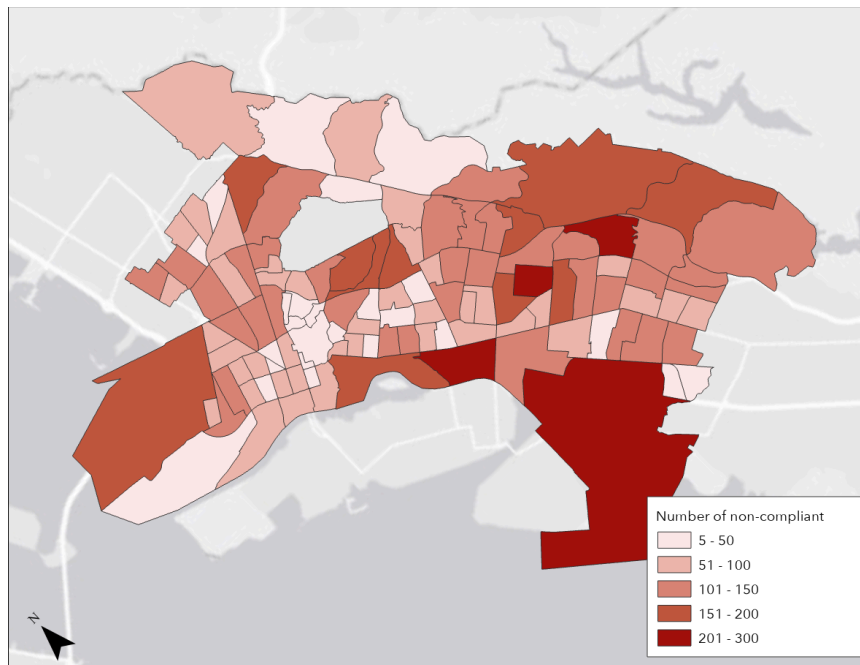
Among the 37 census tracts with no sidewalk gaps, 17 fall into the *High/Highest* equity priority categories, 8 into *Medium*, and 12 into *Lower/Lowest*. Conversely, of the 10 census tracts with the most significant sidewalk gaps (197.8 gaps or more per mile of sidewalk), 4 are classified as *High* equity priority (none as *Highest*), 1 as *Medium*, and 5 as *Lower/Lowest*.

4.3 Curb Ramp Assessment

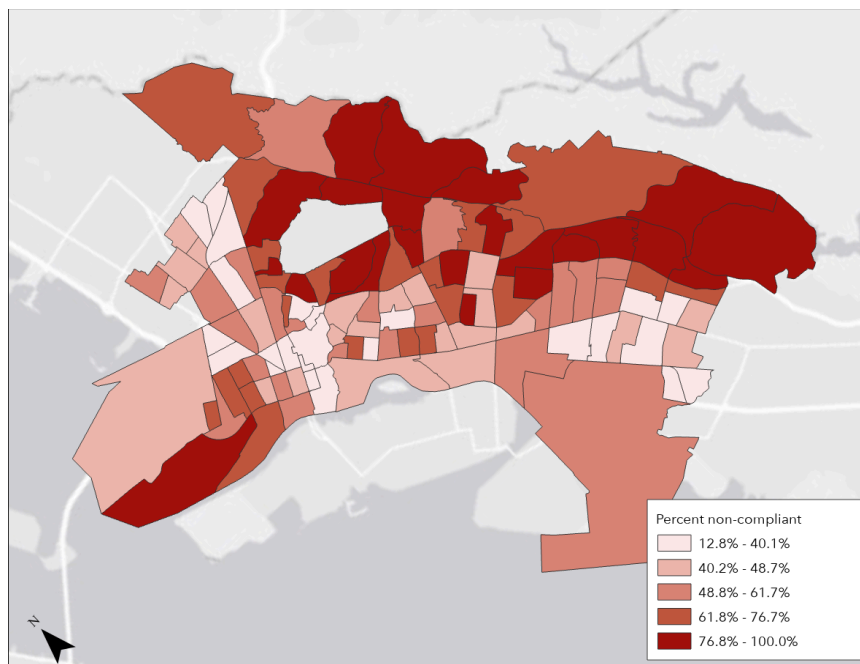
Background

In 2021, the civil engineering and planning firm NCE inventoried the City's curb ramps, cataloguing information such as their geographic location and ADA-compliance, and taking photographs. Similar to the damage point analysis, this report draws on these data and the corresponding Assessment report. The firm collected data on 20,131 curb ramps. They categorized each curb categorized as Compliant, Not Compliant, or Not Compliant - Design Hardship. When specified as Not Compliant - Design Hardship, physical constraints like too narrow of a sidewalk preclude the construction of an ADA-compliant curb ramp. Almost 9,000 (8,974) of the curb ramps were Compliant, 10,052 were Not Compliant, and 1,105 were Not Compliant due to Design Hardship. **Map 7** illustrates the total number of non-compliant curb ramps per census tract while **Map 8** shows the percentage of curb ramps within a census tract that are non-compliant.

Map 7. Total number of curb ramps that are not ADA-compliant per census tract



Map 8. Percent of curb ramps within each census tract that are not ADA-compliant



The data show that the *Highest* and *High* equity priority areas have better rates of ADA-compliance compared to the *Lowest*, *Low*, and *Medium* equity priority areas (**Figure 2**). Of the bottom quintile of census tracts with the highest rates of non-compliant curb ramps, *Lowest*

and *High* equity priority areas have the most non-compliant curb ramps total in absolute terms (**Figure 3**).

Figure 2. Percent non-compliant curb ramps within each equity priority designation

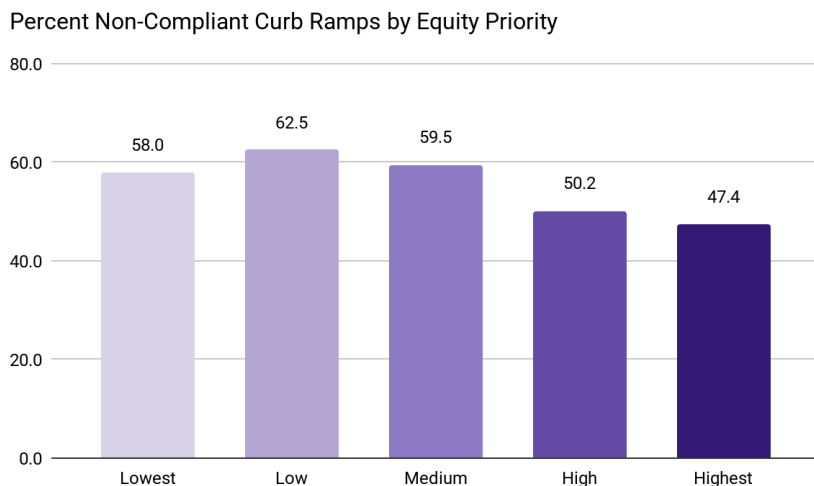
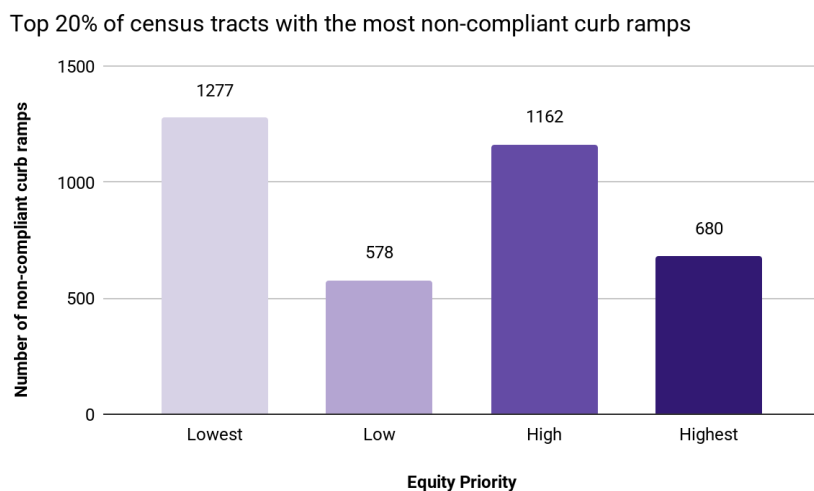


Figure 3. Top 20% of census tracts with the most non-compliant curb ramps, by equity priority



5.4 Street Tree Assessment

Background

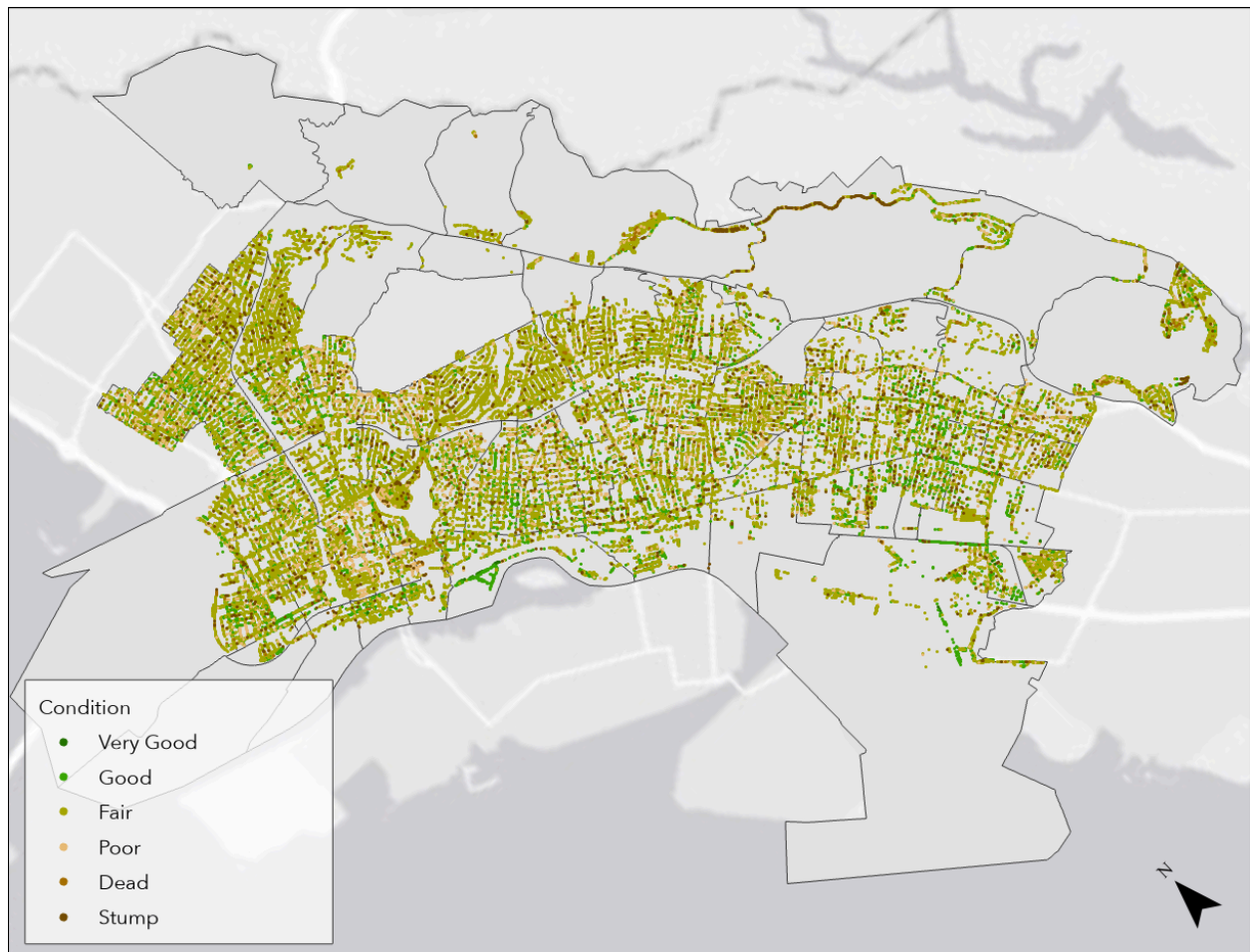
In 2019, the City contracted with Davey Resource Group to complete an inventory of all public street trees, cataloging information such as geographic location, species, condition, and

maintenance type and priority. This report uses the City's Public Tree Inventory. The inventory includes 70,420 data points, of which 67,363 are trees that are alive. Two hundred and thirty-two trees are outside of the census boundaries and, therefore, excluded from any analysis by census tract or equity priority neighborhood.

In particular, it is important to note that the data files only include trees that are owned and managed by the City. These trees are planted on public property such as parkways, public parks, and sidewalks. Areas in the northern hill region of Oakland are largely covered by privately-owned trees.

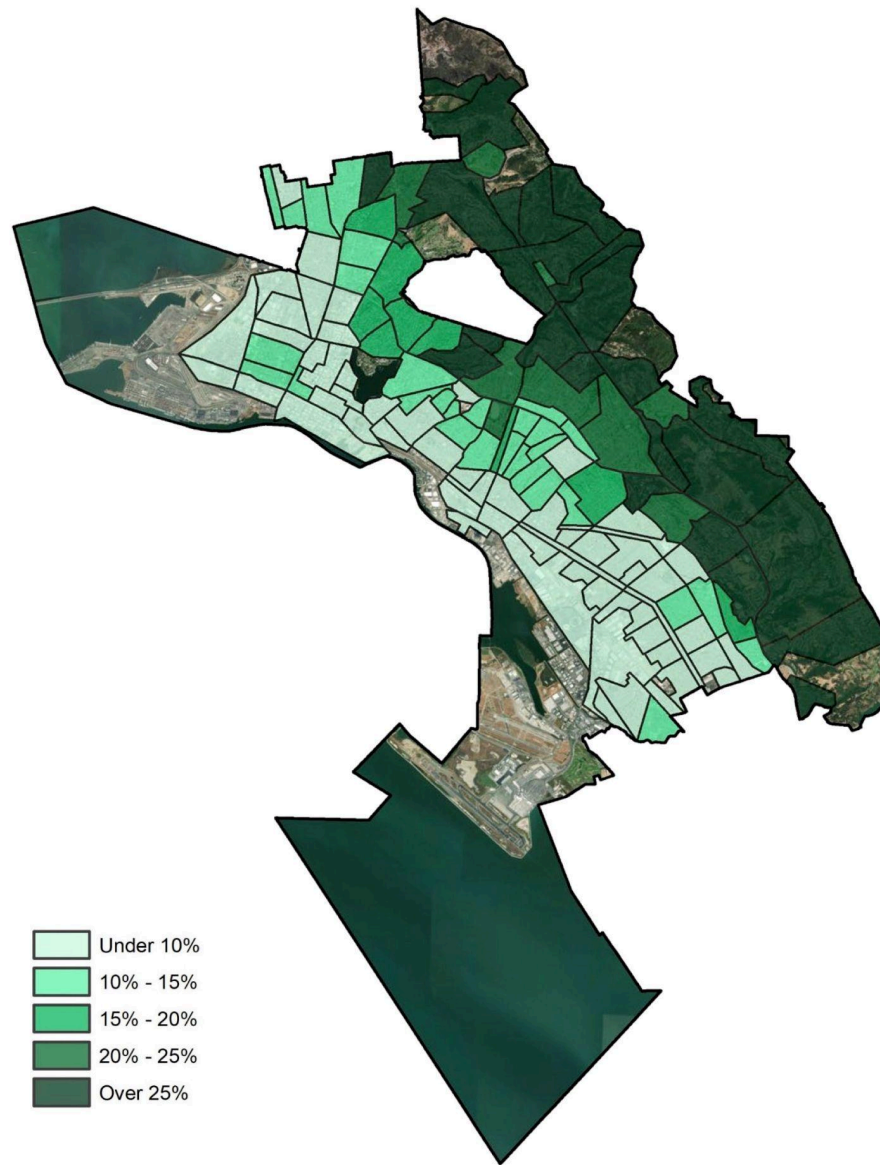
Map 9 shows all of the City-owned street tree data points categorized by condition. From this map, it may seem as though there are no trees in neighborhoods located in the hills. However, cross-referencing the data with **Map 10** reveals that the hill neighborhoods have significantly greater canopy coverage than other areas of the city, indicating that there are many healthy, privately-owned trees.

