UNIVERSITY OF CALIFORNIA

Los Angeles

Overcoming Barriers to Accessible Transit

A thesis submitted in partial satisfaction

of the requirements for the degree Master of Arts

in Urban and Regional Planning

by

Carla Paola Salehian

2014

ABSTRACT OF THE THESIS

Overcoming Barriers to Accessible Transit

by

Carla Paola Salehian

Master of Arts in Urban and Regional Planning

University of California, Los Angeles, 2014

Professor Anastasia Loukaitou-Sideris, Chair

After the enactment of the Americans with Disabilities Act in 1990, transit agencies across the country have since sought to improve basic operations and enhance existing services for better meeting the needs of transit users with disabilities. Despite the advancements that have been made with regard to transit and accessibility, barriers to accessing transit continue to exist for disabled persons. Most notably, infrastructure issues proximal to transit stops such as cracked or uneven sidewalks or a lack of curb cuts have created a significant challenge; many communities lack coordination between agencies and municipalities to address these issues and in a time of economic downturns and ever-budgets, it is common for responsible parties to neglect these responsibilities or pass them on to others.

This study involved surveying approximately six-hundred transit agencies across the United States to explore details on ways in which they have responded to these challenges. Detailed case studies were then performed on two model agencies: Portland, Oregon's TriMet and Wenatchee, Washington's Link Transit. While the two agencies differ in size and resource availability, both have experienced success in reducing costly paratransit ridership and increasing fixed route ridership in the years following their

accessibility strategies and efforts. Critical to their success, both agencies were quick to recognize the importance (and universal benefits) of improving access, understanding that improving infrastructure and access in public spaces improves the health and livelihood of *all* citizens. Second, they were successful in the way they assessed existing situations (either by using advanced data analysis tools or more traditional fieldwork methods) and were able to react accordingly. Finally, both agencies also demonstrated creative techniques in cutting costs by incorporating the use of unconventional materials or novel infrastructure treatment methods. In demonstrating a holistic approach to improving accessibility, TriMet and Link Transit were not only able to address physical barriers to transit, but psychological and information exchange barriers, as well, indicating that true success is measured not only by conformance to ADA standards, but in understanding the needs of *all* their users and adapting their services to meet those needs.

The thesis of Carla Paola Salehian is approved.

Anastasia Loukaitou-Sideris

Martin Wachs

Leobardo Estrada

University of California, Los Angeles

2014

TABLE OF CONTENTS

LIST OF FIGURES

(Corresponding to Chapter)

ACKNOWLEDGEMENTS

As in any substantial piece of research, this thesis could not have been completed without the support and guidance of several individuals. First, I would like to extend my sincerest gratitude to my faculty chair, Anastasia Loukaitou-Sideris, whose expertise and tireless guidance was a constant source of inspiration. I was also fortunate enough to receive support from Martin Wachs and Leobardo Estrada. Together, this faculty committee demonstrated a deep passion for the research process and a profound interest in my thesis subject matter that provided me encouragement from the very start. Additionally, this research project would not have been possible without the support and funding of the Mineta Transportation Institute, whose passion for social equity and justice also served as a tremendous source of support.

Second, I would like to thank all who assisted in the research-gathering phases of this project. Stephen Gibson's enthusiasm and assistance was exceptional in conducting fieldwork and Young Park, Richard DeRock, and Howard Johnson, all dedicated tremendous amounts of time to participating in interviews and, in the case of Mr. Park, providing personal tours of project areas. Their expertise and experiences were invaluable to this research and their efforts toward achieving universal transit access were hugely encouraging and inspiring.

Finally, I would like to acknowledge my family for being a constant source of support and inspiration in my life. No matter the challenge I might encounter, your ceaseless encouragement makes me feel as if I can accomplish anything. This, in itself, is the most valuable gift any daughter or sister could ask for.

CHAPTER 1:

STATEMENT OF THE PROBLEM

STATEMENT OF THE PROBLEM

Introduction of the Topic

Enacted in July of 1990, the Americans with Disabilities Act (ADA) was designed to prohibit discrimination based on disability in areas such as employment, public services, telecommunications and transportation (Rosenbloom 2007). In response, transit agencies across the country have since sought to improve basic operations, enhance existing services, and when necessary, provide alternate services for better meeting the needs of customers with disabilities. While alternative types of services are usually ADA compliant and meet all the necessary legal requirements and obligations, the sobering fact remains that barriers to public transport continue to challenge persons with disabilities, often preventing them from utilizing public transportation. Most notably, infrastructure issues in proximity to transit stops have created major obstacles to accessibility including cracked or uneven sidewalks, lack of curb cuts, unsafe street crossings, and poor street lighting. While one might think repairing these barriers should seem a straightforward task, addressing them is often a challenge in and of itself. In most communities, different agencies are responsible for pieces of the same pathway and land parcels often fall under several jurisdictions. Coordination and collaboration must be established from multiple stakeholders, complicating matters further. Furthermore, funding for these repairs is often very difficult to obtain. In a time of economic downturns and ever-tightening budgets, agencies seem all too likely to neglect these responsibilities or pass them on to others.

In response to these challenges, this thesis will identify successful strategies employed by transit agencies for overcoming barriers that are currently impeding access to transit stops for disabled persons. It is expected that this could be accomplished in a series of steps. First, an online survey will be distributed to about six-hundred transit agencies, nationwide, asking for

details on ways in which they have been able to address these barriers (or have attempted to do so), and the type of strategies they have followed to do so. Second a literature review will be conducted on design strategies and best practices for making public transit more accessible for people with disabilities. Third, two case studies will be presented of exemplary programs (as determined by sources such as the survey and the literature review). Lastly, lessons learned from the survey, literature review, and case studies will be gathered and expanded upon to form general design and policy recommendations with regard to accessibility and transit stop infrastructure.

Existing literature on the subject describes at great length the multiple barriers that currently exist between transit and accessibility including physical and psychological barriers and barriers to information access (Koppa 1998). Less readily available, are sources pointing toward transit agencies that have successfully collaborated with local municipalities in addressing these issues. This study holds the potential to contribute to existing literature by providing exemplary models in urban design and program structure by which other transit agencies, policymakers, and stakeholders can benefit.

PROJECT STATEMENT:

This case study identifies successful strategies that can be employed by transit agencies for overcoming infrastructure barriers impeding access to transit stops for disabled persons and provides design and policy recommendations to be applied at a wider scale.

CHAPTER 2:

RESEARCH DESIGN & CONCEPTUAL FRAMEWORK

RESEARCH DESIGN

(Conceptual Framework)

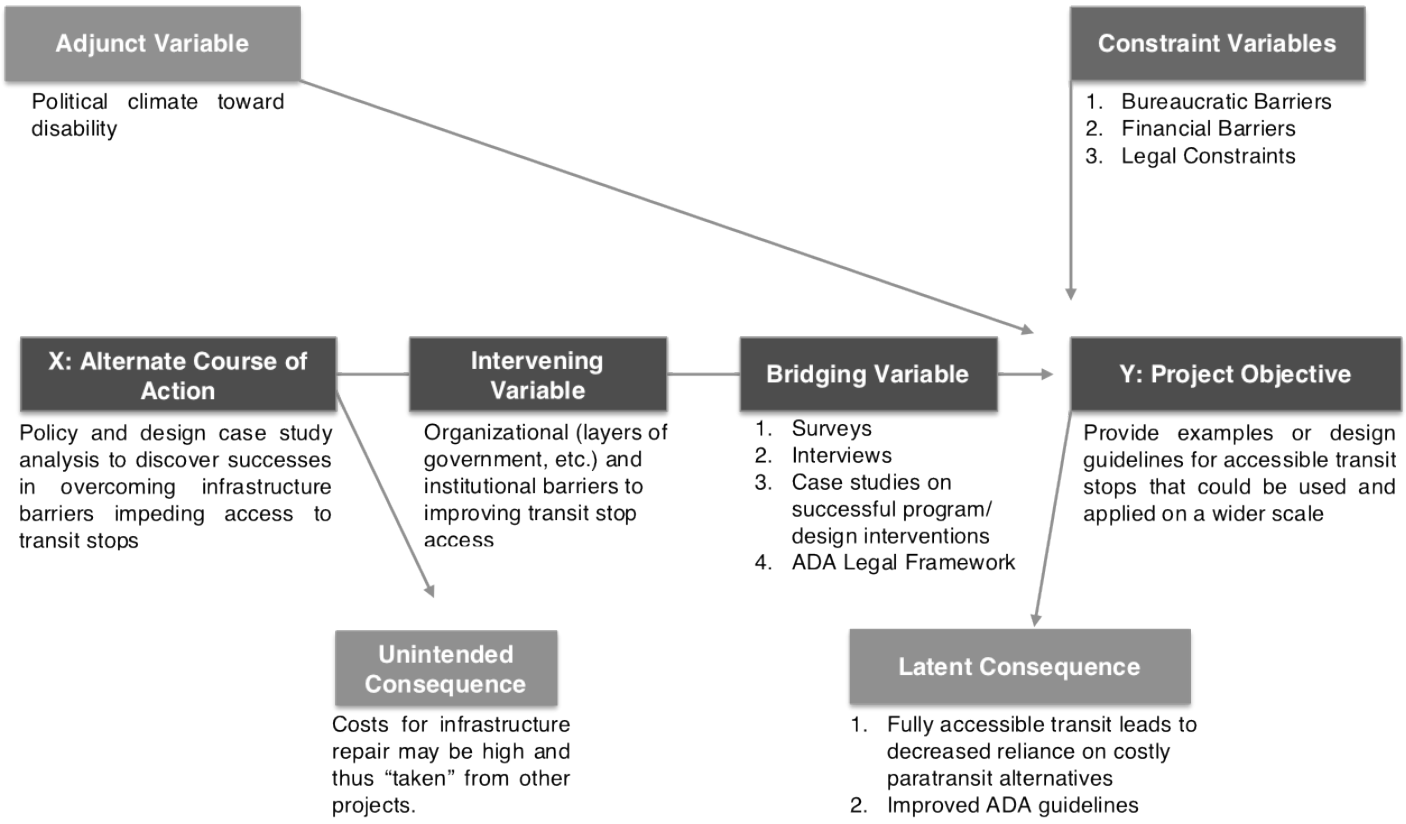
The conceptual model on the next page presents an overview of the research design for this thesis. It begins with the X variable or "Alternate Course of Action" which in this case, will be the creation of a policy and design case study to discover and shed light upon a transit agency's successes in overcoming barriers impeding access to transit stops for persons with disabilities. A suspected "Intervening Variable" for this study will be the organizational and institutional barriers to improving transit stops. This includes the complex layers of government involved in providing infrastructure and maintenance. The "Bridging Variables" for this study, or the tools that will be used to overcome the intervening variable, will be a combination of surveys and interviews (used to identify potential case studies), in addition to relevant case studies discovered while conducting the literature review. Lastly the ADA legal framework will provide a baseline of requirements with which I can measure program "successes" in terms of meeting or exceeding expectations.

This process will lead to my ultimate "Project Objective" which is to provide examples or design guidelines for accessible transit stops that could be used and applied by transit agencies on a wider scale. In addition, the project objective could even lead toward positive "Latent Consequences" such as the creation of fully accessible transit which could lead to decreased reliance on costly paratransit alternatives and improved ADA guidelines. It is expected that this project will run across several "Constraint Variables" that could act as roadblocks toward the project objective. These include bureaucratic barriers, or the question of "Who is ultimately responsible for infrastructure improvements?" Another constraint variable could be the financial barriers, or the question of "Who pays for the infrastructure improvements?" With local

municipalities constantly struggling with budgeting, it is expected that this constraint variable will be the most significant. Lastly, legal constraints could also serve as a third constraint variable. The "Adjunct Variable" in the case of this project could be the existing political climate toward disability and an "Unintended Consequence" of this project could be that the high costs for infrastructure repair could remove funding from other important programs. Each of these issues will be considered while conducting the literature review and constructing the methodology.

CONCEPTUAL FRAMEWORK

Mapping the Project Structure and Topics



CHAPTER 3:

LITERATURE REVIEW

LITERATURE REVIEW

As mentioned before, providing accessible public transit for users with disabilities in the United States goes back several decades but became paramount in 1990 through the passage of the Americans with Disabilities Act, which prohibited discrimination based on disability in areas such as employment, public services, telecommunications, and transportation (Rosenbloom, 2007) In response to this seminal piece of legislation, transit agencies have since sought to improve basic operations, enhance existing services, and when necessary, provide alternate services for better meeting the needs of customers with disabilities. Traditionally, transit institutions provide disability services in two ways; accessible fixed-route services, operating on a predetermined route and schedule, and within this fixed-route service system, personal paratransit services, operating on a demand-responsive, door-to-door system for those unable to utilize the fixed-route system due to the extent of their disability (Koppa, 1998). While there is little doubt the ADA was a major milestone in achieving justice for disabled individuals, it is clear that the transition toward achieving fully accessible transit systems has been more complex and timely than originally expected. Today, almost twenty-five years after the passage of that monumental law, buses and other forms of public transportation are more accessible but despite this, much of the same issues regarding physical infrastructural barriers in and around bus stops that existed prior to 1990 continue to act as major deterrents, preventing many users with disabilities from even considering using public transit in the first place.

While literature on best practices and specific recommendations of how to overcome infrastructural barriers and make public transit more accessible to people with disabilities remain relatively underdeveloped, examining the broader literature allows for opportunities to discover the richness and complexities of topics such as critiques of the legal framework of the Americans

with Disabilities Act, bus transportation patterns of the disabled, their barriers toward access, and emerging technologies and strategies to overcome these barriers. The following sections of this literature review develop each of these topics beginning with the most broad and then narrowing in scope and subject to provide a contextual framework of the topic.

PART I: LEGAL HISTORY OF DISABILITY AND TRANSIT IN UNITED STATES

The legal background of disability in the United States is one that is deeply intertwined with the reform movements of the 1960's. Much like the civil rights movement that preceded it, literature regarding disability and the law primarily treats this issue as one of social justice – a relationship that is emphasized by Jon Graves (1978). In his article, "Mass Transportation: Separate But Equal," he presents an early, optimistic viewpoint of the existing framework and systems initially created to address issues of public transport, including the Urban Mass Transportation Assistance Act of 1970. At the time the article was written, the law was initially requiring transit agencies to begin retrofitting their buses to serve the disabled and provide separate alternatives to bus transit when this was not an option. Graves (1978) notes that while accessibility costs for agencies would be staggering at first, it is nevertheless a necessary duty and responsibility. He states this most clearly when he sites a court ruling in the related *Atlantis Community, Inc. v. Adams* case, "It is apparent that we are on the frontier of a new era of concern for the civil rights of all persons. In its perceptions of personhood, the law must not accept any diminution or dilution from individual dignity or worth because parts of a person are missing, disfunctioning or nonfunctional." (Graves, 1978, p. 681)

Graves's hopeful tone is not shared in subsequent literature, however. In "Closing the Doors on the handicapped," Jay Damashek (1982) explains that public transport and accessibility is a much more complicated issue than Graves (1978) suggests. Specifically, Damashek (1982)

describes the ways in which individuals with disabilities should be seen as having both physical *and* psychological barriers to accessible transit and presents the argument that simply providing alternatives to bus transit may not be sufficient. In doing so, he goes on to describe the debilitating psychological impacts of inferiority that could arise from exclusion or separate treatment, especially in terms of segregating transportation systems and even goes so far as to compare the issue to the effect of segregation as discussed in *Brown v. Board of Education 347 U.S. 483 (1954)* making the claim that "a separate transportation system surely must have a comparable effect on the disabled" (Damashek, 1982, p. 32)

Sharon Rennert (1988) echoes Dameshek's (1982) claims that separate transit services do not always translate to *equal* services for the disabled. Specifically, this article takes a critical look at Section 504 of the Rehabilitation Act of 1973, a "cornerstone of the civil rights movement for disabled people" that "prohibits discrimination against disabled people in all programs and activities that receive Federal financial assistance" (Rennert, 1988, p. 361). The exact service requirements for transit agencies were not identified in the law, however. The following sections of the article describe the two distinct approaches that have been utilized to provide transportation to disabled users (paratransit, and modification of existing routes and stations) and how this two-pronged approach was upheld in *Americans Disabled for Accessible Public Transportation (ADAPT) vs. Dole 676 F. Supp. 635 (1988)*, in which a Federal district court found that Section 504 did not require that all bus routes have buses accessible to disabled people. The article argues that *ADAPT* was wrongly decided and that the ruling violates Section 504. Rennert (1988) explains that paratransit services are so costly, they can only meet a small fraction of the transportation needs of disabled riders and additionally, the quality of service provided by paratransit is often inferior to that of fixed-route services. Put simply, Rennert (1998) believes that *ADAPT* ruling ignored the true mandate of Section 504 – "the elimination of the discriminatory

barriers that prevent disabled people from meaningful access to public transportation services" (Rennert, 1988, p. 409).

The Americans with Disabilities Act:

Each of these laws and legal rulings provided the groundwork for the pinnacle of all accessibility laws in the United States, the Americans with Disabilities Act (ADA) of 1990. As previously mentioned, the Americans with Disabilities Act is a broad piece of legislation created with the intention of eliminating discrimination against the disabled in multiple areas (Koppa, 1998). Specific to transportation issues, the ADA fundamentally changed the previous relationship between paratransit and fixed-route services. As described by Koppa (1998) in an "Overview of the Americans with Disabilities Act", according to the ADA, "paratransit is no longer considered a substitute for accessible fixed-route service – rather, both are required. The ADA requires transit operators to provide complementary paratransit services that "shadow" all of the fixed route systems" (p. vii). Users described by the ADA as qualifying for paratransit services would likely be those who are limited in their ability to travel from their point of origin to the nearest fixed-route stop and/or climbing inside the bus once at the stop. As such, people who use either a manual wheelchair or a motorized chair or scooter would not be eligible. (Koppa, 1998)

In addition, the ADA provides checklists of minimum requirements specific to bus stop infrastructure design**.** The lists include descriptions of regulations for bus stop area and bus landing pads, bus shelter requirements, rail station requirements, accessible paths, signage, and amenities. Interestingly, specifications on lighting and security, as well as specifications related to those with visual and cognitive impairments are *not* included in the list of minimum ADA requirements. As described by the United States Access Board (an independent agency of the

United States government devoted to accessibility for people with disabilities), under the ADA, the Department of Transportation (DOT) issues and enforces accessibility standards for transportation facilities that are based on these ADA guidelines, last updated in 2004 (See Appendix A).

The Effects of the Americans with Disabilities Act:

Much like the laws and regulations that preceded the ADA, opinions on the effect it would have on the disabled were optimistic at first. For authors such as Carol Denson (1998), expectations were high as the ADA was considered to be a major breakthrough for transit users with disabilities that laid the groundwork for creating a more accessible and just transit system. In her 1998 article, "Transitioning to Fixed-Route Services", Denson illustrates some of these high expectations by explaining that "by July of 1995, 60 percent of the nation's fixed-route buses and rail transit were in compliance with the ADA accessibility provisions" and that "full compliance is expected by the year 2002" (Denson, 1998, p. 37).

Considering these accomplishments, Denson (1998) then assessed the effects increased compliance would have on bus transit usage by surveying paratransit users to determine the likelihood of whether they would consider switching to the fixed-route systems, and the remaining barriers that could prevent such a transition. The small study was conducted in New Castle County, Delaware and the results were quite surprising. The majority of users responded that despite increased accessibility, they would most likely not consider using fixed-route transit. Lack of information on bus stop location did not seem to be a major issue; 80 percent knew where the nearest bus stop was (Denson, 2008). Instead, the primary limitation of using the fixed-route bus system appeared to be the distance between their residence and the bus stop, itself. As a result, Denson (1998) described that the survey results supported two overall themes: (1) an

accessible bus fleet is just one piece of a larger system required to make fixed-route public transit a viable option for the disabled and (2) even with system-wide improvements, a large number of paratransit users may still be unwilling to stop utilizing a service that they may have now become very familiar with (Denson, 1998). Additionally, over 33 percent of the population expressed that their primary concern was the need for outside structural changes (curb cuts, ramps, etc.) indicating that more focus should be placed on elements of accessibility in the future.

PART II: DISABLED USER TRANSPORTATION PATTERNS AND REMAINING BARRIERS TO ACCESSIBILITY

Almost ten years after Denson's assessment of the ADA, Sandra Rosenbloom (2007) performed another critical assessment of the Act and the effect it has had on transit users with disabilities. In her article "Transportation Patterns and Problems of People with Disabilities," Rosenbloom emphasizes the value of the regulations set forth by the Americans with Disabilities Act but explains the necessity for transit providers to go *beyond* the minimum requirements of the ADA to fully address the needs of these travelers and entice more disabled users to consider public transit as a means of transport. In the first part of this article, Rosenbloom (2007) provides an overview of current travel patterns of people with disabilities, describing that over 75 percent of those claiming mobility problems in a survey explained it was due to difficulty in walking. In addition, roughly a third of survey respondents claimed there was no public transit in their area and those who did report having transit, rarely used it. Instead, the vast majority of disabled travelers tend to rely heavily on automobiles. Much of these statistics emphasize the complexity of issues related to disability and transportation. Namely, that the biggest challenge for transportation planners hoping to serve the needs for the disabled would be to convince them first that transit is a viable option.

