Turn Left at the Station:
How Safety and Wayfinding Influences the Transit User's Experience

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A thesis
submitted in partial fulfillment of the
requirements for the degree of

Master of Urban Planning

University of Washington
2013

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Program Authorized to Offer Degrees:
Urban Design and Planning

University of Washington

Abstract

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This thesis investigates the quality of connections between multiple modes of transportation at three city center transit hubs located in Portland, OR, Seattle, WA, and Vancouver, BC. Consideration is given to the perspective of the transit user, especially the new transit user. Existing literature falls short in defining the meaning of "high quality connections" in context with the unique qualities of a station area setting. The literature has instead emphasized components that contribute to successful transit-oriented development. This thesis argues that planners should consider the way station areas are designed, maintained, and operated, because these factors make a difference both to the length of time of a transit user's trip and to the overall quality of experience for the transit user. Trips by transit inherently take longer than trips by automobile due to time spent walking to / from as well as within the station, stopping and boarding passengers. Therefore, transit connections must be comfortable and understandable in order for transit to become competitive to

the automobile, and in order to attract new riders and to retain them. The literature reveals that the priorities for transit users are safety, especially at night, clear wayfinding, and signage that is easy to understand.

This thesis uses a Multi-Criteria Post Occupancy Evaluation methodology to study the three hubs of Pioneer Square, Portland, Westlake Center, Seattle, and City Centre / Granville, Vancouver. Criteria includes:

- Review of related planning documents and background information,
- Recording of the physical environment,
- Observations of transit users,
- Transit user interviews, and
- Interviews with public officials.

This research has found that the station area studied in Portland, which is entirely above ground, is successful in providing the right balance of amenities in the right locations to make a transit user feel safe and comfortable finding their way using transit. However, the presence of an underground component in a transit system creates complexity for Seattle and Vancouver. Transit users report being confused about how and where to enter the underground transit system, especially when there are two uncoordinated tunnels as in the case of Vancouver. Transit user interviews also revealed a significantly higher level of concern about transit use at night in underground tunnels as opposed to in Portland's above ground setting. It is worthwhile to invest resources into further identifying and alleviating these concerns because improvements in these areas are key to increasing the long-term competitiveness of transit.

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All images, including maps and tables, are by the author unless otherwise stated.

Acknowledgements

This research has been influenced by several professors, members of the Urban Design and Planning Professionals Council, and practicing professionals including Professor Anne Vernez - Moudon, David Blum, and Daniel Rowe. Most importantly, thesis chair, Professor Christine Bae, PhD has dedicated many hours, even while on sabbatical, to guide and direct this work. Her breadth of understanding of the field and clarity with which she interprets the work of others has made it possible for the author to narrow the topic from a wide range of possibilities. Committee members, Professor Manish Chalana, March, and Daniel Carlson, have been supportive through the process and have guided the approach for this work.

I would also like to thank my husband, Douglas Whitfield, my son, Aidan Whitfield, and my mother, Mary Paviol for their love and support through this process. This work is dedicated to the memory of my father, James A. Paviol, who encouraged me to pursue my own dreams.

A special thank you goes to the many anonymous transit users who took the time to answer the intercept survey, especially the Vancouverites who let multiple trains go by while they elaborated about their city in great detail. Also many thanks to City of Vancouver Transportation Planners, Ian MacPhee and Chris Robertson who shared their enthusiasm for planning for wayfinding near stations and their findings from an intercept interview that was conducted as part of the Vancouver Wayfinding Project. Also special thanks to Portland's TriMet employees, Jerry Gillock, Trimet Road Supervisor Field Operations and Allen Yeager for providing information about the TriMet transit system. I hope that my work shed light on many transportation planners and urban designers in the U.S. and the world who are involved in transit station design.

Chapter 1

Introduction

Finding one's way through complex connections using public transit can be intimidating to a new transit user. Even someone who rides transit regularly needs to feel confident that they can move outside of their comfort zone and make transfers in more unfamiliar parts of the transit network. As the Washington State Legislature maintains a goal to reduce annual per capita vehicle miles traveled by fifty percent of 2011 levels by 2050 and eighteen percent of 2011 levels by 2020 (RCW 47.01.440), it becomes more important to develop strategies to attract new transit riders to begin to ride transit.

This thesis is written at a time in Seattle when Sound Transit is planning an expansion of light rail to the University District, Roosevelt, Northgate, and the eastside communities of Bellevue and Redmond. Affected cities have begun to conceptualize the arrangement of land use surrounding the station areas to encourage transit-oriented communities. For example, at the University District, the City of Seattle has begun work on an Urban Design Framework Strategy to establish zoning changes for the area surrounding the future Roosevelt Station.

The purpose of this thesis is to bring to light an important, but often overlooked, aspect of planning transit-oriented development: that of arriving at and connecting through the transit station area. Large, multi-modal transit connection points can feel confusing and unsafe to the new transit user if the connections are not designed logically, if safety is not considered, and / or if adequate information is not available.

Poorly designed transportation connections are more common than one would think. They are a result of illogical connections and wayfinding systems that start and stop at the edge of each separately implemented transit project. This situation can occur when each project is designed independently of the context. It is common for a large scale transportation mega-project to be designed with many different consultants, each having a limited scope.

This thesis identifies, through the examination of case studies, the specific elements of transportation connections that cause problems for the transit user, and the specific elements that transit users value. Case studies examined within this thesis provide detailed information that identify features of the built environment at station areas that support or are in conflict with a set of goals generated by national surveys of transit user preferences. This built environment information is supported by interviews with transit users at each study area. Further information is gathered through structured observations of transit users, reviews of planning and other supporting documents, and interviews with select public officials. These data are evaluated and graded to identify which practices are recommended, where improvements can be made, and what more can be done.

Chapter 2 of this thesis reviews the literature on transit-oriented development and the built environment components at the station area, and recorded transit user preferences. Chapter 3 presents background on each study area, including a comparison of ridership data for each location. Chapter 4 summarizes the methodology used to consider each case, a "Post-Occupancy Evaluation" using the "Multi-Criteria" method to compensate for the inherent weakness of each method of data gathering. Chapter 5 presents data about each of the three case studies. Chapter 6 presents the results / evaluation, in which data from Chapter 5 are evaluated relative to a standard set of goals to establish a rank (high, medium, low) for each goal of each study area. Chapter 7 presents recommendations and conclusions.

This thesis recommends that planners, urban designers, elected officials, and business and community leaders prioritize actions such as coordination between agencies, the development of design guidelines to address the entirety of the connection, and the education of area business owners to encourage safety practices such as visibility to the street. In general, it is important to think of the space surrounding the transit access point from the perspective of the transit user. Planners and urban designers should continuously ask the question, "How user-friendly and safe does it seem to use transit connection points, especially when the sites are complex or if the transit user is new to the system?" as plans are made for new transit-oriented development.

Chapter 2

Literature Review

There is a very large body of work exploring the concept of Transit-Oriented Development (TOD) (Ewing, 2010). Many of these studies attempt to measure whether changes to the built environment surrounding multi-modal transit facilities will cause more people to ride transit i.e. the effect of population and job density increases on travel behavior (Ewing, 2010). It has been found that residents who live in and around a transit station are five times more likely to commute by transit than those living in other areas (Lund, 2004).

Much of the literature about TOD is based on a general consensus regarding the goals surrounding the implementation of TOD. TOD land uses must generate the demand for a high quality, high frequency transit service. Cervero first developed the concept of the 3Ds of travel demand: Density, Diversity, and Design. (Cervero, 1997) These original Ds have been expanded to now be known as the 5'D's, which appear, as written, in text below. (Ewing, 2010) Many places are considering the regional needs of TOD, and are developing sets of typology that address a range of economic markets and fit the geography of the location. (Futurewise, 2009)

Within this large set of TOD literature lies a group of studies that address the elements of urban design that contribute to the experience of accessing transit within the TOD. This thesis draws from studies within this group that have identified which elements of accessing transit are most important to the transit user.

Summary of Transit - Oriented Development (TOD) Literature

The concept of transit-oriented development originated with Ebenezer Howard's 1898 publication, Garden Cities of Tomorrow, (Howard, 1902) which calls for dense development located walking distance to transit. Since the 1980's New Urbanists have resurrected this concept, along with many other traditional neighborhood concepts, as an alternative form of development to what they

perceive as auto-centric sprawl. (Duany, 2009) Transit-Oriented Development seeks to provide a moderate to high density form of mixed-use development located within an easy walking distance to a major transit stop. Walking distance is considered to be no more than 1/4 to 1/3 of a mile, but could be up to 1/2 mile if the walking route to station is determined to be pedestrian-friendly. (Lund, 2004)

In his 1993 work titled The next American metropolis: ecology, community, and the American dream, Peter Calthorpe introduced a schematic design concept of Transit - Oriented development. This type of development includes high intensity activity near a transit station and lower intensity activity 2,000 feet further out. Reaching the transit stop easily is a high priority. Therefore, main roadways run are along diagonal axes radiating from the center. The area immediately surrounding the transit stop contains commercial development, served by a major arterial on the backside, and public open space. (Calthorpe, 1993) The concept of planning for a gradient from high density and supporting uses and amenities near the transit center to lower density further out has been explored in detail through the use of a "Transect" diagram by urban designer / architect, Andrés Duany. The transect diagram divides land use into zones from the high activity center to further out. New urbanists who subscribe to this concept often create detailed land use code for each segment, known as "Form-Based Code Design Guidelines". These guidelines deal specifically with the physical form that is envisioned for each segment. (Duany, 2009)

Advocates of Transit - Oriented Development generally agree on the components of a successful TOD. In 1997 Robert Cervero and Kara Kockelman introduced the concept of the 3Ds: Density, Diversity, and Design. (Cervero, 1997) Since then, two Ds of Destination Accessibility and Distance to Transit have been added. The sixth and seventh Ds of Demand Management, including parking supply and cost, and Demographics are less commonly considered. (Ewing, 2010)

The more common 5Ds are directly quoted from Reid Ewing and Robert Cervero in their 2010 work, Travel and the Built Environment: A Meta-Analysis as follows:

- **Density:** population per acre. Less commonly employment per acre. 6 dwelling units per acre is considered the minimum density for TOD.
- **Diversity:** number of different land uses in a given area and the degree to which they are represented in land area, floor area, or employment.
- **Design:** street network characteristics within an area. Block size, proportion of four-way intersections, number of intersections per square mile, sidewalk coverage (share of block faces with sidewalks), average building setbacks, average street widths, number of pedestrian crossings, street trees, and other features of the built environment that differentiate pedestrian-oriented environments from auto-oriented ones.
- **Destination Accessibility:** ease of access to trip regional or local destinations. Local accessibility is the distance from home to the nearest store.
- **Distance to Transit:** average of the shortest street routes from a residences or workplaces in an area to the nearest rail station or bus stop. Aka "Transit Route Density" Distance between transit stops, number of stations per unit area.

"Transit-Oriented Communities: A Blueprint for Washington State" uses a system of station typology to guide the implementation of goals and measures. The typology allows for differences in the implementation of target densities and the extent of pedestrian amenities provided. Implementation goals and measures include pedestrian and bicycle connectivity, mix of uses, green infrastructure and open space, and urban design. (Futurewise, 2009).

Summary of Urban Design TOD Literature

The impact of urban design on transit ridership is somewhat difficult to measure. Many individual components of design are thought to work together collectively to make a small impact on transit ridership. (Ewing, 2010) Also, it is generally difficult to measure an individual's response to physical design factors such as neighborhood design and streetscape improvements because there is so much variation among individual preferences. In studies that try to measure the influence of these urban design measures in predicting changes in transit ridership among individual station area residents, urban design features are thought to have very little influence (Lund, 2004). However, it is thought that high quality urban design features could help offset the negative aspects of living in an area with high densities and the negative externalities of transit operations such as fumes and noise (Futurewise, 2009).

Many studies list components of the built environment surrounding transit stations that collectively contribute to the transit user's experience (Rabinowitz, 1989 and Kittelson & Associates, Inc., 2003). The transit - oriented communities report for Washington State considers urban design to consist of "well-designed buildings, streetscapes and public spaces that support pedestrian safety and promote neighborhood character and values." Designs should also allow for the flow of pedestrian and bicycle circulation. (Futurewise, 2009).

However, many of these studies fail in that they do not consider human behavior research and the preferences of transit riders. (Iseki, 2010)

Summary of Urban Design TOD Literature with User Preference Priorities

In their 2010 article, "Style versus Service? An Analysis of User Perceptions of Transit Stops and Stations." Hiroyuki Iseki and Brian Taylor conducted a study in which they surveyed 749 transit users at 12 transit stops throughout Los Angeles. They used statistical methods to prioritize features of the transit stop environment that are most important to riders. First, they conducted a survey that asked passengers how important, then how satisfied, the passengers have been with

several components of traveling by transit. The survey questions were derived from a literature review of the most important features of using transit. Survey questions were divided into the categories of amenities, information, connection & reliability, access, and security & safety.

After trying a few statistical methods to analyze the data, which are explained in the article, the authors settle on a "multivariate ordered regression analysis" because they explain that this method "best accounts for the influences each attribute has on one another". The results of this analysis rank transit user preferences as follows:

1. Schedule adherence,
2. Concern for personal safety (security guards, lighting, and overall perceptions of security),
3. Navigability of the stop or station (easy to get around, signs are helpful, easy to find stop or platform).

More detailed information can be gained for the purposes of this thesis by looking at the intermediate statistical analyses conducted by the authors. First, Table 1 considers each survey question on transit rider preferences and provides the percentage of respondents who rank that criteria as important. These rankings, called "Importance Rate" in Iseki and Taylor's study, are considered independent of one another and do not add up to 100% when considered as a whole. Table 1 of this thesis is derived from the article's Table 1. Rating and Ranking for Importance, Satisfaction, and Importance - Satisfaction on page 32 of the article. Statements, "Survey Questions" are listed in order of importance. Since each question is considered individually as opposed to parts of a whole, the importance rate is similar from question to question.

Category	Survey Question	Importance Rate
Safety	I feel safe here at night	78%
Safety	I feel safe here during the day	77%
Connection & Reliability	My bus / train is usually on time	76%
Safety	There is a way for me to get help in an emergency	74%
Safety	The station is well lit at night	73%
Connection & Reliability	I usually have a short wait to catch my bus / train	70%
Access	It's easy to find my stop or platform	70%
Amenities	There is shelter here to protect me from the sun or rain	69%
Information	The signs here are helpful	69%
Amenities	There is a public restroom nearby	59%
Amenities	The station / stop area is clean	58%
Access	It is easy to get around this station / stop	57%
Amenities	There are enough places to sit	50%

Table 1 Transit User Preferences

The authors then work to determine which attributes of a transit station most influence a person's decision to use transit. Table 2 of this thesis is derived from the Iseki article's Table 2. Final Ordered Logistic Regression Model of Factors Predicting Users Overall Satisfaction Level with their Transit Stop or Station on page 38. Iseki and Taylor used a chi-square test and an ordered logistic regression analyses to rank survey questions in order from best fit, highest R2 to lowest R2. However, each of these Pseudo R2 results are very low and close together, showing that there is not much difference between the highest and lowest ranked question.

Survey Question	Pseudo R^2
It's easy to get around this station/stop	pseudo- $R^2 = 0.16$
I usually have a short wait to catch my bus/train	pseudo- $R^2 = 0.12$
It's easy to find my stop or platform	pseudo- $R^2 = 0.12$
This station is well lit at night	pseudo- $R^2 = 0.11$
Having security guards here makes me feel safer	pseudo- $R^2 = 0.10$

Table 2 Ranked survey questions using ordered logistic regression analysis

Another subsequent study in Los Angeles by Fink asked Los Angeles residents with access to transit to submit photos and descriptions of both positive and negative aspects of using the public transportation system (Visual Ethnography) (Fink, 2011). Many photos addressed the themes of the physical elements of the transit system and learning to use and navigate the transit network. Of the 89 participants, all were above average in education, and 31 submitted photos of at least one trip.

Fink's study reveals that different people have different opinions on the ease of usefulness of signage based on their previous experiences. Study participants have revealed that in larger east coast cities where they previously resided, they had to work harder and pay more careful attention to details to find their way through a transit system. In Los Angeles, the Red and Purple trains arrive on the same platform and transit users must pay attention to a small sign on the side of the train to know if they are boarding the right train. This confuses many Los Angeles transit users, who are thought by the east coast riders to be "under – transit - literate" (Fink, 2011)

Several participants in the Fink Visual Ethnography study say that many Los Angeles residents will walk several blocks out of their way to avoid one particular transit station for safety concerns. (Fink, 2011)

Since these two studies took place in Los Angeles, the question becomes how applicable they are to the Seattle region. When comparing the demographics of the study area for the Iseki study, which took place in the city of Los Angeles, as compared to King County (Table 3), King County has a higher percentage of the population achieving graduate or professional degrees and a higher

income than the City of Los Angeles. If the population using transit is representative of the overall population for these two areas, then the Iseki study would represent the concerns of a less educated, lower income population. This population is likely to value design less, which would skew the results of the survey away from valuing design. The Fink article states that the participants had higher than average income and education.

Location	Percent of population with Bachelor's Degree or Higher	Graduate or Professional Degree	Median Annual Household Income	Average Annual Household Income
City of Los Angeles	30.5%	10.3%	$50,028	$77,982
King County	29.2%	16.8%	$61,250	$88,809

Table 3 Transit User Preferences (Source: 2007 – 2011 American Community Survey 5 – Year Estimates)

Summary of Transit User Preference Surveys in the Puget Sound Region

The most comprehensive transit user preference survey that is conducted biennially in the Puget Sound Region is the King County Metro Rider / Non-Rider Survey. In 2011, this random telephone survey captured response from 1,241 regular riders, 214 infrequent riders, and 1,066 non-riders. Key findings related to this thesis include the following:

- Riders in Seattle and North King County report being most concerned about safety at night, and this concern is more related to safety at the bus stop than safety riding transit vehicles themselves (78% total satisfied riding in dark, 73% total satisfied waiting in the dark). Metro considers nighttime safety at bus stops to be "neighborhood specific" and outside of their control. 90% of riders report being satisfied with safety in the transit tunnel.

- King County Metro hypothesizes that riders in Seattle, as compared to other parts of their service area, are more likely to use transit during all times of the day, and are more likely to be on the bus at night. Riders are satisfied with safety during the day.

- While customer satisfaction ratings remain high with respect to customer information, the ratings have been steadily decreasing over the past several years. This dissatisfaction is thought to be caused by an increase in the expectations of customers, who have become more demanding as a result of the availability of real time information in other aspects of their lives. Metro recognizes that printed material has a disadvantage when they need to update material or make alerts. Metro states that difficulties getting off-line information is a deterrent to getting information about trips, especially incremental trips to locations unfamiliar to riders.

    - 88% (a decrease from 92% in 2009) of transit riders report being satisfied with information about routes and schedules.

    - 83% (a decrease from 91% in 2009) of passengers report being satisfied with the ability to get a current printed timetable.

- The overall frequency of transferring has increased. Most transfers (88%) occur in "Seattle / North King", where transfers are made between the following modes:

    - 5% of transfers occur from Metro buses to the streetcar

    - 18% of transfers occur from Metro buses to a Sound Transit bus

    - 22% of transfers occur from Metro buses to the Sound Transit Link Light Rail

    - 3% of transfers occur from Metro buses to Pierce Transit

    - 6% of transfers occur from Metro buses to the Community Transit

Concern for Personal Safety

Consistent with Fink's findings that transit riders will walk out of their way to avoid transit stations known to be of safety concern, theories on place-based crime support the idea that certain transit spots can be considered crime "hot spots" where higher rates of crime occur. (Loukaitou-Sideris, 1999) A 2002 survey by the U.K. Department of Transport indicated that transit ridership would be 10.5% higher if the general public "felt more secure when traveling, particularly when waiting at stations" (Carter, 2005).

Summary of Safety – Related Issues at Transit Areas

The transit user's perception of safety while waiting for their bus or train is a significant factor in determining whether that transit user will use a particular station or make the journey, especially if the transit user is female and / or if the trip is taken during the night. People's perception of the relative safety of an area is influenced by several built environment factors. (Loukaitou-Sideris and Fink, 2008)

Several general theories exist regarding the relationship between the built environment and a person's concern about safety. These general theories can be applied to safety at transit connection areas, and are listed below with theories that are more specific to transit areas.

- Jane Jacobs argued that people must be able to observe pubic streets to maintain informal social control of criminal activity. She called this natural surveillance "eyes on the street" (Jacobs, 1961). This concept is often referred to as "informal surveillance".

- The "Broken Window" theory of crime (Wilson and Kelling, 1982) states that if a broken window is left unrepaired, it sends the signal that no one is in control, and criminals are apt to prey on the area. This theory applies to the need to remove graffiti, repair broken transit signs, fix run – down buildings and remove litter. These factors are commonly referred to by criminologists as "physical incivilities"

(Loukaitou-Sideris, 2008 and Fink 2011).

- More crimes occur along major streets and in places with multiple “escape routes” (Brantingham & Brantingham, 1993).
- When station entries are blocked from the line of vision of from law enforcement officers, the area feels unsafe. (Fink, 2011)
- Multiple escape routes from an enclosed area can make passengers feel more secure.
- Areas should be well lit. Transit users fear dark areas where people can hide. (Loukaitou-Sideris and Fink, 2008).
- It is easier to patrol stations that have fewer access points. (Griffin, 2004)
- Desolate areas feel unsafe because transit users feel there would be nobody to help if an incident were to occur. Transit users notice whether staff is available to assist them (Loukaitou-Sideris and Fink, 2008).
- Transit users would prefer there not be “social incivilities” present in the station area. Social incivilities include loud, rowdy crowds, or the homeless. (Loukaitou-Sideris and Fink, 2008).

It is important to note here that “social incivilities” is a term derived directly from the literature and do not necessarily represent the individual beliefs of the author.

Longer wait times represent a higher risk of crime. In certain cases, transit users have been known to avoid making trips if this risk associated with longer wait times is too high. (Loukaitou-Sideris and Fink, 2008).

Summary of Signage and Wayfinding

Signage and wayfinding systems orient people to an area and help them find their way. Systems are composed of directional and identification signage. Directional signs help people find their way through a place and identification signs identify the destination. There are many components of the information contained on signage. These include:

- How messages are worded
- Where the information is located
- How the messages and locations of the various signs in the program relate to each other in a consistent cohesive network of information

When evaluating signage, it is important to consider the graphic system and how the graphic elements are arranged into layouts to communicate the message and emphasize messages. Do they create a visual identity? (Calori, 2007)

When considering signage and wayfinding systems relative to transit, it is important to consider several factors. The design of the station entrance must stand out and be visible in the urban landscape. It must be located central to the natural flow of pedestrians, yet outside of main walkways. Most successful station entrances are located either in public buildings or in parks or plazas. (Griffin, 2004) Multiple station entrances and long, circuitous paths between stations easily lead to confusion, so a simple and obvious system should be used. (Griffin, 2004)

Information kiosks are often recommended in platform areas to provide transit users with information about their route. Real-time computerized information is recommended. These kiosks should be visible, but outside the path of transit user flow. (Griffin, 2004)

Audible information is mandated by the Americans with Disabilities Act. Stations require audible and visual information to inform transit users of transit and other information. (US Dept. of Justice, 2013)

The goal of designers of transit stations is to minimize the distance transit users must travel. This is accomplished by finding the most direct route possible that does not require too many times of climbing up and down stairs. A well designed transit station would require no signage at all. (Griffin, 2004)

The inclusion of real time information, such as transit arrival and departure information is highly desired by an audience of transit users who is becoming more demanding. (Fink, 2011) Transit users are increasingly valuing real time information as awareness of the availability of this data has increased. In an on-board survey of 1,138 King County Metro riders and 887 Sound Transit Riders, 65% of females and 55% of males reported valuing real time information (King County, 2012).

A consistent signage theme with standardized graphics is very important to transit users, who must be able to quickly recognize signs. Signs should be placed in locations based on a "wayfinding analysis" by an "information architect". (Griffin, 2004) Transit users have reported being concerned about the visibility of signage in a wayfinding system. (Fink, 2011) Also important is that the transit user be able to easily identify where they are, where they can go, and how to get there based on reading the signs. (Calori, 2007)

Chapter 3

Study Areas

Study areas were selected based on the criteria of having multiple transit connections, having served as a transit connection for at least ten years, being the largest transit connection points in the city, located in central business districts, and being served by high quality transit. Since this thesis was based out of Seattle, Washington, study areas were chosen in Seattle, Washington, Portland, Oregon and Vancouver, British Columbia. These three cities have the largest populations of all cities in the pacific northwestern United States. San Francisco, California, New York, New York, and Toronto, Ontario were also considered for this study, but the necessity of making multiple visits to each study site would have proven to be too expensive. The map of the pacific northwest of the United States shown in Figure 1 below shows the locations of the study areas.

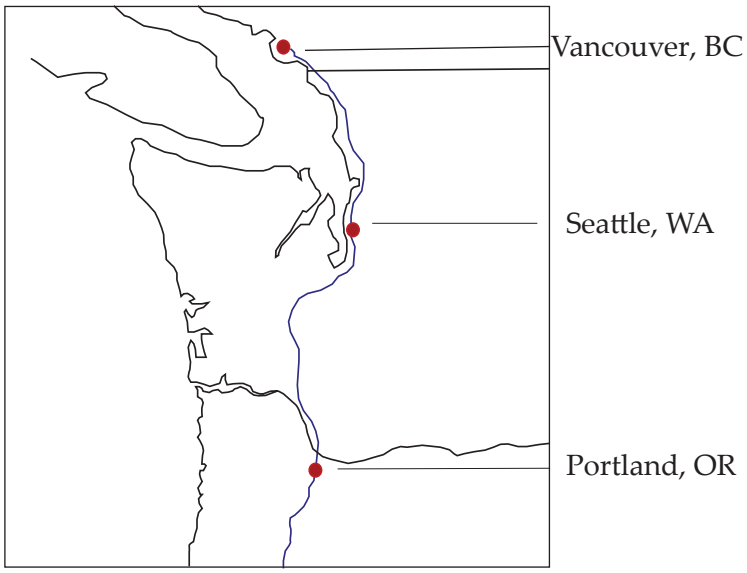


Figure 1 Study areas are located in Vancouver, B.C., Seattle, WA, and Portland, OR

Specific study area locations are the City Centre and Granville Station connection in Vancouver, B.C., Westlake Station in Seattle, WA, and Pioneer Square in Portland, OR.

The intent of the use of the selection criteria is that the selected study areas represent vibrant, high

traffic, areas with complex transit connections that are likely to be traversed by new transit users. Guidance in site selection was provided through the review of two books that each compare transit systems and land use between cities, *The Transit Metropolis: A Global Inquiry* by Robert Cervero, published in 1998, and the more recent *Transport for Suburbia: Beyond the Automobile Age* by Robert Mees published in 2010. These books evaluate the success of transit systems based on how transit has developed in conjunction with land use.