Map 9. Distribution of City-owned street trees



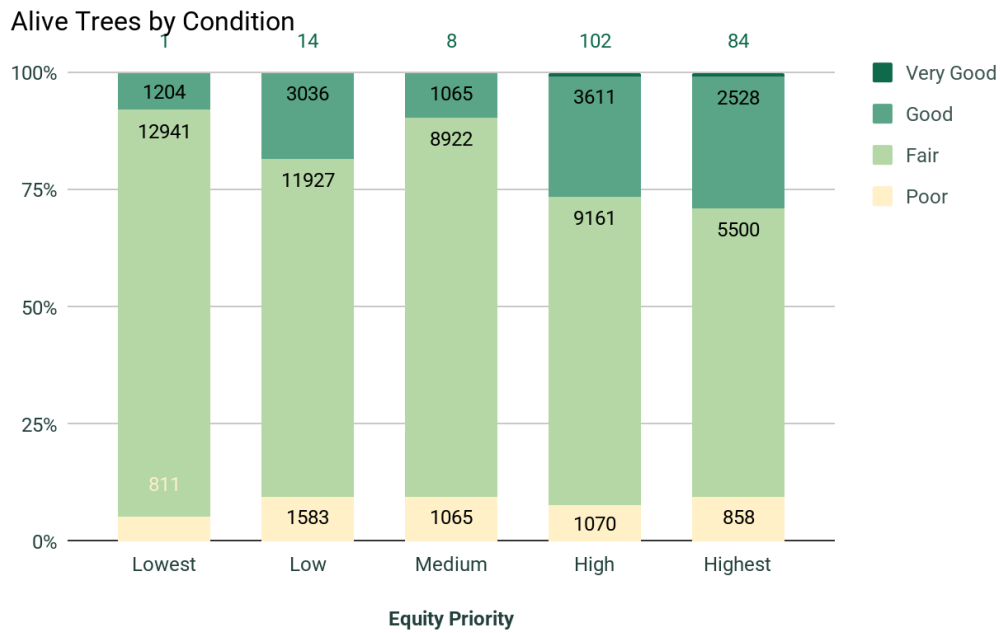
Map 10 includes the canopy coverage of trees planted on privately-owned land, and highlights a spatial pattern that breaks down according to income and communities of color.

Map 10. Tree canopy coverage by neighborhood (Davey Resource Group)

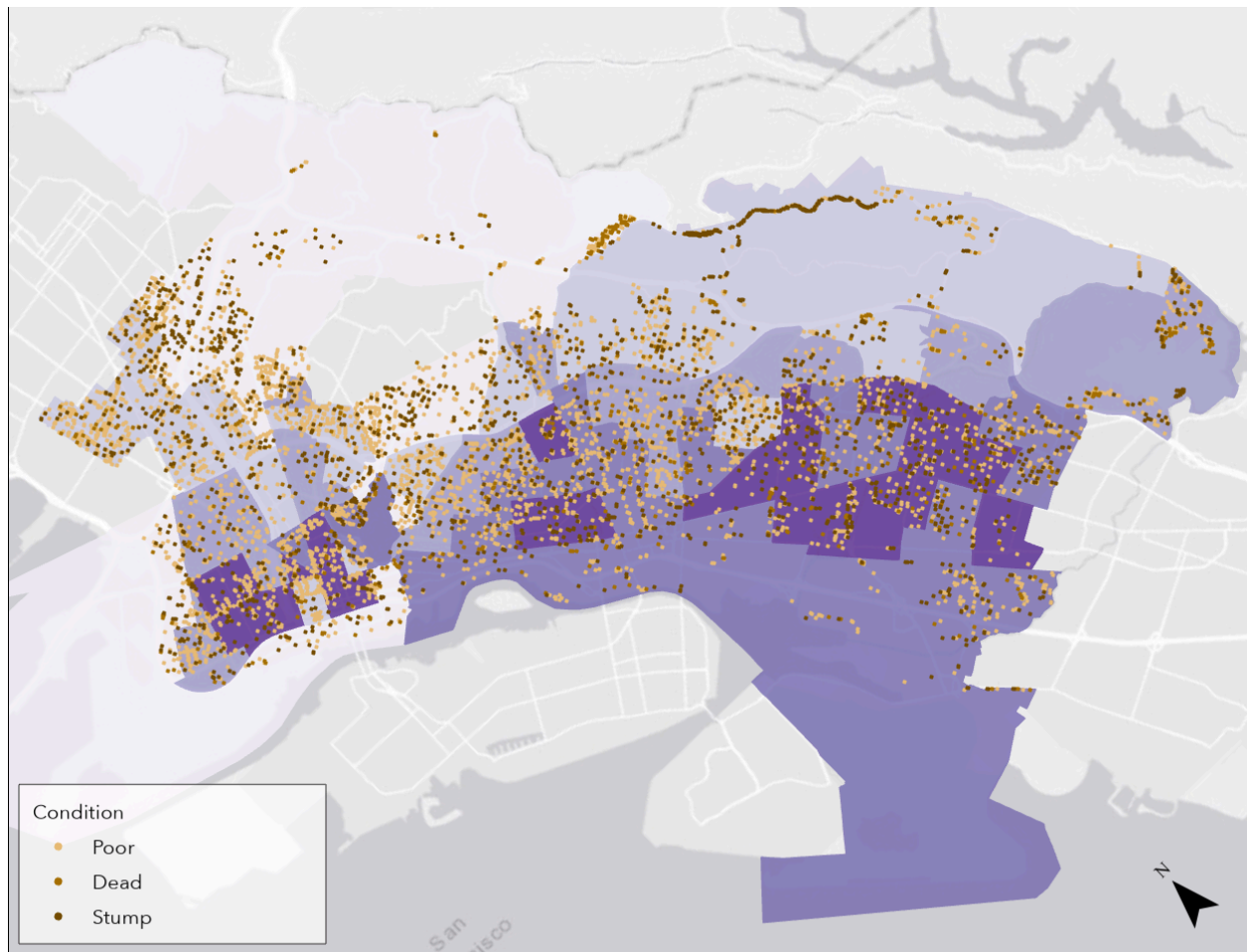


To understand the overall distribution of tree condition across the city, I graphed tree condition by equity priority. **Figure 4** shows that most trees are in Fair condition across all equity priority neighborhoods. The *High* and *Highest* equity priority areas have a higher proportion of good condition trees and far greater Very Good trees in absolute terms compared to areas of lower equity priority. However, taken together **Map 11** and **Map 12** show that the distribution of trees that are Poor, Dead, or a Stump loosely aligns with equity priority.

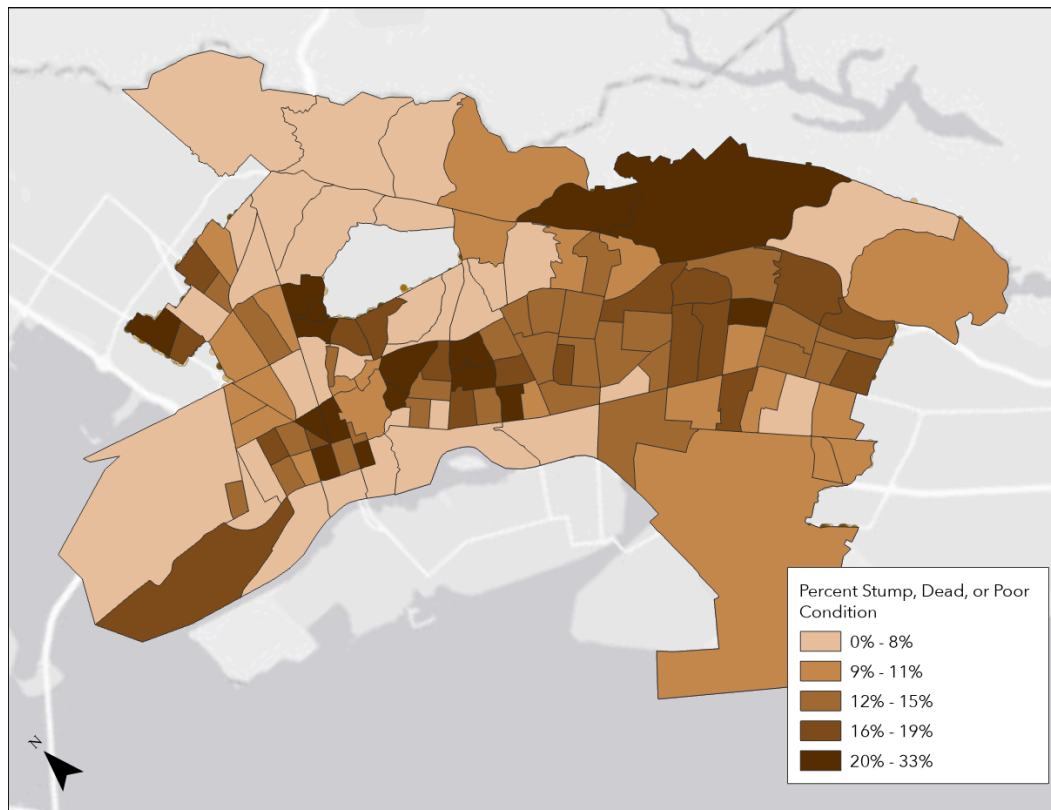
Figure 4. Tree condition by equity priority



Map 11. Trees in poor, dead or stump condition

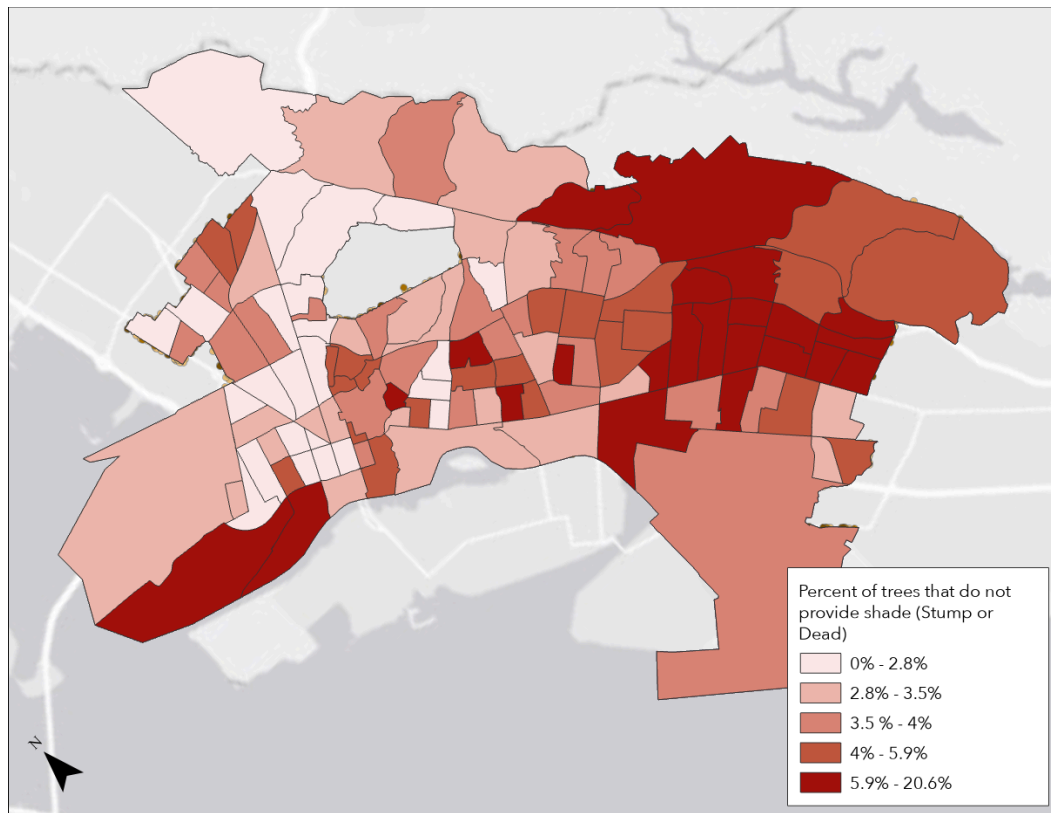


Map 12. Percent of City-owned trees within census tract that are in poor, dead, or stump condition



To understand the degree to which public street trees provide shade, I calculated the percentage of trees within each census tract that are dead or a stump (**Map 13**). This tree condition status serves as a proxy for shade provided and should be understood within the context of overall tree canopy coverage as captured via satellite imagery by the Davey Resource Group (**Map 10**). Central/East Oakland planning areas have the highest proportion of trees that are either a stump or dead and do not provide shade coverage. When looking specifically at City-owned trees, the majority of trees that are either dead or stumps or in poor condition are clustered in census tracts south of I-580 and north of I-880, also aligning with equity priority.

Map 13. Percent of public street trees that do not provide shade, categorized as a stump or dead



4.5 Active Transportation (Bikeways)

I include existing bikeways and their class types in the Existing Conditions map with a dataset last updated in February of 2025. There are 200 miles of bikeways in Oakland, the majority of which are classified as bike lanes (Class 2) and bike routes (Class 3) (**Map 14** and **Figure 5**). The Planning Areas with the greatest mileage of bikeways are North Oakland/Adams Point (48.4 miles), Eastlake/Fruitvale (46.9 miles), and Downtown (34.5 miles). The greatest mileage of bikeways is in the *High* and *Lowest* equity priority areas (**Figure 6**).

