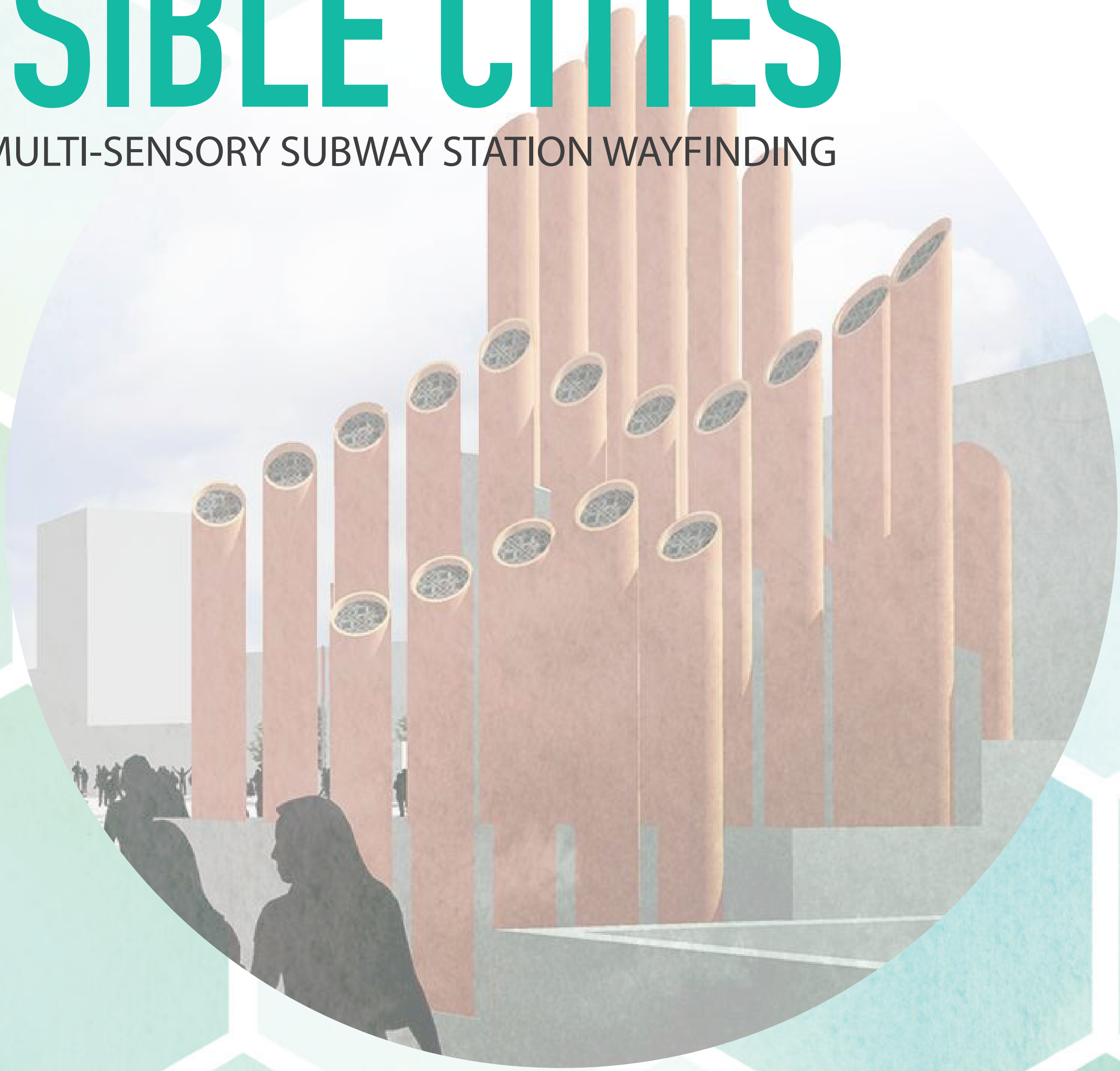
INVISIBLE CITIES

A STUDY ON MULTI-SENSORY SUBWAY STATION WAYFINDING



INDEPENDENT RESEARCH PROJECT 2016

WINNIE Y. CHANG

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A STUDY ON MULTI-SENSORY SUBWAY STATION WAYFINDING

WINNIE Y. CHANG

"Submitted in partial satisfaction of the requirements for the degree of"

BACHELOR OF SCIENCE IN LANDSCAPE ARCHITECTURE

In the Department of Human Ecology
University of California, Davis

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ABSTRACT

Wayfinding holds a key component in making a site accessible. In studying how accessible a site is, its wayfinding can be evaluated for its inclusiveness for user groups with disabilities. This project focuses on the experiences of individuals with visual impairment using subways. Subway stations in dense urban areas are typically located underground and out of sight, making wayfinding essential in locating station entrances from the street level.

Visual impairment is the fourth most common disability in the United States behind mobility, cognitive, and independent living disabilities. With decreased reliability on vision, the senses of sound and touch are heightened in navigation. Existing subway station wayfinding does not typically include wayfinding in forms other than signage, making the sense of sight the only sense engaged in the formal wayfinding process. This can be challenging for individuals with visual impairment, especially if the signage does not thoroughly consider designs for limited vision, resulting in signage that may be poor in contrast, obstructed, or just too small.

This project looks into engaging the senses of sound and touch in addition to sight to improve the wayfinding experience for all. By designing for individuals with visual impairment, this project shows how a wayfinding experience that taps into multiple senses in addition to improving signage can effectively invite a larger population of subway riders to use the Downtown Berkeley BART Station. Through research and design investigation, this project proposes a hypothetical retrofit of the Downtown Berkeley BART Station with increased accessibility.

ACKNOWLEDGEMENTS

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I would like to thank Tamara Wood, Katt Jones, Scott Smith, and Rick Watson, who generously gave their time to make this project possible. Their insights were invaluable in providing direction for the project.

Special thanks to the UC Davis Landscape Architecture program for equipping me with the skills and knowledge to enter the landscape architecture profession.

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INTRODUCTION

There is no single description that defines the city dweller as there is no single age group, occupation, physical or mental condition, or overall general lifestyle that can fit the entire urban demographic. However, one thing that can be said about cities: the people are always on the move. One city dweller may be making a beeline towards work in their own personal vehicle while another commuter may take the bus or metro. A traveler visiting the city for the first time may be looking for clues on how to get to their destination under the least amount of time while another may welcome the experience of getting lost in a foreign city. A local resident may live three blocks away from a favorite café and knows the route by heart and moves towards their destination without much thought.

Sight is the primary sense that guides most individuals in navigation. What if cities were suddenly stripped of most of this visual information? Although not as simple as asking a sighted individual to close his or her eyes and find their way through a space, it can be a place to start understanding the challenges individuals with visual impairment encounter. With a decrease in sight, there is a heightened sense of hearing and touch in the wayfinding process. The greater majority of individuals do not tap into these valuable sensory cues as purposefully as do individuals with visual impairment.

Designing for individuals who rely on more than just the sense of sight as a primary sense may be the next step in making cities more accessible and intriguing. A walk from the bus stop to the subway could actively engage the sense of hearing and touch in addition to sight.

CHAPTER ONE

PROBLEM STATEMENT

OVERVIEW

Cities are typically designed for the majority and may not effectively address the needs of individuals with disabilities in its details. Visual impairment is one of the most prevalent disabilities in the nation. Most individuals with visual impairment are unable to drive and must rely on public transit such as the subway. Current subway station design sequence may limit wayfinding design and, in its process, neglect the needs of certain user groups.

Figure 1.1 First Public Curb Ramp Commemoration Plaque

PROBLEM STATEMENT

During a rush, a BART rider may only have a few minutes to get to the subway station before the train departs. In this scenario, the legibility of the route to the subway station is highly valuable and can determine whether one makes or misses the train. The performance of existing wayfinding on site directly affects the ability of an individual to navigate through complex city streetscapes to reach a BART station entrance. Wayfinding is essential in simplifying these complex sensory-inundated landscapes to create ease of navigation. With the evident need for wayfinding, my research project looks at two concepts which form my argument that existing wayfinding at many subway stations is insufficient. First, cities are often not designed for everyone; second, wayfinding at subway station entrances often comes an afterthought in subway station design and development.

The first concept to be discussed is that cities are not designed for everyone. The evidence for this begins with the practice of designing for the majority—the individual with no physical or mental disability. In the streamlined process of developing a city and designing with the majority in mind, user groups such as individuals with disabilities become insufficiently represented in the completed design. In 2013, the Centers for Disease Control and Prevention (CDC) published a report on the prevalence of disabilities among adults in the United States with a corresponding infographic that indicates that the five most common disabilities found in the United States, in order of prevalence, are mobility, cognition, independent living, vision, and self-care as seen in Figure 1.2 (CDC, 2013).

In pursuit of a more inclusive community, Berkeley was the first city in the world to build curb cuts up and down its streets allowing individuals in wheelchairs to have more accessibility (Williamson, 2012). A floor plaque at the intersection of Center Street and Shattuck Avenue at the corner adjacent to the Downtown Berkeley BART Station plaza commemorates the efforts of individuals "who have fought for equal access in every community" (Figure 1.1). It has since become the law for curb cuts to be available at all sidewalks pushed by the American Disability Act of 1990. Individuals without mobility disability are not affected by the addition of curb cuts and more likely benefit from the smoother transitions between street and sidewalk. Curb cuts were designed for individuals with mobility disabilities in mind but have ultimately provided a convenience the majority can benefit from as well.

Berkeley has proven to be a city with the energy to catalyze a movement that could attract a lawmaker's attention in setting design regulations for individuals with disabilities. It may be of interest of this city to extend "equal access in every community" to individuals with other disabilities (Figure 1.1). As mentioned before, visual impairment is the fourth most prevalent disability in America behind mobility, cognition, and independent living disabilities. Laws for mobility disability have been passed triumphantly and implemented in every city in the United States. There is much less recognition for other common disabilities in the design of the urban form. This research project will focus on the use of subway stations by individuals with visual impairment because simple retrofits and renovations to many existing forms at subway stations may effectively improve the experience for this user group.

A 2013 estimate found that over 7 million people nationwide have a visual impairment (National Federation of the Blind, 2013). Driving is not an option for many who have a visual impairment. As a result, many take to public transportation. Roughly 45% of individuals with disabilities use public transit (Marston, Golledge, Costanzo, 1997, p. 3). Less than 23% of individuals with disabilities of working age nationwide are employed, partially due to the challenge in reaching places of work (Marston, Golledge, Constanzo, 1997, p. 2). A component to addressing this issue would be to increase the accessibility to public transit for all user groups through improved wayfinding.

The second concept to be discussed in the section is that designing subway station wayfinding is generally an afterthought in subway station design and development. As mentioned earlier, around half of all individuals with disabilities use public transportation. The needs of this user group is severely underrepresented in subway station wayfinding. The issue may start from the design of the subway

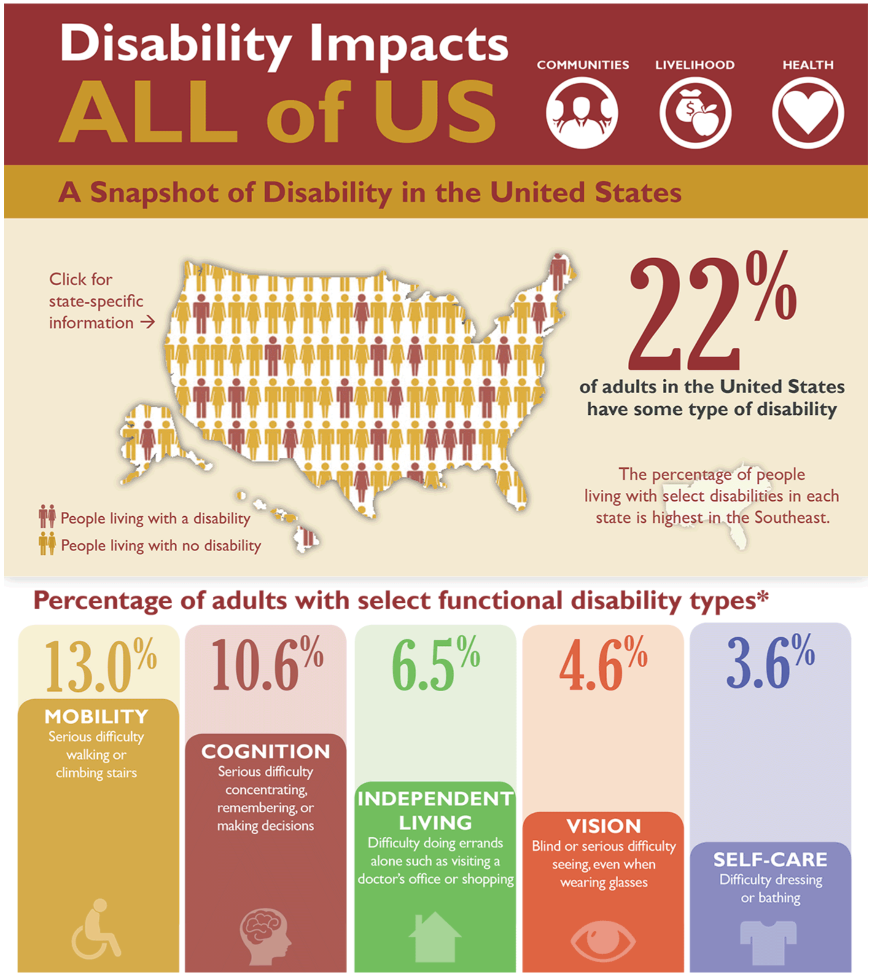


Figure 1.2 A Snapshot of Disability in the United States

Figure 1.3 Clearing a Path for People with Special Needs Clears the Path for Everyone

station. The design process is often methodical, streamlined, and cost-effective; however, in the process, may not effectively address certain user groups such as individuals with visually impairment.