The three study areas are different from one another in that Portland is the only city of the three that does not have underground transit, as shown in the image in Figure 2.

Figure 2 Portland transit at surface level

Though Portland and Seattle have roughly the same size population within the city limits, the population of the metropolitan area is roughly half the size of the population of the metropolitan areas of Vancouver and Seattle. Each has roughly the same size transit systems. The non-residential

density downtown in Seattle is higher, and Seattle made the unique choice to construct the Bus Tunnel under its downtown streets. At the time of publication of this thesis, the bus tunnel is currently being converted to be used entirely by light rail. Vancouver BC is about 25% denser in residential density than both Seattle and Portland. The overall percentage of people using public transportation is much higher for Vancouver, BC, at 16.5 percent compared to 6 and 7 percent for Portland and Seattle respectively. Table 4 summarizes the population, density, and the percentage of residents using public transportation within each municipal boundary.

City	City Population	Density (dwelling units per acre)	Public Transport to Work (%)	Public Transport to Work (%)
Portland, OR	583,776	30.9	6.0	12.1
Seattle, WA	608,660	27	7.0	18.5
Vancouver, BC	603,502	42.5	16.5	Not available

Table 4 Summary of Population and Ridership (Sources: Population, US Census 2010 and Statistics Canada, 2012. Density and general Public Transport, Mees, 2010. Public Transport to Work, US Census Bureau, 2006-2010 American Community Survey.

Figure 3 shows that Vancouver's transit system is roughly three times as large as that of Seattle and Portland, with Seattle slightly larger than Portland. Table 5 shows available information regarding annual boardings for the three cities by transit type. Vancouver's ridership was slightly higher in 2010 due to the increase in ridership caused by the Olympic Games in February that year.

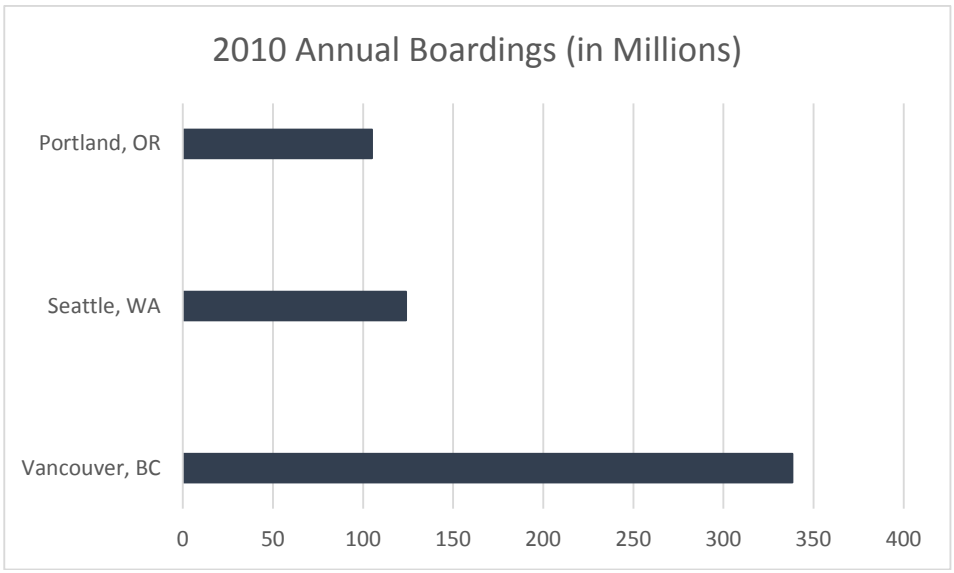


Figure 3 Comparison of 2010 System-wide Annual Boardings (Millions)

City	2009 Annual Boardings	2010 Annual Boardings	2011 Annual Boardings
Portland, OR			
Bus	66.1 Million	60.6 Million	58.4 Million
MAX lines	35.2 Million	38.4 Million	41.2 Million
Seattle, WA			
Metro Bus	111.1 Million	109 Million	112 Million
Sound Transit Link	2.5 Million	2.4 Million	2.5 Million
Sound Transit Express Bus	12.8 Million	12.5 Million	13.7 Million
Vancouver, BC			
Bus	220.4 Million	220.8 Million	Not Available
Skytrain – Expo and Millenium Lines	73 Million	79 Million	Not Available
Skytrain – Canada Line	11.4 Million	38.5 Million	Not Available

Table 5 2009 to 2011 System-Wide Annual Ridership (Sources: Vancouver Boardings, TransLink, 2011. Portland Boardings, TriMet, 2012. Seattle Bus Boardings, Metro, 2011, and Sound Transit, 2012.)

Chapter 4

Methodology

Previous studies have begun to identify the preferences of transit users through photography and intercept surveys. (Iseki, 2010 and Fink, 2011) Further exploration is necessary to better understand the relationship between the site-specific elements of the built environment at transit station areas and user perceptions.

In order to study this connection in depth, this thesis evaluates three transit connection points, as discussed in Chapter 3. Since this thesis seeks to explore the relationship between the perceptions of transit users and the physical environment, an evaluation method is used that fulfills both needs. Since this is a qualitative evaluation, each site is graded on a scale of high, medium, and low; instead of on a numeric scale to account for the inexactness of the measurement system. This thesis strives to answer the following research questions:

1. How do elements of the built environment, such as circulation and signage, contribute to people's perceptions of accessing a transit system?
2. What are people's perceptions of accessing a transit system at multi-modal transit access points, i.e. rail and bus stations?
3. What is occurring in these facilities that is working well and could be replicated in other areas?
4. What is occurring in these facilities that is not working and could be improved?
5. What more could be done?

To answer these research questions, this thesis follows the methodology of post-occupancy evaluations (POE), and in particular, a "multi-criteria" POE. The term, "multi-criteria" is a specific type of POE as defined by the literature. A POE is defined as "the examination of the

effectiveness for human users of occupied designed environments. Effectiveness can be defined as the achievement of personal and institutional goals. The post-occupancy evaluator observes, records, and describes." (Zimring, 1980)

By selecting three similar examples of urban transit connection points as the unit of analysis, it is assumed that the findings will be applicable to other transit settings. Since this analysis is guided heavily by findings in the literature, the lens through which the environments are largely viewed are guided by knowledge set that has been observed in many locations. Unique characteristics of each place, such as the differing approach toward the use of weapons in Canada, lesson the generalizability of the findings.

There is no standardized method for conducting a POE (Federal Facilities Council, 2001). One method focuses on the design process to provide goals for the evaluation. Some POEs of this type include a "designer's walk-through" where the designer provides information about the reasons the built environment was shaped the way that it was (Zimring, 1980).

This thesis uses a "multi-method" technique of POE consisting of:

- Review of related planning documents and background information
- Recording of the physical environment
- Observations of transit users
- Transit user interviews
- Interviews with public officials

This multi-method technique was chosen so that the strengths of some methods can compensate for the weaknesses of other methods when considered as a whole, a concept known as "convergent validity" (Zimring, 1980). Therefore, each method is not required to stand on its own.

Data was gathered for this thesis beginning in July, 2012. First, observations of transit users and recordings of the physical environment were completed for each study area. Then, when it was apparent that the study would benefit from a survey of the transit users and public officials,

Task	Portland, OR	Seattle, WA	Vancouver, BC
Observation of transit users	Friday, August 3, 2012, 3:00 pm to 4:00 pm	Wednesday, August 1, 2012, 9:00 am to 10:00 am Wednesday, August 1, 2012, 5:00 pm to 6:00 pm	Sunday, October 14, 2012, 3:00 pm to 4:00 pm Sunday, March 24, 2013, 3:00 pm to 4:00 pm
Recording of the physical surroundings	Friday, August 3, 2012 and Monday, August 5, 2012	Multiple dates beginning Thursday, July 26, 2012	Saturday, October 13, Sunday, October 14, and Monday, February 18, 2013
Transit-user interviews	Saturday, February 23, 2013 and Sunday, February 24, 2013	Sunday, March 17, 2013, between 1 pm and 5 pm	Monday, February 18, 2013 from 1pm to 4pm Sunday March 24, 2013, 10:45 am to 5 pm

Table 6 Timing of the use of evaluation methods

approval was sought from the University of Washington Human Subjects Division, and interviews were conducted between February 18, 2013 and March 24, 2013. Table 6 provides the days and times during which each evaluation task was conducted. Documents and background information was compiled continuously, and dates of interviews with public officials are noted in Appendix F.

Review of related planning documents and background information

At the onset of each POE, implementing documents and background materials were gathered through requests of the agencies, review of agency web sites, and the review of materials in local and the University of Washington libraries. Google Maps and spatial databases from the Washington State Geospatial Data Archive (WAGDA), the Portland, Oregon data portal, and the

Vancouver BC web data portal were consulted. This GIS data was used to build maps that address circulation, safety, and locations of signage.

Recording of the physical surroundings

Using the interviews and observations as cues, the physical environment was systematically recorded with respect to the transit user preference goals, which are later used in the overall evaluation. The physical environment is photo-documented and mapped using symbols to represent the concepts contained within the goals.

Maps with symbols were used in cases where goals were difficult to explain with text and figures alone. For example, an "Eyes on the Street" map was created for each study area. This map uses symbols to represent the extent to which the exterior can be viewed from the interior of buildings surrounding the site. Building exteriors are rated from "Visibility", to "Visible By Design Only" to "No Visibility". A building edge would receive a rating of "Visibility" if any of the fascade of the lower level is permeable with windows. Buildings rated "Visible By Design Only" are designed the same way as "Visible" buildings, but the occupant has installed long term barriers in front of windows, such as office divider walls. "No Visibility" means the occupant is not able to see out of the building due to the design of the building's fascade. Upper stories of buildings and sidewalk activities are generally not considered except where noteworthy such as food cart vendors, sidewalk seating, and second story balconies with seating. "Social incivilities" were recorded as locations where panhandlers and homeless were observed multiple times.

A location map of signage and wayfinding markers for each study area is also developed. This map shows the location of bus stop signs, rail signs, route information signs, fare machines, and city information signs.

Observation of transit users

Initial observations for all three cities occurred between August and October, 2012. An additional observation of Vancouver was made in March, 2013.

Prior to the observations, study areas were explored to determine how many vantage points were necessary to capture the range of transit user experiences. In each case, there was clearly one vantage point that captured the most information. Certainly, this study might have benefited from having multiple observations periods to pick up on the various subtleties of a transit user's experience, but the multi-method POE methodology allows other methods to compensate for this weakness. Not all three vantage points are located in platform areas. In Vancouver, the platform layout is very clear and simple, so observations occurred in the mezzanine level of the Granville Station where transit users must find their way out or find their transfer to the Canada Line.

The location, time of day and day of week was selected for each observation that would maximize the chance of observing new transit users. Observations occurred on route to and from the airport during the summer tourist season for Portland and Seattle and the shoulder season for Vancouver. Portland was observed on a Friday as weekend travelers came in from the airport. Seattle was observed at two time periods on a Wednesday, because Wednesdays are often the start of a long weekend during the Seattle summer and the most productive location for observing is in the boarding area for Link Light Rail. Vancouver was observed in October on a Sunday at a location where passengers are on route to the airport. Early October is the shoulder season for tourists. Vancouver was observed a second time in March, 2013.

The behavior of transit users was observed as they approach the boarding platform and as they disembark their bus or train. Transit users were watched using the signage, looking for the signage, asking for directions, or moving confidently toward or away from their platform. Results of these observations are recorded in Appendix A. Care was taken to observe from a distance and not to interfere with the activities of the transit user.

Interviews with public officials

For each of the three study areas, city police and transit security officers were asked questions to address how safe transit users feel while in the station area, and how easy it seems for transit users to find their way through their connection. These interviews were conducted at the station areas,

in the same manner as the transit user intercept interviews using essential the same questions. Less structured discussions with transit security and customer service officers were useful early in the process helped define the research. A phone interview and in-person scheduled meeting occurred in Vancouver, BC with City of Vancouver Transportation Planners, Ian MacPhee and Chris Robertson. At the meeting in their city office, they shared their findings from an intercept interview that was conducted as part of the Vancouver Wayfinding Project. Transcripts of interviews with public officials appear in Appendix B. This thesis also draws from an interview of Jack Lattemann, a senior transit planner at King County Metro by Oran Viriyincy, which was conducted as part of research on the Bus Tunnel for Christine Bae's Built Environments Lab, "Back to the Future: A History of Transit Planning in the Puget Sound Region". (Bae, 2013)

Transit user interviews

Initial observations in Seattle, Portland and Vancouver revealed that transit users struggled with wayfinding in Vancouver between the City Center and Granville Stations and in Seattle's Westlake Station. Issues of safety seemed to be a concern at Pike Street and 3rd Avenues in Seattle and, to a lesser degree, in Portland's Pioneer Square. These observations shed light on the importance of seeking some first hand understanding of the transit user experience. Therefore, the author developed a brief survey and obtained approval to administer this survey from the University of Washington Human Subjects Review Board.

An Exempt Status request was approved by the University of Washington Human Subjects Division starting February 13, 2013 (see Appendix D), which allowed the author to perform intercept interviews of adults at station areas. In addition to this survey, during the summer of 2012, the City of Vancouver in partnership with Translink and the Downtown Vancouver Business Association conducted an intercept survey of 150 people observing new prototype signs which have been installed in front of the City Centre and Granville Stations.

Four questions were developed based on the transit user preferences revealed as most important to transit users in the Iseki and Taylor article. Full transcripts of the interviews appear in Appendix C.

The interview questions are as follows:

A. What has been your experience finding _____
(bus stop/platform/transfers/multimodal-bike, taxi- connection)?

B. How helpful is the signage?

C. What do you think of the quality of shelter here?

D. How safe do you feel here?

Subjects were not selected at random. Instead, an attempt was made to select for transit users who seemed like they were making the connection for the first time. These users were identified as those who were looking at signage, asking for directions, or carrying suitcases. Suitcases were seen as an indicator that the transit user was likely headed for the airport and was possibly from out of town. Transit users who are less familiar with the transit system are able to provide the most recent first-hand accounts of the challenges associated with arriving at the station and they tend to pay more careful attention to the signage along the way. However, the author did not specify a time period for the questions, which allows transit users to respond by telling about their first experience making the connection in this area, especially if it was fairly recent and could be remembered well. Many transit riders who are residents of Vancouver BC were very interested to explain how they regularly help visitors find their way through the system. These responses, though not directly attributed to the person being interviewed, provide good insight, and are included in the analysis. Regular transit riders who use the system during the weekday rush hour, generally know where they are going. Therefore, interviews were conducted at off peak periods, such as at times when transit riders were likely to be headed to the airport on a Sunday afternoon. Most interviews occurred at the platform level at the locations where transit riders catch the train to the airport.

Interviews in Seattle were conducted on Sunday, March 17, 2013 between 1 pm and 5 pm. Weather was 48 degrees, partly sunny, and breezy. There was a large number of people carrying suitcases and boarding the train to the airport. Most interviews were conducted at the Platform level of Westlake Station, southbound side. Two were conducted on the northbound side. Three were

conducted outside the station at a bus stop along 3rd Ave. Additional information about each transit user is provided in the section following the interview responses for each city in Appendix C.

Interviews in Portland were conducted Saturday, February 23 and Sunday, February 24, 2013. The temperature was 48 degrees Saturday, partly sunny. Sunday temperature was partly sunny, 52 degrees. Interviews took place on the three sides of Pioneer Square where transit boards. One interview took place on Morrison Street at the Portland Streetcar stop.

Interviews in Vancouver, BC were conducted on Sunday, March 24 at the platform level of the Canada Line train in the City Centre Station. The Canada Line is the newer line which heads to the airport. The day was sunny and 60 degrees. Interviews took place between 10 am and 4 pm.

Evaluation

A standard evaluation matrix was constructed to measure how well each transit environment, when taken as a whole, performs related to a series of goals related to safety and wayfinding. These goals were based on the literature review of each topic. Each area is generally measured and given a ranking of high, medium, or low to signify how well the area meets the goal, with high meaning the study area meets the goals very well.

The basis for the evaluation is the material found in Chapter 5: Case Studies and Analysis. The evaluation matrix references the results sections by method of discovery by including abbreviations for each source: Review of related planning documents (Doc); Recording of the physical environment (Rec); Observations of transit users (Obs); Interviews with public officials (Pub); and Transit user interviews (Int). Findings from each study area are evaluated according to goals in the categories: safety, wayfinding and signage content, which are listed in Table 7. Goals were established for a fourth category, shelter, but transit user interviews revealed that shelter is not depended on in the Pacific Northwest. Appendix E contains the goals for shelter.

Safety Goals	Description
"Eyes on the Street"	There are opportunities for informal surveillance by occupants of the surrounding establishments.
Social incivilities	Social incivilities (ie homeless, rowdy crowds, beggars) are not present.
Lighting at night	The station is well lit at night.
Visibility	The area is visible.
Maintenance	The area is well maintained (no broken glass, litter, nor graffiti).
Activity levels	People and activity are in the area during the time the transit operates (not deserted).
Escape routes	If the space is underground, there are multiple exit opportunities that are clearly visible.
Security guards	Security guards are present.

Wayfinding Goals	Description
Unified signage concept	Signage is easily identifiable and fits together in one unified high quality graphic scheme.
Signage location	Signage is located where it is needed.
Circulation quality	The general flow of circulation through the station area is of a high quality and easy to navigate through even without signage.
Entrance Identity	Entrances are clearly identified if stations are underground.
Platform Identity	The bus stop / platform is identified.
Connections to Multi-modal	Signage is available to connect transit users to multi-modal connections (bike, taxi, bus, streetcar).
Connection to City	Signage designed to connect the transit rider to the rest of the city is well located.

Signage Content Goals	Description
Trip Initiation / Payment	Signage provides a transit user with enough information to initiate a trip by transit (eg payment information)
Real Time	Real-time information is accurate and helpful.
Route Information	Route information signs are clear and easy to understand.
City Information	Signage designed to connect the transit rider to the rest of the city is clear and easy to understand.
Bus Stop / Platform Information	Bus stop or platform signs are clear and easy to understand.

Table 7 Evaluation criteria

Chapter 5

Case Studies and Analysis

Case studies in this chapter focus on answering the following two research questions:

1. How do elements of the built environment, such as circulation and signage, contribute to people's perceptions of accessing a transit system?
2. What are people's perceptions of accessing a transit system at multi-modal transit access points, i.e. rail and bus stations?

To answer the first question, a complete detailed record of elements of the built environment is gathered in relationship with the set of goals that have been developed for the upcoming evaluation of each study area. Each case study is informed by interviews with transit users, background documents, interviews with public officials, and observations of transit users so that photo-documentation is focused on relevant issues.

To answer the second question, interviews and observations that reveal the perceptions of transit users are analyzed in this chapter.

This chapter forms the foundation for Chapter 6 Results / Evaluation, which ranks each study area according to a common set of goals outlined in the previous chapter, Chapter 4 Methodology.

Transit user interviews revealed that "shelter" is not an important user preference in the Pacific Northwest because there is so much light rain that people carry umbrellas and do not depend on the shelter. Since shelter is not as important in comparison with safety and wayfinding, data about shelter was not gathered and analyzed in this thesis except for the transit user interviews. However, one could argue that shelter is a user preference to the visitor.

Study Area 1: Pioneer Square, Portland, Oregon

Portland's transportation and land use policies are well integrated, making Portland a good example of a city form that has adapted to the transportation system. (Cervero, 1998). Pioneer Square, a 200-foot block in the center of downtown Portland, is widely considered to be the "living room" for Portland. It was first developed in 1858, as Portland's first public school. It later became the Portland Hotel, then Meier and Frank department store bought the hotel in the 1940's to build a two story parking garage. When an eleven story parking garage was proposed in the 1960's, local leaders commenced a process to acquire the land for public open space through the Downtown Plan. (Weigand, 1993)

Figure 4 Original downtown bus mall

The 1978 *Downtown Program for Portland* prepared by the City of Portland Development Commission outlined plans for making Portland accessible by buses running north – south in a "5th / 6th Transit Mall". The Mall connects to the north to the "Transportation Center", the location of regional bus and rail service as shown in Figure 6. (City of Portland, 1978) Figure 4 shows an early photo of the bus mall. The original bus shelter shown remains today as shown adjacent to the new bus mall shown in Figure 5.

Figure 5 Current bus mall

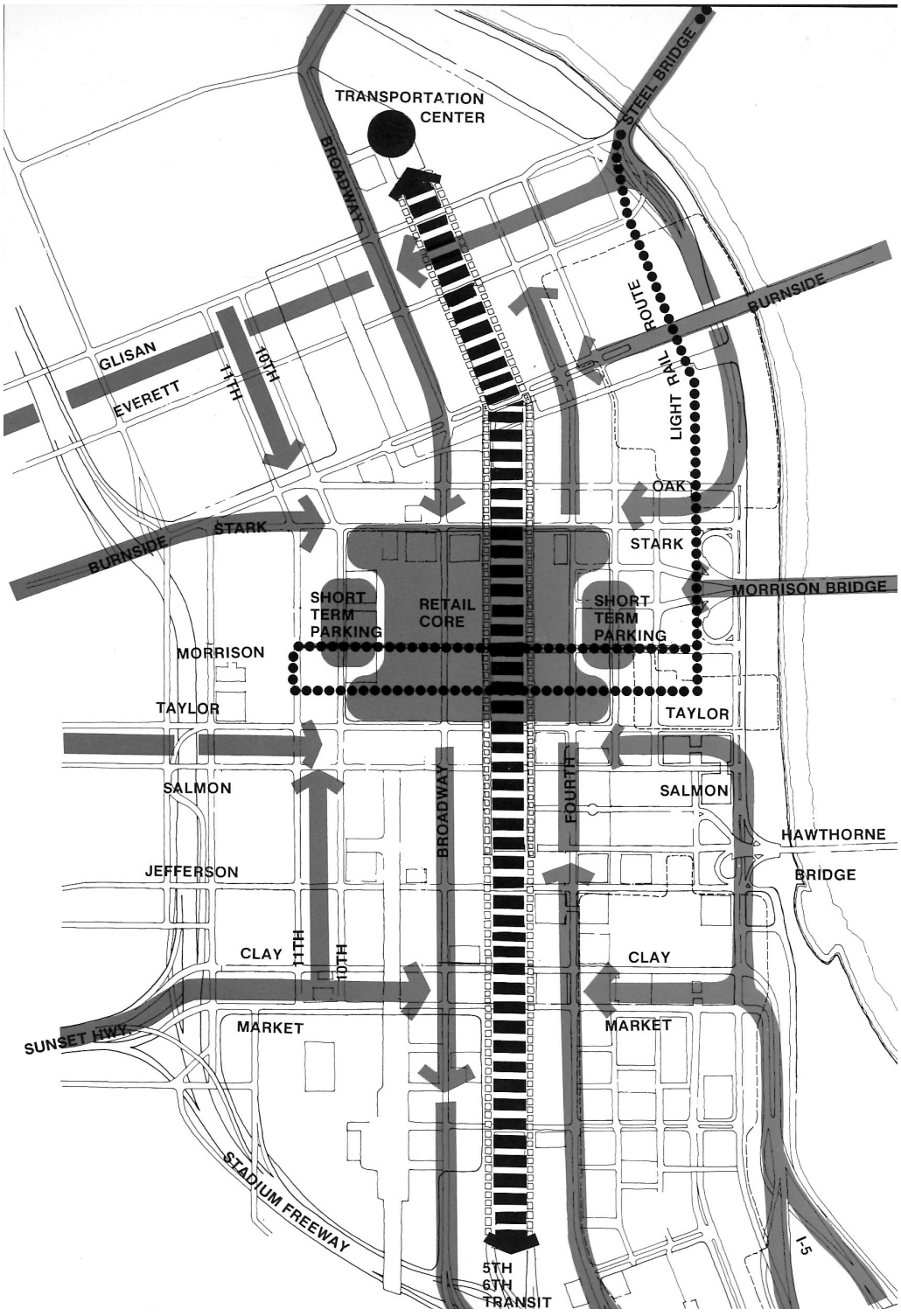


Figure 6 1978 Vision for transportation in Portland shows Tri-Met's 5th and 6th Avenue Transit mall (black dashed line in the center), and the TriMet light rail route to the airport (dotted line). These early plans provided efficient transit service to center of the downtown area. (City of Portland Development Commission, 1978)

This transit mall was updated in 2004 with the construction of the MAX Yellow Line, doubling weekday bus ridership with 17 lines running through the Mall. The City of Portland Streetcar is owned and operated by the City of Portland. Pioneer Square stands at the intersection of all four MAX Light Rail Lines:

- Blue Line: a 15-mile segment from downtown to Gresham to the east, which opened in 1986.
- Red Line: a 5.5 mile segment to Portland International Airport to the northeast, which opened in 2001.
- Yellow Line: a 5.9 mile segment from the Expo Center through N/NE Portland to the Rose Quarter, which opened in 2004.
- Green Line: a 8.3 mile segment to Clackamas County, which opened in 2009.

Orientation map showing circulation by multiple modes

Figure 7 provides a map of Pioneer Square and its immediate surroundings to illustrate the flow of circulation through the site. Pioneer Square has access to bike, transit and bus on all four sides. Bike access is on a two way street to the west (Broadway Ave SW). Access to the red line and blue line TriMet light rail is from a one - way couplet transit priority pair of streets (SW Morrison to the north and SW Yamhill St to the south). This pair of streets is designed to allow the doors of the train to open onto the sidewalk. Buses do not run along these streets. Northbound buses can be boarded on SW 6th Ave across the street from Pioneer Square. Access to the TriMet Light Rail Yellow and Green lines are at this location as well. Southbound trains and buses run one block further to the east along SW 5th Ave. There is a bus stop at every block along SW 5th and 6th Avenues. The City of Portland streetcar runs north-south along SW 10th and SW 11th Avenues, a three block walk along SW Yamhill St or SW Morrison St from Pioneer Square.