Rosenbloom (2007) implies that any sort of "convincing" will be difficult and details some of the major shortcomings of the ADA regulations in providing viable community transportation resources. Specific to buses, Rosenbloom (2007) explains that the ADA required public transit operators to purchase only accessible buses after August 1990, with the intention that in time, all fleets should become totally accessible (p. 5). Without structured deadlines or accountability measures in the Act, however, the implementation of this process was much slower than expected and by 2002, only 88 percent of all buses met the mandate (a 22 percent increase from the numbers previously described by Denson in 1995, but still falling short from the "full compliance by year 2002" expectations). In addition to equipment updates and maintenance, lack of driver training was also discovered to be a serious barrier to ensuring fully accessible transit. Rosenbloom (2007) explains that a lack of proper training created much hesitation in a driver's ability to operate the lift/ramp equipment. In fact, it was cited that "some drivers who did not know how to cycle the lift, refused to do so, telling a passenger the lift was not functional. Other drivers were afraid that making time to board a passenger with a disability would cause them to run behind schedule" (Rosenbloom, 2007, p.6). Many of these problems have lessened over time due to a combination of better equipment, improvements in driver training, and increased manager surveillance and response, but nevertheless, users with disabilities do continue to experience these sorts of hindrances throughout their travel routes, potentially impacting their attitude toward public transit.

Rosenbloom (2007) goes on to describe the ways in which transit agencies could improve their bus systems including the need for low-floor buses, expanding routes and service hours, and better information systems on travel options. Despite these suggestions for improving the transit system, itself, Rosenbloom (2007) does echo Denson (1998) in emphasizing that the most significant transportation problems remaining are barriers in the pedestrian environment, "which

far outnumber reported problems with transit or paratransit modes, although they may well explain the lower rates of use of these modes" (p.3). She explains that without enforceable standards, many local governments have again done the minimum in terms of ensuring that the pedestrian environment complies with the ADA, and in addition, have grown lax in properly maintaining accessibility of the sidewalks and existing bus stops.

In "The Role of Public Transportation as a Job Access Mode", Lubin and Deka (2012) further support the claim that simply providing accessible transit is often not enough, and that particular attention must be paid to ensuring accessibility at transit stops, especially in terms of improving overall livelihood for users with disabilities. This article examines the role of public transit in providing job access for people with disabilities. It utilizes survey methods on job-seeking people with disabilities throughout 18 centers of the New Jersey Division of Vocational Rehabilitation Services to identify insights on availability, use, and needs regarding different modes of travel and how it affects job access. The surveys revealed that public transportation was perceived to have a critical role in enhancing job access for the disabled. Furthermore, it was important that transit stops were in close proximity to home. While users were generally favorable to the transit agency services and equipment, nearly half of the respondents were dissatisfied with the stations or stops. Particularly, complaints were listed about sidewalks, street crossings and intersections, and street lighting. The article concludes by stating that although transit agencies are not typically responsible for bus stop infrastructure, "municipalities with large stations and stops should pay attention to this finding and make the environment safer" (Lubin and Deka, 2012, p. 97).

A report by Koppa, Davies, and Rodriguez (1998) was successful in identifying much of the multiple infrastructural and bus stop barriers to accessible transit. These barriers are divided into the following three categories:

1. Physical Barriers: Including architectural obstacles such as stairs, curbs, and doorways and infrastructural barriers such as lack of lighting or safe crosswalks.
2. Psychological Barriers: These were most often attributed to security concerns often maximized by details such as lack of maintenance. Other fears particular to users with disabilities include stigmatization, lack of confidence in one's own abilities, and an inability to deal with the unexpected.
3. Barriers to Information Exchange: These barriers are usually categorized as physical deficits and cognitive deficits that prevent one from accessing the information needed to access a destination. These barriers are mostly associated with users with visual or cognitive disabilities and as such, are also referred to as the "invisible barrier."

The identification of these barriers eventually led to a survey/interview that Koppa, et al. (1998) conducted at several transit agencies on the topic of these barriers and how to overcome them. They found that the trend toward mainstreaming as many disabled riders as possible toward fixed route or route-diversion transit, or a service that deviates from the standard fixed route to pick up and drop off passengers upon request, will continue. Despite some successes in overcoming physical barriers, considerable roadblocks in creating truly accessible transit remain. Particularly, psychological barriers are still significant and may override advances in technology. In addition, they note that much remains to be done in addressing the needs of those with cognitive impairments and more needs to be done in "getting the word out" and ensuring users with disabilities that public transit will work for them.

PART III: RESPONSES TO INFRASTRUCTURAL BARRIERS TO ACCESSIBILITY

While many authors call attention to the fact that infrastructural problems continue to act as a major barrier to accessible transit across the country, others have also focused their attention on overcoming these barriers. In the article "The Vital Role of Street Design and Management in Reducing Barriers to Older Peoples' Mobility," Lavery et al. (1996) present a European perspective on dealing with these issues. Their study begins during the mid-1990's when accessible buses were first coming into operation in the United Kingdom and Europe at large. Contrary to widely held beliefs that this would lead to increases in overall ridership for the elderly and disabled, Lavery et al. (1996) believed that there would be little increase because of the low patronage by these groups and the existing built environment conditions. After researching studies performed in Germany and throughout the rest of Europe, the authors found that while low-floor, accessible buses contributed to improved boarding times and public image for public transport, no significant increase in bus usage was observed, and much like the studies performed in the United States, barriers within the travel environment were still a persistent problem.

Lavery et al. (1996) outlined 18 major barriers to good access in the built environment surrounding transit stops and listed the people most affected by each of them. The list of those affected included not only the physically disabled, but other groups of riders, as well. For example, they described that a "lack of dropped kerbs" affected not only wheelchair users, but people with shopping carts and strollers, too, while "slippery surfaces" were listed as affecting "ambulant people using walking sticks, walking frames, or crutches; and people wearing shoes with steel tips or stiletto heels" (Lavery et al., 1996, p. 188) Equipped with these observations, Lavery et al. make the important declaration that much of the problems with the infrastructure at transit stops are problems related to design, and more importantly, they call attention to the

fact that "designers must be aware of the fact that designing for the 'average' person [or a physically fit, young adult] is a thing of the past" (Lavery et al., 1996, p. 189) Instead, planners and urban designers should create spaces with all demographics in mind; young and old, fit and frail. The remainder of the article describes several specific characteristics for improving street design (skid resistance, strength, frost resistance, and abrasion) and concludes by calling attention to the fact that vehicle and transportation design in recent decades has been technology-driven rather than people-driven. Being so, it is the responsibility of the planner or designer to develop an interdisciplinary approach to include street characteristics and reduce built environment barriers.

Lavery et al. (1996)'s call for maximizing "access" to include all sorts of users echoes many of the concepts and theoretical background of a philosophical shift in perspective in designing for the disabled that has been growing in popularity: Universal Design. Universal design is a concept first coined by North Carolina State University's Ron Mace in the 1970's (Audirac, 2008). While originally meant to describe a "disability inclusive" architectural approach (one in which urban design and architecture are paired with social justice), today, the concept has become an international design philosophy and has influenced works in multiple fields including industrial design and engineering (Audirac, 2008). Though the term dates back to the 1970's, universal design is considered to be a relatively new school of thought that is premised on the following five design principles:

1. Barrier-Free Design: The goal of making the built environment barrier-free for all persons, including those with physical limitations.
2. Accessible Design: Typically mandated by the ADA, accessible design ensures equal opportunity for access to mobility, facilities, devices, and services for people with disabilities.

3. Assistive Technology: Engineering that helps people with disabilities to perform certain tasks independently that they were unable to do before.
4. Inclusive Design: Ensuring that the widest group possible has access to products and services regardless of their age or disability.
5. Transgenerational Design: Improving the quality of life for people of all ages or abilities (Audirac, 2008).

In other words, these five design principles demonstrate that universal design not only intends to improve accessibility for those with physical limitations, but also promotes a broader paradigm, acknowledging and celebrating diversity and inclusivity. Moreover, it promotes a design outlook that upholds the "dignity and independence of all by placing disability and aging within the context of normal expectation of the human condition" (Audirac, 2008, p. 4). Universal Design seems to have developed from much of the disability civil rights advocates of the 1960's and 70's, emphasizing inclusivity over segregation. Although empirical testing of 'universally designed' spaces shows that these design concepts do not fix all problems with accessibility and do not fully achieve the end-goal of a truly *equal* experience, they do come close and undoubtedly provide several benefits for the users (Danford and Maurer, 2005).

Ivonne Audirac (2008) studied the concept of Universal Design and assessed whether it could be applied to transportation planning in her article "Accessing Transit as Universal Design." She begins by observing universal design as a global paradigm and the ways in which it has been integrated internationally. In the Scandinavian countries of Europe and the United Kingdom, for example, universal design terminology has become infused in policy. In Japan, universal design has gained particular prominence (especially considering the aging population there) and has grown tremendously in the fields of business and technology. In the United States, universal design has emerged as a response to the Americans with Disabilities Act's codification

of accessibility for disability, and the universal design movement has become more pedagogical in nature, consisting more of think tanks, consultant groups, and university centers, which act as consultants for professionals (Audirac, 2008).

Audirac (2008) goes on to describe how recent measures to create accessible transportation have focused on technical solutions to removing the physical barriers affecting specific disabled groups and that the problem with these approaches is that despite being a means to an end, they largely tend to segregate users into the "normal" and the "impaired." As an alternative approach, universal design's full-integration approach could directly address many transportation issues of social exclusion and mobility such as physical exclusion, exclusion from facilities, and even fear-based exclusion (Audirac, 2008). Principles such as these could be critical in planning to meet future needs. Audirac (2008) states that the population of Americans aged 65 and older is estimated to increase by 80 percent by the year 2025, and while previous mentioned authors would suggest a small likelihood that older Americans will switch their driving habits, others find that public transit may be their only other alternative to asking for a ride. Audirac (2008) notes a growing trend in American transit agencies to move beyond ADA accessibility requirements and becoming more receptive to universal design principles. All in all, she feels that "applying universal design to transit accessibility at the micro, meso, and macro scales can assist American cities and metropolitan planning organizations to redress the various forms of social exclusion related to suppressed travel of mobility-disadvantaged populations" (Audirac, 2008, p. 13). To further illustrate the ways in which universal design can apply to transit, the figure below summarizes these philosophies and ideologies and pairs the barriers to accessible transit listed by Koppa et al. (1998) with the corresponding universal design principles and the ideas described by Audirac (2008).

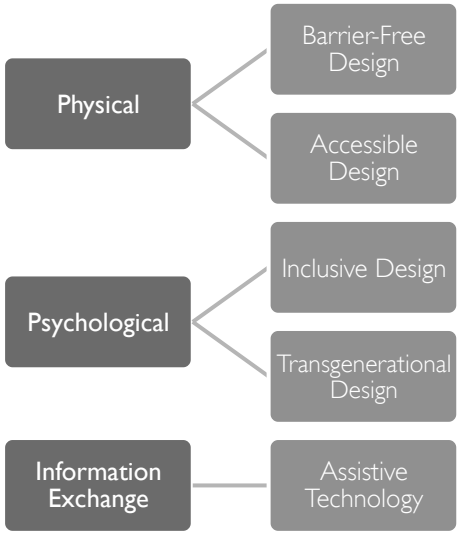


Figure 3.1: Barriers to Accessibility and Respective Universal Design Principles

PART IV: RELATED STUDIES/METHODOLOGIES

Apart from the existing knowledge surrounding the issue of accessibility and transit, remaining barriers toward accessible transit stops, and the actions and strategies employed to overcome these barriers, much can also be gained from related studies and methodologies to build knowledge upon this subject. In a 2009 study, Wanyang Wu created optimization models for selecting bus stops for accessibility improvements for people with disabilities. Methods for this study included (1) establishing a bus stop requirement checklist based on the minimum accessibility requirements outlined by the ADA, (2) developing a database for the area of study within the state of Florida that includes transit and socioeconomic data, and finally (3) developing two optimization models to help identify a priority list of bus stops for accessibility improvements – one to meet only the minimum ADA requirements and one to meet optimized universal design characteristics (Wu, 2009). Once developed, Wu's model identified nearly half (49 percent) of the bus stops within the selected area of study, which did not meet minimum ADA requirements, making these the top priority in terms of site selection. While this approach is technical and relies

heavily on quantitative methods, the practicality of Wu's study lies in the manner in which it is grounded in reality and considers budgeting and economics. Most notably, his study takes into account the fact that most transit agencies or municipal governments operate on limited budgets and can only select a limited number of bus stop locations for infrastructural improvements annually.

Once project sites are selected, another valuable resource in the development of this project could be the Project ACTION's "Accessible Pathways to Bus Stops and Transit Facilities" process guide sponsored by the Easter Seals, an international charitable organization devoted to providing services, education, and outreach for persons with disabilities. This resource provides design guidelines and standards, as well as a four-step process for improving sidewalks, road crossings, and infrastructural conditions surrounding bus stops or rail stations. These steps include (1) Identifying goals, (2) Conducting a community report card, (3) Preparing an action plan, and (4) Ensuring follow-up (Easter Seals, 2009). While this guide should be customized to meet the specific needs of individual communities, it provides useful information in terms of answering questions such as "Who is responsible for accessible pathways?" Additionally, sections such as the "8 Ingredients of Success" (listed in Figure 2) could be especially useful for the case selection process. Most importantly, the primary purpose of this guide is to "help readers understand the inter-relationships between the work of local jurisdictions, transit agencies and advocacy/community groups" (Easter Seals, 2009, p. 1).

A few existing case studies of the assessment of bus stop accessibility could also prove useful for this study. Most notably, in Tucson, Arizona, Davita Mueller (2009) created a bus stop accessibility report in which individual bus stops within a given area of study were assessed and scored on a scale of 0-5 in terms of access (based on the minimum ADA requirements) and the presence of five amenities (trash receptacles, street lighting, map display case, shade, bike rack,

and shade.) After collecting this data, Mueller (2009) discovered that 35 percent of all active bus stops had an ADA accessibility score of 5, indicating they met all the ADA requirements and only half of the bus stops had curb cuts and connecting sidewalks. The practicality of this method of study is exhibited in the manner in which Mueller (2009) was able to take these scores and map them to create a visual representation of bus stop accessibility within Tucson. Furthermore, her scoring system was used to identify the most accessible bus stops, which could serve as models for other stops in need of refurbishments.

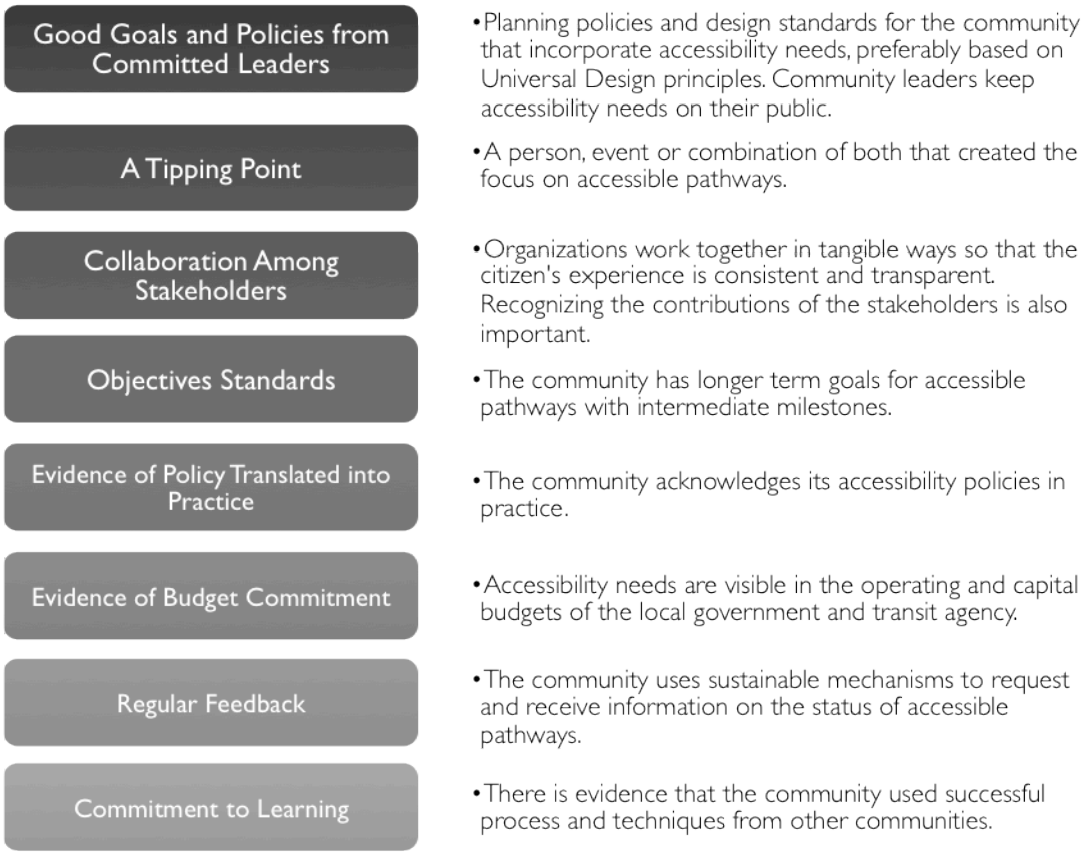


Figure 3.2: Easter Seals Project ACTION's "Eight Ingredients of Success"

PART V: CONCLUSIONS

Overall, existing literature on the topic of bus transit accessibility demonstrates that there is much to be learned from past studies and case methodologies. By studying the legal basis of this topic and the Americans with Disabilities Act, the framework by which design guidelines and regulations were first created becomes clear. Studying the transportation patterns of the disabled and existing barriers to accessible transit demonstrates that the design regulations specified by the ADA often fall short of meeting *all* transportation needs for transit users with disabilities and in response to this, several authors have begun to identify manners in which transportation barriers can be identified and overcome. Within this contextual framework, this thesis project will contribute to the existing literature by combining much of the methods described above and will attempt to further develop the subject of overcoming barriers to accessible bus stops and provide successful case study examples and design and policy recommendations for accessible bus stops that, as mentioned before, can be applied on a wider scale.

CHAPTER 4:

RESEARCH METHODOLOGY

RESEARCH METHODOLOGY

This thesis project fits within the framework of a greater national study funded by the Federal Transit Administration and organized by the Mineta Transportation Institute titled "The Nexus Between Infrastructure and Accessibility." The project aims to identify successful strategies being employed by transit agencies in the United States (by means of a nationwide online survey) to address infrastructure barriers to accessible transit stops for users with disabilities with the objective of creating a detailed report documenting the strategies to provide guidance and recommendations for transit agencies that are seeking to address this issue. This thesis project, however, went beyond the scope and framework of the FTA study with the aim to identify and conduct a detailed analysis on a set of "best practices" programs employed by transit agencies (one large and one small) in the western region of the United States that have successfully overcome infrastructural barriers to accessibility. As such, the case study research method allows for the opportunity to create a more detailed understanding of this complex topic of study and provides practical knowledge that could serve as model programs for other agencies. In order to achieve this, the project primarily relied upon qualitative data, utilizing survey and interview methods to gather that data. In addition, quantitative data was also collected during the analysis process. The methodology for this study can be broken down into three major parts: (1) the case study selection process, (2) two detailed case study analyses, and (3) development of broader design guidelines.

1. CASE STUDY SELECTION: Prior to conducting detailed analysis of a program, one of the first steps of this project involved choosing the case studies. The case study selection process for this thesis project started at the national scale and began with the distribution of a survey

(created using the Google Forms platform) to transit agencies across the country with the intention of utilizing the results in order to both gain a better understanding of existing conditions with regard to accessibility programming and transit, and as a means of identifying exemplary programs that have surpassed the minimum ADA requirements. In order to do this, a list of contacts were acquired through the Federal Transit Administration's "National Transit Database," a resource established in response to an act of Congress listing contact information and statistics on all transit systems in the United States that are recipients or beneficiaries of grants from the FTA. Using this resource, the contact information for around 600 agencies was collected and organized by region. After this, a ten-question online survey link was emailed to each of the transit agency managers in order to identify whether they are aware of the barriers to accessible transit that might exist in their area and if they have responded with any measures or actions to help rectify these barriers. (See Appendix B for the complete survey questionnaire.) A total of 152 responses, representative of a wide range of agency types and geographic regions, were collected and a series of follow-up emails were sent to agencies until the benchmark figure of responses was captured. This represented a 23 percent response rate.