In 1940, architecture historian Talbot Hamlin made the following observation of the design of a subway station entrance in New York:

> "…discouragement arises at the sight of the street entrances of the New York Sixth Avenue Subway. Here again is a matter requiring design which affects millions of people, here again is design of the most utterly pedestrian, uninspired, and mechanical type…The design of subway stations is too important a matter to be left to the unsupervised efforts of a municipal engineering bureau, however competent." (Wicker, 1979, p. 37).

The subway station is further lost into the urban fabric as observed by the architects of San Francisco's BART stations when they "…discovered soon after they were hired that their job was mostly to apply finishes and install entrances to structures whose basic configurations had been frozen years before" (Wicker, 1979, p. 340). This observation showcases the issue with the sequence and low-reaching levels of involvement in the early development of many subway stations. A similar conclusion is also reached by Arthur and Passini (1992) in their suggestion that architects and graphic designers should work in close collaboration. In current public wayfinding, they observe that the architects create a building and then expect graphic designers to come up with the wayfinding within the building afterwards. It is a difficult task when the two disciplines do not collaborate from the start. Typically, the graphic designer unsuccessfully tries to impose a wayfinding design into the complete building and is blamed for the poor performance of the imposed wayfinding features (Arthur and Passini, 1992, p.17). Current subway station wayfinding is driven by these existing methods and approaches. The creative architectural expression is hindered by the driving thought that a subway is simply "a machine for getting on and off trains." (Wicker, 1979, p. 184). There are vague areas of collaboration and a sequence of development that suppresses creative design solutions at subway stations. It is during the standard design and development of subway stations when needs for certain user groups such as the visually impaired become underaddressed in the final subway station design.

In addition to possibly missing the train, insufficient wayfinding system at subway systems can lead to unanticipated monetary, emotional, accessibility, and safety implications (Arthur and Passini, 1992, p.11). A subway station may not reach its full potential in ridership numbers if some potential riders deliberately avoid the subway due to the frustrations in navigating to the station. Emotional stress from insufficient wayfinding could arise from missing a train or feeling incompetent as a result of not being able to decode the existing wayfinding at the station. Lastly, an insufficient wayfinding system can put a rider's safety at high risk. For example, in an extreme case, there may be a situation at a station that would require a rider to evacuate the station. Proper wayfinding information is crucial in evacuating a large number of people out of a station in a narrow window of time (Arthur and Passini, 1992, p. 7-11).

In summarizing the Problem Statement, existing wayfinding is insufficient at subway stations because the task of designing cities is difficult and, in its process, may neglect certain user groups. However, designing for everyone may simply mean looking at design from a different angle. In designing for improved accessibility, designing for individuals with disabilities may benefit everyone as in the case of the curb cut. The designing of a wayfinding system comes in late in the process of subway station design and development and as a result is not flexible to creative design solutions. A reimagined sequence of subway station design and development, incorporating wayfinding design earlier into the picture, may alleviate issues found in existing wayfinding at subway stations.

CHAPTER TWO

PURPOSE STATEMENT & RESEARCH QUESTION

OVERVIEW

This project looks into evaluating the existing wayfinding experience at the Downtown Berkeley BART Station with the intention of reimagining the station with improved wayfinding drawn from evidence found from research. A definition of relevant terms and the research questions set the basis for Research Design.

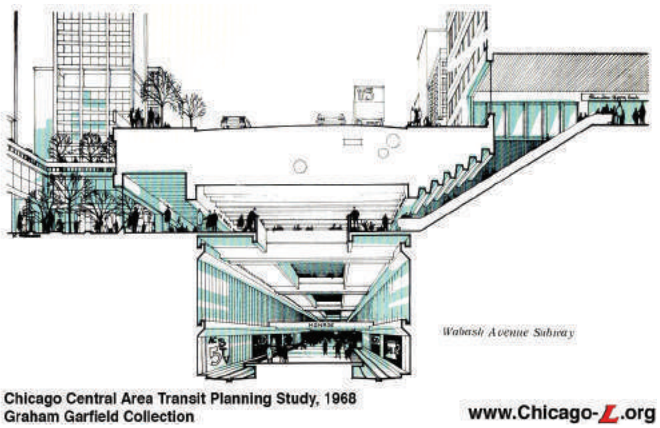


Figure 2.1 Subway Station Cross Section

PURPOSE STATEMENT

The purpose of this research project is to study the effectiveness of existing wayfinding for BART riders with visual impairment at the Downtown Berkeley BART Station. For this research project, both informal and formal wayfinding are considered the definition of existing wayfinding at the BART station. This study seeks to understand the challenges of navigating through an urban environment with a visual impairment.

The objective of this research project is to propose a hypothetical retrofit of the Downtown Berkeley BART Station site drawing from literature on wayfinding and personal research. Research for this study would include the observation of both formal and informal wayfinding cues at existing subway stations. Data collected from this research can determine gaps in information for certain senses and subsequently direct future wayfinding efforts to these areas. The retrofit would identify site recommendations and subsequent proposed site elements. End-products for this retrofit would include a plan, section, and other graphics that would illustrate a potential solution for retrofitting the site in response to the literature review and research. The intent of this study is to suggest the potential for creative wayfinding elements that engage visual, auditory, and tactile senses in subway station wayfinding.

In establishing a framework for the rest of the study, the next portion of this section will address the different terminology relevant to the study as presented by different literature from wayfinding, sensory perception, and subway station design.

Subway. A rail system with a portion of the track that goes underground.

Wayfinding. The term "wayfinding" itself was coined by Kevin Lynch in 1960 where it was first defined as "a consistent use and organization of definite sensory cues from the external environment" (Kevin Lynch, 1960). Wayfinding, as defined by Golledge, Jacobson, Kitchin, and Blades, is the process of visualizing a spatial network and creating connections as one travels through the space. It involves knowing origins and even destinations that one may or may not be aware of. Sequentially, this leads to path selection through criteria, i.e. shortest distance, shortest time, and least number of turns. Gibson describes wayfinding as enhancing a space without losing its original character (Gibson, 2009, p.14). Arthur and Passini suggest another definition that wayfinding is problem solving under uncertainty. There may be a gap in information, but a part of wayfinding is to find new alternatives along the route if needed.

Sensory Perception. Sensory perception is found to be an essential part of wayfinding across most wayfinding literature. Golledge, Jacobson, Kitchin, and Blades suggest that most people do not use cartographic representations or instruments in navigation, instead relying heavily on sensory information. This sensory information is gathered from moving through an environment (Golledge, Jacobson, Kitchin, and Blades, 2000, p.94). The sensory cues in the environment can increase the legibility of a path, meaning the effectiveness of environmental cues in guiding the individual in making route decisions (Golledge, Jacobson, Kitchin, and Blades, 2000, p.95). The five senses play a role in developing spatial knowledge. When sensory perception is discussed in wayfinding literature, the authors consistently find that visual perception contains the strongest and most beneficial sensory information in wayfinding. The varying significance and relevance in wayfinding associated with each sense can be developed as primary sensory information or secondary sensory information in developing wayfinding designs.

Visual Perception. Visual perception is considered the most reliable sense in wayfinding. Vision offers a precision in distance, direction, and identification that auditory perception falls short in (Kitchin and Freundschuh, 2000, p.222).

The effectiveness of visual information partially comes from the speed in which information can be taken in. Eyes can move quickly across different scenes, taking in many visual cues (Schinazi, Thrash, Chebat, 2015, p.42). In busy environments such as the approach to a subway entrance in an urban area, visual cues providing quick information becomes very helpful in guiding the individual through the space. The reliability and quick response time to visual cues for individuals with sight is the reason why signage is the most prevalent method of designed into wayfinding systems.

Other measures can spatially orient subway users such as keeping openness in the station to allow the subway user to comprehend the overall station circulation (Wicker, 1979, p.163).

Figure 2.2 Icons of the Fives Senses

Auditory Perception. In the absence of visual perception, as in the case of inidividuals who are blind, auditory perception is an important method of wayfinding. Of the 314 million people who are visually impaired worldwide, 45 million are blind (Patel and Vij, 2011, p.193). Travel capabilities are hindered for the individuals with visual impairment because of the visual dominance of many existing wayfinding features. Typical auditory wayfinding is the use of tactile paving such as truncated domes at curb cuts indicating to an individual with visual impairment that they are approaching a street or sidewalk.

The use of auditory cues as a method of wayfinding is validated further with auditory information processing being an integral part of Orientation and Mobility Training for individuals with visual impairment. Koutsoklenis and Papadopoulous tested out the qualitative perception of auditory cues through a focus group in which subjects who have undergone Orientation and Mobility Training and those that had not received this training. Their questionnaire contained questions targeted at discovering the most helpful auditory cues in wayfinding. Car brakes, people entering/leaving a stop, work in progress, taxi passing, motorcycle, vehicle horn, and bus passing were a few that made the top of this list. Each of the mentioned auditory cues provided many clues as to what the environment the individual navigating a space is in. For example, the sound of a passing bus would help indicate that there is a bus stop nearby and that the individual is traveling along a large street. The sound of cars passing, people entering or leaving a shop, and children playing at a playground were determined as the most helpful sounds in spatial orientation (Koutsoklenis and Papadopoulous, 2011, p.704).

Vertical Orientation. Most wayfinding studies refer only to the horizontal orientation in wayfinding. In multi-level sites such as a subway stations, the relationship between the approach to the station entrance above ground to the station and trains underground is unclear. This makes the individual trying to find the underground subway station unclear about where his or her destination is and how to get there. Understanding where the train runs underground from above ground could spatially orient an individual. This is observed by Bigler, Brugger, Utzinger and Richter in their research of wayfinding in places with level changes. They believe people are capable of understanding spatial relationships across vertical levels, but some factors can make this complicated such as a misalignment of features between levels (Bigler, Brugger, Utzinger and Richter, 2014, p.178).

An innovative wayfinding measure at subway stations that helps establish vertical orientation is the use of skylights to bring sunlight onto the platform or mezzanine of the underground station (Wicker, 1979, p.190). This integration of natural light from above ground helps establish the relationship between the urban context above ground and the subway station underneath, thus helping with spatially orienting the subway user.

Cognitive Maps & Spatial Orientation. Cognitive maps are discussed across many wayfinding literature. As described by Arthur and Passini, spatial orientation is established through the development of a cognitive map and once the individual is able to orient themselves within their constructed cognitive map (Arthur and Passini, 1992, p. 18). In Cognitive Mapping: Past, Present, and Future, Kitchin and Freundschuh suggest cognitive mapping as a synthesis of primary (e.g. sensory) and secondary experiences (e.g. maps) (Kitchin and Freundschuh, 2000, p.1). Building onto this definition, Golledge, Jacobson, Kitchin, and Blades define cognitive mapping as an internal representation of the experience in the external environment. It may not necessarily be a literal cartography map. Instead, Golledge, Jacobson, Kitchin, and Blades suggest that cognitive maps are a representation of the environment distributed in different modules in the brain. Included in their definition of cognitive mapping is the ability to get to one's destination and ability to communicate this knowledge with others. It can be suggested that cognitive maps require a sequential understanding in getting from point A to point B. Golledge, Jacobson, Kitchin, and Blades emphasize the importance of accurate object-to-object relations in cognitive mapping in order to avoid distorting or fragmenting one's understanding of a space (Golledge, Jacobson, Kitchin, and Blades, 2000, p.96).

Cognitive maps are constructed as an individual navigates through a space. Steps that help build construct the cognitive map include route learning as introduced by Golledge, Jacobson, Kitchin, and Blades (Golledge, Jacobson, Kitchin, and Blades, 2000, p.97). Route learning is the ability to recall paths after they have been repeated. Repetition is a key factor in developing a strong cognitive map. An individual is spatially oriented once they have developed a cognitive map. Creating a more navigable space could include developing sensory cues that would result in the construction of a cognitive map.

