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A Case Study of Pedestrian Environments Around Tamien Station in San Jose, California: An Analysis of Existing Conditions and Recommendations to Improve Pedestrian Access and Promote Walking Around Tamien Station

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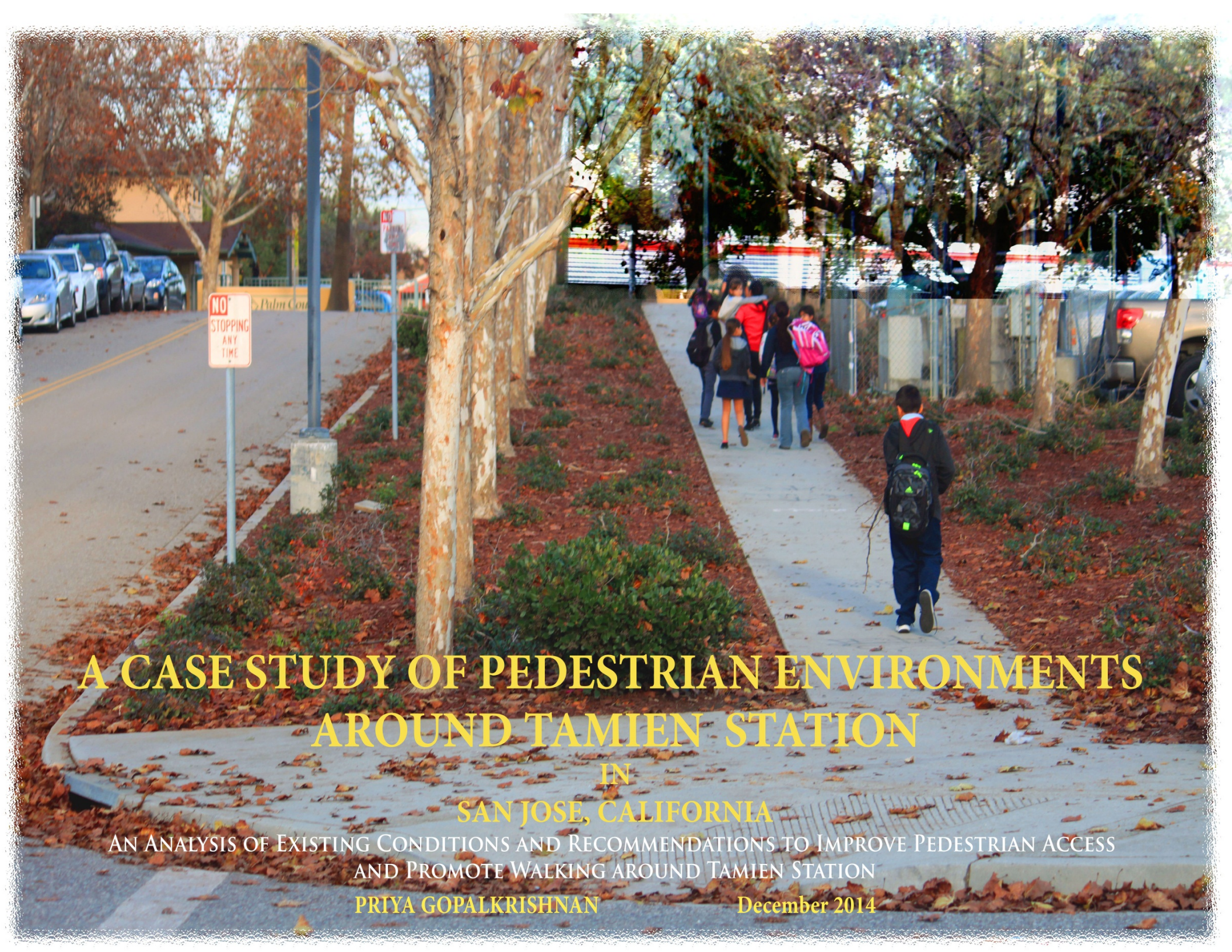

A CASE STUDY OF PEDESTRIAN ENVIRONMENTS AROUND TAMIEN STATION

IN

SAN JOSE, CALIFORNIA

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A CASE STUDY OF PEDESTRIAN ENVIRONMENTS AROUND TAMIEN STATION IN SAN JOSE, CALIFORNIA

AN ANALYSIS OF EXISTING CONDITIONS AND RECOMMENDATIONS TO IMPROVE PEDESTRIAN ACCESS AND PROMOTE WALKING AROUND TAMIEN STATION

A Planning Report
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Priya Gopalkrishnan
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Note: All images in this report, including the cover were taken or created by the author unless otherwise indicated.

1. Why is Walkability Important?

1.1 Objective of this Research

Planners have constantly studied the design of the built environment and its influence on walking for transit access. According to the authors, Cervero and Kockelman, in a 1997 study, greater densities, varied land uses, and development plans favorable to the pedestrian, must exist simultaneously to some extent in order to gain a reasonable measure of transit ridership.[1] Supporting the findings of Cervero and Kockelman, the City of San Jose in its *Tamien Station Specific Plan* (TSSP)[2] has posited that a higher level of density would attract economic development and would improve the quality of life of the residents of San Jose in identified growth areas, including Tamien area. It is important to identify the linkages between design elements and pedestrian access to transit in order to create walkable districts, improve ridership, and create a more active pedestrian environment in transit oriented neighborhoods. The objective of this research is to understand how the analysis of design elements can foster design recommendations for the transformation of the pedestrian environment around the Tamien Station area. This was done by conducting a street segment audit for twenty-five selected streets around the one-half mile walking distance of Tamien Station providing recommendations based on audit findings and urban design analysis.

1.2 Overview of the Methods

In order to study the relationship between urban form, pedestrian activity, and transit access, this research investigated the existing conditions around Tamien Station area, in San Jose, California. The

[1] Robert Cervero and Kara Kockelman, "Travel Demand and the 3Ds: Density, Diversity, and Design," *Transportation Research Part D: Transport and Environment* 2, no. 3 (1997): 199-219.

[2] City of San Jose, *Tamien Station Area Specific Plan* (March 1995), 1-2.

research methodology involved an audit of twenty-five street blocks, ten from the newer Tamien neighborhood and fifteen from the older Washington neighborhood, resulting in two hundred and eighty six variables overall. The audit questionnaire investigated four major factors that are linked with pedestrian activity, namely, accessibility, urban form elements, pedestrian amenities, and comfort and safety of the environment. Around sixty variables were categorized to form urban design elements, namely, ease of crossing, imageability, human scale, transparency, enclosure, pedestrian amenities, sidewalk characteristics, and complexity. The audit questions formed the basis for the urban design elements and analysis. Post audit, Geographic Information System (GIS) was used in audit analysis and visually mapping the design elements, as well as the individual variables from the audit. The audit questionnaire focused on the intersection first and then the entire street, inspecting both sides.

The audit findings show that overall, streets further away from the station scored better over others from the immediate vicinity of Tamien Station, while examining elements, human scale, enclosure, and transparency, while the audited street segments from the entire study area scored low and medium while investigating pedestrian amenities and ease of crossing. Although the main street providing station access to Tamien Caltrain station was included in the observation, GIS analysis from audit findings for that particular street could not be done due to unavailability of street attribute data in the GIS shape file. Despite barriers, such as large walking distances to retail and commercial uses, abrupt, uneven sidewalks, visible dumpsters, garbage, graffiti, visible signs of homeless activity along the freeway underpass that provides pedestrian access, audit findings from observing pedestrian movement around the study area show that walking and biking for using public transportation occurs largely during morning and evening peak hours. Hence findings show that residents around Tamien neighborhood who walk to the station commute to work using

public transportation during these morning and evening peak times.

1.3 Relevance of this Research

According to Santa Clara Valley Transportation Authority (VTA), the local transportation agency in the Bay Area for the Santa Clara County, "Walking is the most fundamental form of transportation and is very important for transit access as 71 percent of VTA's transit users walk to their transit stop."[3] Improving the walkability of the Tamien neighborhood will benefit the residents in many ways. The findings from the audit observation suggest that key concerns on walkability in this area are about transit accessibility and connectivity, inadequate signage, insufficient number of activities that would make the station area livelier, and overall safety.

The walkability of any environment is directly determined by the amount and variety of activities that occur in the area, especially walking trips for various activities. Walkability has frequently been discussed in recent planning literature, and the idea is linked to various topics, including health, vitality, housing, school access, and improved quality of life. Richard Jackson, in his book, *Designing Healthy Communities,* says, "One proof of the potential beneficial effect of the built environment is, living in areas with walkable green spaces positively influences the longevity of urban senior citizens independent of their age, sex, marital and socioeconomic statuses."[4] Indeed, research shows that low-income immigrants living in the least-walkable neighborhoods in cities are 50 percent more likely to develop health conditions, such as diabetes.[5]

[3] Valley Transportation Authority, *Pedestrian Access to Transit,* 2014, http://www.vta.org/sfc/servlet.shepherd/document/download/069A0000001eAwWIAU (accessed October 3, 2014).

[4] Richard J. Jackson and Stacy Sinclair, *Designing Healthy Communities* (San Francisco: John Wiley & Sons, 2012), 22-23.

[5] Emily Badger, "An Alarming Strong Link Between Walkability and Diabetes," Citylab, 2012, http://www.citylab.com/politics/2012/09/alarmingly-strong-

For thriving areas to exist close to transit within cities, areas zoned as transit-oriented developments, and walkable neighborhoods must be an inherent piece of the puzzle. Today, many old neighborhoods as well as those prior to the freeway construction era, stand as an example of neighborhoods that would be considered walkable neighborhoods. Various downtown areas of the United States have neighborhoods that are inherently walkable. This element of pedestrian accessibility seems to have been a quality that was often naturally occurring, as if it were a finely intertwined part of the neighborhood fabric.

A large number of the Americans from the baby boomer generation are already or will be over 65 by 2035, and they prefer to age in place, in the same neighborhoods they grew up.[6] With their changing needs, they would require safe and direct access to transit in order to go about their daily travel.

Other potential benefits of living in walkable neighborhoods are good schools. Research shows that some of the top performing schools are often located in highly walkable parts of the city, and often, not being able to walk children to a good school within the neighborhood is a concern for many parents.[7] Yet another concern today in many sprawling neighborhoods is walkable access to fresh produce and neighborhood markets. Since many residential neighborhoods are zoned out of commercial uses, many corner grocery stores shut their business in older areas. Newer residential developments do not allow commercial uses; most daily trips are made using the car. People hardly walk in suburban areas. In many cities in the US, including New York and Washington D.C., up to 75 percent of their resident populations live within

link-between-diabetes-and-walkability/3326/ (accessed May 6, 2014).

[6] Sarah Goodyear, "What Does Livable Mean to Older Americans?," Citylab, 2014, http://www.citylab.com/cityfixer/2014/04/what-does-livable-mean-older-americans/8968/ (accessed May 6, 2014).

[7] Emily Badger, "Is There a Link Between Walkability and Local School Performance?," Citylab, 2013, http://www.citylab.com/commute/2013/03/there-link-between-walkability-and-local-school-performance/4992/ (accessed May 6, 2014).

walkable distance from most of their needs, such as living a quarter mile from stores selling healthy foods.[8]

Millennials are a demographic group who are born between 1980 and 2000 that are interested in living in urban areas close to transit and would be willing to give up their car if they had access to very efficient transportation system.[9] It is this group that Richard Florida, a leading urban theorist, a professor, and a senior-editor for *The Atlantic*, talks about as the creative class, where he believes that among the oldest of the millennials, a significantly smaller number will move to suburbs for raising a family as compared to the earlier generation, much of this would be into a suburb that is walkable and close to transit, as mentioned in his book, *The Rise of the Creative Class*.[10]

According to Jeff Speck, the author of *Walkable City*, designing communities with a variety of daily uses, such as a corner grocery store, coffee shops, schools, libraries, and churches around public transit provides the impetus for people to walk, bike, and use public transit.[11] For cities like San Jose, there are huge benefits for the environment, the city, and its people, in terms of reduced carbon emissions from personal vehicles, financial benefit to the city government, and monetary and health benefits to the individual.

Christopher Leinberger, the author of *Option of Urbanism: Investing in a New American Dream*, states that, "in walkable urban places, where there is a mix of development and activities, more people

[8] Sarah Goodyear, "In the U.S., a Quick Walk to the Store Is a Rare Thing Indeed," Citylab, 2014, http://www.citylab.com/commute/2014/04/us-quick-walk-store-rare-thing-indeed/8837/ (accessed May 6, 2014).
[9] Anthony Flint, "What Millenials Want-And Why Cities Are Right to Pay Them So Much Attention," Citylab, 2014, http://www.citylab.com/housing/2014/05/what-millennials-wantand-why-cities-are-right-pay-them-so-much-attention/9032/ (accessed May 6, 2014).

[10] USA TODAY, "American Cities To Millennials: Don't Leave," http://www.usatoday.com/story/news/nation/2012/12/03/american-cities-to-millennials-dont-leave-us/1744357/ (accessed May 10, 2014).
[11] Green City Blue Lake, "*What is Walkable Urbanism*," Green City Blue Lake http://www.gcbl.org/blog/2013/07/what-is-walkable-urbanism (accessed May 6, 2014).

are attracted to be a part of the street life, thereby, encouraging more restaurants and retail development, increased business due to customers, increasing rents, reducing safety concerns,[12] making buildings more valuable, and raising property taxes."[13] Walkable urban spaces with greater density increase real estate values, as there is value creation due to projects that are located within walking distance of each other. For example, a residential condominium near a grocery store like Trader Joe's or Whole Foods attracts many homebuyers to live in these condo units. More often than not, the landowners, developers, and the store owners are often benefitted by the economic development due to increased customers.[14]

An urban design analysis of streets within one-half mile of Tamien Station is necessary for several reasons. First, urban design enhances the aesthetic qualities of the street and its relationship to the edges of a neighborhood. Planning for the pedestrian is a very important as seen in the City of San Jose's *Envision 2040 General Plan,*[15] and in the VTA's study.[16] According to Jan Gehl, "the city's edge, particularly the lower floors of a building, has a decisive influence on life of the city space."[17] For example, he describes how the edges form a thin, almost invisible line, where the building meets the street, in places with good urban design.

[12] Pivo, Gary and Jeffrey Fisher, "The Walkability Premium in Commercial Real Estate Investments," Real Estate Economics. 39(2):2011 www.u.arizona.edu/~gpivo/Walkability20Paper20February2010.pdf

[13] Christopher B. Leinberger, *Option of Urbanism : Investing in a New American Dream* (Washington, DC: Island Press, 2009) 132.

[14] Ibid.

[15] City of San Jose, *Envision San Jose General Plan 2040* (November 2011), 14-25.

[16] Valley Transportation Authority, *Pedestrian Access to Transit,* 2014, http://www.vta.org/sfc/servlet.shepherd/document/download/069A0000001eAwWIAU (accessed October 3, 2014).

[17] News, "*Interview with Jan Gehl*," American Society of Landscape Architects http://www.asla.org/ContentDetail.aspx?id=31346 (accessed October 2014).

1.4 Overview of the Report

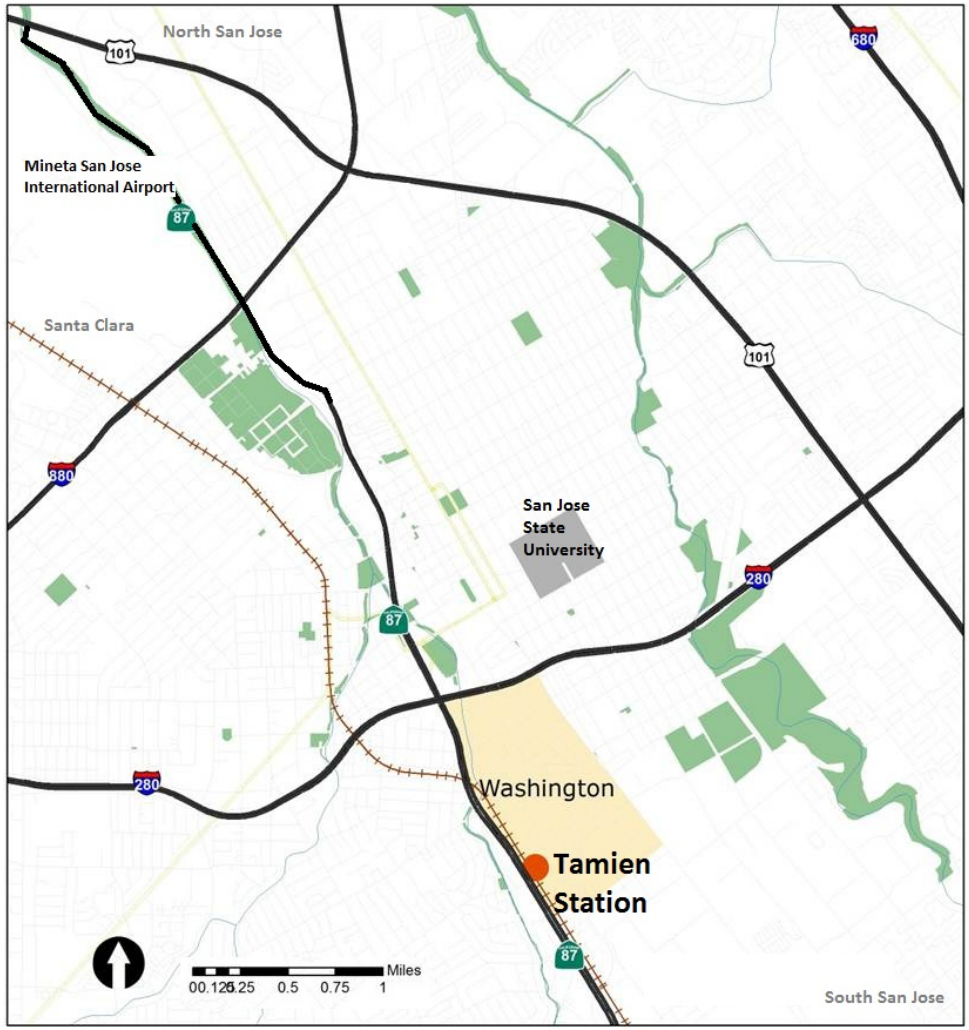
The following pages of this report consist of five additional chapters. **Chapter 2** presents the complete overview of the Tamien area, its specific plan policies, as well as selected examples around station areas. **Chapter 3** provides a review of existing literature around pedestrian access to transit, as well as design elements.

Chapter 4 describes the data collection and the research methodology for walkability assessments, including street segment selections and audit tool development. **Chapter 5** analyzes the data from audit findings particularly from the eight urban design elements that are visualized using Geographic Information System (GIS), through the use of ESRI's ArcGIS software, version 10.2. These eight design elements are formed by selecting around sixty audit variables. A detailed analysis of each variable is also included with reference to the maps from section 5.2.

Chapter 6 presents the summary of findings as well as design and policy recommendations for the successful revitalization of the space around the Station area.

2. The Tamien Station Area

Figure 1: Contextual Location Map of Tamien Station Area. Source: Map created by Priya Gopalkrishnan using City Of San Jose, GIS Data.



2.1 The Study Area

Figure 2: Caltrain Rider Accesses Tamien Station using the Freeway Underpass. Source: Priya Gopalkrishnan

The Tamien area of San Jose is marked as a planned development area (PDA) by the Metropolitan Transportation Commission (MTC), an MPO for the nine counties of the Bay Area, in their regional plan update, the *Plan Bay Area* (PBA), which focuses on job and housing growth for the region in three main cities, including San Francisco, Oakland, and San Jose. The many neighborhoods within the one-half mile radius around Tamien Station include Washington, Goodyear, Tamien, and Willow Glen. The Tamien study area was chosen because it is south of Diridon Station and most trains stop there. Although Caltrain provides service to passengers who are traveling to Gilroy on only three trains, during the weekdays it runs during the morning and evening rush hours. Hence, Tamien can be considered a last stop on the Caltrain line. On the weekends, Caltrain does not provide train service to Tamien; instead, it runs a shuttle bus from Diridon.

Tamien Station is served jointly by VTA and Caltrain. VTA has an elevated light rail line at Tamien, going further south, providing connections up to Santa Teresa. The freeway underpass connects transit service stations, the light rail and the Caltrain stations. Peninsula Corridor Joint Powers Board,

known as Caltrain today, owns the tracks[18] and shares the rail corridor with Union Pacific Railroad (UPR), and continues to operate along Southern Pacific Company's original route connecting San Jose and San Francisco.[19] UPR runs the freight trains along this track.

Tamien Station is also adjacent to Willow Glen, an affluent neighborhood, which is economically strong and politically influential. There are plans for the High Speed Rail to run along this rail corridor connecting San Jose to San Francisco.

Few buildings and surrounding landscape that are a part of the newer development have good maintenance. The surrounding multifamily residential condominiums that are part of the older developments, predominantly comprises of seniors. Many residents including seniors walk the streets, either to take transit, drop their child or grandchild off at daycare or preschool, or for fitness purposes.

Figure 3 shows the existing zoning around the Tamien Area. The colors pink, yellow, brown, and grey each represent commercial, residential, medium-high density residential, and light industrial zoning areas.

Studying the area at a greater detail is necessary for making suggestions for relevant improvements, which will serve as a handy reference document for the City of San Jose when it updates its *Tamien Specific Plan*. This study examines the level of walkability and its relationship to the pedestrian environment and access to transit, the findings of this study indicate a strong need for these agencies and governmental bodies to establish a set of guidelines that will ensure future development is aligned with overarching goals of the City of San Jose's *Envision 2040 General Plan*.

The Tamien Station has two main types of transit stops, Caltrain, which is a commuter rail station,

[18] The Golden Gate Railroad Museum, "History of the Peninsula Commute Route," http://archived.ggrm.org/about_the_museum/history/peninsula.htm (accessed October 2014).

[19] Ibid.

which connects San Jose to San Francisco, and Valley Transportation Authority (VTA) Light Rail, which provides rail service within the Santa Clara County. Additionally, the one-half mile surrounding this area falls under three council districts and thus priorities for this area lie under three different council member's agendas. While this may not be a limitation, it definitely necessitates better coordination in order to implement a revitalized plan and urban design policies for future development plans. According to Jonathan Barnett, in his book *Urban Design as Public Policy*, "design review process functions as a screening mechanism to identify major policy issues where changes in the law or in administrative practice are necessary, and hence, design review needs a consistent but adaptive response."[20]

The major arterial streets within the study area are as show in **Figure 4.** The major arterials area Willow St. and Minnesota St. lie horizontal to the study area as shown in red, while Lick Ave and Lelong St. are the minor arterial roads shown in blue.

[20] Jonathan Barnett, *Urban Design as Public Policy* (McGraw-Hill Inc., 1974), 174.

Currently, the only users in the study area, apart from the residential condominium development, are parking lots for Caltrain and VTA riders, and a childcare center on VTA property. There are no commercial uses within the Transit Core subarea of Tamien Station as mandated in the Specific Plan. Hence, the study area is very auto-oriented and lacks the vibrancy and safety to make this a great pedestrian destination. Highly walkable areas also have high real estate values. This land use change will have a tremendous impact on the growth and economic development of the area. Understanding what residents want is the first step in integrating resident participation into the community planning process.[21]

[21] Local Government Commission *"Participation tools for better community planning*," Community Design, http://lgc.org/wordpress/docs/freepub/community_design/guides/Participation_Tools_for_Better_Community_Planning.pdf (accessed May 10, 2014).

Figure 3: Existing zoning in the study area. Source: Author's modification of zoning maps from City of San Jose, http://www.sanjoseca.gov/index.aspx?NID=3296 (accessed October 6, 2014).

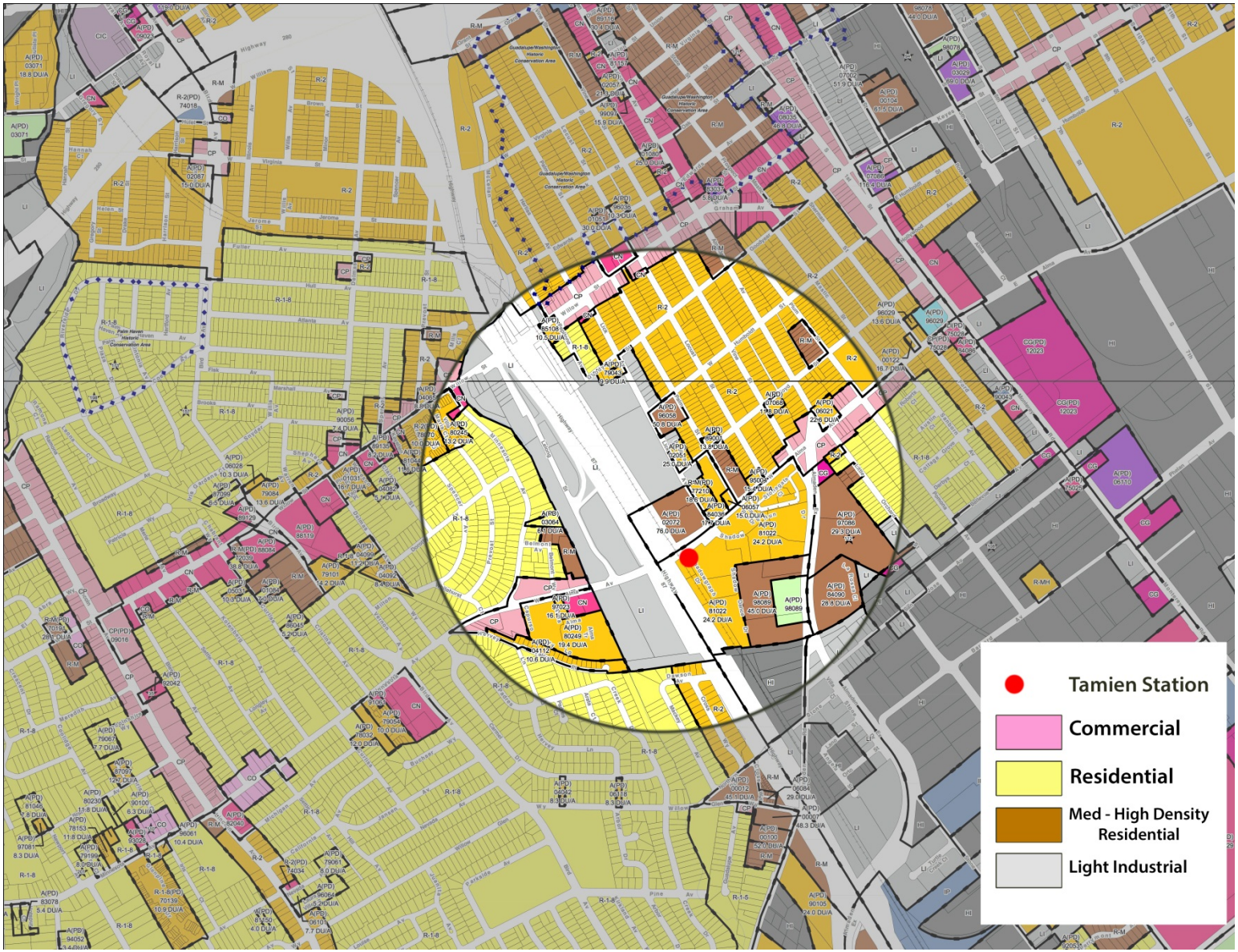
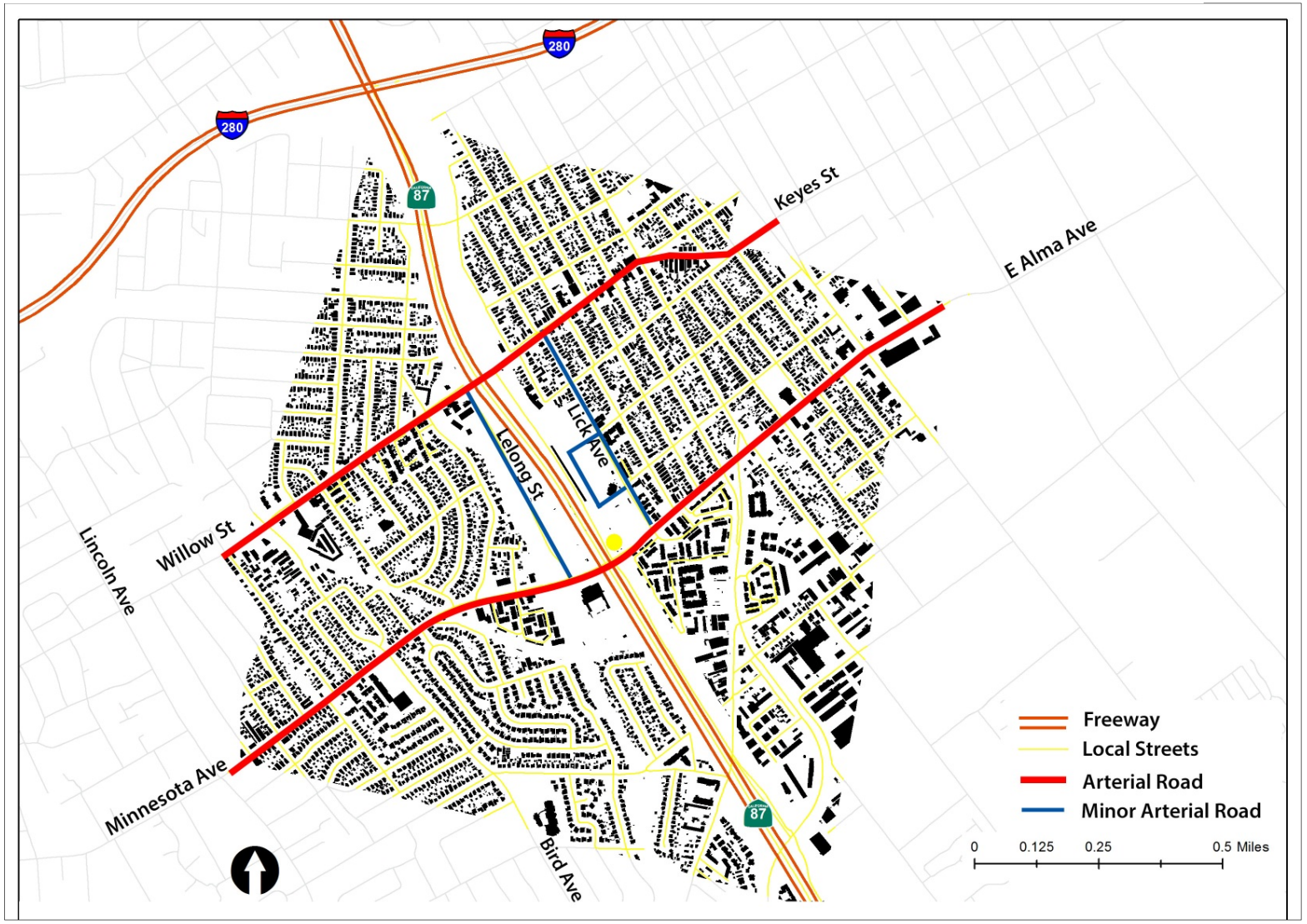
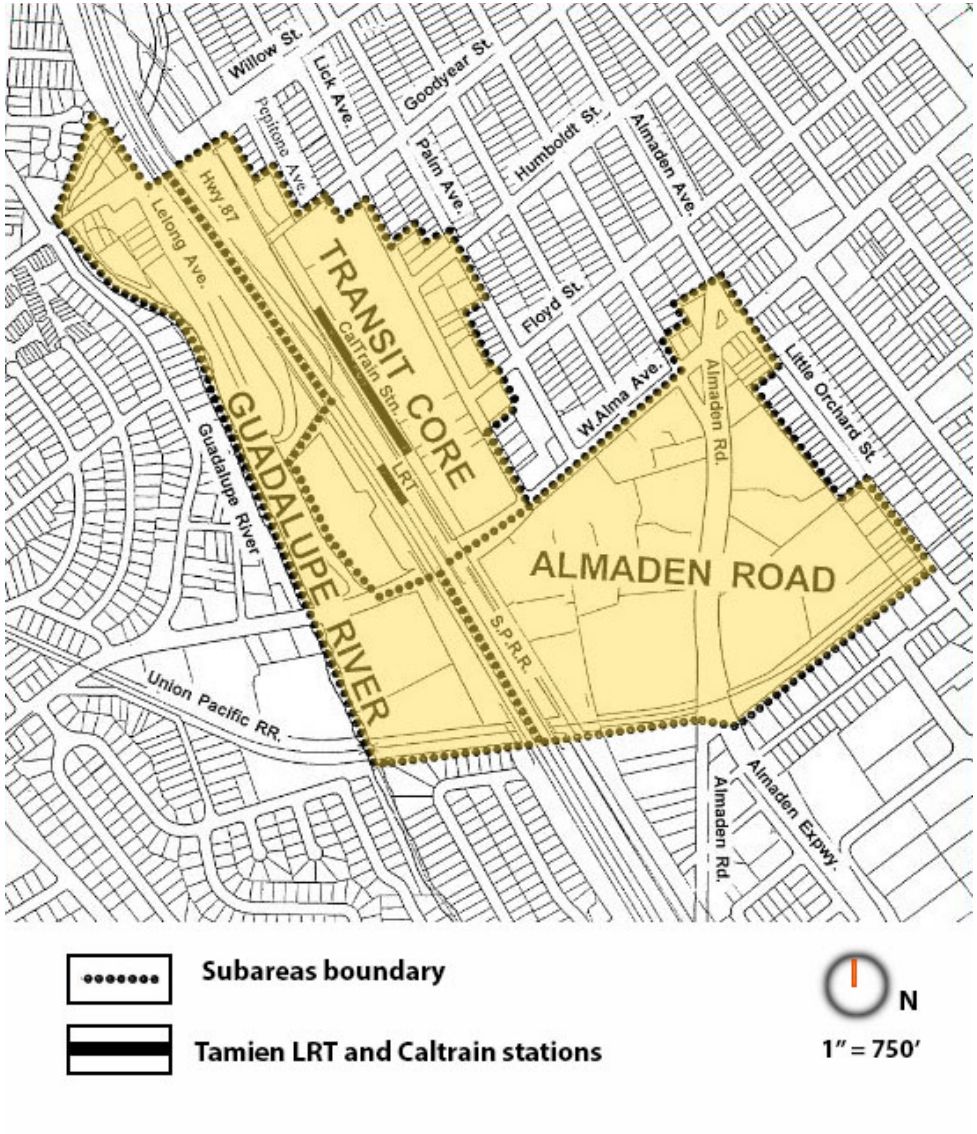


Figure 4: Major Streets within One Mile Walking Distance of Tamien Station Area, San Jose.
Source: Map created by Priya Gopalkrishnan based on City of San Jose, GIS Data.



