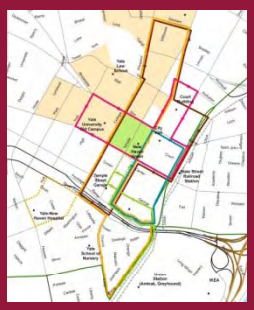
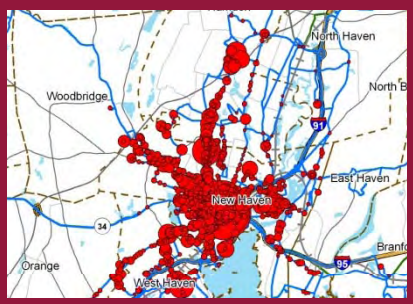
Implementation of the Regional Transit Study

Final Report

South Central Regional Council of Governments

July 2008





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1.0 EXECUTIVE SUMMARY

This report was developed as part of an effort to advance the work begun by the 2005 Regional Transit Study into the next stage of implementation. The Regional Transit Study was completed by the South Central Region COG in April 2005. Its purpose was to examine existing transit services and develop strategies for improvements. The study proposed 10 specific strategies and categorized the recommended strategies into high, medium, and low priority groups. This implementation project was established to develop specific implementable applications of four high-priority strategies: 1) route simplification, 2) establish a hub system, 3) consolidate/coordinate downtown New Haven shuttles, and 4) establish new flex route services.

This project assembled recent information on ridership, employment, major downtown and suburban destinations, and relevant planned developments in the region that would be needed in order to develop implementable applications of the high-priority strategies. Remaining efforts focused on evaluating different downtown shuttle options, developing route simplification actions in concert with new transit hubs, and prioritizing potential service areas as candidates for new flex route services.

Six downtown shuttle options were analyzed, all aimed at eliminating overlap between shuttle services and making the system simpler while continuing to serve existing shuttle markets and providing better service to potential new markets at Union Station and in the Medical Area. Either of two options, shown in Figure 1-1, could be implemented. It is recommended that Connecticut DOT and the City of New Haven identify potential additional funding partners and determine the most appropriate downtown shuttle options given the availability of funding and the desirability of a direct connection between the Medical Area and downtown. A single route connecting Union Station to downtown and to the Medical Area, replacing existing shuttle services, could be implemented at a net annual operating cost of about $530,000, or a bi-directional loop providing all connections among Union Station, downtown and the Medical Area, could be implemented at a net annual operating cost of about $1.18 million.

Proposed route simplifications are shown in Figures 1-2 through 1-6. The proposed changes in Figures 1-2 and 1-3 would restructure some service on the west side of New Haven to establish a more consistent route network at all times of day and all days of the week. Route Q Edgewood would be enhanced to serve the Chapel/George corridor, Westville Center and Amity Shopping Center at all times and would provide new evening service. The West Hills area would be served by Route B Whalley at all times and Route B would see fewer evening route variations. New transit hubs would be established at Westville Center and at Putnam and Dixwell, the latter served by an extended Shelton Avenue route and by evening service on Route O Winchester.

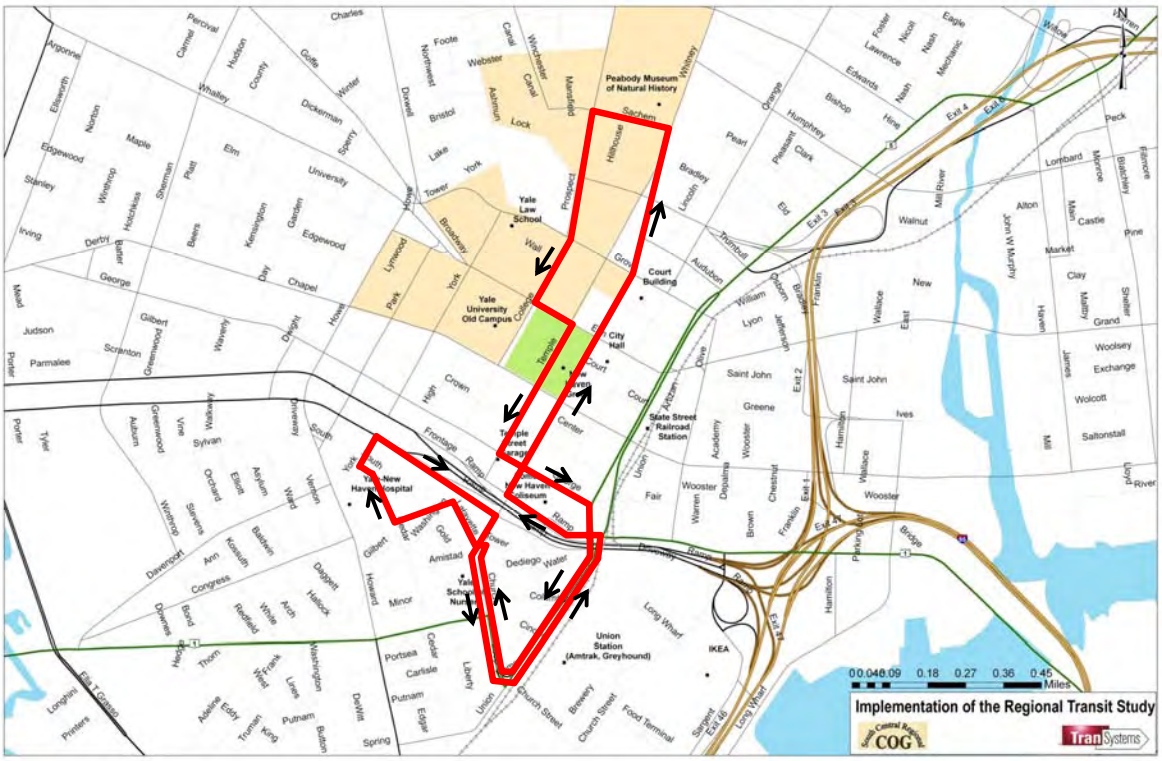
In Hamden, shown in Figure 1-4, a hub would be established at Hamden Plaza with connections between Routes D and J. The outer end of Route D would be simplified and Route J weekend service would be made consistent. In Fair Haven, all Route D service (as shown in Figure 1-5) would be extended to a new hub at or near Wal-Mart on Foxon Boulevard in order to provide more frequent service between Ferry Street and Wal-Mart and to reduce overcrowding on some Route D trips. Foxon Road would be served by an extended Route Q instead of Route D and the Route C midday local service would be merged into Route D. Route C peak period service would be simplified, as shown in Figure 1-6.

The route simplification actions would help to attract new riders by creating a more consistent, easy to understand, route system. Some existing riders would be positively affected while others would be affected in neutral or negative ways. The proposed changes would require an additional four peak vehicles and would result in an increase in CTTransit annual operating costs of approximately $630,000.

The study also prioritized potential areas for new flex route services in the region, screening the areas based on a set of evaluation criteria. Areas in Wallingford, Orange and East Haven were identified as having the highest potential for new flex route services. Initial designs are proposed for services in each of these areas. Each would use a single vehicle to provide hourly service at an annual operating cost of approximately $200,000.

Figure 1-1: Recommended Downtown Shuttle Options

Option 5



Option 6

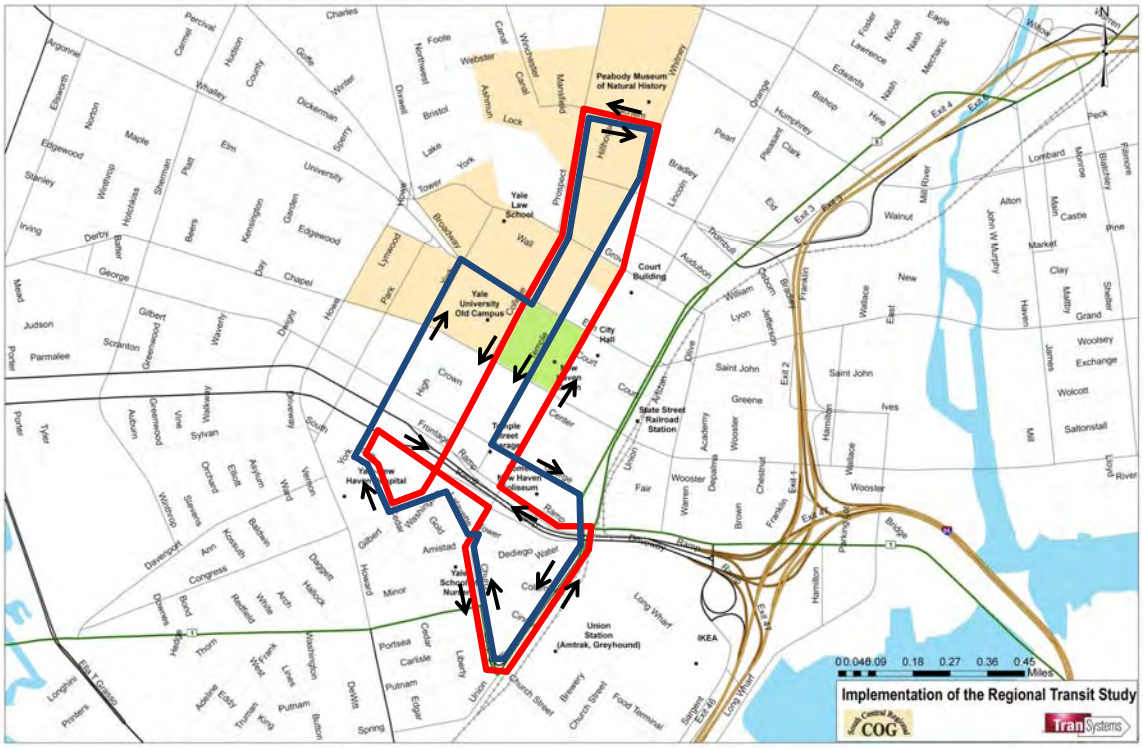


Figure 1-2: Proposed Route F and Q Changes

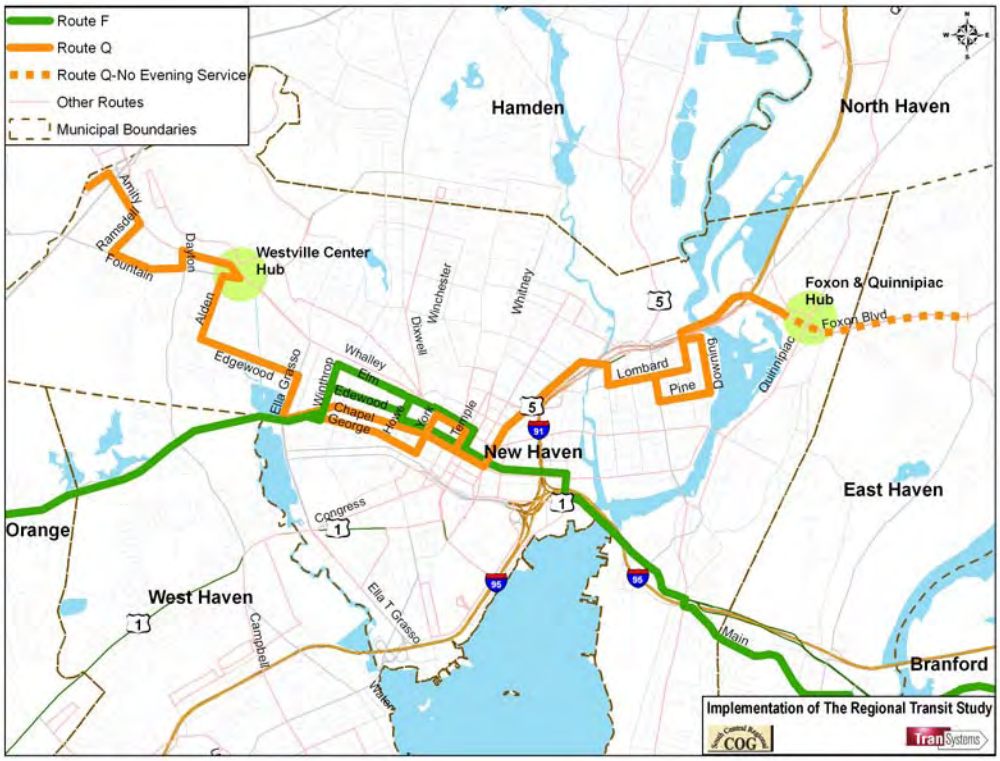


Figure 1-3: Proposed Route B, G, and Z Changes

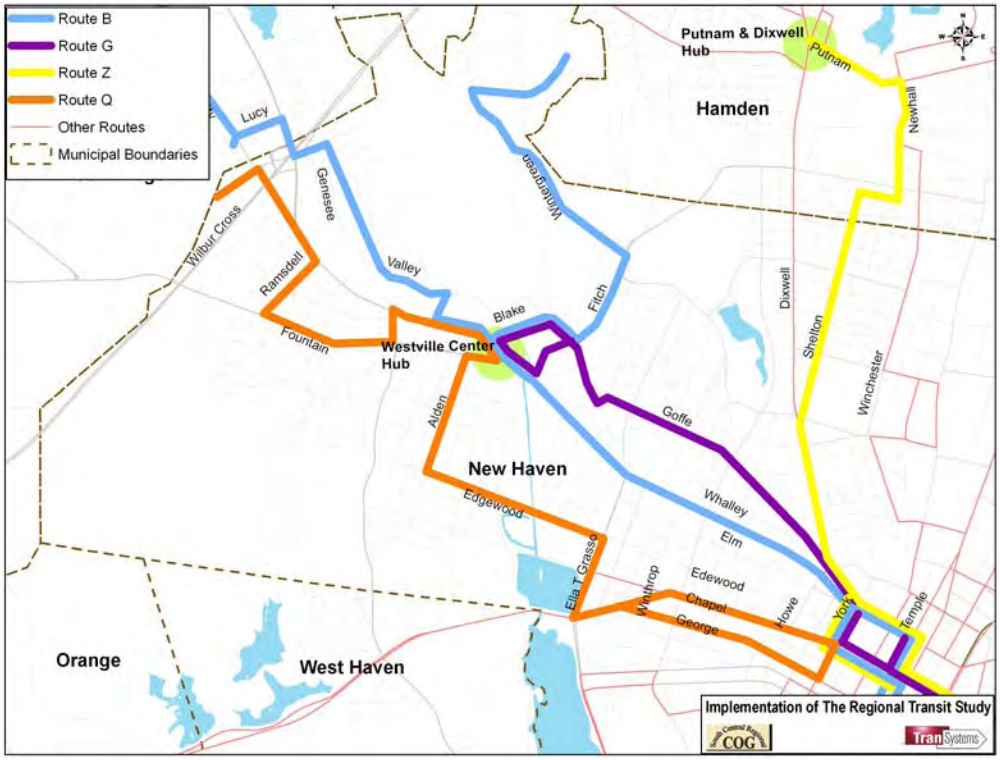


Figure 1-4: Proposed Route D, J, and O Changes

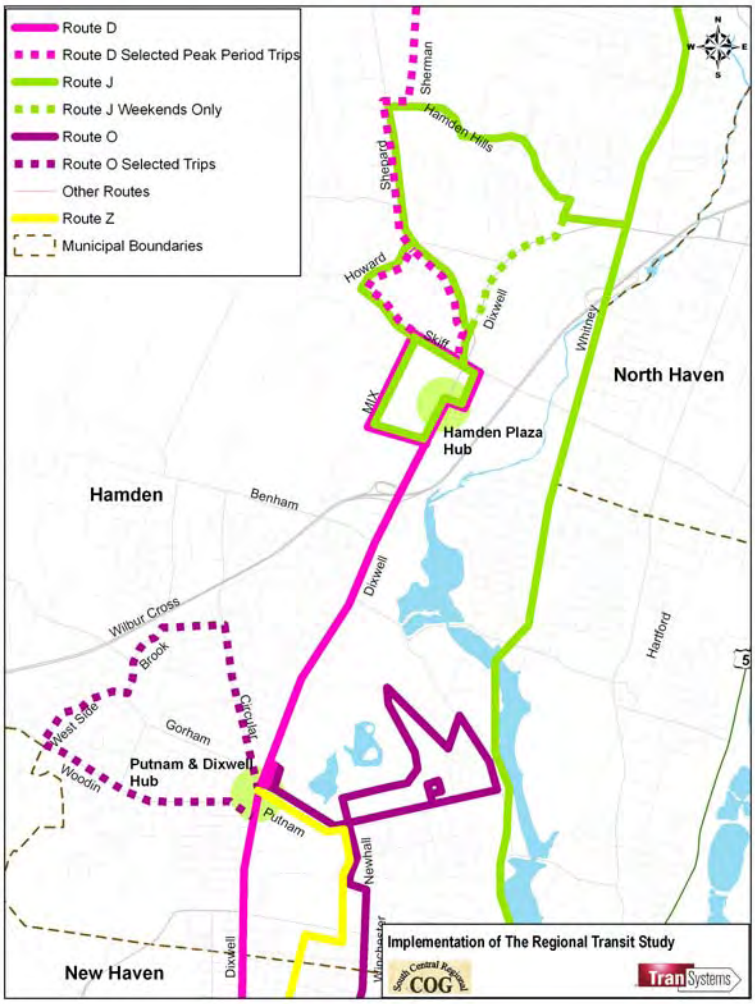


Figure 1-5: Proposed Route D Changes

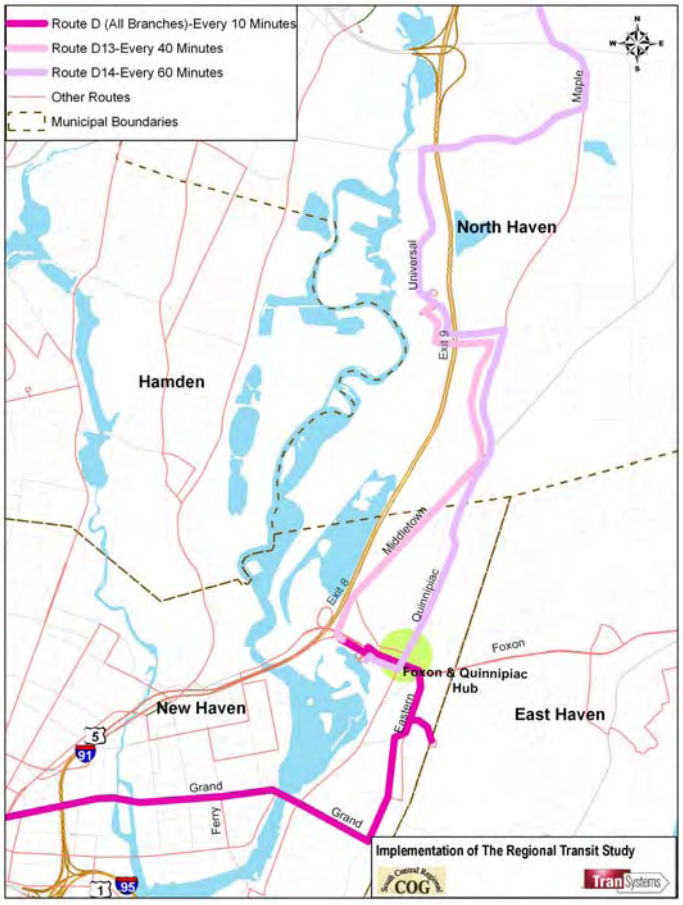
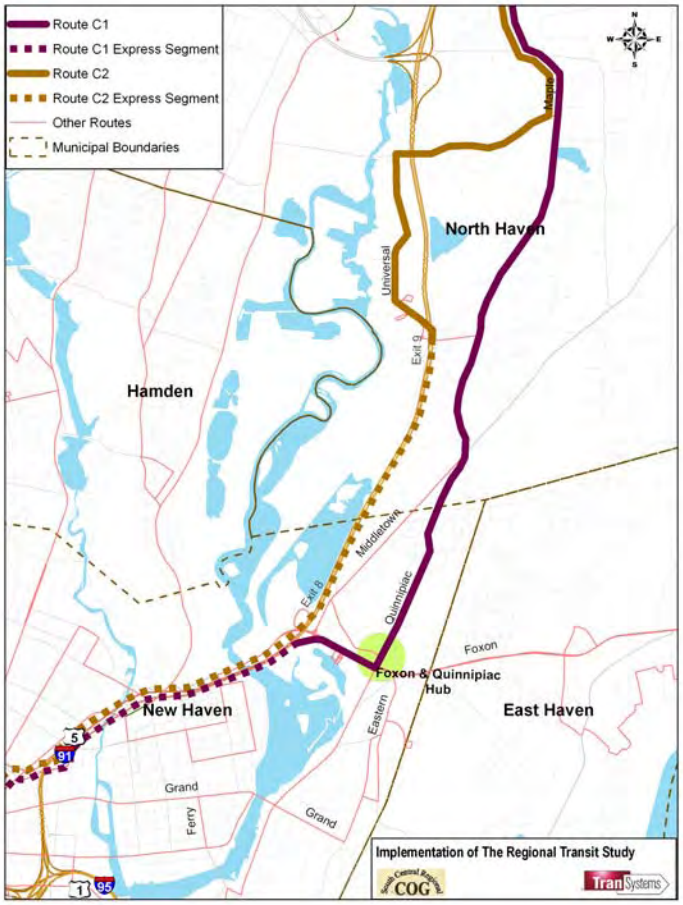


Figure 1-6: Proposed Route C Changes



2.0 INTRODUCTION

This report was developed as part of an effort to advance the work begun by the 2005 Regional Transit Study into the next stage of implementation. The Regional Transit Study was completed by the South Central Region COG in April 2005. Its purpose was to examine existing transit services and develop strategies for improvements. The study developed a variety of strategies and ultimately narrowed the list down to 10 specific strategies. It evaluated conceptual ridership, financial, and service impacts of each strategy. After an extensive stakeholder and public involvement process, the study categorized the recommended strategies into high, medium, and low priority groups.

This implementation project was established to develop specific implementable applications of four high-priority strategies:

- Route Simplification
- Hub and Spoke System
- Consolidated/Coordinated Downtown New Haven Shuttles
- Flex Route Service

The project scope of work included general tasks for initial data gathering, Transit Advisory Group (TAG) involvement, and public involvement. Three tasks were devoted to developing the applications of the four strategies. Task 4 focused on consolidation and coordination of downtown New Haven shuttles. Task 5 focused on route simplification and implementation of transit hubs. Task 6 focused on identifying the next areas to implement flexible services following the implementation of the North Branford R-Link. An additional task, not covered by this report and documented under a separate cover, focused on examining the feasibility of establishing a modern streetcar in new Haven.

The following sections document the analyses and recommendations of the project. Section 3 documents the background and supporting data gathered as a supplement to the data gathered for the Regional Transit Study. The next three sections cover project recommendations. Section 4 covers the consolidation of downtown shuttles. Section 5 covers transit hubs and route simplification. Section 6 covers potential flex routes. Finally, Section 7 summarizes the project recommendations and presents preliminary implementation plan.

3.0 PROJECT BACKGROUND AND SUPPORTING DATA

This section presents a summary of the data on existing services assembled for the Implementation of the Regional Transit Study project. It covers transit services and ridership, employment, major downtown and suburban destinations, and relevant planned developments in the South Central Region of Connecticut. This is not intended to be an exhaustive catalog of existing conditions. An exhaustive summary was included in the *Existing Conditions Report* for the Regional Transit Development Strategies Study in December 2004. The purpose of this section is rather to provide a snapshot of current transit services, ridership, and development, highlighting key changes that have occurred since the Regional Transit Study was completed. The focus of the effort was to collect specific information needed for analyzing downtown shuttle operations, identifying possible hubs and opportunities for route simplification and developing applications of flex routes in the area.

3.1 Current Transit Services and Ridership

The South Central Connecticut region is served by a wide variety of transit services, including fixed-route bus service, paratransit service, two commuter rail services, intercity rail service, and intercity bus service. The majority of the information is on CT Transit New Haven Division services, because these services were the primary focus of the Regional Transit Study and are the main emphasis of the current implementation project.

The project team gathered the following information about existing transit services and ridership to provide input for its efforts:

- Current maps and schedules for all CTTransit New Haven, Meriden, and Wallingford Division routes, GNHTD-operated downtown shuttles, Milford Transit routes, Shore Line East trains, the Metro-North New Haven Line trains, Amtrak trains, and Greyhound, Peter Pan, and Bonanza intercity buses
- Route-level ridership data for all CTTransit New Haven Division routes and for GNHTD-operated downtown shuttles
- On-off count data by stop for all CTTransit New Haven Division routes (similar data for the GNHTD-operated downtown shuttles is not available)
- A sample of pass boardings and transfer data for all CTTransit New Haven Division routes
- Route profile information for all CTTransit New Haven Division routes and GNHTD-operated downtown shuttles including service hours and service-miles
- Vehicle block and headway sheets for all CTTransit New Haven Division routes
- Operating costs data for CTTransit New Haven Division routes and GNHTD's downtown shuttles
- Ridership information (a database of individual trip origins, destinations, dates and times) for GNHTD-operated paratransit services including Regional Rides, ADA, Jobs Access, and Dial-A-Ride trips
- Qualitative information and documents provided by SCRCOG on the Regional Transit Study and follow-up efforts and input

A summary of this data is presented below.

3.1.1. CT Transit New Haven Division Fixed Route Bus Services

The largest provider of fixed-route bus services in the South Central Connecticut region is the New Haven Division of Connecticut Transit. Connecticut Transit (CTTransit) is the Connecticut Department of Transportation (ConnDOT)-owned bus service. Funding for CTTransit is provided by ConnDOT and through the fare revenues collected. Funding levels are determined by the state budget and ConnDOT determines the overall service levels that are provided. Several companies operate services in metropolitan areas throughout Connecticut under contract to ConnDOT.

The CT TRANSIT New Haven Division serves the greater New Haven area including a number of towns from Milford in the West to Branford in the East, and from Meriden in the North to the Long Island Sound in the South. Figure 3-1 shows the area of coverage by the CT TRANSIT New Haven Division. Figure 3-2 is a closer-up view of the core CT TRANSIT service area. Figure 3-3 is an image of the CT TRANSIT New Haven Metro Area System Map. These images show that the general pattern of the services is radial from the regional and core area perspectives. This indicates that riders may have to travel to the inner part of the core area in order to make connections to destinations that are geographically close to their origin. They also show that there are numerous variations for some routes. This suggests a potential for simplification of routes.

Table 3-1 lists the existing CT TRANSIT New Haven Division routes and hours of service. In the New Haven Division, CT TRANSIT provides a total of 859 revenue hours of service on weekdays, and 496 and 176 revenue hours of service on Saturdays and Sundays, respectively. The most intensively served routes include Route B, D, J, and O (the O-Route 1 side only), which have more than 50 revenue hours of service during weekdays and more than 30 revenue hours during Saturdays. Route D has the highest amount of service (102 and 56 revenue hours for weekday and Saturday, respectively).

Table 3-2 shows the current route level ridership for a typical day. There are a number of routes with daily boardings greater than 1,000 for both weekdays and Saturdays. These include both sides of Route B (B-Congress Ave/West Haven and B-Whalley Ave), both sides of Route D (D-Dixwell Ave and D-Grand Ave), Route F-West Chapel/Rte.34, Route J-Savin Rock/Milford, and the western side of Route O (O-Route 1).

Figure 3-4 shows the magnitude of ridership by stop on CTTransit New Haven Division routes in the core CTTransit New Haven Division service area. This map shows weekday boardings based on CTTransit count data from 2006 through 2008. Based on these figures, some characteristics of the current demand can be observed:

- As would be expected, the City of New Haven has the highest level of demand and the most high-volume stops; a few stops within this area have more than 500 boardings per day.
- There are quite a few locations with high levels of boardings outside of the city of New Haven; these include the Hamden Plaza area, West Haven Center, and the CT Post Mall.
- There are quite a few places where large demand stops are located at the intersection of several routes, or where several medium-volume stops are clustered near each other and near the intersection of several routes. These locations could be good candidates for developing future service hubs.

In addition to CT TRANSIT New Haven Division fixed-route bus services, several other fixed-route local and commuter bus services operate in the South Central Connecticut region.

Transfer patterns were assessed by obtaining raw data from CTTransit representing the approximately 33,000 transfers slips used during a one week period in October, 2007. Data on pass usage was also obtained for the same period and used to identify approximately 15,000 trips meeting the criteria for being considered a “transfer” trip. Finally on/off counts were used to identify through-riders on each of the through-routed services. These data were used to develop a transfer matrix for New Haven representing approximately 10,000 daily transfers and through trips passing through downtown New Haven. This matrix is shown in Table 3-3. In the table, routes are referenced by their CTTransit two-letter code. Through trips are shaded.

3.1.2. Other Fixed Route Bus Services

There are a number of other fixed-route bus services in the South Central Connecticut region. In addition to the CTTransit New Haven Division, there are services provided by the CTTransit Meriden and Wallingford Divisions, Milford Transit District, and DATTCO.

Figure 3-1: CTTransit New Haven Division Regional Service Area

Figure 3-2: CTTransit New Haven Division Core Service Area

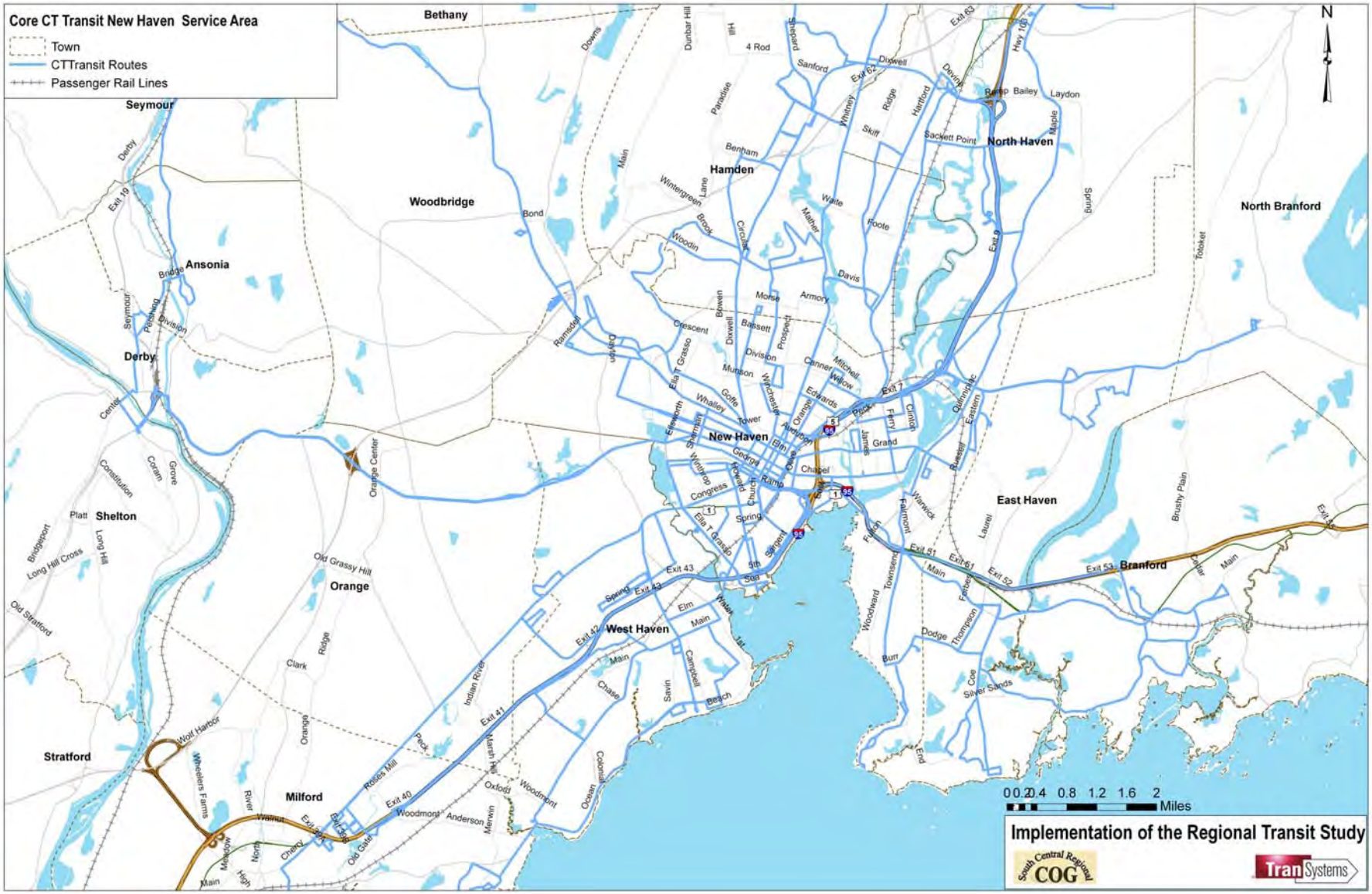


Figure 3-3: CTTransit New Haven Metro Area System Map

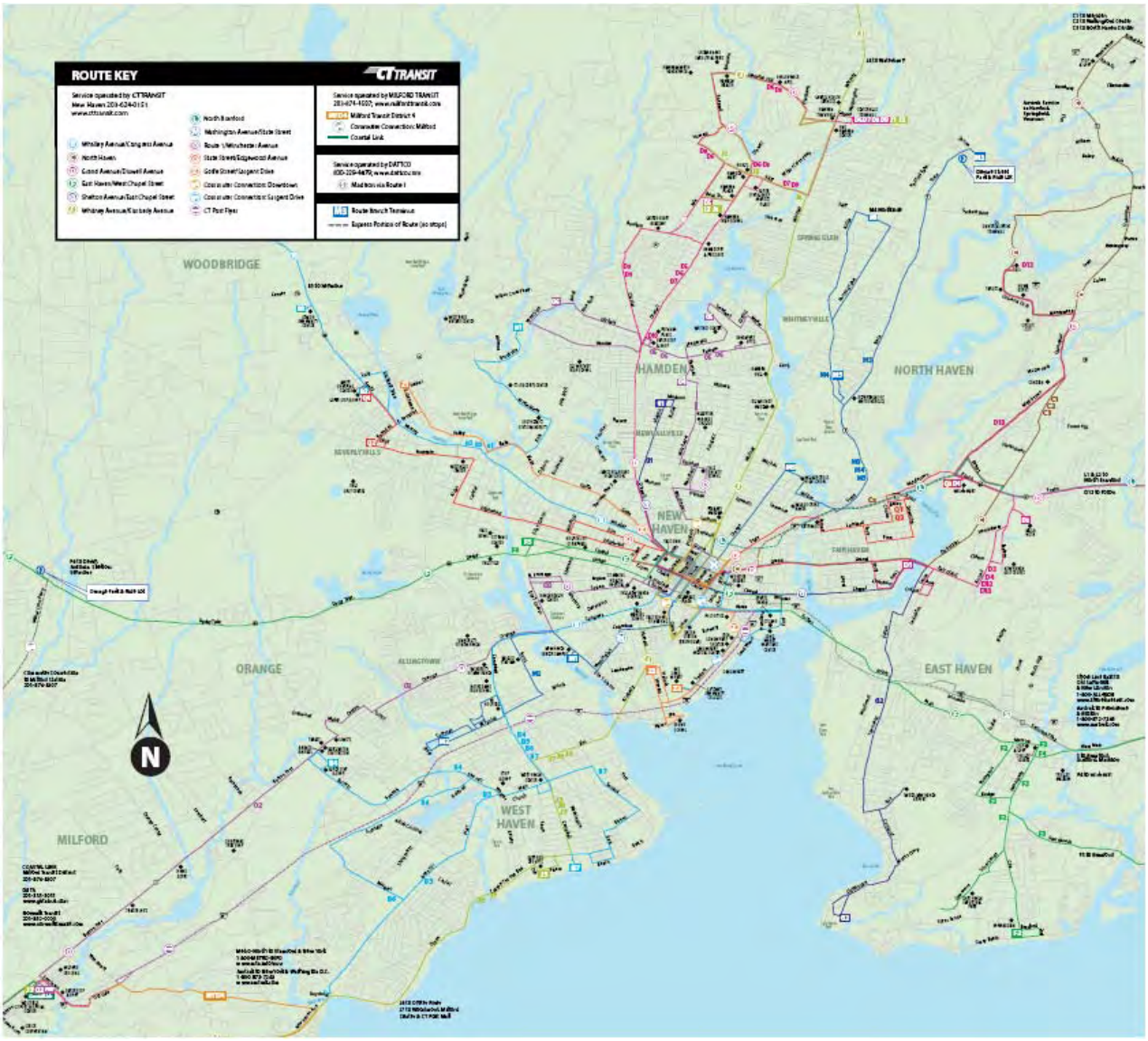


Table 3-1: CTTransit New Haven Division Routes and Hours of Service

Route	Name	Weekday	Saturday	Sunday
NH-BC	B-CONGRESS AVE/WEST HAVEN	72h04	41h08	23h14
NH-BW	B-WHALLEY AVE	75h42	36h16	13h58
NH-C	C-NORTH HAVEN	45h00	17h23	5h16
NH-DD	D-DIXWELL AVE	102h32	56h14	23h21
NH-DG	D-GRAND AVE	78h41	52h53	20h48
NH-FE	F-EAST HAVEN	32h28	21h24	0
NH-FW	F-WEST CHAPEL/RTE. 34	42h33	30h30	0
NH-GL	G-EAST CHAPEL ST	28h44	16h38	9h21
NH-GS	G-SHELTON AVE	11h23	7h47	0
NH-JK	J-SAVIN ROCK/MILFORD	50h14	36h41	11h59
NH-JW	J-WHITNEY AVENUE	53h37	30h30	27h59
NH-L1	L-ROUTE 80	3h23	0	0
NH-MS	M-STATE STREET	26h16	9h00	0
NH-MW	M-WASHINGTON AVE	28h06	11h08	0
NH-OS	O-ROUTE 1	66h40	65h41	18h27
NH-OW	O-WINCHESTER AVE	27h08	13h09	6h15
NH-QB	Q-EDGEWOOD AVE	30h07	18h08	8h29
NH-QL	Q-STATE ST	25h48	14h23	7h02
NH-SLCA	SLE-COMMUTER CONNECTION-DOWNTOWN-AM	2h03	0	0
NH-SLCP	SLE-COMMUTER CONNECTION-DOWNTOWN-PM	3h36	0	0
NH-SLSC	SLE-COMMUTER CONNECTION-SARGENT DR	3h14	0	0
NH-TS	TS-TEMPLE STREET GARAGE SHUTTLE	7h00	0	0
NH-ZS	Z-SARGENT DRIVE	20h31	6h08	0
NH-ZW	Z-GOFFE STREET	22h24	10h32	0

Table 3-2: CTTransit New Haven Division Daily Boardings

Route	Name	Weekday	Saturday	Sunday
NH-BC	B-CONGRESS AVE/WEST HAVEN	3781	1926	1296
NH-BW	B-WHALLEY AVE	4258	2481	647
NH-C	C-NORTH HAVEN	1225	453	86
NH-DD	D-DIXWELL AVE	6482	4614	2120
NH-DG	D-GRAND AVE	3749	2957	1471
NH-FE	F-EAST HAVEN	1097	682	0
NH-FW	F-WEST CHAPEL/RTE. 34	1800	1206	0
NH-GL	G-EAST CHAPEL ST	939	424	501
NH-GS	G-SHELTON AVE	571	367	0
NH-JK	J-SAVIN ROCK/MILFORD	2321	1415	414
NH-JW	J-WHITNEY AVENUE	1783	809	196
NH-L1	L-ROUTE 80	49	0	0
NH-MS	M-STATE STREET	1127	445	0
NH-MW	M-WASHINGTON AVE	1507	448	0
NH-OS	O-ROUTE 1	2783	2543	603
NH-OW	O-WINCHESTER AVE	986	511	180
NH-QB	Q-EDGEWOOD AVE	1038	692	382
NH-QL	Q-STATE ST	1264	637	192
NH-SLCA	SLE-COMMUTER CONNECTION-DOWNTOWN-AM	64	0	0
NH-SLCP	SLE-COMMUTER CONNECTION-DOWNTOWN-PM	55	0	0
NH-SLSC	SLE-COMMUTER CONNECTION-SARGENT DR	46	0	0
NH-TS	TS-TEMPLE STREET GARAGE SHUTTLE	158	0	0
NH-ZS	Z-SARGENT DRIVE	1160	244	0
NH-ZW	Z-GOFFE STREET	1040	311	0

Note: The figures above represent average daily boardings based on survey samples from 2006 to 2008.