Map 14. Existing bikeways

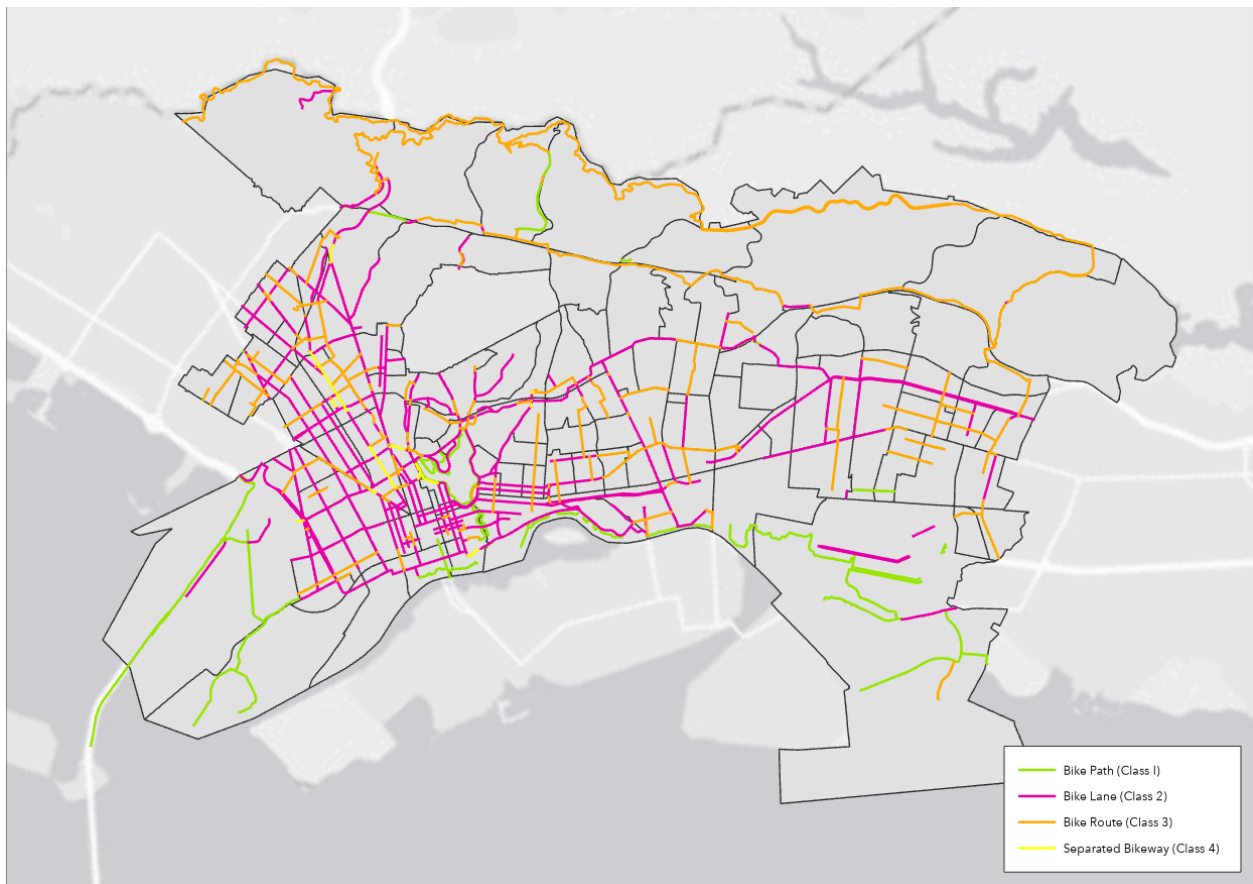


Figure 5. Bikeway classification breakdown

Mileage of Bikeway by Class

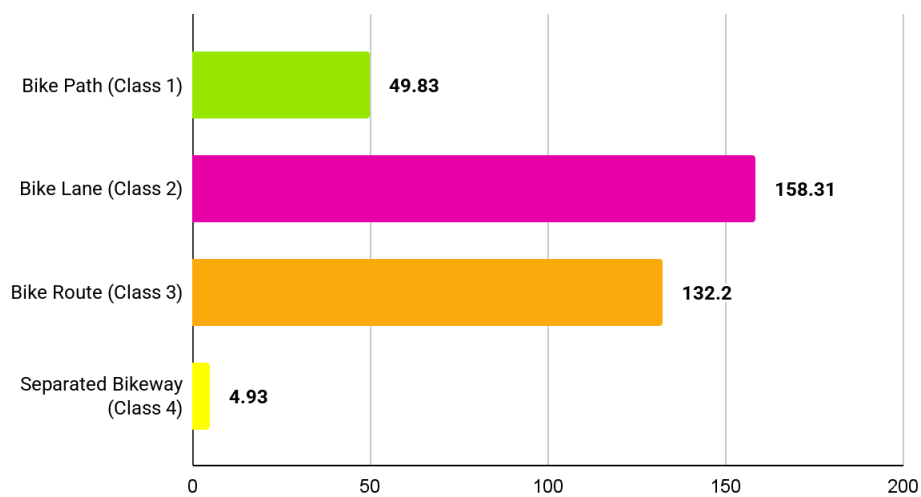
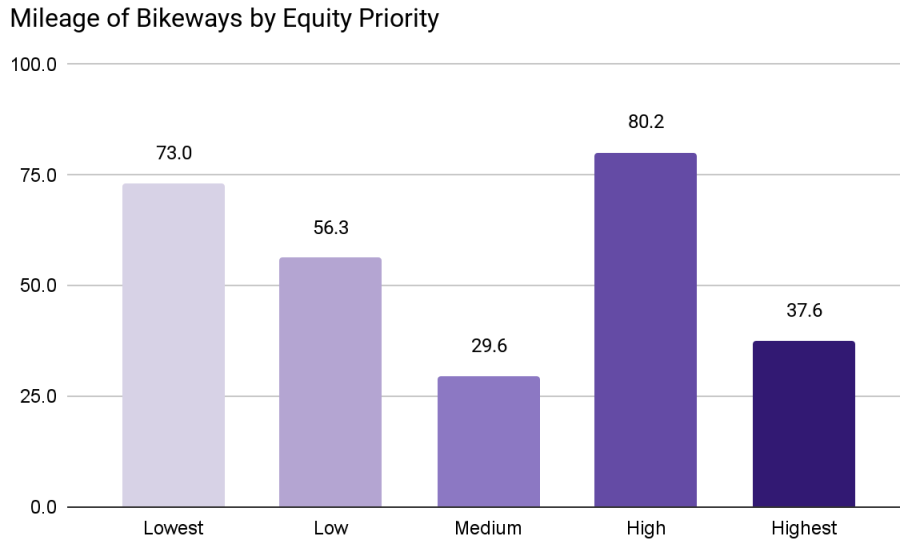


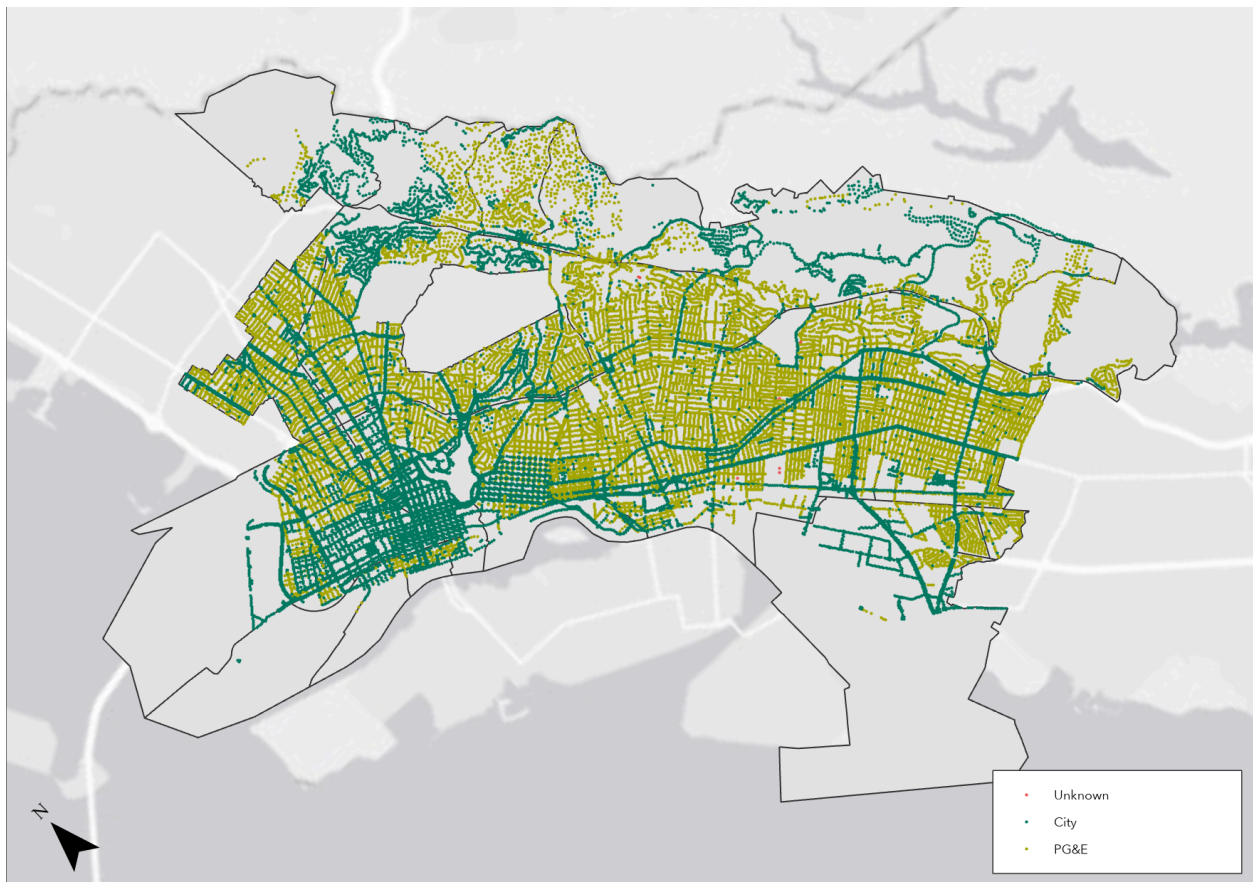
Figure 6. Miles of bikeways by equity priority



4.6 Streetlights

Streetlight data include information on ownership (City or PG&E) as well as physical characteristics (height, material, wattage), and installation date. Information on maintenance status was not available for analysis at this time. Of the 37,987 streetlights in the City, 18,428 are owned by the City, 19,539 (51%) are owned by PG&E, and 20 have unknown ownership (**Map 14**).

Map 14. Streetlights by ownership



4.7 Pedestrian Crosswalks and Traffic Controls

The pedestrian crosswalks dataset includes information on traffic control type (all-way stop, side-street stop, traffic signal, yield), striping type (basic, continental), and striping color (white, yellow). Yellow crosswalks are used to signal school zones. Condition and maintenance information is largely unavailable. The Existing Conditions map symbolizes the striping type and traffic control.

Image 1. Snapshot of crosswalk and traffic control symbology



There are 5,744 crosswalks in total of which 2,524 (43.9%) use basic striping and 3,220 (56.1%) use continental striping. Continental striping, or ladder-style striping, is more visible than basic crosswalk markings, which increases driver awareness and consequently pedestrian safety. The high-contrast design is more easily seen in low-light or low-visibility conditions and is endorsed by agencies such as the FHWA and NACTO for its effectiveness.

Map 15 displays the percentage of crosswalks in each census tract that feature continental striping. Nine census tracts have less than 25% of their crosswalks marked in this style. Among these, the lower equity priority tracts tend to have the fewest total crosswalks citywide, with counts ranging from 9 to 27. In contrast, the two higher equity priority tracts in this group have the highest total number of crosswalks, 47 and 98. **Figure 7** illustrates the distribution of crosswalk types by equity priority level. Higher equity priority areas contain a little more than half of all crosswalks in the city.

Map 15. Crosswalks and percentage of continental crosswalks by census tract

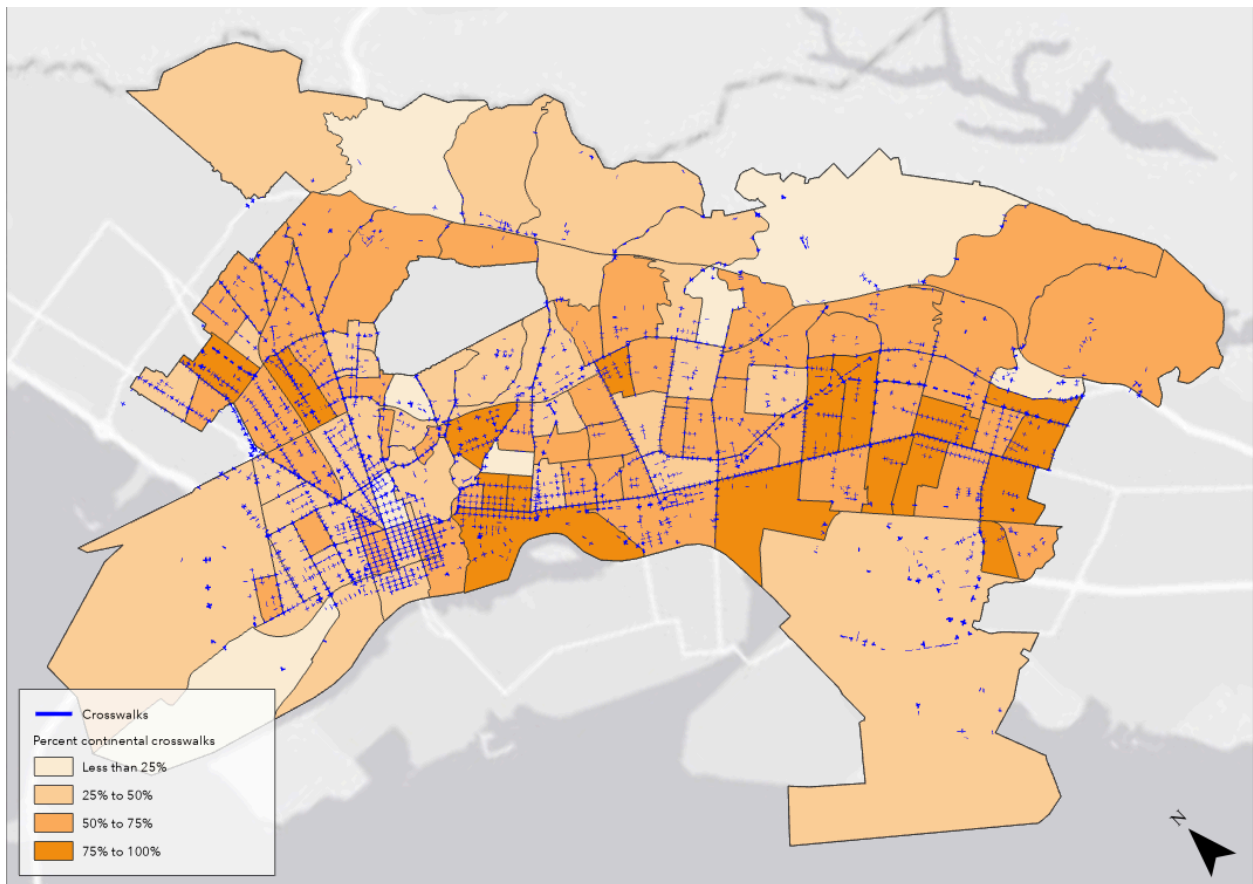
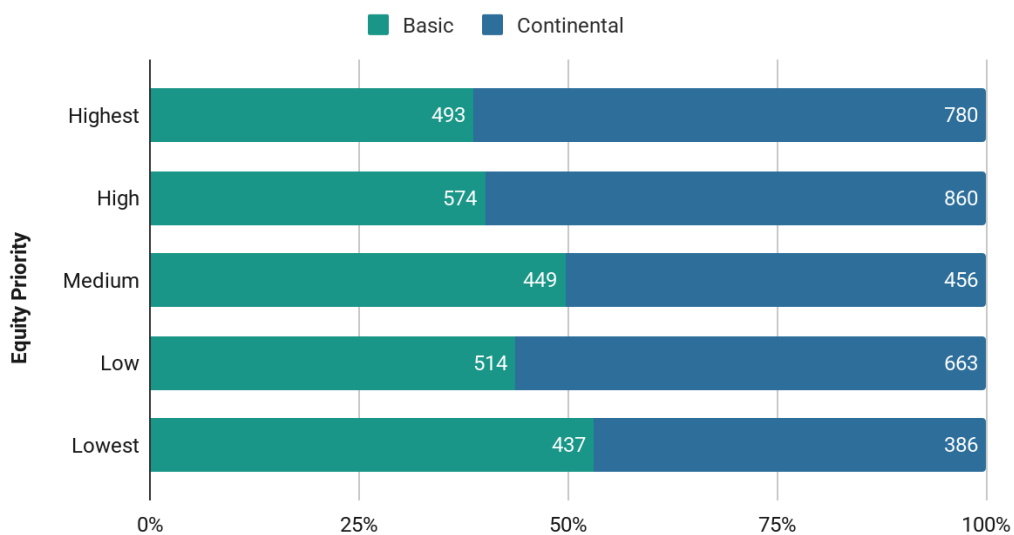


Figure 7. Percentage breakdown of crosswalk type for each equity priority

Type of Crosswalk by Equity Priority



5. Analysis

5.1 Summary of Findings

Figure 8 displays the number of census tracts within each equity priority level that have at-risk pavement (weighted PCI between 50 and 69) and poor pavement (weighted PCI below 50). A total of 60 tracts fall into the at-risk category, while 22 have poor pavement condition. The number of tracts with at-risk pavement is relatively consistent across all equity priority levels. However, the *Lowest* equity priority neighborhoods have the highest number of tracts with poor pavement: 10, compared to 5 in the *Medium* and 7 in the higher equity priority categories.

Figure 8. Number of census tracts with at-risk or poor pavement condition, by equity priority

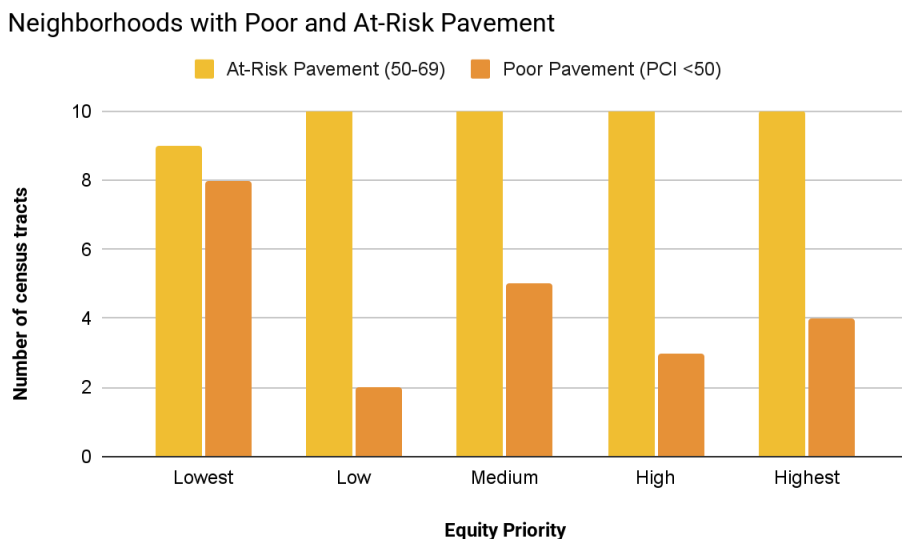


Figure 9 highlights the top 20% of census tracts with the highest number of damage points per 1,000 feet of sidewalk and the most severe (Priority 1 and Priority 2 repair) damage points per 1,000 feet of sidewalk. Each category includes 22 tracts. The *Lowest* and *Medium* equity priority tracts make up almost two-thirds of the neighborhoods with the highest total and most severe damage per 1,000 feet of sidewalk. For total damage points per 1,000 feet, the distribution is fairly even between lower and higher equity priority areas (8 and 7 tracts total, respectively). However, for severe damage points per 1,000 feet, lower equity priority areas are disproportionately affected, with over three times as many tracts (13), compared to higher equity priority areas (4).