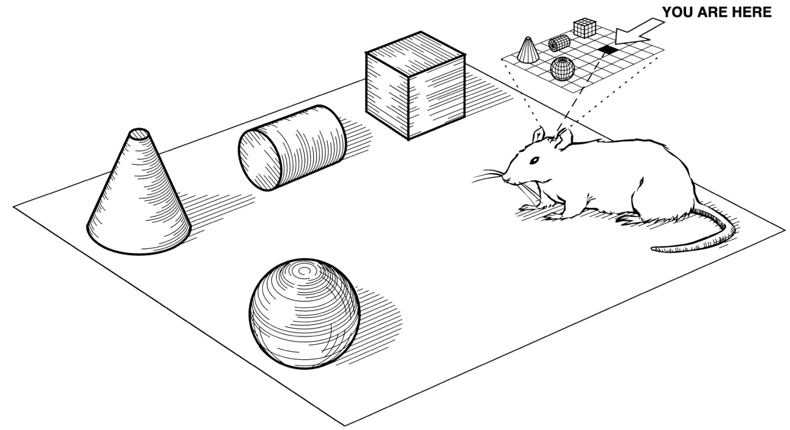


Figure 2.3 Representation of a Cognitive Map

RESEARCH QUESTION

In searching for a response to the purpose of my project and subsequent Downtown Berkeley BART Station retrofit, I proposed the following research question: **“What is the role of sensory perception in subway station wayfinding?”**

Utilizing various research methods to respond to my research question, I hope to identify primary and secondary sensory cues used by subway users to reach the station entrance and to be able to understand how effective they are in contributing to the site’s overall wayfinding performance.

As a secondary questions, I ask “How effective is existing subway station wayfinding in helping individuals with visual impairment locate the subway entrance?” and “How can existing wayfinding be improved to become more inclusive of different user groups?”. The intent of these secondary questions is to support findings for the main research question and to bridge conceptual ideas with physical recommendations for the Downtown Berkeley BART Station retrofit.

CHAPTER THREE

RESEARCH DESIGN, METHODS, & DATA COLLECTION

OVERVIEW

The three research methods of direct observation, intercept surveys, and informed observer interviews are introduced for the purpose of responding to the proposed research questions. Details on each method and the data collected are described in this section.

RESEARCH DESIGN

In developing a research design, my intent was to utilize methods that would capture the experiences of individuals, in which the project would directly involve, as accurately as possible. The research design was to focus on documenting the physical and social qualities of the project site to understand the role of sensory perception in subway station wayfinding. The methods chosen were to effectively respond to my research question through my best understanding of the site and its users in the limited window of time available to complete the project.

Through my personal observations from frequenting the site, I determined that sensory perception at subway stations cannot be generalized and that each subway station has its own inventory of sensory cues that could be documented for design investigation. This directed me to incorporate a sensory experience inventory at the project site to analyze existing wayfinding performance. One of two primary methods that this was to be done was through direct observation. The purpose of direct observation was to document the role of sensory perception at the Downtown Berkeley BART Station informed by relevant literature. The second primary method was to conduct intercept surveys at the site. The purpose of doing so was to paint a picture of who the project site is used by and their experiences of the site and its wayfinding.

The third research method chosen to answer my research question was informed observer interviews. Interviews were to be helpful in providing knowledge and multiple perspectives on the topic of subway station wayfinding through the focus on individuals with visual impairment and/or knowledge of the Downtown Berkeley BART Station. As an individual with sight, I wanted to be exposed to a sensory experience different from my own to be able to begin the understand the challenges of finding the subway station entrance with a visual impairment and, as a designer, be able to make informed design decisions for this user group.

METHODS

The following section will describe the details of implementing my three research methods of direct observation, intercept surveys, and informed observer interviews. All of my direct observations and intercept surveying were conducting between March 26th, 2016 to May 13th, 2016 on Friday mornings between 9am-12pm. This was the only time frame I was able to study because it was the only time of the week I was able to travel to Berkeley from Davis. Nonetheless, my methods should reflect the users of the site on a typical weekday morning.

Through my first research method of direct observation, my goal was to make observations of the physical and social qualities of the project site. To document these qualities, I began with trying to understand the circulation of the site to identify primary routes utilized and to study the relationship of these routes with public transportation nodes and wayfinding. I observed the movement and circulation of people over several trips to the site and created a foot circulation map of the site denoting which routes had heavy or moderate circulation and stationary individuals at the site. The purpose of this map was to identify a bus stop to BART entrance route that could be further studied for its wayfinding sequence of experience. The route selected was to focus on a primary route between a bus stop and BART entrance to study the availability and role of existing auditory, visual, and tactile cues in helping a rider navigate between the different modes of public transit.

The second research method implemented was intercept surveys. The purpose of conducting intercept surveys was to study the general use of the site. The intercept survey was implemented at two locations on the site: the main entrance of the Downtown Berkeley BART Station (Location 1) and the bus stop in the plaza (Location 2). These two locations were of particular focus to study navigation in between these two modes of public transit. In complementing the typical sequence of experience route as described in the first research method, studying the route between Locations 1 and 2 would evaluate an additional well-travelled route between the main entrance and the bus stop at the other end of the plaza. Participants of the intercept survey at Location 1 were individuals entering the station rather than exiting because I believed that the process of navigating to the station entrance would still be fresh on their minds, rather than recalled from previous trips. Participants of the intercept survey at Location 2 were whoever was present at the bus stop at the time of survey implementation.

The intercept survey questions could be separated into three sections: the survey sample, the sensory experience, and the Downtown Berkeley BART Plaza use. The purpose of the survey sample was to determine how closely the participants studied represented the ridership demographics of the 2008 BART Ridership Report for the particular station. The sensory experience questions were to identify primary wayfinding elements used by the participants to navigate the site and to evaluate the use of formal existing wayfinding. The Downtown Berkeley BART Plaza use questions were to begin understanding the flow of people at the plaza and how improved wayfinding can be integrated into complex social fabric of the existing plaza.

The third research method of informed observers was to provide insight on topics I could only understand so much through literature reviews, direct observation, and intercept surveys. The interviews were conducted across various platforms from in-person, over phone, and through email. I interviewed Rick Watson, a BART rider with visual impairment, briefly on site on April 8th, 2016, and Tamara Wood, BART rider with a visual impairment, over the phone on April 16th, 2016 to document first-hand experiences of taking BART with a visual impairment and recommendations on how this could be improved. I interviewed Katt Jones, Orientation and Mobility Specialist, over email on April 28th, 2016 to learn how individuals with sight can better understand the experience of individuals with visual impairment. I interviewed Scott Smith, BART architect involved in the Downtown Berkeley Plaza and Transit Area Improvement project, in-person on March 4th, 2016 along with two mechanical engineers at BART to inquire about the feasibility of implementing multi-sensory wayfinding designs at BART.

RESEARCH METHOD I: DIRECT OBSERVATION

EXISTING BART WAYFINDING SIGNAGE & STRUCTURES

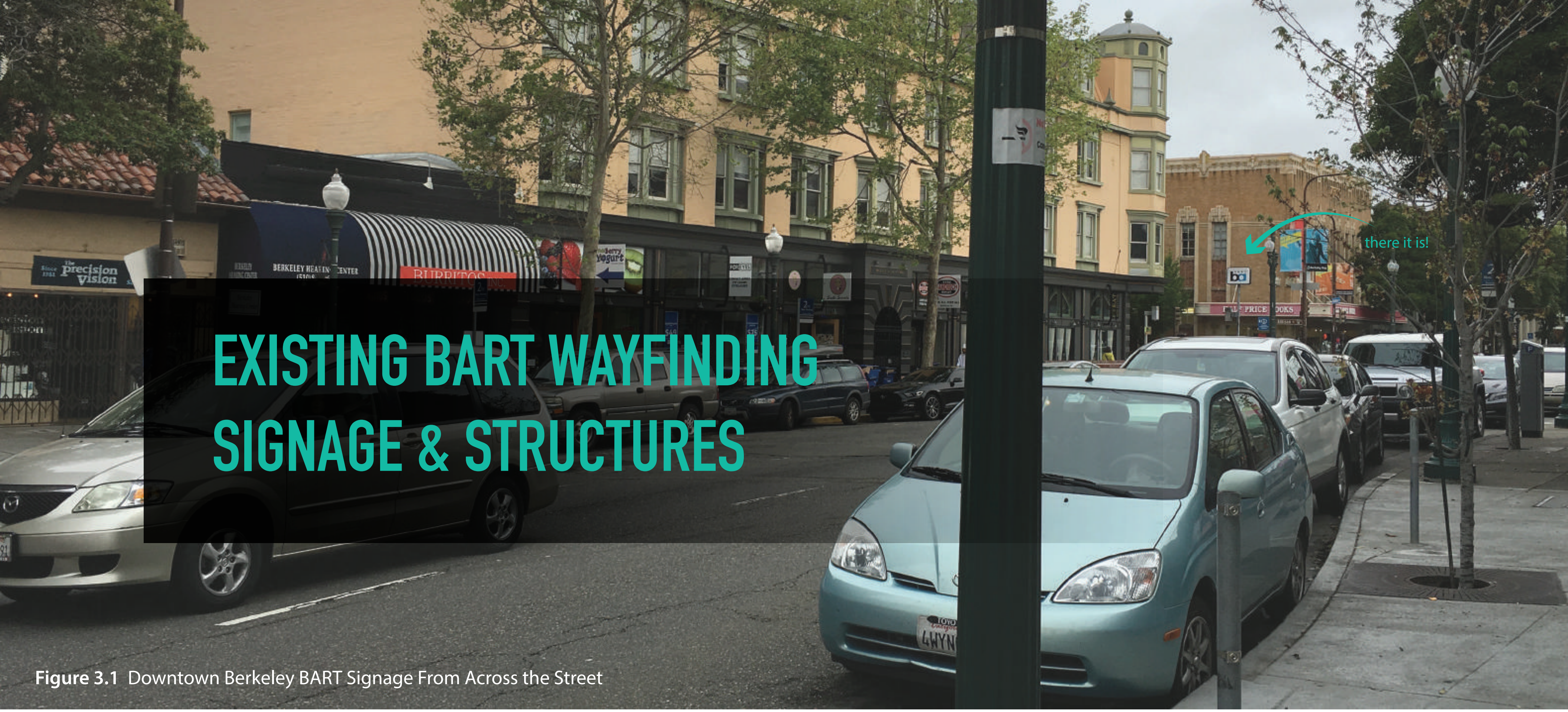


Figure 3.1 Downtown Berkeley BART Signage From Across the Street

BART

Figure 3.2 BART Logo

The Downtown Berkeley BART station has a main entrance and five additional side entrances. Formal wayfinding at the typical side entrances of this station is found in the form of signage as seen in Figure 3.3. The signage displays the BART logo in the rough dimensions of a 3'x2' white panel elevated roughly 15 feet off the ground. It is not very noticeable from a distance in the case of tree canopies blocking the line of sight, the small size, and low visual contrast of the signage from the rest of its surroundings.

