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Quantifying Patron Needs at Intermodal Facilities

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16. Abstract

New Jersey has a varied network of commuter rail, light rail, bus, paratransit, county and private shuttle services. These services meet a range of needs including commuter travel to major employment centers, local bus service for various trip purposes, and specialized services for people with special transportation needs. With such a rich network, there are many opportunities for making multi-link transfers between modes and services. In the mature NJ TRANSIT system, it is unlikely that significant additional capacity will be added in the near future. At the same time, increasing development and maturity of suburban centers will create the demand for more complex, multi-link trips. Research conducted in the United States and abroad has documented traveler needs at transit transfer facilities, as well as best practices in facility design, customer information, and technologies that support transit transfers.

This research study builds on the existing body of research to determine in which features of the transit transfer experience are most important to New Jersey transit customers. Field work and site inspections at transit facilities throughout the state yielded a typology of transit transfer locations that can be used by decision-makers to categorize and plan transit transfer locations throughout the state. Data from the intercept survey found that customers overall were most satisfied with station/stop access and customer information and least satisfied with facility maintenance, amenities and service levels. At the same time customers valued service features most. In particular, conditions at local facilities showed significant room for improvement. Customers using these facilities reported lower than average levels of satisfaction with virtually all the features they cited as highly important. The findings from this study provide important insights and valuable data to help transportation decision makers understand better how to improve the experience of transit transfer customers in New Jersey and to potentially grow ridership by encouraging more patrons to make multi-link trips while using the transit system.

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EXECUTIVE SUMMARY

New Jersey has a rich and diverse network of commuter rail, light rail, bus, paratransit, county and private shuttle services. These services meet a range of needs including: commuter travel to major employment centers; local bus service for various trip purposes; and, specialized services for people with special transportation needs. Within this extensive network there are many opportunities for making multi-link transfers between modes and services. In the mature NJ TRANSIT system, it is unlikely that significant additional capacity will be added in the near future. However, increasing development and maturity of suburban centers will create the demand for more complex, multi-link trips.

The objectives of this research were to: document typical design, information and service characteristics of transit transfer points in New Jersey; determine the needs, wants, and concerns of transferring passengers; and identify the design elements and other features that would best facilitate transfer trips by meeting passengers' stated needs. To achieve these objectives, the research team:

- Conducted a comprehensive literature review and series of expert interviews to identify the characteristics of linked transit trips, barriers to these types of trips and best practices in designing and operating transit transfer points and facilities.
- Developed a typology of transit transfer points and facilities to facilitate an understanding of how different types of facilities operate and function in New Jersey.
- Designed and implemented a customer intercept survey to examine how satisfied riders are with different transit transfer features and which features are most important to customers at different types of facilities.

The literature review highlighted that certain principles of customer-oriented transit are universal. For example: offering a safe and secure system; having readily available and understandable service information; having an efficient fare collection system in place; and, designing and maintaining high quality stations and facilities are very important to all customers. Customer-oriented transit features are especially important for those that may be transferring from one mode or service to another. Interviews with New Jersey transportation experts revealed a number of institutional barriers that make planning for transit transfer trips and facilities challenging. These include:

- Limited evening and weekend transit service.
- The practice of NJ TRANSIT rail and bus schedule changes not occurring simultaneously due to differing union contracts among modes.
- No current means of coordinating operations and information sharing among and between operators that may serve the same location.

- Limited data on passenger movements and real-time data on vehicle status to aid transfer planning and operations.
- The influence of “home rule” issues, such as municipal governments determining the location of bus stops and retail shopping mall operators prohibiting transit operations on their properties.

Field work and site inspections at transit facilities throughout the state yielded a typology of transit transfer locations that includes four facility types (A through D) ranging from high amenity, major multi-modal transportation hubs with very frequent transit service (Type A) to local on-street boarding locations where customers may transfer from one mode to another but where amenity and service levels are considerably lower (Type D). The typology can be used by decision-makers to categorize and plan transit transfer locations throughout the state.

Data from the intercept survey found that customers overall were most satisfied with station/stop access and customer information and least satisfied with facility maintenance and amenities and service levels. At the same time customers valued service features more highly than others. The top ten transfer features reported as highly important by transfer customers were:

1. Services being on-time
2. Protection from the weather
3. Availability of seating
4. Wait time between transfers
5. Presence of police or security personnel
6. Real time “next bus or train” information
7. Safety at the station/stop at night
8. Frequency of service from 3 pm to 8 pm
9. Frequency of service till 10 am
10. Schedule coordination between transfers

These findings were generally consistent across facility types but there were important variations (see Table 11). In particular, conditions at Type C/D facilities showed significant room for improvement. Customers using these facilities reported lower than average levels of satisfaction with virtually all the features they cited as highly important.

The findings from this study provide important insights and valuable data to help transportation decision makers understand better how to improve the experience of transit transfer customers in New Jersey and to potentially grow ridership by

encouraging more patrons to make multi-link trips while using the transit system. Specific recommendations include:

- NJ TRANSIT should rationalize the process by which rail and bus schedule changes are determined and better coordinate the implementation of schedule changes to synchronize inter- and intra-modal schedule coordination as much as feasible at transit transfer locations. This may require legislative changes and/or changes to union contracts.

- NJ TRANSIT should develop and implement a plan to deploy ITS technologies, including automatic vehicle location (AVL) technology and automatic passenger counters as well as traveler information systems to provide real-time service information to customers.

- NJ TRANSIT should review its current fare structure, especially with regard to how its bus service and Access Link fares are calculated. The agency should also review its policies and methods for fare collection. The focus should be on simplifying the fare structure, expanding fare collection options, and integrating fare media between modes and transit system operators.

- NJ TRANSIT should work with other public and private transit service providers to identify a network of county and regional transfer points throughout the state using the transfer facility typology developed as part of this study. This network of transfer locations can provide a focus for transfer activity between modes, routes and services regardless of service provider.

- NJ TRANSIT and other transit services providers should assess conditions at existing and planned transfer facilities using the facility assessment checklist developed as part of this study. Particular attention should be given to Type C/D facilities. Data from the customer intercept survey can then be used in conjunction with site assessment data to identify and prioritize improvement needs at each location based on facility type designations.

- NJ TRANSIT should develop station/stop design standards that define the minimum desirable features for each type of transfer location, especially bus transfer locations. Design standards should address protection from weather, seating, lighting, customer information displays, directional signage and other amenities as needed based on the transfer location typology.

- NJ TRANSIT, NJDOT and local governments should prioritize and implement pedestrian and bicycle access and safety improvements around identified transfer facilities.

- NJ TRANSIT should work with local government leaders, private land owners, and the NJ Legislature to develop policy and legislative changes that will enhance the agency's ability to plan and operate transit transfer facilities. This should include the ability to locate and construct transfer facilities where

operationally efficient and advantageous on both public and private commercial property.

- NJ TRANSIT and other transit operators should identify and pursue joint development opportunities to improve conditions at facilities based on the typology.
- NJ TRANSIT and other transit operators should provide additional peak and off-peak service to transit transfer facilities, when operating budget will allow.

INTRODUCTION

New Jersey has a rich and diverse network of commuter rail, light rail, bus, paratransit, county and private shuttle services. These services meet a range of needs including: commuter travel to major employment centers; local bus service for various trip purposes; and, specialized services for people with special transportation needs. Within this extensive network there are many opportunities for making multi-link transfers between modes and services. In the mature NJ TRANSIT system, it is unlikely that significant additional capacity will be added in the near future. However, increasing development and maturity of suburban centers will create the demand for more complex, multi-link trips. Future transit improvements should focus on supporting these types of trips.

Research conducted in the United States and abroad has documented traveler needs at transit transfer facilities, as well as best practices in facility design, customer information and technologies that support transit transfers. Regardless of any specific need of a targeted customer group (i.e., commuters; people with disabilities), certain principles of customer-oriented transit are universal. These include offering: a safe and secure system; having readily available and understandable service information; having an efficient fare collection system in place; and, designing and maintaining high quality stations and facilities. This research study builds on the existing body of research to determine the best strategies for making transit transfers in New Jersey most appealing to both prospective and existing transit customers.

RESEARCH OBJECTIVES

The objectives of this research were to: document typical design, information and service characteristics of transit transfer points in New Jersey; determine the needs, wants, and concerns of transferring passengers; and, identify the design elements and other features that would best facilitate transfer trips by meeting passengers' stated needs. For the purpose of this study, we use the term "transfer trips" to refer to any multi-leg trip that involves de-boarding one transit service and boarding another, regardless of whether the passenger is switching modes (bus to ferry), service types (local to express), or service provider. The term "transit" is inclusive of heavy rail, light rail, subway, local bus, highway coach bus, private commuter bus that operates on a regular schedule, bus shuttle (such as a community circulator, rail feeder or senior shopping service), ferry and on-demand paratransit services. We also considered auto, pedestrian and bicycle access to and from station/stops.

LITERATURE REVIEW

One of the characteristics of transit travel that distinguishes it from private auto, bicycle, and foot travel, is the fixed, linear nature of most individual transit routes. In order to expand the range of destinations reachable from a given point on the system, transfers are required. Passengers typically have to access the transit system by walking, driving, cycling or through another transit service. The value of the transit system as a network, therefore, is dependent on the ability of passengers to construct efficient, comfortable multi-leg trips. The ease with which passengers make transfers is affected by a number of factors, including wait time (incorporating schedules and reliability), fares, fare media, ease of obtaining customer information, and the walking and waiting environment at the transfer location.

To understand better traveler needs at transit transfer facilities, as well as best practices in facility design, customer information and technologies that support transit transfers, the research team conducted a review of academic peer-reviewed journals, as well as reports and guidelines published by transit and other government agencies. A search of relevant keywords was conducted using the Transportation Research Information Services (TRIS) of the Transportation Research Board, Google Scholar, Google, ISI Web of Knowledge, and CD-ROMs from recent Annual Meetings of the Transportation Research Board. Special attention was paid to literature that addresses the specific needs of special populations, such as the elderly, passengers with disabilities, and passengers with limited English proficiency.

The review revealed four primary topic areas covered in the literature. These topic areas are summarized below and addressed in more detail under corresponding subject headings in the remainder of this section:

- Transfer penalty and passenger decision making: This topic area explores how passengers make decisions when planning transit trips. Research has long shown that passengers value waiting time more than in-vehicle time. Therefore, minimizing wait time and customer discomfort of waiting may encourage transfer trips.

- Transit operations: This topic area relates to the scheduling of transit services and includes transit coverage, length of service day considerations, frequency of service, and coordination of schedules between transit modes and services at a transfer points. In addition, this area addresses schedule adherence and service reliability. Both are important for transferring passengers because they control the ability to make the transfer trip, the wait time between vehicles, and the chance of missing a connection due to a delayed arrival. Finally this topic area includes related literature on facility design and amenities such as shelter from the elements, adequacy of the movement and waiting areas, walking distances and level changes, and the presence of retail all play a role in the comfort and convenience of transferring.

- Customer information: This broad topic area encompasses all the means that passengers receive information about routes, schedules, service adjustments, safety information, and amenities, including: printed material, wayfinding, static printed signs, variable electronic signs, public address systems, transit agency staff, websites, and mobile devices such as smart phones and personal data assistants. The needs of passengers with visual impairments or limited English proficiency are particularly important here.

- Safety and security: This topic area addresses the role real and perceived safety and security play in transit trip planning. Feeling safe and secure from crime is an essential component of any transit trip. Passengers who face an actual or perceived risk of crime are unlikely to make a transit trip, especially one that involves waiting at a transfer point.

Although these four topic areas represent major themes in the literature, there is considerable overlap among them. Studies that looked at most or all of these themes and their influence on transfer behavior, or otherwise looked at transfer behavior holistically, are included under the heading "Transfer penalty and passenger decision making."

Transfer Penalty and Passenger Decision-Making

The literature and reports most significant to this study are those that address the general problem of transit transfers. For the most part, these studies assess the quality of transfer trip-making and suggest ways to improve transit transfers in order to make transit more viable for a broader variety of trips. Many of these studies are concerned with what is referred to as the transfer penalty, which amounts to the actual and perceived cost experienced by transit customers that must wait at a station/stop in order to make a transfer trip. According to the literature, waiting time is generally valued by transit customers at a higher rate than in-vehicle and walking time and many studies suggest that the wait time premium is significantly higher. Transfer penalty studies have typically examined multiple aspects of the transfer experience, often considering transit operations, customer information, wayfinding, transfer facility, and security all at the same time.

The study with the most holistic approach to exploring passenger perspectives on transit transfers was completed by Taylor, Iseki, Miller and Smart [(1)] for Caltrans in 2009. The purpose of the study was to create an assessment tool for evaluating the quality of transit transfers and assisting transit managers in prioritizing improvements at any given transfer facility. As part of this study, researchers surveyed approximately 750 transit riders at 12 different transit transfer locations in Los Angeles County, CA. Survey locations ranged from bus stops to major rail/light rail/bus transfer hubs. The objective of the survey was to determine which factors are most important to user satisfaction when making transfer trips. Researchers asked riders about their out-of vehicle transit travel (walking, waiting, and transferring) and assessed factors relating to access

(directional flow and wayfinding), connections and reliability, information, amenities, and security and safety.

The authors used an Importance-Satisfaction analysis to adjust customer satisfaction responses with the stated importance of each factor, and then used ordered logistic regression models to examine transit users' perception of services and the built environment at transit stations/stops. They identified a "hierarchy of traveler wait and transfer needs" indicating that "frequent, reliable service in an environment of personal safety" outweighed physical characteristics of the stop or station for riders [(1)]. Ease of navigating to and around the stop or station was the next most important factor. The authors interpret these findings to mean that security and service frequency are fundamental requirements that trump comfort and amenities in the minds of transit riders.

The study also included a nationwide survey of 175 transit operators to investigate what they believed to be most important at transfer facilities, both from their perspective and what they know about the perspectives of their passengers. The researchers found that "safety and security related factors far outweighed other attribute factors at transit stops, stations, and transfer facilities" in expressed importance by transit operators, and that transit operators correctly perceived that safety and security would be top concerns of their passengers[(1)].

Adding to our understanding of the transfer penalty on multimodal systems, Liu, Pendyala, and Polzin [(2)] examined how transfer penalties vary across transit modes in the New York-New Jersey metropolitan region. They modeled transit ridership in a traditional four-step travel model under various transfer scenarios using stated preference data collected from different commuter corridors in the region. They found that customers perceive intermodal transfers (e.g. rail to bus) as more costly than intramodal (e.g. bus to bus, rail to rail) transfers, in term of the transfer time penalty.

Guo and Wilson [(3)] developed a discrete choice model using Massachusetts Bay Transportation Authority (MBTA) survey data to examine how long passengers would be willing to walk to avoid a transfer. The study expanded on previous research by including alternative paths, localized land use, and topography. The authors found that the average transfer penalty for the MBTA system is equivalent to 9.5 minutes. In other words, a traveler would choose to walk instead of use transit if the increased travel time from walking was less than 9.5 minutes. However, they stress that there is significant variation depending on time of day, land use factors, and quality of pedestrian facilities.

In another look at the transfer penalty, Hess, Brown and Shoup conducted a natural experiment on the time valuation of UCLA college students. The study investigated how transit passengers value wait time [(4)]. College students using local bus services were given the choice of boarding a bus right away for 75 cents or waiting for the next bus, which would be free. In observing and surveying study participants, the research team found that 86 percent of riders chose to wait rather than pay. Based on an average

waiting time of 5.3 minutes, the researchers estimated the value of wait time to be $8.50 per hour.

Relating specifically to the NJ TRANSIT system, Carnegie [5] completed an unpublished study that explored bus access, facility design and service characteristics at three commuter rail stations on the Northeast Corridor rail line. The study included field investigations to document street characteristics, development patterns, and bus service amenities in the area of the stations and an analysis of service frequency and schedule coordination. He found that bus service connections at or near stations lacked visibility, bus stops often lacked basic amenities, the quality of pedestrian connections to stations and stops were poor, and that the routing and scheduling of buses near train stations can be confusing and inconvenient. In particular, skip-stop service and service variations by time of day or day of week were found to be potentially challenging, particularly for new riders and riders transferring at the stations. The study recommended a multi-faceted strategy to address these deficiencies, including improving the visibility of connecting bus services through signage and branding, improving bus stop amenities, increasing information about connecting services at rail stations and nearby bus stops, and integrating better bus services into the station area with bus lanes or signal priority.

Looking beyond the United States, Reilly [6] compared transit service design and operation practices in the United States and Europe. The author based the comparison on observational research conducted during a study tour sponsored by the Transit Cooperative Research Program of the National Academies. According to the study, operational differences in Europe include longer distances between stops for both bus and rail and schedule coordination in downtowns. These features are enabled by technologies such as schedule adherence systems, signal preemption, and electronic fare collection. Station/stop facilities in Europe provided better customer information at bus stops and greater use of off-board fare collection. Schedule coordination, better customer information and off-board fare collection can all contribute to easier, faster transfers.

In February 2010, the Metropolitan Transportation Commission (MTC), the Metropolitan Planning Organization (MPO) for the San Francisco Bay area in California, adopted the MTC Transit Coordination Implementation Plan [7]. The plan requires schedule coordination among transit operators in the MPO service area; established cross-agency standards for directional signs, wayfinding kiosks, and both static and real-time transit information displays; expanded an existing regional fare card system to more operators, and requires real-time vehicle location data sharing with a regional 511 agency. These improvements are intended to enhance the ability of passengers to make transfer trips and increase transit ridership overall.