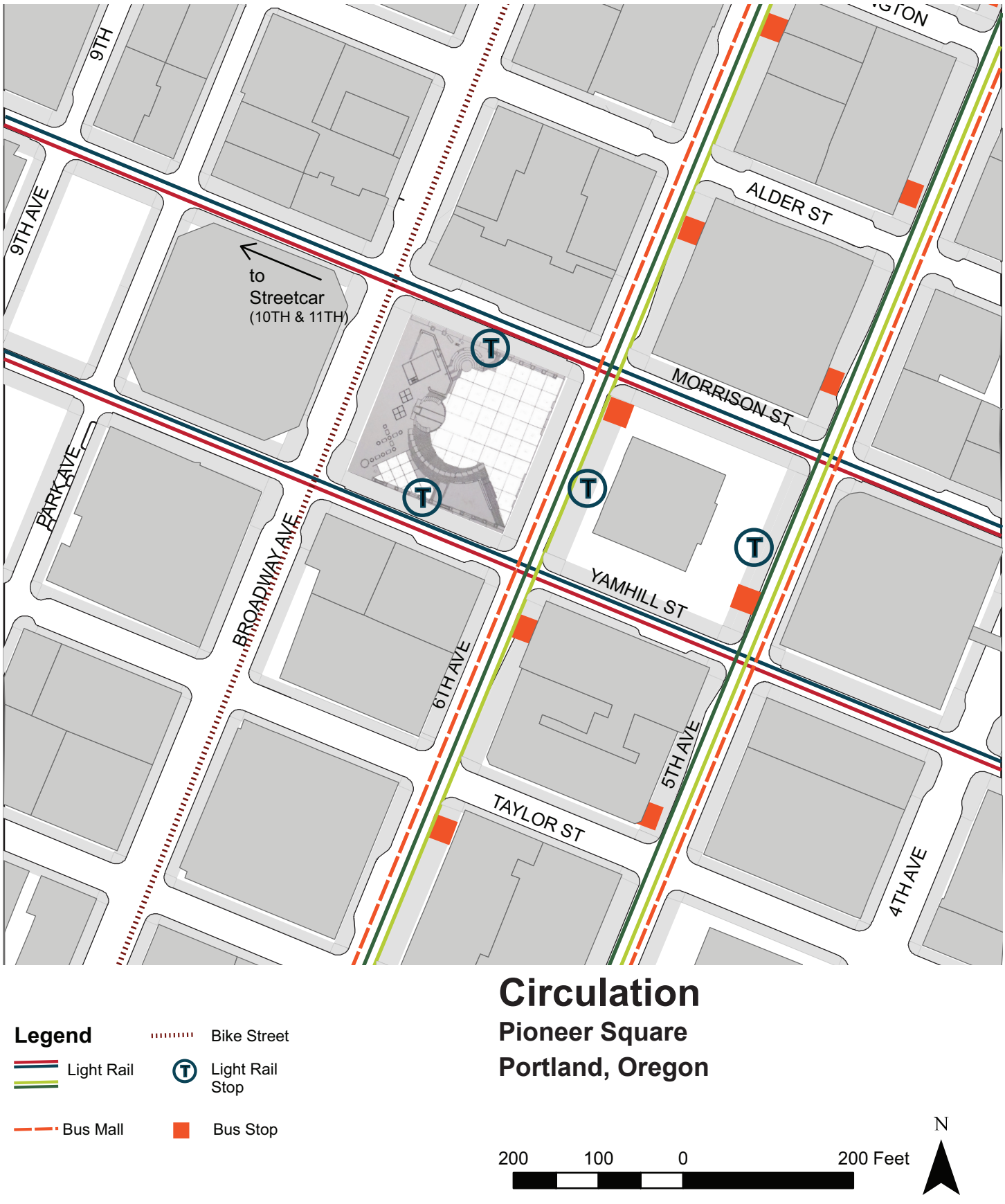


Figure 7 Circulation map of the area surrounding Pioneer Square in Portland, OR

Safety

This section records components of the built environment based on safety goals from the literature. Figure 8 contains a map of the are with respect to safety factors.

Portland Safety Goals	*Comments*
"Eyes on the Street"	Figure 8, "Eyes on the Street" shows that over half of the area surrounding Pioneer Square contains uses that provide good visibility to the street. Two department stores and the Pioneer Courthouse are closed off to the street and provide no visibility. For example, Figure 9 shows the upper levels of the Macy's building at SW 6th Ave and SW Morrison St with window coverings blocking the views of the transit access points from the upper floors. Also, a bank at Yamhill and 6th Ave places partitions against the large glass windows to block views out to the street. Figure 10 shows an example of many closed ground floor retail establishments in Portland. These areas are considered "visible by design only". One very positive example of "eyes on the street" is the design of the Margulis Jewelers storefront on SW Yamhill St and SW Broadway, as seen in Figure 11. Large glass windows provide clear visiblity to the street corner, and building occupants have direct view of passengers waiting for the red and blue lines. Missing from the store are bars on the windows or any signs that the owner does not trust the safety of the transit area. A surveillance camera and video monitor can be seen clearly through the window.
Social incivilities	Pioneer Square houses a high number of social incivilities, especially during the summer when the space is more active. It was observed that the area at the intersection of SW Morrison St and SW 6th Ave seems to have a higher proportion of social incivilities. This part of Pioneer Square has fewer "eyes on the street" than other areas.
Lighting at night	Ambient station area lighting covers the entire waiting area surrounding Pioneer Square as seen in Figure 12. The new bus shelters along SW 5th and 6th Avenues are internally illuminated and bright, as shown in Figure 13.
Visibility	Figure 14 shows that the columns along SW Yamhill Street are large enough for people to hide or hide hazard materials behind them.
Maintenance	Very little graffiti and litter was observed in the station area. Litter was observed in the street on SW Broadway Ave.
Activity levels	People were observed in the station area from 6:30 am to midnight, but very few people were present in the early morning and late evening.
Escape routes	Not Applicable
Security guards	Security guards were present.

Figure 8 Safety / "Eyes on the Street" map of the area surrounding Pioneer Square in Portland, OR

Figure 9 Example of a building, at the intersection of 6th and Morrison, with no eyes the street

Figure 10 Example of a building that is visible by design only

Figure 11 Example of a building with good eyes on the street at Margulis Jewelers

Figure 12 Pioneer Square night lighting

Figure 13 New internally illuminated bus shelter lighting along SW 6th Ave

Figure 14 Large columns may block visibility

Signage and Wayfinding

Pioneer Square is set in a location with very good access to multiple modes of transportation. The design of the station area is so effective and efficient that it possible to connect between light rail trains and to the TriMet bus system without using any signs at all. Figure 15 shows locations of the signage and wayfinding elements in the Pioneer Square area. Signage and fare machine capacity is excellent for passengers boarding the red and blue light rail lines from Pioneer Square because there are three fare machines on each 200 foot side of the square with light rail. However, there are no signs that show that SW Broadway Ave is a designated bicycle street. Signs to the Streetcar exist in small print on the City Information sign at SW Broadway Ave and SW Morrison St. The level of city information signage appears inadequate to show multi-modal transportation connectivity.

Portland Wayfinding Goals	*Comments*
Unified signage concept	See Figure 16 and Figure 17for TriMet light rail information signs and platform signs. The red and blue lines are differentiated from the yellow and black lines by being housed on different colored, magenta and black fixtures. TriMet bus theme differs but is similar, as seen in Figure 18.
Signage location	Signage is provided in areas where it makes sense for signage to be. An exception is that only two corridors were chosen for the location of city information signs.
Circulation quality	Bike, light rail, and bus is visible from Pioneer Square. Signage is required to find the street car.
Entrance Identity	The bus stops and platforms are clearly identified as shown in Figure 19.
Platform Identity	There are no signs idendifying the bike route on SW Broadway Ave. The Streetcar is identified in small print on one of the city information signs.
Connections to Multi-modal	Outdoor bike parking is provided as single bike racks in multiple locations and as a cluster at the intersection of SW Broadway Ave and SW Morrison St, as shown in Figure 20. SW Broadway Ave is designated a bikeway and has bicycle friendly pathways, as shown in Figure 21. The light rail trains have designated space for bikes to hang vertically.
Connection to City	Not every route leaving the transit station contains a sign orienting passengers to the rest of the city.

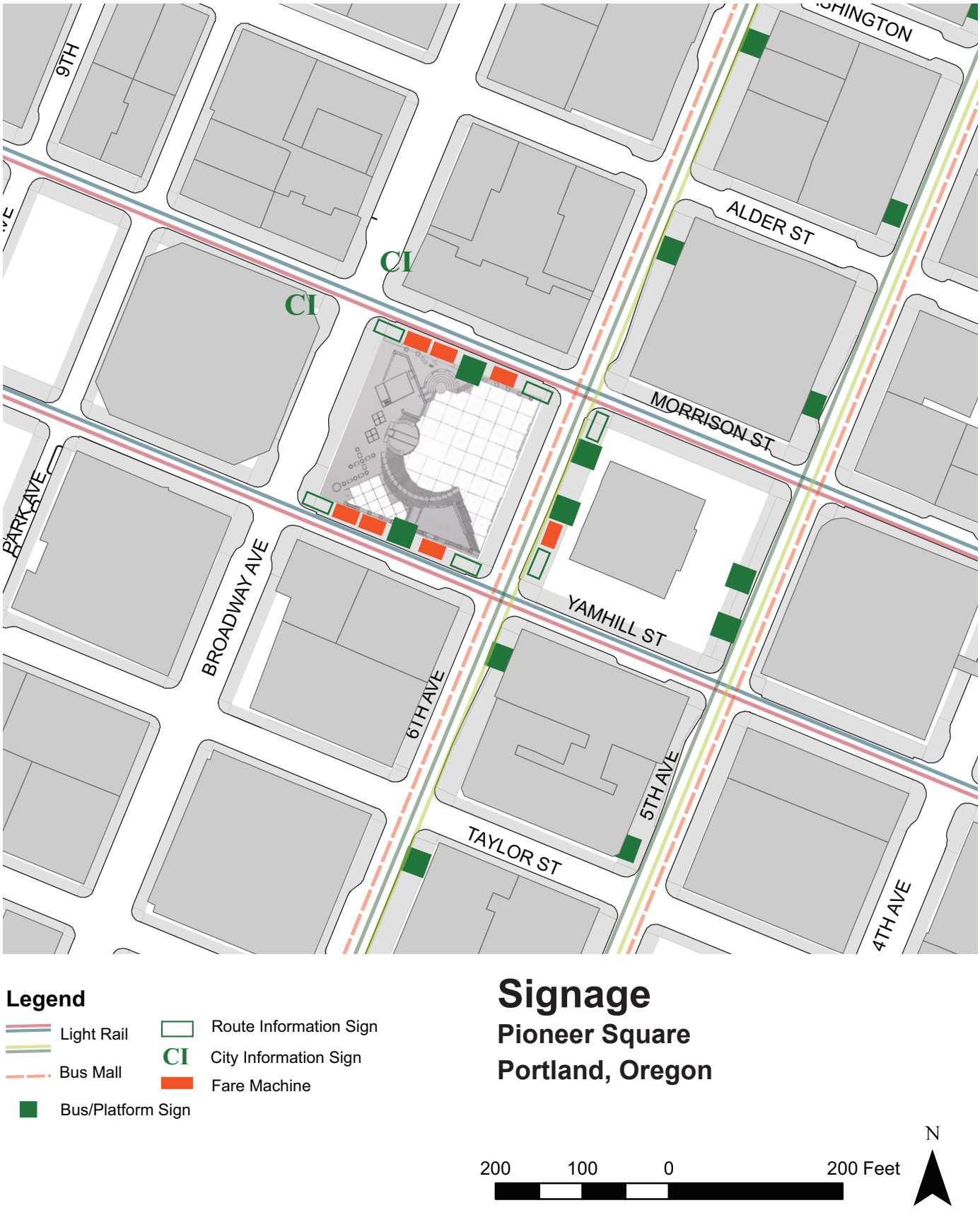


Figure 15 Signage map of the area surrounding Pioneer Square in Portland, OR

Figure 16 Tri-Met Route Information Sign

Figure 17 Tri-Met Light Rail Platform Sign

Figure 18 Tri-Met Light Rail Platform Sign

Figure 19 Sign showing bus connections from that are coded by letter

Figure 20 Largest cluster of bike parking at SW Broadway Ave and SW Morrison St

Figure 21 Bicycle infrastructure on SW Broadway Ave

Figure 22 Portland Streetcar with simple arrival time reader board

Figure 23 Tri-Met bus stop with moitor displaying real-time information.

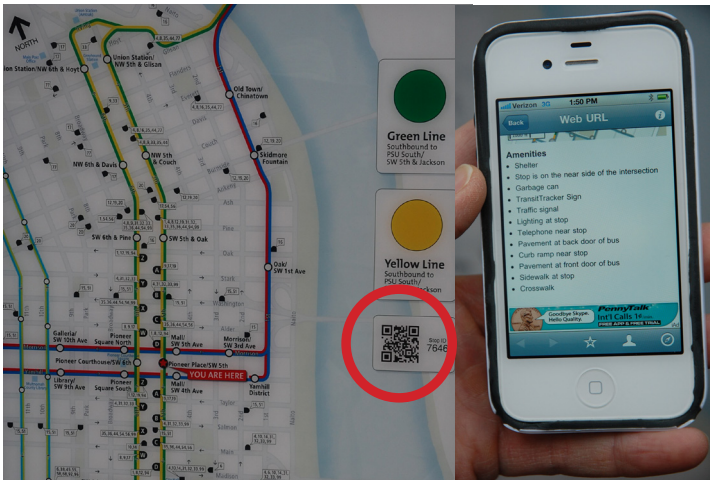


Figure 24 Tri-Met bus stop with link to real-time information on Smart Phone

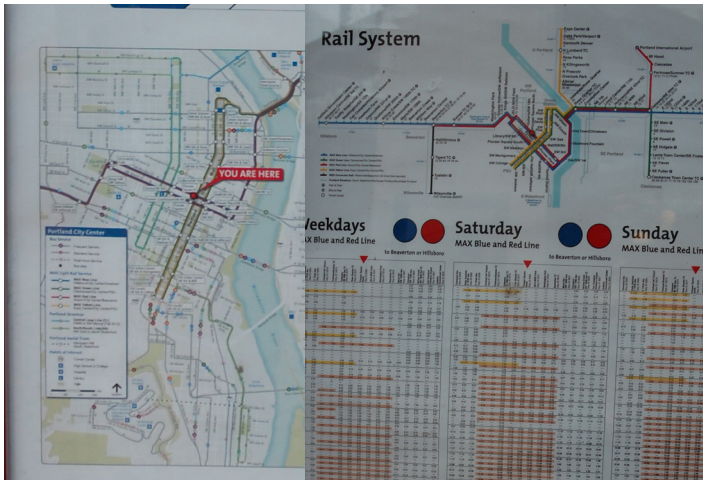


Figure 25 Tri Met Light Rail Signage shows a schematic system map a schedule, and a location map with routing information

Signage Content

The content of the signage was reviewed to record the content of the information available for transit users, and to assess the apparent helpfulness of the information.

Portland Signage Content Goals	*Comments*
Trip Initiation / Payment	Signs provide information on paying a fare, light rail route, a schematic diagram of the full light rail system, and TriMet bus numbers. Some schedule information for the light rail is provided on signs. Detailed bus information is not provided on the signs, but signs have a link for Smart Phone users.
Real Time	The streetcars have a very simple reader board with estimated arrival times, as shown in Figure 22. These are not always accurate. The bus stops along 5th and 6th Avenues have an LCD board, with arrival times and an entertaining display of historic photos (Figure 23). These times are accurate. Bus stop signage has a link to data on a smart phone (see Figure 24), which is accurate. Other Light Rail stops have real time information, such as the Lloyd Center station. Pioneer Square light rail stations do not have real time information.
Route Information	Figure 25 shows that TriMet Light Rail signage shows a schematic system map (upper left, and a close up map of the downtown area with the exact location of the transit rider shown. Detailed hours of operation information is also shown. Figure 26 shows that TriMet bus signs also show route information and clearly identify routes served. Despite the clarity of the signs, transit users seek assistance from TriMet personnel, as shown in Figure 27.
City Information	The signs linking the station to the rest of the city are color coded, show a close up picture of the local area and how it fits with other areas, which are also color coded. Arrows point to important features such as the transit station. See Figure 28 for an example of both sides of this signage.
Bus Stop / Platform Information	The stop and platform signs are clear and have large letters so they can be viewed from far away.

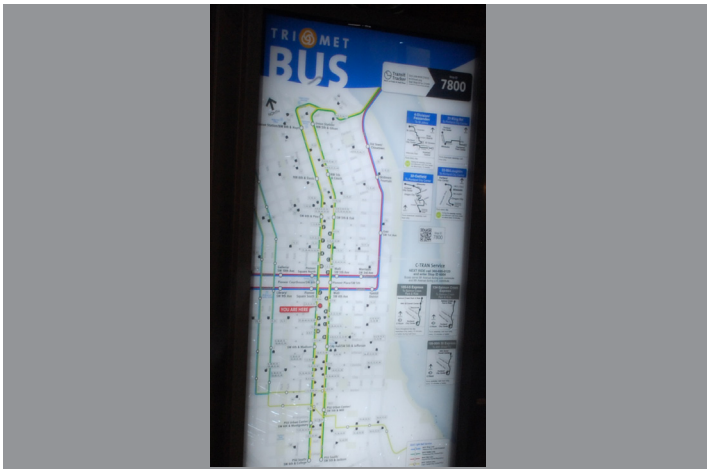


Figure 26 Tri Met bus signage shows a route map of the downtown area and schematic diagrams of the routes served.

Figure 27 Tri Met officials are available to answer questions.

Figure 28 Orientation signage to the city includes directional arrows, a bubble map showing context, and a loal map.

Study Area 2: Westlake Station, Seattle WA

Westlake Station is one of five stations that comprise the Seattle Bus Tunnel, and it is located between 3rd and 6th Avenues along Pine Street at the northwest edge of the downtown Seattle commercial district. The bus tunnel is shown in the map in Figure 76. Surround uses are primarily offices, shopping, and restaurants with some hotels. The Seattle Bus Tunnel opened in 1990 as a response to traffic congestion through the downtown area. (Bae, et..al., 2013) The tunnel was initially designed for future light rail, and currently there are 16 routes serving Westlake Station, 15 King County Metro routes and one Sound Transit Regional Express route. In addition, Sound Transit Link Light Rail has run service to the Sea-Tac Airport since 2007, when the tunnel was retrofitted to allow for both bus and train. It is currently estimated that only light rail will run in the tunnel by 2021 when Sound Transit Link Light Rail extends to Northgate.

Figure 29 Map showing the Seattle Bus Tunnel (Source: King County Metro)

Buses in the surrounding area run along 2nd, 3rd, and 4th Avenues. 3rd Avenue hosts two bus stops on either side of Pine Street. Buses in this area use "skip stop spacing", where passengers board at every other stop. There are approximately 50 routes serving the surface streets, including two bus rapid transit routes, RapidRide C to West Seattle and RapidRide D to Ballard. At the time of writing this thesis, there are discussions about consolidating this bus traffic onto 3rd Avenue, making 3rd Avenue a pedestrian and bus only street. The South Lake Union Streetcar runs along Westlake Avenue to the South Lake Union Biotech campus, originating at 5th Avenue and Olive Way. The monorail, originally constructed for the 1962 World's Fair, runs from the 5th Avenue, 3rd floor of the Westlake Center Mall, to Seattle Center.

Orientation Map showing circulation by multiple modes

As shown in Figure 30, Circulation, Westlake Station, outlined in a black dashed line, is accessible either directly from Pine Street and 5th Avenue or through lower level connections from Macy's, Nordstrom, Nordstrom Rack, and Westlake Center. The tunnel is accessible through both above ground entrances from the street, as shown with a solid line circle around a "T" or from within area shopping centers, as shown with a dashed "T" and circle symbol. Pine Street is designated as a bike street in the Seattle Bicycle Master Plan. (Seattle, 2007)

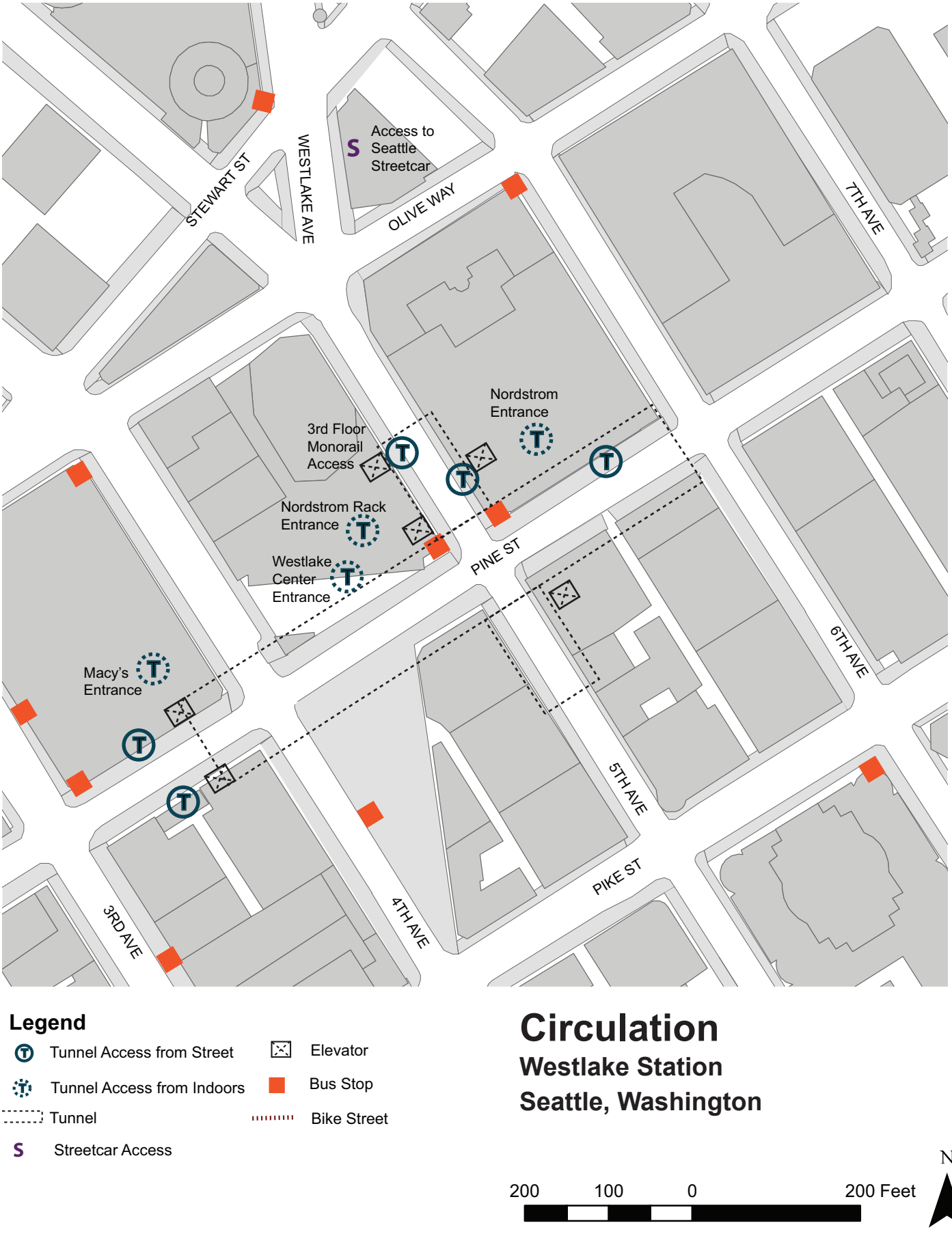


Figure 30 Circulation map of the area surrounding Westlake Station, Seattle, WA

Safety

This section records components of the built environment based on safety goals from the literature. Figure 31 contains a map of the are with respect to safety factors.

Seattle Safety Goals	*Comments*
"Eyes on the Street"	Figure 31 maps the observed levels of visibility from the surrounding uses to the points at which transit users enter the bus tunnel and board the bus. This "Eyes on the Street" shows that many of the buildings in this station area have opaque façades and interior uses are not designed to be visible to the street. There is permeability facing Westlake Plaza along Pine Street between 4th and 5th Avenues, and second story outdoor eating is provided in Westlake Mall as shown in Figure 32. A coffee shop at the intersection of Pine Street and 4th Avenue is designed to be outwardly focused to the street, as shown in Figure 33. The large department stores and malls (Nordstrom, Pacific Place, Westlake Center and Macy's) have window displays or blank walls facing the street, allowing for no eyes on the street, as shown by Figure 34. Within the station, lower level access connects to a Mezzanine level, which is open to the platform level below, allowing transit users to view the platform from above as shown in Figure 35.
Social incivilities	Social incivilities in this area tend to gather in high traffic areas. Social incivilities include large groups of people loitering as shown inFigure 36.
Lighting at night	The area surrounding Westlake Station is well lit. Globe shaped street lights are tightly spaced along 4th Avenue, and there are lights on the branches of the street trees. The area inside the station is well lit and has high ceilings.
Visibility	The interior of the station is meticulously cleaned and maintained. Outside the station it is possible to find some graffiti and broken signage, as shown in Figure 37.
Maintenance	Very little graffiti and litter was observed in the station area. Litter was observed in the street on SW Broadway Ave.
Activity levels	People and activity are present during the day, but there is no residential use in this area and most shops close at 7 pm, with restaurants staying open later. The transit tunnel is open Monday through Saturday from 5 a.m. to 1 a.m. and Sunday from 6 a.m. to midnight. The area feels deserted late at night and early in the morning.
Escape routes	Because the Mezzanine level designed with an open format, there are multiple visible exits from the tunnel.
Security guards	Transit security is at the Platform level at all times, with one security guard present at each side (northbound and southbound) of the tunnel. Above ground, there is often police presence with a patrol car parked along Pine Street.

