Regional Transit Development Strategies Study

STRATEGIES EVALUATION REPORT

South Central Regional COG

April 2005

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Prepared for

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1 Introduction

The South Central Regional Council of Governments initiated the Regional Transit Development Strategies Study (RTDS) to examine how the existing network of transit services in the region currently works, and to develop strategies to improve transit and address the region's future transit needs. During the first stage of the study, the study team collected data from transit operators to establish the current regional-scale transit environment—putting South Central Connecticut transit experience in perspective. The results of this task are found in a previous technical memorandum titled "Existing Conditions Report".

In the second stage of the study, a range of transit service options for the Region have been identified. The broad transit strategies are intended to stimulate dialog and to determine which options may be appropriate in different setting or areas of the region. From the general list of strategies, ten distinct services were described in detail and evaluated using both the regional transportation model and off-model approaches. The results of this task are found in this technical memorandum.In the third stage of the study, the ten services evaluated in stage 2 will be grouped into short-, medium- and long-range transit improvement packages . For each of the packages, next steps for implementation will be developed.

1.1 Public Involvement

Public Involvement for the RTDS Study has two elements, the Technical Committee and outreach to the general public. The Technical Committee is designed to provide feedback to the study team over the course of the project. Public Meetings will be held to present the results of the study at critical stages and gather comments from the public.

The Technical Committee serves as a working group consisting of SCRCOG staff, ConnDOT officials, CT Transit and other service providers, and town and city planning staff. This group is responsible for review of technical data, reports and project methodologies.

The first Technical Committee meeting was held to kick-off the project, and to brief the project stakeholders on the project purpose and initial results of the existing conditions task, . The second Technical Committee meeting was held during the alternative scoping and screening process, and the third at the end of that process to approve the short list of alternatives. One additional Technical Committee meeting will be held to discuss the packaging of the regional transit strategies.

The first public meeting was held to inform the public of the scope, schedule, and key issues, and to solicit input for overall goals and objectives. The meeting was located and scheduled to coincide with rush hour in a major transit facility, and this strategy was successful in generating high attendance and numerous comments. One additional Public

Meeting will be held as the study continues, to inform the public of the results of the alternatives analysis.

1.2 Evaluation Criteria

This chapter presents a short list of potential transit improvement strategies for the SCRCOG region, along with a brief description of each strategy. These strategies were selected through a screening process that matched various transit improvements to stated regional transit needs detailed in Technical Memorandum #1. A comprehensive list of strategies was initially developed from the following sources: (1) the initial strategies developed as part of the public open house meeting at Union Station, (2) strategies based on comments made by the public, transit service providers and the Study Technical Committee, and (3) strategies that the study team developed to address identified transit needs in the region. This short list of ten strategies was evaluated based on the performance measures outlined in the Existing Conditions memo, using the SCRCOG model and other off-model techniques.

1.3 Summary of Strategies

The ten strategies evaluated as part of this study are as follows:

1. **Hub & Spoke System** – This would include the development of transit hubs and a system of trunk routes (spokes) linking major and minor transit hubs throughout the region. This strategy would revise route pairings, improve regional bus service, and implement crosstown bus routes.
2. **Route Simplification** - Most **CT**TRANSIT-New Haven routes have a large number of variations, which makes service complex and difficult to understand. Evidence from other systems indicates that simpler route structures attract more riders than complex route structures.
3. **Consolidation of New Haven Shuttles** - Four public shuttles currently operate in downtown New Haven. The consolidation of some or all of these routes could allow more frequent service, greater efficiency, and utilization.
4. **Better Bus Rail Coordination at Union Station and State Street Stations** - Improved bus connections at Union Station could improve the accessibility of rail service and help alleviate parking shortages. In New Haven, existing CTTRANSIT services could be reconfigured to improve connections.
5. **Rapid Bus Corridors** - The development of "rapid bus" corridors along the most important radial routes, in which frequent and faster service would be provided, could improve service for existing riders and attract new "choice" riders. It could also be a precursor toward the development of Bus Rapid Transit (BRT) services.
6. **Stop Consolidation** - CTTRANSIT-New Haven routes generally have very close stop spacings. This reduces walk distances, but makes service very slow. The consolidation of stops could make service faster and attract new riders.
7. **New Rider-Request Service** - Rider-Request service is a type of flexible bus service that provides a combination of fixed route and demand responsive service. In areas where densities are low, Rider-Request service can often provide better

coverage than fixed-route service at a lower cost than a combination of traditional fixed-route and complementary paratransit service.

8. **Improved Bus Shelters & Amenities** - The provision of shelters and other passenger amenities at higher volume bus stops could improve passenger comfort.
9. **Park and Ride Facilities & Amenities** - The development of new park and ride facilities, and the expansion of existing facilities where parking shortages exist would improve access to new and existing transit services.
10. **Expansion of Joint Fare Arrangements** – Joint fare systems make the system more convenient for current and potential users, and may make the system more attractive to new riders.

1.4 Strategies being evaluated in other initiatives

In addition to these ten strategies, a number of strategies are already being considered in other studies. These additional strategies are seen as vital to the regional transit system and will likely be included as recommendations in this study; however, they will not be reevaluated here – only integrated into the recommendations. These strategies involve improving existing rail services and facilities to provide more convenient service and to address capacity issues, providing better transit information to increase the visibility of existing services and to make transit travel more understandable.

1.4.1 Parking Expansion

There are currently parking shortages at New Haven and Milford Stations, which has the effect of discouraging usage, particularly for mid-day travel. Parking expansion at these locations would increase ridership, and was a TSB high priority recommendation. Additional parking at both of these stations is currently being addressed. In addition, several Shore Line East stations are currently being station improved with new platforms, pedestrian crossings and parking. Once construction is complete, Branford Station will have 199 parking spaces (versus 100 spaces before), Guilford Station will have 176 at the station and 150 nearby for a total of 326 (versus 151 spaces before), and Madison Station will have 199 spaces (versus 114 spaces before).

New Haven

Parking at Union Station in New Haven is at capacity during the weekday commute, as well as sometimes on weekends. Funding is currently being pursued for the construction of an additional 1,000- to 1,250-space parking structure on the site of the existing surface parking for Union Station, just north of the existing parking garage. The garage is scheduled to open in the winter of 2007-2008, and will be operated by the New Haven Parking Authority.

Milford

There is currently a feasibility study underway to determine the appropriate location, size, and configuration of additional parking at the Metro North Rail Station in

Milford. The South Central Connecticut Regional Council of Governments is directing this study.

1.4.2 New Haven to Springfield (MA) Commuter Rail Service

In the Spring of 2002, ConnDOT initiated a study to identify actions that need to be taken to implement commuter rail service from New Haven through Hartford to Springfield, MA, which would provide commuters with more options north of New Haven. An Implementation Plan is being developed that will evaluate existing facilities, determine the level of service that can be accommodated with existing infrastructure, evaluate additional levels of service, and the ridership, costs, and infrastructure improvements associated with each scenario. Site-specific station locations and parking requirements will be identified, including the station's potential to attract economic and transit-oriented development.

Products from the study may include a capital development plan, an operational plan, an implementation plan, and performance measures. Recommended study actions and assumptions were discussed at public meetings in the Fall of 2004. The study is scheduled for completion in 2005.

1.4.3 Development of a Regional Transit Information Clearinghouse

Currently, difficulty in obtaining and interpreting information on existing transit services and schedules discourages transit use, which is especially true in areas where services are operated by more than one company or agency. A clearinghouse that provides a single source of transit information could increase use of existing services by increasing public awareness of available service and facilitating trip planning.

An initiative called Trips123, covering the broader New York City metro area, is currently being developed by TRANSCOM, a coalition of 21 transportation agencies. The end product will be a web-based database that will offer trip availability and planning information. At the present time the system is partially operational. It can provide information on the rail services to and from greater New Haven, but does not yet include information regarding the bus systems in South Central Connecticut.

2 Transit Improvement Strategies

Organization of this Chapter

This chapter includes detailed discussion of each of the 10 strategies identified as potentially beneficial for South Central Connecticut. The strategies are discussed in an order that corresponds to three broad categories. The first four strategies involve changing routing arrangements. Strategies in this set restructure existing services to maximize the efficiency and effectiveness, or establish new traditional bus routes to provide more convenient service. The next several strategies represent a new type of service that is not currently offered in South Central Connecticut. The third set includes those strategies that require both new infrastructure and significant capital costs. Two strategies—Hub and Spoke and Rapid Bus—would include non-capital as well as capital improvements, and are grouped earlier in the report, according to their non-capital elements, since those elements could be pursued independently of capital improvements.

Each individual strategy is first described and discussed in general terms. The basic concepts are explained, and examples are given from other regions where the strategy has been successful. In most cases this is followed by a specific recommended application to South Central Connecticut. For each strategy there is then a section titled “Expected Impacts in South Central Connecticut.” This is a data-based section which assesses the likely success rate within the study area of each strategy. The discussion of each strategy ends with a brief summary of recommendations.

2.1 Reconfigured Service Focused on Transit Hubs

Most existing transit service in the New Haven area is focused on downtown New Haven. The development of a system of transit hubs to serve as focal points for area transit services, combined with reconfigured bus services, could be an efficient way to:

- Provide more direct service throughout the region.
- Provide better links to other modes.
- Improve connectivity.
- Reduce travel times.
- Improve passenger comfort and convenience.
- Reduce operating costs.

2.1.1 Overview of Transit Hubs

Transit hubs provide a focal point for regional and local transit services, and are typically served by a variety of transit services. These include major trunk services that provide connections between transit centers and downtowns and between the different transit centers, local bus services, flexible services, and private carrier services.

The size of transit hubs—or transit centers, as they are often called—and the features that they provide are typically related to the location, ridership levels, and bus service levels. Transit centers range from simple on-street facilities with few amenities (see Figure 2.1-1) to larger regional facilities with climate controlled passenger waiting areas, parking, transit information, and complementary joint uses discussed above (see Figure 2.1-2). The range of features that transit centers can provide include:

- Enclosed, climate-controlled waiting area
- Shelters
- Information kiosks
- Public telephones
- Emergency phones
- Passenger assistance telephone
- Real-time passenger information
- Lighting
- Parking
- Concessions
- Seating
- Bike racks

Figure 2.1-1: On-Street Transit Center (Lowell, MA)

Because they gather multiple transit routes and services together, major transit hubs provide an excellent opportunity to pursue joint development, combining public and private funding for construction and operation of the hubs. The larger hubs are often seen by developers as an opportunity to provide retail services to the traveling public such as convenience stores, snack shops, dry cleaning, and daycares.

Figure 2.1-2: Northgate Transit Center (Seattle, WA)

In South Central Connecticut, there are a large number of potential sites for transit centers. Furthermore, the development of a system of transit centers could provide for the development of a hub and spoke transit system that, as described further below, could provide much more convenient service and reduce operating costs. Transit centers also typically help increase the visibility of available transit services.

2.1.2 Potential Transit Center Locations

In South Central Connecticut, transit centers could be developed at major activity centers that are already well served by transit. These include town centers, major shopping centers, rail stations, and park and ride lots. Potential locations are shown in Figure 2.1-3 and listed in Table 2.1-1.

Figure 2.1-3
Potential Transit Center Locations

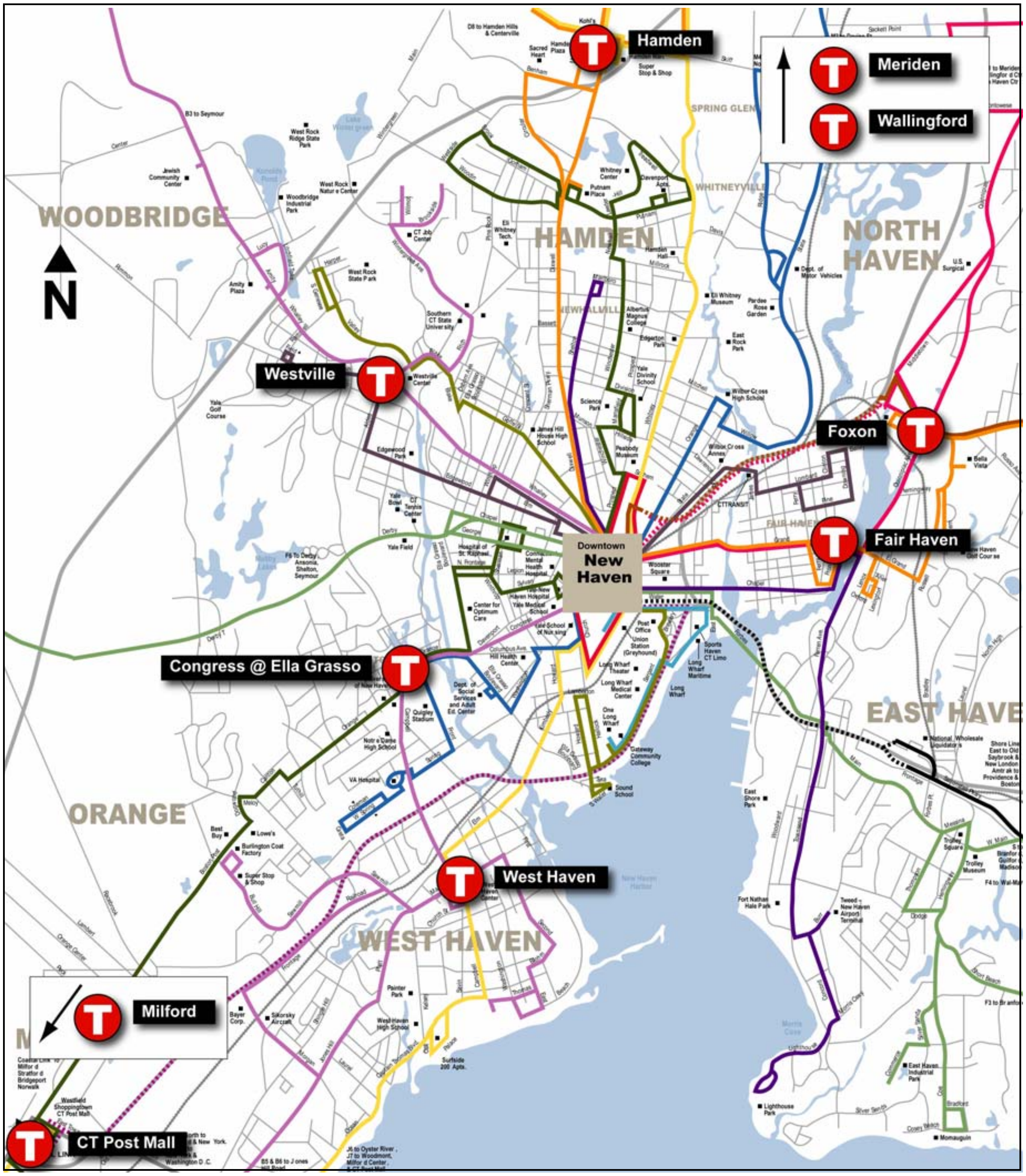


Table 2.1-1:
Potential Transit Center Locations and Existing Transit Services

Location	Current Services	Other Nearby Routes
Meriden Station (Meriden)	MTD A Yale Acres MTD B Kohl's Plaza-South Meriden MTD C West Main St - East Main St Amtrak	
Wallingford Station (Wallingford)	C1 Meriden Local C2 Wallingford Center Local C2x Wallingford Center Express C3x North Haven Center Express NET Wallingford Route Amtrak	
Hamden Plaza (Hamden)	D5 Hamden Plaza D6 Hamden Hills/Centerville D7 Centerville D8 Hamden Hills/Centerville via Circular Avenue D9 Centerville via Circular Ave D11 Hamden Plaza via Circular Ave J2 Hamden Hills/Hamden Plaza J8 Hamden Plaza via Skiff St	D10 Putnam Place M4 Northside O5 Leeder Hill O6 Pine Rock
Universal Drive (North Haven)	C1 Meriden Local C2 Wallingford Center Local C3 North Haven Center Local C2x Wallingford Center Express C3x North Haven Center Express	M4 Northside
Quinnipiac @ Foxon (New Haven)	C1 Meriden Local C2 Wallingford Center Local C3 North Haven Center Local C1x Meriden Express C2x Wallingford Center Express C3x North Haven Center Express D4 Lowe's L1 Route 80 - Foxon via Maple & Carol L2 Route 80 - Foxon	D3 Bella Vista
Fair Haven (Near Grand Ave/Front Street or East Grand Ave / Quinnipiac Ave)	C1 Meriden Local C2 Wallingford Center Local C3 North Haven Center Local D1 Front Street D2 Oxford St D3 Bella Vista D4 Lowe's D12 Route 80 & Thompson	Q1 Lombard St Loop

Table 2.1-1(cont'd):
Potential Transit Center Locations and Existing Transit Services

Location	Current Services	Other Nearby Routes
Westville Center (New Haven)	B1 Rockview/Brookside/SC State University B2 Amity Road B3 Amity Road/JCC Z1 West Hills	Q2 Beverly Hills
Congress & Ella Grasso (New Haven)	B4 Bull Hill Lane B5 Jones Hill Road B6 Jones Hill Road via Railroad Avenue B7 Savin Rock via Second Avenue M2 Veteran's Hospital O2 CT Post Mall	M1 New Haven Plaza
West Haven Green (West Haven)	B4 Bull Hill Lane B5 Jones Hill Road B6 Jones Hill Road via Railroad Avenue B7 Savin Rock via Second Avenue J5 Savin Rock J6 Oyster River J7 Milford - CT Post Mall	M2 Veteran's Hospital
Connecticut Post Mall (Milford)	J7 Milford - CT Post Mall O2 CT Post Mall PMF Post Mall Flyer MTD 1 Coastal Link MTD 2 Post Mall/The Dock MTD 4 Woodmont	
Milford Station (Milford)	J7 Milford - CT Post Mall O2 CT Post Mall MTD 1 Coastal Link MTD 2 Post Mall/The Dock MTD 3 Westshore MTD 4 Woodmont Metro-North New Haven Line	

Note that the locations in Table 2.1-1 represent a list of all of the locations that have been identified to date as part of this study. Some of these locations, such as Meriden Station and Milford Station, already are de-facto transit centers, while others would need to be developed from the ground up. Also note that the development of such a system of transit centers would almost certainly involve the development of fewer transit centers than are included in Table 2.1-1, with those to be ultimately pursued determined as part of subsequent work.

2.1.3 Reconfigured Services

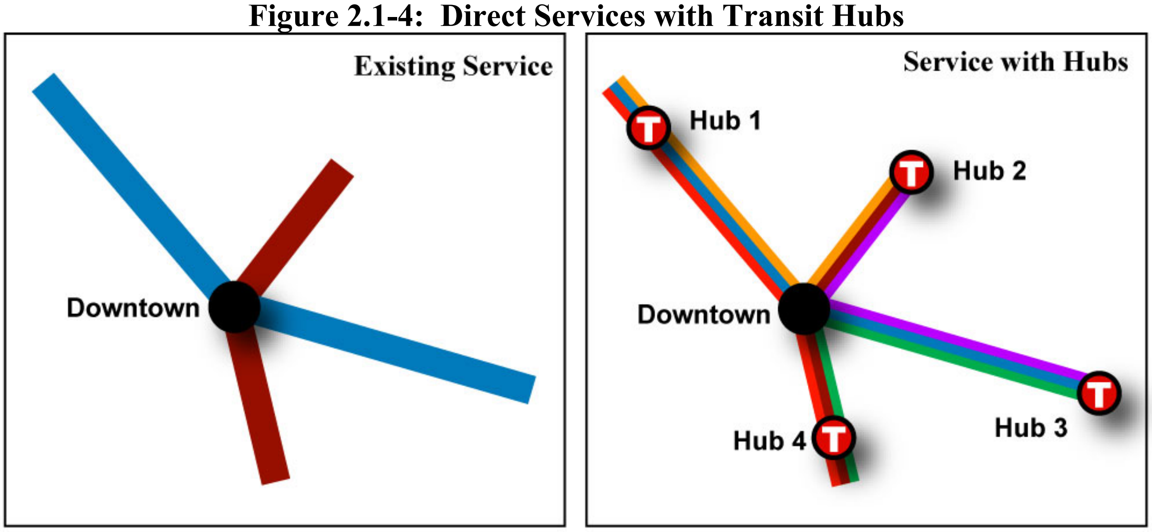
Most importantly for South Central Connecticut, the development of a system of transit hubs could offer a way to provide much better service without increasing operating costs (and in some cases may provide for operating cost savings). Improved services would include:

- Hub-to-Hub and Hub-to-Downtown Services: Fast and frequent services would connect the transit hubs to each other and to downtown New Haven. These services could include existing rail services (Metro-North, Shoreline East, and Amtrak), express bus routes, and reconfigured local bus routes.
- Local Bus Services: Local fixed-route bus service would provide connections to more densely developed areas around the transit hubs.
- New Flexible Services: Flexible bus service, such as neighborhood shuttles and Rider-Request, to less densely developed areas.
- Private Carrier Services: A variety of private services, such as intercity bus service, taxis, university shuttles, and airport shuttle services could also serve major hubs.

Hub-to-Hub and Hub-to-Downtown Services

Most South Central Connecticut bus service currently operates between at least one of the potential transit hub locations and downtown New Haven. Furthermore, most **CT**TRANSIT-New Haven routes have multiple legs that operate on opposite side of downtown New Haven. By revising the way that the different legs are joined, it would be possible to provide direct service between most of the potential hubs without increasing operating costs (see Figure 2.1-4).

Figure 2.1-4: Direct Services with Transit Hubs



Note: Line widths are proportional to the service frequencies on each route. With hubs, frequencies on each leg would remain the same, but frequencies between hubs would be lower than end-to-end frequencies on existing through-routed services.

In the New Haven area, direct connections between hubs could be provided by changing the manner in which **CT**TRANSIT's numerous route variations are linked, and by combining some **CT**TRANSIT-New Haven routes with those of other area operators. In re-connecting route legs, it would be important to ensure that route leg pairings continue to have similar service levels. There are a number of ways in which this could be done, one example of which is illustrated in Figure 2.1-5 and summarized in Table 2.1-2. In total, these types of changes could provide non-stop or one-stop service to a much larger number of destinations in South Central Connecticut, which would create a more seamless public transportation system.