As part of the planning process, MTC conducted evaluations of “prototypical” transit hubs. Transit hubs were first classified into one of four types based on intensity of use: urban hubs with buses loading on-street, urban hubs with off-street bus loading, bus-

only hubs, and BART with off-street bus loading. Then, five “prototypical” hubs were selected to represent different classified types, geographic areas, and land uses (urban, suburban, downtown). The evaluation identified deficiencies and provided recommendations for wayfinding, customer information, use of real-time technology, last-mile access (including shuttles, pedestrian access, bicycle access, taxis, and other travel options), on-site amenities and infrastructure (walking distance, shelter, seating, restrooms, security), and fare coordination.

For a more general understanding of passenger decision-making as it relates to the transit experience, the research team reviewed the Transit Capacity and Quality of Service Manual [8] published by the Transportation Research Board. Part 3 of the manual, presents a framework for assessing service quality, which is defined as the overall measured or perceived performance of transit service from the passenger’s point of view. Quality of service is divided into two main categories: service availability/capacity (coverage, service span, frequency) and comfort /convenience (wait time, shelter, reliability, crowding, security, cost, and transfers). Since service availability/capacity and customer comfort/convenience both play an important role in decisions to make transfer trips among choice riders in particular, the quality of service framework presented in the manual is highly applicable to the evaluation of the transfer experience.

Transit Operations, Facilities and Amenities

Another area of research addresses transit operational approaches to facilitate transfer trips. In particular, there is a significant body of literature examining how reducing transfer times through schedule coordination and routing can ease transit transfers. Under the umbrella of transit operations, significant attention is paid to transit agency routing, scheduling and fare policies and in particular schedule coordination between intersecting transit services. This topic area also addresses how transit facility design affects the ease of transferring.

Operations

Chowdhury and Chien [9] developed an analytical approach for coordinating schedules between a rail line and feeder bus routes, that seeks to minimize the cost to both operators and passengers. They note that minimizing transfer wait time can significantly improve service quality for passengers, because waiting time is a significant contributor to the “transfer penalty.” However, when scheduled wait times are small, a delayed bus can cause passengers to miss their connection, a significant inconvenience that can dissuade future transfer trips. The approach utilizes a procedure for optimizing intermodal transfers using an objective total cost function that balances the cost of building in “slack” time (a scheduling cushion to allow for vehicle delays) with the cost of potential missed transfers. Not surprisingly, they conclude that rail-bus coordination is most beneficial for routes with long headways and reliable bus arrival times. They recommend that slack time be built in to bus-to-rail transfers except in the case of highly variable bus arrival times or very frequent service.

Representative of the work done on optimizing interconnected transit routes, Peng and Fan [10] developed a conceptual framework for using a geographic zone system for optimizing the routing and scheduling of transit services. The authors developed a computational model that takes into account intermodal connections between rail, feeder bus, and express bus. The model is intended to be used by transit planners as a decision support system for planning or optimizing an integrated transit system.

Other researchers have explored the potential of advances in technology. Dessouky, Hall, Zhang and Singh [11] explored how advances in on-board Global Positioning System (GPS) communication technologies can enable improvements in the coordination of bus transfers. They simulated bus schedule coordination using real-time communication of location to a central dispatch office and compared this to more traditional on-site coordination. Regardless of which method is used, coordination control consists of delaying the departure of a bus from a terminal or transfer point to wait for passengers coming on another bus that has not yet arrived. Delaying a bus departure for the purpose of coordination involves an inherent trade-off – the time benefit that transferring passengers receive by not having to wait for the next bus when making a connection is weighed against the time cost to those passengers already on the connecting bus who are forced to wait. The potential benefits of real-time communication is that the dispatch office would be able to predict the arrival time of a delayed bus at a given time point with greater accuracy using the real-time GPS location as compared to driver radio-dispatch communication. The authors conclude that real-time communication will be most beneficial when transfers combine long headways with small schedule slack time.

Facilities and Amenities

The investment, design and maintenance of a transit facility impact the level of comfort and convenience experienced by passengers transferring or waiting to transfer. The walking distance between deboarding and boarding areas, pedestrian flow, shelter, changes in levels, provision of elevator and escalators, and the travel path for those with mobility impairments all determine passenger comfort when moving through the facility. When waiting, shelter, climate control, seating, availability of food and convenience retail and restrooms are important features.

Planning guidance for designing transit facilities that encourage transfers is found in the Transit Capacity and Quality of Service Manual [8]. Part 7 of the manual, “Stop, Station, and Terminal Capacity”, presents procedures for evaluating and sizing passenger walkways, stairways, queuing areas and waiting areas for various types of transit facilities: bus stops, transit centers, bus way stations, light rail stations, heavy rail stations, commuter rail stations, ferries, and intermodal terminals. The manual also describes pedestrian level of service, a method of evaluating the comfort and function of a walking space, and design considerations for walkways, waiting areas, doorways, stairways, escalators, moving walkways, elevators and fare gates. These guidelines are useful when conducting visual evaluations of pedestrian flow and space at transit stations/stops.

Passengers with access and functional needs, such as those with mobility, visual, hearing, or cognitive disabilities, should also be considered in facility design. Easter Seals Project ACTION, with funding from the Federal Transit Administration, developed a method for assessing the accessibility of bus stops for persons with disabilities [12]. The report presents a bus stop inventory checklist and bus stop design guidelines based on the principles of universal design. Beyond meeting the minimum requirements of the Americans with Disabilities Act of 1990, universal design seeks to best meet the needs of all members of the population, including those with disabilities. The bus stop checklist addresses location, pedestrian access, comfort amenities, safety and security, and information features. Accessible pedestrian access to a solid-surface sheltered waiting area is important, as is accessible information. Minimizing walking distance, providing safe street crossings, seating and a secure environment are important for all passengers but are of particular importance for those with mobility needs.

The role of a transfer location as a public civic space should also be considered. Volinski and Page [13] present four case studies of bus transfer facilities that were designed and programmed to provide community benefit through partnerships and joint development: the Charlotte, North Carolina transportation center, two Corpus Christi, Texas bus stations, the Ground Transportation Center in Cedar Rapids, Iowa and the Linden Transit Center in Columbus, Ohio. In these examples, the transfer centers provided a location for human services or served as a catalyst to local redevelopment. The authors argue that transit agency investment can create transfer facilities that are a community asset rather than an undesirable land use. This is a valuable reminder to look beyond the basic amenities within the facility footprint and towards the role that the transfer location might play in the larger community.

Determining the relative importance of amenities to waiting passengers has been another topic of inquiry in the literature. Geetika [14] analyzed a customer survey designed to investigate the determinants of customer satisfaction on the North Central Railway zone of Indian Railways in India. The 16-question survey, which employed a five point Likert scale, was administered to 700 passengers at a northern Indian railway station. The author found that the availability of food and drink at the station was the most important factor for customer satisfaction, followed by the behavior of railway employees.

Passenger Information

Information is critical for transit passengers for trip planning and during the trip to navigate facilities and be informed of service changes. Multi-leg transfer trips are necessarily more complicated to plan and execute than single-leg trips. Therefore, passenger information is especially important. While reports and guidebooks that include passenger information topics are discussed above, research and guidance primarily concerned with passenger information, including research into how advances in information technology can enable more frequent, seamless, and ubiquitous distribution of service information, are covered under this subheading.

John Fruin [15] prepared a synthesis of passenger information for transit transfer facilities for the Transportation Research Board in 1985. Although the synthesis predates recent technological advances such as real-time information displays, websites and mobile devices, the report provides a comprehensive overview of passenger information methods and concepts. The author describes four types of information aids: “visual communication” which includes service and stop identification signs, guide signs, maps, posted schedules; “oral communication” which includes audible information such as customer service telephone numbers, public address systems, and direct verbal contact with transit personnel and other passengers; “distributed information” which includes route maps, timetables, newsletters, press releases, advertising, and other printed information; and, “interactive passenger information” which includes computer trip planners and interactive kiosks.

Fruin developed a five-level classification of transfer facilities based on volume, quantity of routes and modes, physical design of the facility, and regional importance. Within these categories, typical customer information features are defined. He makes the case for comprehensive planning of a passenger information program and grounds his recommendations in the understanding that passengers benefit from a system that has simple messages, presented in a consistent design or format, reinforced through continuity and repetition. Fruin’s work formed the background for later evaluations and guidance on transit passenger information, including the Transit Capacity and Quality of Service Manual.

The ability of potential passengers to understand and use timetables and schedules is important on complex, multi-leg trips where transfers have to be pre-planned. Cain [16] investigated what design elements of printed transit information are most beneficial and most problematic for both transit users and non-users. One hundred eighty participants were recruited and observed completing a trip planning exercise using a variety of prototype materials developed for the study. The study was conducted in three Tampa, Florida malls. Trip planning was divided into five sections: identifying trip origin and destination; selecting bus routes; locating bus stops; identifying the correct section of the schedule; and, using the schedule. Cain found that participants had high success using a system map to locate routes and stops, but had difficulty using a schedule timetable. Twenty percent of participants said they would use transit more often after completing the exercise, suggesting that providing education on using transit information materials may lead to increased transit ridership. These findings were later used to redesign and test the printed schedule materials for the Transfort transit system in Fort Collins, Colorado [17].

Other research on passenger information has focused on advances in technology. Zografos, Spitadakis, and Androutsopoulos [18] examined how passenger information systems can facilitate multimodal trip-making. The authors describe the development of a trip planning application for use in Athens, Greece and surrounding areas. The application is notable for providing itinerary information for multi-link trips that include both inter-urban and intra-urban components across different transit system operators. It also provides information updates and reminders to passengers via a website, cellular

short message service, and telephone for the entire lifecycle of the trip. The application was evaluated positively by a survey of 200 potential users and met both technical and cost-effectiveness tests. This demonstration shows the potential of technology when the challenges of sharing schedules and real-time performance information across agencies can be addressed.

In another study that demonstrates the potential of mobile internet devices, University of Washington researchers Ferris, Watkins and Boring [19], developed an iPhone application that takes advantage of the device's built-in global positioning system to provide refined trip-planning advice and real-time bus arrival information based on the user's current location. The application is an extension of the trip-planning and bus arrival website OneBusAway operated for the University of Washington bus system. Sixteen study participants completed a trial of the application. In a survey of 488 self-selected users of OneBusAway, those respondents who had participated in the iPhone application trial expressed higher satisfaction with OneBusAway services and were more likely to use them to alter their transit trip plans.

Information technology also has the potential to assist passengers with visual impairments in navigating transit facilities. Marston and Church [20] present the results of a study that investigated how Remote Infrared Audible Signage (RIAS) can be used to improve the travel experience of visually impaired customers. RIAS consists of doorway and destination transmitters that activate an audible message on a users' receiver when the receiver is pointed at it. Thirty legally blind persons were observed completing a series of navigation tests in the San Francisco Caltrain terminal, both with and without RIAS, to measure and identify barriers to transit use. Study participants time to complete the tests varied widely based on consistency of placement and presence of non-auditory clues, however, use of RIAS led to consistent improvement in test times.

Safety and Security

Safety and security is important to transfer passengers, who must spend more time walking between deboarding and boarding areas, and waiting for their next trip to board and depart than non-transferring passengers. Security threats that may impact transit passengers include pick pocketing, harassment, robbery and assault. In addition to actual safety risk, the passenger's perception of security is also important. Even if a transit facility has a low incident rate of crime, potential passengers may avoid it if it is poorly lit and/or maintained or there is a lack of visible security measures such as police patrols, call boxes, and security cameras.

Comprehensive guidance on security design and planning for transit agencies is provided in Transit Security Design Considerations – Final Report [21] from Volpe National Transportation Systems Center. This report is intended to assist transit agencies in developing a *Threat and Vulnerability Assessment* (TVA) and a *Security Plan*. Various strategies are discussed for both large and small bus and rail facilities. Overall, the strategies emphasize integration of systems and communication

technologies both within an agency and across different agencies, implementation of design strategies relating to physical spaces and equipment, and establishment of policies and procedures. The authors also share lessons learned from previous security emergencies.

The risk of crime while making a transit trip is not limited to facilities controlled by the transit agency. Making this case, Smith [22] presents a framework for analyzing the security needs of women transit passengers. A "whole journey" approach is used, that considers the security needs from the origin to the destination, including access to and from the stop/station, on the assumption that passengers evaluate their personal safety risk against the most risky part of the trip, which may occur outside the transit system. Smith recommended employing crime prevention techniques that take a "situational" approach that uses environmental design and passenger education to reduce the potential for crime at a particular location.

Anastasia Loukaitou-Sideris of the University of California, Los Angeles has written extensively on the factors contributing to transit crime. In Hot Spots of Bus Stop Crime [23], she used direct observation, mapping, surveys, and interviews to examine the effect of urban design and land use on crime suffered by passengers waiting at ten high-crime bus stops Los Angeles, CA. Conditions at these locations were compared to four low-crime bus stops which served as control cases. The study found that negative land uses, lack of surveillance, crowding, neglected buildings and streets, and easy escape routes contribute to crime at bus stops. Loukaitou-Sideris recommended that increased policing and the relocation of bus stops away from areas characterized by negative land uses, antisocial activity, vacant lots could improve conditions.

Loukaitou-Sideris also examined how built environment and social characteristics impact crime at light rail stations, using a case study of the Green Line in Los Angeles, California [24]. This line was selected because of the diversity of land use and socio-demographic characteristics along its length. The study employed multivariate regression analysis using crime statistics; census, land use, and ridership data; and observations about the adjacent built environment. She found that serious crime was closely correlated with population density, while less serious crime (such as graffiti) was dependent on station ridership and the percent of low income households in the vicinity. The author concludes that both socio-demographics and environmental variables play a role in explaining light rail station crime, and makes the argument that station security planning should extend beyond the station into the surrounding neighborhood.

Summary and Discussion

The study with perhaps the most relevance to the current research was completed by Taylor, Iseki, Miller and Smart [1] for Caltrans. The authors identified a "hierarchy of traveler wait and transfer needs" indicating that "frequent, reliable service in an environment of personal safety" outweighed physical characteristics of the stop or station for riders. Ease of navigating to and around the stop or station was the next most

important factor. They interpret these findings to mean that security and service frequency are fundamental requirements that trump comfort and amenities in the minds of transit riders. While the Taylor, et al. study broke new ground in methods for evaluating the transfer experience, it was conducted within a single region where transit passenger patronage is dominated by bus. The much greater prevalence of heavy rail and light rail in New Jersey, coupled with the great diversity of transit modes and agencies, may reveal new findings about the importance of transfer factors across different modes and intensities of transfer facility types.

Other important findings from the literature include:

- Intermodal transfers (e.g. rail to bus) are perceived by passengers to be more "costly" than intramodal (e.g. bus to bus, rail to rail) transfers [2].

- Passenger comfort and convenience play an important role in decisions to make transfer trips, particularly among choice riders [8].

- Minimizing transfer wait time can significantly improve service quality for passengers, especially when passengers are transferring between rail and bus modes. Rail-bus coordination is most beneficial for routes with long headways and reliable bus arrival times [9].

- Pedestrian access to a solid-surface, sheltered waiting areas, accessible information, minimal walking distance between transfer locations, safe street crossings, seating and a secure environment are important for all passengers but even more so for persons with mobility needs [12].

- Well designed transfer facilities can be a community asset, serving as a catalyst for retail and other community development [13].

- Transit passengers benefit from system information communicated with simple messages, presented in a consistent design or format, and reinforced through continuity and repetition [15].

- The ability of potential passengers to understand and use timetables and schedules is important on complex, multi-leg trips where transfers have to be pre-planned [16].

- Information technology can play an important role in facilitating transit transfer trips and improving the overall quality of the transit experience while making transit trips [11, 18, 19, 20]. This can be especially true for passengers with visual impairments [20]. Further, use of information technology to provide real-time communication with passengers is most beneficial when transfers combine long headways with minimal schedule slack time [11].

- Safety and security is important to transfer passengers, who must spend more time walking between deboarding and boarding areas, and waiting for their next trip to board and depart than non-transferring passengers [21, 22, 23]. In particular, with regard to bus stops, “negative” adjacent land uses, lack of surveillance, crowding, neglected buildings and streets, and easy escape routes for criminals contribute to increases in crime [23]. In the case of light rail, crime has been associated with socio-demographic characteristics of nearby neighborhoods and environmental variables. This suggests that station security planning should extend beyond the station into the surrounding neighborhood [24].

The literature clearly demonstrates that many factors influence a transit passenger’s experience when making transfer trips. For example, ease of finding information, travel time, waiting time, cost, comfort, amenity, and a sense of security all play an important role. As described in the remainder of this report, these insights were used to categorize and assess transit transfer locations in New Jersey and explore passenger needs and priorities when making transfer trips at different types of facilities using different modes.

STRUCTURED INTERVIEWS

During the months of May through June 2010, the research team conducted a series of structured interviews with a variety of stakeholders with knowledge of transfer trips and facilities in New Jersey. The purpose of the interviews was to: gain a thorough understanding of the role of transit transfer locations play in transit operations and travel patterns in New Jersey; help define the different types of transfer locations present in New Jersey; and identify issues, concerns, and suggestions for planning, designing and operating transfer locations. Interview participants were selected in consultation with NJ TRANSIT. The research team conducted nine interview sessions involving a total of 33 individuals from fourteen organizations. Interviews were conducted in-person or by telephone and each interview lasted approximately 60 to 90 minutes. Table 1 provides a list of the organizations interviewed.

Table 1 – List of Organizations and Date Interviewed

Organization Interviewed	Date
NJ TRANSIT	5.13.10
Transportation Management Associations (TMAs): Keep Middlesex Moving TMA, Greater Mercer TMA, and TransOptions TMA	5.18.10
SYSTRA	5.24.10
New Jersey Department of Transportation	5.25.10
North Jersey Transportation Planning Authority	6.1.10
County Paratransit Operators: Middlesex County Transportation, Ocean County Transportation, Somerset County Transportation (also representing the NJ Council on Special Transportation)	6.3.10
Governor's Office – Transportation Policy	6.14.10
New Jersey Travel Independence Program, Inc.	6.17.10
Private Bus Carriers: Lakeland Bus Lines, Inc. and Coach USA/Suburban Transit	6.24.10

Individual interview reports are included in Appendix A.