Once the results were gathered, the agencies which had established programs to cater to the needs of disabled users were sorted and their responses were categorized and compared to established criteria, as identified during the literature review process. Specifically, special attention was given to whether programs described by agencies (a) surpassed the minimum requirements prescribed in the Americans with Disabilities Act, (b) made an effort to include "universal design" concepts, and (c) followed measures similar to the Easter Seal's Project ACTION's " Eight Ingredients of Success" in order to determine their qualification for case study selection. Overall, survey responses were measured against ingredients such as whether the program facilitated collaboration among stakeholders, whether it assessed and responded to

infrastructural barriers, and whether efforts were taken to overcome informational barriers. In the end, after creating a list of potential case studies and performing informal telephone calls to each of the candidates to learn more information on their programs (including what they consider to be the major successes of their program, whether they believed their efforts went beyond the minimum ADA requirements, and whether the agency has conducted any studies to evaluate the effects of their efforts), the two cases that best met most of the listed ingredients were selected for detailed analysis.

Analysis Plan:

a. Survey Distribution: Collect contact information for transit agencies and distribute online survey.
b. Data Organization: Assess and categorize survey responses.
c. Data Analysis: Rank responses/agencies in comparison to the outlined criteria/existing literature.

2. CASE STUDY ANALYSIS: Once the case selection process was complete, the second phase of the project involved gathering detailed data on the chosen cases. First background demographic data was gathered for the area of study. This background information primarily focused on age, disability, and transportation census data and was analyzed to determine numbers of disabled and elderly individuals that stand to gain from fully accessible transit. Second, a more detailed semi-structured interview was conducted of the transit agency manager (or appropriate representative) to better understand unique insights into the agency's program, the conditions that existed prior to their intervention, the conditions by which they were able to

successfully implement their program, and the effect it has had on its community so far (See Appendix C for sample interview questions). These interviews were conducted by phone and in-person and were supplemented by field observations and photographic documentation gathered during the site visit.

Analysis Plan:

a. Data Organization: Organize background data including relevant demographics and develop maps illustrating bus routes and stops.
b. Data Analysis: Create figures to illustrate the demographics of existing bus routes and stops.
c. Interview Transcription
d. Interview Analysis

3. DESIGN & POLICY RECOMMENDATION DEVELOPMENT: After conducting the literature review, survey analysis, and case study analysis, I then approached my project from a broader perspective and determined ways in which these case studies could be useful to agencies outside their service areas. Specifically, I aggregated my findings and created general "lessons learned" or "design and policy recommendations" for creating accessible bus stops that could potentially be replicated throughout the United States. It is intended that these conclusions and recommendations serve as a resource to transit agencies and local municipalities.

Analysis Plan:

a. Data Analysis: Summarize the case study key findings.
b. Create a Descriptive Table: A summary of the key design guidelines.

CAVEATS TO THESE RESEARCH METHODS:

As in most studies, the methods utilized present unique limitations for this research. First, limitations of the online survey include the important fact that there is risk involved in the number of surveys that are actually completed and little control over who *actually* completes the surveys. Additionally, there is little control over who completes the survey as it is common for managers to delegate these tasks to their employees. There is a chance the most qualified agency representatives will not be the ones answering the questions. Similarly, there is nothing to ensure that the agencies with the best programs will complete the survey in the first place and could go unrecognized. Lastly, the survey itself is designed in a manner that allows flexibility in terms of response length and anonymity. In other words, respondents are given the option to skip answers or not provide contact information. Therefore, there is the additional risk of receiving incomplete information, or not being able to correlate survey responses to particular agencies.

In addition, the interviewing method also presents similar problems and caveats. First, there is always the chance that the interviewee might have strong biases that will influence his or her interpretation on the successes (or shortcomings) of their agency, especially in dealing with a considerably sensitive subject such as accessibility. Details such as the wording of questions could spark an unintended reaction or could be interpreted in a way that is contrary to what the interviewer intended. In addition, the interviewee may struggle to acknowledge viewpoints outside of their own. In reviewing the caveats to these research methods, it is clear that each of the methods being used for this study has some drawbacks. Nevertheless, reasonable steps were followed to minimize the weaknesses of each method, which included the employment of multiple research methods throughout the process.

CHAPTER 5:

SIGNIFICANCE OF THE STUDY

SIGNIFICANCE OF THE STUDY

Overall, the project's importance and significance lies in the multiple impacts it could potentially have on three separate levels. First, it will contribute to existing literature by going beyond providing descriptions of existing barriers and will instead provide examples of successful policy in *overcoming* these barriers, particularly in dealing with frequently cited issues such as bureaucratic and financial obstacles. Additionally, few other studies have been found that performed surveys on a broad scale in order to find their case study[1].

Second, the research also has the potential to impact those outside the academic sphere. A recognized research institute sponsors this study, and much of the work developed for this thesis will ultimately be presented in a final report. Thus, there is a considerable chance that it will be circulated among transportation agency professionals and will provide them with a series of contemporary "best practices" – policy models that could provide guidance and recommendations to help them address a broad range of infrastructural barriers. Additionally, it is expected that the design guidelines will be especially useful for agencies looking to make investments in designing new or updating existing transit stop infrastructure.

Finally, above all else, the project's importance ultimately lies in the seriousness of the problem at hand and the enormous benefits that stand to be gained in bringing awareness and potential solutions to the issue of infrastructural barriers to accessible transit. There is no denying the obstacles to creating accessible transit are plentiful. Nevertheless, by ensuring accessible pathways to transit, disabled users are provided an increased sense of independence by promoting individual mobility, time flexibility, and reducing their reliance on costly paratransit

[1] Research discovered during this initial national "sweep" would uncover cases beyond the western region that other research teams, namely through the Mineta Transportation Institute, could further investigate.

services (ITE 2009). Ultimately, improved infrastructure and accessible public spaces do not only directly benefit transit users with disabilities, they also improve the health and livelihood of us all.

CHAPTER 6:

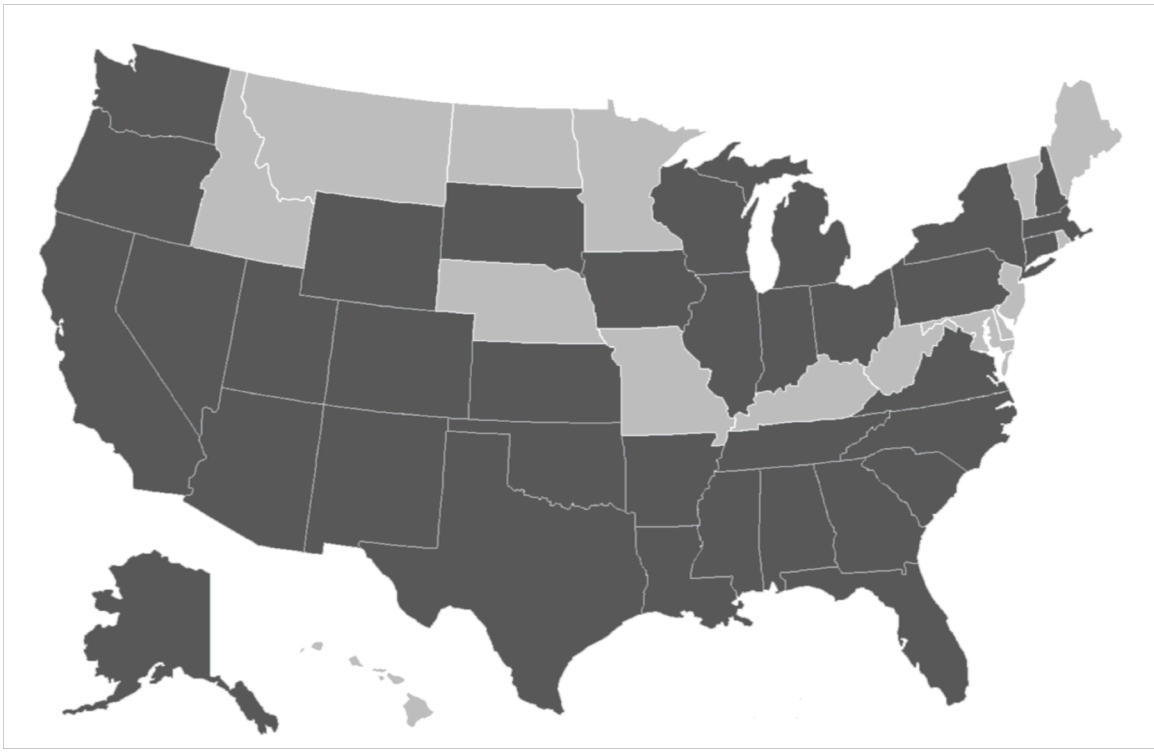
PROJECT FINDINGS

SURVEY RESULTS

A Snapshot of Current Accessibility Practices Around the United States

As mentioned previously, one of the first steps in the case study selection process involved the distribution of a ten-question online survey to 665 transit agencies across the country as a means of gaining a better understanding of existing practices with regard to accessibility programming and transit, and as a means of identifying exemplary programs that have surpassed the minimum ADA requirements. The survey (as seen in Appendix B) began by asking whether the transit agency had any practices or programs in place that address physical barriers faced by riders with disabilities and, if so, to list those programs. The subsequent questions in the survey then touched upon the issue of infrastructural barriers and whether the agency had taken any action to address or mitigate those barriers in their service areas. Finally, the last questions asked for the details of these projects as well as any obstacles that may have prevented the agency from addressing those barriers.

Overall, the survey had an impressive total of 152 responses (a 22.9 percent response rate) representing a wide range of transit agencies across the country. Responses were received from a total of 35 states (37 entries did not provide their contact information or indicated a state.) In terms of a regional breakdown of the survey responses, thirty agencies from the West/Pacific region responded to the survey as well as eleven agencies from the Southwest, seven agencies from the Rocky Mountain region, twenty-five agencies from the Midwest/Great Plains, twenty-eight agencies from the Southern region, and finally, twelve agencies from the Northeast/Mid-Atlantic (See Figure 6.1).



WEST/PACIFIC - 30		SOUTHWEST - 11		ROCKY MOUNTAINS - 7	
AK – 2	CA – 20	AZ – 3	NM – 1	CO – 2	UT – 2
OR – 2	WA – 6	OK – 1	TX – 6	NV – 2	WY – 1
MIDWEST/GREAT PLAINS - 25		**SOUTH - 28**		**NORTHEAST/MID-ATLANTIC - 12**	
IL – 2	MI – 9	AL – 1	NC – 6	CT – 3	NY – 2
IA – 1	OH – 6	AR – 1	SC – 2	MA – 2	PA – 4
IN – 2	WI – 3	FL – 7	TN – 2	NH – 1	
KS – 1	SD – 1	LA – 2	VA – 3		
		MS - 1	GA – 3		

Figure 6.1: Survey Response Regional Distribution

Of the 152 agencies that responded to the survey, the vast majority (70 percent) claimed to have developed practices or programs to address the physical barriers faced by riders with disabilities. When asked to list or explain these practices, most agencies mentioned that their fleet of buses or trains are accessible, that their infrastructure was compliant with ADA or FTA requirements, or that they had Dial-a-Ride or Paratransit services to serve the needs of their disabled users. Others had developed more proactive practices to address these issues. Twenty-one programs (13.8 percent) mentioned they had developed strategic programs and have developed specific committees, research teams, and advisory committees to address these issues. Seventeen agencies (11.1 percent) wrote about their worker-training program, while nineteen agencies (12.5 percent) mentioned they had established partnerships with local jurisdictions or private developers.

Agencies were also asked to identify whether they were aware of any prevalent infrastructural barriers to accessible transit stops or stations throughout their service area. Lack of sidewalks was the most common response among agencies; nearly 80 percent of the agencies described this as a major concern. After this, lack of bus shelters or shade and lack of curb cuts or wheelchair accessible ramps were also common responses, as well as broken or cracked sidewalks and unsignalized street crossings or intersections – over half of the agencies identified these barriers to accessing transit in their service areas. Other barriers to accessing transit include inadequate lighting, lack of signage or wayfinding information, utility poles or other barriers on sidewalks, insufficient maintenance, and lack of elevators or escalators. The full breakdown of these barriers to accessible transit stops can be seen below in Figure 6.2.

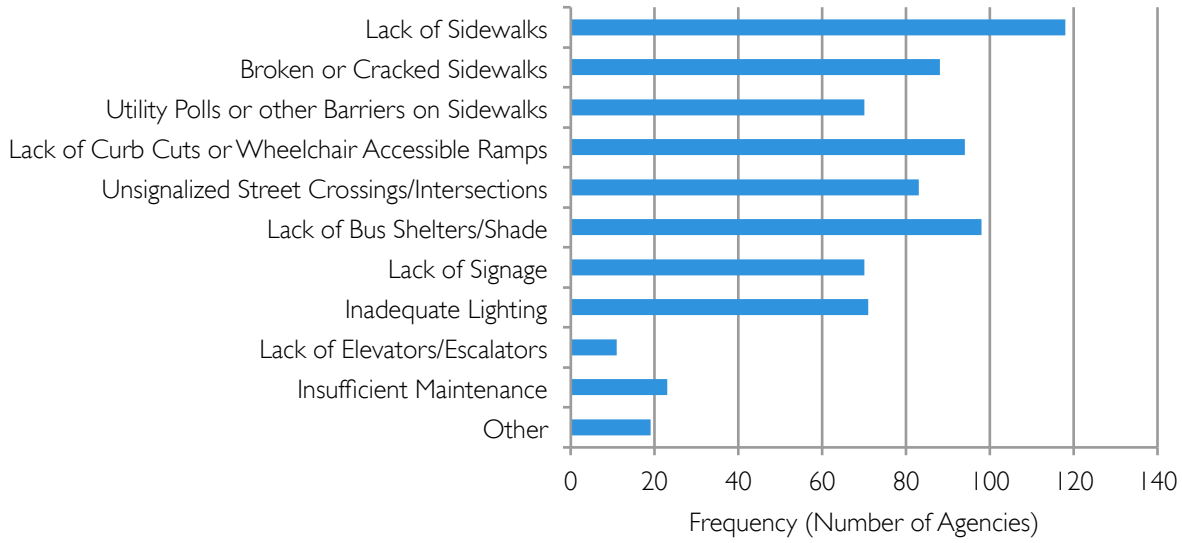


Figure 6.2: Major Barriers to Accessing Transit Stops in Service Area

Agencies were then asked if they had taken any action or performed any measures to specifically address the barriers they listed and once again, the vast majority (74 percent) of agencies stated that they had. When asked to list or explain these measures, their responses were less varied than before. Many agencies (over 33 percent) explained that they had established partnerships with local jurisdictions and agencies. Twenty-six agencies (17 percent) described that they had facilitated or organized infrastructural or construction improvements, and twenty-three agencies (15 percent) again pointed to strategic programs that were developed to address these barriers. Thirteen agencies (8.6 percent) also explained they had established targeted (or set aside) funding to fix these issues, while others also pointed to their paratransit program as a way of addressing the infrastructural issues in their service areas.

Figure 6.3 illustrates the breakdown of the responses that were given when agencies were asked to describe any notable successes resulting from their programs or actions. As seen, improved infrastructure (more stops, bus shelters, accessible sidewalks, etc.) and overall access and ADA compliance were the most common responses. After this, agencies also noted improved

coordination with local jurisdictions and increased ridership by users with disabilities as successes stemming from their programs. A small number of agencies also noted that there was improved customer satisfaction (five), safety and awareness (six), and that they had received financial compensation or grants as a result of implementing their program to address infrastructural barriers to accessing transit (five).

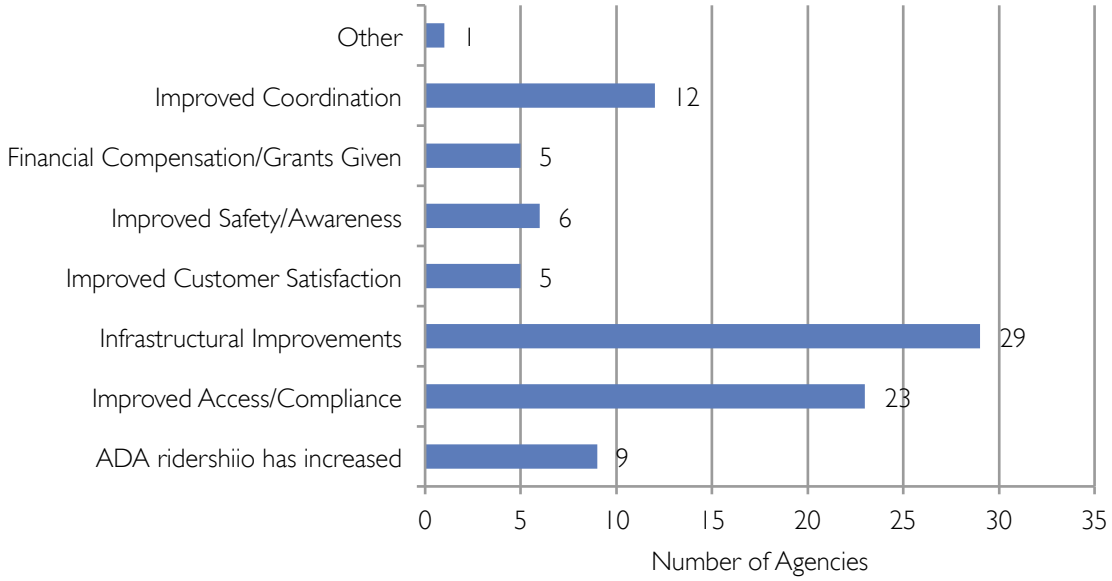


Figure 6.3: Notable Successes that have Resulted from Implemented Measures

It is important to note that many of these successes were not accomplished without their fair share of obstacles. Nearly all the agencies that participated in the survey identified obstacles that prevented or hindered their agency from addressing physical barriers faced by riders with disabilities. Of the 131 agencies that provided a response to this question, most agencies (65 percent), financial or budgeting factors remain as a significant obstacle. This was especially true in smaller agencies as many stated government funding cutbacks had halted all but the most basic repair and maintenance functions. Just over 20 percent of all transit agencies identified bureaucratic or institutional barriers to implementing infrastructural improvements. Specifically,

some mentioned a general disconnect between city planning, city council and their agencies leading to lack of coordination in organizing such programs. Finally, resistance from the public or local businesses (NIMBYism, right-of-way issues, etc.) was another barrier noted by about 11 percent of all agencies (Figure 6.4).

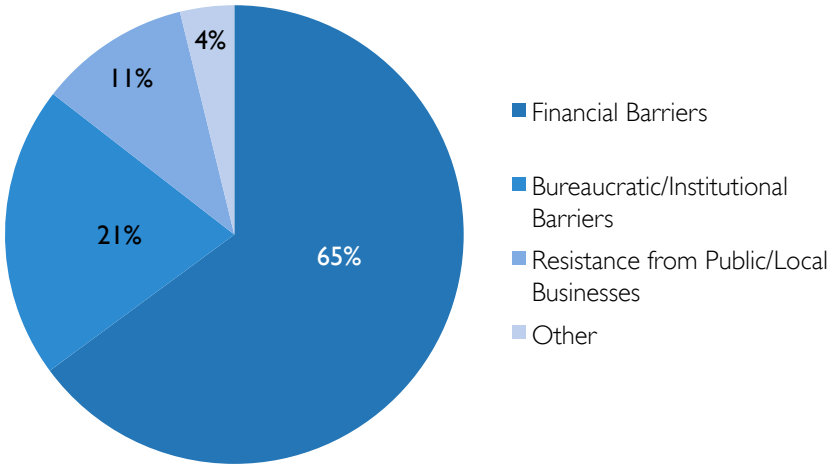


Figure 6.4: Significant Obstacles to Addressing Physical Barriers to Accessible Transit

All in all, while the survey received responses from a broad array of transit agency types and sizes, it was interesting to see the striking similarities among many agencies. First, in terms of obstacles to achieving accessible transit, funding seems to be an almost universal issue. It is possible that this leads to a second major observation: overall, many agencies seemed rather complacent in only providing the minimum required ADA elements (accessible transit options, compliant design standards) and could not seem to point toward particular efforts that surpassed these requirements. As a result, this later facilitated the case study selection process; agencies that *did* make extraordinary efforts in improving accessibility were easy to identify.

A handful of agencies described innovative solutions such as "Adopt-a Stop" or "Bus Stop Improvement Programs" to organize their infrastructural improvement efforts and establish sufficient funding measures (grants, etc.) Such agencies also tended to list program achievements that went beyond meeting the minimum ADA requirements. It was these agencies that wrote about upgrading their stops and pedestrian connections, travel-training courses, enhanced driver's education, and authored pedestrian network analysis to map the gaps in pedestrian infrastructure and locate corridors that need significant work. As a result, such agencies also listed significant achievements upon implementing these programs such as drops in paratransit ridership and increases in lift boarding at bus stops where improvements were made. After going through each of these exemplary survey responses, around eight agencies located in the west stood out as potential case studies. After conducting follow-up phone interviews with these agencies, the model case studies for this project became quite clear. Two agencies (one large and one small) demonstrated a deep understanding of accessibility-related issues and exemplified unique approaches to addressing barriers to accessing transit: TriMet in Portland, Oregon and Link Transit in Wenatchee, Washington.

