APPENDIX A

LITERATURE REVIEW AND SUMMARY OF STAKEHOLDER INTERVIEWS

INTRODUCTION

A literature review was conducted to identify the current body of knowledge and research related to transit station access throughout North America, as well as some from Europe, Asia, and Australia.[1] The following key points emerged from the literature review:

- Transit station access planning must effectively consider local characteristics (e.g., demographics, land use) to develop a balanced and successful multi-modal access plan.
- The body of literature on access mode choice shows that while characteristics of individual travelers play a large role in transit access decisions, external policy and design factors also play a large role.
- There are several well-established evaluation tools available to assess the quality of pedestrian, bicycle, and transit facilities.
- Transit Oriented Development (TOD) has a number of environmental benefits and the potential to increase ridership; however, to be successful TOD must incorporate partnerships and be sensitive to local market conditions.
- Park-and-ride facilities accommodate a large portion of ridership for many high-capacity transit systems, and they will likely continue to play a large role for the foreseeable future to maximize transit ridership and accessibility to the transit system.
- Where parking demand exceeds capacity, research shows that parking pricing and Transportation Demand Management (TDM) measures can encourage auto drivers to switch to other access modes; however, this can run the risk of reducing ridership if not priced appropriately.
- Feeder bus services to transit stations that are both time-competitive for the passenger and cost-effective for the agency are difficult to provide, but can have major benefits. Potential strategies to accomplish these dual objectives include flexible routes, customer information and Intelligent Transportation Systems (ITS), and fare coordination.
- Pedestrian access to transit stations is determined by many factors, including distance, urban design, pedestrian facilities, crime, and characteristics of individual travelers. While transit agencies cannot affect distance, agencies do have the potential to increase walking mode shares through improvements to the walk environment.
- Surveys of walk access trips show that many pedestrians walk between 0.5 and 1 mile to transit stations, indicating that the traditional focus on only the first half mile underestimates the actual potential for walking trips.
- Bicycle access to transit stations is largely dependent on factors outside of transit agency control (e.g., quality of the bicycle network); however, provision of secure bicycle parking at transit stations significantly increases bicycle access mode share.

The information gathered in this process was used by the research team to select stakeholder interviews. The research team interviewed a total of 64 stakeholders representing 25 transit agencies in Canada and the United States. An additional 4 transit agencies were contacted, but declined to be interviewed. In addition to the interviews themselves, the research team collected relevant background information for each agency from the National Transit Database, agency websites, and agency

[1] The literature review has been published as *TCRP Web-Only Document 44: Literature Review for Providing Access to Public Transit Stations* and can be accessed at: http://144.171.11.40/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=2358

publications. This document provides a detailed summary of the background information and stakeholder interviews pertaining to access planning programs.

Key findings and lessons learned from both literature review and stakeholder interviews are summarized here.

ACCESS ISSUES

There is a substantial body of literature summarizing transit access mode issues, including several comprehensive transit access mode guidelines produced by transit agencies. This literature indicates that many agencies are planning for integrated, multi-modal access to high-capacity transit rather than focusing on a single access mode. In several cases (e.g., BART and WMATA), these agencies are prioritizing non-auto access trips due to both environmental benefits and the high-cost of providing facilities for automobiles at transit stations.

In addition to considering multiple access modes, agencies are also considering how to address mode of access for polycentric urban areas. Decentralization of American cities over the past 50 years has created the need for transit to destinations other than the CBD to be successful. Doing so requires consideration of suburban transit stations as both origins and destinations for transit trips.

At the same time, the research indicates that automobiles will continue to play a large role in access to transit stations and that station planning must take local conditions into account to be successful. For instance, *TCRP Report 82: Improving Transit Options for Older People* shows that the demographics of the population in the surrounding area will affect how people get to the transit station. Similarly, making transit viable to serve lower density areas will require continued provision of park-and-ride facilities.