The main entrance is a dark-toned rotunda with the height and evident difference in material from the rest of the site to stand out as an important landmark as seen in Figure 3.4. The only BART signage on the rotunda is a tiny sign reading "Berkeley" at the top of the

Figure 3.3 Typical Side BART Entrance

Figure 3.4 Main BART Entrance

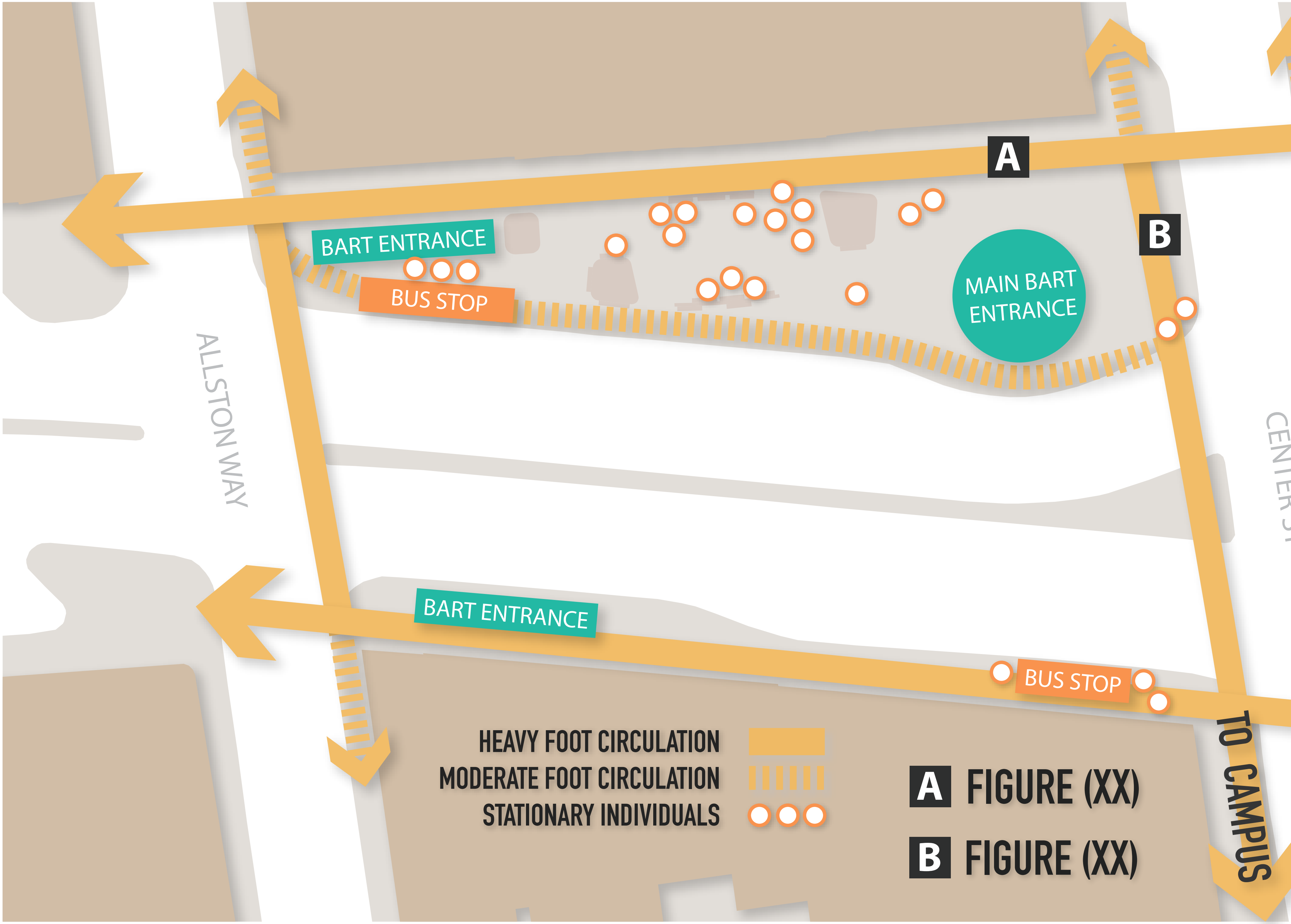
entrance of the rotunda. It can be easily missed and does not use the BART logo to help indicate that the rotunda is a BART entrance. Although well-associated as the main entrance to those who frequent the station, the rotunda is obscure to those who are new to the site. Aside from the stream of people entering the station, there is little information that this is a BART entrance for those heading to the station for the first time.

...BART station entrance or time capsule?

There are two types of wayfinding maps located on the site indicating the different bus stops and BART entrances and landmarks in the local area. They are effective in explaining where the user is relative to the site context. It would benefit to keep these existing wayfinding maps on the site.

Figure 3.5 Wayfinding Map 1

Figure 3.6 Wayfinding Map 2


A
B
BART ENTRANCE
BUS STOP
MAIN BART ENTRANCE
ALLSTON WAY
CENTER ST
BART ENTRANCE
BUS STOP
TO CAMPUS
HEAVY FOOT CIRCULATION
MODERATE FOOT CIRCULATION
STATIONARY INDIVIDUALS
A FIGURE (XX)
B FIGURE (XX)

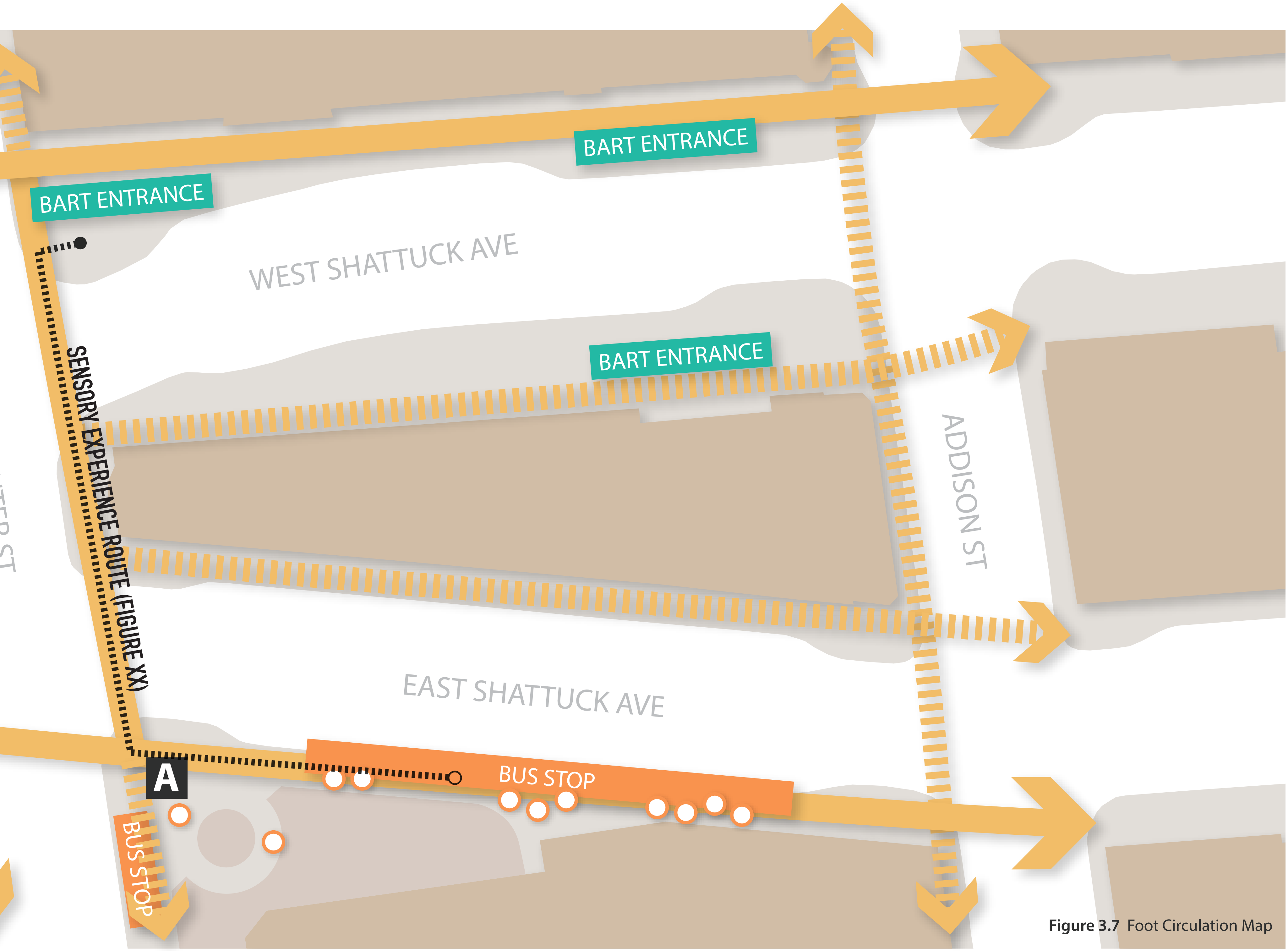
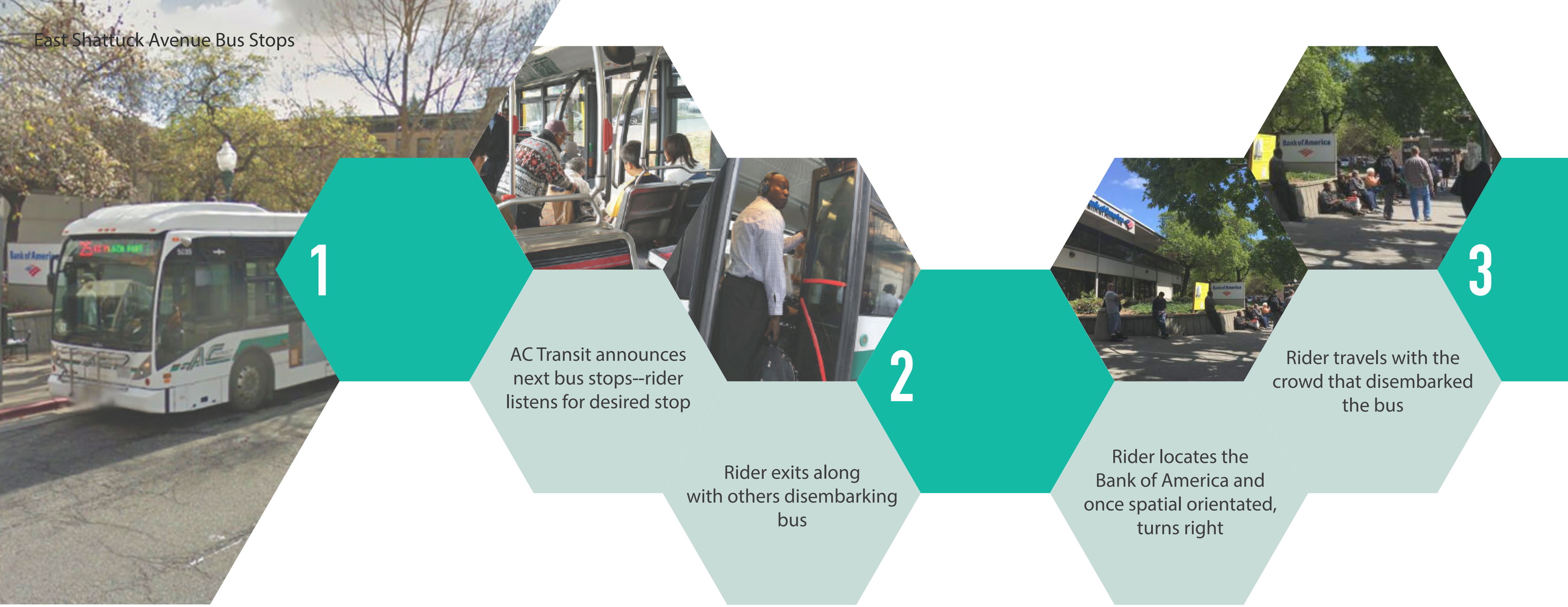


Figure 3.7 Foot Circulation Map



SEQUENCE OF EXPERIENCE
BUS STOP TO BART ENTRANCE

This route was selected for a more detailed sequence of experience study because it is a primary route between the bus hub on East Shattuck and a BART entrance. I completed this sequence by following and observing numerous individuals who disembarked a bus at this bus hub and made their way to this particular side BART entrance.