Summary Findings

The following is a summary of key findings from the interviews.

- Transfer trips play a significant and essential role in transit travel in New Jersey. This was noted as true across modes and geographic locations in the State. Many participants opined that transfer trips will increase in the coming years due to factors including an increased focus on local facilities and services, greater recognition of the importance of transfers among stakeholders broadly in the

transportation community, and an increase in the number of private providers operating services in New Jersey.

- There are several threshold barriers that limit customer use of transfer trips. These include: 1) limited customer knowledge about what transfer trips are possible, how to make them and where; 2) customer anxiety, aggravation and sometimes anger associated with making transfer trips that stems from a lack of control and uncertainty about making connections. These barriers need to be addressed to facilitate transfer trips

- There are a number of institutional barriers that make planning for transfer trips challenging. Examples include: 1) limited evening and weekend transit service; 2) the practice of NJ TRANSIT rail and bus schedule changes not occurring simultaneously due to differing union contracts among modes; 3) no current means of coordinating operations and information sharing among and between operators that may serve the same location; and 4) lack of available data on passenger movements and real-time data on vehicle status since NJ TRANSIT vehicles are not currently equipped with automatic vehicle location (AVL) technology or automatic passenger counters. If available, such data could aid planning for transfers and identifying places with a high volume of transfer trip-making.

- According to interview participants, the characteristics of transfer facilities deemed most important from the customer perspective include: 1) frequent, reliable service; 2) schedule coordination/well timed connections; 3) ability to transfer within a reasonable distance between boarding and alighting points; 4) clear and accurate wayfinding signage and travel information available both on-site and online; 5) presence of basic customer amenities, especially shelters; 6) presence of safety features such as lighting; 7) facilities designed for universal access; 8) and fare transferability/interoperability. Participants noted that many of these features can reduce travel-related anxiety and empower riders to make transfer trips.

- The importance of service frequency, lighting/security and presence of shelters were specifically mentioned as features particularly important for travelers with disabilities and senior citizens. Similarly, the need for clearly communicated information on how to use the transit system, how to make transfers and wayfinding were highlighted to be particularly important to seniors and people with limited English proficiency. Ease of physical access and movement around facilities and between services/modes was noted as being particularly important for people with disabilities and seniors.

- Other issues highlighted by multiple participants included: 1) potential neighborhood/community concerns and “home rule” can significantly influence planning and implementing transfer facilities/locations (e.g., municipal governments determine the location of bus stops); 2) the relationship between

retail shopping malls and public transit varies by locality and can be an impediment to planning and implementing transfer facilities/locations; and 3) technology applications will likely play an increasing role in facilitating transfer travel.

The Role of Transfer Trips and Facilities in New Jersey

The overwhelming majority of interview participants reported that transfer trips play a significant and essential role in transit travel in New Jersey. They acknowledged that transfer trip information should be made as clear and easy to understand as possible for both existing and prospective transit customers. Some noted that transfer travel can be viewed as an efficiency measure, since it allows the system to serve more customers. Others noted that transfer trips will become increasingly important to the State in the coming years due to factors including an increased focus on local transit hubs and local services, greater recognition of the importance of transfers, and an increase in the number of private providers operating services in New Jersey. Also, if high speed rail is implemented, transfers between modes will become even more significant.

NJ TRANSIT staff and other interviewees indicated that transfer trips are important for all transit modes. For example, more than one-third of rail passengers who disembark in Newark transfer to another mode or service. Transfer trips are also crucial to bus operations, as they help to minimize redundancy and maximize movement of the greatest number of travelers, especially in urban areas. In suburban and rural areas, there are generally fewer opportunities to make transfers and wait times are usually longer with few facilities available to travelers. Transfer trips are also frequent among light rail passengers. This is partly due to the fact that New Jersey's light rail systems were designed to facilitate transfer movements. For example, the Hudson-Bergen Light Rail (HBLR) distributes passengers to connecting bus, ferry and heavy rail service and feeds employment along the waterfront. In contrast, private bus operators observed that the majority of their customers are exclusive to their respective lines and they do not tend to transfer.

With regard to transit passengers with disabilities, representatives from the New Jersey Travel Independence Program (NJTIP), which provides travel instruction services, explained that transfer trips are very important to their students. They stated that at least half of the travel instruction they provide involves students making transfer trips. NJTIP staff observed that transit travel in northern NJ is very likely to necessitate a transfer, so, being capable of transferring safely to any mode definitely increases travel options.

The importance of transfer trips to populations with special needs was reiterated by representatives from county paratransit operators and transportation management associations. For example, participants noted that community buses such as the BurLink shuttle in Burlington County, which operates as a flexible fixed route service, is coordinated with NJ TRANSIT bus routes and the River Line light rail service to facilitate transfers. County paratransit providers are also very interested in working with NJ

TRANSIT and other providers to facilitate the ability of more county to county demand response services to link up with NJ TRANSIT services for transfers. For their part, NJ TRANSIT recognizes the need to build partnerships with community transportation providers, as well as with private operators, so that issues such as poorly timed schedules and coordinated fare policies can be examined. NJ TRANSIT indicated that many higher education institutions throughout the State also recognize the value of facilitating transfer trips and seek to serve as transport hubs for their students, faculty, staff and surrounding communities. For example, William Paterson University is interested in hosting a park and ride facility for both university and non-University users, while Montclair State College wants to make the best use of their access to both rail and bus services.

Recognizing the inherent importance of transfer trips to public transportation travel in New Jersey, NJ TRANSIT bus service planners reported that the agency is currently funding three studies focused on enhancing intermodal connections through improved service delivery, stop locations and facility/stop design and amenities. Each of these three studies – the Greater Newark-Elizabeth study, the Northwest Bus study and the Northeast New Jersey Metro Mobility study – are focused on making bus transit travel and transfer trips function better to meet customer needs and improve services.

Challenges and Customer Needs in Making Transfer Trips

While virtually every person interviewed acknowledged the significance of transfer trips to public transit travel in New Jersey, most also remarked about the many challenges to making transfer trips more appealing to customers. One challenge is the public's general lack of familiarity with the transit system and potential transfer connections between and within modes. Another is the fact that customers generally try to avoid making transfer trips because transfers are often perceived as burdensome, frustrating and sometimes confusing. Transfer locations are sometimes poorly designed and lack basic security features and amenities. Consequently, interview participants suggested that educating the public on how to make transfers will be important to expanding transfer activity. Also important will be reducing the anxiety and aggravation customers feel when making transfers.

Participants also cited several institutional challenges. One involves the fact that NJ TRANSIT rail and bus schedule changes do not occur simultaneously due to differing union contracts. Another challenge involves lack of available passenger and vehicle tracking data. NJ TRANSIT vehicles are not currently equipped AVL technology or automatic passenger counters. If available, this data could aid in the planning of transfer trips. The reality that less transit service is available on evenings and weekends was also cited as a challenge for those seeking to make transfer trips.

When interview participants were asked: "what characteristics of transfer facilities are most important to transit customers?" responses varied, but interestingly, the same ten or so broad response categories were consistently mentioned. The topics are listed

below along with issues and recommendations for improving customer transfer experiences.

- Traveler information: Clear maps, signs and schedules at facilities (including bus stops) are a very important feature and need to be regularly updated. This is especially important for infrequent riders and riders with functional and access needs. Maps and regularly updated schedule information should also be available on-line and via mobile device. Real time schedule and service information should be offered whenever possible. Signage should be "destination based" at transfer locations directing passengers to transfer locations and nearby points of interest. It would be beneficial to standardize basic signage across modes so it is easily recognized and understood. Cameras should be placed in stations when possible that enable riders to see when their vehicle arrives. Integrated information on all services should be offered, regardless of the agency, organization or company providing the service.

- Security and safety: Station/stops should be well lit and incorporate security features (cameras, policy patrols) as needed to ensure that customers perceive facilities to be safe from crime. Security and safety concerns are especially a concern for bus travelers and less of an issue at larger facilities with a police presence. Overall, security features decrease rider anxiety.

- Station/stop design: The relationship between the station/stop and its surrounding neighborhood is important. Stations/stops should not be isolated and should be oriented toward other uses in the neighborhood. Stations/stops should be designed for access by all users regardless of age or disability status. Making the station walking area as flat as possible is valuable. Places where buses and pedestrians share space should be designed with pedestrian safety as a priority.

- Station/stop amenities: Overall, amenities contribute to decreased rider anxiety. Shelters are a necessity. They indicate a safe place of permanence for riders, facilitate information distribution, and provide protection from the elements. Shelters should be well-lit and climate controlled when possible. Shelters should include seating and trash receptacles. Retail and convenience amenities, either integrated or adjacent to a facility, can also important but are less critical.

- Service characteristics: Transit service should be as frequent as feasible. A minimum frequency of one vehicle every 20 minutes is best. This provides a degree of certainty for passengers and minimizes wait time for missed connections. Service reliability and schedule coordination are also very important. Scheduling should be timed so that customers have adequate time to access transfer points without too long a wait. Schedules should be coordinated between modes and services regardless of operator.

- Fare transferability/interoperability: Fare media should be simple and fare collections should be as automated as possible. Patrons shouldn't need to provide exact change. Fare costs should be reasonable and equitable. For example, if rail to bus transfers are free, the reverse should also be true. Fare media should be cross honored whenever possible.

- Ease of transfer: Transferring passengers should only have to walk a reasonable distance between boarding/alighting points. Riders should not be expected to walk a half-mile to access transfer services.

Of the characteristics mentioned above, the ones most frequently cited were: the need for clear signage and availability of accurate travel information both on-site and online; the need for basic amenities, especially shelters; the importance of safety features such as lighting; and the need for service frequency, reliability and schedule coordination.

The value of and need to improve coordination between local, county, private and NJ TRANSIT services was expressed by a variety of interviewees as a critical step to facilitating transfer travel. County paratransit providers provided examples of local services that failed primarily because they were not coordinated with NJ TRANSIT. As a result the services were inefficient and failed to attract a significant rider base. Specific suggestions for achieving the goal of increased coordination were few, but some participants noted that improved communication among providers was a critical first step to achieving that goal.

Concerns Related to Passengers with Access and Functional Needs

People with access and functional needs such as persons with disabilities, senior citizens and non-English speaking customers may face unique challenges related to making transfer trips. To understand these challenges in more detail, the research asked interviewees to share their experience and expertise specifically on this topic. Many of the concerns cited by passengers with access and functional needs were the same or similar to those mentioned for transit users in general. For example, the importance of service frequency, security and presence of shelters and other amenities were noted as particularly important for passengers with special needs. NJTIP travel trainers explained that the physical ease of making the transfer is a critical concern for people with disabilities and senior citizen travelers.

In terms of safety, both infrastructure and crime-related concerns need to be considered and addressed. Crowds also pose a concern, with too few patrons at a facility making that station/stop vulnerable to criminal activities, while large crowds can make it extremely difficult for some people with mobility and cognitive impairments to safely navigate pathways. With regard to facility design/movement, interviewees noted that ramp access, depressed curbing and/or curb cuts and functioning elevators are crucial for special populations. Also important is informing riders of the shortest, most direct

accessible walking route within and around the station facility. In general, multi-level stations are harder for people with disabilities to navigate. Also, exterior station doors are not subject to Americans with Disabilities Act (ADA) regulations so if they are not automatic, that frequently causes difficulties. In addition, many people with disabilities cannot use turn-styles.

To facilitate movement around stations/stops, intersection signal timing must be considered, since pedestrian signal cycles are frequently too short to permit safe movement by all. Concrete pathways and sidewalks around stops are of particular importance when considering the accessibility of bus stops. With regard to rail, it was acknowledged that retrofitting rail stations for accessibility can be very costly, so efforts are made to accommodate special populations during initial design work. When older rail stations are renovated, increasing accessibility is usually a key goal. This was the case as part of the Ridgewood and Somerville train station projects.

Communication can be a challenge for people with disabilities. To overcome this obstacle, information must be clearly conveyed. Having station agents present can be particularly helpful for travelers with special needs and NJTIP interviewees noted they advise students to seek out transit operators for information assistance. Signage should also be consistent across modes (color, shape, etc.), and more signs should be located along paths and near elevators and exits. Signs should be positioned at eye level. One participant explained that too often bus stop signs are hard to see for people in wheelchairs because they are positioned too high and the text is too small. Signs should also indicate how to access various points within a station, such as exits, street access, and different modes. To address the needs of those with visual impairments/low vision, audible talking devices should be deployed at stations, on board vehicles and at roadway intersections.

Interview participants also called attention to issues related to maintenance of devices/tools designed to aide travelers with special needs. For example, automated announcement systems currently used on buses frequently go out of service. In addition, bus kneels frequently do not operate during the cold weather and wheelchair lifts have to be used frequently to remain functional. Further, the weight of electric wheelchairs can break/damage lifts on smaller mini-buses (16 passenger or less vehicles).

Participants opined that a significant obstacle to greater use of transit by senior citizens is a lack of knowledge and understanding of how to use the system. Transportation Management Association (TMA) representatives explained that based on their experiences working with seniors on travel training initiatives, seniors often report feeling confused with regard to using transit. For example, schedules typically list time points only. Seniors not familiar with taking transit don't always understand other stops between their origin and final destination are possible. It was also noted that seniors are often unaware that buses can kneel to make access easier. In terms of amenities,

county paratransit providers explained that access to nearby restrooms, well-lit and secure station/stop areas and flat walking surfaces are critical for senior travelers.

With regard to people with limited English proficiency, participants noted that little to no information is available for non-English speaking transit customers and the ADA does not address non-English speakers nor does NJ TRANSIT have an agency wide policy on translation of information materials. Despite these obstacles, several participants indicated their overall impression is that these travelers generally "pick up" what they need to know to successfully complete their desired trips within the system. To alleviate travel concerns for passengers with limited English proficiency, participants suggested that universal signage be employed. Others suggested that consideration be given to using signage in other language(s) in locales with a large population of foreign speaking residents.

Other Issues Impacting Transfer Facility Planning and Implementation

In discussing customer needs and obstacles in making transfer trips, three additional topic areas were frequently mentioned: 1) the impact of neighborhood/community concerns and "home rule" on planning and implementing transfer facilities/locations; 2) the relationship between retail shopping malls and public transit; and, 3) the role technology applications may play in facilitating transfer travel. Each of these is discussed in more detail below.

Neighborhood and Community Concerns

The impact of neighborhood/community concerns and "home rule" on planning and implementing transfer facilities/locations was an issue repeatedly mentioned by multiple interviewees. Participants reported facing local opposition to the placement of bus stops and shelters where it is most convenient for transfers, noting that municipalities have to approve these locations and in the case of bus shelters, accept responsibility for maintenance of those shelters (sometimes via resolution). Often, sites deemed most appropriate by service planners for the ease and convenience of customers and/or to facilitate transfer activities are not approved by municipalities. As a result less desirable sites are selected. At the same time, it is important to emphasize that not all municipalities are difficult to work with in terms of selecting transportation sites in their community. For example, East Brunswick and Monroe Townships in Middlesex County are working with NJ TRANSIT to install increased bus signage in their communities.

With regard to amenities, NJ TRANSIT will provide shelters, pads and associated 'no parking' signs to entities seeking one, provided that entity agrees to maintain the shelter (by signing a maintenance agreement). Maintenance costs typically involve cleaning and replacing glass panels when needed. However, NJ TRANSIT does not provide lighting for the shelter/stop area. One option towns have pursued to defray the cost of shelter maintenance is to develop an agreement with an advertising company that puts up the shelter and lighting and maintains it in return for ad space.

An often cited concern regarding the placement or expansion of new transport facilities is the potential for increased traffic that will not benefit the community where that facility is constructed. To address this concern, some transportation entities try to place facilities in close proximity to shopping areas so that the local economy will benefit from facility users. Demonstrating the potential economic benefits of a given transportation project to a community can be very helpful. The best way to address potential community concerns is to engage municipal officials and the public early in the planning process.

Shopping Malls and Transit

Several interviewees, including NJ TRANSIT, county paratransit providers and private bus operators, noted that the managers of some private shopping malls seek to minimize the visibility and frequency of bus trips to their property. While large shopping centers typically tolerate bus service, they do not want to "see it." Thus, some malls will only permit the placement of transit signs/stops and/or shelter facilities on the fringe of their property, away from mall entrances, reducing the potential convenience and utility for passengers. Others will permit bus stops at mall entrances, but without signage or shelters. In some cases, malls have requested that transit providers pay a fee to access their property, in part to establish a legal agreement that protects the mall from liability. When transit providers can demonstrate self-insurance, such requirements may be waived.

Interviewees noted that several malls owned by the Simon Property Group, Inc., including Livingston Mall, Rockaway Mall, Riverside Square and The Short Hills Mall, seek to minimize bus service. For example, the Rockaway Mall will not permit bus shelters or signage on their facility property, even though there is a park and ride facility at the mall site and the mall serves as a transfer point for several public and private transit providers. Other companies were noted for their support of bus access to their properties. For example, Hartz Mountain has successfully integrated transit into their Harmon Meadow mall/hotel property complex in Secaucus. The Bridgewater Common Mall complex was also mentioned for their positive efforts in working with Somerset County on transportation issues in the mall area.

It was clear from the interviews that more effective strategies are needed to communicate the mutual benefits of located transit facilities on commercial retail property. Interviewees repeatedly noted that shopping malls and centers, even smaller facilities, are invaluable transfer nodes that are greatly underutilized, particularly since shopping malls are frequented by all demographic and age groups and for some communities, serve as a key center for community activity. For example, Ocean County Mall is served by several transportation providers and is frequented by many area residents not only for shopping purposes, but also because the county operates a satellite government office in the mall.