Finally, the results of *TCRP 118: BRT Practitioner's Guide* show that Bus Rapid Transit (BRT) and Light Rail Transit (LRT) share many characteristics and that well-designed BRT systems generate ridership equivalent to LRT systems. For TCRP Project B-38, this indicates that mode of access planning for BRT stations will follow many of the same principles as those already established for LRT. One important distinguishing factor of BRT, however, is the opportunity to provide a "one-seat ride" where a single vehicle serves as both feeder and line-haul mode. This approach can reduce the need for station transfer facilities and parking, if the BRT line is able to increase the number of people walking to the station.

EVALUATION TOOLS AND ACCESS PROGRAMS

The literature review identified many evaluation tools applicable to transit access planning. Some of these tools were developed with transit access specifically in mind, while others were developed for other applications but can be applied to specific aspects of transit access.

There is considerable research on access mode choice, which shows that individual characteristics as well as built environment characteristics are important. Both aggregate and disaggregate models have been developed, based on data availability. Transit agencies may use these models to estimate transit access mode shares under proposed development or improvement scenarios.

Willson and Menotti (2007) also provide an evaluation tool to assess ridership and financial impacts of development scenarios to trade-off the impacts of new development versus lost parking spaces. Other ridership tools, such as Kuby, et al. (2004), are available to estimate ridership based on a wide range of factors that include access variables. Note that this research shows that newer light-rail systems in polycentric urban areas are not necessarily oriented toward CBD trips, further supporting the need to plan suburban station areas to accommodate both access and egress trips.

There are also several evaluation tools to describe the quality of pedestrian and bicycle facilities. These tools can be used to identify specific deficiencies and needed improvements to increase non-

motorized access. Similarly, the *Transit Capacity and Quality of Service Manual* provides tools to assess the quality of transit facilities from the passenger perspective.

Interviews with transit agencies identified the following characteristics of access planning programs and data collection:

- Most transit agencies do not have formal access guidelines or procedures for conducting access planning. In these agencies, access planning occurs on a case-by-case basis. In many cases, informal tools and processes are available for access planning (e.g., Metra).
- Many agencies have specific policies related to certain aspects of access planning (e.g., LA Metro's Parking Policy, NJ Transit's Handbook on Planning for Transit-Friendly Land Use) but do not have overarching policies or guidelines.
- Several agencies have adopted access guidelines and procedures for access planning, including BART, RTD, and WMATA. These Access Guidelines were also reviewed as part of the literature review.
- Several agencies have developed or are developing station typologies to assist access decisions, including CTA, BART, and MARTA.
- Access planning typically occurs as part of planning for new lines and access characteristics (particularly parking availability) are critical to ridership projections.
- Few agencies have specific access mode split targets. Those that do are typically system-wide. BART is currently developing station-specific access mode share targets based on the results of a 2008 passenger survey.
- Data collection on access mode shares varies considerably by agency. In some cases, information on access mode shares is only anecdotal. However, many agencies have passenger survey data that provide access mode shares.
- Survey costs typically prevent agencies from updating access mode share information frequently. In many cases, data are over 5 years old.
- Where available, access mode shares are provided in the detailed summaries.

PARK-AND-RIDE/KISS-AND-RIDE

Park-and-ride facilities provide a large portion of ridership for many high-capacity transit systems, and will likely continue to play a large role for the foreseeable future to maximize transit ridership and availability. The success of park-and-ride is determined by many factors, including parking availability and ease of other access modes.

Where parking demand exceeds capacity, research shows that parking pricing and TDM measures can encourage auto drivers to switch to other access modes, but can run the risk of reducing ridership if not priced appropriately. While advanced parking management has not been shown to increase ridership significantly in the short-term, it does benefit customer satisfaction, which may have long-term benefits.

Compared to park-and-ride, there is a smaller focus on kiss-and-ride service. However, the available research indicates that this may be a relatively untapped market for transit agencies with potentially high benefits at low costs.