SEQUENCE DESCRIPTION

1
AC Transit rider disembarks at desired bus stop

2
After disembarking bus, rider determines whether to turn left or right by looking for wayfinding cues

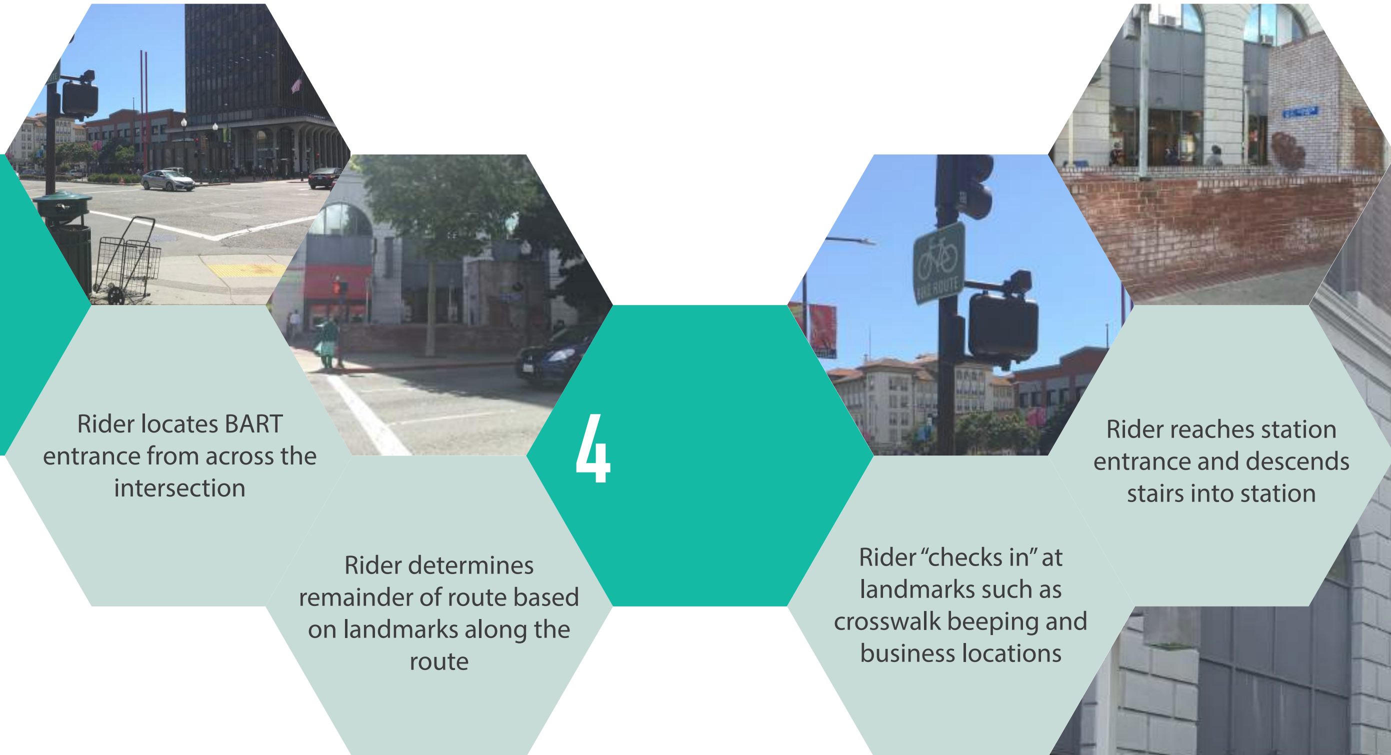


Figure 3.8 Sequence of Experience Diagram

Downtown Berkeley BART
Side Entrance with Elevator

3
Rider locates direction of station entrance and determines route

4
Rider confirms they are heading in the right direction by "checking in" to surrounding sensory landmarks

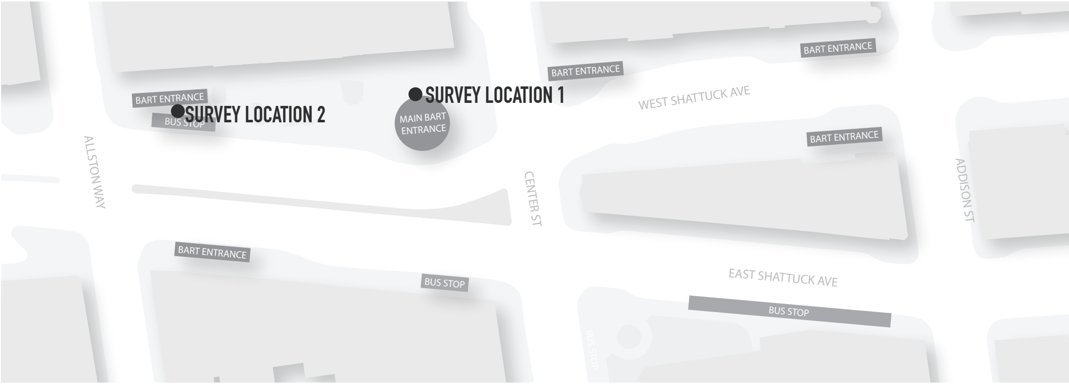


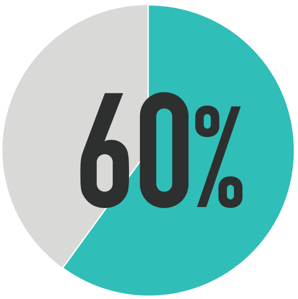
Figure 3.9 Survey Locations Map

RESEARCH METHOD II: INTERCEPT SURVEYS

SURVEY SAMPLE BARART ENTRANCE

Figure 3.10 Location 1 Survey Sample Pie Charts

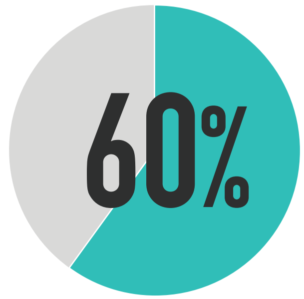
How often do you use this BART station?



used Downtown Berkeley BART station several times a week or more

Several times a week or more · Once a week or less · First Time

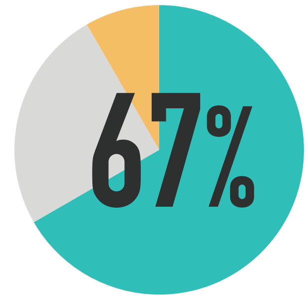
Did you take another mode of public transportation before this to get here?



took another mode of public transportation to get to the station

Yes · No

If so, what kind?



of those who took another mode of public transportation took a bus

Bus · Car · Bike

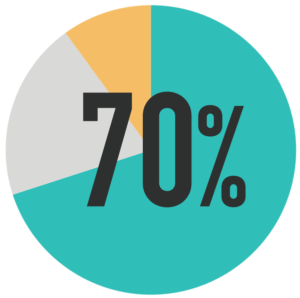
KEY TAKEAWAYS

- Population surveyed reflects ridership demographic from 2008 BART Station Profile Report
- Population surveyed uses station frequently and responses may be influenced by familiarity of route
- More than half of the population surveyed relied on a bus to reach the BART station
- Population surveyed would benefit from improved connectivity between bus stops and BART entrances

SURVEY SAMPLE BUS STOP

Figure 3.11 Location 2 Survey Sample Pie Charts

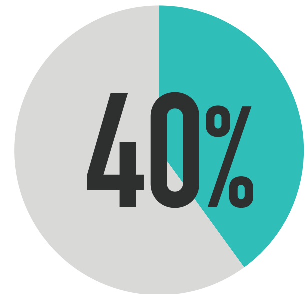
How often do you use this BART station?



used Downtown Berkeley BART station several times a week or more

Several times a week or more   Once a week or less   First Time

Did you take BART before this to get to this bus stop?



took BART before to get to the bus stop

Yes   No

KEY TAKEAWAYS

Population surveyed reflects ridership demographic from 2008 BART Station Profile Report

Population surveyed uses station frequently and responses may be influenced by familiarity of route

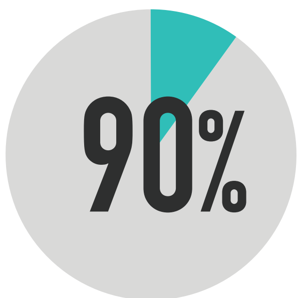
Nearly half of the population surveyed took BART to get to the bus stop

Population surveyed would benefit from improved connectivity between bus stops and BART entrances

SENSORY EXPERIENCE

Figure 3.12 Sensory Experience Pie Charts

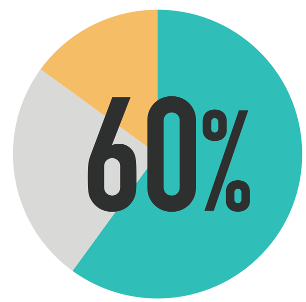
Did you use signage to navigate to the station entrance?



did NOT use signage to navigate to the station entrance

■ Yes ■ No

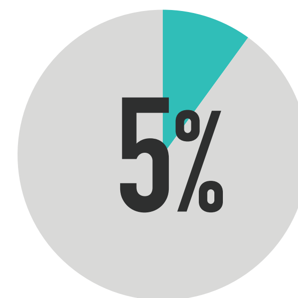
What other cues in your surroundings helped you navigate to the station entrance?



used surrounding buildings or the station rotunda to navigate to the station entrance

■ Surrounding buildings or rotunda ■ Street Names ■ Other (items mentioned only once)

Do you have any visual impairment?



of population surveyed had a visual impairment

■ Yes ■ No

KEY TAKEAWAYS

Existing station signage is not used by most of the BART demographic

Most of the BART demographic relies on non-verbal wayfinding cues to reach the station entrance

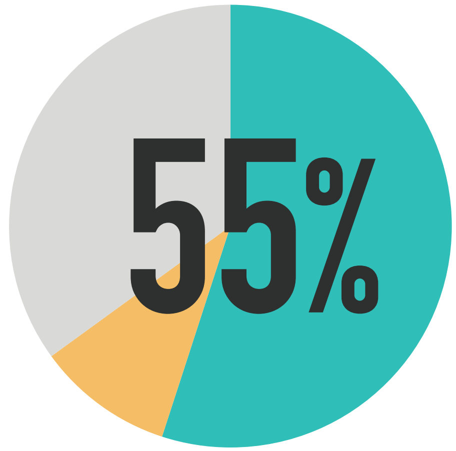
Visual access to surrounding buildings or the station rotunda provided the largest wayfinding service

Population surveyed reflects responses of a primarily sighted sample of individuals

DOWNTOWN BERKELEY BART PLAZA USE

Figure 3.13 Plaza Use Pie Charts

How much time do you usually spend in the Downtown Berkeley BART Plaza?



spend 30 minutes or less in the Downtown Berkeley BART plaza- another 35% do not spend any time here

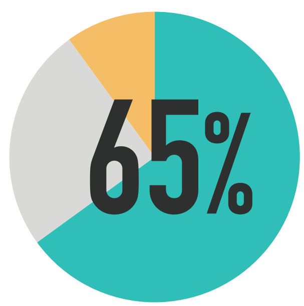
30 minutes or less | More than 30 minutes | None

Why do you not spend any time in the plaza?

of those who do not use the plaza are just passing through

Just passing through | No reason to stay | Avoiding homeless population

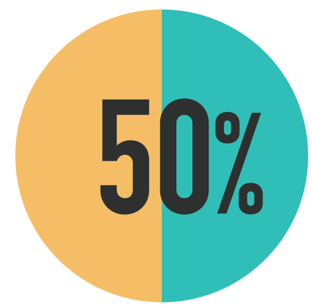
What are you doing in your 30 minutes or less time spent in the plaza?



of those who spend 30 minutes or less in the plaza are waiting for the bus

Waiting for the bus | Hanging out | Eating

What are you doing in your 30 minutes or more time spent in the plaza?



of those who spend 30 minutes or more in the plaza are hanging out or eating

Eating | Hanging out

RESEARCH METHOD III:
INFORMED OBSERVER INTERVIEWS

TAMARA WOOD INTERVIEW TAKING BART WITH VISUAL IMPAIRMENT

Tamara Wood is a BART rider with visual impairment. She has age-related macular degeneration, resulting in central vision loss but the peripheral vision is retained. This means her vision is more impressionistic because central vision provides more detail than peripheral vision. Macular degeneration is one of the most common visual impairments for older people.

Figure 3.14 Visual Paths

How can wayfinding signage be improved?

A. "Signage would be more legible if it is black and white, well back-lit, and at least 5 to 7 feet above ground."

What has been the most helpful non-visual wayfinding cue you have encountered?

A. "Truncated domes, wayfinding tile, visual paths in hospitals (Figure 3.14), and the tactile path at the Pleasant Hill BART which connects the bus stop to the BART entry to gate. Canes can detect even the tiniest rise."

What has been the most helpful informal wayfinding cue you have encountered?

A. "Overhang structures, the overpass at Rockridge BART Station, shadows differentiating light and dark, structure of the building if it is unique to its surroundings, and the temperature difference in shadows have been helpful informal wayfinding cues."

Do you feel any frustration or avoid public transportation because of insufficient wayfinding systems?

A. Tamara does not feel any frustration because she personally enjoys going to go places. "However, the biggest frustration at BART is not seeing signage at BART stations, especially if it is not consistent between stations and if the contrast just isn't high enough."

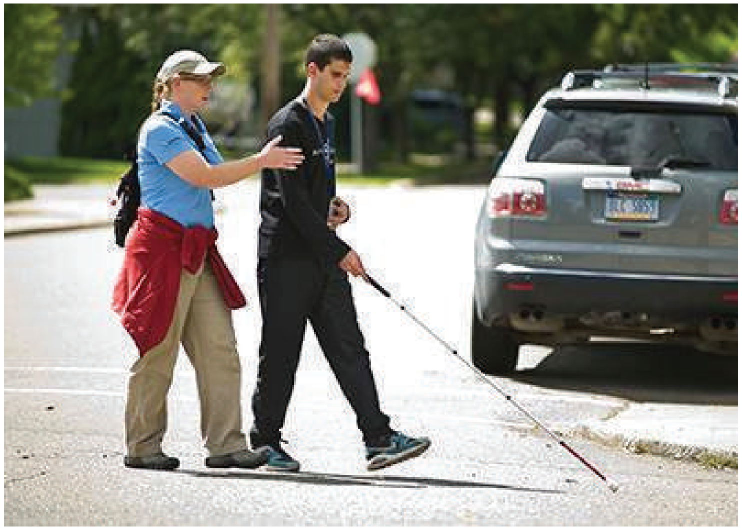


Figure 3.15 Route Training in Progress

What is your best tip for a visually impaired individual walking through a city?

A. A tip would be to have an instructor or to get route training (Figure 3.15). Tamara typically looks up a place on the computer before going there. She is comfortable going to airports and places she's familiar with; however, in any new city, she would rather go with support.

What would you say or recommend to architects and designers to better understand the experience of visually impaired individuals?

A. "Light is very important. Most visually impaired still have light sensitivity. A good design example is at the School for the Blind in Fremont. The doors are recessed so when they are opened, they won't hit anyone. The windows are recessed so no bright sunlight goes into building. Direct light can be painful and disorienting.