The Tamien Transit Core Area

Figure 5: Transit Subareas. Author: Priya Gopalkrishnan. Source: City of San Jose, *Tamien Station Specific Plan* (March 1995), 23.



The Tamien Station falls under the Tamien Transit Core Area that is bounded by Alma Ave. to the south and Lick Ave. on the east, Route 87 on the West, and Willow St. on the north. This subarea facilitates the best environment to intensify building, specifically high density residential or mixed use development that is focused on transit use, according to the TSSP. This area has both the Caltrain and Light Rail stations, and there is a four acre neighborhood park proposed for the benefit of the existing and the future residents of this area as shown in **Figure 5** titled Transit subareas identified by TSSP update shows the boundary of the Tamien Station Plan Area.

In 2003, the area surrounding Tamien Station was re-zoned into a Transit Corridor Residential (25+) zoning from a Mixed Use (25-150 DU/AC) high density, Tamien Station Area Planned Community (PC). This zoning change reduced the minimum setback for residential buildings along Lick Avenue from fifteen feet to five feet, which gave

better enclosure to the street. It also meant that no commercial use can be built in the future in this area. Although this rezoning has benefitted a well-known San Jose developer, the City of San Jose, and its transit using residents, the users face many issues of congestion on the roads and in the parking lot during train arrivals, as well as issues of access and safety. The rezoning also meant that no neighborhood grocery stores, coffee shops, or convenience stores, waiting areas, and finally places for overnight lodging,[22] could be built within walking distance of this transit corridor. Due to the rezoning, there were two high rise condominium apartments proposed and designs were drawn by Dahlin group, a planning firm from Pleasanton, for the VTA,[23] in the former Alma Bowl[24] site as well as many townhouses, and a public park in the parcels in the immediate vicinity of the Tamien Station. One of the towers adjacent to the station that was completed just before the recession was the only major building built along with a few townhouses. The other buildings originally planned for this area remain on drawing boards, and the City of San Jose and the VTA have renewed plans for developing this area once again.

2.2 Analysis of Tamien Station Area

The *Tamien Station Specific Plan* policies (TSSP) for land use and design for the Tamien Station area allow for vertical mixed use commercial uses within the transit core area, such as a variety of housing, kiosks and small

[22] Jan Gehl, *Life Between Buildings: Using Public Space* (Washington, DC: Island Press, 2011).

[23] DeAnza Post, "Tamien Station Area Plan Back Online With Outreach Meetings: Questions Remain," http://deanzapost.com/2014/08/18/sj-tamien-station-area-plan-back-online-with-outreach-meetings-questions-remain/ (accessed October 3, 2014).

[24] Diana Stickler, "Willow Glen Timeline: Alma Bowl," Mercury News, http://www.mercurynews.com/ci_7483222 (accessed October 2, 2014).

commercial vendors where kiosks would be located at the Caltrain and Park entrances, which are public/quasi-public areas.

"The Tamien Station Area Specific Plan (TSSP) is a separate policy document, from the General Plan, that provides the background, vision, and community character for this Planned Community (PC)."[25] This document specifies the land use and urban design objectives for the area within this specific plan. The TSSP is the long range development plan for this area. The first and the main objective listed in this plan for this area is to encourage transit use and create a pedestrian friendly surrounding.

Design policies include building orientation to the street along Alma Avenue with a development pattern that boosts the pedestrian character of the surrounding neighborhoods with good pedestrian linkages. Due to the steep slope of Alma Avenue, commercial uses may be oriented along the Caltrain and the daycare center parking area.[26]

Figure 19 and Figure 41 show the opportunities and constraints around Tamien Station.

Opportunities and Constraints

The Specific Plan lists opportunities and constraints for this area under various categories, namely, land use[27], transportation[28], park and open space[29], and urban design as seen in **Table 1**.

[25] City of San Jose, *Tamien Station Area Specific Plan* (March 1995).
[26] City of San Jose, *Tamien Station Area Specific Plan* (March 1995), 28.
[27] City of San Jose, *Tamien Station Area Specific Plan* (March 1995).
[28] City of San Jose, *Tamien Station Area Specific Plan* (March 1995), 11-14.
[29] Ibid.

Table 1: Opportunities and Constraints

Categories	Opportunities	Constraints
Land Use	To create value by developing vacant and under-utilized sites within the core area and allow intensification of parking lot use.	New development sites shall be free of hazardous materials.
Transportation	Improve existing multimodal transit facilities and reduce auto dependency. Presence of the Route 87 additionally offers efficient connectivity to highways 680, 280, and 101.	The Tamien multimodal station currently is devoid of public amenities, such as restrooms, cafes or refreshment kiosks, book stands, or an adequately roofed platform space.
Parks and Open Space	Provide much needed open space or park access in addition to the Guadalupe River trail.	Insufficient funds for development and maintenance of the new park at the currently designated four acre park site.
Urban Design	Draw upon neighborhood design elements and style to the new planned, compact, livable, and pedestrian-oriented community.	Concerns of negative visual and privacy impacts due to new development; hence limit building configurations.
Source: City of San Jose, *Tamien Station Area Specific Plan* (March 1995), 11-14.		

The *Tamien Specific Plan* area is located a few miles away from Downtown San Jose, along the Guadalupe Transportation Corridor measuring about one forty acres. The area boundaries include, Willow St. Lick Ave.,

Alma Ave., Little Orchard St., the Union Pacific railroad tracks that is commonly used by both ACE, Amtrak, and Caltrain, respectively and State Highway 87 bisects this area.

The goals and objectives of the *Tamien Specific Plan* adopted in 1995 and the *Envision San Jose General Plan 2040,* identify the need to create a pedestrian friendly environment, incorporate a wide variety of land uses, and intensify development in the area adjacent to the station with a mix of high density residential and commercial uses that will reinforce and attract pedestrian activity. The change in the land use designation of the Tamien Station Area Planned Community (PC) from mixed-use to transit corridor residential in 2003, allowed a developer to build high density residential condominiums adjacent to the area. As part of the land use change, the developer would build a park on the City-owned parcel, although the park has not been built till date. The change in the land use designation meant developers did not have to build exclusively commercial uses within the *Tamien Specific Plan* study area boundary, a significant benefit as the developer gets less return for their investment when building mixed use. Since building mixed use developments are expensive and they are not being built, it suggests that the city decided to change the zoning in order to attract development in this area.

From the Land Use diagram from before 1995, it is evident that the parcel that currently has 11 story condominiums on the site of Alma Bowl originally had a recreational and entertainment lodge land use designation.[30] The study area's zoning has been updated from Recreational to Mixed use after the *TSSP* was adopted.

[30] City of San Jose, *Tamien Station Area Specific Plan* (March 1995), 28.

2.3 Washington Neighborhood

Tamien Station is a part of the Greater Washington neighborhood along the Guadalupe freeway. This is one of the oldest neighborhoods in San Jose and is predominantly a lower income neighborhood with a large Hispanic population.[31] A staggering sixty percent of this neighborhood's residents have less than a high school degree. The streets from this older, existing development within the Washington neighborhood were narrow with mixed uses, corner grocery stores, and buildings on the street with five feet setbacks. Washington is the immediate neighborhood serving the Tamien transit core area (refer Figure 4).

[31] MTC-ABAG Library, Bay Area Census, "Race/Ethnicity Percentage by City, 2000-2010," http://www.bayareacensus.ca.gov/cities/SanJose.htm (May 6, 2014).

2.4 Envision 2040 General Plan

One of the major strategies of the City of San Jose in its *General Plan Envision 2040*, is to "design streets for people, not just for cars, and to promote development of streetscapes that act as urban design elements for the entire city, and to support and utilize the streetscapes for people strategy by maintaining a land use and transportation network and transportation facilities that promote increased walking, bicycling, and public transit use."[32]

The City of San Jose in its *General Plan Envision 2040,* has many goals for improving the pedestrian experience in its *Pedestrian Master Plan*[33]*,* with a safe and efficient multimodal transportation system, improved walkability, and access to public transit, such as "improve walking and bicycling facilities to be more convenient, comfortable and safe, so that they are primary transportation modes in San Jose and maximize use of existing and future public transportation services to increase ridership and decrease the use of private automobiles."[34]

According to this updated *Envision 2040 General Plan*, the City of San Jose plans to increase jobs and housing growth in various parts of the City, including Specific Plan areas identified as transit corridor and transit station areas. By identifying growth areas proximate to transit facilities, the City is trying to establish a connection between land use and transportation.[35]

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[32] City of San Jose, *Envision San Jose General Plan 2040* (November 2011), 14-25.

[33] City of San Jose, *Envision San Jose General Plan 2040* (November 2011).

[34] City of San Jose, "*Proposed General Plan Update Goals, Policies, and Implementation Actions*," City of San Jose, http://www.sanjoseca.gov/DocumentCenter/View/19418 (accessed Feb 21, 2013).

[35] City of San Jose *Envision San Jose General Plan 2040* (November 2011).

Figure 6: Site Opportunities. Source: Photos taken and map drawn by the Priya Gopalkrishnan using City of San Jose, GIS data.

Figure 7: Site Constraints. Source: Photos taken and map drawn by the Priya Gopalkrishnan using City of San Jose, GIS data.

2.5 Analysis of Tamien Station Area

Figure 8: Building Footprint of One-half Mile Around Tamien Station. Source: Map created by Priya Gopalkrishnan using City of San Jose, GIS data.

Figure 9: Building Footprint Diagram Showing the One Mile Walkshed around the Study Area. Source: Map created by Priya Gopalkrishnan using City of San Jose, GIS data.

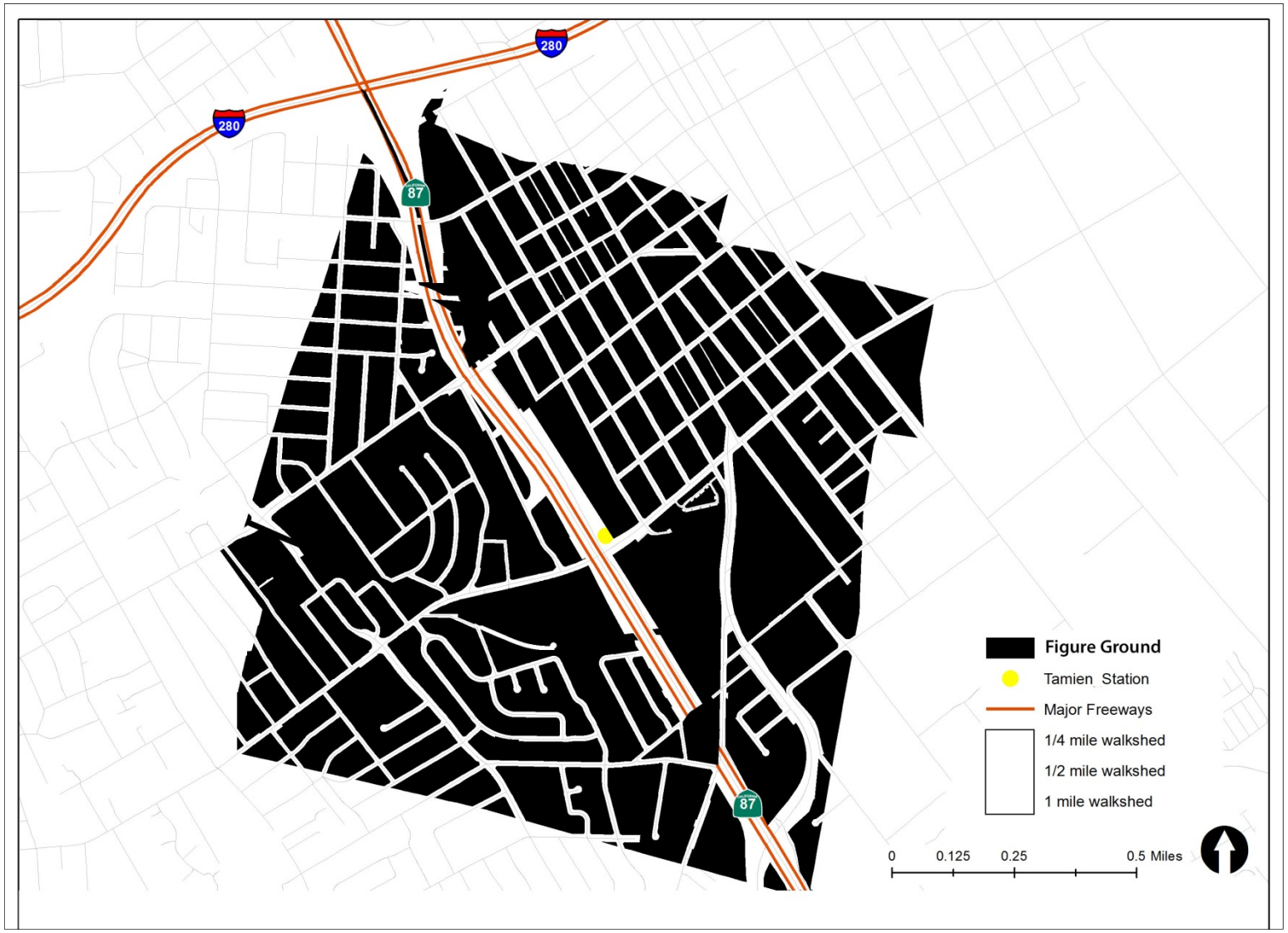
Figure Ground Diagram

The building foot print and figure ground diagram from **Figure 8-9** and **Figure 10** shows the building footprint in black and the surrounding open spaces, including parking, in grey, with the roads denoted in white. The purpose of the figure ground diagram is to visualize the study area in terms of positive and negative spaces.

While Figure 8 represents the building footprint around the one-half mile (10 minute) walking distance around the station, Figure 9 represents the building footprint along the 5, 10, and 15 minute walkshed around the station which covers a larger area.

The Tamien Station area has already been described through its various existing Specific Plan goals and policies. However, the purpose of this chapter is to analyze the study area and highlight the positive and negative aspects.

Figure 10: Figure Ground Diagram for the Study Area. **Source:** Map created by Priya Gopalkrishnan using City of San Jose, GIS data.



3. Synthesis from Existing Literature

The purpose of this literature review is to study and examine the influence of urban design on pedestrian behavior and transit use, if there is any, as well as explore walkability assessments of the built environment around transit stations, creating walkable spaces, and providing pedestrians with transit access through effective policy implementation. The existing literature also acts as a potential source for solutions by providing design guidelines and relevant information for policy-makers. "Urban design factors and a pedestrian friendly design are positive planning factors in reducing automobile use through the reduction of automobile traffic speed and enhancing pedestrian accessibility to a transit center."[36]

"Planners have theorized the importance of the built environment in shaping an individual's travel behavior."[37] Many studies, including Ewing and Cervero (2001), Handy (1996), and Krizek (2003) have assessed the connection between public transit ridership and the quality of that built environment, especially for walking and biking.[38]

[36] Wann-Ming Wey and Yin-Hao Chiu, "Assessing the walkability of pedestrian environment under the transit-oriented development," *Habitat International* 38 (2013): 106-118.

[37] Sherry Ryan and Lawrence F. Frank, "Pedestrian Environments and Transit Riderships," *Journal of Public Transportation* 12, no. 1 (2009): 39-57.

[38] Ibid.

3.1 What are the urban design factors that influence pedestrian behavior and transit use?

Much of the literature in planning studies has focused on finding linkages between land use and travel behavior. Although studies finding linkages between neighborhood design elements and improved walkability still remain inconclusive despite much research effort in this area.[39] Studies examining land use and travel behavior have hypothesized the linkages between urban form elements and travel induced walking. Twelve studies examining the factors that affect travel behavior analyze land use and vehicular travel using different variables, while a few studies examine the impact of urban form on travel behavior[40]; others take a combined look at urban form and socio-demographic elements and their effects on travel behavior.[41] Two studies, including Crane and Crepeau's (1996) & (1998) study of travel behavior, concluded that communities designed to reduce auto use could improve the environment through planning. The findings based on travel diary data, regression modeling, empirical study, GIS analysis, and research shows that there is no evidence of neighborhood street design elements affecting travel behavior.[42]

The successful implementation of Transit Oriented Developments (TOD) requires a good amount of pedestrian activity and pedestrian traffic in order to realize most of the benefits of TODs.[43] According to a 1998 TOD study by Boarnet and Sarmiento, the modeling approach and geographical scale are important factors when

[39] Marlon Boarnet and Susan Sarmiento, "Can Land-use Policy Really Affect Travel Behavior? A Study of the Link between Non-work Travel and Land-use Characteristics," *Urban Studies* 35, no. 7 (1998): 1155-1169.

[40] Michael Greenwald and Marlon Boarnet, "The Built environment as a Determinant of Walking behavior: Analyzing Non-Work Pedestrian Travel Behavior in Portland, Oregon," *Transportation Research Board* 1780 (2001):33-41.

[41] Marlon Boarnet and Susan Sarmiento, 1155-1169.

[42] Randall Crane and Richard Crepeau, "Does neighborhood design influence travel? A behavioral analysis of travel diary and GIS data," *Transportation Research Part D*: Transport and Environment 3, no. 4 (1998): 225-238.

[43] Michael Greenwald and Marlon Boarnet, 33-41.

examining any linkage between land use and non-work vehicular trips.[44] Boarnet and Sarmiento studied the travel diary data of 769 individuals taking non-work car trips over a two-day period.[45] They observe in a 1998 TOD study that "the number of non-work automobile trips that an individual makes in a two-day period is modeled as a function of socio-demographic variables and land-use characteristics near the person's place of residence and that land-use variables are statistically insignificant in all but one of the specifications, the new urbanist neighborhoods."[46] The land use variables the authors examined include retail job density (RETDEN), service jobs density (SERVDEN), and population density (POPDEN).[47] However, Greenwald and Boarnet's 2001 study contradicted these findings stating that "research on the impacts of land use on decisions for non-work walking travel realized that densities do impact decisions to walk, with a highly localized effect."[48]

There is a movement, which Cervero (2001) refers to as "The New Urbanist movement" which posits that "that designing neighborhoods, communities and regions to be more compact and walkable will result in increased pedestrian activity, increased transit use, and decreased reliance on the private auto."[49] However, the percentage by which each element listed above affects the individual's decision to walk is unclear.[50] The findings from Cervero's study of factors influencing pedestrian access to transit, determine that urban design elements also have the potential to influence the pedestrian behavior and choice to take transit for non-work trips as opposed to using one's own car.[51] Cervero supported this finding in a 2001 study of the influence of

[44] Marlon Boarnet and Susan Sarmiento, 1155-1169.
[45] Ibid.
[46] Ibid.
[47] Marlon Boarnet and Susan Sarmiento, 1155-1169.
[48] Michael Greenwald and Marlon Boarnet, 33-41.
[49] Robert Cervero, "Walk-and-Ride: Factors Influencing Pedestrian Access to Transit," *Journal of Public Transportation 7*, no.3 (2001): 1-23.
[50] Ibid.
[51] Michael Greenwald and Marlon Boarnet, 33-41.

the three elements of urban form, including density, diversity, and design, on an individual's decision to use public transit rather than driving alone.[52]

Three studies that have looked at the influence of land use on personal vehicular trips have stated that their findings are not complete.[53] Although the influence of neighborhood urban form on pedestrian walking behavior is not significant enough, there still is a belief that researching the Tamien Station area of San Jose will benefit planners who work in local jurisdictions such as city governments.[54]

The findings from three studies, including Cervero, Ewing, and Handy state that manipulating urban form and building dense neighborhood developments would enable the reduction of travel by automobile for all non-work and shopping trips.[55] For example, manipulating refers to changing zoning on a particular parcel or permitting development for increased FAR (floor area ratio). According to a 2001 study by Boarnet and Crane on the influence of urban form elements on travel and transit use, people's choice of trips in any mode of transport depends on the travel benefits derived from such a mode of transport. For example, mode choice is often made based upon considerations of time saved or the lower costs of the trip, which vary according to the elements of urban form.[56] For short distance trips, lower speed of travel shaped urban form.[57] For example, "persons who dislike driving might both drive less and choose to live in a high density, mixed use neighborhood that supports transportation alternatives other than driving."[58]

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[52] Robert Cervero, 1-23.
[53] Michael Greenwald and Marlon Boarnet, 33-41.
[54] Ibid.
[55] Marlon Boarnet and Susan Sarmiento, 1155-1169.
[56] Marlon Boarnet and Randall Crane, *Travel by Design: The Influence of Urban Form on Travel* (Oxford: Oxford University Press, 2001).
[57] Ibid.
[58] Ibid.

Thus, the hypothesis is not conclusive, and there is no one solution to the question, “though there is a possibility of limited existing evidence that urban design may influence travel behavior at the margin.”[59] It is clear, though, that variable selection and urban form elements matter when studying the affect urban form has on travel behavior. Boarnet and Crane’s 2001 study was limited, as it focused on highly auto-oriented Southern California and the authors considered car travel only for non-work related trips.[60] Even though research suggests that urban form and travel behavior are linked[61], car travel can be reduced only if there are many transit oriented mixed-use developments.[62] Crane and Crepeau felt there were exceptions to this study, such as when new engine technology, gas taxes or congestion pricing were considered. All the studies were based on developments within the United States. Some studies looked exclusively at Southern California. Although the insights from the above studies may be applicable elsewhere, there is no reference to any research conducted outside the US among the studies chosen for this literature review. Hence, it is not clear from the reviewed literature that there is enough evidence to prove the impacts of urban form on travel behavior.

[59] Ibid.
[60] Ibid.
[61] Ibid.
[62] Randall Crane and Richard Crepeau, 225-238.

3.2 Why is it important to assess the walkability of a pedestrian environments under TOD's and how can it help provide better pedestrian access to transit?

In a 2009 study in San Diego, Ryan and Frank stated that public transit ridership is higher in urban areas as these environments are more favorable to transit-based trip making, where people walk and bike more.[63] Three studies highlight the methods used in assessing the walkability conditions of the built environment, showed that, "walking experience is affected by the cumulative impact of multiple interactions (both positive and negative) as people walk in the pedestrian environment."[64] Urban design factors, such as imagebility, human scale, and a pedestrian-friendly design are positive planning factors that "TOD planning emphasizes by minimizing automobile use through the reduction of traffic speed and enhancing pedestrian accessibility to a transit center in order to improve the city design of the pedestrian space in a city."[65]

According to Cervero in a 2007 study, TODs must provide good pedestrian access to final destinations, for example, offices close to transit stations in order to boost ridership in trains and buses.[66]

[63] Randall Crane and Richard Crepeau, 225-238.
[64] C.E Kelly, M. R. Tight, F. C. Hodgson, and M. W. Page, "A comparison of three methods for assessing the walkability of the pedestrian environment," *Journal of Transport Geography* 19, no. 6 (2011): 1500-1508.
[65] Wann-Ming Wey and Yin-Hao Chiu, 106-118.
[66] Robert Cervero, "Transit-oriented development's ridership bonus: a product of self-selection and public policies," *Environment & Planning A* 39, no. 9 (2007): 2068-2085.

3.3 What are the effective methods of measuring the qualities related to walkability in other pedestrian environment around TOD analyses, and what strategies are used to frame policy recommendations based on existing literature and studies?

GIS data has the potential to be used to construct measures of environmental attributes and to develop indices of walkability for cities, regions or local communities.[67]

An analysis of the pedestrian environment can be produced through various research methods. Many studies on the topic of walkability in general use geographic information systems (GIS), a multiple criteria decision-making (MCDM) matrix technique, or a combination of both techniques to effectively analyze current walkability conditions of the pedestrian environment. The policy analysis literature supports "using walkability index as a land development standard or performance measure to be included in the local land-development process."[68] As Ryan and Frank in 2009 study observe, focusing on the pedestrian can enhance a proposed development project, indeed the walkability index of the proposed project can dramatically alter the outcome. By using a walkability index, it is posited "the land use and circulation elements achieve walkability goals."[69]

Discussion related to policy-making for pedestrian environments in TOD has concluded that TOD ridership impacts can be used in advising public policy.[70] For example, Robert Cervero notes that "by setting credits against transportation impact fees, developers finance urban infrastructure, such as new roads and expansions

[67] Eva Leslie, et al., "Walkability of Local Communities: Using Geographic Information Systems to Objectively Assess Relevant Environmental Attributes," *Health & Place* 1, vol. 13 (2007):111-122.
[68] Robert Cervero, 2068-2085.
[69] Sherry Ryan and Lawrence F. Frank, 39-57.
[70] Robert Cervero, 2068-2085.

by contributing to escrow funds."[71] Two studies in TODs examining pedestrian level of service (LOS), a measure of transit level of service, concluded that a lesser number of routes and longer wait times lead to lower service levels, whereas shorter wait times and more routes have the highest level of service.[72] Additionally, C.E. Kelly et al. examined a measure of walkability based on the pedestrian level of service (LOS) which tests walking conditions based on route, design factors, such as path width, obstructions, location and user factors.[73] One of the main advantages of using this method is that it calculates a score specifically for pedestrians in the built environment.[74] A study by C.E. Kelly in 2011 confirmed the lack of pedestrian maps as a factor that deters walking, as maps are largely based off road map for vehicles, despite improvements in technology where a pedestrian can access Google Street View and Google Maps on their smart phones as they go.

First developed for the Neighborhood Quality of Life Study (NQLS),[75] authors Kelly et al., based around original research conducted by Frank et al., build an index of walkability which employs the most frequently used characteristics of urban form as discussed in urban design, transportation and planning literature. Understanding the factors that influence physical activity is a crucial component, so assessing environmental factors and identifying patterns is the starting point to determine what specific characteristics influence the "walkability" of a community. This idea of "walkability" encompasses the features of a community or "built environment" that determine whether an area is appropriate for residents to travel by foot to work, to access

[71] Ibid.
[72] Sherry Ryan and Lawrence F. Frank, 39-57.
[73] C.E Kelly, et.al, "A comparison of three methods for assessing the walkability of the pedestrian environment," *Journal of Transport Geography* 19, no. 6 (2011): 1500-1508.
[74] Ibid.
[75] C.E Kelly et.al, "A comparison of three methods for assessing the walkability of the pedestrian environment," *Journal of Transport Geography* 19, no. 6 (2011): 1500-1508.

retail opportunities (such as grocery stores), for leisure activities or for exercise. The index of walkability designed by authors Kelly et al. when applied in the PLACE study focuses on forecasting behaviors that include foot travel to work, school, or similar everyday destinations that are not simply for leisure.[76]

In a 2007 study by Cervero, he states that, "If employers opt not to pass on parking charges to their workers, local planners who wish to encourage more transit riding among station-area residents can do little about this."[77] According to Cervero (1993), "Transit-focused land use measures, such as clustered development around rail stations and transportation demand management (TDM) programs are a powerful combination for attracting transit ridership."[78] The author believes that when jobs are focused around transit stations, there is a higher likelihood of attracting commuters using transit, especially if the employer collects parking fees.[79]

Policies such as, location efficient mortgage (LEM) programs, as noted by Krizek in a 2003 study researching smart-growth and transit supportive home loans, can be used to qualify people buying homes in TODs because of their preference for taking transit and owning fewer cars.[80] According to Cervero, in a 2007 study, allowing transit agencies to sell parking lot lands to private developers has produced more transit based housing, increased ridership levels, reduced demand for government operating subsidies, and thereby enabled affordable housing to be built on parking lots in the transit station area.[81]

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[76] Eva Leslie, et al., 111-122.
[77] Robert Cervero, 2068-2085.
[78] Robert Cervero, "Ridership Impacts of Transit-Focused Development in California," *Institute of Urban and Regional Development*, University of California, Berkeley, Monograph 45 (1993).
[79] Ibid.
[80] Kevin Krizek, "Operationalizing Neighborhood Accessibility for Land Use-Travel Behavior Research and Regional Modeling," *Journal of Planning Education and Research 22,* no. 3 (2003): 270-287.
[81] Robert Cervero, "Transit-oriented development's ridership bonus: a product of self-selection and public policies," *Environment & Planning A* 39, no. 9 (2007): 2068-2085.

Evidence shows that analysis of pedestrian environments should be holistic and spatial analysis of environmental attributes supports walkability. City governments must take the initiative in forming policies that link pedestrian environment and transit access for all, including pedestrians.

Because of today's complex problems, including urban sprawl, traffic congestion, and climate change, planning at the local level will need to be sustainable and linked with land use and urban design to reduce automobile use for taking public transit.[82]

Linking where people live and work allows more people to commute by foot. Although there is enough evidence that supports walkability attributes and pedestrian environments in TODs, the linkages between pedestrian environment and walkability attributes as identified by the literature are not conclusive. Through the study of the pedestrian environment around Tamien Station supplemented by design guidelines and recommendations, this research aims to fill this gap between the growing literature on walkability assessments and the built environment. By gaining knowledge of best practices, it will enable future planners to design more accessible pedestrian access to transit and encourage the planning of walkable neighborhoods around station areas for living, working, and playing.

[82] Robert Cervero, "Ridership Impacts of Transit-Focused Development in California," *Institute of Urban and Regional Development*, University of California, Berkeley, Monograph 45 (1993).

3.4 Design guidelines for successful walkable streets based on existing research: Characteristics

Walkable streets are essential elements of public spaces. The success of a walkable street in outdoor environments is widely researched by many, including William Whyte, Allan Jacob, and Reid Ewing. William Whyte observed the interactions between people and city spaces and was a pioneer who observed pedestrian behavior through his Street Life Project.[83] Additionally, researchers Allan Jacobs, William Whyte, and Reid Ewing, based upon their research and observations of successful working public spaces, have established a list of design elements that work or deter in creating great urban public spaces and city streets.[84]

Allan Jacobs in *Great Streets* recommends that a great street should be safe from traffic and encourage walking, sometimes fast and at times for leisure.[85]

Physical Comfort: Jacobs stresses the importance of walking in comfort. The space and the building envelope should provide physical comfort, such as small fountains, seating at the corners along the Paseo.[86]

Human scale and transparency: Human scale and transparency are two important elements for a great street. Buildings, walls and trees together define the boundary.[87] Trees provide shade for people walking as well as buildings placed along the sidewalk give the street a human scale as the eyes of the person walking has a sixty-degree cone of vision.

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[83] William H. Whyte, *The Social Life of Public Spaces* (New York: Project for Public Spaces, 1980), 10.
[84] Allan Jacobs, *Great Streets* (Cambridge, MA: MIT Press, 1995), 270-292.
[85] Ibid.
[86] Ibid.
[87] Ibid.

Accessibility: For great streets, the next criterion is accessibility.[88] Great streets are accessible by public transit while crossing or walking along, and under them, for example, streets that act as underpasses.

Design: the design of the street counts. However, it does not happen overnight, and it takes time for each element of design to be built, including buildings, pedestrian amenities, and landscaping.[89]

Allan Jacobs also emphasizes the need for street amenities, including fountains, benches, kiosks, lights, canopies, signages, and paving to improve identity as a guideline to make great streets.[90]

Undesirables: Allan Jacob also highlights the fact on public sitting areas that attract homeless and beggars and that sitting areas should not be isolated. They can be highlighted, grouped, or placed in front of activity areas.[91]

Density and diversity: One of the last qualities of making great streets according to Allan Jacobs is density.[92] Density is the number of people living in the area that affect the use of the outdoor spaces and diversity of uses.

Slope: A great street often has a change of elevation, although not very steep. This allows the pedestrian to view further into the distance ahead.

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[88] Allan Jacobs, *Great Streets* (Cambridge, MA: MIT Press, 1995), 270-292.
[89] Ibid.
[90] Ibid.
[91] Ibid.
[92] Allan Jacobs, *Great Streets* (Cambridge, MA: MIT Press, 1995), 270-292.

4. Description of Data Collection and Research Methodology

4.1 Overview of the Walkability Assessment Methods

One of the frequently used methods of walkability assessment of street blocks is to complete a manual assessment by foot, using an audit questionnaire tool. The audit data collected is then tabulated using Excel. It is also common to record data using smartphone applications (apps), such as Trimble Terraflex, tablets, or a global positioning system (GPS) handheld device similar to the ones manufactured by Trimble. The data is then analyzed using Excel or SPSS or a similar statistical analysis package.

The audit tool selected for this research is a modified version of the Irvine Minnesota Inventory (IMI).[93] This audit tool has been tested for providing reliable analysis of urban design elements that boost or reduce walking.[94] The study testing IMI audit tool concluded that variables such as characteristics of sidewalk infrastructure, street crossings, land use, and traffic speeds were strongly linked with walking for the purpose of travel.[95] Additionally, this research references another audit tool that measures five urban design elements related to the physical characteristics of streets[96] as described in section 4.4.

