Bus Rapid Transit Plans in New York's Capital District

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Abstract

The Capital District Transportation Authority (CDTA) is seeking to implement Bus Rapid Transit service in the NY 5 corridor, which runs for 16.5 miles between Albany and Schenectady. The benefits of BRT will be to improve service for current riders, draw new riders to the system, help spur economic revitalization in the corridor, provide key nodes for new development, and improve the image of transit in the Capital District as a whole. When fully in place, the key features of BRT on NY 5 will include limited-stop service, substantial passenger facilities and amenities at each station, real-time passenger information, improved pedestrian environment, park-and-ride opportunities, priority treatment at intersections, queue jumpers at key points, off-vehicle fare collection, and a specific brand image to distinguish BRT from other bus services. The cumulative impact of these types of improvements—in travel time, passenger comfort, passenger information, and image—will lead to an increase in transit ridership in the NY 5 corridor. Based on experience at other North American transit agencies that have implemented BRT, an increase of 22 percent to 29 percent is expected, depending on the ultimate travel time savings that is achieved.

Background

For over a century, New York State Route 5 (NY 5) has been one of the main travel corridors in the Capital District. Anchored by the two cities of Albany and Schenectady, the arrow-straight route running 16.5 miles from northwest to southeast has served bicyclists, pedestrians, horsecars, streetcars, automobiles, buses, and trucks.

In the post-war era, the character of NY 5 changed, reflecting shifts in employment, land use, transportation modes, and lifestyles. While still a critical transit corridor, with about 10,000 riders per day on CDTA's buses, most of the roadway is dominated by automobiles, whether in terms of traffic flow, pavement space, or automobile-related land use. Retail redevelopment has occurred in certain places in the corridor, such as at Colonie Center, but other segments of the corridor have lagged economically and are in need of revitalization.

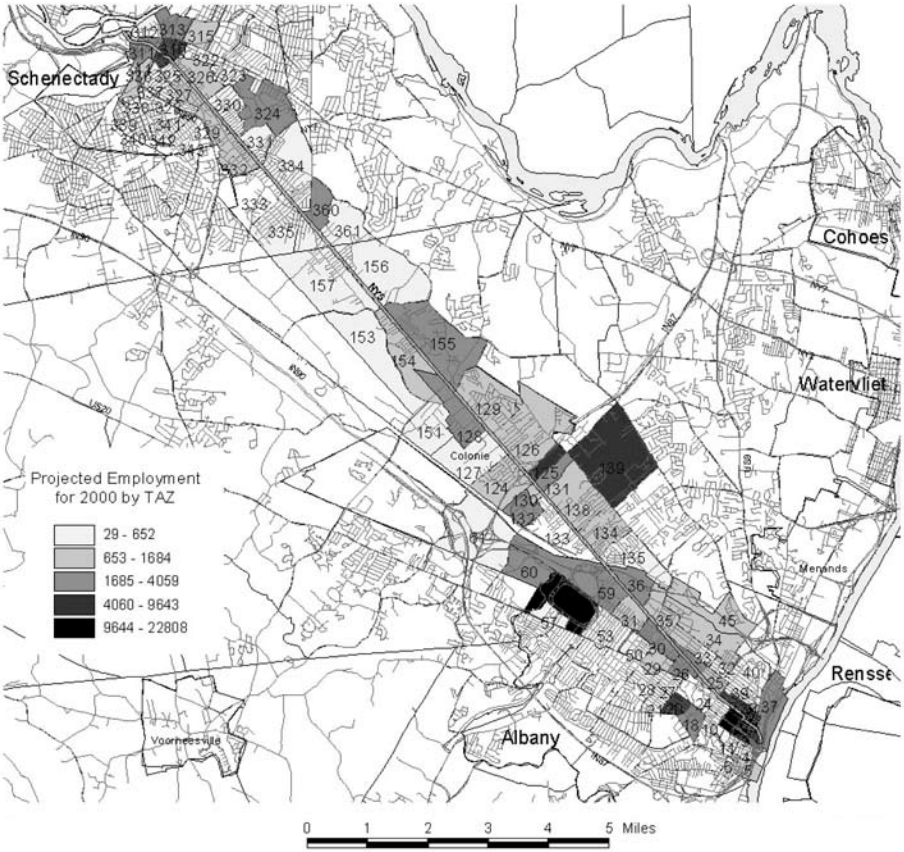
The NY 5 Land Use and Transportation Study helped to develop a consensus vision for the corridor, called the "Preferred Future Scenario." This scenario combines significant investments to stimulate economic development, urban design recommendations to create a safe, attractive environment for all modes of transport, and the establishment of a Bus Rapid Transit (BRT) route in the corridor to tie the new development together with fast, convenient, and comfortable public transport.

During the last decade in the United States, BRT has gained interest as an effective way to improve conventional bus service to retain and attract ridership (Levinson et al. 2003). Often based on successful examples overseas, many U.S. cities have planned BRT solutions for their communities. The characteristics of urban areas in the U.S., however, are usually very different from the conditions found in the overseas cases; for example, lower densities, sprawl, and higher motorization rates (Rodriguez 2003). To some extent, NY 5 presents those characteristics typical of U.S. urban areas but it also has some special conditions that make it different and potentially more suitable for BRT. NY 5 connects two urban areas with relatively high population density and several important destinations are found along the corridor itself (see Figure 1 and Figure 2). As opposed to other corridors being studied for BRT, this corridor is multi-centric with most of its trip attractors within walking distance of the main roadway corridor.