Figure 9. Number of census tracts that fall in worst 20% of sidewalk damage counts, by equity priority

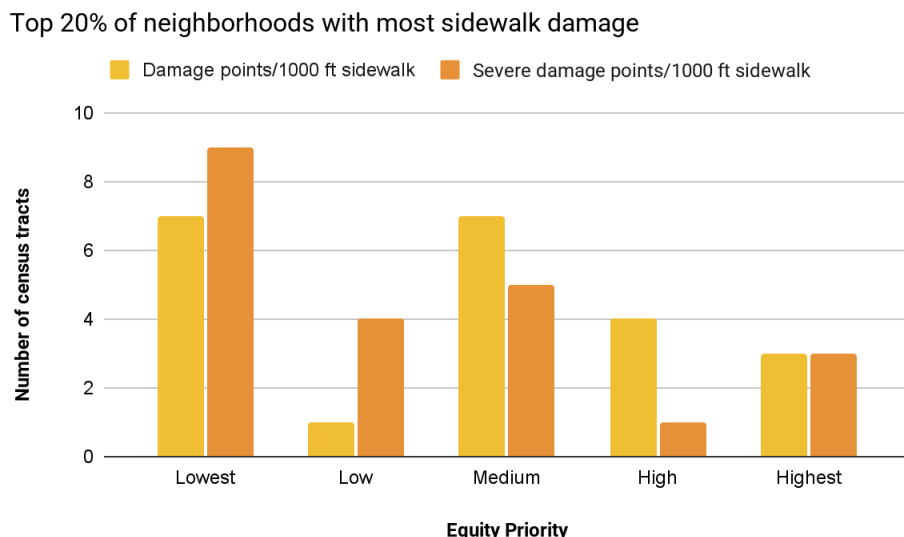


Figure 10 shows the top 20% of census tracts with the longest total sidewalk gaps and the highest gap length (in feet) per mile of existing sidewalk. Of Oakland's 116 census tracts, only 76 have any sidewalk gaps, making the top 20% equal to 15 tracts. Notably, none of these tracts fall in the Highest equity priority. While the *Lowest*, *Low*, and *Medium* equity priority groups each have three tracts represented, the *High* equity priority group includes six tracts. Despite this, the *Lowest* equity priority tracts account for nearly double the total gap mileage—8.56 miles compared to 4.89 miles in the *High* equity group. When examining sidewalk gaps per mile, the *Lowest* and *High* equity priority categories each include five tracts. However, the *Lowest* equity group has a significantly higher average gap per mile, 706.8 feet compared to 304 feet in the *High* equity group.

Figure 10. Number of census tracts that fall in worst 20% of sidewalk discontinuity measures, by equity priority

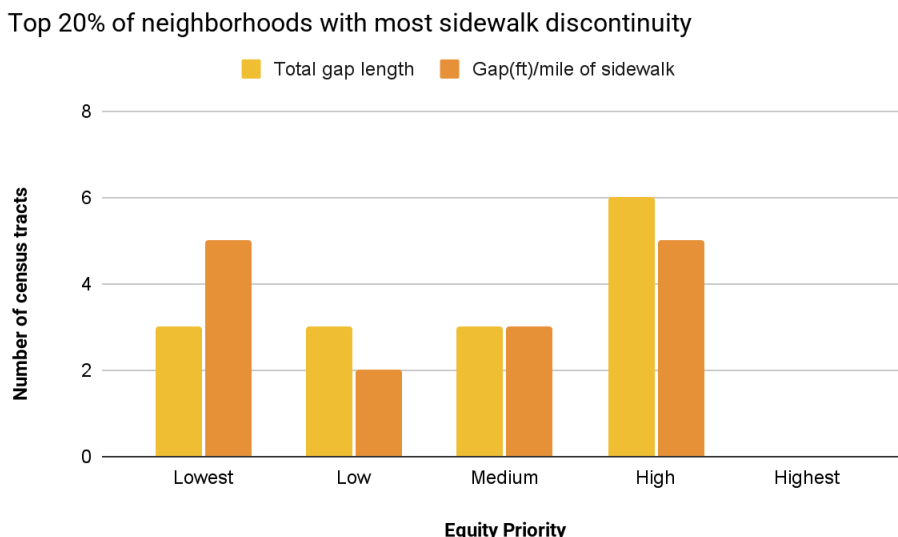


Figure 11 displays the number of census tracts within each equity priority that have the most significant curb ramp compliance issues. The top 20% of tracts with the highest total number of non-compliant curb ramps includes 22 tracts, while 17 tracts have more than 50% of their curb ramps classified as non-compliant. In both cases, the *Lowest* and *High* equity priority groups have the most tracts represented, with no tracts falling under the *Medium* equity priority category. Among the six tracts with over 75% of curb ramps non-compliant, five are in the *Low* or *Lowest* equity groups, and only one is in the *High* equity group. Additionally, of the four tracts with more than 200 non-compliant curb ramps, two are in the *High* and two in the *Low* equity priority category. These findings suggest that while total non-compliant curb ramp counts are distributed across equity levels, the most severe compliance issues—such as high percentages of non-compliance—are more concentrated in lower equity priority areas.

Figure 11. Number of census tracts that fall in top 20% of most total non-compliant curb ramps and census tracts with more than 50% of curb ramps non-compliant, by equity priority

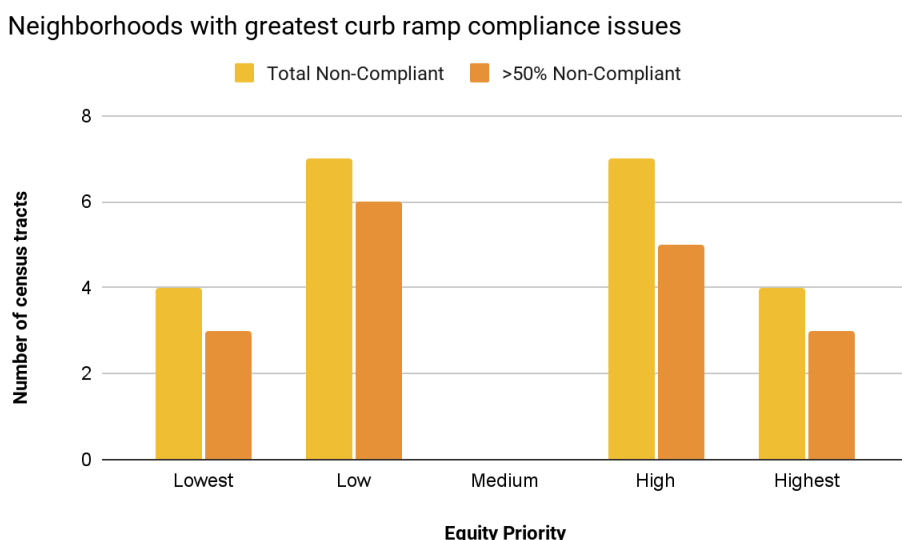
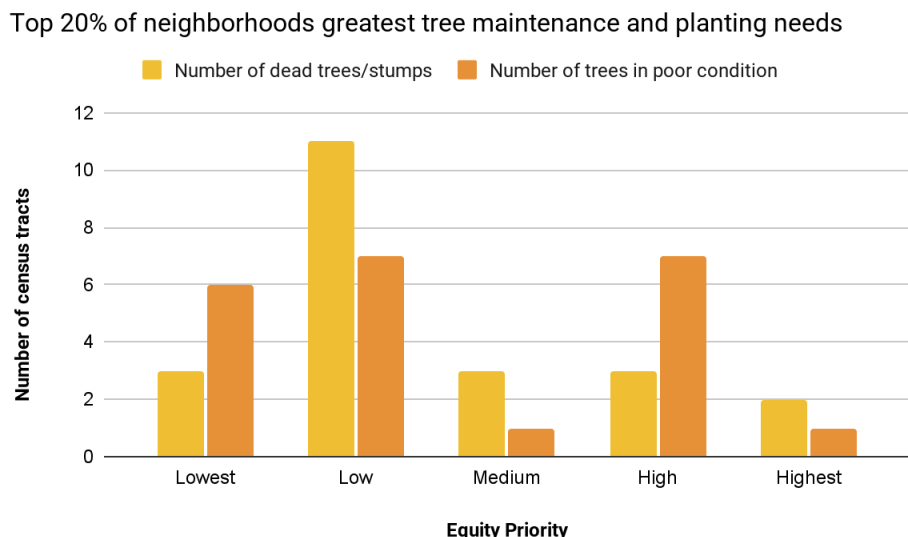


Figure 12 shows the top 20% of neighborhoods with the greatest tree maintenance and planting needs, totaling 22 tracts each. The lower equity priority bracket accounts for the majority of tracts with dead trees and stumps (14 tracts), compared to three tracts in the *Medium* category and a combined five tracts in the *High* and *Highest* categories. Similarly, for trees in poor condition which indicate a need for maintenance, 13 tracts fall within lower equity priority areas, one in the *Medium* category, and eight in the higher equity priority categories.

While these numbers may suggest a need to prioritize tree maintenance in lower equity priority neighborhoods, it is important to note that the data only reflects City-owned street trees. As I previously discussed, areas classified as *Low* and *Lowest* equity priority have the highest overall tree canopy cover, largely due to the presence of privately-owned trees. The dense and healthy canopy in these areas indicates that many trees are well-maintained despite being outside the scope of City maintenance.

Figure 12. Number of census tracts that fall in 20% of tree maintenance and planting needs, by equity priority



See [Appendix](#) for the corresponding data tables for the above figures.

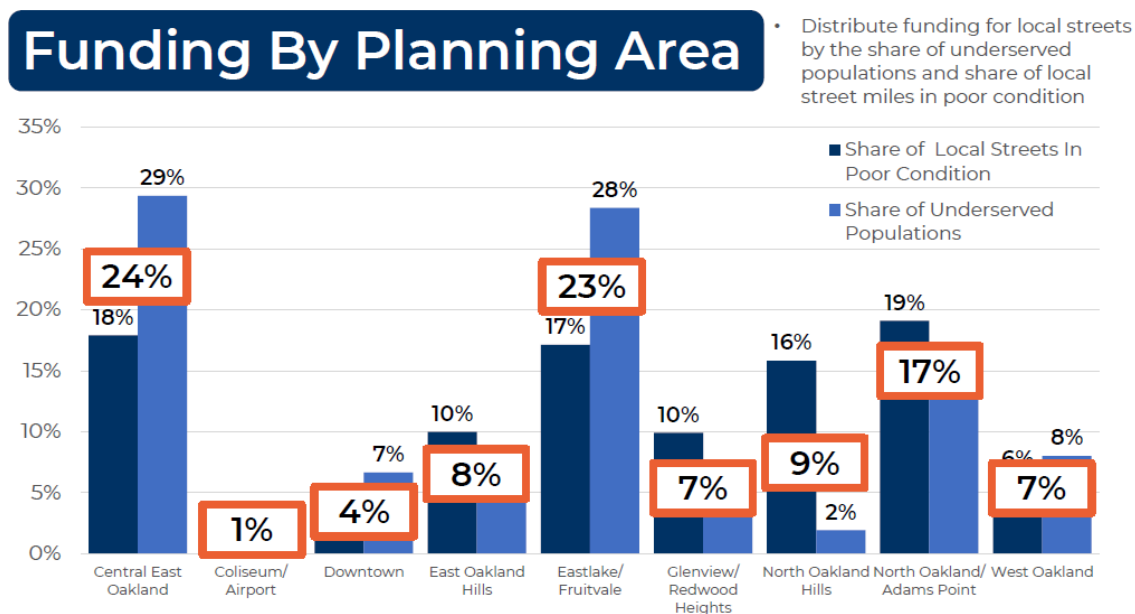
5.2 Implications

The analysis reveals that infrastructure challenges such as poor pavement, severe sidewalk damage, and non-compliant curb ramps are not confined to any one equity priority level but are often concentrated in Low and Lowest equity priority tracts. The following section attempts to contextualize these findings within broader spatial, environmental, demographic, and physical conditions that shape infrastructure need and performance. Differences in topography—such as the steep hills in many lower equity priority neighborhoods—contribute to persistent pavement and sidewalk challenges that are more difficult and costly to address. Meanwhile, higher equity priority neighborhoods, though they showed the most significant gains in pavement quality, continue to face overlapping burdens, including higher rates of residents with disabilities, more severe sidewalk damage, limited tree canopy, and disproportionate exposure to pollution and heat.

In 2019, OakDOT launched the Great Pave initiative, a three-year paving plan that used the share of local streets in poor condition and share of underserved populations to prioritize and guide funding and paving prioritization (City of Oakland, 2019). Based on this equity-focused approach, Central/East Oakland and Eastlake/Fruitvale planning areas received the most funding (**Figure 13**). These two planning areas have some of the highest proportion of *Highest*

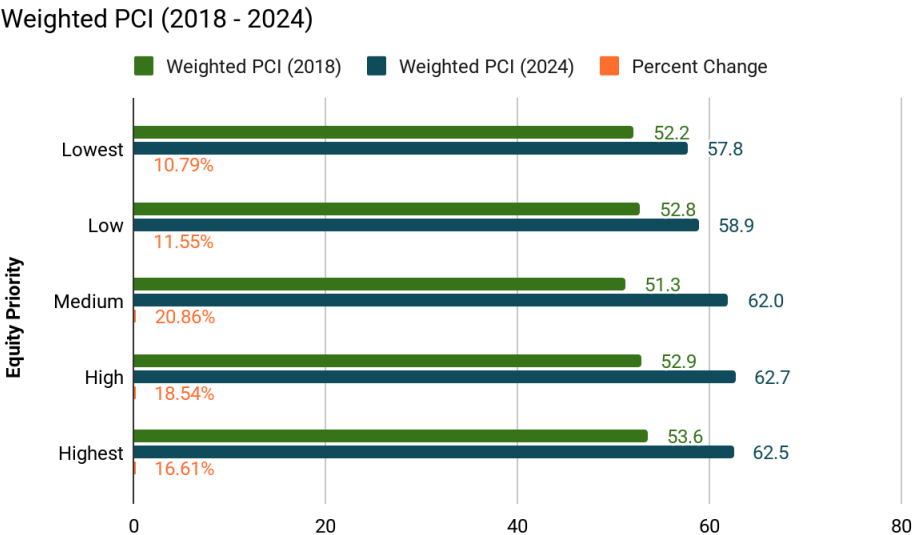
and *High* equity priority neighborhoods Central/East Oakland neighborhoods are 90% Highest or High equity priority while Eastlake/Fruitvale is 58%.

Figure 13. Funding for Great Pavé by Planning Area (Source: OakDOT)



The Great Pavé's data-driven method proved effective when comparing changes in weighted PCI across equity priority from 2018 prior to the plan's implementation to 2024. The greatest percent change observed in weighted PCI was in the *Medium*, *High*, and *Highest* equity priority areas (**Figure 14**). The weighted PCI values of the *Medium*, *High*, and *Highest* equity priority areas in 2024 exceed those in the *Lowest* and *Low* equity priority areas by around two standard deviations. These findings suggest that the City's commitment to an equity-driven prioritization approach resulted in consequential gains in closing the neighborhood income-based disparity in infrastructure quality.

Figure 14. Comparing Weighted Pavement Condition Index (PCI) before and after the Great Pave



When considering the mileage of poor condition pavement across the City and segmenting by equity priority designation, the lower equity priority areas have more miles of poor condition pavement in both absolute and proportion compared to the *High* and *Highest* equity priority areas both before and after the Great Pave. When looking at the percent change of poor condition pavement mileage between 2018 and 2024, *Medium* and *High* equity priority areas saw the greatest improvements (**Table 4**). However, the *Highest* priority areas experienced the lowest percent change in poor condition pavement mileage (**Table 4**).