The urban design elements, namely, imageability, enclosure, human scale, transparency, and complexity, are qualities that greatly influence the walking for travel. These are common elements chosen by urban designers and planners for a subjective measurement of the street

[93] Kristen Day, et al., "IMI: Irvine Minnesota Inventory (paper version)," https://webfiles.uci.edu/kday/public/index.html; Appendix A.

[94] Marlon Boarnet, et al., "The Street Level Built Environment and Physical Activity and Walking: Results of a Predictive Validity Study for the Irvine Minnesota Inventory," *Environment and Behavior* 43, no. 6 (2011): 735-775.

[95] Ibid.

[96] Reid Ewing and Susan Handy. "Measuring the Unmeasurable: Urban Design Qualities Related to Walkability." *Journal of Urban Design* 14, no. 1(2009): 65-84.

environment.[97] These design elements combined with three additional elements, namely, ease of crossing the street, sidewalk characteristics, and pedestrian amenities on the sidewalk are the eight elements that form the basis of my design guidelines stemming from the audit research methods. Urban design analysis was another research method used in this research.

This research also used GIS in street block selection and in data analysis post completion of the audit as described in the next subsection. Google street view is often used by many researchers for measuring infrastructure related to walking at the neighborhood level.[98] Google Maps was used as an overlay to GIS for selecting street segments.

Section 4.2 describes the methodology for selecting the street segments. **Section 4.3** presents the methodology for developing the audit tool and the variables included in the assessment. **Section 4.4** presents the methodology for the post audit GIS analysis of data collected through the audit assessment.

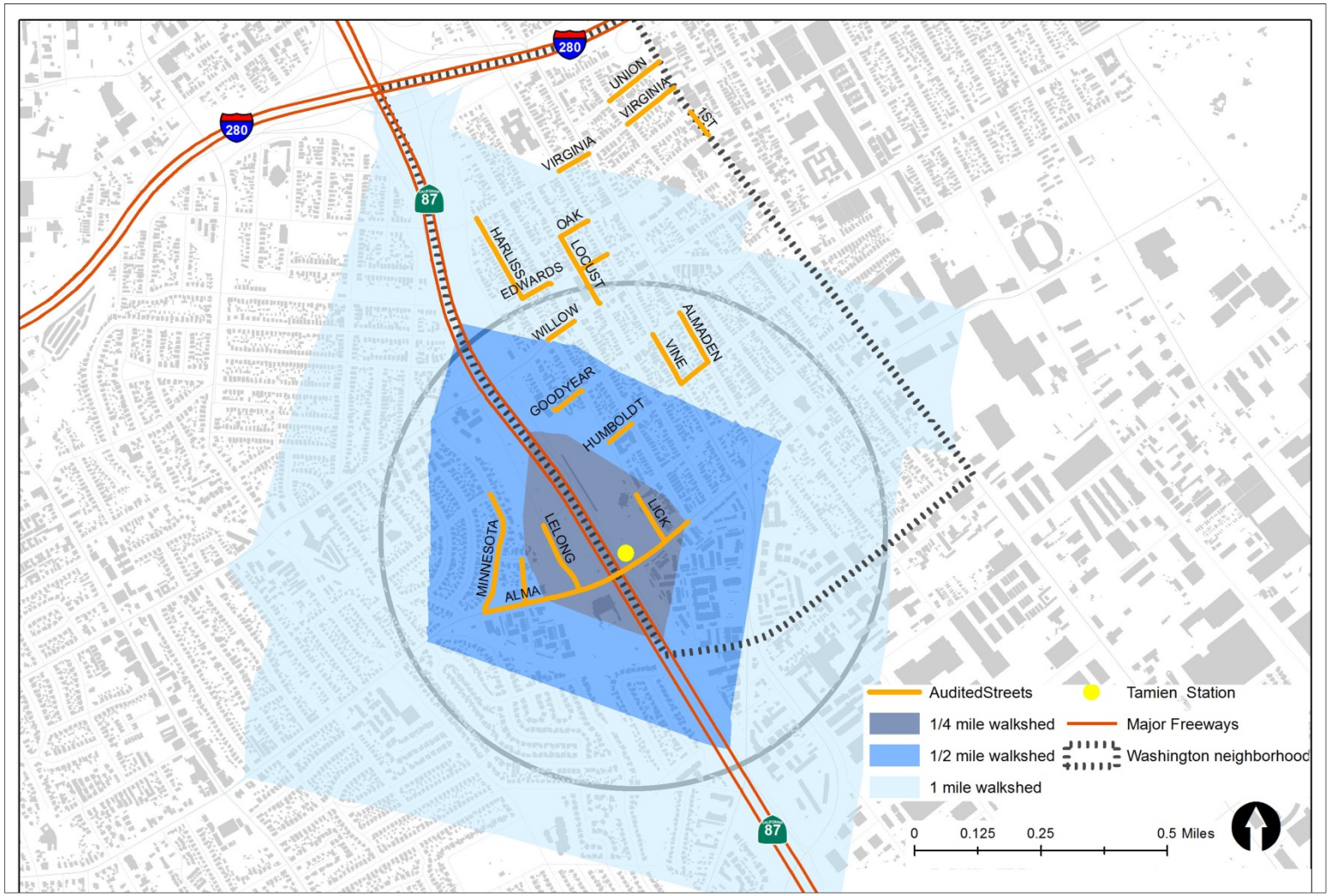
[97] Reid Ewing and Susan Handy. "Measuring the Unmeasurable: Urban Design Qualities Related to Walkability." *Journal of Urban Design* 14, no. 1(2009): 65-84.
[98] Andrew Rundle, "Using Google Street View to Implement Community Audit Tools: The Pedestrian Environment Data Scan," http://activelivingresearch.org/using-google-street-view-implement-community-audit-tools-pedestrian-environment-data-scan (accessed October 05, 2014).

4.2 Methodology for Selecting Street Segments

As explained in section 4.1, there is a strong relationship between walking for travel and the variables, namely, sidewalk amenities, traffic speeds, and land use. For the purpose of this research, twenty-five street segments were audited around the Tamien Station area, fifteen from the older Washington neighborhood and ten from the immediate surroundings of the newer Tamien transit core area. GIS was used in selecting the street segments by parsing the attribute data for the streets. After conducting a site visit, Google Maps was used as an overlay to GIS base map, in order to check for accuracy of the street count around the Tamien core area. It was found that a few segments in the quasi-public area around Tamien did not have attribute data as the GIS layer was not updated with street information from the newer development at the time of this audit.

Next, all the streets within the one-half mile radius around Tamien Station were assigned a segment ID in the GIS attribute table. Twenty-five streets were randomly selected from this list (refer **Figure 11**). The street selection was based on unique characteristics from streets within the study area and the older neighborhood, such as architecture style and character, land uses, and physical amenities present. After selecting the streets using GIS shapefile, the street addresses were located on Google Maps and Google street view in order to verify street existence or closures, street attributes, including the presence of street furniture, murals or artwork on the sidewalk and buildings, changes to building setbacks, and banners and signages that may have been removed during ongoing construction activities in this area. Google street view is a collection of recorded imagery that offers panoramic views and enabled in verifying the changes to the built environment around Tamien Station in the recent past. The Tamien core area had a mix of non-residential and residential uses while the older Washington neighborhood was mainly residential except for the presence of a few corner grocery stores.

Figure 11: Location of Streets Selected for the Segment Audit in Tamien and Washington Neighborhoods and One Mile Walkshed Around the Station. **Source:** Map created by Priya Gopalkrishnan using City of San Jose, GIS data.



4.3 Methodology for Developing the Audit Tool and the Variables Included

Description of the IMI Audit Tool

The IMI tool was chosen for the audit assessment of the streets around Tamien Station which was developed by Kristen Day, Ph.D., Marlon Boarnet, Ph.D., Mariela Alfonzo, MURP, and Ann Forsyth, Ph.D.[99] This research uses the modified version of the IMI tool as an audit assessment tool. The IMI tool was modified for this research as explained further in this section.

The IMI assessment consists of an audit questionnaire with seventy-four questions, including two hundred eighty-six sub-questions. These questions examine both sides of the street segment through four groups, namely, accessibility, urban form elements, pedestrian amenities, and comfort and safety of the environment.[100]

Additionally the walkability metrics for qualitative and quantitative street design features developed by authors Reid Ewing and Otto Clemente, in their book, *Measuring Urban Design,* investigates various urban design elements, namely, "imageability, visual enclosure, human scale, transparency, and complexity," in order to examine the relationship between walking behavior and the various elements.[101] The eight urban form elements used in this research are imageability, ease of crossing, enclosure, transparency, human scale, pedestrian access to amenities, sidewalk characteristics, and complexity.

[99] Kristen Day, et al., "Irvine Minnesota Inventory," http://activelivingresearch.org/irvine-minnesota-inventory (accessed February 12, 2013).

[100] Kristen Day, et al., "IMI - Irvine Minnesota Inventory Audit," https://webfiles.uci.edu/kday/public/Irvine_MN_Inventory.pdf (accessed February 12, 2013).

[101] Reid Ewing and Otto Clemente, *Measuring Urban Design: Metrics for Livable Places (Metropolitan Planning+Design)*. (Washington, DC: Island Press, 2013), 1-23.

This research uses the IMI modified tool and consists of an audit questionnaire with seventy four questions, including two hundred and eighty six sub-questions. The IMI audit examined both sides of the street segment. Each complete street audit studied various elements of the built-form, including traffic and transportation elements, pedestrian amenities, urban form elements, street infrastructure, and land use characteristics. The traffic and transportation elements include presence of street crossings, signals, and condition of the curb, sidewalks characteristics, like street infrastructure and amenities, and urban form elements, such as imageability (identity), enclosure, and human scale.

All variables are grouped by adding up the scores of select categories within each design element, which were then equally weighted. All the variables from elements chosen were normalized and categorized into three defined score categories 1-High, 0.5-Medium, and 0-Low. Moreover, variables whose value equaled zero and those with no data were recorded as zero. The only difference to this rule was the variable "number of lanes" that was coded reverse, based on how the increase in the number of lanes affected the quality of a street or an intersection in its ease of crossing at the pedestrian level. Additionally, this approach simplified the data analysis as it created uniform data visualization and methods for comparison among the different variables forming the elements mentioned above.

Each element has variables that have equal weighting (refer Table 2). The first element and factor influencing walking behavior considered was **Imageability**.[102] This element included variables from the audit data that related largely to the physical attributes of the urban form. Imageability is defined as the presence of an architectural or historic character of the building facade (front face of the building), to the place that may be identified by the presence of many elements, including buildings that stand out or

[102] Reid Ewing and Otto Clemente, *Measuring Urban Design: Metrics for Livable Places (Metropolitan Planning+Design)*. (Washington, DC: Island Press, 2013), 1-23.

Table 2: Table shows the method of calculation and equal weighting for deriving the element, Human Scale.

Human Scale														
Street No.		Q62	Q67	Q72	Q73	Q74	Q75	Q76	Q80	Q99	Q119	Q195	Q197	Q201	TotalH
A&Ll		0	0	0	0	0	0	0	0	0	0	0.5	1	0.5	2
A-LB		1	1	0	1	1	1	0	1	1	0	1	0.5	0	8.5
A-BM		1	1	1	1	0	1	0	0	1	0	1	0.5	0.5	8
A-L&P		0	0	0	0	0	0	0	0	0	0	1	0.5	0.5	2
Li&A		0	0	0	0	0	0	0	0	0	0	0.5	0.5	0.5	1.5
Li&Cc		0	0	0	0	0	0	0	0	0	0	1	0.5	1	2.5
Ll/LR		0	0	0	0	0	0	0	0	0	0	0.5	0	1	1.5
A/Belm		0	0	1	1	0	0	1	1	0	0.5	0	0.5	0.5	5.5
M-D/Bl		0	0	0	0	0	0	0	0	0	0	0	0.5	0.5	1
M-B/Al		0	0	0	1	0	1	0	0	0	0	0.5	0.5	0.5	3.5
Segment ID 40		0	1	1	1	0	0	0	0	0	0	1	0.5	0.5	5
167		0	1	0	0	0	0	0	0	0	0	1	0.5	0.5	3
164		0	0	0	0	0	0	0	0	0	0	1	0.5	0.5	2
56		0	0	0	0	0	1	0	0	0	0	1	0	0.5	2.5
57		0	0	0	0	0	0	0	0	0	0	1	0.5	0.5	2
76		0	0	0	0	0	0	0	0	0	0	1	0	0.5	1.5
54		0	0	0	0	0	0	0	0	0	0	1	0.5	0.5	2
103		0	0	0	1	0	0	0	0	0	0	0	0.5	0.5	2
49		0	1	1	0	0	0	0	0	0	0	0.5	0.5	0.5	3.5
3		0	0	1	1	0	0	0	0	0	0	0.5	0.5	0.5	3.5
149		0	1	1	1	0	0	0	0	0	0	0.5	0.5	1	5
50		0	0	0	0	0	0	0	0	0	0	1	0.5	1	2.5
93		0	0	0	1	0	1	0	0	0	0	1	0.5	0.5	4
139		0	0	0	0	0	0	0	0	0	0	1	0.5	0.5	2
21		0	0	1	1	0	1	0	0	0	0	1	0.5	0	4.5
Total		2	6	7	10	1	6	1	2	2	0.5	18.5	11.5	13.5	81

Source: Priya Gopalkrishnan

buildings of importance.[103] Imageability is linked closely to the urban design characteristics of the neighborhood observed here. This element forms the basis of any urban design analysis and the outcomes of the audit analysis proved that this was a very important element that would be part of the policy and urban design guideline in order to create more activity and economic development in this area. Such developments and improved access would translate into increased transit use. The variables studied included, the presence of or absence of the following variables, including number of parks, courtyards, plazas, landscape features, historic buildings, buildings with symbolic identity, buildings of various shapes and forms, number of pedestrians on the street throughout the duration of the audit, changes to the area, largely from new constructions, change in setbacks, presence of vacant lands, as verified by Google Street View, noise levels, and presence of outdoor dining in the study area are factors that play a key role in shaping the pedestrian environment. The variables included are Q1, Q115, Q118, Q119, Q148, Q187, Q198, Q243, Q250, Q251, Q252, where "Q#" is referenced from Appendix A.

The second important element for this research that was studied was **Ease of Crossing the Street**.[104] Ease of crossing is very important for pedestrian access. The multiple variables from this element included, presence of places intended for street crossing Q2, presence of curb cuts Q10, condition and convenience of curb cuts Q11 & Q12, presence of a traffic signal Q13, wait times for crosswalks Q26, and number of vehicle lanes for car travel Q37. Street crossing conditions were met by analyzing these variables.

The third element analyzed using the street audits that would be useful in answering this research question was **Enclosure**.[105] Enclosure is the criteria

[103] Ibid.

[104] Element created by the author, as shown in Table 2.

[105] Reid Ewing and Otto Clemente, *Measuring Urban Design: Metrics for Livable Places (Metropolitan Planning+Design)*. (Washington, DC: Island Press, 2013), 1-23.

for looking at variables that give a sense of bounding to a space, physically and visually. Urban design uses many elements, including landscape, variety of building heights, and the presence of a building wall on either or both sides of the streets. The heights and the space left between buildings control how much of the sky the user sees above.[106] Buildings situated on a site in a continuous fashion direct the pedestrian towards a focal point ahead, a point in their destination that they would like to walk towards.[107] Variables chosen for the analysis include, proportion of sidewalk cover Q144-146; number of street trees lining between the sidewalk and the street, on either one or both sides Q194; and building widths Q209-211.

The fourth element analyzed looked at **Transparency**, that is a quality attributed to the built environment.[108] It is the quality of a space that relates to the way it builds a connection with the street and the user rather than closing off the two from one another, such as an inward looking building.[109] For example, variables such as the length of the street wall; the number of punctures or variation on a building façade and separate building entrances Q213; long and wide buildings being broken up by variety in elevation treatments Q212 or depth achieved due to window styles and treatments; a visual break to the monotonous long street wall Q204; presence or absence of blank walls Q203; number of street level broken windows Q225; existence of iron bars on windows or doors Q202; visible dumpsters Q224, and whether the first level uses are apparent to the pedestrians walking by Q206, are criteria for quantifying transparency.[110]

The fifth element selected for the analysis was **Human Scale**. Human scale is an element that is the visual range that the human can see, standing

[106] Reid Ewing and Otto Clemente, *Measuring Urban Design: Metrics for Livable Places (Metropolitan Planning+Design)*. (Washington, DC: Island Press, 2013), 1-23.
[107] Ibid.
[108] Ibid.
[109] Reid Ewing and Otto Clemente, *Measuring Urban Design: Metrics for Livable Places (Metropolitan Planning+Design)*. (Washington, DC: Island Press, 2013), 1-23.
[110] Ibid.

on the street.[111] Pedestrians walk at a slower speed than a runner or a bicyclist. This gives ample time for the pedestrian to absorb the sensory images and perceptions of space surrounding the user and respond to a situation. As Jan Gehl writes in *Cities for People*, "old cities were designed on a three miles per hour scale, in which a pedestrian would have ample time to study the details of buildings up close as well as survey mountains in the distance".[112] Gehl emphasizes the need for urban designers and city planners to work at a different scale, including the scale of the city that people view at their eye level, and believes that building placement directly affects the number of users on the street, having a particular influence on the number of people walking and staying in the surrounding space or neighborhood.[113] The variables chosen for analyzing this element are: presence of recreational uses Q62; institutional and religious uses Q67; retail uses Q72; commercial uses like restaurants and fast food Q73, including presence at ground level in mixed use multistoried buildings Q99, Q74; small and medium grocery stores Q75, Q76; gas/service station Q80; public garden Q119; size of tree canopy Q195; building heights Q197, and average setback from the building to the sidewalk or street Q201.[114]

The sixth element analyzed was the presence of **Sidewalk Amenities**, a key element that improves pedestrian access and increases use of the street. Presence of outdoor dining areas increased the staying capacity for pedestrian users, resulting in two notable benefits. First, it helped in economic development and second, increased economic development and people lingering in the area meant that there was more activity on or adjacent to the street. According to Jan Gehl, the author of *Cities for People,* increasing pedestrianism and reducing car traffic in key city streets, for example, Stroget in

[111] Ibid.
[112] Jan Gehl, *Cities for People* (Washington, DC: Island Press, 2010), 43-44.
[113] Jan Gehl, *Cities for People* (Washington, DC: Island Press, 2010), 195.

[114] Reid Ewing and Otto Clemente, *Measuring Urban Design: Metrics for Livable Places (Metropolitan Planning+Design).* (Washington, DC: Island Press, 2013), 1-23.

Copenhagen, leads to improved city life.[115] Another example of old cities with high focus for pedestrian activity is Venice. Jan Gehl states, "Venice has good mix of dense buildings, short walking distances, beautiful spaces, mixed land uses, activity at ground levels in buildings, architectural design and details all on a human scale".[116] The variables examined include, the presence of outdoor dining areas Q187, bus stops with seating Q189, benches Q188, and ledges for sitting Q190, heat lamps Q191, fountains Q192, and public restrooms Q193.

The seventh and eight elements were **sidewalk characteristics** and **complexity** of the built environment. The sidewalk characteristic variables influenced the pedestrian use and transit access in station areas. The variables used for analyzing sidewalk characteristics include presence of sidewalks on either or both sides of the street Q139, completeness Q140, the sidewalk width in order to accommodate pedestrians Q141, and the presence of shaded sidewalk caused by the trees Q196. The eighth and final element analyzed for solving this research problem was **Complexity**.[117] Complexity is defined by Reid Ewing and Otto Clemente, in *Measuring Urban Design*, as "the visual richness of a place that depends on the variety of the physical environment, specifically the numbers and kinds of buildings, architectural diversity and ornamentation, landscape elements, street furniture, signage, and human activity".[118]

Hence, the variables in this element criteria include the presence of a mural or another decorative public art Q204, separate building blocks Q208, how easily visible is this public art from the street Q247, numbers of buildings that provide visual breaks, variety of building colors Q244, dominant smell Q254, air pollution detected by smell or by sight

[115] Jan Gehl, *Cities for People* (Washington, DC: Island Press, 2010) 12-13.
[116] Jan Gehl, *Cities for People* (Washington, DC: Island Press, 2010) 13.
[117] Reid Ewing and Otto Clemente, *Measuring Urban Design: Metrics for Livable Places (Metropolitan Planning+Design).* (Washington, DC: Island Press, 2013), 1-23.
[118] Reid Ewing and Otto Clemente, *Measuring Urban Design: Metrics for Livable Places (Metropolitan Planning+Design).* (Washington, DC: Island Press, 2013), 130.

Q255, and uniqueness of building facade Q245 were noted in the audit sheet for each of the twenty-five street audits. Each element had multiple variables scores for the twenty-five streets. Thus, each street had an element score. For examples, refer to Table 2. These eight urban design elements formed the basis of the design recommendations later in Chapter 6.

These elements were developed after thorough research on various elements considered for urban design research. The decision to use the elements such as imageability, enclosure, transparency, complexity, and human scale rose from the basis of ease of understanding and the common usage of terms such as human scale in architecture and urban design. The few questions excluded from the IMI approach for street audits were not relevant for the study area. For example, questions related to the presence of a harbor, beach or marina.

The IMI approach provides a training protocol and codebook version two, that were used in order to understand the audit methodology for conducting the observations.[119] The IMI codebook two point zero describes in detail the audit process as well as clarifies the audit question's response individually.[120] The codebook version three point zero mentions various scales for analyzing the data collected from using this approach, including perceived safety from crime, perceived safety from traffic, pleasureability, and accessibility.[121]

[119] Kristen Day, et al., "Codebook: Irvine Minnesota Inventory for Observation of Physical Environment Features Linked to Physical Activity," Codebook (2005), https://webfiles.uci.edu/kday/public/index.html (accessed Feb 05, 2013).
[120] Ibid.
[121] Ibid.

4.4 Methodology for Post Audit GIS Analysis of Data Collected

GIS is used for post audit analysis of collected data. The raw data for all the audit was normalized into three categories, namely, high, medium, and low. Out of the 286 audit variables for twenty-five streets, a total of sixty selected variables that related to eight elements were equally weighted, and their scores were added into an excel spreadsheet. The data was then entered manually into the attribute table of the street feature class in ArcGIS 10.2. The data was then visualized spatially into a thematic choropleth map showing the design element score in three colors, namely, red (high), orange (medium), and blue (low). This map was overlaid above a basemap of the Tamien station area in San Jose.

5. Summary of Audit findings

The audit findings show that the study area does not have a strong identity or a sense of place. While the existing sites around the station show many opportunities for revitalization there are a few significant constraints as discussed in the section **5.3**. Some of these constraints include poor conditions and signs of defragmentation of the streets surrounding the station. Lack of street connectivity impedes both walking and bicycling. The freeway underpass poses a great safety concern to pedestrians taking transit due to visible signs of homeless activity, unattended garbage, and poor lighting. Large surface parking lots that undermine Identity, Enclosure, Human scale, and Transparency as discussed in the section **5.1**. However, there are many opportunities to change the character of this space as identified in section **5.3.** The design recommendations based on the opportunities available in the study area are elaborated further in the Chapter **6**.

The audit data was collected during early August 2014 and organized in a tabular form until September 2014. Low-income neighborhoods lack funding for public art as they have different needs as compared to wealthy neighborhoods. The findings from the twenty-five street segment audit show that the neighborhood surrounding the station area lacks public art or murals. Other elements that stood out were that the percentage of streets having medium and high amounts of graffiti was a little less than half of all the audited streets. The study area had a number of vacant lots, which amounted to one-third of the sampled number of streets for the audit, most of which were in the area with the newer developments. Half of the ten audited streets from the study area, within the immediate surroundings of Tamien Station had lots under construction. Another audit question examined the streets with empty lots.

Out of the general maintenance of buildings category, only about a quarter of the study area streets audited

were attractive. Findings from the audit show, a little more than one-half of the streets audited were in fair condition. Similarly, in the general maintenance of landscaping category, the new development area fared slightly better than the older development. For example, only a quarter of the audited streets had good and attractive landscape. However, a third of the audited streets had landscaping in fair condition. Landscaping requires periodic maintenance and the City of San Jose was already putting noticeable effort, funds, and time into landscape maintenance throughout the city including the study area. Post audit GIS analysis, the findings were categorized by design elements and are visually represented in the maps below. Each map highlights the streets in the ranges of high, medium, and low scores. Each map depicts one of the elements coded and compiled into a spreadsheet attached with the GIS layer containing the twenty-five streets that were selected using an attribute query using ArcGIS 10.2.

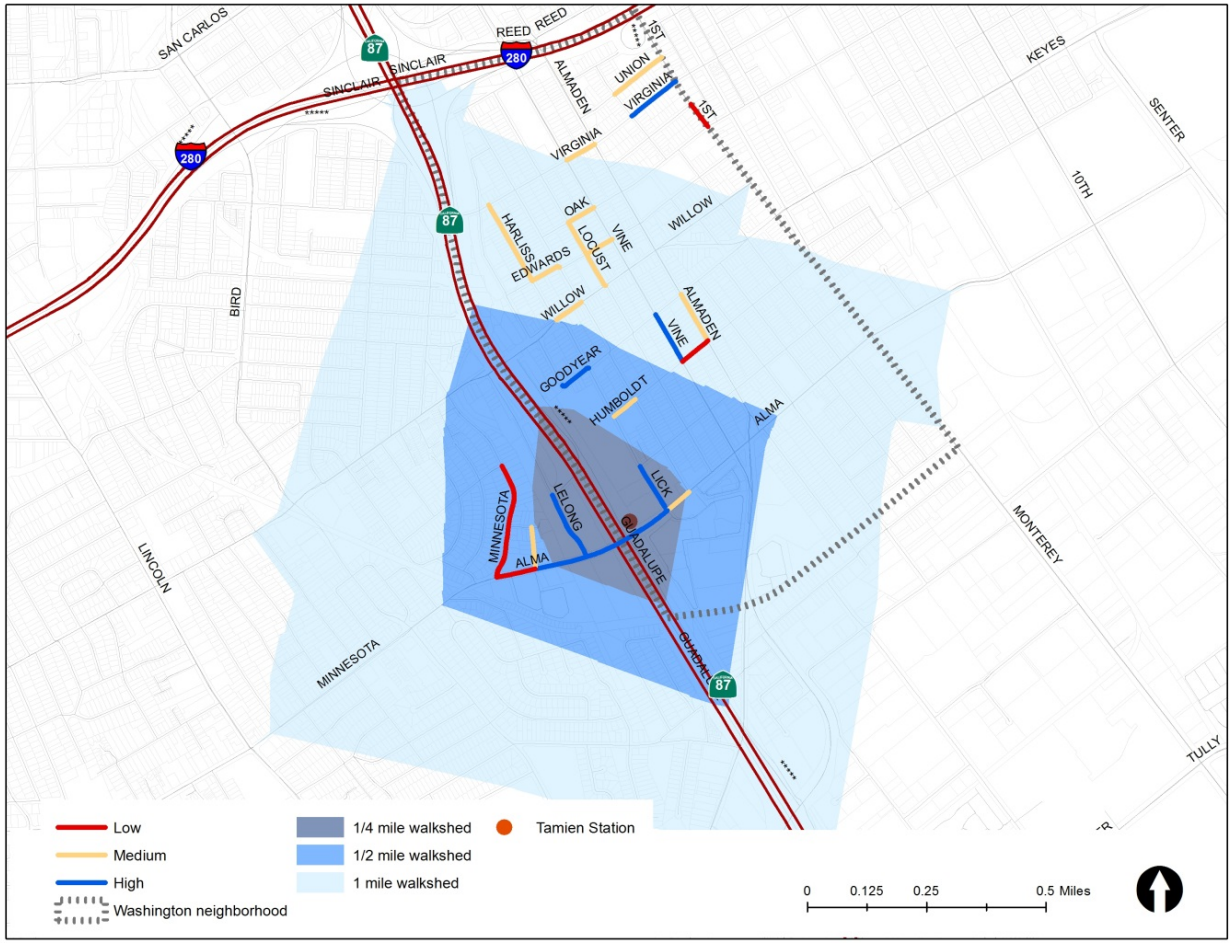
The findings from the audit variables investigating the attractiveness of existing lighting and signages shows that less than a quarter of the quality and type of light fixtures within the study area were attractive. Almost all areas were audited during the day, although site visits during late evening hours and at night were also undertaken. The findings of the data and from personal observation show that the area outside Tamien Station as well the adjacent older development area had inadequate type and amount of lighting and lacked clarity of signages. This was observed to be a great hindrance in navigation by pedestrians as well as automobiles.

From two hundred eighty-six audit variables, less than eighty variables were grouped to form eight elements in order to visually represent these urban design variables and derive conclusions from the analysis that will benefit future planning efforts and influence current planning decisions for projects in pipeline. The selection of a detailed IMI audit tool allowed fine grained data collection for the twenty-five randomly selected streets.

5.1 Findings by Element

Ease of Crossing

Figure 12: Ease of Crossing Around Tamien Station, San Jose, CA. Source: Map created by Priya Gopalkrishnan based on Audit Findings.



The purpose of this section is to understand the findings from the analysis of the various elements that influence Urban Design, which are visually represented using GIS.

Figures 12 to 19 visually represent the urban design elements chosen for this research based on the audit variables,[122] that were either created or selected based on the element definition[123] and which provide structure for this research, forming the basis for urban design guidelines that follows in the latter part of this report in Chapter 6.

The Figure 12 describes the three consolidated score ranges from grouping of the audit data variables, collected for the element ease of crossing the street, as shown above. The three ranges include high, medium, and low, which is the equivalent of good, fair, and poor, when the figure describes elements that are largely qualitative in nature, for example, human scale.

Ease of crossing in this research is a grouping of various attributes of physical qualities of the space that satisfied the conditions for ease in crossing faced by any pedestrian user of the space around this Tamien Station area. These attributes listed include, places intended for pedestrian crossing (at the intersections as the study area did not have any mid-block crossings), presence of curb cuts where crossing takes place, convenience in using curb cuts, crosswalk wait times that would allow pedestrian crossing accounting for children, seniors, and people with disability, and number of vehicle lanes for auto travel.[124]

Map color red shows streets with low or a poor score, orange color represents streets with medium or fair score, and blue-colored streets in the figure

[122] Kristen Day, et al., "Codebook: Irvine Minnesota Inventory for Observation of Physical Environment Features Linked to Physical Activity," Codebook (2005), https://webfiles.uci.edu/kday/public/Final_Codebook.3.pdf (accessed Feb 05, 2013).

[123] Reid Ewing and Otto Clemente, *Measuring Urban Design: Metrics for Livable Places (Metropolitan Planning+Design).* (Washington, DC: Island Press, 2013).

[124] Kristen Day, et al., "IMI: Irvine Minnesota Inventory (paper version)," https://webfiles.uci.edu/kday/public/index.html; Appendix A.

above depict a high or good score. Hence, streets denoted in red are difficult to cross, and those depicted in blue are easier to cross. During the audit data collection and observation process, people were seen crossing a difficult street with a lack of one or more of the above attributes, including places where a mid-block crossing would have been appropriate. In addition, the map showing ease of crossing at the intersection level show a low presence or absence of the above variables, depicted as a red dots, where some of the attributes are present, depicted as orange dots, and where all of the variables are present, depicted as blue dots.

Seven blue streets out of twenty-five score high in ease of crossing the street. Streets marked in orange as mostly in the older Washington residential neighborhood have a medium (fair) score, where streets are fairly easy to cross, including areas with corner store grocery, institutional or church buildings that often attract lot of traffic, both vehicular and foot. The majority of streets shown in red in the newer Tamien area score poorly due to low or no presence of some or all of these variables, namely; places intended for street crossing, presence of curb cuts, condition and convenience of curb cuts, especially for elderly and people with children, presence of a traffic signal, wait times for crosswalks, and higher number of vehicular travel lanes.

Imageability

Figure 13: Imageability of the Study Area Around Tamien Station in San Jose, CA. Source: Map created by Priya Gopalkrishnan based on Audit Findings.