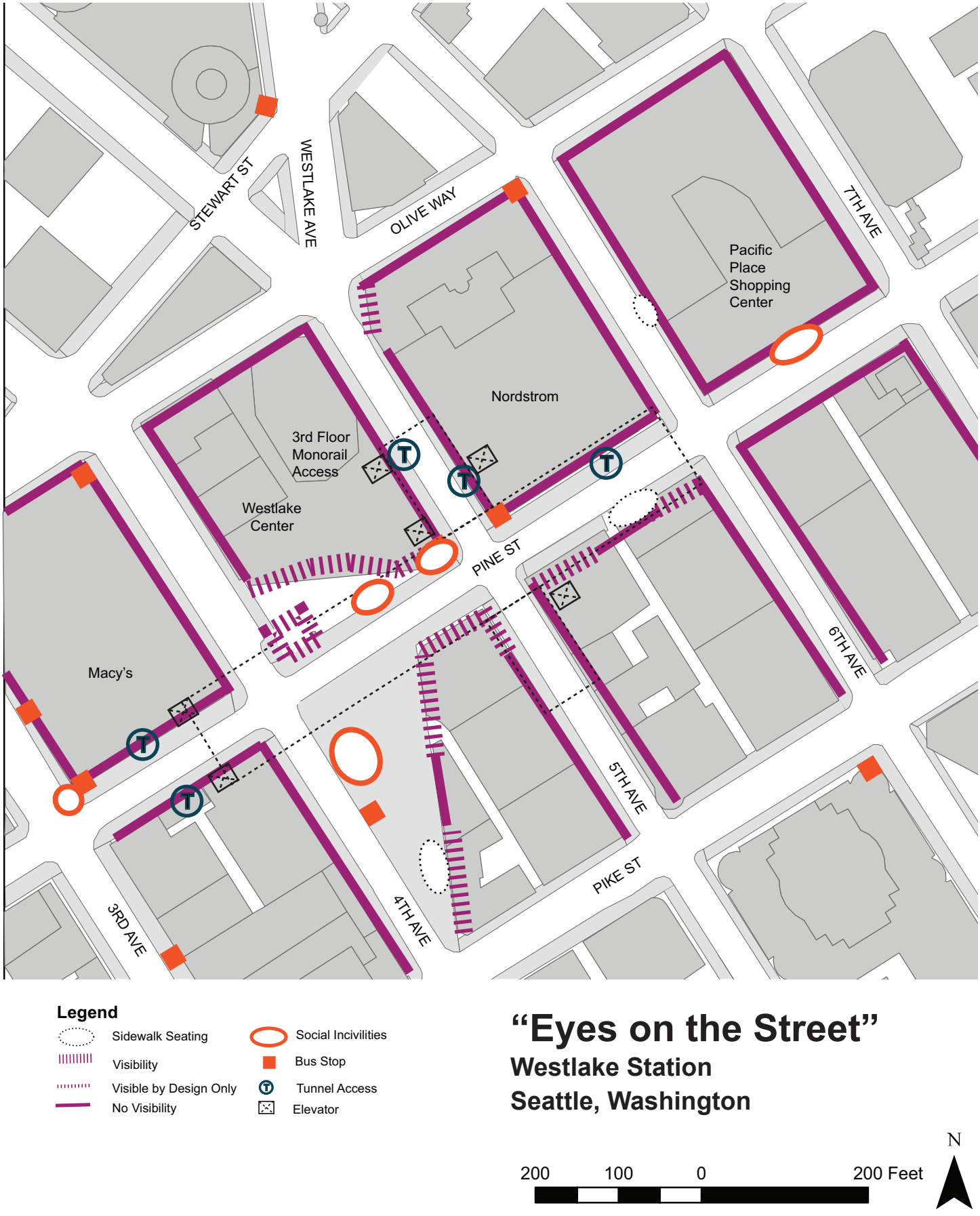


Figure 31 Safety / "Eyes on the Street" map of the area surrounding Westlake Station, Seattle, WA

Figure 32 Third floor outdoor seating provides seasonal "Eyes On The Street"

Figure 33 The coffee shop at the corner of Pine Street and 4th Avenue has windows all around.

Figure 34 Blank fascades front the streets at the station area.

Figure 35 The Platform level is visible from the Mezzannine Level inside the Bus Tunnel.

Figure 36 Social incivilities include many people loitering at Westlake Park.

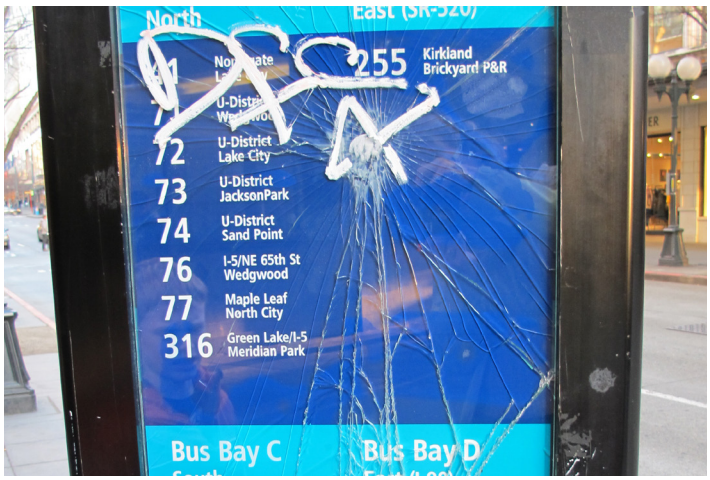


Figure 37 Broken glass and graffitti are present on this Bus Route Sign.

Signage and Wayfinding

Figure 38 shows the locations of signage in the station area.

Seattle Wayfinding Goals	*Comments*
Unified signage concept	The signage in the station area is not uniform. Finger signs and city information signs, as shown in Figure 39, Figure 40 and Figure 41, are similar in design. Bus information signs, Bus Tunnel identity signs, and signs within the station look different, as shown in Figure 42 and Figure 43.
Signage location	Figure 44 shows that there is no signage near some elevators within the Mezzanine level of the bus tunnel. There are not very many directional signs on the surface streets above that lead transit users to the bus tunnel. Not all of the entrances to the bus tunnel say which bus routes are served by the tunnel.
Circulation quality	It is challenging to find the entrances to the bus tunnel from the surface streets above.
Entrance Identity	Entrances to the Bus Tunnel are identified, but in some instances, as shown in Figure 45, signage is too small to be clear from a distance and is perpendicular to the building façade, making it difficult to see from the street. In other cases, such as at the entrance to Nordstrom, signage to the bus tunnel is angled and set close to the street, making it easier to see, as shown in Figure 46.
Platform Identity	All bus stops and platforms are identified with signage.
Connections to Multi-modal	Finger signs connect transit users to other modes. While Pine Street is identified as a bicycle route, there is not signage identifying it as such, and bicycle amenities are not present.
Connection to City	City information signs are well located, as they occur frequently and are located in high traffic areas.

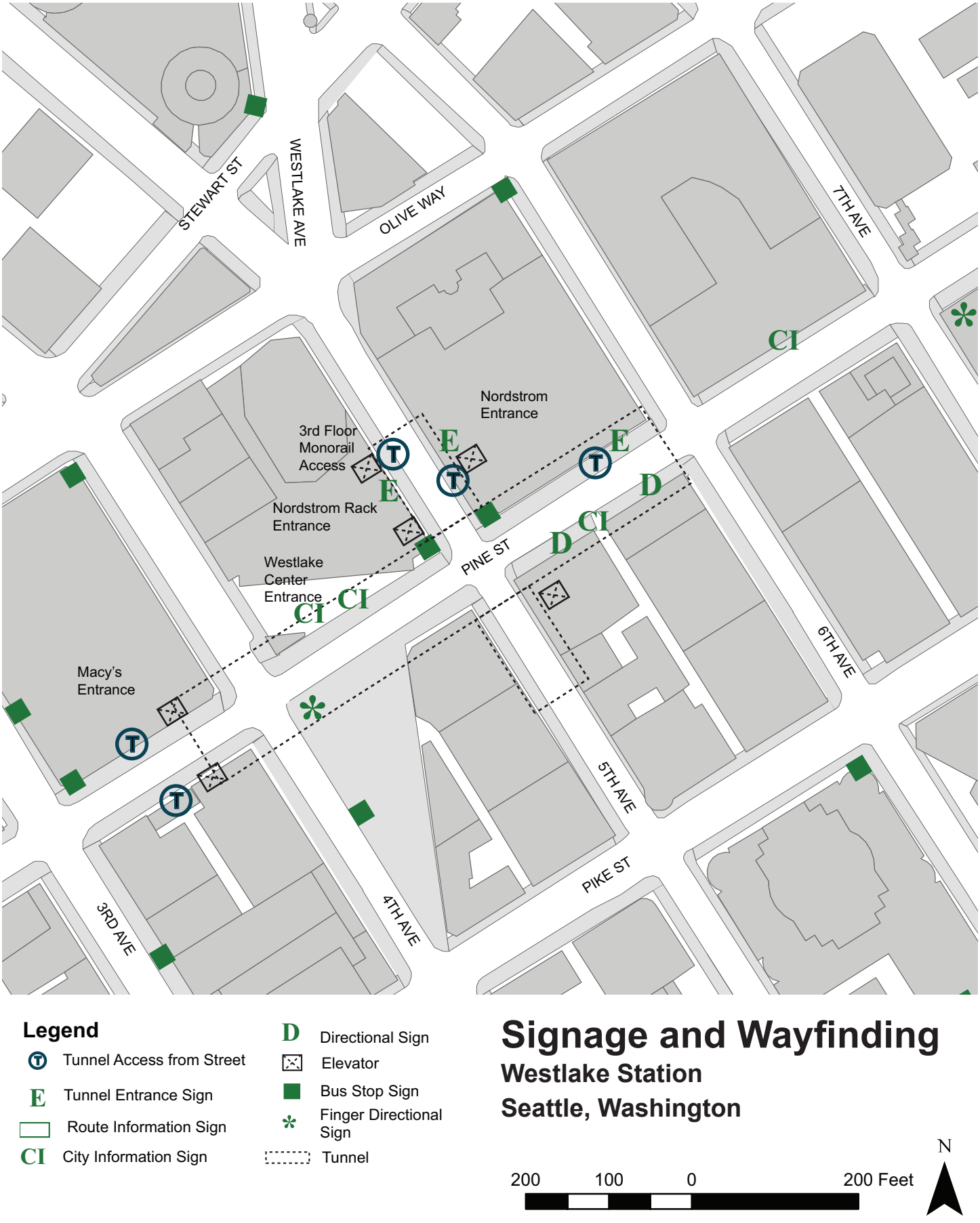


Figure 38 Signage map of the area surrounding Westlake Station, Seattle, WA

Figure 39 City information sign in front of Westlake Center.

Figure 40 "Finger" directional sign at Westlake Plaza.

Figure 41 Two different styles of directional signs mounted to light poles.

Figure 42 Bus signs have standard colors and icons.

Figure 43 These transit information signs are typical of the signs found within Westlake Station.

Figure 44 Westlake Station elevator without signage nearby.

Signage Content

Seattle Signage Content Goals	*Comments*
Trip Initiation / Payment	The Orca Card fare payment machines explain the payment process very well. An Orca card fare machine is shown in Figure 47. It contains clear instructions and a large digital screen as shown in Figure 48.
Real Time	Real time information is not available in this location.
Route Information	Bus route information signs contain multiple lines and can be confusing, as shown in Figure 49. The route information for the Link Light Rail is simpler, and therefore easy to understand.
City Information	City information signage is somewhat clear and easy to understand. North is up on the maps. One side of the maps contains a shaded bubble contextual map of the area. Bus signs show both King County Metro routes and Sound Transit routes.
Bus Stop / Platform Information	Bus stop signs on the surface streets are very easy to understand, with large interchangeable black letters for the bus routes served by the stop as shown in Figure 50. Platform signs within the bus tunnel clearly state routes served.

Figure 45 Tunnel entry sign is small and difficult to read.

Figure 46 Larger angled streetside sign is easier to read.

Figure 47 Ticket and Orca Card fare machine

Figure 48 Ticket and Orca Card screen

Figure 49 Bus route map on a sign

Figure 50 Bus stop sign with interchangeable route numbers

Study Area 3: City Center Stations, Vancouver, British Columbia

This study area centers on the connection of the two routes of Vancouver's frequent service SkyTrain. Two trains reach the study area at Granville Station, which is part of the original Dunsmuir tunnel. The Dunsmuir Tunnel was built in 1932 by the Canadian Pacific Railway to connect Burrard Inlet to False Creek. (Davies, 1993) SkyTrains through this area remain underground until they reach Stadium Station to the east, then trains run on elevated tracks. The first SkyTrain, the Expo line, shown in blue in the map in Figure 51, began service in 1986. (Translink, 2013) The Millennium line, shown in yellow, opened in 2002. Both of these trains are operated by the British Columbia Rapid Transit Company Ltd. (BCRTC).

The newer Canada Line, shown in light blue and on the west in Figure 51, opened in 2009 in preparation for the 2010 Winter Olympic Games. It was designed to take passengers from the airport to downtown in 25 minutes, stopping at the cruise ship terminal. The private company, ProTrans BC, is under a 30-year contract to operate the Canada Line. (TransLink, 2012)

The City of Vancouver has successfully encouraged residential use in the downtown area. However, according to an interview with the City of Vancouver, as the Canada Line was developing the City Centre Station, the City of Vancouver offered the Toronto based investment company who owns the City Centre Mall rights to build a residential tower above the station entry and the investment company turned down the offer based on concern of incompatibility between transit riders and residential use.

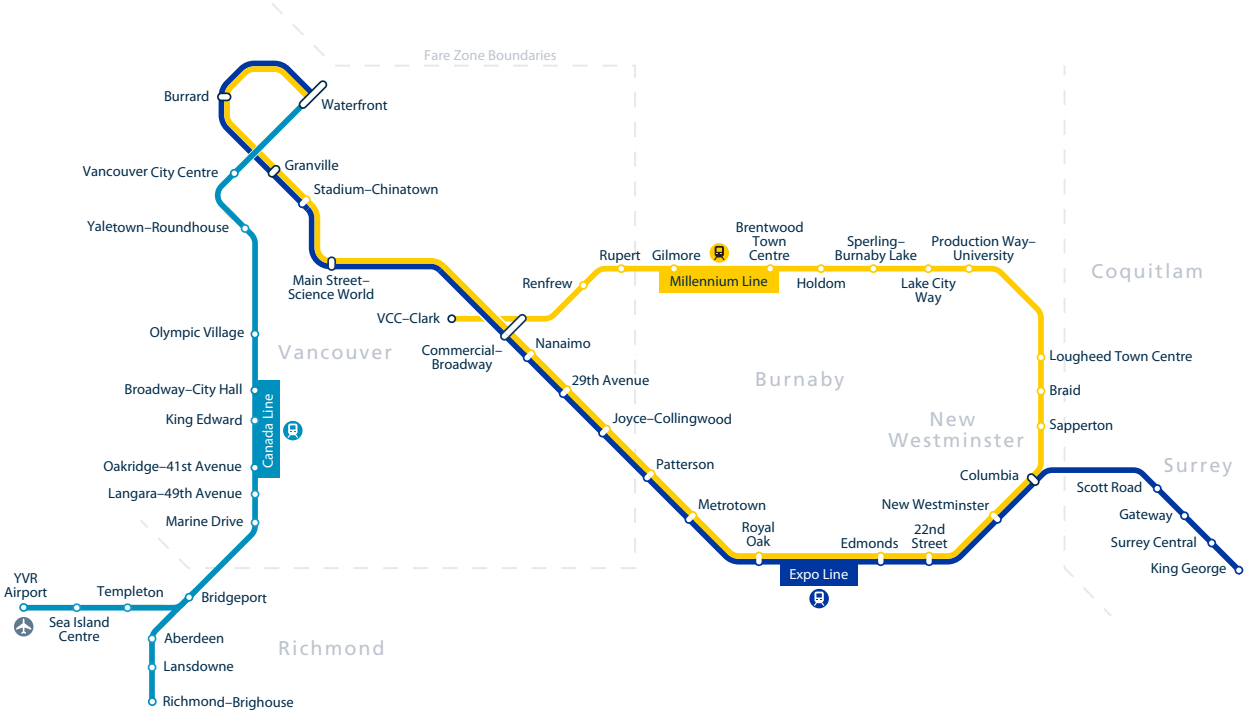


Figure 51 Vancouver Transit System Map (Source: Translink)

Orientation Map showing circulation by multiple modes

Figure 52, the Circulation map for the Vancouver study area, shows the tunnel entrances for the SkyTrain line, as well as surface bus service locations. The two-way Granville Street transit mall serves eight frequent service TransLink bus routes, the largest concentration of bus routes through the downtown area. Cars also run in both directions along Granville St.

There are two separate transit tunnels serving this area. They are connected at the mezzanine level through the Pacific Centre, Vancouver Centre, and the Bay department store. This access between lines underground through the Vancouver Centre Mall is provided during mall hours, from 9:30 am to 7 pm Mondays to Wednesdays, to 9 pm Thursdays and Fridays, to 6 pm Saturdays, and from 11 am to 5:30 pm Sundays and Holidays.

Underground passage to the Canada Line is located in the block east of the Granville St. Mall, south of W. George St. Ticketed passengers must pass through turnstiles, then find the separate

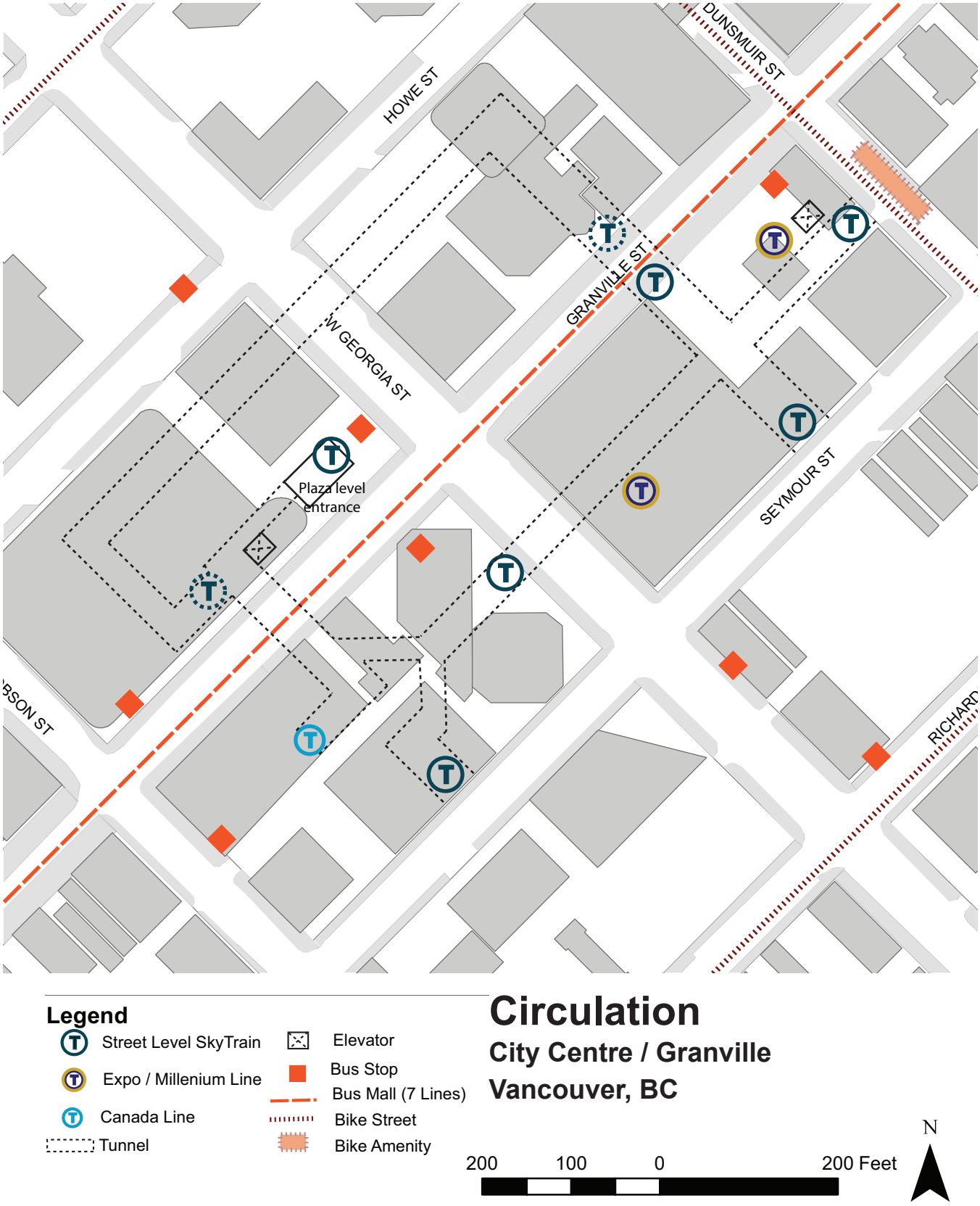


Figure 52 Circulation map of the area surrounding City Centre / Granville Stations, Vancouver, BC

entrance to the Expo / Millenium lines under the Bay department store on the other side of W. Georgia St. Unfortunately, this underground connection is confusing. The connection has improved somewhat since this author's first visit to the area in September, 2012, because TransLink has installed new signage from the Expo/Millenium station (see Figure 53 and Figure 54). Similar signage has not been installed in the Canada Line Station.

Although there are six surface entrances to the subway stations, two entrances are most prominent. The main entrance to the Canada Line is at the plaza level at the intersection of W. Georgia St. and Granville St., as shown in Figure 55. It houses stairs and two escalators in a well-lit glass enclosure. There is an elevator adjacent. The main entrance to the Expo / Millenium Lines is located mid-block with access from Granville St. under the Bay department store, shown in Figure 56. Figure 57 shows one of the new signs that have been installed at the entrance to the Granville Street Station to show how to reach the Vancouver City Centre Station, which is 400 feet southwest of the Granville Street Station entry. Figure 58 shows the view to the City Centre Station at the halfway mark. The large graphic "T" demarking the transit station is visible at the side of the City Centre entrance.

Secondary entrances to the Expo and Millenium SkyTrain tunnel operate during limited hours, and are not easy to find from inside the tunnel. Figure 59 shows the entrance to the tunnel under the Bay department store from Seymour Street. Figure 60 shows the entrance to the same tunnel from Dunsmuir Street, a bike access street, from the north. These two tunnel entrances are considered to be part of "Granville Station". Shown in Figure 61, another underground passage is from the Pacific Centre shopping mall, under Granville Street, to the Canada Line. Figure 62 shows an underground passage to Granville Station where passengers can enter through the Bay department store from the food court area. This passage is very difficult to navigate as it is not well marked, even with the new signage.

One block to the south, there are two secondary entrances from the street level to the Canada Line and one underground passage through Pacific Centre shopping mall. The entrance from W

Figure 53 Original minimal system of signage in place in 2012

Figure 54 TransLink recently installed new signs throughout the tunnel passage, as shown above.

Figure 55 The Vancouver City Centre Station, entrance to the Canada Line. The elevator is shown to the left.

Figure 56 Granville Street Station entrance to the Expo and Millenium SkyTrain under the Bay department store.

Figure 57 New sign showing directions to the Vancouver City Centre Station from the Granville Station.

Figure 58 View of City Centre Station when walking from Granville Station.

Figure 59 Seymour Street entrance to Granville Station (north of W Georgia St.) leading to tunnel under the Bay department store

Figure 60 Dunsmuir Street entrance to Granville Station leading to tunnel under the Bay department store

Figure 61 No signage guides the way to Granville Station from the Pacific Centre mall

Figure 62 Passage under Granville Street from the City Centre shopping Mall to the entrance to the City Centre Station and the Canada Line

Figure 64 Entrance to the Canada Line from W Georgia Street

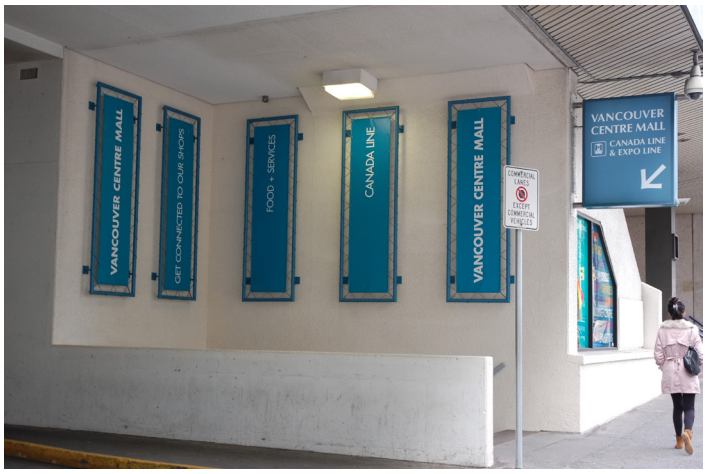


Figure 63 Entrance to the Canada Line from Seymour Street

Georgia Street, shown in Figure 63, does not have the signature blue T. Also missing the blue T, the entrance from Seymour Street, shown in Figure 64, is located adjacent to a parking garage. This entrance to Seymour Street, as shown in Figure 65 is very difficult to find from inside the tunnel as it is not identified as being a point of access to the street level. Figure 66 shows that in contrast, the entrance to W Georgia Street is easy to find.

Figure 65 Seymour Street. exit is not identified from within the tunnel. Access is circled in this photo.

Figure 66 Passage from tunnel to W Georgia Street Entrance

Safety

This section records components of the built environment based on safety goals from the literature. Figure 67 contains a map of the are with respect to safety factors.

Vancouver Safety Goals	*Comments*
"Eyes on the Street"	Figure 67 maps the observed levels of visibility from the surrounding uses to the points at which transit users enter the subway system and board the buses that run along Granville Street. Office and retail uses surround the transit access points. Granville Street is lined on the east with small shops, bars and restaurants, some with sidewalk seating. On the west side of Granville Street, façade improvements for the new Nordstrom department store are underway. This store is not expected to have visibility to the street. The design of The Bay department store includes portions that relate to the street.
Social incivilities	Social incivilities are present in small numbers during the weekday. Figure 68 shows a sign stating that the act of playing music for money is regulated. Social incivilities are located in high traffic areas, such as intersections on route between the two Skytrain stations. There is a sunken plaza west of the City Centre station with very limited visibility, closed adjacent storefronts, and only one entrance where people loiter, as shown in Figure 69 and Figure 70.
Lighting at night	Figure 71 and Figure 72 show that the City Centre Station is well lit at night. However, the sunken plaza to the west is not well lit. Tightly spaced pole lights illuminate both sides of the Bus Mall along Granville Street as shown in Figure 73 and Figure 74. Lighted advertising signs exist on both sides of the bus shelters. The letter T at the bus stop is clearly lit, as seen in Figure 74. Secondary entrances to the tunnel are well lighted, as shown in Figure 75.
Visibility	Good visibility is maintained in all areas except the sunken park located on the west side of the plaza level entrance to the Canada Line.
Maintenance	No graffiti or broken glass was observed in this portion of the city. However, small litter, such as cigarette butts and candy wrappers, was prevalent in the area.
Activity levels	The area fronting Granville Street, W Georgia Street, and Robson Street is very active. Dunsmuir Street and Seymour Street are less active.
Escape routes	There are multiple exit opportunities, as shown on the circulation map, but the secondary exit opportunities near the Canada Line are not very visible.
Security guards	City of Vancouver police patrol the area on foot in pairs and by bicycle. Figure 76 shows a police car that is regularly parked in the station area. Figure 77 shows security officers on bicycle. Transit security and customer service staff are present on trains and in the station area and tunnel in pairs, as shown in Figure 78. Security cameras are located in multiple locations throughout the station areas. Figure 79 shows a "Safe Zone" at the platform level near the track, where passengers can sit and be on camera. Despite all of these precautions, passengers have reported not feeling safe in the station areas.