Externally, some cues on sidewalk to indicate that you are approaching a doorway. Something tiny will do. Doorways can be recessed and doors themselves can be darker. In addition, designing for higher contrast would be very helpful."

RICK WATSON INTERVIEW TAKING BART WITH VISUAL IMPAIRMENT

Rick Watson is a BART rider with visual impairment. He uses BART farily regularly and has become familiar with the Downtown Berkeley BART Station. He utilizes a white cane Figure 3.16, a mobility tool often used by individuals who are blind or visually impaired to gather tactile information from the surroundings.

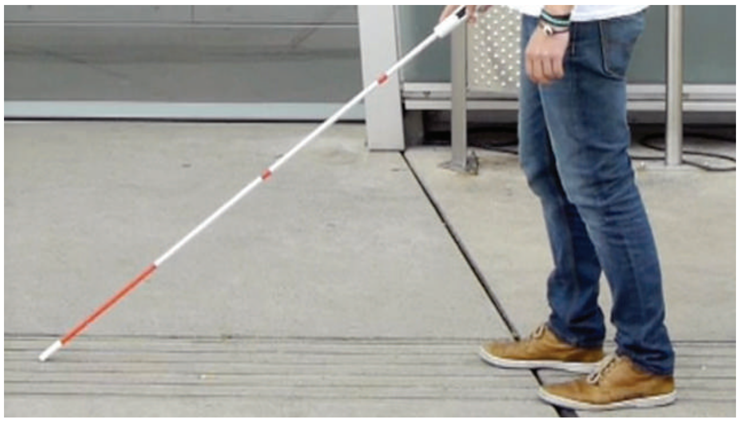


Figure 3.16 Tactile Wayfinding with a White Cane

Figure 3.17 Wayfinding Tile along BART Platform

What are some helpful wayfinding cues at BART stations?

A. The beeping of crosswalk signs at intersections is helpful while crossing streets. The black and yellow truncated domes along the edge of the train platform is also very helpful.

How can existing BART wayfinding be improved for users with visual impairment?

A. The extension of the black tile portion of the truncated domes at some stations has been helpful. The black tile at Downtown Berkeley BART Station is not extended. More tactile wayfinding at BART stations would be helpful to help differentiate the change in material **(**Figure 3.17**)**.

What other existing wayfinding elements at the Downtown Berkeley BART Station, in particular, can be improved for users with visual impairment?

A. The distance between the secondary station entrances is fairly far from the turnstiles. It would help to set up a new turnstile closer to the secondary entrances because the sounds at the turnstiles help Rick listen for walking direction.

How helpful are auditory cues in subway station wayfinding?

A. Auditory cues are most helpful if they are known ahead of time.

SCOTT SMITH BART ARCHITECT INTERVIEW

Scott Smith is an architect for BART and has worked on the Downtown Berkeley BART Plaza and Transit Area Improvement Project, set to be completed in Fall 2017. Two BART mechanical engineers joined in on the interview to comment on the project feasibility as to be discussed in Design Investigation and Analysis.

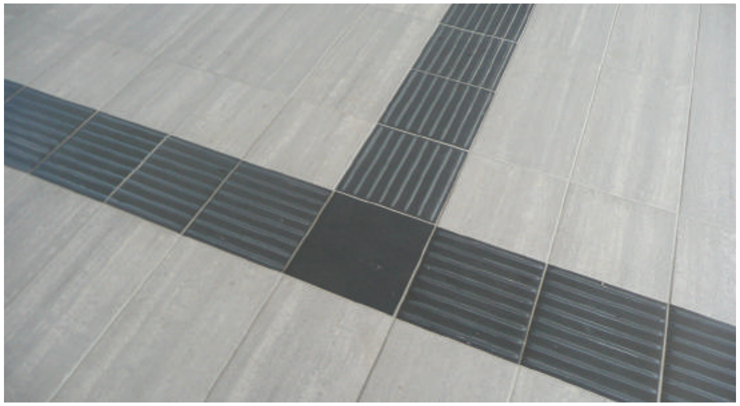


Figure 3.18 Wayfinding Tile

How were riders with disabilities addressed in the design and development of the Downtown Berkeley BART Plaza and Transit Area Improvement Project?

A. The disability issue addressed regarded the limited space between the elevator door and fire utilities right in front at one of the station entrances. Individuals in wheelchairs may have trouble maneuvering out of this spot.

What kinds of wayfinding for individuals with visual impairment has BART inegrated into any station design?

A. Some stations have introduced tactile wayfinding by laying out wayfinding tile from the subway train platform to the fare collection area to bus stops (Figure 3.18).

Do you think that current BART station development is sequential in that architects finish their work first then graphic designers come into the picture afterwards?

A. Yes

KATT JONES INTERVIEW ORIENTATION AND MOBILITY SPECIALIST

Katt Jones is a Orientation and Mobility Specialist at LightHouse for the Blind and Visually Impaired in San Francisco, an organization that provides services for individuals who are blind or have visual impairment. Part of her job includes providing route training for individuals who are blind or have visual impairment. The interview was conducted over email.

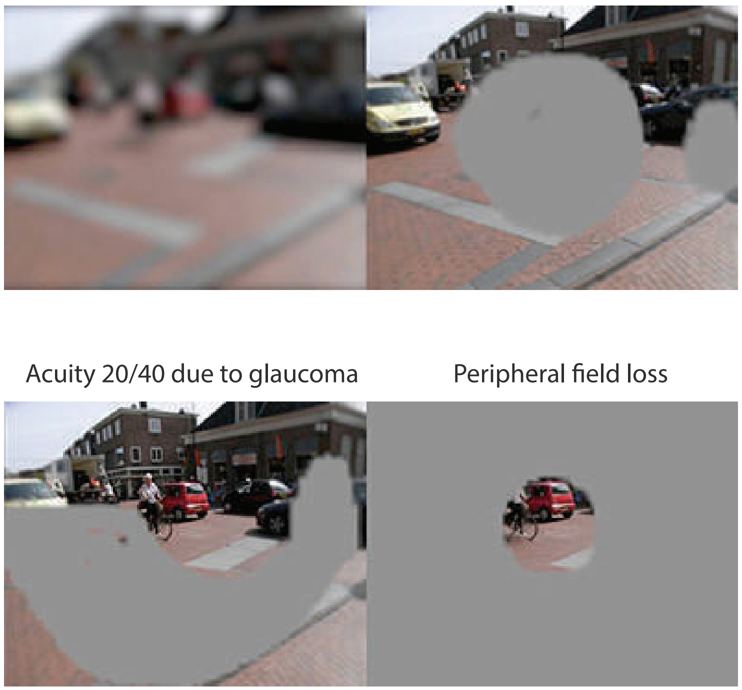


Figure 3.19 Common Visual Impairments

Which environmental cues that you point out do visually impaired individuals best respond to?

A. "It really varies depending on the eye condition and how much vision the person has and how much spatial awareness they have (Figure 3.19). If they are totally blind then I will point out tactile and auditory cues such as truncated domes (yellow bumps), curb edges, wheelchair ramps, building/lawn edges, stairs, obstacles, etc. If the person has some remaining vision then I will look for things that are large/high contrast like crosswalk lines and signage they can read. Auditory cues include the sound of the traffic on parallel and perpendicular streets, the sound of audible pedestrian signals, the sound of machines beeping (fare gates), and using echolocation (Figure 3.20) to distinguish the presence of a wall/building/ hallway/doorway/etc. Of these, the most important ones tend to be: curb edges/ramps, sound of the traffic, and developing echolocation skills."

What issues do the individuals with visual impairment find most challenging with navigating in a city? At BART? With public transportation in general?

A. "In a city, crossing large busy streets without veering; at BART, locating the stairs/escalator/elevator especially if unfamiliar with the BART station; and with public transportation in general, locating bus stops, figuring out how to transfer, and knowing how to navigate to their destination once off the bus."

What tips do you have for individuals with visual impairment if they stray from the route they were trained for and need to find their way back?

A. "First they need to recognize that they have strayed from the route, which requires that they are aware of their surroundings and the different landmarks along the path that they should be checking for as they walk. Then they have to problem solve their way back to where they need to go which can include soliciting assistance (asking someone nearby for help), reversing their route until they locate a landmark that can help reorient them, or consulting a GPS device/app to figure out where they are."

What advice would you give to other individuals with sight to better understand the experience of individuals with visual impairment?

A. "First I would let them know that many people with visual impairments have some remaining vision. It might be cloudy, it might be a pinhole, it might have blindspots, but many people can see a little bit and that doesn't mean they can see like you or are "faking." Second I would let them know that they should never touch or grab a person with a visual impairment. Instead, they can always ask that person if they need any help and find out what that person might need from them. If they ask to be guided then offer your elbow for them to hold onto. If you see someone heading towards an obstacle, curb, or stairs, don't freak out since their cane will find it for them."

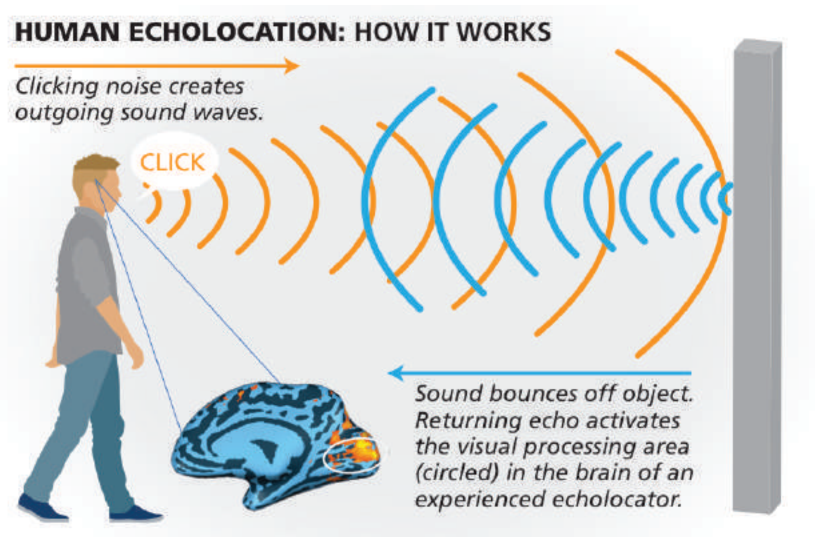


Figure 3.20 Echolocation

Figure 3.21 Change in Paving

Figure 3.22 Text Recommendations for Visual Impairment

What would you say or recommend to architects and designers to better understand the experience of visually impaired individuals?

A. "Most architects and designers do not consider how a space sounds at all. Big open spaces can be very disorienting to those who are blind since there is nothing to trail with their cane or orient to. I would also recommend making design choices that make spaces more high contrast for low vision people can be really helpful. For example, if a wall is a light color and the door is a dark color, it will be much easier to locate as a low vision person. Texture changes on the ground are also a fantastic way to make a space more accessible (Figure 3.21). These texture changes can create subtle pathways for cane users to follow that sighted people won't notice. Lastly, I would recommend better signage that is free of clutter, back lit illuminated, white text on dark background, large print, and serif-free font (Figure 3.22). Also, just having better lighting in general would make a lot of spaces more accessible with bright, energy efficient, LED lights."

Figure 4.1 Downtown Berkeley BART Station Site Context

CHAPTER FOUR

DOWNTOWN BERKELEY BART STATION

DESIGN INVESTIGATION & ANALYSIS

SITE SELECTION

The Downtown Berkeley BART Station is located along the Richmond to Fremont and Richmond to Daly City/Milbrae BART lines. It is located at a prime location among shops, restaurants, theaters, and other destinations. The western edge of University of California, Berkeley campus is less than 800 feet away from the subway entrance. There is no parking structure immediately at this station, but there is street parking available around the site. Subway riders can also get to the station by foot, bike, other public transportation, or automobile drop-off. Around 13,744 riders enter the Downtown Berkeley BART Station on an average weekday with around 3,000 of the riders coming from home. Around 71% of riders getting to the station arrive there by foot, 10% by bicycle, 9% by bus/transit, 6% dropped off, 3% by car, and 1% by carpool.

The main station entrance is within a rotunda that leads down to the station below. Its front entrance faces into the block towards a bank entrance. Signange has a minimal influence in indicating that this is the main BART entrance. The plaza south of the entrance is a simple landscape with brick ground material and brick seat walls and planters. The plaza is roughly 60' wide and 300' long. There is another side BART entrance in the same plaza at the southern end roughly 200' south of the main entrance. There are a total of six BART entrances including the main entrance in the vicinity.