The stakeholder interviews found that almost all transit agencies have some form of park-and-ride program. Only NYCT and Lane Transit District have very limited park-and-ride facilities and rely primarily on other access modes for their high-capacity transit systems. Most agencies have active park-

and-ride programs encompassing thousands of parking spaces. Table A-1 summarizes parking spaces by transit agency.

Table A-1 Transit Agency Parking Supply

Transit Agency	# of Spaces	Transit Agency	# of Spaces
Bay Area Rapid Transit (BART)	47,000	Metro North	50,000
California DOT	N/A	Metro Transit	2,700
Capital Metro	1,300	Miami-Dade Transit	11,500
Charlotte Area Transportation System	3,100	New Jersey Transit	84,000
Chicago Transit Authority	6,700	NYCT	Unavailable
Denver RTD	12,000	OC Transpo	5,400
GO Transit	52,000	Pace	900
LA County MTA	16,200	Port Authority	15,000
Lane Transit District	250	Sound Transit	12,000
MARTA	24,000	South Florida RTA	4,000
Maryland Transit Administration	11,000	Valley Transit Authority	6,500
MBTA	65,000	Washington Metro (WMATA)	61,000
Metra	89,000		

Most parking is owned by transit agencies. However, park-and-ride facilities are owned by local jurisdictions or regional authorities in several cases (e.g., NJ Transit, MBTA).

As a general rule, parking prices depend in large measure on demand, as expected. However, there are many other factors that also influence parking prices, including:

- Political and other concerns often inhibit agencies from charging fees or raising prices to match demand (e.g., GO Transit, Sound Transit).
- Political and other concerns often inhibit agencies from charging for all, rather than a portion of, parking (e.g., LA Metro).
- Prices are sometimes fixed system-wide despite a wide range in utilization between stations (e.g., Miami-Dade Transit).
- Where local jurisdictions control parking, they may resist pricing and/or implement residency controls on usage (e.g., NJ Transit, Metra). This can create both over- and under-utilization.

Many agencies see increased parking supply as key to increasing future ridership. However, the ability to construct new parking is limited in most cases due to high capital costs, difficulty of obtaining land, and community resistance. Parking fees are significant revenue generators for several transit agencies, including BART, NJ Transit, WMATA, and MBTA.

TRANSIT-ORIENTED DEVELOPMENT (TOD)

TOD is the subject of a large body of research, policies, and case studies, of which a large portion is related to transit access. Overall, research shows that there are many instances of successful TOD in the United States occurring at both new and existing stations, and as both greenfield development and redevelopment. The market for TOD, however, is still oriented toward residential and office development, with few examples of successful large-scale retail TOD.

Successful TOD can help transit agencies increase ridership while decreasing the cost of providing parking and/or feeder services. However, there are many elements that are required for TOD to occur. Most importantly, TOD is dependent on market forces, which may not always favor increasing density and reducing parking. Good design principles are required to ensure that new development truly is oriented to transit, and not simply adjacent to transit. In addition, fostering TOD requires partnerships between public agencies and with private developers to overcome institutional barriers.

The review of experiences in both the United States and internationally indicate that TOD benefits from supporting policies at a state-wide and regional level as well as embrace of TOD principles at the local level.

All of the transit agencies interviewed indicate general support for TOD and a desire for more TOD in station areas. However, relatively few agencies have official joint-development guidelines or significant experience with joint-development.

From the perspective of transit agencies, TOD generally falls into two areas: (1) TOD within the vicinity of the station on land not owned by the agency, and (2) joint-development on land owned by the agency. TOD on land not owned by the agency is generally outside of the direct control of a transit agency. Transit agency roles in these cases are typically development review and depend on the strong relations with local jurisdictions. In the case of OC Transpo, the City of Ottawa controls land use and operates the transit system, allowing OC Transpo to participate more directly in zoning decisions. Opportunities for joint-development are limited by the amount of land owned by agencies. Many older systems, such as the CTA and NYCT, have very little land available for joint-development. Newer systems, such as BART and WMATA, often have more opportunities for joint-development and are more active in pursuing joint-development.