TRIMET

Portland, Oregon

Centered in a city known across the country and throughout popular culture for its progressive attitude toward social and environmental issues, it comes as little surprise that the Tri-County Metropolitan Transportation District of Oregon (more commonly known as TriMet) would stand out as an exemplary transit system in the United States. This mass transit public agency, operating in a region that spans most of the Portland metropolitan area, boasts a popular reputation among the country's leading transportation agencies, ranking 7th in transit ridership despite Portland being the 24th largest city in the United States in population size. Among many of TriMet's successes in servicing its population, its strategic efforts and programming designed to cater to the needs of the elderly and users with disabilities are what set this agency apart from others. As previously mentioned, upon selecting TriMet as a case study, one of the subsequent tasks was a site visit to Portland to experience some of these features on a first-hand basis. The following chapter discusses some of the system characteristics, as experienced during the site visit, as well as detailed information regarding some of TriMet's accessibility projects and initiatives discussed during an interview with TriMet's manager of Capital Improvements, Mr. Young Park.

1. DEMOGRAPHIC BACKGROUND AND COMMUNITY CHARACTERISTICS

Created in 1969 by the Oregon legislature, TriMet replaced five private bus companies that operated in the counties of Multnomah, Washington, and Clackamas. Today, the agency has an expansive service area covering around 532 square miles (See Appendix D on page 91) with a population size of around 1.5 million. Figure 6.5 below describes past and projected

population growth for the three counties and overall from 2000 to 2030. As demonstrated, Multnomah County (located in the northwestern area of Oregon and primarily comprising the City of Portland) has the highest population of the three counties. When looking at projected U.S. Census population estimates, however, it becomes apparent that both Clackamas County (located just south of Multnomah) and Washington County (located just west of Multnomah) are expected to experience higher population growth.

GEOGRAPHIC BOUNDARY	2000	2010	2030	% CHANGE 2000-2010	% CHANGE 2000-2030
Multnomah County	660,486	735,334	800,565	11%	21%
Clackamas County	338,391	375,992	536,123	11%	58%
Washington County	445,342	529,710	788,162	19%	77%
Tri-County Area	1,444,219	1,641,036	2,124,850	14%	47%
Oregon	3,421,399	3,831,074	4,626,015	12%	35%

Figure 6.5: Tri-County and Regional Area Total Population
Source: U.S. Census, SF1 (2000, 2010); 2012 Coordinated Transportation Plan for Elderly and Disabled, TriMet

Considering this report is studying TriMet's accessibility efforts, data was also collected with regard to the elderly and disabled population as a means of better understanding the existing demographic condition of the population that could most benefit from those accessibility efforts. With regard to the elderly (or the 65+ population), demographic data for all counties within the state of Oregon seem to be consistent with similar trends throughout the United States, illustrating that the elderly are a significant and growing population group. According to 2010 census data, 11 percent of the Tri-County Area population is 65 years of age or older. While this is slightly below the state and national average of 13 percent, tremendous growth is observed in the 2030 projection where it is expected the elderly population will experience a 97

percent change. Most notably, the most drastic growth in the elderly population is expected to occur within Washington County where the percent change is projected to be around 123 percent (See Figure 6.6 for more details).

GEOGRAPHIC BOUNDARY	65 OR OLDER (2010)		65 OR OLDER (2030)		% CHANGE 2010-2030
	number	percent	number	percent	
Multnomah County	77,423	11%	143,992	18%	86%
Clackamas County	51,231	14%	94,945	18%	85%
Washington County	53,109	10%	118,607	15%	123%
Tri-County Area	181,763	11%	2,124,850	14%	47%
Oregon	438,177	13%	4,626,015	12%	35%

Figure 6.6: Tri-County and Regional Area Elderly (65+) Population
Source: U.S. Census, SF1 (2000, 2010); 2012 Coordinated Transportation Plan for Elderly and Disabled, TriMet

According to the U.S. Census bureau, the term disability is defined as a "long-lasting physical, mental, or emotional condition" and can make certain activities such as walking, climbing stairs, bathing, or learning difficult. Census data regarding disability is organized into six categories: sensory, physical, mental, self-care, go-outside-home, and employment. Across all categories, mobility issues are often among the most significant impediments for individuals with disabilities. For many, inability to independently transport themselves to work or other activities makes them largely reliant on public transportation. Figure 6.7 below shows census data for all six disability categories in the three counties within TriMet's service area as well as the entire State of Oregon. Similar to the figures describing the elderly population, it is estimated that people with disabilities also make up about 11 percent of the entire Tri-County area population. This is slightly below the state percentage of 13 percent.

GEOGRAPHIC BOUNDARY	POPULATION WITH DISABILITIES	
	number	percent
Multnomah County	82,350	11%
Clackamas County	42,224	11%
Washington County	48,928	9%
Tri-County Area	173,502	11%
Oregon	505,869	13%

Figure 6.7: Tri-County and Regional Area Population with Disabilities
Source: 2010 ACS 3 year estimate; 2012 Coordinated Transportation Plan for Elderly and Disabled, TriMet

2. TRIMET TRANSPORTATION SYSTEM OVERVIEW

While TriMet's transportation system began with the bus, over the years it has evolved to encompass a wide system of services including the MAX light rail system, WES commuter rail, and LIFT paratransit. Additionally, TriMet also operates the City of Portland-owned Portland Streetcar system. Combined, these services provide a complete and convenient transit system connecting residents and visitors with the community. TriMet buses serve much of the Portland metro area and include bus lines that connect with MAX, WES, and the Portland Streetcar. Currently, TriMet operates around 600 buses running along 79 bus lines with a total of 6,742 bus stops. Ridership for the 2013 fiscal year was reported to be nearly 60 million trips. Additionally, TriMet's MAX light rail system connects the Downtown Portland area to several surrounding communities including Beaverton, Clackamas, Gresham, Hillsboro, and the Portland International Airport. There are 4 MAX lines and 87 stations; the light rail ridership for the 2013 fiscal year was around 39 million trips. The newer WES commuter rail system (opened in 2009) travels on existing freight tracks to provide the cities of Beaverton, Tigard, Tualatin and Wilsonville with weekday rush-hour service and has five stations. Ridership for the 2013 fiscal year was 440,000 trips. Lastly, TriMet's LIFT paratransit service provides an alternative to users

with disabilities unable to ride regular buses or transit. There are 253 LIFT buses and 15 LIFT vans in TriMet's fleet and paratransit ridership for the 2013 fiscal year was estimated to be around 1 million trips. See Figures 6.8 and 6.9 below for a summary of TriMet's transportation system characteristics and fares. (TriMet At-a-Glance, 2014)

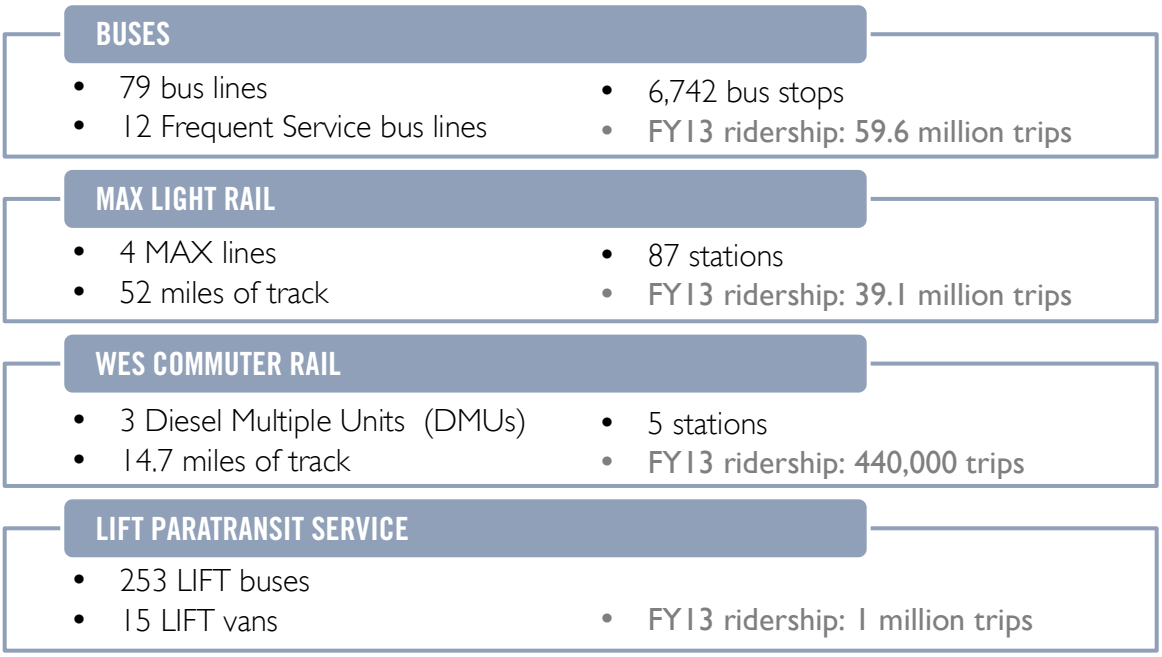


Figure 6.8: Summary of TriMet's Transportation System
Source: 2014 "TriMet At-a-Glance"

	2-HOUR TICKET	1-DAY PASS	
Adult	$2.50	$5.00	*Fares are Valid for travel on any combination of buses, MAX Light Rail, WES Commuter Rail, & Portland Street Car.*
Honored Citizen	$1.00	$2.00	
Youth	$1.65	$3.30	
LIFT	$2.45	–	

Figure 6.9: TriMet Fares Breakdown
Source: 2014 "TriMet At-a-Glance"

Accessibility Features & Mobility Management Systems

Accessibility features are fully integrated within the TriMet transportation system, cater to a wide variety of user needs, and are designed to create safety and convenience for *all* users. For those with limited mobility, all buses, trains, transit centers and stations are fully accessible to people using mobility devices. For those who are blind or have low vision, accommodations such as texturized tiles along platform edges exist along all MAX and WES stations, braille/raised-letter signage exists throughout most transit stops, and most systems are equipped with automatic audio announcements of stops. Finally, for the deaf or hard of hearing, digital displays with real-time arrival information can be found throughout several bus stops and transit stations, reader boards with route information are located within most trains and buses, and light-up displays are found inside nearly all modes of public transit indicating when a stop has been requested (TriMet Accessibility, 2014). To further encourage seniors and people with disabilities to use transit, TriMet has an "Honored Citizen" reduced rate for seniors age 65 or older, people on Medicare, and people with a mental or physical disability (TriMet At-a-Glance, 2014).

Figure 6.10: TriMet's Accessibility Features Examples – Digital Displays and Texturized Tiles
Source: Author

While many of these features have now become "standard practice" for transit agencies, a feature more unique to TriMet is that of its "Travel Training" system. Created in partnership with Ride Connection, a non-profit community service operation, travel training allows seniors and people with disabilities the opportunity to learn how to use public transportation to travel independently. Provided at no charge for qualified individuals living in the Tri-County area, users can participate in either group or one-on-one travel training provided by a qualified "travel instructor". For those who are still unable to utilize fixed-route transit, TriMet also provides their LIFT paratransit service, neighborhood shuttles, and medical transportation for low-income Oregon Health Plan Plus[2] members who need rides to medical appointments and have no other transportation options available. (MTM, 2013)

3. RELATED PROJECTS AND INITIATIVES

Apart from TriMet's impressive array of accessibility features and mobility management systems designed to accommodate users while *riding* transit, the agency's holistic approach to accessibility has also led them to create a series of projects and initiatives that enhance walkability and access *to* the transit stations. Particularly relevant to this study, TriMet's "Coordinated Transportation Plan for the Elderly and Disabled", Pedestrian Network Analysis project, and Bus Stop Improvement Program all address infrastructural barriers that might pose as obstacles to using transit for riders with disabilities.

[2] The Oregon Health Plan (OHP) provides health care coverage to low-income Oregonians through programs administered by the Division of Medical Assistance Programs (DMAP).

Coordinated Transportation Plan for the Elderly and Disabled

First, the "Coordinated Transportation Plan for the Elderly and Disabled" or "CTP" incorporates the agency's overarching vision in relation to issues dealing with accessibility. The plan was designed to accomplish a wide assortment of goals including: guiding transportation investments toward providing a full range of options for the elderly and people with disabilities, fostering independent and productive lives, strengthening community connections, and striving for continual improvement of services through coordination, innovation, and community involvement. The document was first created in 2006 in anticipation of the growing demand for accessible transit (as demonstrated through demographic projections) and was most recently updated in 2012 as a result of a series of meetings between transportation providers and sponsors (including the Special Transportation Fund Advisory Committee, staff representing the County Aging and Disability agencies, and TriMet) to assess additional population needs. As a result, meeting participants were asked to confirm whether a preliminary list of potential transportation needs was accurate, whether there were additional needs that needed to be addressed, and to list which of those issues were the most urgent. Common infrastructural issues that were addressed included gaps in sidewalks or difficult crosswalks, security and lighting issues, and a lack of seats or shelters at bus stops. (TriMet, CTP, 2012)

During the meetings, explicit concern was raised over the need for improvements in the paths of travel leading to the bus stops or rail stations, especially in the lower-income suburban areas surrounding downtown Portland. In response to these infrastructural concerns, the CTP sets forth the following strategic initiatives:

- Encourage the use of fixed-route transit: Particular strategies with regard to this include the implementation of trip screening and path of travel review (achieved by

the previously mentioned "Travel Training" ADA paratransit eligibility process for new applicants), bus stop improvements, paratransit feeder services (for customers who are able to use fixed-route transit but have difficulty accessing nearest bus stops), and route deviation (only after pre-scheduled requests.)

- Enhance pedestrian access: The CTP encourages jurisdictions with the tri-county area to take advantage of the basic human desire to be self-reliant and healthy by making communities more pedestrian-friendly for elderly and disabled populations. Additionally, it sets forth a series of actions that can be taken to address safety and security concerns at transit facilities including improved lighting/visibility, improved communications with transit security personnel, and provision of provide public information on transit and security.

To further promote a wholly accessible and efficient system, the CTP also addresses other common barriers to accessing transit by proposing the following:

- Promote coordination among service providers: This includes detailed measures addressing everything from coordinating with private sector transportation services to non-profit organizations and medical facilities and making use of online reservation services to establish open and transparent networks to allow for coordination.
- Improved Information and referral/program outreach: TriMet understands that advertising their accessibility options to the public is oftentimes just as important as developing those programs in the first place. Consequently, their information and program outreach measures include information distribution strategies and increasing outreach to both the public and policymakers.

Overall, the CTP clearly demonstrates TriMet's serious dedication toward improving accessibility for the elderly and disabled populations. By clearly and effectively stating its position toward meeting the needs of these populations, it creates the framework for a system of programs, projects, and strategies that all contribute toward making advances in creating accessible transit. (TriMet, CTP, 2012)

Pedestrian Network Analysis

While the CTP provides an overarching framework by which TriMet approaches accessibility issues, the Pedestrian Network Analysis project provides an example by which TriMet uses advanced data analysis methods to facilitate the programming of their improvement measures. In this project, TriMet and its regional partners worked together to develop an objective and quantifiable model by which to prioritize places with the greatest *need* for infrastructure improvements and the greatest *potential effect* based on existing usage. It was a large project intended to meet a wide variety of TriMet's CTP goals and objectives by means of prioritizing safety, increasing rider independence, and reducing the need for paratransit (which, at the time of the project's inception in 2012, cost around $29 per ride). (TriMet, Pedestrian Network Analysis Project Overview, 2012)

By means of this project, TriMet identified sixty-six clusters of stops, encompassing roughly 600 stops, as high need/high opportunity areas. Based off of this data, TriMet and its partners then chose ten key focus areas on which to place their attention first. Figure 6.11 below lists each of these cluster areas as well as a corresponding map demonstrating that the majority of the clusters are outside the downtown core in the peripheral counties.

	JURISDICTION	TRANSIT AREA
1	City of Beaverton	SW Farmington Rd. & SW Murray Blvd.
2	Clackamas County	Clackamas Town Center Transit Center
3	City of Gresham	SE Division St. & SE 182nd Ave.
4	City of Hillsboro	Tanasbourne Town Center
5	City of Oregon City	Clackamas County Red Solis Campus
6	City of Portland	SE Division St. & SE 122nd Ave.
7	City of Portland	SE Powel Blvd. & SE 82nd Ave.
8	City of Portland	Hillsdale
9	City of Tigard	Tigard Transit Center
10	Washington County	SW Beaverton-Hillsdale Hwy. & SW Scholls Ferry Rd.

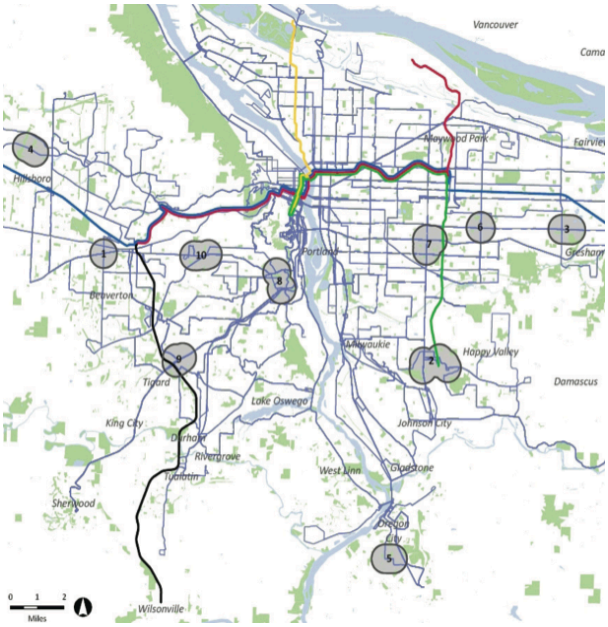


Figure 6.11: Pedestrian Network Analysis Project's Ten Focus Areas
Source: 2012 "TriMet Pedestrian Network Analysis Project Overview"

Bus Stop Improvement Program

Finally, after setting forth their broad goals and objectives in a transportation plan and formulating a systematic approach to identifying prime locations for improvements, TriMet's Bus Stop Improvement Program is designed to *implement* those infrastructural and design improvements at the ground level. First, whether developing an entirely new bus stop or refurbishing an existing bus stop, TriMet begins by consulting its "Bus Stop Design Guidelines." Last updated in 2010, this document identifies the elements of the TriMet bus stops, sets guidelines for the design of the stop and the placement of its amenities, and describes the process for managing and developing bus stops at TriMet. Once again, this document also illustrates the strong emphasis this agency places on bus stop access and infrastructure, and this is perhaps best demonstrated by the document's opening words, that state; "The public's first impression of TriMet and its services is the bus stop. It is important that bus stops are easily identifiable, safe,

accessible, and a comfortable place to wait for the bus" (TriMet, Bus Stop Design Guidelines, 2010, p. i).

With these clear intentions set in place, TriMet has had a number of successes in improving the physical conditions of a large number of bus stops. The details of these capital improvements initiated as a result of their Bus Stop Improvement Program are detailed in the later section of the Bus Stop Design Guidelines document, including the following:

- On-street transit facilities development: Focusing on improving pedestrian safety, TriMet improved infrastructural conditions at ten sites (as of July of 2012), integrating sidewalk and bus stop ADA improvements.
- Bus shelter expansion: Initiated in the year 2000 with the primary goal of improving patron comfort at bus stops currently lacking shelter, TriMet has placed around 100 new bus shelters and plans to continue until 500 new shelters have been placed.
- Security lighting at bus shelter and stops: Beginning in the year 2004, TriMet installed around 100 solar LED lights onto bus shelters on TV Highway, Barbur Boulevard, and Powell Boulevard and approached installations in around 320 shelter sites and 30 bus stops in 2012.
- Bus stop sign & pole replacement with customer information displays: Created as a part of a larger branding measure, TriMet's older bus stop signs and poles were replaced with new two-sided bus stop signs and poles to distinguish bus stop identity and place and allowing riders to have quick access to real-time arrivals through TransitTracker by phone.

Further accomplishments achieved by these measures are exemplified in their Line 57-Tualatin Valley (TV) Highway/Forest Grove Pedestrian Improvement Project; a project initiated in 2009 and designed to improve bus stop and pedestrian infrastructure along the transit corridor. The following section describes this case study in detail. Information for the case study came primarily through on-site observations and interviews with TriMet's Capital Projects Manager, Mr. Young Park.

4. CASE STUDY: LINE 57-TV HIGHWAY/FOREST GROVE PEDESTRIAN IMPROVEMENT PROJECT

At first impression, visiting the TV Highway feels much like visiting any suburban commercial corridor in the United States. Two lanes run in either direction and are lined with commercial-only land uses (auto dealerships, old 'strip shopping centers' with large parking lots, etc.) and the urban form is overwhelmingly automobile-oriented; sidewalks are long, intersections are widely dispersed, and cars consistently travel at considerably high speeds (the average speed limit is around 40 mph.) Put simply, it is not an area that attracts very much pedestrian activity. Just beyond the block or two of commercially designated land uses running along either side of the highway, however, on discovers high-density residential areas largely populated by lower income, transit dependent populations, including that of a largely Hispanic population. It was these characteristics that made this an area of interest for TriMet.