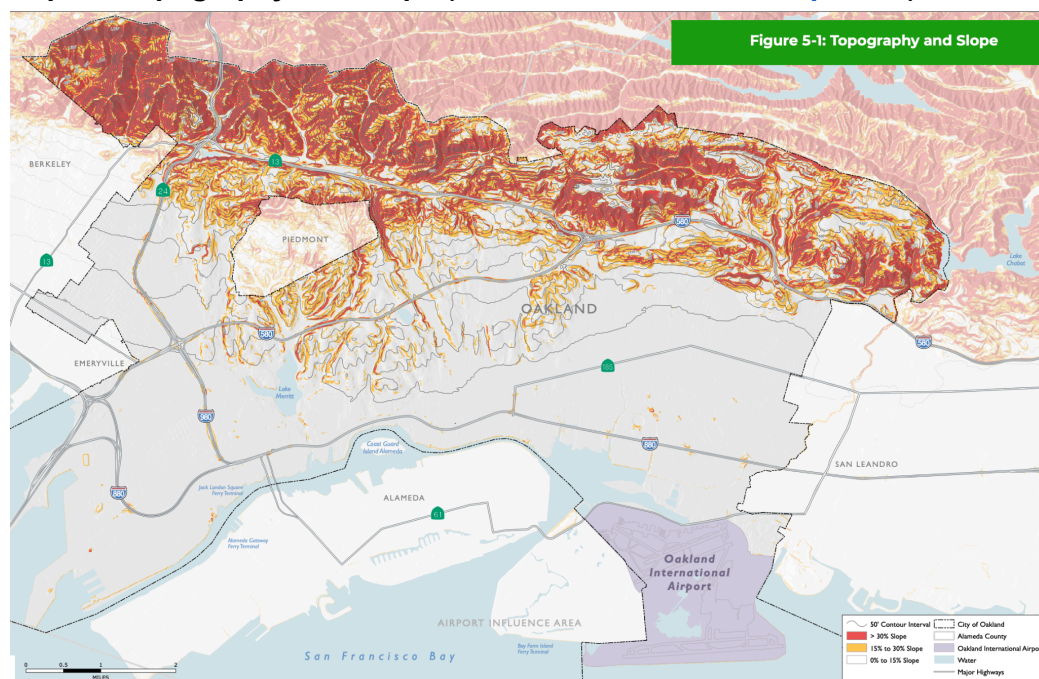
Table 4. Poor condition pavement mileage by equity priority

EQUITY PRIORITY	TOTAL PAVEMENT (MI)	MILES OF POOR CONDITION PAVEMENT (PCI<50) IN 2018	MILES OF POOR CONDITION PAVEMENT (PCI<50) IN 2024	PERCENT CHANGE
Lowest	407	231	188	-18.7%
Low	343	175	140	-20.0%
Medium	236	122	90	-26.2%
High	334	166	121	-26.8%
Highest	238	111	92	-17.1%

Oakland's terrain transitions from flat coastal plains south of I-580 freeway to steep hills reaching elevations greater than 1,700 feet (Topographic-map, n.d.). **Map 16** shows the topography and slope in the city. Areas northeast of US-13, which coincide with the majority of the City's *Lowest* and *Low* equity priority areas, have the greatest slope illustrated in red. While the data show that these areas also have greater sidewalk damage, lower curb ramp compliance, and poorer pavement, the physical terrain may be a key contributing factor to these issues.

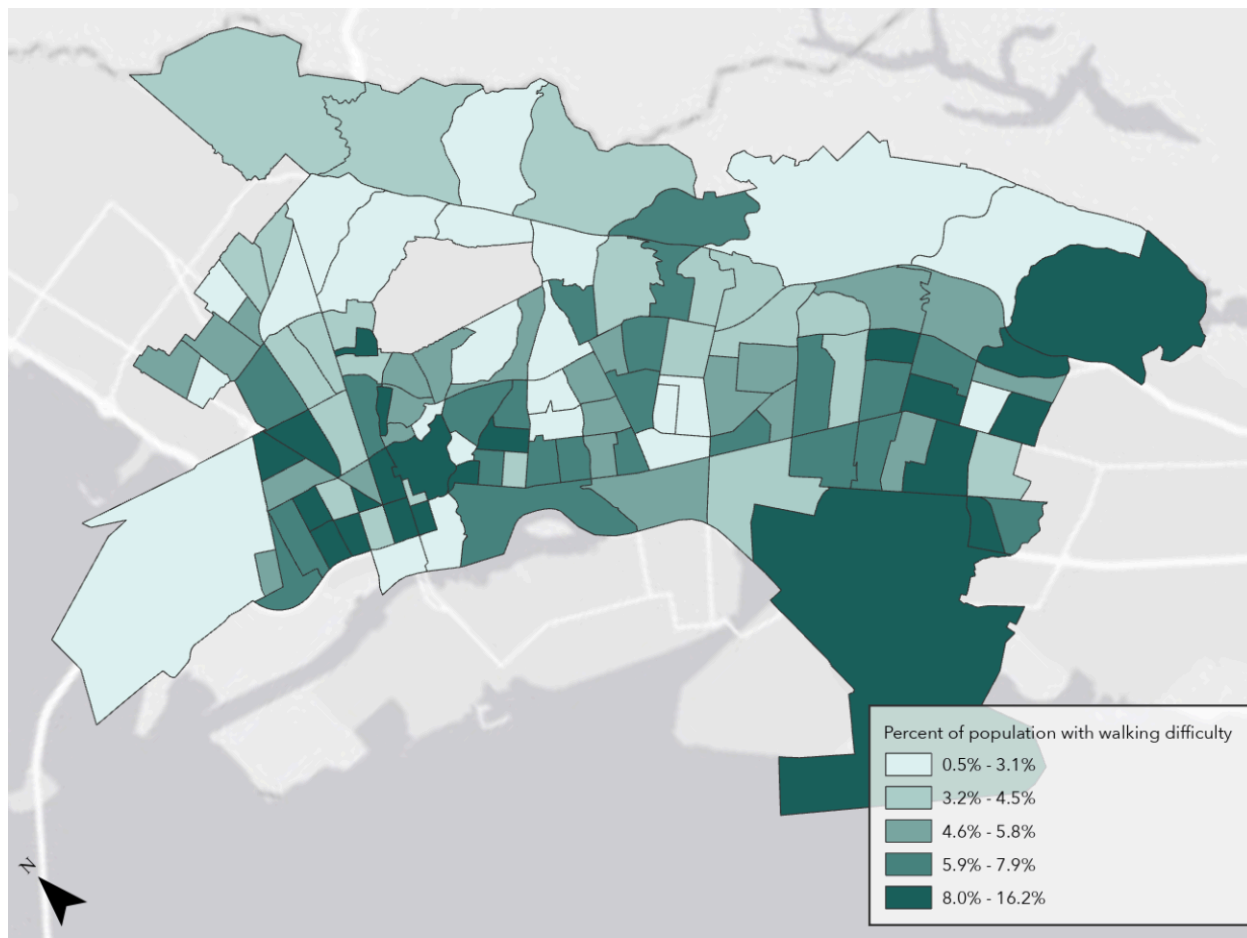
Sidewalks in hillier areas are more susceptible to damage due to a variety of interacting factors. Steep slopes are more prone to drainage issues which can lead to soil erosion which can lead to settling, cracking, or structural failure of the sidewalk (Precision Concrete Cutting, n.d.). As previously discussed and illustrated by **Map 10** and **Map 20**, the Oakland Hills feature a higher density of trees whose root systems have the potential to disrupt sidewalks. Over time, these roots can cause concrete slabs to shift and lift, resulting in uneven or cracked sidewalks. This higher concentration of street trees in hilly areas compounds the physical stresses on sidewalk infrastructure and contributes to more frequent and severe damage. In addition to sidewalk deterioration, pavement in hilly areas is more prone to damage and failure due to increased vehicle impact at the start of an incline and at the base of a hill (East Coat Pavement, n.d.). Furthermore, a hilly terrain can make it more difficult to build compliant and walkable sidewalks given the steep slope.

Map 16. Topography and Slope (Source: [Oakland 2045 Map Atlas](#))



Map 17 visualizes the rates of ambulatory disability by census tract. People with ambulatory disabilities often face challenges with walking and commonly rely on assistive devices such as wheelchairs, canes, or walkers to get around. Consequently, they are disproportionately affected by uneven or damaged sidewalks and are especially dependent on the presence of ADA-compliant curb ramps to navigate the built environment safely and independently.

Map 17. Percent of population with ambulatory disability



Notably, when focusing on the 20% of census tracts with the highest rates of ambulatory disability (8% or more of the population), 15 (or 68%) tracts are in *High* or *Highest* equity priority areas. The remaining seven tracts are designated as *Medium* priority. None are in the *Low* or *Lowest* equity priority category, underscoring a clear relationship between disability rates and equity priority.

Table 5 provides further detail on these 22 tracts, including the percentage of non-compliant curb ramps, total mileage of missing sidewalks, and the number of severe sidewalk damage points per 1,000 feet of sidewalk. Over two-thirds of these tracts are designated as *High* or

Highest equity priority, and nearly 60% have more than half of their curb ramps out of compliance with ADA standards—indicating a clear misalignment between infrastructure conditions and community accessibility needs. The two tracts with the greatest sidewalk gaps—Census Tract 409000 (0.716 mi) and 410100 (0.535 mi)—are both classified as High equity priority, underscoring the disproportionate impact on communities already facing systemic disadvantage.

Several of these equity-priority areas also exhibit high concentrations of physical barriers, such as dense clusters of severe sidewalk damage, further compounding mobility challenges for residents—many of whom report elevated rates of walking difficulty. These overlapping deficiencies suggest that residents in areas with poor pavement conditions are more likely to experience multiple, reinforcing barriers to safe, accessible, and connected pedestrian infrastructure.

Table 5. Highest rates of ambulatory disability, curb ramp compliance, and sidewalk issues.

CENSUS TRACT	EQUITY PRIORITY	% OF POPULATION WITH AMBULATORY DISABILITY	% NON-ADA-COMPLIANT CURB RAMPS	MISSING SIDEWALK (MI)	# OF P1 P2 DAMAGE POINTS PER 1,000 FT OF SIDEWALK
402802	Highest	16.2	37%	0.000	2
403000	Highest	15.0	48%	0.000	4
402400	Highest	14.5	77%	0.000	8
401500	Medium	12.7	39%	0.177	10
408400	Highest	12.4	51%	0.068	6
402600	Highest	11.7	42%	0.000	4
410400	High	11.2	46%	0.043	5
405302	Medium	10.9	58%	0.062	3
402900	Highest	10.8	35%	0.000	4
409100	High	10.7	30%	0.016	4
403401	High	10.4	15%	0.000	3
403502	Medium	10.0	62%	0.000	37
409400	High	10.0	35%	0.271	9
409600	Highest	10.0	27%	0.000	5
409000	High	9.9	51%	0.716	1
401400	Medium	9.8	52%	0.000	14

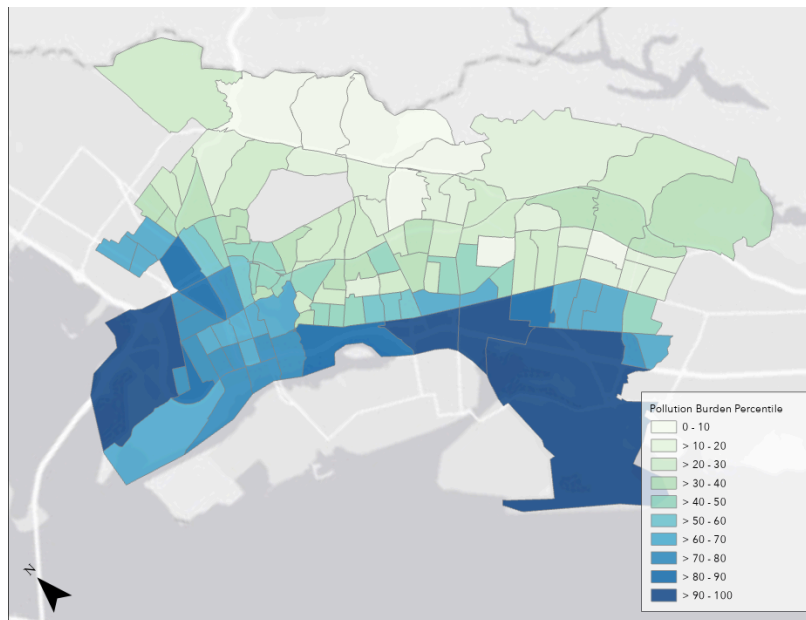
403301	Highest	9.5	185	0.000	5
410000	Medium	9.3	81%	0.020	4
402500	Highest	8.4	74%	0.003	7
404102	Medium	8.3	78%	0.034	6
405500	Medium	8.1	44%	0.000	6
410100	High	8.0	83%	0.535	5

These infrastructure disparities assume added significance when considering that residents in lower-income neighborhoods, many of whom fall into the *High* and *Highest* equity priority tracts, are more likely to rely on walking, biking, or transit for daily travel, whereas higher-income populations tend to depend more heavily on private vehicles (Wang and Renne, 2023).

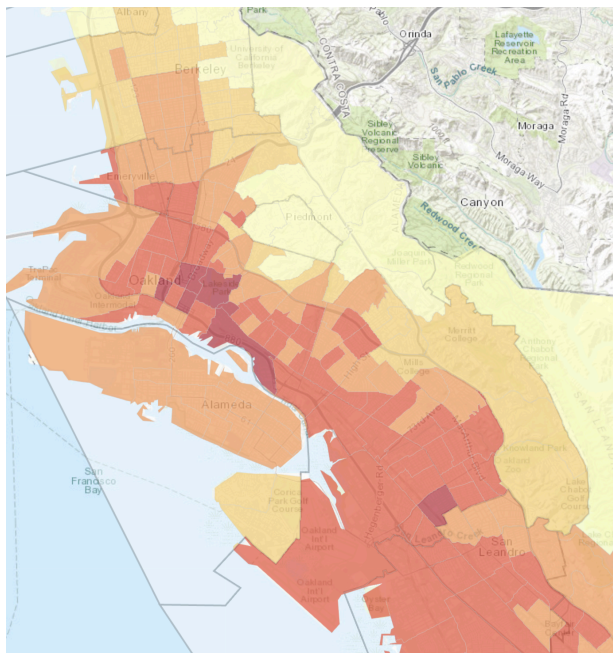
From an equity perspective, it is especially important to close gaps in access to active transportation infrastructure such as sidewalks, lighting, and bikeways. According to the 2022 National Household Travel Survey, 87% of all person trips were made by private vehicle, 6.9% by walking, and 1.5% by public transportation. While driving dominates mode share, walking is the second most common travel mode, and 44% of those who completed trips by walking reported incomes below \$75,000 (Bricka et al., 2024). Mode split by income bracket reveals that individuals earning less than \$25,000 drive significantly less but walk and use transit more than higher-income groups (Wang & Renne, 2023). Similarly, low-income populations report the highest rates of walking and bicycling to commute to work (Snyder, 2014). Transportation patterns also vary by race and ethnicity: African American and Asian individuals have the highest share of transit trips, while mixed race individuals and Asian Americans have the highest rates of walking to work, followed by Latinos (McKenzie, 2014; McDonald, 2008).

Map 18 highlights significant environmental justice issues in the City by illustrating how pollution burden percentile breaks down spatially. In particular, the flatlands and neighborhoods in West and East Oakland fall within the highest percentiles for pollution burden in California, there is a clear correlation with the OakDOT Priority Neighborhoods dataset. Areas with higher pollution burden percentile are exposed to especially high levels of air pollution, toxic runoff and traffic density and are subject to the adverse environmental effects experienced as a result of proximity to hazards like waste facilities, cleanup sites, and groundwater threats (California Office of Environmental Health Hazard Assessment, 2025). The map underscores how these environmental hazards are not distributed equally and are concentrated in *High* equity priority neighborhoods, reflecting broader patterns of systemic inequity in where pollution sources are located and who bears their impacts. Alameda County's Heat Vulnerability Index highlights a similar spatial pattern in **Map 19**.