Figure 3-4: CTTransit New Haven Division Daily Boardings by Bus Stop

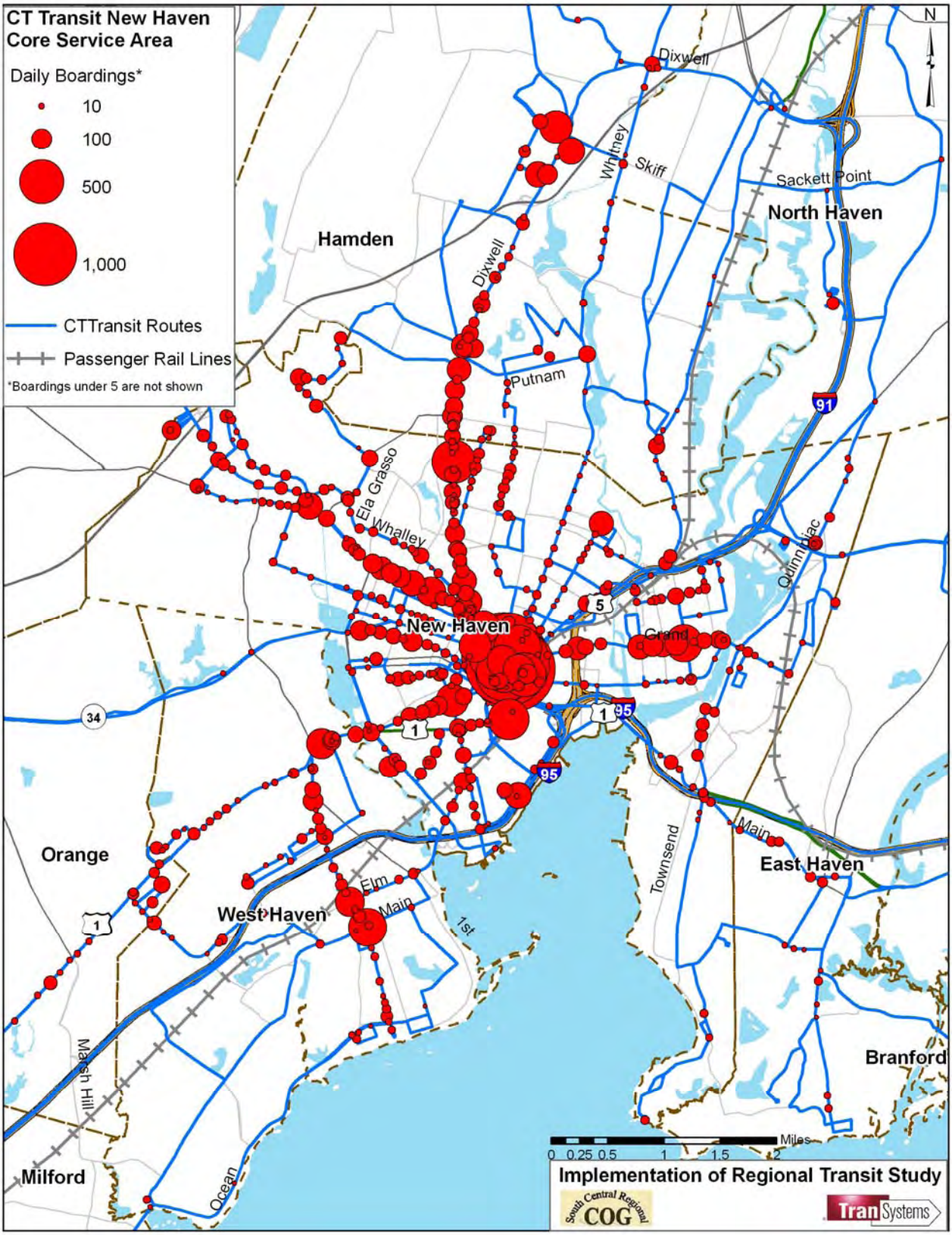


Table 3-3: CTTransit New Haven Division Weekday Transfer Matrix

	Route To																							
Route From	BW	BC	C	DD	DG	FE	FW	GS	GL	ZW	ZS	JK	JW	L1	MS	MW	OS	OW	QL	QB	CCD	CCS	TS	Grand Total
BW	-	275	36	151	109	23	27	18	27	16	31	78	43	1	48	51	85	21	27	18	1	-	1	1,088
BC	243	-	31	171	95	33	51	24	34	25	37	45	24	1	38	31	71	22	39	25	-	0	1	1,042
C	34	51	-	44	-	10	17	5	3	7	12	17	11	1	11	18	19	8	6	6	1	1	-	284
DD	130	139	30	-	152	32	63	-	21	29	48	79	26	2	41	80	100	15	44	24	1	0	0	1,058
DG	108	131	-	253	-	28	50	4	13	24	35	52	29	-	24	72	88	18	17	18	1	-	0	965
FE	30	44	11	36	31	-	44	7	-	4	17	15	9	-	9	24	26	8	13	8	0	-	1	337
FW	22	37	10	60	40	50	-	9	11	7	21	23	12	-	13	24	16	16	11	4	-	0	-	385
GS	17	23	7	-	9	6	11	-	45	5	8	7	6	0	8	15	12	4	5	3	1	0	-	193
GL	32	40	7	36	8	-	14	12	-	9	21	8	6	-	11	15	35	8	5	7	0	0	-	275
ZW	18	22	6	39	25	10	9	3	7	-	149	9	10	-	10	18	29	4	14	4	-	3	-	389
ZS	26	28	9	53	34	11	18	12	13	91	-	11	7	0	11	12	23	7	19	14	-	-	-	400
JK	43	46	13	68	45	12	18	8	12	8	9	-	80	-	17	11	24	20	16	6	-	-	0	457
JW	42	37	9	29	24	9	21	4	6	7	7	115	-	0	7	17	14	7	10	9	0	0	1	375
L1	3	2	0	2	0	-	0	1	-	1	0	0	-	-	0	0	1	0	0	0	-	-	-	13
MS	34	34	12	50	26	13	18	9	13	16	13	20	13	-	-	60	21	11	9	12	-	-	-	384
MW	44	28	20	70	62	18	22	13	14	18	10	13	17	1	51	-	19	10	22	9	-	0	0	460
OS	57	60	13	87	76	15	15	11	16	16	23	15	17	1	20	9	-	76	27	16	-	-	0	570
OW	26	29	8	26	15	9	14	4	5	5	13	18	6	0	13	14	154	-	11	8	-	-	0	378
QL	30	36	7	46	13	9	14	4	3	15	22	16	7	-	6	21	33	9	-	41	-	-	0	332
QB	13	27	5	37	14	7	5	4	3	4	16	15	8	0	8	14	19	6	47	-	0	0	-	251
CCD	3	1	0	3	1	0	1	1	1	0	-	0	0	-	1	0	1	1	-	0	-	-	-	15
CCS	0	0	-	-	0	-	-	-	-	0	-	0	-	-	-	-	0	0	-	-	0	-	-	2
TS	15	11	0	14	8	2	3	1	3	2	1	1	1	-	1	0	4	3	1	3	-	-	-	74
Grand Total	970	1,103	232	1,275	789	298	436	155	248	307	493	557	333	8	350	506	794	275	343	237	6	6	5	9,726

Milford Transit District

The Milford Transit District serves the City of Milford with fixed route bus service and ADA van service. The agency operates three local routes (Routes 2, 3, and 4) which run Monday through Saturday and serve the CT Post Mall, The Dock, Westshore, Woodmont, and other areas. Milford Transit also jointly operates the Coastal Link (with Greater Bridgeport Transit and Norwalk Transit), which operates 7 days a week.

CT TRANSIT Meriden and Wallingford Division

The CT TRANSIT Meriden and Wallingford Divisions operate local fixed route services in their respective areas through a contract with Northeast Transportation Company, with a total of 4 routes. Three local routes (Routes A, B, and C) operate in Meriden, focusing on the Meriden rail station, downtown Meriden, the Westfield Shoppingtown mall, Midstate Medical Center, and residential areas in Meriden. One local route, the Wallingford Local, serves the Town of Wallingford, focusing on the Wallingford town center, the rail station, and nearby commercial and residential areas.

DATTCO Service

DATTCO is a private transportation company based in New Britain, CT that operates several state-subsidized commuter routes in southern and central Connecticut. These include the S route, which operates on weekdays between downtown New Haven, Branford, Guilford, and Madison, and the New Haven-Hartford Express, which runs on weekdays between the two cities with intermediate stops in Middletown and Wethersfield.

3.1.3. Downtown New Haven Shuttles

The City of New Haven, in partnership with the Greater New Haven Transit District (GNHTD), operates two free shuttle routes within the downtown New Haven area: the Downtown Electric Trolley and the Downtown Parking Shuttle. CTTransit operates two shuttle routes connecting to the two downtown rail stations, the Commuter Connection Downtown and the Temple Street Garage Shuttle. The alignments of these routes are shown in Figure 3-5 and their service is summarized in Table 3-4. Routes in the map are color-coded to match those in Table 3-4. Table 3-5 shows the current annual operating cost for each service. Costs are based on actual 2007 annual hours and miles and on current CTTransit costs and GNHTD hourly rates.

GNHTD operates the Downtown Electric Trolley along a one-way loop following Chapel, York, Elm, and State streets with an extension up to Audubon Street between Church and Orange. The trolley serves State Street Station, the New Haven Green, the Yale Old Campus, the arts district on Audubon Street, and the McQueeny Apartments senior housing complex. Service is offered approximately every 15 minutes six days a week during the mid-day and afternoon peak periods (from 11 a.m. through 6 p.m.). No service is provided before 11 a.m. The downtown Electric Trolley operates with two vehicles throughout its seven-hour period of operation. The vehicles on the route are unique electric powered replica trolleys owned by the City of New Haven. While they are non-polluting electric vehicles, they are limited in the amount of time they can operate between charges and they are nearing the end of their useful life. The service is financed by the City of New Haven through revenues from parking facilities.

The Downtown Parking Shuttle operates in a loop along State Street, North Frontage Street, Church Street, and Elm Street, primarily transporting employees of United Illuminating and New Alliance Bank from parking areas along North Frontage Street to their workplaces along Church Street. Service is provided weekdays from 7 a.m. through 9 a.m. and 4 p.m. through 6 p.m. The GNHTD downtown parking shuttle operates with a single “cutaway” van type vehicle. Service is provided for a limited two-hour period in each peak commuting period. Service is partially financed by United Illuminating, New Alliance and the City of New Haven. However, the majority of operating funds are provided by the State of Connecticut.

Figure 3-5: Existing CTTransit and GNHTD Downtown Shuttle Routes

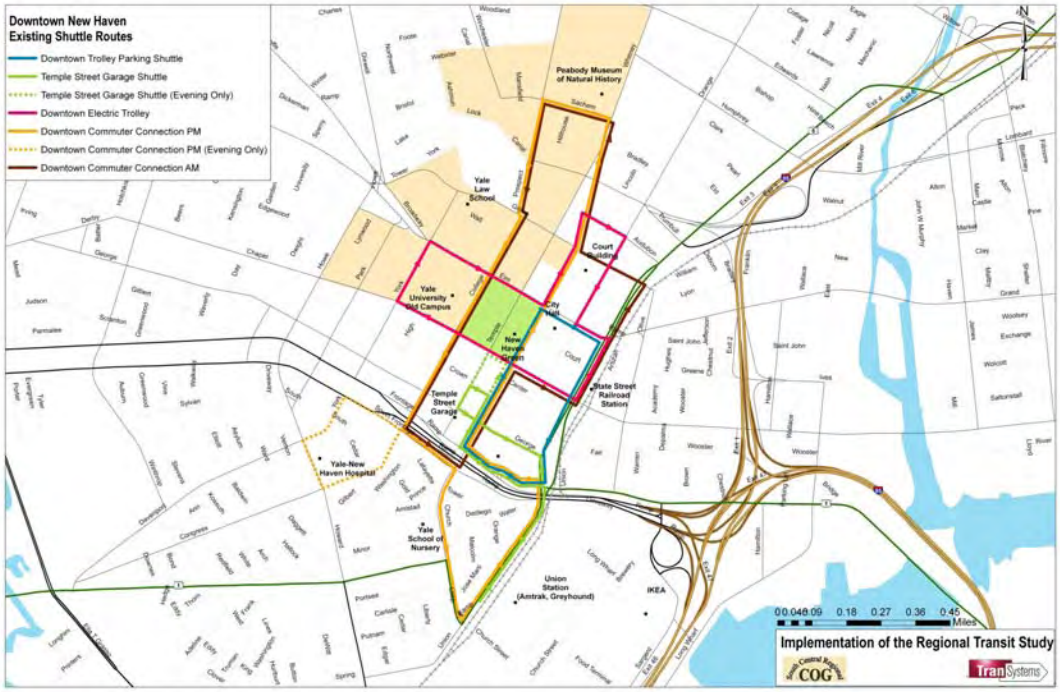


Table 3-4: Existing CTTransit and GNHTD Downtown Shuttle Routes

Route	Operator	Days of Operation	Span of Service	Frequency of Service
Downtown Electric Trolley	GNHTD	Mon - Sat	11:00AM – 6:00PM	Every 15 minutes
Downtown Parking Shuttle	GNHTD	Weekdays	7:00AM – 9:00AM, 4:00PM – 6:00PM	Every 10 minutes
Temple Street Garage Shuttle	CTTransit	Weekdays	6:30AM – 9:45AM, 3:00PM – 10:00PM	Every 15 minutes
Commuter Connection Downtown AM	CTTransit	Weekdays	6:15AM – 10:15AM	Meets SLE trains (every 25-35 minutes)
Commuter Connection Downtown PM	CTTransit	Weekdays	3:00PM – 8:30PM	Meets SLE trains (every 20-60 minutes)

Table 3-5: Annual Operating Cost of Shuttle Services

Shuttle Route	Vehicles Required				Revenue-Hours		Cost	
	AM	Mid	PM	Eve.	Daily	Annual	Daily	Annual
Downtown Electric Trolley		2	2		16.8	5,171	$1,061	$325,773
Downtown Parking Shuttle	1		1		5.9	1,509	$373	$95,067
Temple Street Garage Shuttle	1		1	1	10.8	2,754	$499	$127,123
Commuter Connection Downtown AM	1				3.4	867	$162	$41,285
Commuter Connection Downtown PM			1		4.2	1,071	$213	$54,226

According to the GNHTD, total ridership on the Downtown Electric Trolley was 48,690 boardings in 2007, which translates into just under 160 boardings per day. Ridership on the Downtown Parking Shuttle was 16,428 boardings in 2007, which translates into approximately 65 boardings per day.

CTTransit also operates the Commuter Connection, a service designed to bring riders from the Shore Line East commuter rail into downtown New Haven. The service meets most Shore Line East trains at either State Street Station (in the AM peak) or Union Station (in the PM peak). The time between trips varies from as little as 20 minutes to an hour or more, depending on the train schedule. In the AM peak, buses on the Commuter Connection will hold for a late arriving train so commuters don't have to worry about missing a connection. This service charges a regular local bus fare. However, Shore Line East "Monthly Plus Bus" train tickets are accepted on the Commuter Connection and all CTTransit bus routes. Shore Line East and the Commuter Connection operate only on weekdays. A single regular transit bus provides the Commuter Connection service. CTTransit also operates a parking shuttle between the Temple Street Garage and Union Station. Service is provided every 15 minutes on weekdays during the AM and PM peak periods and through the evening until 10 p.m. The Temple Street Garage shuttle operates with a single smaller sized CTTransit vehicle for just over three hours in the AM peak and for seven hours in the PM peak through the evening.

Not shown in these tables and figures, Yale University also operates several routes through its main campus and nearby locations including Union Station, Yale-New Haven Hospital, and the Peabody Museum of Natural History. Yale-New Haven Hospital also operates its own shuttle routes circulating through the medical center area and serving satellite parking facilities and Union Station.

3.1.4. Paratransit Services

In addition to the fixed-route bus service described above, a number of paratransit services are offered in the South Central Connecticut region. Most of the paratransit service in the region is provided by the Greater New Haven Transit District (GNHTD); in Milford it is provided by the Milford Transit District. Four main paratransit programs are offered by GNHTD: the Regional Rides Program, the Dial-A-Ride Program, Americans with Disabilities Act (ADA) complementary paratransit, and the Jobs Access/Reverse Commute (JARC) Program. These programs are briefly described in the sections below.

Regional Rides Program

The Regional Rides Program (RRP) provides paratransit services to individuals meeting certain requirements who are residents of the 12 member municipalities served by the RRP. These municipalities include Bethany, Branford, East Haven, Hamden, Guilford, Orange, New Haven, North Branford, North Haven, Wallingford, West Haven, and

Woodbridge. Rides must be within the boundaries of the 12 member municipalities serviced by the RRP. Riders must be residents of one of these municipalities and be over 60 years of age or have a disability as outlined by ADA regulations. Service is offered 7 days a week – Monday through Friday from 7 a.m. to 8 p.m., and Saturday and Sunday from 8 a.m. to 5 p.m. In November 2007, there were 1,841 passenger trips provided through the Regional Rides Program by the GNHTD, or an average of approximately 61 trips per service day.

Dial-A-Ride (DAR) Program

The Dial-A-Ride Program provides paratransit services to individuals meeting certain requirements who are residents of the 9 member municipalities served by the DAR Program. These municipalities include Branford, East Haven, Hamden, New Haven, North Branford, North Haven, Orange, West Haven, and Woodbridge. This service is basically an extension of the hours of the Regional Rides Program in a subset of the RRP communities; Dial-A-Ride service is not provided in Bethany, Guilford, or Wallingford (which have RRP service).

Rides on the DAR Program must be within the boundaries of the 9 member municipalities serviced by the DAR Program. Riders must be residents of one of these municipalities and otherwise meet the same requirements as for the RRP. Service is offered 7 days a week – Monday through Friday from 5 a.m. to 7 a.m. and 8 p.m. to 12 a.m., and Saturday and Sunday from 5 a.m. to 8 a.m. and 5 p.m. to 12 a.m. In November 2007, there were 96 passenger trips provided through the Dial-A-Ride Program by the GNHTD, or an average of approximately 3 trips per service day.

Americans with Disabilities Act (ADA) Complementary Paratransit

ADA complementary paratransit service is offered to individuals who have a disability as outlined by ADA regulations. Rides must be within ¾ mile on either side of an established CT TRANSIT fixed route. Service is provided 7 days a week from 5 a.m. to 12 a.m. In November 2007, there were 8,952 passenger trips provided through the ADA complementary paratransit program by the GNHTD, or an average of approximately 300 trips per service day.

In Meriden and Wallingford, complementary paratransit services are provided by Northeast Transportation Company. The Milford Transit District also provides its own complementary paratransit service.

Job Access/Reverse Committee (JARC) Program

The JARC Program provides paratransit services to individuals who have a disability as outlined by ADA regulations, who are a member of GNHTD. Rides must be within the boundaries of the member municipalities of the GNHTD, which include Branford, East Haven, Hamden, New Haven, North Branford, North Haven, Orange, West Haven, and Woodbridge. Hours of service are Monday through Friday from 6 a.m. to 6 p.m. In November 2007, there were 300 passenger trips provided through the JARC program by the GNHTD, or an average of approximately 14 trips per service day.

3.1.5. Rail and Intercity Bus Services

The South Central Connecticut region has several commuter and intercity passenger rail and bus services in addition to the local transit services described above. All of these serve Union Station. The rail and intercity bus carriers serving Union Station are listed in Table 3-6. The table shows the frequency of service provided by each carrier. The existing rail and intercity bus services in the region, as well as the planned New Haven-Hartford-Springfield commuter rail service, are described briefly below.

Metro-North New Haven Line Commuter Rail Service and Ridership

The Metro-North New Haven Line is operated by the MTA Metro-North Railroad and provides commuter rail service seven days a week between New Haven and Grand Central Terminal in New York City. Metro-North primarily serves

Table 3-6: Rail and Intercity Bus Services at Union Station

Route	Approximate Frequency of Service (departures and arrivals)				
	AM Peak	Midday	PM Peak	Evening	Weekend
Shore Line East (commuter rail)	25-35 min	--	20-60 min	--	--
Metro-North (commuter rail)	10-20 min	60 min	10-20 min	30-60 min	30-60 min
Amtrak (Northeast Corridor)	30 min	60 min	30 min	30 min	30-60 min
Amtrak (New Haven- Hartford-Springfield)	60 min	60-180 min	60 min	60-120 min	60-120 min
Greyhound/Peter Pan/Bonanza (intercity bus)	30-90 min	30-120 min	30-90 min	30-90 min	30-90 min

Notes:
(1) Amtrak and intercity bus carriers provide extra service on Fridays, Sundays, and holidays
(2) Metro-North ridership at Union Station on weekends is comparable to weekday levels (unusual for commuter rail lines).

Union Station in New Haven, with a limited number of trains also serving New Haven's State Street Station during weekday peak periods. Other major stops along the New Haven Line include Milford, Bridgeport, Stamford, Greenwich, and New Rochelle, NY. Average Metro-North ridership at Union Station in 2006 was approximately 3,825 inbound boardings on weekdays, 3,918 inbound boardings on Saturdays, and 3,240 inbound boardings on Sundays[1]. Average Metro-North ridership at State Street Station in 2006 was approximately 42 inbound boardings on weekdays; Metro-North trains do not serve State Street Station on weekends. New Haven-Union Station was unusual among stations on the Metro-North New Haven Line in that its weekend ridership is comparable to its weekday ridership; while at most other stations, weekend ridership is half or less than half the weekday level.

The Connecticut Department of Transportation (ConnDOT) is in the process of designing two new stations to be added to the New Haven Line between New Haven and Milford. One station would be located in the City of West Haven near Sawmill Road, and the other would be located in the Town of Orange near Marsh Hill Road. The addition of these stations is likely to have implications for local bus services and hub locations in coming years.

Shore Line East Commuter Rail Service and Ridership

The Shore Line East Line is operated by the Connecticut Department of Transportation and provides commuter rail service on weekdays between New London and Stamford. On the eastern end of the line, most trains terminate or originate in Old Saybrook, with only one train in each direction serving New London in the evening. On the western end of the line, most trains terminate or originate at Union Station in New Haven, while also serving State Street Station, with two through trains continuing west to Bridgeport and Stamford. Service is provided only during the morning and evening peak periods (approximately 5:30 a.m. to 10:00 a.m. and 3:00 p.m. to 9:30 p.m.).

[1] 2006 New Haven Line Weekday and Weekend Inbound Station Boardings provided by ConnDOT Rail Operations Feb. 2008.

System-wide ridership on the Shore Line East service was approximately 44,500 boardings in October 2007, the most recent month for which data was available. This represented an average of approximately 1,930 boardings per day.[2] Average daily ridership at State Street Station in October 2007 was approximately 220 boardings and 300 alightings, while average daily ridership at Union Station in October 2007 was approximately 780 boardings and 700 alightings. It is believed that many riders destined for Union Station may be connecting to MetroNorth trains and may not have a local destination in New Haven.

Amtrak Intercity Services

Amtrak operates intercity rail service on two corridors through the South Central Connecticut region. On the Northeast Corridor line, which runs generally from the southwest to the northeast through the area, Amtrak operates frequent service to Boston and Providence to the northeast, and New York, Philadelphia, and Washington, DC to the southwest. Connecting service is offered from these cities to many other destinations in the Amtrak national rail network. Services on the Northeast Corridor include the Acela Express, Amtrak's high-speed, limited stop service geared particularly to business travelers, and the Acela Regional, a conventional-speed speed service with stops at most or all local stations. The only station in the South Central Connecticut region with Amtrak Northeast Corridor service is New Haven-Union Station. Northeast Corridor trains serve Union Station roughly every 30 minutes in the AM and PM peaks, every 60 minutes in the midday, and every 30 to 60 minutes on weekends.

Amtrak also operates service on the north-south corridor between New Haven and Hartford. Amtrak's Vermonter service provides one round trip per day between St. Albans, VT and Washington, DC including stops at New Haven-Union Station, Wallingford, and Meriden in the South Central Connecticut region. Amtrak also operates the Springfield Shuttle service between Springfield, MA and New Haven, including stops in Wallingford and Meriden. This shuttle service connects to the Northeast Corridor via a transfer at New Haven-Union Station, and offers four round trips on weekdays and five round trips on Saturdays and Sundays.

During Fiscal Year 2007, Amtrak ridership at New Haven-Union Station was 640,281 boardings plus alightings, which made New Haven the twelfth busiest station in the national Amtrak system. Ridership at Meriden Station was 30,114 boardings plus alightings, while ridership at Wallingford Station was 13,187 boardings plus alightings.

Intercity Bus Services

In addition to the rail services, intercity bus service is offered between the South Central Connecticut region and other cities in New England and beyond. The primary hub of intercity bus service in the region is at Union Station. From Union Station, direct service is offered to cities including New York, Hartford, Springfield, Providence, and Boston. From these cities, connecting service is offered to destinations across the country. New Haven-Union Station is served by Greyhound, and Peter Pan/Bonanza Bus. Nearly 40 arrivals and departures are offered on these carriers from Union Station on a typical weekday (including both originating/terminating trips and through trips). Additional service is offered on Fridays, Sundays, and holidays.

In addition to the intercity service at New Haven-Union Station, coach bus service is offered from cities in the South Central Connecticut region (including New Haven, Branford, and Milford) to the Foxwoods and Mohegan Sun casino complexes.

[2] Provided by ConnDOT Rail Operations in Feb. 2008.

Planned New Haven-Hartford-Springfield Commuter Rail Service

ConnDOT is in the process of planning for commuter rail service on the north-south route between New Haven, Hartford, and Springfield, MA. According to the 2005 Implementation Study for the project, the Start-Up Service Recommended Action includes the following characteristics:

- Bi-directional service (oriented to both New Haven and Springfield)
- Weekday service every 30 minutes in peak periods
- 8 new round trips per day to supplement existing Amtrak service
- A total of 12 start-up stations, including New Haven-Union Station, New Haven-State Street Station, North Haven, Wallingford, and Meriden

A possible future Wharton Brook Station was also identified in the Implementation Study, near the old Pratt & Whitney site in North Haven.

The projected system-wide ridership for the Start-Up Service Recommended Action was 2,428 new weekday boardings in the 2025 horizon planning year. The projected 2025 weekday ridership at stations in the South Central Connecticut region was 249 boardings at New Haven-Union Station, 243 boardings at New Haven-State Street Station, 213 boardings in North Haven, 256 boardings in Wallingford, and 206 boardings in Meriden.

3.2 South Central Connecticut Employment Locations and Major Destinations

Identifying major destinations, ongoing projects and planned developments in the project area is an important step in developing applications of the service strategies. Major destinations can be identified by examining locations of major employers and clusters of smaller employers. They can also be identified by examining destinations of current transit riders. It is also important to consider recent and upcoming developments.

3.2.1. Major Employers

Figure 3-6 shows the major employers (with 10 or more employees) within the core CT Transit service area, based on 2006 information purchased from Dun & Bradstreet. From the regional perspective, it clearly shows that employers are mostly concentrated along the Northeast-Southwest corridor following Interstate 91 and the passenger rail, as well as along the West-East corridor around Interstate 95. The close-up view shows that the big employers are more spread-out within the core area, with the highest concentration in the City of New Haven. Table 3-7 lists the largest employers within the South Central Connecticut region (those with more than 1,000 employees). Four of these big employers are in New Haven.

It is important to note that the status of several of these major employment sites has changed or is in the process of changing since this snapshot in 2006. For instance, Anthem Health in North Haven is down-sizing and the site is in the process of being converted to graduate facilities for Quinnipiac University. The Bayer Pharmaceuticals facility near the West Haven-Orange border is also in the process of down-sizing and over time is to be converted to a major new Yale University facility. Other changes may have taken place since this employment information was published in 2006.

Figure 3-6: Major Employers within CTTransit Core Service Area

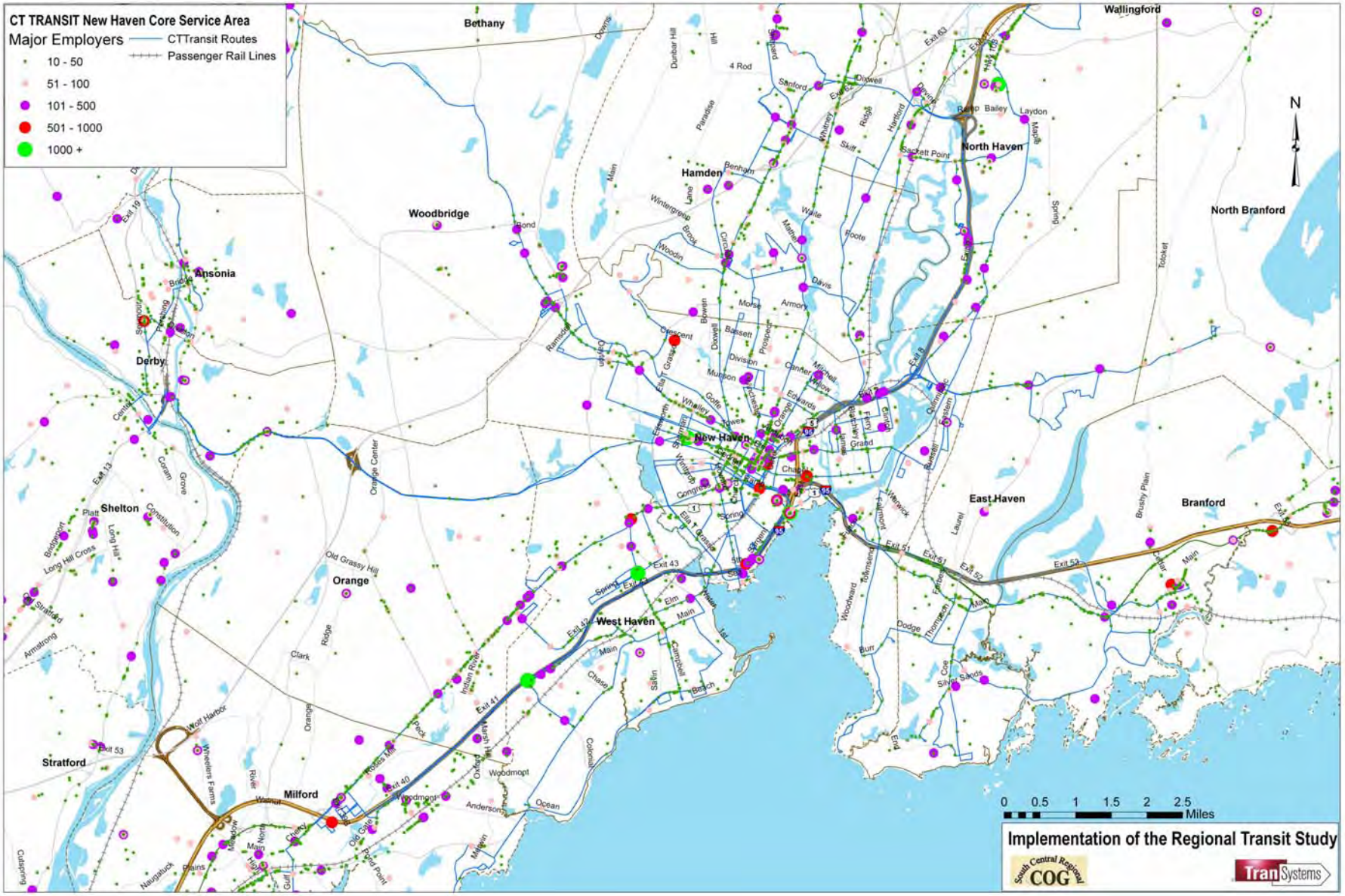


Table 3-7: Large Employers in the South Central Region

Company/Institution	Address City	Employment
Yale University	New Haven	11,000
Yale-New Haven Hospital Inc	New Haven	5800
Protocol	Cheshire*	4300
Hospital of St Raphael	New Haven	3400
AT&T	New Haven	2500
Craftsmen	Hamden	1956
Anthem Health Plan Inc	North Haven	1800
Veterans Health Administration	West Haven	1500
Bristol-Myers Squibb Co	Wallingford	1100
Southern Connecticut State University	New Haven	1000

Source: Dun and Bradstreet, 2006
*Not within a SCRCOG municipality

3.2.2. Major Current Transit Destinations

Stop-level ridership information for the CTTransit New Haven Division was used to identify high-volume ridership locations as a way of identifying key current destinations for transit riders in the project area. Ridership by bus stop was shown in Figure 3-4. This provides insights into key destinations where people in the region travel when using existing CTTransit bus services.

3.2.3. Other Major Destinations and New Developments

Major destinations and new developments in the downtown area were used to develop options for consolidated downtown shuttles. Important destinations and emerging developments across the region help identify locations of proposed transit hubs, or the focal point for new flex route services.

The project considered the following information about key destinations and recent and planned developments within downtown New Haven and elsewhere in the region:

- Input from SCRCOG staff and other stakeholders at the project initiation meetings in January 2008
- *New Haven-Hartford-Springfield Commuter Rail Implementation Study*, Wilbur Smith Associates, June 2005
- *Final State Environmental Impact Evaluation – New Railroad Station at City of West Haven or Town of Orange,* Connecticut Department of Transportation, June 2007
- Relevant agency/institution websites (e.g., City of New Haven, Town of North Haven, City of West Haven, Town of Orange, Yale University, Quinnipiac University)

Destinations and Developments in Downtown New Haven

There are a variety of major destinations in downtown New Haven, including government buildings, office buildings, train stations, entertainment and recreational attractions, retail areas, and major parking facilities. The following is a list of key downtown destinations identified based on stakeholder input and the other sources identified above:

- New Haven City Hall
- New Haven Public Library
- New Haven Green
- New Haven County Courthouse
- Federal Building
- Yale University Old Campus
- Yale University Law School
- Peabody Museum of Natural History
- Theatre District
- Connecticut Children's Museum
- Yale-New Haven Hospital
- Yale Medical School
- Yale School of Nursing
- Union Station
- State Street Station
- Temple Street Parking Garage
- Former Coliseum site/parking facility

In addition to the above destinations, some recent or planned developments in downtown New Haven include the following:

- The construction of a new consolidated downtown campus for Gateway Community College - east of the Temple Street Parking Garage
- Closure of the Shartenberg parking lot and development of 400 residential units - near the corner of State Street and Chapel Street
- Demolition of the old New Haven Coliseum, temporarily used as surface parking with longer-term development plans – between George Street and North Frontage Street centered on Orange Street
- Construction of a new cancer center at Yale-New Haven Hospital - near South Frontage and Park Street
- Construction of a new building for the Cooperative Arts & Humanities Magnet High School – College Street between George Street and Crown Street
- The planned construction of a new parking garage at Union Station - north of the existing garage on the east side of Union Avenue
- The recently opened IKEA near downtown on Sargent Drive

The key downtown destinations and developments in downtown New Haven listed above are shown graphically in Figure 3-7. The recent or planned developments are labeled with yellow highlights.

Destinations and Developments in Outside Downtown New Haven

In addition to the major destinations in downtown New Haven, there are a number of centers of activity and development elsewhere in the South Central Connecticut region. Major centers of activity and transit usage include most retail areas, town centers, colleges and high schools. These are important to identify as potential locations for transit hubs or end points for possible new flex routes. Important recent or planned new developments outside of downtown New Haven include the following:

- Conversion of the Anthem Blue Cross site in North Haven to a Quinnipiac University graduate school facility
- Conversion of the Bayer Pharmaceuticals site on the West Haven-Orange border to a new satellite campus for Yale University
- Redevelopment of the former Pratt & Whitney site in North Haven
- Consolidation of Gateway Community College from its North Haven and New Haven-Sargent Drive facilities to a consolidated location in downtown New Haven
- Opening of the new Quinnipiac University Sports Center in Hamden
- Planned construction of new Metro-North Railroad commuter rail stations in West Haven and Orange
- Planned commuter rail stations and parking facilities related to the New Haven-Hartford-Springfield commuter rail service, in North Haven, Wallingford, and Meriden

The key new developments above are shown graphically in Figure 3-8.

Figure 3-7: Major Destinations and Developments in Downtown New Haven

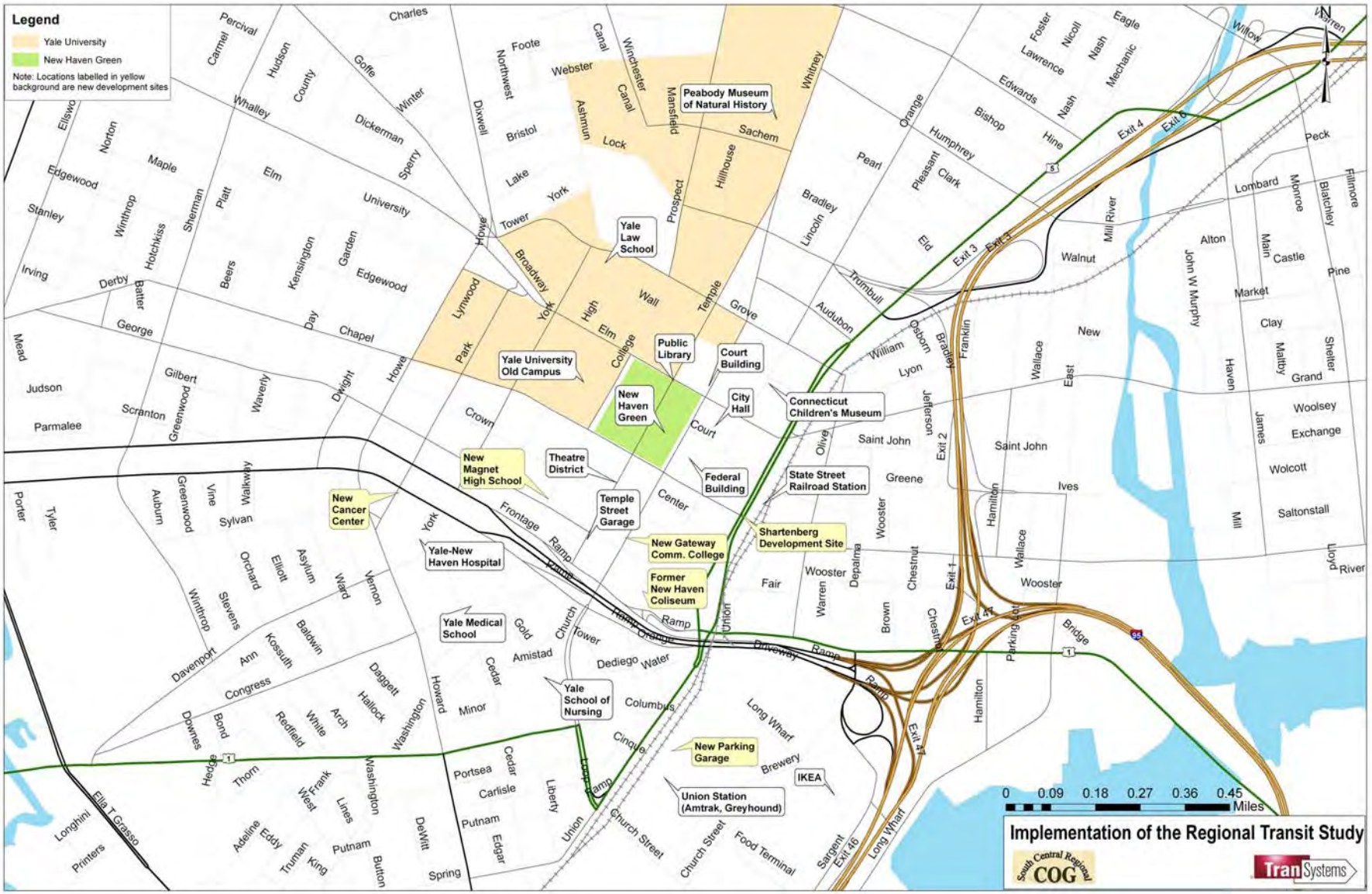
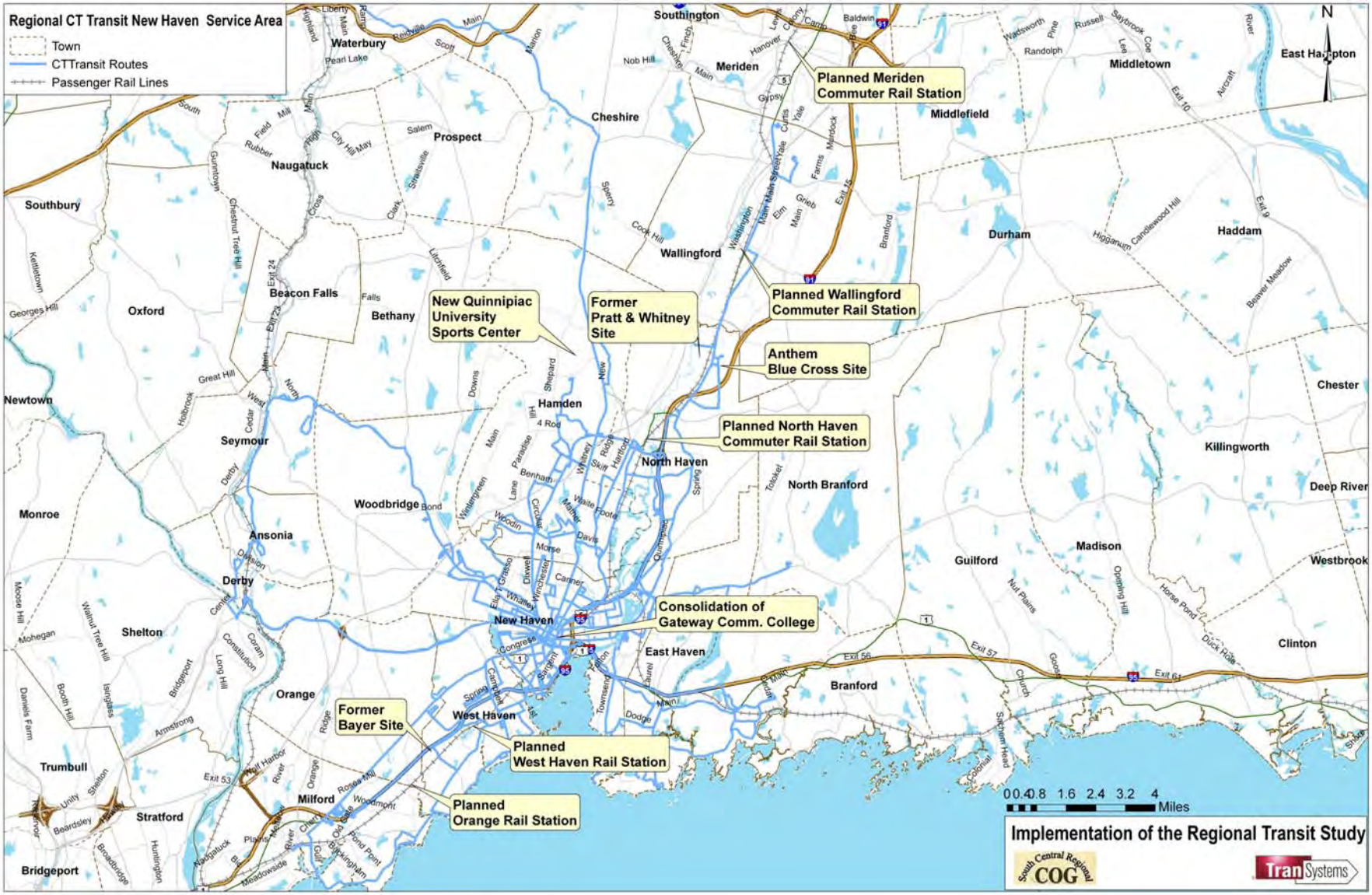


Figure 3-8: Major Developments Elsewhere in the Region



4.0 PROJECT RECOMMENDATIONS - CONSOLIDATION OF DOWNTOWN SHUTTLES

The goal of Task 4 of the Implementation of the Regional Transit Study was to make better use of transit resources in the downtown by consolidating or coordinating shuttles. Four different downtown shuttle services are operated by the Greater New Haven Transit District (GNHTD) and CT Transit. This section discusses the existing and potential markets for shuttle services, strategies to improve shuttle service, and shuttle service design parameters. Several options are presented, followed by a summary and evaluation.