The Role of Technology

A final topic area mentioned often by interview participants related to the role technology can play in facilitating transfer trips. A number of participants described how technology has enhanced their services. For example, county paratransit providers noted that having AVL technology onboard vehicles allows them to provide real time information to customers. Private bus operators indicated that use of AVL and GPS technology not only permits them to update customers with real time information, but also improves scheduling efficiency and increases the accountability of drivers in the field. Currently, NJ TRANSIT is piloting some GPS use on their bus fleet.

Other technologies being employed to improve transfer trip-making include Public Announcement (PA) systems, electronic signage, and text to audible speech systems. Departure Vision for hand-held cell phones is now available at the NY and Hoboken stations. With regard to real time technology, NJ TRANSIT is piloting the deployment of NextBus technology that offers real time information via variable message signs on the HBLR system. There are also plans underway to offer real time information capability on the Newark Light Rail. Web/cell technology is being used with Go28 in Bloomfield and the Walter Rand Transportation Center has bus information signs that are schedule based but have the ability to show delays.

Others mentioned that NJ TRANSIT should make use of existing technology such as transit trip planning software by including detailed information on how to make transfers on their website, as well as on Google maps. Others noted that NJ TRANSIT should make available on their online and print station maps and via Google maps the specific location of station elevators and other detailed station accessibility information so customers with special needs can plan ahead. The representative from Middlesex County Department of Transportation reported they are currently working with Google Transit to incorporate community transit services on this platform.

Plans are also underway by NJ TRANSIT to reinstall bus stop signs throughout the State, which will include the “MyBus” schedule information service. The new signs will include a five digit number on each sign. Riders can enter that number into their phone to access information on the next three buses scheduled to arrive. If a stop services multiple lines, riders will be prompted to enter more specific information.

It is obvious from the examples described above how technology can directly aid transfer trips. Technology tools can provide customers with the information they need to determine what options work best for their desired trip. Information in turn decreases anxiety. However, it is important to note that despite the advantages technology offers in facilitating transfer trips, traditional methods of transit communication (e.g. static maps and timetables) should still always remain available and current.

Finally, interviewees noted that uncoordinated and/or conflicting fare policies can be an impediment to transfer trips. In that regard, the NJ TRANSIT fare structure was

described as difficult to explain to the public and a lack of cost parity between services was noted. Riders often have difficulty understanding the current bus zone fare structure and what privileges they can enjoy on various NJ TRANSIT modes with the purchase of monthly commuter rail passes or multiple zone bus passes. Overall, sentiment was that more universal, cross-mode fare capabilities are needed. Some suggested offering flat rates for services. Others noted that customers frequently request smart cards instead of weekly or monthly passes. These are not currently available. NJ TRANSIT and other interviewees acknowledged that there are a variety of problems with smart card implementation that need to be resolved, including customer understanding regarding interest charges, etc., especially among the underserved. Right now NJ TRANSIT is installing new fare collection equipment on its buses that does not include smart card, but it can be added at a later point.

Conclusion

The interviews conducted for this study yielded important insight and valuable information related to: customer issues/concerns associated with making transit transfer trips; the characteristics of service and transfer locations likely to be important from a customer perspective; and, ways to enhance the attractiveness of transfer trips among both existing and potential new customers. The interview sessions also brought to light several institutional barriers that hinder transfer trip making and external influences, such as “home rule” concerns and a lack of receptivity on the part of private property owners such as shopping malls to hosting transfer facilities. The findings from the interview sessions provided an important foundation for benchmarking transfer points and facilities in New Jersey, designing the topic guide for the consumer focus groups, developing the questionnaire for the customer intercept survey, and informing the development of policy recommendations at the end of the study.

BENCHMARKING TRANSIT TRANSFER FACILITIES IN NEW JERSEY

In order to better understand the typical design, information amenities and service characteristics at different types of transfer locations in New Jersey, the research team undertook a facility benchmarking process. The first step in this process was to develop a draft typology, or classification system, of transfer points and facilities. The typology was developed based on a review of related transit station categorizations found in the literature, findings from the expert interviews conducted for this study, and a GIS-supported analysis of mode proximity.

The transfer location typology includes four location types based on two primary considerations: 1) level of modal integration; and 2) level of customer amenity. Other considerations include level of service and station/stop access. The four location types are as follows:

- **Type A** – Major regional intermodal facility served by four or more transit modes, with a high level of passenger amenity.
- **Type B** – Intermodal/Intramodal facility served by three or fewer transit modes, with a high level of passenger amenity.
- **Type C** – Intermodal/Intramodal facility served by three or fewer transit modes, with a basic level of passenger amenity.
- **Type D** – Transit station/stop served primarily by one mode, community shuttles and/or park & ride, with limited passenger amenity.

Table 2 – Transfer Location Amenity Profile

Limited	Basic	Enhanced
• Standard station/stop sign • Basic shelter w/seating • Static schedule information for each service route • Lighting	• Signage designating boarding and transfer locations • Static schedule information including intermodal schedule and connection information • Sheltered waiting area w/seating • Lighting • Security cameras and/or emergency phone • Physical elements such as wayfinding signs making clear where to connect between services • Ticket Vending Machine • Taxi stand • Bicycle racks/lockers	Basic level of amenity plus the following: • Enclosed waiting area with seating • Real-time schedule information • PA system for service announcements • Personnel presence such as ticket agent/customer service office • Restrooms and/or concessions • May include police presence

Table 3 – Transit Transfer Location Typology

Type	Description	Examples
Type A	**Transit Modes:** Served by 4 or more transit modes – interstate rail, commuter rail, light rail, interstate bus, local bus, ferry, shuttle/jitney **Level of service**: High **Level of amenity**: Enhanced **Access:** Walk, bike, transit, park & ride	Newark Penn Station, Port Authority Bus Terminal (NYC), Journal Square Transportation Center, Trenton Transit Center, Hoboken Terminal, Exchange Place, Secaucus Junction Station
Type B	**Transit Modes:** Served by 3 or fewer modes - commuter rail, light rail, interstate bus, local bus, ferry, shuttle/jitney **Level of service**: High to moderate **Level of amenity**: Enhanced **Access:** Walk, bike, transit, park & ride	Metropark Station, Port Imperial Ferry Terminal in Weehawkin, Walter Rand Transportation Center, Wayne/Route 23 (1000 stalls), Hackensack Terminal (bus), Atlantic City Bus Terminal & Atlantic City Rail Station, New Brunswick Rail Station
Type C	**Transit Modes:** Served by 3 or fewer modes - commuter rail, light rail, interstate bus, local bus, ferry, shuttle/jitney **Level of service**: Moderate to low **Level of amenity**: Basic **Access:** Walk, bike, transit, park & ride	Rahway station, Broadway Bus Terminal in Paterson, East Brunswick Transportation Center, Ridgewood Bus Terminal, Passaic Bus Terminal, Broadway Bus Terminal – Paterson, HBLR 34th St Park-and-Ride – Bayonne, Summit Rail Station;
Type D	**Transit Modes:** Served primarily by one transit mode – commuter rail, light rail, interstate bus, local bus, ferry, shuttle/jitney **Level of service**: Moderate to low **Level of amenity**: Limited **Access:** Walk, bike, transit, park & ride	31st St at Bergenline Ave – Union City, HBLR 9th St Station – Hoboken, Brunswick Square Mall, Old Bridge Municipal Complex, Woodbridge Center Mall, Kendall Park Academy Park-and-Ride

Table 2 presents three amenity profiles that represent the desirable level of amenity associated with different types of transfer locations. Table 3 presents the four location types, differentiated by the number of modes serving the location, level of service, level of amenity, and station/stop access. As with any classification system the typology presented here does not fit all locations. Transit agencies and their local partners develop transfer points with features that respond to local context, site history and resource constraints. Therefore, not all transfer locations in New Jersey will fit neatly into the defined categories. In addition to the four types depicted in the table, there are single-mode stations/stops with varying levels of amenity where intermodal transfers are not expected to make up a significant portion of transit trip-making. These locations are primarily standard bus and light rail stops served by walk-up/bicycle access with limited or no accommodation for access by auto or other modes of transit.

Validating the Typology

In order to validate the draft transfer location typology and to document existing features at various location types, the research team conducted fourteen site inspections. The

universe of possible field visit locations included all bus, rail, light rail, and shuttle stops in New Jersey where passengers transfer from one transit service to another, whether between or within modes. Also included are park-and-ride locations where transit passengers park, then board a bus, rail, or light rail service. In order to narrow the selection pool, the research team worked with NJ TRANSIT to identify locations they felt were representative of the categories represented in the draft typology. Tables 4 and 5 include a list of field visit locations suggested by interview participants. Figures 1 and 2 depict the geographic diversity represented in the list of potential site visit locations considered

Table 4 – Field Visits Suggested During Interviews, Type A and B

Name	City	Contributors
Type A		
Exchange Place	Jersey City	NJ TRANSIT
Hoboken Terminal	Hoboken	NJ TRANSIT
Journal Square Transp. Center	Jersey City	NJ TRANSIT, NJTIP
Newark Penn Station	Newark	NJ TRANSIT, NJTIP
Port Authority Bus Terminal	New York	NJ TRANSIT, Coach USA/Lakeland
Secaucus Junction Station	Secaucus	NJ TRANSIT, NJTIP
Trenton Transit Center	Trenton	NJ TRANSIT
Type B		
Atlantic City Bus Terminal	Atlantic City	NJ TRANSIT, NJDOT
Dover Station	Dover	NJDOT
Elizabeth Station	Elizabeth	NJ TRANSIT
Garden State Plaza Mall	Paramus	NJ TRANSIT
Hackensack Bus Terminal	Hackensack	NJ TRANSIT, NJDOT, NJTIP
Hamilton Train Station	Hamilton	NJDOT
Irvington Bus Terminal	Irvington	NJ TRANSIT, NJDOT, NJTIP, Governor's Office
Lindenwold Station	Lindenwold	NJ TRANSIT
Long Branch Rail Station	Long Branch	NJ TRANSIT
Metropark Station	Iselin	NJTRANSIT
Morristown Station	Morristown	NJ TRANSIT, Governor's Office
Princeton Junction	West Windsor	NJ TRANSIT
Toms River Terminal	Toms River	County Paratransit
Walter Rand Transportation Center	Camden	NJ TRANSIT, SYSTRA
Wayne Route 23 Transit Center	Wayne	NJ TRANSIT, NJTPA
Willowbrook Mall	Wayne	NJ TRANSIT
Newark Broad Street Station	Newark	NJ TRANSIT, SYSTRA, NJTIP

Table 5 – Field Visits Suggested During Interviews, Type C and D

Name	City	Contributors
Type C		
22nd St Station	Bayonne	NJ TRANSIT
34th St Station	Bayonne	NJTRANSIT
9th St Station	Hoboken	NJTRANSIT
Broadway Bus Terminal	Paterson	NJTRANSIT
Exit 8A Park and Ride	Monroe	NJDOT, Coach USA/Lakeland
Garfield Avenue	Jersey City	NJ TRANSIT
Hartz/Harmon Meadow Plaza	Secaucus	NJ TRANSIT
Lakewood Bus Terminal	Lakewood	County Paratransit
Liberty State Park	Jersey City	NJ TRANSIT
New Brunswick Station	New Brunswick	NJ TRANSIT, Coach USA/Lakeland
Ocean County Mall	Toms River	County Paratransit, Governor's Office
Orange Street Light Rail Station	Newark	NJ TRANSIT, NJTPA
Parsippany Road at Route 46	Parsippany-Troy Hills	Coach USA/Lakeland
Passaic Bus Terminal	Passaic	NJ TRANSIT
Pennsauken/Route 73 Station	Pennsauken	NJ TRANSIT
Pleasantville Bus Terminal	Pleasantville	NJDOT
Quaker Bridge Mall	Lawrenceville	TMA
Ridgewood Bus Terminal	Ridgewood	NJ TRANSIT
Rockaway Mall	Rockaway	NJDOT, Coach USA/Lakeland
Simon Properties - Livingston Mall	Livingston	NJ TRANSIT
Simon Properties - Short Hills Mall	Short Hills	NJ TRANSIT
Simon Properties - The Shops at Riverside	Hackensack	NJ TRANSIT
Summit Station	Summit	NJTRANSIT, NJDOT
Tonnelle Ave	North Bergen	NJ TRANSIT
Vince Lombardi Park-and-Ride	Ridgefield	NJ TRANSIT
West Side Avenue Station	Jersey City	NJ TRANSIT
Type D		
31st St/Bergenline Ave	Union City	NJ TRANSIT
Kendall Park Skating Rink	Kendall Park	Coach USA/Lakeland
Rockaway Mall	Rockaway	NJ TRANSIT
Branchburg (Transbridge P&R)	Branchburg	NJ TRANSIT

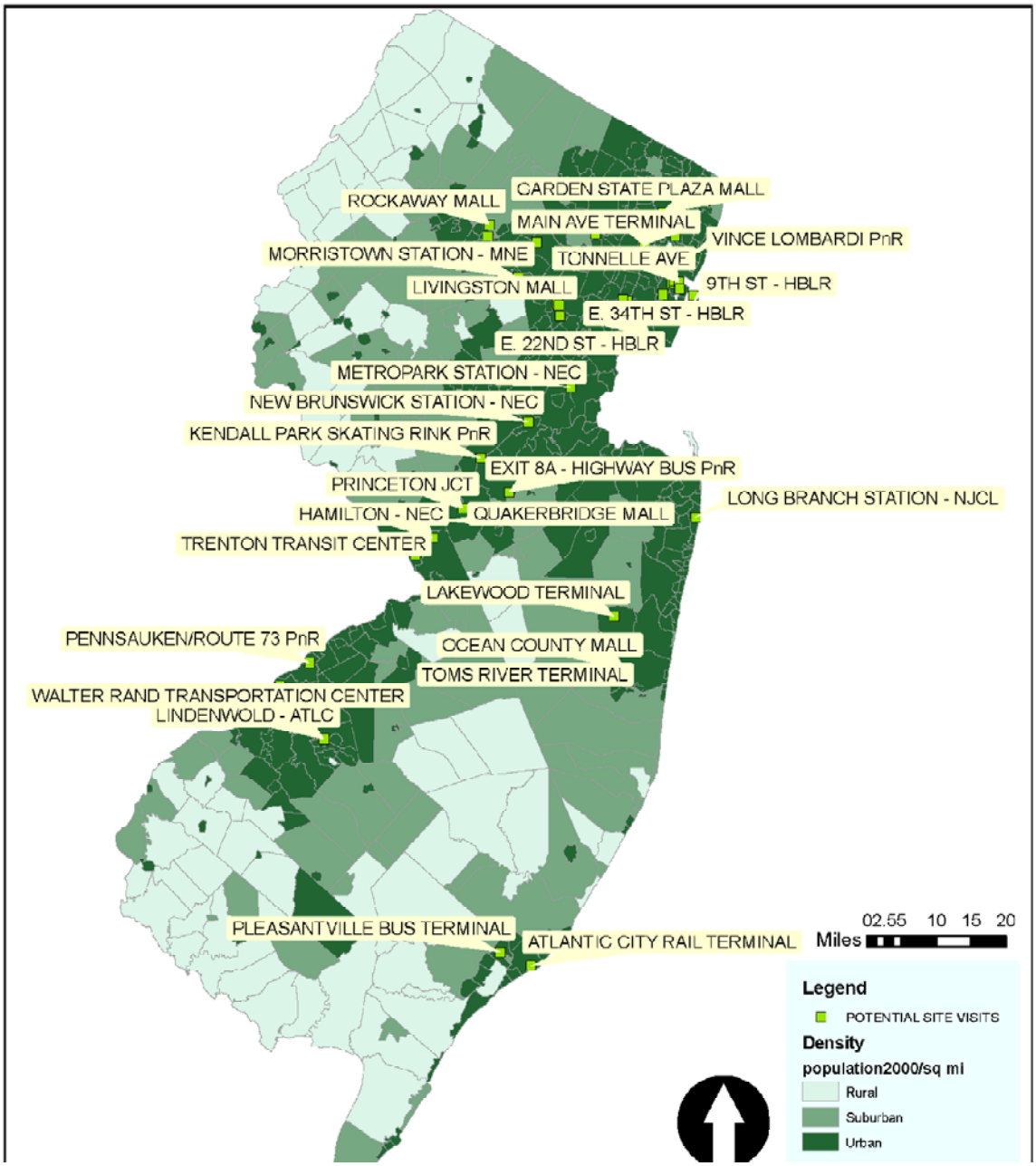

Figure 1. Potential Site Visit Locations Statewide

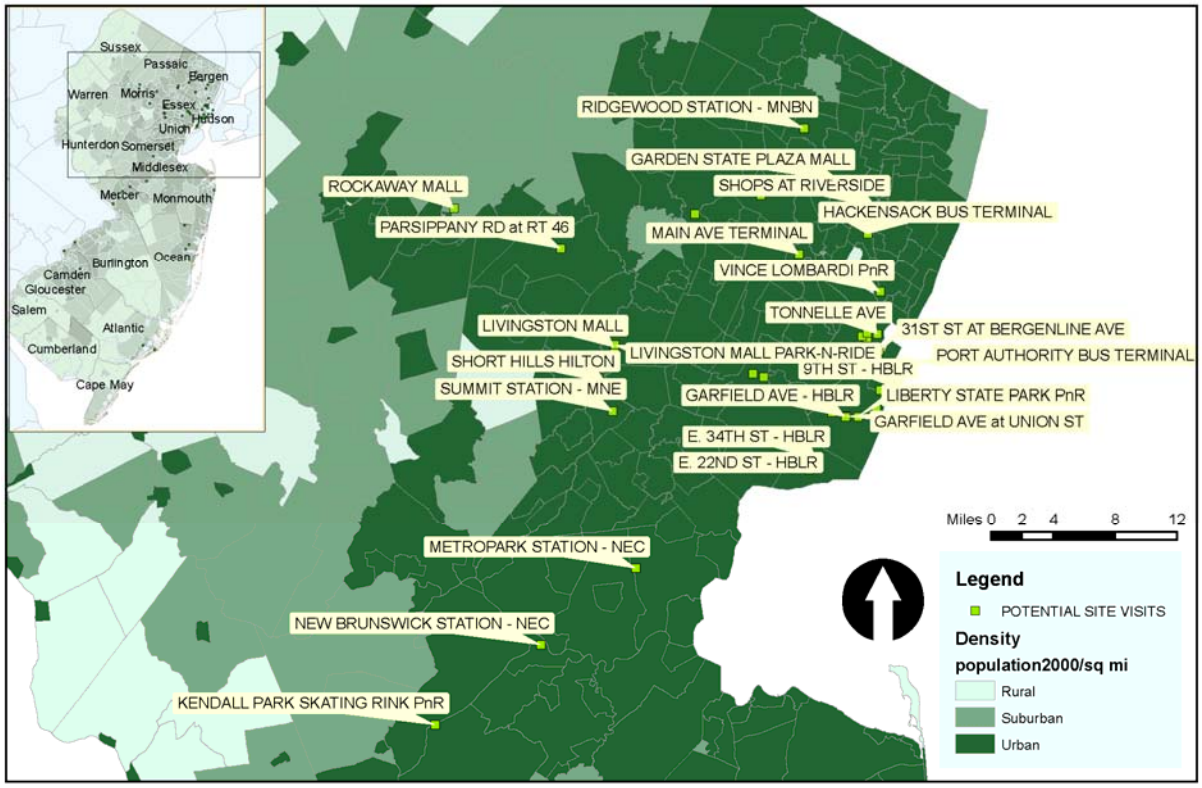

Figure 2. Potential Site Visit Locations in Northern and Central New Jersey

As part of the site selection process, the research team assembled a variety of information and data on the 51 locations listed in Tables 4 and 5. Data points included information on available transit services, station/stop area land use density, typology classification, parking and special features. This information was used to compare sites based on the following criteria:

- **Typology category** – Select at least two site within each category represented in the draft typology.
- **Diversity of facility type** – To the extent practical, select sites that represent the diversity of the transit system, including commuter rail, light rail, local bus, highway-oriented park-and-ride, urban bus terminal, and shopping mall transfer points.
- **Diversity of mode combinations** – Select sites representative of the variety of modal transfer combinations available in the transit system: rail/rail, bus/bus, rail/light rail/bus, park and ride/bus, rail/ferry, etc.
- **Land use and geographic diversity** – Select sites representative of New Jersey's urban, suburban and rural areas and, to the extent practical, select sites that represent the geographic diversity, including sites from northern, central, and southern regions.

The initial screening of potential sites yielded a short list of 23 candidate sites. These locations, organized by facility type, are listed in Table 6. Final site selections were made in consultation with NJ TRANSIT and included the following 14 sites indicated with an asterisk (*) in Table 6.

Table 6 – Short List of Candidate Field Visit Sites

Name	City	Modes
Type A		
*Hoboken Terminal	Hoboken	Commuter rail, light rail, ferry, bus, shuttle
Newark Penn Station	Newark	Amtrak, commuter rail, light rail, bus, shuttle
*Metropark Station	Woodbridge	Amtrak, commuter rail, bus, shuttle
Secaucus Junction Station	Secaucus	Commuter rail
*Trenton Transit Center	Trenton	Amtrak, commuter rail, light rail, bus, shuttle
Type B		
Atlantic City Bus Terminal	Atlantic City	Local bus, shuttle
Irvington Bus Terminal	Irvington	Local bus
*Lindenwold Station	Lindenwold	High speed rail, commuter rail, local bus
Newark Broad Street Station	Newark	Commuter rail, light rail, local bus
*Walter Rand Transportation Center	Camden	High speed rail, light rail, local bus
Willowbrook Mall	Wayne	Local bus
*Hackensack Bus Terminal	Hackensack	Interstate bus, local bus
Type C		
Exit 8A Park & Ride	Monroe	Interstate bus, local bus
Garfield Avenue	Jersey City	Light rail, local bus
Ocean County Mall	Toms River	Local bus, shuttle
*New Brunswick Station	New Brunswick	Commuter rail, interstate bus, local bus, shuttle
*Pennsauken/Route 73 Station	Pennsauken	Light rail, local bus
Pleasantville Bus Terminal	Pleasantville	Bus
*Ridgewood Bus Terminal	Ridgewood	Interstate bus, local bus
Type D		
*Branchburg (Transbridge P&R)	Branchburg	Interstate bus
*31st St/Bergenline Ave	Union City	Local bus
Kendall Park Park & Ride	South Brunswick	Interstate bus, local bus
*Livingston Mall	Livingston	Interstate bus, local bus, shuttle
*Ocean County Mall	Toms River	Local bus, shuttle
*Queen Ann Road /Cedar Lane	Teaneck	Local bus
Rockaway Mall	Rockaway	Local bus

Site Inspection Results

The protocol for collecting data and making observations during each site visit was guided by a site visit checklist. The checklist was divided into five sections designed to facilitate the development of site profiles for each locations. The five sections and the type of data collected under each heading were as follows:

A. Site Background
- Facility type.
- Modes, routes and operators serving facility.
- On-site parking characteristics (availability, number of spaces, utilization).
- Presence of bicycle parking/facilities.
- Surrounding neighborhood characteristics (density, land uses, motor vehicle volumes, posted speed limits, pedestrian volumes.

B. Site Access
- Linkage to adjacent streets.
- Linkage between modes.
- Walking time between transfer points.
- Number of level changes between transfer points.
- Presence and character of signage.
- Presence and condition of sidewalks, crosswalks and other pedestrian street crossing features.
- Connectivity of boarding/alighting areas to surrounding neighborhood (e.g., are there sidewalks).
- Crowding conditions.
- Location of boarding/alighting areas in relation to street.
- Material and condition of boarding/alighting areas.
- Accessibility/obstacles for mobility assistance devices such as wheelchairs and walkers.

C. Safety & Security
- Type of sufficiency of lighting.
- Presence of police.
- Presence of call boxes/emergency phones.
- Presence of pay telephone.
- Presence of security cameras.
- Presence of homeless/transients near station/stop.
- General feeling of safety within station/stop.
- General feeling of safety in surrounding neighborhood.

D. Customer Information
- Transit facility identification signs.
- Presence of directional signage.
- Sign legibility.
- Adequacy of signs for people with disabilities.
- Presence of wayfinding signs to transfer locations.

- Presence of ticketing options and fare information.
- PA announcements are made.
- Printed maps and schedule information are posted and available to take.
- Use of information technology aids is visible.

E. Maintenance & Amenities

- Evidence of liter and graffiti.
- Availability of trash receptacles.
- Presence of condition of restrooms.
- Presence and condition of escalators/elevators.
- Availability and condition of shelters and seating.
- Presence of convenience services at or nearby station/stop.

Copies of the site visit checklist and individual site profiles are included as Appendix C. As shown in Table 7, the ten field visit inspections conducted by the research team largely validated the facility type characteristics suggested in the draft typology. Expected results appear in bold in the table.

Table 7 – Field Visit Inspection Results

Location/Type	# of transit modes	Level of Service	Amenity Profile
Type A	**4+**	**High**	**Enhanced**
Hoboken Terminal	4	High	Enhanced
Metropark Station	4	High	Enhanced
Trenton Transportation Center	4	High	Enhanced
Type B	**3 or fewer**	**High-Mod**	**Enhanced**
Hackensack Bus Terminal	2	Mod	Enhanced
Lindenwold Station	3	High	Enhanced
Walter Rand Transportation Center	3	High	Enhanced
Type C	**3 or fewer**	**Mod-Low**	**Basic**
New Brunswick Station	3	Mod	Enhanced
Pennsauken/Route 73 Station	3	Mod	Basic
Ridgewood Bus Terminal	2	Low	Basic
Type D	**1 or more**	**Low**	**Limited**
Branchburg Park & Ride	1 bus	Low	Sub-limited
Livingston Mall	4 Bus + shuttles	Low	Limited
Ocean County Mall	1 bus + shuttles	Low	Sub-limited
31st Street/Bergenline Avenue	2 bus	Low	Limited
Queen Ann Rd/Cedar Lane	2 bus	Low	Limited

The purpose of the typology is to enable general distinctions between typical stations and stops that will be useful for documenting the current State of practice and for making recommendations related to enhancing transfer facilities in the future. Field observations made during the site visits to the facilities representative of Types A, B and C confirmed expected modal integration, level of service and amenity profile characteristics. However, observations made at the sites representative of facility Type D showed varying conditions that were not always consistent with the suggested typology characteristics. For example, at 31st Street and Bergenline Avenue the mode and amenity profiles fit the typology but the level of service was significantly higher than expected. This would imply that this location could be categories as a Type C location if the level of amenities at this site were improved. In the case of the Branchburg Park & Ride and Ocean County Mall there were so few amenities that the sites could not be classified as meeting even the limited amenity profile. Based on the field visits it appears that the draft typology will serve its intended purpose.

CUSTOMER FOCUS GROUPS

In order to fully understand the specific experiences of passengers making linked trips at different types of transfer locations the research team conducted four customer focus groups. Three of the focus groups were populated with transit passengers recruited randomly at Hoboken Terminal, Hackensack Bus Terminal and the Walter Rand Transportation Center. The fourth group was populated with NJ TRANSIT Access Link customers and was conducted in Newark, NJ. The later was designed to ensure adequate representation and understanding of the unique challenges faced by people with disabilities when making transfer trips.

The focus groups were held on 14 December 2010 at the Walter Rand Transportation Center in Camden, Bergen County Planning Office in Hackensack on 15 December 2010, Hoboken Rail Terminal in Hoboken on 16 December 2010, and NJ TRANSIT Headquarters in Newark on 20 December 2010. Each group was moderated by Jon Carnegie, the Executive Director of the Voorhees Transportation Center. Prior to each focus group, participants filled out a pre-focus group questionnaire, answering various demographic and ridership questions. A copy of the pre-focus group questionnaire can be found in Appendix B.

Focus Group Recruiting

The goal for focus group recruitment was to populate four homogenous focus groups. Homogeneity was defined as being a rider who transfers. Toward that end, focus group participants were recruited by members of the research team on December 9th to 14th at the Walter Rand Transportation Center in Camden, Hoboken Terminal in Hoboken, and the Hackensack Bus Terminal in Hackensack. At each location, three trained recruiters were deployed to hand out flyers to riders between 4:30 p.m. and 6:30 p.m. The fourth focus group was recruited by telephone with the assistance of NJ TRANSIT's office of ADA services using an internal customer database.

The flyers distributed by recruiters contained all of the basic information that a potential participant would need to know to make an informed decision about participating in the group (location, time commitment required, incentives, food information, who is conducting, who is the sponsor). The flyer directed potential participants to call a 1-800 number maintained by the Bloustein Center for Survey Research at Rutgers (BCSR). Anyone who called the number received a return call within one business day of calling. This recruiting effort yielded roughly 111 potential participants for 40 potential slots. In the end, 36 NJ TRANSIT riders participated in the focus groups, with nine in Camden, ten in Hackensack, seven in Hoboken, and ten in Newark. Table 8 presents a profile of focus group participants.

Table 8 – Overview of Focus Group Participants

	Camden	Hackensack	Hoboken	Newark	Total
	N = 9	N = 10	N = 7	N = 10	N = 36
Age					
Average Age	43.1	42.6	42.6	57.2	46.9
Gender					
Male	44%	40%	57%	50%	47%
Female	56%	60%	43%	50%	53%
Household Total Income					
1. Less than $25,000	67%	70%	14%	50%	53%
2. $25,000 to less than $50,000	33%	10%	14%	38%	24%
3. $50,000 to less than $100,000	0%	20%	43%	13%	18%
4. $100,000 or more	0%	0%	29%	0%	6%
Level of Education					
1. Less than High School Graduate	13%	22%	0%	0%	9%
2. High School Graduate (GED)	63%	44%	0%	33..%	36%
3. Some college (or technical vocational school/professional business school)	25%	33%	14%	33%	27%
4. Two-year College degree (AA: Associate in Arts)	0%	0%	14%	11%	6%
5. Four-year College degree (BA or BS: Bachelor of Arts/Science degree)	0%	0%	43%	11%	12%
6. Graduate work, but no advanced degree	0%	0%	14%	11%	6%
7. Graduate degree (Masters, PhD, Lawyer, Medical Doctor)	0%	0%	14%	0%	3%
Marital Status					
1. Single - Never Married	67%	44%	57%	60%	57%
2. Married / Civil Union	0%	0%	43%	20%	14%
3. Divorced	22%	33%	0%	10%	17%
4. Widowed	0%	0%	0%	10%	3%
5. Living with partner	11%	22%	0%	0%	9%
Do you ride the train or bus at least once a month					
Yes	100%	100%	100%	100%	100%
No	0%	0%	0%	0%	0%
Do you commute to work on a train or bus					
Yes	78%	70%	100%	50%	72%
No	22%	30%	0%	50%	28%

The groups were moderated using a topic guide developed specifically for this project, which served as a scripted outline for focus group discussions. The guide covered background on the study, presented the ground "rules" for the focus group discussion and outlined the general scope and content of subjects to be covered during the session. Topics probed at the session were organized around seven primary domains:

1. Transit travel patterns.
2. Transit transfers.
3. Stop/station facility characteristics.
4. Safety & Security.
5. Customer Information.
6. Transit service characteristics.
7. Ease of transfer.

In addition, participants were asked to complete a draft intercept questionnaire. Following completion of the questionnaire, they were asked to share their thoughts and observations about the questions asked and which if any questions were difficult to answer. At the conclusion of each focus group, every participant was given an index card and was asked to write down the most important thing that can be done to improve the transfer experience from a customer's perspective.

Analysis of focus group data

Focus group proceedings were audio taped and then professionally transcribed. These transcriptions served as the basis for the content analysis. Each transcription was downloaded into a qualitative analysis package, ATLAS.ti, to efficiently analyze the themes explored in the focus groups. In addition to the transcripts, information provided by the index cards participants filled out at the conclusion of each group was loaded into ATLAS.ti. The analysis of the focus groups discussions was completed inductively by allowing themes to emerge from successive readings and coding of the focus group transcripts and collected materials [(26)].

Summary of Findings

Transit Utilization in General

All focus group participants, currently or had until recently, made a transfer trip as part of their regular use of NJ TRANSIT services. Most Camden and Hackensack participants were primarily bus riders and had no transportation alternatives other than public transportation. Hoboken participants were primarily commuter rail and/or light rail riders and most had access to cars, thereby making them "choice riders." All Newark participants had a physical disability and utilized Access Link, the ADA paratransit service operated by NJ TRANSIT.

Camden and Hackensack Groups

Transfer Time, Trip Length and Schedules

In describing the lengths of their trips that included transfers, participants were mixed in their responses. Some stated that their trips took *x* hours, with *x* including only time actually spent riding the bus. Some participants included time spent walking to or from the bus stop in their overall time estimations, and some participants included time spent waiting to make a transfer. The selection of inclusion criteria for the "the time of my trip" clearly varied across participants, and there appeared to be no universal means by which to measure the concept, and the time spent transferring seems to have been partly responsible for this variety. Stated trip times varied between 30 minutes and 2 hours.

Many participants indicated that they often took an earlier bus during the first stage of a trip in order to ensure making a particular transfer. Participants were not satisfied with arriving early, as this was due to the unreliability of the bus schedule, but they believed they did not have a choice, as adhering to the bus schedule often resulted in arriving at their destination late to very late. Participants arrived early because the bus for the first stage of their trip would often be late or early, and the bus for the second stage of their trip would also often not be on time. Participants indicated that as a result of this unreliability, they often waited a long time for their connection, which many found frustrating. Participants reported average wait times of 20-30 minutes for a transfer, which everyone agreed was the acceptable limit, though others indicated that longer waits were very common.

Responses to the amount of a time a bus may be "acceptably" late were varied. Some believed 10 minutes was acceptable, others believed 15-20 minutes was acceptable, and one person believed 30 minutes was acceptable. Though no respondent seemed particularly satisfied by the late buses, many seemed to accept and anticipate a certain measure of lateness, and adjusted their own schedules accordingly.

Participants were remarkably well versed in scheduling discourse and could often cite a series of scheduled buses, including those buses that would afford enough time to make a transfer to other buses. No participant believed that the stated bus schedule was an accurate means by which to make a transfer.

Trip Quality: Drivers, Tickets, Stations

With regards to those issues that made a transfer trip positive or negative, participants had a wide range of responses. Many members of the Hackensack group cited the bus driver as the primary cause of a positive or negative trip. As one member stated, "If the bus driver's having a bad day, everyone's having a bad day." Many participants noted that bus drivers often drove past a stop without picking up or discharging passengers, and so waving to signal the driver was a necessity. Others noted that wearing light clothing was necessary at night, particularly as many stops were poorly lit. Participants were mixed as to whether these episodes were deliberate or unintentional, but they

agreed that watching the bus drive by their stop was a common experience. One participant suggested that bus stops be equipped with a light that could be activated to signal a driver to stop. Some drivers were described as being unfamiliar with the routes. Others were described as being rude or having a bad attitude, and one had responded to a participant's question with, "I don't care, call whoever you want." Participants were able to recognize the drivers in question, and others could name or describe poor or offensive bus drivers.