Figure 2.1-5: Potential Transit Centers and Services Connecting to Them

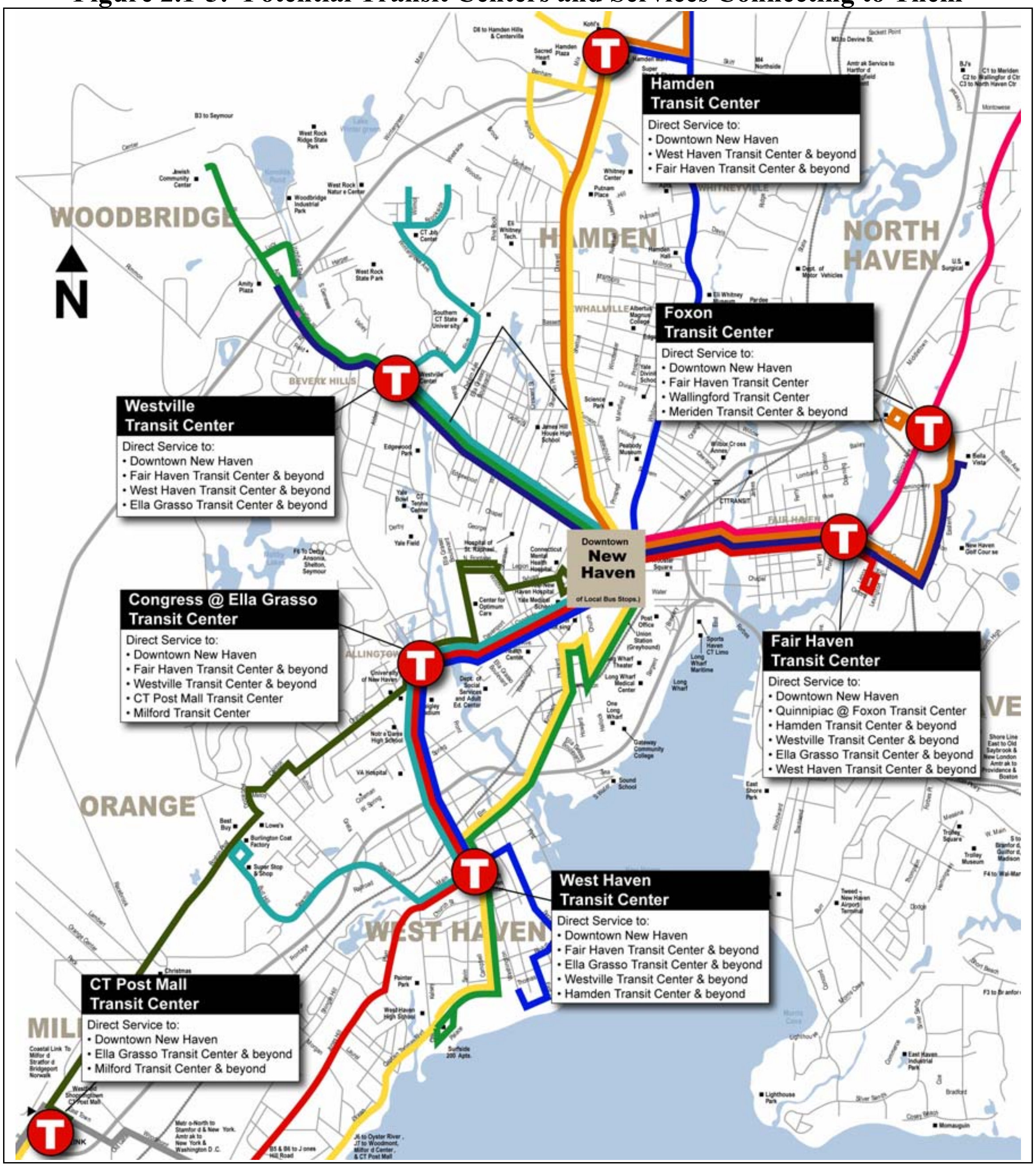


Table 2.1-2:
Example Through-Route Changes to Provide Direct Connections between Hubs

From/To	New Through-Route Combination
Hamden Transit Center – West Haven Transit Center	{D5 Hamden Plaza} + {J7 Milford – CT Post Mall}
Hamden Transit Center – Fair Haven Transit Center – Quinnipiac @ Foxon Transit Center	{D7 Centerville / D8 Hamden Hills/Centerville via Circular Ave / D9 Centerville via Circular Ave / D11 Hamden Plaza via Circular Ave} + {D4 Lowe's}
Westville Transit Center – West Haven Transit Center	{B3 Amity Road/Jewish Community Center} + {J5 Savin Rock}
Quinnipiac @ Foxon Transit Center – Fair Haven Transit Center – Congress @ Ella Grasso Transit Center – West Haven Transit Center	{D2 Oxford Street} + {B5 Jones Hill Road}
Hamden Transit Center – Fair Haven Transit Center – Quinnipiac @ Foxon Transit Center	{D7 Centerville / D8 Hamden Hills/Centerville via Circular Ave / D9 Centerville via Circular Ave / D11 Hamden Plaza via Circular Ave} + {D4 Lowe's}

Improved Local Services

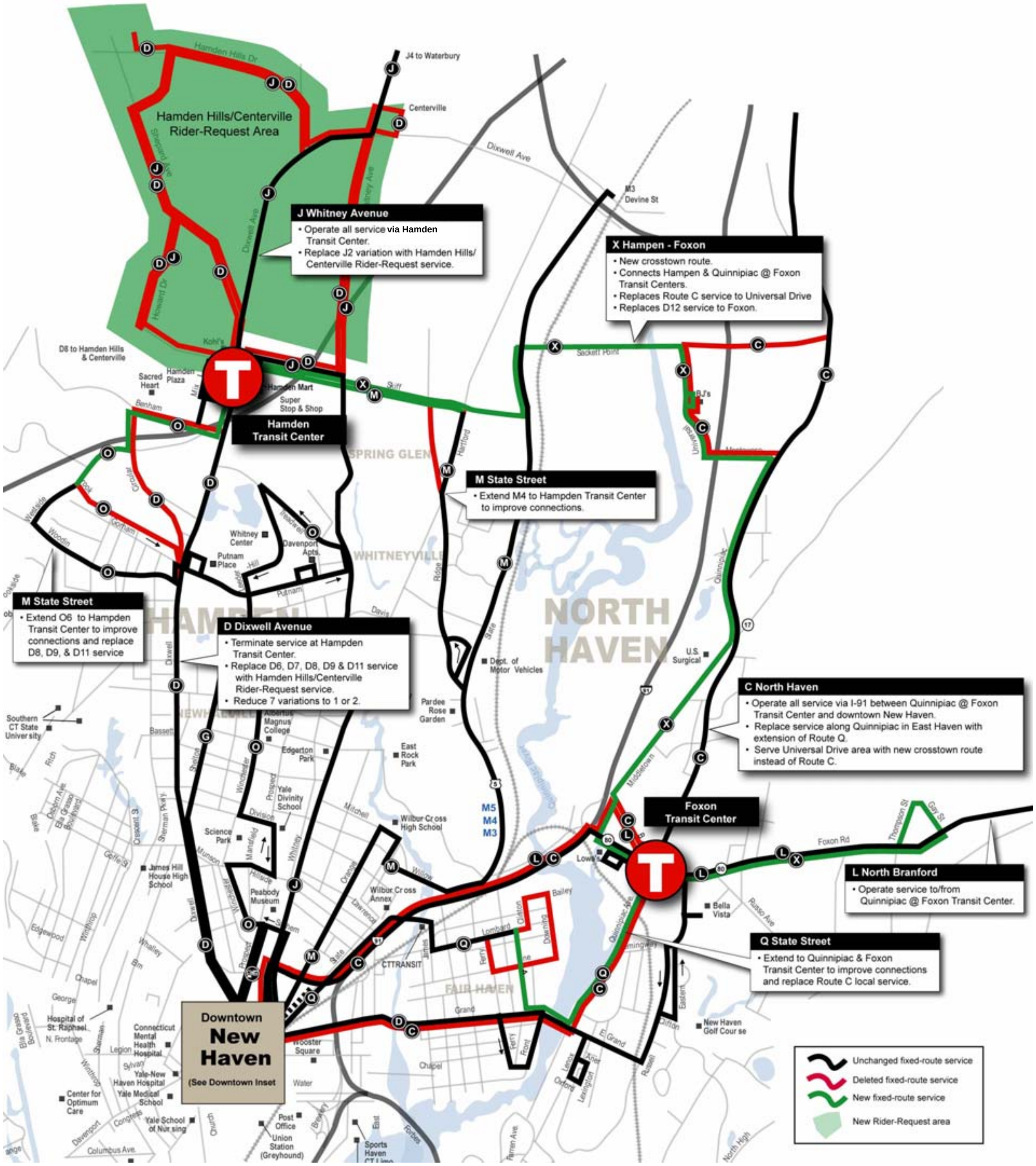
Transit hubs can also improve and simplify local services, and in some cases reduce operating costs. Currently, **CT**TRANSIT-New Haven operates a large number of variations to provide service to as many locations as possible. With the use of transit hubs, similar service coverage could be provided with far fewer variations, which would make service much easier to understand, improve its visibility, and potentially attract new system users.

An example of how this could be done in the Hamden and North Haven areas is shown in Figure 2.1-6.[1] With the development of the Hamden and Quinnipiac @ Foxon Transit centers, local services could be rationalized to provide better connections and thus more comprehensive travel opportunities, and to simplify existing routes:

- Local routes operating in the vicinity of the Hamden and Quinnipiac @ Foxon transit centers would operate to, from, or via one or both of the transit centers. In some cases, routes would be extended to the transit centers; in other cases, routes would deviate off of their existing alignments.
- A new crosstown route would link the Hamden and Quinnipiac @ Foxon transit centers, replace many of the variations on Routes C and D, and serve new areas along Skiff Street and Sackett Point Road. This could provide new direct service and greatly simplify service on Routes C and D.

[1] *Note that this example is intended to illustrate the types of improvements that would be possible, and does not represent specific service change recommendations.*

Figure 2.1-6: Transit Center and Local Service Improvement Example



- Rider-Request service between the Hamden Transit Center and the Hamden Hills/Centerville area and the Hamden Transit Center would replace six low frequency variations on Routes D and J. This could provide more convenient service to passengers in that area and greatly simplify service on Routes D and J. (Rider-Request service is discussed in detail in Section 2.7, pages 40 through 60.)
- An extension of Route Q from Fair Haven to the Quinnipiac @ Foxon Transit Center would increase travel opportunities for Fair Haven residents and allow all

Route C North Haven service to be routed via I-91 to provide simpler and faster service on that route.

- Route L North Haven service would operate to and from the Quinnipiac @ Foxon Transit Center to reduce costs on that route.

In total, these changes would provide faster service, more direct service, and more comprehensive service coverage, in Hamden and North Haven.

2.1.4 Expected Impacts in South Central Connecticut

Analysis

The fundamental strength to the Hub and Spoke concept is the ability of riders to travel more easily between origin and desired destination points. Travel times and the number of trips requiring a transfer are reduced, creating a more seamless system.

Hub-and-Spoke modifications have met with success in other cities. For example, service changes implemented in Jacksonville, FL, in early 2003, made service faster and more convenient, reduced wait times, and extended service to new areas. Service was improved for most riders, the changes received widespread public support, and corridor ridership increased by 11 to 12%.

According to available data, demand for direct travel between some areas surrounding Downtown New Haven is equivalent to demand for direct travel to Downtown. Origin-destination pairs with high travel demand may not be best served by the existing transit system. For example, travel between the Whitney and Whalley corridors is not currently possible without at least one transfer, despite high demand. On the other hand, relatively little demand exists for travel between the Grand and Dixwell corridors, but this is one of the best-connected pairs of corridors, with six direct D-line buses per hour.

Routing changes within the system can be made relatively easily, and at little cost. The discussion above proposes a number of changes that could lead to better service by simply re-connecting various existing routes to one another. For example, the Coastal and Grand corridors are connected via a direct route by joining ends of the current B2 (Jones Hill) route to the D5 (Oxford) route. Service along all corridors remains consistent, and all routes continue to go through downtown New Haven, but routes requiring no transfer are available to more locations.

While re-routings are relatively easy to accomplish, a true Hub-and-Spoke system also includes the development of hubs. This involves the enhancement of a location served by several routes into a recognizable transit center. In some cases, it may be possible to use an existing facility as a hub, such as a shopping mall. Usually, though, some capital development is required. In SCRCOG's case, it is reasonable to move forward with route restructuring and the locating of transit hubs, while the capital development of the transit centers, including construction of new facilities, is pursued further.

Despite positive indications that a hub-and-spoke system would improve regional transit, more detailed analysis and service design would be necessary to develop an optimized system. This study examined only one potential configuration of a hub-and-spoke system With more detailed analysis, this example system could be improved upon. As Figures 3.1-7 demonstrate, not all re-routings would be equally attractive to current or potential riders. Also, these desire lines are based on SCRCOG's Transportation Demand Model, and should be validated before being used as the basis for system restructuring. We also suggest that ridership counts and passenger surveys be conducted in order to more precisely establish ridership levels and important origin-destination pairs.

The development of a hub-and-spoke system will also involve changes that will impact many or most existing riders. If implemented well, most of these changes should be beneficial, and only relatively few will be negatively impacted. However, it will be essential that existing riders understand the changes that will be considered, and that they have a voice in how these changes are made. Potential new riders should also be involved. To accomplish this, the development of a hub-and-spoke system will need to be accompanied by a comprehensive public involvement process in order to ensure that revised services will meet the needs of both existing riders and potential new riders.

Finally, the need for careful design should be stressed. If the system is redesigned to reduce transfers and transfer times, but at the cost of increased headway on popular corridors, there may be no net benefit to users of the system, and ridership may fall.

Recommendations

Based on the data available the Hub and Spoke concept would be beneficial for the Region to pursue in the near- to mid-term. The restructuring of services could be pursued with minimal additional effort and funding, while the development of hubs would require additional planning and funding.

2.2 Route Simplification

CTTransit-New Haven operates a large number of variations on most of its routes. These variations have been added over the years to expand service coverage and to respond to user requests. However, while the large number of variations accomplish these objectives, they also make the New Haven's bus route network very complex. This complexity likely deters many other area residents from using transit. Evidence from other systems indicates that —in total—a simpler route structure will attract more riders than a complex route structure.

2.2.1 Benefits of a Simple Route Structure

For people to use transit, they must be able to understand it, and simple route structures are easier to understand than complex route structures. As stated in TCRP's "Traveler Response to Transportation System Changes" report,[2] "the degree of routing and scheduling simplicity offered to the transit user will affect the ease of which the rider becomes informed. The result is that "a readily transparent service design can to some extent market itself insofar as user information needs are concerned," while "a highly complex operation places heavy demand on the provision of information and the rider's ability to interpret and absorb it."

The importance of an easily understandable system is heightened by the fact that most transit systems experience very high levels of turnover (due to changes in residence and employment, family circumstances, driving and parking conditions, etc.). While specific turnover information is not available on New Haven transit riders, the TCRP report cited above reported that surveys of nine cities in 1997 and 1998 indicated that 24 to 50% of all bus riders had been using transit for less than one year. Furthermore, the TCRP report finds that on any given day, one to eight percent of a system's riders may be using transit service for the first time.

Transit systems with simpler route structures are also better able to attract casual riders. In contrast, those with more complex route structures "put off riders with only a moderate inclination to try transit."

Because of these factors, a simple route structure will attract more riders than a complex system. Potential new riders will be more willing try the system, and once they do, the simpler route structure will help ensure that they get to where they want to when they want to without experiencing problems. In total, a simpler route structure can:

- Increase the number of regular riders.
- Increase use of the system by "casual," or infrequent users.
- Minimize the number of problems that all riders have in using the system.

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[2] *Transit Cooperative Research Program, Transportation Research Board, Chapter 11, 2003.*

2.2.2 Existing CTTRANSIT-New Haven Services

CTTRANSIT-New Haven currently operates 12 routes, all of which operate to or through downtown New Haven. All routes have multiple variations, as well as a large number of sub-variations.[3] As shown in Table 2.2-1, the simplest routes (Route Q and Commuter Connection) have 2 variations and 8 sub-variations, while the most complex (Route D) has 13 variations and 20 sub-variations.

Table 2.2.1
CTTRANSIT-New Haven Routes and Variations (Weekdays)

Route	Variations	Sub-variations
B Whalley Avenue/Congress Avenue	7	20
C North Haven	3	14
D Grand Avenue/Dixwell Avenue	13	20
F West Chapel St/East Haven	5	26
G Shelton Avenue/East Chapel St	2	12
J Whitney Ave/Kimberly Ave	7	21
L North Branford	3	5
M Washington Ave/State St	6	15
O Winchester Ave/Sylvan Ave	5	11
Q State Street/Edgewood Avenue	2	8
Z Goffe Street/Sargent Drive	3	10
CC Commuter Connection: Downtown/Sargent Dr	2	8

Furthermore, individual variations often operate via multiple sub-variations, so the actual number of variation/sub-variation combinations is typically higher than the values indicated in Table 2.2-1. The large number of variation and sub-variation combinations also means that on some routes, nearly all trips operate slightly differently. This makes service very difficult for new riders to understand; in many cases, it is also likely a large number of existing riders do not fully comprehend the service that they use.

Two examples are Routes B and C:

- Route C North Haven provides a total of 51 one-way vehicle trips per weekday. All service operates to and from downtown New Haven, but there are six outer terminals (Kohl's in Meriden, Barnes Industrial Park, Anthem Blue Cross, Washington Avenue at Glenn Road, and Washington Avenue at Clintonville Lane, and Universal Drive). There are also a large number of variations along the length of the route, most of which involve service via Universal Drive, and in and out of shopping centers and office and industrial parks. There are also express and local variations. Of the 51 total trips, no more than 8 follow the same

[3] *Variations refer to the variations presented in printed schedules (for example, C1, C2, C3, etc.). Sub-variations refer to number of different routes individual variations may take, as indicated by footnotes on the public timetables.*

alignment from end-to-end, and 27 trips operate along completely unique alignments.

- Route B Whalley Avenue/Congress Avenue is a very high frequency route that provides 308 one-way trips per weekday. In total, there are 28 combinations of variations and sub-variations (see Figure 2.2-1). As with Route C, these variations and sub-variations involve different terminals and different intermediate routings.

Further complicating matters are **CT**TRANSIT's route naming conventions. Most **CT**TRANSIT-New Haven routes operate through downtown New Haven, with each leg from downtown given a different variation number (Route B, for example, operates as B1, B2, or B3 north of downtown, and as B4, B5, B6, or B7 to the south). Trips that operate through downtown operate along two variations, with the trip given the name of the final variation. Therefore, a Route B trip between Bull Hill Lane and Amity Shopping Center would operate as Route B2 northbound but as B4 southbound. On multiple variation routes such as Route B, riders would travel outbound on a B1, B2, or B3 trip, and then back on a B4, B5, B6, or B7 trip. The only constant for passengers would be that they would not usually go out and return on routes labeled the same way.

The combination of a very complicated route structure with **CT**TRANSIT's unusual route naming convention results in a system that can be very difficult for potential riders to understand—on a route-by-route basis, perhaps one of the most complex in the United States. This complexity is very likely a barrier to higher ridership levels.

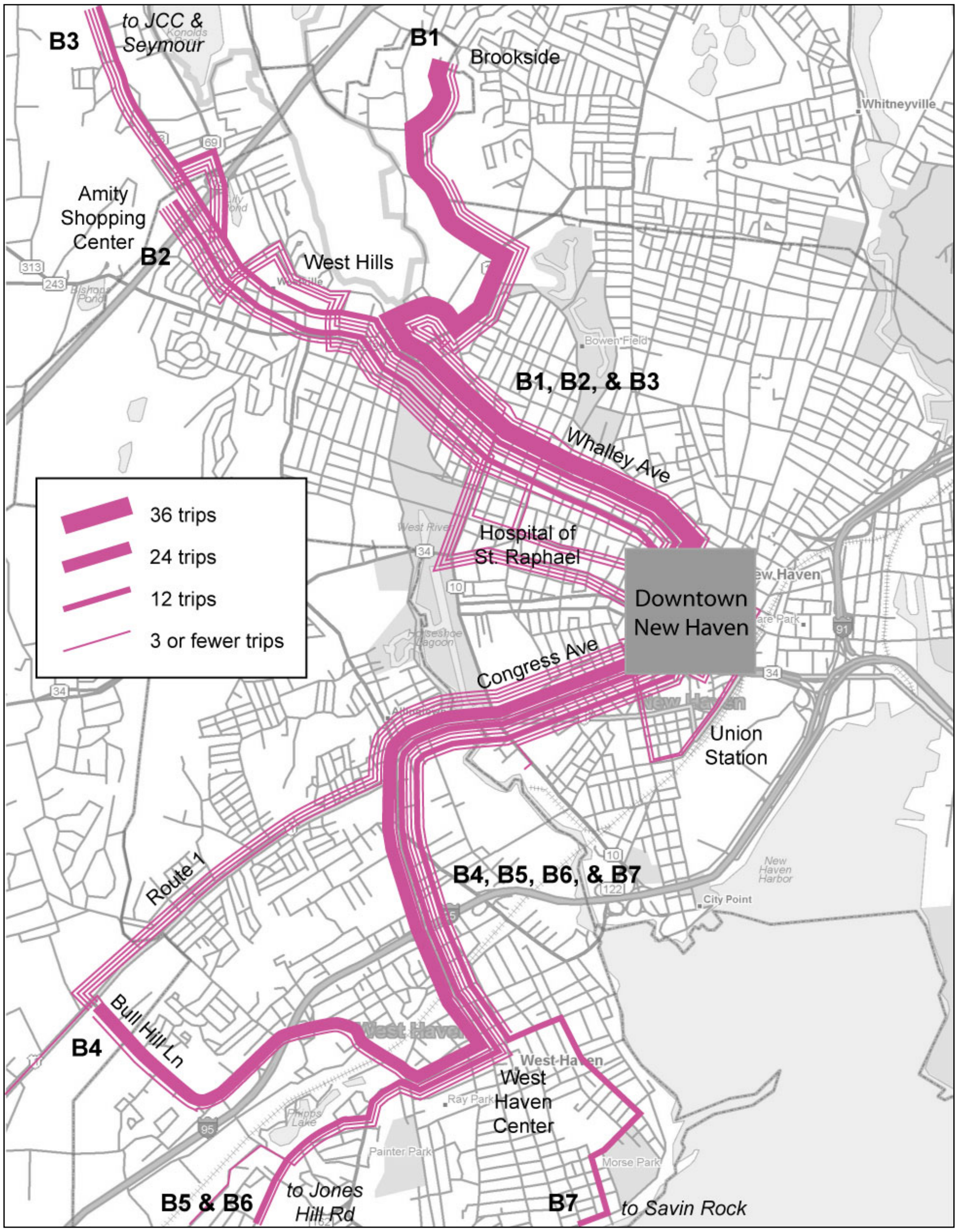
2.2.3 Potential Improvements

The simplification of CTTRANSIT-New Haven's services would involve reducing the number of route variations and sub-variations, and renaming routes so that inbound and outbound services have the same designations. This would involve five general steps:

1. An examination of ridership patterns on each of **CT**TRANSIT's routes to determine ridership levels on each variation
2. An assessment of whether those ridership levels justified the additional complexity that the route variation introduced.
3. An examination of alternative ways to provide similar service that involved fewer variations.
4. The development and implementation of changes based on steps 2 and 3.
5. The development and application of a new route naming convention.