Several AC Transit busses make a stop at this plaza. As a result, people are constantly circulating through the site. The constant flow of people through the site makes the Downtown Berkeley BART Station Plaza a suitable place to receive a lot of input on sensory perception. The plaza is located on Shattuck Avenue, a busy street which runs through Downtown Berkeley. The station and its vincinity encompass many restaurants and shops with people constantly flowing in and out of the site, making the site full of different sensory information to process. The actual BART station itself is located underneath the plaza. Riders can take escalators or stairs down towards the station from the street-level station entrances.

DESIGN INVESTIGATION

Drawing from research evidence applicable to subway station wayfinding, I arrived at several site recommendations that could be implemented at the Downtown Berkeley BART Station to improve its wayfinding performance. From site recommendations, I investigated physical site elements that could be implemented that would engage the visual, auditory, and tactile senses in subway station wayfinding. There are overarching wayfinding goals that can be applied to all the visual, auditory, and tactile wayfinding elements as found in Figure 4.2. The detailed recommendations and elements for the three senses are described in Figure 4.3.

RESEARCH EVIDENCE	SITE RECOMMENDATION
APPLICABLE TO ALL SENSORY WAYFINDING	
Nearly half of the population surveyed relied on a bus to reach the station. Population surveyed would benefit from improved connectivity between bus stops and BART entrances (Intercept Surveys, 2016, p. 40 in document)	Improved connectivity between bus stops and BART entrances
Roughly 45% of individuals with disabilities use public transit (Marston, Golledge, Costanzo, 1997, p. 3)	
[The biggest issues] with public transportation in general [include] locating bus stops, figuring out how to transfer, and knowing how to navigate to their destination once off the bus." (Katt Jones, Informed Observers Interview, 2016, p. 50 in document)	
After disembarking bus, rider determines whether to turn left or right by looking for wayfinding cues (Sensory Experience, p. 36 in document)	Visual, auditory, and tactile landmarks
Rider confirms they are heading in the right direction by "checking-in" to surrounding sensory landmarks (Sensory Experience, p. 37 in document)	

Figure 4.2 Research Evidence & Recommendations Applicable to All Senses

RESEARCH EVIDENCE	SITE RECOMMENDATION
VISUAL WAYFINDING	
Openness in stations for better comprehension of the overall circulation (Wicker, 1979, p.163)	Improve visual legibility of route between bus stops and BART entrances by clearing lines of sight
Visual access to surrounding buildings or the station rotunda provided the largest wayfinding service (Intercept Survey, p. 42 in document)	Improve visual legibility of route between bus stops and BART entrances by improving or introducing visual landmarks
"...signage that is free of clutter, back lit illuminated, white text on dark background, large print, and serif-free font." (Katt Jones, Informed Observers Interview, 2016, p. 54 in document)	Improve BART signage based on findings
AUDITORY WAYFINDING	
"If [the individual in the process of route training] is totally blind then I will point out tactile and auditory cues..." (Katt Jones, Informed Observers Interview, 2016, p. 50 in document) Importance of accurate object-to-object relations in cognitive mapping in order to avoid distorting or fragmenting one's understanding of a space (Golledge, Jacobson, Kitchin, and Blades, 2000, p.96)	Improve auditory legibility of route by introducing consistent auditory landmarks at important decision-making nodes
The sound of cars passing, people entering or leaving a shop, and children playing at a playground were determined as the most helpful sounds in spatial orientation (Koutsoklenis and Papadopoulous, 2011, p.704)	Amplify the sounds of people at important spaces by creating a place people where want to stay longer in
TACTILE WAYFINDING	
"If [the individual in the process of route training] is totally blind then I will point out tactile and auditory cues..." (Katt Jones, Informed Observers Interview, 2016, p. 50 in document) "Truncated domes, wayfinding tile, and in hospitals, visual paths [provide the most helpful non-visual wayfinding cue] and the tactile path at the Pleasant Hill BART connects the bus stop to the BART entry to gate." (Tamara Wood, Informed Observers Interview, p. 46 in document)	Tactile wayfinding on the ground along important routes
58% of those who do not use the plaza are just passing through (Intercept Survey, p. 44 in document)	Unobstructed paths for those who only wish to pass through the plaza
Texture changes on the ground are also a fantastic way to make a space more accessible. These texture changes can create subtle pathways for cane users to follow that sighted people won't notice." (Katt Jones, Informed Observers Interview, 2016, p. 52 in document)	Texture change at plaza to indicate arrival at an important space

SITE RETROFIT ELEMENTS	ELEMENT ID IN PLAN (Figure 4.4)
Remove trees and reconfigure existing planters at plazas that block the line of sight between bus stop, BART entrances, and important visual landmarks	A
Introduce tall light installations at the bus hub and at main entrance	B
Tall, raised BART signage columns with BART logo and station name in high contrast at station entrances	C
Introduce auditory landmark at each side BART entrance activated by BART trains passing by underground	D
Space in the plaza for gatherings, waiting for the bus, eating, and hanging out	A
Wayfinding tile connecting primary bus to to BART entrance routes	E
Reconfigure existing planters at plaza that obstruct circulation between bus stop and BART entrances	A
Textured material different from surrounding material at plaza	F

Figure 4.3 Sensory Specific Research Evidence, Recommendations, & Retrofit Elements

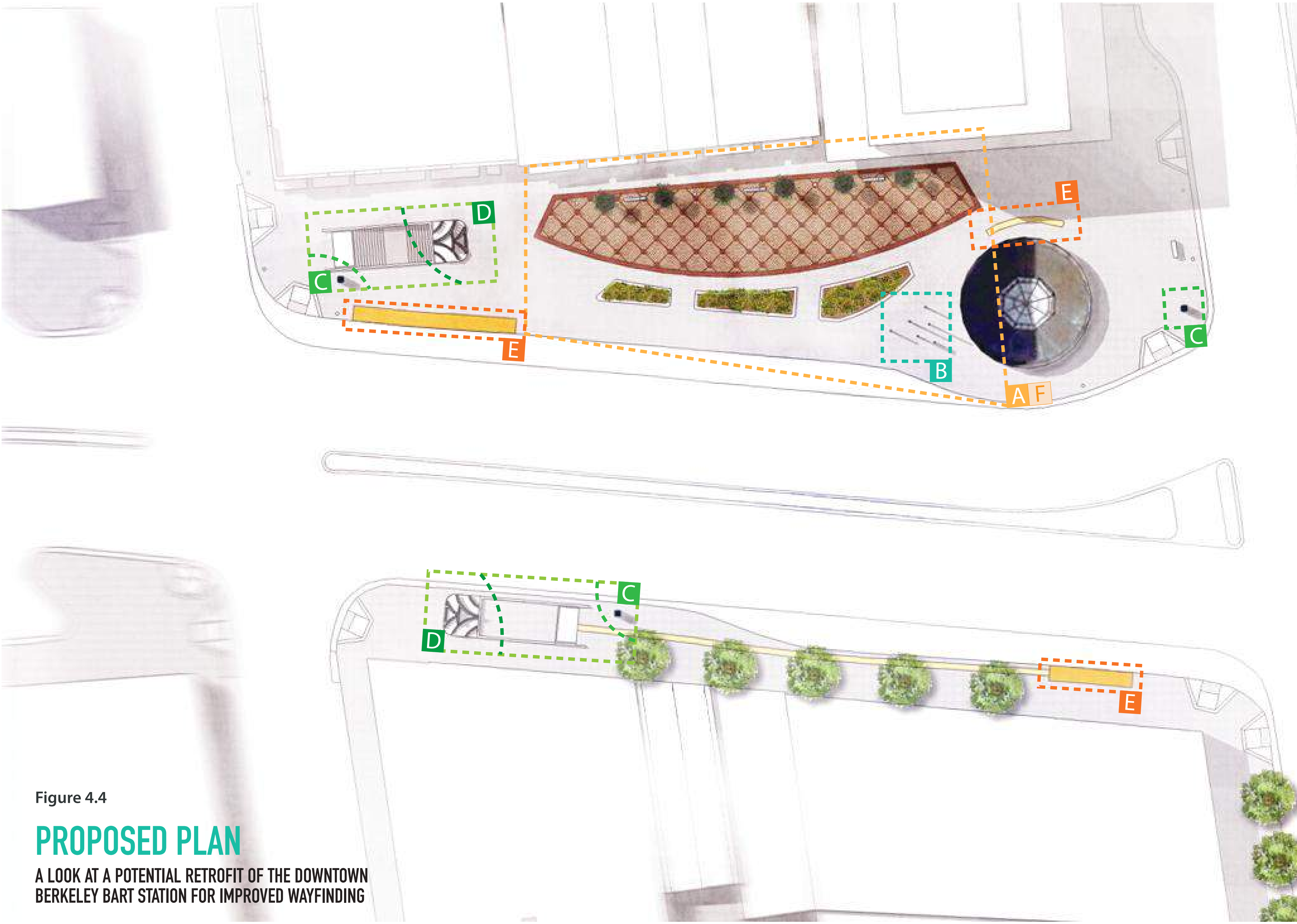
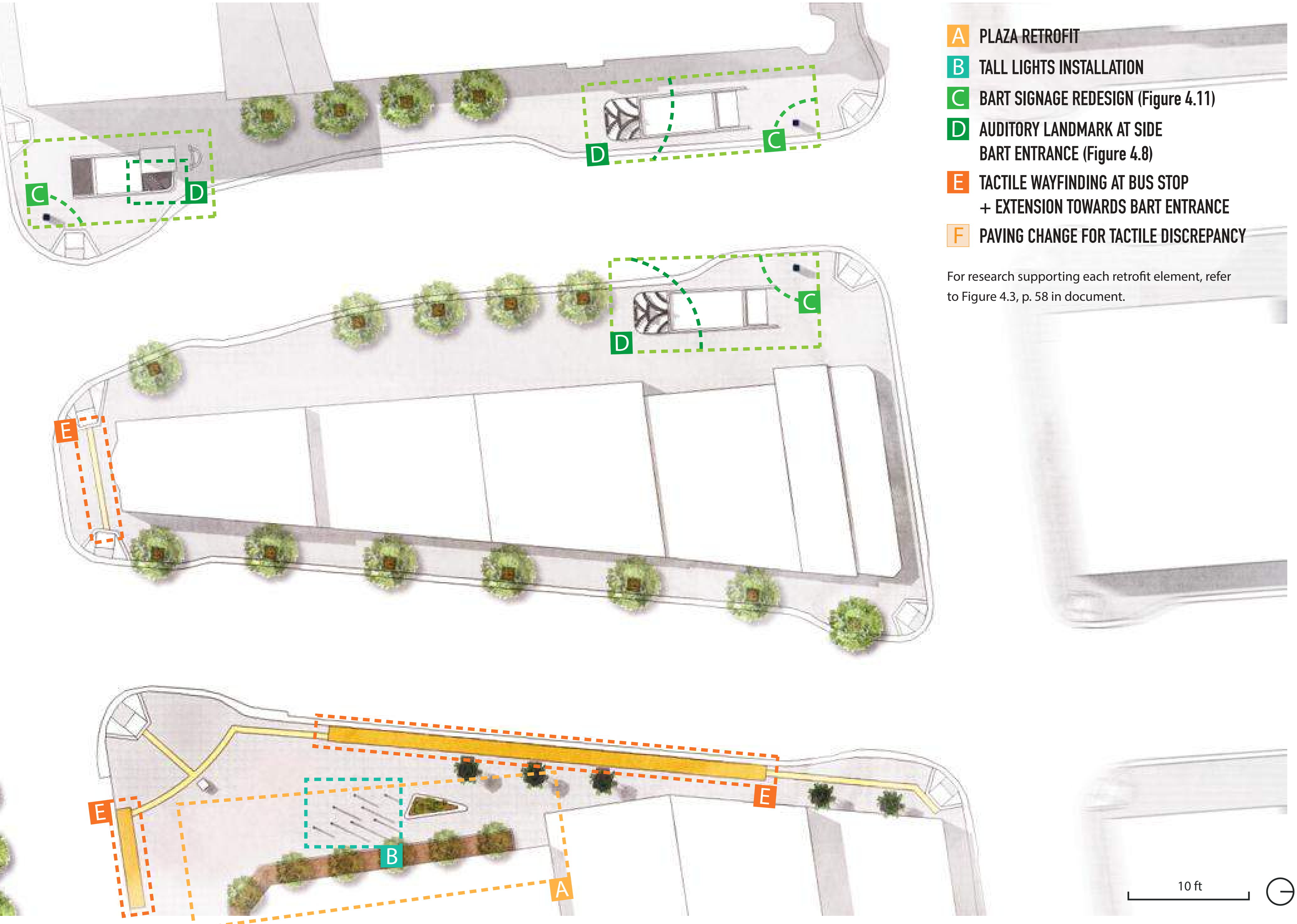


Figure 4.4

PROPOSED PLAN

A LOOK AT A POTENTIAL RETROFIT OF THE DOWNTOWN BERKELEY BART STATION FOR IMPROVED WAYFINDING



A PLAZA RETROFIT

B TALL LIGHTS INSTALLATION

C BART SIGNAGE REDESIGN (Figure 4.11)