Line 57 is located to the west of the City of Portland connecting the suburban city of Beaverton, through Hillsboro, to Forest Grove (See Figure 6.12.) Flanking one end of the route is the Beaverton Transit Center, a newly refurbished transit hub serviced by WES commuter rail, MAX light rail Red and Blue Lines, and many buses. Additionally, the transit center features a large Bike & Ride bicycle shed for transit users to securely store their bikes. With its state-of-the-

art facilities and new upgrades, it comes as no surprise that this is the busiest transit center in TriMet's system. Bus line 57 is a frequent service line extending westward from the Beaverton Transit Center with a headway time averaging between fifteen and twenty minutes on weekdays and twenty to thirty minutes on weekends. Line 57 has consistently been among the top ten busiest bus lines within the TriMet system with an average of around 50,000 rides per week (trimet.org). Back in 2008, it was these high ridership averages, paired with a considerable need for infrastructural improvements (lack of sidewalks, bus shelters, etc.) that prompted TriMet to participate in the development of the TV Highway Corridor Plan (TVCP) in partnership with the Oregon Department of Transportation (ODOT).

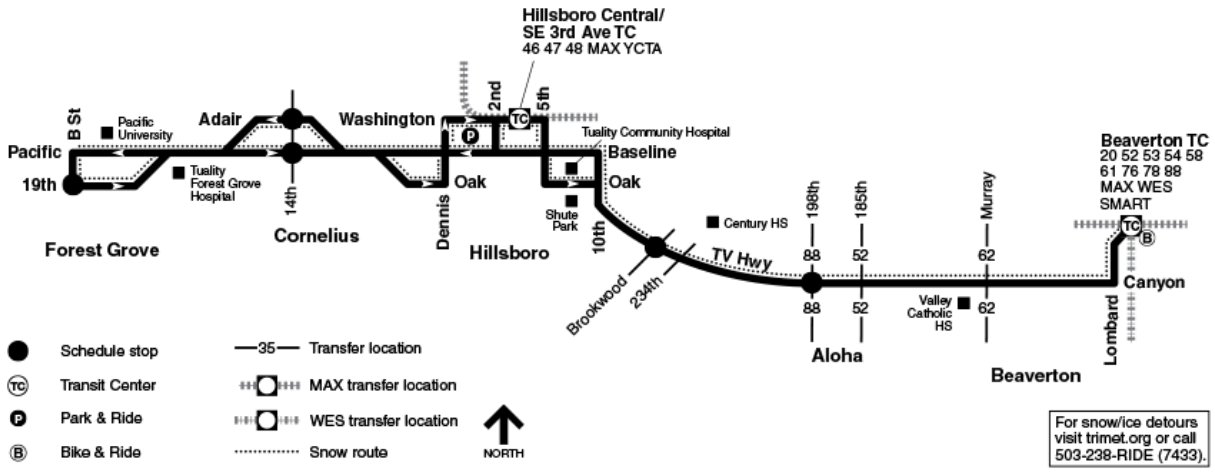


Figure 6.12: Line 57-TV Highway/Forest Grove Route
Source: trimet.org

According to Young Park, TriMet was able to secure a grant of around $700,000 through the ODOT to improve bus stop conditions and pedestrian access infrastructure along the TV Highway. The Line 57-TV Highway/Forest Grove Pedestrian Improvement Project was initiated in 2009 and upon the project's completion, TriMet was able to create around $500,000 worth of infrastructural improvements at a total of 17 bus stops and surrounding pathways

resulting in increased pedestrian safety and comfort. Most encouraging in terms of accessibility for riders with disabilities, the bus stops with infrastructural improvements have experienced an increase in ADA ridership as well as an overall decrease in paratransit demand. (Y. Park, personal communication, February 21, 2014)

The Planning Process

In keeping with TriMet's holistic approach to addressing transportation issues, this project fits within the framework of several of the agency's programs and broader plans. As explained by Park, the project falls under the operating strategies of their Bus Stop Improvement program and is consistent to their overall vision and strategic initiatives outlined in the Coordinated Transportation Plan for the Elderly and Disabled including those of encouraging the use of fixed-route transit and enhancing pedestrian access and walkability. Apart from this, however, Park emphasized that one of the major aspects of this project that makes it a success is the manner in which they were able to coordinate with surrounding jurisdictions and allow them to also take ownership of the project, "It isn't something that TriMet is trying to do on our own," he exclaimed, "we are constantly working with everyone, together" (personal communication, February 21, 2014).

Teamwork was undoubtedly a defining feature of this project. Upon its initiation, the TV Highway Pedestrian Access Work Group, a team of consultants and TriMet and ODOT representatives, began to closely evaluate infrastructural conditions and facilities along the corridor and identified and prioritized areas in most need of improvements. As described by Park (and evidenced in Figure 6.13), "The sidewalk connectivity here was dismal, at best. There were sidewalks that were poor in quality and were far too narrow or nonexistent" (personal

communication, February 21, 2014). Upon evaluation, the team identified around 43 highway crossings and 17 bus stops that were ranked as poor or very poor in terms of their safety or accessibility and outlined a series of measures that could be taken to improve their physical conditions. Among the outlined measures was the inclusion of amenities (shelters, seating, trash cans, lighting, digital displays, etc.) improving curb cuts and sidewalk conditions, and designing safer crosswalks. (Y. Park, personal communication, February 21, 2014)

Figure 6.13: SW Oak & 17th – Before and After Line 57-TV Highway Improvements
Source: Young Park, TriMet

After identifying the bus stops in need of improvement, a similar teamwork method is carried on during the planning process and to implement those changes. Being the only public transit provider within the expansive tri-county area, the agency benefits from having established a firm and efficient working relationship with the twenty-six jurisdictions within its area of service. As explained during the interview, it is usually a combination of the local jurisdictions and TriMet that leads the planning process, with local jurisdictions leading the planning of the regional streetscape (Y. Park, personal communication, February 21, 2014). At the more site-specific project levels, TriMet usually takes command, leading the efforts in notifying adjacent businesses and homeowners (via letters sent at least two weeks in advance) and ultimately

determining where bus stops should be installed and the type of necessary physical improvements. This can, to a large extent, be attributed to the leverage TriMet has in tapping into grant resources and a "very robust funding intake" to make these improvements. This is a responsibility TriMet does not carry lightly. As Park put it,

> "TriMet, in our case, is a little more unique than other systems that I know. In those systems, the local jurisdictions has complete ownership of the bus stop leaving transit agencies at their mercy in terms of the permitting for everything including the bus stop sign pole, the shelter, or the design of the shelter. Here at TriMet, we are the one transit system in the region and our vision has always been that the bus stops are our responsibility. We are concerned for the whole process and our mission is to serve the community. Some jurisdictions might be threatened by this but for the most part, all of the jurisdictions we serve are on board" (personal communication, February 21, 2014).

Evidence of the good-natured partnerships TriMet has been able to establish with local municipalities is demonstrated when observing the efficiency in the average time frame it takes to approve their bus stop improvement projects. According to Park, an individual bus stop improvement can be implemented in a matter of three months from the time it is identified and then designed. "[The City of Portland has] committed a big portion of their staff resources (around 25 percent) toward focusing on TriMet-related projects," says Park (personal communication, February 21, 2014). With a well functioning inter-governmental agreement system set in place with the City of Portland, TriMet accumulates proposals and designs for around five to six locations before turning it over to the city to get all the necessary permits. After notifying all the businesses and stakeholders of the proposed changes, the city, itself takes charge of providing the manpower and managing the construction process with TriMet providing for a significant amount of funding while also serving the role as consultant and final inspector. As a result, this allows TriMet to streamline the process, completing the improvement within three months as opposed to a year (which is the norm for many other transit agencies).

This streamlined timeline process also occurred in the development of the TV Highway project but due to the fact that this was a larger project, involving sixteen to seventeen bus stops, it took TriMet about one year to put all the plans together, commission a design, and get approval from all the affected jurisdictions. When asked about the stakeholders involved in bus stop improvement projects, Park identified the typical participants for these sorts of projects including local jurisdictions, local businesses, surrounding communities, neighborhood associations, and bicycle coalitions. Also an active participant in many of TriMet's projects, and especially those related to issues of accessibility, is its standing committee, Citizens for Accessible Transportation (CAT). Established in 1985 and comprised of fifteen representatives of the larger elderly and disabled population, TriMet checks in with this group regularly, informing them of upcoming projects and receiving feedback on issues they would like to have addressed. "They are an important ally as well as a helpful checks-and-balances tool for TriMet and our programs," says Park, "the partnership works really well to leverage what we do and gives them a sense of ownership in the improvements that are accomplished" (personal communication, February 21, 2014). He further reported that while CAT was very supportive of the TV Highway improvement project, it was not directly involved throughout the planning or implementation process.

Instead, more specific to this project were the unique methods used to conduct community-outreach and encourage public support. Due to the large scope of this project, TriMet paired its launching with significant promotions and improvements on the *service* side of Line 57. Specifically, TriMet was able to foster increased community support by upgrading Line 57 to a frequent service line with a fifteen-minute headway time on weekdays. In doing so, all public outreach and communication efforts (website announcement, public notices, etc.)

described the project as a "complete package" upgrade (Y. Park, personal communication, February 21, 2014).

TriMet is not immune to challenges arising in the process because of NIMBYism, however, Park described pushback from neighbors as a common occurrence, most often in instances where the agency is establishing a brand new stop or routes in close vicinity to an individual's home or business. Despite this, the agency can find comfort in its considerably high approval rating in the region. Based on their 2013 "Attitude and Awareness Survey," it was reported that three-quarters of all TriMet riders approve of the work TriMet is doing across the region, claiming, above other things, good service and good coverage (TriMet, Attitude and Awareness Survey, 2013). "I think everybody knows we are here to serve the community," says Park, "It's part of our mission, if we need to place a stop in a certain place we are going to be pretty adamant that that happens. At the same time we are somewhat flexible to make sure that stop is not outside someone's *front door*, but regardless, we always try to do what's right on a bigger scale" (personal communication, February 21, 2014).

Project Costs and Funding

As demonstrated in the nationwide survey conducted for this study, approximately 65 percent of survey participants indicated financial barriers as a significant obstacle to addressing infrastructural barriers to accessible transit. According to TCRP Report B-40, grant funds paid for the majority of the infrastructural improvements for the *entire* Line 57-TV Highway/Forest Grove Pedestrian Improvement Project were paid for using grant funds, which totaled to $512,167 ($417,415 in construction costs and $94,752 in shelter amenity costs). In the case of TriMet, the agency has been able to drastically reduce costs thanks to its aforementioned inter-governmental agreement with the City of Portland (TCRP, 2013). By sending jobs over to the

City directly and having their in-house crews take charge of the construction, TriMet reduces the man-hours required in getting a project permitted and constructed through a contractor and is able to virtually cut the cost in half. With regard to the TV Highway improvements, TriMet covered the costs of the concrete and other materials while the City took responsibility for the labor. In one instance, Park reported sidewalk construction costs totaling to just under $4,000 for an improvement that would normally cost about $20,000 (Y. Park, personal communication, February 21, 2014).

As for maintenance costs, long-term sidewalk maintenance is the responsibility of the local jurisdiction or a neighboring business owner. However, TriMet does make a pronounced effort in ensuring proper construction the first time around so that the improvement has at minimum a ten to twenty year life span. The maintenance of amenities and bus shelters is TriMet's responsibility, and by employing locally manufactured street furniture and recycling techniques, the agency has been able to keep maintenance costs at no more than a few hundred dollars per year. One such example in cost savings is the method by which TriMet recycles bus shelter glass panels. According to TriMet's website, each year, about 750 panels are scratched and etched upon by vandals. While normal glass panels would cost around $200 to replace, TriMet removes the vandalized glass, sandblasts it with an artist-designed pattern, and reinstalls it where needed (See Figure 6.14). The sandblasting method not only removes the scratches and replaces them with aesthetically pleasing (and locally commissioned) artwork, but also costs under $20 saving TriMet an estimated $100,000 per year (www.trimet.org).

Figure 6.14: TriMet's Bus Shelter Art
Source: Author

Interestingly, while funding resources were a main concern for transit agencies across the country, they are less of a concern for TriMet. This can be attributed to the agency's several funding sources. Figure 6.15 illustrates the breakdown of the agency's FY14 budget operating revenues and expenses, indicating payroll taxes as the major source of funding and operation costs as the primary expense. Funding specific to projects created to enhance services for the elderly and the disabled, however, often comes primarily from two sources: the State Special Transportation Fund program and various grants. First, in terms of State funding, TriMet's Coordinated Transportation Plan for the Elderly and People with Disabilities (2012) states that the "TriMet STF area receives approximately $13.5 million in STF formula and discretionary funds a biennium" (p. 7-2). For the past five years, these funds have played an important role in supporting innovative services such as TriMet's Ride Connection/RideWise paratransit eligibility program.

Understanding the limitations of this flat resource, however, TriMet has also taken an active approach toward seeking other sources of grant funding. More recently, TriMet joined forces with various jurisdictions in applying for a series of grants. They were awarded three

separate grants, which, according to Park total to around $6 million dedicated solely to physical improvements for the FY 16-19 cycle (personal communication, February 21, 2014). Upon asking Park why he believed TriMet has been so successful in overcoming financial barriers to providing accessible transit, his response tied back to the agency's partnerships with local jurisdictions:

> "For me, the reason why our agency is different is the time we save on our short construction. Funding is the least of my worries, especially when we can get surrounding jurisdictions involved. They already have the tools and the skills. When we are able to have them act as our contractors, then I can just put the plans together, transfer it over, and get twenty of these improvements built in the time it would normally take to build one" (personal communication, February 21, 2014).

In other words, TriMet's success in raising funds for their projects is not only attributed to their ability to secure grants, but can also be tied to project management and their effective ability to cut costs.

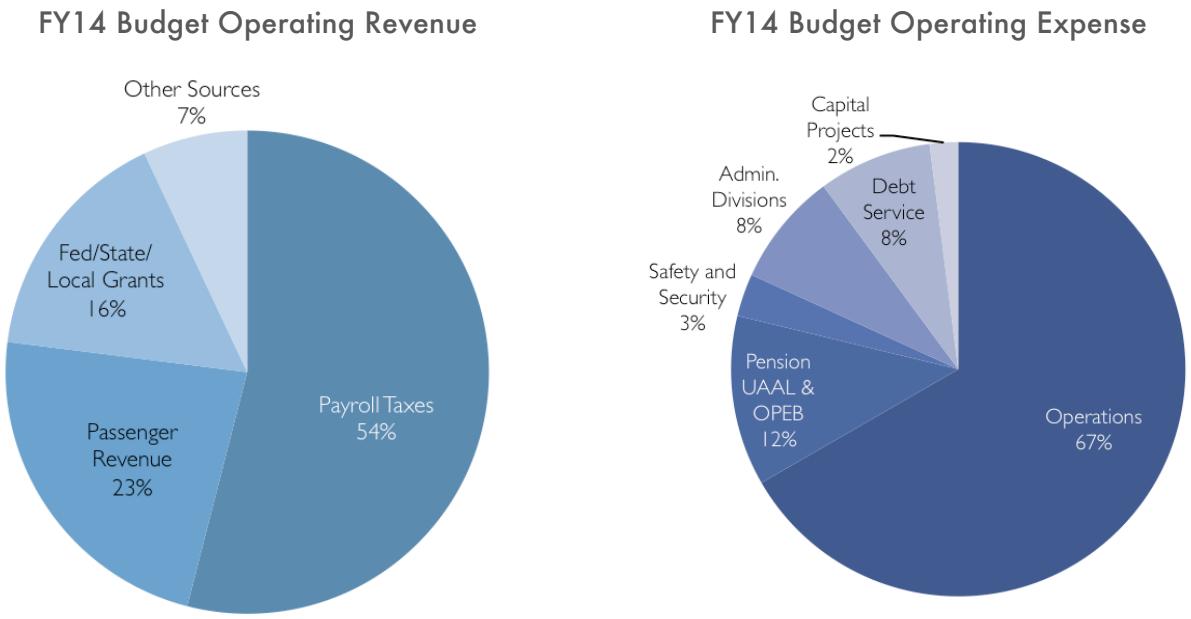


Figure 6.15: TriMet FY14 Budget Operating Revenue and Expense Breakdown
Source: 2014 "TriMet At-a-Glance"

Design Innovations

For the implementation of the TV Highway/Forest Grove Pedestrian Improvement Project, particular attention was placed on the technological and physical design innovations that make TriMet's transit stops unique. First, with regard to the transit stop infrastructure, Park described the agency's more recent practice of placing guards, or two to three inch thick pieces of plastic, that they attach to the stop's curb or concrete edge (personal communication, February 21, 2014). As a result, both bus tires and the sidewalk, itself, are protected from damage when a driver is pulling up to a stop, and the agency is able to save on maintenance costs in the long run. Additionally, as was previously mentioned, TriMet's emphasis on improving brand identity and wayfinding led to an upgrade of bus stop signs and poles. As a result of this upgrade, TriMet's bus stop poles are now designed in a way that makes them octagonal in shape, lending to the placement of their two-sided signs to be fixed at any angle providing for maximum visibility. In terms of seating, the agency has been able to provide options in areas with limited space while still allowing for ADA sidewalk width requirements. This was accomplished through the adoption of the use of Simme seats, two individual seats attached to the bus stop pole, itself, and locally produced in Eugene, Oregon. By having the octagonal shaped pole, bus stop designers are able to position the seat so that it can fit in any angle. This feature was noticed in several Line 57 stops that were too small to allow for the placement of a bus shelter and seemed to be well-used by transit riders. As seen in Figure 6.16, the perpendicular positioning of the seating does not remove much space from the main sidewalk right-of-way and allows for uninhibited use of the pathway.

Figure 6.16: TriMet's Simme Seating in Action
Source: Author

Second, with regard to information and safety, TriMet makes a pronounced effort to remain in the vanguard of technological advancements. Park described that in response to the ubiquity of smart phone ownership, TriMet has developed applications that allow you to pay your fare on your mobile and easily access real time information on arrival times (personal communication, February 21, 2014). Additionally, some bus stops are equipped with signaling devices, a blinking light that can be activated at the push of a button to inform an approaching bus driver that a rider is at the stop. This is a particularly useful feature during late evening hours or in poorly lit areas.

Implementation Challenges

While there is little doubt of the TV Highway/Forest Grove Pedestrian Improvement Project's success in terms of incorporating many of the agency's design innovations, the project's implementation was not without its fair share of challenges. As previously discussed, funding and cooperation from local jurisdictions did not serve as major barriers for the implementation of this

project. Instead, more notable challenges were associated with the existing geography and transportation characteristics of Line 57, itself. For example, the TV highway runs alongside an active freight railroad in several locations. According to Park, this created several complications including right-of-way and safety issues. Eventually, agreements were formed with the railroad company, and TriMet was able to construct ADA adequate landing pads in areas encroaching upon the rail right-of-way. In response to safety concerns, proximity issues with the railroad in certain areas were ameliorated with fencing. The high traffic speeds along the TV highway posed another significant challenge, and additional measures had to be taken to ensure that street crossings would be safe and effective. Mr. Park noted that some other challenges continue to exist, particularly in some instances where gaps in the pedestrian network remain or where obstacles were too great to fit within the scope or timeline of the project. In these instances, it is hoped that the project can serve as a catalyst and encourage local jurisdictions or nearby business owners to invest in making the necessary changes. (Y. Park, personal communication, February 21, 2014)

Project Evaluation

There is no denying that the infrastructural barriers TriMet and its partners were able to address along the TV highway are extremely impressive. In visiting several of the improved bus stops and their seamless integration into their surroundings, it was difficult to believe that broken and cracked sidewalks, unkempt landscaping, a lack of curb cuts, and dangerous pedestrian crosswalks all characterized the highway only a few years ago. Instead, most sidewalks are clean, and landscaping elements and bus stop amenities exist where they were once absent. Because of this, I was particularly interested in the public response to the project's results. Park explained that public feedback was always welcome but in terms of actively seeking acknowledgement for

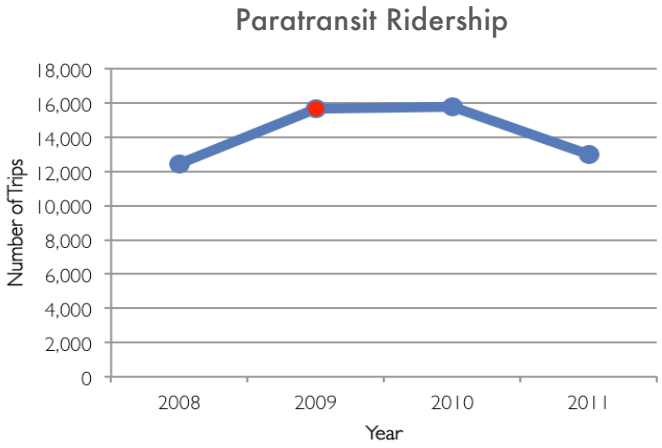
their efforts, that was another story. "That's not our mission," explained Park, "our mission is to target improvements that we know are going to have a major impact and the ridership numbers are our reward. If we see a jump or a spike in the numbers and see happier customers waiting at the bus stop, then we know we've done our job" (personal communication, February 21, 2014).