Figure 1. Population Density in NY5 Corridor between Albany and Schenectady

Source: CDTC

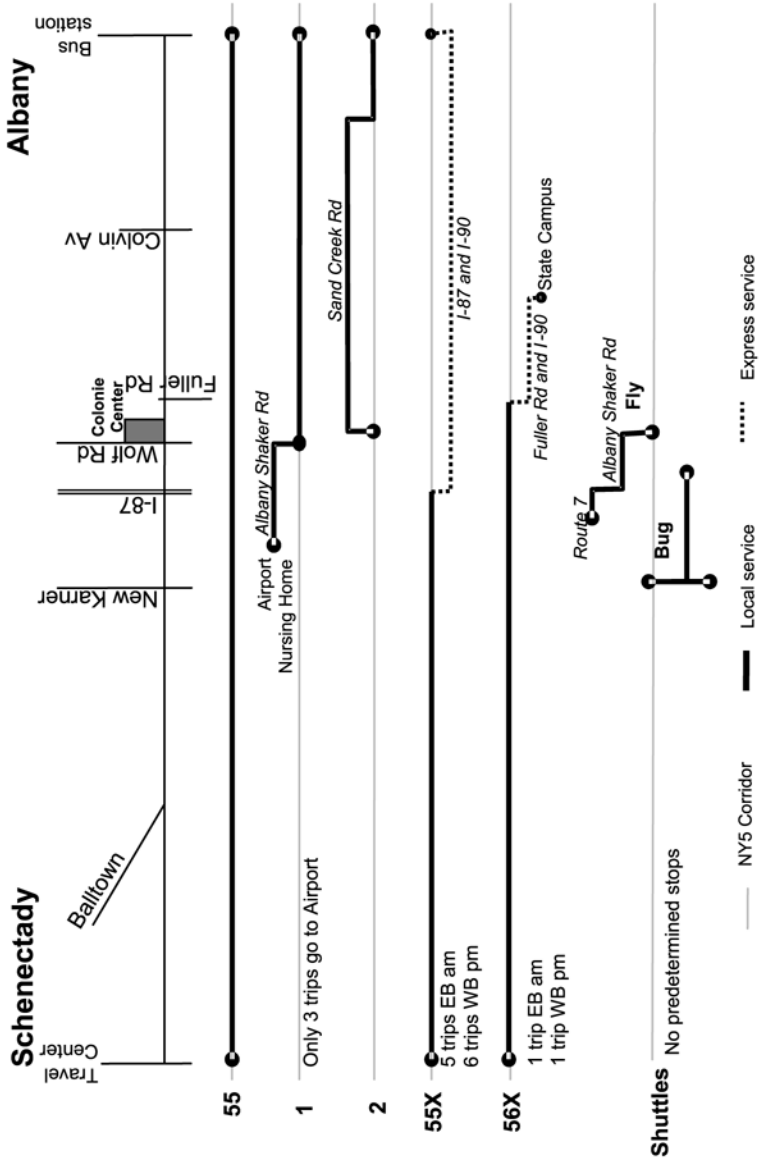
Figure 2. Estimated 2000 Employment in NY5 Corridor between Albany and Schenectady



Source: CDTC

Currently, five routes run in the NY 5 corridor for a significant portion of their alignment, routes: 55, 1, 2, 55X, and 56X. Figure 3 shows a schematic of these routes. Routes 55 and 1 run at 15-minute headways during peak periods. Route 2 runs at 20-minute headways during peak periods. There are two shuttle services that do not run on the corridor but provide complementary service to the riders of NY 5 bus routes. These shuttles do not have predetermined stops; they stop at the places requested by the passengers.

Figure 3. Transit Routes in NY 5 Corridor



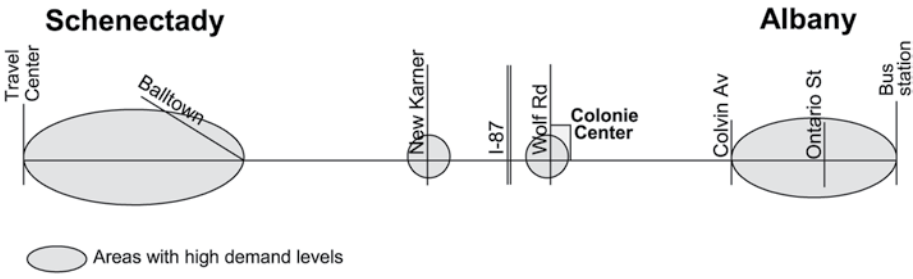
A boardings and alightings census along the NY5 transit routes was conducted. This census provided extensive data to understand the ridership behavior along the corridor and throughout the day. Table 1 shows the total weekday ridership by route. As observed, routes 55 and 1 carry almost 90 percent of the demand in the corridor.

Table 1. Weekday Ridership in NY5 Transit Routes along NY5[1]

Route	Weekday	Saturday	Sunday
55	5,860	4,220	2,870
1	2,650	1,420	150
2	1,120	270	
55X	290		
56X	30		
Total	*9,950*	*5,910*	*3,020*

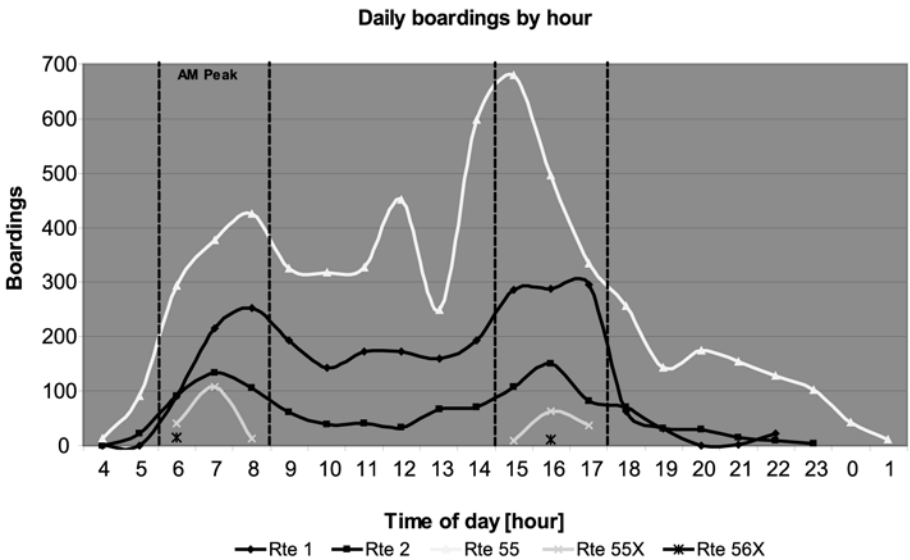
Due to differences in development densities, a ridership imbalance was observed between the eastern part of the corridor (Albany segment) and the western part of the corridor (Schenectady segment), with the former accounting for 70 percent of the total boardings. The most heavily used stops are in downtown Albany, at Lark Street and Pearl - Lodge Street, with 1,050 and 1,150 ons and offs per day in both directions, respectively. Based on the ridership census data, Figure 4 summarizes schematically the most important segments in NY 5 from a ridership standpoint.

Figure 4. Higher demand segments in NY5



The temporal distribution of demand throughout the day was also considered. Figure 5 presents the hourly distribution of the demand for each of the NY5 bus routes. The afternoon peak for Route 55 occurs earlier (between 3:00 and 4:00 p.m.) than for the other routes (between 4:00 and 5:00 p.m.). The corridor shows a conventional temporal distribution of demand, with peaks in the AM and PM periods. However, for Route 55 and Route 1, the PM peak is higher than the AM peak, which is unusual; generally, the AM peak is found to be the critical time period of the day. A more subtle but clear midday peak was also observed.