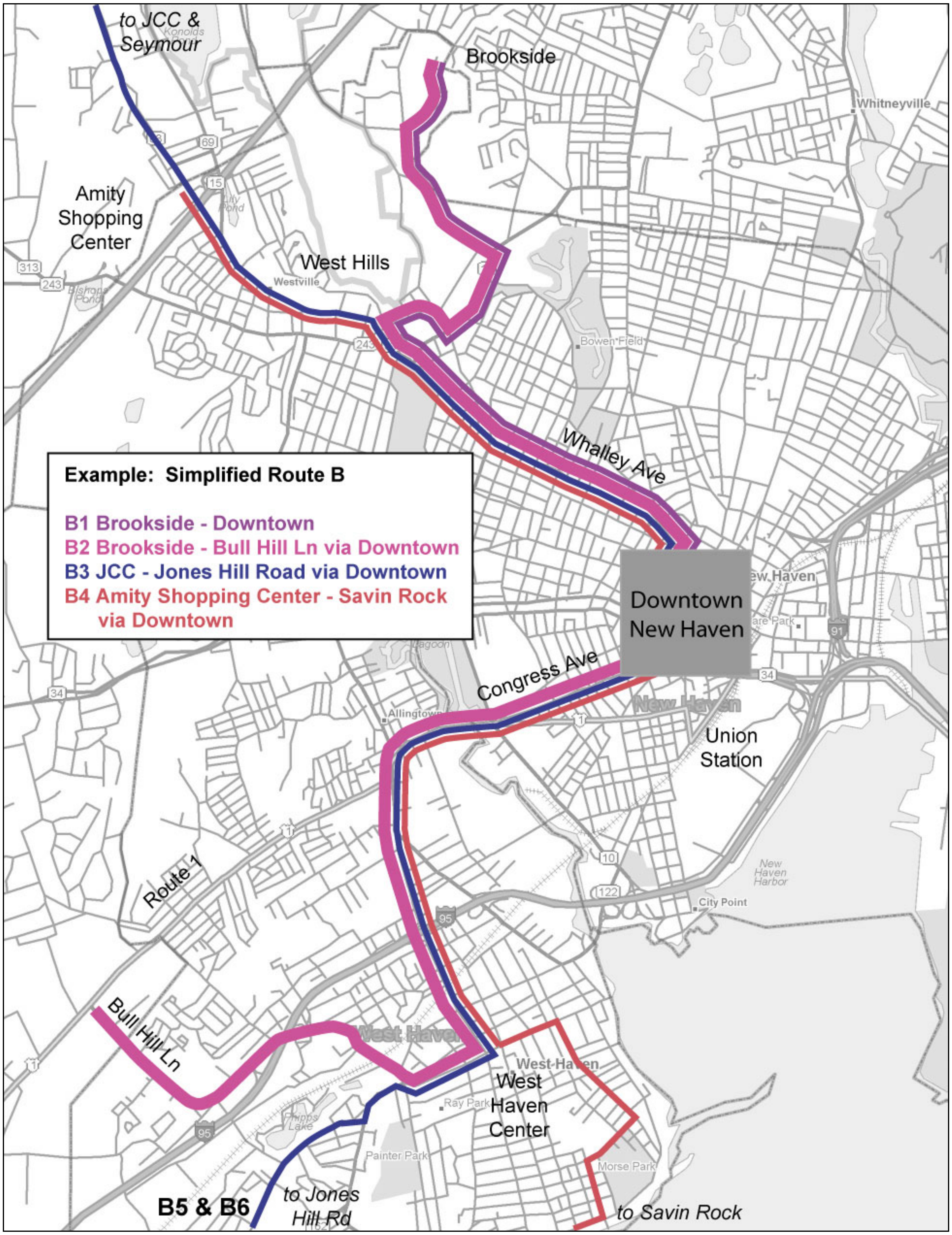
A simplified example of how this could be done with Route B Whalley Avenue/Congress Avenue is shown in Figure 2.2-2. In this example, 7 variations and 20 sub-variations would be reduced to 3 variations and no sub-variations by (1) linking pairs of variations that operate north and south of downtown into single variations that operate through downtown, and (2) eliminating sub-variations that serve few riders.[4]

Figure 2.2-1: Route B Whalley Avenue/Congress Avenue Variations



[4] *As stated, this is a simplified example. For all systems, there are legitimate reasons to operate multiple variations (for example, it makes little sense to provide service to and from a shopping center when it is closed), and an actual examination of how to best simplify the route would likely determine that some sub-variations should be maintained. In this case the number of sub-variations would be greatly reduced but not entirely eliminated.*

Figure 2.2-2: Example - Route C Whalley Avenue/Congress Avenue



2.2.4 Expected Impacts in South Central Connecticut

Analysis

Various studies in other cities and regions have indicated that simplification can attract casual or spontaneous riders, attract more regular riders, and enhance the overall transit experience. The South Central Connecticut Region seems particularly likely to benefit from similar improvements, because the current system is among the most complicated in the United States, and because the region is demographically similar to other areas.

Table 2.2-2
Cities having made route simplifications, and the results of the improvements

Community	Actions	Results
Seattle / Renton, WA	Establish Hub & Spoke structure; Route consolidation on key corridors; Improved cross-town, community, and reverse-commute services. Intense community outreach and analysis involved in designing changes.	Ridership up 12% after one year (630 riders)
Orange Co, CA	Increase service on key routes; Headways made more consistent; Unproductive routes eliminated; New community & feeder routes. Overall service-hours reduced	Ridership up 10%, net costs down 5%
Riverside, CA	Increased frequency on key direct routes, shifted all headways to 15, 30, or 60 minutes, while growing service hours no more than 4%.	Ridership up 20%, 5x the increase in bus hours of service.

Source: TCRP Report 95, Chapter 10 – Bus Routing and Coverage

In other regions where route simplification has occurred, it has always been paired with other modifications and improvements, making the unique effect of simplification impossible to determine. Nonetheless, simplification is consistently cited as an important contributing factor to successfully restructured services, such as those shown in Table 2.2-2.

Recommendations

We recommend combining route simplification with the route modifications discussed under the Hub & Spoke section in Section 3.1. Allowing simplification, while reconnecting origin and destination points, will provide more flexibility in designing new Hub and Spoke connections, while maintaining service frequencies and ensuring seamlessness.

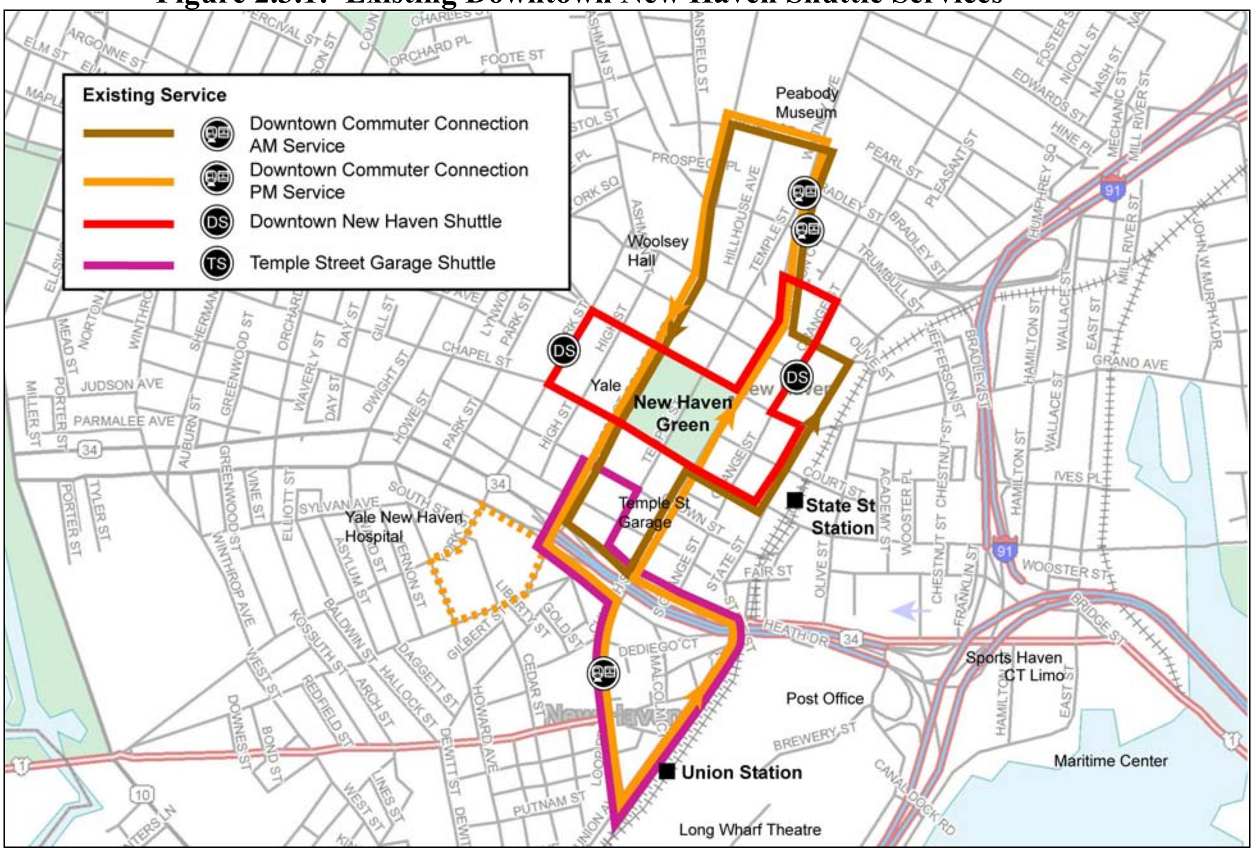
SCRCOG and the regional transit providers should be proactive in reaching out the public to explain the benefits of route simplification, and to listen to and talk with system users. It would also be beneficial to initiate an advertising campaign when restructuring takes place.

2.3 Downtown Shuttles

Currently, in addition to numerous private services, three public shuttle services provide service in downtown New Haven (see also Figure 2.3-1):

- New Haven Transit District's New Haven Trolley
- **CT**TRANSIT's Downtown Commuter Connection
- **CT**TRANSIT's Temple Street Shuttle

Figure 2.3.1: Existing Downtown New Haven Shuttle Services



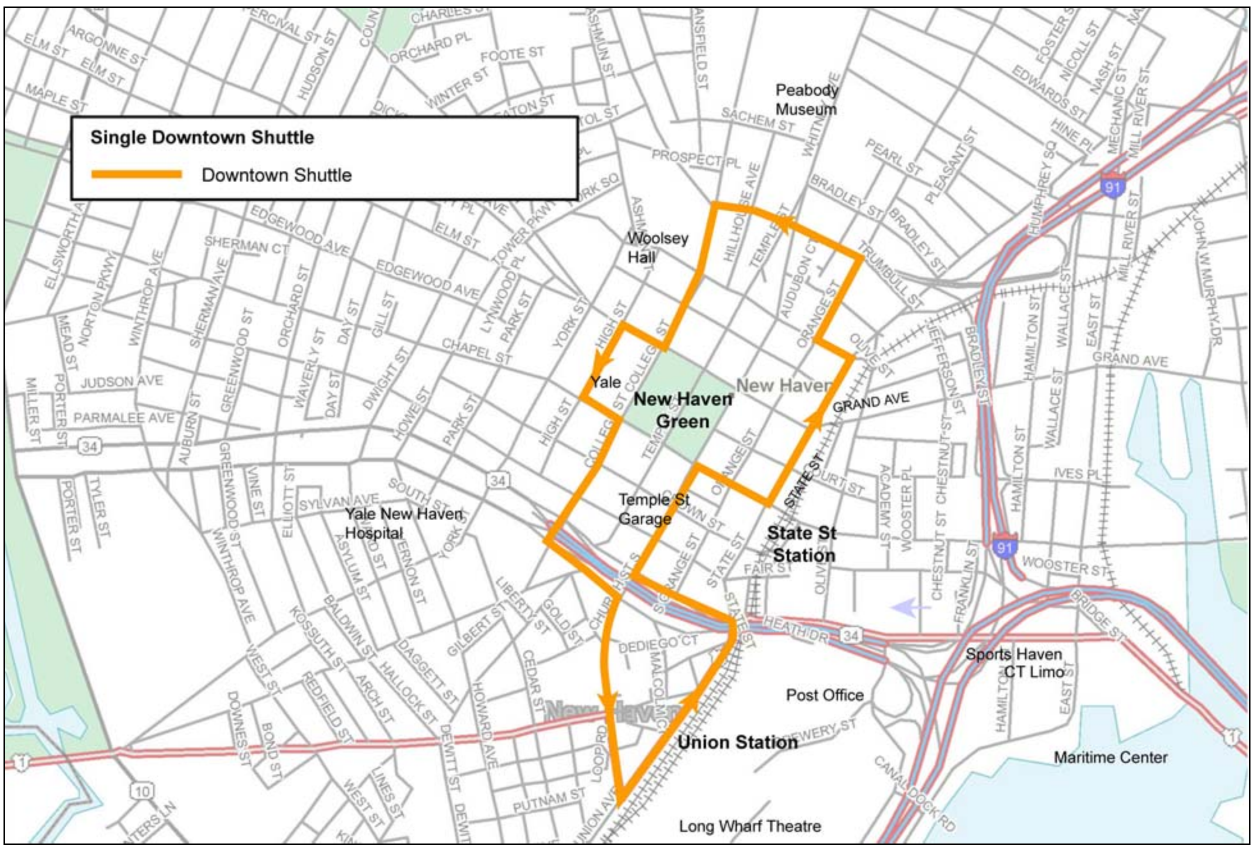
Each of these shuttle services is designed to serve specific markets:

- The New Haven Trolley, a free demonstration service utilizing distinctive electric vehicles to serve short trips within downtown.
- The Downtown Commuter Connection route, a regular-fare route designed to provide connections with Shore Line East trains.
- The Temple Street Shuttle, a regular-fare route, is designed to provide connections between the Temple Street Garage and Union Station so that commuters to use the Temple Street garage as satellite parking for Union Station.

Each of the shuttles operates during different spans of service, with different service frequencies, and along different alignments. These services vary in effectiveness, and as an overall system, service is fragmented and there is a significant amount of duplication. The fact that the shuttles are targeted toward specific markets may also mean that wider ridership markets are not being served.

To both simplify service and serve additional markets, the existing downtown shuttles could be combined into a single shuttle service that serves the same or similar destinations. There would be a number of ways in which this could be done, one example of which is shown in Figure 2.3-2.

Figure 2.3.2 Single Downtown Shuttle



In this example:

- A single route would operate from 6:15 to 10:00 pm. This would be the same overall span of service as the existing shuttles, but in general, longer spans of service would be provided within downtown and to and from Union and State Street stations.
- Service would operate every 10 or 15 minutes throughout the day. This would be the same service frequency as the New Haven Trolley and Temple Street Shuttle, but more frequent than the Commuter Connection Downtown route.

- Rail connections would be provided at Union and State Street stations throughout the day. These connections would be much better for New Haven Line and Amtrak service and nearly as good as current connections for Shore Line East service.
- The service design would be simpler and consistent throughout the day, which would make service much more understandable.
- Duplication among existing services would be eliminated.

The operation of a single route would likely increase operating costs, as frequent service would be provided over a larger area for a longer span of service. However, there would be some offsetting savings due to the elimination of service duplication. In this example, the hours of service that would be provided on weekdays would increase from 25.3 to 31.5, or by 6.2 hours. Using **CT**TRANSIT-New Haven's existing cost structure, operating costs would increase by approximately $120,000 per year.

2.3.1 Expected Impacts in South Central Connecticut

Analysis

To analyze the effects of consolidating the existing shuttle routes, the SCRCOG TDM was used. The existing services – Electric Trolley, Temple Street Shuttle, and three variants of the Commuter Connection Shuttle – were eliminated and replaced with one line running the loop presented above. Two scenarios were established, with headways of 10 and 15 minutes.

Both scenarios lead to increased ridership system-wide, with substantially higher ridership on the shuttle route than on the routes it replaced (see Table 2.3-1). In the Shuttle 10 scenario, shuttle ridership is higher than base in the all time periods, while in the Shuttle 15 scenario, peak-period board-ings are about 15% (~40 riders) lower than the base-scenario shuttles, but off-peak riders (+235) more than make up for that loss.

In both scenarios, riders are drawn off of the rest of the system in favor of the shuttle in substantial numbers. Nonetheless, results certainly indicate that the consolidated shuttle concept bears promise for reducing vehicle service hours and costs while expanding ridership.

Recommendations

All indicators suggest that the consolidation of downtown shuttle services would be a successful way for the New Haven transit providers to improve convenience and eliminate redundant service at a reasonable cost. We recommend that SCRCOG and the transit providers collaboratively establish a preferred route, and implement it as soon as possible.

2.4 Improved New Haven Bus-Rail Connections

Currently, seven of 14 **CT**TRANSIT-New Haven routes provide connections with rail at State Street Station. However, at Union Station, which is New Haven's major rail station and the terminal point for most Metro-North service, connections are much more limited. All day connections are available with only two routes, and there are no regular connections between Union Station and downtown New Haven (see Table 2.4-1).

Table 2.4-1
Existing Bus-Rail Connections at Union and State Street Stations

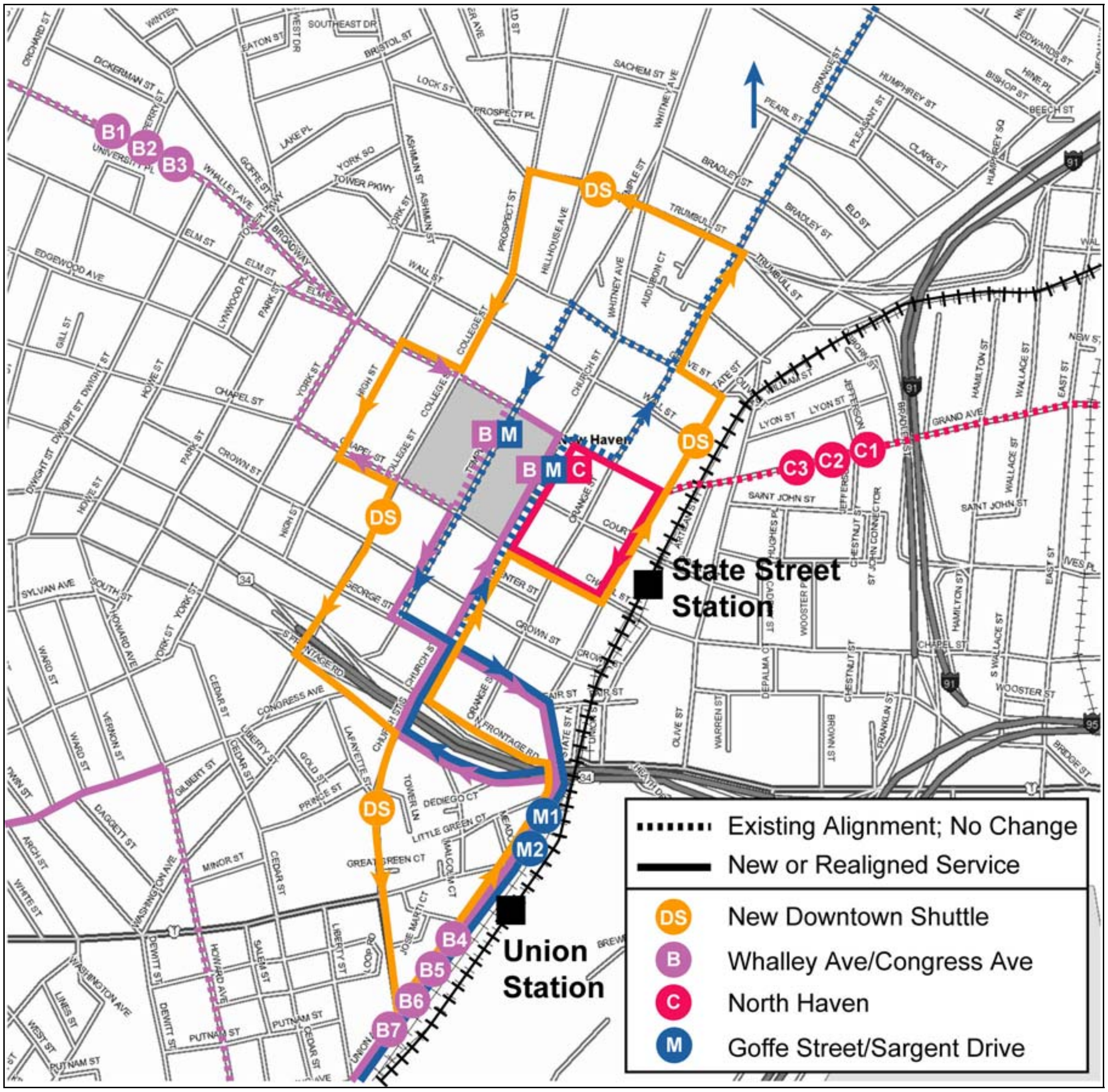
	Union Station	State Street Station
Union Station		
B Whalley Avenue & B Congress Street	Limited	
C North Haven		
D Grand Avenue & D Dixwell Avenue		√
F East Haven & F West Chapel Street		√
G Shelton Avenue/East Chapel Street		√
J Whitney Avenue & J Kimberly Avenue	√	
L North Branford		
M Washington Avenue/State Street		
O Sylvan Avenue & O Winchester Avenue		
Q State Street/Edgewood Avenue		√
Z Goffe Street/Sargent Drive		√
Commuter Connection: Downtown NH (PM)		
AM Service		√
PM Service	√	
Commuter Connection: Sargent Drive (PM)		
AM Service	Limited	√
PM Service	√	
Temple Street Parking Garage Shuttle	√	

The most important change that could be made at Union Station would be to implement shuttle service to and from downtown New Haven. Relatively simple changes could also be made to Routes B Whalley Avenue/Congress Avenue and M Washington Avenue/State Street to provide additional connections.