4.1 Markets for Shuttle Services

Each of the existing shuttle routes caters to a different market. These markets are listed in Table 4-1 and illustrated in Figures 4-1 and 4-2.

The Commuter Connection serves Shore Line East riders. These are generally commuters who exit the train in the morning at State Street Station and board the train in the evening at Union Station. As shown in the table, the Commuter Connection averages 64 boardings in the morning compared to the 265 morning alightings at the station on Shore Line East. In the evening, a similar number of riders travel to Union Station. It is assumed that these are mostly Shore Line East riders, although MetroNorth railroad also serves the station.

The Temple Street Garage Shuttle carries an average of 158 riders per day (both directions). The garage has over 1,200 spaces so accessing Union Station using this shuttle is not likely the major use of the garage. The GNHTD-operated parking shuttle averages only 65 riders per day.

Ridership on the Downtown Electric Trolley has declined in recent years and there is currently no one strong market for the service. The trolley carries about 160 riders per day. One group of riders is believed to be residents from the McQueeny Apartments on Orange Street which has 150 units of subsidized senior housing.

As part of the study, several potential downtown shuttle markets were identified and are shown in Table 4-2. Most significant is the market for travel between Union Station and downtown. This is served by the Commuter Connection in the PM peak period, somewhat by the Temple Street Garage Shuttle in both peak periods, and by Yale Transit in the evening. There is currently no service in the mid-day and the garage shuttle does not really penetrate much of downtown in the peak periods. Providing a good connection all day long between Union Station and downtown would address the need in this market.

Other markets were identified through a meeting with downtown interests and shuttle operators. Yale New Haven Hospital identified a need for shuttle connections during the mid-day between the hospital and downtown and well as expansion of service connecting to Union Station. (Peak period service to Union Station is provided by Yale Transit.) Later service in the evening was seen as a need in order to provide service from the theaters in the city to Union Station. Service to the new Gateway Community College building next to the Temple Street Garage was seen as a potential market, particularly for employees who may commute by train. Finally, the upper State Street area was identified as needing service, although this is a bit beyond the downtown area as currently served by the shuttles.

The market for service between Union Station and downtown is significant because of the significant level of rail and intercity bus service at Union Station. The rail and intercity bus carriers serving Union Station were listed above in Table 3-5. The table shows the frequency of service provided by each carrier. The table illustrates how frequent service to New Haven is in the peak periods. In the mid-day, rail service is provided hourly, although there are numerous bus arrivals and departures throughout the day. While detailed ridership data is not available for most of these services, clearly people are arriving and departing New Haven at Union Station throughout the day and are a potential market for shuttle service.

Table 4-1: Existing Markets for Downtown Shuttles

Market	Currently Served by a Shuttle?	Comments
State Street Station to employers north of Green	Yes, in the AM – Commuter Connection Downtown AM	265 AM Peak SLE alightings in 2007; 2006-2008 Commuter Connection AM ridership was about 64 boardings/day
Union Station to employers north of Green	Yes, in the PM – Commuter Connection Downtown PM	336 AM Peak MNRR alightings in 2001; 702 AM Peak SLE alightings in 2007 (many are transfers to MNRR); 2006-2008 Commuter Connection PM ridership was about 55 boardings/day
Temple Street Garage to Union Station	Yes – Temple Street Shuttle	1,219 spaces in garage; 2006-2008 avg. ridership was about 158 boardings/day (compared to 119/day on CC Downtown)
Parking lots/structures to United Illuminating and New Haven Savings	Yes – Downtown Parking Shuttle	2007 ridership on shuttle was about 65 boardings/day
McQueeny Apartments to downtown shopping, services	Yes – Downtown Electric Trolley	Complex consists of 150 units of subsidized senior housing

Table 4-2: Potential Markets for Downtown Shuttles

Market	Currently Served by a Shuttle?	Comments
Midday travelers from Union Station to Yale, downtown shops, museums, attractions	No	Yale shuttles serve this market in the evening, but not before 6:00PM
Yale-New Haven Hospital/medical center area to downtown retail	No, but served by CTTransit Routes O, B	Suggested at January stakeholder meeting; mainly a midday/lunchtime demand
Theatre district to Union Station	No	Suggested at January stakeholder meeting; Evenings, probably Wednesday through Saturday, fall-winter-spring
State Street Station area to Upper State Street retail	No, but served by CTTransit Route Q	Suggested at January stakeholder meeting
Commuters to new Gateway Community College location	(Not applicable)	Market still to be determined, but could include commuters by train

Figure 4-1: Existing Markets for Downtown Shuttles – AM Peak

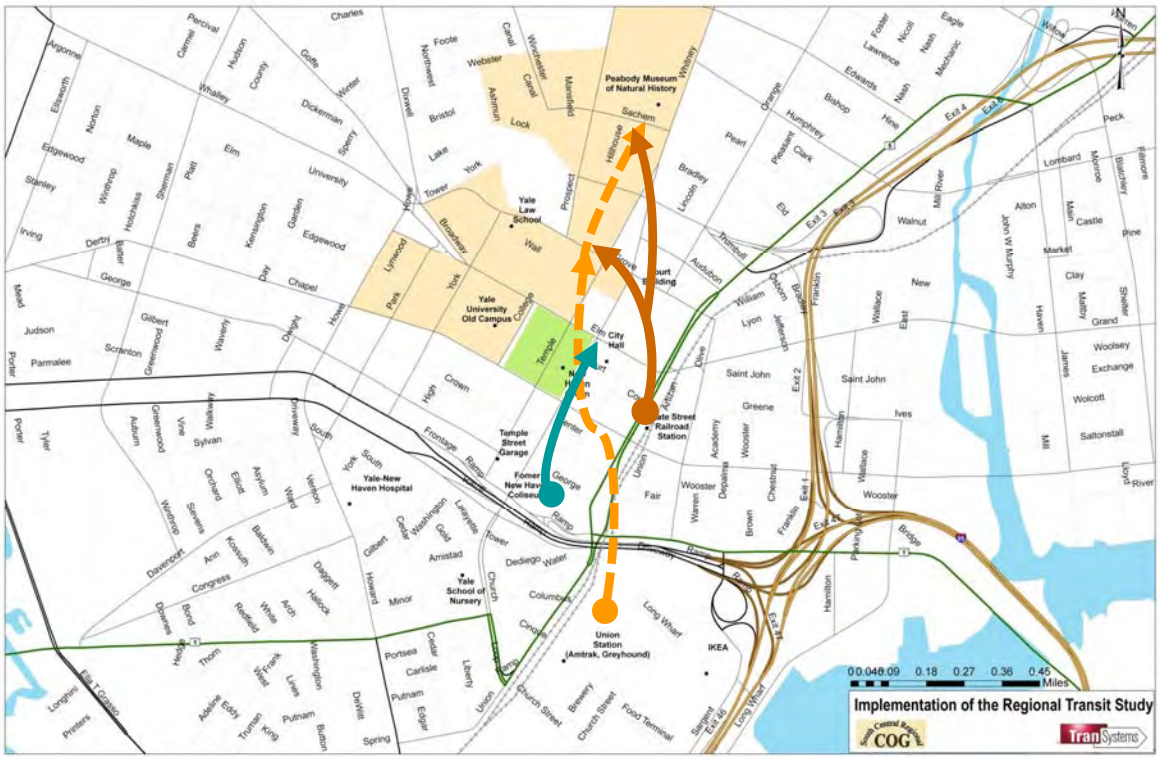


Figure 4-2: Existing Markets for Downtown Shuttles – PM Peak

4.2

Shuttle Consolidation Strategies

The goal of this effort was to make better use of transit resources in the downtown by consolidating or coordinating the various shuttle routes currently operating. Several strategies were identified to accomplish this goal. These are outlined below following a discussion of service design parameters used to develop the specifics of the service options.

In order to make better use of transit shuttle resources in the downtown, the following service consolidation strategies were identified:

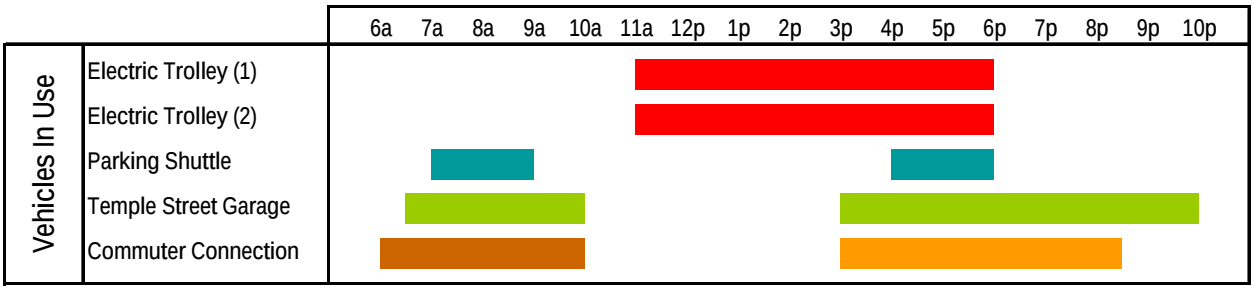
- Eliminate overlap between shuttle services and reduce the number of different routes
- Make the system simpler and more understandable
- Continue to serve existing Commuter Connection and parking shuttle markets
- Better serve commuters and visitors arriving from train stations (especially Union Station) all day long
- Connect the medical area to downtown in the mid-day
- Support the city's downtown economic development objectives (e.g., downtown retail, theatres, new developments)

4.3 Service Design for Shuttle Options

In developing the details of each of the options, several service design parameters had to be established so that the options could be compared on an equal basis. These focused on guidelines for determining the proposed frequency of service on each option, and on estimating the travel time on each proposed service. These two factors determine the number of vehicles and drivers needed and are therefore the major determinant of the operating cost of any transit service.

The number of transit vehicles currently allocated to each of the routes is shown in Figure 4-3. While a different type of vehicle type is used on each route, the figure illustrates the number of vehicles in service by time of day. In the AM peak there are three vehicles in service – one on each of the parking shuttles and one of the Commuter Connection. Between 10 a.m. and 11 a.m. no service is provided. During the mid-day only the two electric trolley vehicles are operated. The three vehicles providing peak service on the parking shuttles and Commuter Connection are again in service in the p.m. peak along with the two electric trolleys for a total of five vehicles. After 6 p.m. only the Temple Street Garage Shuttle and the Commuter Connection vehicles are in service, with only the Temple Street Garage shuttle operating from 8 p.m. to 10 p.m. Combined together, the four services provide approximately 37½ revenue vehicle-hours of service per weekday.

Figure 4-3: Vehicles Assigned to CTTransit and GNHTD Shuttle Routes



With each of the existing shuttles operating at a different service frequency, guidelines for setting the frequency of service had to be based on the markets that each proposed route would be expected to serve. Therefore, the frequency of service on a proposed route would have to replicate the most frequent of the existing services it would replace. This resulted in the following guidelines for service headways (time schedule between consecutive trips):

- 10-12 minutes if the downtown parking shuttle market is served
- 15 minutes if the Temple Garage parking shuttle market is served
- Approximately 25-30 minutes if the Shore Line East commuter market is served
- 15 minutes for services in the mid-day

The calculation of the round trip time on each shuttle route had to be estimated. Estimates were based on existing scheduled running times (round trip time without any scheduled layover at the terminal point) for the Commuter Connection. No new field observations or measurements were conducted. Commuter Connection scheduled running times in both peak periods and the length of the two peak period routes were used to establish an average speed for shuttle service in the downtown. For each different proposed route, running times were established based on the length of the route and the calculated average shuttle speed. Layover time at the station was added to the running time to get a full round trip cycle time. Four minutes layover was added for mid-day and PM peak service. Seven minutes was added in the AM peak to allow more time for shuttles to wait for delayed Shore Line East trains (as Commuter Connection shuttles do today).

If the overall span of service (number of hours that a route operates during the day) and the number of days per year that a service operates are the same for the alternatives being considered, then the number of shuttle vehicles (and therefore drivers) is the most critical determinant of their relative operating cost. Vehicle requirements for each option were calculated based on the required frequency and cycle time (round trip running time plus station dwell time). Vehicle requirements were calculated for each route in each option for the AM peak hour, a representative mid-day hour, the PM peak hour, and a late evening hour. The current vehicle requirements, for all shuttle service considered is three in the AM peak, two in the mid-day, five in the PM peak and one in the evening. This is considered to be the baseline service against which other options will be compared. In the figures in subsequent sections of this memo, this comparison is shown in a box like the one shown at the right. The option being evaluated is shown in the top row with the baseline vehicle requirements in the bottom row for comparison.

AM / Mid / PM / Eve
0 / 0 / 0 / 0
3 / 2 / 5 / 1

4.4 Service Options

With the goals of making the system simpler with a reduced number of routes and no overlap between services, efforts were first focused on developing a single route that could operate all day and could serve all markets. The Regional Transit Study proposed that such a route be developed. A modified version of that proposal was developed so that nearly all of the markets identified above could be served. Additional ideas were also considered, including those that left some of the current markets, such as the parking shuttle markets, to continue to be served by their own dedicated service. Ideas were also considered that would simplify the routes but that would vary the service by time of day to cater to the different markets. These ideas were condensed into four options that were evaluated in detail in a technical memorandum. Those options were:

1. Single route all day, serving all markets
2. Single route all day, with separate parking shuttles
3. Single route, alignment varying by time of day
4. Eliminate shuttles, facilitate use of CTTransit services

Subsequent review and discussions led to a desire to place greater emphasis on the simplicity of the service, less emphasis on minimizing cost, and a desire to connect the medical area to Union Station at all times of day to

supplement the peak period service for employees now provided by Yale Transit and Yale-New Haven Hospital. This led to two additional options:

5. Single route all day extended to the medical area
6. Single bi-directional loop all day

These options are described and evaluated in below.

4.4.1. Option 1 - Single Route All Day, Serving All Current Markets

Option 1, shown in Figure 4-4, emphasizes the simplicity of having one route that serves all markets with the route remaining the same all day. The route would not vary by time of day. A single route could serve all markets currently served by all of the CTTransit and GNHTD shuttles. In order to serve all markets and not vary by time of day, the route would serve both rail stations and connect the parking facilities to Union Station in both directions. It would also serve the downtown parking shuttle market. While it would serve all current markets, as can be seen in the figure, serving all of these markets would make the route rather convoluted and make it virtually impossible to expand the route to serve additional markets such as the medical area. The route shown is rather long route and would require four vehicles to operate 10 minute headways in the peaks and three vehicles to operate 15 minute headways in the mid-day.

Having a single route all day eliminates all duplication and any confusion over which route to take. However, the routing would have to be long and somewhat convoluted and would serve some existing markets poorly. While service in both directions between State Street Station and areas north of the Green would be good, access between Union Station and those areas would be slowed by the need to serve State Street Station and the parking areas in between. Access between Union Station and the Church Street area would also be slowed by the need to serve the parking areas. Access between Union Station other parts of downtown would be accomplished only through stops at the Temple Street Garage. Riders of existing parking shuttles would also lose their exclusive routes and may experience some degradation of service reliability due to the long route. Many of the existing markets need to be served only during certain hours and in different directions at different times. Combining them results in over-serving some markets at some times of day and would result in unnecessary cost and inconvenience.

In order to serve all markets, this route ends up focused on stations and parking. It does not serve downtown destinations well or provide any improvements to downtown circulation, including service to the medical area. It does have the advantage of connecting Union Station to downtown all day, and the high frequency of AM peak service effectively eliminates the need to hold shuttle vehicles for late morning trains.

Overall this option is more costly than current service to achieve the same level of service, has significant negative impacts on current shuttle riders, and only addresses some of the new markets identified.

4.4.2. Option 2 - Single Route All Day, Separate Parking Shuttles

Option 2, shown in Figure 4-5, also emphasizes the simplicity of having a route that remains the same all day. It includes a single route that operates all day, but leaves the two parking shuttles (the Temple Street Garage Shuttle and Downtown Parking Shuttle) unchanged. The main shuttle route would not vary by time of day. The route would serve the markets currently served by the Commuter Connection and would replace the Downtown Electric Trolley. It serves both rail stations and the medical area. This route would only need to be frequent enough to meet Shore Line East trains, but due to its length would require two vehicles rather than the current single vehicle on the Commuter Connection. To provide the specified 15 minute headways in the mid-day, three vehicles would be required. In peak periods, two additional vehicles would still be required for the parking shuttles.

Figure 4-4: Option 1 - Single Route All Day, Serving All Current Markets

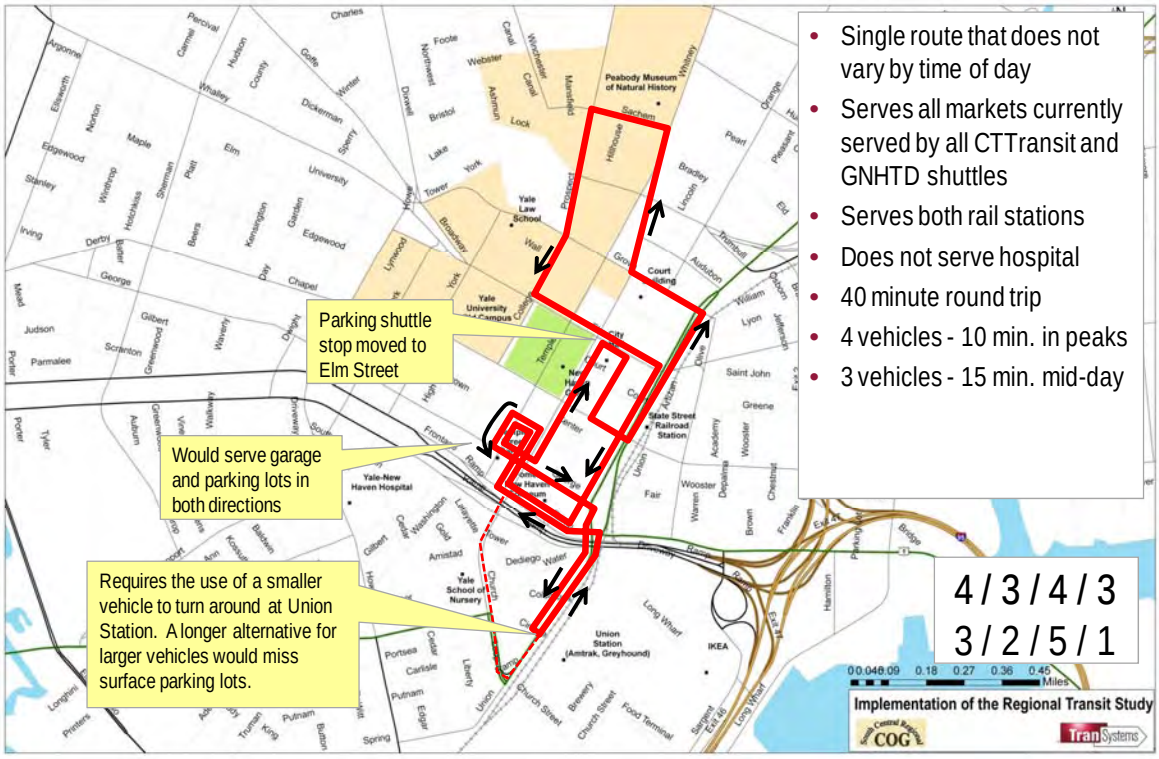
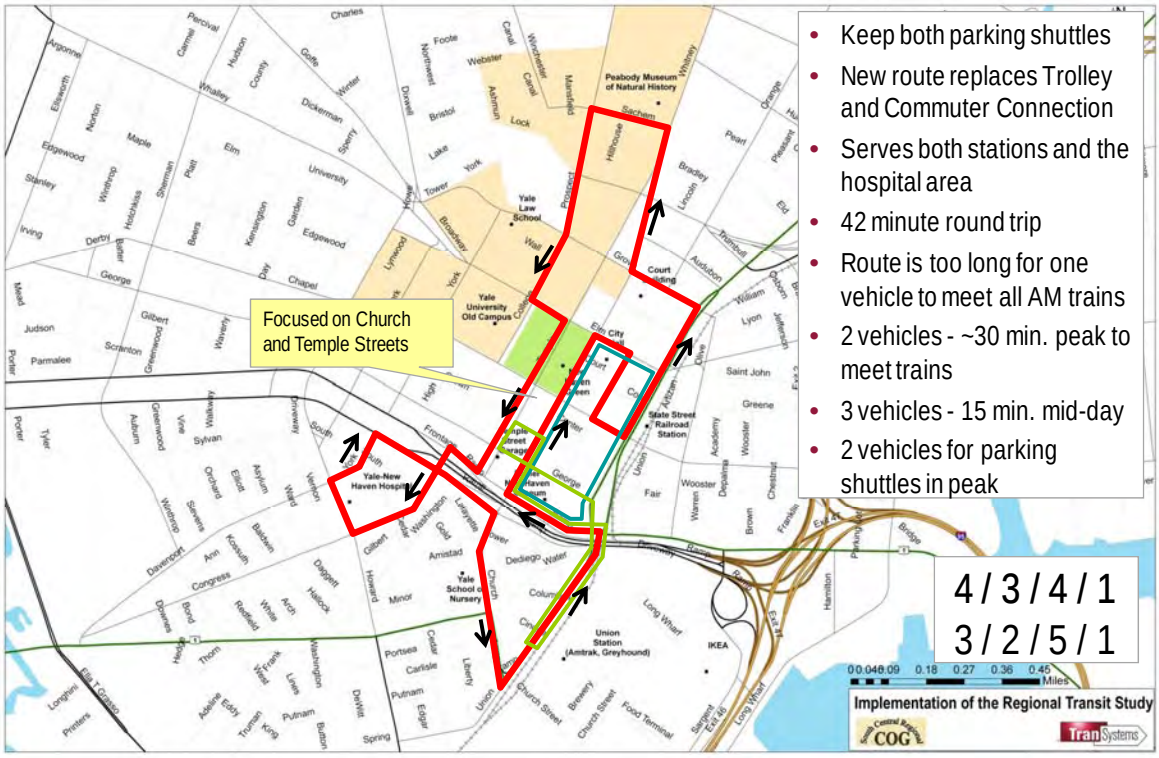


Figure 4-5: Option 2 - Single Route All Day, Separate Parking Shuttles



A single route all day, with separate parking shuttles, results in a more direct route than trying to also serve the parking shuttle markets with the same route. Having a single route all day also avoids any confusion over routings that change during the day. Riders of existing parking shuttles would keep their exclusive routes. With two vehicles in service on the main shuttle route in the AM peak, AM peak trips would have ample time to hold for late Shore Line East trains. The route serves both train stations. It directly serves existing Shore Line East AM riders traveling from State Street Station to the north of the Green. Service from Union Station to Church Street for AM commuters is good. However, service from downtown to both train stations for PM commuters is long and indirect since downtown employees heading to Union Station would have to travel via the medical area. Similarly, while this option provides service to the medical area, employees making mid-day trips to downtown would have to travel via Union Station. With a single route that does not change all day, both the medical area and train station would have to be served all day regardless of the variation in demand throughout the day.

Overall, this option is more costly than current service to achieve the same level of service. It provides better service than Option 1 to new markets and has fewer significant negative impacts on current shuttle riders. However, some markets are still served poorly.

4.4.3. Option 3 – Single Route, Alignment Varying by Time of Day

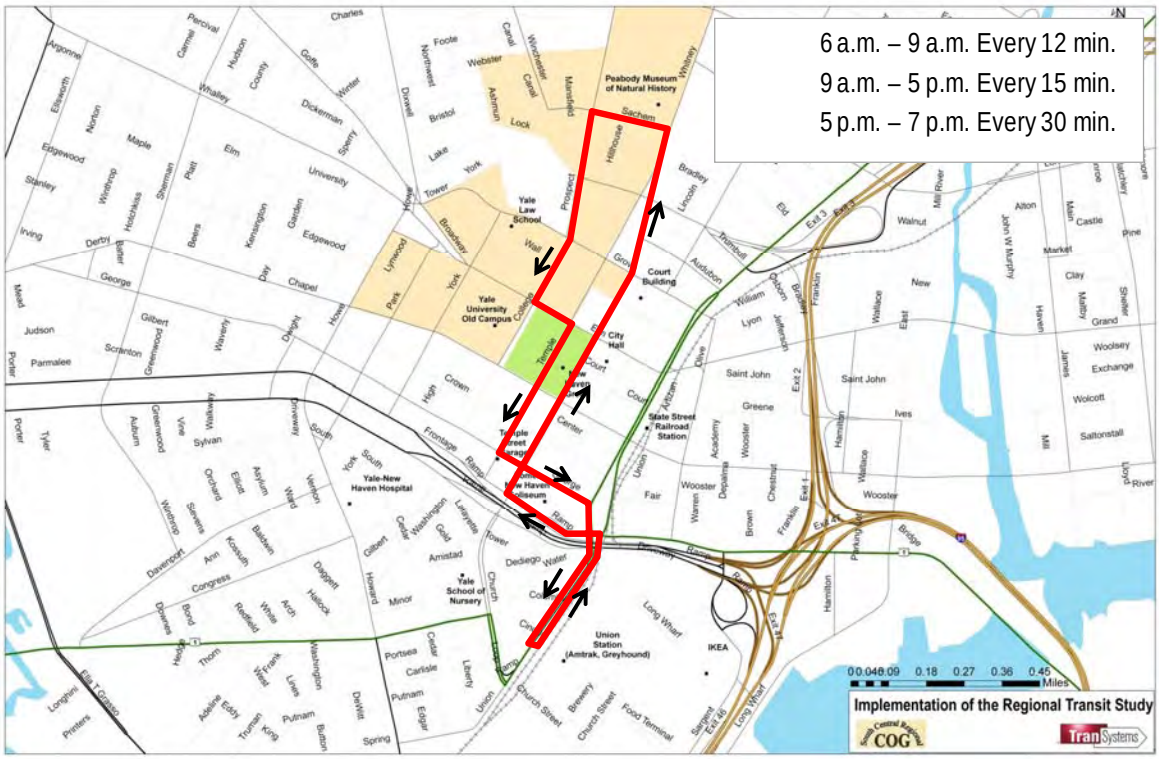
With the markets for shuttle service varying throughout the day, this option, shown in Figure 4-6, allows the route to vary by time of day, tailoring the route to different markets and directions at different times, while trying to keep the route and its variations as simple and easy to understand as possible. In developing this option, different sub-options were considered. In peak periods, sub-options considered whether all markets should be served with a single route, or the parking shuttles could be kept separate. The best solution appears to be to keep the parking shuttles separate in the PM peak but to allow the main shuttle route to serve those markets in the AM peak. Mid-day sub-options were considered in order to provide the best balance between service to the downtown to/from Union Station market and to the downtown to/from the medical area market. The best solution appears to be a mid-day-only extension of the route from the Green at College and Elm to the medical area.

In the AM peak, service would be operated every 12 minutes with three vehicles. Some trips would divert off Church Street to serve State Street Station in order to meet Shore Line East trains. There would be no need for a separate parking shuttle or Temple Garage shuttle in the AM peak. In the mid-day, service would be provided every 15 minutes using the same three vehicles. From the intersection of College and Elm, all trips would divert down College and back on York to Elm to serve the medical area. This diversion would end before the PM peak period and one vehicle would switch to providing service on the Temple Street Garage Shuttle while the other two continue to provide service every 15 minutes on the shorter route with no medical area diversion. At 5 p.m. service would be reduced to approximately every 30 minutes and be scheduled to meet trains. Only one vehicle would be needed on the main route, while one remained on the Temple Street Garage shuttle. The downtown parking shuttle would operate for the two hour PM peak period. The main shuttle route would stop running in the early evening while the shuttle serving the Green, the Theater District, the Temple Street Garage, Gateway Community College and Union Station would continue until approximately 11 p.m.

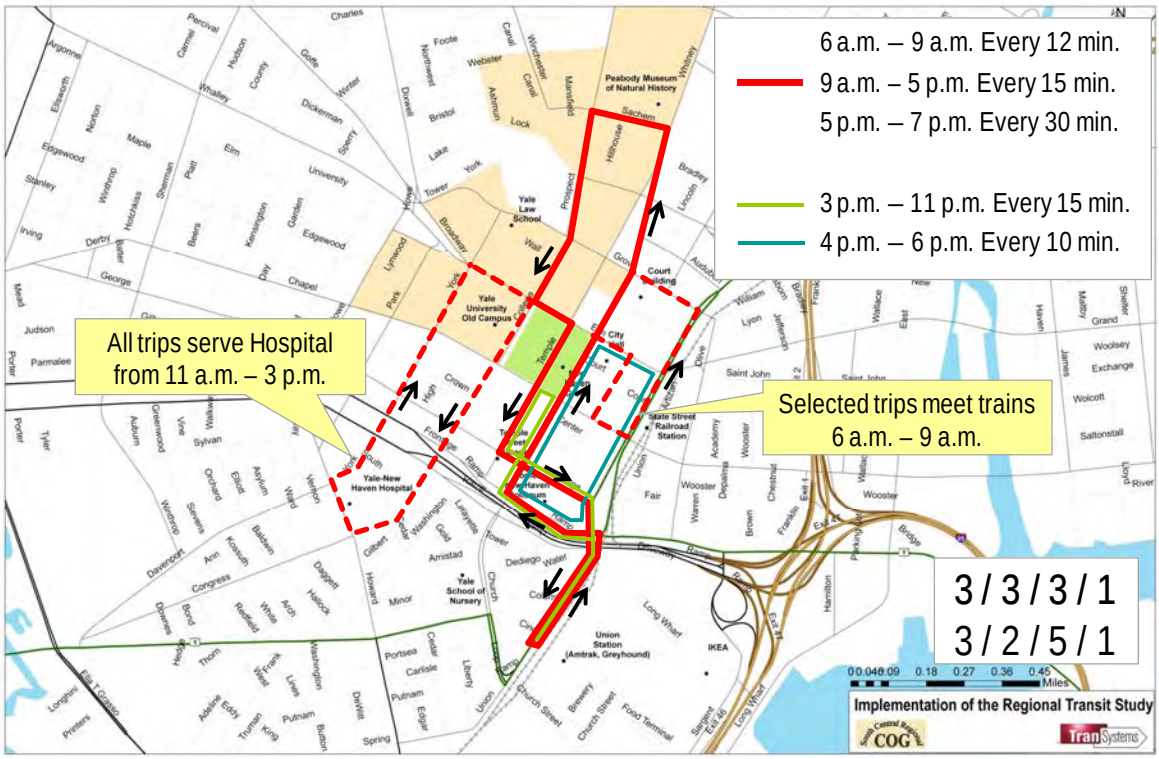
In Option 3, the variable routing could be quite confusing. However, the core route, shown in solid red in the figure, is consistent throughout the day. This option consolidates most existing shuttle services into one route (with some variations). Riders of existing parking shuttles would lose their exclusive routes only in the morning. In this option, the Union Station to downtown market is served all day with reasonably direct service. The medical area to downtown market is served only in the mid-day, but with reasonably direct service. While not as simple as the non-varying options, this option would have a lower cost than either Option 1 or Option 2.

Figure 4-6: Option 3 – Single Route, Alignment Varying by Time of Day

A) Option 3 Core Route



B) Option 3 Complete Service Concept



4.4.4. Option 4 – Eliminate Shuttles, Facilitate Use of CTTransit Service

Option 4 reflects a completely different concept for providing mobility within the downtown area. Rather than operate dedicated shuttles, a menu of strategies would be employed to make it easier to use the existing fixed route bus network for downtown travel. Shuttles serving just the downtown area would be eliminated and the savings used to facilitate use of existing CTTransit service in the downtown area.

While none of the strategies that could be included were developed in detail for this study, this option would likely include the following, at a minimum:

- Minor re-routing to consolidate fixed-route CTTransit bus service on four major corridors
- Minor adjustments to stop locations
- Branding of sets of routes
- Possible fare-free or reduced fare zone (for specific groups, or for all users)

Regular fixed route bus service in New Haven is already focused on a few specific corridors through downtown. With a few minor route modifications and possibly some stop relocation, these routes could be marketed as a coherent system of four corridors through downtown, as shown in Figure 4.7. Routes B and O would need some modification in the medical area and Route M could be re-routed to serve Union Station. Some changes in stop locations might be needed to consolidate service in the east-west corridor (Routes D, F, G, Q and Z). With these minor changes, downtown service could be marketed more like a rail system, with a few color-coded lines and designated named station stops.

Fare policy can be used to reduce or eliminate the cost of short trips within the downtown. This would eliminate the disincentive to used fixed route buses due to the need to pay a full fare that is perceived as the cost of a much longer trip. There are numerous issues associated with free fare zones, including increased fare evasion, revenue loss, political pressure to expand the zone, and equity concerns. These are beyond the scope of a shuttle consolidation/coordination task. However, the boundaries of a possible downtown free fare zone are shown in the figure.

Option 4 represents a departure from the dedicated shuttle routes currently operated and evaluated as part of the other options. If this is explored further, significant obstacles to route and stop changes may be discovered. The revenue loss from reduced or free fares may be too great such that the operating cost savings (from elimination of shuttles) may not offset the revenue loss. Numerous other issues may be raised, including equity considerations. Nevertheless, this option could still be pursued in lieu of a dedicated shuttle in the future if there is interest.

4.4.5. Option 5 - Single Route All Day Extended to the Medical Area

Option 5, shown in Figure 4.8, expands on the core route in Option 3. It differs from Option 3 in that the route would remain the same all day except for some AM peak trips that would serve State Street Station. The route would serve the markets currently served by the Commuter Connection and would replace the Downtown Electric Trolley. It serves both rail stations and the medical area. It does not provide a direct connection between the medical area and downtown, but rather requires those riders to travel via Union Station. This route would only need to be frequent enough to meet Shore Line East trains, but due to its length would require two vehicles rather than the current single vehicle on the Commuter Connection. To provide the specified 15 minute headways in the mid-day, three vehicles would be required. In peak periods, two additional vehicles would still be required for the parking shuttles[3].

[3] In the AM peak, the main shuttle route could serve the two parking shuttle markets. However, the frequency may need to be increased to provide service comparable to current levels.