Several agencies, including WMATA, RTD, and OC Transpo have TOD guidelines to direct agency activities. However, issues surrounding the use of land acquired through eminent domain for private development vary by location and can be significant barriers to joint-development. For example, the Florida state legislature passed a law requiring a minimum of 10 years before land acquired through eminent domain can be used for private development, limiting the ability to plan for joint-development as part of system expansions. Similarly, in Colorado there is significant opposition and legal challenges to joint-development with land acquired through eminent domain. As a result, there is currently no clear policy directive on joint-development as RTD attempts to solve associated legal issues.

The replacement of existing park-and-ride spaces through TOD is a key concern to most agencies and is often a barrier to increasing TOD. Most agencies require a one-to-one replacement of any parking in joint-development, either through formal or informal policies. To replace surface parking lost to development, joint-development must often be accompanied by structured parking. The result is that many TOD projects are not financially feasible without public subsidies to cover at least some of the costs of the structured parking.

Few agencies have reduced net parking through TOD, due primarily to concerns about ridership impacts from elimination of park–and-ride spaces. Agency experience supports this conclusion, for example:

- BART has revised its policy requiring parking replacement to allow up to a 25% net reduction in parking through TOD, but no development has yet occurred with a reduction in parking.
- Miami-Dade Transit is open to reducing parking where current parking is under-utilized, including plans for residential TOD at the Brownville station that will reduce park-and-ride spaces by 75%.
- OC Transpo is planning to reduce parking at the Baseline station as part of a TOD. The Baseline station was formerly a terminal, but parking demand decreased after the line was extended.
- Several other agencies indicated a willingness to consider parking reductions as part of future joint-development opportunities.

FEEDER TRANSIT SERVICE

Transit feeder service is an attractive option for many people that live outside of walking distance to access transit service, especially for those without vehicles available or for whom the cost of parking is prohibitive. Moreover, feeder transit has congestion and emissions benefits of park-and-ride access. However, feeder service must be time-competitive with the automobile to be successful, which can make providing service costly, especially in low-density areas.

Developing feeder services that are both time-competitive and cost-effective would provide major benefits to transit services. Potential strategies include flexible route systems to increase routing efficiency and ITS to provide customer information and scheduling. Finally, coordinated fare policies and schedules between line-haul and feeder services are critical to building ridership.

Feeder services to high-capacity transit stations are operated under a range of strategies. In many cases, the same agency runs both the line-haul and feeder service, while local operators are responsible for feeder service in others. In most light rail and BRT systems, feeder and line-haul service is run by the same agency (e.g. VTA, OC Transpo, Port Authority). However, most commuter rail systems rely on local operators for feeder service (e.g., Metra). Some agencies that are responsible for their own feeder service include the following:

- GO Transit operates feeder service to many of its commuter rail stations.
- Metro-North funds feeder and distributor service at many of its stations.
- SFRTA provides free shuttle services at several stations that are not served by local operators.
- NJ Transit encourages local operators to provide feeder service through a program to fund transit vehicle purchases and a portion of operating costs.

Where feeder services are run by local operators, there is a range of fare integration policies. In many cases, though, a lack of fare integration is seen as a barrier to increased ridership (e.g., SFRTA). In other cases, fares are completely separate, requiring passengers to pay multiple fares (e.g., BART, Metra). GO Transit pays 75% of local connecting service fare.