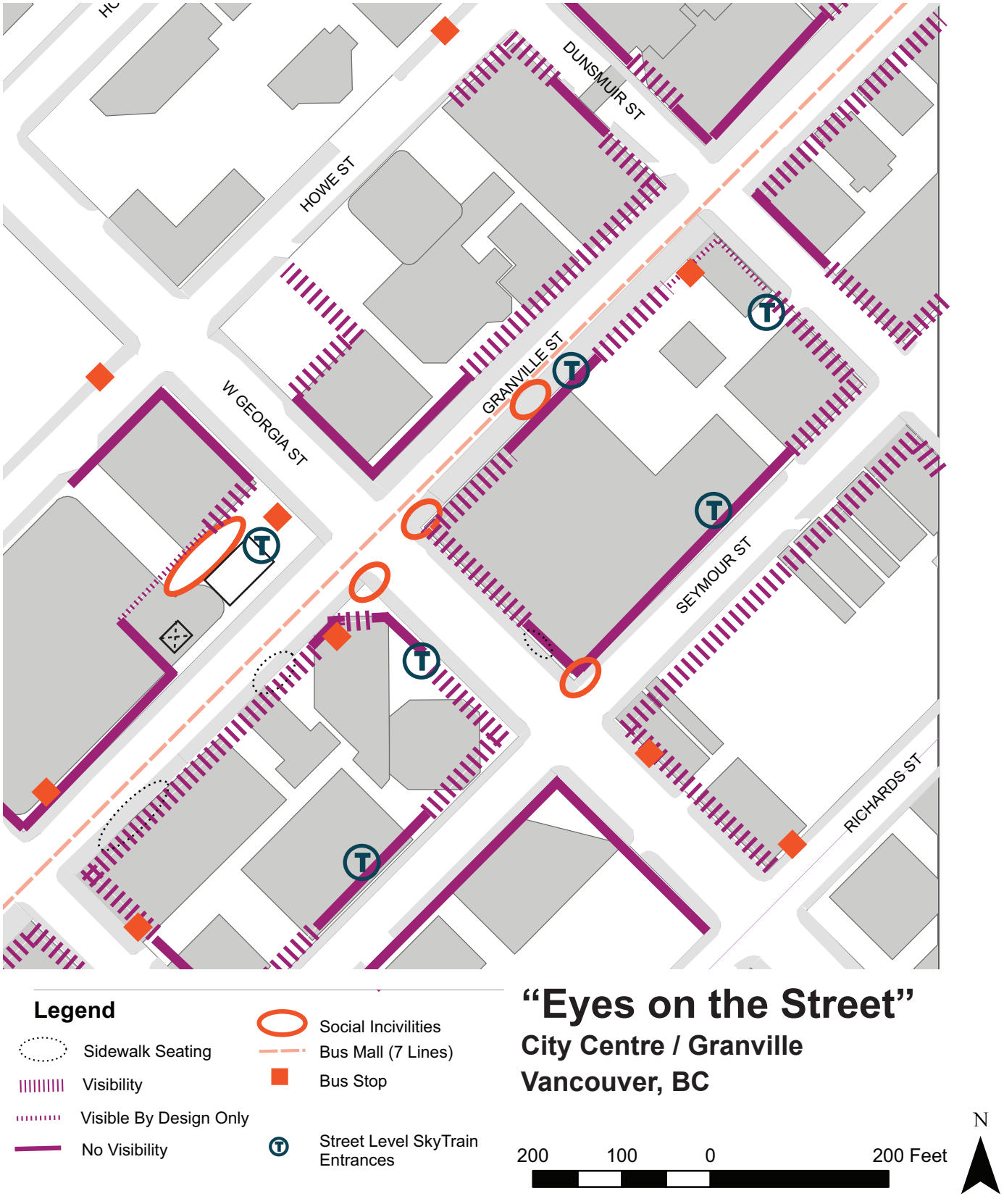


Figure 67 Safety map of the area surrounding City Centre / Granville Stations, Vancouver, BC

Figure 68 Sign stating that “Busking” is regulated

Figure 69 Only one entrance exists to an isolated sunken plaza west of the City Centre Station entrance

Figure 70 Storefronts opening to isolated plaza west of station entry are all empty.

Figure 71 The City Centre Station is well lit at night except the sunken plaza to the west

Figure 72 City Centre Station at night

Figure 73 Lighted bus stops on Granville Street

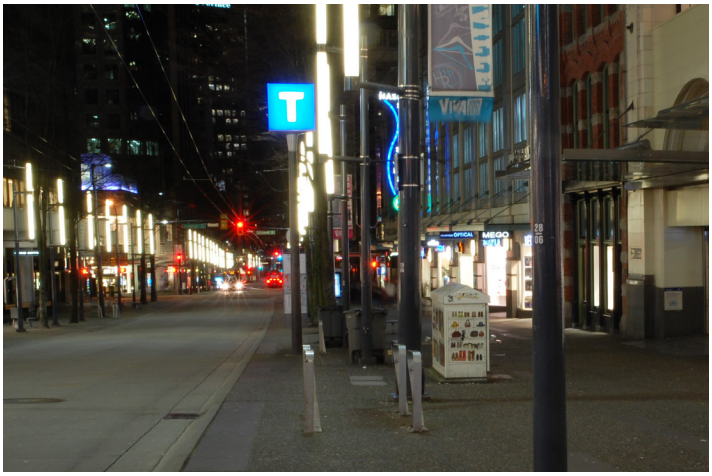


Figure 74 Consistent lighted blue "T" bus stop sign

Figure 75 Granville Station Entrance at night

Figure 76 Vancouver police vehicle seen at the statin area

Figure 77 Bicycle security patrol

Figure 78 TransLink information at the underground entrance to the Canada Line

Figure 79 Designated "Safe Zone" located at the platform level by the train tracks, where passengers can sit and be recorded on camera

Signage and Wayfinding

Locations of signage and wayfinding features are identified in Figure 80.

Vancouver Wayfinding Goals	*Comments*
Unified signage concept	Signage in this area is in transition as the City of Vancouver, the Downtown Vancouver Business Association, and TransLink work together to implement a new signage standard. Since the Canada Line is operated by a third party provider, the signage scheme has not been fully implemented. For example, the two secondary entrances to the Canada Line Station are not marked with the letter 'T'.
Signage location	Figure 81 shows that there is no signage at the entry to the City Centre Station, access to the Canada Line explaining route information. The figure identifies a potential location for this signage. Transit users must go downstairs to look at the map to see where the train goes. All three SkyTrain lines terminate at "Waterfront Station", but there are two separate locations called "Waterfront Station". The need for a sign is so strong that a hand-written sandwich board exists as shown in Figure 82. Also, there is no route nor payment information signs provided for bus service, as shown in Figure 83.
Circulation quality	Without signs and generally good availability of customer service officials helping, it would be very difficult to find the Canada Line from the Expo and Millenium Lines.
Entrance Identity	With exception of the two secondary entrances to the Canada Line, entrances are identified with a large blue and white "T". This "T" is either placed on a pole in front of the station entry or attached to the side of the building.
Platform Identity	Bus stops are identified with clear signage, as shown in Figure 84. The subway platform area is small and very simple and easy to understand.
Connections to Multi-modal	There are no signs linking transit users to multi-modal connections. Figure 85 shows that bicycle access is provided in a designated bike lane on Dunsmuir Street. Dunsmuir Street is part of a network of bike streets in this part of the city, which include the perpendicular Hornby Street to the west and Richards Street to the east. A large cluster of bike parking is available in this location, half of which is shown in Figure 86 in front of the north entrance to Granville Station. Smaller bunches of bike racks can be found along Granville Street,
Connection to City	The City of Vancouver is leading a team to develop a set of signs with city information. This signage is located at the intersection of W Georgia St and Granville St., directly in front of the plaza level entrance to the Canada Line.

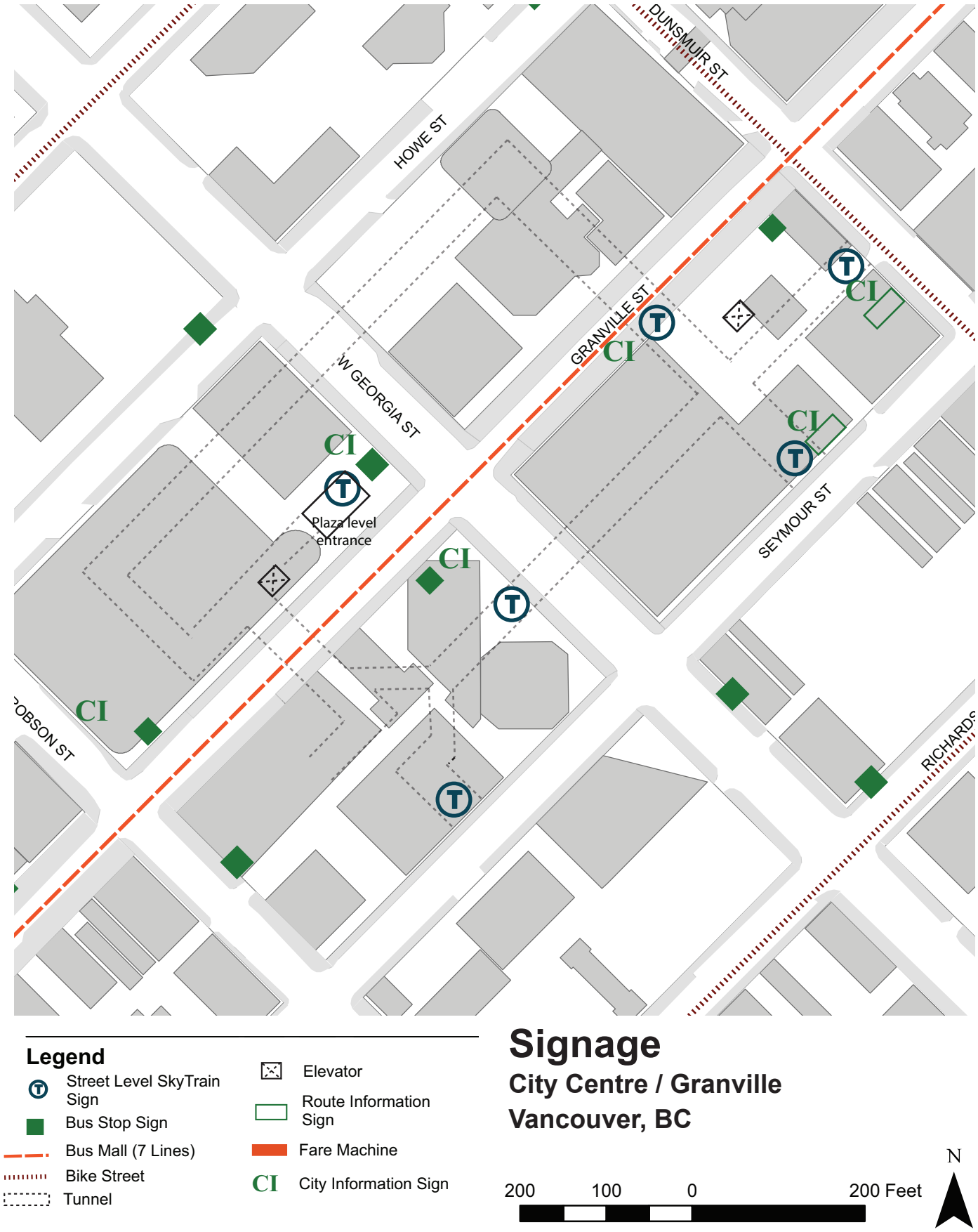


Figure 80 Signage map of the area surrounding City Centre / Granville Stations, Vancouver, BC

Figure 81 The City Centre Station does not have route information. One possible location for this type of information is circled in the photo above.

Figure 82 A difficult to navigate connection between the Canada Line Station and the Expo / Millenium Line Station at the waterfront caused the need for this temporary sign.

Figure 83 There are no information signs at TransLink bus shelters, only advertisements and a bus stop sign.

Figure 84 TransLink bus stop signd consists of route names only. As buses arrive, they display the route name and number in the sign circled above.

Figure 85 Dunsmuir Street contains a separated bike lane and outdoor parking.

Figure 86 Smaller clusters of bike racks are located in several locations throughout the station area

Signage Content

Vancouver Signage Content Goals	*Comments*
Trip Initiation / Payment	There is no information available to make a trip by bus except the bus stop number and route names and numbers. There is ample information available to make a trip by SkyTrain, but, with the exception of the signs at the Seymour Street and Dunsmuir Street Granville Station entrances, as shown in Figures 70 and 71, it exists below ground at the station entries as shown in Figure 72. Where this information does exist, it is clustered together in a way that provides a lot of information at once as opposed to spreading the information out in the landscape where it might be more useful.
Real Time	At the platform level there is a real-time display showing the anticipated arrival time of the next two trains. Also, bus signs display an image that provides information for Smart Phones.
Route Information	Figures 70 and 71 show maps of bus and other transit connections from Granville Station. These maps are very clear and easy to understand. Below grade SkyTrain, signage contains a system map showing the trains (Figure 72), but the transit map on the fare machine does not include the Canada Line (Figure 73). There is no route information provided for the bus
City Information	The City of Vancouver's new "Ahead up" mapping for the city is very clear and easy to understand, as shown in Figure 74. The maps pictures of landmarks that a visitor can look for to gain their bearings in the landscape. Figure 75 shows a trip planning map located at station entrances for the area walking distance to the station.
Bus Stop / Platform Information	Bus and platform signs are clear and easy to understand.

Figure 87 Secondary entrances to Granville Station provide transit users with multiple maps showing bus connection information and city information.

Figure 88 Larger scale transit information

Figure 89 Underground signs at the Skytrain stations show Bus Rapid Transit, Commuter Rail, and SkyTrain

Figure 90 This sign, found on a fare machine, does not show the Canada Line.

Figure 91 City information sign using the “ahead up” wayfinding system.

Figure 92 City information sign at the entrances to Granville Station.

The Perceptions of the Transit User in Accessing Transit Systems at the Three Case Study Areas

This section makes comparisons between the three case study areas with regard to how transit users perceive accessing their transit system. This section is structurally different from the previous section which documents the built environment because the information is able to be converted into a simple ‚Äúpositive‚Äù or ‚Äúnegative‚Äù response, which then allows for comparisons to be made more easily. It is important to understand here that, due to limitations of this study, there are not a large number of responses to the transit user interviews.

Therefore, this section attempts to provide an answer to the following research question:

2. What are people‚Äôs perceptions of accessing a transit system at multi-modal transit access points, i.e. rail and bus stations?

Analysis of observations of transit users

The only city with sufficient signage to meet the needs of all observed transit users is Portland. In Portland, transit users were able to find signage as soon as they disembarked the light rail vehicle because the signage was placed directly in sight. The longest time any passenger took to observe the sign before walking to their destination was four minutes. Three groups of transit users were seen being approached by, then assisted by a transit service personnel.

In Seattle, transit users often disembarked their bus or light rail and looked for a sign. Then, not finding any, they often spent a few minutes with frustrated expressions on their faces and then reviewed the set of signs in the tunnel. Often, these signs did not seem to provide the information they needed. Boarding the train, transit users were frequently seen disembarking a bus, then looking for information to make a transfer. After not seeing this information, transit users were seen allowing one Link light rail train pass, then boarding the next light rail train.

Similarly, in Vancouver, transit users were observed being very confused about how to get to the Canada Line from Granville Station. During the first observation period, transit users were

observed looking for signs and asking mall security guards and the general public how to find the Canada Line. Signs were installed prior to the next observation in February, 2013, and there was much less confusion observed. However, February is not tourist season in Vancouver so the true test of these new signs will be over the summer.

Analysis of interviews with public officials

Transit security officers were interviewed for each study area. These interviews revealed that a common concern between cities is that transit security are limited to enforcing the law on transit property only, and must coordinate with city police for outside areas. The City of Portland and TriMet have developed a program in which they coordinate successfully between the agencies. This program is recognized by other cities struggling with the issue, and other cities come to Portland for training to set up similar programs.

An interview with officials from the City of Vancouver revealed that they are also addressing a common issue, that of providing wayfinding signage at the station areas. As the test sites were evaluated, it was revealed that there is much confusion about how to find information about the bus service in the area.

Analysis of transit user interviews

In order to make comparisons between the cities, the transit user interview responses were summarized based on whether they were generally positive or negative according to a common set of assumptions. One example assumption is that if a transit user admitted to asking for information, even if they said the experience was easy, it was it was considered ‚Äúsomewhat challenging to figure out‚Äù.

Next, individual responses that contribute to the knowledge about each area are more closely examined and categorized. Because the sample sizes are very small, between 8 and 21 responses per city, results cannot be generalized to the entire population of transit users. Also, the number of transit users who answered the questions vary per question due to the nature of conducting an

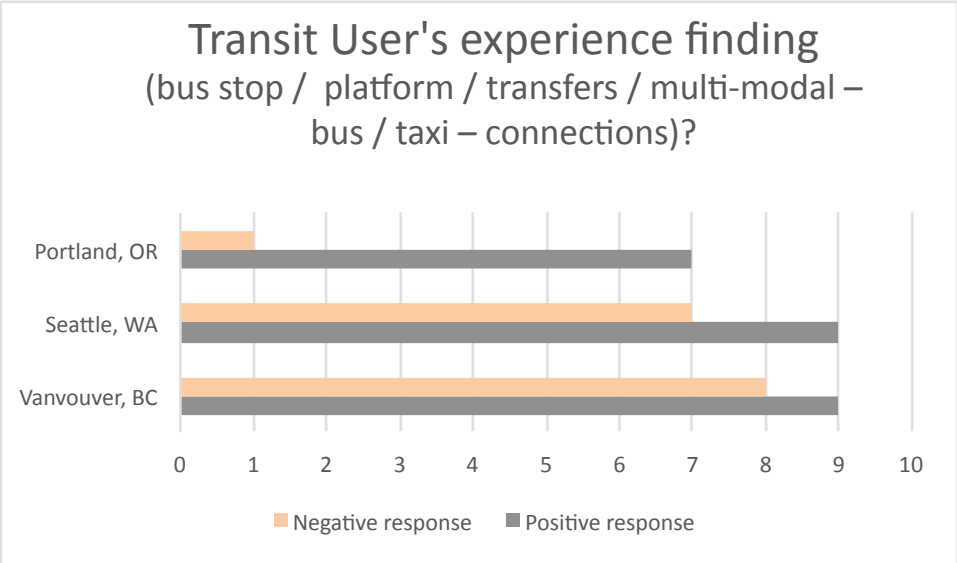
intercept interview in which the subject sometimes catches their bus or train before the interview is complete. However, the numbers of responses are appropriate for the purpose of a Post-Occupancy Evaluation because the use of multiple methods compensates for the deficiency of any one particular method. (Zimring, 1980).

Interview Question A

What has been your experience finding _____
(bus stop/platform/transfers/multimodal-bike, taxi- connection)?

For the first question, Figure 93 shows that more transit users who were interviewed in all three cities had a positive experience finding their platform than not. A very high proportion of transit users Portland, OR had a positive experience compared with those in Seattle, WA and Vancouver, BC.

A. What has been your experience finding _____
(bus stop/platform/transfers/multimodal-bike, taxi- connection)?



Seattle, WA n = 16, Vancouver, BC n = 17, Portland, OR n = 8

Figure 93 Summary of Responses to the Question about the Experience Finding ___

Six out of nine positive responses for Seattle and Vancouver were from transit users who were quick to point out that their trip was easy because they had come here before. Figure 94 graphically separates these two levels of positive responses if one were to consider the responses separately. It is possible that at least a few respondents may have had difficulty finding the platform their first trip because four out of eight newer transit users in Vancouver, and two out of five newer transit users in Seattle revealed that finding the station was challenging the first time, which was not the day of the interview. These transit users were counted as "negative responses" in the General Summary of Question A, Figure 93.

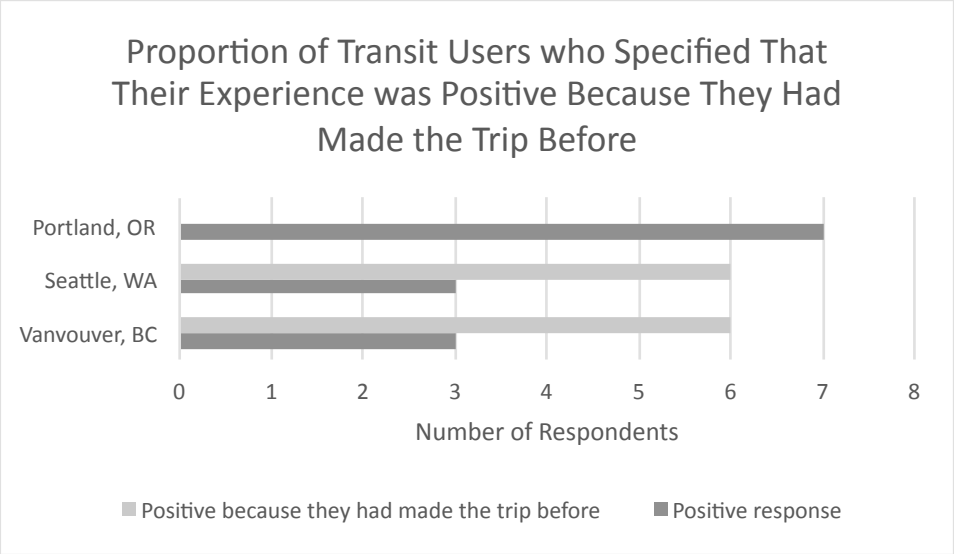


Figure 94 Proportion of Transit Users Who Specified That Their Experience Was Positive Because They Had Made the Trip Before.

It is possible that one reason why Portland had a much higher proportion of positive responses compared to Seattle and Vancouver is that the act of descending into a tunnel adds complexity. The most common problem of transit riders who are unfamiliar with the systems in Vancouver and Seattle is that there are not enough clear indications of where the transit tunnel is and how to navigate through it when the transit user is on the surface street above.

Three out of seventeen respondents in Seattle had difficulty finding the tunnel entrance:

- One pair of passengers did not understand where to go and were told to find the Link Light Rail at 3rd and Pine. They got there and looked around but saw no signs. Finally they asked someone who was handing out religious material and that person pointed them to the entry to the bus tunnel. Once they got inside the bus tunnel, they really did not have any problem figuring out where to go.
- The first time one couple tried to find the tunnel they had a hard time figuring out where to go. They looked on Google maps for the Link Light Rail, and ended up going to a concrete park across the street that looked like where the train could arrive. They waited there for about 10 minutes and only saw buses go by. Then they asked someone and were told to go downstairs into the tunnel.
- A third passenger found it a little hard to find the entrance to the bus tunnel at first.

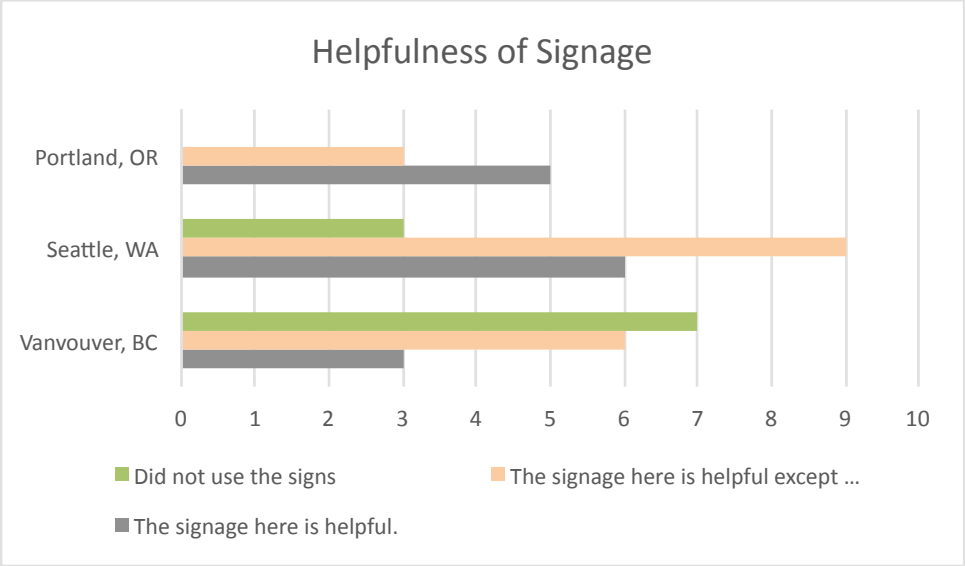
In Vancouver, five local resident respondents took the time to explain - at great length - the problems new transit users have finding their platform. These respondents feel that their transit system is so confusing for visitors that residents are regularly asked for assistance. A full transcript of these responses appear as interview numbers 6, 7, 10, 11, and 16 in Appendix C. In general, visitors often have difficulty making transfers between Granville Station (Expo and Millennium Lines) and the City Centre Station (Canada Line to the Airport). According to one respondent,

> *"Especially during the summer tourist season, I see many international visitors with suitcases having a difficult time finding their way to the airport. The tourists come in big groups, and seem to be desperately looking for help from anyone who is available."*

Interview Question B How helpful is the signage?

For the second question, , "How helpful is the signage?"Figure 95 compares the three cities with respect to the number of people interviewed who either did not use the signs, used the signs and found them helpful, or identified problems with the signs ("helpful except ..."). Once again, Portland, OR stands out because all respondents reported having used the signs. Vancouver, BC had the most transit users who did not use the signs. One possible explanation for this difference is that Portland, OR has many more signs available than are present in Vancouver, BC. About

half of the transit users in Seattle reported problems with the signage compared and less than half in Vancouver and Portland. Two respondents in Seattle volunteered that they thought Portland is a much easier transit system to navigate.



Seattle, WA n = 18, Vancouver, BC n = 16, Portland, OR n = 8

Figure 95 Summary of Responses Related to the Helpfulness of the Signage

The most commonly reported signage concerns in Seattle, reported by three individuals each, are:

1. There needs to be more signs and maps at the escalator and elevator areas on the Mezzanine level of the bus tunnel that have a ‚Äúyou are here‚Äù symbol. Two respondents noted that signs like this existed but were removed.
2. Signs identifying the transit direction (ie southbound train) at the platform level are either hard to find or confusing.

Two respondents each noted the following signage problems:

1. Signs for the surface buses are confusing. One transit user said,

   “I don’t like these signs at all. They look like you need to be an engineer to understand it - and I‚Äôm not an engineer. Half the time I feels like I am standing at the bus stop looking at the sign, and by the time I finally figure out the map I realize that my bus has just come and gone. Then I have to wait for the next bus”

Another transit user commented that,

> *"The signs for the surface buses are a little confusing. The runs need to be marked better. There were only a couple of places where the bus makes stops and these places were not clearly identified."*

2. Signs directing transit users to the station from outside need to be improved. Some transit users are not able to see any signs outside the station that identify how to enter the station. One transit user acknowledged that when the station identifiers exist, they often tend to blend in with the buildings too much and therefore cannot be seen.

Two transit users commented in favor of the signage as follows:

> One transit user thinks the signs here in Seattle are always helpful. The signs are large and have two sides. Route names are in large clear letter, black on white. The rates and information are good on the signs. She used to live in Boston and New York City, and the bus system here is much easier to navigate. In Boston, especially, you would hardly know where to stand to catch the bus. There wouldn't be any bus stop signs anywhere, and there were never nice street signs like the ones in Seattle.
>
> Another passenger commented that the color and style of the "T" is very good.