Figure 4-7: Option 4 – Eliminate Shuttles, Facilitate Use of CTTransit Service

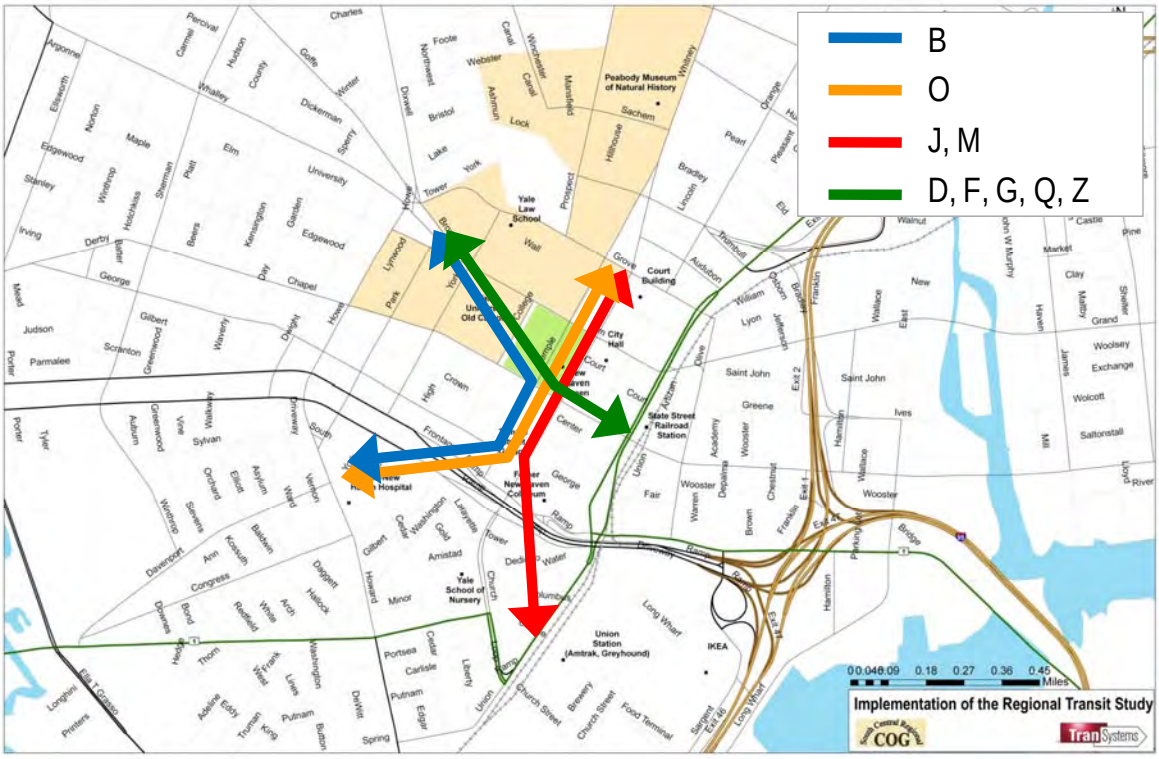
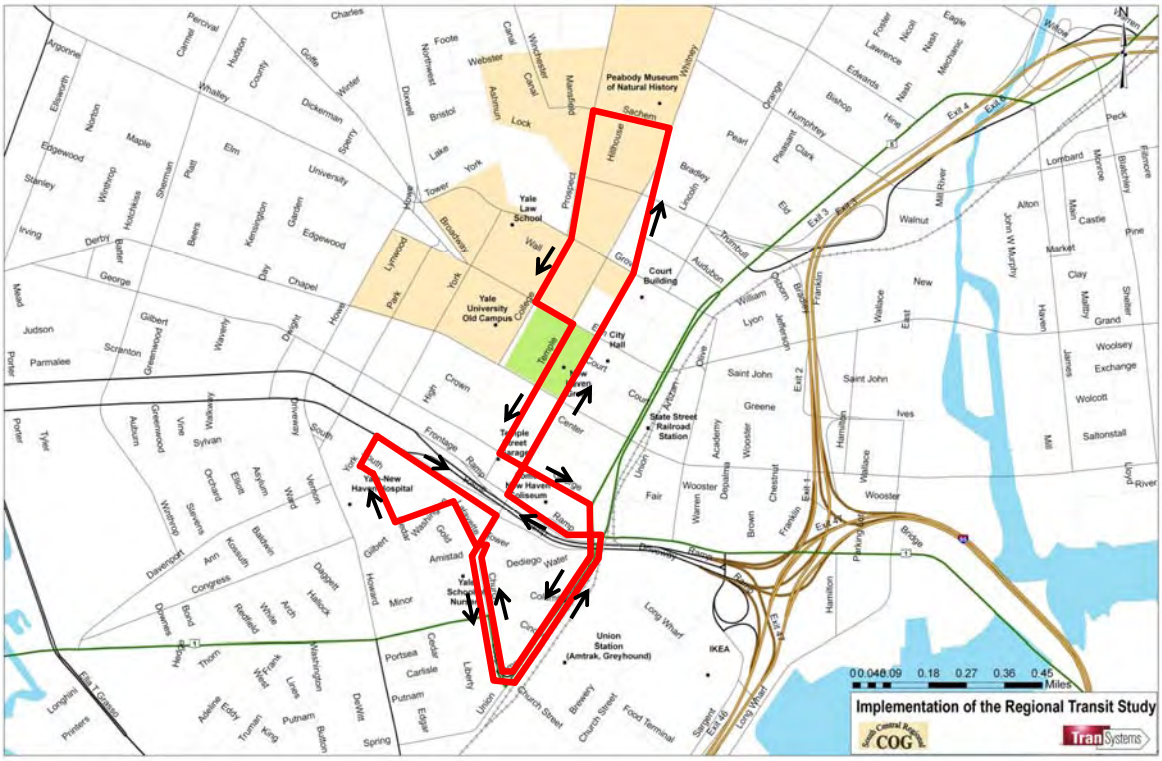


Figure 4-8: Option 5 - Single Route All Day Extended to the Medical Area



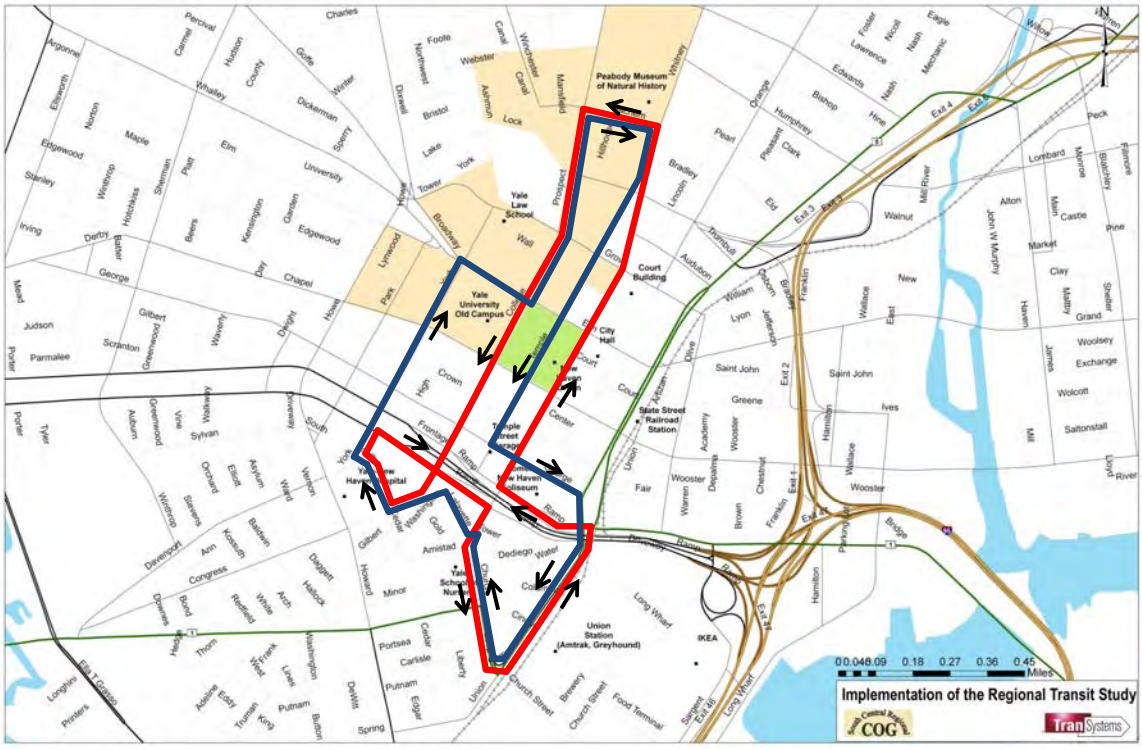
Except for medical area to downtown trips, this option results in a simple direct route for most riders. Having a single route all day also avoids any confusion over routings that change during the day. Riders of existing parking shuttles would keep their exclusive routes. With two vehicles in service on the main shuttle route in the AM peak, AM peak trips would have ample time to hold for late Shore Line East trains. The route serves both train stations. It directly serves existing Shore Line East AM riders traveling from State Street Station to the north of the Green. Service from Union Station to Church Street for AM commuters is also good. While this option provides good service between the medical area and Union Station, employees making mid-day trips to downtown would have to travel via Union Station.

Overall, this option is more costly than current service but it provides additional service between Union Station and the medical area. It is more direct and simpler than previous options. However, the medical area to downtown market is not well-served.

4.4.6. Option 6 - Single Bi-Directional Loop All Day

Option 6, shown in Figure 4.9, fills in the gap in the medical area to downtown service in Option 5. Unlike previous options, it consists of two continuous loops operating in opposite directions (shown in the figure as red and blue). The two routes would remain unchanged all day, again except for some AM peak trips on the red (counter-clockwise) loop that would serve State Street Station. The route would serve the markets currently served by the Commuter Connection and would replace the Downtown Electric Trolley. It serves both rail stations and the medical area. In peak periods, this route would only need to be frequent enough to meet Shore Line East trains, but due to its length would require two vehicles on each loop (four total) rather than the current single vehicle on the Commuter

Figure 4-9: Option 6 - Single Bi-Directional Loop All Day



Connection. To provide the specified 15 minute headways in the mid-day, three vehicles would be required on each loop (six total). Again, in peak periods, two additional vehicles would still be required for the parking shuttles.[4]

This option results in a simple direct route for most riders, albeit at a significantly higher cost than other options. Having a single route all day also avoids any confusion over routings that change during the day. Riders of existing parking shuttles would keep their exclusive routes. With two vehicles in service on the red loop in the AM peak, AM peak trips would have ample time to hold for late Shore Line East trains. The route serves both train stations. It makes the desired connections between the medical area and Union Station and between the medical area and downtown. It directly serves existing Shore Line East AM riders traveling from State Street Station to the north of the Green. Service from Union Station to Church Street for AM commuters is also good.

Overall, this option is much more costly than current service but it also achieves all of the desired objectives. It is more direct and simpler than previous options and serves all the desired markets.

4.5 Downtown Shuttle Summary and Evaluation

The vehicle requirements by time period were used to develop estimated costs for each option. These are shown in Table 4-3 alongside the cost of the existing Downtown Electric Trolley and Downtown Commuter Connection. The estimated operating costs for the new service options assume eight peak hours (3½ AM Peak hours and 4½ PM Peak hours), plus five midday and 3 evening hours per day, with service operating weekdays and Saturdays, but not Sundays or holidays (307 days per year). These costs are based on current CTTransit hourly costs. The cost of the shuttle options range from a low of about $800,000 for Option 3 to $1.6 million for Option 6. This compares to about $420,000 for the two existing services that would be replaced, for a net cost of between $380,000 and $1.18 million.

The strategies outlined in Section 4.2 were used to generate a short list of evaluation measures shown in Table 4-4. Each of the six options was evaluated qualitatively and the results are shown in the table. These measures are somewhat subjective and are not weighted to reflect differing degrees of importance that may exist for some measures. Nevertheless, they give a useful summary and comparison of the relative impacts of the options. It is clear that all of the options have positive and negative elements. The table suggests that Option 5 (Single Route All Day Extended to the Medical Area) and 6 (Single Bi-Directional Loop All Day) may be the most promising, based on these criteria. Both options:

- Serve all current shuttle markets well
- Provide frequent all day service between Union Station and downtown
- Provide frequent all day service between Union Station and the Medical Area

Option 6 provides a much better connection between the Medical Area and downtown, albeit at a much higher cost than Option 5. Option 2 only partly met the needs of each market because the loop would operate in only one direction. Option 3 could serve most, but not all, markets well at low cost, but would be more complex than other options.

It is recommended that Connecticut DOT, the City of New Haven and any additional potential funding partners determine whether the potential benefits of Option 6, in terms of connections between the Medical Area and downtown, can justify the additional cost versus Option 5. The choice of shuttle option will likely be dependent on obtaining funding from a variety of project partners. Funding partners could include downtown business groups, individual downtown businesses and institutions, the City and DOT.

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[4] In the AM peak, the blue shuttle route could serve the parking shuttle market, while the red route could serve the Temple Street garage market. However, the frequency may need to be increased to provide service comparable to current levels.

Table 4-3: Annual Operating Cost of Shuttle Options

Shuttle Option	Vehicles Required				Revenue-Hours		Cost	
	AM	Mid	PM	Eve.	Daily	Annual	Daily	Annual
Downtown Electric Trolley (Existing)		2	2		16.8	5,171	$1,061	$325,773
Commuter Connection AM/PM (Existing)	1		1		7.6	1,938	$375	$95,511
1. Single route all day, serving all markets	4	3	4	3	56	17,192	$3,464	$1,063,547
2. Single route all day, with separate parking shuttles	4	3	4	1	50	15,350	$3,093	$949,596
3. Single route, alignment varying by time of day	3	3	3	1	42	12,894	$2,598	$797,661
5. Single route all day extended to Medical Area	4	3	4	1	50	15,350	$3,093	$949,596
6. Single bi-directional loop	6	6	6	2	84	25,788	$5,196	$1,595,321

Table 4-4: Evaluation of Shuttle Options

Criteria	Option						
	Current	1	2	3	4	5	6
Number of different shuttle routes	-	+	-	0	-	0	0
Overlap of shuttle routes	-	+	0	0	+	0	0
Simplicity of shuttle route	+	-	+	0	0	+	+
Consistency by time of day	0	+	+	-	+	+	+
Maintain AM State St. rail connection	+	+	+	+	-	+	+
Maintain PM Union Station connection	+	0	0	+	+	+	+
Maintain service to Temple Garage market	+	+	+	+	0	+	+
Maintain service to parking shuttle market	+	+	+	+	-	+	+
Provide AM Union Station connection	-	0	+	+	+	+	+
Provide mid-day Union Station connection	-	0	0	0	0	+	+
Provide Union Station - Medical Area connection	-	-	0	-	-	+	+
Provide Medical Area - downtown connection	-	-	0	+	0	0	+
Reduce AM vehicle requirement	0	-	-	0	+	-	-
Reduce Mid-day vehicle requirement	0	-	-	-	+	-	-
Reduce PM vehicle requirement	0	+	+	+	+	+	-
Revenue impact	0	0	0	0	-	0	0
Total ("+" minus "-")	-1	2	4	4	2	8	7

5.0 PROJECT RECOMMENDATIONS - TRANSIT HUBS AND ROUTE SIMPLIFICATION

Task 5 of the Implementation of the Regional Transit Study consisted of the identification of route changes that would simplify routes and implement more of a hub-based route network.

Many New Haven division CTTransit routes are seen as complex and confusing since they operated with multiple versions, or variations. Most of the variations have unique numbers (B1 and B2, for example), while some are simply dealt with using schedule notes. In the evening and on Sundays, there are several combination routes operated. These are designated by the two or three letters of the routes they combine (FQZ, for example). Some of the variations reflect different destinations, while others are shortened versions of longer routes. In some cases, there is a separate variation number for each different combination of possible routings. The goal of Task 5 was to reduce the number of unique variations on several routes in order to make the system more understandable and easier to use.

After review of the schedules for all 11 regular CTTransit routes in New Haven, it appeared that most variations do exist for a good reason, to serve a particular demand at a particular time of day. A large source of route variations and combinations appears to have resulted from an effort to reduce costs during the evening and on Sundays. It appears that the traditional route network that had existed for many years was performing within acceptable limits during the day on weekdays and on Saturdays, but during low ridership periods costs had to be reduced and so routes were consolidated at those times into a minimum acceptable coverage route network. This generated many new route variations that served important travel markets in a manner other than the way they were served by the historical day time route network. Essentially, two route networks are now operated, one minimum network serving the most critical markets and operating at the lowest demand times, and the other the historical route network that has existed for many years.

The difference between the two accounts for many of the different route variations. If the number of these variations is to be reduced, one of two things must occur. Either the minimum coverage network needs to be made more like the regular network, or the regular network should be adjusted such that certain parts more closely resemble the minimum coverage network. The former approach would represent a step back to a level of off-peak service provided in the past, with a reversal of many of the cost-saving service adjustments that have been made. The result would likely be a significant increase in cost. The latter approach would require some changes to long standing routes making some routes look more like the minimum coverage network with other routes serving the route segments not served by the minimum network. This latter approach holds more promise as a means to simplify the route network without substantial increases in cost but will pose challenges in that it could result in changes to long-standing routes.

In addition to route simplification options, a number of potential transit hubs were identified in the Regional Transit Study. These are reviewed below and several additional potential hubs and refinements are suggested. Following the discussion of potential hubs, possibilities for route simplification and route modifications to serve the hubs are discussed. Possible changes in five areas were identified. These were then reviewed and prioritized by the TAG and three of these areas were selected for further development of service changes which are documented below. At the end of this section, a convention for renaming the routes is described, along with an initial list of new route names.

In the analyses below, estimates of impacted riders are based on CTTransit on/off counts collected over a two-year period from January 2006 until January 2008. The counts generally are equivalent to an observation of a single day. Where the counts represented less than a full day, ridership on the trips observed was factored up to represent a full day. Operating costs are based on an estimate of the additional daily vehicle revenue-hours needed. These were expanded to annual vehicle revenue-hours assuming 255 weekdays, 52 Saturdays, and 58 Sundays/holidays.

Annual operating costs were calculated assuming current CTTransit hourly operating costs of $61.86 per revenue-hour.[5]

5.1 Potential Transit Hubs

The institution of transit hubs poses some opportunities and some challenges. Hubs can make some new connections possible and some existing connections easier. This can sometimes reduce the number of route variations needed at the price of introducing transfers. In other cases, hubs will make new connections possible at some inconvenience to existing riders and possibly additional cost to the operator.

Based on a review of current transit services and land uses in the region, input from stakeholders at the project start-up meeting and a review of available ridership figures, a list of potential hub locations in the region was developed.

These potential hubs represent generalized areas in the region where a hub could be established. In a few cases, such as Wallingford and Fair Haven, two potential hub locations are shown within a given area. Ultimately a single preferred location would be chosen if these hubs are developed.

The potential hub locations are summarized in Table 5-1 and shown in Figure 5-1. Note that the hub options noted with an asterisk were suggested in the 2005 Regional Transit Study. Also note that the ridership figures shown include only CTTransit New Haven Division bus routes.

5.2 Prioritization of Corridors for Simplification

Preliminary hub and route simplification concepts were developed in five areas.

West Haven: Possible simplification could include making Route O from the University of New Haven to CT Post Mall part of Route B and reducing the number of branches on route B to two – B4 and the former Route O. B5 would become part of Route J and Route O would be extended to cover B7. Route B would be the principal route in the area with service at night and on Sundays, with some service on Route J. Routes O and M would not operate at night or on Sunday. Hubs could be instituted at New Haven University, West Haven Green and/or the planned West Haven Station. Small adjustments in routes would serve these hubs.

New Haven West Side: Possible simplification could include operating the FQZ combination route at all times as the major route in the area south of Whalley Ave. The inner portion of Route Q would be combined with the middle of Route Z to form a new route ending at the Westville hub with service only during the day on weekdays and Saturdays. This would allow the elimination of evening diversions on Route B. Route F would be limited to just the hourly service to Seymour. Route G could be diverted to serve the inner portion of Route Z, if necessary. These changes could simplify Route B and create a consistent service pattern for the area.

Hamden/North Haven: Possible changes could include eliminating the overlap between J and D variations north of Hamden Plaza, extending Route G to the Putnam and Dixwell hub, and extending Route M to the Hamden Plaza and/or Universal Drive hubs.

Fair Haven/North Haven: Possible changes include splitting Route C into local and express routes with the local service folded into Route D, plus extending all Route Q service to a Fair Haven and/or a Foxon & Quinnipiac hub. There could be some cost savings resulting from consolidating Route C into Route D which could be used to modify Route Q.

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[5] This figure is based on $34.50 hourly labor cost plus $2.2134 per mile, an average speed of 11.1 miles per hour, and deadhead hours at 4.7% of revenue hours

Table 5-1: Potential Hub Locations

No.	Location (Municipality)	Existing Transit Services at Location	Existing Ridership within ½ Mile (NH Div. routes only)	Existing Land Uses, Activity Centers	Notes
1*	Meriden RR Station (Meriden)	-Meriden Route A, B, and C -Amtrak	NA	Near downtown Meriden retail/office	Proposed stop on NH-H-S commuter rail line
2A*	Wallingford RR Station (Wallingford)	-CTT Route C1, C2, C2x -NET Wallingford Local route -Amtrak	31 weekday boardings	Retail, residential	Proposed stop on NH-H-S commuter rail line
2B*	Wallingford Center (Wallingford)	-CTT Route C1, C2, C2x -NET Wallingford Local route	25 weekday boardings	Retail, small office	Already a few small custom shelters near the Center
3*	Hamden Plaza/ Skiff & Dixwell (Hamden)	-CTT Route D5, D6, D7, D8, D9, J2, J8	851 weekday boardings	4 strip/big-box retail centers; dense (3-6 story) housing nearby; Hamden High School	All CTT routes pass Skiff & Dixwell, but only some loop through/around Hamden Plaza; may be possible to locate on Dixwell south of Skiff (to reduce walking distances)
4	Dixwell & Putnam (New Haven)	-CTT Route D5, D6, D7, D8, O5, O6	949 weekday boardings	Super Stop & Shop; other retail; moderately dense residential	Substantial number of boardings at 3-4 stops nearby
5*	Universal Drive (North Haven)	-CTT Route C1, C2, C2x, C3, C3x, C4x, D13 (M3 nearby)	59 weekday boardings	Several big-box retail centers; some office/light industrial a long walk away	Three different stops, spread out considerably; CTT Route M3 comes close and could be extended; Potential for flex route service?
6*	Quinnipiac & Foxon (Rte. 80) (New Haven)	-CTT Route C1, C1x, C2, C2x, C3, C3x, C4x, D4, D13, L1, L2, Q3	159 weekday boardings	Wal-Mart, other retail, multifamily (2-3 story) housing	Big crossroads, with major retail to the west and high-density residential to the southeast; need to determine exactly where routes would meet
7A*	Fair Haven – Grand & Ferry (New Haven)	-CTT Route C1, C2, C3, D1, D3, D4, D12, D13	1,479 weekday boardings	Multifamily residential; retail, magnet high school	Location with highest number of boardings is Grand & Ferry, but would need to re-route G to stop at this location
7B*	Fair Haven – Grand & Quinnipiac (New Haven)	-CTT Route C1, C2, C3, D1, D3, D4, D12, D13, G2	742 weekday boardings	Small retail, single-family residential	Area is somewhat constrained by street widths and hilly topography
8	Forbes Ave. & Townsend Ave. (East Haven)	-CTT Route F2, F3, F4, G2	258 weekday boardings	Retail, single-family residential	Could be part of a circumferential hub-to-hub route on the east side

No.	Location (Municipality)	Existing Transit Services at Location	Existing Ridership within ½ Mile (NH Div. routes only)	Existing Land Uses, Activity Centers	Notes
9	Branford Center (several possible sites: RR Station, Green, or Cherry Hill Park & Ride)	Routes vary by location, but generally: -CTT Route F3 and F4 -DATTCO Route S -GNHTD R-LINK	36 weekday boardings	Park & Ride lot, RR Station, town Green, office/light industrial	Some of these sites connect to the R-LINK, which serves as a circumferential hub-to-hub service; need to check operationally which location makes sense
10*	Westville Center (New Haven)	-CTT Route B1, B2, B3, Z1 (Q2, Q4 nearby)	816 weekday boardings	Multifamily residential, dense retail; Southern CT State University (a few blocks to the north)	Need see how hub would fit on street – this part of Whalley Ave. is narrow; CTT Route Z1 comes close but doesn't hit Whalley – need to determine whether to connect
11	University of New Haven - Route 1 and Campbell (West Haven)	-CTT Route B4, B5, B6, B7, O2 (M2 nearby)	739 weekday boardings	Multifamily residential, retail, University of New Haven	There are a number of possible hub locations in this area, including farther east on Route 1 (Orange-Congress) and farther south in West Haven; need to sort these out
12A*	West Haven Center (West Haven)	CTT Routes B4, B5, B6, B7, J5. J6, J7	828 weekday boardings	Dense retail, town hall, churches, single-family residential	Enhanced shelter already in place near Town Green
12B*	Planned West Haven RR Station (West Haven)	Currently: CTT Routes B4, B6; Planned: Metro-North rail	80 weekday boardings	Industrial, residential	Planned new stop on Metro-North New Haven line; some redevelopment sites nearby; would need to shift some service
13	Planned Orange RR Station (Orange)	-None currently; CTT Post Mall Flyer (PMF) runs express nearby; -Planned Metro-North rail	None	Former Bayer campus, now owned and being developed by Yale; light industrial	Planned new stop on Metro-North New Haven Line; Potential for flex route service or connecting Yale shuttle service?
14*	CT Post Mall (Milford)	-CTT Routes J7, O2, Post Mall Flyer (PMF) -Milford Transit routes -Coastal Link	580 weekday boardings	Major regional mall; borders I-95 with little else around	CTT and Milford already working on making this a hub; Potential for flex route service?
15*	Milford Station (Milford)	-CTT Route J7 (O2 nearby) -Milford Transit routes -Coastal Link -Metro-North rail	53 weekday boardings	Existing RR Station; some retail nearby; multifamily and single-family residential	Potential for flex route service?

Figure 5-1: Potential Hub Locations

Fair Haven/East Haven: It may be possible to consolidate routes F and G with a common trunk. The common trunk could follow the most direct route to New Haven (the current Route F) or connect to a Fair Haven transit hub (via the less direct current Route G) providing connections to the Foxon & Quinnipiac and Universal Drive commercial areas.

The TAG met to select which areas to develop further. The group selected the New Haven West Side, Hamden/North Haven and Fair Haven/North Haven areas. More specific proposed route changes were developed for each of these areas. The New Haven West Side area was subsequently split into two separate sets of proposals with one of those sets also including the east side of Route Q that had been included in the Fair Haven area. In some cases, the recommended changes presented below differ from the above original proposals for the area.

5.3 New Haven West Side Recommendations (F & Q)

This area includes the west side of Route F (West Chapel Street) and both sides of Route Q (State Street / Edgewood Avenue). The proposed changes include transit hubs at Westville Center and a Foxon hub at or near the Wal-Mart near Foxon and Quinnipiac.

5.3.1. Current Service

Current service on Routes F and Q is shown in Figure 5-2.

Route F (West Chapel Street) provides service from Seymour and Ansonia to downtown New Haven. F6 provides hourly service to Ansonia/Seymour from 6 a.m. to 7 p.m. weekdays and Saturdays. Additional Route F service in New Haven is provided as Route F5 as far west as Ella Grasso Boulevard. F5 and F6 together provide service in New Haven every 15-20 minutes in peaks and every 30 minutes midday and Saturday. Most service is through routed to the east of downtown with Route F (East Haven). F6 service from downtown to Seymour and back generally takes about 2½ hours, while a round trip on F5 takes about 30 minutes. The span of service within New Haven is longer than that on outer portion to Seymour. Evening and Sunday trips serve only the New Haven portion of Route F West Chapel and continue out on one of four different combinations with Routes Q, B, and Z.

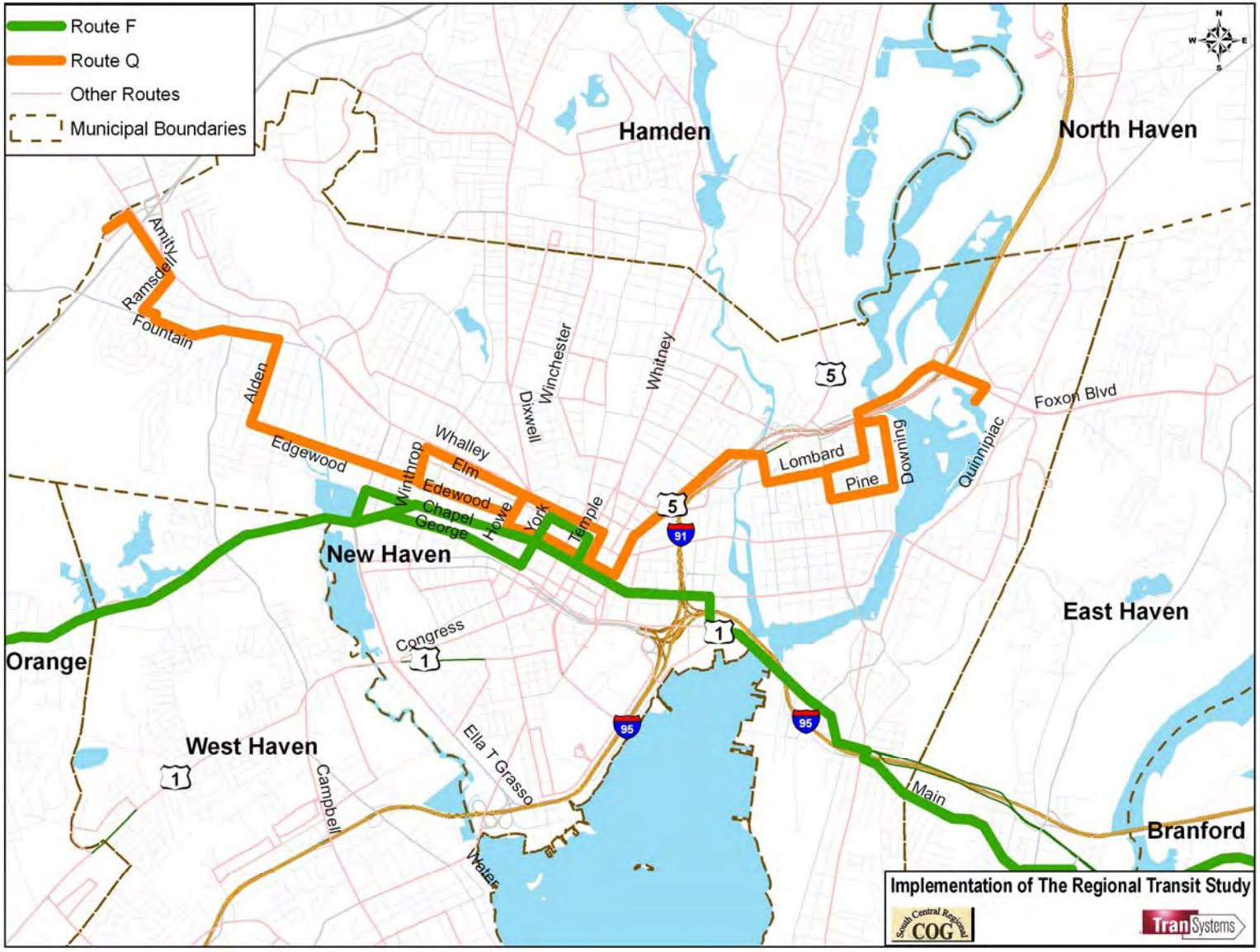
Route Q provides east-west service through New Haven. Q Edgewood Avenue (west of downtown) / Q State Street (east of downtown) operates between Beverly Hills (Q2) to the west and Lombard Loop (Q1) to the east with peak period trips extending west to Amity Shopping Center (Q4) and east to Wal-Mart (Q3) on Foxon Boulevard. Peak period weekday service operates every 20 minutes while midday weekday service operates every 30 minutes between Beverly Hills and the Lombard Loop. There is no weekday evening service west of downtown while some outbound service operates on the east side from downtown to the CTTransit garage and some inbound service operates to the garage from Wal-Mart. Saturday service operates every 30 minutes with every other trip extending to Amity to the west and Wal-Mart to the east. On Saturday evening and Sunday west side service is provided hourly on the FQZ combination which covers the inner part of Route F and only the outer portion of Route Q between Ella Grasso Boulevard and Amity. On Sunday, east side service is provided hourly to Wal-Mart. This Sunday service is not through-routed with the FQZ west side service.

Current round trip cycle times on Route Q vary depending on the termini of the trip. The longer version of the route (Amity to Wal-Mart) requires 120 minutes (including 16 minutes layover), while the shorter version (Beverly Hills to Lombard Loop) requires 90 minutes (including 10 minutes layover). Sunday service between downtown and Wal-Mart, and the Sunday FQZ combination, each take 60 minutes.

5.3.2. Corridor Assessment and Simplification Strategy

On Route F, peak period peak loads average less than 20 passengers per bus. However, given the very long F6 trips and very short F5 trips, F6 trips are likely to be much more heavily loaded than F5 trips. It is estimated, based on CTTransit on/off counts, that F6 peak period peak loads likely average 30 passengers per bus, while F5 peak

Figure 5-2: Current Routes F and Q



period peak loads likely average less than 10 passengers per bus. Stops in New Haven covered by both versions generate more riders than the long outer portion of the route. This higher productivity appears to be part of the reason for the higher frequency afforded by the overlapping of the two versions. Because F6 trips already have a substantial number of riders on board when buses enter New Haven, F5 trips are needed to draw off some of the New Haven riders. The result is some of the New Haven riders still boarding F6 trips while others board nearly empty F5 trips.

The heavier ridership on the New Haven portion also appears to be the reason for providing evening and Sunday service on that segment through various combination routes while there is no evening and Sunday service to Seymour. This adds to the complexity of service on the route. A more ideal situation might be for Route F to follow a route through New Haven that does not need night and Sunday service and that generates fewer riders so that less supplemental service is needed on F5. This would allow for a simpler and possibly lower cost route structure.

On Route Q, peak loads average less than 20 passengers per bus on both sides of the route. The extensions to Amity and Wal-Mart were implemented fairly recently. The Wal-Mart extension has been well-received and has generated modest ridership. The Amity extension has generated somewhat fewer riders. Service on these extensions on all trips would be simpler and may generate greater ridership. Route Q passes near the proposed Westville Hub and could be modified to serve that location. That change, and the Amity extension, creates more overlap with Route B2/B3. Reducing that overlap could shift Route B riders to Route Q, improving the route's productivity.

The strategy for simplifying service and providing hub service in a cost-effective manner would be as follows:

- Modify Route Q to serve the segments of Q and F with the longest span of service
- Modify Route F to serve segments with a more limited span of service
- Use these modifications to eliminate the need for evening and Sunday combination routes
- Connect Route Q to a Westville Center hub and extend all trips to Amity
- Extend Route Q to serve a Foxon hub near Wal-Mart during all hours

A further eastward extension of Route Q to incorporate D12 service on Foxon Road during current D12 service hours could also be included in order to accomplish simplification of the Fair Haven/North Haven service discussed below.

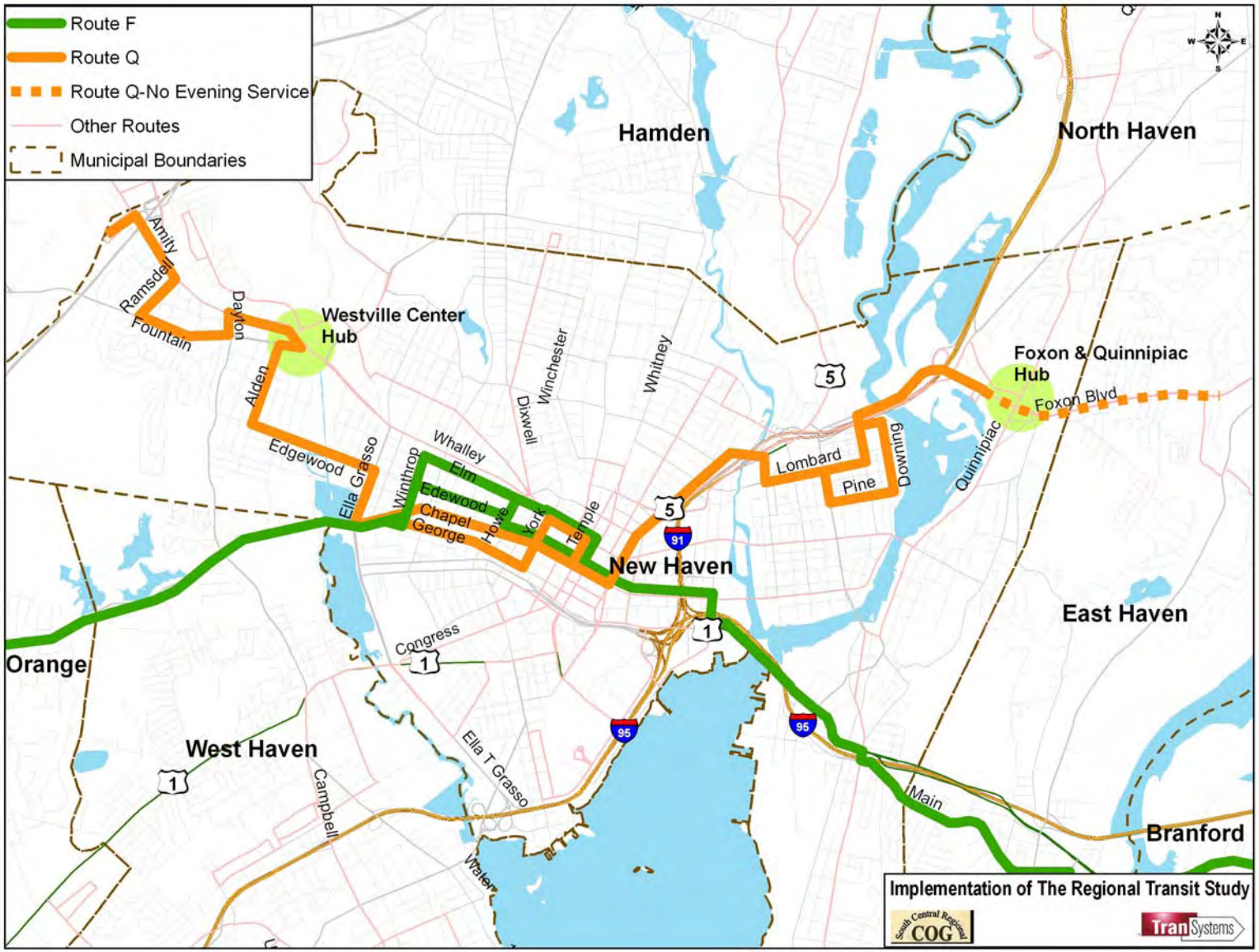
5.3.3. Proposed Service

The proposed service for these routes is shown in Figure 5-3.

The proposed changes for Route F are to re-route Route F between York Street and Winthrop Avenue in New Haven to follow current Route Q, and then follow Winthrop to the existing route on Derby/George. This is expected to add only 2-3 minutes to the F6 round trip time. Hourly service would continue on F6. Route F5 service would be modified to serve a loop via Elm, Winthrop and Edgewood and would be reduced to no more than hourly (providing service every 30 minutes on the segment overlapping with F6). These F5 trips would be lightly used and are needed only to maintain vehicle spacing on the overall route and to provide the 30 minute headways that Elm and Edgewood riders currently receive. There would be no evening or Sunday service on Route F.

The proposed changes for Route Q are to re-route Route Q between York and Ella Grasso to follow current Route F6, and then follow Ella Grasso to Edgewood. The route would also be re-routed from Fountain Street to Whalley between Westville Center and Dayton in order to serve the Westville hub. All Q Edgewood trips would be extended to Amity. All Q State Street trips would be extended to Foxon & Gay via Wal-Mart (replacing D12 service) on weekdays and Saturdays and only to Wal-Mart weekday evenings. Current weekday and Saturday daytime

Figure 5-3: Proposed Routes F and Q



headways would continue along the full route from Amity to Foxon & Gay. An hourly headway would be operated peak between Amity and Wal-Mart in the evening until about 9:00 p.m. and all day on Sundays. (Sunday service would need to continue to serve a loop including West Hills similar to the existing FQZ loop.)

5.3.4. Rider Impacts

Route Q changes would provide a simpler and more consistent service pattern for riders in Beverly Hills, Westville, and the Chapel/George corridor, including St. Raphael Hospital. The easier-to-understand route structure should help attract new ridership.

The proposed changes would have some impact on current riders. Some riders would simply have to use a different route from the same bus stop when traveling to/from downtown. Others may have to use different stops, which in some cases would require a longer walk, but in some cases could result in a shorter walk.

The largest instance of riders using a different route would be in the area between downtown and Winthrop Street where Routes F and Q would swap alignments. Between 524 and 842 Route F riders[6] traveling to/from Chapel and George would switch to Route Q, while 185 Route Q riders traveling to/from Elm and Edgewood would switch to Route F. This would result in an estimated net shift from Route F to Route Q of between 339 and 657 riders. This would allow for a reduction in the number of F5 trips, resulting in a cost savings, while increasing peak loads on Route Q to a level still below bus seating capacity.

A second instance of riders using a different route would be along Foxon Road where current Route D riders would have to switch to Route Q. There are 121 daily boardings and alightings along Foxon Road (Route 80) in this area. The origins/destinations of the downtown end of these trips are unknown. This could result in an additional transfer for any of these riders who are traveling to or from Grand Avenue on Route D.

Some outbound riders boarding outside downtown would have to walk to a different stop to access their route. In some cases this could involve a longer walk while in others it could be a shorter walk. Approximately 104 Route F riders who board or alight on Chapel or George and travel to the outer part of the route would have to use stops on Elm, Edgewood, Howe or Winthrop. Another 85 Route Q riders who board or alight on Elm or Edgewood and travel to the outer part of the route would have to use stops on Chapel or George.

The proposed changes would result in no service along a three block section of Edgewood between Winthrop and Ella Grasso. Approximately 74 riders between downtown and the two stops in that area would have to use stops at Edgewood & Winthrop (F) or Edgewood & Ella Grasso (Q).

Similarly, changes to Route Q to serve the Westville Center hub would leave the three block section of Fountain between Alden and Dayton with no service. Approximately 89 riders would need to walk to stops on Alden, Whalley or Dayton. The number of weekday riders (boardings + alightings) affected by stop are shown in Table 5-2.

Table 5-2: Riders Impacted by Modifications to Route Q

Stop	Daily Riders	Impact
Fountain & McKinley	35	1 block walk to Alden Avenue
Fountain & Barnett	25	about 1 block walk to Whalley Avenue
Fountain and Forest/Emerson	29	about 1 block walk to Dayton Street

[6] A range is given because the segment of Derby and George between Winthrop and Ella Grasso would be served by both routes, giving a choice for some riders.

5.3.5. Costs of Proposed Service

These changes allow the combined frequency of service on Route F to be reduced to every 30 minutes. This would result in the elimination of approximately 12 peak period F5 round trips, for a savings of 6 revenue-hours per weekday.

Changes to Route Q would involve an increase in costs. The Route Q cycle time from Amity to Foxon & Gay would be 140 min. (with a 10 minute layover) or 150 min. (with a 20 minute layover). This means that peak period service at the current 20 minute headway would require seven buses instead of the current six and that midday and early evening service would require five buses instead of the current three. With evening service extended two hours until 9:00 p.m., these changes would result in 23 additional revenue-hours per weekday.

Route Q Saturday service would similarly require five buses instead of the current three. With evening service extended four hours until 9:00 p.m., these changes would result in 28 additional revenue-hours per Saturday. No change is expected in the cost of Sunday service in comparison to the current configuration, including the FQZ combination route.