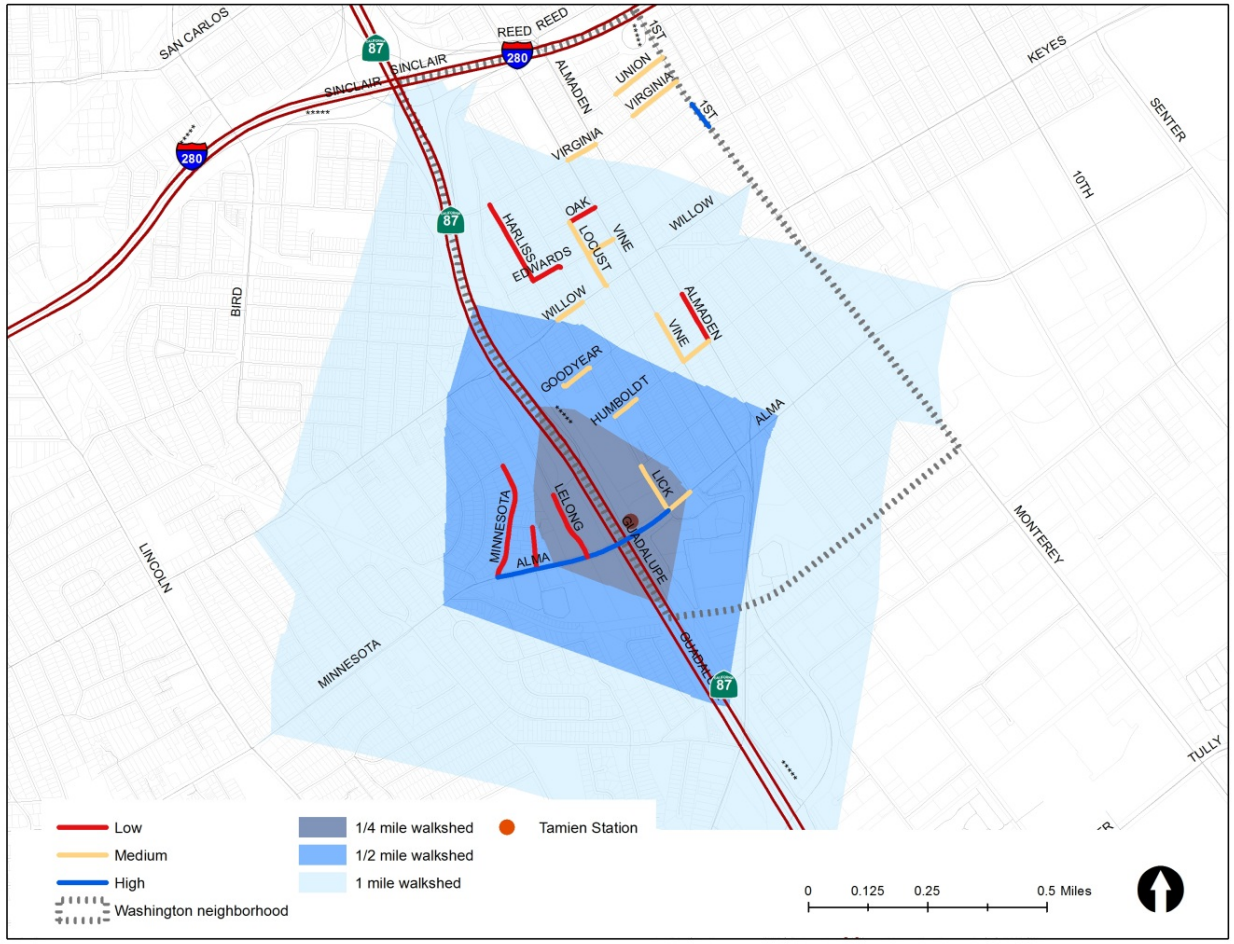


Figure 13 shows the neighborhood characteristics that define the identity of a place. Elements of neighborhood identity are grouped to form the urban design element of **imageability**. The authors Reid Ewing and Otto Clemente, wrote in, *Measuring Urban Design*, "Imageability is the quality of a place that makes it distinct,

recognizable, and memorable."[125] Imageability is further defined by many theorists of the urban realm, including Kevin Lynch and Jan Gehl, as places with a certain focal point, an identifiable landmark, which provides visual orientation to the user of that space. According to Reid Ewing and Otto Clemente, "Imageability of a space also depends on multiple urban design elements like legibility, human scale, complexity, and transparency."[126]

Imageability or neighborhood identity element in the research is a grouping of various attributes of the physical space that include the variables as follows. The presence of a neighborhood entry or signs that suggest that one is entering a special area[127], presence or absence of vacant commercial spaces[128], presence of playing or sports field[129], presence of a courtyard or a plaza space[130], presence of sidewalk coverage[131], the slope of the street segment[132], size of the trees along the segment[133], how interesting the architecture and urban design of that street segment was[134], perception of crime and personal safety while walking along the street[135], the number of people walking on the street during the duration of the audit[136], and the number of people standing on the street during the entire time of this observation[137]. Four of the ten streets from the

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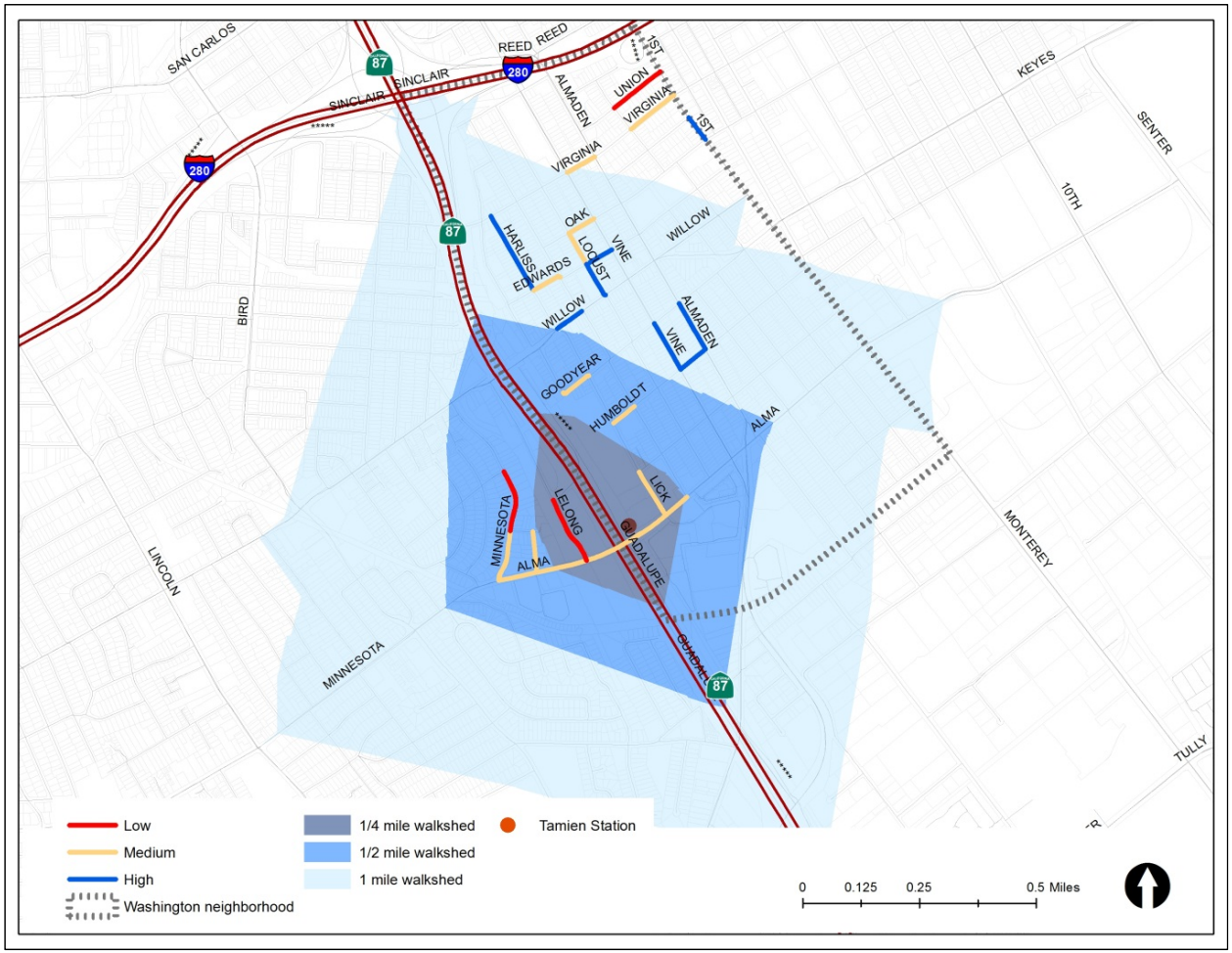
[125] Reid Ewing and Otto Clemente, *Measuring Urban Design: Metrics for Livable Places (Metropolitan Planning+Design).* (Washington, DC: Island Press, 2013), *6*
[126] Ibid.
[127] Kristen Day, et al., "IMI: Irvine Minnesota Inventory (paper version)," https://webfiles.uci.edu/kday/public/index.html; Appendix A., Imageability
[128] Ibid.
[129] Ibid.
[130] Ibid.
[131] Ibid.
[132] Ibid.
[133] Ibid.
[134] Ibid.
[135] ibid.
[136] Ibid.
[137] Ibid.

newer development rate poorly, with few streets having a high imageability in the newer Tamien neighborhood. The older neighborhood had a large number of medium scoring streets (ten out of fifteen) due to the architectural style and presence of elements such as front porches, grocery stores, outdoor seating as compared to the newer Tamien neighborhood where only one street satisfied the maximum number of variables of imageability.

The streets scored poorly due to many missing elements, such as parks, courtyards, plazas, landscape features, variety of buildings in different shapes and forms, pedestrian density during the day, many vacant sites, high noise levels on poor scoring streets, and very few restaurants and outdoor dining spaces.

Enclosure

Figure 14: Enclosure Around Tamien Station, San Jose, CA. Source: Map created by Priya Gopalkrishnan based on Audit Findings.



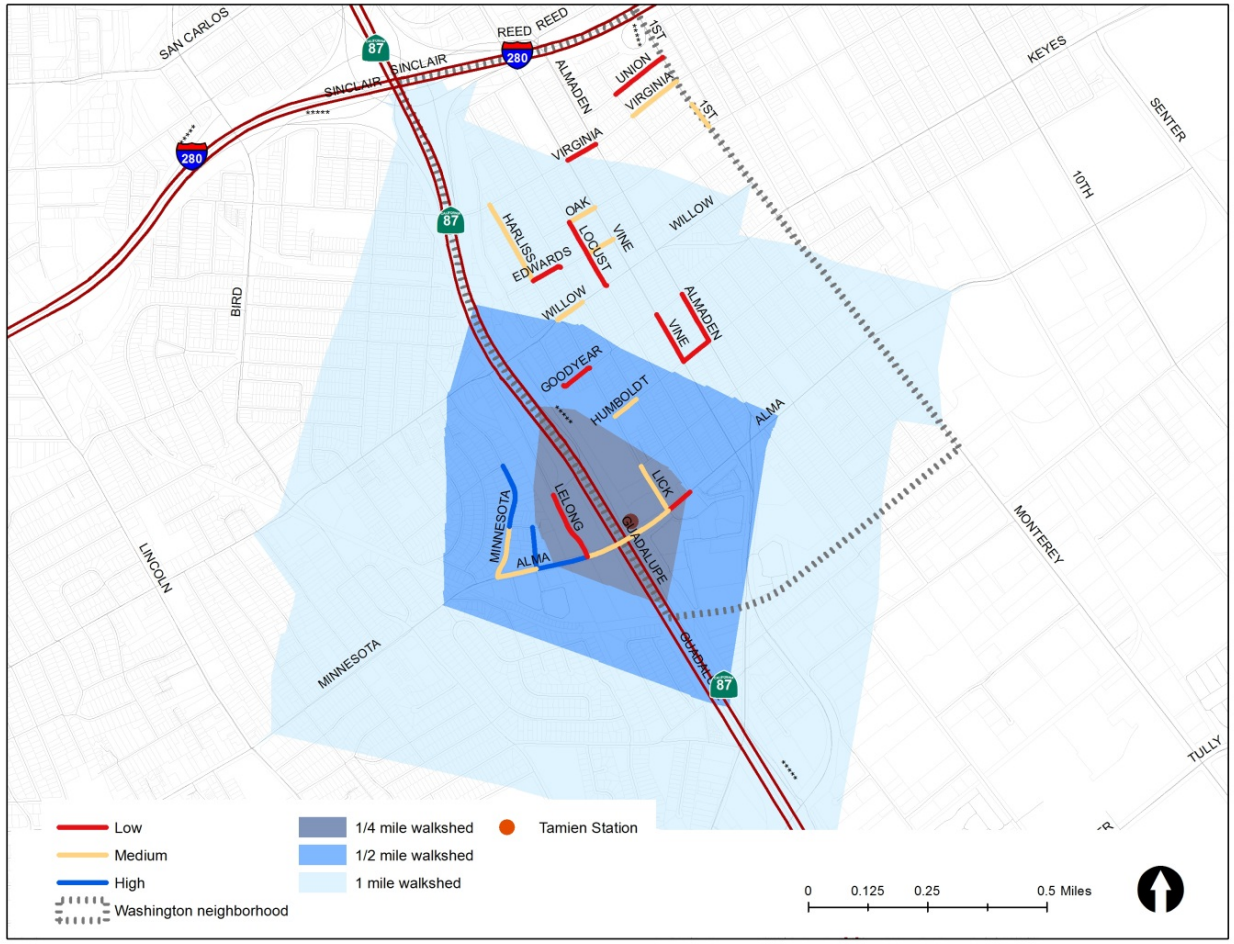
The street envelope is the presence of buildings and landscaping in the order that creates a sense of enclosure. Enclosure depicted in the figure on the side, is a grouping of many attributes that include, presence of sidewalk coverage elements, such as arcades, which enables buildings being footed on the street, awnings, number of street trees on the segment, width of the buildings along the block adjacent to the street, such as wide, medium, and narrow width.[138]

One arterial street leading to Route 87 had very low enclosure score. The newer neighborhood streets predominantly scored medium due to good street canopy achieved by trees lined at intervals between the sidewalk and the street, and due to the number of narrow to medium width buildings.

[138] Ibid.

Transparency

Figure 15: Transparency Around Tamien Station, San Jose, CA. Source: Map created by Priya Gopalkrishnan based on Audit Findings.



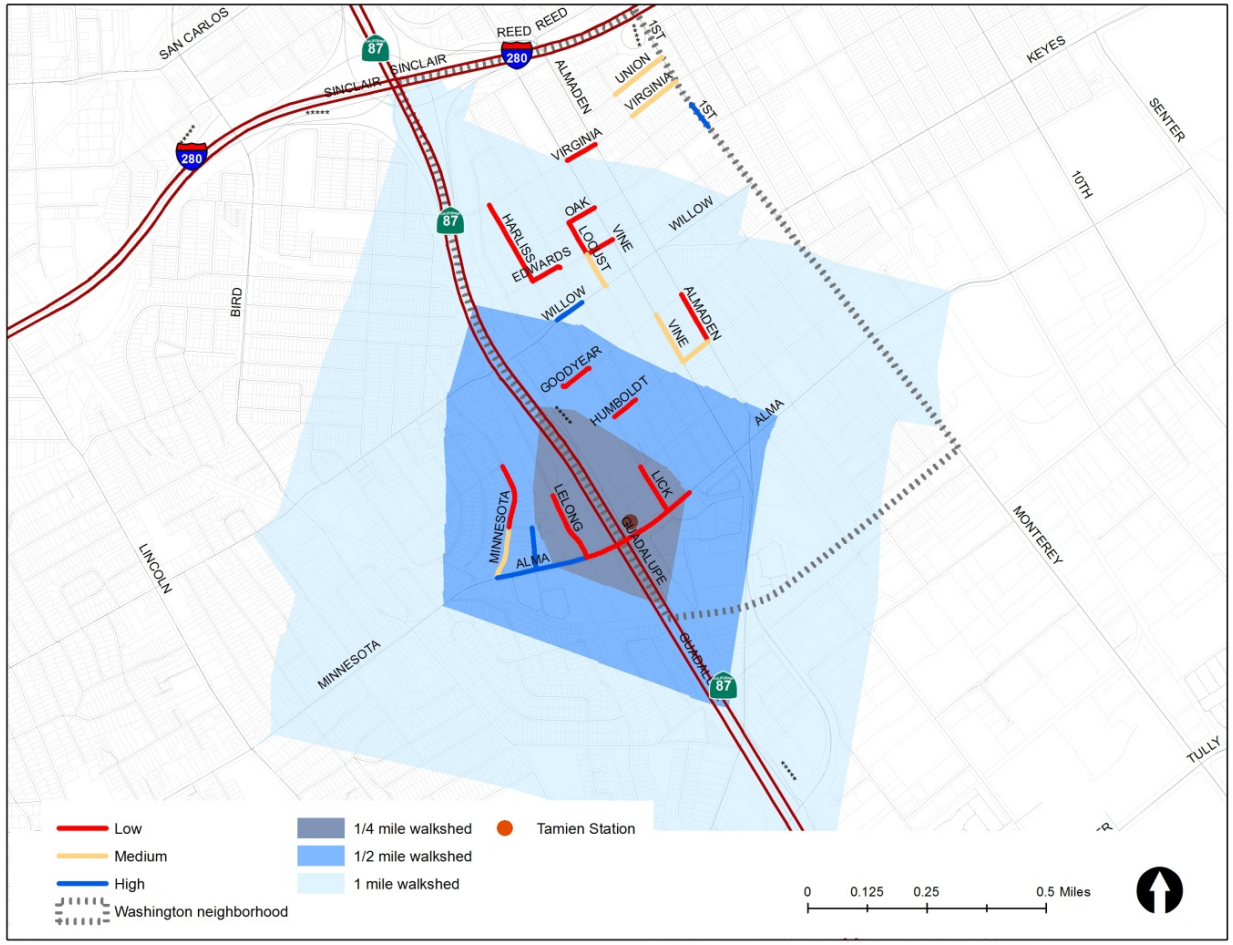
Transparency is the element that describes the activities at the street level adjacent to buildings. The figure to the left shows the element of transparency which is a grouping of various variables, including the presence of buildings with bars on windows[139], the presence and the proportion of blank walls along the street, presence of a mural or an art feature along the street audited, the visual interaction between the pedestrian and activities occurring at the first level of the building along the street, the elevation treatment in physical or visual hierarchy of wide buildings with architectural details and the use of colors, the number of separate vehicular entrances along the street block, presence of visible dumpsters, and the presence of broken windows along the street audited. All of the variables selected in studying the urban design element of transparency were weighted equally.

Two of ten streets from the newer neighborhood had a poor transparency score, while it was eight of fifteen in the Washington neighborhood. It was the newer Tamien neighborhood that had higher scores than the Washington neighborhood, which had a quarter of audited streets with medium scores. Streets scored high or medium largely due to the presence of many variables including street wall length, many windows over blank long street walls, variety of building facades, separate building entrances, variety in elevation treatments on building facades that reduced the monotony, depth achieved due to window styles and treatments, fewer broken windows or iron bars, fewer dumpsters visible, and the ground floor activities largely visible to the pedestrian creating a connection between the public and the private realms.

[139] Ibid.

Human Scale

Figure 16: Human Scale Around Tamien Station, San Jose, CA. Source: Map created by Priya Gopalkrishnan based on Audit Findings.

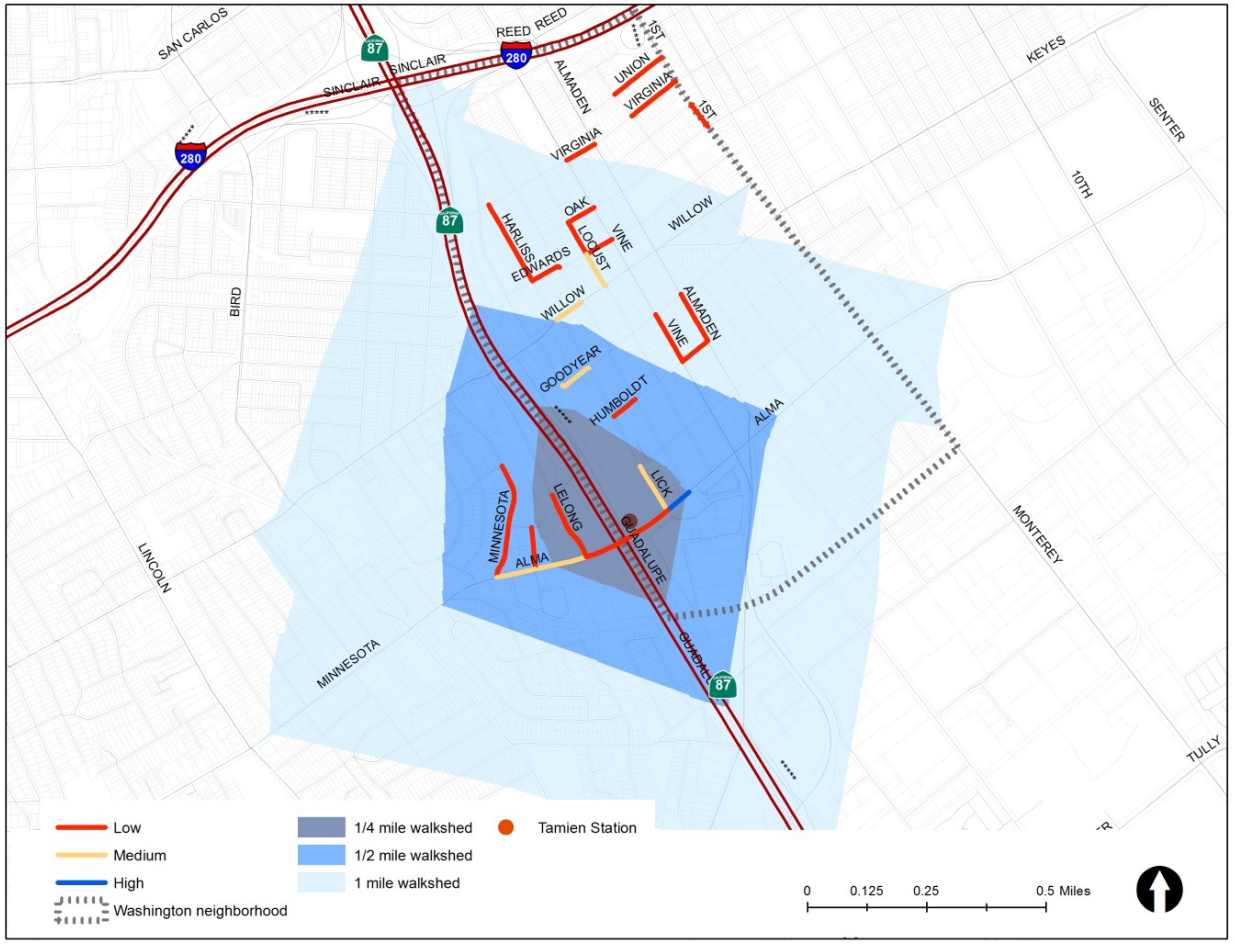


Human scale, as an element of urban design, is the relationship between the building along the street and visual eye level cone of a pedestrian (Figure 16). The adjacent figure denotes human scale represented visually based on the data analyzed that was gathered for the twenty-five streets through field observation and inputting data on the paper audit tool of the IMI, version two. The variables that were grouped in order to evaluate human scale, included presence of recreational facilities, presence of religious institutions like churches and temples, presence of retail stores, restaurants, fast food chains, presence of medium or large grocery stores, presence of gas stations, presence of nonresidential uses on the ground floor, including restaurants, presence of a public garden, sizes of various trees present of the street, various building heights of buildings present along the street, and the average setback of the buildings from the street or the sidewalk, if present.

Only one-fifth of the audited street blocks had high (blue) scores for human scale as most of the neighborhood had a low (red) score. High scores were due to the presence of many variables, namely, variety in land use, neighborhood retail, commercial uses and mixed use multistoried buildings, presence of different food options, many amenities, including grocery stores and gas stations, public gardens or trails, shaded sidewalks due to large tree canopy, variable building heights and short setback from the street.

Pedestrian Amenities

Figure 17: Pedestrian Amenities Around Tamien Station, San Jose, CA. **Source:** Map created by Priya Gopalkrishnan based on Audit Findings.



Pedestrian amenities along the sidewalk are shown in Figure 17. This element consists of many variables, including the presence of benches or chairs[140], presence of bus stops with seating, presence of ledges for sitting, and presence of other amenities such as heat lamps or fountains.

The image above shows the audited streets, a majority of them are depicted in red for scoring low in having pedestrian amenities. The newer neighborhood had an equal number of high and medium scored streets while the older neighborhood had more streets in red. It is apparent that the newer development around Tamien Station has more amenities in contrast to those surrounding the Washington station. The selected streets along the main arterial road with a low score, includes Alma Avenue, in the newer neighborhood, is adjacent to a major thoroughfare as VTA transit buses run along the east-west corridor, connecting Eastridge to West Valley, San Jose. The medium scoring streets had fewer outdoor dining areas, bus stops with seating, benches and ledges along sidewalk for sitting. None of the streets had heat lamps, fountains, or public restrooms.

[140] Kristen Day, et al., "IMI: Irvine Minnesota Inventory (paper version)," https://webfiles.uci.edu/kday/public/index.html; Appendix A.

Sidewalk Characteristics

Figure 18: Sidewalk Characteristics of the Study Area Around Tamien Station, San Jose, CA. Source: Map created by Priya Gopalkrishnan based on audit findings.

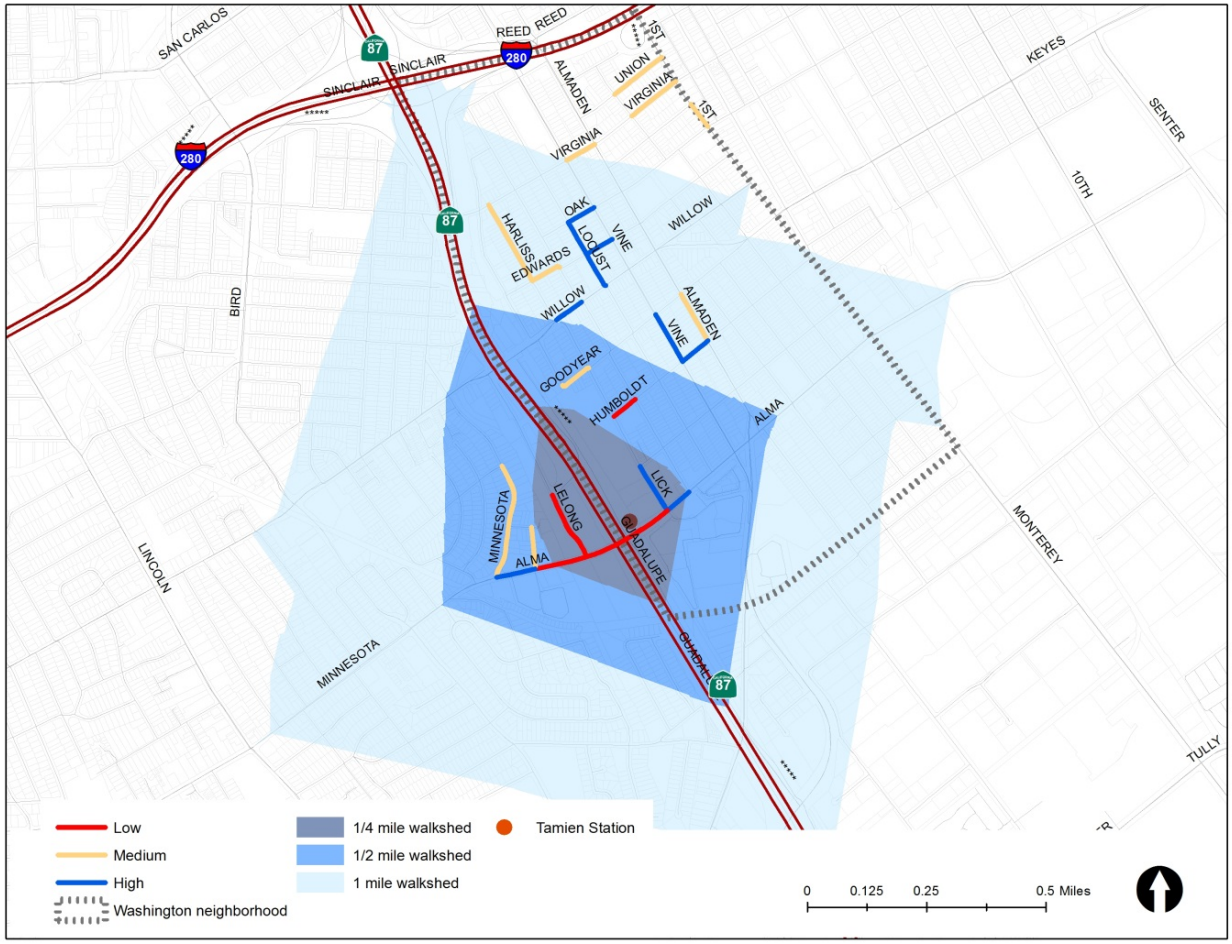


Figure 18 shows the urban design element, sidewalk characteristic, that has been examined through the street audit observation tool and visually represented using Esri's ArcGIS 10.2. The variables in this group include, number of sides of the street where sidewalks are present, sidewalk completeness on one or both sides, width of the sidewalk to accommodate people on foot, and the amount of the sidewalk shaded due to tree canopy.[141]

Less than half of the audited streets as seen in the figure above scored high as represented in blue. Only three streets, including Alma Avenue, a major arterial road, scored low among twenty-five audited streets. The streets in the older neighborhood have a higher presence of sidewalk characteristics including presence of sidewalks on one or both sides of the street, sidewalk completeness and width, and adequate shade provided by tree canopy as compared to Tamien area.

[141] Appendix A, 6

Complexity

Figure 19: Complexity Around the Study Area at Tamien Station, San Jose. Source: Map created by Priya Gopalkrishnan based on audit findings.

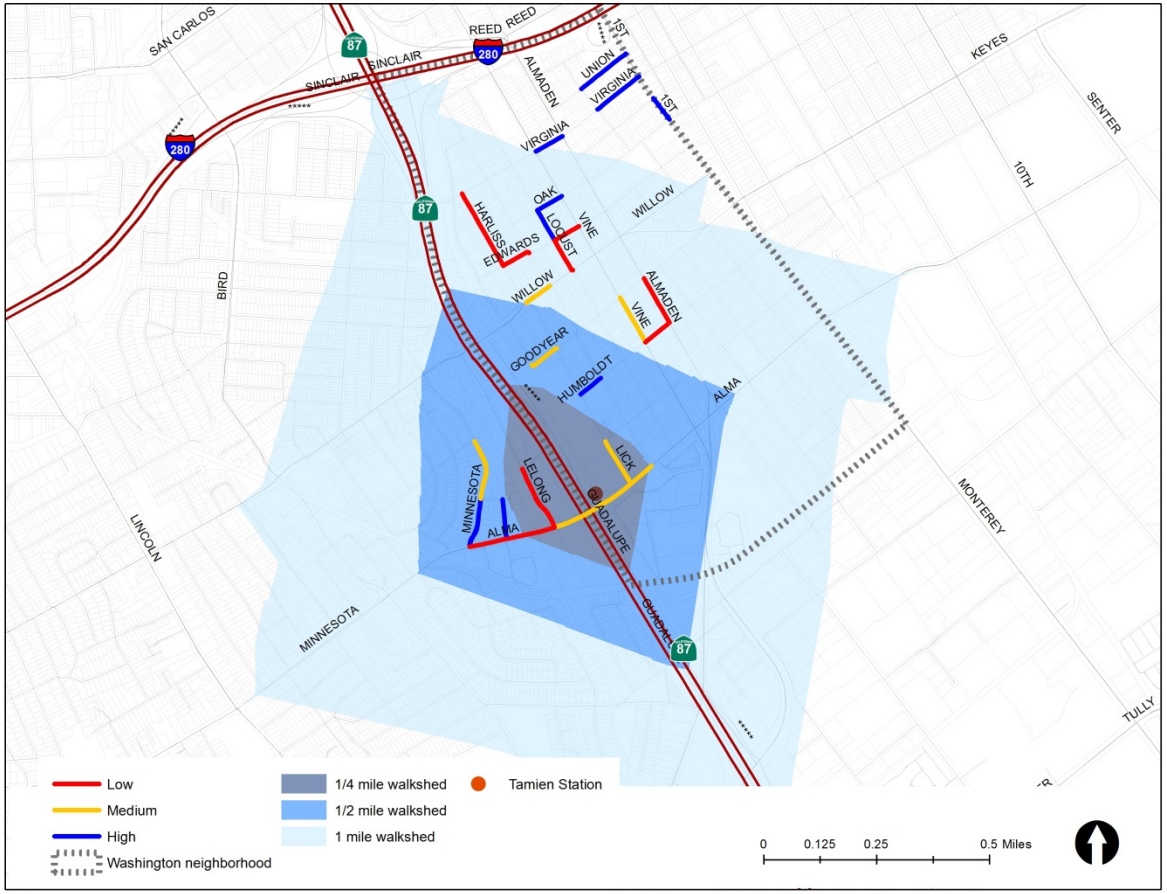


Figure 19 represents a very important urban design element known as complexity. Complexity is the variety and number of physical elements measured. It is observed that newer buildings are much wider than older

style of construction partly due to the current modernist style as well as advancements in building construction and technology used today. Although complexity is an element that is examined through various elements in combination, it is also dependent on other elements such as imageability, enclosure, and human scale. The variables in the group include presence of a mural or an decorative feature on blank walls adjacent to the street segment audited, the number of separate buildings on the block, the color of buildings along the audited street segment, whether the façade of the signage of most buildings appealing or interesting, presence of billboards, presence of a dominant unpleasant smell, and the presence of air pollution that can be caught by smell or sight.[142]

The image above shows an even number of high, medium, and low scoring streets in blue, orange, and red, respectively. Predominantly single family residences along streets have high complexity scores as evidenced by the literature of streets achieving a finer quality. Alma and Lick Ave., both major and minor arterial roads leading up to the Tamien Caltrain Station have a medium score due to fewer variables present and presence of vacant land. The part of Alma Avenue and Lelong Street that led to the VTA Station parking lot entrance and the freeway entrance scored the lowest in the Tamien area, compared to streets in Washington neighborhood that were adjacent to car dealerships or industrial and storage sites.

Streets with fewer numbers of variables, namely murals, visible public art, many buildings with variable heights, colors, variety in building facades, lower pollution or dominant smells had a medium (orange) score.