Constraints on the ability to purchase tickets negatively impacted many participants' transfer trips. Participants cited a lack of ticket machines, as well as a lack of working ticket machines, as the main problems. Participants expressed annoyance at the inability of on-bus fare collection machines to dispense change. Participants also noted that bus drivers were often inconsistent in charging transfer fees. Many participants believed that all public transportation systems in the area should adopt a universal fare structure. One participant noted that his monthly bus pass granted him access to the River Line and that this information should be made public. No other participant was aware of this, and many were intrigued by it and annoyed that NJ TRANSIT has not publicized this fact.

As to the importance of a stop or station's characteristics in affecting the quality of a transfer trip, respondents noted that protection from the elements was an important factor, particularly at those stops that lacked shelters or were run down. Participants noted that the absence of benches at stops decreased the overall quality of a transfer trip experience, as did the lack of available seating on buses. The cleanliness of the stop was important, as was the availability of a restroom. Participants were disappointed by the lack of access to restrooms on the weekends. A few participants expressed a desire for more working pay phones that accepted calling cards. The presence of stores, restaurants, and ATMs was deemed "nice to have" but not particularly important.

Safety, Security and Information

All participants agreed that safety was a concern while waiting for a transfer. Many believed there was not enough of a police presence, particularly at night. At night, one participant stated, "you're on your own." "It's every man for himself," added another. Many participants at the Hackensack group believed that the police were not doing their jobs. Many participants had seen surveillance cameras at stations and appreciated their presence, although many Camden participants stated that the cameras were more useful in proving their own innocence in case they were accused of a crime. The Camden group believed that the police were inappropriately aggressive, and some participants stated they had been unfairly arrested at stations. As one participant said, the presence of cameras means "they can't say it was me."

Participants were split as to whether they felt unsafe waiting to make a transfer in specific locations because of the station itself or because of the neighborhood. Many

participants complained about rats. One participant noted a stop that was located "near a forest" that had too many wild animals.

Some participants noted that crime was not their primary safety concern; rather, traffic concerned them the most. Crossing busy streets made these participants feel unsafe, and some noted that certain bus stops did not have sidewalks, thereby increasing the risk of being hit by a car.

With regards to information that may help a customer make a transfer, many participants believed more was required. Many noted that walking to make a transfer was confusing, difficult, and time-wasting until it had been repeated many times. Many agreed that more real time information was required to inform passengers of delays. One passenger suggested that a text messaging service be available to allow passengers to access information about the next scheduled bus. Everyone agreed that more printed schedules, posted schedules, and PA announcements were necessary. Confusion over ticket validation was cited as a significant problem. The presence of more staff was also desired, although many believed that current NJ TRANSIT staff are uninformed or do not want to help.

Some participants had used the NJ TRANSIT website, and most were satisfied with the site, as well as with the trip planning function. One participant did not like that the trip planner map was produced as a PDF. Others preferred using MapQuest. Some participants used the 1-800 number to get information about bus schedules. Some participants accessed information about their transfer through their mobile device, and some indicated that they would use a computer kiosk to access information if one was made available.

Hoboken

Transfer Time, Trip Length and Schedules

As with the Camden and Hackensack groups, the Hoboken group was of mixed opinion when asked to conceptualize the lengths of their trips. Again, some participants included time spent walking to or from the bus stop in their overall time estimations, some participants included time spent waiting to make a transfer, others did neither, and others did both. One participant noted, "I'm responsible for [walking to make my transfer]…the train is someone else's responsibility." Another participant agreed, adding, "[walking is my responsibility]…NJ TRANSIT being on time is their responsibility." A participant from England believed that responsibility wasn't an issue, indicating that public transportation in England was so reliable that he didn't believe that the two were distinct. He instead framed the relationship as cooperative.

As with the Camden and Hackensack groups, many participants at the Hoboken group indicated that they began their trips earlier than necessary to ensure making a transfer. Many were frustrated about the need to leave early and cited the inconvenience of the train schedule and late trains as the primary causes. Many noted that crowds and

station layouts also played a factor in potentially missing a transfer, as the presence of too many people on poorly designed staircases caused in-station delays. Participants believed that a wait of 5-15 minutes was the maximum permissible delay for a late train.

One participant noted that he stopped making a two transfer trip because he missed too many connections due to late trains. He currently takes a single train into New York, which takes 50 fewer minutes and at a cheaper parking cost, though he now must drive to a station further from his home. He stated that the removal of a transfer from his trip allows him to read, relax, and listen to music.

Another participant added that transferring has negative financial implications due to the differences in fare structures between transit systems. She cited "the psychology of reaching down into the pocket, waiting in the line" as a taxing, tiring, and expensive experience.

One participant added that if a rider doesn't have a vehicle, he or she has to accept the reality of transferring, but then cautioned that if a rider does have a car—as many participants at this group did— then the combination of transferring and differing fare structures drives current and potential passengers away. Some participants agreed that the reason they chose to ride NJ TRANSIT rather than drive their cars was due to cost savings. Others were willing to pay more for public transportation out of a feeling of social responsibility. "[It's] what I should be doing," one participant stated.

While participants seemed to primarily consider finances when deciding whether to drive or take public transportation, the possibility of acquiring better or faster service on public transportation was worth paying for. One participant cut her 5-transfers trip down to 4 at a cost of $200/month, which saved her 10 hours of travel time a week. Another added $50-$60 in PATH tickets and added a transfer to his trip rather than experience continuing unreliable service on NJ TRANSIT.

Trip Quality: Stations and Tickets

Participants believed that adequate shelter from the elements was very important for a transfer trip, as was overall cleanliness and the availability of clean restrooms. Most participants believed that good lighting was important, while two male participants disagreed, suggesting that the issue was "a gender thing." One participant added that the lighting of signs was very important, as it could often be difficult to identify a particular station at night. Participants did not think that pay phones were necessary, though they did want better cell phone service.

The availability of parking was cited as a very important issue, as was its price. Many participants noted that they would stop using public transportation and begin driving if parking prices went up, as many believed they soon would.

With regards to purchasing tickets, most participants believed that the onboard surcharge was “outrageous,” particularly if a station is crowded and a train is about to depart. Most had a monthly pass and agreed that a universal fare card across all services would be ideal.

The group was mixed as to the importance of the availability of amenities such as convenience stores, restaurants, and ATMs. Many stated that such amenities were not important at all, though some relied on convenience stores in stations for breakfast. One participant noted that he initially considered amenities unimportant, but then changed his mind, observing that it’s nice to have a coffee and a chat and “do something normal.”

Safety, Security and Information

With regards to safety, participants at the Hoboken group stated that they often felt safe. This sense of safety was largely due to the presence of police and security personnel, as well as the presence of NJ TRANSIT employees. Crowds were also seen as creating a sense of safety, although concerns about illness and bed bugs partially mitigated the benefit. Good lighting also contributed to a sense of safety, as did the time of day.

Participants believed that access to reliable, up-to-date information was a very important issue during their transfer trips. The group restated a desire for signs that were better lit to reveal station names. One participant suggested posting real-time departures at the upper levels of stations, noting that people often rush and knock others down in an effort to meet a train that may or may not have already pulled into the station. These crowd rushes are dangerous and delay everyone’s trip, the participant stated, and posting real-time departures would make transferring safer and easier.

Participants noted a disparity between a train’s actual status and the taped announcements they heard over the PA system. Participants noted that the PA system often provided incorrect information as to a particular train’s status, and that better coordination was required to ensure making transfers. Participants also noted that it was often difficult to locate the appropriate track or area to make a transfer, as some stations were poorly marked.

Most participants had used the NJ TRANSIT website, and many found it useful, particularly because of the service alerts. One participant had experience in filing a service complaint through the web site. Half of the group had used the trip planning function and found it useful for determining exactly how best to make a transfer. Some accessed both the website and the trip planner from their mobiles devices, and found the format comparably useful. One participant had signed up for the alert service through the website, though he stated, “[It is] hit or miss whether you get the alert or not.” No participants had observed or called the number listed on bus stop signs that provides a bus schedule by phone.

Newark

All Newark participants had a physical disability and utilized Access Link, the ADA paratransit service operated by NJ TRANSIT. Half used Access Link regularly, nine used public transportation regularly, and the 10th participant did not leave home often but used public transportation when he did. Only three participants indicated that they had any alternatives to public transportation. These included rides from friends and cabs. All participants estimated that public transportation accounted for 90-100 percent of their travel, and many indicated that public transportation was the only mode by which they traveled. All participants used public transportation for shopping, recreation, and social activities, and five participants used public transportation to travel to work.

A few participants stated that they mixed Access Link with other forms of public transportation for these purposes. These mixed riders primarily used other NJ TRANSIT services in addition to Access Link. Several factors determined whether these participants added public transportation to their trip, including: timing, familiarity with that type of travel, confidence in not getting lost, timing and number of transfers, speed, and the length of waits between Access Link and other modes of transportation.

Most participants knew about county paratransit services, but only one participant used such a service regularly. County paratransit services were deemed too limiting, as each county's service is limited to in-county travel. Another participant used a town paratransit service offered to seniors. One participant rode PATH, another participant used the Access-A-Ride services operated by NYMTA, and another rode both PATH and MTA subway and bus services.

Transfer Time, Trip Length and Schedules

With regards to Access Link and transfer trips, participants' responses were mixed. Although many expressed gratitude for having a service like Access Link available, every participant also had "horror stories" about the service. A participant's feelings about Access Link seemed to be, as many participants stated, more a measure of one's own patience, given that there are no realistic alternatives to the service. Some participants were thankful it existed, while others were very frustrated by it. All agreed that Access Link was not always reliable and using the service was time consuming. Participants had either made peace with these problems or continued to be frustrated.

Participants believed that the acceptable amount of time to wait for a transfer was 10-30 minutes. Access Link trips with transfers, however, often took up to three hours as a result of very long waits. Participants routinely described waiting for a transfer, either on a bus or outside, for longer than one hour. One participant described a transfer trip that took only 1.5 hours, which caused the group to spontaneously express amazement. Many participants could recall a trip that took more than three hours, and one participant described a trip that could occasionally take over six hours as a result of delays.

Trip Quality: Stations, Drivers and Routes

Most participants used Access Link to transfer to a fixed route bus or train. The overall experience of doing so was described as positive, particularly if the route involved passing through Newark Penn Station. Participants appreciated the renovations in Newark and were familiar with the station's layout, and staff and fellow passengers were described as "very helpful." The gap between the platform and the train was considered the most difficult part of passing through Newark, and one participant described a recent trip during which she had fallen into it.

With regard to other trips from Access Link to fixed route transportation, a positive trip often included helpful staff and a familiar layout. A participant's familiarity with and confidence in making a trip at a specific station often seemed to be a key factor in their overall travel experience. Participants noted the Access Link driver often played a role in the quality of the trip, depending on whether or not the driver aided the participant in getting around. Participants were well aware of the legal limitations imposed on drivers, but many appreciated whatever help drivers were willing to offer. Participants described stories of being "abandoned" at stations by drivers, with little ability to maneuver or find the station.

Participants were mixed on the specific issue of whether Access Link drivers should have more leeway in choosing routes. Some believed that drivers should have more of a role in route choice, as the current routes are not efficient. Others noted that drivers occasionally took them on "joy rides" by going severely off-route. One participant described a particular driver who often returned to and passed the participant's original pickup point many times before proceeding to the desired destination.

All participants were aware that other Access Link passengers were affecting their own travel plans. As one participant stated, "It's not my private limousine service, you gotta be reasonable." Others were less forgiving, particularly when their own trip did not require a transfer and the trip subsequently involved multiple transfers as a result of another passenger's trip. "You're a hostage on these buses," one participant stated. "That's frustrating," another participant noted. Some participants scheduled their Access Link pickup far earlier in advance than they required to accommodate these delays. Participants seemed willing to accept the limitations presented by this form of collective travel, though better communication between the driver and passengers would be appreciated. Participants stated that they often did not know how long a trip would be extended and sometimes waited for up to an hour in a strange location to accommodate another passenger, and consequently could not adequately prepare their schedules.

Participants described using Access Link to transfer to another Access Link bus as difficult and time consuming, and many participants avoided this type of transfer. A number of causes were given for these delays. Some participants noted that transferring from one Access Link bus to another Access Link bus could be made easy or difficult depending on how far apart the buses were from one another. Some drivers

parked next to each other, to allow the passengers to transfer easily and safely. Other drivers parked very far from one another, and navigating the parking lots in which the buses were parked could be very difficult and occasionally dangerous. Many transfers at the Clark location were described as being exceptionally difficult.

With regard to payment on Access Link, participants were disappointed that change could not be made, as all participants at all of the groups were. Newark participants were particularly frustrated by the fact that the prices vary along with the ever-changing routes, so it is often difficult to predict the cost of any given trip.

Participants believed the following issues were very important when making a transfer: protection from the elements, cleanliness, and seating availability. The presence of restrooms was important to some, particularly for those participants whose trips took several hours. Most participants did not believe that the availability of pay phones was important, as most had cell phones. Having access to ticket machines was important to some, though most participants paid on the bus and no participants had a monthly pass. The presence of amenities, such as convenience stores, was considered unimportant.

Participants believed good lighting was important, primarily for safety reasons. Even those participants who were visually impaired believed that good lighting contributed to an overall safer environment. Participants found that the presence of police and NJ TRANSIT personnel made them feel safe, as did the presence of other passengers. Crowds were considered a slight nuisance, but the overall safety benefit outweighed any negatives, and as one participant observed, “most people let you on the train first.” Another participant added, “safety is better than convenience.” The presence of security cameras and emergency call boxes was also considered an important factor in contributing to a safe environment.

Participants believed that posted schedules and printed timetables were important in ensuring an easy transfer trip for those who could read them, although they were far more enthusiastic in hoping for clearer PA announcements and an increase in NJ TRANSIT staff and assistants. Participants expressed that they often felt at ease asking staff for help. Signs that indicated the direction of a transfer location were not considered important.

Participants stated that the NJ TRANSIT website was difficult to use and most did not use it, nor did they access information through a mobile device. Many participants accessed transfer information through NJ TRANSIT’s phone service, though some expressed disappointment that the number is no longer toll-free.

CUSTOMER INTERCEPT SURVEY

Using information from the literature review, practice scan and customer focus groups, the research team designed, pretested and implemented a passenger intercept survey at a total of 12 survey locations throughout the state. The survey locations were selected to be representative of the transfer facility typology developed for the study and described earlier in the report. The passenger intercept survey was designed to collect data on customer satisfaction with 30 different transfer-related service and facility characteristics arrayed among five general categories, including: service level, facility maintenance and amenities, customer information, station/stop access, and safety/security. The survey also collected data on the importance customers place on different features as well as basic demographic information and information on transit use in general. A copy of the survey questionnaire is included in Appendix D. Figure 3 shows the geographic distribution of survey locations by type of facility.

In total, 7,776 survey questionnaires were distributed at the 12 survey sites. Nearly 2,400 completed questionnaires were returned, yielding a 31 percent overall response rate. As shown in Table 9, location-specific response rates ranged from approximately 30 to 40 percent, except the 31st Street/Bergenline Avenue and the Livingston Mall sites, which were 9 percent and 14 percent respectively.