2.4.1 New Downtown Shuttle

Frequent, all day connections between Union Station and downtown New Haven could be provided through the operation of a shuttle service. One way to do this would be through the implementation of the consolidated downtown shuttle described in the "Improved Downtown Shuttle" chapter. This route, which would replace the existing downtown shuttles (the New Haven Trolley, Downtown Commuter Connection, and Temple Street Parking Shuttle route), would operate in a loop between Union Station, State Street Station and downtown New Haven (see Figure 2.4-1) every 10 or 15 minutes from 6:15 to 10:00 pm.

Figure 2.4-1
CTTRANSIT New Haven Alignment Changes



Note: Only routes with revised alignments are shown.

2.4.2 B Whalley Avenue & B Congress Avenue

Route B has seven variations. Three Whalley Avenue variations operate to the north and west of downtown New Haven and serve Amity, Brookside, and Rockview, and Southern Connecticut State University. Four Congress Avenue variations operate to the south and west of downtown and serve the University of New Haven, the Veterans Administration (VA) Hospital and the West Haven Green.

Whalley Avenue Variations to the North and West of Downtown

- B1 Rockview/Brookside/SC State University
- B2 Amity Road
- B3 Amity Road/Jewish Community Center

Congress Avenue Variations to the South and West of Downtown

- B4 Bull Lane
- B5 Jones Hill Road
- B6 Jones Hill Road via Railroad Avenue
- B7 Savin Rock via Second Avenue

Nearly all B1 and B2 trips are interlined with B4, B5, B6, and B7 trips. Because of these interlinings, a minor re-routing of B4, B5, B6, and B7 service via Union Station would provide direct connections between Union Station and downtown. B4, B5, B6, and B7 alignments would be revised as follows (see also Figure 2.4-1).

- Outbound: Temple Street to left on George Street to right on State Street to Union Avenue to right on Spring Avenue to right on Howard Avenue to left on Congress Avenue to rejoin existing alignment.
- Inbound: From Congress Avenue, right on Howard Avenue to left on Spring Avenue to left on Union Avenue to State Street to left on North Frontage Road to right on Church Street to left on Elm Street to left on Chapel Street to terminal.

2.4.3 M Washington Avenue/State Street

Route M State Street/Washington Avenue has six variations. Two Washington Avenue variations serve West Haven and New Haven. Major stops include the VA Hospital and the Department of Social Services:

- M1 New Haven Plaza
- M2 Veterans Hospital

Four State Street variations serve Hamden:

- M3 Devine Street
- M4 Northside
- M5 Davis & Ridge
- M6 Mitchell Drive

A minor re-routing of the M1 and M2 Washington Avenue variations, combined with continued through-routing of Washington Avenue and State Street variations, would allow nearly all service to operate via Union Station:

- Outbound: Temple Street to left on George Street to right on State Street to Union Avenue to Spring Avenue to rejoin existing alignment at Washington Avenue.
- Inbound: From Washington Avenue at Spring Avenue, bear right onto Spring Avenue to Union Avenue to State Street to left on North Frontage Road to right on Church Street to rejoin existing alignment.

2.4.4 Expected Impacts in South Central Connecticut

Analysis

The SCRCOG Transportation Demand Model was used to examine this concept. It was found that ridership changes due to reduced bus-rail transfer times are negligible. We concluded that improved transfer times would not have much impact on ridership.

The model's outcome is realistic for a number of reasons. Many commuter-rail users who work downtown chose to walk to and from their work destinations rather than use transit, while others are provided direct transit service by their employer. Also, the greater reliability of bus transit relative to rail has an impact. A connection that is better timed with *scheduled* departures is of little value on days when the train is late.

To test the overall importance of transfer time to ridership, a scenario was established in which the maximum wait time for all transit routes was set to zero. The result was an increase in transit person-trips of 2.8% (710 riders), with only 0.3% improvement in rail ridership (45 riders). Thus the model predicts that there is a much higher sensitivity to bus-bus transfer time than to transfer time to and from the rail modes. So, efforts to reduce bus-to-bus transfer time would produce a much more pronounced benefit than similar efforts to improve bus-rail transfer time.

Recommendations

With the exception of the shuttle consolidation, discussed in Section 3.3, this strategy is not recommended as a priority for implementation. This is based on the finding that ridership has very low sensitivity to bus-rail transfer time. Nonetheless, the route restructuring could probably be done at very low cost, and may be worthwhile on an experimental basis, or in combination with other route-restructuring strategies discussed in Sections 3.1 and 3.2.

2.5 Rapid Bus

Over the past decade, in Connecticut and elsewhere, much attention has been placed on the development of Bus Rapid Transit (BRT) systems. These systems provide rail-like service, but with buses, and are typically less expensive to construct than rail service. However, while costs are lower than rail, BRT systems are still expensive. Implementation times are also long.

In order to provide many of the same benefits as BRT or rail service, some transit systems—most notably the Los Angeles Metro and the San Francisco Bay Area's AC Transit—have begun operating "Rapid Bus" service. This type of service includes the elements of BRT that can be implemented on existing roadways, and at a lower cost and in a much shorter timeframe (see Table 2.5-1).

Table 2.5-1
Service Elements of Rapid Bus versus Bus Rapid Transit

	Rapid Bus	Bus Rapid Transit
Frequent Service	√	√
Bus Signal Priority	√	√
Headway-Based Schedules	√	√
Simple Route Layout	√	√
Less Frequent Stops	√	√
Integrated with Local Bus Service	√	√
Unique Identity for Service	√	√
Level Boarding and Alighting		√
High Capacity Buses		√
Exclusive Lanes		√
Off-Vehicle Fare Payment		√

2.5.1 Rapid Bus Services in other Communities

LA Metro's service, which is called "Metro Rapid," was the first Rapid Bus service in the United States, and now consists of nine lines. As described by the MTA, the most important attributes of this service are (see Figure 2.4-1):

- Simple route layout: Makes it easy to find, use and remember.
- Frequent service: Buses arrive as often as every 3-10 minutes during peak commuting times.
- Fewer stops: Stops spaced about a ¾ mile apart, like rail lines, at most major transfer points.
- Level boarding: Low-floor buses speed-up dwell times.

- Bus priority at traffic signals: New technology reduces traffic delay by extending the green light or shortening the red light to help Metro Rapid get through intersections.
- Color-coded buses and stops: Metro Rapid's distinctive red paint makes it easy to identify Metro Rapid stops and buses.
- Enhanced stations: Metro Rapid stations provide information, lighting, canopies and "Next Trip" displays

Figure 2.5-1
Los Angeles Metro Rapid Service

Metro Rapid service has reduced travel times by as much as 29%, which has increased ridership by up to 40%. One-third of the increase represents new riders who had never before ridden transit.

In Oakland, California, AC Transit's definition of Rapid Bus service is similar to Los Angeles' (see also Figure 2.5-2):

- Headway based schedules with maximum 12 minute headways.
- Stops one-half to two-thirds of a mile apart on average.
- As many stops far side as possible.
- Traffic signal coordination, transit signal priority, queue jump lanes.
- Recognizable shelters, with Rapid branding and bus arrival information signs.
- Recognizable vehicles, with Rapid branding and features which reduced dwell times.

AC Transit's first Rapid Bus route (72R San Pablo) went into service in June 2003. Travel times were reduced by 17%, and ridership on the Rapid Bus route is 66% higher than on the local route that it replaced. Total corridor ridership has increased by 20%.

Figure 2.5-2

AC Transit Rapid Bus Service

California is not the only place where Rapid Bus systems have been successfully implemented. Experiences in Boston, Cleveland, and Vancouver, Canada, have also been positive. Table 2.5-2 summarizes the experiences with Rapid Bus systems available at this time.

Table 2.5-2 shows that the benefits of Rapid Bus systems are not limited to long corridors, such as in Los Angeles. The highest percentage growth in ridership to date on an on-street BRT systems has been on the Silver Line in Boston, which is the shortest and slowest of all those available for study.

An important qualitative impact of rapid bus systems is the perception that generate. Often they are seen to travel faster than surrounding traffic.

2.5.2 Potential Applications of Rapid Bus Service in South Central CT

Locations

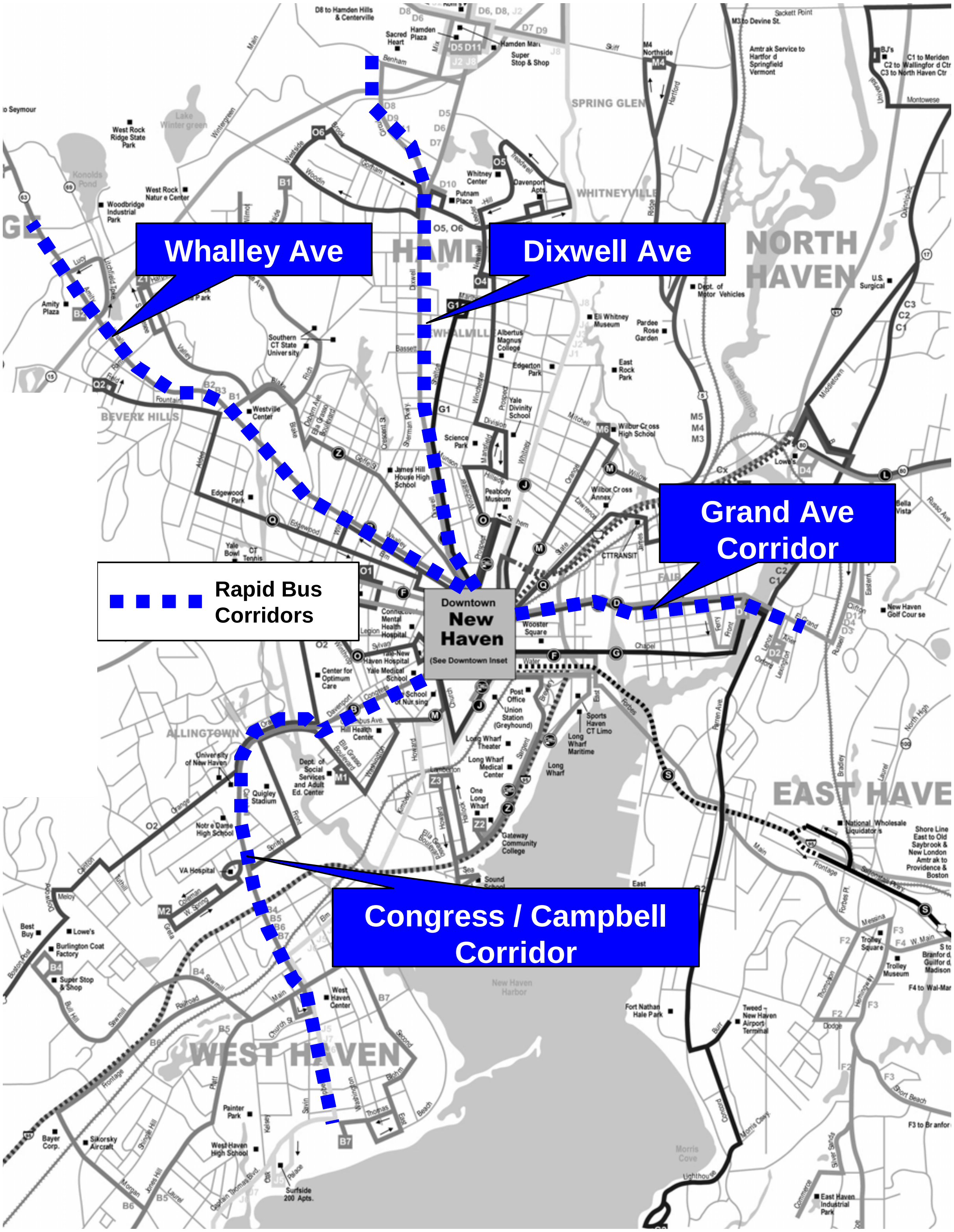
The development of Rapid Bus services would be most appropriate in corridors that already have high ridership on local routes. In these areas, based on experience in other cities, Rapid Bus lines could be expected to improve service and reduce travel times for existing riders, and attract new riders to transit. Existing high ridership transit corridors in South Central Connecticut, are (1) Whaley Avenue, (2) Congress Avenue/Campbell Avenue, (3) Dixwell Avenue, and (4) Grand Avenue.

Table 2.5-2: Summary of Rapid Bus Implementation Results in Other Major Cities

	BRT Line Statistics				Measures to Reduce Travel Times			Travel Time Savings			Ridership	
City/Service	Length (miles)	No. of Stations	Stations /Mile	Avg Speed (mph)	Bus Lanes	Queue Jump Lanes	Transit Signal Priority	Before (mins)	After (mins)	Savings	Daily	Incr
Boston												
Silver Line, Phase 1	2.2	13	5.9	8-9	Curbside		√	15-20	14-17	7-15%	14,100	85%
Cleveland												
Euclid Avenue*	7	30	4.3	12	Median			41	33	20%	29,500	13%
Los Angeles												
Wilshire-Whittier Metro Rapid	26.0	30	1.2	19			√	76	55	28%	40,000	26%
Ventura Boulevard Metro Rapid	16.0	15	0.9	18			√	56	43	23%	9,000	33%
Oakland												
San Pablo Rapid Bus	14.0	26	1.9	16		√	√	63	52	17%	13,800	6%
Vancouver												
Broadway "B" Line	11.1	14	1.3	14	in places - curbside & median	√	√	48	33-43	10-30%	26,000	44%
Richmond "B" Line	9.8	19	1.9	14	Median	√	√	42	32	24%	14,000	

*Anticipated
Sources:
Boston: www.MBTA.com & KKO data
Charlotte, Cleveland, Los Angeles and Vancouver: Levinson, H., Zimmerman, S., et al, TCRP Report 90, Bus Rapid Transit, Volume 1, Case Studies in Bus Rapid Transit, Transportation Research Board, National Research Council, Washington, D.C. 2003.
Oakland: www.actransit.org & AC Transit "San Pablo Rapid" report (undated)

Figure 2.5-3
Potential Rapid Bus Corridors for the Greater New Haven area



Methods of Implementation

In South-Central Connecticut, three means are available to implement rapid bus corridors without increasing vehicle service hours:

- Traffic signal coordination, and transit signal priority;
- Queue jump lanes; and
- Stop consolidation (discussed in detail in the next section of this report)

Traffic signal coordination involves adjusting signal timings to average bus speeds along a corridor, while traffic signal priority allows normal signal operation to be modified to better accommodate transit vehicles. Signal preemption—actually interrupting the normal signal process—is another option. Preemption systems for emergency vehicles have been implemented in many places, and the same technology could be used by transit vehicles.

Queue-jump lanes are additional lanes at an intersection that allow transit vehicles to move ahead of other traffic stopped at a signal. This strategy, obviously, has geometric requirements which may or may not be available at a given intersection. Queue-jump lanes can be created by taking space from normal traffic lanes, intersection islands or medians, sidewalks, or from private land.

Signal preemption and queue-jump lanes are particularly effective at generating the image of speed and efficiency, since drivers of private vehicles are pre-empted and passed by transit vehicles. This can have an important quantitative effect, which is difficult to represent accurately in a model. The analysis using the SCRCOG model, discussed below, did not attempt to account for these impacts.

2.5.3 Expected Impacts in South Central Connecticut

Analysis

To study the effects of rapid bus improvements, the SCRCOG Transportation Demand Model was used. A scenario was created in which bus travel speeds were increased by 20% on portions of the four corridors (Dixwell, Whally, Grand and Congress/Campbell) shown in Figure 2.5-3. Results show an increase in transit trips, and a reduction in total passenger hours. This reflects the importance of time assumed by the model in choosing transit over auto modes. Time-sensitivity is generally accurate at representing real traveler behavior, and "choice riders" (those with options other than using transit) tend to value time especially highly when considering which mode to use.

In our analysis, the rapid bus corridors are assumed to begin and end outside of the core of downtown New Haven. This is because queue-jump lanes and signal prioritization are assumed to be infeasible in this zone. Queue-jump lanes are unlikely to work geometrically, due to the narrower streets, higher land values, and more intense development. And, because most corridors downtown experience frequent transit use in all directions, signal prioritization would have limited value, since speeding up one bus corridor would have the result of slowing down another.

A 20% travel time improvement represents a mid-range estimate. Other systems in the U.S. that have implemented on-street rapid bus systems have seen travel time savings in this range or higher, depending on the particular technologies used (see Table 2.5-2).

Output from the model analysis suggests that the rapid bus scenario will improve ridership both in the affected corridors and on the system as a whole. While the actual increase in system use predicted by the model are modest (4 to 6%, or about 500 riders), this should be used only as a general guide. Systems in the US which have implemented rapid bus improvements have seen ridership growth ranging from 6% to 85%. We see no significant difference between South-Central Connecticut and other regions where rapid bus has been very successful, and conclude that it is reasonable to expect improvements of 10 to 20% on the affected corridors. The model predicts that some ridership will be drawn from the unchanged bus routes to the faster options.

Recommendations

The implementation of Rapid Bus improvements would likely lead to improved use of the transit system in South-Central Connecticut, as it would reduce travel times and better serve customers. Because the physical improvements required to implement rapid bus corridors can be expensive, full implementation of this strategy is recommended for the mid- to long-term, so that planning and coordination can be performed and the necessary funding can be identified.

Implementation of queue-jump lanes and signal prioritization would require the transit provider to coordinate and plan with other agencies, particularly municipal highway departments and ConnDoT. This needs to take place through the usual planning process, and should engage all potential stakeholders. Due to the planning and funding requirements, these improvements will need to be pursued over the mid- to long-term. We do recommend that SCRCOG begin that pursuit immediately.

2.6 Bus Stop Consolidation

The spacing of bus stops represents a balance between access and speed. Closely spaced stops reduce the distances that passengers must walk to get to and from stops, but make bus service very slow. Conversely, stops spaced further apart require passengers to walk further to get to and from stops, but can make service faster. In the New Haven area, the balance is generally weighted toward more stops and slower service.

Elsewhere, the focus has begun to shift toward reducing the number of stops in order to make service faster. In San Francisco, the city increased its standard for bus stop spacing to 800 to 1000 feet (or 5 to 7 stops per mile), and consolidated the stops on all of its major trunk and crosstown routes. The reduction of up to 40% of the stops in certain areas reduced travel times by 10 to 15%. In the Seattle area, King County Metro has consolidated stops on a number of major routes to reduce the number of stops from approximately nine per mile to six, or approximately 33%.

In addition to faster service, stop consolidation can also provide other benefits. A reduction in bus stops can provide for an increase in parking, reduce traffic conflicts between buses and other traffic, and reduce maintenance costs. The higher volumes of passengers using the consolidated stops can also warrant the provision of greater levels of stop amenities such as shelters, benches, and schedule information.

Bus stop spacings in many locations in the New Haven area are very short. These stop spacings are not unusual, especially for older cities in the Northeast, but are much closer together than for systems that have explicitly addressed the issue (see Table 2.6-1). As in San Francisco and Seattle, it is likely that a stop consolidation program could produce travel time savings that would outweigh the disadvantages of longer walk distances.

Table 2.6-1
Bus Stop Spacing Standards

	Distance Between Stops (ft)	Stops per Mile
Chicago (CTA)	660	8
Chicago (Pace)	660-1320	4-8
Delaware (Delaware DOT)	750-1000	5-7
Minneapolis (Metro Transit)	660	8
Philadelphia (SEPTA)		
Existing Service	500	11
New Service	1000	5
San Francisco (SF Muni)	800-1000	5-7
SF Bay Area (AC Transit)	500-1300	4-11
Seattle (King County Metro)	900-1200	4-6

The consolidation of bus stops would require a review of bus stops on a corridor-by-corridor basis that would be based on a number of factors:

- Ridership levels
- Interface with other routes and transportation services
- Type of roadway and traffic conditions
- Distance and ease of access to adjacent stops
- Surrounding land use and activity volumes
- Population densities and demographic characteristics
- Topography of the area

In general, locations with low ridership would be targeted for stop consolidation. In these areas, individual stops would be eliminated or adjacent stops may be consolidated at an intermediate location. Determination of stops to be retained would be based on operational, safety, accessibility, customer convenience, and the suitability of the site for customer facilities. Consolidation of several low-ridership stops may justify installation of facilities at the new location, in which case the new facilities could be perceived as an improvement in the service environment to the passenger.

2.6.1 Expected Impacts in South Central Connecticut

Analysis

The SCRCOG Transportation Demand Model could not be used to directly address the strategy of removing stops, but, the findings of the rapid bus scenario are applicable, since this is a means of enabling vehicles to travel more quickly. Studies of stop consolidation have found average time savings, per stop, of between 17 and 33 seconds, and travel-times savings of up to 20% on affected corridors. If this were found to be possible on the corridors studied in the rapid bus scenario, it would effectively implement that strategy. At the low end, travel time savings from stop consolidation have produced 4% savings in travel time along effective corridors, equivalent to one fifth of the 20% savings represented in the rapid bus model scenario.

Before eliminating stops, transit providers will need to be sure that desirable system access points are not eliminated. Once those data are available, a hierarchy of stops should be developed, and a threshold of use identified, below which stops should be considered for removal. These data will also be helpful in implementing route simplification and shelter improvement (see corresponding sections of this report).

A review of individual bus stops is not available at this time, due to lacking data. According to staff at CT-Transit, however, these data should be collected and available within calendar year 2005.

Recommendations

Stop consolidation should be pursued as a first step to implementation of a rapid bus strategy (see Section 3.5). Consolidating stops can be pursued immediately, since it can be done by the transit providers without needing to coordinate with other entities or seek funding to add or modify signal infrastructure.

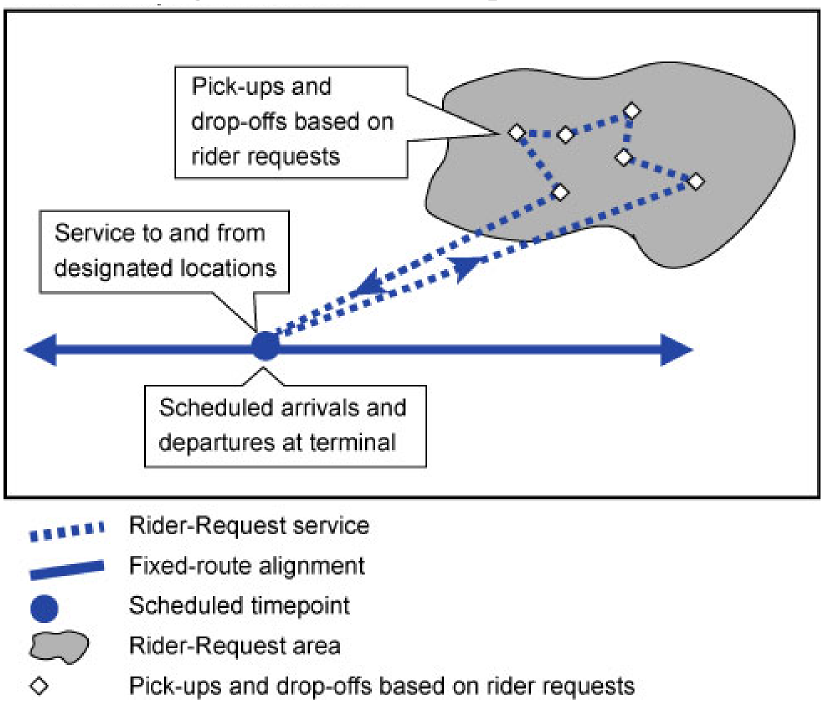
SCRCOG and the regional transit providers should be proactive in reaching out the public to explain the benefits of eliminating stops, and to listen to and talk with system users. It would also be beneficial to initiate an advertising campaign when the consolidation occurs.

