

STAMFORD URBAN TRANSIT STUDY

Final Report





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URBAN TRANSIT STUDY INTRODUCTION

Executive Summary



STAMFORD BUS AND SHUTTLE STUDY



TRANSIT IN STAMFORD – PLANNING FOR SUCCESS

The purpose of the Stamford Bus and Shuttle study was to evaluate current CTtransit and private shuttle bus operations, focusing on the Stamford Transportation Center (STC). The shuttle study represented the first phase of the overall effort and included a detailed investigation of private shuttles and the impacts of shuttle services on network operations and traffic circulation in and around the STC.

The second phase explored the CTtransit bus system more broadly and looked at transportation network opportunities. This document summarizes strategies to enhance additional components of the urban transit and transportation network including CTtransit services, roadway operations around the STC and along bus routes, last-mile connectivity improvements, and non-motorized access to, from and through the STC hub.

The study was funded by the Connecticut Department of Transportation (CTDOT) and the United States Department of Transportation (USDOT). The study was administered by the Western Connecticut Council of Governments (WestCOG).

The Urban Transit Study phase of the Stamford Bus and Shuttle Study focused on five key elements:

- Stakeholder & Public Engagement
- Existing Conditions
- Opportunities
- Network Alternatives
- Implementation



STAKEHOLDER & PUBLIC ENGAGEMENT

The Stamford Bus and Shuttle Study included outreach to CTtransit riders, non-riders, and public sector stakeholders. Public engagement focused on identifying network gaps and challenges for current bus riders, with an eye toward foundational improvements and future system expansion. This study did not focus on detailed service planning; rather, sought to develop a framework for system growth in the next decade or more.

STAMFORD BUS AND SHUTTLE STUDY



To coordinate with public sector stakeholders, the study team formed a Technical Committee (TC) with representatives from CTDOT, WestCOG, the City of Stamford, CTtransit, and Fusco Management Company (property manager for the STC). Bus riders shared their input through pop-up events and an open house held at the STC in early 2017. An online travel survey and the project website offered additional opportunities to contact the project team (www.stamfordbusandshuttle.com).



More than 30 transit users in Stamford attended the February 2017 Open House.



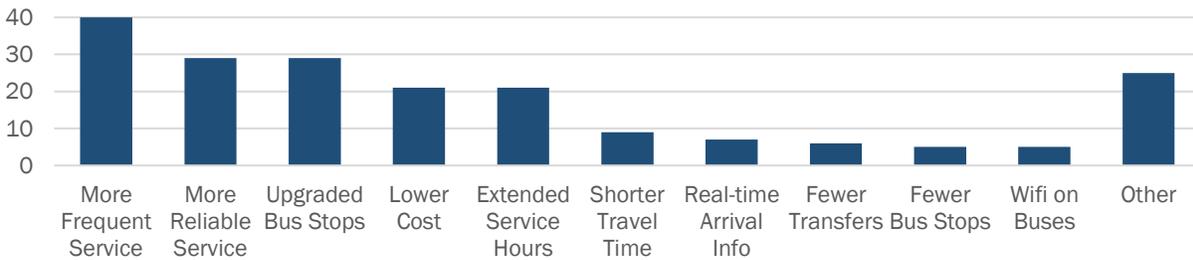
Display boards were used to explain study concepts and solicit feedback on user experience and priorities.

Between November 2016 and February 2017, the study team led a community engagement campaign to learn about the needs, motivations, and experiences of CTtransit bus passengers in Stamford. Surveys were conducted, including in-person feedback at the STC and Atlantic Square and an online survey, which also included questions regarding other non-bus modes of transportation. (The e-survey was available on the project website in English and Spanish and was distributed through the listservs of project partners.) A sample of current rider priorities is summarized in Table 1, clearly indicating a desire for frequency and reliability over discretionary amenities.

STAMFORD BUS AND SHUTTLE STUDY



Table 1 – Bus Rider Priorities

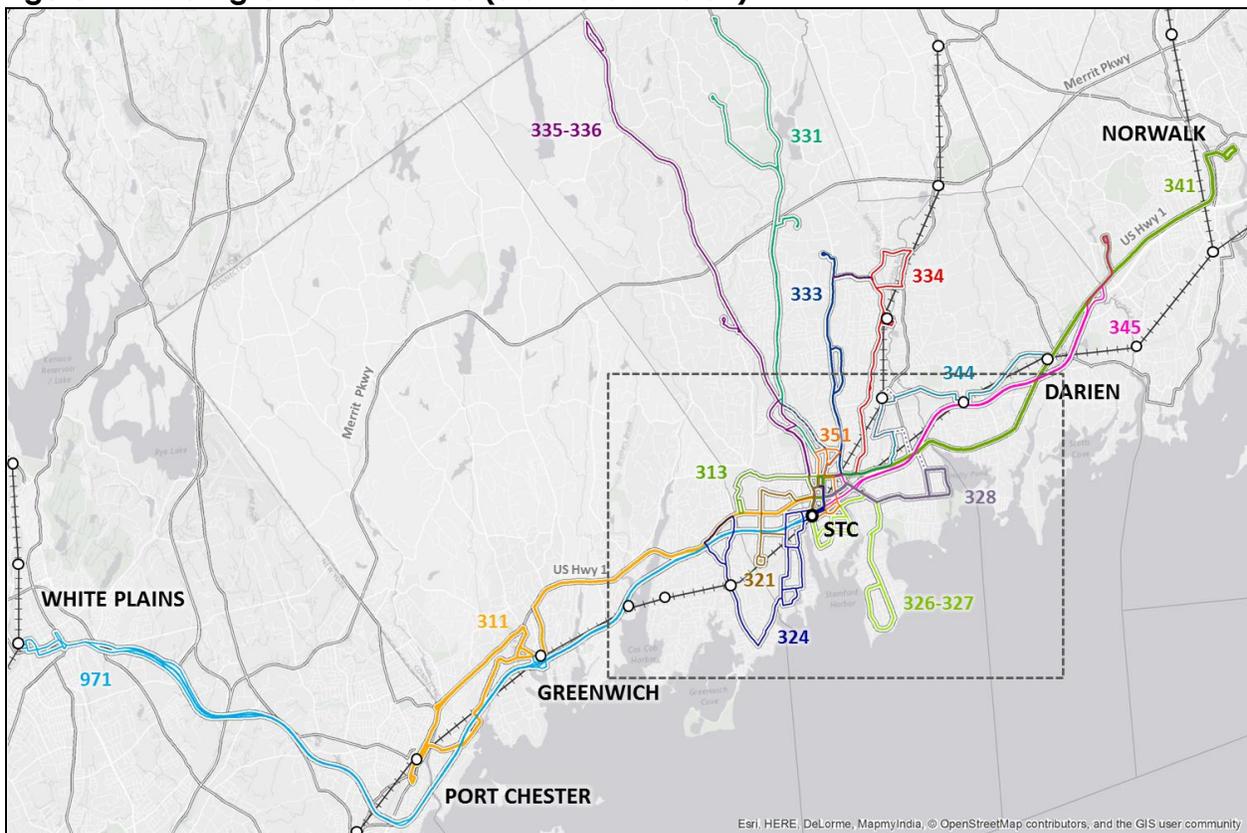


EXISTING TRANSIT

CTtransit Stamford Division

CTtransit’s Stamford Division serves the city of Stamford and links Stamford with Port Chester, NY, Greenwich, Darien, and Norwalk. Commuter service is also provided to White Plains, NY. The routes run primarily along a radial pattern from the STC, which has close to 2,400 passenger boardings on a weekday. The full Stamford Division has close to 15,000 weekday boardings, or approximately 3.5 million annually. Service span is generally 5:30 a.m. to 12:00 a.m. on weekdays, and reduces during the weekend, with typical service spans between 7:00 a.m. to 7:00 p.m. with hourly frequencies.

Figure 1 – Existing CTtransit Routes (Stamford Division)



STAMFORD BUS AND SHUTTLE STUDY



Route Classification

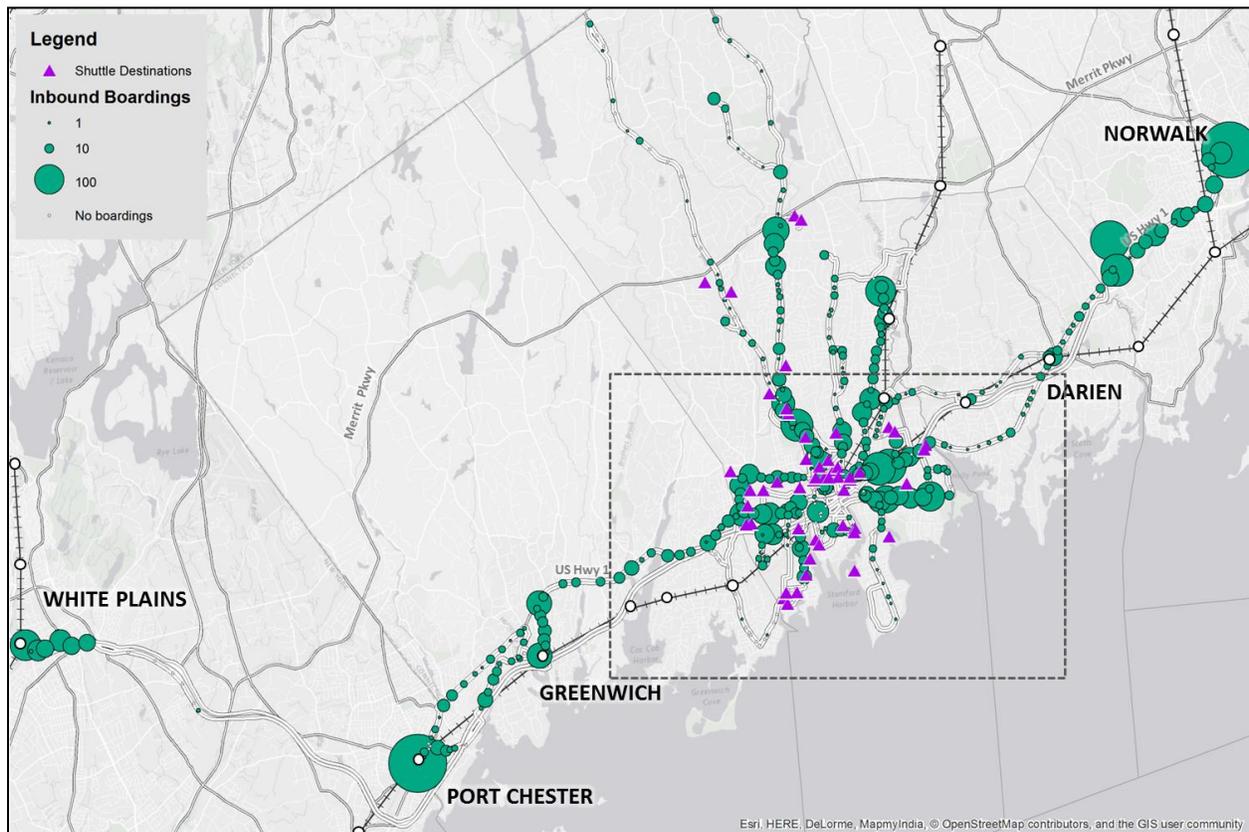
CTtransit's routes provide service for shorter trips within the defined inner and outer urban parts of Stamford and also provide longer distance routes to specific areas and attractors. Additionally, some routes are designed to provide "last mile" connections for inbound train commuters working in Stamford and "first mile" connections for commuters traveling from Stamford to surrounding towns. Bus routes in Stamford serve a variety of markets, including long-distance commuters, regional travel in the US Route 1 corridor, and local travel within neighborhoods close to the downtown area.

Service Coverage and Ridership

The Stamford Division network provides good geographic coverage and serves all major employment areas in and around Stamford. In addition to CTtransit's network, there are many businesses and residential complexes served by private shuttles located within the ¼-mile network's catchment area. This shows that the CTtransit network can provide an alternative to shuttle users if the shuttles are not available.

Figure 2 illustrates daily inbound bus boardings at the bus stop level. Ridership is significant in the Stamford core, the US Route 1 corridor (including connections to Port Chester, Greenwich, and Norwalk), the Long Ridge and High Ridge Road corridors, and the Hope Street corridor to Springdale.

Figure 2 – Ridership Patterns: Weekday Inbound Boardings (Excluding Transfers)





STAMFORD BUS AND SHUTTLE STUDY

Other Transit

Many large employers and property managers in and around Stamford provide free private shuttle buses to transport employees between the STC and employment or residential sites. Rail service at the STC includes Metro-North Railroad commuter service and regional Amtrak service. Regional bus connections include CTtransit’s 971 STAMFORD / WHITE PLAINS EXPRESS.

ALTERNATIVES DEVELOPMENT

Based on an analysis of existing transit service demand and regional travel patterns (including non-transit trips), the study identified various gaps and opportunities for CTtransit in the Stamford area, leading to the development of a long-list of options for addressing those gaps:

- 1) New service areas
- 2) Service level increases
- 3) Express services
- 4) Premium bus service
- 5) Transit priority measures
- 6) Changes to route network
- 7) Alternative service methods
- 8) Stop consolidation
- 9) Pedestrian environment

The options and alternatives here are presented at the strategic level, designed to consider opportunities and challenges for the Stamford system well into the future. Each was evaluated relative to performance metrics and community and Technical Committee feedback. Those with the highest potential for system growth and improvement were retained for more detailed consideration.

OPPORTUNITIES

In total, six of the nine alternatives advanced to formal recommendations. The three that are not moving forward – new service areas, premium bus service, and improving pedestrian environment – either do not adequately address the goals of this study or would require detailed analysis falling outside the study’s scope. The remaining six alternatives are:

- Service level increases
- Express services
- Transit priority measures
- Changes to route network
- Alternative service methods
- Stop consolidation

Performance Metrics

The nine alternatives were evaluated with respect to the following performance metrics:

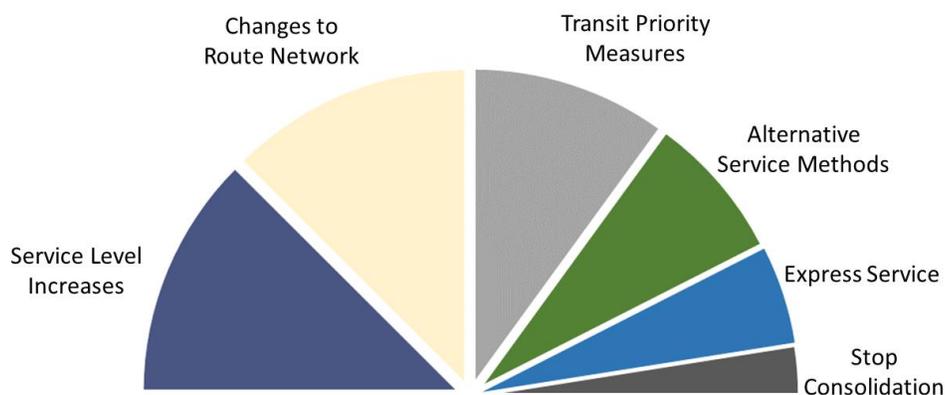
- Transit performance**
 - Ridership changes
 - Headways
 - Intermodal connectivity
 - Reliability
 - Environmental justice
- Transportation system performance**
 - Walkability and access to transit
 - Increased mobility/accessibility
- Economics**
 - Costs (capital & operating)
 - Access to jobs and transit customers
 - Development compatibility
- Public Involvement**
 - Technical Committee (TC) prioritization
 - Community input



IMPLEMENTATION

The implementation plan outlines the path forward for each of the six preferred alternatives, including proposals for implementation priority as a function of Technical Committee and stakeholder feedback and the performance metrics described above. The Urban Transit Study report describes high-level costs in terms of capital requirements and estimated operating costs, discusses implementation issues including prerequisites, and outlines the key roles from supporting agencies. The entirety of the Stamford Bus and Shuttle Study has focused on a multi-faceted approach, recognizing the range of implementation components, complexity, and potential level of benefit from various recommendations

MULTI-FACETED APPROACH



Implementation guidance for the recommendations is summarized as follows, including discussion of phasing, priorities, and champions for implementation.

Service Level Increases

Increasing service frequency and service span was considered on all routes. Ideally, service level increases could be implemented on every route; however, the emphasis on the highest demand routes is considered the key priority.

The four routes with the highest demand include Routes 311 Port Chester, 328 Cove Road, 331 High Ridge Road (south of the Merritt Parkway), and 341 Norwalk. The service level increases would lower peak headways from 20 minutes to 15 minutes and off-peak headways from 30 minutes to 20 minutes.

Priority/Phasing

The combined Route 311 / Route 341 is a high priority and its implementation will be guided through work on the separate [Route 1 BRT Feasibility Study](#). Between the proposed changes for Route 328 and Route 331, the Route 331 – High Ridge is recommended as a priority step (if both routes cannot be implemented simultaneously) since it results in higher net ridership increases and better tailors the allocation of resources based on demand.

Key Roles

Implementation Lead

- CTtransit

Supporting Partners

- CTDOT
- City of Stamford



STAMFORD BUS AND SHUTTLE STUDY

Changes to Route Network

Overall, the structure and function of the CTtransit route network is effective and does not warrant significant change. Additions to the route network are proposed to address gaps within the network and help improve the performance of existing routes. Proposed changes include new connections between the Springdale area and employment centers, and reconfiguration of the interlined pair Route 311 / Route 341 for more direct routing through downtown Stamford (see related Route 1 BRT Feasibility Study). Proposed new routes include Springdale-Cove, Springdale-Westover, and Springdale-Westhill. These are crosstown routes that do not connect to the STC.

Key Roles

Implementation Lead

- CTtransit

Supporting Partners

- CTDOT

Priority/Phasing

For the new market routes recommended in this study, each plays an important role in improving the network, and should be implemented as a package. However, if available funding dictates a staged approach, the chief difference among these routes is their financial performance, and so they could be implemented in that order:

1. Springdale – Cove
2. Springdale – Westover
3. Springdale - Westhill

Transit Priority Measures

Transit priority measures could be beneficial throughout the network but are recommended as priority elements on North State Street, notably between Atlantic Avenue and Washington Boulevard, and on Washington Boulevard from Henry Street to at least Tresser Boulevard and preferably to Broad Street.