Unsurprisingly, the ridership 'numbers' at each of the seventeen improved bus stops thus far have been encouraging. Advanced data tracking technology installed in TriMet's fixed-route fleet collects passenger activity data for each stop including boarding, exit, and lift or ramp deployment. Figure 6.17 below presents a snapshot of weekday boardings ('ons') and lift deployment figures for all seventeen improved bus stops recorded between fall of 2008 (prior to the implementation of the improvements) and fall of 2011. As shown, figures for the number of bus boardings fluctuated slightly at first (dropping 1.32 percent soon after the improvements were implemented and later stabilized, resulting in an overall 9.5 percent increase in boardings from 2008 to 2011. More impressive were the changes in ridership for transit riders with disabilities. Lift/ramp deployments before and immediately after the infrastructure improvements increased an overwhelming 96 percent. While percentage growth was not as dramatic in subsequent years, figures consistently grew between around two and six percent. In comparing 2008 to 2011 figures, the number of lift or ramp deployments in busses grew about 112% indicating that the infrastructure improvements greatly impacted the transportation patterns of riders with disabilities and enabled many individuals to begin using fixed-use transit.

	FALL 2008	FALL 2009	FALL 2010	FALL 2011	% CHANGE 2008-2009	% CHANGE 2009-2010	% CHANGE 2010-2011	% CHANGE 2008-2011
Boardings	1137	1122	1177	1245	-1.3%	4.9%	5.8%	9.5%
Lift/Ramp Deployment	172	337	343	364	95.9%	1.8%	6.1%	111.6%

Figure 6.17: Fixed Route Ridership 2008-2011
Source: TriMet, Personal Communication

Further corroborating this observation, yearly paratransit ridership data taken along the Line 57 line from 2008-2011 illustrates that while there has been an overall increase in paratransit trips taken, the rate at which the demand for paratransit has grown significantly decreased once the infrastructure improvements were implemented. Prior to the TV Highway Pedestrian Improvement Project, the number of paratransit trips increased around 26% from 2008-2009. Once the infrastructural improvements were completed, the percent increase in number of paratransit shifts dropped to under 1%. More recently, the number of paratransit trips between 2010 and 2011 *decreased* by 17%.



Note: Figures represent annual data for the areas near Line 57. Infrastructural improvements were constructed during the summer of 2009 (indicated in red.)

	2008	2009	2010	2011	% CHANGE 2008-2009	% CHANGE 2009-2010	% CHANGE 2010-2011	% CHANGE 2008-2011
Paratransit Trips	12452	15656	15762	13015	25.7%	0.7%	-17.4%	4.5%

Figure 6.18: Paratransit Ridership 2008-2011
Source: TriMet, Personal Communication

Overall, these figures suggest that while standard fixed-route ridership figures have remained relatively stable, the TV Highway Pedestrian Improvement Project has been successful in improving transit accessibility along Line 57 and suggests that infrastructural upgrades

designed to improve walkability can make a significant impact on increasing transit options for users with disabilities.

Users with disabilities and the elderly are not the only ones to have benefited from this project, however. One particular 'pleasant surprise' gained from this project benefited Latino customers. As previously mentioned, the area surrounding the TV Highway has a substantially large Latino community who were not particularly vocal in expressing their transportation needs. Often times, these individuals had to learn to adapt to poor transit conditions in terms of the existing infrastructure (it was poorly lit, lacked visibility and safety, etc.) According to Park, it was not until TriMet and its partners noticed these problems that they were able to make the necessary changes and adjustments (which at one particular location included relocating the stop location and working to get a large shelter installed.) To TriMet's surprise, a large number of these community members attended their next board meeting to voice their support and appreciation for the bus stop improvements. (Y. Park, personal communication, February 21, 2014)

Conclusions & Lessons Learned

In reflecting on the TriMet transportation system, accessibility-related projects and programs, and the success of the TV Highway/Forest Grove Pedestrian Improvement Project, three particular characteristics stand out as major takeaways or lessons to be learned:

1. Advocate: Improved infrastructure and accessible public spaces do not only directly benefit transit users with disabilities, they improve the health and livelihood of all citizens. TriMet's early adoption of this vision has allowed accessibility improvement elements to seamlessly become integrated in many of their projects. The sooner local jurisdictions and agencies adopt similar visions of "universal" design leading to

"universal" benefits, the easier it is to garner support for developing related policy initiatives or investing money into these projects.

2. Innovate: TriMet demonstrates that staying updated in terms of the latest data analysis tools and incorporating creative methods of utilizing "green" materials are almost always worthwhile investments because they can increase efficiency and save money in the long term. This was especially evident in the agency's Pedestrian Network Analysis project, paratransit eligibility program, and even in their thrifty design innovations including its sandblasted bus shelter art and installation of locally produced Simme seating.
3. Communicate: Finally, TriMet demonstrates the importance of involving all stakeholders from the early stages of project development and ensuring that clear and frequent lines of communication are maintained along the way. For projects targeting improved access for people with disabilities and the elderly, standing committees such as TriMet's "Citizens for Accessible Transportation (CAT)" can make a significant difference to the quality of a project and can facilitate the project approval process.

Unsurprisingly, it was this third major takeaway that TriMet emphasized the most when asked if the agency had any advice for other transit agencies that might want to make similar infrastructure improvements around bus stops. According to Park, establishing solid partnerships/intergovernmental agreements with stakeholders and ensuring they share a common goal or vision is key. "You can't do it by yourself," Park explains, "I think you've got to make sure that the local jurisdictions have ownership of the streets and sidewalks. If they aren't then it's going to be an uphill battle" (personal communication, February 21, 2014). This is an

important lesson that can be applied to agencies of any size, especially considering the financial benefits that could result from such partnerships. For Park, the effort of reaching out to other agencies, governmental bodies, and resources that can contribute not only allows TriMet to "stretch their dollar," but also establishes a greater sense of community.

There is no doubt that this sense of collaboration has contributed greatly toward TriMet's success and has added to Portland's establishment as an environmentally and socially progressive city. In looking ahead toward future projects, TriMet shows no signs of slowing down. Most notably, the agency and several of its partners are currently in the finishing stages of developing a new light rail system that will run across the Willamette River on Tilikum Crossing, or the "Bridge of the People." With an estimated cost of around $1.5 billion and an expected completion date in September of 2015, the project will be unique and distinctive in the United States for being a dedicated "transit only" bridge designed to carry light rail trains, buses, cyclists, and streetcars (Y. Park, personal communication, February 21, 2014). It will also feature very wide sidewalks for pedestrians to allow for a safe and pleasant pedestrian experience. All in all, the weather might be notoriously cloudy in Portland but in terms of its transportation and accessibility, the future looks very bright.

LINK TRANSIT

Wenatchee, Washington

Deep in the northwestern area of central Washington, about 150 miles east of Seattle, one finds the small city of Wenatchee, in a setting distinguished for its stunning natural beauty. To the east is a confluence of two rushing rivers (the Wenatchee and the Columbia) and to the west are the towering peaks of the Cascades. With a history deeply intertwined with that of agriculture and harvest, its rural terrain and characteristics have provided several unique challenges in terms of ensuring accessible public transportation. Despite this, Link Transit, a public transit provider centered in Wenatchee and servicing all of Chelan County and some population centers in Douglas County, has set forth significant efforts to ensure accessibility for all its patrons demonstrating the positive effects of strategic policy planning. It was primarily for this reason that Link Transit was selected as the second case study of successful efforts in overcoming barriers to accessible transit, particularly with regard to those made by a smaller agency. The following chapter begins by describing a broad overview of the agency's transit system characteristics and then goes on to describe recent efforts in improving accessibility and encouraging the use of fixed-route transit as discussed in an interview with Link Transit's general manager, Richard DeRock and operations manager, Howard Johnson.

1. DEMOGRAPHIC BACKGROUND AND COMMUNITY CHARACTERISTICS

In October 1988, a group of Wenatchee's business and political representatives joined together to discuss the possibility of bringing public transit back into the area, marking the first steps toward the establishment of Link Transit. The prior public transit service in the city had stopped operating in 1968. Because of this, the idea of reestablishing a public transportation

system was met with great enthusiasm by many of these representatives, for it would offer the opportunity to enhance tourism, link communities together, and help the elderly. As a result, the Public Transit Benefit Area (PTBA) was established and by 1990, the new public transportation system was set up with funding from a four-tenths of one percent local sales tax (approved by voters within the PTBA) and a 63 percent match from the Motor Vehicle Excise tax. It was a major step forward for establishing transit in the area and by 1996, Link Transit's service area had grown to an estimated population of 87,000.

Since that time, the community has experienced several changes. In 2013, the agency's estimated service area population grew to a total of around 115,000 in sixteen communities (See Figure 6.19). In terms of its demographic composition, the area has also experienced many changes. The once overwhelmingly Caucasian community is now thirty percent Hispanic including a lot of first generation immigrants. As far as its age breakdown, the greater Wenatchee area is unique in the sense that it has what is sometimes referred to as a "hollowed" demographic, in that the population here is both very young and very old. This is partly due to the fact that as soon as residents reach college-age, they move elsewhere in search of education and career paths.

Disability data for the area was more difficult to find. Formal disability services tend to be situated in larger cities such as Spokane and Seattle. Additionally, with roughly seven census tracts in the valley, population counts are too low to provide details. However, we do know that a large number of assisted-living facilities exists in Wenatchee, considering its small population size. In the central area of the city of Wenatchee, alone, thirteen facilities could be found within a 1.5 mile radius.

LINK TRANSIT COMMUNITIES SERVED	
Wenatchee	Chelan
East Wenatchee	Entiat
Leavenworth	Ardenvoir
Peshastin	Chelan Falls
Dryden	Orondo
Cashmere	Waterville
Monitor	Malaga
Manson	Rock Island

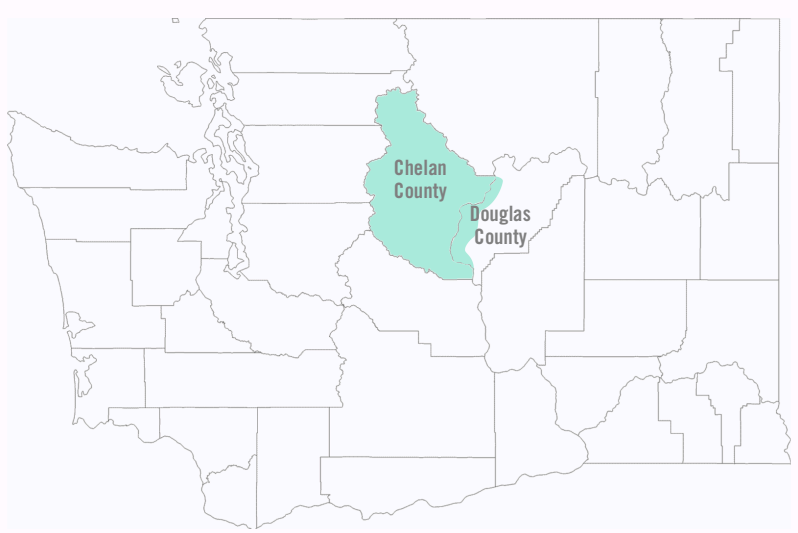


Figure 6.19: Link Transit Communities Served and Regional Service Area Map
Source: 2013 "Link Transit Service Area – Wenatchee and Environs"

Demographic characteristics show that the median household income for the area is lower than that of the rest of Washington. In Chelan County, for example, census data shows that the median household income between the years 2008 to 2012 was $50,582, compared to the Washington median household income of about $60,000 or the national median household income of about $53,0000. As a result of these characteristics, Link Transit's development was occurring at the same time that the area's 'transit dependent' population (due to income, age, or disability) was decreasing. The following section provides an overview of the Link Transit system and the programs that have been developed to respond to the community's needs.

2. LINK TRANSIT SYSTEM OVERVIEW

In the years since the agency was first established, Link Transit has expanded its services to include bus, trolley, dial a ride (DART), and paratransit (LinkPlus) services in a service area that is estimated to encompass approximately 3,500 square miles. Link Transit currently provides bus services along eight local fixed routes, eight commuter routes, and one dial-a-ride route for

the small city of Leavenworth. Link Transit also services two trolley routes: one in Wenatchee (with nineteen stops) and the other in East Wenatchee (with eight stops). Lastly, the agency also provides a LinkPlus paratransit service for individuals whose disability prevents them from using the regular fixed-route bus service. This service is provided up to three quarters of a mile beyond where the regular fixed route buses travel, and if the ride service request is placed at least one hour before the desired trip. Service for all these modes of transport is provided from Monday through Friday (from about 5:00AM to 8:00PM, and on Saturday from 7:30AM until 5:30PM. Figures 6.20 and 6.21 provide a summary of Link Transit's fares and system features.

	1 - ZONE	2 - ZONE	NOTES
Fixed Route – Single Ride	$1.00	$2.50	
Fixed Route – Reduced	$0.50	$2.00	Disabled, Medicare Card Holder, 65+
Fixed Route – Day Pass	$2.00	$5.00	
Trolley	Free	N/A	
LinkPlus	$1.50	$3.00	No charge for LinkPlus rider on fixed route

Figure 6.20: Link Transit Fares Breakdown
Source: linktransit.com

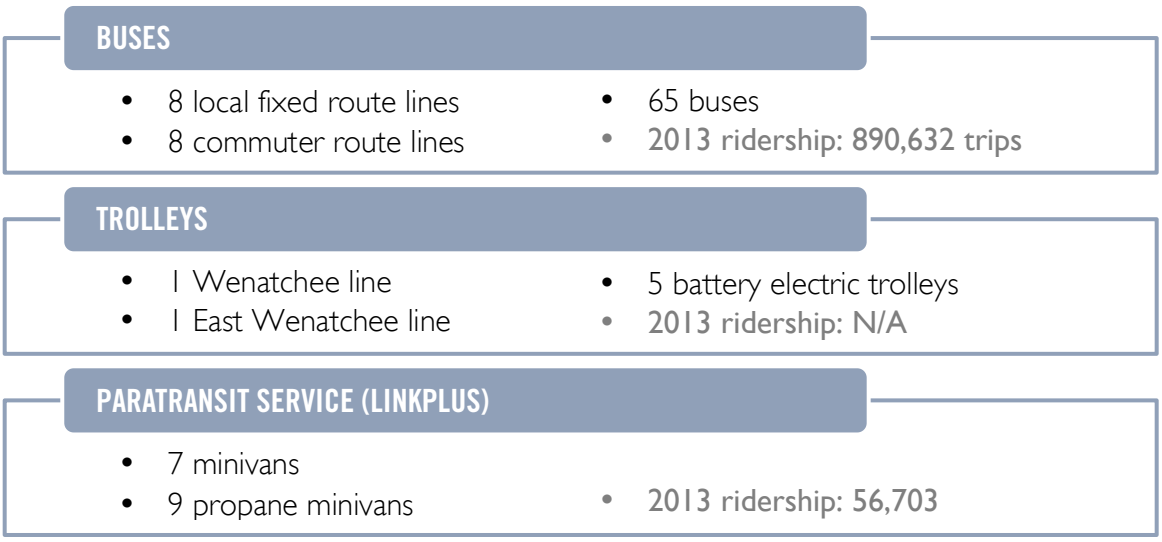


Figure 6.21: Summary of Link Transit's Transportation System
Source: 2013 "Link Transit Service Area – Wenatchee and Environs"

While its paratransit services have been widely used in more recent years, Link Transit has performed a system wide strategic push to encourage elderly and disabled users to make the switch from paratransit (which costs Link Transit an average of $34 per person, per trip) to fixed route services. On March 26, 2014, UCLA doctoral student, and colleague Stephen Gibson met with Richard DeRock, Link Transit's General Manager, and Howard Johnson, Operations Manager, in Wenatchee to discuss these strategies and efforts. Details of this conversation and its findings are described in the following sections.

3. ACCESSIBILITY PROJECTS AND INITIATIVES

Prior Conditions

While Link Transit has experienced several ups and downs throughout its history, one particular time of great difficulty occurred in the year 2000 when voters statewide repealed the Motor Vehicle Excise Tax (MVAT), causing a huge reduction in Link Transit's budget and leading to a series of subsequent difficult situations. By 2002 (the year Richard DeRock was hired as general manager), the agency was spending nearly half of its budget (47 percent) on paratransit, which at the time was estimated to have around 425 daily trips. This paired with the plummeting figures in fixed route ridership caused the board to contemplate the possibility of becoming a paratransit-only operation. "There didn't appear to be any way of moving things forward," explained DeRock, "Paratransit was eating us alive." The existing infrastructural conditions in the agency's service area were also in severe need of improvements. Approximately 80 percent of the agency's bus stops were unimproved, curb cuts throughout Wenatchee and its neighboring communities were not universal, and at a broader scale, the area's design features were largely automobile and truck-oriented (See Figure 6.22 for examples.)

Figure 6.22: Rural Bus Stop Infrastructure Conditions
Source: Richard DeRock, Link Transit

Upon facing these challenges, the agency's first course of action was to assess why paratransit ridership was growing at such an alarming rate and what attributes were preventing users from making trips on fixed route transit. In making this assessment, DeRock found that most paratransit trips were taken for the purpose of medical appointments or for shopping needs and that the origins of these trips were largely in assisted living or rehabilitation facilities. Despite the fact that these origin and destination points were located along the existing fixed route bus lines, elderly and disabled riders preferred to take paratransit due to fact that fixed route travel often required a transfer, the stairs and lifts on their high floor buses were intimidating, and the average fixed route travel time was longer. Most fixed route stops were without shelters or benches. Considering that at this time the paratransit service was free of charge, Link Transit customers had no incentive to use fixed route transit and were simply making rational transportation decisions on the basis of convenience.

Based on the agency's established trends and observations, it was clear that the agency would have to undergo several system updates and transformations. Richard DeRock and Howard Johnson described these changes by a means of a multi-pronged approach including: limiting the agency's paratransit services, making a series of fixed route system improvements, infrastructural improvements, and encouraging an overall shift in attitude toward paratransit.

Paratransit Programming Changes

Considering the degree to which paratransit was posing a budgeting burden to the agency, making adjustments to this branch of service was a top priority for Richard DeRock upon taking up the position as general management. One of the ways in which Link Transit began to attempt to curve paratransit demand was by increasing its eligibility requirements and incorporating a travel-training component to the eligibility process. Eligibility for the LinkPlus paratransit service is evaluated through an in-person "transit review" in which a Link Transit representative determines whether an individual is capable of using paratransit or whether his/her eligibility meets one of the following criteria:

- Unconditional: When a transit user's disability permanently prevents them from boarding or riding a fixed route bus.
- Conditional: When a transit user is able to use fixed route for some circumstances, but is not able to board a bus in certain situations where a barrier prevents the rider from getting to or from a bus stop. Examples of these barriers include infrastructural barriers such as a lack of curb cuts or environmental barriers posed by harsh weather conditions.

- Temporary: When a transit user's disability or injury temporarily prevents them from using fixed route buses.

Within twenty-one days of completing the transit review, an applicant is then notified on the eligibility determination. With regard to the area's large elderly population, the agency's eligibility requirements are slightly more generous during the winter. As explained by DeRock, "there are a lot of people who are not classically disabled by definition but they have balance or bone density issues that makes the winter very dangerous for them and they can qualify for paratransit during ice and snow periods."

Apart from eligibility requirements, adjustments were also made with regard to fares. Prior to 2000, paratransit services were free for eligible users. The decision to start charging its riders $1.50 for a "1 Zone Single Ride" or $3.00 for a "2 Zone Single Ride" (rates that are $0.50 more expensive than equivalent fixed route rides) was met with some hesitancy and trepidation due to a Washington State Supreme Court ruling that declared that Spokane Transit could not charge higher fares for paratransit than their fixed route services. DeRock was quick to note that applying this logic to Wenatchee was not applicable due to the important fact that unlike the situation in Wenatchee, Spokane's fixed route buses were not accessible and users with disabilities had no alternative to using paratransit. "That part of the ruling kind of got lost in the history," says DeRock, "everyone assumed that no one could charge more for paratransit." Thus, LinkPlus started charging a fee for paratransit use, but paratransit eligible riders were now able to ride fixed route transit free-of-charge, which provided conditionally eligible users an added incentive to switch their transit habits.

Eligibility requirements and implementing fares for usage were not the only changes Link Transit made to its paratransit system; changes were made with regard to *service*, as well. For one

thing, they intentionally "slowed down" their paratransit service. "We put various stops into it, made group rides…we made paratransit more like transit" explained DeRock. As a result of this, Link Transit believed its riders would be further incentivized to ride the bus, where they would have more control over their trips. Another change that was implemented in terms of paratransit service was with regard to driver training and wages. The agency's drivers for fixed route and paratransit are provided with the same training, belong to the same union, and are paid the same wages. Upon seeing the positive shifts from paratransit to fixed route service, DeRock has become a major advocate for creating parity between the two services and ensuring that fixed route bus drivers also operate paratransit vans. For users with disabilities, a sense of trust and familiarity is often created with paratransit drivers and seeing those same drivers operate fixed route buses often facilitates the transition process for users that might be more hesitant to switch from paratransit to fixed route.