Table 9 – Overview of Survey Administration & Completes

			Completes				
Location	*Date*	*# of Surveys Distributed*	*6am - 10am*	*11am – 3pm*	*4pm – 7pm*	*Total*	*R Rate*
Hackensack	3/15/2011	300	83	22	16	121	40.33%
Trenton	3/16/2011	500	130	17	41	188	37.60%
31st Street/ Bergenline Avenue	3/17/2011	800	60	6	5	71	8.88%
Pennsauken	3/22/2011	125	53	4	5	62	49.60%
Livingston Mall	3/29 & 5/12/2011	405	30	16	11	57	14.07%
Hoboken	3/30/2011	1,400	483	74	34	591	42.21%
Camden	4/6/2011	1,100	223	54	83	360	32.73%
Ridgewood	4/14/2011	290	76	8	13	97	33.45%
Teaneck	4/14/2011	70	10	4	4	18	25.71%
Branchburg	4/20/2011	86	23	0	0	23	26.74%
Lindenwold	4/21/2011	1,400	350	16	64	430	30.71%
New Brunswick	5/11/2011	1,300	309	26	32	367	28.23%
	Totals	7,776	1,830	247	308	2,385	30.67%

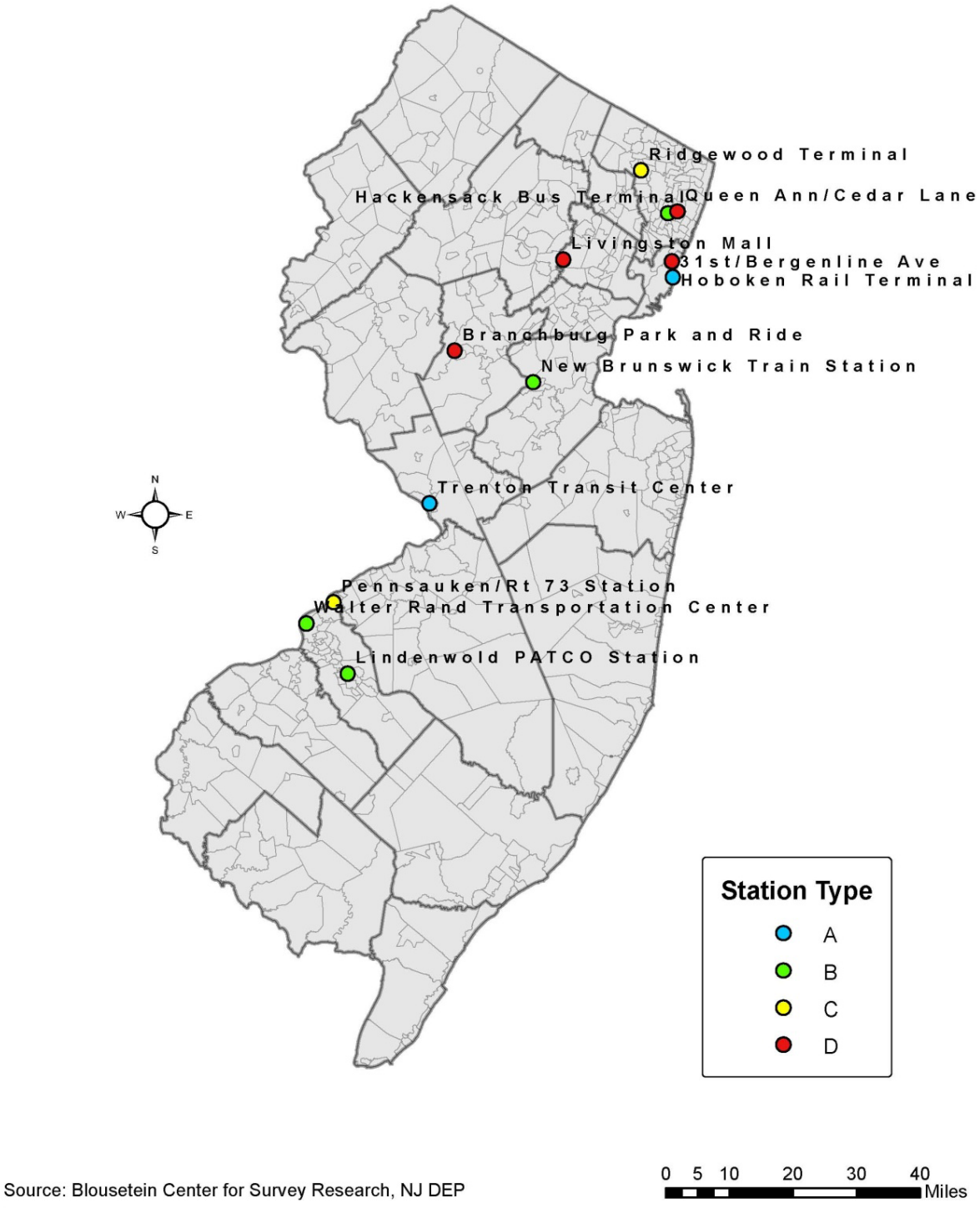

Figure 3. Survey Locations by Type

Customer Satisfaction with Transfer Trips and Features

An important component of this research was to explore customer satisfaction based on transit transfer experiences. In that regard, survey respondents were asked about their level of satisfaction with 30 different transfer-related service and facility characteristics, including features related to service levels, facility maintenance and amenities, customer information, station/stop access, and safety/security. All satisfaction ratings were measured on a five-point scale:

- Very satisfied (5).
- Somewhat satisfied (4).
- Neither satisfied or unsatisfied (3).
- Somewhat unsatisfied (2).
- Very unsatisfied (1).

Customer satisfaction with their overall transit transfer experience was generally high, with a mean satisfaction score as measured by all survey responses of 3.95. Older riders (over 55) are generally more satisfied than younger riders. As shown in Figure 4, satisfaction with specific features was somewhat lower across all categories. Customers overall were most satisfied with station/stop access and customer information and least satisfied with facility maintenance and amenities and service levels. Customers sixty-five and older were much more satisfied with safety/security, service level, and station/stop access features than other age categories. Although gender differences were limited, women overall were more satisfied with service level, customer information and station/stop access; while men were more satisfied with safety/security and facility maintenance/amenities (see Figure 5).

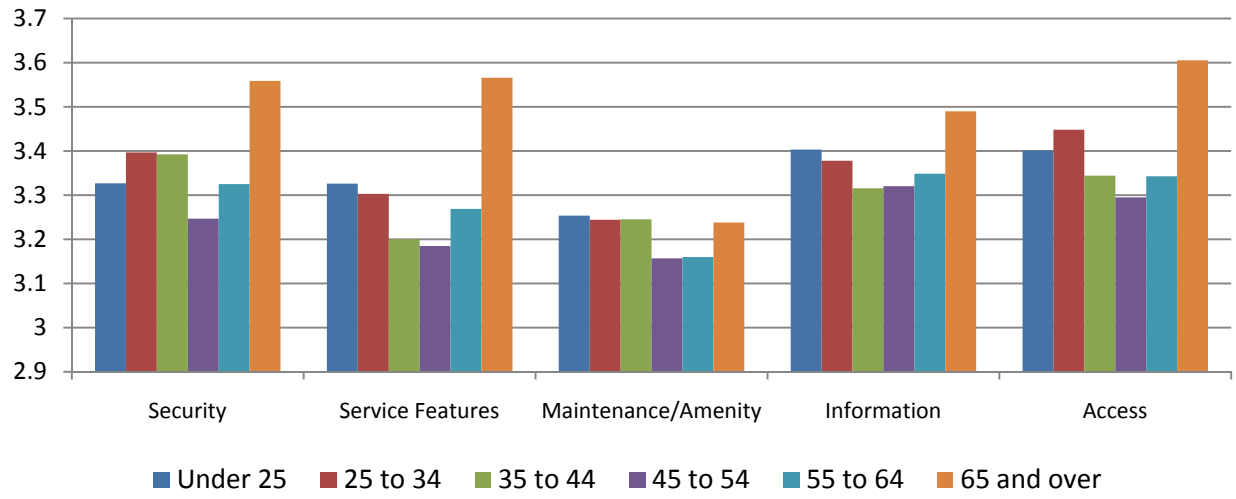

Figure 4. Feature Satisfaction by Age Category

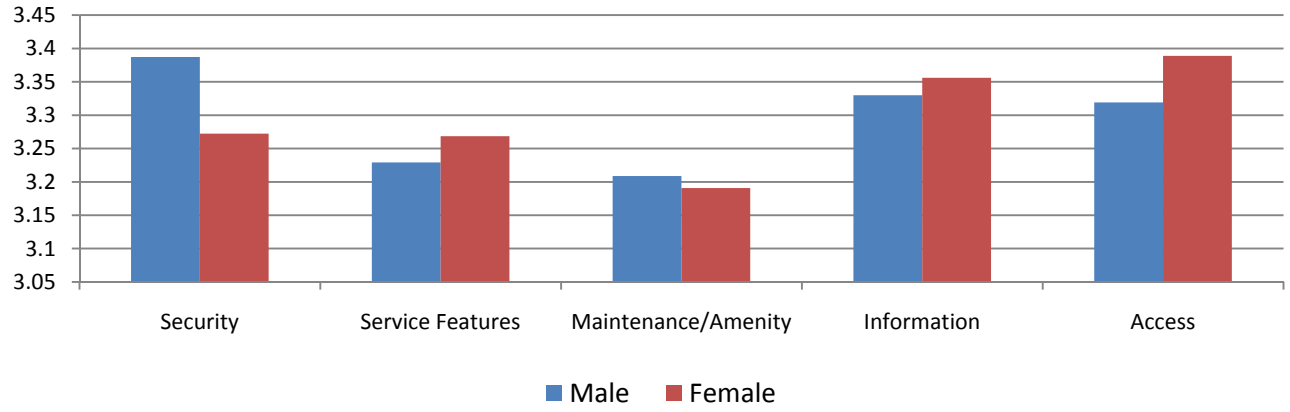

Figure 5. Feature Satisfaction by Gender

Figure 6 shows the stratification of incomes among survey respondents. Many respondents were clustered around higher incomes. The mode for the graph is in the $150,000 or more category. Income did not appear to have a significant influence on overall satisfaction with the transfer experience or individual feature satisfaction ratings.

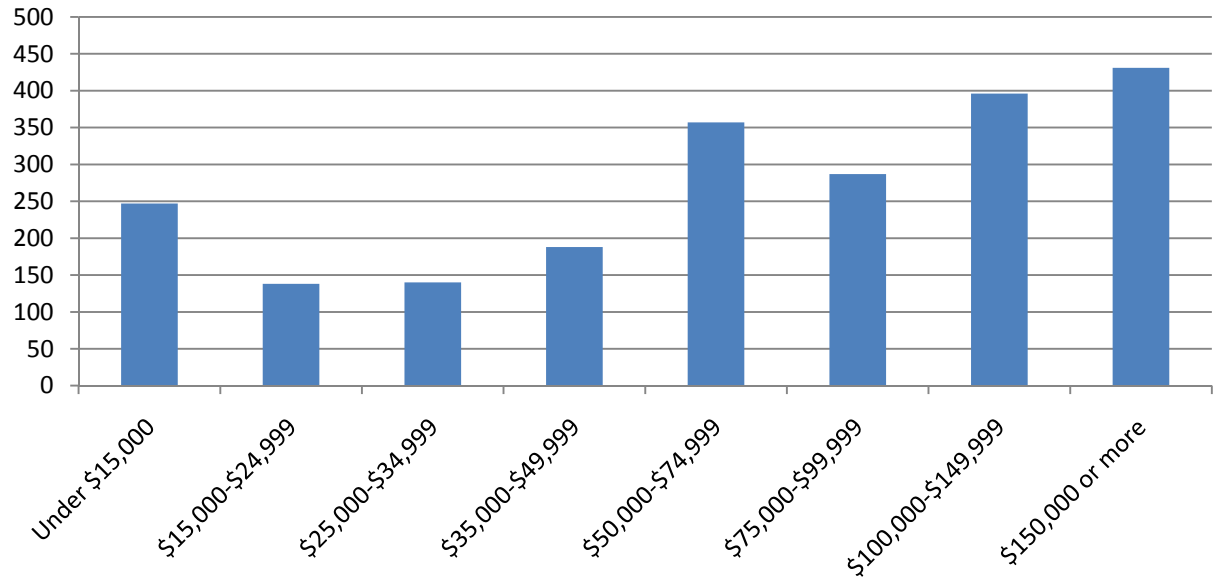

Figure 6. Income Stratification of Survey Respondents

The vast majority of survey respondents were frequent users of transit. More than 80 percent of those surveyed ride transit five or more times a week. Only four responses came from first-time customers and just 36 came from customers who ride less than once a month. Consistent with these results, the reported trip purposes were overwhelmingly for work (82 percent); half (50 percent) held monthly passes; and over 90 percent of trips originated from home. Infrequent riders, those that use transit less than once or twice per week, are only slightly more satisfied and the difference is not statistically significant. However, midday riders (who tend to be less frequent transit users) have higher levels of overall satisfaction.

Destination travel was predictable based on commute patterns. Survey responses were mostly received from those traveling during the morning peak period (78 percent). 40 percent of survey respondents reported accessing the station/stop where they received the survey by auto (either driving themselves or being dropped off). Roughly the same proportion used bus or train to access the station/stop where they received the survey (14 percent bus; 19 percent train). Very few respondents (4 percent) reported using an automobile to reach their final destination, while 15 percent transferred to a bus and 18 percent to a train to reach their final destination.

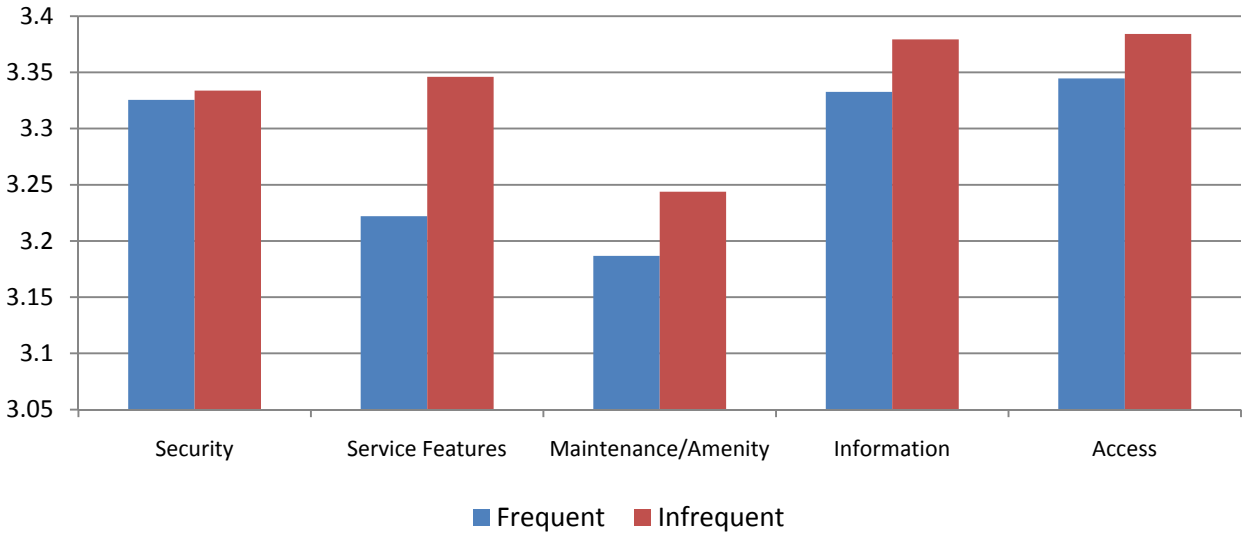

Figure 7. Feature Satisfaction by Frequent vs. Infrequent Transit Users

Approximately 55 percent used the station/stop where they received the survey as a transfer point 5 or more times per week. 17 percent transferred at the station/stop less than once a month. Part of this discrepancy could be that the station/stop where they received the survey was either close to their origin or final destination and therefore they would not be transferring at that particular location or not at all. Infrequent riders were somewhat more tolerant of service level in terms of their stated satisfaction scores. As shown in Figure 7, mean satisfaction with regard to all feature categories was higher among infrequent riders. However, it should be noted that these differences were not statistically significant except in the case of service levels. With a mean satisfaction

score of 3.35 versus 3.22, for this feature category, infrequent riders were significantly more satisfied with service levels than frequent riders.

According to the survey responses, transfer wait times were generally low. More than half of respondents reported transfer wait times of 10 minute or less. The remainder are evenly distributed among longer wait categories. Figure 8 shows the distribution of wait times among survey respondents.

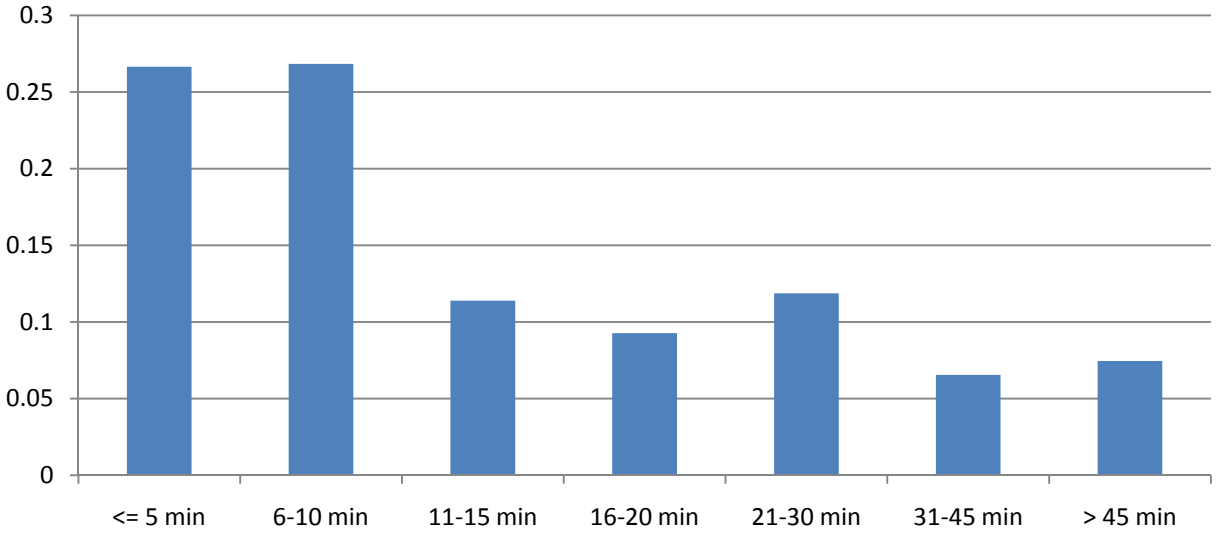

Figure 8. Distribution of Transfer Wait Times

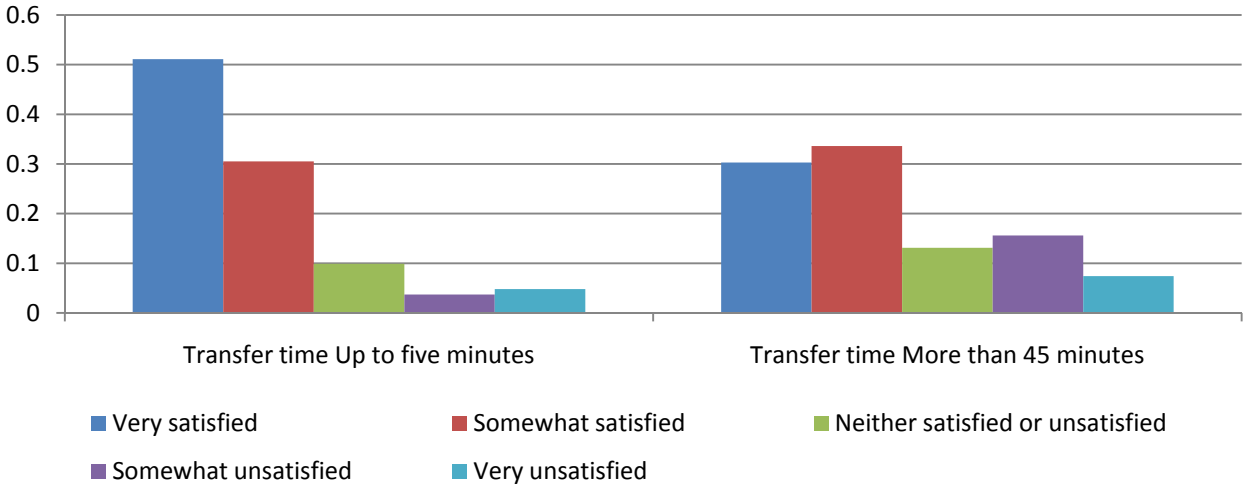

Figure 9. Customer Satisfaction by Transfer Wait Time Extremes

Customer satisfaction as it relates to transfer wait time was most pronounced in the extremes. Riders who had to wait less than 5 minutes for a transfer were generally more satisfied than others, while riders forced to wait in excess of 45 minutes were least satisfied (see Figure 9). Interestingly, in between these two extremes, the data show little variation in terms of overall satisfaction with transfer trips. It is true however that there is a slight downward trend in satisfaction as wait time increases.