Map 18. CalEnviroScreen 4.0 Pollution Burden Percentile



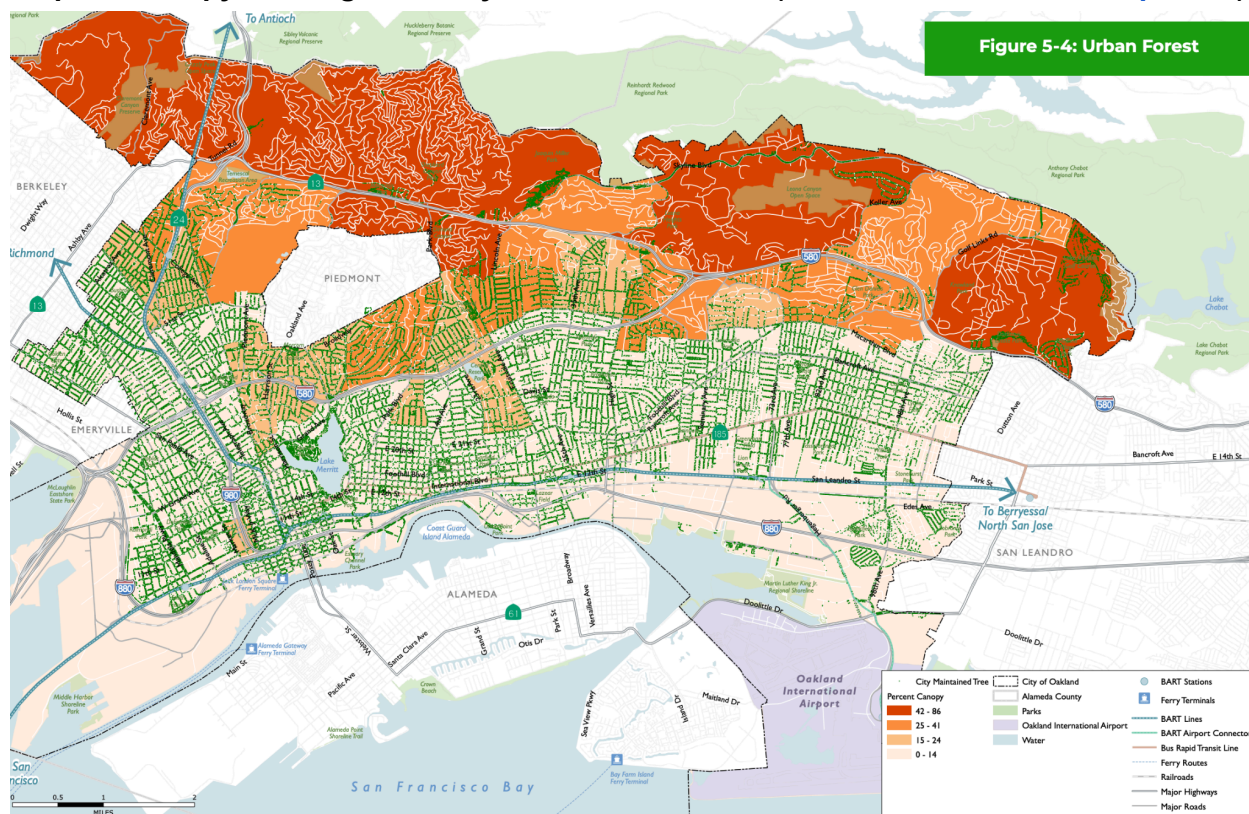
Map 19. Heat Vulnerability in Alameda County (Source: [Alameda County](#))



In line with the earlier discussion about street trees and canopy cover, **Map 20** shows that there is an inverse relationship between the level of canopy cover and the density of City-owned street trees. The red and orange areas indicate higher canopy cover, and these exact areas align with the same areas that have low pollution burden percentile and lower heat vulnerability compared to the rest of the City. When compared to the CalEnviroScreen 4.0 Pollution Burden percentile map (**Map 18**), the relationship between pollution burden and canopy coverage is

stark. Areas with the lowest pollution burden coincide with areas with the highest tree canopy coverage in the City.

Map 20. Canopy coverage and City-owned street trees (Source: [Oakland 2045 Map Atlas](#))



Street trees play a vital role in addressing these environmental justice issues by improving air quality, reducing the urban heat island effect, providing shade, and improving overall public health and livability of city streets (Ettinger et al., 2024; Ren et al., 2023; Eisenman et al., 2021). Trees filter harmful pollutants like fine particulate matter and black carbon, which have been detected in higher levels in low-income neighborhoods and communities of color located in proximity of highways and industrial areas. Street trees are also essential to creating more walkable conditions for residents (Sang et al., 2025; Kobos, 2016).

While the geospatial analysis may reveal only modest equity disparities in current transportation asset conditions—and in some cases even show greater infrastructure needs in Low and Lowest equity priority areas—these patterns must be viewed in the context of historical planning and infrastructure decisions. Such decisions have produced long-standing spatial inequities, where disadvantage is concentrated in specific areas, as discussed earlier. High and Highest equity priority neighborhoods continue to face compounded challenges, as evidenced by elevated pollution burdens, higher rates of disability, and other overlapping vulnerabilities. These disparities are starkly reflected in life expectancy as residents of East Oakland live, on average, 10 years less than those in the Oakland Hills (75 vs. 85 years), underscoring the cumulative

impact of environmental and infrastructural inequities (Metropolitan Transportation Commission, 2017). In contrast, lower equity priority areas often include households with greater individual and financial resources, which can buffer the effects of limited infrastructure.

To continue to meaningfully advance equity, higher equity priority areas require and should continue to receive greater public investment. Targeted improvements in these neighborhoods are critical for addressing long-standing disparities and ensuring more equitable access to safe, high-quality, and supportive infrastructure. Addressing these disparities can contribute to better overall socioeconomic outcomes (Chen et al., 2025). While this analysis assesses the current distribution and condition of transportation assets, it is important to understand that an equitable distribution does not necessarily equate to equitable outcomes as resources should be allocated to redress the impacts of historical disinvestment and environmental injustice. Future planning efforts should build upon this analysis to guide more restorative, equity-driven investment strategies.

6. Conclusion and Policy Recommendations

In addition to department-identified priorities and initiatives outlined in official plans such as the [5-Year Paving Plan](#) and [Pedestrian Plan](#), OakDOT uses 311 service requests as a supplemental tool to identify maintenance needs for certain transportation assets, including sidewalks, pavement, and curb ramps—a practice common among many municipalities nationwide. However, studies on a variety of cities such as Houston, New York, Portland, and Boston have consistently shown that 311 usage is not equitable. More privileged populations—typically whiter and wealthier—are significantly more likely to use these systems (de Benedictis Kessner, 2023; Tanaka et al., 2021; Kontokosta et al., 2017; Cook et al., 2024; He, 2023). On the flip side, historically marginalized communities, including lower-income residents and people of color, are less likely to report issues through 311 (Cook et al., 2024). Neighborhoods with lower rates of 311 reporting often have higher concentrations of people of color, elevated unemployment rates, lower incomes, and greater numbers of limited English speakers (Kontokosta et al., 2017). As a result, relying solely on 311 data can reinforce existing disparities; well-resourced areas continue to receive more attention and improvements, while underserved areas fall further behind. In short, 311 is not an equitable indicator of infrastructure needs and should not be treated as a comprehensive proxy. OakDOT’s own Racial Equity Impact Analysis of pothole-related 311 requests and maintenance practice confirmed these disparities. To address this equity issue, the agency supplements 311 data with additional strategies to ensure more equitable maintenance prioritization.

To move toward a more equitable and data-informed approach, OakDOT should prioritize the continued development and regular updating of comprehensive transportation asset data that captures both the existence and, critically, the condition of each asset. In parallel, the agency should establish clear, well-defined metrics tailored to each asset type and ensure these metrics are ranked and weighted appropriately based on strategic goals. When embedded within a broader strategic planning framework, metrics can help clearly define desired outcomes, set measurable targets or directional trends, and align day-to-day efforts with higher-level policy goals. Ultimately, this approach can improve visibility within the agency, support more equitable and smarter resource allocation, and improve the agency’s ability to track and evaluate its progress.

Table 6. Examples of potential metrics

ASSET	METRIC
Sidewalks	• create a condition rating scale that helps planners quickly assess the quality of a sidewalk (see: SDOT) ○ percent of sidewalks in good or better condition • number of damage points per 1,000 feet of sidewalk • percent of areas that have sidewalks

	• percent of sidewalks with continuous, unobstructed pathways (sidewalk condition score) • number of accessibility complaints or violations per year • percent of essential places (e.g., schools, parks, libraries, healthcare) accessible by connected sidewalks • number of sidewalk gaps closed annually
Roadways	• Weighted average PCI • Potholes filled • Crash frequency in high-frequency corridors • percent of arterial streets with fair or better pavement condition
Bike infrastructure	• increase percent of bicycle and micromobility trips (particularly among underrepresented groups) • percent of households within ¼ mile to a bikeway • percent of schools directly served by a bikeway • percent of bikeways with fair or good pavement condition
Trees	• percent tree canopy coverage in right-of-way (divide by arterial streets and more) • heat island index correlation • tree health rating by equity priority • tree count per capita
Overall	• set general asset condition targets: what percentage to be in good or fair condition

Taken together, these asset condition measures can feed into a composite existing conditions score or into a prioritization model to support more strategic decisions around resource allocation and project selection. Ramandeep Josen, Asset Management Strategic Advisor at the Seattle Department of Transportation (SDOT), demonstrated a Project Prioritization Dashboard that incorporates performance data from Seattle’s seven highest-value assets into various prioritization frameworks. This demonstration serves as the foundation for the next iteration of the tool, which will include impact analysis to assess whether SDOT’s work is improving specific performance metrics. These metrics are directly aligned with the goals of the Seattle Transportation Plan. By leveraging this tool, planners can identify which design interventions yield the greatest impact and which repairs deliver the most effective outcomes. The tool functions as a validator of results, highlighting how transportation asset data can be used to pursue maintenance and capital projects that maximize impact and advance equity in the community.

To further strengthen the legitimacy and relevance of its data, OakDOT would benefit from partnering with community-based organizations on the development of metrics, data collection, and validation of findings. Collaborating with trusted local groups, particularly those with deep

and long-standing relationships in the neighborhoods they serve, can help ensure the data accurately reflects on-the-ground realities and lived experiences. Building these partnerships can also enhance public trust and support greater transparency in decision-making processes.

By supplementing community engagement and institutional knowledge with data-driven insights, OakDOT can make more informed decisions and better align its investments with community needs and long-term transportation equity objectives. At the project level, understanding the existing conditions of transportation assets in any given area helps inform outreach efforts. This awareness empowers staff to approach community conversations with greater sensitivity, recognizing which needs are already being met and which remain unaddressed.

7. References

- Addas, A. (2025). Impact of neighborhood safety on adolescent physical activity in Saudi Arabia: Gender and socio-economic perspectives. *Frontiers in Public Health*, 13, 1520851. <https://doi.org/10.3389/fpubh.2025.1520851>
- Administrative instruction 580—Race and equity*. (2021, June 14). City of Oakland. https://cao-94612.s3.us-west-2.amazonaws.com/documents/Administrative-Instruction-580-Race-and-Equity_2023-03-22-211634_ykyr.pdf
- American Society of Civil Engineers. (2025). *Roads*. ASCE's 2025 Infrastructure Report Card . <https://infrastructurereportcard.org/cat-item/roads-infrastructure/>
- American Society of Civil Engineers & EBP. (2021). *Failure to Act: Economic Impacts of Status Quo Investment Across Infrastructure Systems* (p. 23). https://infrastructurereportcard.org/wp-content/uploads/2021/02/FTA_Econ_Impacts_Status_Quo-1.pdf
- Bastiaanssen, J., Johnson, D., & Lucas, K. (2020). Does transport help people to gain employment? A systematic review and meta-analysis of the empirical evidence. *Transport Reviews*, 40(5), 607–628. <https://ideas.repec.org/a/taf/transr/v40y2020i5p607-628.html>
- Bise, R. D., Rodgers, J. C. I., Maguigan, M. A., Beaulieu, B., Keith, W., Maguigan, C. L., & Meng, Dr. Q. (2018). Sidewalks as measures of infrastructure inequities. *Southeastern Geographer*, 58(1), 39–57. <https://muse.jhu.edu/pub/12/article/689984>
- Blumenberg, E. (2017). Social Equity and Urban Transportation. In *The geography of urban transportation*. Guilford Publications.
- Bock, M., Cardazzi, A., & Humphreys, B. R. (2021). *Where the rubber meets the road: Pavement damage reduces traffic safety and speed* (SSRN Scholarly Paper 3909621). <https://papers.ssrn.com/abstract=3909621>
- Bogart, D. (2022). Infrastructure and institutions: Lessons from history. *Regional Science and Urban Economics*, 94, 103626. <https://doi.org/10.1016/j.regsciurbeco.2020.103626>
- Bonilla, M., Rasdorf, W., Liu, M., Al-Ghandour, M., & He, C. (2023). Inequity reduction in road maintenance funding for municipalities. *Public Works Management & Policy*, 28(3), 339–362. <https://doi.org/10.1177/1087724X221130047>
- Bricka, S., Reuscher, T., Fisher, M., Beard, J., & Sun, X. (2024). *Summary of Travel Trends: 2022 National Household Travel Survey* (Trends in Travel Behavior, 1969–2022 FHWA-HPL-24-009). Federal Highway Administration. https://nhts.ornl.gov/assets/2022/pub/2022_NHTS_Summary_Travel_Trends.pdf
- CalEnviroScreen scoring & model*. (n.d.). [Government]. Scoring & Model - OEHHHA; California Office of Environmental Health Hazard Assessment. Retrieved May 15, 2025, from <https://oehha.ca.gov/calenviroscreen/scoring-model>

- Chen, N., & Wang, C.-H. (2020). Does green transportation promote accessibility for equity in medium-size U.S. cities? *Transportation Research Part D: Transport and Environment*, 84, 102365. <https://doi.org/10.1016/j.trd.2020.102365>
- Chen, Z., Ki, D., Li, Z., & Wang, K. (2025). Assessing equity in infrastructure investment distribution among U.S. cities. *Cities*, 162, 105898. <https://doi.org/10.1016/j.cities.2025.105898>
- Chingos, M., & Blagg, K. (2017). *Student Transportation and Educational Access: How Students Get to School in Denver, Detroit, New Orleans, New York City, and Washington, DC*. Urban Institute . <https://www.urban.org/research/publication/student-transportation-and-educational-access>
- City of Oakland pavement condition index (PCI)*. (n.d.). [Map]. Oakland Department of Transportation . Retrieved May 13, 2025, from <https://www.arcgis.com/apps/dashboards/5d844eacab5f40598fcd0e45376d785f>
- Classification methods—Arcgis for microsoft 365 | documentation*. (n.d.). Retrieved May 20, 2025, from <https://doc.arcgis.com/en/microsoft-365/latest/get-started/classification-methods.htm#:~:text=The%20natural%20breaks%20classification%20method,that%20are%20not%20evenly%20distributed.>
- Coleman, N., Esmalian, A., & Mostafavi, A. (2020). Equitable resilience in infrastructure systems: Empirical assessment of disparities in hardship experiences of vulnerable populations during service disruptions. *Natural Hazards Review*, 21(4), 04020034. [https://doi.org/10.1061/\(ASCE\)NH.1527-6996.0000401](https://doi.org/10.1061/(ASCE)NH.1527-6996.0000401)
- Coleman, N., Li, X., Comes, T., & Mostafavi, A. (2023). *Weaving equity into infrastructure resilience research and practice: A decadal review and future directions* (arXiv:2310.19194). arXiv. <https://doi.org/10.48550/arXiv.2310.19194>
- Cook, S. J., Zuhlke, S., & Saywitz, R. (2024). Potholes, 311 reports, and a theory of heterogeneous resident demand for city services. *Policy Studies Journal*, 52(3), 647–669. <https://doi.org/10.1111/psj.12540>
- Corning-Padilla, A., & Rowangould, G. (2020). Sustainable and equitable financing for sidewalk maintenance. *Cities*, 107, 102874. <https://doi.org/10.1016/j.cities.2020.102874>
- Crosswalk visibility enhancements*. (n.d.). FHWA. Retrieved May 31, 2025, from <https://highways.dot.gov/safety/proven-safety-countermeasures/crosswalk-visibility-enhancements>
- Currier, L., Glaeser, E. L., & Kreindler, G. E. (2023). *Infrastructure inequality: Who pays the cost of road roughness?* (Working Paper 31981). National Bureau of Economic Research. <https://doi.org/10.3386/w31981>
- Cutting, P. C. (2024, September 16). 5 common sidewalk hazards and fixes in southern california. *Precision Concrete Cutting*. <https://socalpcc.com/5-common-sidewalk-hazards-in-southern-california-and-how-to-fix-them/>
- Data Analytics Subcommittee of the Racial Equity Team. (n.d.). *Oakland geographic equity toolbox and equity map methodology and literature review*. Oakland Department of Transportation . <https://cao-94612.s3.us-west-2.amazonaws.com/documents/Methodology-Literature-Review-FINAL-Update.pdf>
- de Benedictis Kessner, J. (2023). *Where the sidewalk ends: How participation contributes to inequity in basic government service provision*.