Options on both streets can be accomplished within the existing right-of-way only by re-allocating lane capacity from general traffic to bus and shuttle only, along with complementary signal priority treatments. Initially, this could be done in peak periods only, and as a pilot program to test performance and local acceptance.

Key Roles

Implementation Lead

- City of Stamford

Supporting Partners

- CTDOT
- CTtransit
- Stamford business community

Priority and Phasing

Transit priority on North State Street should be considered first, followed by (or in conjunction with) Washington Boulevard. This could also be framed as a pilot project to test the feasibility and impacts for wider application. Outreach to transit customers, employers, and local property owners is vital to advancing such a pilot project. The business community is a valuable partner, as private shuttles could also benefit significantly from priority measures on North State Street and Washington Boulevard.

Alternative Service Methods (North of Merritt Parkway)

Alternative service concepts are proposed for the area north of Merritt Parkway to better tailor the resources and service levels to the demand in this area. These alternative service methods for the area north of Merritt Parkway would be implanted in conjunction with the service level changes



STAMFORD BUS AND SHUTTLE STUDY

recommended for Route 331 High Ridge south of Merritt Parkway, as an alternative to the reduced service levels on the fixed route service.

In this concept, CTtransit would enter into a contract with a taxi company, transportation networking company (TNC), or other provider to provide on-demand service north of Merritt Parkway, in the areas currently serviced by Route 331 – High Ridge and 336 Long Ridge. These on-demand services would connect with transfers to the fixed route service at Merritt Parkway on Long Ridge Road and High Ridge Road.

Priority and Phasing

Because of the potential for savings with this change, consideration should be given to combination with other priority items, especially service level increases, to offset the cost. Policy groundwork must also be laid to enable this change in service delivery and potential impacts on transit operating contracts.

Express and Limited Stop Services

Three enhanced route options have been considered in this study. First, a limited stop service option on US Route 1 affecting the Route 311 / Route 341 service has been deferred in favor of the separate Route 1 BRT Feasibility Study.

The second two options include Route 331 – High Ridge – one as a limited stop overlay service which would partially replace the existing local service, and the second as a non-stop express. The non-stop express would operate from the Merritt Parkway park-and-ride providing a direct connection to downtown Stamford.

Maximizing the potential of this service would require additional parking spaces at an expanded park-and-ride lot. Since there is no imminent solution to this issue and alternatives require additional study, this option is not recommended as a priority at this time but should be considered if opportunities arise.

Bus Stop Consolidation

The final measure among the recommended priorities is the consolidation of little used stops throughout the network. The elimination of unused stops could also be part of this program, though this will have negligible impact on the service. The greatest potential time savings will come from a reduction in the number of stops with low to moderate activity and the policy direction for appropriate, efficient spacing. Eliminating stops with low (but not zero) use can have some impact in terms of travel time and reliability, making the service more attractive and promoting additional ridership as a result.

Key Roles

Implementation Lead

- CTDOT

Supporting Partners

- CTtransit
- City of Stamford
- Private sector operators

Key Roles

Implementation Lead

- CTtransit

Supporting Partners

- CTDOT

Key Roles

Implementation Lead

- CTtransit

Supporting Partners

- City of Stamford
- CTDOT

STAMFORD BUS AND SHUTTLE STUDY



Priority / Phasing

As part of the proposed study, routes should be examined to determine where even small decreases in travel time or increases in service reliability might be important and prioritize these routes. For instance, if a route is experiencing running time and schedule adherence issues to the point where a service adjustment is required, a stop consolidation program may eliminate or at least defer this unwanted change.

CONCLUSION

As a mid- to long-range plan, the Urban Transit Plan provides a framework and sufficient analysis and direction to program subsequent study and commitment to the associated improvements. Taken together, these recommendations will build on the strengths of the CTtransit and the urban transportation network in Stamford and position the City and the region for continued success.

ACKNOWLEDGMENTS

This study represents a collaborative effort between WestCOG, CTDOT, the City of Stamford, CTtransit, and the consultant team, led by Fitzgerald & Halliday, Inc. of Hartford, Connecticut, and New York, New York.

Vital insights and outreach assistance were provided by the Stamford business community, including the Business Council of Fairfield County, Stamford Partnership, Stamford Downtown, and the Stamford Chamber of Commerce, along with each of the businesses that provided time and input during early interviews. Background information and operational assistance were provided by Fusco Property Management at the Stamford Transportation Center.

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URBAN TRANSIT STUDY CHAPTER ONE

Existing Conditions



INTRODUCTION

About the Study

The Stamford Bus and Shuttle Study evaluates current bus transit and shuttle operations in the city of Stamford, focusing on the Stamford Transportation Center (STC). The earlier phase of the study provided a detailed investigation of private shuttles serving the STC. The Shuttle Study document assessed the effects of the shuttle services on network operations and traffic circulation in and around the STC and provided governance and operating scenarios for a more efficient, coordinated shuttle system.

In the Shuttle Study, CTtransit service was considered in the context of the shuttle network. This document explores the CTtransit system more broadly and looks at systemwide opportunities. This document presents strategies to enhance additional components of the urban transit and transportation network including CTtransit services, roadway operations in the vicinity of the STC and along bus routes, last-mile connectivity improvements, and non-motorized access to, from and through the STC hub.

About This Document

This document provides an overview of the existing conditions relating to the local transit network in and around Stamford. The primary focus is the City of Stamford, but much of the analysis covers the wider area served by CTtransit's Stamford Division.

This document first provides a brief overview of the **land use and urban structure** in and around Stamford. This includes a general description of the urban form in Stamford and neighboring communities.

The next chapter covers the **existing transit supply**, primarily focused on CTtransit's services. It includes a discussion of the various routes and their roles, service coverage, service levels, and demand patterns. It also briefly describes the private employee shuttles operating in Stamford, and the other transit services that connect with CTtransit's Stamford services.

This is followed by analysis of the **existing travel demand patterns** for the wider population (not just transit users). This looks at the distribution of trip origins/destinations and major trip flows, and how they compare to transit services.

The relationship between transit supply and wider travel demand is then explored in more detail in the final chapter on **gaps and opportunities**. This includes an assessment of potential new markets for transit, or travel markets where transit is under-used. It also includes descriptions of the various other service gaps that have been identified throughout this document.

The **options discussion** provides a long list of options for potential changes and enhancements to Stamford's transit. These are strategic-level options with discussion on the advantages and disadvantages of each. Case studies of successful implementation of similar options elsewhere are used to provide illustrative examples of the options, where appropriate. Premium bus service forms one of the options under consideration. This work includes high-level financial analysis.

Finally, the **conclusions/next steps** section discusses the future work for this phase of the study.

LAND USE AND URBAN STRUCTURE

Stamford is a city of more than 128,000 residents in Fairfield County, on the coast of Connecticut, near the Southwestern border of Connecticut and New York State. Only 30 miles from Manhattan, Stamford has a considerable connection to New York City in part due to companies headquartering their offices in Stamford’s downtown and technology parks.

Stamford is a considerable employment hub in the area, with major employers including General Electric Capital Corporation, Pitney Bowes, Inc., Stamford Hospital, and the Stamford Town Center. Stamford is also home to branches of the University of Connecticut (UConn), University of Bridgeport, and Sacred Heart University (SHU). While all schools are considered commuter campuses, the UConn and SHU campuses are located in downtown Stamford.

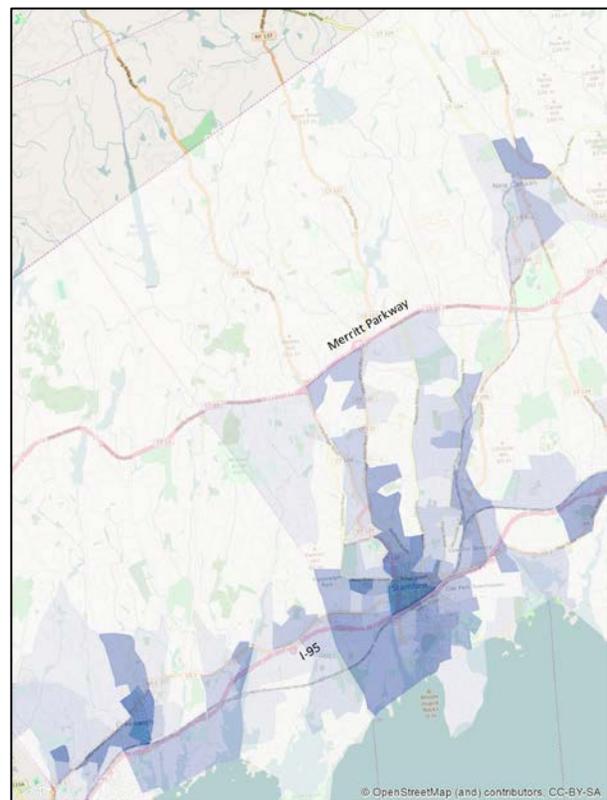
Stamford enjoys a dense and commercially rich downtown with newly developing mixed-use areas, particularly south of Downtown in the Harbor Point area. While downtown Stamford is relatively dense, population density decreases rapidly in the northern portions of the city and becomes especially low density north of Merritt Parkway. These areas are comprised of primarily single-family homes on large lots.

Much of the urban layout in these outlying areas is served by disconnected, curvilinear streets. This disconnection is further compounded by significant topology considerations. Steep grade from the coast makes walking and cycling north-south difficult, and east-west options in Stamford are limited, especially north of Merritt Parkway.

Figure 1 Population Density



Figure 2 Employment Density



Interstate 95 and the Route 1 BRT Feasibility Study roughly parallel each other through the downtown and provide the major east-west connection in downtown Stamford. Merritt Parkway runs through the northern part of the city, serving commuters to and from New York City as well as commuters heading to Stamford from the east.

Figure 1 and Figure 2 illustrate the population and employment density in Stamford and surrounding communities. (Stronger colors represent higher densities.) The highest population density is found just outside downtown Stamford, while the highest job density is found in the center of downtown Stamford. There are also higher population densities in Greenwich (in the southwest).

Employment is generally concentrated along I-95/US Route 1, Long Ridge Road, and Stamford's eastern border. These corridors are therefore important targets for transit service, as routes in these corridors will serve a relatively high density of jobs.

Both population and employment density are low north of the Merritt Parkway, except for the town of New Canaan in the northeast. This suggests that most of this area may only sustain lower transit service levels. However, a link between New Canaan and other community centers may be warranted. However, it should be noted that there is existing Metro-North service to New Canaan via the New Canaan line.

EXISTING TRANSIT SUPPLY

This section describes the conditions relating to the current transit network and supply across Stamford. It includes network-level analysis on the provided service and existing demand by route, bus stop, and time period.

CTtransit Stamford Division

CTtransit's Stamford Division serves the city of Stamford, and also provides commuter service to surrounding cities (primarily White Plains, Greenwich, Port Chester, Darien, and Norwalk). As shown in Figure 3 and Figure 4, the division operates 12 local fixed route services and 3 commuter services (the I-BUS, route 345 NCC FLYER, and the STAMFORD CONNECTOR).

The routes run primarily along a radial pattern. All serve the STC, which has close to 2,400 boardings on a weekday. Field observations suggest that the majority of boardings at the STC are passengers transferring from other CTtransit routes.

The Stamford Division has close to 15,000 average weekly boardings, or approximately 3.5 million annually.¹ Service span is generally 5:30 a.m. to 12:00 a.m. on weekdays with 20-30 minute frequencies.² Service is diminished during the weekend³, with typical service spans between 7:00 a.m. to 7:00 p.m. with hourly frequencies.

¹ The private shuttles operating out of the STC also average about 15,000 weekly boards. See the Phase A materials for more information on the private shuttles.

² Route 45 NCC FLYER operates from Monday to Thursday on regular class days during the fall and spring semesters only

³ There is no weekend service on the 351 STAMFORD CONNECTOR

Figure 3 Existing CTtransit Routes (System)

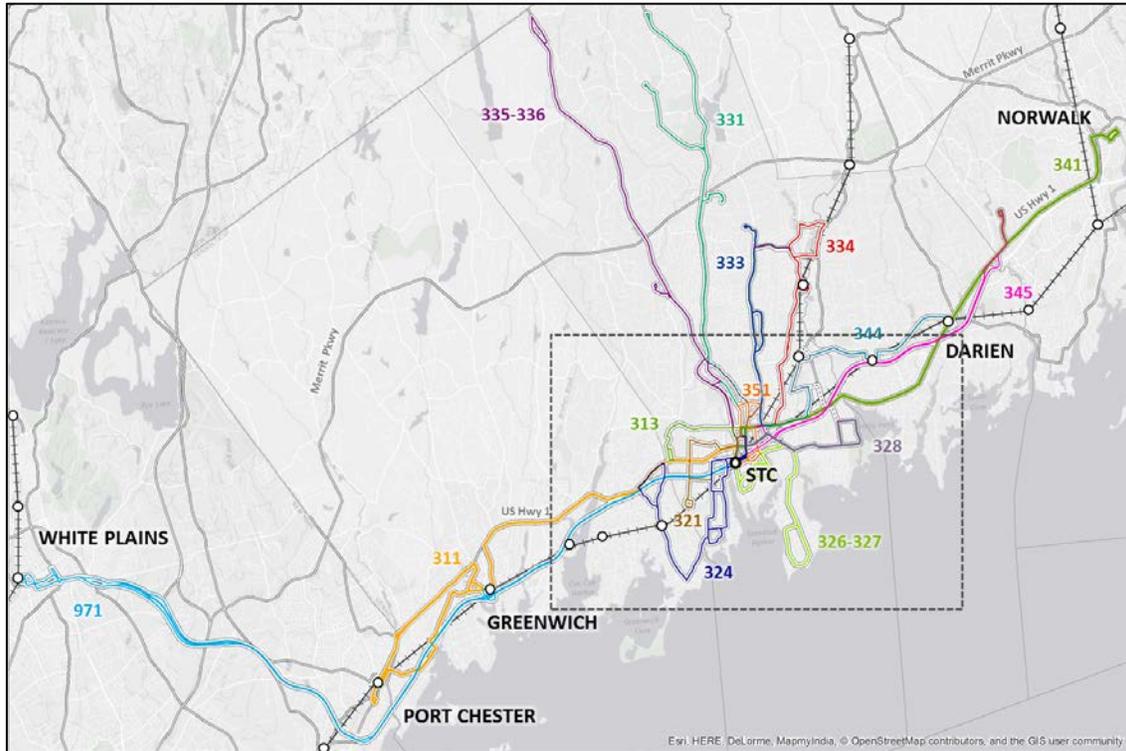


Figure 4 Existing CTtransit Routes (Core)



Route Classification

CTtransit’s routes provide service for shorter trips within the defined inner and outer urban parts of Stamford and also provide longer distance routes to specific areas and attractors. Additionally, some routes are designed to provide “last mile” connections for inbound train commuters working in Stamford and “first mile” connections for commuters traveling between Stamford and surrounding towns.

CTtransit’s routes in Stamford serve a variety of markets. Some are aimed at long-distance commuters coming into Stamford from outside the community, while otherwise are targeted at local travel within neighborhoods close to the downtown area. Consequently, this report organizes the services into four groups to aid discussion and analysis, as shown in Table 1.

Table 1 CTtransit Route Types

Group	#	Route Name	Length (miles)	Mean stop spacing (ft)	Start of Service	End of Service
Commuter service	345	NCC FLYER	7.1	6,860	7:10 AM	4:20 PM
	971	STAMFORD / WHITE PLAINS EXPRESS	15.5	4,317	5:30 AM	10:09 PM
Long-haul	311	PORT CHESTER	9.1	665	5:06 AM	12:35 AM
	341	NORWALK	10.1	914	4:55 AM	12:30 AM
Medium-haul	331	HIGH RIDGE	9.9	820	5:20 AM	11:58 PM
	335-336	WASHINGTON / LONG RIDGE	8.9	851	5:45 AM	8:23 PM
	333	NEWFIELD	4.5	726	6:10 AM	11:48 PM
	334	HOPE ST	4.8	617	5:30 AM	11:48 PM
	344	GLENBROOK	6.1	775	5:44 AM	11:14 PM
Short-haul city service	313	WEST BROAD	2.7	671	5:20 AM	11:43 PM
	321	WEST AVE	2.5	495	5:39 AM	12:07 AM
	324	FAIRFIELD	5.6	537	5:25 AM	12:03 PM
	326-327	PACIFIC / SHIPPAN	4.4	675	5:46 AM	12:15 AM
	328	COVE RD	5.8	911	4:56 AM	12:44 AM
	351	STAMFORD CONNECTOR	2.7	1,129	6:57 AM	6:13 PM

With the exception of route 971 STAMFORD / WHITE PLAINS EXPRESS, all routes have a cash fare of \$1.75, with free transfers between routes. For route 971 STAMFORD / WHITE PLAINS EXPRESS, the cash fare is \$3.20. Users of this route get free transfers onto other CTtransit routes in Stamford; those transferring *from* other CTtransit routes in Stamford must pay the difference between the local and express fares.