Fixed Route Service Improvements

Paired with Link Transit's paratransit programming changes, improvements were also made to its fixed route service as a way of further incentivizing paratransit users to change their transit habits. First, the agency made a push toward updating its equipment by purchasing used low floor buses. "Rather than having traditional buses where the floor is three and a half feet off the ground, the low floor buses are nine inches off the ground" explained DeRock. As a result, a ramp could quickly and efficiently be deployed as opposed to the slow and cumbersome lifts on higher floor buses. Additionally, changes were also made to the bus routes themselves, incorporating the observations found during the agency's paratransit ridership assessment. Specifically, a circular route was created that connected several of the largest senior housing facilities, a senior center, most of the grocery stores, the hospital, and the clinic. Most

importantly, this route was designed to be transfer-free, which made it convenient and appealing to seniors and disabled users who were highly dependent on paratransit to make a similar trip.

Upon increasing the convenience and efficiency of their fixed route service, Link Transit proceeded by embarking on aggressive outreach to the community to inform them of these service improvements. "We worked with our newspaper and radio stations to talk to people about why it made sense for people to be on regular buses instead of paratransit, said DeRock, "We explained that we weren't taking something away from people; we were giving them more options through a change in the equation." Efforts to reach out to the community were not only targeting the elderly or users with disabilities, the agency also made an effort to produce a marketing campaign geared toward the general public in order to increase community awareness. By stressing the importance of social equity for riders with disabilities, the agency noticed that the community, at large, became very receptive and would go out of their way to help disabled riders navigate the transit system. "There were times when a person would get on [a bus] in a wheelchair and the other riders on the bus would clap for them because they hadn't seen it before on normal buses." By embracing this larger, community-wide effort, the public was able to further encourage paratransit riders to use fixed route services.

Infrastructural Improvements

Link Transit has also made significant efforts at a smaller scale to improve transit accessibility in and around its bus stops. While the agency might not have the budgeting capacity of a larger agency (the agency sets aside around $50,000 per year for capital improvements such as curb cuts, sidewalk construction, etc.), it has been successful in discovering a variety of cost effective alternatives that have facilitated their accessibility efforts. For example, the agency has made use of water soluble, vinyl acetate-acrylic copolymer soil stabilization material (commonly

referred to as "Rhino Snot") at many of its rural bus stop locations to create flat, stable, and durable landing pad alternatives with the same amount of money that might have only been sufficient to create one standard cement landing pad. To date, the agency has used Rhino Snot to create nearly seventy of these bus pads (See Figure XX). "They're nothing spectacular," says DeRock, "but you can deploy a wheelchair lift to it, it's off the road, it's a safe place to wait and they're surprisingly durable. We were told the material would have a three year life span but [seven years later] it's still solid."

Figure 6.23: Rural Bus Stops Improved Using "Rhino Snot"
Source: Richard DeRock, Link Transit

From time to time, the agency's small community size has allowed them to respond to smaller-scale individual projects, or what DeRock refers to as "easy fixes." When the construction of a simple curb cut or clearing a pathway makes the difference between a rider's using fixed-route daily or being paratransit-dependent, the agency makes a pronounced effort toward fixing the issue themselves or requesting help from local municipalities. According to DeRock, surrounding cities have become increasingly responsive to these requests; "As they understood our demands and our needs and the fact that we've been willing to put some money

into fixing things that are their responsibility, they have become much more open to stepping up and doing most of those things."

Apart from these common capital improvement projects, DeRock also described some of Link Transit's more exceptional projects including a highway transit stop near Leavenworth and another transit center in the Wenatchee Valley Mall. Typical infrastructural improvements for these projects included the installation of information kiosks, constructing shelters and benches at high value stops (while working with the surrounding business community to improve access), identifying and improving pathways, and constructing several critical curb cuts. According to DeRock and Johnson, these projects can range from a cost of $50,000 to $140,000 and are usually implemented with the help of federal grants which can cover up to around three-quarters of the total cost of each project. Figure 6.24 below provides a series of photographs featuring the improvements made at these transit stops.

Figure 6.24: Link Transit's Capital Improvements Projects
Source: Stephen Gibson, UCLA

Attitudinal Shifts

Critical to the success exhibited in each of Link Transit's efforts toward improving accessibility infrastructure and transportation programming was the overall attitudinal shift the agency experienced toward its ADA services. Prior to the passage of the Americans with Disabilities Act there was an overall corporate philosophy that the elderly and people with disabilities should solely use paratransit. Particular to this small rural community, Link Transit instead places a strong emphasis on referring to their transportation system as an all-encompassing *social service*. As explained by Howard Johnson, "We have a philosophy that is inherent in the organization in which we're more care-giving than most other agencies." Being that they are operating their transportation system in a small community, Link Transit is able to provide a more personal and neighborly sense of service. In fact, they even go so far as to refer to their riders as "guests" rather than patrons. By stressing the notion of the transit rider as a guest, the agency has been able to create a welcoming environment for all transit riders. "There's also a sense here that operators aren't going to leave someone stuck. They're going to find a way to make the trip happen and there's a real ownership of their guests," says DeRock. In the case of the elderly or riders with disabilities where a fear of the unknown or of their physical limitations may always be present, this approach can be especially useful in providing an increased sense of confidence.

Project Evaluation

Upon implementing its comprehensive efforts to improving transit accessibility for the elderly and disabled, Link Transit's initial results proved significant. In 2007, it was found that paratransit trips decreased by about 41 percent while fixed route trips were up by 106 percent,

indicating that paratransit users were likely changing their transit patters and moving to fixed route trips. Figures 6.25 and 6.26 on the following page provide ridership trends and boarding patterns in more recent years, demonstrated similar patterns. In the years following 2007, paratransit Ridership trends from 2005 to 2013 indicate small fluctuations but an overall increase in annual fixed route and flex route boardings. As demonstrated in Figure 6.25, ridership peaked in 2011 with just over 962,000 boardings, dropped by around 100,000 boardings in 2012, only to increase again in recent years. DeRock and Johnson indicated that present day fixed route boardings are now estimated to be around 1 million per year. In comparison, annual paratransit boarding figures have experienced similar fluctuations (See Figure 6.26). In more recent years, however, ridership has seen an overall decrease from its peak of 83,044 boardings in 2008 to its lowest ridership in recent years of 56,703 boardings in 2013; a decrease of around 32 percent in five years. "Back in 2002, we were doing a daily average of 450-475 paratransit trips," explained DeRock, "We're down to about 210 a day now…and we've cut our paratransit from 47 percent to 24 percent of our budget." Most impressive about these figures is the fact that the reduction in paratransit use was entirely voluntary. By creating a combination of incentives and fixed route infrastructure improvements, users made the choice to switch over to fixed route transit as soon as they learned the option was more efficient and convenient.

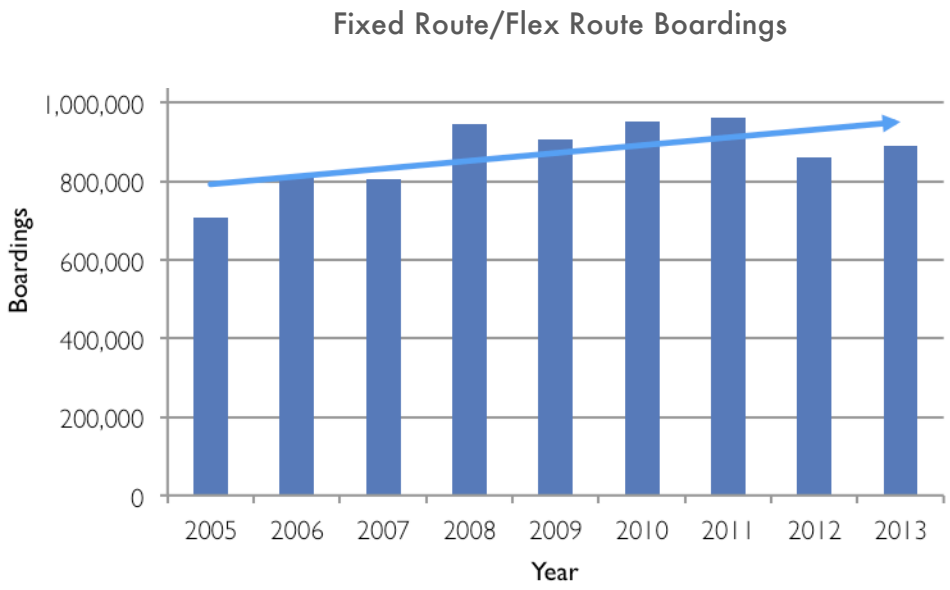


Figure 6.25: Annual Fixed Route/Flex Route Boardings
Source: 2013 "Link Transit Service Area – Wenatchee and Environs"

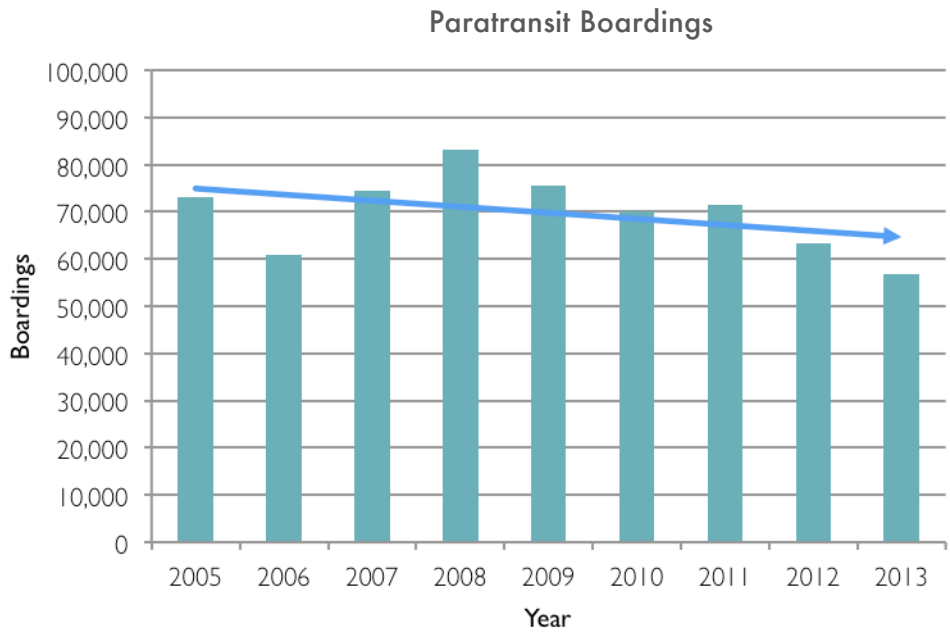


Figure 6.26: Annual Paratransit Boardings
Source: 2013 "Link Transit Service Area – Wenatchee and Environs"

Conclusions & Lessons Learned

Upon reflecting on Link Transit's transportation system, accessibility-related projects and programs, and the success it has had in transitioning its elderly and disabled population from paratransit to fixed route transportation, several characteristics stand out as major takeaways or lessons to be learned:

1. Understand your clients and their needs: As is typical for the success of any complex project, communication is always key. Prior to establishing any policy or physical changes to their transportation system, DeRock and his team understood the importance of research and conducting fieldwork as a means of better assessing Link Transit's clients and their needs. This included conducting a series of informal interviews with paratransit patrons, evaluating existing route patterns and their flaws, and spending time on buses and vans and in bus stops.
2. React accordingly: Efforts transit agencies take toward better understanding their clients make a tremendous difference in ensuring that the changes they propose would be the most appropriate allocation of their funds. In the case of Link Transit, the agency was able to pinpoint flaws in their existing fixed route system (inefficient routes that failed to connect major neighborhood amenities, time-consuming lift deployment in higher floor buses, etc.) and make targeted changes causing a tremendous impact in the areas where their systems needed it the most (reducing user dependency on costly paratransit.)
3. Foster a positive attitude toward service: Finally, it takes the proper attitude to ensure paratransit riders are comfortable and confident enough to voluntarily switch their transportation habits. By incorporating a "guest" philosophy toward their

services, Link Transit is able to create a friendly and welcoming environment for *all* their users. Individual attention, catering to a guest's particular needs is more likely to be given at this smaller, community-type setting that oftentimes cannot be matched in more urban settings. Furthermore, by leading by example, Link Transit is able to promote tolerance and awareness toward the elderly and people with disabilities at a larger, community-wide level.

According to DeRock, success in increasing transit accessibility can only be achieved from a holistic approach toward transportation planning. As he explained:

> "People will ask over the years, 'What have you done that's worked?' It's not just one thing it's everything! It's pathways, it's low- floor buses, it's training, it's the parity, it's community attitude, the idea that it should be positive to have people with disabilities on the regular buses. You have to do all of it to get the benefit."

Overall, it appears there is little doubt Link Transit's approach is having a tremendous effect in the lives of its citizens for the better, demonstrating one final lesson to be learned: that a small agency is capable of creating a large impact.

CHAPTER 7:

CONCLUSIONS

CONCLUSIONS

Design and Policy Recommendations

For the past several decades, transit agencies across the United States have demonstrated an increased awareness of the complexity of accommodating the needs of the elderly and users with disabilities. Often, these accommodations are made in the form of alternate fares, driver and rider training, and transit vehicle infrastructure modifications. While there is little doubt that the state of accessibility in public transportation is much improved from the poor conditions of the past, this study found that barriers to accessibility, particularly with regard to physical or infrastructural conditions, persist throughout the country and have posed complex obstacles for transit agencies both large and small. As such, this study sought to identify successful strategies employed by transit agencies for overcoming these barriers that are currently impeding access to transit stops for disabled persons.

In order to accomplish this, an online survey was distributed to approximately six hundred agencies across the country. This was done as an attempt to acquire a better understanding of existing practices to addressing accessibility issues in addition to the remaining obstacles they might have encountered along the way. The survey found that while the majority of agencies (70 percent) had developed practices or programs to address the physical barriers in and around transit stops faced by riders with disabilities, many acknowledged that infrastructural barriers continue to exist in their service areas, including a lack of sidewalks, bus shelters or shade, and lack of curb cuts or wheelchair accessible ramps. Additionally nearly two-thirds of the agencies that responded claimed financial limitations to be a significant obstacle to addressing these physical barriers to accessible transit. Despite this sobering reality, the survey proved to be very helpful in uncovering creative and effective measures taken by some agencies toward

improving transit accessibility. Most notable were the efforts set forth by TriMet in the greater Portland metropolitan area and Link Transit, an agency servicing the small city of Wenatchee in central Washington.

Field visits and conversations with representatives from both agencies proved helpful in discovering the characteristics that made each of their approaches unique. Moreover, the two case studies revealed the comparative strengths and weaknesses of large and small transit agencies. TriMet, a considerably large agency with a robust budget and a wide array of resources, demonstrated the ability to organize and facilitate larger, more regional projects such as that of the Line 57-TV Highway/Forest Grove Pedestrian Improvement Project. It demonstrated insight on how to integrate design, infrastructure, and technology as it made use of innovative data analysis tools to focus and prioritize their infrastructure improvement efforts. With the support and backing from local municipalities such as the City of Portland. TriMet's primary strength lies in its ability to create a lasting impact on a broader scale. That said, its 'broad strokes' analysis and big data approach to completing projects signifies that the agency, in turn, may run the risk of losing the ability to focus on individual cases.

In comparison, the rural nature of the service area and fiscal constraints limit Link Transit's ability to implement larger infrastructural improvements and demonstrate the ways in which context matters. This case study reminded us of the challenges of responding to disability issues in low-density, sparsely populated areas. Their reliance on low-technology improvements meant they were more limited in making infrastructural improvements in the paths of travel leading to and from transit stops. Despite this, Link Transit's smaller scale of operation allows them to provide increased personalized care and create an impact at a more intimate scale. By setting forth a policy that its drivers operate both fixed route and paratransit services, adopting a "guest" approach toward its patrons, and leading community-wide awareness efforts encouraging

the use of fixed route transit, Link Transit was able to provide riders with confidence and the incentives to voluntarily make the switch from paratransit to fixed route.

Differences aside, the similarities between the two case studies are also telling, and lead to the following recommendations.

1. Recognize the Importance (and Universal Benefits) of Improving Access

   First, the success TriMet and Link Transit has been able to achieve in improving transit access can largely be attributed to the attitude and perspective by which they approach accessibility. Both agencies demonstrate a deep understanding of accessibility-related issues and their careful care and attention to providing services for users with disabilities go far beyond the minimum ADA requirements. Furthermore, the two agencies understand that improving infrastructure and access in public spaces does not only benefit transit users with disabilities, but also the health and livelihood of all citizens. By adopting this vision and promoting tolerance and awareness at a community-wide level, they are able to garner increased support for their projects, reduce the psychological barriers and fears often attributed to utilizing transit, and ultimately, create an inclusive and welcoming environment for all.

2. Take Time to Understand your Users Before Implementing Change

   Second, the agencies are also successful in the way they assess existing situations and then react accordingly. Both Link Transit and TriMet consistently conduct a fair amount of fieldwork and research as a means of better understanding their users and their needs. The TriMet case study demonstrated the impact of advanced data

analysis tools and the importance of communication with *all* stakeholders throughout the *entire* project development process. Additionally, they made use of standing committees and intergovernmental agreements with local municipalities to facilitate the approval of their projects. Link Transit conducted a series of informal interviews and were able to pinpoint flaws in their existing route system and create targeted changes to their policy and services to incentivize paratransit users to switch to fixed route modes transit. Both methods are indicative of the importance of proper information exchange between transit agencies and their riders and demonstrate opportunities for different levels of public engagement.

3. Encourage Innovation and Think Creatively

Third, the two agencies also demonstrate creative techniques in cutting costs by incorporating the use of unconventional materials or novel infrastructure treatment methods. Namely, TriMet demonstrates that small measures such as installing locally produced Simme seating or recycling vandalized glass panes on bus shelters are almost always worthwhile investments in the way they are able to increase efficiency and cut costs. Link Transit was able to effect change while cutting costs by implementing the use of "Rhino Snot" at several of their rural bus stops, a water soluble, vinyl acetate-acrylic copolymer soil stabilization material more commonly used by the military to create temporary airfields..

In the years since adopting these practices and procedures, TriMet and Link Transit have experienced success measured by the significant drops in paratransit usage and increases in fixed

route ridership. More importantly, the two transit agencies have demonstrated that a holistic approach to addressing accessibility is oftentimes the most effective. By performing careful community assessments, communicating with stakeholders, implementing innovative technology and creative techniques, and recognizing the importance and universal benefits of improved access, TriMet and Link Transit were not only able to address physical barriers to accessing transit, but psychological and information exchange barriers, as well. Ultimately, they teach us that true success is measured not only by conformance to ADA standards, but in understanding the needs of *all* their users and adapting their services to meet their needs. TriMet and Link Transit did not find success by treating their disabled riders differently from other riders; they found success in recognizing that users with disabilities make the same choices for the same reasons as people without disabilities. It has been nearly twenty-five years since the passage of the Americans with Disabilities Act. There is no doubt that there still that the country still has ways to go before achieving universally accessible public transportation. The efforts set forth by TriMet and Link Transit give reason for hope that the road ahead will be considerably smoother.

APPENDIX A

Minimum ADA Requirements

The Americans with Disabilities Act (ADA) of 1990 outlines the minimum requirements that are required to create accessible bus stops and remains the most important design reference for transit stop design. In addition to the ADA, a series of supplementary updates, guidelines, and standards have been developed to act as references for those in the industry. The following list details some of the minimum ADA requirements specific to bus transit as outlined by these documents. (Wu, 2009)

BUS STOP AREA AND BUS LANDING PADS:

A bus stop platform is a designated bus stop area clear of obstructions to facilitate boarding and disembarking for all users. It must meet the following criteria:

- The platform must be a firm, stable surface.
- It must have a minimum clear length of 96 inches (2,440 millimeters), measured from the curb or vehicle roadway edge, and a clear width of at least 60 inches (1,,524 illimeters), measured parallel to the roadway.
- The platform may only have a maximum slop of 1:50 (2 percent) perpendicular to the roadway for water drainage.
- The platform pad must be connected to streets, sidewalks, or pedestrian paths by an accessible route.

BUS SHELTER:

New bus shelters must be installed or older ones replaced to accommodate wheelchair or mobility aided users, as follows:

- The bus shelter must have a minimum clear floor area of 30 by 48 inches (762 by 1,219 millimeters), entirely within the perimeter of the shelter.
- An accessible route to the boarding area or landing pad must connect it.
- Bus stop shelters should not be placed on the wheelchair-landing pad.

- General ADA mobility clearance guidelines should be followed around the shelter and between the shelter and other street fixtures.
- A clearance of 36 inches (914 millimeters) should be maintained around the shelter and an adjacent sidewalk (more is preferred).
- Advertising panels should be located downstream of the traffic flow to allow an approaching bus driver to view the interior of the shelter easily. Indirect surveillance from passing traffic should be preserved through proper placement of the panels.

LIGHTING AND SECURITY

There are no specific ADA requirements for lighting and security.