[142] Kristen Day, et al., "IMI: Irvine Minnesota Inventory (paper version)," https://webfiles.uci.edu/kday/public/index.html; Appendix A.

5.2 Findings by Variables

Of the 286 variables, sixty formed the key variables analyzed while studying the area through the eight elements as discussed in section 5.1. From these sixty variables, twenty main variables are (refer section 5.2) are discussed in detail below.

This section comprises of the analysis from the many variables from audit data that are spatially visualized and represented in the form of GIS maps.

1. The **Figure 20** represents the presence or absence of a monument, a neighborhood identity marker, or banners that denote entry into a neighborhood. Findings from the street segment audit indicate that the area surrounding Tamien Station currently does not have a neighborhood identity. There is no monument or marker indicating an entry into Tamien Area.

Figure 20: Map Showing the Presence of the Monument or Marker Identity Around Tamien Station, San Jose, CA.
Source: Map created by Priya Gopalkrishnan based on Audit Findings.

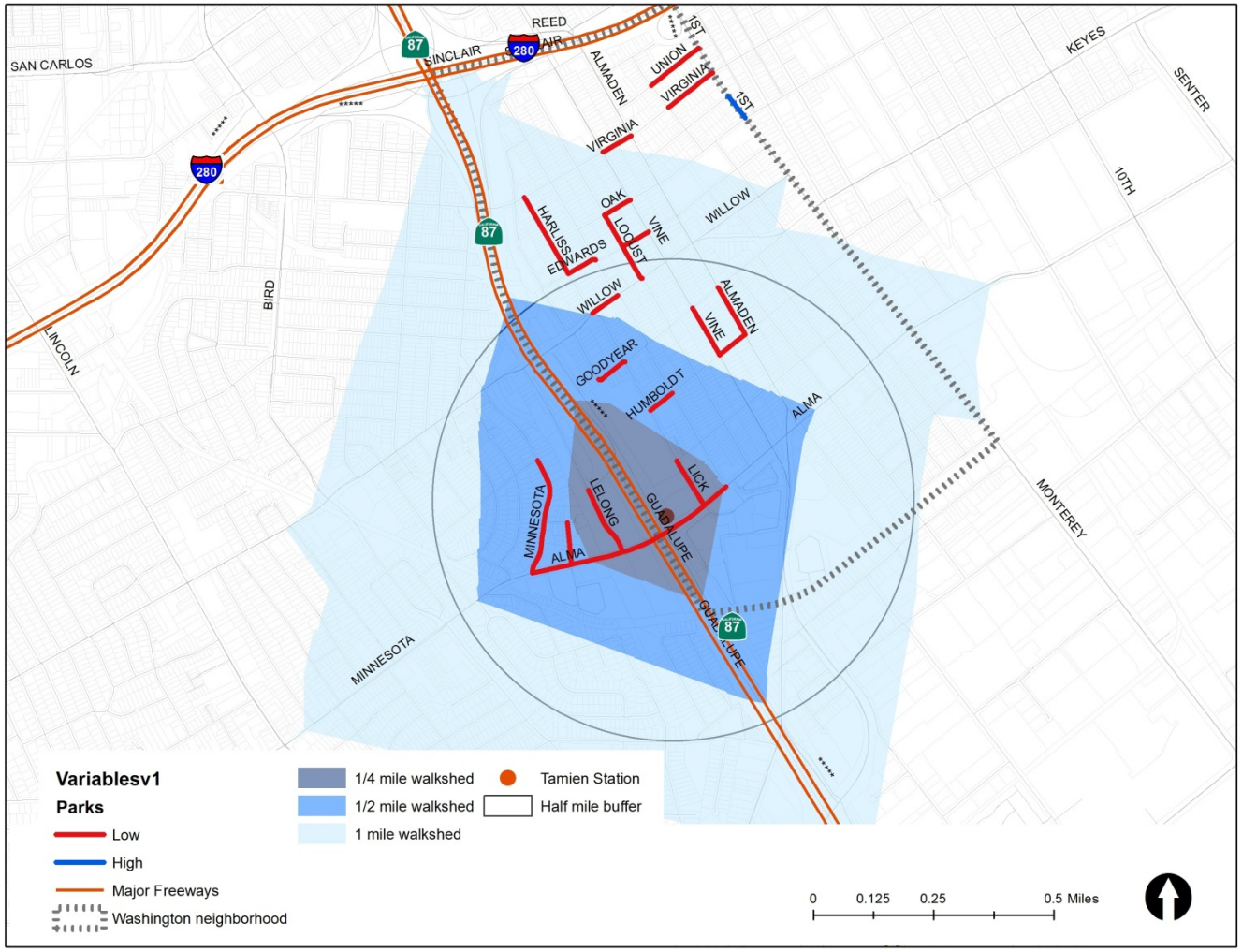
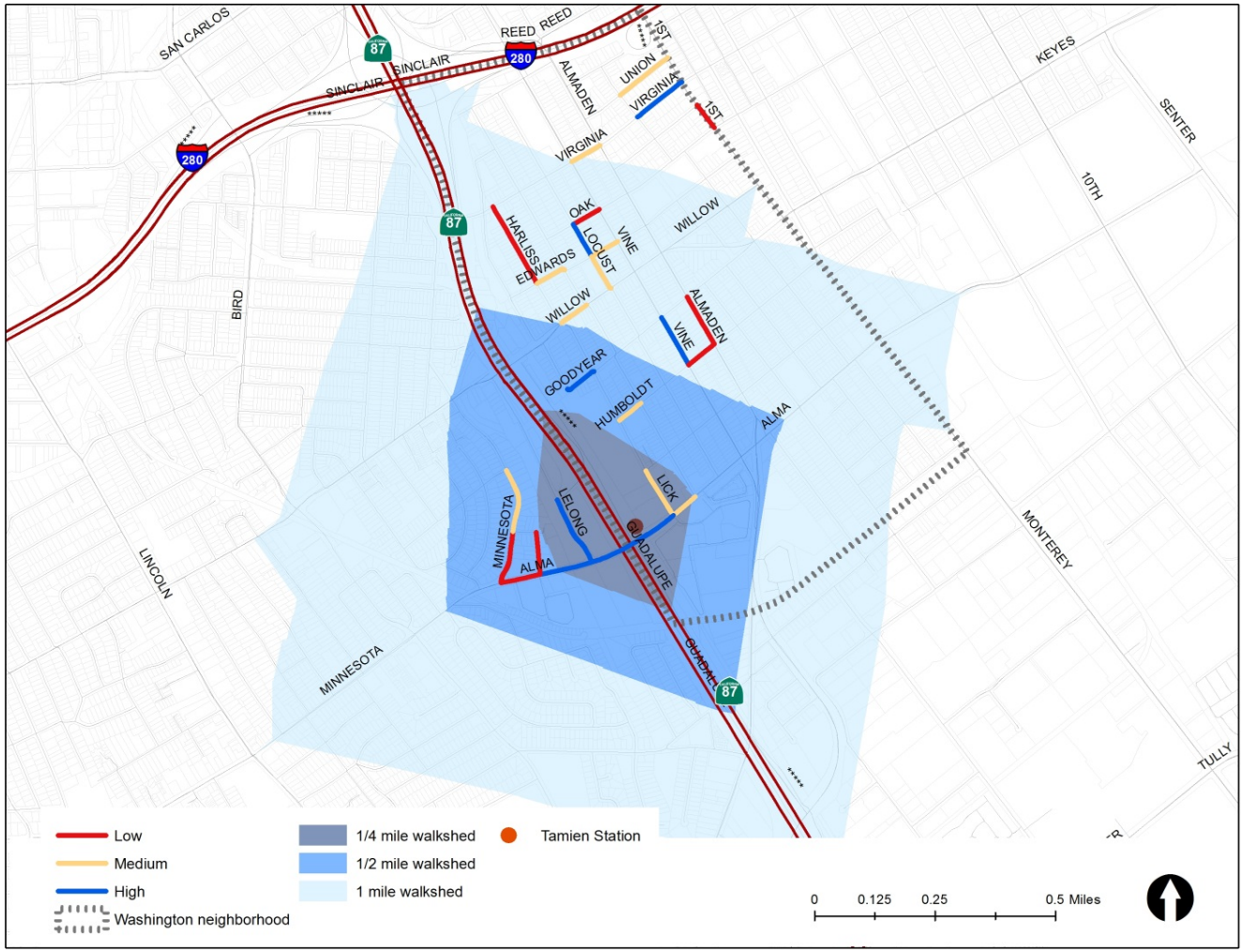


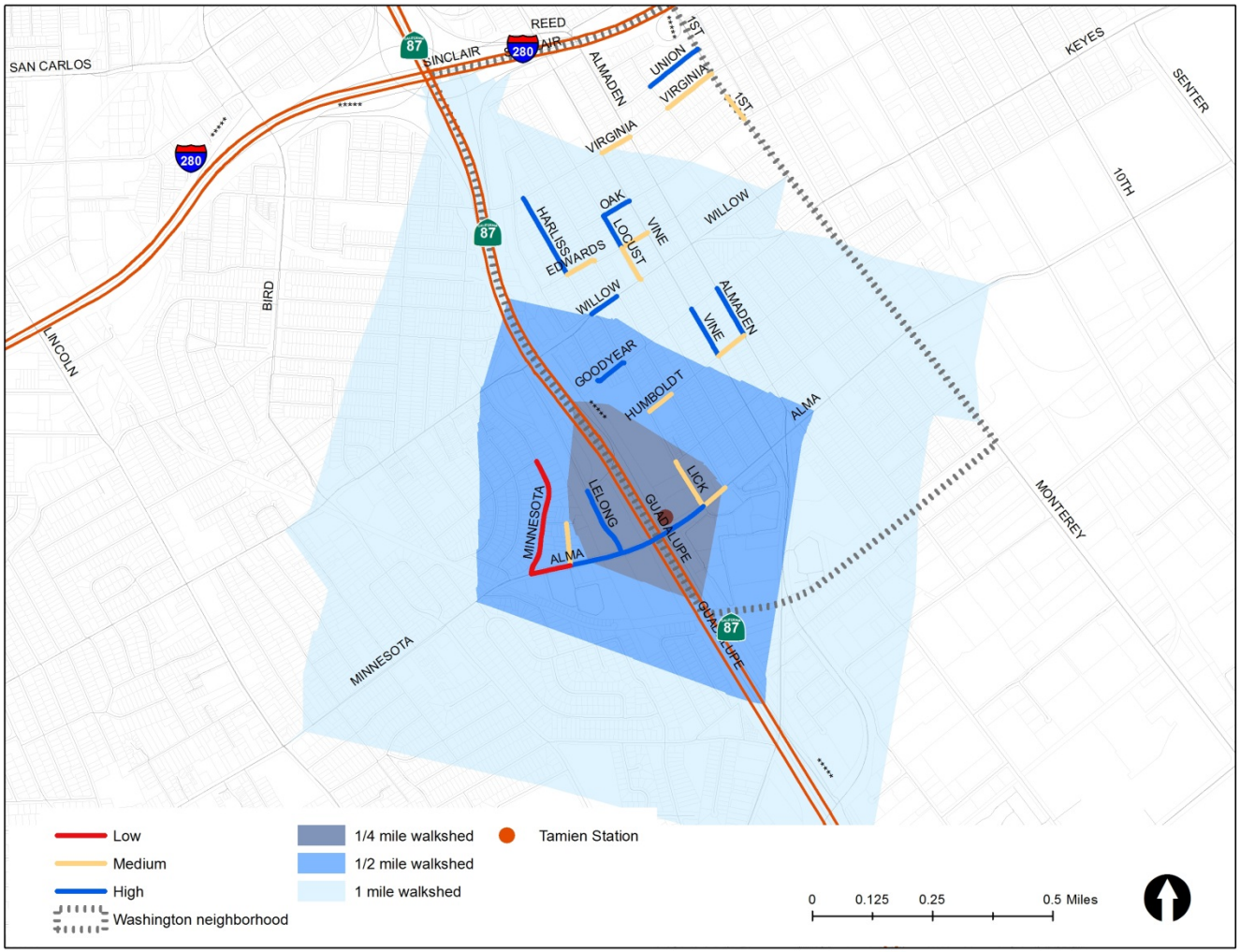
Figure 21: Map Showing the Presence of Marking for Pedestrian Crossing Around Tamien Station, San Jose, CA.
Source: Map created by Priya Gopalkrishnan based on Audit Findings.



2. **Figure 21** represents the presence or absence of markings for pedestrian crossing in places intended for crossing. As seen in the figure, two-thirds of the audited streets have a good to medium score. Streets in the newer Tamien neighborhood all had crossing markings at all places intended to cross.

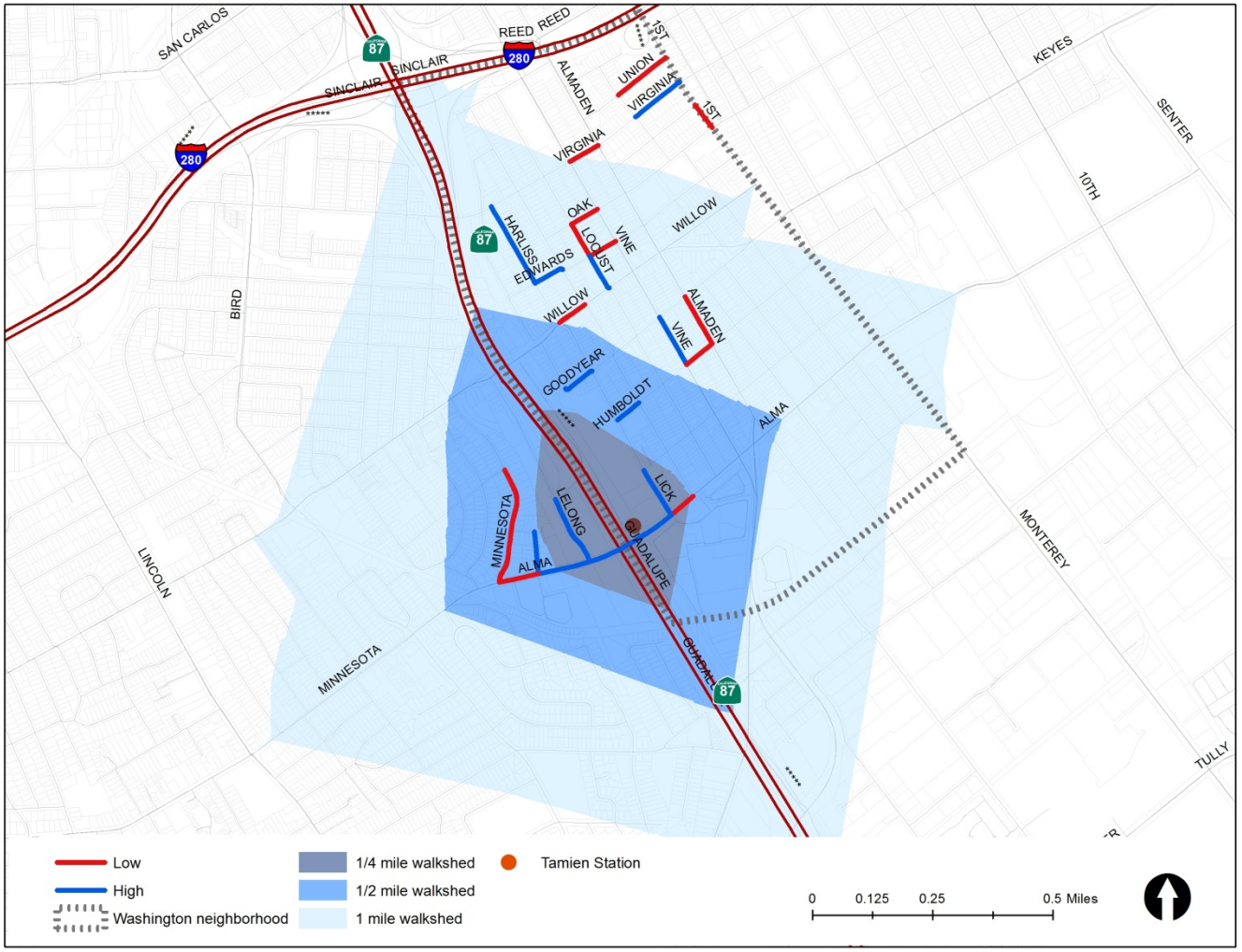
3. **Figure 22** represents the variable presence of curb-cuts. A little less than half of the twenty-five audited streets have curb-cuts used by all pedestrians, including children and elderly.

Figure 22: Map Showing the Variable, Presence of Curb Cuts Around Tamien Station, San Jose, CA. Source: Map created by Priya Gopalkrishnan based on Audit Findings.



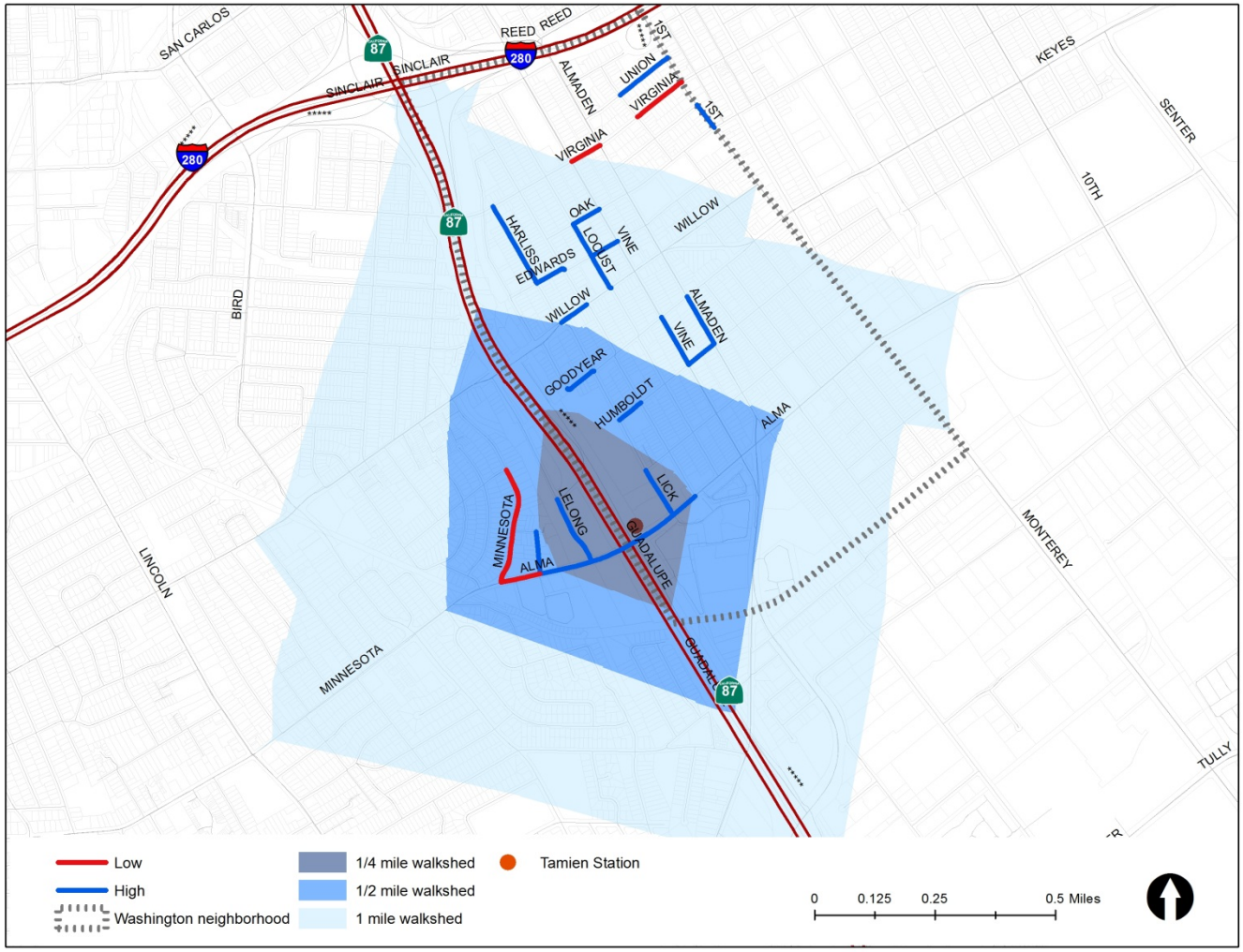
4. **Figure 23** represents the variable convenience of curb-cuts. A little less than half of the twenty-five audited streets have curb-cuts that are convenient to cross for all pedestrians, including children and elderly.

Figure 23: Map Shows the Variable, Convenience of Curb Cuts in the Study Area. Source: Map created by Priya Gopalkrishnan based on Audit Findings.



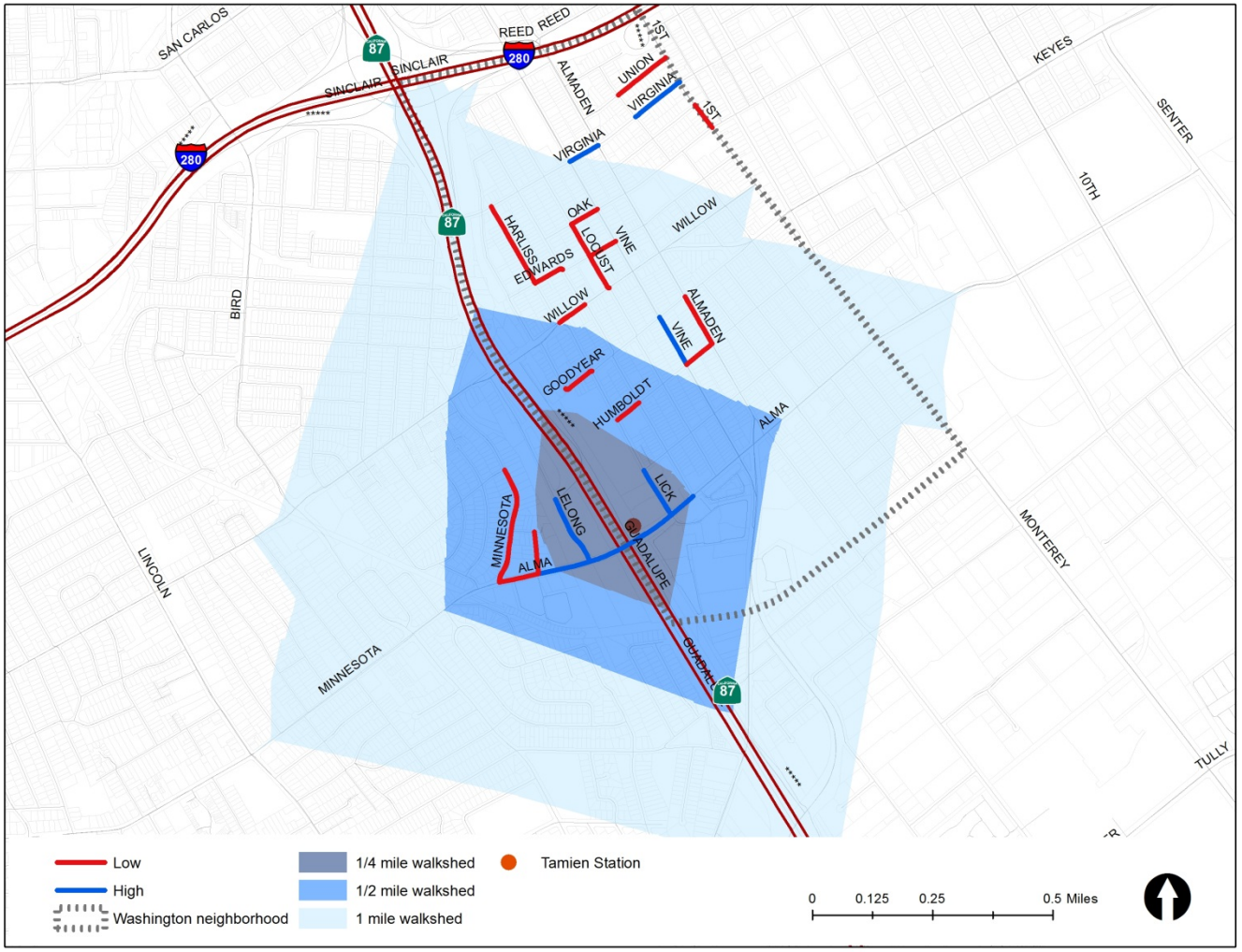
5. **Figure 24** spatially represents the variable condition of curb-cuts. Little more than three-quarter of the audited streets have curb-cuts that are in good condition.

Figure 24: Map Shows the Variable, Condition of Curb Cuts in the Study Area. Source: Map created by Priya Gopalkrishnan based on Audit Findings.



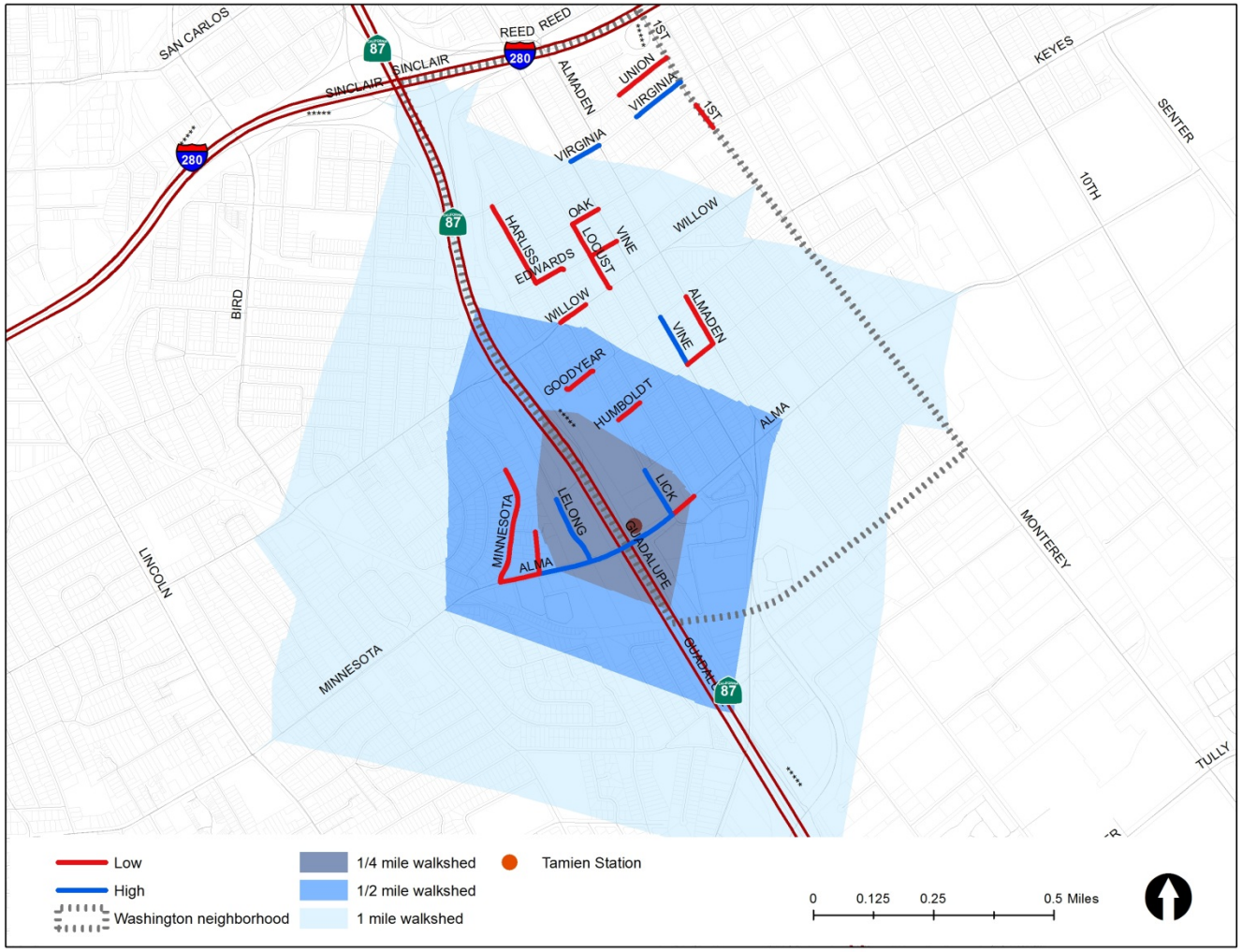
6. **Figure 25** spatially represents the variable presence of traffic signal system. About one-third of the audited streets have a traffic signal system. The Washington neighborhood is predominantly residential with shorter length of streets compared to the arterial roads that fall within the newer neighborhood. Alma Ave. required traffic signals at two intersections as seen on the map. The two streets on Alma and Minnesota intersection are depicted in red. There is a neighborhood grocery store, laundry service, sit-down and fast food restaurants, and a church at this location. People often cross the street this junction when the cars are at a distance that may be a potential danger to their lives.

Figure 25: Map Shows the Variable, Traffic Signal Presence in the Study Area. Source: Map created by Priya Gopalkrishnan based on Audit Findings.



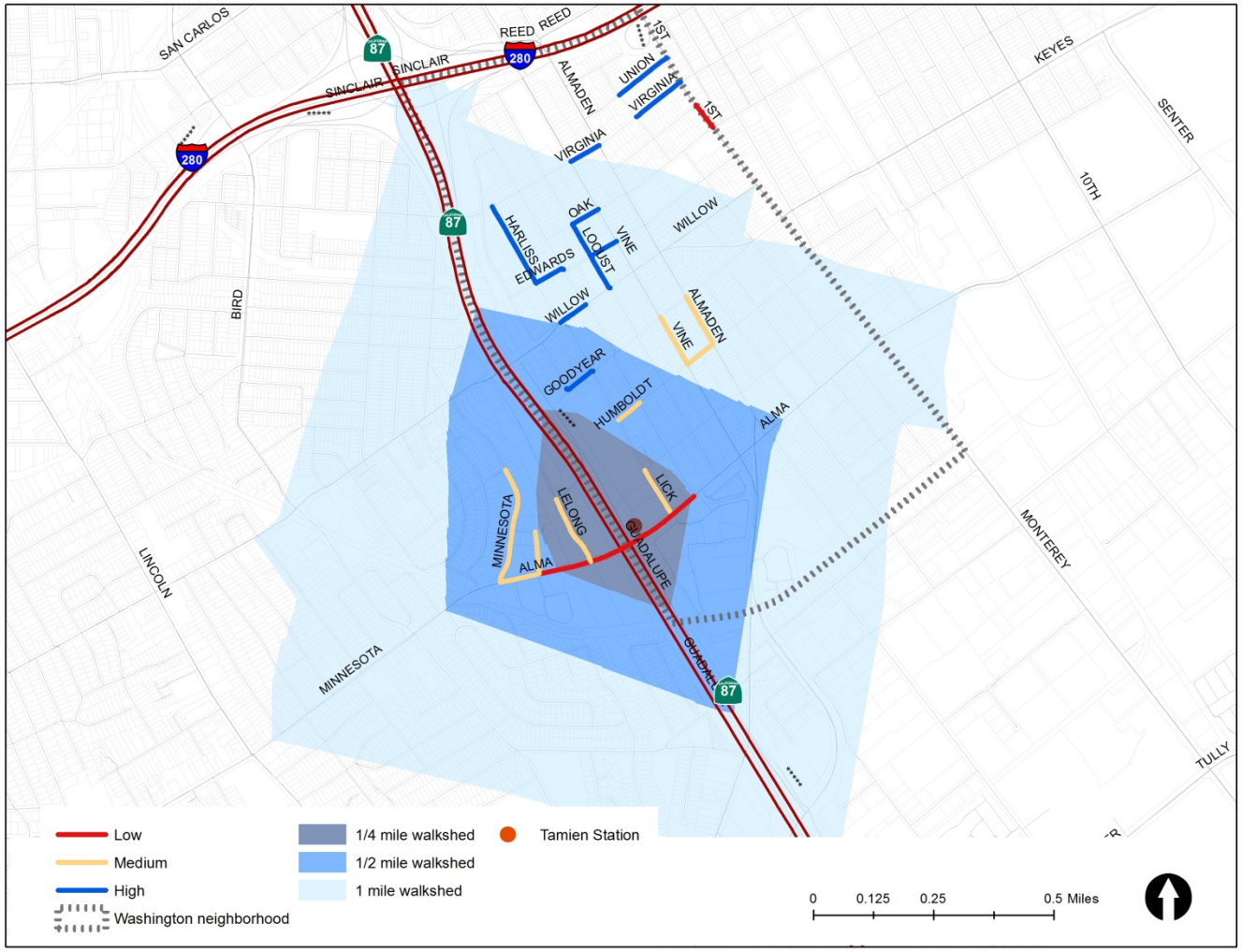
7. **Figure 26** examines to the variable crosswalk wait times. The findings show that crosswalk wait times are better in the newer neighborhood, which allows all pedestrians, including people with disabilities, to cross intersections easily.

Figure 26: Map Shows the Variable, Crosswalk Wait Times in the Study Area. Source: Map created by Priya Gopalkrishnan based on Audit Findings.