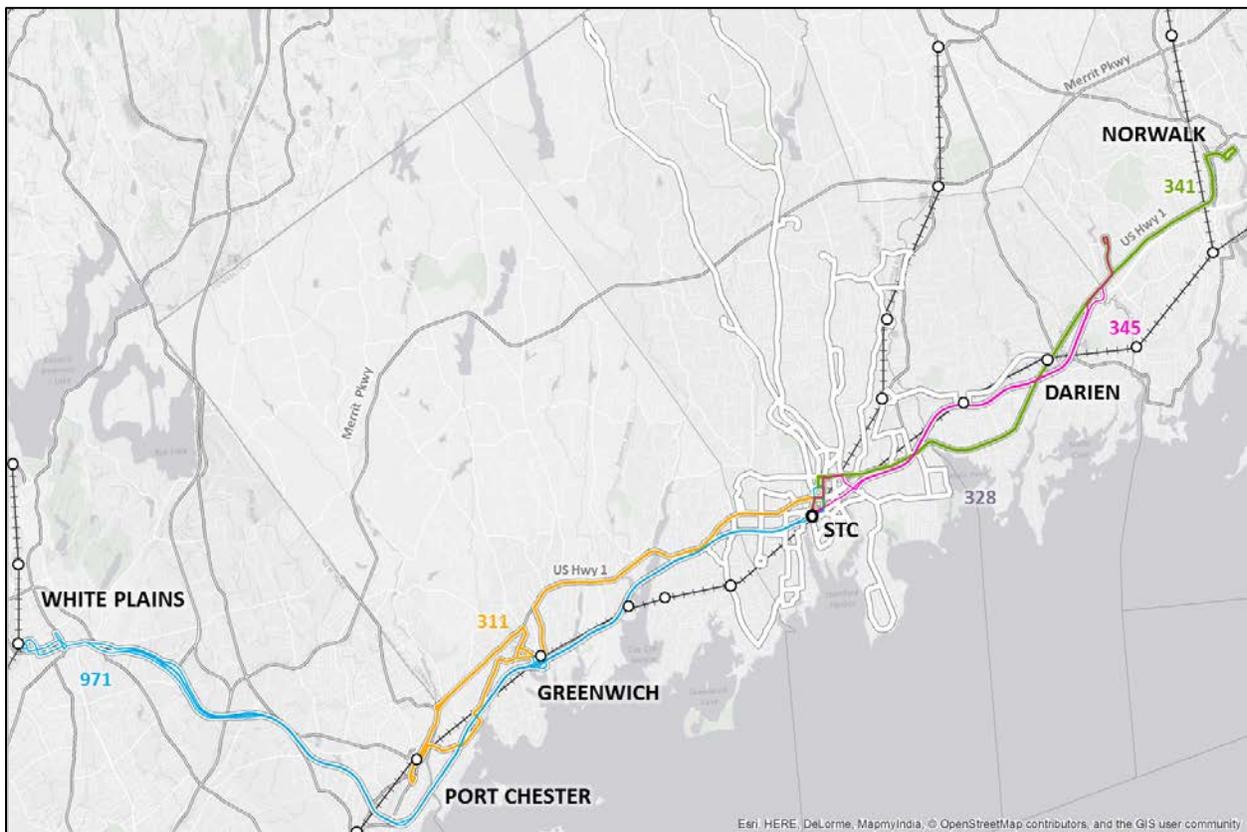
Apart from the commuter service routes, all routes have stop spacing indicative of local service. The average stop spacing is low compared with similar systems, which means that there is a shorter distance between stops relative to other systems.

Commuter Service

As shown in Figure 5, routes 971 STAMFORD/WHITE PLAINS EXPRESS and 345 NCC FLYER provide inter-municipal, limited-stop service to significant commuter attractors outside of Stamford. Route 971 STAMFORD/WHITE PLAINS EXPRESS serves White Plains, NY, using I-95 and I-287.

Route 345 NCC FLYER provides a non-stop connection between the STC and Norwalk Community College (NCC), seven miles northeast of downtown Stamford. It provides peak-only service Monday through Thursdays. When this route is not operating, route 341 NORWALK offers an alternative service to the campus.

Figure 5 Commuter and Long-Haul Routes



Long-Haul Routes

Routes 311 PORT CHESTER and 341 NORWALK serve communities and significant attractors beyond the outer zone along US Route 1, a historic highway corridor. Both services run throughout the day (5:00 a.m. to 12:30 a.m.). Route 341 NORWALK runs northeast via Darien, while route 311 PORT CHESTER runs southwest to Port Chester via Greenwich. Route 311 has two branches (in addition to the core route): route 311A runs via southern Greenwich, and route 312 WEST MAIN STREET runs only as far as Stamford’s west end.

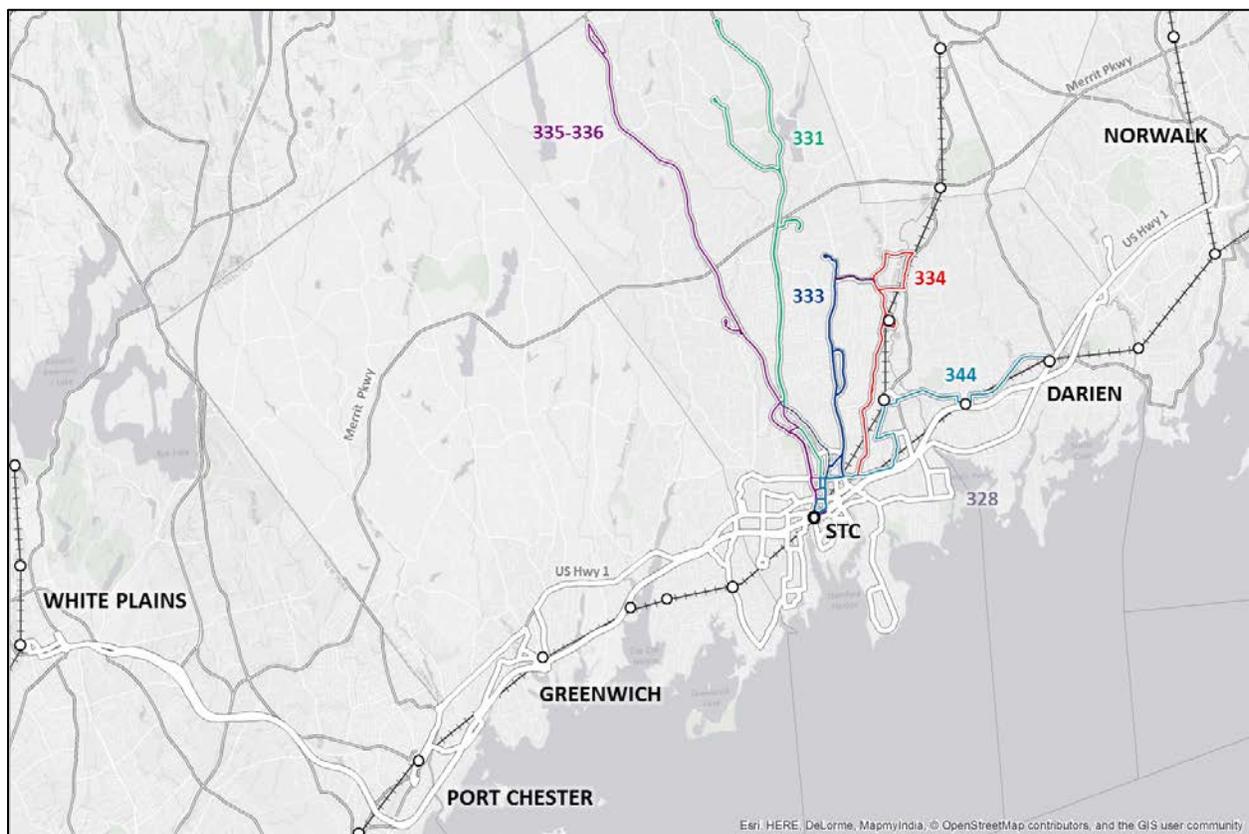
Medium-Haul Routes

As shown in Figure 6, the medium-haul routes are:

- 331 HIGH RIDGE
- 335-336 WASHINGTON / LONG RIDGE
- 333 NEWFIELD
- 334 HOPE ST
- 344 GLENBROOK

These routes serve primarily suburban communities and educational institutions northeast of the city. All offer all-day service and have stop spacing typical of local service.

Figure 6 Medium-Haul Routes



Routes 331 HIGH RIDGE and 335 WASHINGTON run past the Merritt Parkway, serving small suburban communities and providing service along the main north-south corridors in Stamford. The areas either side of the Merritt Parkway have very different land use patterns. Consequently, some of the later analysis will consider the route segments north and south of Merritt Parkway separately.

Short-Haul City Service Routes

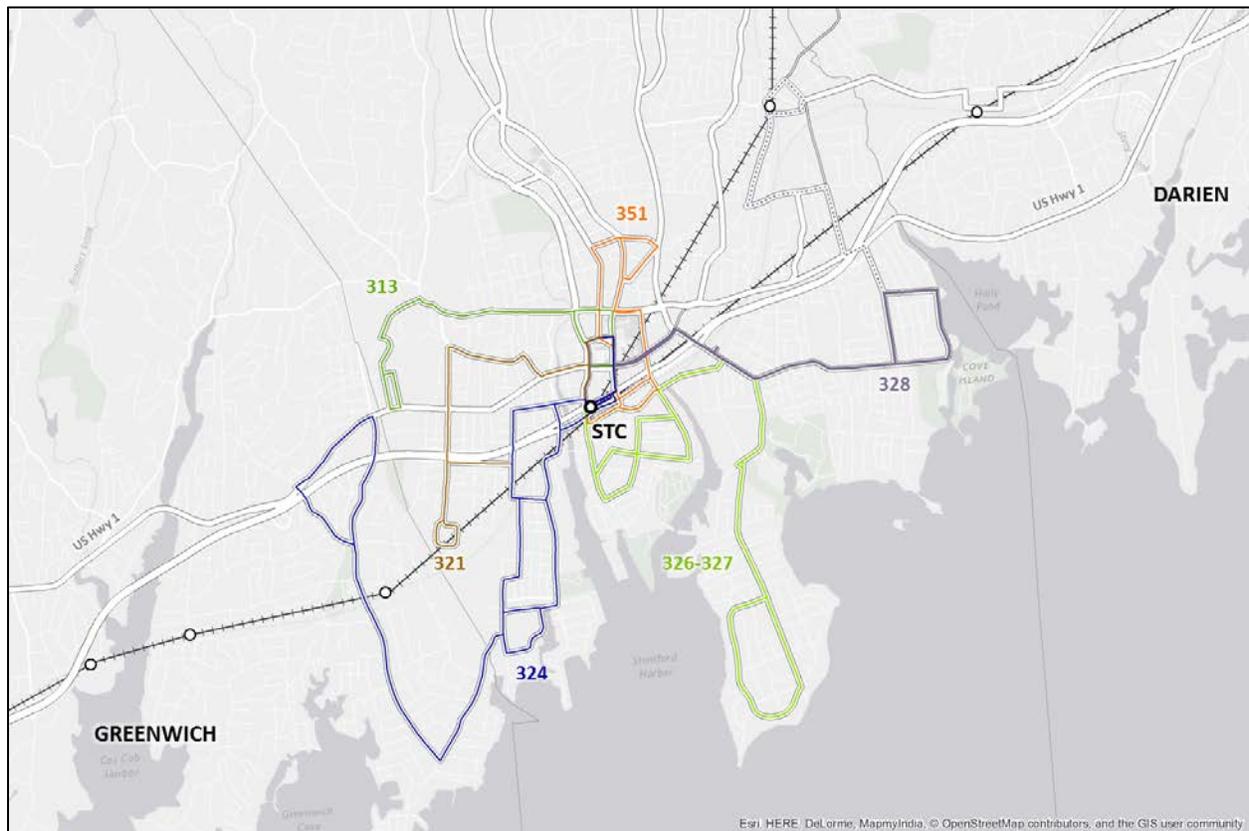
As shown in Figure 7, the short-haul city service routes are:

- 313 WEST BROAD
- 321 WEST AVE

- 324 FAIRFIELD
- 326-327 PACIFIC / SHIPPAN
- 328 COVE RD
- 351 STAMFORD CONNECTOR

Route 351 STAMFORD CONNECTOR primarily serves commuters traveling from the STC to destinations in the downtown. Service aligns with train arrivals during the peak periods, with no off-peak service. Service on the rest of the short-haul city service routes is fairly uniform, providing local service throughout the day.

Figure 7 Short-Haul City Service Routes (Core)



Route Analysis

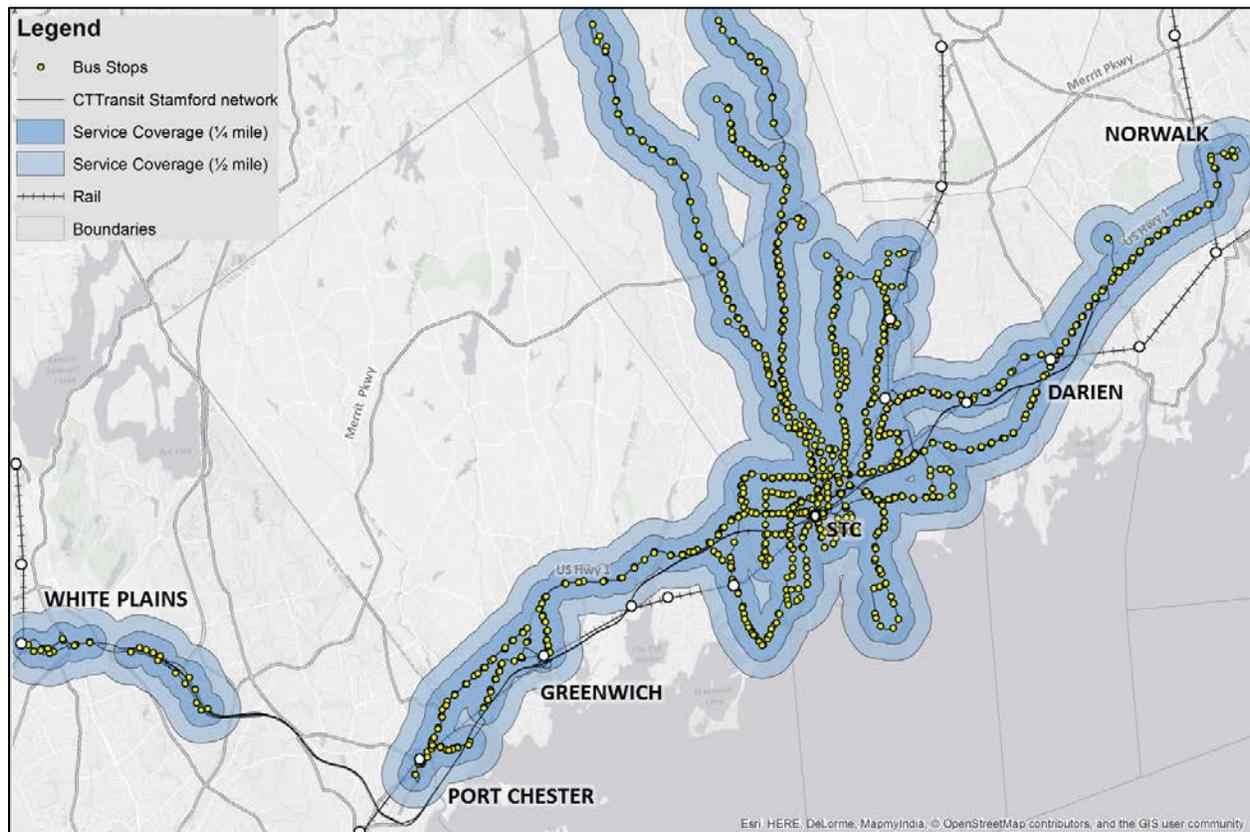
Service Coverage

The area covered by CTtransit’s services is shown in Figure 8, with buffers at $\frac{1}{4}$ mile and $\frac{1}{2}$ mile. No significant holes have been identified in the network. Any expansion of the service area would be into low-density residential areas, and the appropriate type of service would need to be investigated.

Comparing the coverage area with the employment density shown in Figure 2, it reveals that the network provides good geographic coverage of all major employment areas in and around Stamford.

In addition to CTtransit’s network, there are many businesses and residential complexes served by private shuttles located within the $\frac{1}{4}$ -mile network’s catchment area. This shows that the CTtransit network may provide an alternative to shuttle users if the shuttles are not available.

Figure 8 Service Coverage



Service Frequency

Figure 9 shows the service frequency by route and time period. It shows that AM peak and PM peak service frequencies are typically the same, and that mid-day and evening frequencies are also typically the same.

Almost all routes offer two to three buses/hour during the peak periods, and one to two buses/hour during midday and evening periods. For late night service, all routes run at one bus/hour, except for routes 345 NCC Flyer, 335-336 WASHINGTON / LONG RIDGE, and 351 STAMFORD CONNECTOR, which offer no late evening service.

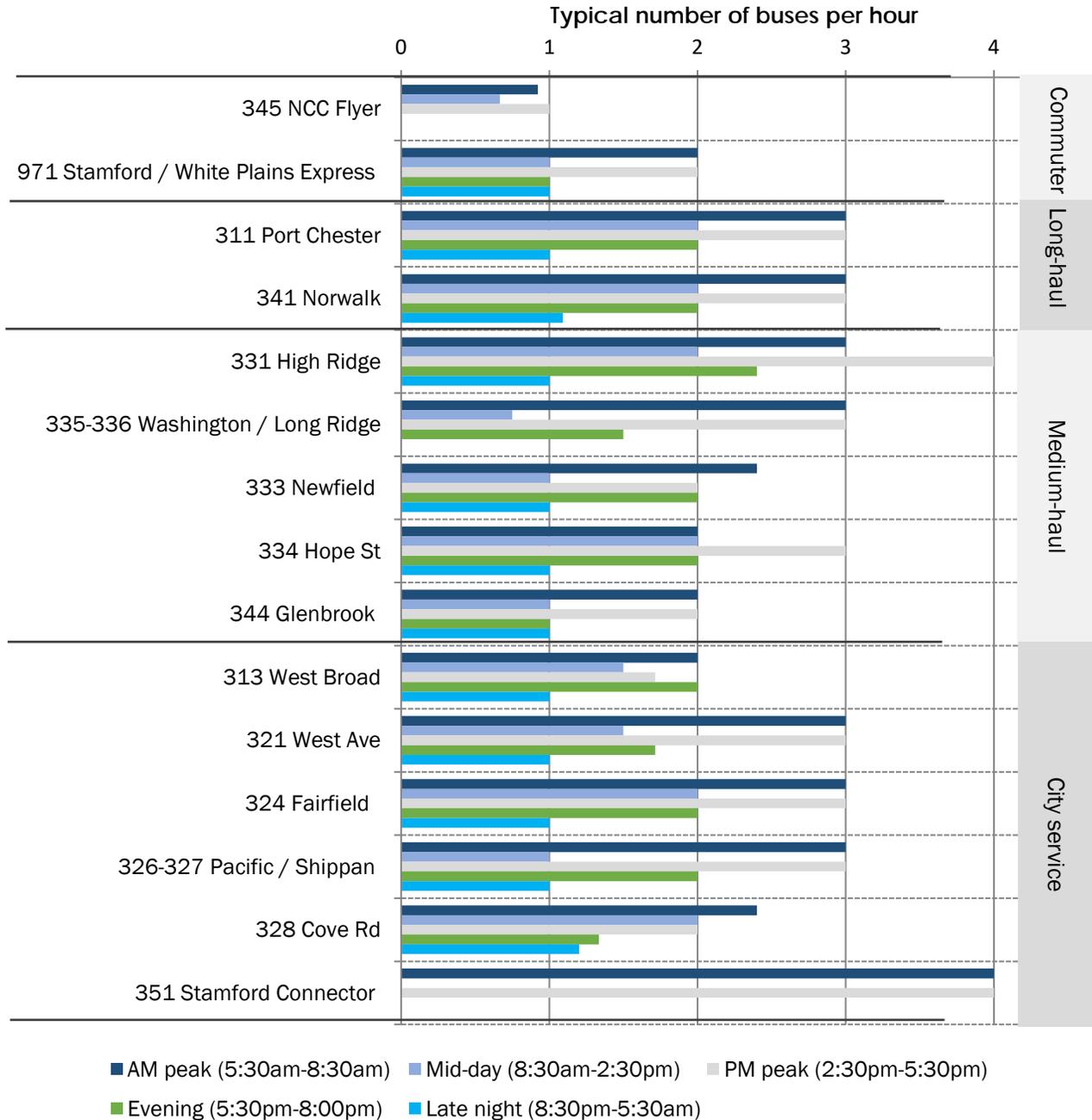
Route 345 NCC FLYER is the only route running fewer than two buses/hour, with 65-minute headway during the AM peak; route 351 STAMFORD CONNECTOR runs four buses/hour. All other routes offer two to three buses/hour during the AM peak. Overall, midday headways are more variable among all routes, whereas late night headways are fairly consistent (60 minutes).