2.7 Ride Request Service

Rider-Request service is a type of flexible bus service that provides a combination of fixed route and demand responsive service. At one end of the route, buses arrive and depart from a transit hub or major transfer point at scheduled times. At other points, the service is entirely flexible, and will pick-up and drop-off passengers at any location within the service area.

These services are best suited to areas where current population and employment densities or the road network make traditional fixed route service uneconomical. Because of the flexible nature of the service, Rider-Request routes serve a number of different types of trips. These include connecting trips between the Rider-Request area and regular fixed-route transit services, and trips completely within the Rider-Request area. Some of these trips would require reservations, while others would not:

Figure 2.7-1: Rider-Request Service



- For trips from scheduled departure points to the Rider-Request areas, riders would not need reservations. Riders would board the Rider-Request route in the same manner as a regular route, and upon boarding, tell the driver where they want to go. They are then dropped off at the curb in front of their destination.
- For trips from Rider-Request areas to terminal points, riders would need to make reservations to be picked up directly at the curb in front of their origin. They would call the transit office and schedule the trip based on their desired arrival time.
- For trips entirely within Rider-Request areas, riders would make reservations for curb-to-curb service.

Specific reservation procedures vary and are determined by the transit system based on factors such as policy, level and type of demand, and other factors.

2.7.1 Rider-Request Advantages and Disadvantages

Rider-Request service provides both advantages and disadvantages compared to more traditional transit services. The primary advantage is that, in areas with lower ridership demand, Rider-Request service can be less costly than traditional fixed-route service. This is because Rider-Request services are handicapped-accessible, and are considered to be "demand-responsive" under ADA regulation. As a result, it is not necessary to provide complimentary paratransit service.[5] Additional advantages are that:

- Compared to deviated fixed-route service, Rider-Request service can provide greater service coverage.
- In the Rider-Request area, passengers at picked-up and dropped-off directly in front of their origin or destination, which makes service more convenient.
- Rider-Request service can increase the productivity of paratransit provision. The focusing of trips through a single point allows for more productive use of vehicles than the many origins to many destinations model of most paratransit services.

Rider-Request services can also be a first step toward the subsequent introduction of regular fixed route service. Rider-Request services can be implemented that currently have low passenger demand, with service later converted to regular fixed-route when growth occurs to the extent that Rider-Request service can no longer effectively accommodate passenger demand.

The primary disadvantage of Rider-Request service is that, although it can be less costly than fixed-route service, it is relatively expensive on a per service-hour basis because it is used in low density areas. The key point is that while it is expensive, it is less expensive than other options. The need to make reservations for many trips also increases the complexity of the service, both in terms of operation, and presentation to the public.

Finally, productivity levels of Rider-Request services are fairly low—well performing services typically carry around 4 to 5 passengers per hour. These low productivity levels mean that Rider-Request services can only operate in lieu of a combination of fixed-route and complimentary paratransit service that carry approximately 8 to 10 passenger per vehicle hour. In these areas, the replacement of existing combinations of fixed-route and complimentary paratransit can reduce operating costs.

2.7.2 Examples of Other Rider-Request Services

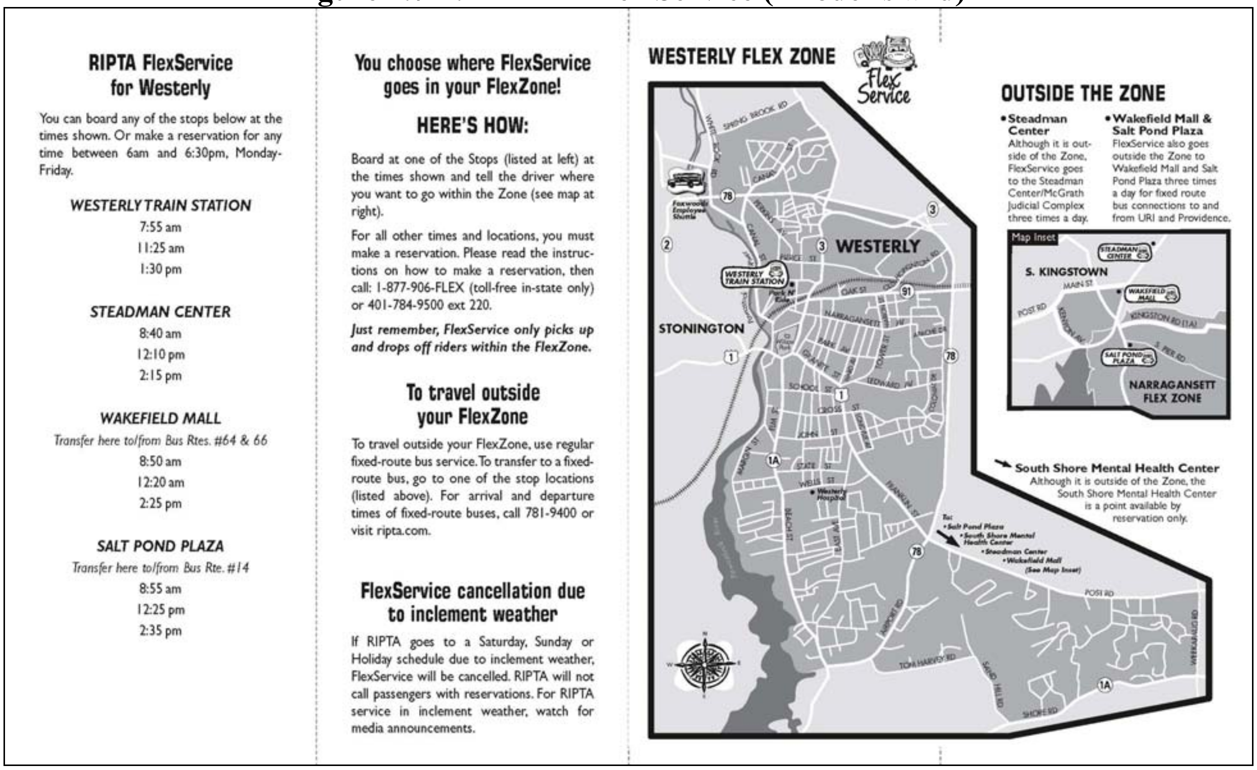
Rider-Request services are provided in a number of areas in the United States. Nearly all services operate with unique names and with different operating and reservations policies. Services in South County, RI, Jacksonville, FL, Raleigh, NC, and Detroit, MI, are described below.

[5] The Americans with Disabilities Act (ADA) requires that, wherever fixed-route transit service is provided, complementary paratransit service must also be provided for persons with disabilities who cannot use the fixed route service. This paratransit service must be provided within 3/4 of a mile of a bus route or rail station, at the same hours and days.

South County, Rhode Island

South County, Rhode Island's RIPTA operates six Rider-Request services, which it calls "Flex Service."[6] These six services each serve suburban and resort communities. Three of the six services stop at designated times at scheduled times, while three operate purely as dial-a-ride services.

Figure 2.7-2: RIPTA Flex Service (Rhode Island)



RIPTA's Flex Services charge the same fare as regular RIPTA services. All Flex services require that reservations be made 48 hours in advance (which is significantly longer than with most other Rider-Request services).

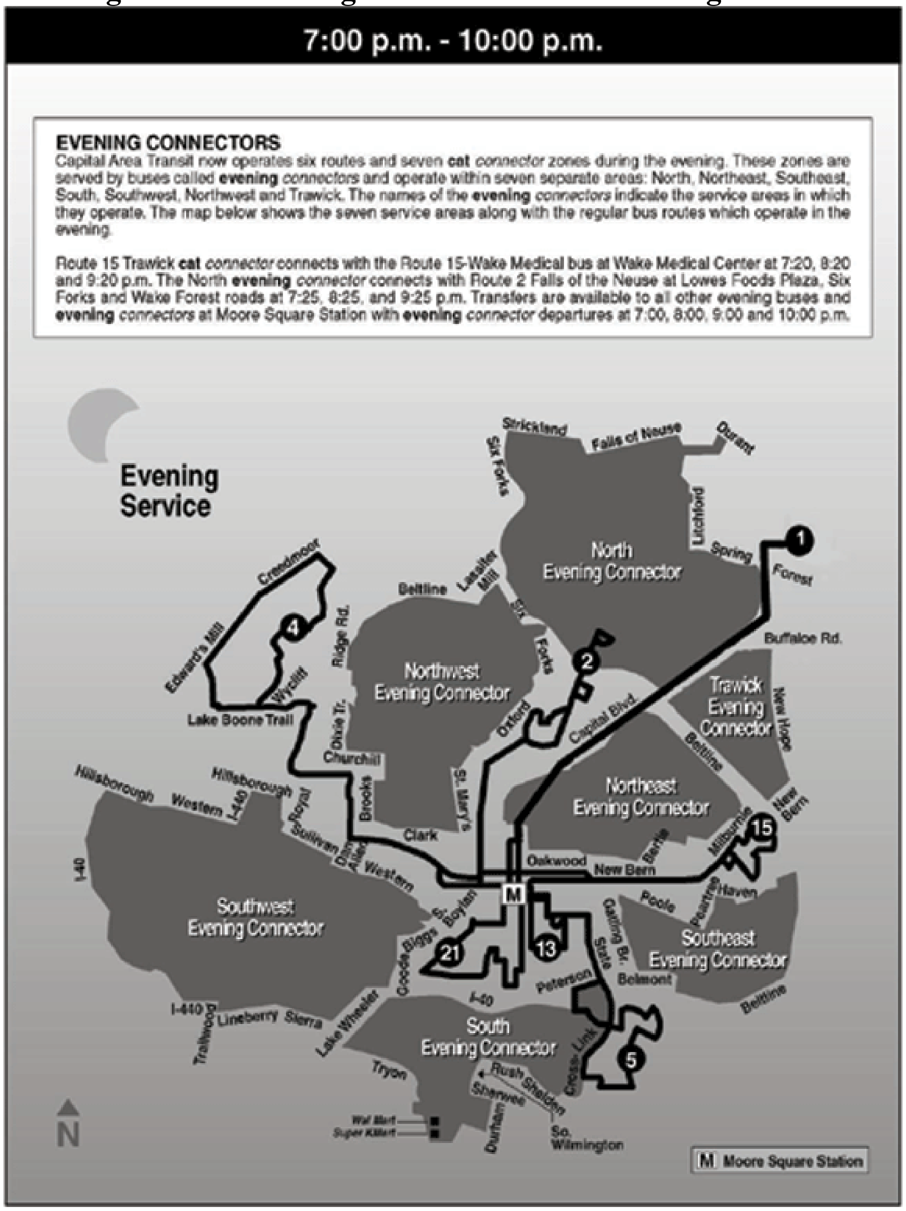
Raleigh, North Carolina

Raleigh, North Carolina's Capital Area Transit District (CAT) operates traditional fixed-route transit service between 5:30 am and 7:00 pm. However, in the early morning between 4:30 am to 5:30 am, and evening from 7:00 pm to 11:00 pm, CAT provides most of its service with Rider-Request services (which it calls "CAT Connectors").

Three different levels of service are provided. Between 4:30 am and 5:30 am, two CAT Connector services connect with one fixed-route service. Between 7:00 pm and 10:00 pm, seven CAT Connector service connect with six fixed-route services (see Figure 2.7-3). Between 10:00 pm and 11:00 pm, three CAT Connector routes connect to two fixed-routes.

[6] *For more detailed information, refer to: www.ripta.com/schedules/index.php/section/60*

Figure 2.7-3: Raleigh CAT Connector Evening Service



CAT accepts reservations up to one hour before pick-up times. Riders are given a pick-up location and time, and are picked-up within a ten minute window around that time.

CAT makes use of some designated boarding locations. If passengers are traveling from a location near a designated stop, they are picked-up at that location. If not, they are picked-up at a closer location.

Detroit, Michigan

The Detroit, Michigan area's SMART operates Rider-Request services under the names "Flexible Route Service" and "Job Express." Two Flexible Route services provide service in suburban areas, and three Job Express routes provide service focused on suburban employment centers.

The two services operate in the same manner, but with different fare structures. Flexible Route Service fares are the same as SMART's regular fare of $1.50 for trips originating at a fixed-route stop, and $2.00 for pick-ups made by reservation. Transfers to and from other services cost 25¢ in both directions. Job Express passengers can transfer from fixed-route service for free, transfer from Job Express to fixed-route for $1.75 (the normal fixed-route fare plus SMART's 25¢ transfer charge), or ride just the Job Express service for 50¢ each way.

Figure 2.7-4: Detroit Rider-Request Service

Reservation procedures also vary by service and by route. On all services it is possible to call for reservations. On some services, it is also possible to arrange for the return trip directly with the driver.

Jacksonville, Florida

Jacksonville, Florida's JTA operates two Rider-Request Services, which it calls "Ride Request." Both services provide scheduled connections between JTA's fixed-route services and suburban work sites. One of the Ride Request routes also serves Jacksonville International Airport.

Fares on JTA's Ride Request services are $2 each way, compared to 75¢ for JTA's fixed-route services. Reservations are requested two or more hours in advance, but can be made directly with drivers (who carry cell phones) with less notice on a space available basis.

2.7.3 Potential Rider-Request Applications in South Central Connecticut

In South Central Connecticut, Rider-Request services could be used to replace low productivity combinations of fixed-route service. In these areas, the replacement of existing services with Rider-Request service could reduce operating costs and improve passenger convenience. Existing low productivity services, in terms of passengers per vehicle service hour, include:[7]

	Passengers/ Vehicle Service Hour
Low Performing Routes	
CTTRANSIT's Sargent Drive Commuter Connection	2.8
CTTRANSIT's Wallingford Route	7.0
CTTRANSIT's L Route – North Branford	10.4
Milford Transit's Route 2 Post Mall/Naugatuck Gardens/ Dock Shopping Center	3.8
Milford Transit's Route 3 Milford Center/West Shore	7.7
Milford Transit's Route 4 Milford Center/Woodmont	6.2
Low Performing Route Segments	
Meriden Transit Route A North End Segment	5.5
Meriden Transit Route B South End Segment	3.5
Meriden Transit Route C West Main Street Segment	6.8
CTTRANSIT Hamden Hill Service (Routes D & J)	No data available on segments

Examples of how Rider-Request service would operate in these areas are provided in the following sections. In addition, Rider-Request service could also be used to extend service to areas that are not currently served, such as:

- Branford
- East Haven
- North Haven
- Orange
- Meriden
- Milford
- Woodbridge

[7] This list is in all likelihood not all inclusive, and more detailed analysis of segment-by-segment ridership patterns on a route-by-route basis would likely identify additional low productivity route segments.

Meriden & Wallingford

Meriden and Wallingford are served by a variety of fixed-route and complimentary paratransit services. These include (see Figure 2.7-5):

- CTTRANSIT-New Haven's C North Haven/Meriden Route, that operates between New Haven and Kohl's in Meriden, just north of the Wallingford line.
- CTTRANIST-Meriden's A Yale Acres – Westfield Shopping Center route.
- CTTRANSIT-Meriden's B Kohl's Plaza – South Meriden route.
- CTTRANSIT-Meriden's C West Main Street – East Main Street route.
- CTTRANSIT-Wallingford's Wallingford route.
- Complimentary paratransit service operated by Northeast Transportation that provides curb-to-curb transportation throughout Meriden and Wallingford for persons with transportation disabilities.

Many of these services carry very low passenger volumes. A reconfiguration of these services to provide fixed-route service in the highest demand corridors and Rider-Request service in lower volume areas could expand service coverage and reduce costs. In addition, evening service would be provided in the highest demand areas of Meriden, and peak period service would be provided to much of Wallingford. This could be done as follows (see also Figure 2.7-6):

1. Combine **CT**TRANSIT's C North Haven/Meriden route with the Kohl's Plaza leg of **CT**TRANSIT-Meriden's B Route and the Westfield Shoppingtown leg of Meriden's A Route. This would combine the highest ridership services in Meriden to create one direct route between Meriden and New Haven. This route would eliminate transfers, and provide a core service around which to focus secondary services. With savings from the changes described below, evening service could also be provided in Meriden.
2. Combine the West Main leg of **CT**TRANSIT-Meriden's C route and the Yale Acres leg of the A route. These route segments have relatively high ridership and would remain most effective as fixed-route services.
3. Convert the West Main Street leg of **CT**TRANSIT-Meriden's C Route and the South Meriden leg of the B Route into Rider-Request services. These route segments have very low ridership, and the conversion of these services to Rider-Request could make service more convenient, and reduce operating costs be eliminating the need to provide complimentary paratransit service.
4. Convert **CT**TRANSIT-Wallingford's Wallingford route into two Rider-Request (Wallingford West and Wallingford East), and expand service hours to include peak period service. These services could expand service coverage, and improve convenience. The expanded service coverage would require two vehicles, compared to one for the existing Wallingford route, but this additional cost could be covered by the savings attributable to not having to provide complimentary paratransit service.

In total, these changes could expand service coverage, reduce transfers, provide evening service in Meriden, for essentially the same cost as the existing service (see Table 2.7-1).