Figure 5. Hourly Distribution of Demand on NY 5



Approach: Planning for BRT Service

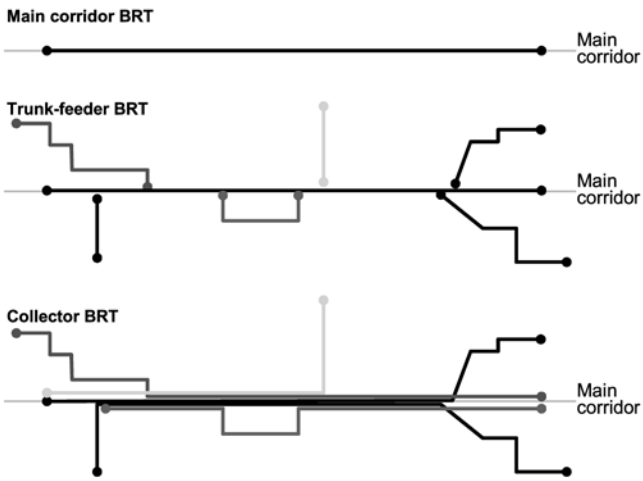
The approach taken to a conceptual plan for the BRT service on NY 5 had three main phases. The first phase consisted of developing a preferred service concept. This was a cooperative process between the consultant team, staff from CDTA and the Capital District Transportation Committee (CDTC), and the Study Advisory Committee (SAC) composed of representatives from municipalities, the State, and other interested parties. The second phase developed this preferred concept

into a full operating and facilities plan. The third phase outlined an implementation plan for these operations and facilities. The following sections describe the approach taken during each of these phases of the planning process of the BRT system on NY 5 and the challenges and issues encountered.

Developing a Service Concept

There are three main conceptual service models for operating a BRT line. Figure 6 shows a schematic of these models. The Main Corridor model operates the BRT service on one main corridor with conventional connections and transfers to other routes in the transit network. This model is most appropriate when most or all of the area's development is located directly on the main corridor. Ridership is highest when the corridor is densely developed with mixed land use, creating opportunities for both origin and destination zones in the corridor.

Figure 6. Conceptual Models for BRT Operations



The Trunk-feeder model operates two types of routes—feeders and a trunk—forcing transfers among them. Trunk routes operate in the main corridor and feeders collect passengers in surrounding areas and transport them to transfer stations on the main corridor. The feeders are considered to be part of the BRT system itself, and are identified as such through vehicles, stations, schedules, maps, fares, etc. This model makes more sense than the collector BRT (see below) when the main corridor route itself operates at high frequencies, different types of vehicles may

be appropriate for the feeder and trunk areas, and/or there are multiple important destinations along the main corridor.

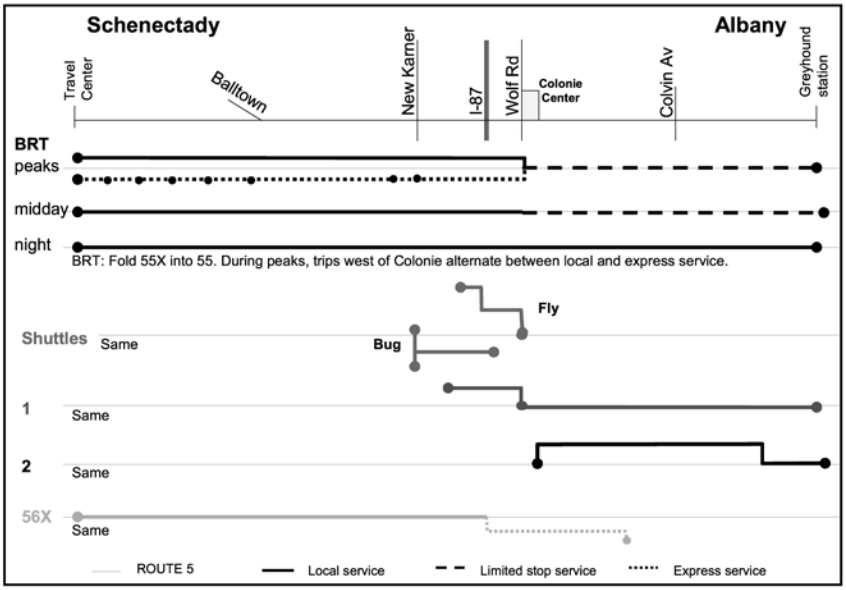
In the Collector model, the same vehicles operate on both feeder and main corridors. The routes are designed to collect passengers in areas surrounding the main corridor and then enter the main corridor, usually, to make use of a transit priority treatment such as a busway. This model is more advantageous when lower densities are present, special priority treatments are provided in the main corridor or an exclusive busway is present, and/or there is one central main attractor area and lower density, sparse generator areas surrounding it.

Many NY 5-specific service alternatives were developed based on the conceptual models described above and on the understanding of the corridors characteristics (i.e., current ridership, densities) mentioned in the background section. Although alternatives of the collector model were considered initially, they were discarded due to the characteristics of the NY 5 corridor: a multi-centric corridor with at least three primary destination areas—downtown Schenectady, downtown Albany, and Colonie Center—along the corridor. As mentioned earlier, the collector model is best suited to areas with a central business district that attracts riders from outer lower-density zones. NY 5, however, has its two highest density areas at both ends of the corridor.

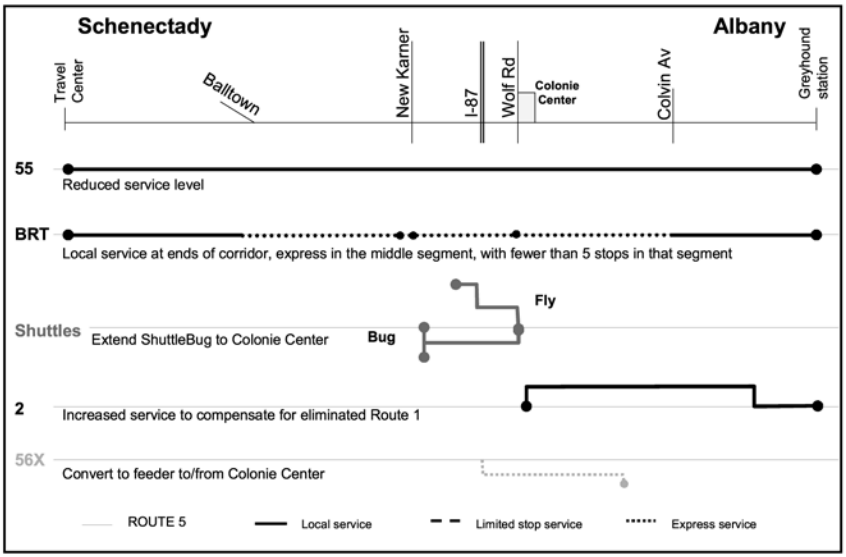
After evaluating many different service options, four alternatives were selected for detailed analysis. Of these resulting alternatives, the first two were based on the main corridor concept and the last two on the trunk-feeder concept. The four alternatives are presented schematically in Figure 7. These alternatives shared a common set of premises:

- The BRT service would run both directions all the time, and to the extent possible at higher frequencies than local parallel routes (Rodriguez, 2003).
- Regardless of the selected service alternative an effort should be made to develop a BRT "brand" including the vehicles, shelters, and, in general, all amenities of the system (Levinson et al. 2003; FTA 2000).
- The BRT service should operate on NY 5 all the way between Albany and Schenectady instead of using express highways because it increases the visibility of transit in the corridor creating incentives toward a better pedestrian environment and land use improvements while serving better the market along NY 5. (The running time difference between an express route on NY 5 and the highway system is not significant according to travel time runs. The expressways to downtown Albany are frequently congested.)

Figure 7. Alternative BRT Models for NY 5

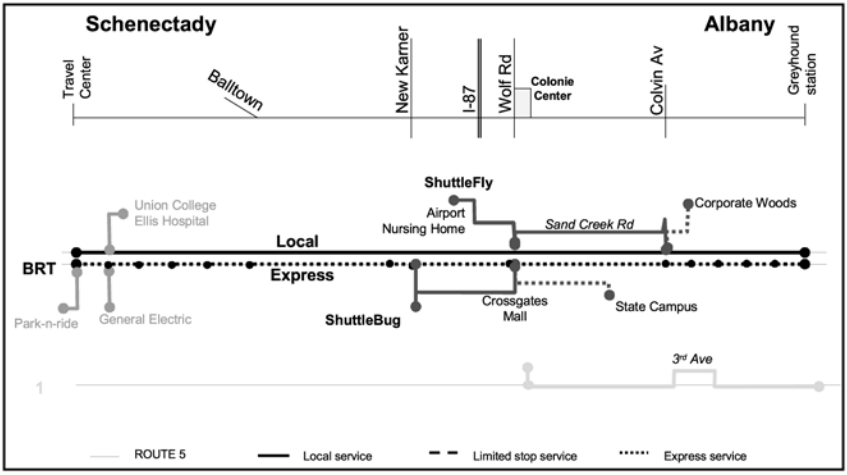


Alternative 1

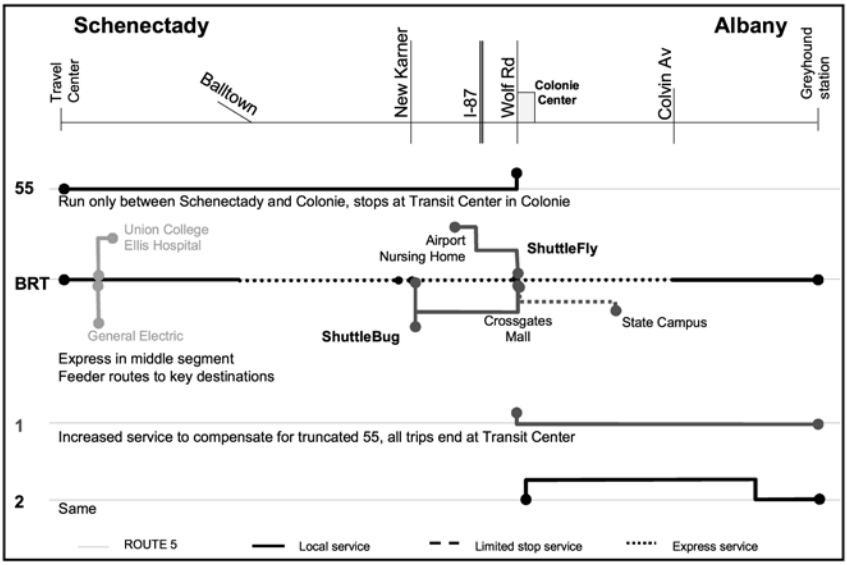


Alternative 2

Figure 7. (cont.)



Alternative 3



Alternative 4

In Alternative 1, Route 55 and 55X are combined to become the BRT service. Most of the day, the BRT service operates limited stop between Albany and Colonie and local west of Colonie. During peaks, this latter portion alternates local and express service. At night, the entire corridor operates as local service. In Alternative 2, the BRT service runs locally in Schenectady and Albany and express in the middle segment. Alternative 3 introduces a super-limited express route that stops only at 20 locations in the corridor; distinctive infrastructure would be built at these locations. A parallel local route would serve the rest of the ridership in the corridor that does not use the 20 highest-volume stops. Alternative 4 is very similar to Alternative 2, but the local route 55 runs only between Schenectady and Colonie; thus, there is no local service that serves the entire corridor end to end.

The four alternatives presented above were evaluated using criteria that can be grouped into two categories: measures of effectiveness from the users' perspective and measures of effectiveness from the operator's standpoint.

The criteria used for the users' perspective are: on-board time, access (walking) time, waiting time, transfers, coverage, image/distinctiveness from current service, simplicity of representation, and service level between key origin and destination pairs.

The criteria used for the operator's perspective are level of operating expense (vehicle revenue hours), level of agency investment (e.g., ITS, vehicles), level of roadway investment, ease of implementation: physical, political, institutional, ridership, and net operating cost

Ultimately, Alternative 3 was selected as the preferred service concept due mostly to its simplicity and rail-like characteristics. The Study Advisory Committee liked the idea that the BRT service could be represented simply and clearly on a schematic map, showing a limited number of station stops. These stops would receive significant infrastructure treatments to raise the visibility of the service. The BRT express service in Alternative 3, with few stops along the route, also suited the ridership pattern observed with the ridership census data, which showed that demand is highly concentrated in Albany, Schenectady, and a few key points in the long middle segment. The limited-stop nature of the express service will result in a substantial decrease in travel time and thus make transit more competitive with private cars. Feeder routes serving the corridor at key transfer stations would be timed to meet BRT vehicles to enhance access to the corridor. This alternative involves the most change from current conditions and may be the most opera-

tionally challenging for CDTA. However, it is the most easy-to-understand alternative for users and its impacts will be easily recognized by the community.