Unlike most other routes, the mid-day service frequencies for routes 335-36 WASHINGTON / LONG RIDGE and 326-327 PACIFIC / SHIPPAN are lower than those for the evening period. Similarly, routes 334 HOPE STREET and 331 HIGH RIDGE are unusual in that the PM peak service frequencies are higher than those in the AM peak.

Route 351 STAMFORD CONNECTOR only offers service during peak periods, although it runs the highest number of buses per hour. Routes 313 WEST BROAD and 345 NCC FLYER provide the lowest service level during both peak periods. Conversely, 351 STAMFORD CONNECTOR, 311 PORT CHESTER, and 341

NORWALK provide the highest service level, running 9, 13 and 10 total buses respectively during both peak periods.

Figure 9 Typical Service Frequency by Time Period



Stamford Transportation Center (STC)

The STC is located immediately north of Stamford rail station. The STC is used by all of CTtransit's bus routes, with all but one route using a set of bus bays underneath I-95. The layout is shown in image on the right.

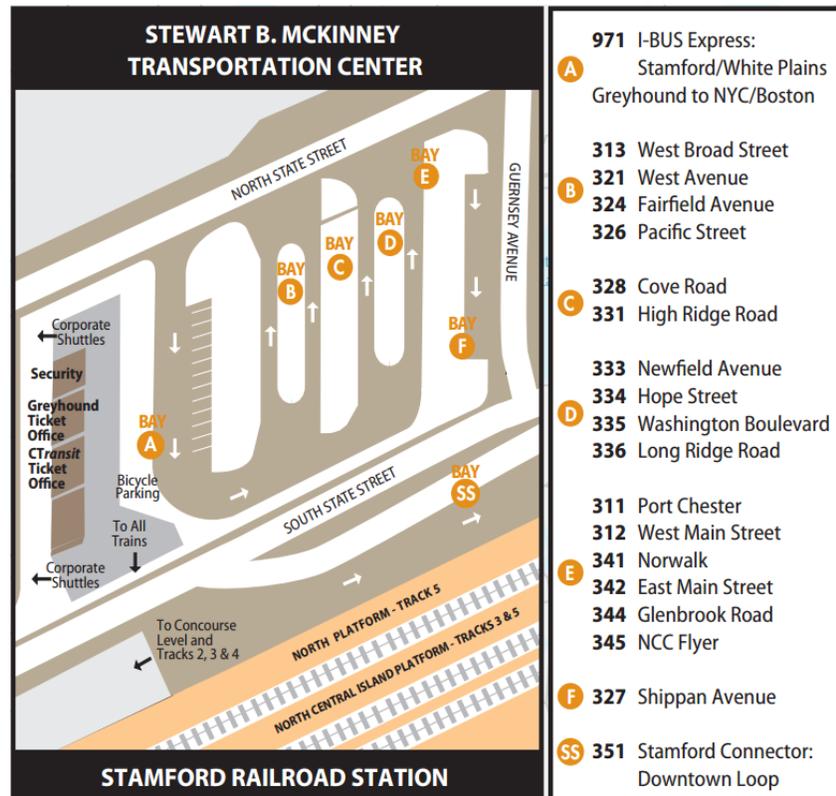
Access to and from the STC's bus bays is via North State Street, which has one-way (westbound) operation. This results in almost all buses being funneled along a single street to enter or exit the STC.

Roughly half of the routes use South State Street and Guernsey Avenue to reach the STC. The street configuration results in many buses taking an indirect route to reach the STC.

Exiting the STC requires that buses turn left out of the north end of the bus bays directly onto North State Street (without the benefit of any signalization). Buses then use Washington Boulevard to head either north or south as they start their route. Most buses need to head northbound at Washington Boulevard, which requires them to turn left across three lanes on North State Street of traffic in order to reach a slip road from North State Street to Washington Boulevard. The whole arrangement for exiting buses poses significant operational challenges.

The structure of CTtransit's route network brings all routes together at a single point. Analysis of the bus ridership data reveals that 27% of the system's (weekday) riders travel through the STC on interlined routes, and an additional 13% of the system's riders alight at the STC. Field observations suggests about half of those alighting then board other CTtransit routes, suggesting that about 33% of system's riders are in some way transferring between CTtransit routes at the STC.

Moving the STC's hub function to another part of downtown could potentially solve some of the operational issues. However, it would still result in all bus routes coming together at single point (or city block). This would result in a large number of buses competing with general traffic, as per the current situation. It would also remove the direct connection to Stamford station for many riders, potentially causing train passengers to switch to auto access. As a result, it is unlikely that moving the STC's hub function to another location would resolve existing challenges.



Rather than move the entirety of the STC's function, there would be benefits in removing a few routes. Giving the acute congestion in and around the STC, removing even a few routes could considerably ease some of the operating pressures.

Routes 311 PORT CHESTER and 341 NORWALK are currently inter-lined throughout the day. Approximately 27% of their combined ridership ride through the STC, but only 10% alight at the STC. These two routes could be reconfigured to run directly along Tresser Boulevard (without going to the STC). This would reduce the journey time for through riders. Riders currently transferring from these two routes at the STC could connect to most other routes at Washington Boulevard or Atlantic Street. The combined frequency of these routes would provide easy access to the remaining routes at the STC and the surrounding area.

Routes 313 WEST BROAD and 344 GLENBROOK both operate along Broad Street before turning south towards the STC. These two routes could also be combined into a single east-west route that bypasses the STC. This would yield journey time savings for those traveling along this corridor. Currently, they are not inter-lined with each other but are inter-lined with various other routes (depending on the time of day). Consequently, data on the number of riders transferring between these routes (whether at the STC or where the routes meet on Broad Street) is needed to quantify the benefits and drawbacks.

Route-Level Demand

Because of the radial nature of the route network, demand in this report is generally presented in two groups: inbound (route operating towards the STC) and outbound (route operating away from the STC).

Figure 10 shows the number of daily boardings by route, while Figure 11 shows the boardings per revenue hour by route, with the system average shown with a dashed line. The system has a total of 14,000 boardings per day and averages 13.2 boardings per revenue hour. The latter figure is fairly low for a suburban municipality and reflects that a significant proportion of transit ridership is not on CTtransit's services.

High Ridership Routes

These charts indicate that routes 311 PORT CHESTER and 341 NORWALK have the highest number of boardings overall and also have high boardings per revenue hour. Routes 328 COVE RD and 345 NCC FLYER also have high boardings per revenue hour. The wider variation in boardings per hour shows that a more in-depth analysis may be required to determine the suitable higher service frequencies for these routes. This analysis would examine the costs of providing additional service and the likely increase in ridership and revenue.

Low Ridership Routes

Figure 11 shows that route 351 STAMFORD CONNECTOR has the lowest (2.4) boardings per revenue hour. This low demand is partly a result of competition from private shuttle services attracting transit users for last mile commute trips. The Shuttle Study document proposed a new downtown circulator. This would replace route 351 STAMFORD CONNECTOR with a fare-free, midday-only service operating at a higher frequency on a revised route. The low demand on route 351 STAMFORD CONNECTOR implies significant changes (or discontinuation) are warranted, and the proposed new downtown circulator would fulfill that.

Figure 10 Daily Boardings by Route

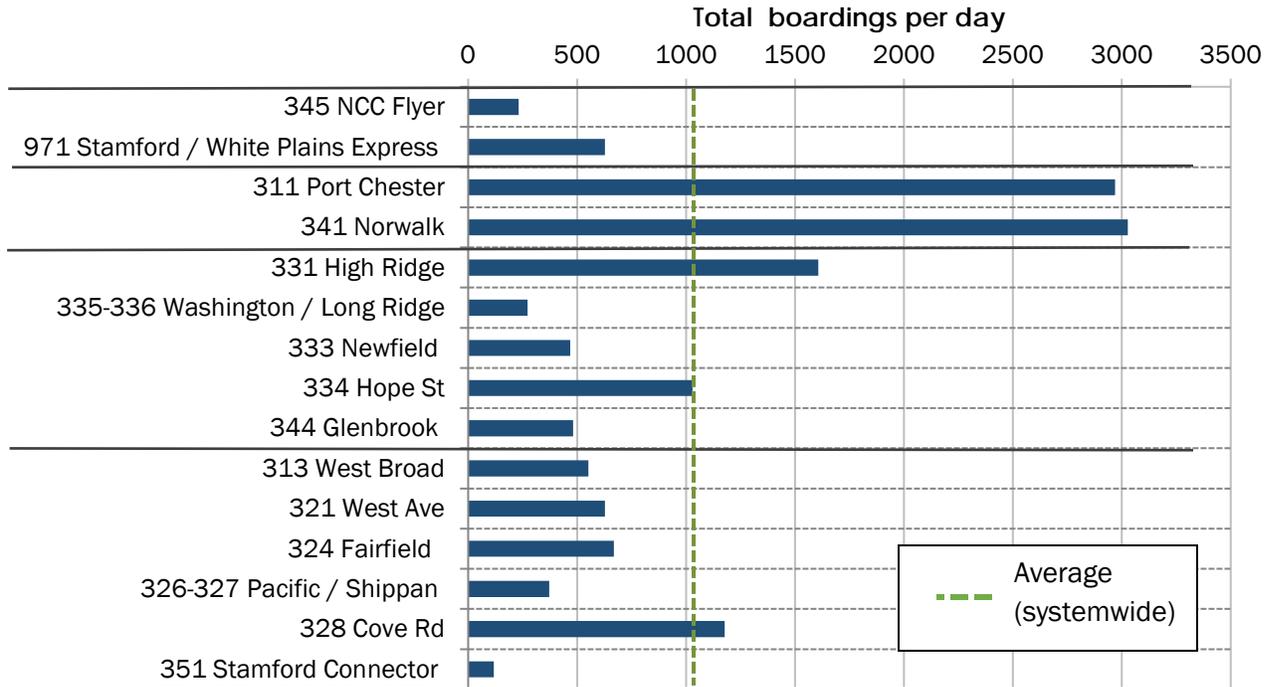
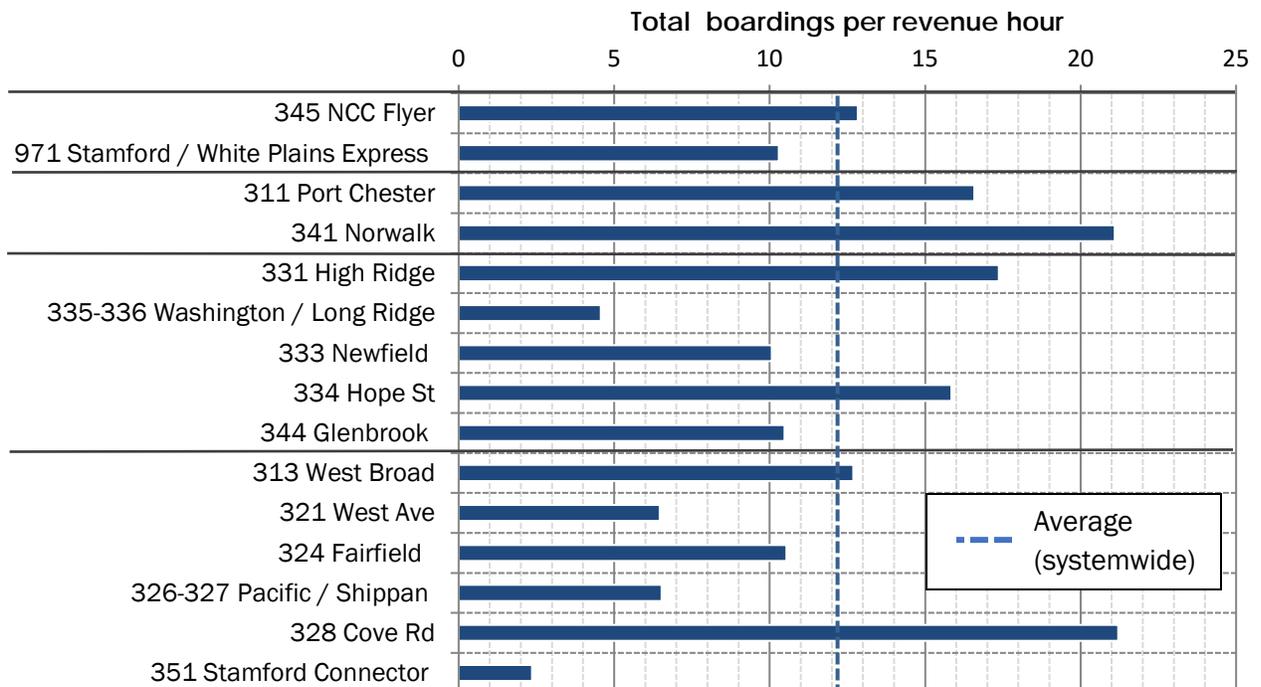


Figure 11 Boardings per Revenue Hour by Route



Routes 321 WEST AVE, 326-327 PACIFIC / SHIPPAN and 335-336 WASHINGTON / LONG RIDGE also have low (4.5 to 6.5) boardings per revenue hour. This level of ridership is lower than typical thresholds for justifying fixed-route transit service. Consequently, the areas served by these routes may be more appropriately served by alternative service delivery methods. The low ridership would also justify significant changes to these routes in order to produce higher ridership and/or reallocate resources.

High Ridge and Long Ridge Corridors

As mentioned earlier, routes 331 HIGH RIDGE and 335-336 WASHINGTON / LONG RIDGE serve different land use patterns along their length. Consequently, a more detailed analysis has been conducted between the route segments north and south of the Merritt Parkway⁴, shown in Table 2.

Table 2 Demand Analysis of Routes 331 and 335-336

Route #	Direction	Boardings per revenue hour (south of Merritt Pkwy)	Boardings per revenue hour (north of Merritt Pkwy)
331	Inbound	17.3	6.9
	Outbound	24.9	0.3
335-336	Inbound	4.5	2.9
	Outbound	7.2	0.2

The results show that the southern segments of these routes (south of the Merritt Parkway to STC) perform considerably better than the northern segment in both inbound and outbound directions. This suggests that different service levels or service delivery methods could be appropriate for the northern and southern segments, or elimination of those segments entirely

Boardings by Time of Day

Figures 12 and 13 indicate the total boardings and boardings per revenue hour by time period. These charts indicate that all boardings happen mainly during peak hours, with the exception of 345 NCC FLYER, where most boardings take place during midday.

Route 328 COVE RD has the highest number of boardings per time period, with more than 30 boardings during PM peak. However, it has fewer total boardings than both Routes 311 PORT CHESTER and 341 NORWALK, two high demand routes along the US Route 1 corridor. Consequently, there might be a need to increase service hours along route 328 COVE RD during PM peak

Although most routes operate with the same service frequencies during the two peak periods, the demand (in boardings/revenue hour) is more variable. For example, routes 311 PORT CHESTER, 333 NEWFIELD, and 334 HOPE ST, in addition to the three commuting routes, have significantly more boardings per revenue hour during AM peak than PM peak. The opposite happens with routes 313 WEST BROAD, 321 WEST AVE, 324 FAIRFIELD, 331 HIGH RIDGE, 341 NORWALK and 343 COVE RD, where the number of boardings per revenue hour during PM peak is significantly higher than during AM peak.

⁴ Transfers on and off have been included in these calculations.

Taken together, this suggests that there may be need for routes to have different service levels in the two peak periods.

Stop-Level Demand

Figures 14 to 17 show the inbound and outbound boardings in a weekday by stop. The size of the bubble is proportional to the number of boardings or alightings, with the STC shown as one stop. The maps also show the locations served by private shuttles. The maps are split by inbound and outbound boardings to reveal differences in travel direction. (Inbound alightings are generally the same as outbound boardings, and vice versa.)

As shown in Figures 14 and 16, all-day outbound boardings mainly concentrate along the east-west corridor and downtown Stamford. There are eight stops with more than 160 outbound boardings per weekday:

- Inner Stamford (Downtown Central): The STC, plus six stops along Bedford Street, Atlantic Street, Broad Street, and Washington Boulevard.
- Outer Stamford: East Main Street & Lockwood Avenue (route 345 NCC FLYER).

Since all routes run primarily along a radial pattern, there are also certain long-distance connecting stops that show consistent demand through all time periods (for example, inbound I-BUS stops around White Plains), as well as around Stamford Downtown Central. There are three stops that get more than 160 inbound boardings per weekday:

- East (Norwalk): Richards Avenue & West Cedar Street (routes 341 NORWALK and 345 NCC FLYER, to serve the Norwalk Community College), and Burnell Boulevard & River Street (route 341 NORWALK).
- West (Port Chester): North Main Street & Westchester Avenue (route 311 PORT CHESTER).

There also multiple route segments without any inbound nor outbound boardings. These include:

- Stops located along routes 324 FAIRFIELD (in Old Greenwich), 326-327 PACIFIC / SHIPPAN (in Shippan/East Side), and 335-336 WASHINGTON / LONG RIDGE (in Westhill).
- Stops located along routes 341 NORWALK and 344 GLENBROOK, where these run in parallel within the Glenbrook East and Darien areas.
- Stops located along route 971 STAMFORD / WHITE PLAINS EXPRESS have no inbound boardings on stops within downtown Stamford, reflecting the route's inter-community function.