Figure 2.7-5: Existing Service in Meriden and Wallingford

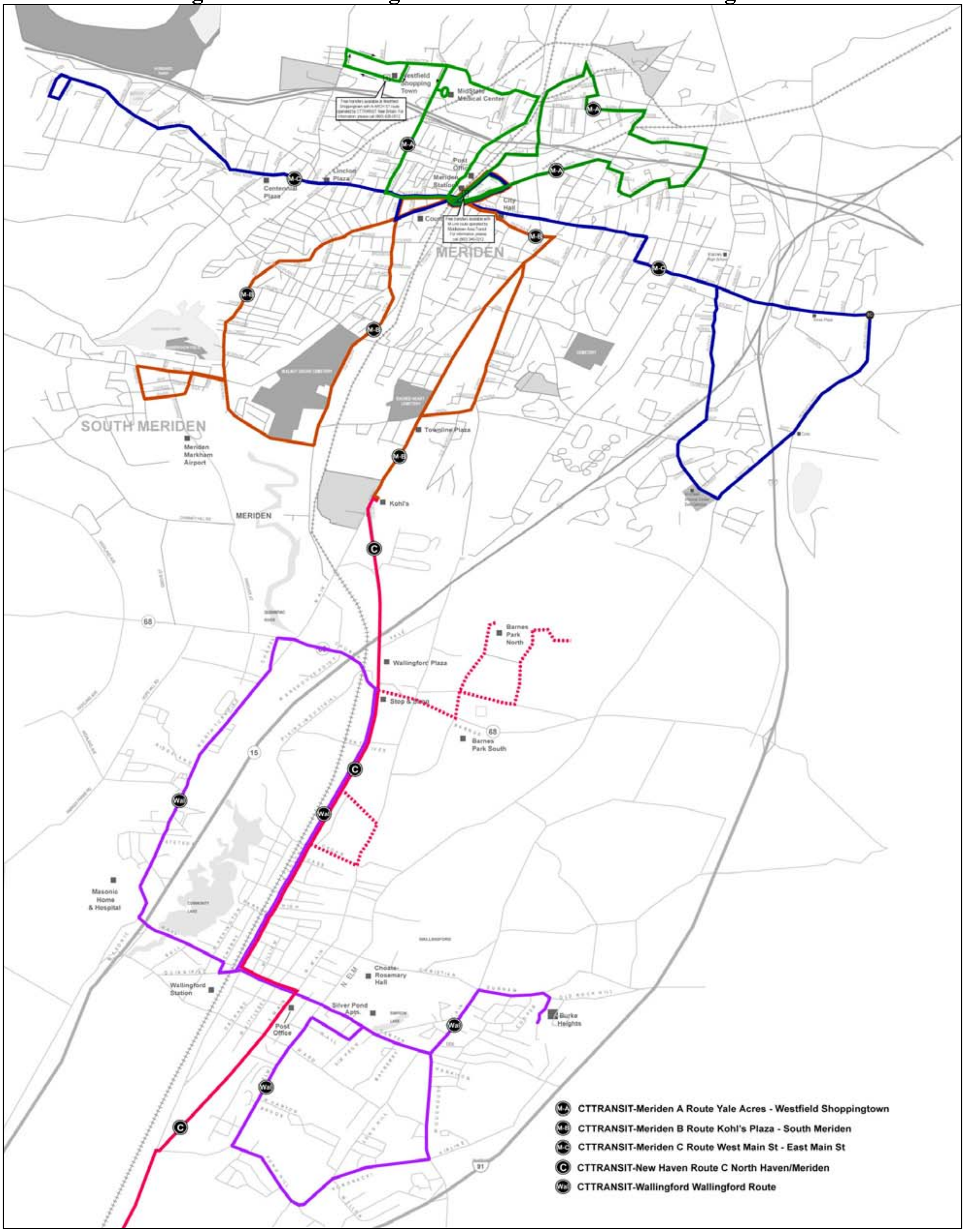


Figure 2.7-6: Reconfigured Service in Meriden and Wallingford with Rider-Request

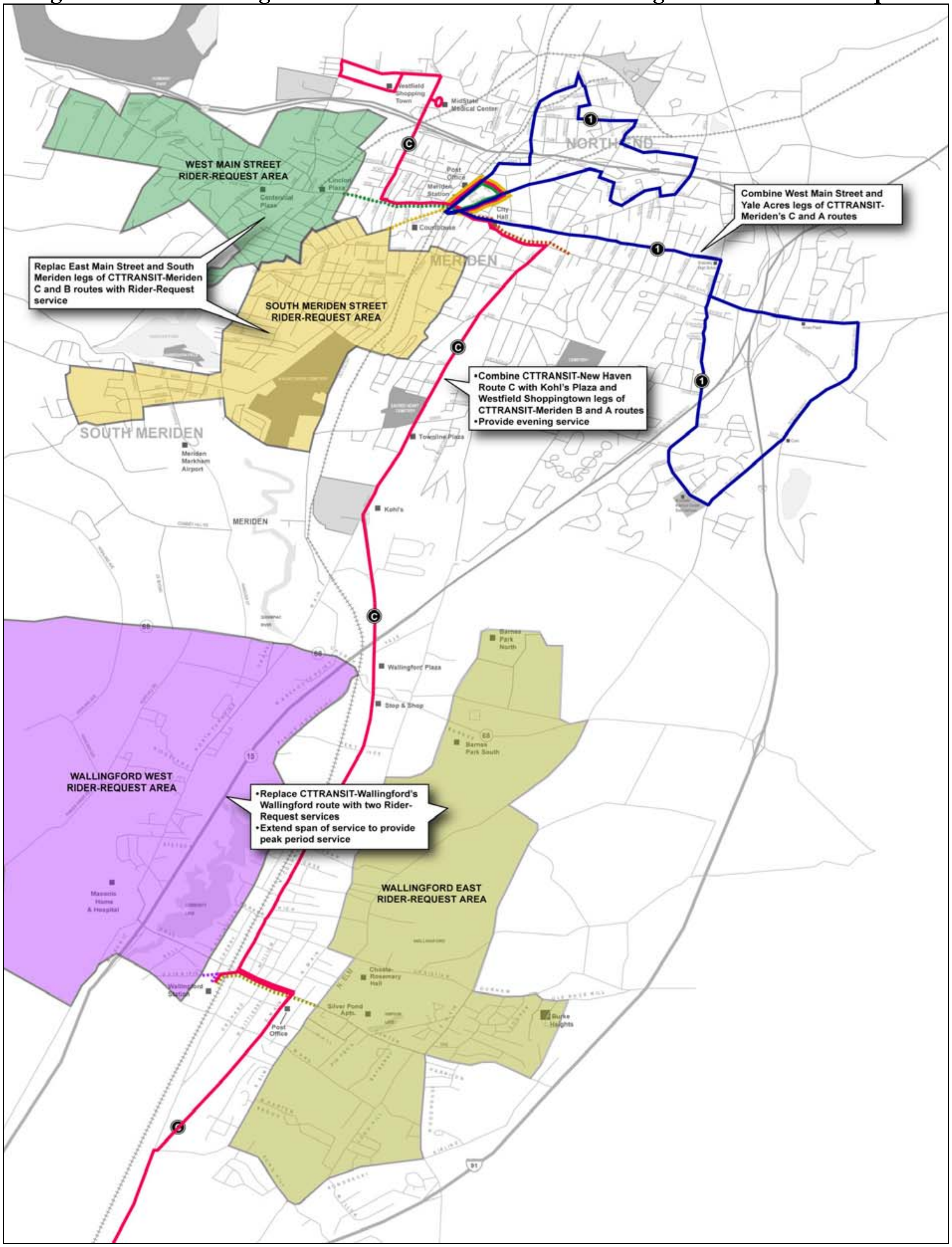


Table 2.7-1: Meriden & Wallingford Reconfigured Service with Rider-Request

	Span of Service Start	End	Headway	Vehicle Req't	VSH	Annual Oper Cost[8]
Existing Service						
CTTRANSIT-Meriden						
A Yale Acres - Westfield Shoppingtown	6:30	17:30	60	1	12.0	$160,000
B Kohl's Plaza - South Meriden	6:30	18:00	60	1	12.5	$165,000
C West Main St - East Main St	6:15	18:00	60	1	12.8	$170,000
CTTRANSIT-New Haven						
C Meriden/North Haven	5:25	22:15	20-60	5	48.6	$780,000
CTTRANSIT-Wallingford						
Wallingford Route	9:00	16:35	60	1	8.6	$115,000
ADA Paratransit	6:30	18:30	DR	5	65.0	$660,000
Total				14	159.4	$2,050,000
Reconfigured Service						
CTTRANSIT-Meriden						
M1 West Main St - Yale Acres	6:30	18:30	60	1	13.0	$170,000
West Main St Rider-Request	6:30	18:30	60	0.5	6.5	$85,000
South Meriden Rider-Request	6:30	18:30	60	0.5	6.5	$85,000
CTTRANSIT-New Haven						
Extend C North Haven/Meriden to Westfield Shoppingtown						
Existing service	5:25	22:15	20-60	5	48.6	$780,000
Extended service	6:30	21:00	60	1	15.5	$250,000
CTTRANSIT-Wallingford						
Wallingford West Rider-Request	6:30	18:30	60	1	13.0	$130,000
Wallingford East Rider-Request	6:30	18:30	60	1	13.0	$130,000
ADA Paratransit[9]	6:30	18:30	DR	3	39.0	
For C New Haven/Meriden	6:30	21:00	DR	1	15.5	$160,000
Other	6:30	18:30	DR	2	26.0	$260,000
Total				13	157.6	$2,050,000

Please note that because this study is intended to identify ways to improve regional transit, the general approach used in developing the Rider-Request alternatives was to reconfigure and improve service at the same cost, rather than reducing cost at the same level of service. As a result, here and elsewhere there are no net reduction in operating costs. For all alternatives, it would be possible to reduce operating costs by eliminating the service expansion elements. This is discussed further in section 3.7.12

Milford

Milford is served by a number of fixed-route and complimentary paratransit services operated by **CT**TRANSIT-New Haven and Milford Transit District (MTD). The major hub for most Milford services is Milford Station, and the Connecticut Post Mall acts as a secondary hub. Existing services within and near Milford include (see Figure 2.7-7):

[8] *Operating costs are in $2002 based on 2002 actual costs.*

[9] *Complimentary paratransit estimate assumes one vehicle to provide complimentary service for Route C North Haven/Meriden in Meriden, and another for Wallingford, plus a third vehicle for Meriden's North End and East Main Street areas.*

- MTD's Route 1 Coastal Link, that operates between the CT Post Mall and Norwalk via Milford Station.
- MTD's Route 2 Post Mall/the Dock, that operates between the CT Post Mall and The Dock shopping Center in Stratford.
- MTD's Route 3 Westshore, that operates between Milford Station and Milford Point.
- MTD's Route 4 Woodmont, that operates between Milford Station and the eastern side of Milford via the CT Post Mall.
- The B5 and B6 variations of **CT**TRANSIT-New Haven's B Congress Avenue Route, that operates between downtown New Haven and the Baybrook Shopping Center on Bayshore Road in New Haven, just north of the Milford line.
- The J6 Oyster River and J7 Milford – CT Post Mall variations of **CT**TRANIST-New Haven's J Kimberly Avenue route. Variation J6 operates between downtown New Haven and Oyster River at the New Haven/Milford town line. Variation J7 operates between downtown New Haven and Milford Station via the CT Post Mall.
- The O2 Connecticut Post Mall variation of **CT**TRANSIT-New Haven's O Sylvan Avenue route. This variation operates between downtown New Haven and CT Post Mall.
- Complimentary paratransit service operated by the MTD that provides curb-to-curb within Milford and to greater New Haven and greater Bridgeport for persons with transportation disabilities.

MTD's local routes (2, 3, and 4) carry very low passenger volumes. As in Meriden and Wallingford, a reconfiguration of these services to provide fixed-route service in the highest demand corridors and Rider-Request service in lower volume areas could expand service coverage and reduce costs. There also appear to be opportunities to improve regional connections between New Haven and Milford. This could be done as follows (see also Figures 2.7-7 and 2.7-8):

1. Replace MTD's three local routes (2 Post Mall/The Dock, 3 Westshore, 4 Woodmont) with two Rider-Request services that would serve nearly all of the area served by the local routes: an East Rider-Request service and a West Rider-Request service, both of which would operate to and from Milford Station.
2. Re-route **CT**TRANSIT's J7 CT Post Mall variation to operate via Woodmont Road and extend to Milford Station in order to replace service now provided by MTD's Routes 2 and 4 that would be outside of the Rider-Request service areas.
3. Extend **CT**TRANSIT's O Sylvan Avenue route from CT Post Mall to Milford Station. This extension would provide a regional connector route between New Haven and Milford that would be similar to MTD's successful Route 1 Coastal Link between Milford and Norwalk. Between the CT Post Mall and Milford Station, this Route O extension would overlap with the north end of MTD's Route 1 Coastal Link, and the combination of the two routes would provide more frequent service between Milford Center and CT Post Mall.

Similar to the Meriden and Wallingford service reconfiguration, these changes could expand service coverage, and reduce transfers for slightly less cost than the existing service (see Table 2.7-2). The changes would also provide more frequent service between Milford Center and the CT Post Mall, and provide a regional connection between Milford and New Haven.

Figure 2.7-7: Existing Milford Service

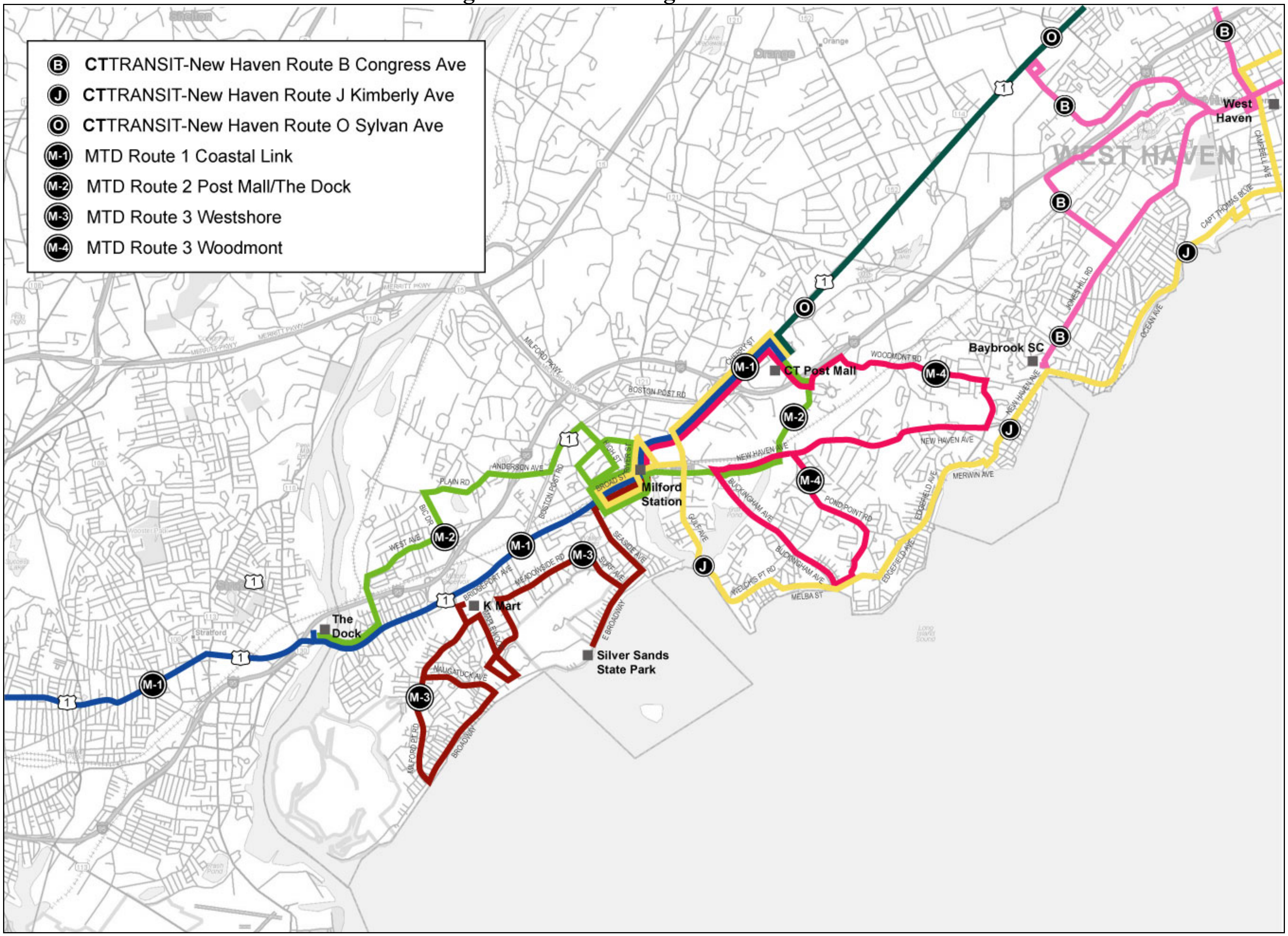


Figure 2.7-8: Reconfigured Milford Service

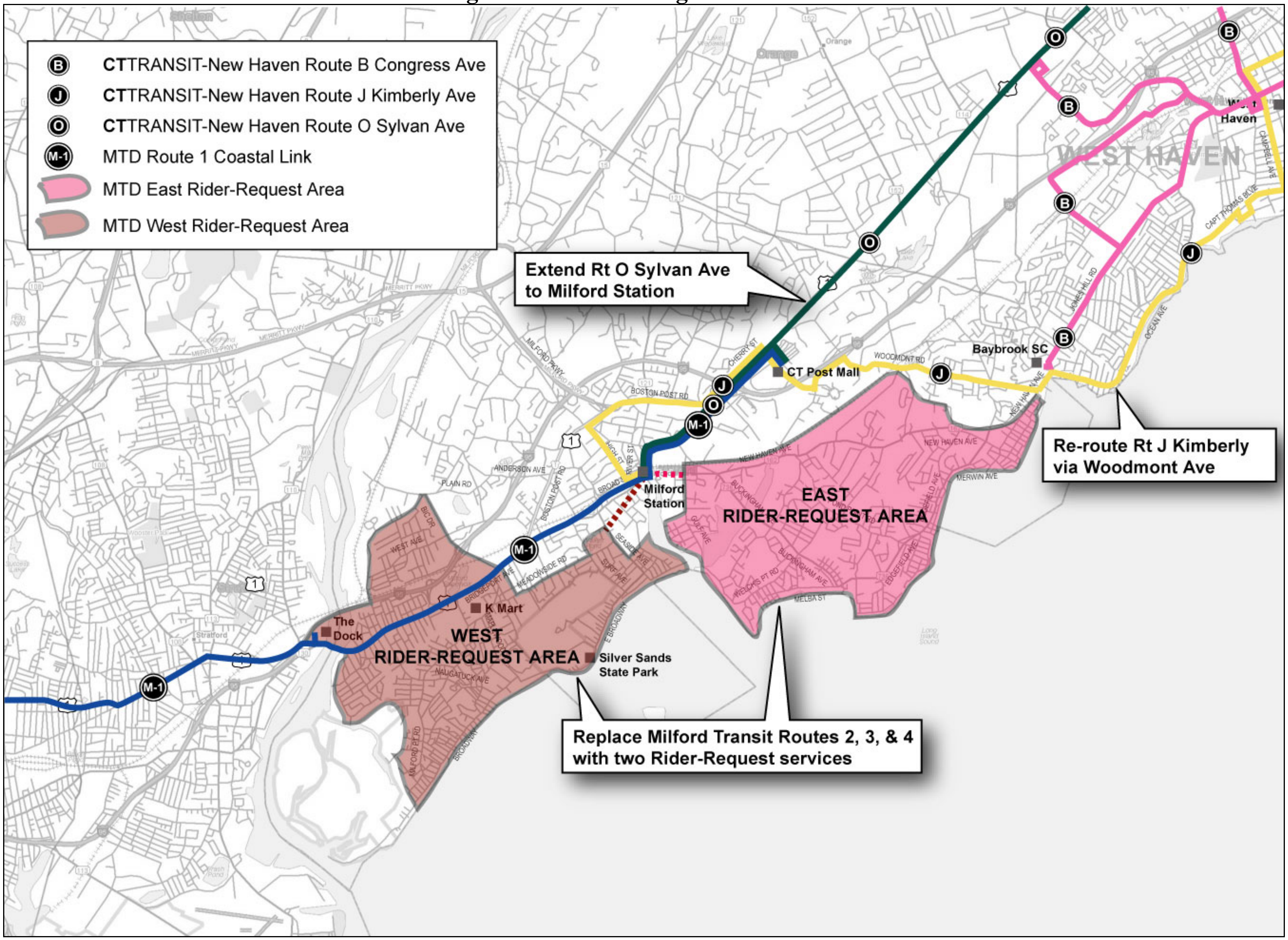


Table 2.7-2: Operating Costs for Reconfigured Milford Service with Rider-Request

	Span of Service Start	End	Headway	Vehicle Reqmnt	VSH	Annual Oper Cost
Existing Service						
Milford Transit District						
1 Coastal Link	5:50	22:00	20-60	6.0	62.0	$483,290
2 Post Mall/The Dock	6:00	18:00	60	1.0	11.0	$85,745
3 Westshore	6:00	18:00	60	1.0	13.0	$101,335
4 Woodmont	6:00	18:00	60	1.0	13.0	$101,335
CTTRANSIT-New Haven						
J7 CT Post Mall	6:18	18:35	60	2.5	32.5	$523,331
O2 CT Post Mall	5:15	20:15	15-30	6.0	51.0	$821,228
ADA Paratransit	6:00	18:00	DR	5.0	65.0	$454,025
Total				22.5	247.5	$2,570,289
Reconfigured Service						
Milford Transit District						
1 Coastal Link	5:50	17:30	20-60	6.0	62.0	$483,290
East Rider-Request	6:00	18:00	60	1.0	13.0	$90,805
West Rider-Request	6:00	18:00	60	1.0	13.0	$90,805
CTTRANSIT-New Haven						
Reroute J7 via Woodmont	6:18	18:35	60	2.5	30.0	$483,075
Extend O2 to Milford Station	5:15	20:15	15-30	6.0	62.3	$1,003,723
ADA Paratransit	6:00	18:00	DR	4.0	52.0	$363,220
Total				20.5	232.3	$2,514,918

Downtown New Haven/Sargent Drive

CTTRANSIT-New Haven's Commuter Connection service is designed to provide connections between Shore Line East service and downtown New Haven and employers along Sargent Drive. There are seven trips from Union and/or State Street Stations (six of which are in the morning) and nine trips to Union and/or State Street Station (six of which are in the afternoon/early evening. Ridership on this route is very low, at only 25 trips per day, which translates to 1.6 passengers per trip and 2.6 passengers per vehicle service hour. Furthermore, Gateway Community College, one of the major destinations in this area, is planning to relocate to downtown New Haven, which would further reduce transit demand along Sargent Drive.

Considering the current poor performance of this route, operating costs could be reduced and better service provided to passengers by converting the route to Rider-Request service that operated to and from Union Station (see Figure 2.7-9). Service would be improved as Rider-Request trips would use the most direct routings between Union Station. This would reduce travel times, as passengers would not need to travel along the current route's fairly circuitous alignment. Assuming that this service were operated by the New Haven Transit District, which has a lower operating cost structure than CTTRANSIT-New Haven, operating costs would be 51% lower (see Table 2.7-3).

Figure 2.7-9: Sargent Drive Rider-Request Service

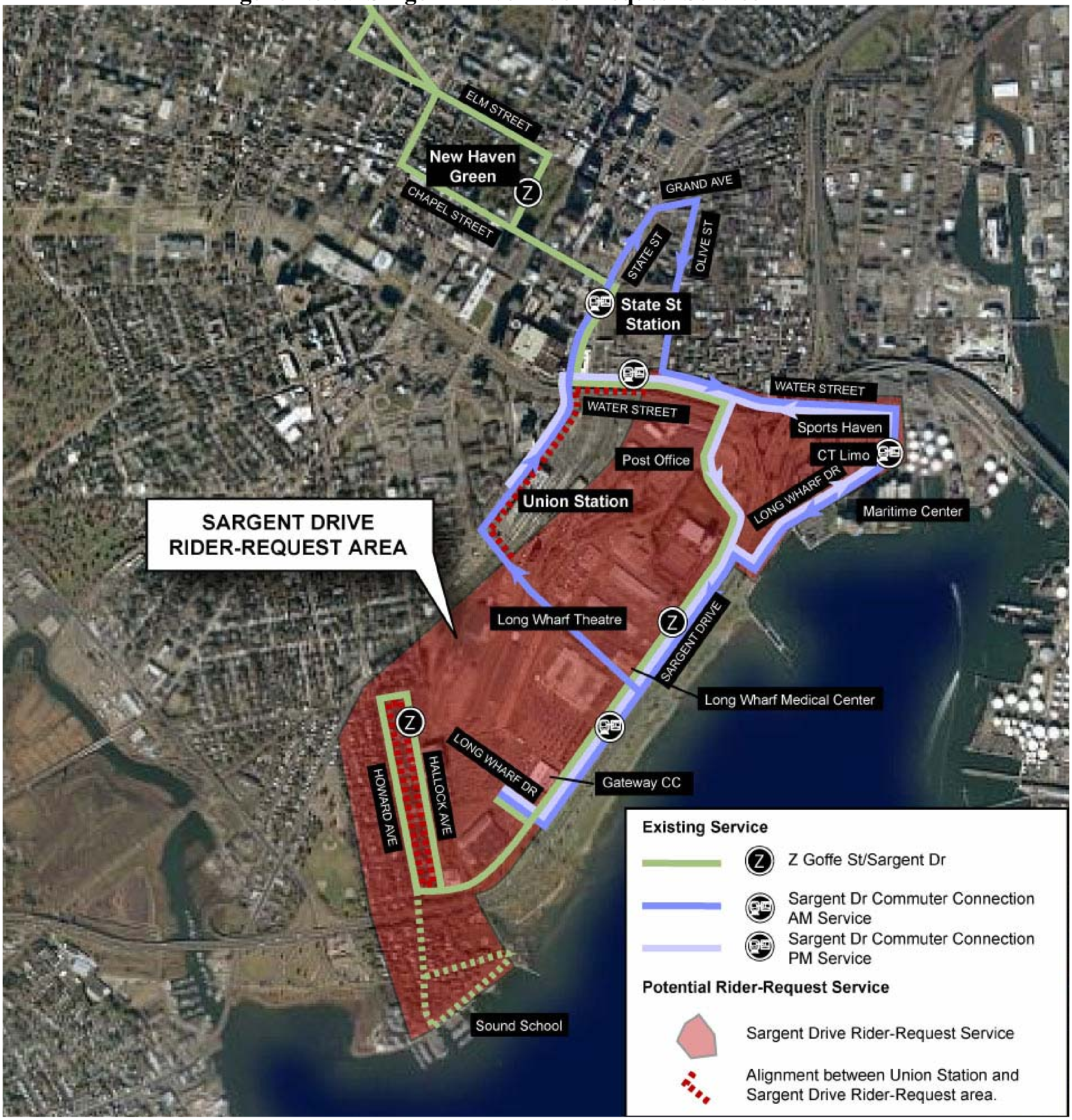


Table 2.7-3: Operating Costs for Sargent Ave Rider-Request Service

	Span of Service Start	End	Headway	Vehicle Req't	VSH	Annual Oper Cost[10]
Existing Service						
CC Sargent Drive						
AM Service	6:15	10:00	23-80	1.0	4.0	$64,407
PM Service	14:55	20:13	25-67	1.0	5.8	$93,390
Total				1.0	9.8	$157,797
Reconfigured Service						
Sargent Ave Rider-Request						
AM Service	6:15	10:00	30-80	1.0	4.3	$32,425
PM Service	14:55	20:13	30-67	1.0	5.8	$44,251
Total				1.0	5.8	$76,676

Hamden

In the Hamden Hills area, fixed-route service is now provided by variations of two **CT**TRANSIT-New Haven Routes:

- The D6 Hamden Hills/Centerville and D8 Hamden Hills/Centerville via Circular Avenue variations of Route D Dixwell Avenue.
- The J2 Hamden Hills/Hamden Plaza variation of Route J Whitney Avenue.