One French Canadian transit user was frustrated that no Seattle signs were in French. Three additional suggestions came from another transit user (transcript number 12 in Appendix C), and are as follows:

- Signs are not well placed
- Verbal announcements should be added
- Electronic displays should blink so they catch people's attention

In Portland, most respondents were quick to point out that the signage is helpful or "very helpful" or "good" at telling them how to find the light rail stop. One transit user pointed out that the color schemes added to the helpfulness. Three out of eight persons interviewed identified deficiencies with the signage as follows:

- The green and yellow lines, which run along the same track, are difficult to tell apart even with signage.
- The transit riders could not easily find their destination on the map so they had to go back to the car and bring the GPS with them.
- Pioneer Square could use more need more real-time information similar to that at Lloyd Center Station.

In Vancouver, one respondent was aware that transferring from the Expo Line to the Canada Line would be difficult, and was impressed that a clear map was located at the door out from Granville Station.

Six respondents either criticized, or did not see the signage. Several transit users complained about the "inexactness" of the signage. One said, "You really need to know where you are headed to make any sense of the signs." Two passengers and a customer service representative pointed out that many people get confused that all three lines terminate at the "Waterfront" station, but in reality, there are two physical Waterfront Stations. Other respondents complain that the language on signage is fragmented and difficult to understand. For example, the sign above the escalator simply says "Way Up".

There is much confusion with the system to collect payment of fares and the ,"zone" system. At Granville Station, there is no information about whether payment includes the Canada Line because the map on the fare machine only shows the Expo and Millennium Lines. Also, the fare machines do not clearly say the time of validity for the tickets and when an extra payment for zones is necessary.

Other complaints included difficulty figuring out how to use the surface buses. Weekday bus drivers were reported as being unhelpful despite that very little information is posted and one respondent revealed inaccuracies with using the telephone information service. The City's

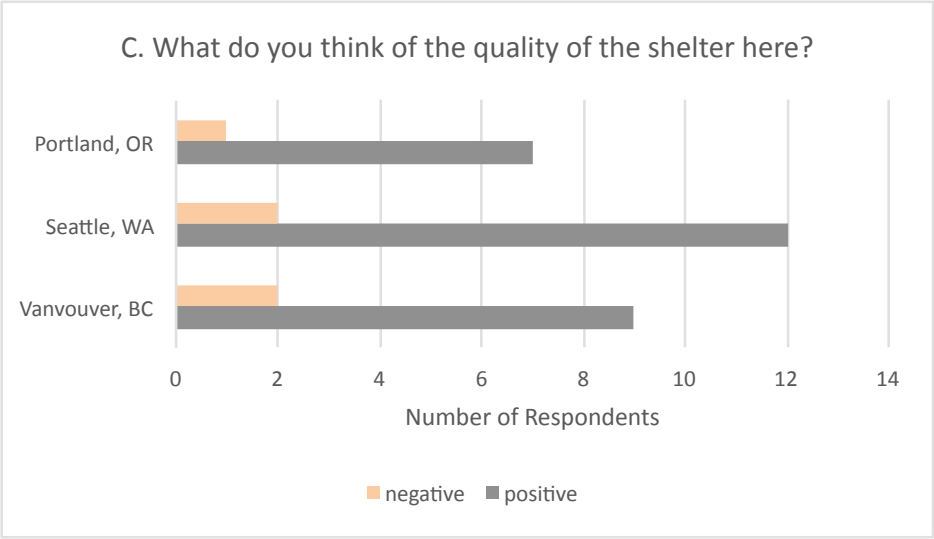
separate intercept survey also revealed problems using the buses. The person administering the survey wrote in the comment section that:

> *"I had no less than 15 people who did not want to take part in the survey but just wanted to know where the buses were ... either they knew the number but needed to find the stop or they wanted to know if they could take buses to their destination .... especially for Granville Island, Stanley Park, East bay and the north shore ... they all wished it would say on the map about the bus route"*

An interview with the agency conducting this survey revealed that TransLink expects transit users to use web-based information, and therefore do not provide information on their signs.

Interview Question C What do you think of the quality of shelter here?

For the next question, "What do you think of the quality of shelter here?", the following graph summarizes general responses to the question of how the transit users felt about the quality of the shelter.



Seattle, WA n = 14, Vancouver, BC n = 11, Portland, OR n = 8

Figure 96 Summary of Responses Related to the Quality of the Shelter

An overwhelming majority of the transit users interviewed are satisfied with the quality of the shelter as shown inFigure 96.

In Portland and Vancouver, transit users report that they do not depend on the shelter to keep them dry. One Vancouver transit user said,

> *"The level of shelter is okay here. There really is not a need for extensive shelter. Everyone here knows to bring an umbrella. I have mine in my backpack."*

The only concern about the shelter was expressed by a visitor, who pondered whether the level of shelter was adequate for wind and rain.

Criticisms of the bus tunnel in Seattle include temperature and lack of cell service. These concerns were not mentioned in Vancouver, even though the same conditions exist. One possible reason that it the conditions are not noticed in Vancouver is that passengers generally spend very little time in the tunnel because the frequency of transit is at 6 minute intervals.

Two transit users in Vancouver BC (response 10 and 14 in Appendix C) and three in Seattle WA (response 6, 8, and 20 in Appendix C) volunteered that they were not as satisfied with the shelters in residential areas, especially in lower income residential areas.

Two transit users complained about the physical structure of Vancouver,Äôs transit stations. One mentioned the platform length as follows:

> *"A lot of people complain about how short the platforms are for the City Centre Canada Line Station. The platform is 80 feet instead of the typical 120 feet Also the width is very narrow. If some of the Toronto stations are any indication, this size is much too small. For example, Union Station, Toronto, gets overwhelmed."*

Another mentioned the stairs as follows:

> *"The biggest problem with the stations is that there are too many steps, especially*

in the Granville Station. Sometimes the escalators are not working and I hear people huffing and puffing to get to the top. The population is getting older and also people on vacation don't want to deal with climbing stairs, so this is a problem."

Interview Question D How safe do you feel here?

The final interview question is

D. How safe do you feel here?

The answers to this question are somewhat challenging to interpret. Most transit users feel safe during the day, as shown byFigure 97.

Seattle, WA n = 15, Vancouver, BC n = 12, Portland, OR n = 8

Figure 97 Summary of How Safe Transit Riders Feel in a Given Area

However, several of the transit users who report feeling safe during the day report not feeling safe after dark. The data did not allow for the creation of a separate comparison of how safe people feel at night because not everyone who responded they felt safe considered safety after dark. It is useful to note, however, that in Portland and Seattle, transit users generally report

feeling safe until dark. In Vancouver, transit users report feeling safe until 11pm and midnight. Higher levels of passenger flow in Vancouver could account for this difference.

Both Seattle and Vancouver have experienced media attention focused on problems associated with the safety of the transit and tunnels. In Seattle, two young female transit users were aware of some fights that broke out at the platform level and both times security guards were reported to be powerless to intervene. One incident reportedly occurred recently. (see transcript numbers 6 and 14 in Appendix C). In Vancouver, the transit security carries guns and has been given substantial authority to intervene. One transit user commented that:

> *"If you have to have armored guards, then it means it is dangerous."*

Recent Vancouver media attention has focused on stabbings in Surrey, an eastern suburb which acts as the terminus of the Expo and Millennium lines. See interview transcript number 10 and 16 in Appendix C for more detailed accounts of gang stabbings and purse snatchings. Since the trains in Vancouver are driverless, there is concern about an inability to seek help if it is needed because there is often no people in the station.

Chapter 6

Results and Evaluation

This evaluation ranks the performance of each station area in relation to goals according to the standards of high, medium, and low.

● High ◐ Medium ○ Low NA Not Applicable

These rankings appear in the space next to the goal in the tables that follow.

Each comment is sourced to each of the five methods used in this multi-method POE. Sources use the abbreviations listed below in parentheses:

- Review of related planning documents and background information (Doc)
- Recording of the physical environment (Rec)
- Observations of transit users (Obs)
- Interviews with public officials (Pub)
- Transit user interviews (Int)

Evaluation of Study Area 1: Pioneer Square, Portland, Oregon

Portland Safety Evaluation	*Rating*	*Source*	*Comments*
"Eyes on the Street"		Rec Pub	Over half of the area surrounding Pioneer Square contains uses that provide good visibility to the street. Areas around bus stops are recorded by both hidden and visible cameras.
Social incivilities		Rec Pub Rec, Pub Pub Doc	Pioneer Square houses a high number of social incivilities. Social incivilities do not cause crime, contrary to what transit users believe. The area at the intersection of SW Morrison St and SW6th Ave has a higher proportion of social incivilities. There is a higher number of social incivilities during the summer when the space is more active. The space serves the purpose of being the "living room" for the city and it is common for people tospend time here people – watching.
Lighting at night		Rec Rec	Ambient station area lighting covers the entire waiting area surround Pioneer Square. The new bus shelters along SW 5th and 6th Avenues are internally illuminated and bright.
Visibility		Rec Pub	There are columns along SW Yamhill Street that seem large enough for people to hide behind. The columns are not really a concern for people to hide behind. It is conceivable that a weapon or a bomb could be placed there out of sight.

Evaluation of Portland Safety, continued on the next page

Evaluation of Portland Safety, continued from the previous page

Maintenance		Rec Pub	Very little graffiti and litter was observed in the station area. Litter was observed in the street on SW Broadway Ave. Tri-Met staff continuously circulate through the station areas to remove graffiti and make necessary repairs.
Activity levels		Doc	Transit operates 22 hours a day (except 2am to 4am) except on Sundays (except 11pm to 4am).
Escape routes	**NA**		No underground system exists.
Security guards		Rec Pub	Security guards were present. TriMet commissions its own security guards who have jurisdiction over the area fronting the "white line" where transit is provided, and under the shelters. TriMet works very closely with the City of Portland Police force, who patrol other areas. City Police are present as uniformed and undercover agents.

Portland Wayfinding Evaluation	*Rating*	*Source*	*Comments*
Unified signage concept		Rec Int	Signage in this area uses the same color palette and design, with accent colors differentiating the transit routes. Color scheme adds to the helpfulness of the signage.
Signage location		Rec Obs Int	The area reveals excellent signage in areas where it makes sense for signage to be. Signage appears to be sufficient to meet the needs of all observed transit users. Transit users were able to find signage as soon as they disembarked the light rail vehicle because the signage was placed directly in sight. Most respondents were quick to point out that the signage is helpful or "very helpful" or "good" at telling them how to find the light rail stop.

Evaluation of Portland Wayfinding, continued on the next page

Evaluation of Portland Wayfinding, continued from the previous page

Circulation quality	○	Rec Obs	Bike, light rail, and bus is visible from Pioneer Square. Signage would be required to find the street car. Transit users are able to disembark their vehicle and find signage quickly, then move to their designation quickly.
Entrance Identity	**NA**		No underground system exists.
Platform Identity	●	Rec	The bus stops and platforms are clearly identified.
Multimodal Connections	○	Rec Rec	There are no signs identifying the bike route on SW Broadway Ave. The Streetcar is identified in small print on one of the city information signs. The amount of bike parking seems adequate compared to the number of bikes parked there, even during the peak summer season. SW Broadway Ave is designated a bikeway and has bicycle friendly pathways. There are no additional bicycle amenities.. The light rail lines have designated space for bikes to hang vertically.
Connection to City	○	Rec	Wayfinding signs orienting transit users to the city only appear on two streets leaving Pioneer Square.

Portland Signage Content Evaluation	*Rating*	*Source*	*Comments*
Trip Initiation / Payment	●	Rec	A transit user is able to pay a fare, and find their transit route by using signage
Real Time	○	Rec	Only certain newly installed bus shelters on 5th and 6th Avenues have real time information, which is accurate. Light rail does not. Street cars have real time information, but it was observed not to be accurate.

Evaluation of Portland Signage Content, continued on the next page

Evaluation of Portland Signage Content, continued from the previous page

Route Information	●	Rec	Both light rail and bus signs identify the current location of the transit user, are clear, and show the entire system in relation to the downtown area.
City Information	●	Rec	Signage connecting the transit user to the city are clear and easy to understand. They contain directional signage pointing the way to city features, and identify where one is on the map in context with other color coded areas.
Bus Stop / Platform Information	○	Rec Int	The stop and platform signs are clear and have large letters so they can be viewed from far away. The green and yellow lines, which run along the same track, are difficult to tell apart even with signage.

Evaluation of Study Area 2: Westlake Station, Seattle, WA

Seattle Safety Evaluation	*Rating*	*Source*	*Comments*
"Eyes on the Street"	○	Rec	The surface streets have minimal ground floor uses. The platform level is visible from the Mezzanine level.
Social incivilities	○	Rec Int	Social incivilities exist in this area, especially in high traffic locations The presence of social incivilities at this station is considered to be less than at other stations.

Evaluation of Seattle Safety, continued on the next page

Lighting at night		Rec	The area surrounding Westlake Station and the tunnel is well lit.
Visibility		Rec	The streetscape surrounding Westlake Station is open and clear of obstacles. The interior of the station is also open and clear.
Maintenance		Rec	The interior of the station is meticulously cleaned and maintained. Transit signs outside the station are not always well maintained.
Activity levels		Int	Early mornings and late night from 9pm to 1 a.m. the station area feels deserted.
Escape routes		Rec	Because the Mezzanine level is designed with an open format, there are multiple visible exits from the tunnel.
Security guards		Rec Int	Transit security is at the Platform level at all times, with one security guard present at each side (northbound and southbound) of the tunnel. Above ground, there is often police presence with a patrol car parked along Pine Street. Transit users question the authority of the transit security.

Seattle Wayfinding Evaluation	*Rating*	*Source*	*Comments*
Unified signage concept	◐	Rec	There are two different sets of graphic schemes – a set of red wayfinding signs, and metro signs.
Signage location	○	Rec, Int	There is no signage near some elevators within the Mezzanine level of the bus tunnel. There needs to be more signs and maps at the escalator and elevator areas on the Mezzanine level of the bus tunnel that have a "you are here" symbol. Two interview respondents noted that signs like this existed but were removed.
		Rec, Obs	There are large sets of transit information signs in one location on each side of the platform level of the bus tunnel. While all the information is here, some transit users have been observed looking for signage and not seeing it. Several times the transit user's train passed by once before they found signage, so they apparently were able to tell how to board the train by seeing it.
		Rec	There are not very many directional signs on the surface streets above that lead transit users to the bus tunnel.
		Int	Three interviewed groups of transit users looked for the Link Light Rail at 3rd and Pine. They got there and looked around but saw no signs. One waited at the bus stop for ten minutes. Both had to ask for help to find the tunnel. Once they got inside the bus tunnel, they did not have any problem figuring out where to go.
		Rec	Not all of the entrances to the bus tunnel say which bus routes are served by the tunnel.
Circulation quality	◐	Int	Although signs show that buses headed in north and south directions are on opposite sides of the track, some transit users report being confused because information about train direction is not as available at the Platform level.

Evaluation of Seattle Wayfinding, continued on the next page

Evaluation of Seattle Wayfinding, continued from the previous page

Entrance Identity	○	Rec, Int	Entrances to the Bus Tunnel are not well identified because signage is too small to be noticeable in most cases. There are too few directional signs leading to transit entrances.
Platform Identity	●	Rec	All bus stops and platforms are identified with signage.
Multimodal Connections	◔	Rec Rec	Finger signs connect transit users to some, but not all other modes. While Pine Street is identified as a bicycle route, there is not signage identifying it as such, and bicycle amenities are not present.
Connection to City	◔	Rec	City information signs are well located, as they occur frequently and are located in high traffic areas.

Seattle Signage Content Evaluation	*Rating*	*Source*	*Comments*
Trip Initiation / Payment	●	Rec Int Int	Signage and fare machines are readily available and are easy to use. The fare machines are very user friendly – much better than those in other cities. Bus signs have route information and fare payment information.
Real Time	○	Rec	Real time information is not available in this location.

Evaluation of Seattle Signage Content, continued on the next page

Route Information		Rec Int Int	Bus route information is more complex and difficult to understand than that of the Link Light Rail. Bus route maps look like an engineer drew them, and (this transit user) is not an engineer. Another transit user commented that the bus runs need to be marked better. The skip-stop spacing especially needs to be better identified. Bus stop signs are always helpful.
City Information		Rec	City information signage is somewhat clear and easy to understand.
Bus Stop / Platform Information		Rec Int	Bus stop signs on the surface streets are very easy to understand, with large interchangeable black letters for the bus routes. A lot more information is provided on bus route signs here than in other cities.

Evaluation of Study Area 3: City Centre / Granville, Vancouver, BC

Vancouver Safety Evaluation	*Rating*	*Source*	*Comments*
"Eyes on the Street"		Rec	The east side of Granville Street and Robson Street have the highest potential for "eyes on the street" as there are multiple small shops and restaurants. Much of the area consists of large department stores and office towers. However, the first floor often replaces blank walls with outwardly facing small shops.
Social incivilities		Rec Int, Pub	Social incivilities are present in small numbers during the weekday. There is a sunken park west of the City Centre station with very limited visibility and only one entrance where people loiter. Rowdy crowds are problematic in this area during weekend nights.
Lighting at night		Rec	Most all areas are well lit at night, except the sunken plaza to the west of the main entrance to the City Centre Station.
Visibility		Rec	Good visibility is maintained in all areas except the sunken park located on the west side of the plaza level entrance to the Canada Line.
Maintenance		Rec	No graffiti or broken glass was observed in this portion of the city. However, small litter, such as cigarette butts and candy wrappers, was prevalent in the area.
Activity levels		Rec	The area fronting Granville Street, W Georgia Street, and Robson Street is very active. Dunsmuir Street and Seymour Street are less active.

Evaluation of Vancouver Safety, continued on the next page

Evaluation of Vancouver Safety, continued from the previous page

Escape routes	○	Rec Pub	There are more opportunities for escape at the mezzanine level than the platform level, but some exit routes are not well labeled. Transit users are concerned about their safety in the platform level of the tunnel because there is nowhere to escape.
Security guards	◍	Rec Doc	The tunnel stations are frequently patrolled by transit police and transit customer service providers. The surrounding areas are patrolled by City of Vancouver Police and Vancouver Ambassadors assist transit users. There are times when the station is empty of people because the Skytrain operates without drivers and security cameras are relied upon. Platform areas have "safe zones" that are within the range of the cameras.

Vancouver Wayfinding Evaluation	*Rating*	*Source*	*Comments*
Unified signage concept	●	Rec Int	The signage fits together in one graphic scheme. The bold "T" symbol is successful. New signage is coordinated so consistent graphics are used.

Evaluation of Vancouver Wayfinding, continued on the next page

Evaluation of Vancouver Wayfinding, continued from the previous page

Signage location	○	Rec Rec, Int, Obs Int	Missing information includes route and payment information for buses, and ample signage connecting the City Centre Station with Granville Station. Signage appears in large groups of signage, which may be confusing to the transit user. Many visitors and others unfamiliar with transit find the connection between Granville Station and City Centre Station to be confusing. A full transcript of these responses appear as interview numbers 6, 7, 10, 11, and 16 in Appendix C. There are too few signs instructing transit users how to make the connection between the two stations. One respondent was aware that transferring from the Expo Line to the Canada Line would be difficult, and was impressed that a clear map was located at the door out from Granville Station.
Circulation quality	○	Rec, Obs Rec, Int	Without signs and generally good availability of customer service officials helping, it would be very difficult to find the Canada Line from the Expo and Millenium Lines. Visitors often exit Granville Station at Dunsmuir Street because it is the first exit area when leaving the station. The Dunsmuir Street Station exit faces north so there are no sight lines to the City Centre Station to the south and the area is more confusing than the Granville Street exit.
Entrance Identity	◍	Rec	With exception of the two secondary entrances to the Canada Line, entrances are identified with a large blue and white “T”. This “T” is either placed on a pole in front of the station entry or attached to the side of the building.
Platform Identity	●	Rec	Bus stops are identified with clear signage. The subway platform area is very simple and easy to understand.

Evaluation of Vancouver Wayfinding, continued on the next page

Evaluation of Vancouver Wayfinding, continued from the previous page

Multimodal Connections	●	Rec Rec Doc, Pub	There are no signs linking transit users to multimodal connections. There is adequate bike parking and bike access on Dunsmuir Street, which connects to the greater network of bike streets. Bike access needs will increase in this area due to the future introduction of bike share.
Connection to City	●	Pub Rec	The City of Vancouver is leading a team to develop a set of signs with city information. New city information signs are placed in high traffic locations near transit entrance ways.

Vancouver Signage Content Evaluation	*Rating*	*Source*	*Comments*
Trip Initiation / Payment	○	Rec Int	Signage for buses is very poor. SkyTrain signage is available below grade, not at the entrances to the tunnels. "You really need to know where you are headed to make any sense of the signs." Two passengers and a customer service representative pointed out that many people get confused that all three lines terminate at the "Waterfront" station, but in reality, there are two physical Waterfront Stations. Other respondents complain that the language on signage is fragmented and difficult to understand. For example, the sign above the escalator simply says "Way Up". There is much confusion with the system to collect payment of fares and the "zone" system. At Granville Station, there is no information about whether payment includes the Canada Line because the map on the fare machine only shows the Expo and Millennium Lines. Also, the fare machines do not clearly say the time of validity for the tickets and when an extra payment for zones is necessary.
Real Time	○	Rec	No real time information exists.

Evaluation of Vancouver Signage Content, continued on the next page

Route Information	○	Rec Pub	Route information signs are located within groups of maps. The maps themselves are clear and easy to understand. There is no route information provided for the bus. The City of Vancouver initiated a program to install new signs in the study area. As the test sites were evaluated, it was revealed that there is much confusion about how to find information about the bus service in the area. The person administering the survey wrote in the comment section that: *"I had no less than 15 people who did not want to take part in the survey but just wanted to know where the buses were… either they knew the number but needed to find the stop or they wanted to know if they could take buses to their destination…especially for Granville Island, Stanley Park, East bay and the north shore … they all wished it would say on the map about the bus route."*
City Information	●	Rec	The City of Vancouver's new "Ahead up" mapping for the city is very clear and easy to understand. The maps contain pictures of landmarks that a visitor can look for to gain their bearings in the landscape and a 10 minute walk circle around where the person is in space.
Bus Stop / Platform Information	○	Rec	Bus and platform signs are clear and easy to understand.

Chapter 7

Discussion, Recommendations and Conclusion

Discussion and Recommendations

The five methods used in this post-occupancy evaluation of the three transit station areas have addressed the remaining three research questions:

3. What is occurring in these facilities that is working well and could be replicated in other areas?
4. What is occurring in these facilities that is not working and could be improved?
5. What more could be done?

The previous section, Chapter 6 Results / Evaluation identified many issues that are either working well or need improvement. In general, it is apparent that it is much more challenging to ensure transit user safety and clear wayfinding in locations that have underground transit.

This chapter will discuss several of the most significant issues and make recommendations about those issues.

Recommendation A. A simple signage and wayfinding system can be achieved most easily if efforts are made by transit agencies to develop conceptually simple transit systems.

It is important to recognize that the transit system in Portland is very easy to understand conceptually, which gives Portland an advantage when providing simple signage and wayfinding. Complex information systems like Seattle's use of partial or complex bus system maps and Vancouver's use of fare zones and multiple stations with the same name cause undue complexity that is not easy to overcome by good signage.

Recommendations

1. Consider simplifying the transfer conceptually like Portland has done when developing printed materials for a transit system. In Portland, the light rail system is developed in such a way that there are four transfer locations. It is easy to explain this system to new transit users, because it simply requires a large scale

map that shows the transfer locations. Bus are inherently more complex, but have been conceptually simplified by grouping transfer locations into letter codes with supporting mapping, announcements and signage. For example the intersection of SW 6th Ave and Yamhill Street as a sign with the letter "Z". This is where transit users can connect to bus routes 1, 12, 19, and 94. The bus driver announces when the bus is entering the connection with "Z" transfers. Passengers know to look for "Z" because it is also shown on their route maps and in online information. This system could be improved by including more explanation at the bus stop.

2. Avoid the implementation of concepts that are conceptually difficult to the transit user, such as a complex fare zone system that differs during different parts of the day, such as in Vancouver.

3. Strive to achieve simpler signage by showing no more than the amount of detail necessary to convey the point.

4. Strive to show the complete transit system on maps.

Recommendation B. Improve Wayfinding to Underground Transit Stations

Transit users report having difficulty finding underground transit when access requires passage through the ground floor entrances of buildings. This difficulty is a result of too little directional signage leading to the passage and/or too little identity signage at the station entrance.

Recommendations:

1. Use signs in multiple locations along a transit user's path to provide of the direction toward the station. The use of multiple signs is beneficial because it minimizes the risk of the transit user not seeing the signage. Signage from above grade to below grade should be seamless.

2. Use large, bold, consistent signs at entrances to underground transit. Signage should contrast with the color of the building façades. Look to Vancouver's large square "T" sign. Vancouver's sign is roughly five times larger than the identity sign used in Seattle. The Pine Street transit entrance at the Seattle Nordstrom works better than other identity signs in this area because it is set toward the street and is angled to be visible from multiple sides.

Recommendation C. Reveal Signage Information using "Progressive disclosure"

In both Vancouver and Seattle, transit agencies have taken the approach of placing multiple panels of information in one place. While this approach meets the goals of this thesis' evaluation, placing so many signs together in one area can be overwhelming to the transit user, according

to City of Vancouver planners who have been studying contemporary theories of signage placement, such as in London Underground. A progressive disclosure technique would allow signage to be available in locations where it is needed most, not just in one grouping where it might be most convenient and cost effective to place signage. For example, in Westlake Station, there is an adequate number of signs, but no signs at the escalators and elevators.

Recommendations:

1. Identify locations where transit users require signage, and ensure that signage is available in those locations
2. Evaluate whether transit users are able to effectively absorb all of the information provided when it is provided in one large cluster of signs.
3. Create a pilot project to use a "slow reveal" approach, similar to that in Portland, where each sign contains a relatively small amount of information, but signs are interspersed in high traffic areas.

Recommendation D. Coordinate Work between Agencies and Consider Context When Making Expansions to or Developing New Transit Facilities

In order to avoid transit connections that are overly complex, it is important to consider the surrounding context. Once a complex connection has been constructed, it is very difficult to correct for this complexity with signage. The addition of the City Centre Station and the Canada Line in 2010 in Vancouver provides an excellent example of the difficulties the city is having overcoming a confusing connection. After numerous complaints, the City and TransLink installed directional signage throughout Granville Station to connect transit users to the City Centre Station. Not all signs had been installed at the time of writing this thesis, but even with the signs, transit users were not finding their way.

Recommendations:

1. Prefer design solutions that provide close and visible connections between transit modes.
2. Ensure that adequate directional signage is placed both above ground and below ground to provide a complete seamless path.