<https://www.hks.harvard.edu/publications/where-sidewalk-ends-how-participation-contributes-inequity-basic-government-service>

DeGood, K. (2020, April 14). Infrastructure Investment Decisions Are Political, Not Technical. *Center for American Progress*.

<https://www.americanprogress.org/article/infrastructure-investment-decisions-political-not-technical/>

Dubey, S., Bailey, A., & Lee, J. (Brian). (2025). Women's perceived safety in public places and public transport: A narrative review of contributing factors and measurement methods. *Cities*, 156, 105534.

<https://doi.org/10.1016/j.cities.2024.105534>

DuPuis, N., & McFarland, C. (2016). *Paying for local infrastructure in a new era of federalism: A State-by-State Analysis*. National League of Cities .

https://www.nlc.org/wp-content/uploads/2016/12/NLC_2016_Infrastructure_Report.pdf

Dyett & Bhatia Urban and Regional Planners. (2024, October). *Oakland 2045 Map Atlas*. Oakland 2045 General Plan . https://cao-94612.s3.us-west-2.amazonaws.com/documents/Map-Atlas_100824.pdf

Eisenman, T. S., Coleman, A. F., & LaBombard, G. (2021). Street trees for bicyclists, pedestrians, and vehicle drivers: A systematic multimodal review. *Urban Science*, 5(3), 56. <https://doi.org/10.3390/urbansci5030056>

Erfani, A., Mahmoudi, J., & Cui, Q. (2024). Measuring social equity in pavement conditions using big data. *Construction Research Congress 2024*, 23–32. <https://doi.org/10.1061/9780784485262.003>

Ettinger, A. K., Bratman, G. N., Carey, M., Hebert, R., Hill, O., Kett, H., Levin, P., Murphy-Williams, M., & Wyse, L. (2024). Street trees provide an opportunity to mitigate urban heat and reduce risk of high heat exposure. *Scientific Reports*, 14(1), 3266. <https://doi.org/10.1038/s41598-024-51921-y>

Gandy, C. A., Armanios, D. E., & Samaras, C. (2023). Social equity of bridge management. *Journal of Management in Engineering*, 39(5), 04023027. <https://doi.org/10.1061/JMENEA.MEENG-5265>

Gardner, B. (2021, July 15). *Equity in urban improvements: Oakland's great pave*. Data-Smart City Solutions; Bloomberg Center for Cities at Harvard University. <https://datasmart.hks.harvard.edu/news/article/equity-urban-improvements-oaklands-great-pave>

Gilens, M., & Page, B. I. (2014). Testing theories of american politics: Elites, interest groups, and average citizens. *Perspectives on Politics*, 12(3), 564–581. <https://doi.org/10.1017/S1537592714001595>

Giovannettone, J. P., Macey, G. P., AghaKouchak, A., Barbato, M., Capehart, W. J., Ganguly, A. R., Hall, M., Helgeson, J. F., Li, S. H., Wu, T., Yan, G., & Vahedifard, F. (2024). Equitable infrastructure: Achieving resilient systems and restorative justice through policy and research innovation. *PNAS Nexus*, 3(5), pgae157. <https://doi.org/10.1093/pnasnexus/pgae157>

Gonzalez, D. J. X., Nardone, A., Nguyen, A. V., Morello-Frosch, R., & Casey, J. A. (2023). Historic redlining and the siting of oil and gas wells in the United States. *Journal of Exposure Science & Environmental Epidemiology*, 33(1), 76–83. <https://doi.org/10.1038/s41370-022-00434-9>

He, Z. K. (2023, June 24). The value of 311 data. *Hunter Urban Review*. <https://hunterurbanreview.commonscs.cuny.edu/the-value-of-311-data/>

- Hooper, E., Peters, S., & Pintus, P. (2018). To what extent can long-term investments in infrastructure reduce inequality? *Journal of Infrastructure, Policy and Development*, 2(2), 193–225.
<https://doi.org/10.24294/jipd.v2i2.858>
- Hossain, A., Sun, X., Thapa, R., & Codjoe, J. (2022). *Applying association rules mining to investigate pedestrian fatal and injury crash patterns under different lighting conditions* (arXiv:2211.03187). arXiv.
<https://doi.org/10.48550/arXiv.2211.03187>
- Howe, C., Lockrem, J., Appel, H., Hackett, E., Boyer, D., Hall, R., Schneider-Mayerson, M., Pope, A., Gupta, A., Rodwell, E., Ballesterio, A., Durbin, T., el-Dahdah, F., Long, E., & Mody, C. (2016). Paradoxical infrastructures: Ruins, retrofit, and risk. *Science, Technology, & Human Values*, 41(3), 547–565.
<https://doi.org/10.1177/0162243915620017>
- Huynh, V. N., Truong, L. T., & De Gruyter, C. (2025). Examining the impacts of road pavement roughness and rutting on traffic safety: A macrolevel analysis. *Traffic Injury Prevention*, 1–7.
<https://doi.org/10.1080/15389588.2024.2448838>
- Jeon, J. S., Dawkins, C., & Pendall, R. (2018). How vehicle access enables low-income households to live in better neighborhoods. *Housing Policy Debate*, 28(6), 920–939.
<https://doi.org/10.1080/10511482.2018.1494023>
- Jones, S. H., & Armanios, D. E. (2020). Methodological framework and feasibility study to assess social equity impacts of the built environment. *Journal of Construction Engineering and Management*, 146(11), 05020016. [https://doi.org/10.1061/\(ASCE\)CO.1943-7862.0001914](https://doi.org/10.1061/(ASCE)CO.1943-7862.0001914)
- Jun, H.-J., & Hur, M. (2015). The relationship between walkability and neighborhood social environment: The importance of physical and perceived walkability. *Applied Geography*, 62, 115–124.
<https://doi.org/10.1016/j.apgeog.2015.04.014>
- Kedarisetty, S., & Misaghi, S. (2024). *Oakland sidewalk and curb ramp assessment final report* (55.158.55; p. 85). NCE.
- Kelly, C. M., Schootman, M., Baker, E. A., Barnidge, E. K., & Lemes, A. (2007). The association of sidewalk walkability and physical disorder with area-level race and poverty. *Journal of Epidemiology & Community Health*, 61(11), 978–983. <https://doi.org/10.1136/jech.2006.054775>
- Key facts about California's surface transportation system*. (2025, May). TRIP.
https://tripnet.org/wp-content/uploads/2020/04/TRIP_Fact_Sheet_CA.pdf
- Khalife, F. G., Arneson, E. E., Atadero, R. A., & Ozbek, M. E. (2023). Assessing social equity considerations within transportation asset management. *Transport Economics and Management*, 1, 160–167.
<https://doi.org/10.1016/j.team.2023.10.001>
- King, D. A., Smart, M. J., & Manville, M. (2022). The poverty of the carless: Toward universal auto access. *Journal of Planning Education and Research*, 42(3), 464–481. <https://doi.org/10.1177/0739456X18823252>
- Klinenberg, E. (2019). *Palaces for the people: How social infrastructure can help fight inequality, polarization, and the decline of civic life*. Broadway Books.
- Kobos, S. (2016, June 27). *The magic of tree-lined streets*. Strong Towns.
<https://www.strongtowns.org/journal/2016/6/26/the-magic-of-tree-lined-streets-1>

- Kontokosta, C., Hong, B., & Korsberg, K. (2017). *Equity in 311 reporting: Understanding socio-spatial differentials in the propensity to complain* (arXiv:1710.02452). arXiv.
<https://doi.org/10.48550/arXiv.1710.02452>
- Lane, H. M., Morello-Frosch, R., Marshall, J. D., & Apte, J. S. (2022). Historical redlining is associated with present-day air pollution disparities in u. S. Cities. *Environmental Science & Technology Letters*, 9(4), 345–350. <https://doi.org/10.1021/acs.estlett.1c01012>
- Le, T. V., & Young, M. M. (2023). Regressive revenue sourcing by local governments. *Urban Studies*, 60(5), 811–828. <https://doi.org/10.1177/00420980221124456>
- Lee, J., Nam, B., & Abdel-Aty, M. (2015). Effects of pavement surface conditions on traffic crash severity. *Journal of Transportation Engineering*, 141(10), 04015020.
[https://doi.org/10.1061/\(ASCE\)TE.1943-5436.0000785](https://doi.org/10.1061/(ASCE)TE.1943-5436.0000785)
- Lens, M. C. (2022). Zoning, land use, and the reproduction of urban inequality. *Annual Review of Sociology*, 48(1), 421–439. <https://doi.org/10.1146/annurev-soc-030420-122027>
- Li, Z., Wang, X., Zarazaga, J., Smith-Colin, J., & Minsker, B. (2022). Do infrastructure deserts exist? Measuring and mapping infrastructure equity: A case study in Dallas, Texas, USA. *Cities*, 130, 103927.
<https://doi.org/10.1016/j.cities.2022.103927>
- Life expectancy—Vital signs—Sf bay area*. (2017, April). Metropolitan Transportation Commission.
<https://vitalsigns.mtc.ca.gov/>
- Litman, T. (2018). *Evaluating transportation equity: Guidance for incorporating distributional impacts in transportation planning* (p. 65). Victoria Transport Policy institute.
https://www.researchgate.net/profile/Todd-Litman-2/publication/284050013_Evaluating_transportation_equity/links/5c4f42bba6fdccd6b5d00a9d/Evaluating-transportation-equity.pdf
- Lopez, R. P., & Hynes, H. P. (2006). Obesity, physical activity, and the urban environment: Public health research needs. *Environmental Health*, 5(1), 25. <https://doi.org/10.1186/1476-069X-5-25>
- Lovasi, G. S., Neckerman, K. M., Quinn, J. W., Weiss, C. C., & Rundle, A. (2009). Effect of individual or neighborhood disadvantage on the association between neighborhood walkability and body mass index. *American Journal of Public Health*, 99(2), 279–284. <https://doi.org/10.2105/AJPH.2008.138230>
- Lowe, K. (2016). Environmental justice and pedestrianism: Sidewalk continuity, race, and poverty in New Orleans, Louisiana. *Transportation Research Record: Journal of the Transportation Research Board*, 2598(1), 119–123. <https://doi.org/10.3141/2598-14>
- McGahey, R., de Souza Briggs, X., Treuhaft, S., & Sherman, J. (2023). *Measuring what matters for Racial Progress: Local and State Innovation in Racial Equity Impact Assessment*. Institute on Race, Power and Political Economy . <https://racepowerpolicy.org/measuring-what-matters/>
- Nardone, A., Rudolph, K. E., Morello-Frosch, R., & Casey, J. A. (2021). Redlines and greenspace: The relationship between historical redlining and 2010 greenspace across the united states. *Environmental Health Perspectives*, 129(1), 017006. <https://doi.org/10.1289/EHP7495>
- Nelson, R., Winling, L., & University of Richmond. (2023). *Mapping Inequality: Redlining in New Deal America*. Digital Scholarship Lab. <https://dsl.richmond.edu/panorama/redlining/>

- Nicoletti, L., Sirenko, M., & Verma, T. (2022). *Disadvantaged communities have lower access to urban infrastructure* (arXiv:2203.13784). arXiv. <https://doi.org/10.48550/arXiv.2203.13784>
- Norwood, C. (2021, April 23). *How infrastructure has historically promoted inequality*. PBS News; Public Broadcasting Service (PBS).
<https://www.pbs.org/newshour/politics/how-infrastructure-has-historically-promoted-inequality>
- OakDOT geographic equity toolbox*. (n.d.-a). City of Oakland. Retrieved May 13, 2025, from <https://www.oaklandca.gov/resources/oakdot-geographic-equity-toolbox>
- OakDOT geographic equity toolbox*. (n.d.-b). Retrieved May 20, 2025, from <https://experience.arcgis.com/experience/57b194ffec8c4a7f949ec17682b819a1/page/Page?views=Priority-Neighborhoods>
- OakDOT kicks off three-year, \$100 million, equity-focused paving plan*. (2019, August 22). City of Oakland.
<https://www.oaklandca.gov/news/oakdot-kicks-off-three-year-100-million-equity-focused-paving-plan>
- Oakland Department of Transportation. (2016, October). *City of Oakland Department of Transportation Strategic Plan*. City of Oakland.
<https://oaklandca.s3.us-west-1.amazonaws.com/oakca1/groups/pwa/documents/report/oak060949.pdf>
- Oakland equity indicators report*. (n.d.). City of Oakland. Retrieved May 22, 2025, from <https://www.oaklandca.gov/documents/equity-indicators-community-briefing-documents>
- Oakland topographic map, elevation, terrain*. (n.d.). [Map]. Retrieved May 31, 2025, from <https://en-us.topographic-map.com/map-8zzs/Oakland/>
- Ong, P. M., & Miller, D. (2005). Spatial and transportation mismatch in los angeles. *Journal of Planning Education and Research*, 25(1), 43–56. <https://doi.org/10.1177/0739456X04270244>
- Overview of Oakland Department of Transportation*. (n.d.). LinkedIn; City of Oakland. Retrieved May 30, 2025, from <https://www.linkedin.com>
- Patel, A. V., Hildebrand, J. S., Leach, C. R., Campbell, P. T., Doyle, C., Shuval, K., Wang, Y., & Gapstur, S. M. (2018). Walking in relation to mortality in a large prospective cohort of older u. S. Adults. *American Journal of Preventive Medicine*, 54(1), 10–19. <https://doi.org/10.1016/j.amepre.2017.08.019>
- Pavement condition index and pavement management program | dublin, ca—Official website*. (n.d.). Pavement Management Program; City of Dublin. Retrieved May 13, 2025, from [https://www.dublin.ca.gov/1955/Pavement-Management-Program#:~:text=Pavement%20Condition%20Index%20\(PCI\)%20is,needed%20to%20prevent%20rapid%20deterioration.](https://www.dublin.ca.gov/1955/Pavement-Management-Program#:~:text=Pavement%20Condition%20Index%20(PCI)%20is,needed%20to%20prevent%20rapid%20deterioration.)
- Pavement condition index (PCI)*. (n.d.). SF.Gov Data Story; City and County of San Francisco. Retrieved May 22, 2025, from <https://www.sf.gov/data--pavement-condition-index-pci>
- Pothole damage costs drivers \$3 billion annually nationwide*. (2016, February 17). AAA SoCal.
<https://news.aaa-calif.com/news/pothole-damage-costs-drivers-3-billion-annually-nationwide>
- Rajaei, M., Echeverri, B., Zuchowicz, Z., Wiltfang, K., & Lucarelli, J. F. (2021). Socioeconomic and racial disparities of sidewalk quality in a traditional rust belt city. *SSM - Population Health*, 16, 100975.
<https://doi.org/10.1016/j.ssmph.2021.100975>