These variations are circuitous and increase the complexity of those routes. With the development of a transit center in Hamden, it may be possible to simplify existing routes and provide more convenient service to Hamden Hills at a lower cost by replacing these variations with Rider-Request service. To do this (see also Figure 2.7-10):

- New Rider-Request service would be implemented between the Hamden Transit Center and Hamden Hills. This service would operate every 60 minutes between 6:30 am and 7:30 pm.
- The D6 and D8 variations of Routes D would be eliminated and be replaced by D5 Hampden Plaza service, which would operate to and from Hamden Plaza.
- Route J2 service would operate to and from the Hamden Transit Center via Skiff Street, and all J4 Waterbury service would operate via the Hamden Transit Center via Skiff Street and Dixwell Avenue.

Assuming that the Rider-Request service would be operated by the New Haven Transit District, the implementation of Hamden Hills Rider-Request service could reduce total operating costs (see Table 2.7-4).

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[10] *Operating cost estimates assume that the New Haven Transit District would operate the Rider-Request service.*

Figure 2.7-10: Hamden Hills Rider-Request Service

Table 2.7-4: Operating Costs for Hamden Hills Rider-Request Service

	Span of Service Start	End	Headway	Vehicle Reqmnt	VSH	Annual Oper Cost
Existing Service						
D Dixwell Avenue						
D6 Hamden Hills/Centrville	6:15	17:02	5 trips	1.0	3.8	$60,381
D8 Hamden Hills/Centrville via Circ Ave	7:03	14:15	5 trips	1.0	3.8	$60,381
J Whitney Ave						
J2 Hamden Hills/Hamden Plaza	7:32	19:42	60	2.0	22.0	$354,237
Total				4.0	29.6	$475,000
Reconfigured Service						
D Dixwell Avenue						
Operate D6 as D5	6:15	17:02	5 trips	1.0	2.5	$40,254
Operate D8 as D5	7:03	14:15	5 trips	1.0	2.5	$40,254
J Whitney Ave						
J2 Hamden Plaza	7:32	19:42	60	1.5	16.5	$265,678
Rider-Request Service						
Hamden Hill/Centerville	6:30	19:30	60	1.0	13.5	$102,998
Total				4.5	35.0	$449,184

Notes on the South Central CT Cost Estimates

Because this study is intended to identify ways to improve regional transit, the general approach used in developing the Rider-Request alternatives was to reconfigure and improve service at the same cost, rather than reducing cost at the same level of service. Rider-Request services are used as a way to produce cost savings, which are diverted to improve fixed routes in the area being considered. As a result, all of the alternatives discussed, except Sargent Drive, include Rider-Request services coupled with fixed-route improvements, and no net reduction in operating costs. These are summarized in Table 2.7-5. For the Meriden/Wallingford and Milford alternatives, it would be possible to reduce operating costs by eliminating the service expansion elements.

- **Meriden/Wallingford:** The elimination of the evening fixed-route service in Meriden and peak period service in Wallingford would reduce operating costs by $138,000. With this change, operating costs would be reduced by 6.1% from current levels.

- **Milford:** The elimination of **CT**TRANSIT-New Haven Route O Sylvan from CT Post Mall to Milford would reduce operating costs by $1.0 million per year. With this change, operating costs would be reduced from current levels by 39.1%.

For the Hamden alternative, it is also likely that operating costs could be reduced. However, the fixed-route changes are more closely intertwined with the Rider-Request changes, and more detailed service design work would be needed to determine potential cost savings.

Table 2.7-5: Summary of Rider-Request Alternatives

Meriden & Wallingford	
Rider-Request Service Replacement:	▪ Three Rider-Request services replace local fixed-route service on all or parts of three routes.
Service Expansion:	▪ Evening fixed-route service added in Meriden between Kohl's and Westfield Shopping Town. ▪ Peak period service added in Wallingford. ▪ Total increase in general public service of 35% (measured in VSH).
Other Service Improvements:	▪ One-seat service added between Meriden and New Haven.
Operating Cost Impact	+0%
Milford	
Rider-Request Service Replacement:	▪ Two Rider-Request services replace local fixed-route service on all or parts of four routes
Service Expansion:	▪ Extension of CTTRANIT-New Haven Route O Sylvan Ave from CT Post Mall to Milford.
Other Service Improvements:	▪ More direct service on CTTRANSIT-New Haven Route J Kimberly Ave. ▪ More frequent service between Milford and CT Post Mall.
Operating Cost Impact	-2.2%
Sargent Drive	
Rider-Request Service Replacement:	▪ One Rider-Request service replaces local fixed-route service on two routes.
Service Expansion:	▪ None.
Other Service Improvements:	▪ More direct service on Rider-Request than on circuitous existing shuttles.
Operating Cost Impact	-51.4%
Hamden	
Rider-Request Service Replacement:	▪ One Rider-Request service replaces local fixed-route service on parts of two routes.
Service Expansion:	▪ 18.2% increase in service (measured in VSH)
Other Service Improvements:	▪ Simplifies complex routes. ▪ More direct routings.
Operating Cost Impact	▪ -5.4%

2.7.4 Expected Impacts in South Central Connecticut

Analysis

There is only limited information available regarding the success of Rider-Request services. The existing research is summarized below:

- TCRP's "Traveler Response to Transportation System Changes" report (TCRP Report 95), states: "Replacement of underutilized fixed route transit with demand responsive service, in appropriate settings, appears to have generally positive effects." Ridership is typically the same or greater so long as comparable levels of service are provided at not too high a fare. The report goes on to say that "small to substantial ridership gains occurred in a majority of cases" (see Table 2.7-6).

Table 2.7-6: Impacts of Conversion of Fixed-Route to Ride-Request Service

		Change in Service Quantity		Change in Fare	Change in Ridership
	Year	Percent	Unit	Percent	Percent
Warsaw, IN	1995	-24%	VSM	12%	41%
Chippewa Falls, WI *	1985	23%	VSH	50%	-68%
Hamilton, OH	1993	0%	VSH	0%	0%
Shakopee, MN	1984	Unreported		Unknown	346%
Norfolk, VA	1981	0%	VSH	100%	4%
Columbia, MD	1971	Unreported		Unknown	342%
Bay Ridges, ON	1970	Unreported		Unknown	422%

* Note: Chippewa Falls changes coincided with elimination of connecting route to neighboring city. Ridership reductions are generally blamed on this change.

- TCRP's "Guidelines for Enhancing Suburban Mobility Using Public Transportation," states that "ridership levels in most systems seldom exceed a few passengers per vehicle hour." However, some systems do achieve higher ridership levels, and the same report cites San Diego's El Cajon Express, which before the San Diego Trolley was extended into the area, averaged approximately 8 passengers per vehicle hour. Livermore California's DART service averages 8 passengers per vehicle hour, versus 3 passengers per vehicle hour for the fixed route service that it replaced.

- TCRP Report 95 indicates that productivity levels among rider-request services range between 3 to 11 passengers per vehicle hour. Productivity levels on the South Central Connecticut routes that would be converted to Rider-Request range from 2.8 to 7.7 passenger per vehicle hour.

- TCRP Report 95 also indicates that ridership on the examined services is weighted toward the poor, elderly, disabled, and students. Concentrations of these populations in the areas examined in South Central CT are moderate to high, lending more reason to believe such services would succeed.

Overall, the observed impacts from other areas provide a strong argument that Rider-Request services would have positive ridership impacts. Furthermore, the ridership levels that are being considered for South Central Connecticut Rider-Request services, on an hourly basis, are consistent with comparable services. Finally, the fixed-route service expansion that would accompany the Rider-Request services would produce additional ridership increases.

Service Considerations

Dispatching:
Our estimate of costs involved in shifting to ride-request service assumes no additional costs to support the call center that dispatches service. We assume that the existing call center, used for the Paratransit operations, has the capacity to handle the additional ride-request lines. If additional call-center capacity would be required, those costs will need to be considered.

Scheduling Requirements for Users:
The time in advance of travel that one must schedule a trip, and the efficiency of routing and dispatching, are factors to consider in developing new service.[11] Demand for ride-request is inelastic to differences between a few days and many days in pre-booking time, but reducing pre-booking time to hours or minutes could be expected to have a greater effect on demand, since impulse trips could be accommodated. Low pre-booking times have been accomplished in other places, such as Jacksonville, where drivers carry cell phones and riders can call drivers directly to be picked-up on very short notice. Such arrangements would generally produce higher ridership on the services.

Demographic Considerations

The size and composition of the market are also factors to consider in designing ride-request services. In available case-studies where demographics are presented, elderly riders are an important component of system use. Students and the disabled each make up another important component in one of these two case-studies. Some of the areas proposed for ride-request service restructuring feature high concentrations of senior citizens, students, and/or disabled persons. Thus, these services could be expected to be supported by the users of existing service.

Recommendations

Rider-request services could improve the productivity of the existing low-ridership routes and route segments in South Central Connecticut that have been identified and discussed above. Overall, the observed impacts from other areas provide a strong argument that Rider-Request services would have positive ridership impacts for the Region. We recommend that the public process required to implement such service be initiated.

As the strategy is pursued, SCRCOG and the transit providers should perform a more thorough study the costs and benefits of the proposed rider-request improvements. Demographic characteristics and attitudes of the current riders on the affected lines should be surveyed, to ensure that the market can be expected to support a ride-request system. Dispatching service requirements should be estimated as well, to determine whether the existing paratransit dispatching system can accommodate the additional demand.

[11] *TCRP, Traveler Response to Transportation System Changes, Chapter 6,* Demand Responsive / ADA.

2.8 Bus Stop Improvements

Most bus riders spend a significant amount of time waiting at bus stops, and that time accounts for a significant amount of their transit experience. Good, comfortable, convenient stops will improve the transit experience of existing riders, and help to attract "choice" transit riders. They will also increase the likelihood that infrequent riders will become regular riders. Furthermore, recent research by the Transit Cooperative Research Program concluded that the cost of better amenities is often more than offset by increased ridership.[12]

In all transit systems, different stops serve different purposes and different volumes of passengers. It is accepted that the most important stops need to well designed, attractive, comfortable, and convenient, and this is usually the case (for example, **CT**TRANSIT's facilities at the New Haven Green). However, much less effort is usually placed on other stops, with the result that they are often located in inconvenient locations and/or provide fewer amenities than may be warranted. In South Central Connecticut, an effort to improve bus stops could both improve service for existing riders and attract new riders.

2.8.1 Bus Stop Features

A wide range of amenities can be provided at bus stops. These include:

- Bus stop signs
- Waiting areas
- Benches/seating
- Shelters
- Lighting
- Trash receptacles
- Route and schedule information
- Real-time passenger information
- Heat
- Landscaping
- Transit maps
- Local area maps and local information
- Vending Machines (newspapers, etc.)
- Bicycle racks
- Telephones
- Clocks

The determination of which elements should be provided would require an explicit determination of what types of design elements and amenities would be appropriate for

[12] The Role of Transit Amenities and Vehicle Characteristics in Building Transit Ridership: Amenities for Transit Handbook, 1999

various types of stops. As an example, the Greater Cleveland RTA recently completed a process which classified all of its stops into one of five classifications, and then specified the features that should be provided for each type of stops.[13] As shown in Table 2.8-1, basic stops that serve relatively few riders would consist simply of a bus stop sign with bus route information, and if possible, a paved waiting area pad, lighting, and a trash can. At the other end of the spectrum, major regional portals would be uniquely designed, and include a full range of amenities including local area information and real-time passenger information. (This example illustrates the Cleveland region's priorities. Input from riders and neighborhoods will be important to determining the amenities that should be included in a stop hierarchy designed for South Central Connecticut.)

2.8.2 South Central Connecticut Bus Stop Improvement Program

The development of a program of bus stop improvements in South Central Connecticut would require a multi-phase process:

1. Develop a hierarchy of stops, in which stops would be classified according to importance (which is generally based on ridership and/or potential ridership).
2. Determine what types of amenities should be provided at each type of stop. In general, more important stops would have a higher level of facilities and amenities, and less important stops would have more basic amenities.

Table 2.8-1: Greater Cleveland RTA Bus Stop Hierarchy and Amenities

	Type 1	Type 2	Type 3	Type 4	Type 5
	Basic Stops	Serving Moderate Density Areas	Serving High Density Areas	Community Destination Stops	Regional Portals
Sign with route ID	√	√	√	√	√
Paved waiting pad	√*	√	√	√	√
Lighting	*	√	√	√	√
Trash can	√*	√	√	√	√
Bench		√	√	√	√
Landscaping		√	√	√	√
Bike rack		√	√	√	√
Shelter			√	√	√
Schedule information			√	√	√
Additional seating			√	√	√
Real-time schedule info				√	√
Public art				√	√
Transit system map				√	√
Local area info				√	√
Unique design elements					√

**Where possible*

[13] *"Transit Waiting Environments, An Ideabook for Making Better Bus Stops," Greater Cleveland Regional Transit Authority, June 2004.*

3. Classify each individual stop in the region based upon the hierarchy developed in step 1.
4. Prioritize improvements (for example, by type of stop, by corridor, etc.)
5. Implement improvements.

It should be noted that the scope of such an effort would be relatively large, and would encompass several transit operators. Most of the effort (up to the prioritization of improvements) could be conducted on a joint basis, while the actual improvements would be implemented by individual operators. Finally, before a commitment was made to the region-wide implementation, the effectiveness of such a program could be tested in pilot corridors.

2.8.3 Expected Impacts in South Central Connecticut

Analysis

A few studies exist that have translated the value of shelter and stop improvements into dollar and travel-time equivalents. A survey of riders of the Chicago CTA rail/subway system performed in 1999 sought to determine the value of improved station stops to its clientele, and two British studies examined similar sets of improvements. The results of all of these studies are shown in Table 2.8-2.

Table 2.8-2
Results of Studies of the Value of Shelter Improvements

RSG, CHICAGO, IL, 1999		
IMPROVEMENT	**VALUE**	**TRAVEL-TIME EQUIVALENT**
Better protection from the weather	2.5 cents/trip	19 seconds/trip
Better protection from the weather *and* heat	4.6 cents/trip	35 sec/trip
Police presence	3.9 cents/trip	29 sec/trip
Real-time Information	3.1 cents/trip	23 sec/trip
Maps / Attraction Information	2.8 cents/trip	21 sec/trip
Cleanliness	2.8 cents/trip	21 sec/trip
STEER DAVIES GLEAVE, LONDON, 1996 (Values converted from pence/trip at 1.92 pence/cent)		
ATTRIBUTE	**VALUE**	
Shelter w/ roof and end panel	10.7 cents/trip	
Basic shelter with roof	8.6 cents/trip	
Lighting at stop	5.9 cents/trip	
Moulded seats	6.5 cents/trip	
Flip seats	4.2 cents/trip	
Bench seats	1.7 cents/trip	
Dirty bus stop	-22.6 cents/trip	
WARDMAN ET AL, EDINBURGH, SCOTLAND, 2001		
ATTRIBUTE	**VALUE - IVT**	
Shelter w/ light, roof, end panels, and seats	1.7 min/trip	
Shelter w/ lighting and roof	1.2 min/trip	

The travel-time equivalents in the first part of Table 2.8-2, relating the results of the CTA study, are calculated based on the SCRCOG model's presumed value of time of 8 cents/minute. The much higher values found in the British studies may, to some extent, be attributable to higher real or assumed values of time found in the UK, but the five-fold difference in results between these studies is cause for some uncertainty. The most conservative option is to assume the CTA results are applicable to the New Haven area, since that study comes from the United States.

As Table 2.8-2 shows, the inclusion of heat with better protection from the elements doubled the value of protection improvements in Chicago. It is reasonable to expect to find similar preferences in South Central Connecticut. The Chicago study was performed in September, and the report notes that the "value might have been even higher had the survey been conducted in the winter."

The actual value of protection from the weather will depend on the level of protection offered. The 2.5 cent/trip value determined in the CTA study represents an improvement from "SOME protection…" to "GOOD protection from wind, rain, and snow". Most CTA platforms already feature some weather protection, whereas most SCRCOG-area bus stops do not. Improving weather protection at stops that currently feature some protection would be similar to the change proposed in the CTA study, so the 2.5 cent/trip value can be assumed with some certainty in that case.

Expanding limited protection at stops where it does not exist may have a value similar to the 2.5 cents/trip indicated in the CTA study, but this is a less-safe assumption. The British studies, which focused more directly on smaller bus stops, suggest that individual riders may value improvements to those facilities at a much higher rate.

The contribution of shelter improvements to actual ridership can be estimated by translating the travel-time equivalents into time savings, and applying the results of the rapid bus scenario. Appendix 1 includes a full explanation of the logic of this conversion. In order to estimate the increase in ridership that comes from improving a given stop, it is necessary to know the number of boardings and alightings at that stop relative to all others. Those data will be available soon; for the time being, a formula is offered that can be used to perform the estimation once data are available:

New boardings @ stop = (Buses per day at stop) * (35/60) * (Daily boardings at stop) / (Daily boardings at average stop)

where: Daily boardings at average stop =
(Boardings per day on total system) / Total number of system stops

To calculate the value of a different amenity, the 35 in the above equation would be replaced by the appropriate value from Table 2.8-2.

The police presence attribute was found in the CTA study to be more important in less active areas, where security is a larger concern. Maps and attraction information might be expected to be of less value in New Haven than in Chicago, since Chicago is much larger and transit users are more likely to use the system to visit unfamiliar parts of the city. The value of cleanliness is probably universal.

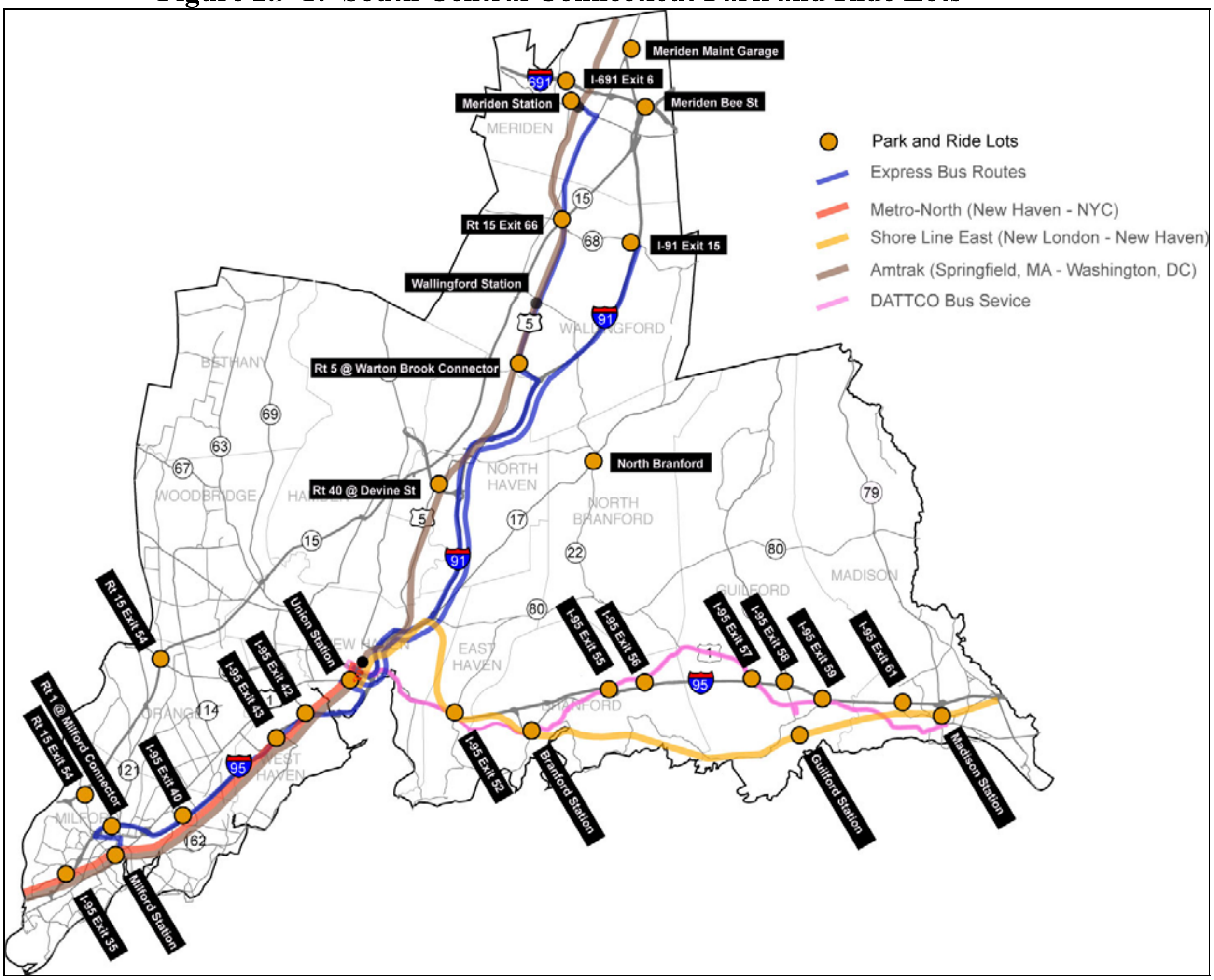
Recommendations

Improving bus shelters in SCRCOG would improve system use, and encourage continued use by existing customers. Further pursuit of this strategy is recommended. Stop-level data will need to be analyzed in order to determine which improvements to make at which stops, and funding will need to be identified prior to implementation. In addition, there are questions regarding the maintenance cost and requirements, and the possible impact of certain improvements on neighborhoods, which must be addressed. Analysis should be carried out jointly by the transit operators in the area, while the individual operators would be responsible for implementing improvements at their own stops.