Schedule coordination is most important for commuter rail service, where headways are long compared to other high capacity transit modes. Most schedules are nominally coordinated, but buses are not held for late trains in many cases where the buses are not strictly feeder services. Schedule coordination between local and line-haul operators is both formal and informal. For example:

- Sound Transit sponsors a regional Transit Integration Group, comprised of senior service development managers from all of the Puget Sound region transit agencies, where service integration discussions take place on a regular basis.
- SFRTA has good relationships with local transit providers that allow informal coordination to be effective. For instance, SFRTA is currently working with local transit agencies to address schedule impacts of SFRTA adding lay-over time to the Tri-Rail schedule.

Reverse commute employer shuttles (e.g., Mountain View Caltrain Station) and community circulator shuttles (Emery Go Round at BART MacArthur Station) are becoming more important means of distributing riders from high-capacity transit service. Shuttles are often critical components of serving suburban employment centers that may not be within easy walking distance of stations.

Finally, the concept of a "one-seat ride" rather than feeder service is popular for both BRT (e.g., OC Transpo) and express bus (e.g., Sound Transit) systems. Under this concept, riders use the same vehicle for both the collection/distribution and line-haul portions of the trip, eliminating the need for a transfer.

On other BRT systems (e.g., LA Orange Line) special vehicles are used for the BRT service, requiring local bus passengers to transfer to access the system.

PEDESTRIAN AND BICYCLE ACCESS

Pedestrian access to transit stations is often considered a given, such as those passengers located less than 0.5 miles from the station will walk and others will not. Surveys of walk access trips show that the *average* walk access trip is nearly 0.5 miles, and that many pedestrians walk more than 0.5 miles to access transit. This indicates that the traditional focus on only the first half mile may underestimate the actual potential for walking trips. However, the research shows that there are many factors other than distance that affect the decision on whether to walk, including urban design, pedestrian facilities, crime, and individual characteristics. By considering these factors, agencies have the potential to increase walking mode share to stations.

With regard to bicycle access, the international literature review shows that it is possible for bicycles to comprise up to 40% of transit access trips. However, realizing such a high percentage is largely dependent on factors outside transit agency control, as system-wide quality of bicycle facilities, topography, weather, and bicycle culture all play large roles in people's willingness to bike. Even so, research indicates that provision of bicycle facilities at transit stations, in particular high-quality bike parking, does have a significant impact on bicycle access.

Pedestrian and bicycle improvements are often made by local jurisdictions. This points to the need for coordination between transit agencies and local jurisdictions to improve bicycle and pedestrian conditions. For instance, in the case of Miami-Dade, the MPO completed the bike parking plan for transit.

The provision of pedestrian access within station areas is typically guided by transit agency design guidelines and ADA standards. Pedestrian access to transit stations (e.g., sidewalk improvements) from adjacent land use is typically controlled by local jurisdictions, and agencies do not typically fund pedestrian improvements on land not owned by the agency. Many transit agencies attempt to work with local jurisdictions to improve pedestrian facilities.

Bicycle ridership varies considerably by system. Some systems are currently dealing with rapidly increasing bicycle access and bicycle-capacity problems (e.g., LTD, BART, LA Metro), while others have very low levels of bicycle access (e.g., Maryland Transit Administration).

Bicycle access strategies typically fall into two broad categories: (1) parking and (2) on-vehicle accommodation. On many systems with high bicycle access mode shares, there is a desire to encourage more riders to park their bicycles at stations rather than bring them on-board. Most agencies allow bicycle on-board vehicles, though many have peak-hour time restrictions. In fact, all of the rail agencies interviewed allow bicycles on-board during non-peak periods. On-board accommodation during peaks varies by agency and is largely dependent on overall demand. Several bus rapid transit services do not currently accommodate bikes on-board or on front-mounted racks.

Bicycle racks are the most common method of bicycle parking. Most agencies noted that bike racks are relatively cheap and can be installed as-needed to meet demand, except where space constraints prohibit additional racks. Bicycle lockers are a major component of bicycle parking in many locations. Lockers are typically rented either annually or semi-annually. BART is moving toward hourly payment for bike lockers through electronic cards to improve utilization.