Developing a Service and Facilities Plan

To develop a service and facilities plan, three parallel efforts were performed: 1) station location and design, 2) operations design, and 3) roadway and physical improvements. Each of these efforts is described below.

Station location and design

This effort included locating the stations and stops of the BRT express and local services, determining the type of infrastructure and amenities at each location, and designing that infrastructure at a conceptual level.

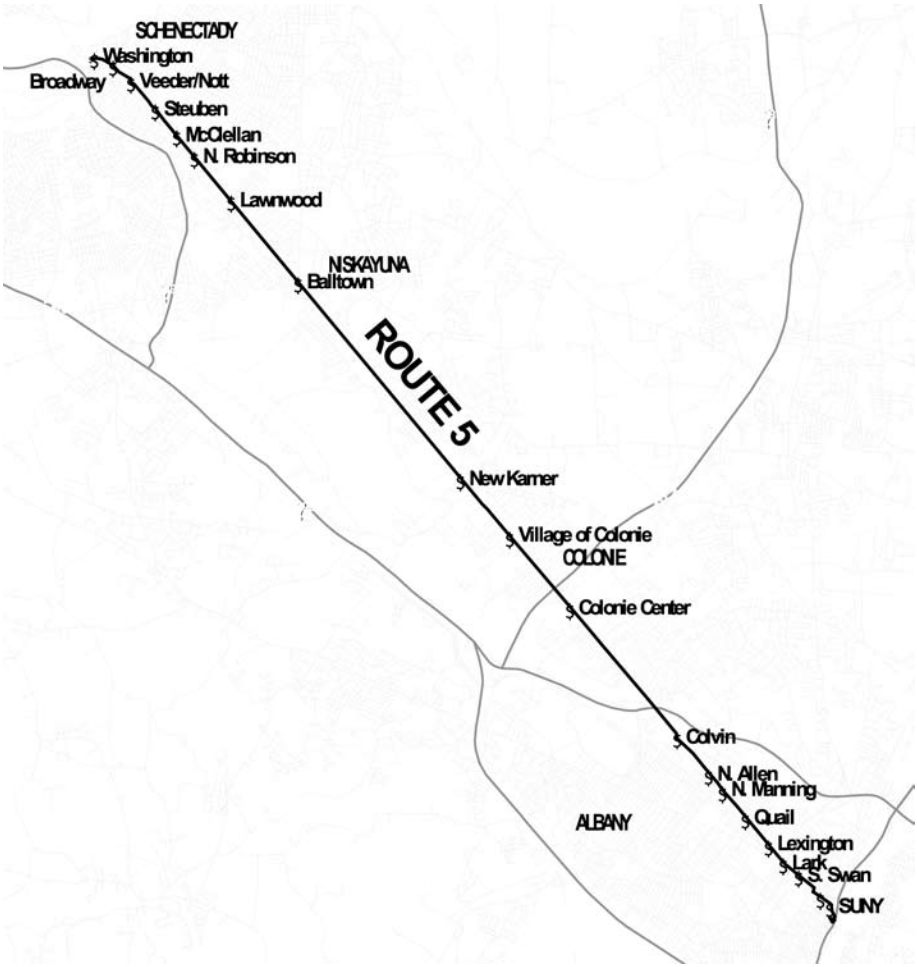
The preliminary selection of the station locations for the BRT express service was based on ridership and stop spacing. An effort was made to select those locations with high numbers of boardings and alighting and at the same time, maintain reasonable spacing between stations Levinson et al. 2003. A total of 20 locations were proposed. Figure 8 shows the approximate locations of the stations along the corridor.

These locations result in an approximate stop spacing of 0.4 miles in the downtown areas and 2.0 miles in the middle (suburban) segment. Most of the BRT stations were located at current high-volume stops. However, some locations with moderate ridership—such as Balltown Road—were recommended because too large a gap is undesirable in urban settings, and they have higher demand compared to their neighboring stops. Figure 9 shows the boardings and alightings in both directions and the location of the BRT express stations.

Of the 20 BRT express stations, 4 were identified to be key transfer stations. These locations will be designed to allow for minimal delay to the corridor services while providing convenient transfers to the feeder/distributor routes. The stations identified to be transfer points are Colvin, Colonie Center, New Karner, and downtown Schenectady.

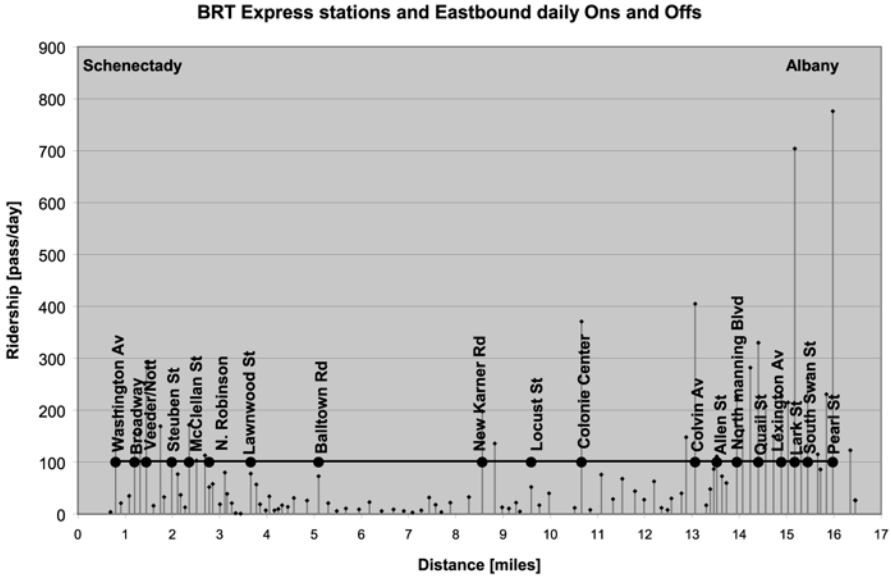
At the locations where BRT express buses would stop, new stations would be constructed. These would be substantial shelters with significant passenger amenities recommended for BRT services (Levinson et al. 2003); Díaz et al. 2004. A standard set of amenities and an optional set of amenities were identified to be deployed at BRT express stations. The standard amenities are recommended at all BRT express