- Ren, F., Qiu, Z., Liu, Z., Bai, H., & Gao, H. O. (2023). Trees help reduce street-side air pollution: A focus on cyclist and pedestrian exposure risk. *Building and Environment*, 229, 109923. <https://doi.org/10.1016/j.buildenv.2022.109923>
- Rigolon, A. (2019). Nonprofits and park equity in Los Angeles: A promising way forward for environmental justice. *Urban Geography*, 40(7), 984–1009. <https://doi.org/10.1080/02723638.2018.1511192>
- Robbins, M. M., & Tran, N. (2015). *Literature review: The impact of pavement roughness on vehicle operating costs*. <https://www.eng.auburn.edu/research/centers/ncat/files/technical-reports/rep15-02.pdf>
- Rundle, A., Neckerman, K. M., Freeman, L., Lovasi, G. S., Purciel, M., Quinn, J., Richards, C., Sircar, N., & Weiss, C. (2009). Neighborhood food environment and walkability predict obesity in new york city. *Environmental Health Perspectives*, 117(3), 442–447. <https://doi.org/10.1289/ehp.11590>
- Salerno, C. (2025, February 6). Unflooding the zone: What do the Trump administration's latest actions signal for transportation? *Transportation For America*. <https://t4america.org/2025/02/05/unflooding-the-zone-what-do-the-trump-administrations-latest-actions-signal-for-transportation/>
- Sang, Y., Hu, Y., Qin, X., Yan, H., Wu, R., Qian, F., Nan, X., Shao, F., & Bao, Z. (2025). Impacts of street tree canopy coverage on pedestrians' dynamic thermal perception and walking willingness. *Sustainable Cities and Society*, 121, 106196. <https://doi.org/10.1016/j.scs.2025.106196>
- Schwarz, K., Fragkias, M., Boone, C. G., Zhou, W., McHale, M., Grove, J. M., O'Neil-Dunne, J., McFadden, J. P., Buckley, G. L., Childers, D., Ogden, L., Pincett, S., Pataki, D., Whitmer, A., & Cadenasso, M. L. (2015). Trees grow on money: Urban tree canopy cover and environmental justice. *PLOS ONE*, 10(4), e0122051. <https://doi.org/10.1371/journal.pone.0122051>
- Self, R. O. (2003). *American Babylon: Race and the struggle for postwar Oakland*. Princeton University Press.
- Services, E. P. (2018, January 31). Areas of pavement most susceptible to potholes | eastcoat pavement. *EastCoat Pavement Services*. <https://eastcoatpavement.com/areas-pavement-susceptible-potholes/>
- Shen, Q. (2001). A spatial analysis of job openings and access in a u. S. Metropolitan area. *Journal of the American Planning Association*, 67(1), 53–68. <https://doi.org/10.1080/01944360108976355>
- Syed, S. T., Gerber, B. S., & Sharp, L. K. (2013). Traveling towards disease: Transportation barriers to health care access. *Journal of Community Health*, 38(5), 976–993. <https://doi.org/10.1007/s10900-013-9681-1>
- Tanaka, A., Koonce, P., Armand, P., & Neilson, J. (2021). Assessing the equity of portland's traffic signal—Proquest. *ITE Journal*, 91(5), 31–37. <https://www.proquest.com/scholarly-journals/assessing-equity-portlands-traffic-signal/docview/2524974836/se-2?accountid=14512>
- Tao, W., Lin, P., & Wang, N. (2021). Optimum life-cycle maintenance strategies of deteriorating highway bridges subject to seismic hazard by a hybrid Markov decision process model. *Structural Safety*, 89, 102042. <https://doi.org/10.1016/j.strusafe.2020.102042>
- Taylor, M. A. P. (2021). Chapter 3—Transportation infrastructure. In M. A. P. Taylor (Ed.), *Climate Change Adaptation for Transportation Systems* (pp. 47–64). Elsevier. <https://doi.org/10.1016/B978-0-12-816638-3.00003-9>

Thornton, C. M., Conway, T. L., Cain, K. L., Gavand, K. A., Saelens, B. E., Frank, L. D., Geremia, C. M., Glanz, K., King, A. C., & Sallis, J. F. (2016). Disparities in pedestrian streetscape environments by income and race/ethnicity. *SSM - Population Health*, 2, 206–216. <https://doi.org/10.1016/j.ssmph.2016.03.004>

U. S. Government Accountability Office. (n.d.). *National highways: Analysis of available data could better ensure equitable pavement condition*. Retrieved December 13, 2024, from <https://www.gao.gov/products/gao-22-104578>

Wang, X., & Renne, J. L. (2023). Socioeconomics of urban travel in the U.S.: Evidence from the 2017 NHTS. *Transportation Research Part D: Transport and Environment*, 116, 103622. <https://doi.org/10.1016/j.trd.2023.103622>

Yin, L., & Zhang, H. (2021). Building walkable and safe neighborhoods: Assessing the built environment characteristics for pedestrian safety in buffalo, NY. *Journal of Transport & Health*, 22, 101129. <https://doi.org/10.1016/j.jth.2021.101129>

Zimmerman, K. A., & Allen, B. W. (2023). *Equity considerations in asset management: Case studies* (Inc. Applied Pavement Technology, Ed.; FHWA-HIF-23-033). <https://rosap.nhtl.bts.gov/view/dot/71831>

8. Appendix

Figure 8 Data Table. Census Tracts with at-risk Pavement

CENSUS TRACT	EQUITY PRIORITY	PLANNING AREA	WEIGHTED PCI
409900	Low	East Oakland Hills	50.31
403900	Low	North Oakland/Adams Point	50.34
404102	Medium	North Oakland/Adams Point	51.94
405800	High	Eastlake/Fruitvale	52.52
406700	Low	Glenview/Redwood Heights	52.78
401100	Low	North Oakland/Adams Point	53.49
408500	High	Central/East Oakland	53.63
407101	High	Eastlake/Fruitvale	54.50
405200	Low	Eastlake/Fruitvale	54.58
406300	High	Eastlake/Fruitvale	54.78
402700	Medium	West Oakland	54.87
400900	Low	North Oakland/Adams Point	55.12
405500	Medium	Eastlake/Fruitvale	55.21
405902	High	Eastlake/Fruitvale	55.29
407900	Low	Glenview/Redwood Heights	55.32
409800	Medium	East Oakland Hills	55.55

MAPPING EQUITY: A GEOSPATIAL EVALUATION OF THE ACCESSIBILITY AND QUALITY OF TRANSPORTATION
INFRASTRUCTURE IN OAKLAND, CA

405600	Medium	Eastlake/Fruitvale	55.70
400600	Lowest	North Oakland/Adams Point	56.33
406602	High	Eastlake/Fruitvale	56.35
408000	Low	East Oakland Hills	56.39
406500	High	Eastlake/Fruitvale	56.46
408100	Low	East Oakland Hills	56.75
404101	Lowest	North Oakland/Adams Point	56.78
410100	High	East Oakland Hills	58.85
401000	Low	North Oakland/Adams Point	59.39
410500	Highest	West Oakland	59.42
408300	Low	East Oakland Hills	59.60
408200	Medium	East Oakland Hills	59.63
404900	Low	Glenview/Redwood Heights	59.75
401400	Medium	West Oakland	59.92
408400	Highest	Central/East Oakland	60.28
405000	Lowest	Glenview/Redwood Heights	60.36
400300	Lowest	North Oakland/Adams Point	60.39
409700	Highest	Central/East Oakland	60.40
402200	Medium	West Oakland	60.45
410000	Medium	East Oakland Hills	60.62
407200	High	Eastlake/Fruitvale	60.68
400800	Low	North Oakland/Adams Point	60.87
401800	Medium	West Oakland	60.98
406202	Highest	Eastlake/Fruitvale	61.88
983200	Lowest	Downtown	62.22
404501	Lowest	North Oakland Hills	62.56
406100	High	Eastlake/Fruitvale	63.50
408900	Highest	Central/East Oakland	64.16
400500	Low	North Oakland/Adams Point	64.31
406000	High	Eastlake/Fruitvale	64.37
407300	High	Central/East Oakland	65.07
401600	Medium	West Oakland	65.55
403302	Lowest	Downtown	66.29
400700	Low	North Oakland/Adams Point	66.47

403301	Highest	Downtown	66.55
408700	Highest	Central/East Oakland	66.96
409000	High	Coliseum/Airport	67.04
409600	Highest	Central/East Oakland	67.05
402801	High	Downtown	67.36
403502	Medium	North Oakland/Adams Point	67.59
400100	Lowest	North Oakland Hills	67.73
402600	Highest	West Oakland	68.09
404700	Lowest	Glenview/Redwood Heights	68.71
407500	Highest	Central/East Oakland	68.73

Figure 8 Data Table: Census tracts with poor condition pavement

CENSUS TRACT	EQUITY PRIORITY	PLANNING AREA	WEIGHTED PCI
405402	High	Eastlake/Fruitvale	24.7
405401	Medium	Eastlake/Fruitvale	35.5
406201	Highest	Eastlake/Fruitvale	36.0
404600	Lowest	North Oakland Hills	36.6
405301	Lowest	Eastlake/Fruitvale	39.4
407800	Medium	Central/East Oakland	40.0
407400	Highest	Central/East Oakland	43.9
403800	Lowest	North Oakland/Adams Point	43.9
407102	Medium	Eastlake/Fruitvale	44.2
405100	Lowest	Glenview/Redwood Heights	44.7
403501	Medium	North Oakland/Adams Point	44.7
404800	Medium	Glenview/Redwood Heights	45.5
401300	Low	North Oakland/Adams Point	45.9
404400	Lowest	North Oakland Hills	46.3
401200	Lowest	North Oakland/Adams Point	46.3
409400	High	Central/East Oakland	46.4
404502	Lowest	North Oakland Hills	46.5
402400	Highest	West Oakland	47.6
407600	High	Central/East Oakland	48.2
409500	Highest	Central/East Oakland	48.7

404200	Lowest	North Oakland Hills	49.0
407700	Low	Central/East Oakland	49.5

Figure 9 Data Table: Top 20% of census tracts with poorest condition sidewalks

CENSUS TRACT	EQUITY PRIORITY	PLAN AREA	# OF DAMAGE POINTS	DAMAGE POINTS PER 1000 FT OF SIDEWALK	TOTAL SIDEWALK LENGTH (MILES)
403502	Medium	North Oakland/Adams Point	836	55	2.9
403701	Medium	North Oakland/Adams Point	722	47	2.9
404400	Lowest	North Oakland Hills	48	33	0.3
404501	Lowest	North Oakland Hills	174	28	1.2
404200	Lowest	North Oakland Hills	1,089	27	7.6
403501	Medium	North Oakland/Adams Point	1,343	25	10.0
404502	Lowest	North Oakland Hills	418	24	3.4
401400	Medium	West Oakland	1,606	23	13.3
405401	Medium	Eastlake/Fruitvale	743	22	6.3
408500	High	Central/East Oakland	1,556	22	13.6
410300	Highest	Central/East Oakland	1,066	21	9.7
400200	Lowest	North Oakland/Adams Point	1,128	20	10.6
400100	Lowest	North Oakland Hills	465	20	4.5
400400	Lowest	North Oakland/Adams Point	1,317	20	12.8
401600	Medium	West Oakland	1,225	19	11.9
410200	High	Central/East Oakland	1,118	19	10.9
408200	Medium	East Oakland Hills	1,065	19	10.4
409600	Highest	Central/East Oakland	1,392	19	13.8
403600	Low	North Oakland/Adams Point	585	19	5.8
405402	High	Eastlake/Fruitvale	556	19	5.6
408400	Highest	Central/East Oakland	944	18	9.7
410400	High	Central/East Oakland	1,259	18	13.2

Figure 9 Data Table. Top 20% of census tracts with highest number of severe damage points and urgent repair maintenance per 1,000 feet of sidewalk

CENSUS TRACT	EQUITY PRIORITY	PLAN AREA	# OF P1 P2 DAMAGE POINTS	NUMBER OF P1 P2 DAMAGE POINTS PER 1000 FT OF SIDEWALK	TOTAL SIDEWALK LENGTH (MILES)
403502	Medium	North Oakland/Adams Point	593	37	3.1
403701	Medium	North Oakland/Adams Point	500	34	2.8
404501	Lowest	North Oakland Hills	142	23	1.2
404200	Lowest	North Oakland Hills	753	19	7.4
404400	Lowest	North Oakland Hills	27	19	0.3
403501	Medium	North Oakland/Adams Point	935	18	10.0
404502	Lowest	North Oakland Hills	282	15	3.6
401400	Medium	West Oakland	1088	14	14.8
407500	Highest	Central/East Oakland	621	14	8.6
407700	Low	Central/East Oakland	1217	12	18.6
404300	Lowest	North Oakland/Adams Point	1397	12	21.4
400200	Lowest	North Oakland/Adams Point	735	12	11.5
400400	Lowest	North Oakland/Adams Point	805	12	12.6
400100	Lowest	North Oakland Hills	283	12	4.5
403600	Low	North Oakland/Adams Point	326	12	5.3
400300	Lowest	North Oakland/Adams Point	1125	11	18.9
407400	Highest	Central/East Oakland	556	11	9.6
401600	Medium	West Oakland	696	11	12.1
400500	Low	North Oakland/Adams Point	581	11	10.4
407600	High	Central/East Oakland	967	10	17.6

408700	Highest	Central/East Oakland	1093	10	20.7
400900	Low	North Oakland/Adams Point	425	10	8.2

Figure 10 Data Table. Top 20% of tracts with greatest sidewalk gap mileage

CENSUS TRACT	EQUITY PRIORITY	GAP MILEAGE
404300	Lowest	4.69
401700	Lowest	3.26
406100	High	1.18
407300	High	1.16
409800	Medium	0.89
406000	High	0.82
409000	High	0.72
407900	Low	0.71
406800	Low	0.69
406700	Low	0.63
404200	Lowest	0.62
401600	Medium	0.55
410100	High	0.54
405800	High	0.48
407800	Medium	0.46

Figure 10 Data Table. Top 20% of tracts with greatest gaps (ft) / sidewalk (mi)

CENSUS TRACT	EQUITY PRIORITY	GAP (FT) / SIDEWALK (MI)
404300	Lowest	1241.47
401700	Lowest	806.55
404600	Lowest	800.72
409800	Medium	461.88
404200	Lowest	455.81
407300	High	399.95
407800	Medium	307.87
406100	High	302.68
405800	High	292.47
407900	Low	283.85
410100	High	280.36

406800	Low	277.67
401600	Medium	268.75
406000	High	246.74
404502	Lowest	229.45

Figure 11 Data Table. Top 20% Census Tracts with the most non-compliant curb ramps

CENSUS TRACT	EQUITY PRIORITY	PLAN AREA	PERCENT NON-COMPLIANT	TOTAL NON-COMPLIANT
406100	High	Eastlake/Fruitvale	49%	266
407700	Low	Central/East Oakland	82%	232
409000	High	Coliseum/Airport	51%	213
408300	Low	East Oakland Hills	89%	209
404900	Low	Glenview/Redwood Heights	67%	199
405100	Lowest	Glenview/Redwood Heights	90%	196
408100	Low	East Oakland Hills	71%	195
407600	High	Central/East Oakland	69%	188
406000	High	Eastlake/Fruitvale	41%	176
407900	Low	Glenview/Redwood Heights	75%	172
401700	Lowest	West Oakland	45%	167
405000	Lowest	Glenview/Redwood Heights	84%	165
409900	Low	East Oakland Hills	81%	155
404300	Lowest	North Oakland/Adams Point	63%	152
408700	Highest	Central/East Oakland	50%	151
410100	High	East Oakland Hills	83%	149
405902	High	Eastlake/Fruitvale	54%	143
405901	Highest	Eastlake/Fruitvale	68%	143
410500	Highest	West Oakland	70%	143
410200	High	Central/East Oakland	75%	142
409700	Highest	Central/East Oakland	62%	141

Figure 11 Data Table. Census Tracts with >50% non-compliant curb ramps

CENSUS TRACT	EQUITY PRIORITY	PERCENT NON-COMPLIANT
409000	High	51%
405902	High	54%
409700	Highest	62%
404300	Lowest	63%
404900	Low	67%
405901	Highest	68%
407600	High	69%
410500	Highest	70%
408100	Low	71%
410200	High	75%
407900	Low	75%
409900	Low	81%
407700	Low	82%
410100	High	83%
405000	Lowest	84%
408300	Low	89%
405100	Lowest	90%

Figure 12 Data Table. Top 20% of census tracts with the most dead trees and stumps

CENSUS TRACT	EQUITY PRIORITY	NUMBER OF DEAD TREES OR STUMPS
408100	Low	203
410000	Medium	146
408000	Low	96
403401	High	92
404600	Lowest	63
409000	High	57
407700	Low	56
408700	Highest	53

400400	Lowest	51
400300	Lowest	49
401700	Lowest	44
407600	High	43
404900	Low	42
406000	High	42
401000	Low	41
405100	Lowest	40
408500	High	38
406700	Low	38
408600	High	37
403800	Lowest	37
406100	High	36
400500	Low	35

Figure 12 Data Table. Top 20% of census tracts with the most trees that need maintenance (Poor condition)

CENSUS TRACT	EQUITY PRIORITY	NUMBER OF TREES THAT NEED MAINTENANCE
400800	Low	205
403401	High	155
405200	Low	133
410000	Medium	131
404101	Lowest	127
408100	Low	121
404000	Low	113
403800	Lowest	111
407700	Low	107
400500	Low	100
404600	Lowest	100
403900	Low	96
403100	Low	94
406500	High	84
402900	Highest	81

MAPPING EQUITY: A GEOSPATIAL EVALUATION OF THE ACCESSIBILITY AND QUALITY OF TRANSPORTATION
INFRASTRUCTURE IN OAKLAND, CA

401100	Low	80
401000	Low	79
405700	Medium	77
405800	High	76
400700	Low	75
408700	Highest	74
407102	Medium	74