Overall, changes in this area would add 17 weekday and 28 Saturday revenue-hours of service. This corresponds to an annual operating cost of approximately $358,000. One additional peak vehicle would be required.

5.4 New Haven West Side Recommendations (B, G, Z)

This area includes the west sides of Routes G (Shelton Avenue), Z (Goffe Street), and B (Whalley Avenue). The proposed changes include transit hubs at Westville Center and at Putnam and Dixwell.

5.4.1. Current Service

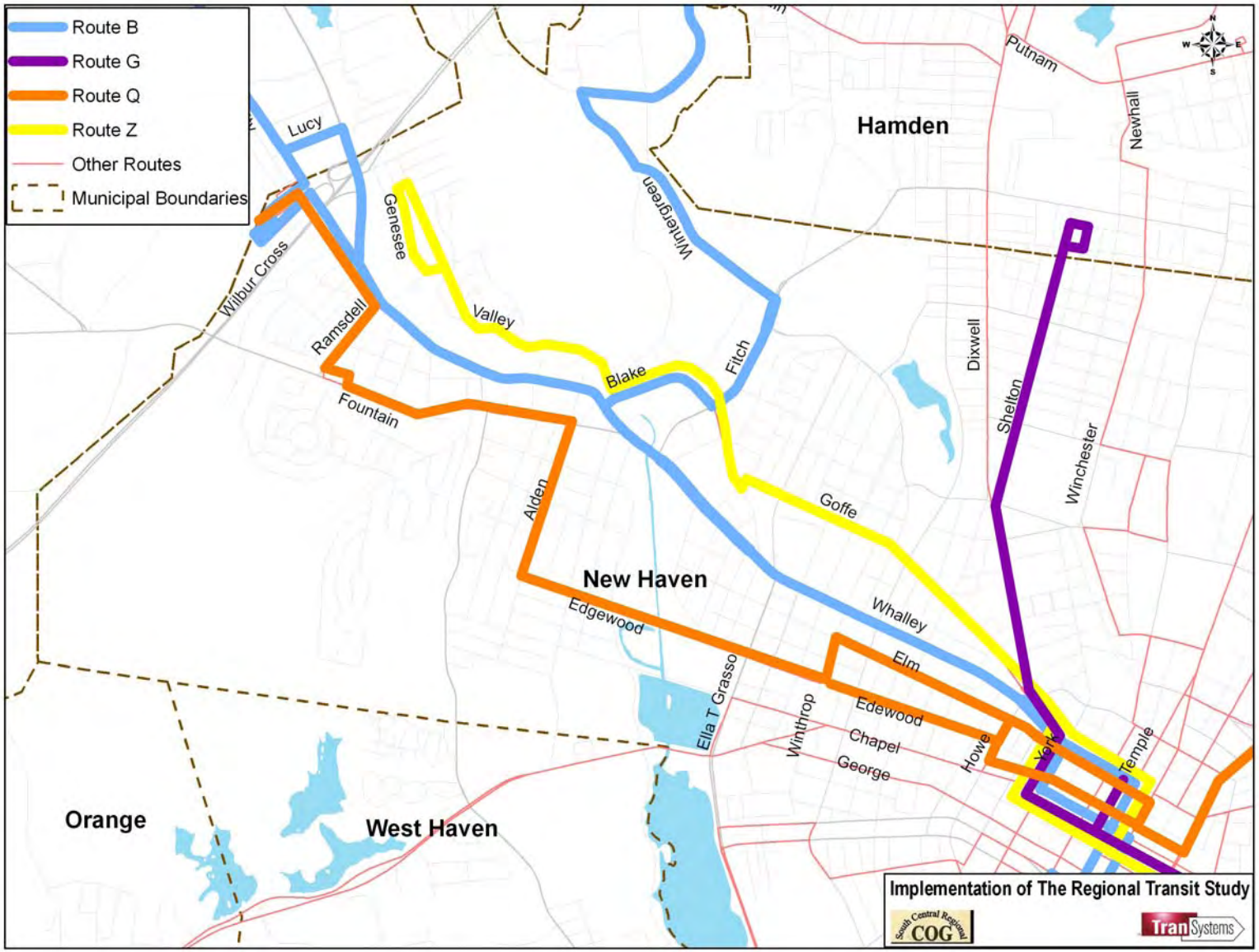
Current service on Routes B, G and Z is shown, along with Route Q, in Figure 5-4.

Route G (Shelton Avenue) provides service to Shelton Avenue and the inner part of Dixwell Avenue. All Route G service on this side of downtown is Route G1. There are no other variations. Weekday service is through-routed with G (East Chapel Street). On Saturday, service on all of Route G is interlined with Route Z. Route G service operates from 6 a.m. to 7 p.m. weekdays and Saturdays, with no service on Sundays. Service operates every 30 minutes in peak periods, every 40 minutes in the midday and every 45 minutes on Saturday. The current cycle time for all of Route G is about 120 minutes (including 24 minutes layover). About 35 minutes of this time is spent on the G Shelton half of the route.

Route Z (Goffe Street) provides service along Goffe Street and to the West Hills neighborhood beyond Westville Center. All service on this side of downtown, except evenings, is Route Z1. Weekday service is through-routed with Z (Sargent Drive). On Saturday, service on all of Route Z is interlined with Route G. Route Z1 service operates from 6 a.m. to 7 p.m. weekdays and Saturdays, with no service on Sundays. Service operates every 20 minutes in peak periods, every 30 minutes in the midday and every 45 minutes on Saturday. Weekday evenings, after Route Z stops operating, service between Westville Center and West Hills is provided hourly by Route B2, while no service is provided along Goffe Street. Saturday evenings and on Sundays, service between Westville Center and West Hills is provided hourly by the combination FQZ route, which operates outbound via Beverly Hills and inbound via West Hills. The current cycle time for all of Route Z is about 90 minutes (including 16 minutes layover). About 45 minutes of this time is spent on the Z Goffe Street half of the route.

On Saturdays, Route G and Z are interlined, with 180 minutes required to complete both routes. This is broken down into about 105 minutes for Route G and about 75 minutes for Route Z.

Figure 5-4: Current Routes B, Z and G



Route B (Whalley Avenue) operates along two branches: B1 to Brookside and B2/B3 to Amity Shopping Center (B3 is an hourly extension of B2 to the Jewish Community Center in Woodbridge). Both braches serve Whalley Avenue from downtown to Westville Center. Beyond Westville Center, only the B2/B3 branch serves Whalley Avenue. B2 ends with a loop along Whalley, Litchfield Turnpike, Lucy and Amity. B3 extends the loop to the JCC. On weekdays and Saturdays service alternates between the two branches. B2/B3 operates every 20 minutes during the day, hourly in the evening, and every 40 minutes Saturday. In the evenings, B2 operates outbound via Whalley Avenue and inbound via West Hills from Amity to Westville Center. There is no B2 service on Sundays (service to Amity provided by FQZ combination route).

5.4.2. Corridor Assessment and Simplification Strategy

Route B is clearly the major route in the corridor. Routes G and Z carry fewer riders and operate a more limited span of service, with no evening or Sunday service. The exception is the West Hills portion of Route Z which receives service through a variation of Route B in the evening, and through the FQZ combination route on Saturday evenings and Sundays. Thus riders traveling to or from West Hills have to use any one of three routes depending on the time and day of travel. Providing service with the same route at all times would be a desirable simplification action.

The proposed hub at Westville Center is the branching point for Route B and is also served by Route Z. Changes proposed for Route Q would also bring it through this hub location. The area proposed for a hub around Putnam and Dixwell attracts a significant number of riders. This area is served by Routes D and O while Route G ends just 0.7 miles away at Shelton and Marlboro. Both of these locations could also potentially be served by a proposed crosstown route (being proposed by others).

The changes proposed above for Route Q would increase the overlap with Route B both in terms of the locations covered and the hours during which the overlap occurs. This could allow Route B to be modified to provide service to West Hills all day long. Service to West Hills on Route Z would no longer be needed allowing Route Z to terminate at the Westville Center hub.

The strategy for simplifying service and providing hub service in a cost-effective manner would be as follows:

- Modify Route Q to serve additional stops on Whalley Avenue (see proposed changes for Route Q)
- Modify Route B2/B3 to serve West Hills at all times on weekdays and Saturdays
- Shorten Route Z to end at a hub at Westville Center
- Extend Route G to a hub at Dixwell & Putnam

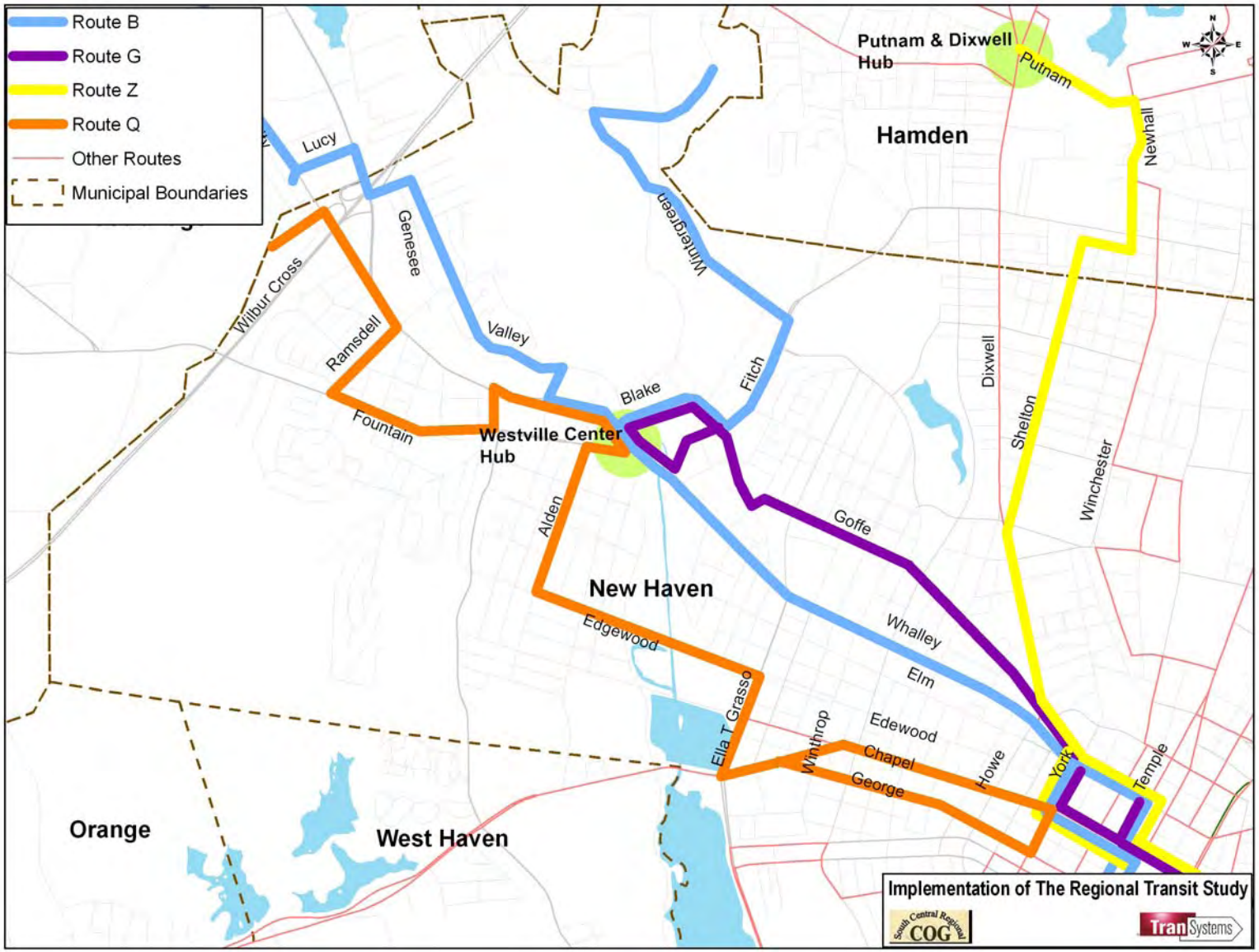
With the lengthening of Route G and the shortening of Route Z, the resulting cycle times on these routes would no longer be consistent with the weekday headways operated. This could be rectified by swapping the through-routing on these routes.

5.4.3. Proposed Service

The proposed service for these routes is shown in Figure 5-5.

The proposed changes for Route B affect only the B2/B3 branch. This branch would be re-routed between Whalley Avenue just beyond Westville Center and Amity Shopping Center via Emerson, Valley, Pond Lily, Whalley/Litchfield Tpk., Lucy and Amity to Amity Shopping Center. The same exact route would be reversed in the inbound direction. B3 trips would continue to serve the Jewish Community Center before stopping at the Amity Shopping Center. This change would add approximately 0.7 miles and 4 minutes to the inbound direction, but should not increase the length of the outbound trip. It is expected that this increase could be accommodated in the current schedule without additional resources. Current headways would continue to operate. This change, and the proposed changes to Route Q, would eliminate the need for all of the evening variations covering portions of Route F and Route Z.

Figure 5-5: Proposed Routes B, Z and G



Route Z (Goffe Street) would be shortened to end at Westville Center. The route would end with a small counterclockwise loop following Blake Street, Whalley Avenue and Fitch Street. The direction of the loop is significant so that inbound buses on all three routes serving the Westville hub would stop on the same side of Whalley Avenue. This change would reduce the cycle time by approximately 11 minutes.

It is proposed that Route G (Shelton Avenue) be extended from the current terminus at Shelton and Marlboro along Marlboro, Newhall and Putnam to the proposed hub near the intersection of Putnam and Dixwell. This extension adds about 1.2 miles each way or about 15 additional minutes in cycle time.

With the lengthening of Route G and the shortening of Route Z, the resulting cycle times on these routes (135 minutes on G and 79 minutes on Z) would no longer be consistent with the weekday headways operated[7]. This could be rectified by swapping the through-routing on these routes, combining Shelton Avenue with Sargent Drive (instead of East Chapel) and combining Goffe Street with East Chapel (instead of Sargent Drive). The result would be a new Route Z Shelton Avenue/Sargent Drive with a cycle time of about 90 minutes (including 10 minutes layover) and a new Route G Goffe Street/East Chapel with a cycle time of about 120 minutes (including 16 minutes layover).

Because the Goffe Street and Shelton Avenue routes currently operate with different headways, changes in headways would be needed. The new Route Z (Shelton Avenue/Sargent Drive) would operate at current Route Z headways - every 20 minutes in peak periods, every 30 minutes in the midday, and every 45 minutes on Saturday. The new Route G (Goffe Street/East Chapel) would operate at current Route G headways - every 30 minutes in peak periods, every 40 minutes in the midday, and every 40 minutes on Saturday. Neither route would have Sunday service. This represents a decrease in weekday frequency along Goffe Street (which would carry fewer riders due to the removal of service to West Hills) and an increase in weekday frequency along Shelton Avenue (which may carry more riders due to the extension to Putnam and Dixwell. This will also increase service in the heavily traveled Dixwell corridor.

5.4.4. Rider Impacts

Route B and Z changes would provide a simpler, more consistent, and slightly more frequent service for riders in the West Hills area. The proposed hub at Putnam and Dixwell will improve connections between routes and provide better service to this destination. Similarly, the proposed hub at Westville Center will also improve connections and provide better service. These two hubs could also be served by a potential crosstown route proposed by others... The easier-to-understand and more connected route structure should help attract new ridership.

The proposed changes would have some impact on current riders traveling to or from points west of Westville Center. Some riders would simply have to use Route B instead of Route Z from the same bus stop when traveling to/from downtown. Others would have to use Route Q instead of Route B from the same bus stop when traveling to/from downtown, while some riders who now use four Route B stops along Whalley Avenue would have to walk further to access Route Q stops along Whalley Avenue.

The largest group of affected riders would be riders traveling to/from West Hills. There are currently about 248 weekday boardings and 177 alightings on the West Hills segment of Route Z who would take Route B2 instead. If these riders are traveling to or from downtown, the only impact on these riders would be positive - an increase in midday frequency. If they are traveling to or from stops along Blake or Goffe streets, the impacts are less clear. There are about 89 weekday inbound alightings (representing 16% of all inbound riders) along Blake and Goffe streets. There are about 96 weekday outbound boardings (representing 22% of all outbound riders) along Blake and Goffe. Most of these are probably traveling to or from West Hills and would need to access B2/B3 along Whalley

[7] The cycle time on a route must be divisible by the headway.

Avenue instead of Z along Goffe. This could be a longer walk for some, but could also be a shorter walk for some others.

Another group of affected riders are those who currently use Route B west of Westville Center along Whalley Avenue between Emerson Street and Amity Shopping Center. Some of these would be directly served by Route Q, while others would have to walk a block or more to a stop on Route Q. The number of weekday riders (boardings + alightings) affected, by stop, is shown below.

Table 5-3: Riders Impacted by Modifications to Route B

Stop	Daily Riders	Impact
Whalley & Dayton	55	stop served by Route Q
Whalley & West Prospect	7	1-2 blocks to nearest Route Q stop
Whalley & Davis	25	2 blocks to nearest Route Q stop
Whalley & Anthony	42	1 block to nearest Route Q stop
Whalley at Cheese 'n Stuff	8	1 block to either Route Q or Route B
Whalley & East Ramsdell	120	stop served by Route Q
Whalley & Glenview	40	stop served by Route Q
Whalley & Amity	33	stop served by Route Q

Route Q riders affected by moving Route Q to serve the Westville Center hub were discussed above.

5.4.5. Estimated Cost:

Changes in Routes G, Z, and B are expected to result in no net change in operating cost from the current service.

5.5 New Haven/Hamden Recommendations (D, J, O)

This area includes the north side of Route D (Dixwell Avenue), Route J (Whitney), and Route O (Winchester Avenue). The proposed changes include transit hubs at Hamden Plaza and at Putnam and Dixwell.

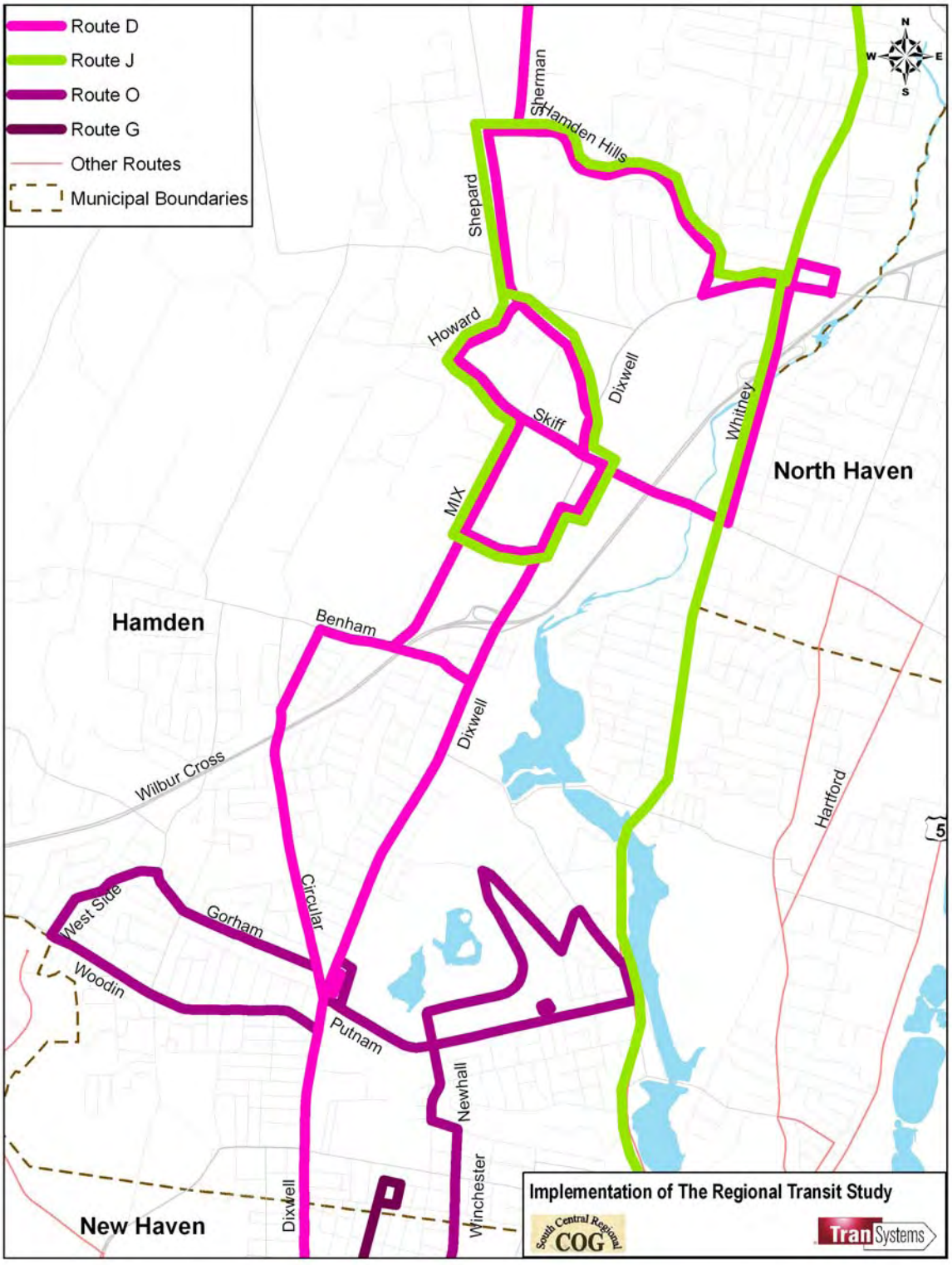
5.5.1. Current Service

Current service on Routes D, J and O is shown, along with Route G, in Figure 5-6.

Route D (Dixwell Avenue) provides frequent service to Hamden Plaza from downtown New Haven and is through-routed with Route D (Grand Avenue). Most trips are Route D5 which provides service directly along Dixwell Avenue from downtown and ends at Hamden Plaza. On weekdays there are four AM peak period trips and five PM peak period trips that serve a loop that extends north of Hamden Plaza (Routes D6, D7, D8 and D9). This loop serves Sherman Industrial Park, Hamden Hills and Centerville. This loop operates in the clockwise direction (Sherman Industrial Park to Hamden Hills to Centerville) in the AM peak, and counter-clockwise in the PM peak. A few weekday trips also divert off Dixwell between Putnam Avenue and Benham Street (D8 and D9). Two AM peak trips and three PM peak trips in each direction make this diversion to serve Circular Avenue, Sacred Heart Academy and Benham Street. None of these variations operate on weekends. However, on Saturdays there are seven round trips on a shorter version of the route (D10) that operates only between downtown and Putnam Avenue.

Route D service operates from 5 a.m. to 1 a.m. seven days a week. Weekday service operates every 10 minutes all day and every 30 minutes in the evening. Saturday service (excluding the extra D10 trips) operates every 15

Figure 5-6: Current Routes D, J, and O



minutes all day and hourly in the evening. Sunday service operates every 30 minutes all day and hourly in the evening.

Route J (Whitney Avenue) provides service along Whitney Avenue from downtown. During most hours, there are two branches that split at Centerville. From Centerville, Route J2 travels to Hamden Plaza via Hamden Hills. Route J4 continues north along Whitney Avenue and travels all the way to Waterbury. On weekends J2 is replaced by J8 which turns off Whitney at Skiff and travels directly to Hamden Plaza bypassing Hamden Hills. On Saturday the inbound trip reverses the outbound trip while on Sunday the inbound trip returns on Skiff but diverts north along Whitney to Centerville before heading inbound via Whitney. On Sunday some of the J4 (Waterbury) trips operate express between downtown and Centerville via I-91, creating the need for J8 to serve Centerville. Each branch operates hourly seven days a week. Route J4 operates from 5 a.m. to about 8 p.m. on weekdays, with shorter hours on weekends. Route J2/J8 operates from 8 a.m. to about 8 p.m. weekdays, with shorter hours on weekends.

Route O (Winchester Avenue) provides service to the neighborhoods north of downtown. Most weekday service is on Route O5 ending at the Putnam and Dixwell hub location. There are six weekday trips (approximately every 2 hours) that are Route O6, which extends west via a loop along Woodin and Gorham streets to Pine Rock. On weekday evenings a shorter route (O4) operates only as far as Mill Rock Road. Weekend service does serve Putnam & Dixwell but omits service to the Whitney Center on Leeder Hill Drive. Weekday Route O service operates every 30 minutes in peak periods, every 40 minutes in the midday, and hourly in the evening. Route O operates every 40 minutes on Saturday and every 60-75 minutes on Sunday.

5.5.2. Corridor Assessment and Simplification Strategy

Route D Dixwell is the highest ridership route in the New Haven Division with 6,500 weekday riders. Peak loads average between 22 and 26 passengers per bus during all weekday time periods. While there are five different variations that operate on weekdays in order to serve the two loops, the two loops carry relatively few riders. The Circular/Benham loop carries an estimated 36 weekday riders, with 23 of those on Circular Avenue. The Sherman/Centerville loop carries about 109 weekday riders, with 82 of these traveling to or from the Industrial Park and only about 17 going to Hamden Hills or Centerville. Service to Hamden Hills and Centerville is provided all day on weekdays by Route J2. Service to Centerville is provided at all times by Route J4 and also by Route J2 on weekdays. Route D could be simplified by reducing the Sherman/Centerville loop to serve only Sherman Industrial Park, leaving Hamden Hills and Centerville to be served by Route J. The Circular/Benham loop could be eliminated, possibly with some of the riders served by changes to Route O.

Route D10 on Saturdays appears to have been inserted into the schedule between what would otherwise be D5 trips spaced evenly every 15 minutes. The effect of this is to reduce crowding on one of every four D5 trips, leaving the others unaffected. Scheduling the D10 bus midway between two D5 trips most likely results in the D10 trips being lightly utilized. In such circumstances, it is generally more effective to provide sufficient resources to reduce the headway on the full route, alleviating crowding to some extent on all trips, rather than only one of four. Furthermore, the proposed extension of the Shelton Avenue route (currently Route G) would provide some of the benefits provided by the D10 service, connecting the Putnam and Dixwell hub and inner Dixwell Avenue with downtown every 40 minutes on Saturdays.

The Hamden Plaza branch of Route J (J2/J8) operates in three different configurations (J2 on weekdays, and two different versions of J8 on Saturdays and on Sundays). Reducing the number of these variations to two, or even one, could simplify the route.

Route O has four different variations. The Pine Rock loop (Route O6) operates on weekdays for only a few trips and serves only about 10 riders per day, all of them on the Woodin side of the loop. This loop could be eliminated, or merged with the higher ridership part of the Route D Circular/Benham loop in order to support the simplification of

Route D. Evening service (Route O4) omits the Putnam and Dixwell hub location. Extending evening service to Putnam and Dixwell would both simplify the route and support the implementation of a hub at that location.

The strategy for simplifying service and providing hub service in a cost-effective manner would be as follows:

- Eliminate Route D diversions along Circular and Benham and provide replacement service with Route O6
- Simplify the Sherman/Centerville loop to be a linear route serving only the Sherman Industrial Park
- Create a single weekend J8 routing serving Centerville and using Dixwell Avenue to Hamden Plaza
- Reduce Route O variations by converting evening trips to O5 (or O7)
- Establish hubs at Hamden Plaza and Putnam & Dixwell

5.5.3. Proposed Service

The proposed service for these routes is shown in Figure 5-7.

It is proposed that Routes D6, D7, D8 and D9 be merged into a single Route D6 variation. It would be the same as D5 as far as Hamden Plaza, and then continue via Skiff, Howard, Shepard, Hamden Hills and Sherman into Sherman Industrial Park, returning via Hamden Hills, Shepard and Dixwell to Skiff. The D8/D9 Circular/Benham loop would be eliminated, leaving only D5 all day with a few D6 trips in peak periods on weekdays. On weekends, the Saturday D10 bus would be eliminated with additional service to Putnam Place provided via Shelton Avenue.

On Route J, no changes are proposed to weekday service. Route J2 will provide the only service to Hamden Hills and so will likely pick up the few Route D riders boarding there who may then transfer to Route D at Hamden Plaza or travel downtown on Route J. On weekends, Route J8 should be modified to operate the same route on both Saturdays and Sundays, following Whitney and Dixwell via Centerville to the Hamden Plaza hub. This will add about 4 minutes per round trip on Sunday but 14 minutes per round trips on Saturday

Route O evening service would be modified to match the weekday day time service, converting all O4 trips to O5. Trips on Route O6 would be modified to follow Woodin, Westside, Brook, Gilbert and Circular to Dixwell, replacing D8/D9 peak direction service on Circular Avenue. Current O6 trips are generally not at the same time as D8/D9 trips and therefore there will be a need to more closely examined ridership on these trips in order to evaluate how many trips and which trips should serve this new loop[8].

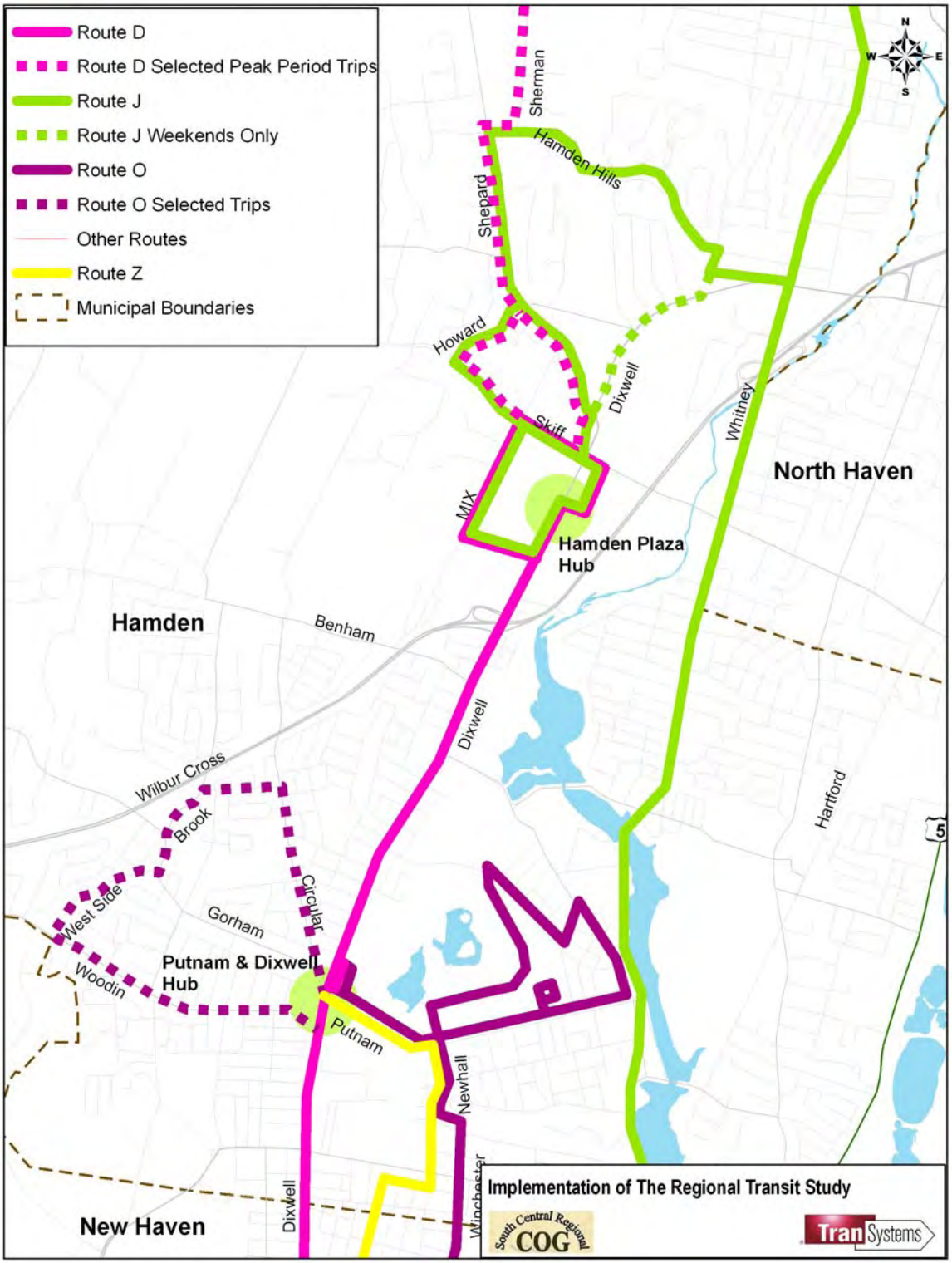
5.5.4. Rider Impacts

Route D and J changes would provide a simpler service pattern for riders north of Hamden Plaza and along Dixwell Avenue. The easier-to-understand route structure should help attract new ridership.

While over 100 weekday riders use the Route D Sherman/Centerville loop, most of these are traveling to or from the Sherman Industrial Park and would not be affected by the proposed changes. Elimination of service to Hamden Hills and Centerville would impact only about 29 daily riders. All would still have service but would have to use Route J and likely transfer to Route D at Hamden Plaza. Most of these riders (22 boardings and alightings) are on Whitney Avenue in Centerville, while just 4 daily boardings and alightings are in Hamden Hills.

[8] Route D peak direction Circular Avenue service that may need to be replaced operates inbound at 7:22 and 8:39 a.m. and outbound at 3:51, 5:11 and 5:51 p.m. Route O Pine Rock loop service operates at 7:58, 9:13, and 10:35 a.m., and at 12:35, 2:35, and 5:55 p.m.

Figure 5-7: Proposed Routes D, J, and O



Consolidation of O6 Woodin/Gorham loop and D8/D9 Circular/Benham loop would leave some riders without service while continuing to serve others. The 14 current weekday boardings and alightings on the Route O6 Woodin/Gorham loop would all continue to be served. The 23 current weekday inbound boardings and outbound alightings on Circular Avenue would be served by Route O instead of Route D. Just 13 current riders (boardings and alightings) on Circular/Benham loop would not be served, including 8 outbound alightings on Benham Street at Sacred Heart Academy.

Details of weekend ridership are not available to assess the impacts of weekend Route J8 changes. However, all riders would continue to be served although in-vehicle times may increase for Hamden Plaza riders.

5.5.5. Estimated Cost:

On Route D, simplification of Sherman/Centerville loop and elimination of Circular/Benham loop could save between one and two revenue-hours per weekday. Elimination of Saturday D10 service saves 7 hours per week.

The evening extension of O4 to become O5 adds about 2 revenue-hours per weekday. Modification of the O6 Woodin/Gorham loop to cover Circular Avenue would add about 4 minutes to each trip. Route O does not have sufficient time for this extension as all Route O6 trips are very tightly scheduled. The entire revised loop is approximately 3.0 miles or about 18 minutes per trip. Schedules will need to be re-worked to assess the cost of this change. For this report, it is conservatively estimated that up to 4 hours of additional service may be needed to serve this loop.

The Route J8 weekend modifications would lengthen the route by 14 minutes per round trip on Saturday and 4 minutes per round trip on Sunday. Schedules may need to be re-worked to assess the cost of this change. For this report, it is conservatively estimated that up to 3 hours of additional Saturday service may be needed to serve this loop.

Overall, changes in this area would add 5 weekday revenue-hours of service but would reduce Saturday service by 4 hours. This corresponds to a net annual operating cost increase of approximately $66,000. It is estimated that one additional peak vehicle would be required on Route O.

5.6 Fair Haven/North Haven Recommendations (D, C)

This area includes the east side of Route D (Grand Avenue) and all of Route C. The proposed changes include a Foxon transit hub in the vicinity of Foxon and Quinnipiac, most likely at the nearby Wal-Mart that serves as the terminus of Route Q.

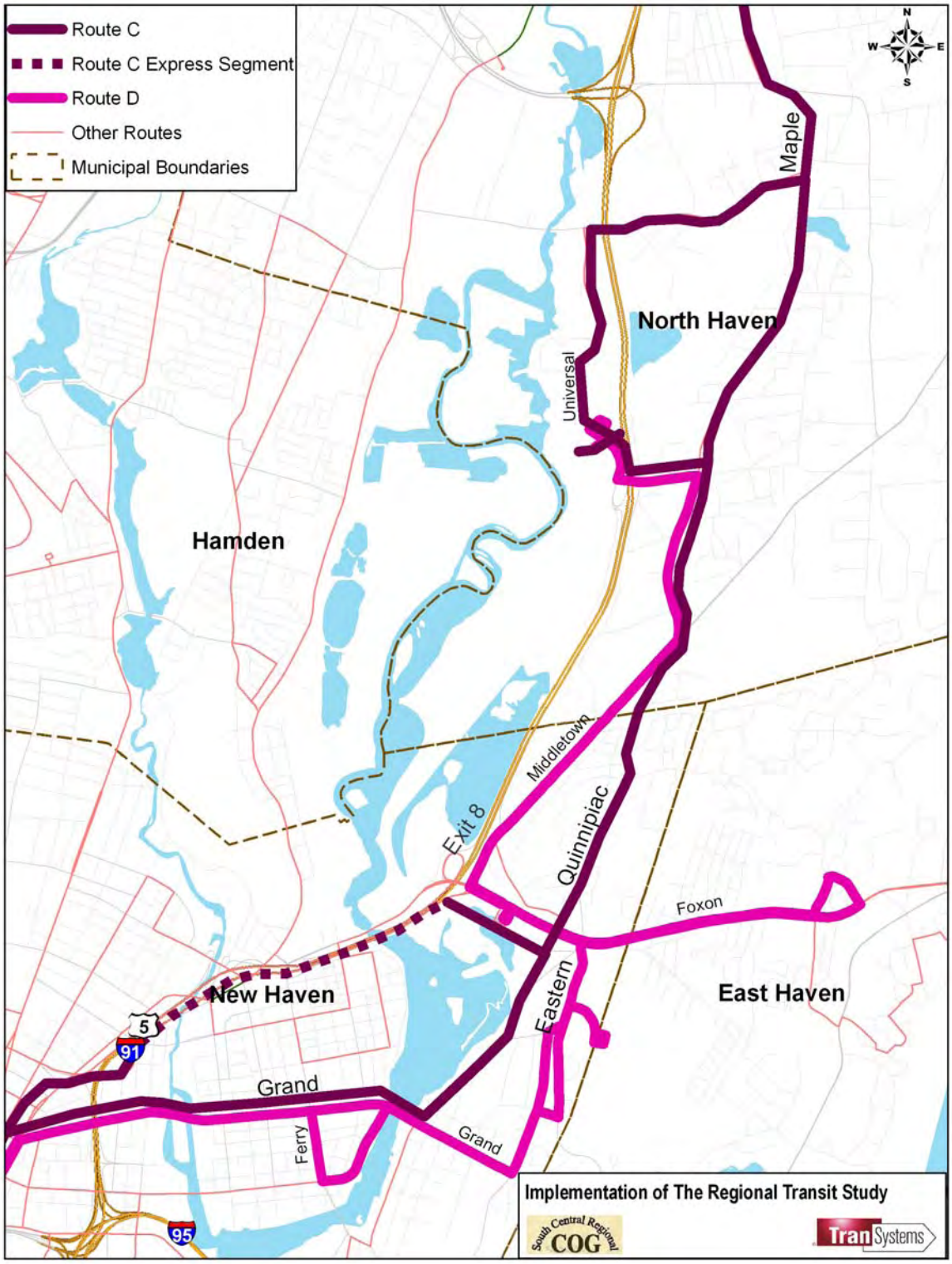
5.6.1. Current Service

Current service on Routes C and D is shown in Figure 5-8.

Route D provides frequent bus service along Grand Avenue in New Haven. Service is provided every 10 minutes on weekdays, every 15 minutes on Saturdays and every 30 minutes on Sundays. On weekdays, every other trip ends at Grand and Ferry (D1) and returns to downtown via Ferry and Front streets beginning the inbound trip at Grand and Front. The remaining weekday service and all Saturday service extends to the intersection of Foxon and Eastern and then splits with alternating service to Universal Drive in North Haven (D13) and to Foxon Road in East Haven (D12). The Universal Drive service (D13) serves the potential hub site at the Wal-Mart on Foxon Boulevard. On Sunday all service ends at the Wal-Mart (D4).

Route C is a very long route that provides service from Meriden, Wallingford and North Haven into New Haven via the Fair Haven section of the city. Weekday peak period and all Sunday service operate via I-91 from Foxon

Figure 5-8: Current Routes C and D



Boulevard (Route 80) to downtown. Peak period service is frequent, but there are many different variations. Weekday midday and all Saturday service operate locally via Grand Avenue to supplement Route D service. Midday service operates hourly while weekend service is even less frequent.