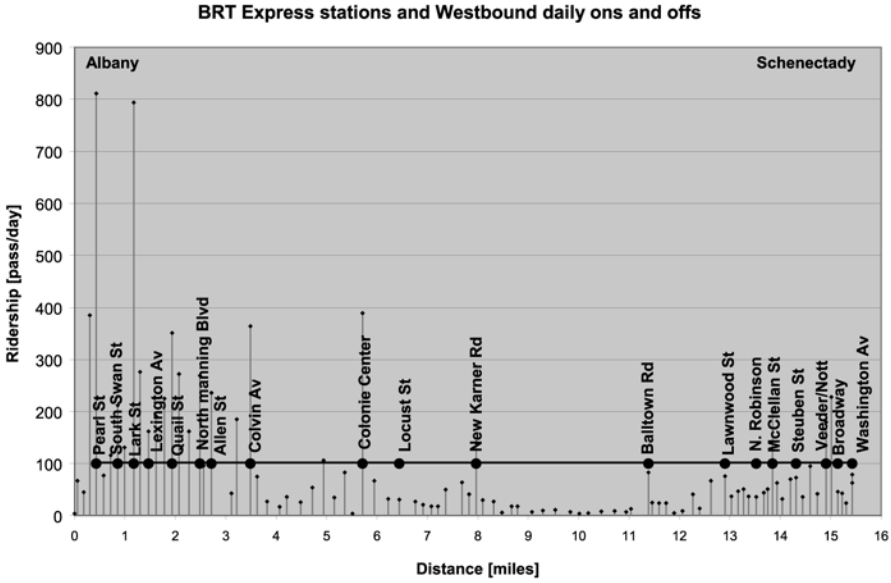
Figure 8. BRT Express Stations



stations. Some amenities play a more important role at particular stations. For example, bike racks play a more important role at locations near low-density, single-family housing areas than in downtown stations. The standard amenities are shelter, station sign, renovated sidewalks, pedestrian lighting, benches, trash cans, newspaper dispenser boxes, customer information (static system information,

Figure 9. Boardings and Alightings on NY 5





real-time information, map of area), bike racks, bulletin boards, and emergency and public phones.

The optional amenities are recommended for deployment at certain stations according to their characteristics. For example, while vending machines and restrooms may be provided only at the higher volume transfer stations, security cameras may be deployed at stations located in areas with potential safety and security issues. The optional amenities are vending machines, security camera, closed circuit TV, and restrooms.

The shelter and all other amenities are proposed to be specifically designed for the BRT system aiming for consistency and a unique image. This may be provided by using similar materials, color scheme, and design style in all elements.

In addition, the specific location (e.g., far side, near side, mid-block) and curb design (e.g. bulb out, curbside, bus bay) of the stations also were addressed (Texas Transportation Institute et al. 1996). In general, far side stations were preferred and recommended at those locations where it was possible (Levinson et al. 2003). Bulb outs were recommended at some locations where sidewalk space is too narrow to provide sufficient space for the shelter. Two conditions were necessary to recommend a bulb out station: an existing curbside parking lane and at least two lanes available for through traffic to guarantee at least one open through lane (Fitzpatrick et al. 2001; Fitzpatrick et al. 2002).

The stop locations for the parallel local service were determined to be at most current Route 55 stops. Some consolidation of stops was recommended for the existing 99 eastbound and 91 westbound stops between Washington Avenue in Schenectady and the Greyhound Bus Station in Albany. The elimination of stops was based on three criteria:

- Stop spacing: stops with current stop spacing of less than 1/8 mile
- Volume: those stops with current average movements per trip below 1.2 were considered for elimination. Movements per trip are total boardings and alightings divided by the total number of trips serving each stop during a period of time. Research has shown that stop elimination is most beneficial when the number of movements (ons + offs) per trip at a stop is about 1. When movements per trip are much greater than one, too many people would be affected by the elimination of the stop. When movements per trip are much lower than one, the stop is hardly used and its elimination would not impact travel time significantly.[2] However, if other circumstances

are present (i.e., stops are too close, no corresponding stop in the opposite direction), low ridership stops are worth considering for elimination.

- Alignment between eastbound and westbound stops: those stops without a corresponding stop in the other direction are considered for elimination. In general, it is recommended to provide corresponding stops in both directions. For many parts of NY 5, this is a challenge due to the numerous one-side intersecting streets.

As a result of this consolidation effort, the local service would stop at 88 eastbound locations and 89 westbound locations, almost all of them with corresponding stops in both directions. Some of these stops already have shelters; new investment at the local stops would be limited to signage and a basic set of amenities.

The feeder routes would operate similar to the existing shuttles, without predetermined stop locations. The driver stops at any place along the route where a passenger requests it. However, it may be desirable to deploy BRT feeder signs at key destination sites to raise the visibility of the system and to show that the feeder connects to the BRT express route. Some potential users may be unaware of the shuttle services because they do not see a sign on the street referring to this service.

Operations

The operations design effort determined the routing, headway, span of service, ridership, and fleet requirements of the service. The routing of the parallel local service would be the same as the current Route 55. The routing of the BRT express service was straightforward on NY 5 from the Travel Center in Schenectady to downtown Albany, but at the eastern end of the corridor, several routing options were explored. Ultimately, it was decided to use the Route 55 alignment for the BRT express as well, for the sake of travel time, layover, and market penetration.

A premise for determining the span of service and headways was to maintain or improve the existing service levels in the corridor for as many passengers as possible. The BRT express service is expected to operate approximately 15 hours between 6:00 a.m. and 9:00 p.m., whereas the BRT local service is recommended to operate similar to existing route 55 between 5:00 a.m. and midnight, with a few trips potentially running earlier than 5:00 a.m. and past midnight. The BRT will operate at 12-minute headways during peak periods, 20-minute headways during the midday, and 30-minute headways during the evening. The local service will operate every 15 minutes in peaks, every 20 minutes in midday, and every 30

minutes at night. In addition, on the eastern half of the corridor, a modified version of the existing Route 1 will continue to operate to accommodate the heavier demand east of Colonie Center. This route will operate with a 15-minute headway during peak periods and a 20-minute headway at other times. The Route 1 service will be coordinated with the corridor-length local service.

The vehicles required to operate the BRT express, parallel local route, and Route 1 services are full length (40-foot) buses, and the vehicles recommended for the shuttles are minibuses of no more than 30 feet in length and with a capacity of at most 40 passengers including standees. At some point in the future, articulated buses may be desirable for the BRT express.

Ridership Forecast

The approach to estimate the future ridership of the proposed routes in the corridor was based on seven steps. First, the current ridership was determined from the boardings counts obtained through the census data. Current ridership in the corridor was about 10,000 boardings per day.