Some of these routes were highlighted in the previous section as having low demand, and hence may benefit from significant changes to the routing. Any changes to the routing should therefore take into consideration these low-demand segments and potentially shift the route elsewhere.

Overall, the inbound demand is less concentrated than the outbound. Nevertheless, as shown in Figures 15 and 17, there are some common high demand areas; for example:

- Stops located along route 311 PORT CHESTER, on both the north-south section in Greenwich, and the section between Greenwich and River Road (in Mianus).
- Stops located mainly along route 341 NORWALK, as well as 344 GLENBROOK, on E Main St close to the Stamford Downtown Central area; when overlapping and running in parallel to route 345 NCC FLYER.

Figure 12 Total Boardings by Time Period

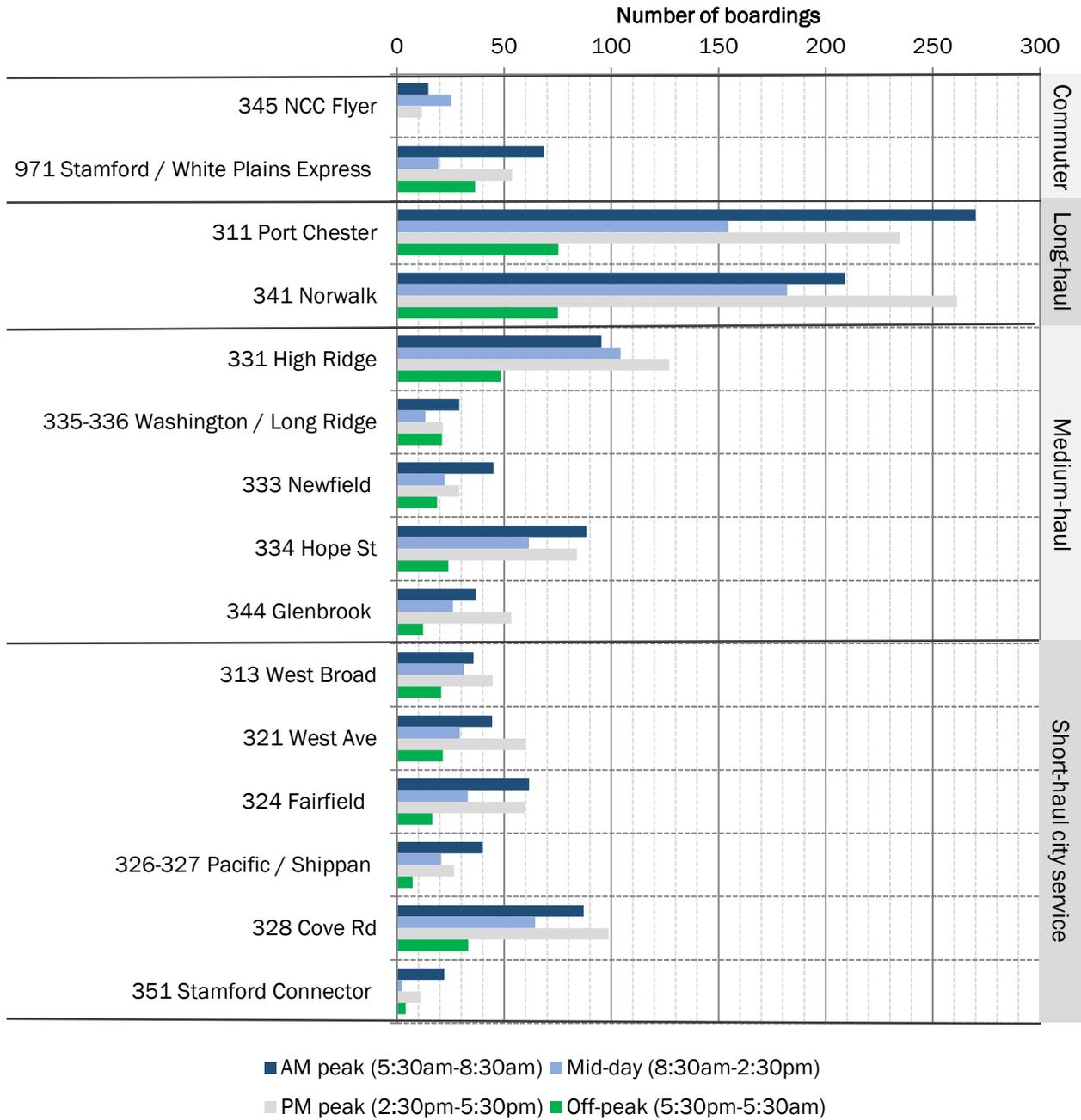
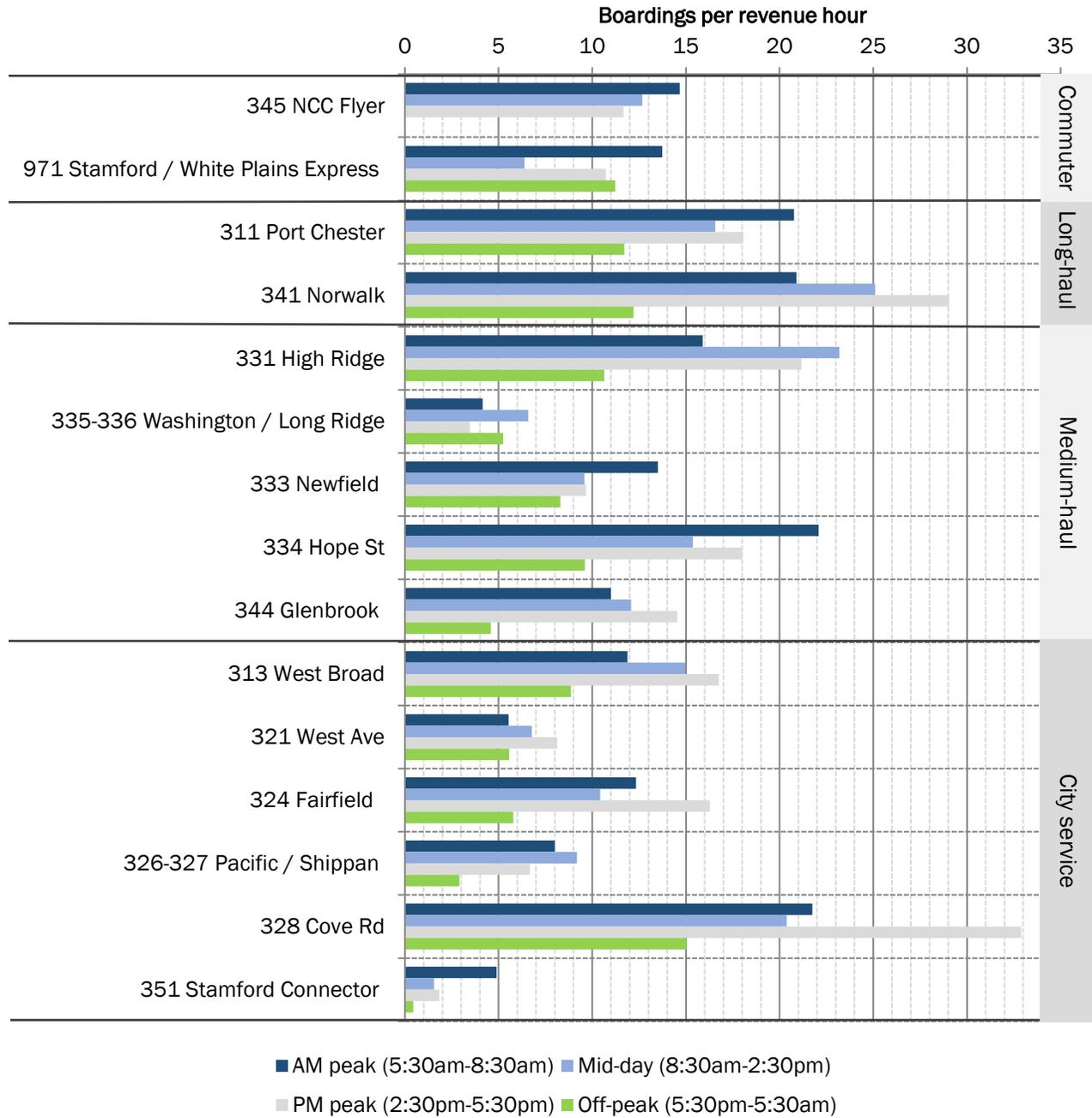


Figure 13 Boardings per Revenue Hour by Time Period



Additionally, there are some stops where inbound and outbound boardings significantly vary. This may be due to the nature of the land use and the activity that takes place in those areas. For example, the following segments have significantly more inbound boardings than outbound boardings:

- Route 341 NORWALK, at the east end of the route in the Norwalk area, where it no longer overlaps with route 45 NCC FLYER.
- Routes 333 NEWFIELD and 335-336 WASHINGTON / LONG RIDGE on their south ends, close to Stamford Downtown Central.
- Route 331 HIGH RIDGE, on the immediate south section of the Merritt Parkway, and where the route splits into two north branches (High Ridge Road & Scofieldtown Road), at the Stamford Museum & Nature Centre.
- Multiple routes within parts of the Stamford downtown area.

Route 971 STAMFORD / WHITE PLAINS EXPRESS has only 19 stops in each direction, which are located in the inner and immediate outer ring and in the White Plains area. Passenger loads for outbound trips and inbound trips at the peak periods are fairly equal, implying it is being used by commuters traveling in both directions.

The two routes on US Route 1 (311 GREENWICH and 341 NORWALK) both show stronger demand at the ends of the routes (downtown Greenwich, downtown Stamford, and downtown Norwalk) than in the intermediate portions. Consequently, there is potential for express service linking these three downtown areas. (Services along this corridor are also the subject of CTDOT’s concurrent Route 1 BRT Feasibility Study.)

Figure 14 Weekday Outbound Boardings – Excluding Transfers (System)

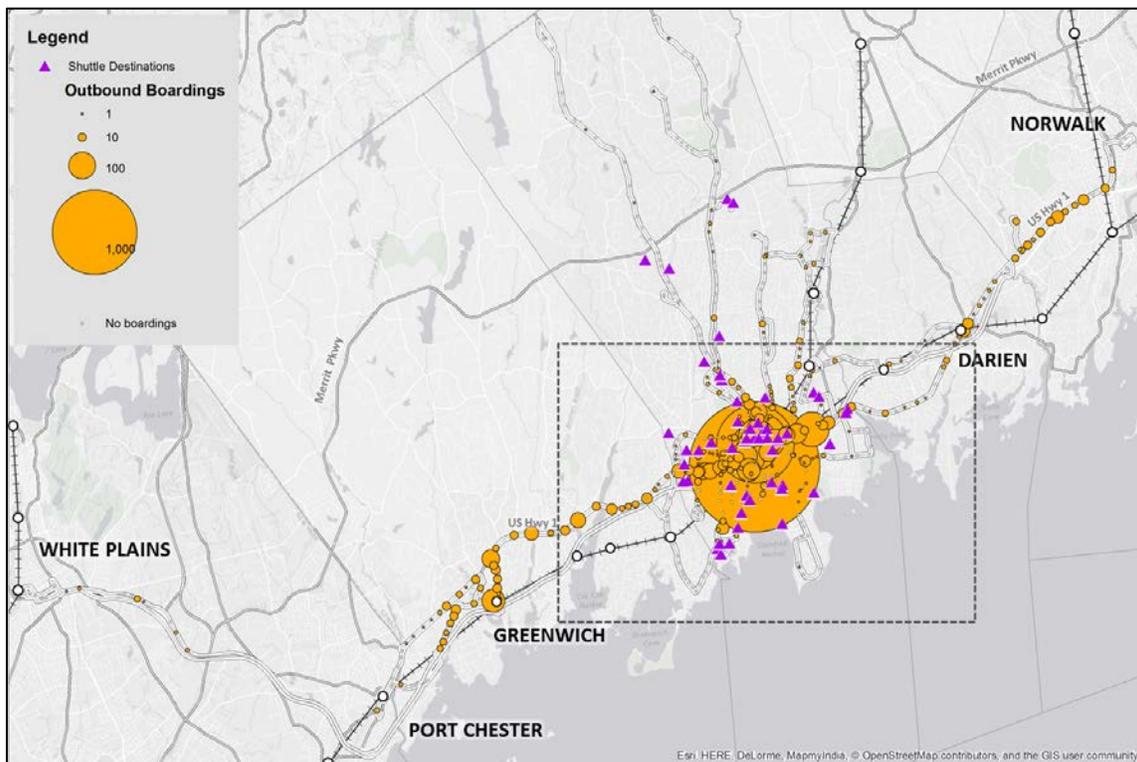


Figure 15 Weekday Inbound Boardings – Transfers Excluded (System)

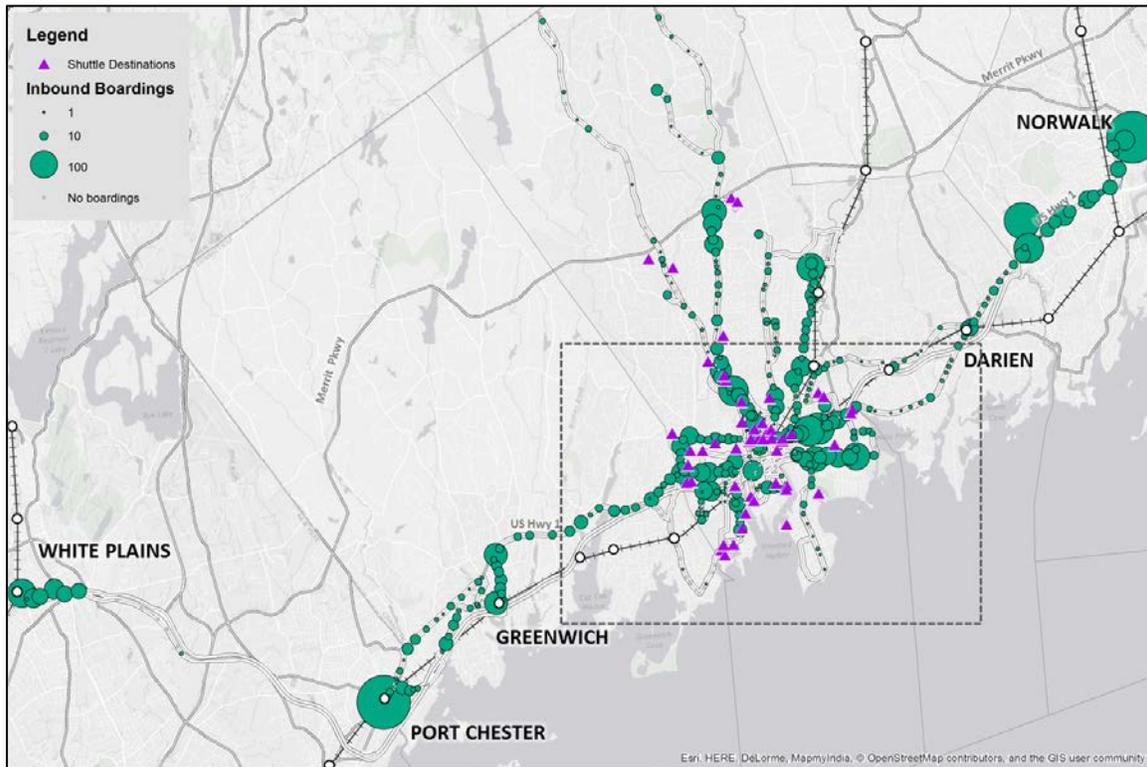


Figure 16 Outbound boardings in a Weekday – Transfers Excluded (Core)