5.6.2. Corridor Assessment and Simplification Strategy

There is substantial overlap between Routes C and D in several areas. During the midday both routes operate along Grand Avenue. Route D runs every ten minutes (six trips per hour) while once each hour a Route C trip operates as a seventh trip in between two of the Route D trips. The two routes separate at Grand and Quinnipiac but then overlap at the intersection of Foxon & Quinnipiac. Some Route C trips also overlap with D13 trips on Middletown Avenue. Both Route C and the D13 branch of Route D serve the Universal Drive area. However, Route C service is hourly and Route D13 Is every 40 minutes leading to an uneven combined headway.

Route C could be simplified by reducing the number of peak period variations. The peak period express service could be separated from the local midday service, as the midday service is almost just a variation and extension of Route D. That midday service could be consolidated with Route D service eliminating the Grand Avenue overlap and making the Route C trips just an extension of Route D.

On Route D peak period peak loads average 25 passengers per bus, but it is likely that these vary considerably from trip to trip given the operating plan on the route. Route D generates considerable ridership beyond the Grand and Front Street termination of the short D1 trips, at least as far as Foxon Boulevard. With D1 trips spaced evenly between D12/D13 trips, the longer Route D variations are likely to be much more heavily loaded than the short D1 trips. Also, by spacing Route C trips evenly between Route D trips that are only ten minutes apart, the following Route D trip is likely to carry far fewer riders than the other five Route D trips each hour. A more effective way to avoid crowding may be to provide service that leads to a more balanced loading of trips. This could be done by extending the section of the route with ten minute headways to include the area up to Foxon Boulevard. By allowing riders from that area to use any one of the six trips per hour, the disparity between loads on the trips would be reduced. Some of the cost of this extension of service can be offset by attaching the outer part of midday Route C trip to one of the extended trips and eliminating the “seventh trip” each hour along Grand Avenue.

Adding Route C as a branch of Route D would increase the number of concurrent variations on weekdays to four. This could be reduced by shifting one of the branches (D12) to Route Q at the Foxon and Quinnipiac hub.

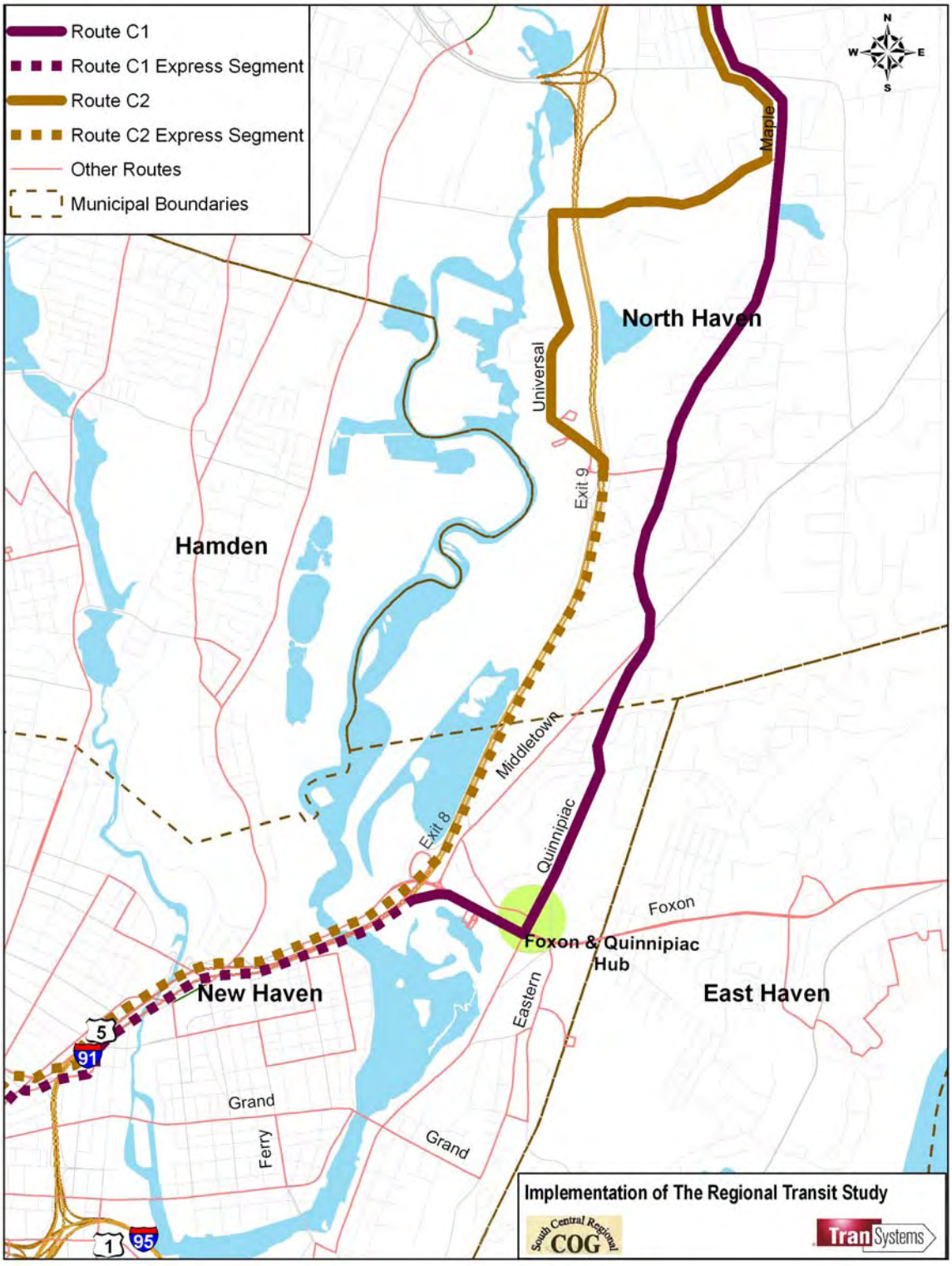
The strategy for simplifying service and providing hub service in a cost-effective manner would be as follows:

- Restrict Route C to existing peak period express trips and reduce the number of variations
- Extend Route D1 short trips to a hub in vicinity of Foxon and Quinnipiac
- Make Route C local trips a branch of Route D
- Make the Foxon Road branch (D12) an extension of Route Q

5.6.3. Proposed Service

Route C would be reduced to a peak-periods-only express service. (All midday, evening and weekend service would be replaced by a new branch of Route D.) All Route C trips would run express on I-91. Route C would no longer serve Middletown Avenue (service would be provided by Route D13). Service on Blakeslee and Bassett would be eliminated after the Gateway Community College North Haven campus closes. (It may be desirable to provide service to the new Quinnipiac campus at the Anthem Blue Cross site in the future after this site is developed.) The number of variations would be reduced to two: C1 Kohl’s to downtown via Quinnipiac and the Foxon hub, and C2 Barnes Industrial Park to downtown via Wharton Brook Park and Universal Drive. These are shown in Figure 5-9.

Figure 5-9: Proposed Route C



From downtown, Route C1 would use I-91 to Exit 8, then follow Foxon, Quinnipiac, Maple, Washington, and South Colony along the existing route through Wallingford to Kohl's. This variation would not serve Universal Drive. Service would be hourly in peak periods and would continue to meet Meriden service at Kohl's. A short version (C3) could operate between North Haven and downtown in peak periods.

From downtown, Route C2 would use I-91 to Exit 9, then follow Montowese, Universal Drive, Sackett Point, Maple, Washington, and South Colony along the existing route through Wallingford to a terminus at Barnes Industrial Park. Trips on C2 would be primarily reverse peak trips with return trips in the peak direction on either C2 or C3. C2 would serve Wharton Brook Industrial Park only in reverse peak direction.

A sample schedule for Route C is shown in Table 5-3.

The proposed service for Route D is shown in Figure 5-10. The trunk portion of Route D along Grand Avenue would continue to operate at current headways, every 10 minutes on weekdays. All Route D trips would follow the current D13 route as far as the Foxon hub (most likely at Wal-Mart). From there, three different variations would operate. Every 40 minutes one trip would continue as D13 to Universal Drive as they currently do. Every 60 minutes one trip would follow a new branch similar to Route C (referred to here as D14) that would extend past the Foxon hub and follow Route C to Kohl's Plaza[9]. (D14 would operate from 8:30 until 2:30 on weekdays and all day on Saturdays.) The remaining Route D trips (current D1 and D12 service) would be replaced by D4 service ending at the Foxon hub (as described above, service along Foxon Road would be provided by Route Q). On Sunday five D14 trips operating only as far as North Haven would be needed to replace current Route C service.

Universal Drive would be served by both D13 and D14 but would continue to have uneven headways. Weekday headways at Universal Drive would follow a pattern of varying headways ranging between 10 and 40 minutes. There are no easy low-cost ways to make this service more consistent. (D14 service would have to increase to every 40 minutes, at the cost of one bus, in order to provide a consistent 20 minute headway between the two branches, or D13 service would need to be decreased to every hour, but with no cost savings.)

These changes would leave some segments without service. The Lenox Street loop would no longer be served and there would be no service provided on Quinnipiac between East Grand and Foxon.

5.6.4. Rider Impacts

Route C changes would provide a simpler and more consistent peak service in the corridor. A somewhat simpler and more effective Route D should benefit both riders east of the river who would receive more frequent service and riders along Grand who would see more balanced loads on buses. The easier-to-understand route structure should also help attract new ridership.

The proposed changes would have impacts on current riders. There would be positive impacts along the Route D corridor between downtown and the Foxon hub. Others would be negatively affected by the elimination of service on the Lenox Loop, Ferry and Front streets on Route D, and parts of Quinnipiac Avenue, Middletown, Blakeslee and Bassett on the current Route C.

The improved frequency between Ferry Street and the Foxon hub will benefit just over 900 current daily riders. It will also result in a more balanced loading of trips along Grand which should in turn reduce crowding on the more heavily used trips. This will be a benefit to the more than 3,600 daily riders passing through the peak load point along Grand.

[9] The hourly D14 trips would need to be scheduled so that they do not conflict with the D13 trips every 40 minutes. For example, if D13 trips leave the hub on the hour, 40 minutes past the hour and 20 minutes past the hour, D14 trips would have to leave at either 10, 30, or 50 minutes past the hour.

Table 5-3: Example Route C Schedule

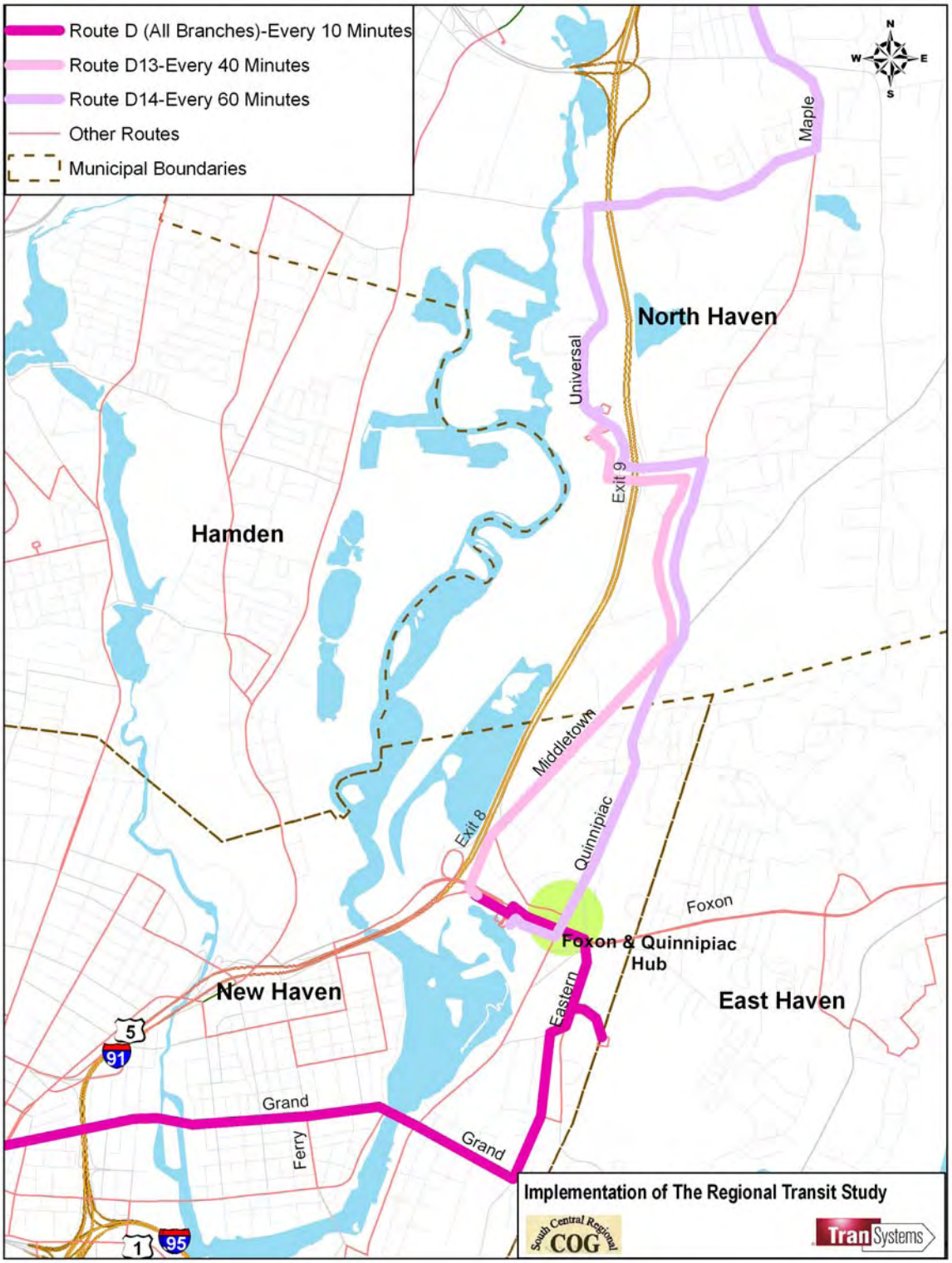
Inbound

Route	Kohl's	Barnes Industrial	Wallingford	Wharton Brook Ind. Park	North Haven Plaza	Universal Drive Hub	Foxon Hub	Downtown
C3					6:40		6:53	7:13
C1	6:52		7:06		7:20		7:33	7:53
C2		7:23	7:36		7:50	7:59		8:23
C3					8:00		8:13	8:33
C1	7:52		8:06		8:20		8:33	8:53
C1	2:52		3:06		3:20		3:32	3:47
C2		3:12	3:26	3:36	3:41	3:50		4:07
C2		3:41	3:55	4:05	4:10	4:19		4:36
C1	3:52		4:06		4:20		4:32	4:47
C2		4:35	4:49	4:59	5:04	5:13		5:30
C1	4:52		5:06		5:20		5:32	5:47
C1	5:52		6:04		6:18		6:30	6:40

Outbound

Route	Downtown	Foxon Hub	Universal Drive Hub	North Haven Plaza	Wharton Brook Ind. Park	Wallingford	Barnes Industrial	Kohl's
C2	5:40		5:53	6:00	6:04	6:11	6:22	
C1	6:00	6:11		6:23		6:33		6:45
C2	6:20		6:35	6:43	6:47	6:56	7:07	
C1	6:40	6:53		7:07		7:19		7:33
C2	7:00		7:18	7:26	7:30	7:39	7:50	
C1	7:30	7:46		8:00		8:12		8:26
C1	3:35	3:51		4:06		4:21		4:35
C3	3:45	4:01		4:16				
C1	4:10	4:26		4:41		4:56		5:10
C1	4:35	4:51		5:06		5:21		5:35
C2	5:05		5:24	5:33		5:48	6:02	
C3	5:35	5:51		6:06				
C1	6:05	6:21		6:36		6:51		7:05

Figure 5-10: Proposed Route D



The reduction from seven to six of the number of trips per hour between Ferry Street and downtown should not significantly impact most riders, as the 10 minute headway on Route D will be retained.

With the proposed simplification of service, several lightly used route segments will no longer be served. These are listed in Table 5-4. Service along Blakeslee and Bassett could be retained without impacting other aspects of the proposed service. Currently half of the ridership generated by that segment is from Gateway Community College and Anthem Blue Cross, both of which will be closing soon. New developments at these sites, such as Quinnipiac University, may necessitate keeping service along all or part of this segment.

5.6.5. Estimated Cost:

The cost of the simplified peak period service on Route C is expected to be comparable to that of the existing service.

The changes in Route D weekday service consist of converting all D12 and D1 trips to D4, merging the outer portion of midday Route C trips with selected Route D4 trips, and eliminating the inner portion (between downtown and Foxon Boulevard) of Route C in the midday. Converting all D12 trips to D4 will result in no change in operating costs. Converting 31 round trips from D1 to D4 will add 40 minutes per round trip, for a total of 21 revenue-hours per weekday. The elimination of the inner portion on Route C will save 60 minutes on each of eight round trips, for a savings of eight revenue-hours per weekday. This leaves a net cost of 13 revenue-hours per weekday.

On Saturday, current Route C service is already somewhat integrated into the Route D schedule not unlike the proposed weekday schedule, so operating costs of the proposed changes should be comparable to that of the current service.

Overall, changes in this area would add 13 weekday revenue-hours of service. This corresponds to an annual operating cost increase of approximately $205,000. Two additional peak vehicles would be required.

Table 5-4: Riders Impacted by Modifications to Routes C and D

Current Route	Route Segment	Daily Riders	Impacts
D	Ferry and Front Street D1 turnaround loop	63	riders must use stops on Grand
D	Lenox Loop	48	riders must use stops on East Grand
C	Quinnipiac between East Grand and Foxon Boulevard	13	most too far to walk to Foxon or East Grand
C	Middletown Avenue	11	all AM outbound alightings (mostly Covidien) would be served by D13
C	Blakeslee and Bassett Streets	40	13 alightings at Gateway CC; no boardings 7 boardings at Anthem; no alightings 20 elsewhere on Blakeslee and Bassett

5.6.6. Route D Alternative

An alternative proposal was also developed for Route D that would reduce the negative impacts on riders who would lose service under the proposed plan. Current riders on Ferry Street, most riders on Quinnipiac between East Grand and Foxon, and to some extent riders on the Lenox Loop would keep their service. The drawback is that the plan is not as simple as the proposed plan.

This alternative is shown in Figure 5-11. The D13 trips and the D4 trips converted from the current D12 would be essentially the same as in the proposed plan, except that they would not make the diversion into Bella Vista. The D14 and D4 trips converted from current D1 trips would follow Grand Avenue to Ferry Street, then follow Ferry across the soon to be re-opened Ferry Street Bridge, turn onto Quinnipiac, Hemmingway, and Eastern, then serve Bella Vista and continue to the Foxon hub. This alternative essentially splits the service between Ferry Street and Foxon hub into two variations, each operating every 20 minutes on weekdays.

Service is maintained on Ferry Street for the vast majority of the 63 daily Ferry and Front Street loop riders. The 48 current Lenox Loop riders would not be served at their current stops, but could be served by the stop one to two blocks away at Quinnipiac and Aner. Service on Quinnipiac between East Grand and Hemingway is maintained for most of the 13 current riders on Quinnipiac. Additionally there are currently about 35 weekday riders using Route G at the stop on Quinnipiac at Aner who would lose service when Route G is re-routed over the Ferry Street Bridge. These riders would be served by Route D under this alternative.

This alternative does not provide the improved frequency to riders between Ferry Street and the Foxon hub that the proposed service provides. However, like the proposed plan, it would provide more balanced loading of trips on Grand and should reduce crowding. This is because the numbers of riders using the two variations are expected to be similar. The lower ridership segments along Ferry and Quinnipiac, combined with Bella Vista, should attract ridership comparable to that on East Grand, Russell, and Eastern.

The cost of this alternative would be equal to that of the proposed plan.

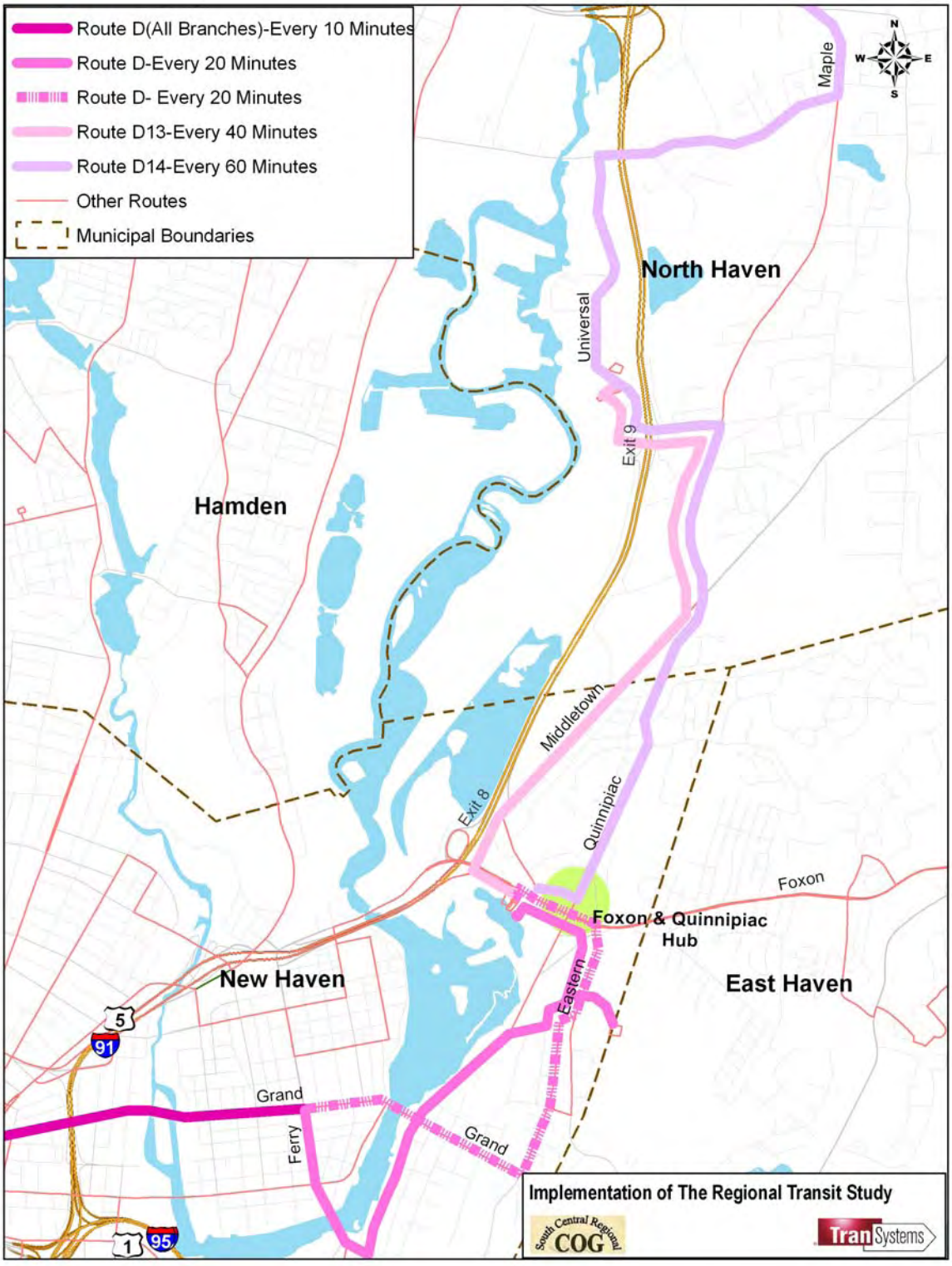
5.7 Summary of Route Simplification Operating Costs

The annual operating costs of each of the above simplification changes are summarized in Table 5-5.

Table 5-5: Summary of Projected Fixed Route Operating Costs

Area	Routes	Additional Peak Vehicles	Increase in Daily Revenue-Hours				Annual Cost
			Weekday	Saturday	Sunday	Annual	
New Haven West Side	F, Q	1	17	28	0	5,791	$358,248
New Haven West Side	B, G, Z	0	0	0	0	0	$0
New Haven/Hamden	D, J, O	1	5	-4	0	1,067	$66,008
Fair Haven/North Haven	C, D	2	13	0	0	3,315	$205,076
Route Simplification Total		4	35	24	0	10,173	$629,332

Figure 5-11: Alternative Route D



5.8 Route Naming Convention

CTTransit is in the process of converting its letter-based route naming system to a number-based system. This process is currently underway in the Hartford Division and CTTransit intends to convert the New Haven Division next. The same convention used in Hartford is likely to be used in New Haven.

In Hartford, each branch of a route is being assigned a unique number. As is the case in New Haven, many Hartford routes extend out on both sides of downtown. The branches on either side of downtown are each given a separate number. If, on one side of downtown, a route splits into two very distinct branches, each branch is given a different number. If the split is near the end of the route, and so affects only a small share of the riders, it may not be given a different number, but rather each branch is distinguished by a letter added to the number. The same is true if some service on a route terminates at an intermediate point along a route. Such service is generally not given a unique number but is distinguished by a letter added to the number. Numbers were assigned with odd numbers on the south and even numbers on the north. There is no consistent even-odd pattern for routes from the east and west.

As an example, in Hartford Route Q currently has a single branch north of downtown, now called Q1. South of downtown, there are two distinct branches. One branch is Q4. The other consists of Q2 and Q3. Much of the service on this branch is Q2 to Westfarms Mall, but some peak period trips end at an intermediate point and are called Q3. Q1 is being renamed Route 46. Q4 is being renamed Route 37. The Q2/Q3 branch is being renamed Route 39, with the Westfarms trips being designated as 39W and the shorter trips designated as just 39.

Each route is being given a name, typically based on the name of the major street being served. Each different version of the route (46, 37, 39, and 39W in the above example) is given a separate named based on its destination and significant intermediate points or streets. In the case of Hartford's Route Q, the names of the route and its branches are as follows:

- 46 Vine Street
    - 46 Coventry St.-Elizabeth Av.
- 37 Jefferson Street-New Britain Avenue
    - 37 Charter Oak Marketplace-West Hartford Place
- 39 Retreat Avenue-New Britain Avenue
    - 39 Elmwood
    - 39W Westfarms

The above rules are guidelines and the set of numbers and names selected for Hartford was the result of an iterative process involving many individuals. Nevertheless, a possible application of this convention to New Haven is shown in Table 5-6. Odd numbered routes extend to the south and west of downtown and are listed on the first page. Even numbered routes extend north and east of downtown and are listed on the second page. Routes including express segments are listed separately on the third page.

Routes to the southwest are given odd numbers less than 20. Routes to the west are given odd numbers in the 20's. Routes to the north are given even numbers less than 20. Routes to the east are given even numbers in the 20's. Routes that operate express along segments of I-91 and I-95 are given numbers in the 40's with odd numbers on I-95 to the south and even numbers on I-91 and I-95 to the north and east.

The table assumes that the proposed route simplification actions identified above are completed prior to, or in conjunction with, the renaming. The table reflects the simplified routes. For routes that have not been examined for simplification, the table reflects the current major route variations. Some minor variations are not listed and may require additional branch letters. Further information on possible phasing in of these changes is discussed in Section 7. It should be noted that the table represents a preliminary list of possible route numbers and a final list will require input and review by CTTransit.

Table 5-6: Preliminary Route Numbers

Route			Branch		
Old	New	Name	Old	New	Name
Z	1	Sargent Drive			
			Z3	1	City Point
			Z3	1S	City Point-Sound School
			Z2	1L	Long Wharf
J	3	Kimberly			
			J7	3	Milford via Union Station and Savin Rock
			JZ	3C	City Point via Union Station
			J6	3R	Oyster River via Union Station and Savin Rock
			J5	3S	Savin Rock via Union Station
			J	3U	Union Station
M	5	Washington Avenue			
			M2	5	Veteran's Hospital
			M1	5E	Ella Grasso Boulevard
B	7	Congress-Savin Rock			
			B7	7	Savin Rock
B	9	Congress-Jones Hill			
			B5	9	Jones Hill Road
			B6	9R	Jones Hill Road via Railroad Avenue
B	11	Congress-Bull Hill			
			B4	11	Bull Hill Lane via Congress
			BO	11A	Bull Hill Lane via Route 1
			B	11H	Yale-New Haven Hospital
			B	11W	West Haven Center via Congress
O	13	Route 1			
			O2	13	Connecticut Post Mall
F	15	Ansonia-Seymour			
			F6*	15	Seymour via Derby, Shelton, and Ansonia
			F5*	15W	Winthrop Street
Q	21	Beverly Hills			
			Q4*	21	Amity Shopping Center via Beverly Hills
B	23	Whalley-Amity Road			
			B2*	23	Amity Shopping Center via West Hills
			B3*	23J	Jewish Community Center via West Hills and Amity
B	25	Whalley-Brookside			
			B1	25	Brookside via SCSU
Z	27	Goffe Street			
			Z1*	27	Westville Center

Table 5-6: (continued)

Route			Branch		
Old	New	Name	Old	New	Name
D	2	Dixwell			
			D5	2	Hamden Plaza
			D6*	2S	Sherman Avenue via Hamden Plaza
G	4	Shelton			
			G1*	4	Putnam Place
O	6	Winchester Avenue			
			O5/O7	6	Putnam Place
			O6*	6P	Pine Rock via Putnam Place
J	8	Whitney			
			J2	8	Hamden Plaza via Hamden Hills
			J1	8C	Centerville
			J8*	8D	Hamden Plaza via Whitney & Dixwell
			J	8E	Whitney & Edwards
			JM	8M	State & Ridge via Whitney
			J1	8Q	Quinnipiac University
J	10	Waterbury			
			J4	10	Waterbury
			J4x	10X	Waterbury Express
M	12	Ridge Road			
			M4	12	Northside
M	14	State Street			
			M3	14	Devine Street Park and Ride
			M6	14R	State & Ridge via State
			JM	14W	State & Ridge via Whitney
Q	22	Lombard			
			Q*	22	Route 80 & Thompson via Foxon Wal-Mart
			Q4	22W	Foxon Wal-Mart
D	24	Grand			
			D4	24	Wal-Mart via Grand
			C*	24M	Meriden-Wallingford-North Haven via Grand and Universal Drive
			D13	24U	Universal Drive via Grand
G	26	East Chapel			
			G2	26	Lighthouse Park
F	28	East Haven			
			F2	28M	Momauguin via East Haven
			F3	28S	Branford-Short Beach via East Haven
			F4	28W	Branford Wal-Mart via East Haven

Table 5-6: (continued)

Route			Branch		
Old	New	Name	Old	New	Name
C	40	Wallingford-North Haven Express			
			C1*	40	Meriden via Quinnipiac, North Haven & Wallingford
			C3*	40A	North Haven Plaza via Quinnipiac
			C2-AM*	40B	Barnes Industrial via Universal Drive and Wharton Brook
			C2-PM*	40C	Barnes Industrial via Universal Drive
PMF	41	Connecticut Post Flyer			
			PMF	41	Connecticut Post Mall
L	42	North Branford			
			L1	42	Route 80 North Branford via Glenmoor
			L2, DL	42F	Route 80 North Branford via Foxon Road
S	44	Route 1			
			S	44	Madison via Branford and Guilford

6.0 PROJECT RECOMMENDATIONS - POTENTIAL FLEX ROUTES

The goal of Task 6 of the Implementation of the Regional Transit Study was to identify potential areas for new flex route services in the region, to screen the areas based on a set of evaluation criteria, and to develop initial designs for services for the most promising areas. Key data needed in identifying areas for flex route service in the region was assembled. SCRCOG staff was consulted regarding the analysis and criteria that were used to develop the North Branford R-LINK flex route service, as well as flex route services in the Estuary region. A methodology to identify and screen the most promising areas for flex route implementation was developed based on this and other experience with similar services.

This section presents the methodology used and the analyses conducted, followed by a discussion of possible new flexible services in the most promising areas.

6.1 Flex Route Analysis Methodology

To support the analyses, the following data was gathered:

- GIS data containing basic population characteristics, including total population and the population of residents over age 60, at the Census block group level from the 2000 U.S. Census.
- A database of major employers in the region purchased from Dun & Bradstreet, including information about employer size (number of employees) and industry classification; these have been geo-coded in order to be displayed as a GIS file.
- GIS data containing the locations of major hospitals and health care-related employers in the region, based on the Dun & Bradstreet data noted above and on knowledge of the area.
- GIS files containing the routes in the CTTransit New Haven Division, Meriden Division, and Wallingford Division.
- A database containing one month's worth of trip data on the four paratransit services operated by the Greater New Haven Transit District (GNHTD): Regional Rides Program, Dial-A-Ride, ADA, and Jobs Access/Reverse Commute (JARC). The database includes the trip origin, date and time, and the trip destination. These were geo-coded in order to be displayed as a GIS file.

One of the most important criteria in developing flex route services is where concentrations of senior citizens are located. Other important factors include proximity to medical-related uses, proximity to retail uses, proximity to employment locations, concentrations of existing paratransit trips, and proximity to transportation hubs. Together these criteria can be used to identify potential areas for flex route service, and screen the areas to identify the most promising opportunities. The screening methodology employed is described below.

1. Develop buffers to exclude areas close to existing fixed-route services – The goal of the flex route task in this project was to identify new flex routes that could complement existing fixed-route services, not replace them. For this reason, it was necessary to exclude areas that are very close to existing fixed routes. Using GIS files of the routes in the CT Transit New Haven, Meriden, and Wallingford Divisions, buffers were created in order to exclude areas that are within a short distance of these routes. A distance of ¼ mile on either side of the fixed routes was used, to represent a comfortable walking distance to these routes. While a greater distance could have been chosen, a shorter distance is more appropriate given that many of the target users for the flex routes are seniors, who may not be willing or able to walk more than ¼ mile to reach a fixed route.

2. Identify areas with concentrations of trip productions – By their nature, flex routes serve more dispersed origins and destinations than traditional fixed-route transit services. However, the service area for a flex route still needs to have a moderate density of trip productions and attractions[10] for it to be productive; otherwise, more traditional paratransit service may be a better solution. Therefore it is important to look at the concentrations of trip productions around the region to start to identify potential flex route zones. Three factors were used to identify concentrations of trip productions:
    a. Population density: Areas with a population density at or just below the threshold necessary to support minimal fixed-route bus service may be suitable for flex routes. This range is roughly 1,000 to 2,500 people per square mile. The 2000 U.S. Census data was mapped in GIS to highlight areas with population density in this range.
    b. Senior population density: Areas with relatively high concentrations of senior residents are also likely to be productive areas for flex services. A density threshold of 250 senior residents per square mile was used. The 2000 U.S. Census data was mapped in GIS to highlight areas with a senior population density above this threshold.
    c. Paratransit trip Productions (home ends): Areas with concentrations of paratransit trip productions (i.e., home ends) may be productive areas for flex route services, since they represent people who already have a need for transit services and cannot or prefer not to use the fixed-route network. The one-month sample of paratransit trip data provided by the GNHTD was mapped to show the distribution of trip productions, with graduated symbols to show the frequency of trips. It should be noted that while many paratransit users may be unable to use a flex route, their presence and trip-making patterns may be indicative of potential travel by others in the area.

    Based on the maps of the three factors described above, the most promising areas, in terms of trip productions, were identified. This was done by visually inspecting and comparing the maps, and drawing areas representing production zones. Areas within the ¼ mile fixed-route buffer developed in Step 1 were excluded.

3. Identify concentrations of trip attractions – While the trip productions for flex routes are often relatively dispersed, the trip attractions (i.e., non-home ends) generally must be fairly concentrated for a flex route to operate productively. Therefore it is also important to look at concentrations of trip attractions around the region. After identifying the most promising production zones, a similar methodology was used for identifying areas with concentrations of trip attractions, looking at four factors:
    a. Hospitals/medical uses: Hospitals and medical-related land uses, such as medical professional buildings, are often generators of flex route trips, as well as traditional paratransit trips. Major hospitals and medical-related land uses were mapped in GIS by looking at the employer data as well as other resources.
    b. Retail uses: Shopping centers, grocery stores, and other major retailers are typically generators of transit trips, particularly for service sector workers who may be employed at these locations. Clusters of retail uses can be mapped in GIS by looking at the employer data and showing employer sizes with graduated symbols.
    c. Overall employment: Other types of employers (besides medical and retail) may also be attractors of flex route and other transit trips. Clusters of employment can also help identify major centers of activity and dense development which may generate flex route trips for other reasons (e.g., municipal services, social services). Clusters of employers were mapped in GIS using the employer data, showing employers sizes with graduated symbols.

[10] It should be noted that the term trip "production" refers to the home end of a one-way trip, regardless of whether it is the trip origin (beginning of the one-way trip) or the destination (end of the one-way trip). Similarly the term trip "attraction" refers to the non-home end of the trip.

d. Paratransit trip Attractions (non-home ends): Areas with concentrations of paratransit trip attractions (i.e., non-home ends) may be productive areas for flex route services, since they represent demonstrated locations of trip demand. The one-month sample of paratransit trip data provided by the GNHTD was mapped to show the distribution of trip attractions with graduated symbols to show the frequency of trips.

Based on the maps of the four factors described above, the largest concentrations of trip attractions were identified. This was done by visually inspecting and comparing the maps and identifying concentrations of attractions. Unlike the productions side, areas within the ¼ mile fixed-route buffer could be included here, since they may attract trips from outer areas.

4. Evaluate how easily the attractions can be reached from the productions – For any transit service to be effective, it must be fairly convenient, time-competitive, and affordable in comparison to other transportation alternatives such as driving or carpooling. The convenience and time-competitiveness of a transit service is determined in large part by the number of transfers required (i.e., whether the trip involves a one-seat ride, a two-seat ride, or more), and the frequency of the service, which determines passenger wait times. Flex routes are no different in this respect; services that are more direct and more frequent will attract more riders, while services that require one or two transfers to other routes, and which run very infrequently, will attract fewer riders.

   The ease of transit travel between the productions and attractions can be looked at in two ways:

   a. The geographic spread of the paratransit trip attractions linked to any production zone: If a production zone generates paratransit trips that are fairly concentrated, flex route trips may exhibit a similar concentration. These trips may be easier to serve with a more consolidated form of transit (i.e., a flex route) than if the trips are dispersed evenly throughout the region. The opposite trip ends (i.e., attractions) associated with each production zone were mapped to show the extent to which they are concentrated or dispersed.

   b. The ease of transit travel from any production zone to an attraction: If travel from a production zone to various attractions can be made easily by transit (i.e., with a one-seat ride, or by linking via a single transfer to a frequent fixed-route), that production zone is probably better suited to flex service than other zones that have more difficult links. The ease of transit connections between production and attraction zones was assessed using visual inspection and a simple rating system.

5. Summarize the strength of the zones in a matrix - The ratings produced from the above steps were then summarized in a simple matrix to determine which zones had the strongest productions, which had the strongest attractions, and which zones had the best transit connection opportunities to attractions.

6. Select the most promising zones for flex route service – Based on the matrix created in Step 5, the top 3 zones were considered to be the most promising for developing the next flex routes in the region.

6.2 Flex Route Analysis

6.2.1. Identification of Potential Flex Route Zones

Steps 1 and 2 led to the identification of potential flex route zones. One restriction on this task was to identify potential flex routes that would complement existing fixed-route services, not replace them. As a result, any areas within ¼ mile of existing fixed routes (or within 3/4 mile of North Branford R-Link) were excluded from consideration for flex service. GIS files of CT Transit New Haven, Meriden, and Wallingford Divisions, plus Milford Transit were used to identify the areas outside these limits. Areas within the exclusion zone were not considered for flex route

service, except to the extent that they would be served at the end of a flex route as it makes a connection to fixed route services.

Next, three factors were considered for the purpose of identifying concentrations of trip productions and defining potential flex route zones. The factors were:

- Population density: Areas with a moderate population density roughly between 1,000 and 2,500 people per square mile
- Senior population density: Areas with relatively high concentrations of senior residents, roughly 250 senior residents per square mile.
- Paratransit trip productions: Areas with concentrations of paratransit trip productions (i.e., home ends) based on a one-month sample of paratransit trip data provided by the GNHTD[11]

Using these three factors, and excluding areas near fixed route service, seven potential flex route zones were identified. These seven potential flex route zones are shown with data on population density, senior density and paratransit trip productions (home ends) in Figures 6-1 through 6-3. The areas and the reasons for their selection are listed in Table 6-1.

Each zone was rated for flex route attractiveness based on the three factors. Each zone was assigned a rating of 0 (low), 1 (medium), 2 (high) for each of the three factors. The ratings were assigned subjectively based on visual inspection of mapped data. Ratings for the three factors were averaged to give a score between 0.0 and 2.0 for the attractiveness at the home end as shown in Table 6-2.