Second, the trip origins and destinations were estimated by creating synthetic O/D matrices for each route based on the load profiles resulting from the ridership census data (Van Zuylen and Willumsen 1980; Willumsen 1994). The matrices were produced with a Visual Basic program written specifically for this purpose. The process is a repetitive loop that allocates each passenger to O-D pairs proportionally to the boardings and alightings for that particular station and considering that at any time, the passenger that has been on the bus the longest (i.e., boarded at the earliest station) is more likely to be allocated to the next alighting stop than any other passenger on the bus. Other restrictions were in place to ensure that the total number of boardings/alightings assigned to station *i* equals the boardings/alightings figure for station *i* in the load profile.

Third, the current trips that are likely to shift to the BRT express service were estimated. It was assumed that if both the current origin and destination stops of a certain trip are within walking distance of BRT express stations, the probability of using the BRT express is between 0 and 1 and follows a parabolic function.[3] Walking distance was assumed to be 0.25 miles upstream and 0.15 miles downstream, accounting for the fact that passengers are more likely to walk longer if they are walking in the direction of travel.[4] Since one current stop or point along the corridor could fall within the catchment area of two BRT stations, the final probability P_j for each current stop or point *j* along the corridor is the maximum of all prob-

abilities to the different BRT stations: $P_j = \text{Max}\ (P_{ij} \forall_i)$. The situation is similar for the other end of the trip (destination). Thus finally, the probability that a trip currently made between O-D pair *m* and *n* will be made on the BRT was expressed as $P\ (m,n) = P_m * P_n$. To obtain the number of trips that are likely to use the new BRT service, the probability for every O-D pair was multiplied by the total number of trips currently made for that O-D pair. This process estimated that during weekdays 3,750 passengers that currently ride on the NY 5 routes are expected to use the BRT express service, which accounts for 38 percent of current ridership.

Fourth, the ridership change (increase or decrease) due to headway changes was estimated by calculating the combined headway differences of the current conditions and the proposed operations for each O-D pair. Industry-standard elasticities were used to determine the ridership impact due to headway changes. A mid-point arc elasticity formula was used in which the elasticities vary depending on the original headway (Barton-Aschman Associates 1981). As a result, the net expected impact on ridership due to headway changes is an increase of 781 passengers (approximately 8%) during weekdays.

Fifth, the ridership change (increase or decrease) due to travel time changes was calculated similarly to the previous step. Current and future travel time for each O-D pair was calculated. The future travel time included the time savings that would be achieved through signal priority and queue jumpers. A transfer penalty was included for those trips that were forced to transfer between routes. Then, industry-standard elasticies were used to determine the ridership impact; a mid-point arc elasticity formula with an elasticity of -0.35 was used (Ecosometrics, 1980). Overall, a weekday ridership increase of 360 to 622 passengers is expected, which translates into an added weekday ridership increase of 3.6 to 6.4 percent, depending on the degree of travel time savings that can be obtained from signal priority treatments in the corridor.

Sixth, the ridership change (increase or decrease) due to other improvements (i.e., image, branding, and amenities) was estimated. Other systems were studied to determine a range of ridership boost that may be expected due to service enhancements other than frequency and travel time. The systems studied were the Silver Line in Boston, the MetroRapid system in Los Angeles, and the Vancouver B-Line. Using the elasticies mentioned above and the before and after ridership, service levels, and travel time, the expected ridership increase due to headway and travel time improvements was identified. Any remaining ridership gained in those systems was allocated to "other" enhancements, which usually

include amenities, image, system identity, and branding. Table 2 shows the total weekday ridership increase obtained from different sources and the breakdown of the share due to headway, travel time, and other improvements. As observed, the ridership increase due to "other" changes, which could be attributed to branding, image, and amenities enhancements, range between 10 percent and 21 percent of original ridership. For the NY 5 corridor, a range between 10 percent and 15 percent was assumed. In the immediate term, before all amenities are implemented for the full corridor, a smaller ridership impact, on the order of 5 percent ridership, would be expected.

Table 2. Case Studies in Ridership Change

	LA MetroRapid		Vancouver	Boston
	Ventura Blvd	Wilshire / Whittier Blvd	B-Line #98	Silver Line
Weekday ridership increase riders	2,850[a]	20,660[a]	4,000[b]	2,290[c]
Weekday ridership increase %	26%	33%	29%	30%
Ridership increase due to headway changes	6%	8%	9%	7%
Ridership increase due to travel time changes	10%	12%	6%	2%
Ridership increase due to other changes	10%	13%	14%	21%

[a] TCRP Report 90 Case studies in Bus Rapid Transit

[b] APTA Intermodal Operations Planning Workshop August 9 – 11, 2004 – Translink Welcoming Session

[c] MBTA counts

Finally, the total estimated ridership for the new system was calculated by adding up the different ridership changes discussed above to the current ridership, as shown in Table 3.

Table 3. Estimated Ridership on NY 5 with Proposed Service

	Weekday		Saturday		Sunday
	Lower	Higher	Lower	Higher	
Current ridership	9,950		5,910		3,020
Ridership increase due to headway	780		417		0
Ridership increase due to travel time	360	620	240	399	0
Ridership increase due to other improvements	1000	1490	590	890	0
Total	**12,090**	**12,840**	**7,157**	**7,616**	**3,020**
Total Increase %	**22%**	**29%**	**21%**	**29%**	**0%**

Roadway Improvements

Prior to the initiation of the BRT Conceptual Design Study, agencies in the Capital District had already made significant progress in moving toward the installation of a transit signal priority system in the NY 5 corridor. The purpose of the present study was to complement that effort with other roadway and transit priority treatments to help give buses in the corridor a competitive advantage over the rest of the traffic stream. This study considered a wide range of possible treatments, including bus-only lanes, HOV lanes, queue jumpers, and bulb-outs. Three specific improvements were identified for thorough analysis. These are a queue jumper at New Karner Road, a queue jumper at Wolf Road, and an exclusive bus lane in downtown Albany. An expanded transit signal priority program was also examined.

NY 5 at New Karner Road is a very busy intersection, with significant movements from westbound NY 5 to southbound New Karner. The proposed queue jumper at this location would allow westbound buses to bypass some of the congestion that forms at this location through a new lane. This new lane would serve both as a queue jumper and a right-turn-only lane for general traffic. The signal at the intersection would give westbound buses an advance green of some six seconds so that the buses could clear the intersection before the rest of the traffic begins to move.