D AUDITORY LANDMARK AT SIDE BART ENTRANCE (Figure 4.8)

E TACTILE WAYFINDING AT BUS STOP + EXTENSION TOWARDS BART ENTRANCE

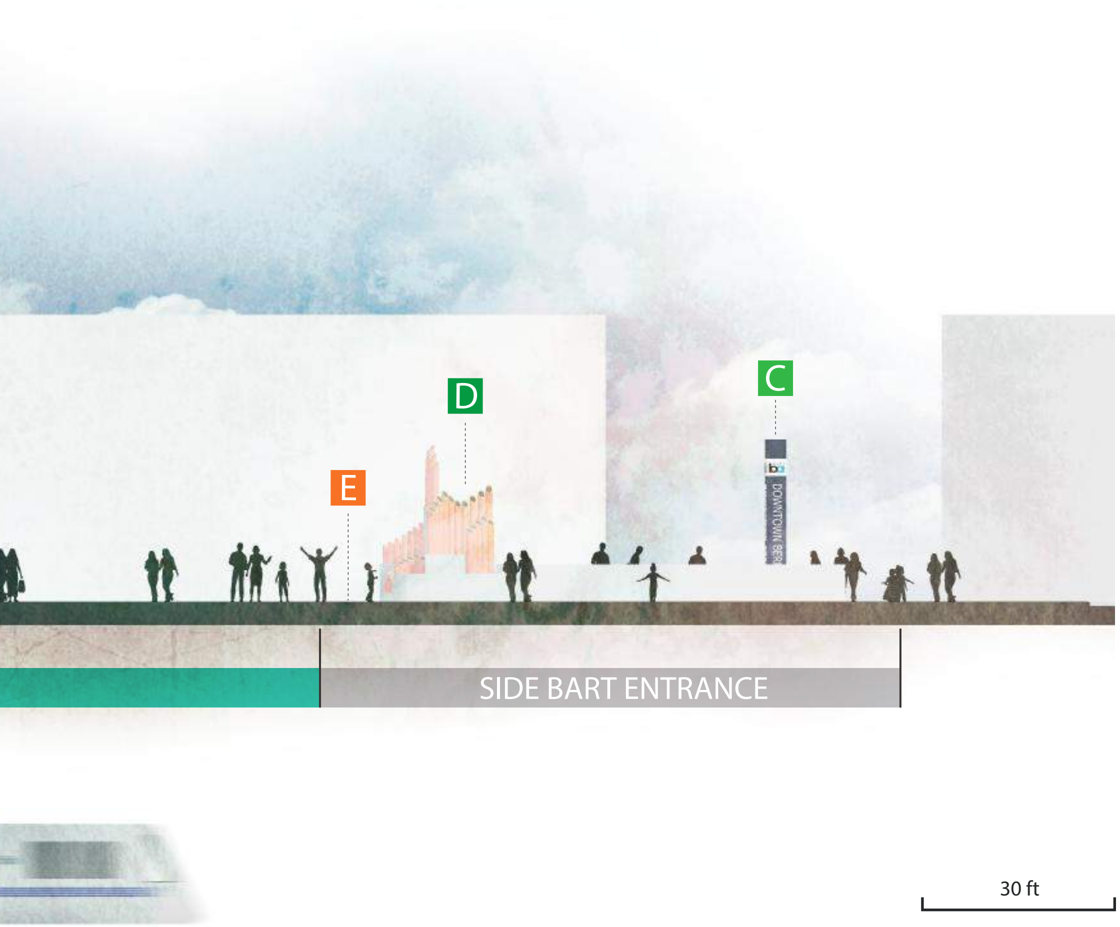
F PAVING CHANGE FOR TACTILE DISCREPANCY

For research supporting each retrofit element, refer to Figure 4.3, p. 58 in document.

Figure 4.5

DOWNTOWN BERKELEY BART PLAZA SECTION

A LOOK AT A POTENTIAL RETROFIT OF THE DOWNTOWN BERKELEY BART STATION FOR IMPROVED WAYFINDING



A PLAZA RETROFIT

B TALL LIGHTS INSTALLATION

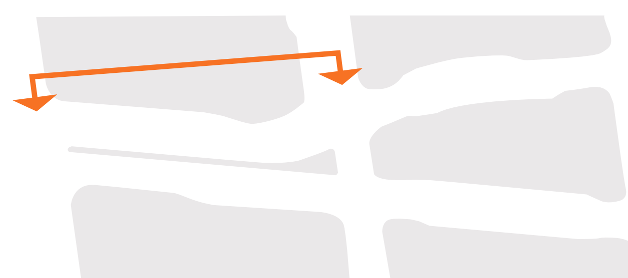
C BART SIGNAGE REDESIGN (Figure 4.11)

D AUDITORY LANDMARK AT SIDE BART ENTRANCE (Figure 4.8)

E TACTILE WAYFINDING AT BUS STOP + EXTENSION TOWARDS BART ENTRANCE

F PAVING CHANGE FOR TACTILE DISCREPANCY

For research supporting each retrofit element, refer to Figure 4.3, p. 58 in document.



AUDITORY LANDMARK HOW IT WORKS

A LOOK AT A POTENTIAL RETROFIT OF THE DOWNTOWN BERKELEY BART STATION FOR IMPROVED WAYFINDING

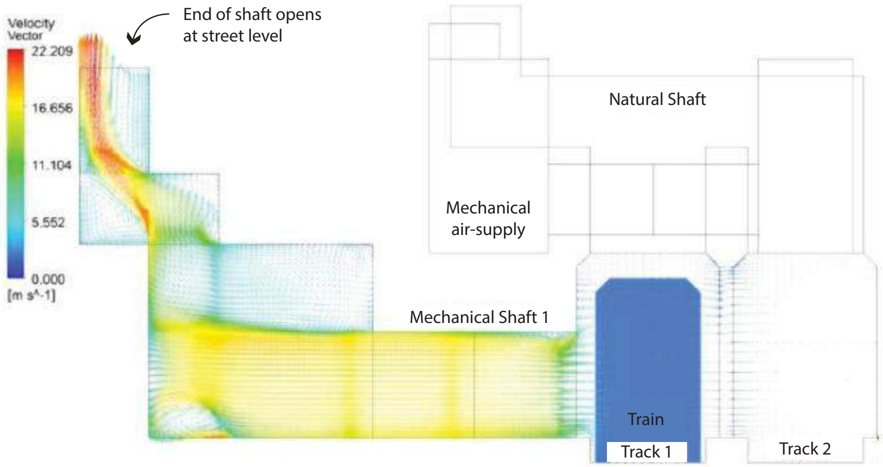


Figure 4.6 Subway Vent Shaft Cross Section

The vent shaft is a structure found along subway routes. They serve the purpose of relieving pressure build-up from within subway tunnels caused by the piston effect and to control air flow and quality in the stations. The piston effect is the air being pushed through a subway tunnel by the trains moving within it (Figure XX). The end of vent shafts typically open up at the pedestrian level and is typically seen as a grate flushed with the paving.

The auditory landmark I am proposing at each side BART entrance would utilize the airflow pushed out through vent shafts. I designed an organ-like installation at the point where the vent shaft meets the pedestrian level, which would create a whistle-like tune every time a train passes by. Trains pass by every 5-10 minutes, making the sound ephemeral but immediately associated with the subways running beneath the surface. The next time a BART rider comes back to the station, a look at the installation would quickly be associated with the sound of the whistle and the subway station below their feet.

Figure 4.7 Auditory Landmark Perspective

Figure 4.8 Auditory Landmark Detail


C
D
A F
E
B
DOWNTOWN BERKELEY

Figure 4.9

PLAZA PERSPECTIVE

A LOOK AT A POTENTIAL RETROFIT OF THE DOWNTOWN BERKELEY BART STATION FOR IMPROVED WAYFINDING

- A PLAZA RETROFIT
- B TALL LIGHTS INSTALLATION
- C BART SIGNAGE REDESIGN (Figure 4.11)
- D AUDITORY LANDMARK AT SIDE BART ENTRANCE (Figure 4.8)
- E TACTILE WAYFINDING AT BUS STOP + EXTENSION TOWARDS BART ENTRANCE
- F PAVING CHANGE FOR TACTILE DISCREPANCY

For research supporting each retrofit element, refer to Figure 4.3, p. 58 in document.

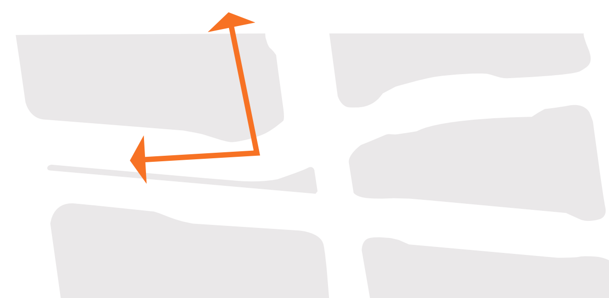


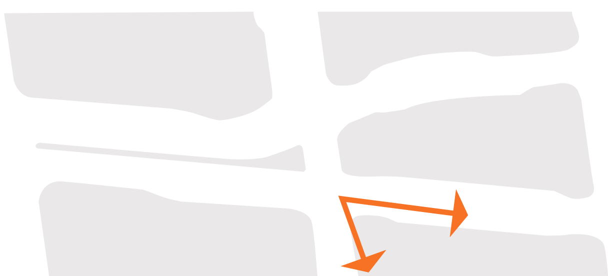
Figure 4.10

EAST SHATTUCK AVENUE BUS HUB PERSPECTIVE

A LOOK AT A POTENTIAL RETROFIT OF THE DOWNTOWN BERKELEY BART STATION FOR IMPROVED WAYFINDING

- A PLAZA RETROFIT
- B TALL LIGHTS INSTALLATION
- C BART SIGNAGE REDESIGN (Figure 4.11)
- D AUDITORY LANDMARK AT SIDE BART ENTRANCE (Figure 4.8)
- E TACTILE WAYFINDING AT BUS STOP + EXTENSION TOWARDS BART ENTRANCE
- F PAVING CHANGE FOR TACTILE DISCREPANCY

For research supporting each retrofit element, refer to Figure 4.3, p. 58 in document.




B
To Bancroft Way
To University Ave
Transit Information
A
E

DESIGN ANALYSIS

The proposed retrofit of the Downtown Berkeley BART Station would expand the existing inventory of sensory cues that help with the legibility of routes between bus stops and BART entrances. With the inclusion of more prominent visual, auditory, and tactile landmarks, the user who frequents the site daily would be able to navigate in between bus stops and BART entrances with heightened intuition. They would "check-in" at the proposed elements along their way and subconsciously confirm that they are on the correct route. The user navigating between a bus stop and the BART entrance for the first time would be able to find highly legible, unobstructed BART signage from across the street as the primary wayfinding element. This user would utilize the other proposed visual, auditory, and tactile elements as secondary wayfinding measures confirming they are on the correct route.

From its foundation in designing for individuals with visual impairment, every user benefits from the proposed wayfinding elements. By engaging in other senses in addition to visual cues, the user is able to create a multi-sensory cognitive map of the site that allows the user to tap into more than just their sense of sight to locate the subway station entrance. The route is made more legible during their current wayfinding experience and more memorable for future trips back to the station.

Figure 4.11 BART Signage Redesign

REFLECTION & CONCLUSION

Cities are complex forms with designs that directly affect those who use them. A key component to the success of an urban space is its accessibility with effective wayfinding being one of the determining factors. Subways are essential to the successful regional mobility of many cities. However, wayfinding at subway stations is often insufficient. Formal wayfinding at subway stations is often in the form of signage, which can be difficult to read and can easily be lost into the landscape along with the station entrance itself. Through improved wayfinding, subways can become more accessible for a larger population.

Designing for individuals with disabilities can be a very effective method of designing a more accessible urban form. This project looked into improving wayfinding at subway stations by designing for individuals with visual impairment. By doing so, users were encouraged to tap into valuable sensory information in the environment that engage more than just the sense of sight.

Major existing subsurface and surface structures at the Downtown Berkeley BART Station have been frozen since their construction and will likely stay that way. However future subway stations could address the topics of accessibility and wayfinding in the early discussions of subway station form and architecture. Earlier discussions and brainstorming would allow for more effective and purposeful wayfinding solutions such as the intentional placement of vent shafts to create auditory landmarks at station entrances.

In closing, a successful urban design is an accessible one. A look at a city’s subway station wayfinding can be a place to start evaluating how accessible the city really is. Since designing for individuals with disabilties would benefit everyone, as explored in this project through the Downtown Berkeley BART Station, why not advocate for this more inclusive city?

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THANK YOU FOR READING

INVISIBLE CITIES

A STUDY ON MULTI-SENSORY SUBWAY STATION WAYFINDING