Table 6-1: Potential Flex Route Areas

P1: New Haven/Woodbridge	some paratransit productions and moderate population and senior density only at the New Haven end
P2: Hamden/Bethany	moderate to relatively high number of paratransit productions, moderate population density at the Hamden end
P3: Orange/Milford	moderate population and senior density in Milford, some paratransit productions in Orange (paratransit data for Milford was not obtained)
P4: East Haven	moderate population density, high number of paratransit productions, high senior density near Route 80
P5: Branford	high senior density, moderate population density, moderate number of paratransit productions
P6: Guilford/Madison	pockets of moderate population and high senior density
P7: Wallingford	moderate population density, high senior density, moderate number of paratransit productions just outside ¼ mile of fixed route service

[11] Note: GNHTD paratransit data covers eight core towns for all programs. Additionally, Orange, Bethany, Wallingford, and Guilford are covered for some programs. Milford and Meriden are only covered for ADA service within ¾ mile of CTTransit service.

Figure 6-1: Population Density and Potential Flex Route Areas

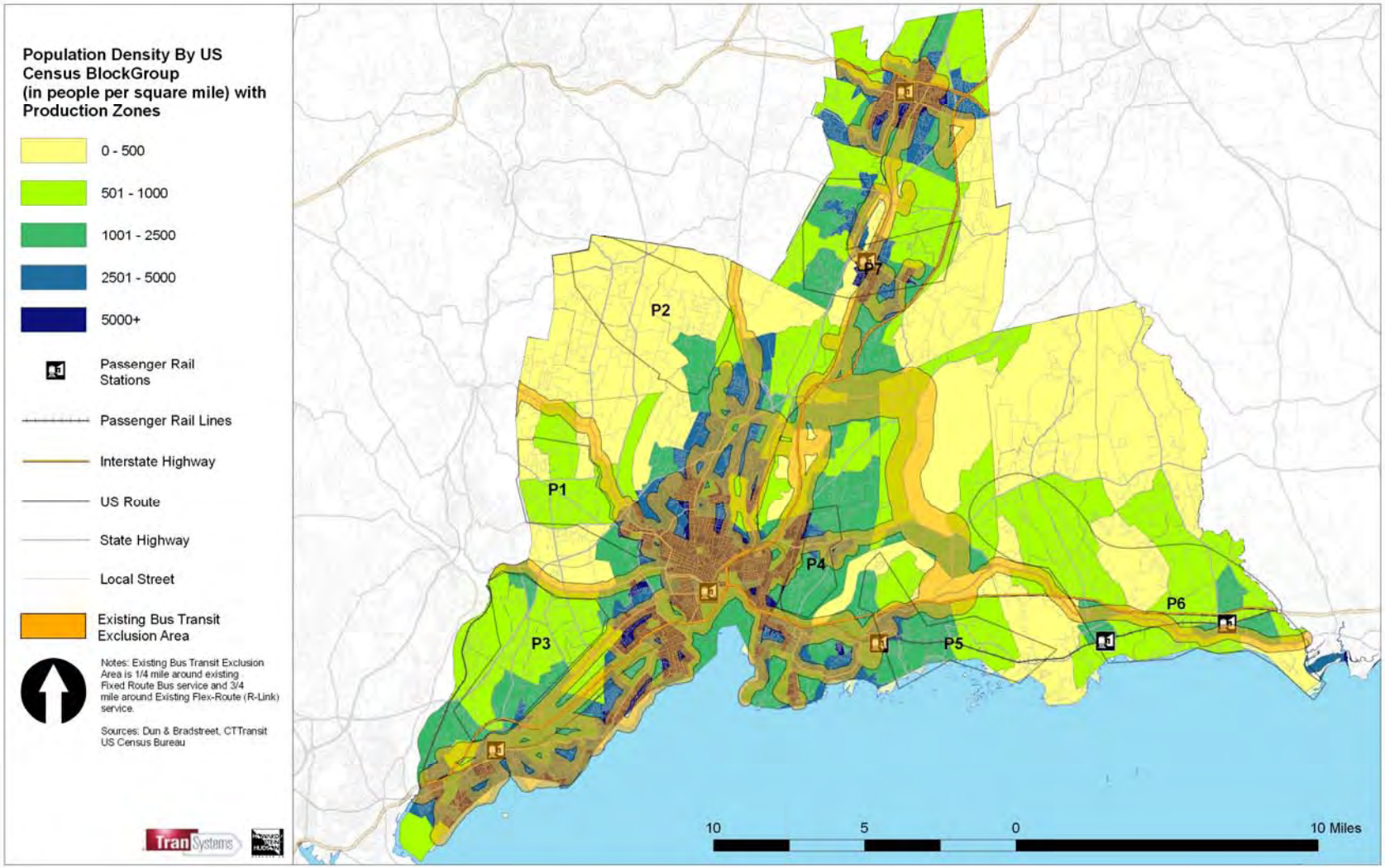


Figure 6-2: Senior Population Density and Potential Flex Route Areas

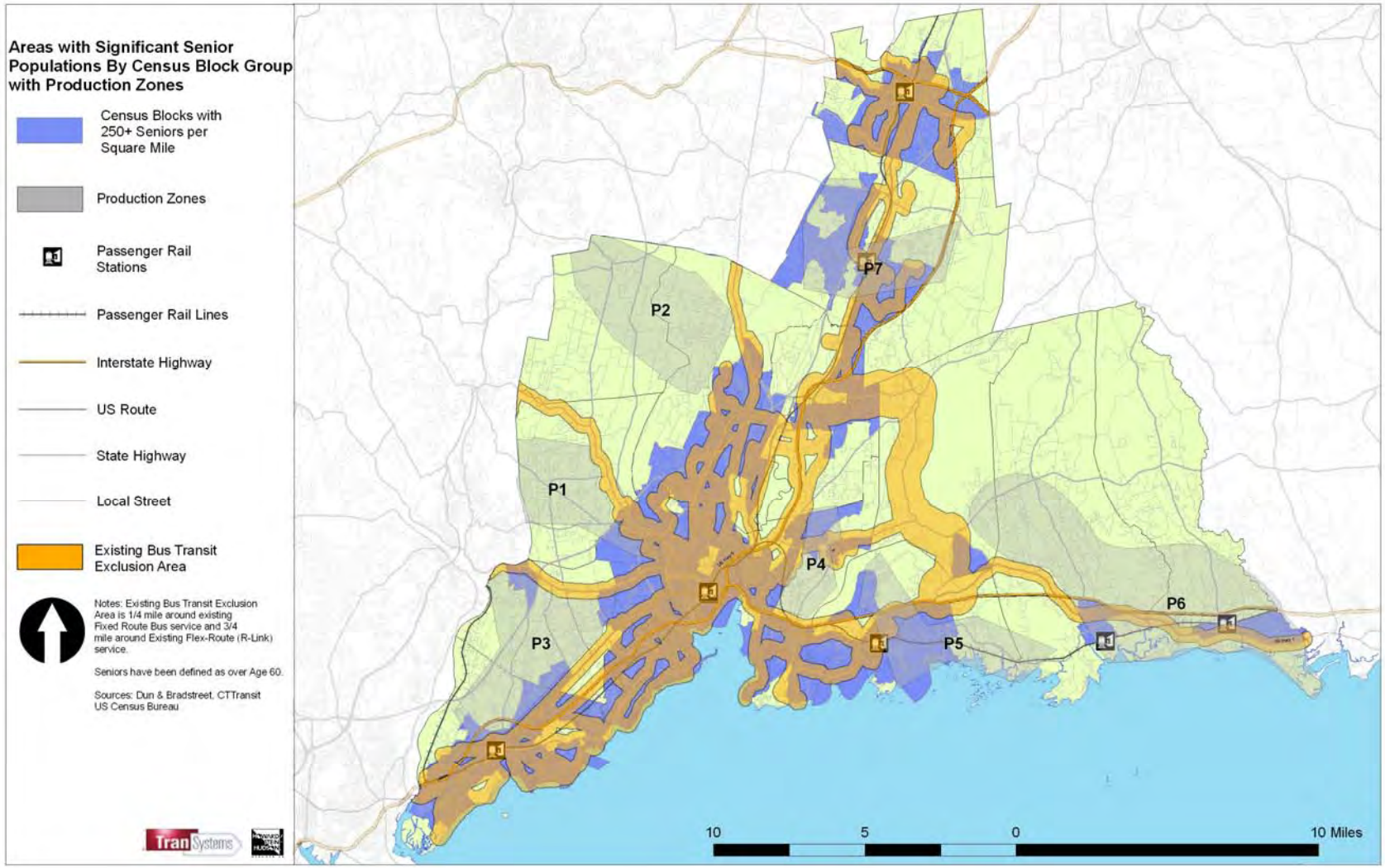


Figure 6-3: Paratransit Trip Productions and Potential Flex Route Areas

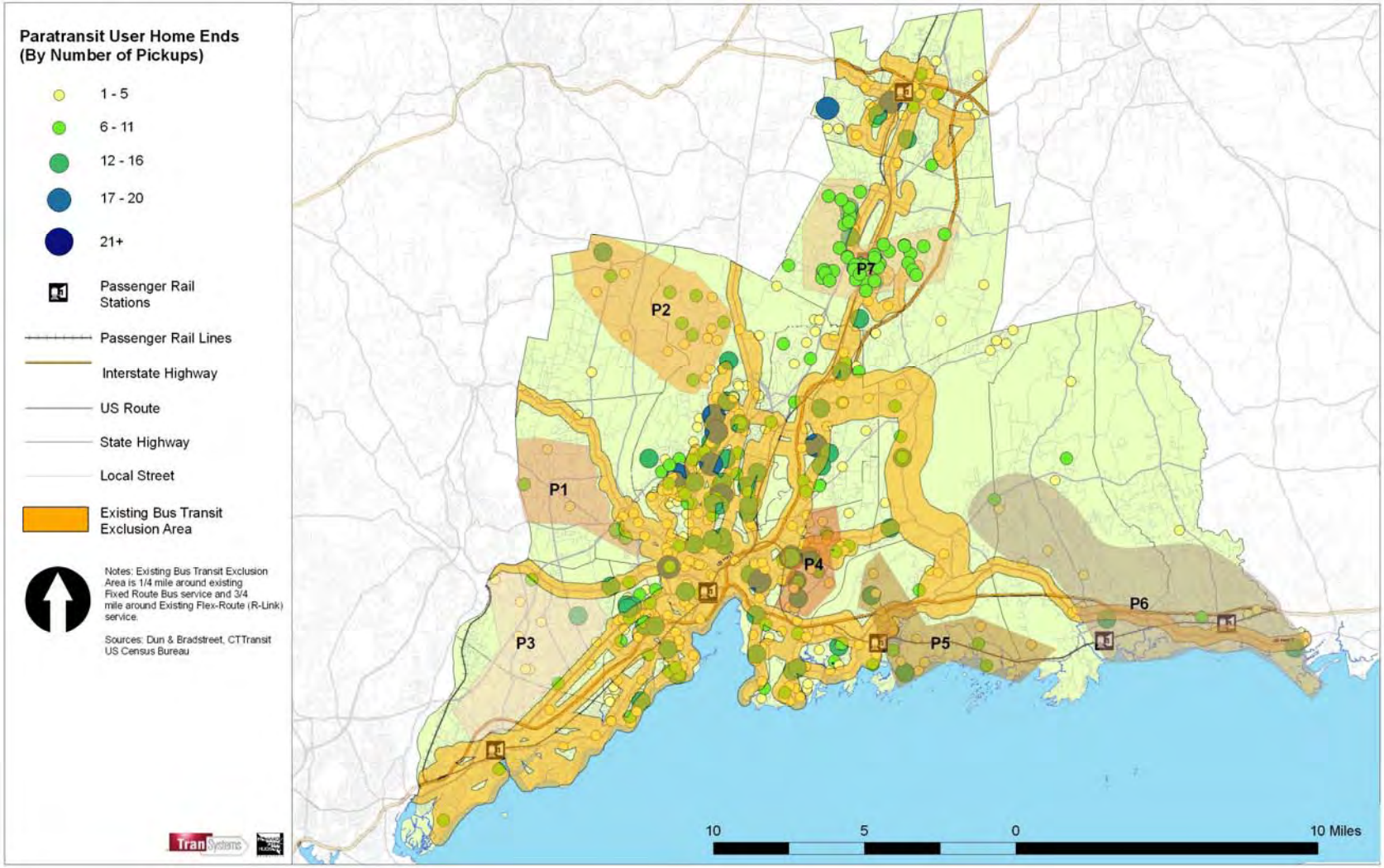


Table 6-2: Home End Ratings for Potential Flex Route Zones

Zone	Ratings for Home End of Trips				
	Population Density	Senior Density	Paratransit Productions	Average Score	Rank
P1	○	○	○	0.0 ○	7
P2	○	○	◑	0.3 ○	6
P3	◑	◑	◑	1.0 ◑	4
P4	●	◑	●	1.7 ◕	2
P5	◑	●	●	1.7 ◕	2
P6	◑	◑	○	0.7 ◔	5
P7	●	●	●	2.0 ●	1

○ Low ◑ Medium ● High

6.2.2. Access to Destinations

Trip attractions (non-home ends of trips) must be somewhat concentrated for a flex route to operate productively. Steps 3 and 4 led to the identification of several key attractions and the level of access to each attraction that would be afforded by a flex route in each candidate zone.

Four factors were considered in identifying key attractions. These factors were:

- Hospitals/medical uses: Major hospitals and other medical-related employers.
- Retail uses: Clusters of retail uses based on employer data
- Overall employment: Clusters of all types of employers
- Paratransit trip attractions: Areas with concentrations of paratransit trip attractions (non-home ends)

Using these factors nine key attractions were identified and are listed in Table 6-3:

Table 6-3: Key Attraction Areas

Central New Haven	regional employment center and medical areas (Yale-New Haven Hospital/Medical Area & St. Raphael's), many paratransit destinations
Central Meriden	regional employment center and medical area, many paratransit destinations
Rt.5 Wallingford/Meriden	major retail and employment destination
Gaylord Hospital (Wallingford)	major hospital
Hamden Plaza	major retail and employment center, many paratransit destinations, medical offices nearby along Whitney
VA Hospital (West Haven)	major hospital and destination for paratransit trips
CT Post Mall/Route 1	major retail and employment destination
Milford	employment center and Milford Hospital
Route 1 corridor	retail and employment concentrations in both towns, several

(Branford/Guilford)	paratransit destinations in Guilford

Next, each of the seven potential flex route zones was evaluated considering its proximity to nearby attractions and the ease of transit travel (based on the number of transfers required) to the nine identified key attraction areas.

The initial methodology for proximity to attractions (described above in Section 6.1) proposed looking only at destinations of area paratransit riders who lived in the zone. After development of the initial methodology, adjacent medical uses and employment were added to the factors considered. Each zone was assigned a rating of 0 (low), 1 (medium), or 2 (high) for each of the following three factors:

- Medical uses - Could a flex route directly serve a major medical facility or cluster of medical offices (as shown in Figure 6-4)
- Employment - Could a flex route directly serve a significant employment cluster, especially retail (as shown in Figures 6-5 and 6-6)
- The geographic spread of the paratransit trip attractions linked to each candidate zone - Could a flex route directly serve the destinations of paratransit riders from that zone[12]

The three factors were averaged to give a score between 0.0 and 2.0 for each zone, as shown in Table 6-4

The ease of transit travel to each of the nine identified attraction areas was also rated. For each zone, the number of key attraction areas that would be directly served by a flex route in that zone was assessed, as well as the number of key attraction areas that would be served by a single transfer from a flex route in that zone. A measure of the number of attraction areas served was developed by taking the number directly served and adding one half the number served by a single transfer[13], as shown in Table 6-4. A maximum score of 2.0 was allowed for any candidate zone.

Each zone was then rated for access to destinations by averaging the rating for nearby attractions and the rating for access to identified attraction areas. The result is a destination score between 0 and 2.0, as shown in Table 6-4.

Table 6-4: Destination Access Ratings for Potential Flex Route Zones

Zone	Ratings for Access to Destinations												
	Destinations Within/Adjacent to the Zone						Access to Other Destinations						
	Medical Facilities	Total/Retail Employment	Paratransit Attractions	Average Score	Rank		Direct Service	One Transfer	Direct + 1/2 Transfer	Rank		Combined Destination Score	Rank
P1	○	○	◑	0.3	4		0	1	0.5	6		0.4	6
P2	○	●	◑	1.0	3		1	2	2.0	1		1.5	3
P3	◑	●	◑	1.3	2		1	2	2.0	1		1.7	2
P4	○	◑	○	0.3	4		0	3	1.5	4		0.9	4
P5	○	◑	○	0.3	4		0	1	0.5	6		0.4	6
P6	○	◑	○	0.3	4		1	0	1.0	5		0.7	5
P7	●	●	◑	1.7	1		2	2	2.0	1		1.8	1

[12] Individual maps (not included in this report) were produced showing the attractions for trips produced in each of the nine potential flex routes areas.

[13] Downtown New Haven was not counted since all areas would have equal one transfer access.

Figure 6-4: Medical Facilities

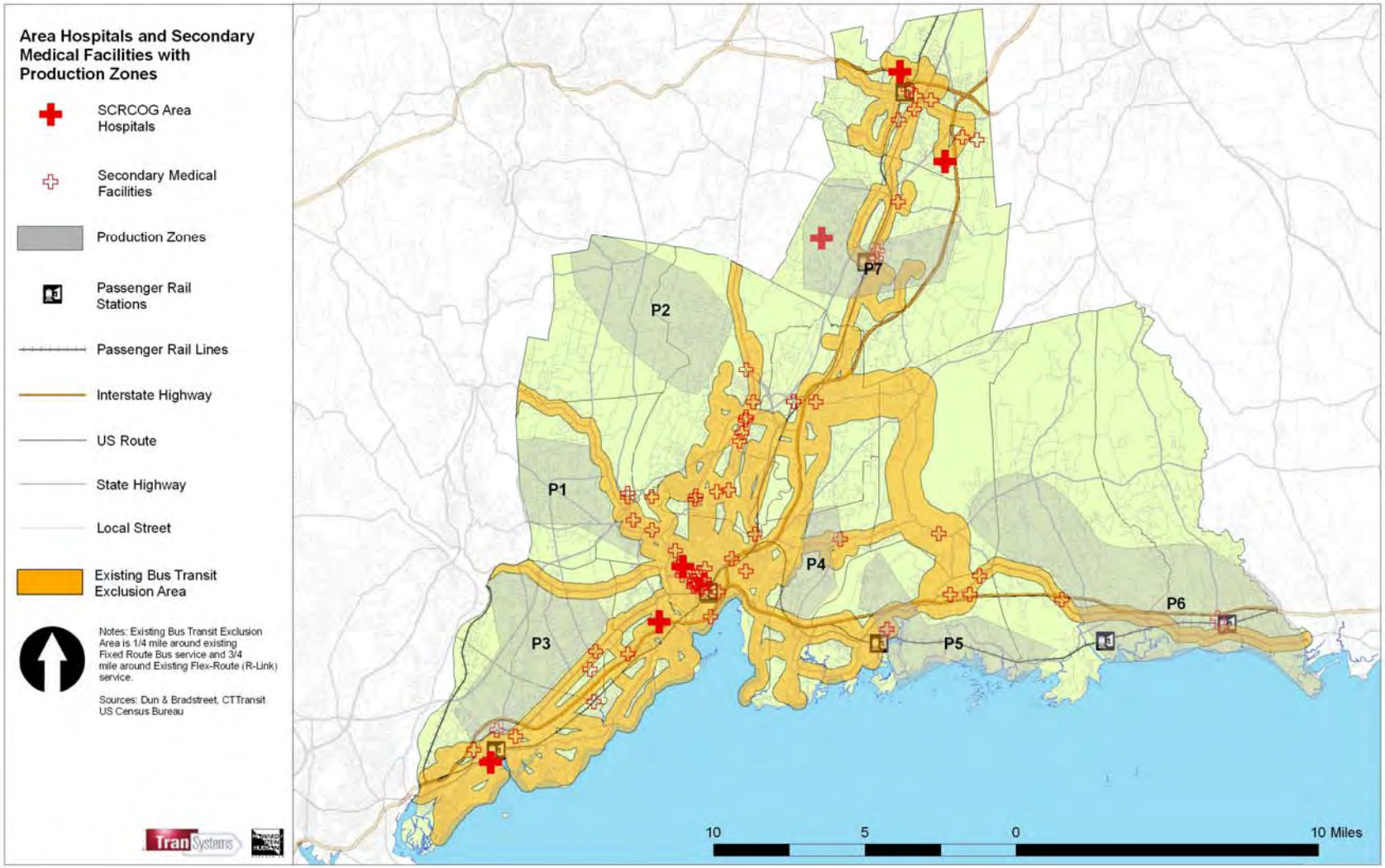


Figure 6-5: Total Employment

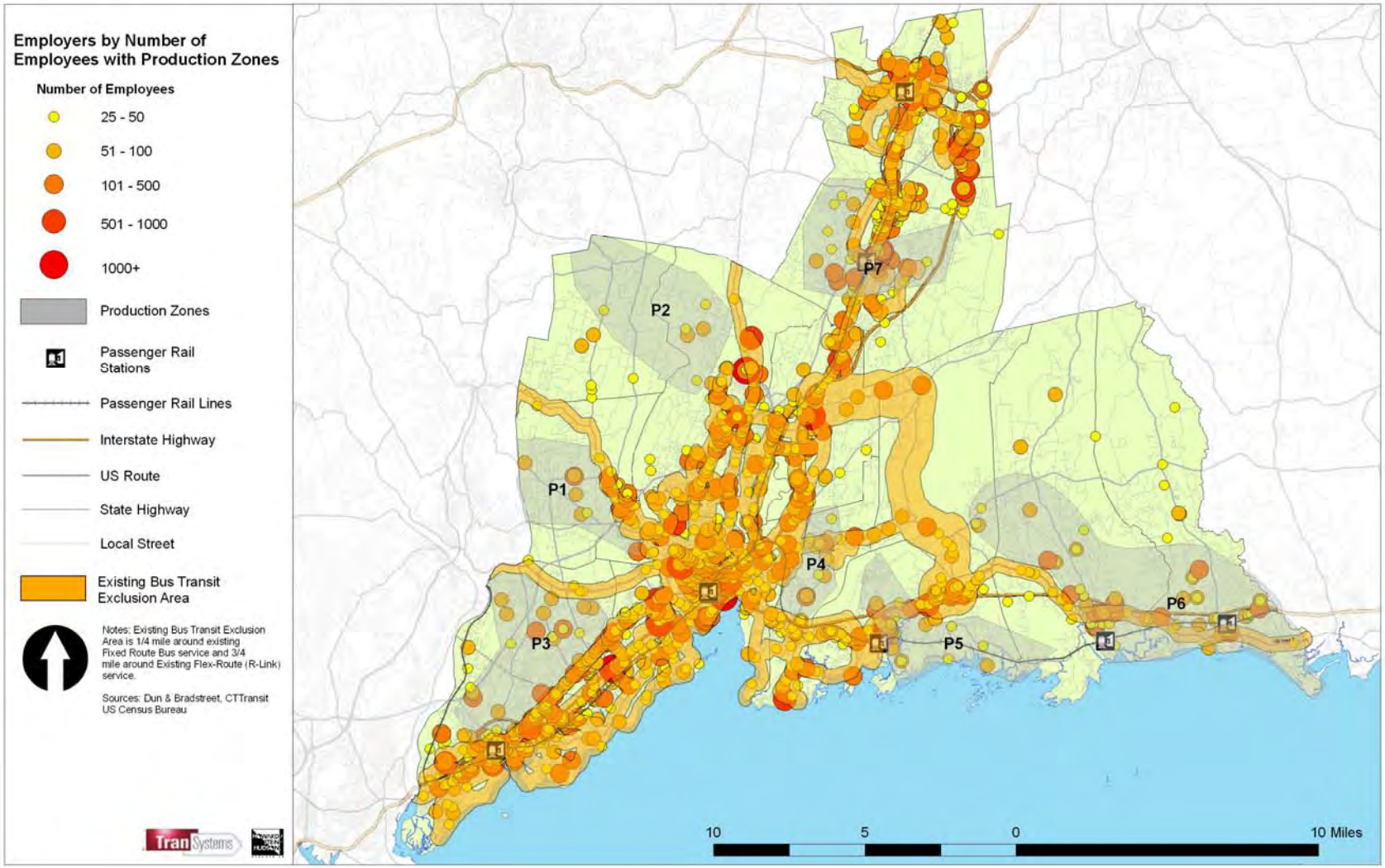
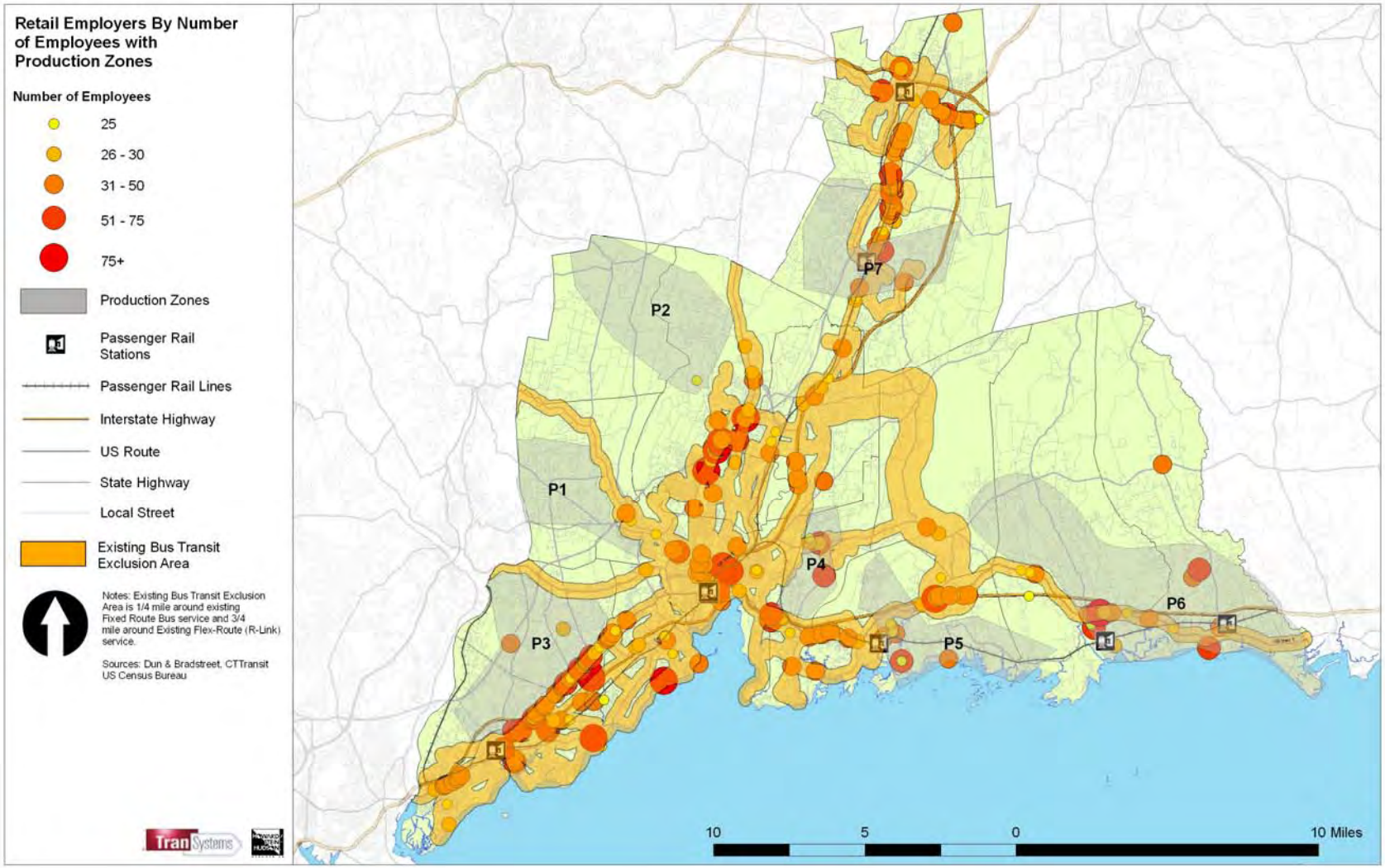


Figure 6-6: Retail Employment



6.2.3.

6.2.4. Evaluation and Prioritization of Potential Zones

Home end scores and destination access scores were added to create a single score between 0 and 4.0 for each zone, as shown in Table 6-5.

Table 6-5: Overall Rakings of Potential Flex Route Zones

Zone	Overall Ranking			
	Home End Score	Destination End Score	Total Score	Rank
P1: New Haven/Woodbridge	0.0	0.4	0.4	7
P2: Hamden/Bethany	0.3	1.5	1.8	5
P3: Orange/Milford	1.0	1.7	2.7	2
P4: East Haven	1.7	0.9	2.6	2
P5: Branford	1.7	0.4	2.1	4
P6: Guilford/Madison	0.7	0.7	1.3	6
P7: Wallingford	2.0	1.8	3.8	1

The Wallingford zone (P7) was ranked highest. A flex route in this area would serve the area on the west side of Wallingford beyond the reach of the Wallingford local bus service. (It could possibly also serve some areas on the east side of Wallingford beyond the reach of the local bus service.) It would serve Gaylord Hospital and would connect with Route C/D and the Wallingford route at Wallingford Center and could also connect with Route C/D and Meriden Route B at Kohl's in Meriden.

The Orange/Milford zone (P3) was ranked second. A flex route in this area would serve the area north and west of Route 1 and could connect to Milford Station, the CT Post Mall and the Route 1 retail center near Bull Hill Lane. The East Haven zone (P4) ranked a close third. A flex route in this area would serve East Haven between Route 80 and Route 1. It could connect to the Foxon hub and to Route F in East Haven.

Possible flex routes in these three areas are outlined in the next section.

6.3 Proposed Flex Routes

6.3.1. Flex Service Design Criteria

It is expected that new flexible services in South Central Connecticut will follow the R-Link model for service design. The R-Link in North Haven, North Branford and Branford is an approximately 12.5 mile route connecting North Branford to Route C at the Stop & Shop in North Haven and to jobs and shopping at the Route 1 Business Park and Stop & Shop in Branford. Vehicles will deviate on request up to ¾ miles from the posted route. Vehicles are scheduled to complete the 25 mile round trip in 83 minutes, for an average speed of 18 miles per hour. This is quite fast for a flexible transit service since stops, traffic, deviations and layovers will all bring the average speed down below the typical running speed. Headways vary between 41 and 83 minutes, with an over two hour gap in the mid-day. Trips are not timed to meet any fixed route service. R-Link service operates between 6:00 a.m. and 7:00 p.m.

In designing a flex route service, several parameters must be considered. These include the frequency of service, the length of the route, the size and shape of the flex area, the span of service, fares, and policies for managing the demand responsive aspects of the service.

New flex routes can be expected to be low frequency routes. Hourly service is a generally accepted level of service for low ridership suburban routes. The frequency may need to be adjusted considering the length of the route. In the case of the R-Link, the route operates at an 83 minute headway, reflecting the 83 minute cycle time, when only one vehicle is in service, and half that when two vehicles are in service. Hourly service also has an advantage in that many of the fixed routes that a new flex route could connect with provide service every 30 or 60 minutes and thus timed transfers can be set up.

The length of a new route, and therefore the size of the service area, will depend on the nature of the area and the destinations and transfer points being served. The optimal length for a route, on the other hand, can be considered to be the longest distance that can still be served in a one hour period, thus requiring only one vehicle for the route while still providing an adequate level of service and being able to make a timed transfer connection. Routes that can operate at the speed of the R-Link could therefore be as long as 18 miles per round trip, or a 9 mile route. Routes that are expected to carry more riders, deviate more, or travel through more congested areas would need to be shorter in order to complete a round trip in one hour.

The size of a flex zone is often set at the ¾ mile limit that is used on the R-Link. This is a reasonable distance for a vehicle to deviate without causing too much delay. It is also consistent with the ¾ mile zone inside which complementary paratransit must be provided for a fixed route bus. A flex zone could go beyond that limit if there is a location that should be served. There may also, however, in some cases be a need to limit the size of the zone. This could be a case where the road network doesn't allow easy access to a location due to natural barriers or just the lack of through streets. A zone could also be limited to avoid including travel generators already served by fixed route services and that do not attract riders of the flex route.

The span of service defines both the hours of the day that the service operates and the days of the week (i.e. whether weekend service is provided). The R-Link operates for 13 hours each weekday (6 a.m. to 7 p.m.) and has no service on weekends. This should be considered a minimum span of service for a flex route whose riders are expected to be commuting to work. For a service oriented to shopping, service could start later and possibly end earlier. For a service oriented to medical trips, service could end earlier and possibly start later.

As is typical of other flexible services, a trip along the basic R-Link route is the same fare as for a fixed route bus trip and a trip with a deviation request charges twice the fare. Transfers to other routes are free. It is assumed that these same policies would be followed on new flex route services.

R-Link deviations require advanced requests by telephone. There are no set rules on the window in which such requests may be made. The hours during which requests made be made are not specified. There are no set policies for tracking no shows and cancellations. New services should be careful to follow the same policies as for the R-Link. However, the operator may want to consider a more formal set of published policies in order to avoid future difficulties as the number of services, and riders taking advantage of them, grows.

6.3.2. Proposed Services

Possible flexible routes in each of the seven areas are described below. In each case, it is assumes that a route would operate for 13 hours per day, 255 weekdays per year. At the current GNHTD rate of $63 per hour, this translates into an annual operating cost of about $209,000 per vehicle in service.

Wallingford

A possible route for a Wallingford flex route is shown in Figure 6-7. This route would begin at Wallingford Center connecting to Route C/D and the Wallingford local service. The other end would be at Kohl's in Meriden, connecting to Route C/D and Meriden Route B. Major streets served would include Quinnipiac Street, Cook Hill Road, Parker Farms Road, Highland Avenue, and Church Street. The route would also serve Gaylord Hospital.

At 9.1 miles each way, it may be possible to make a round trip in about one hour. Hourly service could allow timed connections with Route C/D and the Meriden service at Kohl's, but not at Wallingford Center, at least not in both directions.

One vehicle could provide this service for 13 revenue-hours per weekday.

Orange Milford

A possible route for an Orange/Milford flex route is shown in Figure 6-8. This route would begin at the retail area on Route 1 at Bull Hill Lane where it would connect with Route O and with the terminus of Route B. The other end would be at the CT Post Mall, connecting to Routes J and O, as well as the Coastal Link and Milford Transit Route 4. Major streets served would include Racebrook Road, Orange Center Road, Old Tavern Road and Orange Avenue. The route could extend further into Milford, either to the train station or to Milford Hospital.

Ending at CT Post Mall the route would be 8.0 miles each way. A round trip could probably be completed in one hour. An hourly headway using one vehicle would allow timed connections with at least some routes. Extending the route to the Milford train station would increase the length to 9.9 miles while extending to Milford Hospital would increase the length to 10.5 miles. Given that these extensions would be in the center of the town of Milford, round trip times can be expected to be in the 80-90 minute range, making hourly headways impractical. With longer headways, some timed transfers may still be possible. A longer route could also be operated with two vehicles and a 40-45 minute headway.

One vehicle could provide this service for 13 revenue-hours per weekday, while two vehicles on the longer route would need 26 revenue-hours per weekday.

East Haven

A possible route for an East Haven flex route is shown in Figure 6-9. This route would begin at the Foxon hub, connecting to Routes C, D and Q and serving the Wal-Mart and other retail in the area. The other end would be at the Stop & Shop at Trolley Square in East Haven where it would connect with Route F. It would also intersect with Route S along Route 1 near the Trolley Square end of the route. Major streets served would include Russo Avenue, Strong Street, and Laurel Street. The flex zone may need to be limited, especially at the southern end, due to the limited connectivity of the street network.

At 4.8 miles each way, the route is somewhat short. However, with congested areas both ends, a round trip could probably be made in about 40 minutes. In peak periods, a 40 minute headway using one vehicle would allow timed connections with Route Q at the Foxon hub and reasonably well-timed connections with Route F in East Haven. (The proposed frequent service on Route D at the Foxon hub eliminates the need for timed transfers.) In the midday, the 40 minute headway would not match the 30 minute headways on both Route F and the proposed modified Route Q. Either transfers would not be coordinated or flex route headways would need to be lengthened to one hour.

One vehicle could provide this service for 13 revenue-hours per weekday.