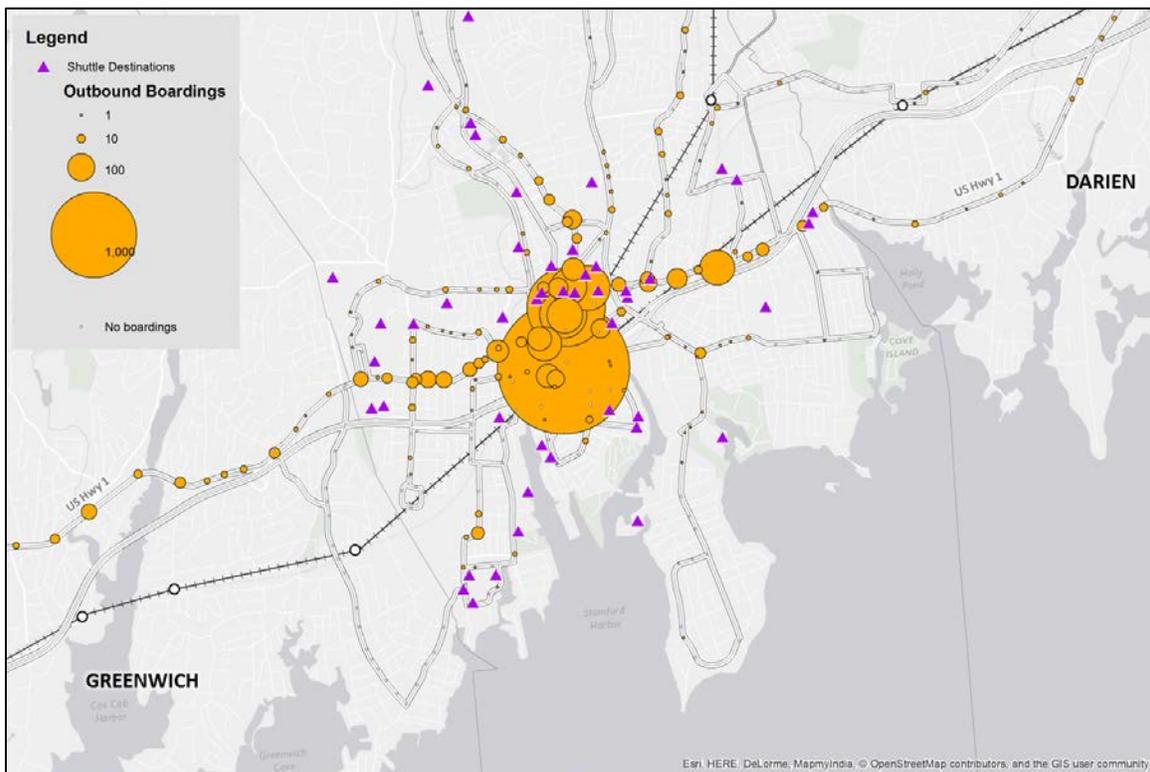
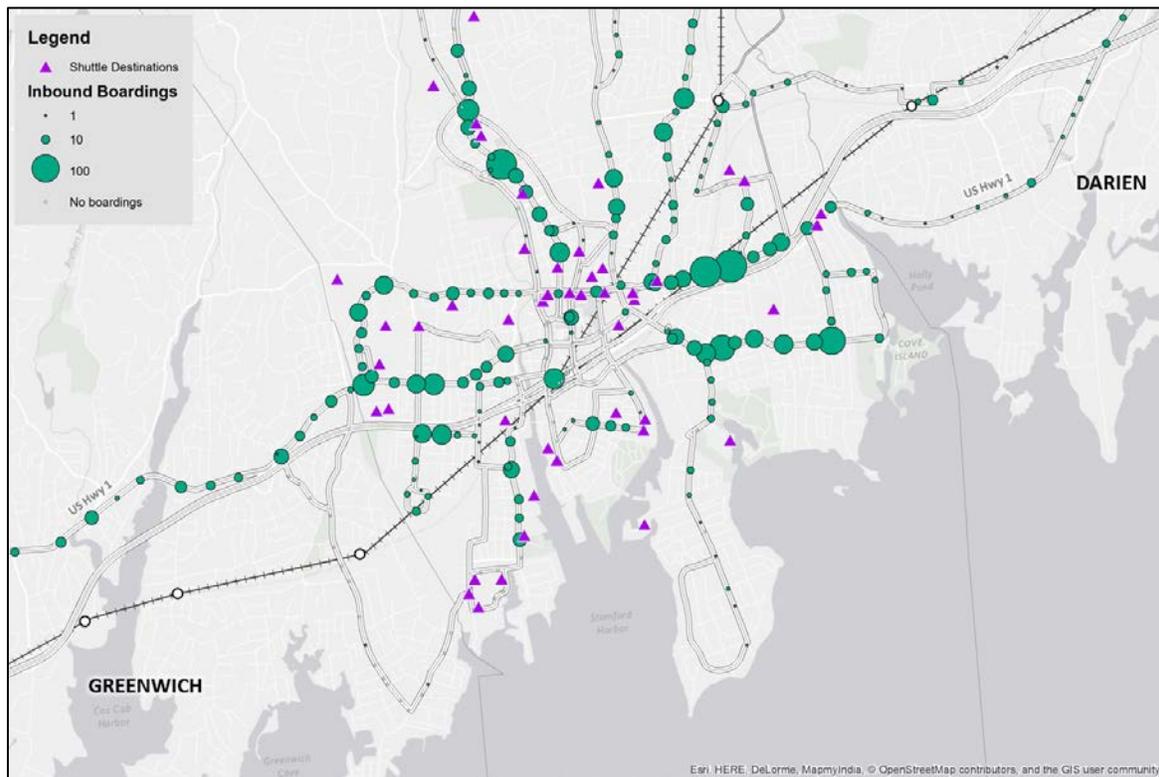


Figure 17 Inbound Boardings in a Weekday – Transfers Excluded (Core)



Private Shuttles

Many large employers in and around Stamford provide free private shuttle buses to transport employees between the STC and employment or residential sites. These shuttle buses are primarily used by those commuting into Stamford by train. The shuttles and their relationship to the CTtransit network have been subject to extensive analysis found in the Shuttle Study document.

Other Transit

Metro-North Railroad

Metro-North Railroad provides commuter rail service with the primary role of linking New York City with areas in the state of New York and in southern Connecticut. However, the services are also used by people commuting into various other major cities, including Stamford. Metro-North’s services within Connecticut are funded by the State of Connecticut.

The STC is served by the New Haven line (including the branch to New Canaan). Stamford has two-way all-day service and serves about 30,000 daily passengers. Travel times to New York City vary depending on stopping pattern, ranging from 49 to 68 minutes. About half of peak services run on a limited-stop pattern (with shorter travel times). Service between Stamford and New York City runs every 5 to 10 minutes in the peaks (with express services roughly every 15 minutes) and every 30 minutes in the off-peak periods. There is roughly half-hourly service between Stamford and New Haven (travel time 60 minutes) and hourly between Stamford and New Canaan (travel time 27 minutes).

Metro-North uses distance-based fares for its services, with no discount for CTtransit transit users paying a cash fare. However, CTtransit offers a discounted “UniTicket” monthly pass, valid on both the rail service and CTtransit’s local bus services.

Other Local Transit

CTtransit’s Stamford services provide connections to the Bee-Line System (in Westchester County, NY) via 311 PORT CHESTER. To the east, Route 341 NORWALK provide connections to the Norwalk Transit District at the WHEELS Hub on Burnell Boulevard. The latter also provides connections to regional COASTAL LINK (jointly operated by Norwalk Transit District, Greater Bridgeport Transit, and Milford Transit District) and ROUTE 7 LINK (operated by Norwalk Transit District).

Users of all these services can all transfer to CTtransit’s services for free. CTtransit users get a \$1.50 discount for the Bee-Line System’s services and free transfers to the other services. These transfer arrangements apply to both those paying a cash fare and those using passes.

EXISTING TRAVEL DEMAND PATTERNS

Data Sources

AirSage Travel Data

The study team obtained travel pattern data from AirSage, a company that uses device location information collected by cellphone companies. The data is analyzed using a zone system devised by the study team. The zone boundaries follow those of Census Block Groups, and most zones contain multiple Census Block Groups. This allows demographic data (and information from the Census) to be easily calculated at the zonal level. Figure 18 and Figure 19 show the main (internal) zone system. To facilitate analysis and discussion, the study team developed a set of standard names for the zones. In addition to the 20 zones shown in the maps, there are three ‘external’ non-geographic buffer zones, corresponding trips to and from the rest of Connecticut, New York City, and the rest of New York state. The AirSage dataset covers trips within and between internal zones and between an internal zone and an external zone.



The data were obtained from information gathered in October 2015. The data provided show the number of trips by origin and destination, split using the following groups:

- Day type: weekday, weekend
- Time of day:
 - AM Peak (6 a.m. – 10 a.m.)
 - Midday (10 a.m. – 3 p.m.)
 - PM Peak (3 p.m. – 7 p.m.)
 - All-day (24 hour)
- Trip purpose:
 - Home-based work: trips between place of residence and place of employment
 - Home-based other: trips between place of residence and locations other than place of employment
 - Non-home-based: trips involving place of residence
- Residence class:

- Inbound commuter: lives outside Stamford area, works inside Stamford area
- Resident worker: lives and works inside Stamford area
- Outbound commuter: lives inside Stamford area, works outside Stamford area
- Home worker: is in home location during working hours
- Short-term visitor: in Stamford area for less than two days
- Long-term visitor: in Stamford area for more than two days, but less than survey period

AirSage also provided Census-derived statistics covering gender, age, income, and household vehicle ownership for travelers by origin, destination, trip purpose, and residence class.

Figure 18 AirSage Zones (System)

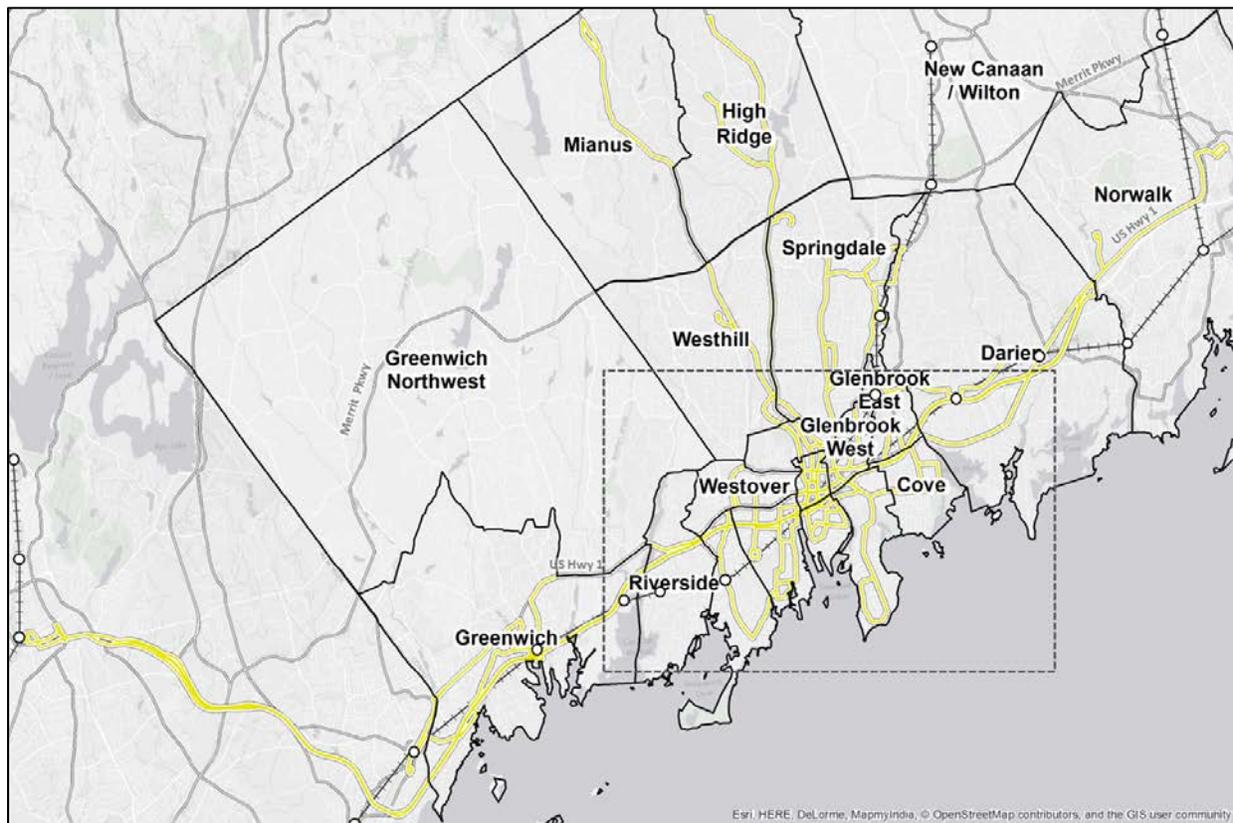
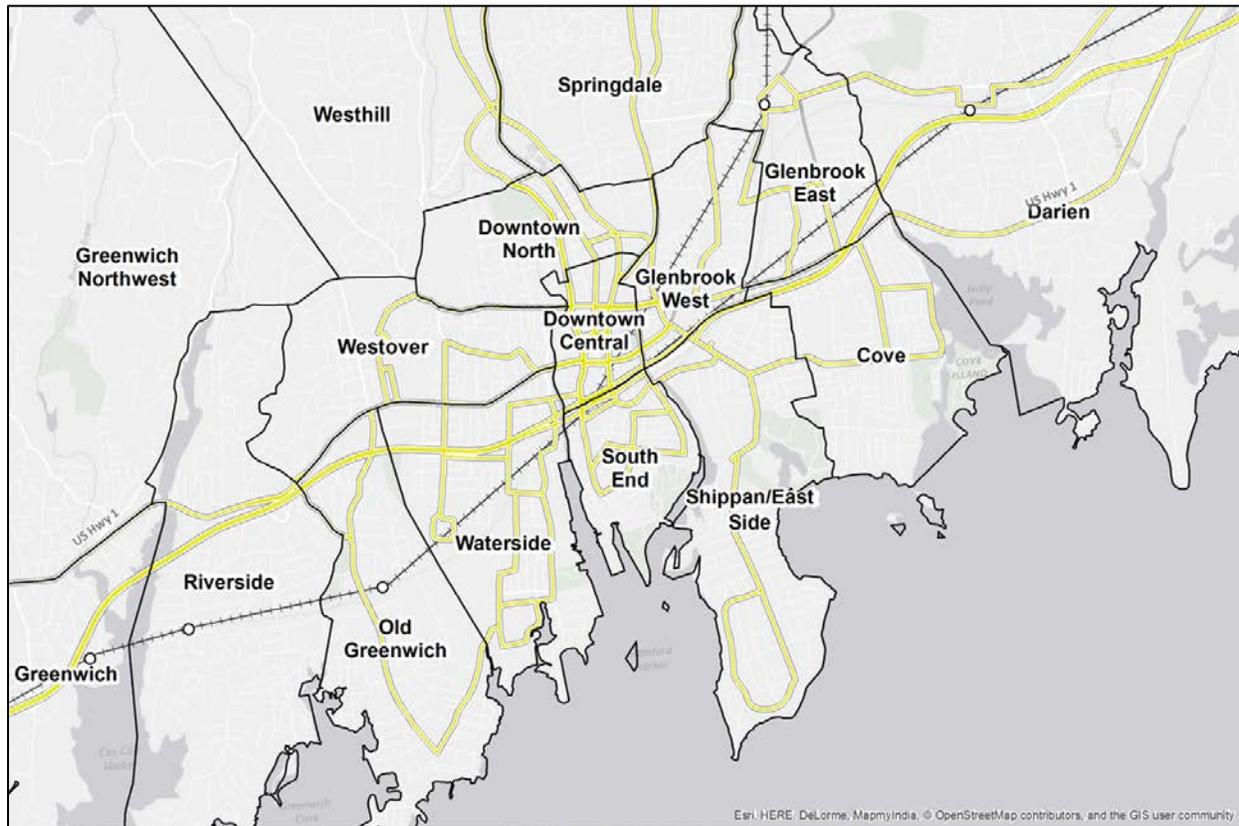


Figure 19 AirSage Zones (Core)



Transit Boarding Data

CTtransit conducts stop-level boarding and alighting counts. The weekday data are aggregated by time period (AM peak, midday, etc.). The aggregated data also include vehicle loads. Where routes are interlined, the vehicle load data can be used to calculate the number of people remaining on board when vehicles switch from one route to the next.

The stop-level boarding and alighting counts were run through a distribution process to calculate the origin-destination matrix at the stop level. This was then aggregated to produce a zone-level origin-destination matrix for each route.

Given the route network and schedules, it is assumed that almost all transfers between routes take place at the STC. Fieldwork was conducted to estimate the proportion of riders on vehicles arriving at the STC transferring to other routes (including through inter-lining). This allowed the individual route-level origin-destination matrices to be combined into a single network-wide origin-destination matrix.

Origins Distribution

Figure 20 shows the density of trip origins in the AM peak for commuters, with each dot representing 150 trips⁵. This is equivalent to the distribution of residents who work. The distribution is similar to the

⁵ The dots are randomly distributed within each zone; they do not represent exact locations.

population density distribution shown in Figure 1, implying there are no residential areas where employment rates are significantly higher or lower than the average for the area.

Figure 21 shows the density of origins for non-commute trips, which each dot representing 150 trips. These trips include trips for leisure, shopping, and education. Again, the distribution is similar to the population density distribution shown in Figure 1. This implies there are no areas generating non-commute trips at a rate significantly different from the area as a whole.

Taken together, the two figures imply that population density in the Stamford area is good predictor of trip generation. This is in line with typical trip characteristics in other urban areas. It also demonstrates how land use policy regarding residential densities and distribution has a major effect on travel patterns.

Comparing these two maps with the CTtransit network in Stamford shows that most trip origins are in areas served by transit. However, it also shows that some are in areas not served by transit, and this may represent an opportunity to expand the service area or consider other mobility options.