Despite overall less service and generally longer transfer wait times, mid-day riders are slightly more satisfied with their overall transfer experience than morning or evening peak riders. This may be due to several other factors, such as station/vehicle crowding and on-time performance during peak periods as well as trip purposes. The majority of peak period travelers are commuting to/from work which adds time pressures associated with arriving to work on time and leaving work based on a transit schedule.

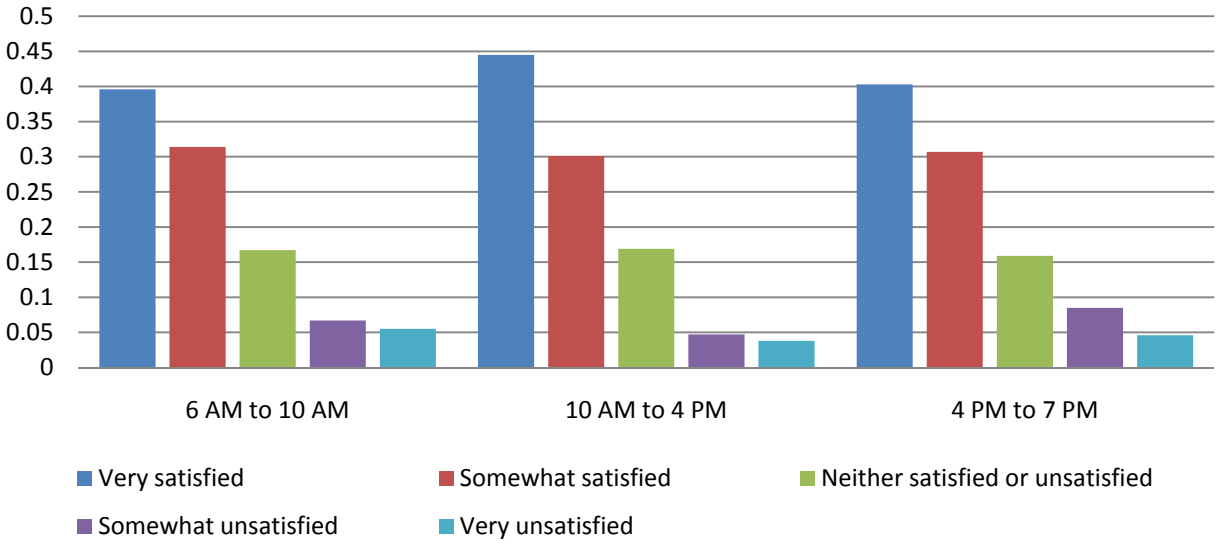

Figure 10. Customer Satisfaction by Time of Travel

Transfer Feature Importance

In addition to overall and feature satisfaction, the survey also queried customers about the level of importance they attach to different transfer-related features. For the purpose of this survey, importance was measured for the same list of 30 service and station/stop item characteristics used to investigate satisfaction. Survey respondents were asked to select their top four most important features from the overall list of 30 features. Importance selections were not ordered, but simply noted as either selected (highly important) or not selected (less important). For the purpose of analysis, the features were again categorized by type: service features, facility maintenance and amenities, customer information, station/stop access and safety/security.

Table 10 lists the 30 transit transfer features appearing in the survey in order of importance based on the number of times each item was reported in the respondents' list of the top four most important features. Overall, the survey results indicate that customers value service features more highly than others. Five of the top ten most important items were in the service features category. Customer Information (with the notable exception of real-time information) was least important to riders. Protection from weather and availability of seating were also reported as highly important. Some safety/security characteristics, such as presence of police/security personnel (348) and general safety at night (325) and day (274) were also rated important by a large number of customers.

Table 10 – Customer Importance Ratings by Category and Feature

	Transfer Feature	Number Reporting as Important	Mean Satisfaction
1	Services being on-time	722	3.4
2	Protection from weather	520	3.4
3	Availability of seating	435	3.5
4	Wait time between transfers	412	3.3
5	Presence of police or security personnel	348	3.1
6	Real time "next bus or train" information	329	3.2
7	Safety at this station/stop at night	325	3.2
8	Frequency of service from 3 pm to 8 pm	305	3.4
9	Frequency of service till 10 am	302	3.6
10	Schedule coordination between transfers	277	3.2
11	Safety at this station/stop during the day	274	3.8
12	Cleanliness	233	3.1
13	Frequency of service after 8 pm	193	2.8
14	Public address announcements	191	3.1
15	Availability of restrooms	177	2.9
16	Availability of parking	165	3.1
17	Safety in the neighborhood around this station/stop	158	3.2
18	Options for buying tickets	152	3.7
19	Posted schedule/route information	141	3.6
20	Presence of security cameras	122	3.1
21	Walking distance between transfers	112	3.7
22	Frequency of service from 10 am to 3 pm	93	3.2
23	Availability of knowledgeable staff	82	3.2
24	Lighting	78	3.5
25	Stores/restaurants to buy a snack or other convenience items	78	3.0
26	Availability of printed schedules to take with you	69	3.5
27	Signs directing you to other locations like waiting areas, exits, etc...	60	3.4
28	Signs directing you to boarding locations	50	3.5
29	Sidewalks and crosswalks	34	3.3
30	Services like ATMs, dry cleaners, etc.	24	2.8
	Key: Item categories		
	Service Features	Access	
	Maintenance/Amenity	Security	
	Information		

The item satisfaction scores and importance data can and should be examined together to gain the fullest understanding of customer transfer experiences. If analysts and decision-makers consider only satisfaction scores, it might be tempting to pursue programs and investments designed to increase customer satisfaction with features that receive a low satisfaction score. However, if low satisfaction items are not important to customers than it may be better to invest limited resources in addressing those items that are more important to customers. For example, three important items listed on the survey appear near the bottom of the list of satisfaction scores but in the top of the list of importance to customers: presence of police and security personnel, schedule coordination between transfers, and real time information. Service frequency after 8 PM, restroom availability, station cleanliness, and public address announcements are other items of low satisfaction that appear to be of higher importance.

An analysis of the item importance/satisfaction ratings by location type can provide perspective on possible rider preferences for targeted improvements. As shown in Table 11, results vary somewhat by facility type. Column 1 of the table lists the top ten features rated “most important” by the survey respondents using each facility type. Column 2 indicates the proportion of survey respondents from each facility type that reported a particular feature among the four most important features to them. Column 3 reports the mean satisfaction score for each feature based on survey data for that facility type only. Column 4 indicates the difference between mean satisfaction scores for the features reported as highly important by users of each facility type compared to the overall mean satisfaction score for those same features among all survey respondents. Mean satisfaction score differences below zero indicate customers of that facility type were less satisfied with that feature than customers overall. Mean satisfaction score differences above zero indicate customers of that facility type were more satisfied with that feature than customers overall.

Customers using Types A and B Facilities appear to be the most satisfied overall with features they deem “most important.” A notable exception is “frequency of service after 8 pm” which was ranked highly important at both facility types but customers had a low level of satisfaction with this feature. The highest levels of dissatisfaction with features deemed important by customers was observed at Facility Type C/D station/stops. In several cases, customers using Facility Type C/D station/stops were significantly less satisfied with features they deemed important than customers overall. Examples include: “protection from weather,” availability of real time information,” and “presence of police and security personnel.”

Table 11 –Top Ten Transfer Features by Facility Type

	Top Ten Transfer Features	Percent Reporting Important	Mean Satisfaction	Difference from Mean for Overall Customers
	Responses for Type A Facilities (n=779)			
1	Services being on-time	36.8	3.34	0.0
2	Wait time between transfers	24.4	3.18	-0.1
3	Protection from weather	23.0	3.67	0.2
4	Frequency of service from 3 pm to 8 pm	20.2	3.28	-0.1
5	Availability of seating	18.7	3.63	0.1
6	Schedule coordination between transfers	18.2	3.05	-0.1
7	Real time "next bus or train" information	16.0	3.48	0.3
8	Frequency of service till 10 am	15.9	3.47	-0.1
9	Safety at this station/stop at night	12.5	3.59	0.4
10	Frequency of service after 8 pm	12.2	2.56	-0.2
	Responses for Type B Facilities (n=1,278)			
1	Services being on-time	25.4	3.39	0.0
2	Protection from weather	20.3	3.48	0.0
3	Presence of police or security personnel	17.5	3.07	-0.1
4	Availability of Seating	17.4	3.52	0.0
5	Safety at this station/stop at night	15.6	3.0	-0.2
6	Safety at this station/stop during the day	15.0	3.69	-0.1
7	Wait time between transfers	13.0	3.40	0.1
8	Real time "next bus or train" information	12.5	3.13	-0.1
9	Cleanliness	11.3	2.95	-0.1
10	Frequency of service till 10 am	10.4	3.67	0.1
	Responses for Type C/D Facilities (n=305)			
1	Services being on-time	33.4	3.28	-0.1
2	Protection from the weather	24.6	2.86	-0.6
3	Availability of seating	18.4	3.27	-0.3
4	Wait time between transfers	16.4	3.03	-0.2
5	Frequency of service till 10 am	14.1	3.40	-0.2
6	Real time "next bus or train" information	13.1	2.67	-0.5
7	Schedule coordination between transfers	10.8	3.15	0.0
8	Presence of police or security personnel	10.8	2.58	-0.6
9	Frequency of service after 8 pm	9.2	2.60	-0.2
10	Safety at this station/stop at night	9.2	3.27	0.0
	Key: Item categories			
	Service Features	Access		
	Maintenance/Amenity	Security		
	Information			

DISCUSSION AND RECOMMENDATIONS

New Jersey has a wide and varied network of public transportation services operated by a range of public and private entities. NJ TRANSIT operates one of the largest public transit agencies in the country providing commuter rail service, light rail service, local and interstate bus service, and Access Link, the agencies complementary ADA paratransit service throughout the state. The Port Authority of New York and New Jersey operates PATH rail service between New Jersey and New York City. The Delaware River Port Authority operates PATCO commuter rail from Camden County to Philadelphia and a host of local government, non-profit and private companies operate shuttles, commuter buses and paratransit services throughout the state. These services meet a range of needs including commuter travel to major employment centers, local bus service for all types of trip purposes, and specialized services for the elderly, disabled, poor and others with special transportation needs.

With such a rich network, there are extraordinary opportunities to improve transit transfers between these services. In the mature NJ TRANSIT system, it is unlikely that significant system capacity will be added in the near future. At the same time, on-going development and the maturity of suburban centers will create the demand for more complex, multi-link trips. Future improvements should focus on supporting these types of trips.

Research conducted in the United States and abroad has documented traveler needs at transit transfer facilities, as well as best practices in facility design, customer information and technologies that support transit transfers. Overall, focusing on meeting customer needs is critical to attracting and maintaining riders. Regardless of any specific need of a targeted customer group (e.g. commuters; people with disabilities), certain principles of customer-oriented transit are universal: offering a safe and secure system; having readily available and understandable service information; having an efficient fare collection system in place; and, designing and maintaining high quality stations and facilities.

Interviews with transportation experts here in New Jersey revealed that there are a number of institutional barriers that make planning for transit transfer trips and facilities challenging. These include:

- Limited evening and weekend transit service.
- The practice of NJ TRANSIT rail and bus schedule changes not occurring simultaneously due to differing union contracts among modes.
- No current means of coordinating operations and information sharing among and between operators that may serve the same location.
- Limited available data on passenger movements and real-time data on vehicle status to aid transfer planning and operations.

- The influence of “home rule” issues, such as municipal governments determining the location of bus stops and retail shopping mall operators prohibiting transit operations on their properties.

Field work and site inspections at transit facilities throughout the state yielded a typology of transit transfer locations, which is described in detail earlier in the report. The typology includes four facility types (A through D) ranging from high amenity, major multi-modal transportation hubs with very frequent transit service (Type A) to local on-street boarding locations where customers may transfer from one mode to another but where amenity and service levels are considerably lower (Type D). The typology can be used by decision-makers to categorize transit transfer locations throughout the state.

The results of the transfer customer intercept survey conducted for the study can help decision-makers understand customer needs in general and at each type of facility. Customers overall were most satisfied with station/stop access and customer information and least satisfied with facility maintenance and amenities and service levels. At the same time customers valued service features more highly than others. Five of the top ten most important transfer trip characteristics were in the service features category, including: services being on time, wait time between transfers, service frequency, and schedule coordination between transfers. Customer Information (with the notable exception of real-time information) was least important to riders. Protection from weather and availability of seating were also reported as highly important. Some safety/security characteristics, such as presence of police/security personnel and general feeling of safety at night and during the day were also rated important by a large number of customers. These findings were generally consistent across facility types but there were important variations. In particular, conditions at Type C/D facilities showed significant room for improvement. Customers using these facilities reported lower than average levels of satisfaction with virtually all the features they cited as highly important.

The findings from this study provide important insights and valuable data to help transportation decision makers understand better how to improve the experience of transit transfer customers in New Jersey and to potentially grow ridership by encouraging more patrons to make multi-link trips while using the transit system. Based on the research, the following recommendations can be made:

- NJ TRANSIT should investigate ways to rationalize the process by which rail and bus schedule changes are determined and coordinate better the implementation of schedule changes to synchronize inter- and intra-modal schedule coordination as much as feasible at transit transfer locations. This may require changes to union contracts and or legislation.
- NJ TRANSIT should develop and implement a strategic plan for deploying ITS technologies system-wide. Recent investments, especially at regional multimodal transit hubs have significantly improved the level of information

available to customers. However, more planning and investment is needed to provide the data and information necessary to facilitate transfer trips, enhance transit operations, and provide much needed traveler information. Critical components of the plan should include equipping all NJ TRANSIT vehicles with automatic vehicle location (AVL) technology and automatic passenger counters as well as the deployment of traveler information systems to provide real-time service information to customers at all Type A and Type B facilities as well as Type C facilities with existing/potential high volumes of transferring customers.

- NJ TRANSIT should review its current fare structure, especially with regard to how its bus service and Access Link fares are calculated. The agency should also review its policies and methods for fare collection. The focus should be on simplifying the fare structure, expanding fare collection options, and integrating fare media between modes and transit system operators.

- NJ TRANSIT should work with other public, private and NGO transit providers to identify a network of county and regional transfer points throughout the state that can provide a focus for transfer activity between modes, routes and services regardless of service provider. These points should be categorized according to the transfer location typology developed as part of this study. Each provider should then review/modify their respective route and service plans to determine what if any service modifications are possible to encourage more seamless transfer trip-making. The county/regional transfer points should be specified in locations that accommodate facility improvements commensurate with the anticipated facility type and level of transit service anticipated. Improvement costs should be shared among the service providers utilizing each location.

- NJ TRANSIT and other transit service providers should work cooperatively to conduct site assessment at each facility using the site assessment checklist developed for this study (a copy of which is included in Appendix C). Early emphasis should be given to assessing and improving basic conditions at Type C/D facilities. The site assessment data should be compared with desired levels of amenity at each facility and reviewed along with the customer satisfaction and feature importance data collected as part of the customer intercept survey to identify and prioritize improvement needs at each location based on facility type designations.

  For example, real-time information is highly desired by customers at all facility types. Improving access to real time service information should be a priority at locations that lack this feature. Cleanliness was an issue at Type B facilities where customers cited cleanliness as highly important yet they also reported low levels of satisfaction with this feature. Facility maintenance policies and procedures should be a priority at Type B facilities. Safety and security were a concern at all except Type A facilities. Type C/D station in particular scored poorly in satisfaction ratings for police/security presence and security cameras. Type B stations scored low for safety at night while customers ranked this feature

highly important. Improvements to address these deficiencies at Type B, C and D facilities should be a priority.

- NJ TRANSIT should develop station/stop design standards that define the minimum desirable features for each type of transfer location, especially bus transfer locations. Design standards should address protection from weather, seating, lighting, customer information displays, directional signage and other amenities as needed based on the transfer location typology.

- NJ Department of Transportation should pursue implementation of its complete streets policy to prioritize access and safety improvements around identified transfer facilities. This should include investing in pedestrian and bicycle improvements on roadways under state jurisdiction as well as making similar improvements on county and municipal roadways a priority as part of the local aid funding program.

- NJ TRANSIT and the NJ Department of Transportation should work with the NJ Legislature and the Governor's office to enact legislation that can enhance the agency's ability to plan and operate transit transfer facilities. This should address the ability to locate and construct transfer facilities where operationally efficient and advantageous on both public and private commercial property.

- NJ TRANSIT should identify and pursue joint development opportunities to improve conditions at facilities based on the typology. This should include joint development focused on bus transfer facilities, which could become a focal point for community activities and a catalyst for private investment in redevelopment around the facility.

- Finally, when operating budgets will allow, NJ TRANSIT and other service providers should consider providing additional peak and off-peak service to transit transfer facilities. Service frequency was consistently ranked highly important by customers while satisfaction scores were low.

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