Branford

A possible route for a Branford flex route is shown in Figure 6-10. This route would serve areas both north and south of the Branford Green. It would connect with Route S at the Branford Green and could connect to Route F in two different ways. In peak periods, it could connect to F3 at the Branford Green and also serve the Branford rail station. In the mid-day, it could serve the Branford Wal-Mart and connect to Route F4 there. In central Branford the route could be designed to serve the town center without the need for many deviations. It would extend west along West Main Street serving either the rail station or Wal-Mart before turning onto Route 1and then heading to the northern

Figure 6-7: Potential Wallingford Flex Route

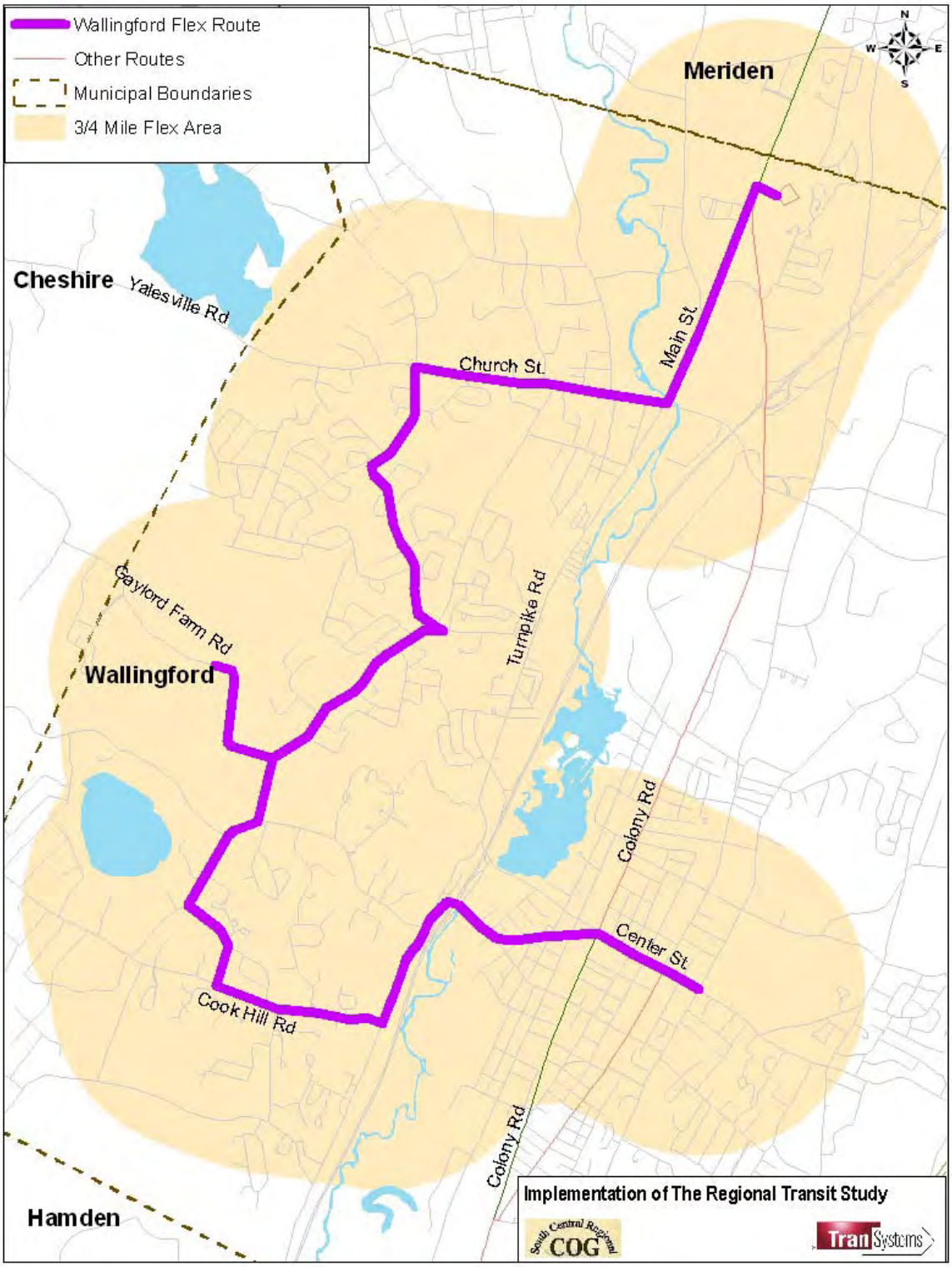


Figure 6-8: Potential Orange Flex Route

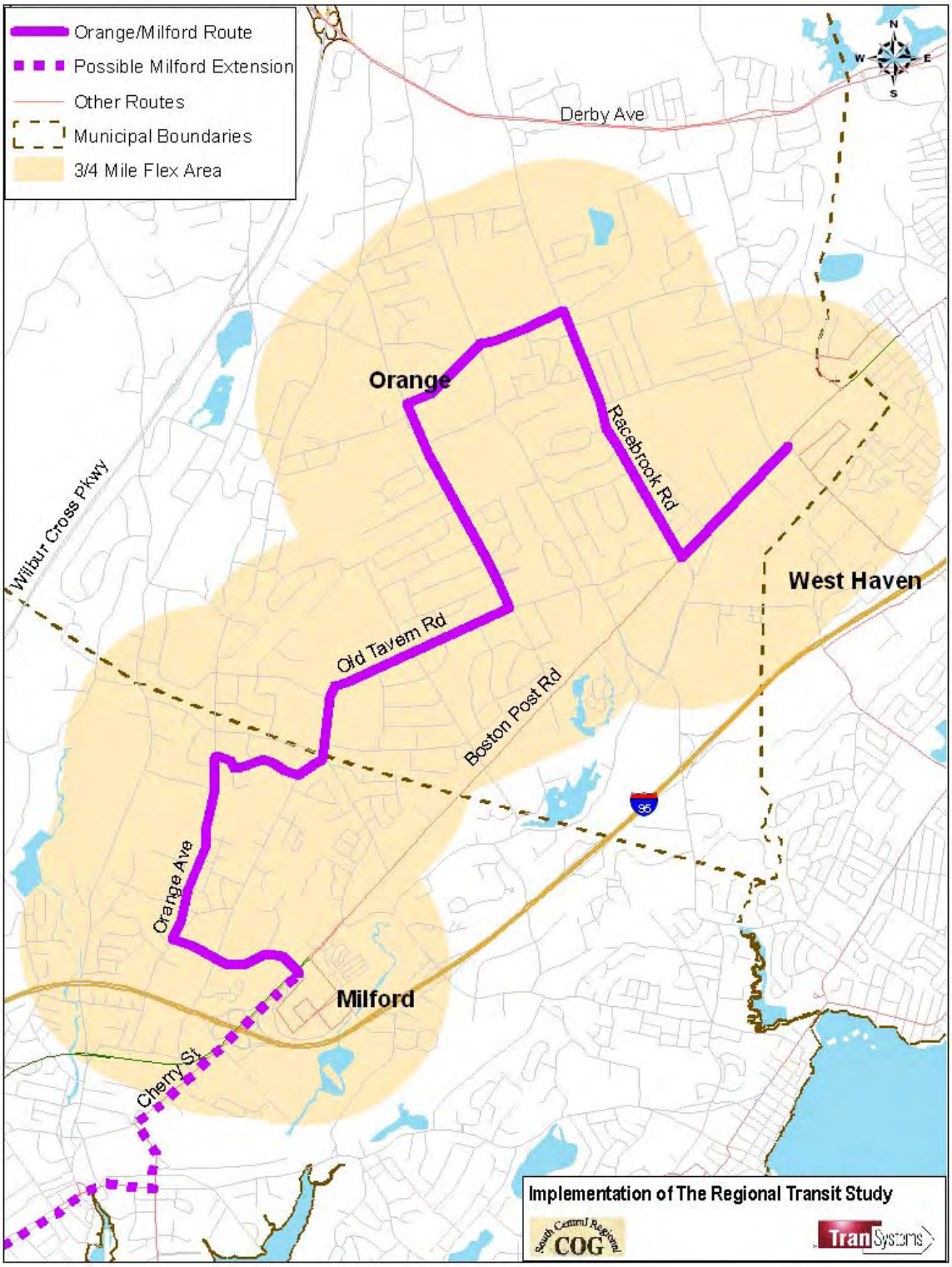


Figure 6-9: Potential East Haven Flex Route

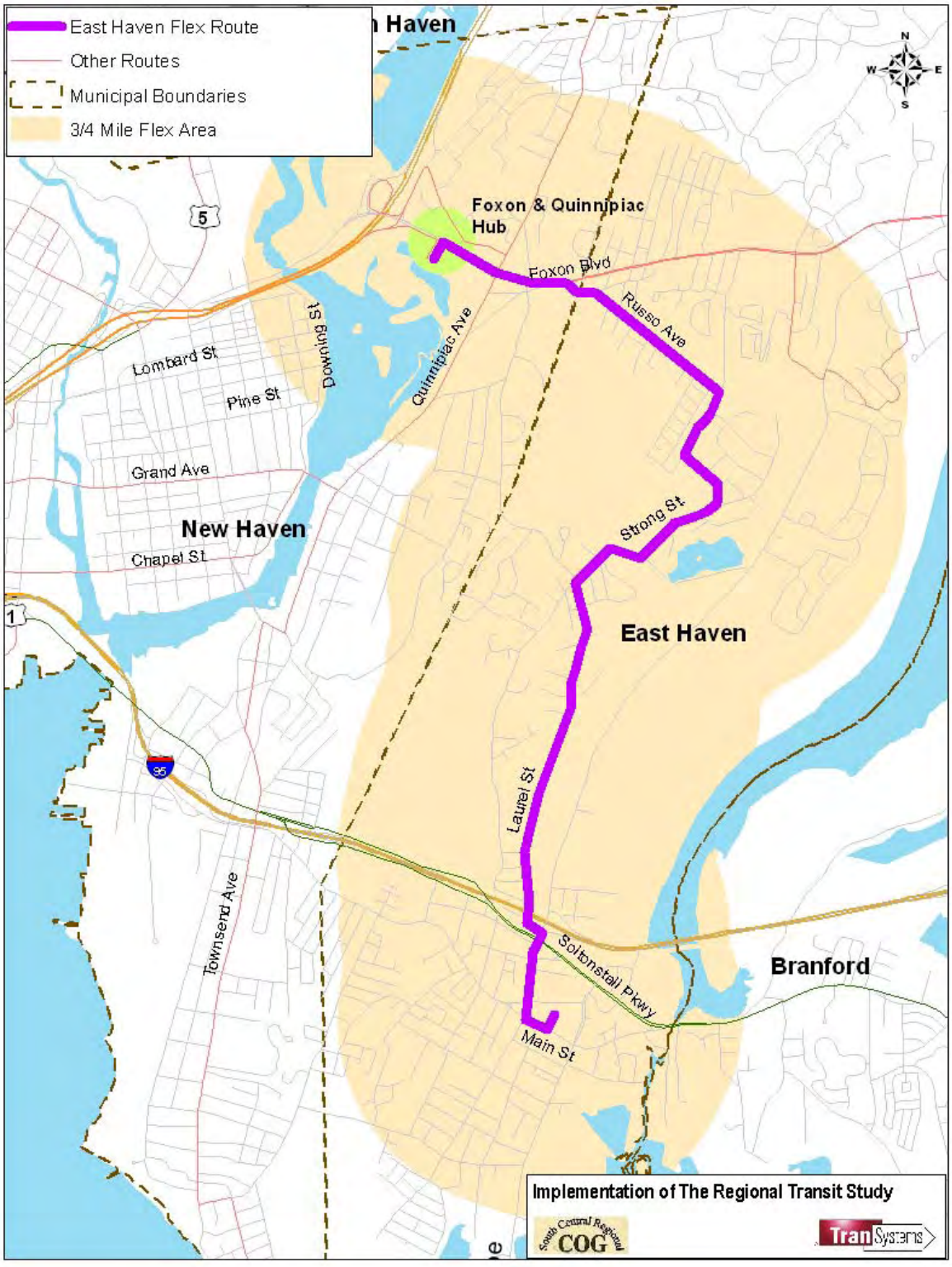
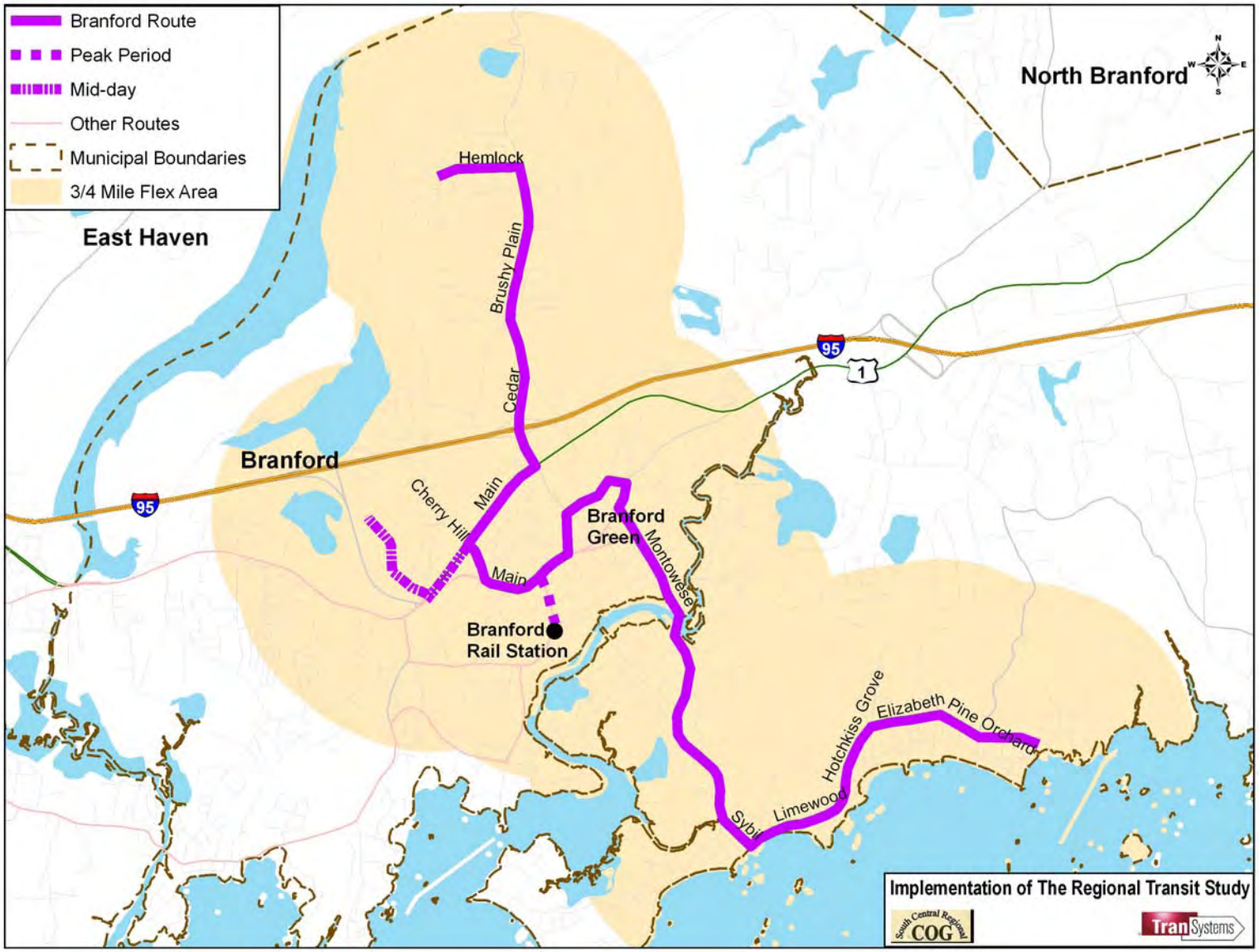


Figure 6-10: Potential Branford Flex Route



residential part of the town. The other end would extend to the residential areas along Long Island Sound. Major streets served would include Brushy Plain Road, North Main (Route 1), West Main, Montowese Street, and Route 146.

At 8.1 miles each way when serving the rail station, and 8.6 miles each way when serving Wal-Mart, it should be possible to make a round trip in about one hour. Hourly service could allow timed connections with Route F, although this would work in only one direction.

One vehicle could provide this service for 13 revenue-hours per weekday.

Hamden/Bethany

A possible route for a Hamden/Bethany flex route is shown in Figure 6-11. This route would begin at the Hamden Plaza hub where it would connect with Routes D and J. It would extend through the northwestern part of Hamden before reaching Bethany. It could end along Amity Road in Bethany, or continue into Naugatuck to the Wal-Mart where it would connect with CTTransit Waterbury Route N2. Major streets served would include Shepard Avenue and West Woods Road in Hamden, Amity Road/Route 63 and many local streets in Bethany. If the route extends into Naugatuck, Route 63 becomes New Haven Road.

Ending along Amity Road in Bethany the route would be about 9 miles each way. A round trip could probably be completed in one hour. Having an hourly headway may be less essential on this route since frequent connecting service on Route D at Hamden Plaza makes timed transfers unnecessary. Extending the route to Wal-Mart in Naugatuck would increase the length to 12.8 miles. The round trip time for a route this length can be expected to be about 80-90 minutes, making hourly headways impractical. However, since Route N2 operates every 80 minutes, it may be possible to create timed transfers in Naugatuck and still operate the route with one vehicle.

One vehicle could provide this service for 13 revenue-hours per weekday.

Guilford/Madison

A possible route for a Guilford/Madison flex route is shown in Figure 6-12. This route would serve areas in both communities connecting residents to the two town centers, the two train stations and the commercial area along Route 1 in Guilford. Given the limited number of major roads in the area, the corridor overlaps considerably with Route S. Beginning in residential areas around the Guilford rail station, it could serve the area around Guilford Green and along Route 1 in Guilford before serving residential areas in Madison north of I-95, and then serve the Madison rail station and town center, as well as residential areas near Long Island Sound. Major streets served would include Whitfield Street, Route 1, Green Hill Road, and Durham Road.

At 9.2 miles each way, a round trip may take slightly more than one hour. Hourly service would not be essential for timed transfers along this route, since the only connecting services, Route S and Shore Line East rail service, do not have regular hourly schedules.

One vehicle could provide this service for 13 revenue-hours per weekday.

Woodbridge

A possible route for a Woodbridge flex route is shown in Figure 6-13. This route would begin at the Westville Center hub in New Haven connecting to Routes B, Q, and G (as proposed above). The other end could be at the Jewish Community Center on Amity Road where it would connect with hourly service on Route B3. Major streets served would include Fountain Street, Ansonia Road, Racebrook Road, Center Road, Newton Road, and Amity Road.

Figure 6-11: Potential Hamden/Bethany Flex Route

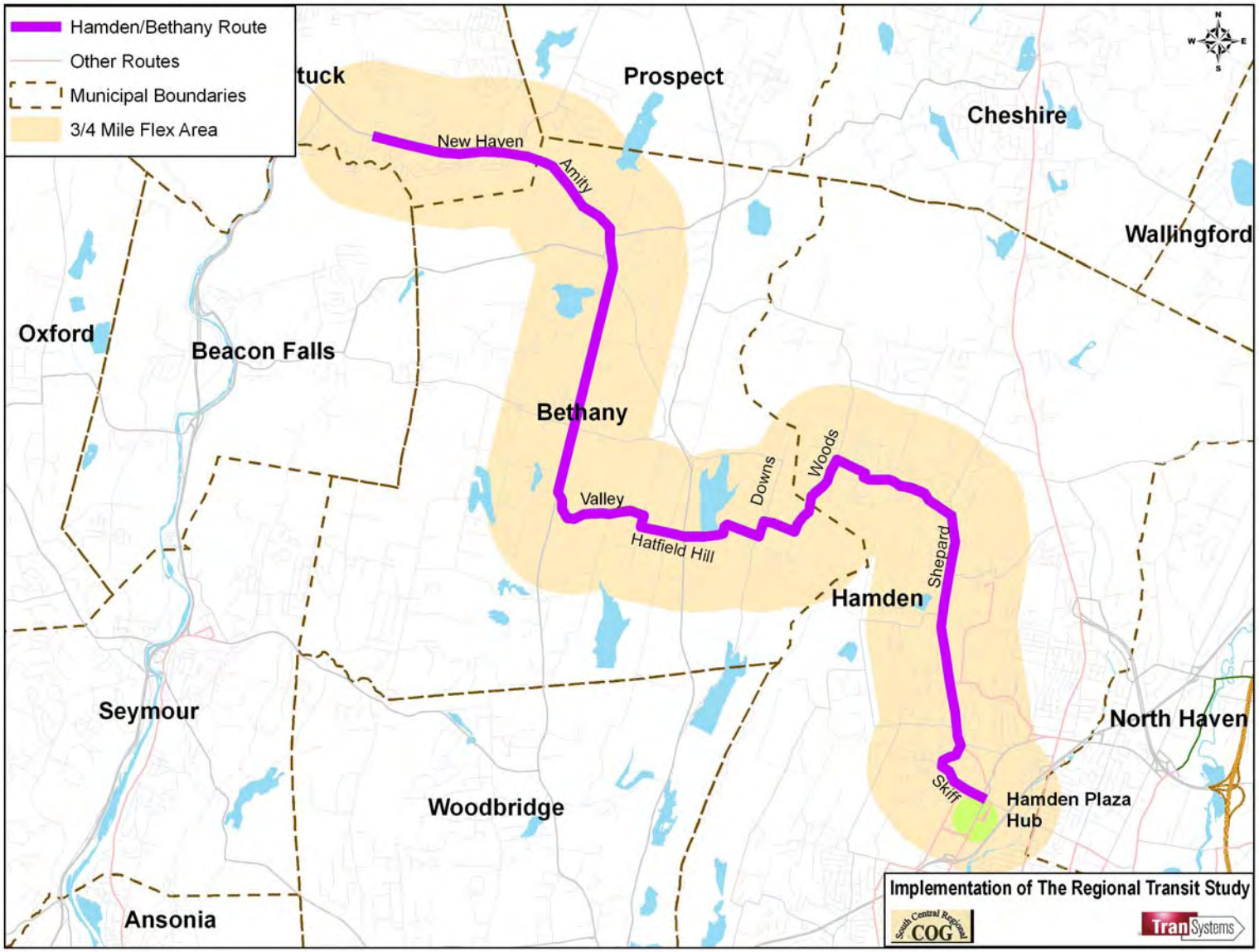


Figure 6-12: Potential Guilford/Madison Flex Route

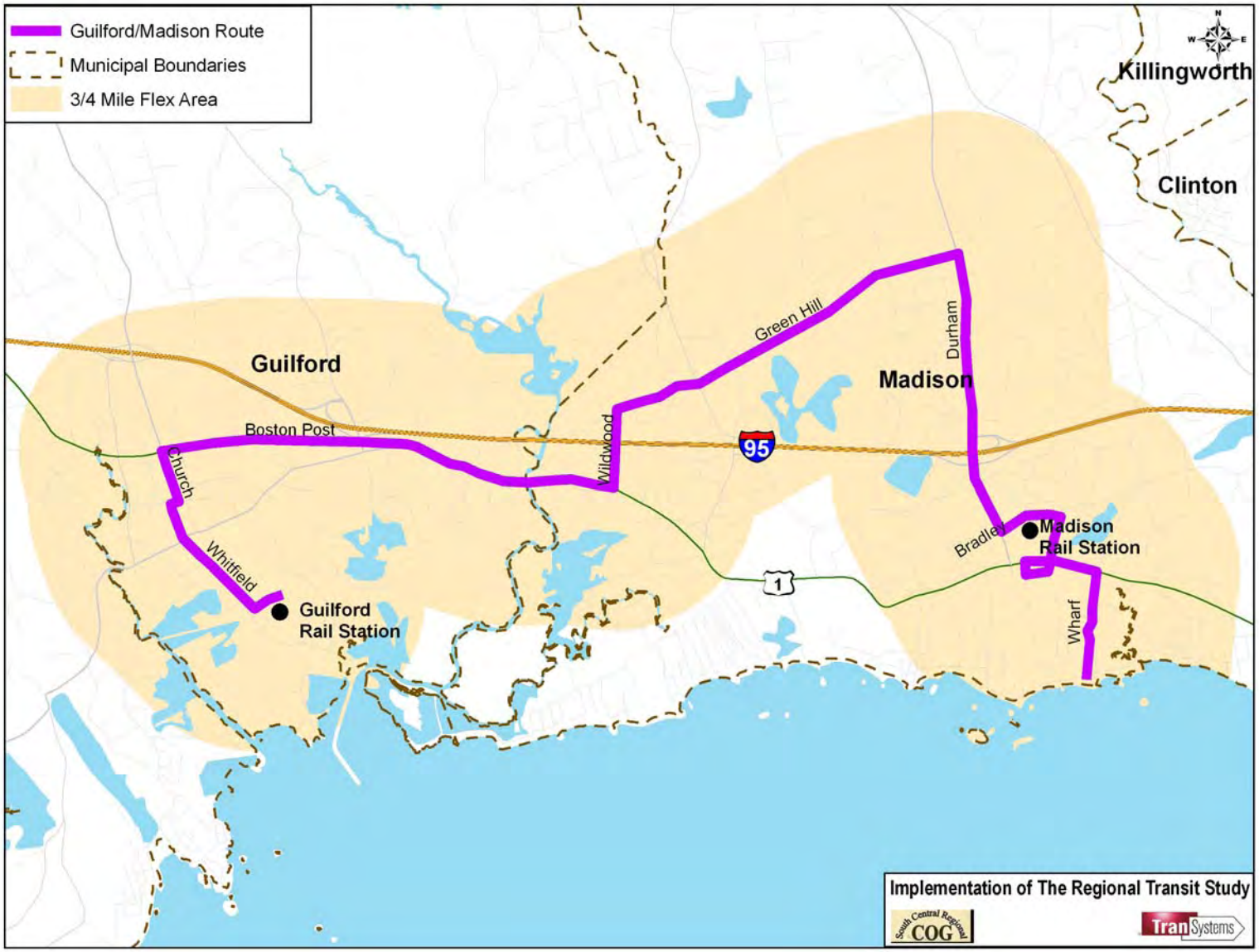
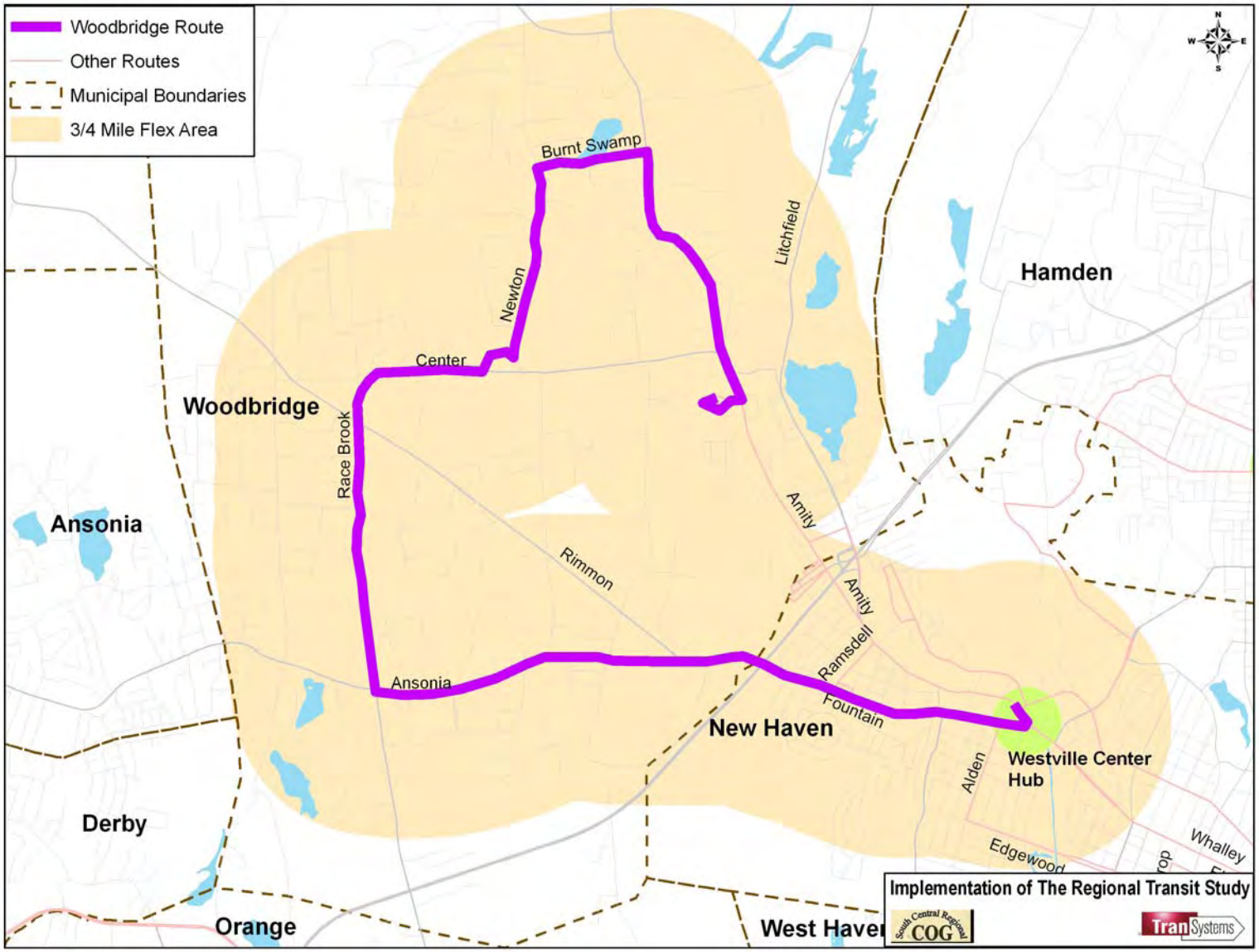


Figure 6-13: Potential Woodbridge Flex Route



At 9.1 miles each way, it may be possible to make a round trip in about one hour. If not, the regular route could be altered to eliminate Newton Road and connect more directly to Amity Road along Center Road. Hourly service could allow timed connections with Route B3 at the Community Center. However, frequent service at Westville Center may make timed transfers less essential.

One vehicle could provide this service for 13 revenue-hours per weekday.

7.0 PROJECT RECOMMENDATIONS - IMPLEMENTATION PLAN

The recommendations for the next stage of implementation of the Regional Transit Study are summarized in this section and a preliminary implementation phasing plan is presented.

7.1 Summary of Recommendations

It is recommended that Connecticut DOT and the City of New Haven identify potential additional funding partners and determine the most appropriate downtown shuttle options given the availability of funding and the desirability of a direct connection between the Medical Area and downtown. Either Option 5, a single route connecting Union Station to downtown and to the Medical Area, or Option 6, a bi-directional loop providing all connections among Union Station, downtown and the Medical Area, could be implemented. Annual operating costs would range from $950,000 for Option 5 to $1.6 million for Option 6. Because this service would replace both the Downtown Electric Trolley and Downtown Commuter Connection, the net cost would range from $530,000 for Option 5 to $1.18 million for Option 6.

Route Simplification of New Haven West Side routes would involve the following changes:

- Switch west side routings of Routes F and Q and reduce the number of F5 trips
- Extend all midday and Saturday Route Q trips to Amity Shopping Center
- Begin weekday evening service on Route Q; drop evening St. Raphael diversions on Route B
- Modify Route B2/B3 to serve West Hills; modify route Q to serve Westville hub; convert Saturday evening FQZ to Route Q; rename Sunday FQZ to Q6
- Extend G Shelton to Putnam and Dixwell; shorten Z Goffe to Westville; switch G and Z through-routing
- Eliminate Saturday D10 bus

Route Simplification of New Haven/Hamden area routes would involve the following changes:

- Extend Route O evening service to Putnam & Dixwell
- Simplify Sherman Industrial park trips on Route D
- move Circular Avenue trips from Route D to Route O
- simplify Route J weekend service

Route Simplification of Fair Haven / North Haven area routes would involve the following changes:

- Extend all weekday daytime and Saturday Route Q trips to Foxon & Gay
- Extend evening Route Q trips to Foxon Boulevard Wal-Mart
- Change D12 Foxon trips to D4 Wal-Mart
- Extend all D1 trips to D4 Foxon Boulevard Wal-Mart
- Move midday and weekend North Haven/Wallingford service from Route C to Route D14
- Simplify Route C peak service

The annual operating costs of these simplification changes from Table 5-5 are repeated in Table 7-1.

Table 7-1: Summary of Projected Fixed Route Operating Costs

Area	Routes	Additional Peak Vehicles	Increase in Daily Revenue-Hours				Annual Cost
			Weekday	Saturday	Sunday	Annual	
New Haven West Side	F, Q	1	17	28	0	5,791	$358,248
New Haven West Side	B, G, Z	0	0	0	0	0	$0
New Haven/Hamden	D, J, O	1	5	-4	0	1,067	$66,008
Fair Haven/North Haven	C, D	2	13	0	0	3,315	$205,076
Route Simplification Total		4	35	24	0	10,173	$629,332

Transit hubs could be implemented at following locations in concert with the route simplification changes and new flex routes:

- Hamden Plaza
- Putnam & Dixwell
- Westville Center
- Foxon/Wal-Mart

In addition, it is recommended that the following areas be considered as the next candidates for flexible services in the region. The evaluation ranked these areas in the order shown:

- Wallingford
- Orange/Milford
- East Haven
- Branford
- Hamden/Bethany
- Guilford/Madison
- Woodbridge

7.2 Phasing Plan for Fixed Route Services

Implementation of changes such as those proposed is usually best accomplished in phases. Phases generally break the changes down into more manageable pieces and can be constructed to correspond to funding availability, vehicle procurement, and physical improvements. However, phases need to be constructed in a way that groups together changes that must occur simultaneously, in order to maintain service to an area, and that properly sequences actions that must occur at the same time or after another changes, such as new service that depends on a new facility.

Among the changes that are proposed for the New Haven area are four transit hubs. These would best be implemented when service changes to the routes serving them would be made. The Hamden Plaza hub should be created when changes are made to the end of Route D Dixwell. The Putnam and Dixwell hub should be implemented when Route Z Shelton is extended and renamed. The Westville Center hub should be implemented when changes are made to have Routes Q and G serve the hub. The Foxon hub will be needed when frequent Route D Grand service is extended.

Among the routing changes, the route with the most changes is Route Q. The extension of all trips to Amity and Wal-Mart add one bus and must be done simultaneously. The extension to Wal-Mart must be done before (or at the same time as) the extension to Foxon and Gay. The swapping of alignments with Route F and the change to serve the Westville Center hub both add time to the route and therefore also can't be done until the additional bus is added to serve the extension to Foxon and Gay.

The changes to Routes G, Z, and B clearly must be done simultaneously as the lengthening of G Shelton depends on the shortening of Z Goffe, which depends on the relocation or Route B to West Hills, which in turn depends on the relocation of Route Q through the Westville Center hub. The elimination of the Route B evening diversions to St. Raphael's must be done with the expansion of Route Q evening service, which should be done at the same time or after the swapping of alignments between Routes Q and F.

On Route D Grand, the relocation of the D12 Foxon Road trips to D4 Wal-Mart must be done simultaneously with the extension of Route Q. Meanwhile, the extension of D1 trips to Wal-Mart should be done at the same time as the incorporation of midday Route C trips into Route D. These two changes to Route D service could happen separately or together, but if done separately, the D12 change should happen first.

On Route D Dixwell, the changes to the northern end should be done at the same time as the elimination of the Circular Avenue loop since the same trips cover both diversions.

A proposed preliminary phasing plan is presented in Table 7-2. The cost by phase is shown in Table 7-3. Five phases are shown, although all the changes could be implemented at once or in fewer phases by combining consecutive phases. The phasing plan includes a phasing-in of the renaming of the routes. In general, routes are renamed as they are simplified. Routes that would not be simplified are still renamed during phases where fewer routes are impacted by the simplification.

Phase 1 is a relatively simple low cost phase simplifying Routes D and J and establishing the Hamden Plaza hub. Phase 2 is the most costly as it implements the expansion of Route Q on which many of the other changes depend and begins to focus more Route D service at the Foxon/Wal-Mart hub. Note that only the ends of Route Q are extended in this phase while the mid-route changes are left to following phases to coincide with changes to other routes. Phase 3 completes the changes to Route D by extending all service to the hub and incorporating Route C. Peak changes to Route C would also occur at this time. In Phase 4, the changes to Routes F and Q are made, including the expansion of evening service on Route Q and elimination of evening Route B diversions. In Phase 5, the last two hubs are established as the coordinated changes are made to routes G, Z, B, and Q. This could also be an ideal time to implement the new crosstown service that has been proposed (by others).

7.3 Implementation of Fixed Route Services

Several actions must be completed in order for the proposed changes to occur. The major steps in the process are shown in Table 7-4.

Implementation of these changes will require an agreement on the changes to be implemented, a more detailed estimate of costs, identification of funding sources, and an agreement on phasing before steps to implement the changes can begin.

Fixed-route services in New Haven are owned and funded by Connecticut DOT and DOT will need to approve any significant changes in service. Therefore, as a first step, SCRCOG and other interested parties will need to carefully review the proposed changes with DOT and come to an agreement on which changes DOT is interested in pursuing. This process may benefit from an additional public meeting with bus riders since the public meeting held prior to production of this report was not well publicized and, as a result, was poorly attended. Once there is general

Table 7-2: Proposed Fixed Route Phasing Plan

Phase 1

- Establish Hamden Plaza hub
- Simplify Sherman Industrial park trips on Route D
- move Circular Avenue trips from Route D to Route O
- Extend Route O evening service to Putnam & Dixwell
- Simplify Route J weekend service
- Rename D (Dixwell), J (Whitney), M (State), O (Winchester)

Phase 2

- Establish Foxon/Wal-Mart hub
- Extend all midday and Saturday Route Q trips to Amity Shopping Center
- Extend all weekday daytime and Saturday Route Q trips to Foxon & Gay
- Extend evening Route Q trips to Foxon Boulevard Wal-Mart
- Change D12 Foxon trips to D4 Wal-Mart
- Rename J (Kimberly), M (Washington), O (Route 1), Q (Edgewood)

Phase 3

- Extend all D1 trips to D4 Wal-Mart
- Move midday and weekend North Haven/Wallingford service from Route C to Route D14
- Simplify Route C peak service
- Rename C (North Haven), D (Grand), L (North Branford)

Phase 4

- Switch west side routings of Routes F and Q and reduce the number of F5 trips
- Begin weekday evening service on Route Q; drop evening St. Raphael diversions on Route B
- Rename F (West Chapel), F (East Haven), G (East Chapel), Q (State), S (Madison)

Phase 5

- Establish hub at Westville Center
- Establish hub at Putnam & Dixwell
- Extend G Shelton to Putnam and Dixwell; shorten Z Goffe to Westville; switch G and Z through-routing; modify Route B2/B3 to serve West Hills; modify route Q to serve Westville hub; convert Saturday evening FQZ to Route Q
- Eliminate Saturday D10 bus
- Rename B (Congress), B (Whalley), G (Shelton), Z (Goffe), Z (Sargent Drive)
- (The new crosstown service being considered by others could be implemented at this time in conjunction with the Westville Center and Putnam & Dixwell hubs.)

Table 7-3: Summary of Fixed Route Operating Costs by Phase

Phase	Routes Modified	Additional Peak Vehicles	Increase in Daily Revenue-Hours				Annual Operating Cost
			M-F	Sat.	Sun.	Annual	
1	D, J, O	1	3	3	0	921	$56,976
2	D, Q	1	21	28	0	6,811	$421,348
3	C, D	2	13	0	0	3,315	$205,076
4	F, Q, B	0	-4	0	0	-1,020	($63,100)
5	G, Z, B, D, O	0	2	-7	0	146	$9,032
Total		4	35	24	0	10,173	$629,332

Table 7-4: Implementation Steps for Fixed Route Service Changes

Timing	Action	Responsibility
as soon as possible	meet with DOT to agree on changes	SCRCOG
as soon as possible	possible second public open house	SCRCOG
upon DOT agreement on changes	develop more detailed cost estimate	CTTransit
when cost estimates are available	identify funding sources	DOT/SCRCOG
in conjunction with identification of funding	determine number of phases	DOT/SCRCOG
when funding is secured	set date for implementation (3-6 months away)	DOT/CTTransit
3 months prior to implementation of each phase	public meeting to present changes	DOT/CTTransit
2 months prior to implementation of each phase	final decision on service changes	DOT/SCRCOG/CTTransit
2 months prior to implementation of each phase	initiate process to change bus stops/signage	SCRCOG/cities
implementation date for each phase	implement service changes	CTTransit

agreement on the changes, CTTransit should be asked to produce a more detailed cost estimate so that sufficient funding can be identified.

Next, funding sources will need to be identified. Most of these changes will require additional operating funds. Changes requiring increases in operating funds in the $10,000 to $20,000 range can often be initiated by CTTransit who will then seek DOT approval for a package of small changes as part of the routine service review process. The changes envisioned here would be larger changes, requiring SCRCOG and DOT to identify specific funding sources. The changes can be phased in, as indicated in Table 7-2. However, the first three phases will require significant increases in operating funds.

Once funding is identified, a decision can be made as to whether five separate phases will be needed or some or all of the phases can be combined. This will likely be based on funding availability, but may also consider whether it is preferable for the riding public to experience these changes as part of one big reconfiguration, or as a series of smaller changes. Vehicle availability may also be a consideration as the first three phases require small increases in the number of peak vehicles operated.

Once a commitment is made and funding is identified, it will take at least 3-6 months to implement the changes, depending on the timing of the decision to proceed. This is because the process of changing service and re-doing

schedules occurs at regular intervals throughout the year. In New Haven, CTTransit typically conducts four such "picks" annually. These are the times when most service and schedule changes are made. At the time of each pick, new schedules are implemented and drivers choose (pick) their work assignments for the next three months. In New Haven, new schedules are always implemented in June and in September. A third, and often a fourth change, occurs in the winter.

In order for new schedules to be developed, an agreement on the changes in routes and schedules must be reached at least two months before implementation. About one month prior to that time, a public meeting will need to be held for any major changes, such as those proposed here. This yields the three month minimum lead time to implement a change. Depending on the timing of a decision to make a change, the lead time can therefore be three to six months.

Concurrent with the service changes, there may be a need for some minor changes in facilities, such as the removal of a few bus stops and possibly the addition of some new bus stops. These issues will need to be coordinated with the individual municipalities having jurisdiction over the bus stops (primarily New Haven and Hamden).

7.4 Implementation of Flexible Services

The proposed flex routes are not dependent on any of the proposed fixed route changes. The East Haven, Hamden/Bethany and Woodbridge routes would work best in conjunction with the implementation of hubs at Foxon and Quinnipiac, Hamden Plaza, and Westville Center, respectively, but they could be instituted at any time. Therefore, the implementation steps for flex route services are distinct from those for the fixed route changes.

In most areas, new flex route services are differentiated from fixed route services in that they are serving areas not traditionally served by fixed route transit and they are a type of service with which the public, both riding and non-riding, may be unfamiliar. As a result, it is often difficult to find the market for the service and to make potential beneficiaries aware of the service and how it works. If a flex route is to be successful, there is a need for significant advance preparation and communication.

SCRCOG will need to initiate efforts to involve community groups in the final planning, preparation, and publicity for each new flex route service. Community involvement is often essential for success. These efforts should attempt to identify one or more local "champions" in each area who is an individual influential in the community and connected to the groups who may be beneficiaries of the service. These initial community outreach efforts should be conducted in several of the potential flex route service areas and the willingness of stakeholders to participate in the development of the service may be a significant factor in choosing which services to implement.

Community groups to be consulted could include local Councils on Aging, disability groups, civic groups, ethnic associations, churches and other religious groups. Any organization that serves clients such as the elderly, youth, low income individuals, and other groups more prone to transit use could be consulted. SCRCOG staff, or other representatives, should attend regularly scheduled meetings of these organizations rather than try to schedule separate public meetings. These groups can be helpful identifying destinations in the service area that should be publicized on the schedule and promotional materials. They can also provide feedback on promotional materials and provide an opportunity to do a more personal type of marketing of the service. These groups could receive "training" in how to access and use the service and could be offered free rides when the service is implemented.

Independently of the initial outreach efforts, SCRCOG will need to identify funding and make arrangements with GNHTD (or another operator) to provide the service. The arrangements for operating the service should be less complex than for fixed route changes, as the mechanism for operating the service already exists through the existing R-Link arrangements. Funding sources will still need to be identified, as the annual operating cost of each flex route is expected to be on the order of $200,000.

The community outreach efforts, however, are still likely to be the most difficult task in achieving a successful implementation. Dialogue with community groups, the targeting likely users, strong local support, and a more personal approach to developing, refining, and promoting the service are needed.

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