Figure 20 AM Work Trip Origins

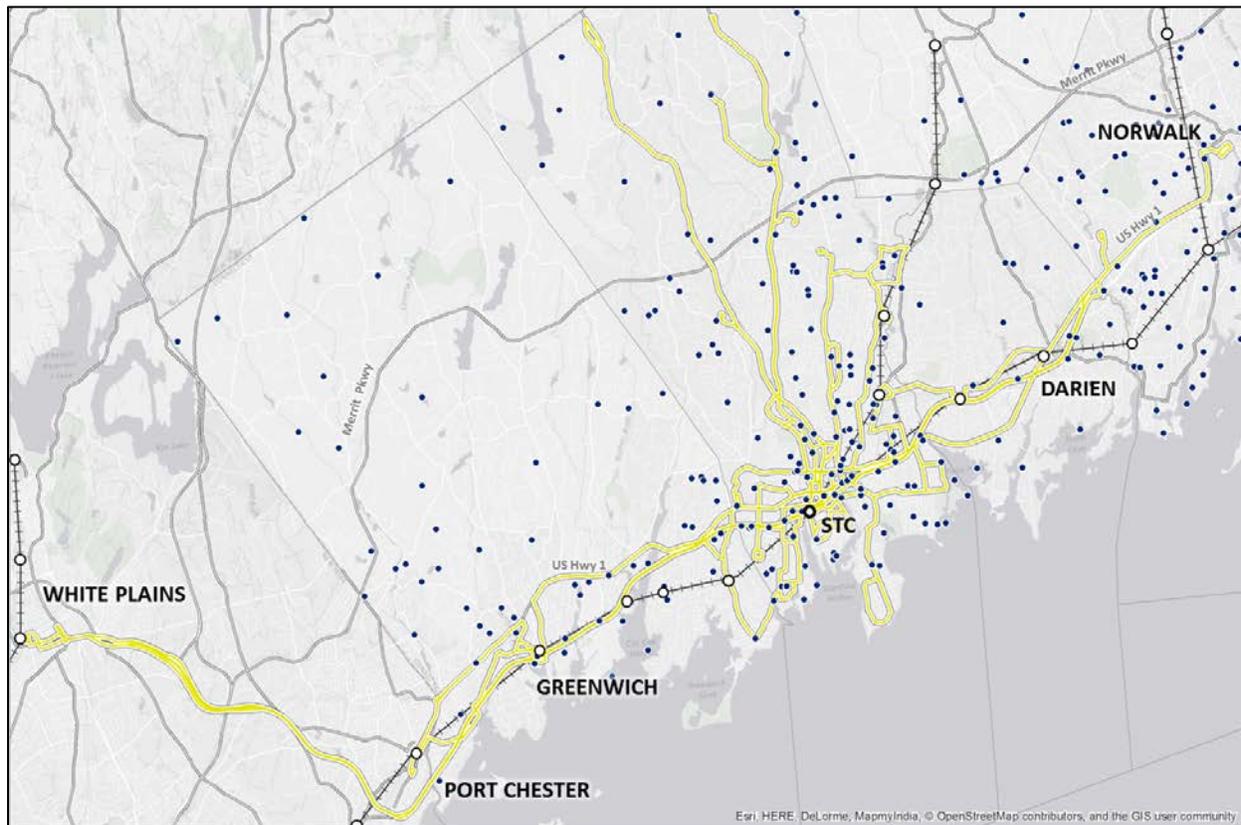
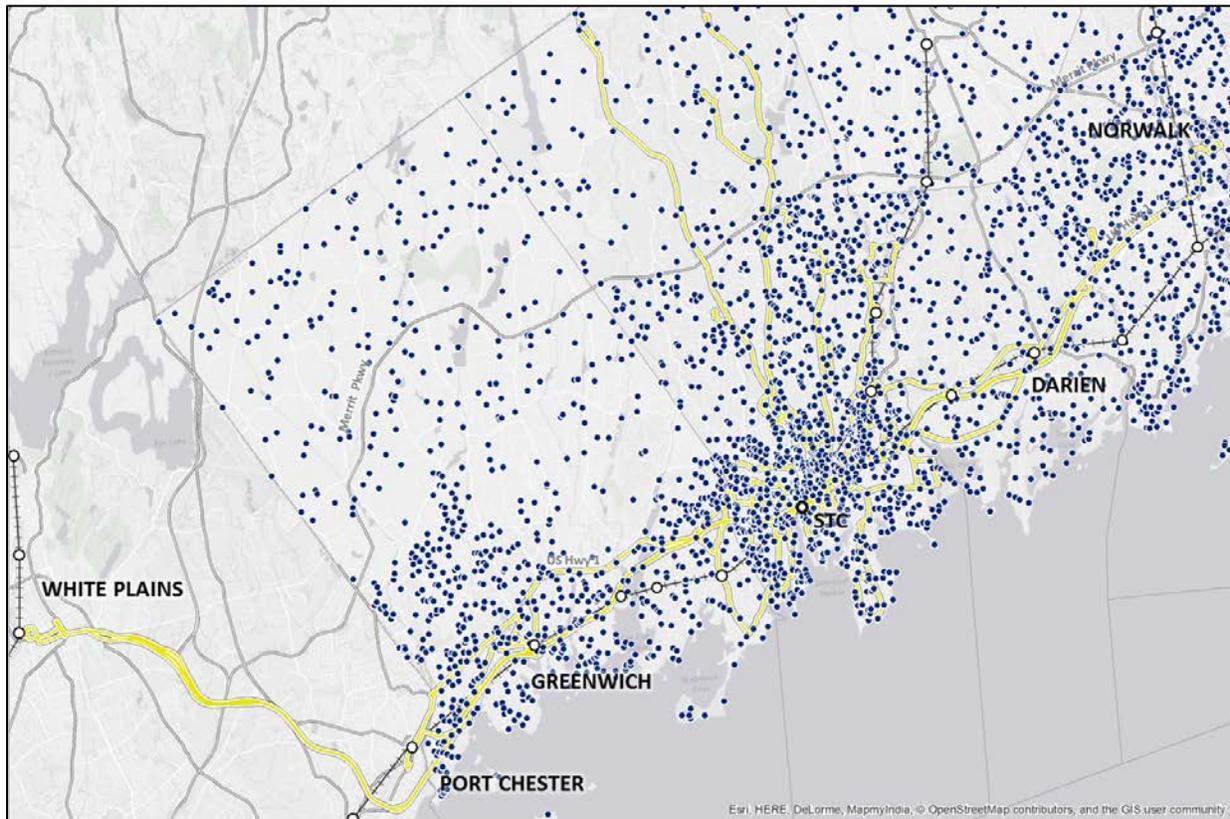


Figure 21 Non-commute Trip Origins



Destination Distribution

Figure 22 shows the density of trip destinations in the AM peak for commuters, with each dot representing 150 trips.

The distribution is similar to the employment density distribution shown in Figure 2, implying there are no employment areas where the proportion of part-time workers is significantly higher or lower than the average for the area.

The map shows that the main concentration of jobs is in the southern half of the City of Stamford. There are also some concentrations around the center of Greenwich, and in and around Norwalk.

Figure 23 shows the density of destinations for non-commute trips, with each dot representing 150 trips. These trips include trips for leisure, shopping, and education.

The map shows that non-commute destinations are more dispersed than workplaces. This is to be expected, as many commercial areas in the Stamford are along major road corridors, or scattered around the downtown area.

Figure 22 AM Work Trip Destinations

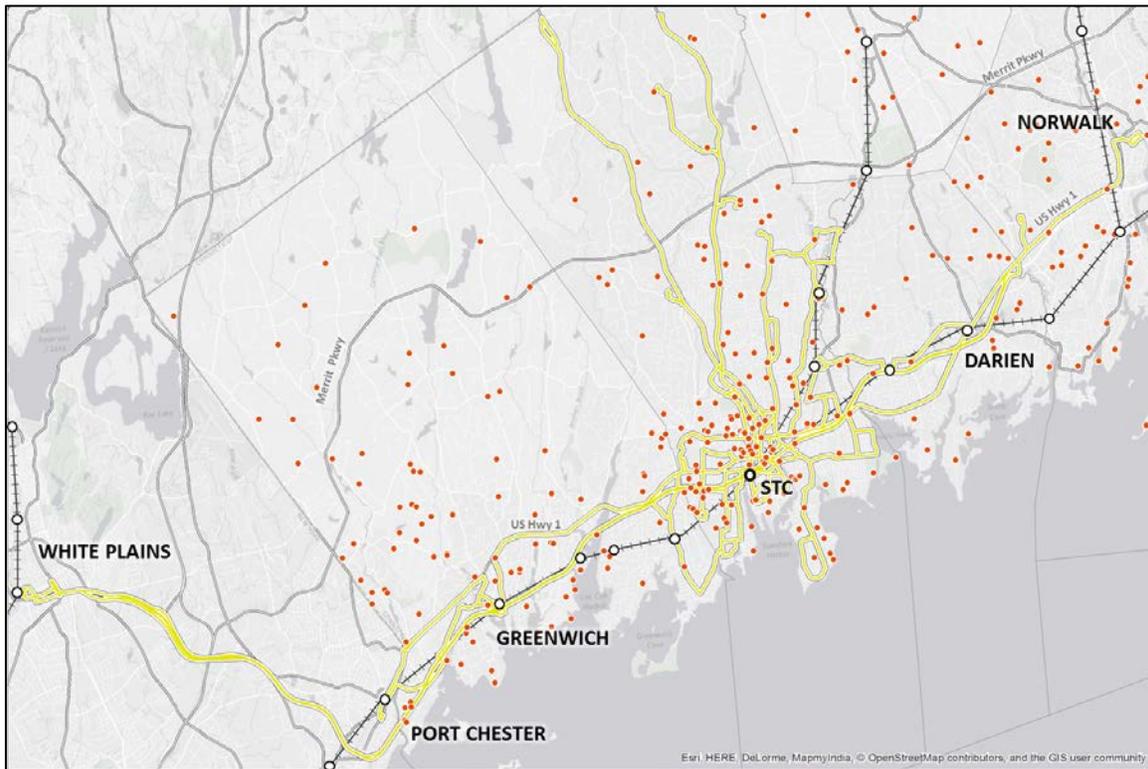


Figure 23 Non-commute Trip Destinations

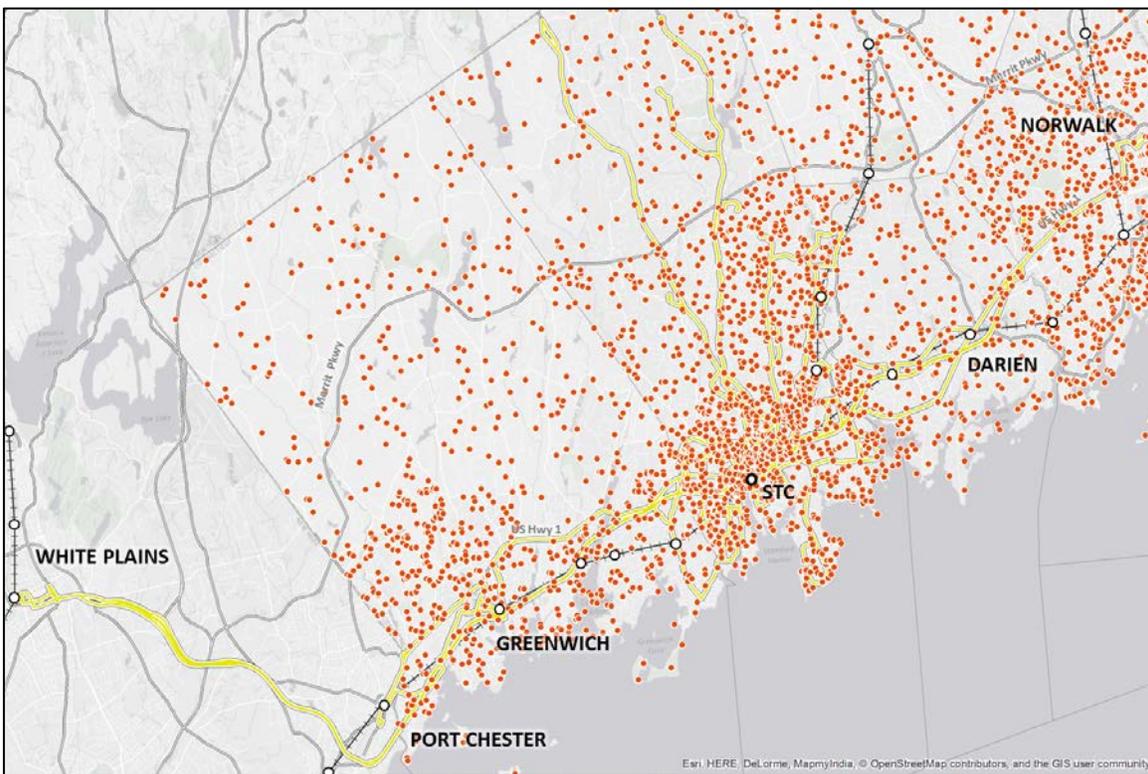


Table 3 Largest Two-way All-day Trip Flow Densities

Zone	Zone	Trips/sq mile	Total trips
Springdale	Downtown Central	649	3,568
Glenbrook East	Waterside	577	1,116
Springdale	Downtown North	560	3,279
Springdale	Glenbrook West	554	3,193
Greenwich	Waterside	526	5,324
Springdale	Waterside	525	3,336
Waterside	Cove	518	1,181
Springdale	Shippan/East Side	498	3,256
Greenwich	Westover	439	4,352
Glenbrook East	Westover	423	729

Table 3 shows the ten largest two-way all-day trips flows, are measured by trip density, along with the total number of trips.

Half of these flows involve Springdale (which is primarily residential), and four out of ten involve Waterside (which is primarily employment). Other zones crop up only once or twice. This implies that Springdale and Waterside are areas with a particularly strong need for good transit.

Most (eight out of ten) of the commute trips flows do not involve downtown zones. The existing transit network is highly focused on downtown. However, many of the flows require potential transit users to transfer downtown, and some of trips will have a very indirect path as a result. This suggests a need for east-west or north-south routes away from downtown core.

Table 4 shows the ten largest AM peak commuting trips flows, are measured by trip density, along with the total number of trips.

Like the all-day flows, half of these flows involve Springdale and four out of ten involve Waterside. Other zones crop up only once or twice. Most (seven out of ten) commute trips flows do not involve downtown zones. Again, this supports need for east-west or north-south routes away from downtown core.

Most private shuttle services are orientated towards employees arriving in Stamford by train, although some residential developments offer shuttle connections to the STC and/or downtown. This means that local residents working in and around Stamford still need effective transit options for their commutes.

Table 4 Largest Two-way AM Peak Commute Trip Flow Densities

Zone	Zone	Trips/sq mile	Total trips
Westover	Glenbrook East	88	152
Glenbrook East	Waterside	85	165
Springdale	Waterside	73	467
Springdale	Downtown Central	64	352
Glenbrook West	Waterside	64	112
Springdale	Downtown North	62	362
Springdale	Glenbrook West	61	352
Waterside	Cove	60	137
Norwalk	Downtown Central	54	885
Springdale	Cove	50	317

GAPS AND OPPORTUNITIES

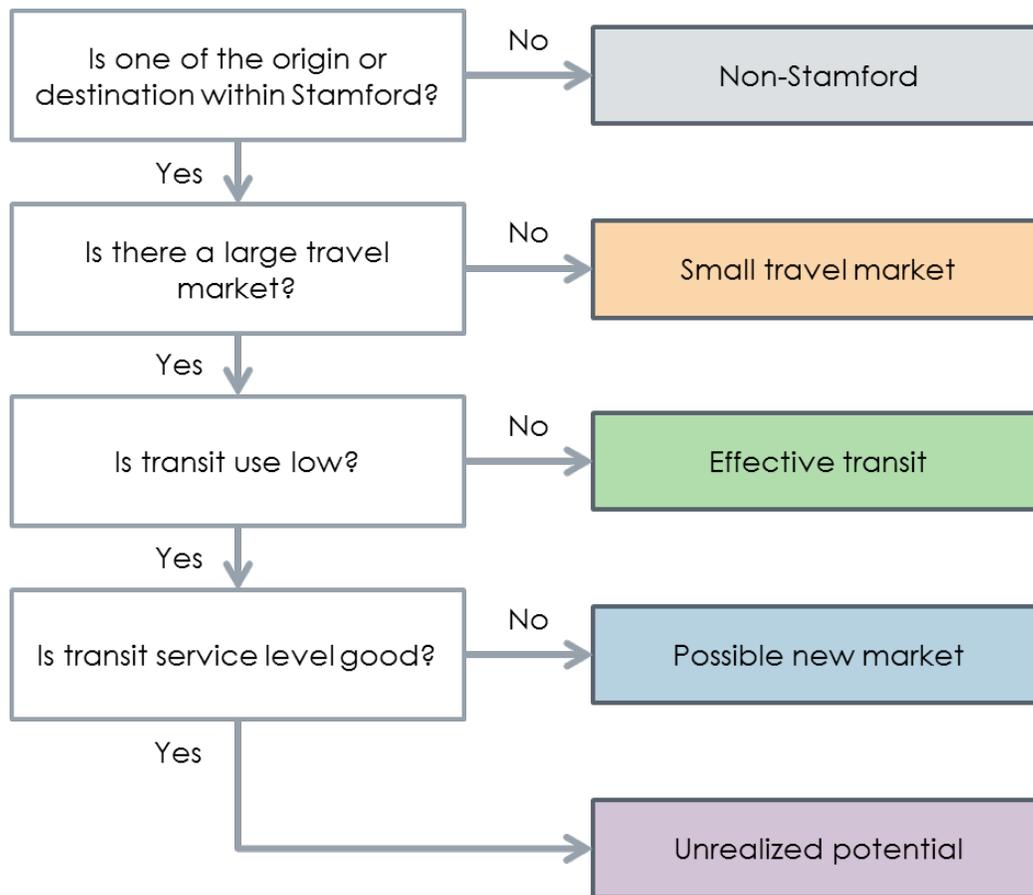
Market Segments

The opportunities for improvements to the transit network depend on overall travel patterns, existing transit use, and the quality of the existing transit. Consequently, all the origin-destination pairs were divided into one of five classes, using the classification process illustrated in Figure 24.

The size of the travel market and use of transit is based on trip density (trips per square mile); transit use is based on the ridership data provided CTtransit.

For the first two market segment classes, alterations to the transit network are not warranted. The congruency analysis will focus on building current successes (effective transit), or where changes may be needed (possible new market, unrealized potential).

Figure 24 Market Segment Classification



Congruency Analysis

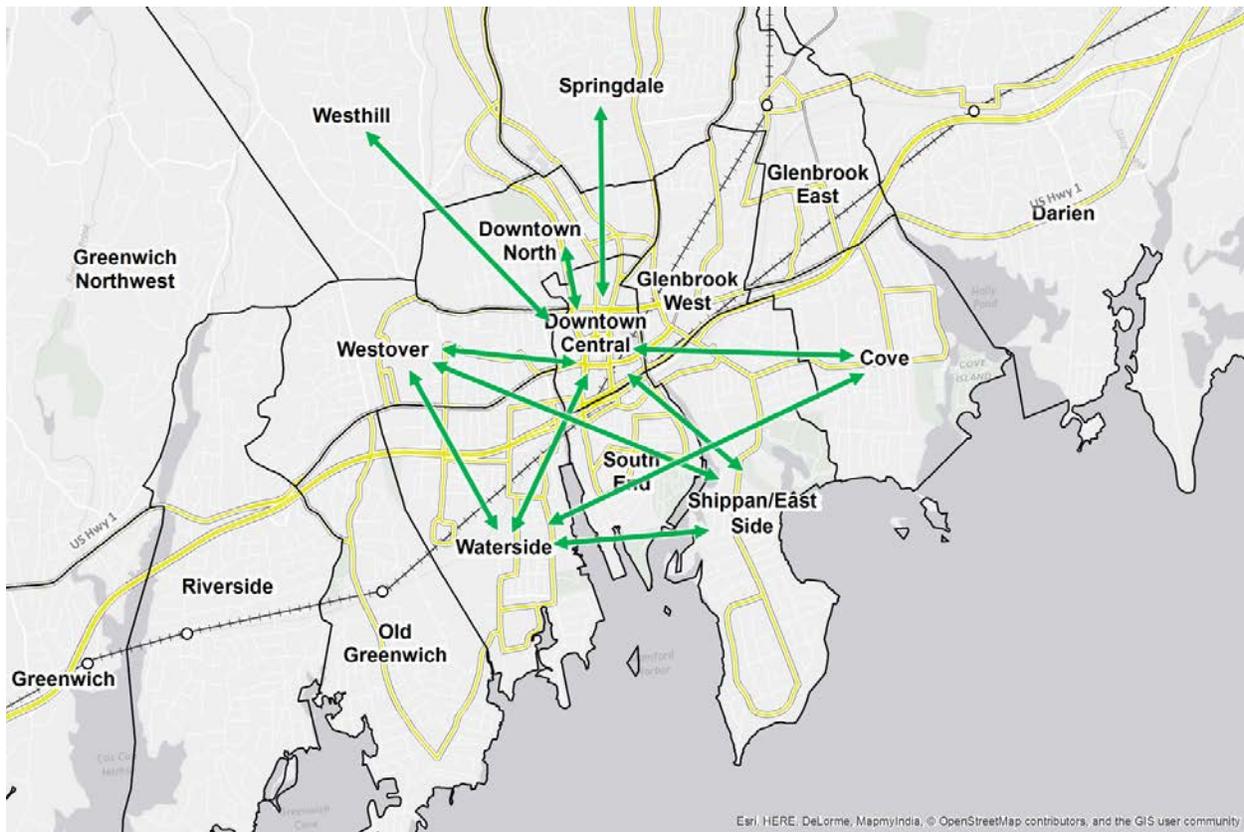
Effective Transit

Figure 25 shows the major origin-destination pairs falling into “effective transit” class. This class covers origin-destination pairs with a significant number of trips and high transit usage.