ACCESSIBLE PATH:

At minimum, an accessible path should fulfill the following critera:

- It should have a minimum clear passage width of 48 inches (1,219 millimeters).
- There should be an accessible link route from public transportation stops to the route for the general public.
- The maximum cross slope should be 1:50.
- The ground and floor surfaces should be stable, firm, and slip resistant.
- Grating spaces should be no greater than .5 inch (13 millimeters) wide in one direction.

Objects may not protrude on an accessible route or maneuvering space. Guidelines for protruding objects are stated below:

- Objects protruding from walls (for example, telephones) with their leading edges between 27 inches and 80 inches (685 millimeters and 2,030 millimeters) above the finished floor shall protrude no more than 4 inches (100 millimeters) into the pathway.
- Objects mounted with their leading edges at or below 27 inches (685 millimeters) above the finished floor may protrude any amount.
- Freestanding objects mounted on posts or pylons may overhang 12 inches (305 millimeters) maximum from 27 to 80 inches (685 millimeters to 2,030 millimeters) above the ground or finished floor.

- Clear headroom should be 80 inches (2,030 millimeters) at minimum. If vertical clearance of an area adjoining an accessible route is less than 80 inches (nominal dimension), a barrier should be provided to warn blind or visually impaired persons.

ROUTE AND TIMETABLE INFORMATION, TRANSIT SIGNAGE

Bus stop signage should fulfill the following criteria.

- Letters and numbers should have a width-to-height ratio between 3:5 and 1:1 and a stroke-width-to-height ratio between 1:5 and 1:10.
- Characters and numbers should be sized according to the viewing distance from which they are to be read.
- The minimum letter height is measured using an upper case X. Lower case characters are permitted.
- Signs should have accompanying pictograms with the equivalent verbal description placed directly below. A border dimension of 6 inches (152 millimeters) at minimum height should be around the signs.
- Characters and sign backgrounds should have a non-glare finish, with characters and symbols contrasting from their background.
- Signage should follow protruding objects requirements as discussed in the Accessible Path section.

AMENITIES

If benches are provided, they should adhere to the following ADA regulations:

- Clear floor or ground space for wheelchairs.
- Seat dimensions: 20 inches (510 millimeters) minimum to 24 inches (610 millimeters) maximum in depth and 42 inches (1,065 millimeters) minimum in length.
- Seat height: 17 inches (430 millimeters) minimum to 19 inches (485 millimeters) maximum above the floor or ground.

- Back support: 42 inches (1,065 mm) minimum in length extending from a point 2 inches (51 mm) maximum above the seat to a point 18 inches (455 mm) minimum above the seat.
- Structure supporting vertical or horizontal forces of 250 pounds applied at any point on the seat, fastener, mounting device, or supporting structure.
- Exposed benches must be slip resistant and designed to shed water.

Also note that vending machines, newspaper boxes, trash receptacles, and other street fixtures must not reduce the minimum ADA requirements.

APPENDIX B

National Transit and Accessibility Survey

Dear Transit Professional,

I am a graduate student researcher working with Anastasia Loukaitou-Sideris of the UCLA Luskin School of Public Affairs and the Mineta Transportation Institute on an FTA-funded study to identify successful strategies United States transit agencies are employing to address infrastructural barriers impeding access to transit facilities for persons with disabilities. In the end, the study will result in the creation of a detailed report written to provide guidance and recommendations to transit agencies on this very important issue.

We would be grateful if you could take some time to complete the survey below and submit your responses by December 6, 2013. The survey is 10 questions long, we will keep your contact information confidential, and the findings will not link responses to particular respondents or transit agencies.

Thank you.

1. Does your agency have any practices or programs that have been developed (or adopted) to address physical barriers faced by riders with disabilities? *(Select one)*
   - ○ Yes
   - ○ No → (If no, please go to question 3)

2. Please list/explain these practices and programs:

3. Is your transit agency aware of infrastructural barriers to accessible transit stops and/or stations that are prevalent in your service area? *(Check all that may apply)*

   Lack of Sidewalks
   Broken or Cracked Sidewalks
   Utility Polls or other Barriers on Sidewalks
   Lack of Curb Cuts or Wheelchair Accessible Ramps
   Unsignalized Street Crossings/Intersections
   Lack of Bus Shelters/Shade
   Lack of Inadequate Signage
   Insufficient Lighting
   Other (list) _____

4. Has your agency taken any action or measures to address these barriers independently or in cooperation with local government and/or other partners? *(Select one)*
   - ○ Yes
   - ○ No → (If no, please go to question 8)

5. Please list/explain these measures:

6. When did you adopt these measures?

7. Please describe any notable successes that have resulted from these measures:

8. What obstacles (bureaucratic, financial, etc.) prevent(ed) or hindered your agency from addressing physical barriers faced by transit riders with disabilities?

9. We would like to know of other efforts in your state or beyond to address physical barriers faced by transit riders with disabilities. Please describe any exemplary such program or best practice you are aware of that others have implemented to accommodate the needs of riders with disabilities?

10. Can we contact you for more information about these programs or practices? Please provide contact information below:

    Contact Name _____

    Agency Name _____

    Telephone Number _____

    Email address _____

APPENDIX C

Interview Questions

GOAL: robust case studies that document the efforts of transit agencies and other entities to improve pathways to transit that have enabled riders of all abilities to access that transit. Pathways are defined as the infrastructure connections between origins and transit stations / stops.

CASE STUDY BRIEF

- Location
- Date of project completion
- Agency(s)
- Area (sq. mi.) – area served by *transit agency, municipal or county or region boundary of political entities*
- Population
- Density
- Population with a disability
- Population 65 years or older
- Public transportation system – agency (if not main actor in project), mode, number of buses or number of stations

CASE STUDY NARRATIVE

1. Introduction

    a. How have the needs of those accessing transit – both persons with disability and pedestrians generally – been addressed in the region (e.g., plans, special studies, projects, advocacy initiatives)?

    b. Has your agency implemented improvements targeting riders with disability that go beyond the ADA requirements? What are they?

    c. What, if any, mobility management strategies does your agency or community utilize (e.g., mobility manager, travel trainer, one-stop info center)?

2. Initiative or Project description [Nature of improvement]

    a. Describe the nature of the improvements that have been made to the pathways that connect origins and transit stations / stops (e.g., new or replaced sidewalks, new ramps, ADA compliant signals, etc.)?

b. Was this improvement part of a larger infrastructure or planning effort (e.g., complete street effort, corridor planning and infrastructure project, redevelopment project)?

c. Are there specific planning policies that relate to the issue (e.g., local comprehensive plan, transit development plan, MPO plan, other)?

3. Background [Nature of community]

a. How many people will (or potentially will) utilize the improvement?

b. Please confirm the size of your service area and the number of riders served?

c. What are the defining characteristics of this community?

    i. What about your community won't we learn from looking only at statistics (i.e. Census)?

d. What brought about the desired improvement ("tipping point")?

    i. Was it internal (within the agency)? Was there external pressure (from stakeholder group)? Was there a legal challenge that brought about improvement?

e. Why was this improvement made rather than another?

4. Planning processes

a. Who led the initiative or planning process?

b. Who were the other key stakeholders – governmental and non-governmental – involved during the planning process?

    i. Were there competing priorities (interests) among these stakeholders?

    ii. Was it difficult to reach consensus among these stakeholders?

c. Were there any stakeholders who were absent (or declined to participate) from the process, but who you believe could have contributed?

d. How long was the planning process? Was it continuous or did it have starts & stops?

e. What kind of outreach / community involvement occurred during this endeavor? At what points during the project did this outreach occur?

f. Were there any right-of-way issues that needed to be addressed during this process?

g. Was there any pushback ("NIMBYism") associated with the project? If yes, how did you resolve it?

h. What were the key challenges to this stage of the project? How were they resolved?

5. For stakeholders/advocacy groups only

a. What led you/your organization to become involved?

b. What types of activities have you undertaken to improve pathways to/from transit stops/stations?

c. Are you satisfied with the results of your involvement? Why/why not?

6. Funding

a. What was the approximate cost of improvement (planning, design, and construction)?

b. Are there any ongoing costs (yearly) for maintenance?

c. Were the project's ultimate costs the same/close to those estimated? If not, how did the costs differ?

d. What funding source(s) was used for this work?

   i. How did you become aware of the available sources/options?

   ii. Was match funding a requirement of the funding you used?

      1. What served as match?

   iii. Is it a sustainable source? [What does sustainable mean in this case – could be used for similar improvements in the future? would pay for maintenance?]

   iv. Are any other sources being pursued either to sustain this effort or to support similar improvements?

e. What were the difficulties in securing the funding?

f. What were the key challenges to this stage of the project? How were they resolved?

7. Implementation (design and build)

a. Please review the steps that were taken to implement this infrastructure improvement.

b. What agencies / entities were involved with the design and construction of the improvement?

c. What were the key challenges to this stage of the project? How did you overcome them?

d. Were there any innovative design strategies employed for this improvement?

e. Were there any innovative programmatic strategies employed for this improvement?

8. Outreach and evaluation

a. What steps were taken to inform the community that this infrastructure improvement had been completed?

b. How has the project been received by the community? Has the agency sought any formal (survey, etc.) or informal feedback on the project?

c. Has there been a measureable increase in the use of transit as a result of this improvement –either generally or by persons with disability? Any anecdotal evidence of increased transit usage?

d. Are you aware if the use of paratransit services has been reduced as a result of this improvement?

e. Are you aware if the improvement has benefitted other members of the public in addition to riders with disability?

9. Advice to other agencies

a. If you could start the planning and development process over knowing what you know now, what would you do differently?

b. Any advice you can share with other agencies/entities trying to make infrastructure improvements that would allow all transit users (including persons with disability) to travel from home, work, etc. to a transit station / stop?

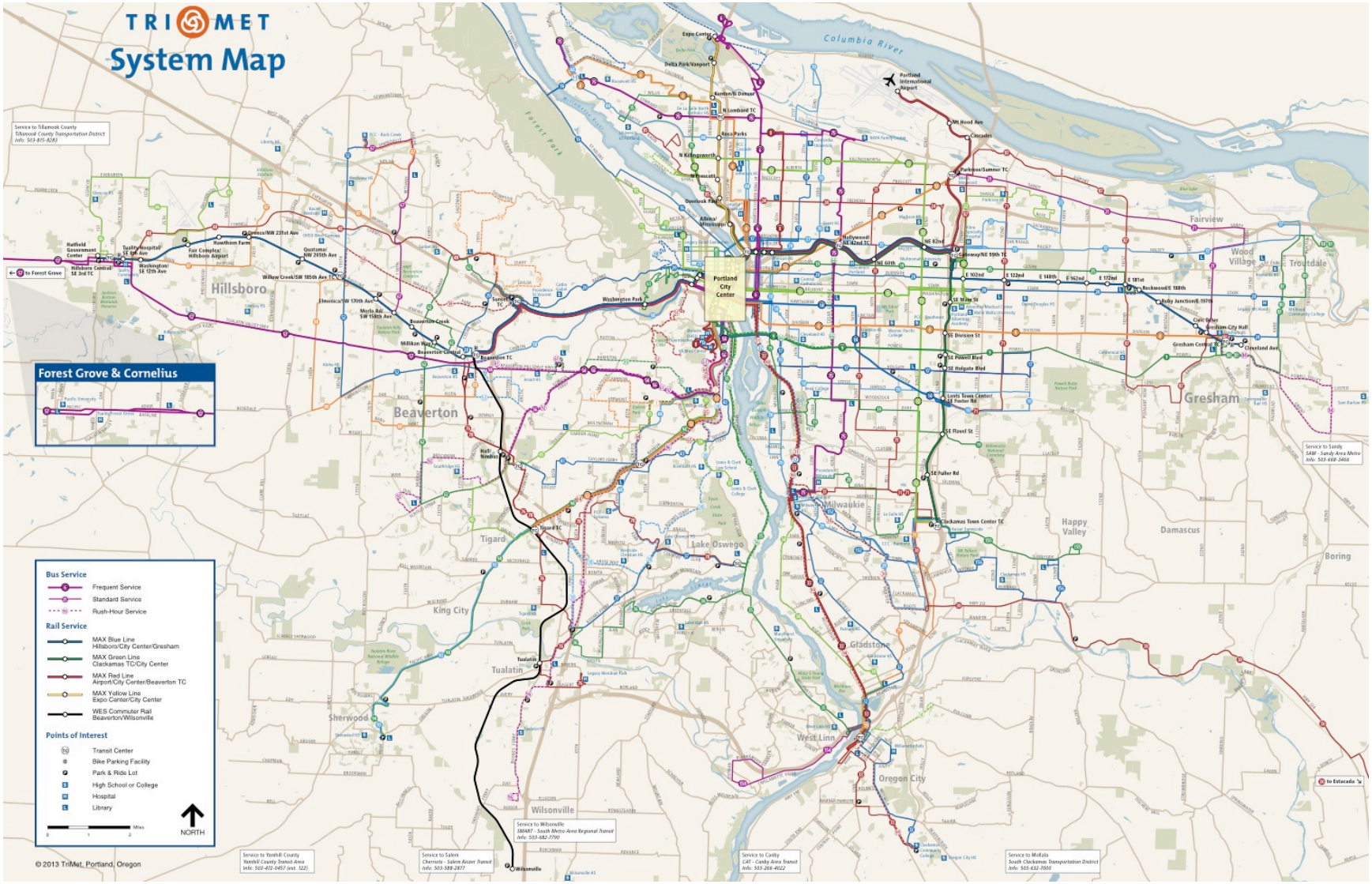
c. Did you experience any obstacles during this process that we haven't yet discussed?

10. Next steps for improvements to ADA infrastructure

a. Does your agency or other stakeholders in your community have any plans to make additional improvements to infrastructure to upgrade connections between where transit users originate from and transit stations / stops?

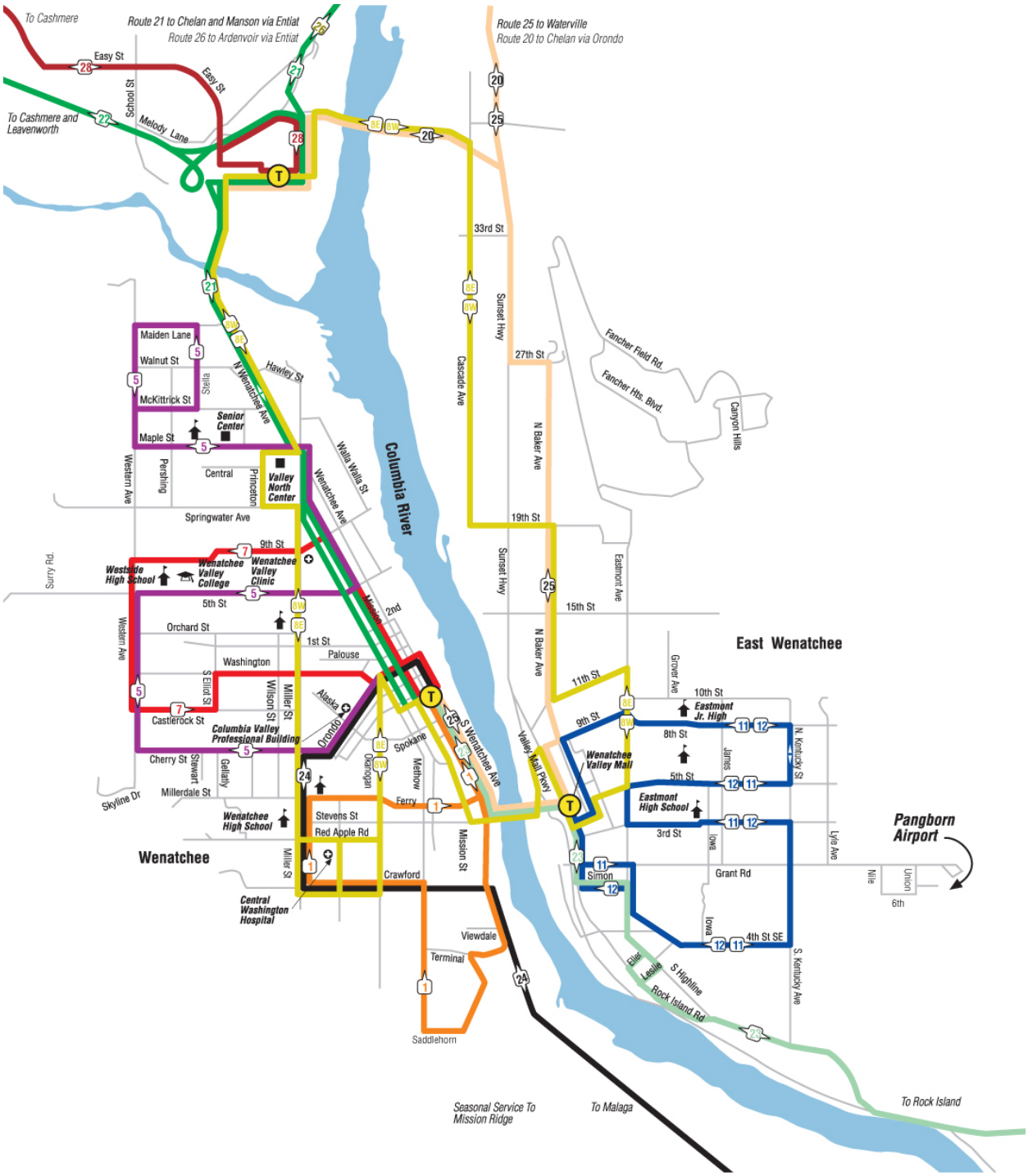
APPENDIX D

TriMet Service Map



APPENDIX E

Link Transit Service Map



REFERENCES:

Audirac, I. (2008). Accessing transit as universal design. *Journal of Planning Literature*, *23*(1), 4-16.

Damashek, J. (1982). Closing the Doors on the Handicapped. *Human Rights*, 30-50.

Danford, G. S., & Maurer, J. (2005). Empirical Tests of the Claimed Benefits of Universal Design. In *EDRA; Proceedings of the Annual Environmental Design Research Association Conference* (Vol. 36, p. 123). The Environmental Design Research Association.

Denson, C. R. (1998). Transitioning to fixed-route services. *Transportation Research Record: Journal of the Transportation Research Board*, *1623*(1), 37-44.

Easter Seals (2009). Accessible Pathways to Bus Stops and Transit Facilities: A Process Guide. *Project ACTION*. Washington, DC.

Graves, J. D. (1978). Mass Transportation: Separate But Equal. *Washburn LJ*, *18*, 673-681.

ITE, The Institute of Transportation Engineers. (2009): "Accessible Pathways to Bus Stops and Transit Facilities: A Process Guide". In *Accessible Community Transportation in Our Nation.* Retrieved from www.projectaction.org

Koppa, R. J., Davies, B., & Rodriguez, K. (1998). *Barriers to use of transportation alternatives by people with disabilities* (No. SWUTC/98/467402-1). Texas Transportation Institute, Southwest Region University Transportation Center, Texas A & M University System.

Lavery, I., Davey, S., Woodside, A., & Ewart, K. (1996). The vital role of street design and management in reducing barriers to older peoples' mobility. *Landscape and Urban Planning*, *35*(2), 181-192.

Lubin, A., & Deka, D. (2012). Role of Public Transportation as Job Access Mode. *Transportation Research Record: Journal of the Transportation Research Board*, *2277*(1), 90-97.

Medical Transportation Management (MTM), (2013). Assessments for TriMet: Tri-County Metropolitan Transportation District of Oregon. Retrieved from http://www.mtm-inc.net/wp-content/uploads/2013/01/Assessment-Trimet-Case-Study.pdf

Mueller, D. (2009). ADA bus stop accessibility study report. Retrieved from http://www.pagnet.org/documents/committees/TPC/2010/PAGTPC-2010-01-06-ADABusStopReport.pdf

Rennert, S. (1988). All Aboard: Accessible Public Transportation for Disabled Persons. *NYUL Rev.*, *63*, 360.

Rosenbloom, S. (2007). Transportation patterns and problems of people with disabilities. *The future of disability in America*, 519-560.

TCRP (2013) "Project B-40: Strategy Guide to Enable and Promote Use of Fixed-Route Transit by People with Disabilities" – TriMet, Portland, OR (Revised Draft).

TriMet (2014) "Accessibility." Retrieved from http://trimet.org/access/

TriMet (2013) "Attitude and Awareness Survey." Retrieved from http://trimet.org/pdfs/publications/TriMet-Attitude-Awareness-Survey-2013.pdf

TriMet (2010) "Bus Stop Design Guidelines." Retrieved from http://trimet.org/pdfs/publications/bus-stop-guidelines.pdf

TriMet (2012) "Coordinated Transportation Plan for the Elderly and Disabled." Retrieved from http://trimet.org/pdfs/publications/elderly-and-disabled-plan.pdf

TriMet (2012) "Pedestrian Network Analysis Project Overview." Retrieved from http://trimet.org/pdfs/publications/pedestrian-study-fact-sheet.pdf

TriMet (2014) "TriMet At-a-Glance." Retrieved from http://trimet.org/pdfs/publications/TriMet-At-a-Glance-2014.pdf

Wu, W. (2009). Optimization models for selecting bus stops for accessibility improvements for people with disabilities. Digital Commons, fiu.edu.