3. Initiate the use of a checklist that must be completed by the lead agency overseeing the coordination of expansion or construction of Transit - Oriented development projects with multi-modal transit connections. This checklist should contain the evaluation goals that are contained within this thesis, so that safety, wayfinding, and signage are considered.

Recommendation E. Address Safety Concerns After Dark

Transit feels inherently unsafe to the transit user after dark, especially when that transit is underground. The presence of security guards is a good solution to increase safety. However, transit users must feel like these security guards have the authority to protect them. There is a perception in Seattle that transit security officers are powerless based on media coverage of two incidents. Vancouver transit security officers have the ability to carry a weapon, and seem to have adequate power to protect passengers, but passengers in Vancouver see this unusual use of weapons as a sign that transit is dangerous. There are jurisdictional issues between transit and city police regarding patrol of areas inside and outside the boundary of transit facilities.

Recommendations:

1. Provide transit security with the authority they require.
2. Address jurisdictional boundaries.
3. Ensure that people are present when transit operates.
4. Future stations could be designed to allow for better “Eyes on the Street”. Westlake Station has areas cut out of the Mezzanine level so that the station area can be viewed from above. Higher traffic uses such as restaurants should be placed adjacent to these cut out areas. The Mezzanine level at both the Granville and City Centre Stations in Vancouver, BC have thriving restaurants operating at all times of day at the Mezzanine level.
5. Limit the access to underground transit after dark to areas where security is available.

Recommendation F. Provide Complete, Yet Flexible Bus Routing Information

It is challenging to provide up to date signage for flexible transit systems. Seattle does a good job with their selection of bus signs in that they contain slide in parts which allow for changes to be made. Vancouver provides almost no bus information, and have been criticized for providing

poor service by phone. They emphasize computer based smart technology, leaving behind the segment of the population without access to a computer. Bus drivers are criticized as being unhelpful.

Recommendations:

1. Move toward the inclusion of more real-time information at stations, either announce audibly or on computer monitors.
2. Provide flexible bus information signs like Seattle's and Portland's interchangeable bus route boards, where bus numbers can be added or changed.
3. Monitor alternative methods of retrieving information on flexible transit service. If bus drivers or phone lines are intended to provide information for those who cannot use the internet, such as seniors, their service quality should be checked periodically.

Recommendation G.

Encourage the Permeability of Storefronts near Transit Connection Areas

The three study areas showed that higher amounts of social incivilities occur in areas where the first floor of adjacent buildings is not permeable to the sidewalk and street edge. Large department stores and malls are a compatible use with transit access, but often times these uses are inwardly focused and present a blank wall to the street edge. Buildings that are designed to be permeable often have windows that are blocked by the occupants, as was observed in all three cities.

Recommendations:

1. Encourage shallow depth uses such as smaller footprint shops and restaurants to face the street at the ground level of shopping malls where transit connections occur.
2. Educate businesses in transit-oriented developments so they are aware of the importance of maintaining visibility from their building to the street. Explain that the safety and perception of safety for the transit user depends on their cooperation.

Recommendations for Further Study

This study would benefit from both additional similar case comparisons, a larger number of transit users interviewed, and additional observations of the cases herein. For the Vancouver example, especially, changes to the wayfinding system that are occurring at the time of completion of this thesis make for an interesting opportunity to evaluate the changes. While there was much less confusion observed in February, February is not tourist season in Vancouver so the true test of these new signs would be over the summer.

The transit user's ability to use signage and respond to wayfinding cues varies by their familiarity and general ability to read posted information. Factors such as a transit user's familiarity with the language, economic, social, or educational status were not considered as part of this study. Some observed basic demographic characteristics of the transit users who were interviewed are contained in Appendix C. A more thorough analysis of transit user preferences containing factors related to these characteristics is recommended.

Conclusion

This thesis shows that the often overlooked issue of making a connection between transit modes and finding transit in a high density, transit – oriented area is an important component to a successful transit – oriented development. Transit connections are an important part of the overall experience of transit users. User-friendly transit is significant to making residents of TODs use transit, which is ultimately the goal of TOD design. Planners who further TOD style development typically do not pay attention to the flow of transit connections, opting instead to concentrate on density, mix of uses, site furnishings, and other standard components of TOD. Engineers and transportation planners who study transit connections do not typically approach the station area with a fine grain level of detail enough to understand how user friendly the station areas are to transit users. These engineers and transportation planners track transit travel

time do not consider the time spent finding the starting or end point of the transit trip, but only consider the time of travel from platform to platform.

This thesis has shown that of three high-density center city transit station areas, two report having significant problems with usability to the transit user. In particular, transit users have found it difficult to find the Westlake Center Bus Tunnel from above grade. Transit users have found it so challenging to find the tunnel that they have reported remembering their first negative experience waiting in the wrong area, or having to ask for directions. Transit users unfamiliar with Vancouver, BC's transfer between Granville Station and the City Centre Station have suffered great difficulty finding the passage between the stations. This difficulty in these two cities translates into lost time – ten minutes, twenty minutes, thirty minutes – that is added to one's commute and discouraging travel, ultimately making the automobile more competitive than transit.

Underground station areas present the most significant problems with wayfinding and connectivity. It seems that often times the above ground transit and wayfinding system is planned separately from the underground system. Consideration of the system and its surroundings must be made in order to provide the most seamless connections.

By following the recommendations in this thesis, planners and public officials will better be able to prioritize safety and wayfinding aspects of the transit user experience. Steps taken to create a more user-friendly transit connection experience will help achieve the overall success of Transit - Oriented development, and should not be overlooked.

References

American Association of State Highway and Transportation Officials (AASHTO). *Guide for Park and Ride Facilities*. Spillar, Robert. Publ. Code: GPRF-2. November 2004.

Bae, Christine, Chalana, Manish, and Oschner, Jeffrey. *Back to the Future: A History of Transit Planning in the Puget Sound Region*. Lulu, 2013

Bechtel, Robert B., et al. *Methods in Environmental and Behavioral Research*. New York: Van Nostrand Reinhold Company, 1987.

Bernick, Michael and Cervero, Robert. *Transit Villages in the 21st Century*. New York: McGraw-Hill, 1996.

Calori, Chris. *Signage and Wayfinding Design: A Complete Guide to Creating Environmental Graphic Design Systems.* New Jersey: John Wiley & Sons, 2007.

Calthorpe, Peter. *The next American metropolis: ecology, community, and the American dream.* New York: Princeton Architectural Press, 1993.

Carter, M. "Gender differences in experiences with and fear of crime in relation to public transport." *Research on women's issues in transportation, Conference proceedings, Transportation Research Board*, vol. 2, no. 35, 2005.

Cervero, Robert, Ferrell, Christopher, and Murphy, Steven. "Transit-Oriented Development and Joint Development in the United States: A Literature Review." *Federal Transit Administration Research Results Digest,* No. 52 (2002): 1 − 144.

Cervero, Robert, Kockelman, Kara. "Travel Demand and the 3Ds: Density, Diversity, and Design." *Transportation Research Part D: Transport and Environment,* Vol. 2, Issue 3 (1997): 199 – 219.

Cervero, Robert. *The Transit Metropolis: A Global Inquiry.* Washington, D.C.: Island Press, 1998.

Davies, David and Nicklason, Lorne. *The CPR's English Bay Branch: The Intended Terminus of the Canadian Pacific Railway?* Canadian Railroad Historical Associations Pacific: 1993.

Dill, Jennifer. *Travel and Transit Use at Portland Area TODs.* Seattle, Wash : Transportation Northwest, Dept. of Civil Engineering, University of Washington, 2006.

Duany, Andrés and Jeff Speck, with Mike Lydon. *The Smart Growth Manual*. New York: McGraw-Hill, 2009.

Dyett, Michael et al. "Case Studies of Transit-Oriented Development". SDOT. http://www.seattle.gov/transportation/ppmp_sap_todstudies.htm (Accessed April 29, 2012).

Ewing, Reid, and Cervero, Robert. "Travel and the Built Environment: A Meta-Analysis." *Journal of the American Planning Association*, Vol. 76. No. 3. (2010): 265 − 294.

Ewing, R., and Cervero, R. "Travel and the built environment: a synthesis." *Transportation Research Record*, Vol. 1780, (2001): 87–114.

Federal Facilities Council. *Learning From Our Buildings: A State-of-the-Practice Summary of Post-Occupancy Evaluation.* Federal Facilities Council Technical Report No. 145. Washington, D.C.: National Academy Press, 2001.

Fink, Camille N.Y. and Taylor, Brian D. "Zen in the Art of Travel Behavior: Using Visual Ethnography to Understand the Transit Experience." *University of California Transportation Center* UCTC-FR-2011-04, (2011):1-64. http://www.escholarship.org.offcampus.lib.washington.edu/uc/item/30b7s24h

Futurewise. "*Transit-Oriented Communities: A Blueprint for Washington State, 2009*". *www.futurewise.org/toc.* (Accessed March 6, 2013.)

Griffin, Kenneth W. *Building Type Basics for Transit Facilities*. New Jersey: John Wiley & Sons, Inc., 2004.

Howard, Ebenezer. *Garden Cities of Tomorrow*. London: S. Sonnenschein & Co., Ltd., 1902.

Iseki, Hiroyuki and Taylor, Brian D. "Style versus Service? An Analysis of User Perceptions of Transit Stops and Stations." *Journal of Public Transportation,* Vol. 13, No. 3 (2010): 23 − 48.

Jacobs, Jane. *The death and life of great American cities*. New York: Random House, 1961.

King County Department of Transportation Metro Transit Division. 2011 Rider / Non-Rider Survey, ORC International, 2011. http://metro.kingcounty.gov/am/reports/2011/2011-rider-non-rider-survey.pdf (Accessed March 6, 2013)

King County Department of Transportation Metro Transit Division. *Annual Performance Measures.* http://metro.kingcounty.gov/am/reports/annual-measures/ridership.html (Accessed March 6, 2013).

King County Department of Transportation Metro Transit Division. SR 520 *On-Board Intercept Survey Report: Spring Post Tolling*, Gilmore Research, July 2012. http://metro.kingcounty.gov/am/reports/2012/metro_sr_520_post_tolling_report_07-2012.pdf (Accessed March 6, 2013).

King County Department of Transportation Metro Transit Division. *Maps*. http://metro.kingcounty.gov/maps/seattle/ (Accessed March 6, 2013).

Kittelson & Associates, Inc., Texas Transport Institute, and Transport Consulting Limited. *Transit Capacity and Quality of Service Manual – 2nd Edition*. Washington, D.C.: National Academic Press, 2003.

Loukaitou-Sideris, Anastasia and Fink, Camille. "Addressing Women's Fear of Victimization in Transportation Settings: A Survey of U.S. Transit Agencies." Urban Affairs Review, no. 44 (2009): 554 − 587.

Loukaitou-Sideris, Anastasia. "Hot Spots of Bus Stop Crime: The Importance of Environmental Attributes." *APA Journal*, Vol 65, No. 4 (1999): 395 − 411.

Lund, Hollie M., Cervero, Robert, and Willson, Richard W. *Travel Characteristics of Transit-Oriented Development in California.* Caltrans: January 2004.

Mees, Paul. *Transport for Suburbia: Beyond the Automobile Age*. Washington, DC: Earthscan, 2010.

Preiser, Wolfgang F., Rabinowitz, Harvey, and White, Edward. *Post-Occupancy Evaluation.* New York: Van Nostrand Reinhold Company, 1988.

Puget Sound Regional Council. *Transportation 2040*. May, 2010. http://www.psrc.org/transportation/t2040/ (Accessed March 6, 2013).

Rabinowitz, H.Z., E.A. Beimborn, P.S. Lindquist, and D.M Opper. 1989 Market Based Transit Facility Design. Washington, D.C. U.S. Department of Transportation. Urban Mass Transportation Administration, 1989.

Rose, Joseph. *TriMet final budget plan eliminates Free Rail Zone, low ridership bus routes, fare zones*. The Oregonian. April 11, 2012.

San Francisco Metropolitan Transportation Commission. *Station Area Planning Manual*. Reconnecting America: Center for Transit - Oriented Development. October 2007.

Seattle, City of. Department of Transportation. "Seattle Bicycle Master Plan." 2007. http://www.seattle.gov/transportation/bikemaster07.htm (Accessed March 6, 2013).

Statistics Canada. 2012. Vancouver, British Columbia (Code 5915022) and British Columbia (Code 59) (table). Census Profile. 2011 Census. Statistics Canada Catalogue no. 98-316-XWE. Ottawa. Released October 24, 2012. http://www12.statcan.gc.ca/census-recensement/2011/dp-pd/prof/index.cfm?Lang=E_(Accessed March 6, 2013).

Translink. Fall 2011 Expo, Millennium and Canada Line Station Counts Program. http://www.translink.ca/~/media/Documents/customer_info/translink_listens/customer_surveys/Transportation%20Improvements%20Research/2011%20SkyTrain%20Station%20Counts.ashx (Accessed March 6, 2013).

Translink Media. "TransLink 2010 Ridership." February, 2011. http://www.translink.ca/en/About-Us/Media/2011/February/TransLink-2010-Ridership.aspx. (Accessed March 6, 2013).

Translink. "SkyTrain". Accessed April 19, 2013. http://www.translink.ca/en/About-Us/Corporate-Overview/Operating-Companies/SkyTrain.aspx (Accessed March 6, 2013).

TriMet. TriMet Audited Service and Ridership Information. October, 2012. http://trimet.org/pdfs/publications/trimetridership.pdf (Accessed March 6, 2013).

TriMet. Facts about TriMet. May 2012. http://trimet.org/pdfs/publications/factsheet.pdf (Accessed March 29, 2013).

TriMet. *Memorandum to General Manager, Board of Directors. From Nancy Jarigese. June 2011 Monthly Performance Report (Includes FY11 Summary).* http://trimet.org/about/performance.htm (Accessed March 6, 2013).

United States Department of Justice. *ADA Home Page*. http://www.ada.gov/ (Accessed April 19, 2013).

Walker, Jarrett. *Human Transit: How Clearer Thinking about Public Transit Can Enrich Our Communities and Our Lives*. Washington, D.C.: Island Press, 2012.

Weigand, Lynnette Renee. "The Contemporary Urban Plaza: A Case Study of Portland's Pioneer Courthouse Square." Master's Thesis, University of Washington, 1993.

Zimring, Craig M. and Reizenstein, J. Post-Occupancy Evaluation: An Overview. Environment and Behavior. v12, n4 (1980): 429 – 450.

Appendix A – Recordings from Observations of Transit Users

Seattle, Washington

Observation 1: Wednesday, August 1, 2012 // 9:00 am 10:00 am

Temp: 70s to 80s // Weather: partly cloudy

Westlake Station, Southbound

Number of passengers present:

An average of 40 transit users were present at the platform. Each time the Link train boarded, an average of 15 passengers remained. 25% of passengers carried luggage.

Number of groups of transit users who were confused:

2

Notes:

- Two passengers carrying luggage disembarked the 301 bus. They looked for information at the platform, but obviously did not see what they were looking for. Then, they waited and watched the Link train go by. They did not board the train. They waited for the next Link train, and boarded it. They were in the bus tunnel for a total of 15 minutes.
- 27 out of 30 passengers boarded the 9:20 am train were carrying luggage.
- An Alaska Airlines flight attendant is seen disembarking the 10 bus confidently with her luggage, waiting five minutes, then boarding the Link.
- One couple came down the elevator with luggage and turned around a few times. They were overheard saying they were heading up to the information station, and they went up the escalator.

Observation 2: Wednesday, August 1, 2012 // 5:00 pm 6:00 pm

Westlake Station, Southbound

Number of passengers present:

The platform was crowded, especially at the south end. An average of 70 transit users were present. Each time the Link train boarded, an average of 45 passengers remained.

Number of groups of transit users who were confused:

3

Notes:

- Two young female passengers unloaded their bikes from the front of the 70X bus and waited less than five minutes to board the Link Light Rail. It seemed challenging to find room on the platform for their bikes, but there was room for them to stand on the train with the bikes when the train arrived.
- Three groups of transit users with luggage allowed one Link train to go by before they caught the second train.

Portland, Oregon

Friday, August 3, 2012 // 3:00 pm to 4:00 pm

Temp: 70s to 80s // Weather: partly cloudy

Pioneer Square, north side, Intersection of SW Morrison and SW Broadway

Number of passengers present:

It is a little difficult in this location to tell which people present are transit users and which are not because Pioneer Square doubles as a park, and there is an attractive seating wall adjacent to the waiting area. It appears that 25 to 30 transit users were present during this time period.

Number of groups of transit users who were confused:

0

Notes:

- Passengers were observed disembarking their trains and having no problems finding information on where to go, because maps and information was within the direct line of vision.
- One family disembarked their train with luggage studied the map for a very short period of time – three minutes, and confidently made their way toward the waterfront.
- Three groups of transit users were seen being approached by, then assisted by a transit service personnel.

Vancouver, B.C.

Observation 1: Sunday, October 14, 2012 // 3:00 pm to 3:00 pm

Temp: 60s // Weather: heavy rain

Granville Station Tunnel Mezzanine Level:

Path toward Granville Street Exit to Canada Line

Number of passengers present:

It was not possible to count the number of passengers present at this location. There was an almost continuous steady flow of passengers.

Number of groups of transit users who were confused:

The observer stopped counting after 20. It is possible that 30 or 40 groups of transit users were confused here.

Notes:

- One group of transit users with luggage walked up to the exit to Granville Street, came back inside, walked back down to where they came from, then walked back up to the door and found a security guard for The Bay, who told them how to get to the Canada Line.
- Two women with luggage headed away from the door to the outside and went down the stairs. They stopped a citizen, who told them to go back out the door.
- One family with luggage went up to the door and stopped to look at a map. After three minutes, somebody approached them to help and they got directed out the door to Granville Street.

Observation 2: Sunday, March 24, 2013 // 3:00 pm to 4:00 pm

Temp: 50s // Weather: partly cloudy

Granville Station Tunnel Mezzanine Level:

Path toward Granville Street Exit to Canada Line

Number of passengers present:

Much fewer transit users were present along this path than during the first observation, but it was still too many to count because they were moving.

Number of groups of transit users who were confused:

2

Notes:

- One passenger stopped to look at the new signage that had been placed on the door leading out to Granville Street, then compared it with his map, and then proceeded out the door. He stood in front of the sign for two minutes.
- One woman asked the security guard for directions, and he pointed her toward the sign on the door.

Appendix B – Transcripts of Interviews with Public Officials

Case Study: Vancouver, B.C.

Monday, February 18, 2013

Interview with Chris Robertson and Ian MacPhee, Strategic Transportation Planners,

City of Vancouver

The City, in partnership with TransLink and the Business Association, has been leading an effort to improve signage in downtown Vancouver. They are using consistent symbology with Translink. In other places, such as London, transit agencies take the lead.

Background on the City of Vancouver Wayfinding Project:

- Study began in summer, 2012.
- Placed the signs in July 2012 in study area.
- Surveyed people in study area.
- Goal for a consistent map and coherency
- City is taking the lead on mapping.
- Study addresses Integration / Identity / Branding Problems
- Similar to signage implemented for Canada Line. 2010 Olympics

Signage methodology:

- Similar to Legible London – Ahead Up Mapping. Sign is rotated so that top is direction the sign is facing. Top is not always north.
- Tested the "Ahead Up" mapping: Orient the maps (Flip orientation) toward the direction someone is walking.
- The advantage of this format is to "avoid mental gymnastics", ie the map is turned the right way so you don't have to. Maps have north up sign on one side and ahead up sign on other side.
- Chose not to include a "planner map" – large scale bubble map of the whole city. If they do they would add it for the whole peninsula.
- Existing wayfinding maps are artwork, new format is GIS based. Updating is easy because signs go into a curved aluminum sheet – the maps are vynal and go inside. They could be replaced monthly. AEG / Applied is the consultant making the maps using "Carto Engine" software. They hold the files.
- Consultant has created a "Style Sheet" to use as a template for GIS information.
- Originally, they wanted color coated signs by area.
- Consultant standards manual to determine where signage should be placed. "Progressive disclosure" is recommended in contemporary thinking, and it means signs are revealed as they are needed, as opposed to all together in one group. Legible Underground London uses "Progressive disclosure" and is considered a good example of station area signage and wayfinding.

Results of survey:

Only 61% of people understand and look for the 5 minute walk circle when asked how long it takes to walk somewhere.

Need for bus information on signage.

Challenges:

- Integration between agencies and jurisdictions has been challenging
- Issues with coordinating with the Canada line, which is TransLink, but is operated by a third party for 30 years.
- "Key Market" challenges for ideal locations for signs. "T" signs placed on external property – private buildings. Sometimes it needs to go on a sign post in the right of way instead. Contractual challenges vs. timeline to get the signage installed.
- City had to develop a standards book for what is a business, what is a landmark. These could not be arbitrary because they could be challenged.
- Now signs at bus shelters have one side for wayfinding and one side for advertising. The city gets part of the revenue from the ads. Selling the best sides – the side most visible to cars – sometimes means the space left over is not as friendly for transit users and pedestrians to view the maps, they sometimes need to stand in an awkward or uncomfortable location.
- Struggle as a city – limited space for information
- Signs with scanner to smart phone have been attacked by guerilla marketers who paste their bar codes onto the signs. Directing people to their own commercial web sites.
- City encouraged density at City Centre station. City offered residential density above station – mall owners turned it down.

Future Work:

The City of Vancouver will conduct a study of safety – underground stations feel less safe. They will propose solutions.

Vancouver now has dedicated transit police with expanded authority to follow offenders out of the transit station and onto the city streets. Now they can also carry guns.

Future bike share – one every three blocks – visible from many places

Will revise map for biking priority

Monday, February 18, 2013

Interview with Vancouver, B.C. Downtown Ambassador

Q: *What types of questions do you receive most often from visitors and new transit users?*

A: People really use these signs (pointing to the prototype Vancouver Wayfinding sign). Most people are looking for a street name first. Then they look for landmarks you can see like the Fairmont.

Q. *How easily do you think people are finding their way through the transit system?*

A: People want to see the transit stations on the map. They know to go through the malls, but the signs to the malls are not on the buildings. There should be more information at the entrances to the transit stations. People have to go down to the subway to read the signs and people really don't want to do that.

Q: *How safe do people seem to feel in this area?*

A: The area is safe. People downtown watch out for each other.

This is a major connecting point. A lot of the buses come through here.

Case Study: Seattle, Washington

Interview with Bus Tunnel Transit Security Guard

Q. *What kind of experience do you think people have finding their stop or platform?*

A. Rush hour riders know where they are going. The Sound Transit Light Rail is the best way to and from the airport, and you often see people coming from the airport to Westlake Station or Pioneer Square. They tend to look confused when they get off the train. Most of them are headed to one of the hotels here downtown.

Q. *How helpful do you think the available signs are to people?*

A. The information center is at Westlake Station. I go there at the end of the day to help close the service counter. Many people ask me for a comprehensive map of the transit system that would show all the routes in one place. We don't have that. Instead we have individual route maps.

Q. *Do you have a way to explain the transit system to a newcomer?*

A. I advise people to buy an Orca card because you pay once and can ride the ferries and all other types of transit.

Q. *Do you give any advice on making transfers or finding your way through the whole system?*

A. Well, you could go to any of the regional transit centers like Bellevue Transit Center or Issaquah Transit Center and connect to multiple buses from there.

Case Study: Portland Oregon

Saturday February 23, 2013

Interview with Jerry Gillock, Trimet Road Supervisor Field Operations and Allen Yeager

Q. *What can you tell me about transit in this area?*

A. 6th ave was a transit mall. This was removed three years ago (2009?) and the buses got integrated with cars on 5th and 6th Avenues. The original bus depot remains in place on Main Street, and is worth seeing – it is a coffee shop. The bus stops along these streets are newer than the others in the city.

During weekday rush hour – 5:30 am to 8 am transit runs every 7 minutes. They have extra part time staff to run buses and light rail.

Light rail and bus are on the same road going the same direction, with no movement to transfer. There are "Multimodal nodes" in our system where you can transfer and get anywhere. That's all you have to remember to understand our transit system.

Q. *How easy is it for one to find their way around using transit?*

A. The buses are coded – that is what the letters on bus signs refer to. For example the intersection of SW 6th Ave and Yamhill Street as a sign with the letter "Z". This is where transit users can connect to bus routes 1, 12, 19, and 94. The bus driver announces when the bus is entering the connection with "Z" transfers. Passengers know to look for "Z" because it is also shown on their route maps and in online information. Unfortunately, this system is not well explained by the signs themselves. Intersections have a large letter (Z) and transit signs have a smaller letter Z. This system makes transfers to and between buses easier.

Q. How safe is this area?

A. This area is safe. The hot spots for crime are in Gresham, Gateway 120th transfer station, and the North area.

Transients – get an honor citizen pass (to pay for the buses now that the free zone was eliminated)

Q. *Are there any other transfer areas that are noteworthy?*

A. Beaverton transfer center is interesting so is zoo

Q. *What sorts of questions do you hear most often?*

A. When free zone was eliminated, we need to explain how to pay.

Streetcars cost $1, run by City, did not coordinate with fares Trimet, which costs $2.50. We try to encourage people to buy an all-day pass for $5 because it transfers everywhere. We eliminated the multiple zone system. There is a $175 ticket if transit users do not pay.

Q. *How is this area patrolled?*

Transit police are also municipal police from surrounding areas – randomly patrol onboard bus and light rail.

Appendix C – Transcripts of Transit User Interviews

Seattle, Washington

All interviews in Seattle were conducted on Sunday, March 17, 2013 between 1 pm and 5 pm. Weather was 48 degrees, partly sunny, and breezy. There was a large number of people carrying suitcases and boarding the train to the airport. Most interviews were conducted at the Platform level of Westlake Station, southbound side. Two were conducted on the northbound side. Three were conducted outside the station at a bus stop along 3rd Ave. Locations and general information about each transit user is provided in the section following the interview responses.

A. What has been your experience finding _____
(bus stop / platform / transfers / multi-modal – bus / taxi – connections)?

1. It has been very easy.
2. It was easy. However, she wishes there were more transit lines available in the system. She prefers Portland (Oregon)'s transit system, and says it is much better.
3. He knew where his platform was already.
4. Once they figured out where to go it was okay. They had to know to look for North / South / East / West then follow the signs.
5. They did not understand where to go and were told to find the Link Light Rail at 3rd and Pine. They got there and looked around but saw no signs. Finally they asked someone who was handing out religious material and that person pointed them to the entry to the bus tunnel. Once they got inside the bus tunnel, they really did not have any problem figuring out where to go.
6. Finds transit easily because she is familiar with the system and knows where she is going.
7. They didn't have any trouble finding the bus tunnel because they arrived here from the airport earlier. They didn't connect to any buses. They took the monorail, which was easy to find.
8. Uses transit a lot so doesn't think about how to get there.
9. Today was fine, but the first time they tried to find the tunnel they had a hard time figuring out where to go. They looked on Google maps for the Link Light Rail, and ended up going to a concrete park across the street that looked like where the train could

arrive. They waited there for about 10 minutes and only saw buses go by. Then they asked someone and were told to go downstairs into the tunnel.