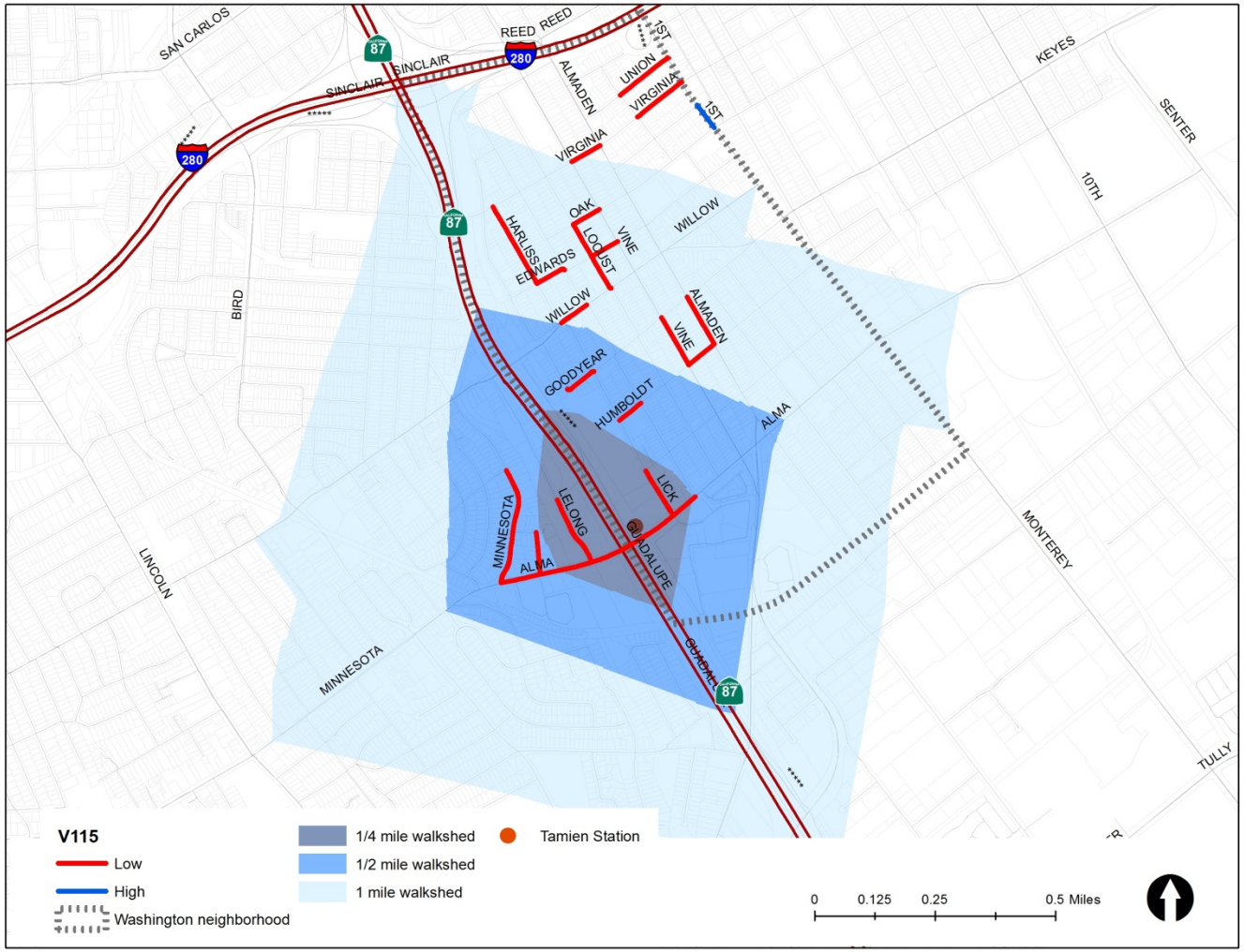
8. **Figure 27** shows the variable number of travel lanes. Alma Ave, an arterial street scored poorly as seen in red, predominantly because it was a six lane street, including left turns. Alma Ave was the main access to the Tamien Station, and the number of lanes discouraged pedestrian use.

Figure 27: Map Shows the Variable, Number of Travel Lanes in the Study Area. Source: Map created by Priya Gopalkrishnan based on Audit Findings.



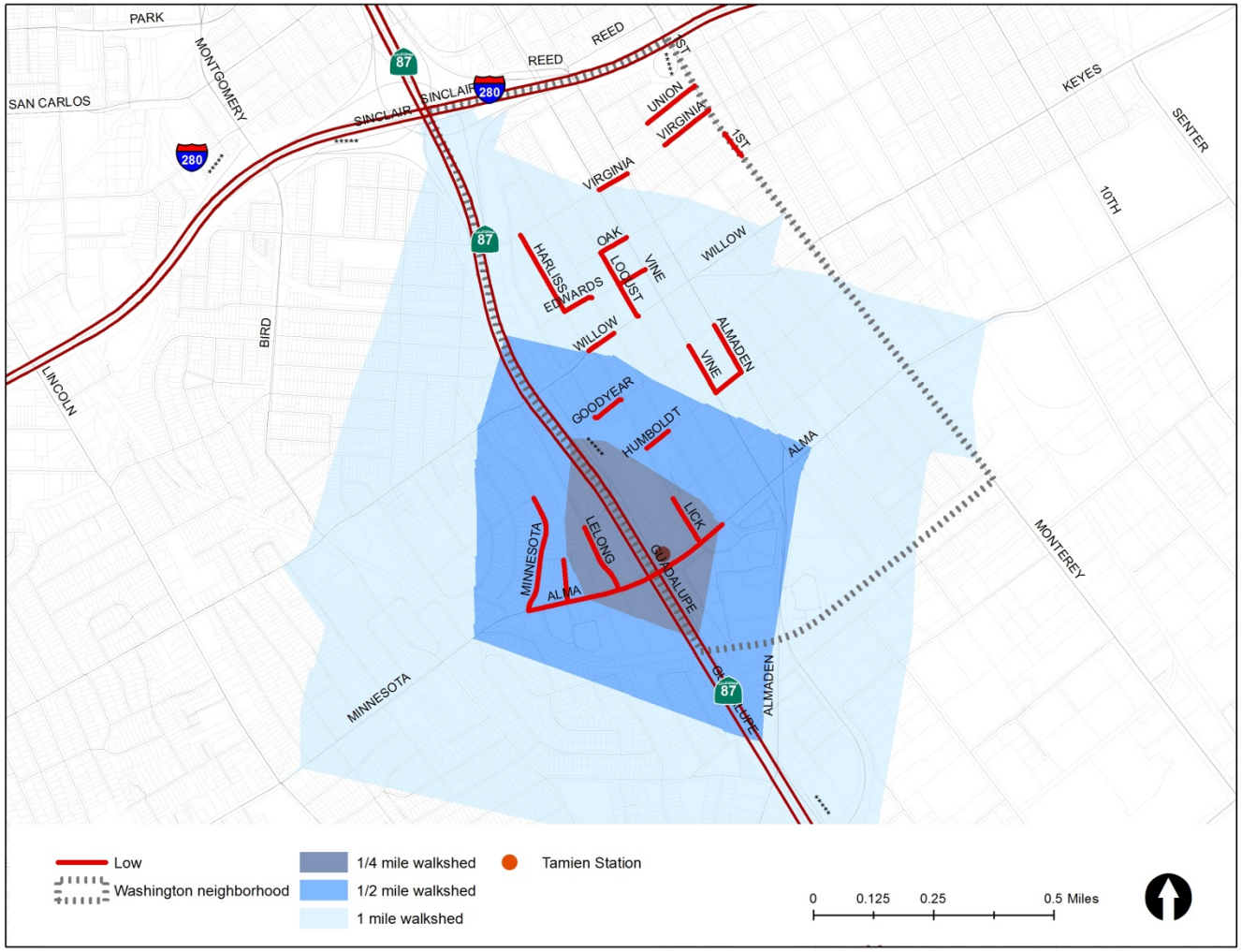
9. **Figure 28** examines the presence of the variable parks and open spaces around the Tamien area. The neighborhood around Tamien lacks open spaces and only one street on S First Street scored high as shown in blue. This street is adjacent to a library branch, which has an open community gathering space.

Figure 28: Map Shows the Presence of Parks in the Study Area. **Source:** Map created by Priya Gopalkrishnan based on Audit Findings.



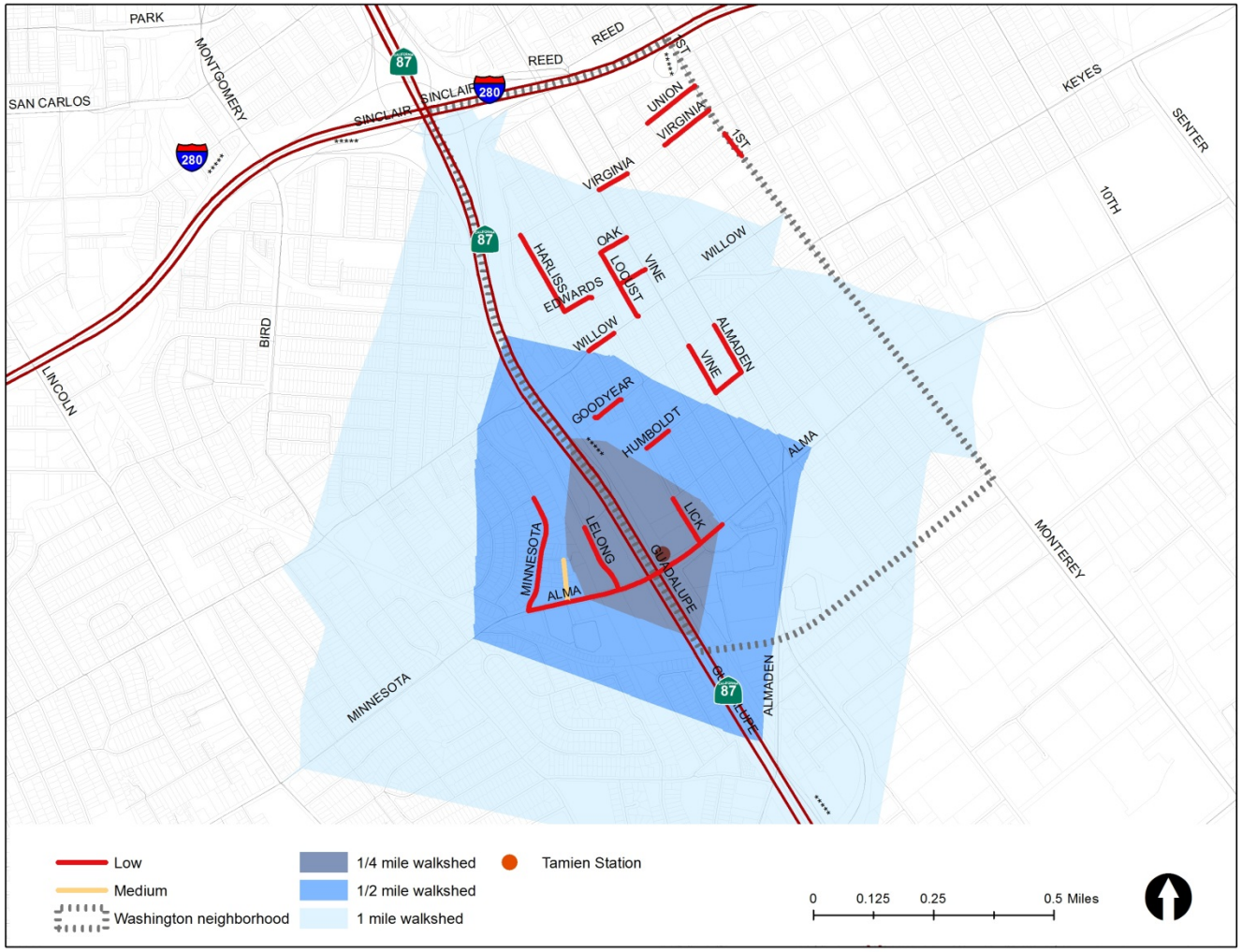
10. **Figure 29** examines the presence of the variable plaza open space. The neighborhood currently lacks designated plaza open spaces. The public/quasi-public open space outside the Tamien station may be used as a plaza open space in the future.

Figure 29: Map Shows the Presence of Plaza Open Spaces in the Study Area. Source: Map created by Priya Gopalkrishnan based on Audit Findings.



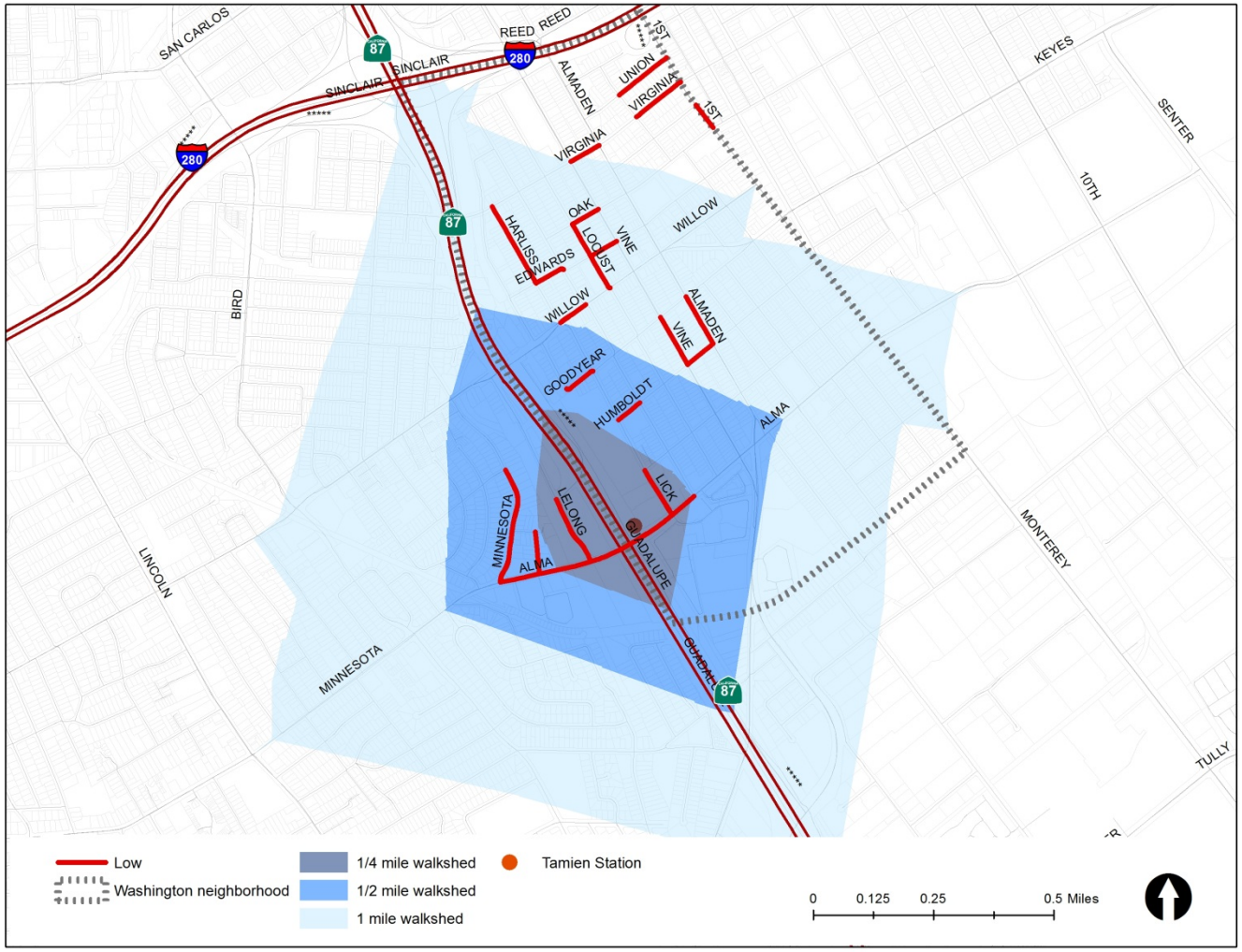
11. **Figure 30** examines the presence of the variable public garden. The neighborhood as seen in previous figures lacks public open spaces. However, along the Guadalupe trail that runs parallel to the Caltrain line, there is a small community garden that goes unnoticed from the main arterial street Alma Ave and which could be a potential public garden if it is opened to the public.

Figure 30: Map Shows the Presence of Gardens in the Study Area. Source: Map created by Priya Gopalkrishnan based on Audit Findings.



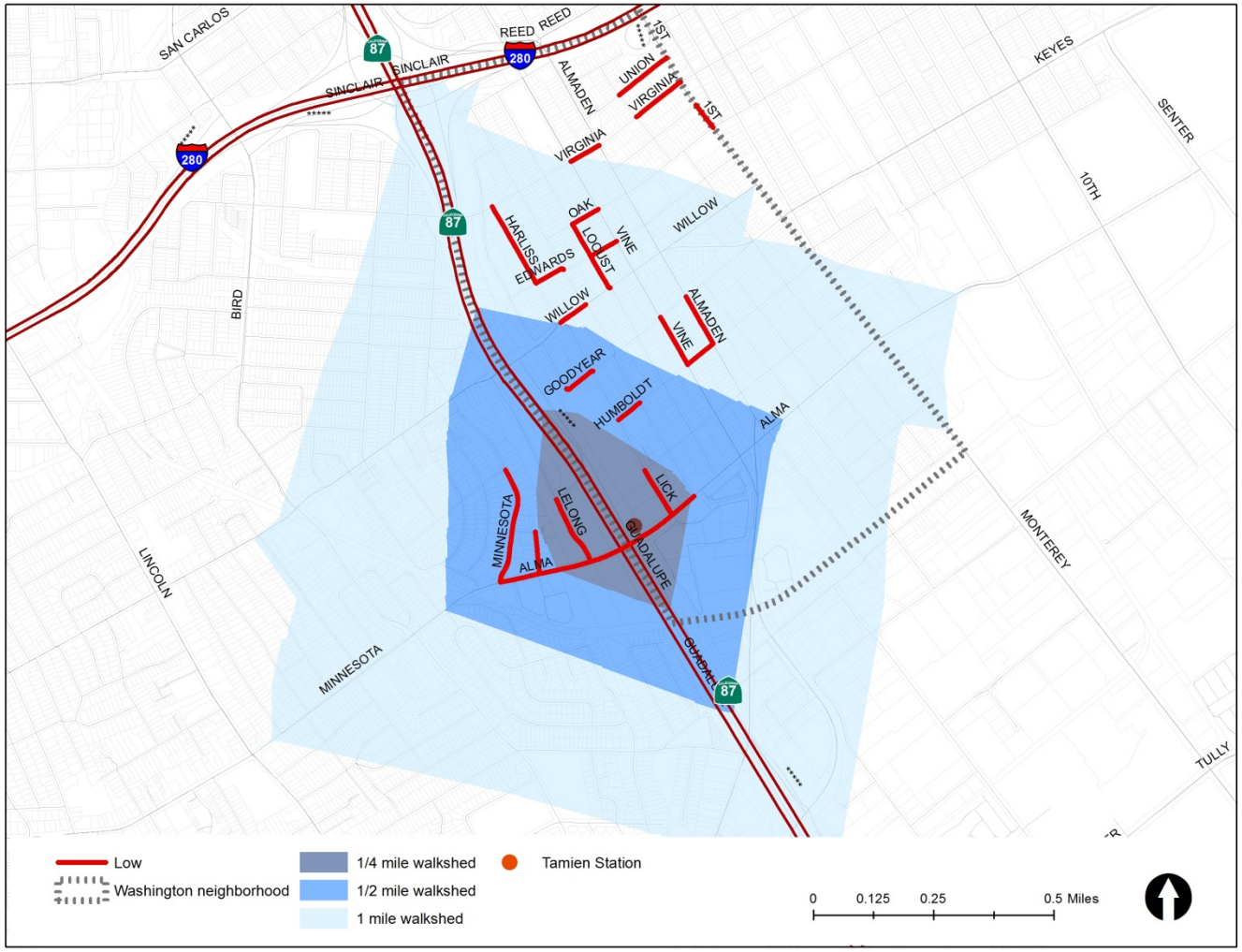
12. **Figure 31** examines sidewalk shading due to the presence of the variable sidewalk coverage by arcade, and as seen in the figure, there are no arcades present within this neighborhood including the arterial street with commercial uses.

Figure 31: Map Shows the Variable, Sidewalk Coverage by Arcades in the Study Area. Source: Map created by Priya Gopalkrishnan based on Audit Findings.



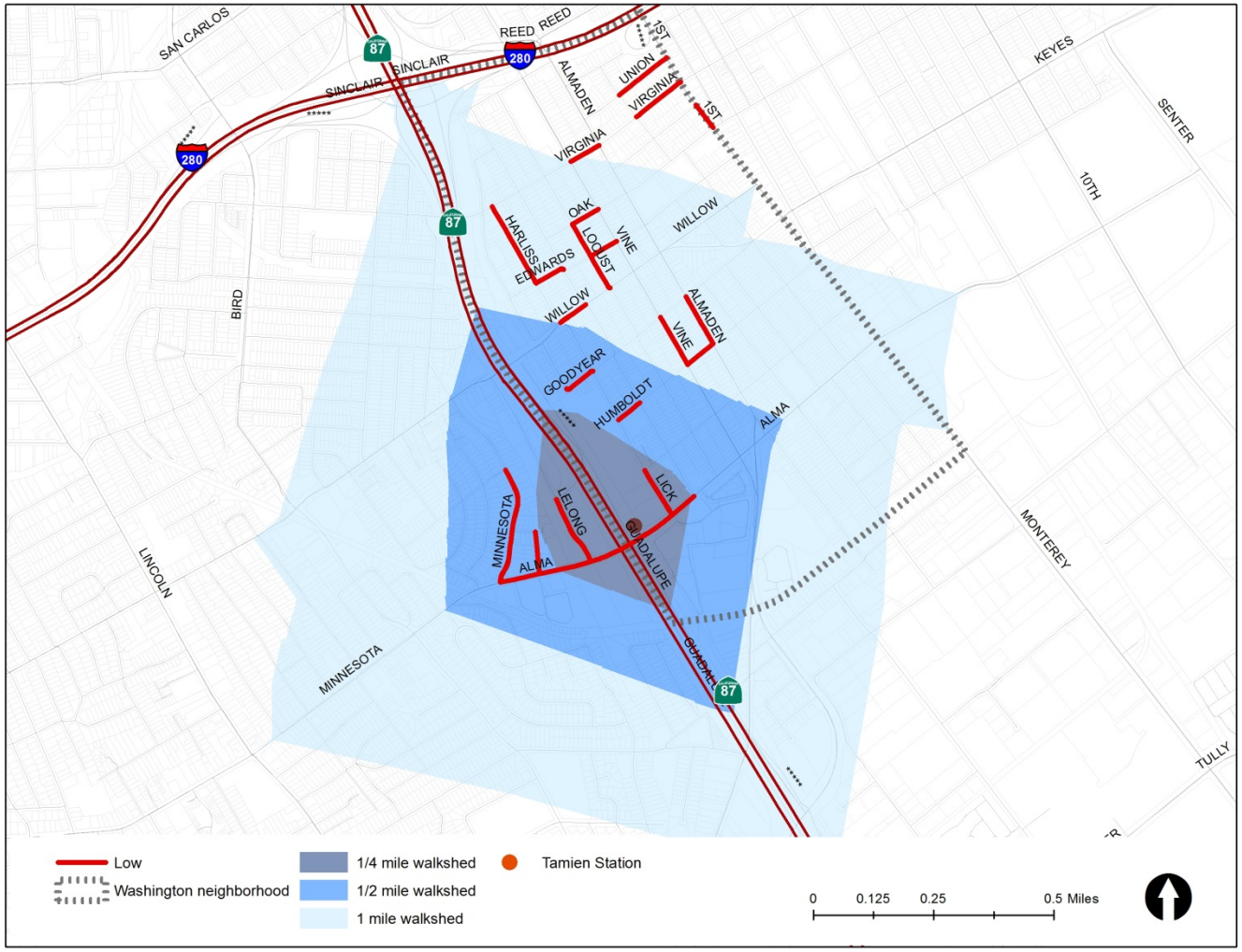
13. **Figure 32** examines the presence of the variable sidewalk coverage by awnings. The area does not have any awnings that provide significant shade on the sidewalk as the few buildings with awnings are setback from the street sidewalk.

Figure 32: Map Shows the Variable, Sidewalk Coverage by Awnings in the Study Area. Source: Map created by Priya Gopalkrishnan based on Audit Findings.



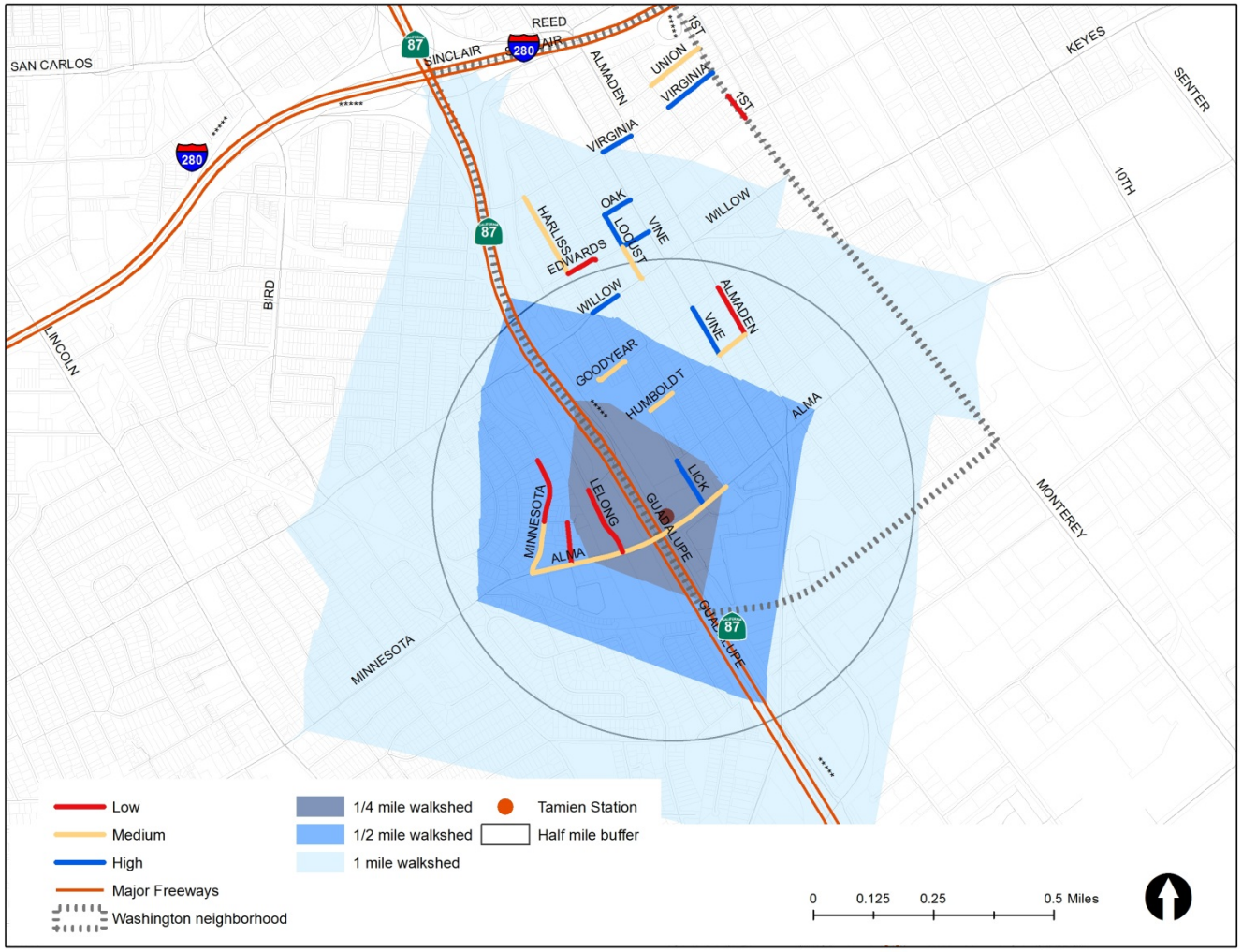
14. **Figure 33** examines the variable presence of sidewalk coverage due to other factors such tall buildings. The street audited did not have this variable and hence no sidewalk coverage due to tall buildings. For example, arterial road did have tall buildings but did not have shade projections on them at least at the ground level and hence there was no shade due to buildings.

Figure 33: Map Shows the Variable, Overall Sidewalk Coverage in the Study Area. Source: Map created by Priya Gopalkrishnan based on Audit Findings.



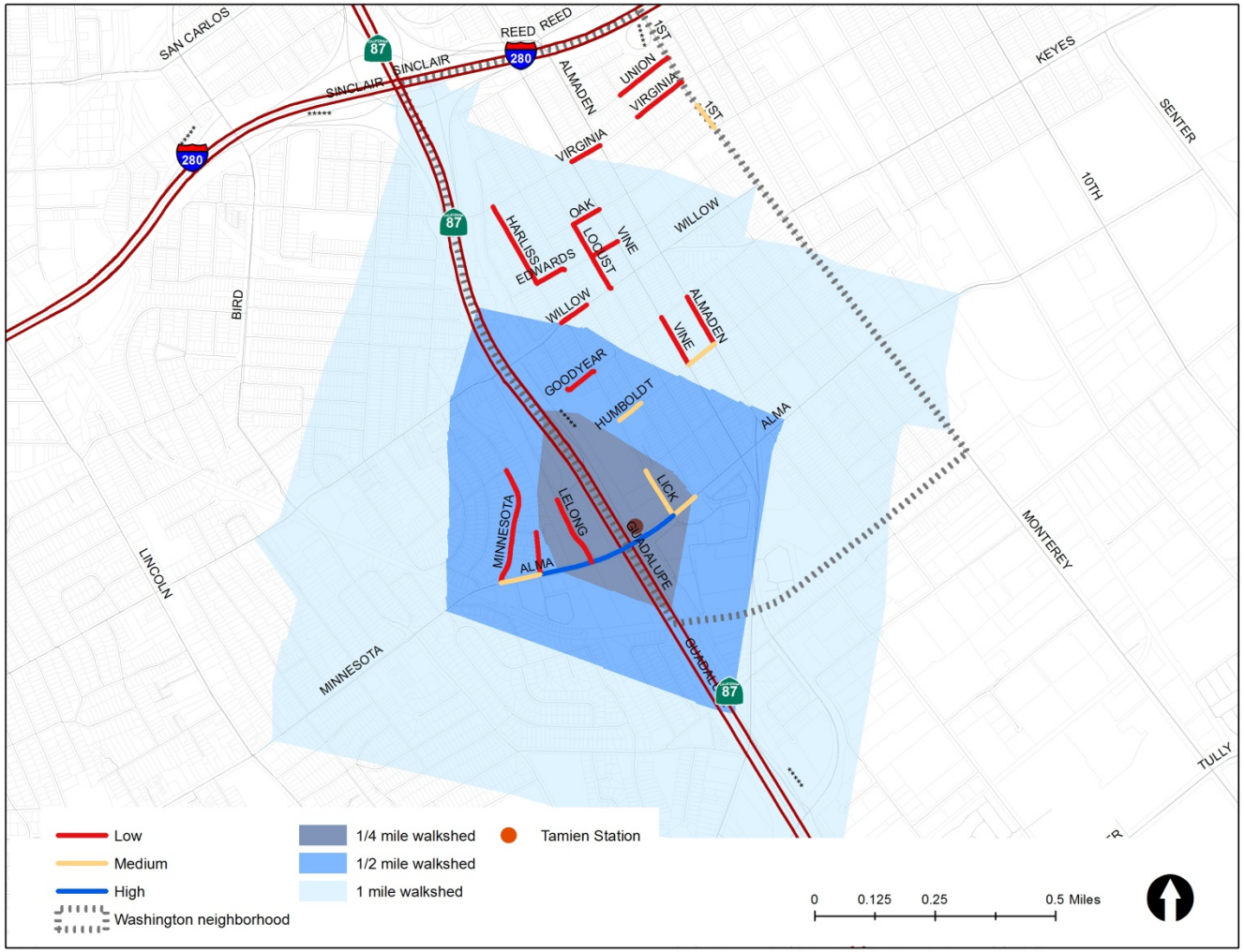
15. **Figure 34** examines the variable landscape buffer whether on both, one side, or where none is present on the sidewalk. The audited streets in the Tamien neighborhood largely scored low to medium (red and orange) while the streets in the Washington neighborhood scored medium to high (orange and blue).

Figure 34: Map Shows the Variable, Sidewalk Landscape Buffer in the Study Area. Source: Map created by Priya Gopalkrishnan based on Audit Findings.