2.9 Park and Ride Expansion

There are currently 32 park and ride lots in South Central Connecticut, most of which are on rail lines, I-95, I-91, and Route 15 (see Figure 2.9-1). Slightly over half (17) are served by some form of transit; the others serve as carpool staging areas. The largest lots are at Union Station (1,200 spaces) and Milford (444 spaces).

Figure 2.9-1: South Central Connecticut Park and Ride Lots



In general, the lots that serve as carpool staging areas are small, and all operate well below capacity. Conversely, lots that serve commuter rail lines are larger and operate near or above capacity (see Table 2.9-1).

Table 2.9-1: Commuter Lot Services and Utilization

	Parking		Available Transit					Facilities			
	Spaces Available	Utilization	Express Bus	Local Bus	Metro North	Shore Line East	Amtrak	Paved	Lighted	Telephone	Station/ Shelter
Branford											
Branford Station	100	>100%				√		√	√	√	√
I-95 Exit 56	40	13%						√	√	√	
I-95 Exit 55	70	29%						√	√		
Route 1 @ Cherry Hill	124	18%		√				√	√	√	√
East Haven											
Rt 1 @ Kimberly Ave West Lot	29	55%		√				√	√	√	
Rt 1 @ Kimberly Ave East Lot	20	55%						√	√	√	
Guilford											
Guilford Station	151	81%				√		√	√	√	√
I-95 Exit 59	58	29%						√	√	√	
I-95 Exit 58 East Lot	113	12%	√					√	√	√	
I-95 Exit 58 West Lot	45	38%	√					√	√	√	
I-95 Exit 57	113	15%	√					√	√	√	
Madison											
Madison Station	114	>100%				√		√	√	√	√
I-95 Exit 79	197	17%	√					√	√	√	
Meriden											
Meriden Station	16			√			√	√	√	√	√
I-691 Exit 6	54	25%						√	√	√	
I-91 at Bee St	72	28%	√					√	√	√	√
Route 15 Maintenance Garage	50							√	√	√	
Milford											
Milford Station	444	75%		√	√		√	√	√	√	√
I-95 Exit 40	65	3%		√				√	√	√	
I-95 Exit 35	46	22%						√	√	√	
Route 15 Exit 55	59	56%						√	√	√	
Route 1 @ Milford Connector	25	60%									
New Haven											
Union Station	1200	94%		√	√	√	√	√	√	√	√
North Haven											
Route 40 Exit 1 West Lot	109	42%		√				√	√	√	
Route 40 Exit 1 East Lot	103	39%						√	√	√	
Orange											
Route 15 Exit 58	154	51%		√				√	√	√	
Wallingford											
Wallingford Station	96	36%		√			√	√	√	√	√
I-91 Exit 15	105	0%						√	√	√	
Route 5 at Wharton Brook Conn	79	35%						√	√	√	
Route 15 Exit 66E	81	48%						√	√	√	
West Haven											
I-95 Exit 42	38							√	√	√	
I-95 Exit 43	74	22%						√	√	√	

(yellow) = Commuter rail stations

Source: SCRCOG (October, 2004)

A number of efforts are already underway to expand commuter parking in South Central Connecticut. In November 2004, parking supply at Branford Station was doubled from 100 to 200 spaces. Plans are in place to expand parking at New Haven's Union Station by 1,250 spaces to both provide more space for commuters and for downtown. Efforts are also underway to construct a new commuter rail station in either West Haven or Orange that would provide 1,000 commuter parking spaces.

Beyond these three stations, additional efforts to expand parking at other New Haven and Shore Line East stations could attract new riders who are currently unable to conveniently access service. These would include:

- Milford Station, where there is a 520 person waiting list for parking permits.
- Madison Station, which was over capacity in October 2004 (110 spaces/141 cars), the excess vehicles being parked in undesignated locations.
- Guilford Station, which was at 81% of capacity in October 2004 (151 spaces/122 cars).

To begin to address these parking shortages, the Shore Line East service is currently undergoing station improvements including new platforms, pedestrian crossings and parking. Once construction is complete, Branford Station will have 199 parking spaces (versus 100 spaces before), Guilford Station will have 176 at the station and 150 nearby for a total of 326 (versus 151 spaces before), and Madison Station will have 199 spaces (versus 114 spaces before). Further efforts to expand parking would generally consist of projecting demand, identifying and evaluating expansion options, and then pursuing the preferred option. In most cases, expansion options would consist of constructing additional spaces.

2.9.1 Expected Impacts in South Central Connecticut

Analysis

The SCRCOG Transportation Demand Model is capable of estimating the effects of new park & ride locations. Two locations were examined: a potential new Park & Ride at a rail stop in West Haven, and the alternate to the West Haven location, in Orange.

West Haven
The South Central Connecticut Council of Governments has recommended West Haven as the preferred site for a new station on the New Haven Line. ConnDOT has hired a consultant to conduct an environmental review of the proposed site for a new rail station to meet the *National Environmental Policy Act* (NEPA) and the *Connecticut Environmental Policy Act*. A new station would include parking for at least 1,000 cars. An alternative site for the station in Orange will also be investigated in the event that the West Haven site is found to be unsuitable. A schematic of the station design is also being developed. The study is scheduled to be completed in 2005.

These two locations (West Haven and Orange) were examined with the model. Although only one of these will be built, it is not yet known which, so both were modeled.

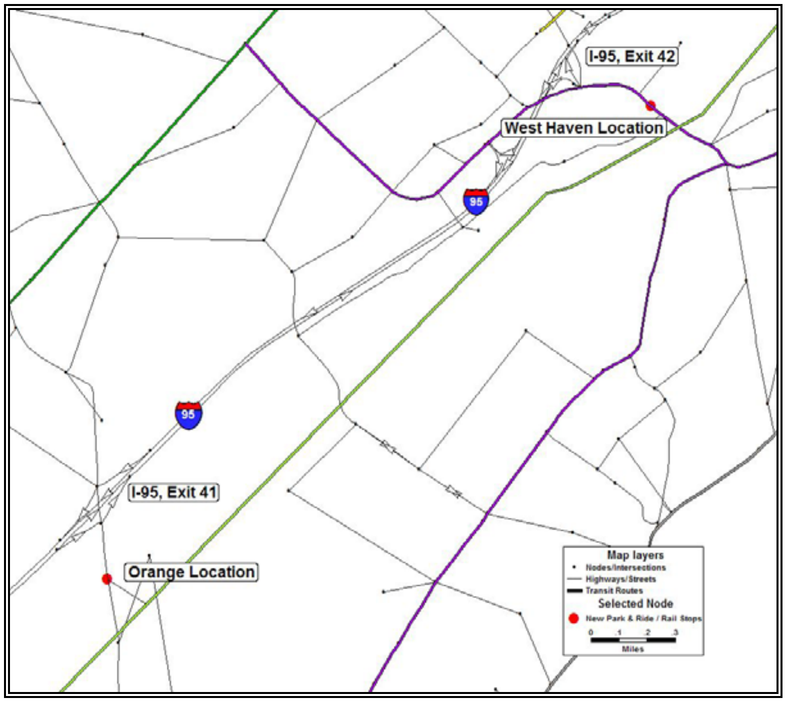
To simulate the West Haven Park & Ride scenario, a park-and-ride node was established just north of the Metro-North railroad tracks along Sawmill Rd. A new stop was created on the Metro-North line just to the east of Sawmill Rd, and connected to the Park & Ride node with a new walk link.

Model results indicate that the new location would be well-used to access transit. About half of the increase would represent shifts from those already using transit, but system-wide use would still rise. Metro-North boardings would rise 1.15% (100 riders), and total transit person-trips increase by about 50. Passenger-miles would rise by a percent on Metro North, indicating increased revenue potential if this scenario were implemented.

Orange
To simulate the Orange Park & Ride scenario, a park-and-ride node was established just north of the Metro-North railroad tracks along Marsh Hill Rd. A new stop was created on the Metro-North line just to the east of Marsh Hill Rd, and connected to the Park & Ride node with a new walk link.

Results of this scenario are nearly identical to those of the West Haven scenario. The most notable differences are somewhat higher growth in Metro North boardings (+1.56%, or 140 riders) and higher growth in Passenger-Miles, due to the greater distance of Orange from the Regional core. System-wide passenger-trips and boardings are no different from the West Haven scenario, however, indicating that the difference between the two locations is the ability of the Orange location to capture a greater proportion of existing transit riders than the West Haven location.

Figure 2.9-2: Proposed Metro North Commuter Stations in West Haven and Orange



Recommendations

Expansion of parking availability along high-productivity transit lines, such as Metro North, would carry clear and immediate benefits to transit use in South Central Connecticut. These opportunities should be pursued.

2.10 Joint Fares

Including the different divisions of CTTRANSIT, South Central Connecticut is served by 10 different fixed-route transit providers. To facilitate travel among different operators, a number of joint fare arrangements have been developed. However, the existing joint fare arrangements are limited in many respects. There are also significant gaps in the services that are covered. Simplification and expansion of joint fare arrangements could make fares more understandable, improve travel opportunities, and could increase transit usage.

2.10.1 Existing Joint Fares

Joint fare and integrated fare arrangements that are currently in place include:

- **CTTRANSIT: CT**TRANSIT provides free transfers between all of its services, including those operated by different divisions, as well with some private services that are subsidized by the state (DATTCO's S-Route in South Central Connecticut). CTTRANSIT 31-Day passes are also valid on all services operated by all **CT**TRANSIT divisions, and on the same private services with which there are free transfers.

- **Shore Line East/Commuter Connection Monthly Plus**: The Monthly Plus pass provides unlimited travel on Shore Line East and all **CT**TRANSIT bus service in New Haven (recently expanded from use only on **CT**TRANSIT Commuter Connection lines). This pass is priced at the cost of a Shore Line East monthly pass plus $9, which is a $36 discount from the price of regular Shore Line East and **CT**TRANSIT passes.

- **Shore Line East/Metro-North UniRail**: The UniRail pass is a combined Shore Line East and Metro-North monthly pass. It provides unlimited travel on Shore Line East and Metro-North New Haven Line service, and provides a $44 to $48 discount from the price of individually purchased Shore Line East and Metro-North monthly passes.

- **Shore Line East/Amtrak:** Shore Line East monthly passes are accepted on selected Amtrak trains between New London and New Haven.

- **Metro-North/Connecting Bus UniTicket:** the UniTicket is a monthly pass available to Metro-North monthly pass holders that is valid on **CT**TRANSIT-New Haven bus service.[14] For trips to and from Milford and New Haven, a UniTicket

[14] *Until recently, this pass was valid only on* connecting *bus service: Routes D, F, D, Q, and Z at State Street Station, Route J at Union Station, and the Milford Commuter Connection and Milford Transit's Routes 2, 3, and 4 at Milford Station. Now the UniTicket is honored on all bus lines.*

with bus connections at one end is priced at $24. With bus connections at both ends, the cost is $41.

- **CTTRANSIT/Milford Transit District:** Milford Transit riders are permitted to transfer to **CT**TRANSIT routes for free. **CT**TRANSIT riders are permitted to transfer to Milford Transit service for 10¢.

- **Shoreline Shuttle/DATTCO S-Route:** The Estuary Transit District allows riders to transfer for free from DATTCO's S-Route to its Shoreline Shuttle. (Free transfers are not permitted in the opposite direction.)

2.10.2 Gaps in Joint Fare Arrangements

The joint fare arrangements described above cover many of the trips that are now made on multiple operators in South Central Connecticut. However, gaps in joint fare arrangements include:

- Metro-North – Milford Transit District Route 1
- Amtrak – Metro-North
- Amtrak – **CT**TRANSIT
- Shoreline Shuttle to DATTCO S-Route
- Shore Line East – DATTCO S-Route (DATTCO's S-Route, in effect, provides mid-day Shore Line East service, but Shore Line East passes are not accepted)

We note that, since the beginning of this study, two gaps that had been identified have been closed. **CT**TRANSIT-New Haven now accepts the Metro-North UniTicket and Shore Line East Monthly passes on all lines, rather than just than the six directly connecting routes.

2.10.3 Potential Joint Fare Improvements

There are a number of ways in which joint fares could be implemented, which range from the development of a regional transit pass, to the expansion of joint fares between individual operators.

Regional Pass

The implementation of a regional transit pass would involve a number operational, institutional, financial, and technical issues. These would be similar to those examined as part of the South Western Regional Planning Agency's Regional Transit Card Implementation Study.[15] That study determined that the development of a Regional Transit Card was feasible, and concluded that the use of "smart card" technology was the

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[15] *Regional Transit Card Implementation Study, South Western Regional Planning Agency, December 2001.*

best option. The cost of a smart card system in South Western Connecticut was estimated at $2.3 million (in 2001). The study also concluded that the implementation of a Regional Transit Card would take "several years," and that shorter-term benefits could be achieved through a phased approach.

Expansion of Individual Joint Pass Programs

A second approach to increasing joint fare opportunities would be to expand upon existing joint fare arrangements, and/or to create new individual joint fare programs. This approach could also be part of a phased approach toward the development of a Regional Pass. Opportunities would include:

- **Replacement of the Shore Line East Monthly Plus pass with a UniTicket** for connecting bus service. In conjunction with the UniRail pass, this would improve options for riders using both Shore Line East and Metro-North.

- **Permit Shore Line East passes to be used on DATTCO's S-Route.** This would provide Shore Line East commuters with passes valid for all day service, rather than just peak and shoulder period service.

- **Expanded Joint Fares with Amtrak.** Expanded joint fares with Amtrak could improve travel along the New Haven Line, between New London and New Haven, and between Meriden and New Haven.

2.10.4 Expected Impacts in South Central Connecticut

Analysis

Continued expansion of joint fare arrangements will improve convenience for existing transit users. We also expect that this strategy could increase ridership somewhat. Unfortunately, there is little data available regarding the elasticity of ridership to joint pricing, when the price itself is not affected. Chapter 12, *Transit Pricing and Fares*, of TCRP Report 95, provides a handful of case studies.

- In New York City between 1997 and 1999, a number of system changes were made including the introduction of free transfers between subway and buses. Weekday subway ridership increased 6.6% on weekdays and 11.5% on weekends. Bus ridership increased more dramatically, 26% and 27% on weekdays and weekends, respectively. Much of the bus ridership is attributed to pre-existing subway users who had previously walked to subway stations.
- Saint Petersburg, Florida, in the 1990s introduced an all-day pass prices at 2.5 times the base fare, and eliminated all transfer costs. Ridership rose 6% and farebox return was up by 8 percentage points in the first six months.
- In a survey in Atlanta, respondents who had bought a combined-system TransCard were asked their first, second, and third-most important reasons for

doing so. A total of 12.7% of respondents indicated their second reason was "easier to transfer"—this was the third most popular second reason, after saving money, and the convenience of not needing cash. Two percent of respondents listed transfer convenience as their first reason for buying a TransCard..

While these results reflect the importance of easy transfers to regular transit users, it bears pointing out that they are combined results, and also include the effects of pricing discounts. Establishing joint fare arrangements in the South Central Connecticut region will certainly help the system remain attractive to current users and draw new ridership. There is little evidence as to whether it would encourage use among "choice riders".

Recommendations

The expansion of joint fare arrangements might not result in significant ridership increases. However, they would certainly make the region's transit system easier to understand and use, and expand travel opportunities. Most could be implemented at very little cost; for example, the Metro-North UniTicket and Shore Line East Monthly Plus passes were recently revised to reflect the existing de-facto use of all **CT**TRANSIT local bus service simply by changing the official policy and publishing new information. Now that this change has been made, pass options could be simplified by simply changing the name of the Shore Line East Monthly Plus pass to "UniTicket."

Expanded joint fares with Amtrak would require a much greater level of effort, and based upon similar arrangements elsewhere, Amtrak would need to be reimbursed for all or part of the difference between the Amtrak fare and local fares. However, such an arrangement could be a relatively simple way to expand the regional rail network.

We recommend continued pursuit of these combined fare arrangements as opportunities arise. Planning agencies should encourage and support such efforts. Operational, institutional, financial, and technical issues surrounding the Regional Pass should continue to be addressed with the goal of eventually phasing in the concept.

3 Conclusions

The Regional Transit Development Strategies Study (RTDS) was initiated by South Central Regional Council of Governments to examine how the existing network of transit services in the region currently works, and to develop strategies to improve transit and address the region's future transit needs. This study has investigated transit needs in the region, identified solutions for improving the efficiency and effectiveness of transit, and recommend near and mid-term strategies that are cost effective and based on community and stakeholder consensus.

Improving transit in the region is important for many reasons, including expectations of continued growth in highway congestion and transportation equity. In identifying strategies, we have focused on the concept that transit service should be concentrated in areas where frequent and reliable service can be provided. Routes should be direct and designed to be cost and/or time competitive with automobiles if possible. The goals of improved transit include both increasing ridership, and assuring that resources provide the most efficient and effective transit service possible.

3.1 Recommendations

In the interest of improving ridership and enhancing the success of transit in South Central Connecticut, a number of promising strategies have been identified. These strategies are summarized in Table 3.1-1.

Improvement strategies recommended as high priorities have low or insignificant costs of implementation and expected impacts on ridership that are positive or strongly positive. These strategies involve reconfiguring existing routes via restructuring, reconnecting legs, or converting to rider request. Almost all of these changes can be made by the transit providers following public input, and need not involve other entities. The one exception is the facility development part of Hub & Spoke system development. This will require a thorough planning process to determine feasible hub locations, secure capital funding, and develop the facilities, and is a long-term strategy. Hub development could be considered a lower priority, but the hub locations must be considered in the short term as service changes are designed, so that significant routing changes are not needed when hub facilities are developed.

Medium priority improvements generally have higher costs of implementation but are expected to generate significant improvements in ridership. Most of these involve capital costs – reconfiguring intersections for rapid bus service, more developed bus stops, and new park & rides. Some joint fare arrangements could be done with limited expenditure, but these are expected to benefit existing passengers, without generating significant ridership growth.

Table 3.1-1: South Central Connecticut Regional Transit Development Strategies Summary

Recommendations

	Implementation Timeframe			Ridership Impacts			Financial Impacts			Service Impacts							Notes
	Short	Medium	Long	Benefit Existing Riders	Attract New Riders	Model / Quantitative Estimate	Operating Costs	Capital Costs	Overall System Productivity	Expand Service/ Fill Gaps	More Convenient/ Comfortable	Simpler/ More Understandable	Fewer Transfers	Faster Service	More Frequent Service	Solves Capacity Constraints	
High Priority																	
Route Simplification	■			↑↑	↑↑	10-20%	–	–	↑	–	↑↑	↑↑	–	↑↑	↑	–	
Development of Hub and Spoke System						10-20%											
Service Changes	■			↑↑	↑↑		↑	↑	↑	↑	↑↑	↑↑	↑↑	↑	–	–	
Hub Facility Development		■	■	↑↑	↑		↑	↑↑↑	↑	–	↑↑	–	–	–	–	–	
Consolidate stops	■			↑↑	↑	5-20%	–	–	↑	–	–	↑	–	↑	–	–	
Consolidate New Haven Shuttles	■			↑	↑	about 100%	↑	–	↑	–	↑	↑	–	–	–	–	
Rider-Request Service	■			↑	↑	about 20%	↓	–	↑	↑	↑	–	–	–	–	–	
Medium Priority																	
Bus Stop Improvements	■	■		↑↑	↑	5-10%	↑	↑↑	↑	–	↑↑	–	–	↑↑	–	–	
"Rapid Bus" Service (excluding stop consolidations)		■	■	↑↑	↑↑	10-20%	–	↑↑↑	↑	↑	↑↑	↑	–	↑↑	↑	–	TSB Rec
Park and Ride Expansion (at rail sites)																	
West Haven or Orange		■	■	↑	↑↑	10-15%	↑	↑↑↑	↑	↑↑	↑↑	–	–	↓	–	↑↑	TSB Rec
Expand Joint Fares	■	■		↑	↑	–	↑	–	–	–	↑	↑	–	–	–	–	TSB Rec
Low Priority																	
Improved Bus-Rail Connections	■			↑	–	–	↑	↑	↑	–	↑	↑	–	↑	–	–	
Parking Expansion																	
New Park and Ride Lots	*To be determined*			↑↑	↑↑	–	↓	↑↑	↑	↑↑	↑↑	↑	–	–	–	↑↑	
Initiatives Underway or Studied Elsewhere																	
New Haven - Hartford - Springfield Commuter Rail		■	■	↑↑	↑↑		↑↑↑	↑↑↑	–	↑↑	↑↑		↑↑	↑↑	↑↑		TSB Rec
Parking Expansion																	
New Haven (in progress)	Underway			↑↑	↑↑		↓	↑↑↑	↑	–	↑↑	–	–	–	–	↑↑	TSB Rec
Milford		■		↑↑	↑↑		↓	↑↑↑	↑	–	↑↑	–	–	–	–	↑↑	TSB Rec
Provide Better Transit Information	Underway			↑	↑		↑	↑	↑	–	–	↑	–	–	–	–	TSB Rec

Key:

Service and Productivity Impacts

- ↑↑ = Strongly Positive
- ↑ = Positive
- – = Neutral/No significant impact
- ↓ = Negative
- ↓↓ = Strongly Negative

Financial Impacts

- ↑↑↑ = Large Increase/High Cost
- ↑↑ = Moderate Increase/Moderate Cost
- ↑ = Low increase/Low cost
- – = No significant impact/cost
- ↓ = Small reduction
- ↓↓ = Moderate reduction
- ↓↓↓ = Large reduction

Rapid bus improvements listed as medium priority include queue-jump lanes and signal prioritization. We recommend stop consolidation be carried out as a higher priority, as this can be done with less coordination or capital funding. Park & Ride locations at high-productivity transit lines are a medium priority.

Bus-rail coordination is listed as a low-priority improvement, because it is not expected to generate much new ridership, and would be accomplished via the consolidation of downtown New Haven shuttles. However, further coordination would involve route restructuring that would not be particularly expensive. If the shuttle reconfiguration indicates that demand for service to Union Station is still unmet – e.g. if there is high peak ridership on the consolidated shuttle to/from Union Station – it may be worthwhile to experiment with reconfigurations that would add more service.

Table 3-1 lists a number of transit initiatives that are underway or are being studied elsewhere, which are discussed in Section 1.4 of this report. As the recommendations of this report are pursued, SCRCOG and providers will need to coordinate with efforts surrounding these improvements.