10. Easily found their way to the train to the airport, but did have to stop and ask for directions.
11. They had to cross the Mezzanine twice to reach the right side of the platform. They came down to the southbound side, second guessed it and went to the north side, then asked the security guard where they needed to be and came back. They said it was more difficult to get their bearings while underground because there was no natural frame of reference, like knowing where Puget Sound is in relation to where you are.
12. They did not have any trouble finding the train.
13. Uses one bus away and metro trip planner to find here destinations. She had no trouble finding the platform today because she takes transit often.
14. Comes here often so it is not a problem.
15. His first time finding the bus tunnel was a couple of weeks ago. It was a little hard to find the entrance to the bus tunnel at first. He does not have trouble using his bike on the train. If there is no room in the bike area, he has room to just stand with it. He carries the bike up the escalator. He makes deliveries by bicycle and he rides on the city streets, regardless of whether there are designated bike streets or not.
16. She was dropped off at Pine and 4th and did not see the elevator, just two flights of stairs. Since she had her suitcase with her, she decided to walk around more until she found an escalator. She took her bag on the escalator two flights down to the Mezzanine level. There she bought a ticket and found the elevator to the platform level. She said she travels a lot and is used to having to look around. She said that Portland, Oregon is easier.
17. –-
18. ---
19. ---
20. ---
21. ---

B. How helpful is the signage?

1. They noticed at the airport that there wasn't much signage at the airport terminal telling them where to catch the train. They finally saw some signs near baggage claim. Then they wandered around looking for signs for Link for 10 minutes before they saw signs for the Link.
2. The signage is fine.
3. He was familiar with the signage so he doesn't look at them.
4. The signs for the surface buses are a little confusing. The runs need to be marked better. There were only a couple of places where the bus makes stops and these places were not clearly identified.
5. They were very impressed with the signage and system related to purchasing a ticket. They wished this system in their hometown of Washington DC was as easy. There it takes 15 minutes to figure out how to buy a ticket.
6. There should be more signs near the escalators at mall areas telling how to get to the bus tunnel because these signs are useful. Many of the outdoor signs do not stand out well because it seems like they blend too well with the buildings. The bright yellow Orca card poles are well done and stand out and show where the light rail area is. The electric reader board signs are nice also.
7. The signage is good at the tunnel. They were disappointed at the airport when they had to walk a long way to get to the Light Rail, and there were no signs saying how far they would need to walk. It seemed like a very far walk.
8. Doesn't look at signs. Instead, uses two applications on Smart Phone – One Bus Away to see when bus will arrive, and Metro Web Site, which she has bookmarked.
9. There are no signs saying the Link Light Rail is located downstairs in the tunnel. Otherwise. The content of the signs is pretty helpful.
10. They did not have to use the signs, but they did look at them.
11. They didn't see the signs saying "southbound train" at first.
12. Signs are not well placed, especially upstairs and through the retail areas. There is too much distance between the directional signage and the elevators, stairs, or escalators such that you have to go too far out of your way to look at a sign and reach the destination.

There are no verbal announcements – people pay attention to verbal announcements. Electric displays should blink if the intention is to get people's attention.

13. The uniqueness of the signs and art for each station helps when you can see them from eye level on the bus and know where to get off. The branding is good. The fact that all the bus stops are the same color and look similar to one another helps you know what to look for.
14. The "T" symbol is very helpful. It was discussed at length by the accessibility committee of Sound Transit. The "T" is now larger outside the stations and has a good contrast with the surroundings. There used to be maps close to where you go downstairs that had a "you are here" symbol on them. They are missing now, and now people have to rely only on following the north south east west signs.
15. The light rail south should be labeled more clearly.
16. ---
17. French Canadian requests for more information to be in French.
18. ---
19. She rides transit all the time and she thinks the signs here in Seattle are always helpful. The signs are large and have two sides. Route names are in large clear letter, black on white. The rates and information are good on the signs. She used to live in Boston and New York City, and the bus system here is much easier to navigate. In Boston, especially, you would hardly know where to stand to catch the bus. There wouldn't be any bus stop signs anywhere, and there were never nice street signs like the ones in Seattle. She uses the ap on her phone all the time – One Bus Away – to know when the bus is coming.
20. ---
21. He doesn't like these signs at all. Just look at it. It looks like you need to be an engineer to understand it - and he's not an engineer. Half the time he feels he is standing at the bus stop looking at the sign, and by the time he finally figure out the map he realizes that his bus has just come and gone. Then he has to wait for the next bus. He uses transit for all his trips. Since he lives in Tacoma and the transit system has less evening and weekend service, sometimes his only choice is to walk. Walking isn't always safe in certain neighborhoods.

C. What do you think of the quality of the shelter here?

1. The bus shelter is clean. They did not use surface buses.
2. Love it.
3. The bus tunnel is great, it looks like it costs a fortune.
4. ----
5. ----
6. The bus tunnel and shelters downtown are good – residential areas don't generally have good bus shelters.
7. The tunnel is very good. It is nice that both buses and trains use the tunnel. They like the different styles and designs for each station.
8. The shelter is fine. Other bus stops are not as nice, especially in the University District.
9. The shelter is very nice. Better cell reception would be nice. The tunnel gets very cold in the winter. In January, cold wind comes down the stairs and through the tunnel.
10. The tunnel is very clean – there is always someone here cleaning it.
11. West lake station is nice
12. It is clean and nice.
13. Nice.
14. ----
15. The tunnel is nice, but it blocks cell signals.
16. ---
17. ---
18. Bus tunnel is one of the nicest station area of any city and he has been to quite a few cities.
19. ---
20. The shelter is good here. Generally, the shelters are good as long as they are facing the right way. There is a new shelter that just got installed at the Fauntleroy Ferry Dock that faces right into rain when the wind is blowing. It needed to be sloped the other way.
21. ---

D. How safe do you feel here?

1. There is a strong presence of helpful people and security guards. They used the tunnel at night. They feel safe and secure compared to Detroit and New York where they are from.
2. She won't use the tunnel after dark. She uses a taxi to get home after dark.
3. He appreciates the visible security. He does not use the transit here after dark.
4. ----
5. Yes.
6. It is helpful to notice security. There are signs saying the area is recorded, which she thinks is good. She knows that some people don't care to be recorded. In 2009 or 2010 a girl was assaulted in the bus tunnel by a group of high school boys and the security people could not do anything about it. It shocked people that security guards could be so powerless. The girl's mother tried to suggest changes for security guards.
7. They feel safe in the tunnel. They used the train from downtown at midnight and felt safe.
8. She feels safe in Westlake. Sometimes she leaves work late in Pioneer Square and the entrance areas to that tunnel station do not feel safe. There is usually a lot of vagrants there begging for money.
9. The tunnel feels very safe. It is very well lit. The female comes here alone at night often, up to 9:30 pm, with no problems.
10. The tunnel feels very safe.
11. They feel very safe at Westlake Station. They parked at the Seatac park and ride. They do not feel as safe in the other stops between Westlake and Seatac. They like seeing that security guards come on the train often to make sure people are paying fares because they have concern about being on the train if people were riding it for free.
12. I do not feel safe here after 9 pm. People here do not stay down here at the platform level. We stand above and watch for the train to come, then quickly make our way down below to catch the train. 11:50 pm is the last train – you have to wonder who really goes on the 11:50 train. Security staff seems to be the key to solve all of these problems. They can be present for safety and for information.
13. Does not travel at night (anytime after 8pm or dark) by self. Thinks Westlake is pretty safe with security guards. Other parts of the city are not as safe.

14. She does not use the bus tunnel at all times, such as at night. There was a problem in Westlake Station a couple of months ago. It was an assault between two women who knew each other. The Security Guards did not have the authority to stop it.
15. He always feels safe in the tunnel.
16. ---
17. ---
18. ---
19. ---
20. ---
21. ---

Interview participant information.

Unless otherwise indicated, interviews were conducted at the platform level of the bus tunnel where southbound link light rail boards.

1. Baby boomer couple from Las Vegas.
2. Older woman. Just moved here from Olympia. Uses bus 2 to 3 times per week for non-work trips.
3. Older male
4. Couple, baby boomers. Don't use the bus often – 3 to 4 times ever. Got on the 150 to Kent before completed interview
5. Baby boomer couple visiting from Washington DC
6. Young woman
7. Baby boomer couple from San Diego
8. Young woman <northbound>
9. Young couple <northbound>
10. Older couple from North Dakota
11. Young couple
12. Couple from India
13. Older woman
14. Woman, visually impared
15. Young man on a bike

16. Young woman carrying a large suitcase
17. French Canadian family
18. Older African American male
19. Young woman < 3rd Ave by bus stop outside tunnel entrance>
20. Older man < 3rd Ave by bus stop outside tunnel entrance>
21. Older man < 3rd Ave by bus stop outside tunnel entrance>
22. Young woman

Portland, Oregon

All interviews were conducted Saturday, February 23 and Sunday, February 24, 2013. The temperature was 48 degrees Saturday, partly sunny. The Sunday weather was partly sunny, with a temperature of 52 degrees. Interviews took place on the three sides of Pioneer Square where transit boards. One interview took place on Morrison Street at the Portland Streetcar stop.

A. What has been your experience finding _____
(bus stop / platform / transfers / multi-modal – bus / taxi – connections)?
    1. It has been easy so far. They are from out of town and have only ridden Light Rail previously. They have asked people to confirm directions before boarding the train just to be sure they know where to go.
    2. He was able to find the light rail stop with a map.
    3. It has been easy.
    4. She got a ride downtown and was dropped off near 5th and Morrison Street (westbound track side). She followed the tracks around to find the eastbound track to the airport. She decided to get to the airport from Pioneer Square so she could people watch while she waited.
    5. They walked from their hotel, and it was very easy to find where to go.
    6. It has been easy for him to find his way to the station. He came here from Chinatown Station.
    7. They used transit this morning to get to the zoo and now they were headed back. They were impressed by how quickly the trains run.
    8. It was easy.

B. How helpful is the signage?
    1. It is very difficult to tell the difference between the yellow and green lines even with the signage.
    2. The signs along his route were good telling him where to go to find the light rail stop.
    3. The signs are helpful, especially due to the color.
    4. She wishes there was more real-time information. The last train to the airport was just leaving as she arrived, and she wishes she could figure out how long it would take until the next train came. The Lloyd Center Station has real-time information. She wishes that were available at Pioneer Square.
    5. The signage is very helpful.
    6. The signage is helpful. On the trains, it is better on the newer trains than on the older trains.
    7. They could not easily find where they needed to go with the maps, so they went back and got the GPS from the car and they have been using it to get around.
    8. She uses her map to get around mostly, but the signage has been helpful.

C. What do you think of the quality of the shelter here?
    1. The shelter seems fine, but it is hard to judge because we have had three days without wind or rain. It seems like with wind or rain, it would be worse.
    2. The shelter is enough for this climate.
    3. The shelter is good.
    4. The shelter seems good. It seems like it would keep people dry.
    5. The shelter is good. It seems like it would protect people from rain and wind.
    6. He does not depend on the shelters to keep him dry when it rains. He wishes there were more benches available.
    7. The shelter is great here.
    8. The shelter here at the streetcar seems to be not enough.

D. How safe do you feel here?
    1. They rate safety as a “4’ out of “5” or a “B”. <said as they glanced toward a group of social incivilities standing a few yards away>. They explained that they are not “city people”.

2. He does not feel scared in this district.
3. So far he has not had any bad experiences. Therefore he feels there is good safety.
4. She feels pretty safe here.
5. They quickly answered that they would not use the train here at night. It is okay during the day. They notice the number of security and people around.
6. He usually feels safe at the stations and on the trains, even at night.
7. They feel okay safe, but couldn't say that they would come to this area at night to ride transit.
8. Reasonably safe – but she does not plan to be here at night.

Interview background and participant information.

1. Mother and daughter <waiting for light rail train at 6th and Yamhill>
2. Male, early 30's, Asian <standing at Broadway and Morrison waiting for Light Rail>
3. Male, late 20's, Indian <6th and Yamhill>
4. Female, early 30's, doesn't use transit regularly, hasn't in a long time. <Broadway and Yamhill>
5. Baby Boomer couple with luggage. <Broadway and Yamhill>
6. Male, 50's, <Broadway and Morrison>
7. Couple with children. First time using transit. Went to the zoo. <5th and Morrison.>
8. Older woman from out of town. <At Morrison Street Streetcar Stop>

Vancouver, B.C

Interviews were conducted Sunday March 24 from 10:45 am to 5 pm

A. What has been your experience finding _____
(bus stop / platform / transfers / multi-modal – bus / taxi – connections)?

1. It has been easy for him to find his way. He walked from West Van (couver) and will take the bus.
2. Easy, but she is familiar with the area already.
3. Retraced their path from the Airport. Quick trip – transfer from Stockholm to Brisbane Australia. Some of the construction near the Canada Line station made the station more difficult to find.

4. It is not her first time here so she knew where she was going and it seems pretty easy.
5. It has been easy.
6. She has lived here all her life, so the transit has been easy to use. She has only needed to learn a little bit of the system at a time as changes and improvements are made. She spends quite a bit of time downtown, and has noticed many people getting confused about how to find the Expo and Millenium lines from the Canada Line. She tells them just to go to Granville Station, but they still get confused and can't seem to see the station even though she thinks it is big and obvious. She doesn't understand how people can get so confused when she personally has traveled in much more difficult places to find your way around and has figured it out. The country of Hungary, for example, is much more complex. A lot of people also think that the Broadway station is confusing to get around.
7. He has been to Vancouver several times before, but has only taken the Expo and Millenium Lines. This was his first time taking the Canada Line. His first difficulty was in making payment to be able to transfer to the Canada Line. The Canada Line information was not listed on the fare machines. He commented that, from the user's perspective, the two lines should function together better instead of being treated so separately. He got off the Expo Line at Granville Station, and was aware that he would need to find another station so he was actively looking for signs on his way out. He found a map on the Granville Street exit door and was able to follow the map's instructions and walk down the street to the City Centre Station.
8. For the most part, it has been easy to find the platform. We use maps. It is much easier here than at the Commercial / Broadway station – that is the "Hub" of the system and it can be very confusing. The train does not go everywhere they wish it would – it would be better if there were more stations further out in the suburbs.
9. She had been to Vancouver a few times before, from Montreal. She finds it pretty easy to use transit here, but she has needed to ask people for directions many times.
10. She found the transit system unfriendly and confusing first compared to Calgary, where she is from. Calgary is half the population (1 million) and is less spread out. The most confusing part of her daily trip has been payment of the fare. Vancouver uses a "zone" system. She must travel through two zones to make trips. Detailed

information about the zones is not provided anywhere on the tickets, the machines, or signs. You can't tell how long the ticket is valid (eg in Calgary tickets are clearly marked that they are valid for 2.5 hours). Canadians use the honor system – after all we pay for the transit system with our taxes. For eight months, she was paying for two zones all the time, until she finally found out from a weekend driver that only one zone was required after 6pm and on weekends. Drivers just let her continue to overpay without correcting her. She thinks the drivers are friendlier and more helpful on the weekends. The flat rate zones on the weekends and holidays make it easier for people to use transit during these times, so she thinks people get out more.

11. She is from here, and uses transit often. She finds her way around with great effort. She feels Vancouver does not have a good transit system. Especially during the summer tourist season, she sees many international visitors with suitcases having a difficult time finding their way to the airport. She helps many of them, but she is not the only one. The tourists come in big groups, and seem to be desperately looking for help from anyone who is available. They mostly come in to the city at Granville Station, then try to find the Canada Line to the airport. She tells them to go out the main door to Granville Street, then one day she came out there to see how easy it would be for them to find their way. She realized it was not easy at all, but it is better now that more signs have been put up. Despite the new signs, two weeks ago she helped someone who just came in from the Canada Line and was trying to find his friend's apartment near the stadium. She accompanied him to the destination because she thought it would be easier than trying to explain the transit system to him. Many times, tourists will exit the station at Dunsmuir carrying their bags up the narrow flight of stairs there. Then when they get to Dunsmuir Street, it is even more confusing. Generally a lot of people complain about Vancouver's transit system, especially that connections between buses and trains are not timed wall. There does not seem to be anyone on the ground at the bus stops communicating to a central agency when buses have broken down and there are 400 people waiting. There have been significant service cuts. Holiday schedules are very confusing.
12. She lives locally and comes to this station often. Still, she often gets confused about where the station is located on Granville Street. She often thinks it is one block away.

13. Finding the station has been pretty easy. She looked it up on the internet then came here.
14. The experience finding the station has been good, but they are from North Vancouver and have used the train occasionally. They took the bus from their house. The bus came 2 minutes early, but it waited for them. They like being able to get to the airport without having to drive and pay for parking.
15. It has been easy. She has a bus pass that takes her the whole way from the Sunshine Coast on one fare, and she really likes that.
16. He knows his way around because he lives downtown and uses transit often. However, he is very familiar with the concerns of visitors because tourists seem to rely on the local people for directions on a regular basis. Mostly, tourists get confused about the names of the rail lines. Having a name per line (Canada, Expo, Millennium) seems too complicated. To complicate matters, the Canada Line is not part of "Skytrain", and it had a different line when it was first constructed.

E. How helpful is the signage?
   1. The signage is very helpful.
   2. Doesn't use the signage.
   3. They did not see any signage.
   4. Didn't use signage. She asked someone instead.
   5. Didn't use signage. Used a map instead.
   6. The maps are very confusing, especially the zones. The zones are not consistent on the maps. For example, at the City Centre Station, the map says that it is two zones to get to Richmond but at the Waterfront Station, the map lists it as one zone.
   7. The map that was placed on the door of the main exit to Granville Street caught his eye. He thought it was very well done and told him exactly what he needed to know. It was placed well – right where he was looking for directions.
   8. The big "T" signs at the station are really helpful to identify the stations. That makes them very easy to find.
   9. She really didn't use the signs much because she asked people instead or looked online for information.

10. She goes online to find information on how to ride the bus. She basically figured out which main streets the buses run on so she knew where to go. Bus drivers are much more helpful on the weekends, it is almost as if they are different part – time drivers that are not as burned out as the ones during the week. You really need to know where you are headed to be able to make any sense of the signs. She often sees people take the wrong train from the Waterfront Station, because the stations and signage is very confusing there.
11. The signage in the rail stations are good except Broadway, where it is very confusing. Buses, on the other hand, do not have any signage. You have to get to know which streets the buses run on, but even so, the buses can run on a street one street over from where you expect or make an unexpected turn even when the destination is the same. Bus drivers are not very helpful during the week. It is as if they are overwhelmed. Her daughter has had pretty good luck with using online to find her way. She tried calling the help desk, but was sent astray too many times. Overall, she considers the quality of the transit system to be poor. She is surprised that public officials think it is so good – and thinks they do not ride transit. She thinks other cities do a better job.
12. She does not look at the signage.
13. More signs are better, in general. She looks at them, especially the real time signs displaying arrival times or the trains.
14. They did not look at the signage. They had looked everything up on the internet before leaving, so they did not need to use the signs.
15. She doesn't use the signage. People have been helpful with directions.
16. Locals and visitors are frustrated by the inexactness of the signage. For example, all three lines (Canada, Expo and Millenium) end at the "Waterfront" station, but there are actually two "Waterfront" stations – one which is the terminus of the Canada Line, and a separate one which is the terminus of the Expo and Millennium Lines. Many people comment that the signage does not use good English. For example, the words, "Way out" are posted at the stairs leading off the Canada Line platform.

F. What do you think of the quality of the shelter here?
    1. The level of shelter is okay here. There really is not a need for extensive shelter. Everyone here knows to bring an umbrella. I have mine in my backpack.

2. It is nice and pretty clean.
3. ---
4. It is okay.
5. Clean – very good light.
6. ---
7. The stations are nice, but he had heard a lot of people complaining about how short the platforms are for the City Centre Canada Line Station. The platform is 80 feet instead of the typical 120'. Also the width is very narrow. If some of the Toronto stations are any indication, this size is much too small. For example, Union Station, Toronto, gets overwhelmed.
8. ---
9. ---
10. The City Centre Stations are very nice. She has noticed that bus shelters in lower income areas are not nice, and are often made of wood. Some shelters have been burned down and not replaced, and many have graffiti and litter. In the nice areas like West Vancouver, the bus shelters are very nice with fiberglass and metal and they look nice.
11. ---
12. The shelter is comfortable.
13. It is nice that each station looks a little different. She also likes that the stations are clean – there is no litter on the ground.
14. The station is good, but it would have been nice if there had been a bus shelter where they live in North Vancouver.
15. The shelter is good – nice.
16. The biggest problem with the stations is that there are too many steps, especially in the Granville Station. Sometimes the escalators are not working and I hear people huffing and puffing to get to the top. The population is getting older and also people on vacation don't want to deal with climbing stairs, so this is a problem.

G. How safe do you feel here?

    1. He feels very safe here. On weekend nights it is not as safe. People get drunk here and fights break out on Granville Street, but even then it is still okay.

2. She feels safe before 11pm.
3. ---
4. I feel okay.
5. Yes.
6. ---
7. He feels safe, even at night, but he feels that is in part because he is a tall, broad, white male.
8. ---
9. ---
10. She takes the Canada Line mostly, but will not ride after 9 pm. She does not feel as comfortable riding after rush hour. She is very hesitant about riding the Expo and Millenium Lines because they go out to Surrey. There are a lot of problems in Surrey. Surrey is like Michigan – a working class area where industry has disappeared. It is now a cheap bedroom community where you can find cheap condominiums then make a long commute into the city. The problem is that parents are leaving their teenagers alone while they get home from work at 8 pm and there are large packs of 12 and 13 year old girls going around and stabbing people. Here in Canada, everyone carries a knife to protect themselves (she pulled out her knife to show me). In Calgary, people carry knifes to protect themselves from wild animals, but here it is people. Another problem with the trains is there is no driver. In other areas, if you feel uncomfortable, you can go up to the front cabin and sit right behind the driver. Here, there is a little red panic strip you can press and apparently a security guard will meet you at the next station. Still, if there is a problem, this might be too late. The police and security guards do not usually ride the trains. It would be nice to see them there more often.
11. She has no fear. She rides transit by herself and carrying her handbag until 12:30 am or 1 am sometimes when she babysits her grandson. She does not live in a savory area.
12. She feels safe here all the time. She has even used the station at 12 am. She would not feel as safe at a different station, such as Broadway / Commercial or even Main Street.

13. She arrived to Vancouver at midnight on Friday and there were a lot of people at the airport walking to the train. It has felt pretty safe here.
14. They feel safe here. They made this same trip at night before, and it still has been okay.
15. Yes, she feels safe.
16. He is ex-military, but he does not think riding the train is safe. If you have to have armored guards, then it means it is dangerous. He is not sure how much police presence there is at night. (He motioned toward four armored guards standing a few feet away). He thinks there has been a recent increase in security as a response to the stabbings and the recent purse snatchings at 29th.

Interview background and participant information.

Unless otherwise indicated, all interviews were conducted on Sunday, March 24 at the platform level of the Canada Line train in the City Centre Station. The Canada Line is the newer line which heads to the airport. The day was sunny and 60 degrees. Interviews took place between 10 am and 4 pm.

1. Young white male, French or Spanish accent. <Street level in front of City Centre Station>
2. Young woman – catching train to Richmond. She lives in the area.
3. Couple with luggage from Stockholm
4. Older woman, not from Vancouver
5. Man with a suitcase
6. Young woman, lived here all her life
7. White male, mid 50's, from Victoria
8. Couple from Calgary with suitcase
9. Young woman from Montreal
10. Woman, mid 50's, relocated from Calgary 1.5 years ago.
11. Gray haired woman without a cane out in front of Granville Station studying the sign.
12. Young woman at Canada Line platform
13. Young woman traveling to airport with luggage - visitor
14. Family of four with suitcases

15. Older woman with suitcase.
16. Man, mid 50’s. Local resident.

Appendix D – Human Subjects Division Exempt Status Determination

Date: 2/13/2013

PI: Ms. Michelle Marie Whitfield
Graduate Student
Urban Design & Planning

CC: Christine Bae

RE: HSD study #44532
"User Friendly Mass Transit Stations: Making Faster, Easier, Safer, and More Comfortable Connections"

Dear Ms. Whitfield:

The University of Washington Human Subjects Division (HSD) has determined that your research qualifies for exempt status in accordance with the federal regulations under 45 CFR 46.101/ 21 CFR 56.104. Details of this determination are as follows:

Exempt category determination: **2**

Determination period: **2/13/2013 - 2/12/2018**.

Although research that qualifies for exempt status is not governed by federal requirements for research involving human subjects, investigators still have a responsibility to protect the rights and welfare of their subjects, and are expected to conduct their research in accordance with the ethical principles of *Justice, Beneficence* and *Respect for Persons, as* described in the Belmont Report, as well as with state and local institutional policy.

Determination Period: An exempt determination is valid for five years from the date of the determination, as long as the nature of the research activity remains the same. If there is any substantive change to the activity that has determined to be exempt, one that alters the overall design, procedures, or risk/benefit ratio to subjects, the exempt determination will no longer be valid. Exempt determinations expire automatically at the end of the five-year period. If you complete your project before the end of the determination period, it is not necessary to make a formal request that your study be closed. Should you need to continue your research activity beyond the five-year determination period, you will need to submit a new *Exempt Status Request* form for review and determination *prior to implementation*.

Revisions: Only modifications that are deemed "minor" are allowable, in other words, modifications that do not change the nature of the research and therefore do not affect the validity of the exempt determination. **Please refer to the Guidance document for more information about what are considered minor changes.** If changes that are considered to be "substantive" occur to the research, that is, changes that alter the nature of the research and therefore affect the validity of the exempt determination, a new *Exempt Status Request* must be submitted to HSD for review and determination *prior to implementation*.

Problems: If issues should arise during the conduct of the research, such as unanticipated problems, adverse events or any problem that may increase the risk to the human subjects and change the category of review, notify HSD promptly. Any complaints from subjects pertaining to the risk and benefits of the research must be reported to HSD.

Please use the HSD study number listed above on any forms submitted which relate to this research, or on any correspondence with the HSD office.

Good luck in your research. If we can be of further assistance, please contact us at (206) 543-0098 or via email at hsdinfo@uw.edu. Thank you for your cooperation.

Sincerely,

Bailey Bell
Human Subjects Review Coordinator
(206) 221-7918
bbell3@uw.edu

Appendix E – Proposed Shelter Evaluation Criteria

Shelter Goals	Description
Size	Shelter size is adequate for the number of transit users served.
Function	Shelter functions to protect the transit user from the weather.
Location	The shelter is well located.