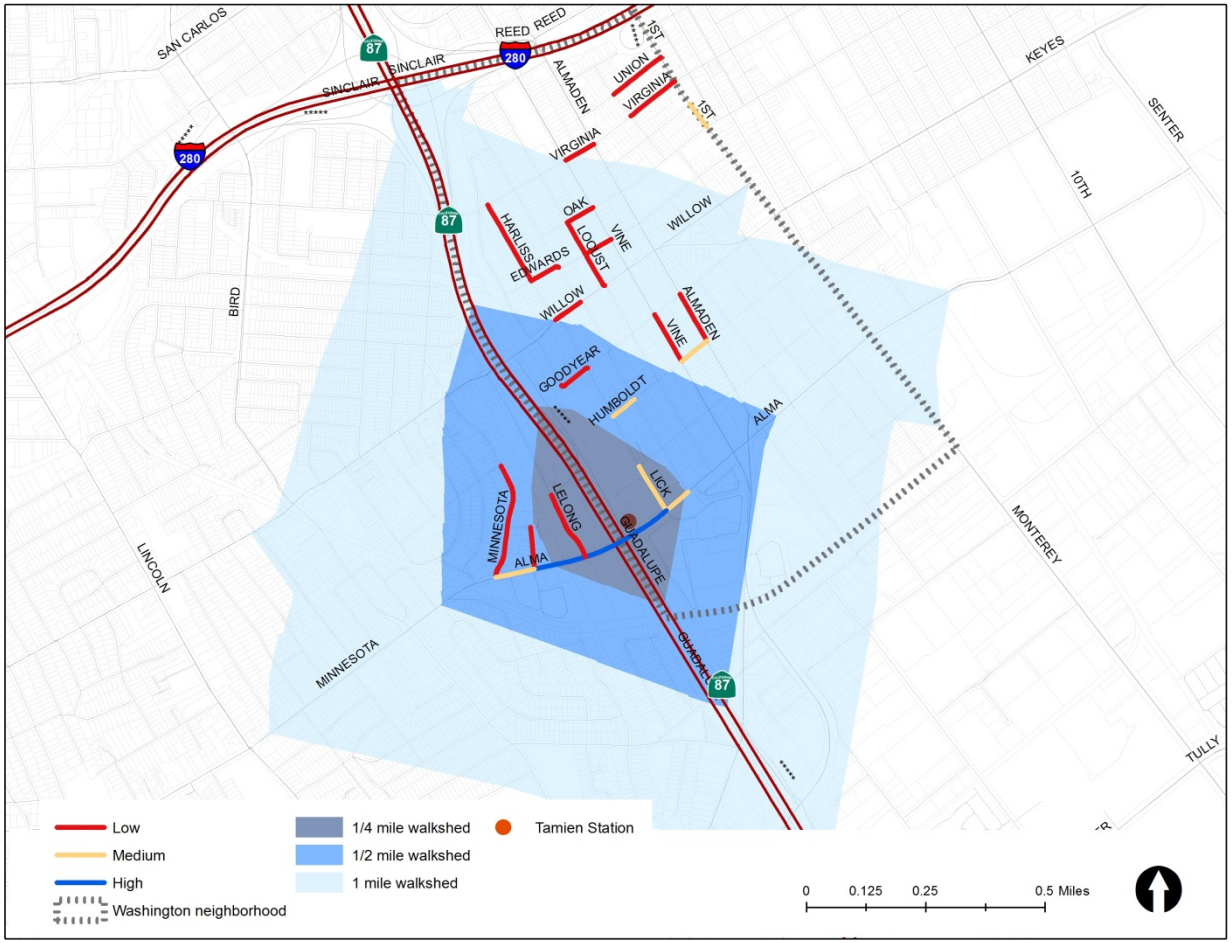
16. **Figure 35** examines the variable outdoor dining area. As seen in the figure, there are very few (three) streets in the entire neighborhood with outdoor dining spaces.

Figure 35: Map Shows the Variable, Outdoor Dining in the Study Area. Source: Map created by Priya Gopalkrishnan based on Audit Findings.



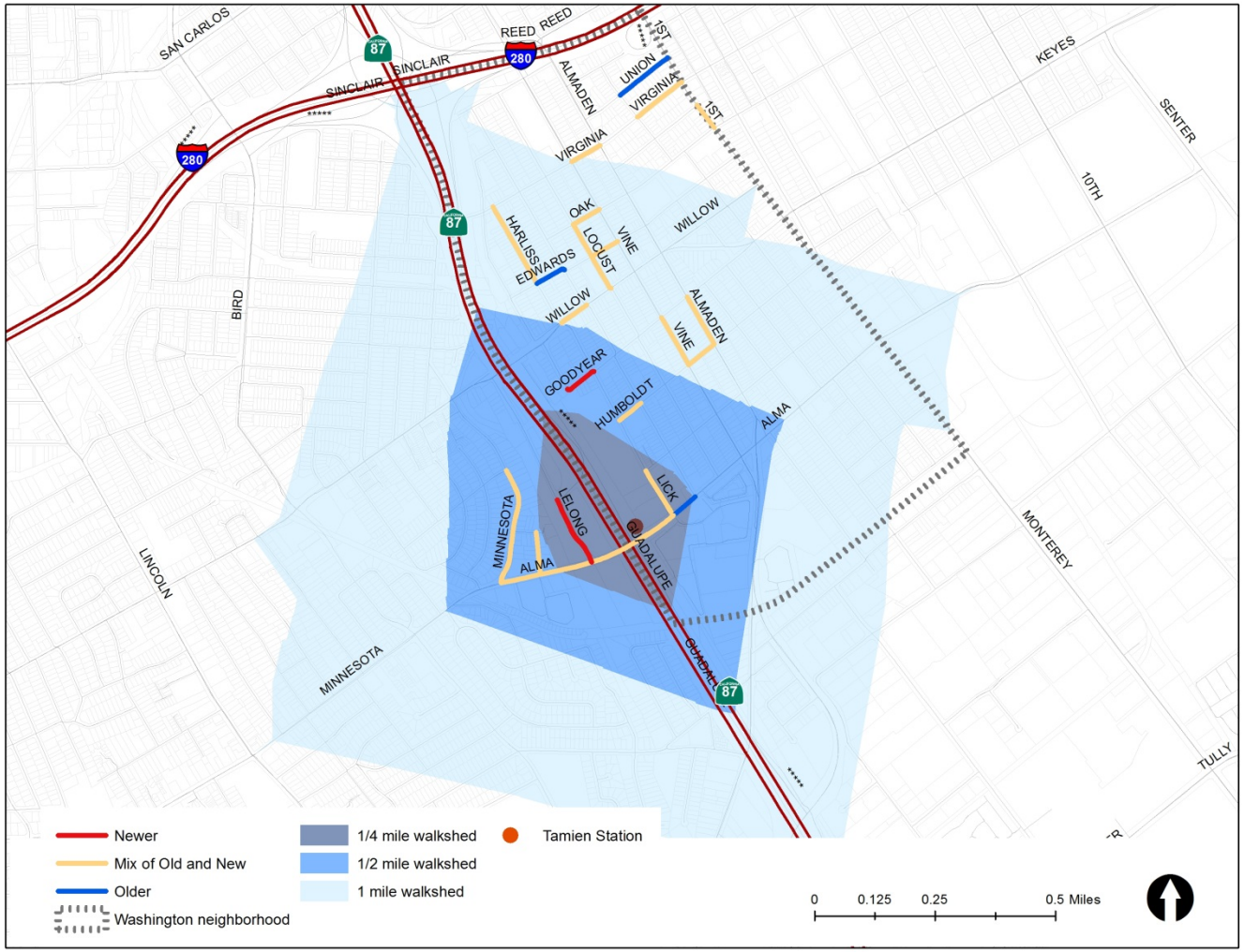
17. **Figure 36** examines the variable number of stories in the audited streets as seen in section 5.2. The findings show the variation between the older and the newer parts neighborhood. The buildings in the older neighborhood are largely single storied while the newer neighborhood has a mix of medium to high rise buildings. The highest number of storied buildings are along Alma and Lick Avenue which scored high (blue), which reached up to 11 stories tall with a partially raised podium and with parking underneath. One-third of the streets in the newer neighborhood have medium scores as they are three to four stories tall.

Figure 36: Map Shows the Variable, Number of Stories in Buildings Along the Street Segment in the Study Area. **Source:** Map created by Priya Gopalkrishnan based on Audit Findings.



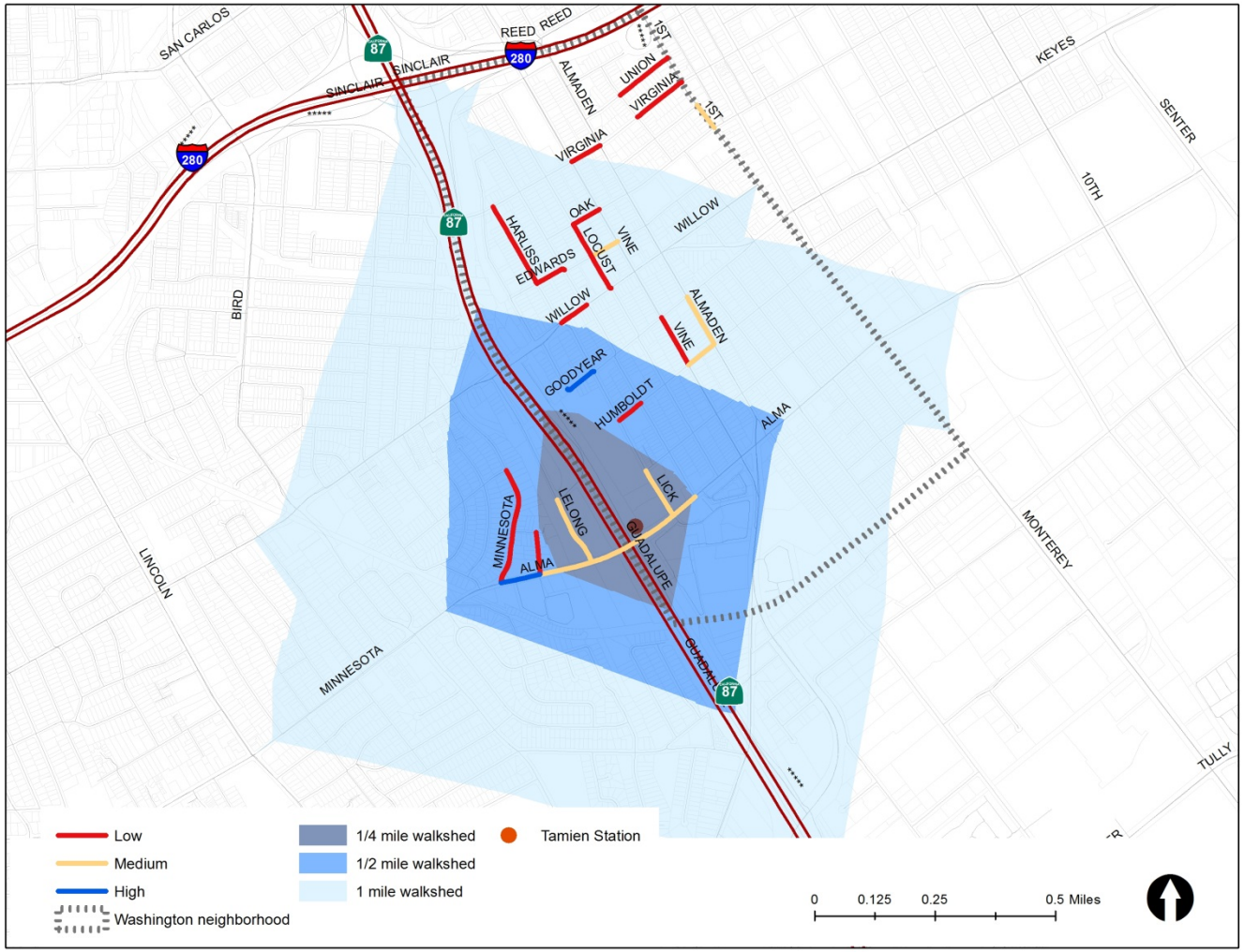
18. **Figure 37** examines the variable age of buildings in this neighborhood as seen in section 5.2. As seen in the figure, the buildings along the audited streets are a mix of old (before 1970) and new (after 2006). Only one-third of the audited streets were historic. There were only two among the audited streets that had new buildings on along the segments. The historic buildings had craftsman style of architectural details in their homes.

Figure 37: Map Shows the Variable, Age of Buildings in the Study Area. Source: Map created by Priya Gopalkrishnan based on Audit Findings.



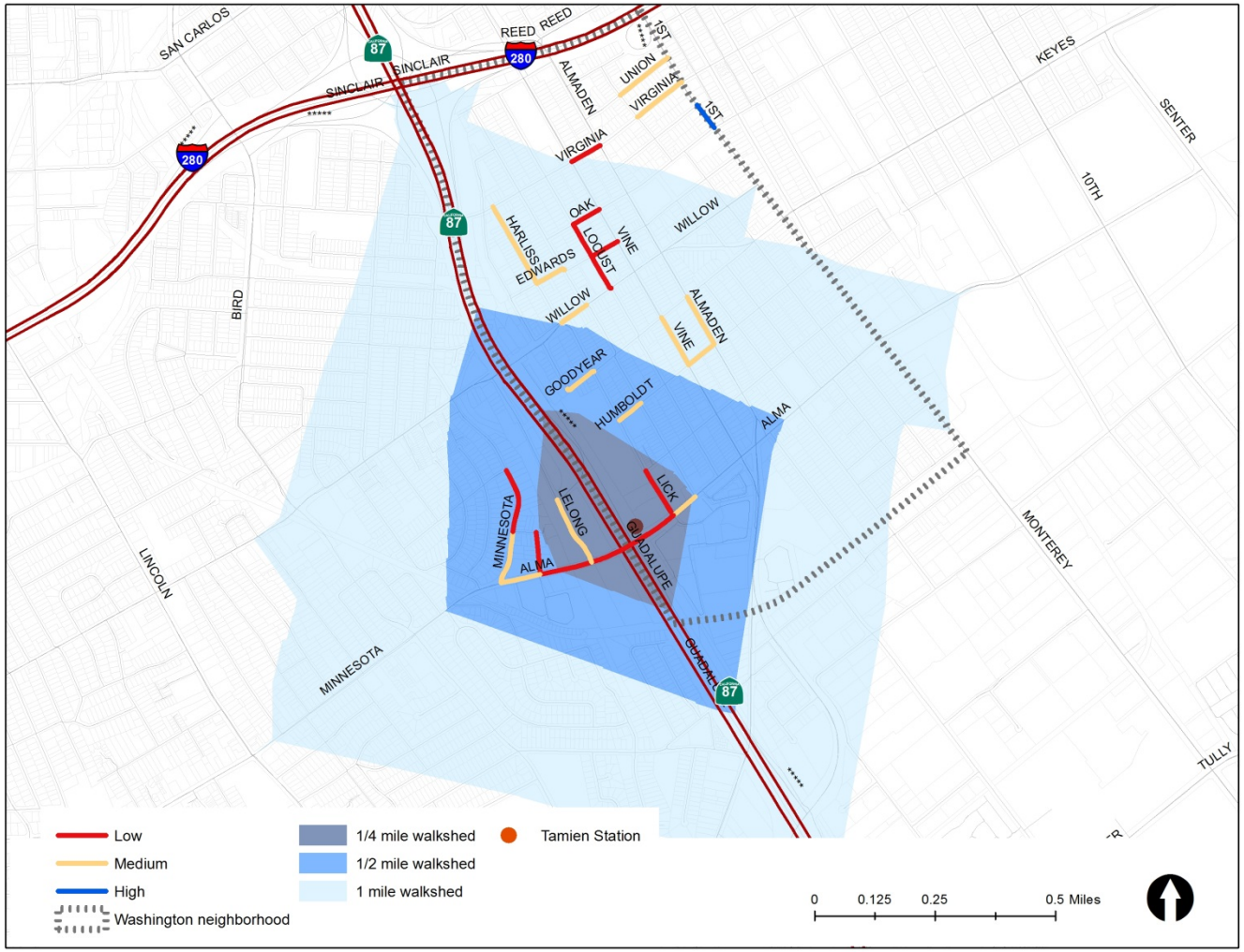
19. **Figure 38** depicts the volume of pedestrians walking in the neighborhood. As stated earlier, streets represented in red score low, those in orange equal medium, and streets in blue represent high. During the street audit, there were low to medium volume of pedestrians walking. During the train arrival times, there is a huge number of pedestrians either walking to their parked cars or to their homes across the arterial road Alma Avenue or bicycling.

Figure 38: Map Shows the Number of Pedestrians Walking along the Street Segment in the Study Area.
Source: Map created by Priya Gopalkrishnan based on Audit Findings.



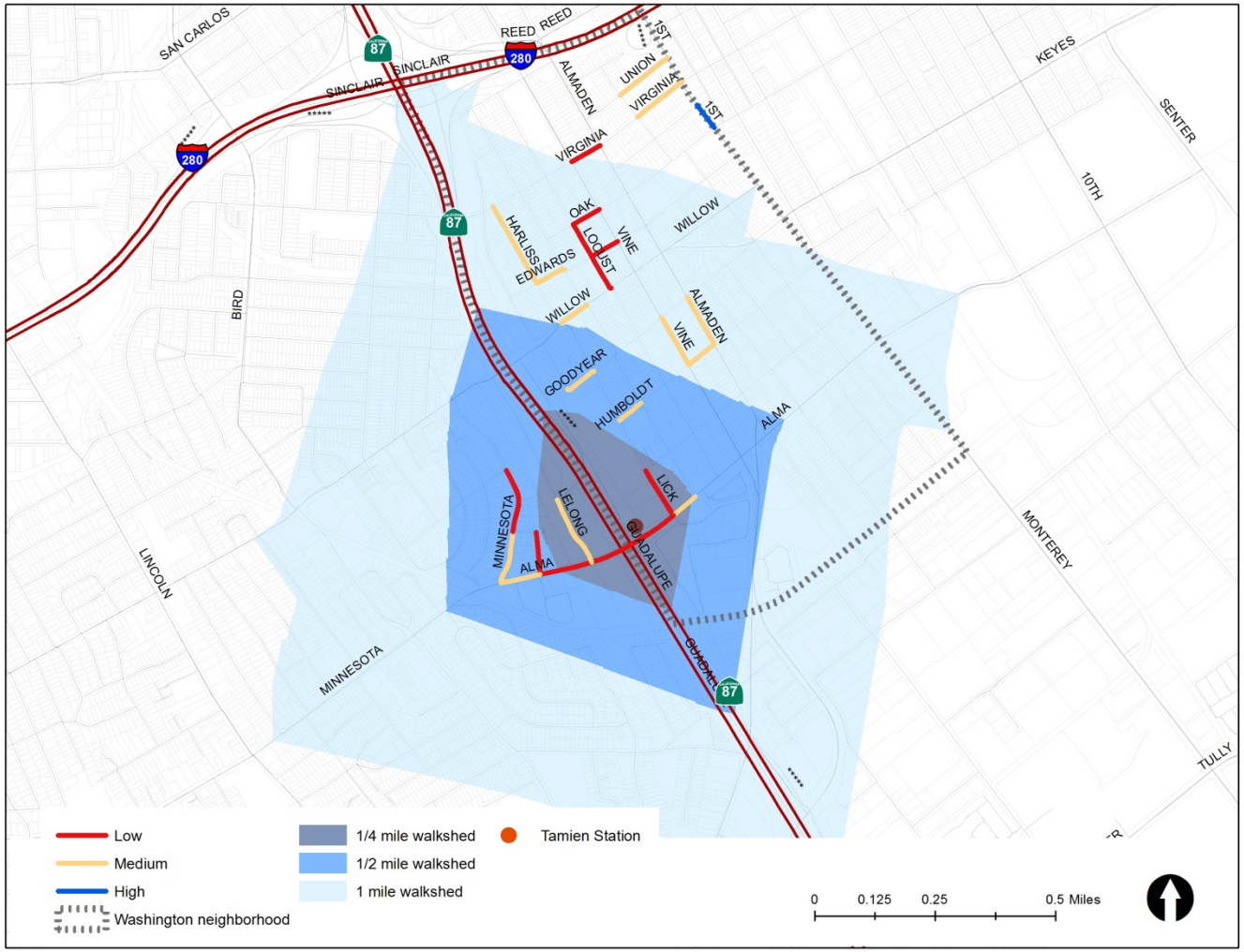
20. **Figure 39** depicts the number of pedestrians standing on the street during the audit period. The findings show that there were many people standing on the street for various reasons, including waiting for bus, train, or waiting for someone.

Figure 39: Map Shows the Number of Pedestrians Standing Along the Street Segment in the Study Area.
Source: Map created by Priya Gopalkrishnan based on Audit Findings.



21. **Figure 40** shows the number of pedestrians sitting on the street throughout the entire audit period. The findings show that there were people sitting only along two streets during the entire audit duration at bus-stops or ledges, possibly waiting for transit or relaxing before they continued their walk, since the demographic taking the bus during the non-school hours were elderly.

Figure 40: Map Shows the Number of Pedestrians Sitting Along the Street Segment in the Study Area.
Source: Map created by Priya Gopalkrishnan based on Audit Findings.



5.3 Summary

The audit findings show that the neighborhood around Tamien could improve pedestrian use and boost transit ridership by improving pedestrian access, connectivity, signages, and amenities. Findings from literature and audit shows that sloping streets have good potential to be a great street as the sloping nature of the street provides a complete view of the entire street.[143]

Despite the current rental market and the attractive price of the condos, a large number of homes still remain vacant. The vacant homes, added to vacant sites around the station, are detrimental to pedestrian use and access. Therefore, many people, including those living across the street, choose to drive. Although, the presence of the park and ride lots provide comfort for the auto driver, they pose as a barrier to the pedestrian due to large walking distances.

Findings show that there are diverse land uses along Alma and Minnesota avenue. Currently, the immediate surrounding of the Tamien station does not have a pedestrian environment (refer figure 8). The location of the light rail station in between the freeway increases the walking distance for transit users from various commercial uses located on the arterial road meant for travel at greater speeds (refer figure 4). The station is mainly designed as a park and ride facility. This adds more private cars waiting to pick up passengers outside the station. This combined with the large surface parking lot and disconnected sidewalks creates a barrier in pedestrian access (refer figure 18, sidewalk characteristics of the study area). Note that the street parallel to Lick Ave along the Caltrain entrance was audited but could not be represented visually in GIS as the “San Jose

[143] Allan Jacobs, *Great Streets* (Cambridge, MA: MIT Press, 1995), 270-292.

roads layer" freely available through the Census website,[144] obtained from Topologically Integrated Geographic Encoding and Referencing (TIGER) shape files and feature classes, did not have the attribute information for that particular street. Access to retail and commercial uses by walking is difficult as walking distances are extremely large and require traversing an underpass to get to either side of the station. Traversing through the underpass is challenging at various times of the day, as shown in the figure showing site constraints (refer figure 7, images A, B, C, and D).

The findings from the analysis of elements pedestrian amenities and sidewalk characteristics (figure 17 and 18) show that the study area lacks open spaces and outdoor seating. Sidewalks are at times abrupt or uneven to walk on. There is presence of graffiti, visible dumpsters and garbage, and signs of homeless activity along the pedestrian access and freeway underpass. Despite these barriers, residents, including those drive and walk or bike, use public transportation for commuting to work as observed by volume of transit users during morning and evening rush hours. There is also a problem of traffic congestion starting from the station access road, leading all the way through Lick and Alma avenue during these hours which pose a risk to the pedestrian and the bicyclist as well. Design elements scored higher in the surrounding neighborhood around Tamien as compared to the immediate neighborhood, although, ease of crossing and pedestrian amenities scored low in the study area. The findings from the research support the hypothesis that design elements analysed in this research affect walkability and form the basis for the recommendations that follow Chapter 6 in order to transform this area into a walkable district, increase pedestrian activity, and improve public transit use.

[144] Census data, "TIGER: Topologically Integrated Geographic Encoding and Referencing Shapefiles," http://www.census.gov/geo/maps-data/data/tiger.html (accessed November 1, 2014).

6. Conclusion

6.1 Summary of Key Findings

The audit results from a block by block analysis based on two hundred and eighty-six variables, and a subset of these that include a little less than sixty variables, which form the urban design elements, show that, among the eight urban design elements studied, **transparency** and **human scale** received the high total scores. On the other hand the audited streets had a very low pedestrian amenities score. The buildings in the Washington and Tamien neighborhoods largely conform to human scale due to their height and architectural style. The audited streets belonged to both the older and the newer neighborhood. The overall human scale score was medium in the older neighborhood. This was partly due to the fact that many of the houses in the older neighborhood were built before World War II. Hence, the street fronts along the houses were more pedestrian-oriented than car-oriented. This also reflected in their design, including fewer setbacks from the street and narrow house widths. Few streets in the newer neighborhood scored a high score as these were adjacent to a major arterial road that had pedestrian amenities, including bus stops, outdoor seating, and restaurants.

The area clearly lacked continuous sidewalk access to the transit station on both the light rail entrance as well as the Caltrain entrance. One-fifth of the audited streets from both neighborhoods scored a medium score for **sidewalk amenities** as seen from a very low score. Sidewalks conditions were poor in the new neighborhood as seen from the medium to low **sidewalk characteristics** scores. Few streets lacked sidewalks and other had poor sidewalk conditions. **Ease of Crossing** scored better in the older Washington neighborhood as compared to the newer neighborhood around the Tamien Transit Corridor. The older neighborhood had relatively shorter street blocks and good sidewalk conditions, and most streets scored a medium score. The new neighborhood had a higher overall ease of crossing score, although some arterial road intersections had

poor crossing scores. These arterial roads fell under routes that saw heavy truck movement. The older neighborhood saw audited streets receive a medium **imageability** scores due to their predominant architecture and urban form, while the newer neighborhood streets, except the arterial street which had a medium score, received low scores.

Closer to three-tenths of the streets audited within the older Washington neighborhood had a high **enclosure** score. However, the newer neighborhood overall street audit score was fair. The streets in the older neighborhood had more landscaping, including landscape barriers between the sidewalk and the street and street trees. The streets audited in the newer part of Tamien neighborhood had higher speed limits along main arterials, streets leading to freeway ramps, and streets leading to the transit station, than those observed in the older, primarily residential area. The arterial street had few vacant lots and some lots with ongoing construction activity. Additionally, these car-oriented streets had wide street blocks, fewer landscaping and street trees providing shade. The older street blocks with buildings situated right on the street had a better feeling of enclosure. A skyscraper on a street with fifteen feet setback on one side had a relatively fair effect of enclosure, although a six-lane street containing buildings with huge setback on the other side of the street scored a medium. Two-tenths of the newer neighborhood audited streets had a high **complexity** score, due to the presence of multiple activities at the street level. Within the older neighborhood equal number of audited streets had high and low scores, mainly due to the number physical activities present at the ground level, as well as the street location at the edge of the neighborhood as compared to being located in the center.

Section 6.3 provides the design recommendations for the site as mentioned earlier. Tamien could improve pedestrian use and boost transit ridership by improving pedestrian access, connectivity, signages and

amenities. Few immediate improvements include installing signages around Tamien station, short street lights, seating, restrooms, refreshment kiosks, and open space.

The findings show that there is great potential in this site and streets around Tamien to become complete streets and to influence walking and boost transit ridership. The changes would need to be made with the pedestrian in focus and by implementing the design recommendations. Few immediate improvements include installing signages around Tamien Station, human scale street lights, amenities, including seating, restrooms, water, food, and open space (refer Figure 19 and 20 for opportunities and constraints) will not only enhance the space surrounding the station but also provide an enriched experience for the transit user.

Additionally, findings show that there is a disconnect currently, between the new housing development and the surrounding neighborhood. Although, new development provides increased density, it must integrate with the surrounding neighborhood to maintain human scale. Implementing the recommendations would warrant incremental changes oriented towards improving the conditions of pedestrian access and walkability of the neighborhood.

6.2 Design Recommendations for City of San Jose

The decision for development in this area is determined by the City of San Jose after considering community input. However, what is in its control is the type of development and the order that will help in realizing its goals. In order for the City to build according to the vision of the General Plan and the Tamien Station Specific Plan, it has to be very selective in project choice. Within the Tamien Area, there are few major construction projects which include newer private amenities for residents, while proposed designs for other parts of the station area are being redesigned. One of the large sites rezoned to transit corridor residential is already having additions to their existing property. However, the site is still devoid of the proposed identical tower leading to a large vacant plot.

In order to improve walkability, pedestrian access, and economic development in the Tamien Station area, it is important that the City of San Jose consider the recommendations that follow for the Tamien Station area. The findings from street audits, GIS and design analysis of the elements, and site analysis as compiled in the table, are described in this section.

Identity

Although the newer residential condominium is part of the updated zoning to transit corridor residential and is part of a transit oriented development, it is mostly isolated and does not have a unifying identity with the rest of the neighborhood. The presence of a Caltrain Commuter Rail Station entrance on one side and the VTA light station elevated in the middle of the freeway deters it from having the identity a larger multimodal destination. Currently, the only pedestrian and bicycle access from the Caltrain entrance side is through a pedestrian underpass that is currently perceived as unsafe, especially during times of the day when frequency of rail

service is low. The area would greatly benefit from having its own identity. This can be done through the recommendations as follows:

Site name and Signages:

Currently, the Tamien Station area site is known by the light rail entrance or the Caltrain entrance. It would benefit from renaming the light rail entrance as Tamien East and the Caltrain entrance as Tamien West. These names are inspired by the idea of using directions. Additionally, provide clear pedestrian directional markers and maps.

Art Installation:

Installing art around the station area can be of two types, regular art in the form of murals and sculptures and interactive art, including light sculptures, for example, *Aurora*, installed in front of the Palo Alto City Hall.[145]

Human Scale and Street Envelope

Building heights and setbacks:

By varying the building heights and reducing setbacks, many new urbanism style neighborhoods achieve human scale. Walkability is improved when people are able to experience the built and the surrounding street environment in scales relative to them. Providing lighting and building facades that relate to the street at the ground level increases human scale.

[145] Charles Gadekan, "Aurora Palo Alto: Interactive Light Sculpture," http://www.aurorapaloalto.com/ (accessed November 1, 2014).

The street envelope is fairly suburban at this location just like any other city in the Bay Area. Also, within the parking lot is a well-known childcare center with many branches in the San Francisco Bay Area. However, since there is a lot of surface parking, the area appears dead and very unfriendly.

Sociability of the space:

Streets shall be safe from traffic and encourage walking in comfort.

Shade:

Provide shade using trees, position of new buildings, and landscape elements.

Transparency (Activity at the street level)

Transparency is the quality of the public realm meeting the private realm at the edge of the street. It is the meeting of the private domain with publicly accessible buildings. In order to substantially improve the quality of life of the neighborhood as well bring in economic development, there needs to be a lot more activity at the street level that creates vibrancy. Every hour as the Caltrain pulls into the train depot, the vast majorities of people walk to their cars and drive away. However, the pedestrians or bicyclists who prefer to walk or ride away from the Caltrain Station side, prefer to go across to the Willow Glen neighborhood, than to take the freeway underpass even during peak morning and evening commute, where there are more eyes on the street.

Accessibility:

Provide clear and easy access to public transit.

Provision for Americans with Disabilities Act (ADA):

Accessible ways must be provided and the entrances must be accessible by everyone, including wheelchairs in order to make them American Disabilities Act (ADA) compliant. Parking spaces may be reduced through exercising an updated parking policy, after ensuring a thorough study of actual use and projected requirements has been conducted.

Density:

Allow for intensification of parking lot space with new buildings above in order to use the air rights. This will enable more people access to transit. With improved and reliable transit service this would lead to increased ridership.

Complexity

Complexity in the streets is a quality that is attained over time due to finer elements that provide an enriching walking environment.

Buildings:

Allow multiple buildings with a variety of activities.

Windows and street walls:

Provision of windows at the ground level with variety and scale.

Pedestrian Amenities

Seating and Lighting:

Amenities such better and adequate seating in the waiting area near the train station is required. Public art may be installed to create an interesting space for people while they wait. Strong enforcement must be in place to reduce graffiti and ensure comfortable and safe environments for the pedestrian and the transit user. Alleyways and underpass areas should provide well-lit spaces.

Signages:

The bicycle trail that runs parallel to the Caltrain station almost runs in a tunnel-like space, which is often considered unsafe. Trails must be made safe with spaces well-lit at intervals and proper signages.

Mobile Food/Refreshment kiosks:

Farmer's market over the weekends and food stands, coffee shop stands may be in place until the City changes the regulations regarding permanent business and commercial zoning. Having coffee shops or food trucks in this place will improve the overall pedestrian environment by increasing pedestrian access to transit.

Park or Public open space:

From the *Specific Plan* and from the audit findings, the neighborhood would greatly benefit from a park space.

Public Restrooms

Provision of clean and safe public restrooms would greatly benefit users.

Safety:

Findings from both literature and street audit show that safety is of great concern. Providing public safety amenities, such as police, as well as more eyes on the street, and including amenities such as kiosks and open spaces in the newer development will improve pedestrian usage of the public space and therefore improve transit access as compared to the present.

Outdoor Room:

Use the quasi-open space as an outdoor room. The neighborhood residents can host outdoor events, a Sunday farmer's market, and the early educational facility can hold an outdoor educational event during the weekends within the parking lot, adjacent to their reserved parking spaces. Such activity generating efforts such as incentivizing coffee shops and food courts would lead to more effective use of the space.

Sidewalk Characteristics

Soft and Hard Landscape:

Vegetation shall be placed to create a noise and visual buffer to between the freeway ramps and the pedestrian underpass that connects the VTA light rail station entrance from the Caltrain entrance. This provides a visual barrier as well as some noise reduction in the alleyway.

Outdoor Dining:

The neighborhood could benefit from more outdoor dining spaces.