Wolf Road is the busiest cross street in the NY 5 corridor. Exit 2 from I-87 feeds directly into this intersection, and Colonie Center mall is located here. Commercial development along Wolf Road is extensive, even beyond Colonie Center. Westbound NY 5 currently has a right-turn-only lane at the Wolf Road intersection. In the westbound direction, it would be desirable to construct an additional lane so that a right-turn lane could be preserved, while the second lane from the curb would be reserved as the bus queue jumper lane. Signage and signal timing would be the key factors in successfully implementing a queue jumper at this location.

An exclusive bus lane in downtown Albany is one of the most controversial elements of this study and represents the greatest challenge among the roadway improvements. NY 5 is very congested in this part of the corridor, and it is relatively narrow here as well. Nevertheless, the very high volume of CDTA buses that funnel into this part of the corridor, particularly during peak periods, means that a *de facto* bus lane already exists, to some extent. Formalizing this bus lane may be feasible only if it is done in such a way as to minimize the loss of scarce park-

ing spaces and the negative impacts on other traffic. This concept will be studied further in future stages of the project.

A project to install transit signal priority (TSP) at 35 intersections in the NY 5 corridor was underway when the Conceptual Design Study began. The study considered the benefits of expanding this program to all of the intersections in the corridor. Both conditional and unconditional priority were analyzed. Ultimately, the study recommended that full unconditional priority be pursued for the entire corridor.

Taken together, the operational changes (limited stop service) and the roadway improvements could result in a travel time savings of up to 17 minutes. Current one-way travel time for Route 55 ranges up to 68 minutes, so this savings represents a possible 25 percent improvement. This figure is in line with the experience of other North American BRT applications.

Developing a Phasing Plan

The final step in the Conceptual Design Study was to develop a phasing plan. The first phase was to be designed to create "critical mass" for the BRT, so that enough BRT elements would be in place to result in a noticeably different and improved service.

Because the BRT concept represents a flexible package of features that have been applied in various combinations in North America and around the world, the first step in developing the phasing plan was to define what will constitute BRT in the NY 5 corridor. The essential elements of BRT were determined to be the following, in descending order of importance:

- clearly identifiable stations with a rich set of amenities
- brand image applied to vehicles and signage
- new vehicles
- transit signal priority
- at least one queue jumper
- park-and-ride spaces

Implementation of these six elements will allow the limited-stop BRT express service to operate efficiently with a significant travel time advantage over the local service and without the customer confusion and complaints that arose with past efforts at limited-stop service in the corridor. The following paragraphs provide more detail on the contents of the three implementation phases.

Phase I (1 to 3 years)

Phase I will include construction of the 20 BRT stations, though not all amenities at all stations would be included initially. A new BRT brand name and image will be created during this phase; this brand will be included on all BRT facilities and the new vehicles when the service first operates. The transit signal priority program currently underway in the NY 5 corridor will be expanded as quickly as possible to help reduce BRT travel times. Similarly, it is recommended to proceed with the queue jumper at Wolf Road to achieve travel time savings and a high degree of visibility of the new service. Up to 250 park-and-ride spaces should be provided to help improve access to the new service. Most of these would be provided through lease agreements with abutting landowners rather than through land purchase and new construction.

This implementation phase is already underway. CDTA has begun the process of procuring new vehicles and is seizing opportunities for station development as they arise. A focus of early efforts is the Colonie Center station, which in many ways will function as the central point in the system.

Phase II (4 to 6 years)

Phase II will include the completion of the 20 BRT stations, filling out the set of amenities described above. Assuming that the Wolf Road queue jumper is successfully implemented in Phase I, a second queue jumper at New Karner Road in the westbound direction will be implemented in Phase II. Additional park-and-ride spaces will be provided, likely through a combination of lease agreements and new construction.

Phase III (7 to 10 years)

The final phase of BRT implementation in the NY 5 corridor includes three elements: new vehicles for the feeder routes, additional park-and-ride spaces, and off-vehicle fare collection.

Implementation and Financing

CDTA is in the process of pursuing funding for various portions of the project. Phase I is fully funded with a combination of earmarked funds, CMAQ funds designated by the MPO through the TIP process, and state and local match. Future phase funding will be subject to the success of Phase I as demonstrated by increases in ridership. With respect to station development, CDTA is taking an incremental approach, working with developers and municipalities as opportunities arise. The owners of Colonie Center and Northway Mall (across NY 5 from Colonie Center) are currently in the process of seeking permits for mall expansion; CDTA is working actively with them and the Town and Village of Colonie to secure right-of-way and accommodations for the keystone station in the system on NY 5 between these two malls.

Conclusions

Bus Rapid Transit is more than a new service concept, and it is more than the construction of facilities and the application of new technologies. It is all of that plus the development of a new transit "product" or mode. During the evaluation and selection process for the preferred service concept, a key factor turned out to be how this new service could be presented to the riding public. How would it be represented on maps and schematic diagrams? The Study Advisory Committee, project staff, and the consultant team all came to the conclusion that a limited-stop service with clearly-defined and substantial stations moved the corridor into the realm of a rail-like solution, without the high cost of rail.

The cumulative impact of the types of improvements associated with BRT (Levinson et al. 2003; Díaz et al. 2004)—travel time, passenger comfort, passenger information, and image—will lead to an increase in transit ridership in the NY 5 corridor. Based on experience at other North American transit agencies that have implemented BRT, an increase of 22 percent to 29 percent is expected, depending on the ultimate travel time savings that is achieved. These percentages translate into at least 2,000 new transit trips in the corridor each weekday, a substantial increase that will help reduce traffic congestion and improve the environment.

The implementation of Bus Rapid Transit in the NY 5 corridor will be the result of drawing together many types of transportation improvements to create a package of features that will be attractive to current and potential riders. These improvements will transform what is now a regular local bus route into a high-

performance, premium service that will expand CDTA's market reach farther into the range of choice riders. The lessons that will be learned in this corridor can then be applied to other major ridership corridors in the Capital District, as well as in other metropolitan areas in North America.

Endnotes

[1] Ridership shown represents only those trips that boarded along the NY5 corridor; total ridership for Route 2 is higher.

[2] Correspondence with Peter Furth, Department Chair and Professor Civil and Environmental Engineering Northeastern University, on May 4, 2004.

[3] The probability function was also tested as a line, which means the probability is directly proportional to the distance between the current stop and the future BRT station. At the end, the results obtained from a parabolic function seemed more realistic based on the consultant's experience

[4] Maximum walking distance is usually considered between 0.25 and 0.5 miles Rodriguez 2003, but in this case users may have already walked some distance before reaching the corridor (i.e., they have walked perpendicular to NY 5). Thus, it was considered realistic to assume that users would only be willing to walk an additional 0.25 or 0.15 miles along NY 5.

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