Ease of Crossing

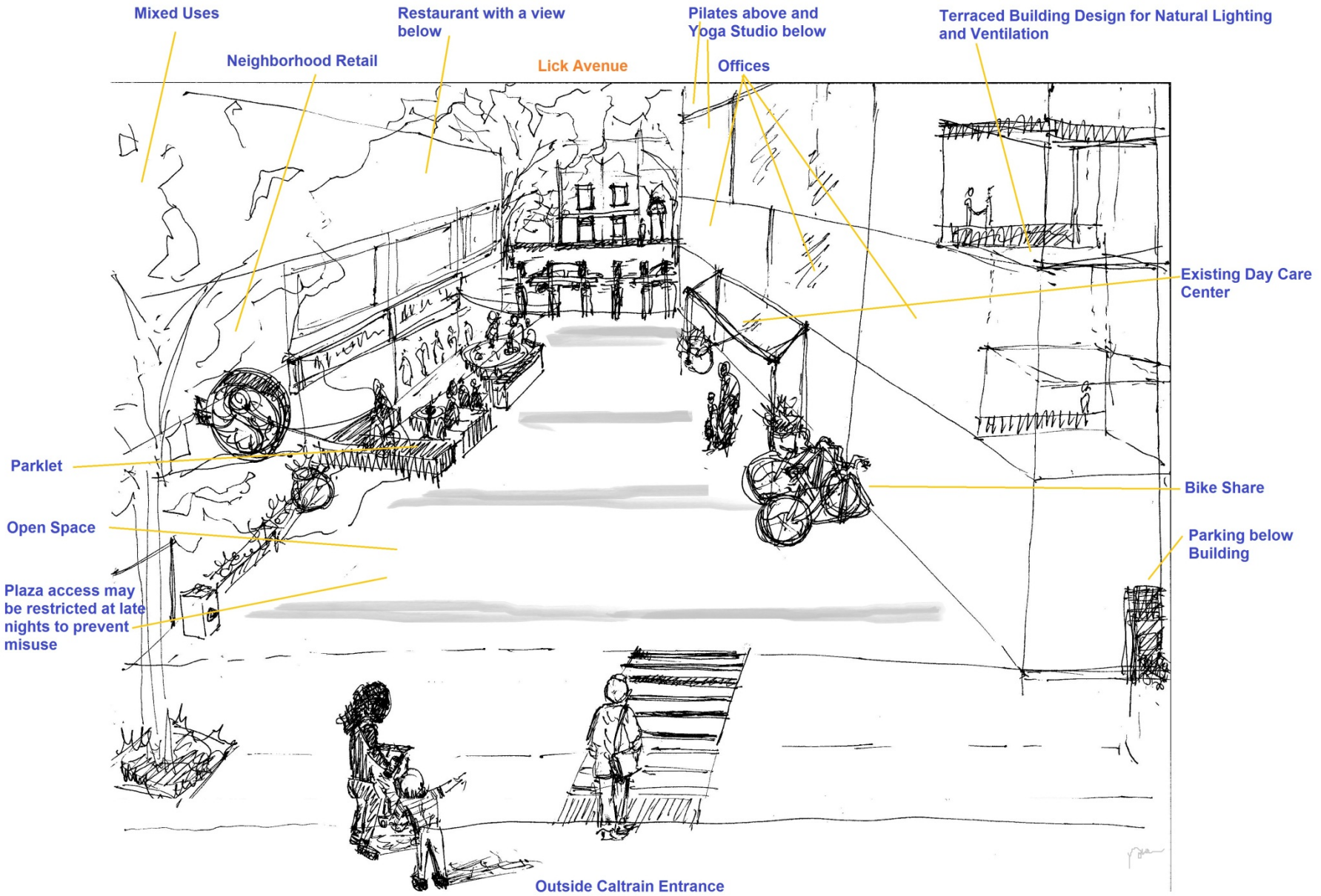
Crosswalk Design:

According to the NACTO book, *Urban Street Design Guide,* pedestrians do not follow a 3-leg crossing at an intersection and it may put pedestrians in a dangerous position.[146] School buses stop next to the quasi-public space outside the train station, making a loop. Hence, placing a crosswalk on the street outside the station, next to the school bus stop as well as adjacent to the early educational center, would provide safe crossing for pedestrians, including children between the ages of 1 and 5 and school aged children.

Conceptual recommendations in Figure 20 show the transformation of the current Caltrain surface parking lot space by new multi-storied buildings providing existing uses such as an early educational center, parking, as well as new uses, such as offices above as seen in the right side of the figure 20. Upper floors can be leased out to yoga studios or dance classes. The site has an plaza-like open space in the center. The left side of the figure 20 shows neighborhood retail uses, coffee shops, restaurants above, and a small parklet outside the café adjacent to Lick ave. In the figure, street next to the retail stores to the left is the main access to the station. Having buildings adjacent to the street here with less setback can define access, create a vista, as well provide a direct route for wayfinding.

146 National Association of City Transportation Officials, *Urban Street Design Guide* (Washington, DC: Island Press, 2013).

Figure 41: Conceptual Design Recommendations for Existing Site Outside Tamien Caltrain Station. Author: Priya Gopalkrishnan


Mixed Uses
Restaurant with a view below
Pilates above and Yoga Studio below
Terraced Building Design for Natural Lighting and Ventilation
Neighborhood Retail
Lick Avenue
Offices
Existing Day Care Center
Parklet
Bike Share
Open Space
Parking below Building
Plaza access may be restricted at late nights to prevent misuse
Outside Caltrain Entrance

6.3 Suggestions For Further Research

The relationships this research found that calls for further research are described further. The first most intruiging relationship is among neighborhood design elements and intersection density, and public transit use. Higher intersection density translates to many buildings and variety of uses. It is seen that older neighborhoods with higher intersection density have finer and compact street design elements. It would be interesting to study how higher intersection density and stronger neighborhood design characteristics affect public transit use.

The second thought-provoking relationship that calls for further research is the relationship between the design of the pedestrian environment of the surrounding station area and parking on pedestrian access to transit. Tamien was developed originally as a park and ride station situated in a suburban location. Stations in suburban neighborhoods, located next to a freeway will always require vehicular access. Hence parking has to be provided. According to the findings from audit observations, transit use is higher during morning and evening peak hours at this location. As mentioned earlier, as a park and ride station, Tamien allows riders to commute to work by public transportation. It will be interesting to study how an increase or decrease in parking spaces provided and the design of the pedestrian environment affect pedestrian access to transit.

The third interesting area for further research is to perform a pedestrian environment audit analysis for all the streets within one mile walking distance surrounding the station, to study pedestrian characteristics, sidewalk amenities, human scale, and land use variation within the study area.

Knowledge and understanding of the nature and characteristics of these relationships promote the efforts to increase pedestrian access to transit because it would provide walkable transit access to more residents and improve the overall walkability of the area. The data collected based on these improvements can be very useful in providing services to current or future residents taking transit.

Conclusion

Research and observation have shown that the size and character of the street influences the quality of the built environment. A street is a physical environment where safety factor depends on the surrounding environment. Land Use and Transportation are interconnected and according to Paul Moore's lecture at USC Sol Price[147], cities need to be mindful of how they spend on transportation and what type, including Bus Rapid Transit (BRT) or Light Rail (LRT) in order for private spending to follow.

Sidewalk presence does not solely determine that the walkability of neighborhoods. There are many newer and wider sidewalks in high traffic areas of various cities in the Bay Area. Overcoming the congestion generated during morning hours and evening hours when the Caltrain arrives, needs to be addressed by the City as part of their Congestion Management strategies.

Despite reducing street setback and creating vertical enclosure by situating buildings of varying heights in close proximity, the scale of the sidewalk needs to be designed in proportion to the scale of the streets, that is, the number of lanes to accommodate various activities in order to promote activities that are driven by

[147] Paul Moore, Managing (Not Solving) Cities' Transportation Problems through Change in Policy and Investment, https://www.youtube.com/watch?v=EUdx88n_lqk (accessed September 10, 2014.

density. The City needs to address issues of safety, better street lighting, and manage parking, which are concerns raised by the residents.

Historically, train stations have been a medium of travel for people. They have been areas that attract economic development. New transit stations should be developed along areas that would attract intense economic activities and development.

Tamien Station area would benefit from revitalization of the region by associating with generators of economic development. Lastly, pedestrianizing the area to a greater extent as well as addressing concerns of graffiti, safety, better lighting, and walkable streets in addition to economic activities will turn around the image of this neighborhood in order to be a model for other station areas in San Jose and in the Bay Area, especially in the context of proposed high speed rail.

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Appendix A: Pedestrian Audit Instrument, adapted from Irvine Minnesota Inventory and Measuring Urban Design, Metrics for Livable Places

Date 9/1/2014	ID		1
Time 11.00 AM			
Observer			
Segment #			
Answer questions 1-9 based on this end of the segment			
Intersection			
Neighborhood Identification			
1. Are there monuments or markers including neighborhood entry signs	1	yes = 1; no = 0	
Street Crossing			
2a. Consider the places on the segment that are intended for	2	all = 2; some = 1; none = 0; NA = 8	
2b. If yes, what type of marking do the crosswalks have? Mark all that			
White painted lines	3	yes = 1; no = 0; NA = 8	
Colored painted lines	4	yes = 1; no = 0; NA = 8	
Zebra striping	5	yes = 1; no = 0; NA = 8	
Different road surface or paving (e.g. tiles, colored concrete, marble,	6	yes = 1; no = 0; NA = 8	
Other	7	yes = 1; no = 0; NA = 8	
2c. If yes, is the location of the marking convenient?	8	yes =2; somewhat = 1; no = 0; NA = 8	
2d. If no, would this intersection be safer or more convenient if there	9	yes =1; no = 0; ; NA = 8	
3a. Are there curb cuts at all places where crossing is expected to	10	all = 2; some = 1; none = 0; NA = 8	
3b. Is the curb cut convenient?	11	yes =1; no = 0; NA =8	
3c. What is the condition of the curb cut?	12	good/moderate=1; poor=0; NA=8	
4a. What type of traffic/pedestrian signal(s)/system(s) is/are provided?			
Traffic signal	13	yes = 1; no = 0	
Stop sign	14	yes = 1; no = 0	
Yield sign	15	yes = 1; no = 0	
Pedestrian signal (automated)	16	yes = 1; no = 0	
Pedestrian signal (activated)	17	yes = 1; no = 0	
Pedestrian signal (with countdown)	18	yes = 1; no = 0	
Pedestrian signal (with sound)	19	yes = 1; no = 0	
Pedestrian crossing sign	20	yes = 1; no = 0	
Traffic assistant/"crossing guard"	21	yes = 1; no = 0	
Pedestrian overpass/underpass/bridge	22	yes =1; no = 0	
4b. If no, would this intersection be safer or more convenient if there	23	yes = 2; somewhat = 1; no = 0; NA=8	
4c. For intersections with pedestrian overpasses/underpasses, is the	24	yes = 2; 1= somewhat; 0 = no; ; NA=8	
4d. For intersections with pedestrian overpasses/underpasses, are	25	yes = 2; 1= somewhat; 0 = no; NA=8	
4e. Are wait times for crosswalks long enough for pedestrians to get	26	yes = 1; no = 0; NA=8	
5. Do cars turning left or right make it unsafe for pedestrians to cross	27	yes =1; no = 0; NA = 8	

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6. Describe the turning radius.	28	1= wide; 0=tight; NA=8	
7. For an individual who is on this segment, is THE DESIGN OF THE ENVIRONMENT safe (traffic wise) to cross the street from this segment? Consider children, older adults, and people with disabilities when answering this question.	29	yes = 2; somewhat = 1; no = 0; cul de sac = 8	
8. For an individual who is on this segment, is THE DESIGN OF THE ENVIRONMENT convenient (traffic wise) to cross the street from this segment? Consider children, older adults, and people with disabilities when answering this question.	30	yes = 2; somewhat = 1; no = 0; cul de sac = 8	
9. Is there a pedestrian island in the middle of the intersection?	31	yes =1; no = 0	
Answer questions 10-12 while standing at the beginning of the segment			
Neighborhood Identification			
10. Does the segment have banners?	32	some/a lot = 2; few = 1; none = 0	
Street Characteristics			
11. Is/does this street...	33	one way = 1; two way = 2	
Intended for pedestrians only (motorized vehicles are prohibited)?	34	1=yes; 0=no	
An alley?	35	1=yes; 0=no	
Too narrow for automobiles?	36	1=yes; 0=no	
12a. How many vehicle lanes are there for car travel? (Include all lanes).	37	Write in your response; NA (no lanes for car	
12b. How many right hand turning lanes are there?	38	Write in your response; NA (no lanes for car	
12c. How many left hand turning lanes are there?	39	Write in your response; NA (no lanes for car	
Begin walking along segment to answer questions 13-61			
13a. What types of land uses are present on this area? Mark all that			
Residential - by height			
Low rise (1-3 stories)	40	yes = 1; no = 0	
Mid-rise (4-8 stories)	41	yes = 1; no = 0	
Mid-high rise (9-12 stories)	42	yes = 1; no = 0	
High rise (13-18 stories)	43	yes = 1; no = 0	
High rise (19-24 stories)	44	yes = 1; no = 0	
High rise (25-40 stories)	45	yes = 1; no = 0	
Super-high rise (40+ stories)	46	yes = 1; no = 0	
Residential - by type			
Single family home - detached	47	yes = 1; no = 0	
Single family home/duplex - attached (2 units)	48	yes = 1; no = 0	
Town homes/Row houses	49	yes = 1; no = 0	
Condo/apartment housing	50	yes = 1; no = 0	
Mobile Homes	51	yes = 1; no = 0	

Dormitories/University housing	52	yes = 1; no = 0	
Residential, other	53	yes = 1; no = 0	
School			
Kindergarten	54	yes = 1; no = 0	
Primary school	55	yes = 1; no = 0	
Secondary school	56	yes = 1; no = 0	
High school	57	yes = 1; no = 0	
University or college (includes all types of building forms)	58	yes = 1; no = 0	
School, other	59	yes = 1; no = 0	
Recreational/Leisure/Fitness			
Gym/fitness center (also includes yoga/pilates studios, etc.)	60	yes = 1; no = 0	
Movie theater	61	yes = 1; no = 0	
Recreational, other	62	yes = 1; no = 0	
Public/Civic Building			
Community center or library	63	yes = 1; no = 0	
Museum, auditorium, concert hall, theater	64	yes = 1; no = 0	
Post office, police station, courthouse, Department of Motor Vehicles	65	yes = 1; no = 0	
Public building, other	66	yes = 1; no = 0	
Institutional			
Religious institution (church, temple, mosque, etc.)	67	yes = 1; no = 0	
Hospital, medical facility, health clinic	68	yes = 1; no = 0	
Institutional, other	69	yes = 1; no = 0	
Commercial			
"Soft" good retail stores. These sell things that last a short time (e.g.,	70	yes = 1; no = 0	
Hard good retail stores. These sell things that last a long time (e.g.,	71	yes = 1; no = 0	
Other retail stores that are not either soft or hard	72	yes = 1; no = 0	
Restaurants - non-fast food	73	yes = 1; no = 0	
Fast food	74	yes = 1; no = 0	
Small grocery store	75	yes = 1; no = 0	
Medium or large grocery store	76	yes = 1; no = 0	
Bank/financial	77	yes = 1; no = 0	
Hotel/hospitality	78	yes = 1; no = 0	
Car dealership	79	yes = 1; no = 0	
Gas/service station	80	yes = 1; no = 0	
Bicycle-related retail (bicycle repair shops, etc.)	81	yes = 1; no = 0	
Local, non-chain stores	82	yes = 1; no = 0	
Regional/national chain stores	83	yes = 1; no = 0	

Commercial, other	84	yes = 1; no = 0	
Office/Service			
Offices	85	yes = 1; no = 0	
Service facilities (includes insurance offices, funeral homes, dry cleaning,	86	yes = 1; no = 0	
Office/service, other	87	yes = 1; no = 0	
Industrial/Manufacturing			
Light industrial (e.g., auto paint and auto body repair shops; i.e. clean	88	yes = 1; no = 0	
Medium or heavy industrial (e.g. chemical plants, oil wells, etc.)	89	yes = 1; no = 0	
Industrial, other	90	yes = 1; no = 0	
Other			
Undeveloped land	91	yes = 1; no = 0	
Agricultural land, ranch, farming	92	yes = 1; no = 0	
Nature feature	93	yes = 1; no = 0	
Site under construction	94	yes = 1; no = 0	
Other	95	yes = 1; no = 0	
13b. Do the buildings in this segment contain vertical-mixed use, that is,	96	yes = 1; no = 0; NA (no buildings>1 story) = 8	
13c. If yes, what uses are on the ground floor? Mark all that apply.			
Retail	97	yes = 1; no = 0	
Office	98	yes = 1; no = 0	
Restaurants	99	yes = 1; no = 0	
Service	100	yes = 1; no = 0	
Other	101	yes = 1; no = 0	
13d. If yes, what uses are on the upper floors (non-ground floor)? Mark			
Retail	102	yes = 1; no = 0; unclear=8	
Office	103	yes = 1; no = 0; unclear=8	
Restaurants	104	yes = 1; no = 0; unclear=8	
Service	105	yes = 1; no = 0; unclear=8	
Residential	106	yes = 1; no = 0; unclear=8	
Other	107	yes = 1; no = 0; unclear=8	
13e. What is the predominant land use on this segment?	108	4= mixed; no predominant use; 3=	
13f. Determine whether any of these distinctive retail types are present			
Big box shops (includes super stores or warehouse stores)	109	yes = 1; no = 0	
Shopping mall	110	yes = 1; no = 0	
Strip mall	111	yes = 1; no = 0	
Row of shops	112	yes = 1; no = 0	
Drive-thru	113	yes = 1; no = 0	
13g. Are there any vacant commercial spaces?	114	some/a lot = 2; few = 1; none = 0	

14a. Mark off all types of public space(s) on this segment and how			
Park/playground	115	attractive = 3; neutral = 2; unattractive = 1;	
Exercise area	116	attractive = 3; neutral = 2; unattractive = 1;	
Playing or sport field	117	attractive = 3; neutral = 2; unattractive = 1;	
Plaza /square /courtyard	118	attractive = 3; neutral = 2; unattractive = 1;	
Public garden	119	attractive = 3; neutral = 2; unattractive = 1;	
Beach	120	attractive = 3; neutral = 2; unattractive = 1;	
Other	121	attractive = 3; neutral = 2; unattractive = 1;	
14b. Is it possible for the general public to use the public space(s)?	122	unclear = 2; yes = 1; no = 0; NA = 8	
14c. How much of the segment is taken up by the public space?	123	More than 50% =3; 25-50% =2; Less than	
Other Land Uses			
15. How many of these land uses are present on this segment?			
Bars/night clubs	124	some/a lot = 2; few = 1; none = 0	
Adult uses	125	some/a lot = 2; few = 1; none = 0	
Check cashing stores/pawn shops/bail bond stores	126	some/a lot = 2; few = 1; none = 0	
Liquor stores	127	some/a lot = 2; few = 1; none = 0	
16. How many of the following gathering places are on this segment?			
Restaurants	128	some/a lot = 2; few = 1; none = 0	
Coffee shops/Tea houses	129	some/a lot = 2; few = 1; none = 0	
Libraries/bookstores	130	some/a lot = 2; few = 1; none = 0	
Convenience store	131	some/a lot = 2; few = 1; none = 0	
Art or craft galleries	132	some/a lot = 2; few = 1; none = 0	
Wine bars/lounges	133	some/a lot = 2; few = 1; none = 0	
Farmers market	134	some/a lot = 2; few = 1; none = 0	
Other	135	some/a lot = 2; few = 1; none = 0	
17a. Is this segment part of a gated community?	136	3= segment is in between two gated	
17b. How many entrances into the gated community are present?	137	Write out response or if 17a=0 or 1, then	
17c. How accessible is the gated community to the general public?	138	2= not accessible; 1= somewhat accessible;	
Sidewalks			
18a. How many sides of the street have sidewalks?	139	count 0 or 1 or 2	
18b. Is the sidewalk complete on one or both sides? Mark N/A if 18a =0	140	Complete on both sides = 2; complete on	
18c. Is the sidewalk wide enough to accommodate pedestrians?	141	yes = 1; 0 = no	
18d. What is the condition or maintenance of the sidewalk? Mark N/A if	142	moderate or good = 2; poor = 1; under	
18e. Is there a decorative or unique paving that covers most or all of the	143	yes = 1; no = 0; NA = 8	
18f. Determine how much of the sidewalk is covered by these features			
Arcades	144	some/ much of s'walk covered = 1; no/little	
Awnings	145	some/ much of s'walk covered = 1; no/little	

Other	146	some/ much of s'walk covered = 1; no/little	
18g. Are any of the following buffers present between the sidewalk or			
Parked cars	147	Both sides = 2; One side = 1; no = 0; NA = 8	
Landscaping	148	Both sides = 2; One side = 1; no = 0; NA = 8	
Bollards	149	Both sides = 2; One side = 1; no = 0; NA = 8	
Street trees	150	Both sides = 2; One side = 1; no = 0; NA = 8	
Fence or guardrail	151	Both sides = 2; One side = 1; no = 0; NA = 8	
Other	152	Both sides = 2; One side = 1; no = 0; NA = 8	
18h. Are any of the following barriers present on the sidewalk?			
Parked cars	153	some/a lot of the segment = 2; little of the	
Parked bicycles or motorcycles	154	some/a lot of the segment = 2; little of the	
Street vendors or informal sellers that are blocking the sidewalk	155	some/a lot of the segment = 2; little of the	
Trees planted in the middle of the sidewalk?	156	some/a lot of the segment = 2; little of the	
Electrical poles	157	some/a lot of the segment = 2; little of the	
Outdoor dining on the sidewalk that is a barrier	158	some/a lot of the segment = 2; little of the	
Other	159	some/a lot of the segment = 2; little of the	
19. Is there median or fence along the middle of the segment that bars	160	yes = 1; no = 0	
20. Are there sidewalks/greenbelts/trails/paths other than sidewalks	161	yes = 1; no = 0	
Bicycles			
21a. Are there bicycle lanes on the segment?	162	yes = 1; no = 0	
21b. How are the bicycle lanes designated? Mark N/A if 21a =0	163	off road = 4; on road physical separation = 3;	
21c. Are any of the following barriers present in the bicycle lane?			
Parked cars	164	Both sides = 2; One side = 1; no = 0; NA = 8	
Parked bicycles or motorcycles	165	Both sides = 2; One side = 1; no = 0; NA = 8	
Bus stop	166	Both sides = 2; One side = 1; no = 0; NA = 8	
Moving vehicles	167	Both sides = 2; One side = 1; no = 0; NA = 8	
Pedestrians	168	Both sides = 2; One side = 1; no = 0; NA = 8	
Other?	169	Both sides = 2; One side = 1; no = 0; NA = 8	
22. Are there bikes parked on the segment?	170	some/a lot = 2; few = 1; none = 0	
23. What kind of bicycle storage is provided on the segment? Mark all			
Bike racks	171	some/a lot = 2; few = 1; none = 0	
Bike parking (covered)	172	yes = 1; no = 0	
Bike parking (uncovered)	173	yes = 1; no = 0	
Other	174	yes = 1; no = 0	
24. Is there a bikeshare system on this segment?	175	yes = 1; no = 0	
Mid Block Crossing			
25a. Is there a marked mid-block crosswalk for pedestrians?	176	yes = 1; no = 0	

25b. What type of marking does the crosswalk have? Mark all that			
White painted lines	177	yes = 1; no = 0; NA = 8	
Colored painted lines	178	yes = 1; no = 0; NA = 8	
Zebra striping	179	yes = 1; no = 0; NA = 8	
Different road surface or paving (e.g. tiles, colored concrete, marble,	180	yes = 1; no = 0; NA = 8	
Pedestrian activated lighting/signal	181	yes = 1; no = 0; NA = 8	
Other	182	yes = 1; no = 0; NA = 8	
25c. If no, would this intersection be safer or more convenient if there	183	yes = 2; somewhat =1; no = 0; NA = 8	
Steepness			
26. How steep or hilly is this segment? Mark all that apply.			
Flat or gentle	184	yes = 1; no = 0	
Moderate	185	yes = 1; no = 0	
Steep	186	yes = 1; no = 0	
Sidewalk Amenities			
27. Are there outdoor dining areas (e.g. cafes, outdoor tables at coffee	187	some/a lot = 2; few = 1; none = 0	
28. Indicate how many of each of the following street			
Benches (not a bus stop) or chairs	188	some/a lot = 2; few = 1; none = 0	
Bus stops with seating	189	some/a lot = 2; few = 1; none = 0	
Ledges for sitting	190	some/a lot = 2; few = 1; none = 0	
Heat lamps	191	some/a lot = 2; few = 1; none = 0	
Fountains	192	yes = 1; no = 0	
29. Are there visible public restrooms on this segment that are clearly	193	yes = 1; no = 0	
Street Trees			
30a. How many street trees are on this segment? (street trees are	194	some/ a lot = 2; few = 1; none = 0	
30b. What size are the trees? Mark N/A if 30a =0	195	2=large or medium; 1=small; NA = 8	
30c. Is the sidewalk shaded by trees? Mark N/A if 30a =0	196	More than 50% = 2;25-50% =1; less than	
Buildings			
31a. What building heights are present on this segment? Mark all that	197	6= 40+ stories; 5 =13-39 stories; 4=9-12	
31b. How many stories are most buildings on the segment?	198	6= 40+ stories; 5 =13-39 stories; 4=9-12	
32. Are there abandoned buildings or lots on this segment?	199	some/a lot = 2; few = 1; none = 0; NA=8	
Streetscape			
33. Is the street "wall" continuous?	200	2= yes, both sides; 1 = yes, one side; 0 = no;	
34. What is the average setback between the sidewalk and the	201	extra large = 4; large =3; medium = 2; small	
Windows			
35. How many buildings on this segment have windows with bars?	202	some/a lot = 2; few = 1; none = 0; NA = 8	
Other Features of Buildings			
36a. How much of the segment has blank walls or buildings with blank	203	some/a lot = 2; few = 1; none = 0; NA = 8	

36b. Is there a mural or other "decorative" art feature on the blank	204	1 = yes; 0 = no	
36c. Is the mural or other "decorative" art feature on the blank wall	205	2 = attractive; 1= neutral; 0 = unattractive	
37. Can you look through the windows on the ground floor to see what	206	yes = 2; somewhat = 1; no = 0; NA = 8 (no	
38a. Are there podium buildings on this segment?	207	some/a lot = 2; few = 1; none = 0; NA = 8	
38b. How many separate buildings are there on the block?	208	2 = one or two buildings, each side; 1= one	
38c. What is the width of the buildings on the block? Mark all that apply			
Wide width	209	all/most = 2; few = 1; none = 0; NA = 8	
Medium width	210	all/most = 2; few = 1; none = 0; NA = 8	
Narrow width	211	all/most = 2; few = 1; none = 0; NA = 8	
38d. If there are wide or medium width buildings on the segment, are	212	yes = 1; no = 0; NA = 8	
38e. How many separate building entrances are there on the block?	213	some/a lot = 2; few = 1; one = 0; NA = 8	
Parking			
39a. Is there a surface parking lot on this segment?	214	both sides = 2; one side = 1; no = 0	
39b. What is the average size of the parking lot(s)? Mark N/A if 39 a = 0	215	Extra large=4; large = 3; medium = 2; small =	
39c. How much of the segment does the parking lot cover? Mark N/A if	216	some/a lot = 2; little = 1; NA = 8	
40a. Is there a parking structure visible on this segment (do not include	217	yes = 1; no = 0	
40b. Looking at the front of the parking structure on the street level	218	parking = 2; varied = 1; not parking other	
Driveways			
41. How many driveways are visible on the segment?	219	some/a lot = 2; few = 1; none = 0	
Maintenance			
42. Describe the general maintenance of the buildings on this segment.	220	attractive = 3; neutral = 2; unattractive = 1;	
43. Describe the general maintenance of the landscaping on this	221	attractive = 3; neutral = 2; unattractive = 1;	
44. How much graffiti is apparent on this segment?	222	some/a lot = 2; little = 1; none = 0	
45. How much litter is apparent on this segment?	223	some/a lot = 2; little = 1; none = 0	
46. Are there dumpsters visible on this segment?	224	some/a lot = 2; few = 1; none = 0	
47. Are there any broken windows on this segment?	225	some/a lot = 2; few = 1; none = 0	
Lighting			
48a. Is there outdoor lighting on the segment? (Include lighting that is	226	yes = 1; no = 0	
48b. Is the lighting adequate?	227	yes = 1; no = 0	
48c. Is the lighting attractive?	228	yes = 1; no = 0	
Freeways			
49. Is there a freeway overpass/underpass connected to this segment?	229	under a freeway overpass =3; next to	
Traffic Features			
50a. Is the speed limit posted?	230	yes = 1; no = 0	
50b. What is the posted speed limit on this segment? Only include those	231	write number posted	
51. Are there measures on this segment that could slow down traffic?			
Speed bump/speed hump/raised crosswalk; or dips (that are intended	232	yes = 1; no = 0	

Rumble strips or bumps (includes dots, reflectors, raised concrete strips,	233	yes = 1; no = 0	
Curb bulb out/curb extension	234	yes = 1; no = 0	
Traffic circle/roundabout	235	yes = 1; no = 0	
Median	236	yes = 1; no = 0	
Angled/ On-street parking (that runs along most or the entire segment -	237	both sides = 2; one side = 1; no = 0	
Other?	238	yes = 1; no = 0	
52a. Is there a cul-de-sac or permanent street closing on this segment?	239	yes = 1; no = 0	
52b. Is there a pedestrian access point or cut through point that allows	240	yes = 1; no = 0; don't know = 7; NA = 8	
Architecture/Design			
53. Rate the attractiveness of the segment (design + maintenance)	241	attractive = 2; neutral = 1; unattractive = 0	
54. How interesting is the architecture/urban design of this segment?	242	interesting = 2; somewhat interesting = 1;	
55. What is the predominant age of most buildings on this segment?	243	2 = older/historic; 1 = mix of older/historic	
56. What is the "coloring" of most buildings on this segment?	244	1 = buildings are variety of colors; 0 =	
57. What is the nature of the façade/signage of most buildings in this	245	1 = most/all facades/signage is	
Other Features of the Segment			
58. How many street vendors or stalls are on this segment? (do not	246	some/a lot = 2; few = 1; none = 0	
59. Is there public art that is visible on this segment?	247	yes = 1; no = 0	
60. Are there billboards present on this segment?	248	some/a lot = 2; few = 1; none = 0	
61. How safe do you feel walking on this segment IN TERMS OF CRIME	249	pretty/very safe = 1;not very safe/unsafe = 0	
62a. How many people were walking on this segment during the time	250	3 = A constant flow of pedestrians were	
62b. How many people were standing on this segment during the time	251	2 = some/a lot; 1 = few; 0 = none	
62c. How many people were sitting on this segment during the time you	252	2 = some/a lot; 1 = few; 0 = none	
Dogs			
63. Are there any loose/unsupervised/barking dogs on this segment	253	yes = 1; no = 0	
Olfactory Character			
64. Is the dominant smell unpleasant?	254	yes = 1; no = 0	
65. Is air pollution detectable by sight or smell from where you are	255	yes = 1; no = 0	
Intersection			
Neighborhood Identification			
1. Are there monuments or markers including neighborhood entry signs	256	yes = 1; no = 0	
Street Crossing			
2a. Consider the places on the segment that are intended for	257	all = 2; some = 1; none = 0; NA = 8	
2b. If yes, what type of marking do the crosswalks have? Mark all that			
White painted lines	258	yes = 1; no = 0; NA = 8	
Colored painted lines	259	yes = 1; no = 0; NA = 8	
Zebra striping	260	yes = 1; no = 0; NA = 8	
Different road surface or paving (e.g. tiles, colored concrete, marble,	261	yes = 1; no = 0; NA = 8	

Other	262	yes = 1; no = 0; NA = 8	
2c. If yes, is the location of the marking convenient?	263	yes =2; somewhat = 1; no = 0; NA = 8	
2d. If no, would this intersection be safer or more convenient if there	264	yes =2; somewhat = 1; no = 0; NA = 8	
3a. Are there curb cuts at all places where crossing is expected to	265	all = 2; some = 1; none = 0; NA = 8	
3b. Is the curb cut convenient?	266	yes =1; no = 0; NA =8	
3c. What is the condition of the curb cut?	267	good/moderate=1; poor=0; NA=8	
4a. What type of traffic/pedestrian signal(s)/system(s) is/are provided?			
Traffic signal	268	yes = 1; no = 0	
Stop sign	269	yes = 1; no = 0	
Yield sign	270	yes = 1; no = 0	
Pedestrian signal (activated)	271	yes = 1; no = 0	
Pedestrian signal (automated)	272	yes = 1; no = 0	
Pedestrian signal (with countdown)	273	yes = 1; no = 0	
Pedestrian signal (with sound)	274	yes = 1; no = 0	
Pedestrian crossing sign	275	yes = 1; no = 0	
Traffic assistant/Crossing guard	276	yes = 1; no = 0	
Pedestrian overpass/underpass/bridge	277	yes =1; no = 0	
4b. If no, would this intersection be safer or more convenient if there	278	yes = 2; somewhat = 1; no = 0; NA = 8	
4c. For intersections with pedestrian overpasses/underpasses, is the	279	yes = 2; 1= somewhat; 0 = no; NA = 8	
4d. For intersections with pedestrian overpasses/underpasses, are	280	yes = 2; 1= somewhat; 0 = no; NA = 8	
4e. Are wait times for crosswalks long enough for pedestrians to get	281	yes = 1; no = 0	
5. Do cars turning left or right make it unsafe for pedestrians to cross	282	yes =1; no = 0; NA = 8	
6. Describe the turning radius.	283	1= wide; 0=tight; NA = 8	
7. For an individual who is on this segment, is THE DESIGN OF THE	284	yes = 2; somewhat = 1; no = 0; cul de sac = 8	
8. For an individual who is on this segment, is THE DESIGN OF THE	285	yes = 2; somewhat = 1; no = 0; cul de sac = 8	
9. Is there a pedestrian island in the middle of the intersection?	286	yes =1; no = 0	

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