The map shows that the highest rates of transit ridership are observed between Stamford downtown and zones that are either adjacent or close to the downtown area. Routes serving these areas would be prime targets for service level increases to build on the existing success.

However, many of the routes serving these zones (particularly 331 HIGH RIDGE, 333 NEWFIELD, 334 HOPE ST, and 335-336 WASHINGTON / LONG RIDGE) extend significantly beyond these zones. This suggests that the inner portions of these routes have greater potential than the outer portions. Consequently, these routes could have higher service levels on their inner segments than on their outer segments.

Figure 25 Markets with Effective Transit



Possible New Markets

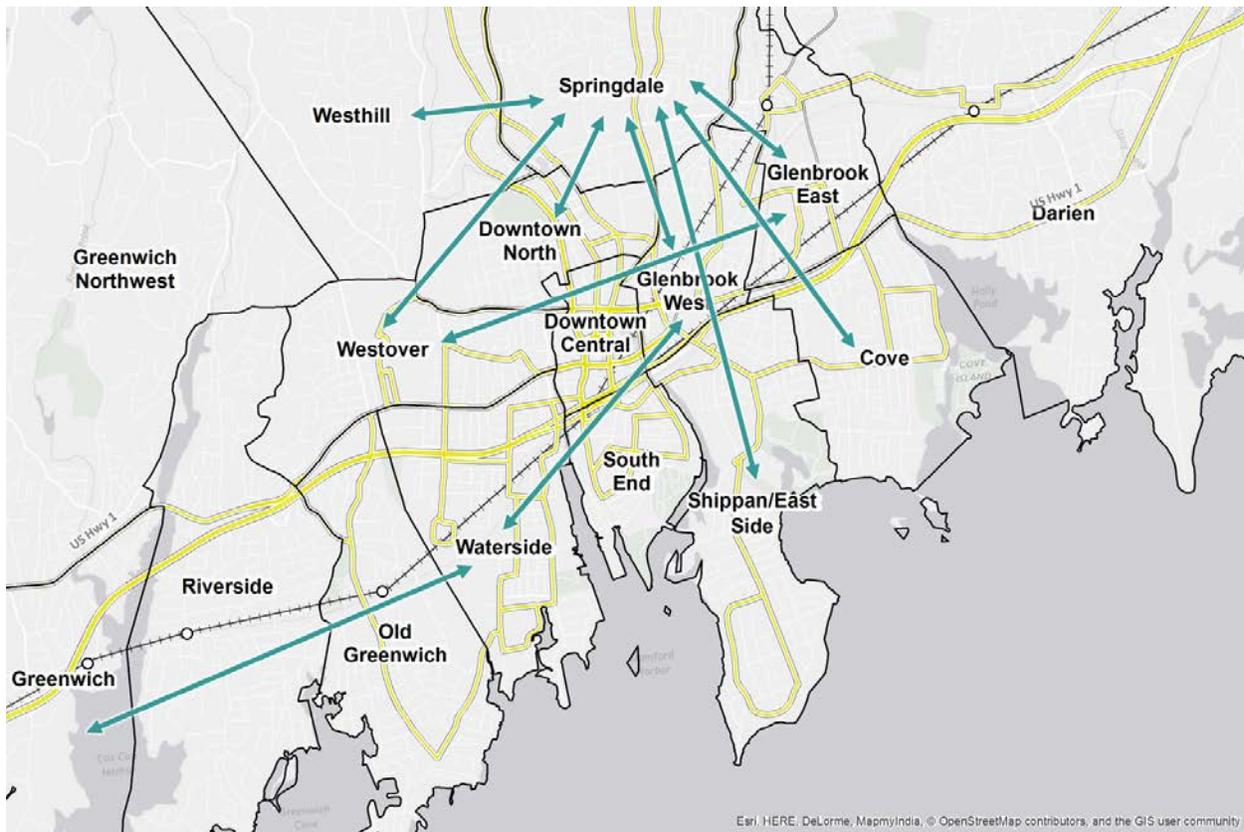
Figure 26 shows the major origin-destination pairs falling into “possible new market” class. This class covers origin-destination pairs with a significant number of trips, but low transit usage and service levels. The flows depicted on the map are the largest in their class (in terms of trips per square mile), and together represent about a third of trips in this class.

The flows shown here are where new transit service would probably have to be introduced to serve these major trip flows. Many of the flows involve Springdale (zone 10). Although Springdale does have transit service, much of the zone has long walk distance to the nearest route. Further, travel between Springdale and the other zones by transit requires a highly indirect path via the STC, making transit service for these flows poor. This suggests a need for north-south routes running east of the downtown areas, as well as for east-west routes running north of the downtown areas.

The other flows shown on the map face a similar problem, with transit travel requiring a highly indirect path via the STC. This suggests a need for east-west routes running north of the downtown, or connections between the ends of routes to the west.

Connections between these potential new routes and other routes would be where they intersect, rather than at a transit hub. This may require enhancements to the pedestrian environment and stop facilities.

Figure 26 Possible New Markets



Unrealized Potential

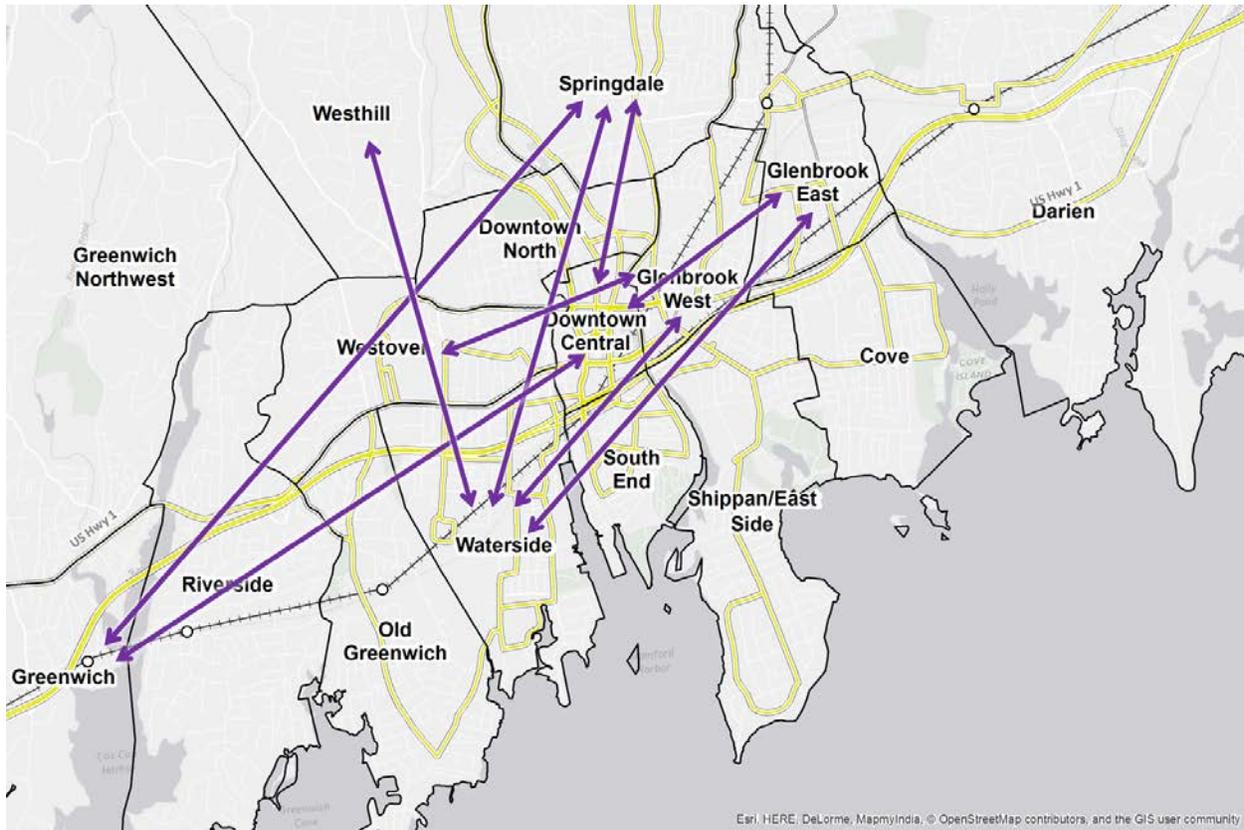
Figure 27 shows the major origin-destination pairs falling into “unrealized potential” class. This class covers origin-destination pairs with a significant number of trips and good transit service but low transit usage. The flows depicted on the map are the largest in their class (in terms of trips per square mile), and together represent about a third of trips in this class.

The flows shown indicate markets where transit is under-performing, given current service levels and overall travel demand levels. The private shuttle services link various employees with the STC. However, these shuttles are unlikely to be reducing transit demand for flows that do not include the downtown core.

Many of the flows involve Waterside (zone 17). Using transit for these flows generally requires transferring at the STC. However, this need to transfer does not result in a particularly indirect route, as a direct route would likely pass through downtown too.

It is unlikely that the need to transfer at STC is the most significant issue here because coordinated schedules and layout of the STC make for very easy transfers. A more likely explanation is that the route serving Waterside (324 FAIRFIELD) is not as effective at providing good service as the initial assessment suggests. Within Waterside, the inbound route operates on different streets to the outbound route. This increases average walk times and is also confusing for potential new customers. This suggests that specific revisions to this route are needed.

Figure 27 Markets with Unrealized Potential



Many of the other flows involve the downtown central (zone 13). Many of CTtransit’s routes pass through this area, resulting in a good transit service. However, there are multiple roads with high traffic volumes in this area. This makes the walk environment less pleasant, which then becomes a significant deterrent to transit use. This suggests that greater transit use in the downtown requires improvements to the pedestrian realm.

Springdale

Springdale (zone 10) appears repeatedly in both sets of flows. This is primarily a residential area, with a high proportion working within Stamford. Consequently, potential service changes should focus on the area as whole, not just the individual flows involving the area.

Service Gaps

Changes to Service Levels

Heavily used long-haul routes such as the 311 PORT CHESTER and 341 NORWALK, providing reasonably frequent transit service for riders throughout the day, are good candidates for increased service. However, they also have more than 60 stops each. These well-used routes may attract more riders along their nine-mile stretch with either limited stop, express overlay service, or potential stop consolidation on the US Route 1 corridor. BRT-like service enhancements on this corridor, including limited stop service overlays, stations and amenities, and transit priority elements, are currently the

subject of the concurrent Route 1 BRT Feasibility Study. The results from this study provide additional evidence of the suitability of this corridor for such enhancements.

Similarly, the more popular southern sections of the medium-haul routes like the 331 High Ridge, and 335-336 Washington / Long Ridge may share the same opportunity. The two routes perform very differently north and south of Merritt Parkway, largely in response to different land use patterns.

Revising service on more lightly travelled routes, such as the 321 WEST AVE, and 326-327 PACIFIC / SHIPPAN or route segments, such as the northern portions of the 331 HIGH RIDGE and 335-336 WASHINGTON / LONG RIDGE, may lead to more creative and useful solutions for those residents.

Solutions could include route changes or options that are no longer fixed route service. Park-and-rides, rideshare drop-off points, or carpool and vanpool designated parking could encourage multimodal travel. Also, savings in operations here could be reinvested into the system elsewhere to provide more frequent, effective, and efficient services to where people make the most trips, making the whole system more useful and attractive for riders. Park-and-rides and rideshare drop-off points could facilitate expanding CTtransit's service coverage area without diluting current service levels to reach new areas. Such changes to parking policy fall outside of CTtransit's direct control and hence will require CTtransit to work in partnership with Stamford and other municipalities.

Stop Consolidation

The average stop spacing on most routes is low, with around half of routes averaging less than 750 feet between stops. Wider stop spacing (and fewer stops) increases average vehicle speed. This potentially reduces transit users (overall) journey time, even if they have a longer walk to their stop. Higher vehicle speeds can also reduce annual operating costs.

Decisions about stop removal would require detailed analysis, considering the effects on walking distances and the general pedestrian environment. This could be conducted as part of wider COA, or as part of a dedicated study

New Service Areas

Another opportunity is to look at better serving employment areas that either do not have private shuttle service from the STC or are being accessed by local resident workers who do not necessarily need to travel to STC. Private shuttle service is also provided only during peak hours and captive commuters who arrive by train may benefit from service during other hours as well, allowing CTtransit to capture this market and provide targeted transit service.

Changes to Route Network

CTtransit provides several options for north-south travel throughout Stamford, connecting mostly at the STC. However, east-west transit options are limited and create barriers for trips that do not go downtown. Radial routes spread outward and do not connect. An opportunity exists to improve these trips and capture travel demand by connecting routes. For example, the east end of route 343 COVE RD could be extended to connect with routes 341 NORWALK or 344 GLENBROOK would provide better connections and east-west options throughout the service area.

Wider Infrastructure

Along with opportunities to address the network, investments in infrastructure including bus lanes on heavily traversed corridors will greatly reduce congestion and overall waiting times, improve reliability and enhance the rider experience for both CTtransit and the private shuttles.

Field observations by study team members indicate a lack of sidewalks along many of the major roads used by transit routes, especially north of the downtown area. As all transit users are also pedestrians, gaps in infrastructure are a significant impediment to transit use. Further, the number of travel flows with unrealized potential involving downtown zones suggests that greater transit use in the downtown requires improvements to the pedestrian realm.

CONCLUSION

Key Findings

- The radial local transit network (centered on the STC) results in overlapping route coverage in downtown Stamford, with few transfers happen between route sections out of downtown.
- Coverage of urban areas is generally good; any further route extension would likely serve a low-density area.
- There are multiple routes where higher service levels could be warranted. These include the two routes serving the US Route 1 corridor, which is the subject of a separate study.
- Route 351 STAMFORD CONNECTOR has very low ridership, and hence significant changes are warranted. The proposal from Shuttle Study document for a free, frequent midday shuttle would fulfill that.
- Routes 331 HIGH RIDGE and 335-336 WASHINGTON / LONG RIDGE perform significantly better south of the Merritt Parkway than to the north. The northern parts may be better provided by alternative means.
- Boardings on inbound services are generally evenly dispersed, while boardings on outbound services are mainly concentrated in downtown Stamford and along US Route 1.
- CTtransit's services provide good connections with the regional rail network and local transit in adjacent areas; integrated fares or free transfers are generally available.
- Population density in the Stamford area is good predictor of trip generation, and most trip origins are in areas served by transit. This demonstrates how land use policy regarding residential densities and distribution has a major effect on travel patterns and transit use.
- Employment in the service area is concentrated in several areas, but other trip attractors (such as commercial areas) are dispersed across the city.
- The Springdale and Waterside are areas with a particularly strong need for better transit.
- The Springdale area is part of many of the key trip flows with unrealized potential or for possible new markets. This is primarily a residential area with a high proportion working within Stamford. Consequently, potential service changes should focus on the area as whole, not just the individual flows involving the area.
- There several potential service gaps and changes that would address the various issues identified in this report.

URBAN TRANSIT STUDY

CHAPTER TWO

Transportation Service Options





INTRODUCTION

About the Study

The Stamford Bus and Shuttle Study will provide a comprehensive evaluation of current bus transit and shuttle operations in the city of Stamford, focusing on the Stamford Transportation Center (STC). The technical scope of services is organized in a phased approach, with Phase A focusing on the private shuttle issues and opportunities in Stamford and Phase B evaluating the broader urban transit opportunities in Stamford.

Phase A provided a detailed investigation of public and private shuttles serving the Stamford Transportation Center (STC), assessing the effects of the shuttle services on network operations and traffic circulation in and around the STC and providing governance and operating scenarios for efficient, coordinated delivery of transit service at the STC for employers and commuters.

Following the initial focus on private shuttles and the potential for improvements to the current shuttle operations, Phase B develops strategies to enhance additional components of the urban transit and transportation network including CTtransit services, roadway operations in the vicinity of the STC and along bus routes, last-mile connectivity improvements, and non-motorized access to, from and through the STC hub.

About This Document

As part of Phase B, an Existing Conditions report was produced, providing an overview of the local transit network in and around Stamford. The primary focus was the City of Stamford, but much of the analysis covered the wider area served by CTtransit's Stamford Division. The analysis identified various gaps and opportunities for CTtransit in the Stamford area.

This report presents a long-list of options for addressing those gaps and opportunities, along with some additional options required by the project's scope of work. The options are as follows:

- 1) New service areas
- 2) Service level increases
- 3) Express services
- 4) Premium bus service
- 5) Transit priority measures
- 6) Changes to route network
- 7) Alternative service methods
- 8) Stop consolidation
- 9) Pedestrian environment

The options here are presented at the strategic level, along with case studies of successful implementation of similar options elsewhere will be used to provide illustrative examples of the options, where appropriate. There is also high-level financial analysis of the costs.

Many of the potential service improvements relate to the US Route 1 corridor. Enhanced transit service on this corridor is currently the subject of a separate study (Route 1 BRT Feasibility Study). Consequently, this document will highlight where this corridor could benefit from various changes, but this will not examine those changes in detail.



Methodology

Many of the options under consideration have some effect on operating costs and/or ridership (and hence revenue). Figure 1 lists the main parameters used in these analyses.

The results of changes to frequency or travel time on ridership were calculated using standard elasticity techniques using the elasticity parameters shown in the table. Changes in route length were converted to changes in run-time (and hence daily operating hours) and used the average speed for CTtransit's Stamford Division in the National Transit Database (NTD). This average speed includes recovery/layover time.

Ridership was converted to revenue using the average revenue per ride; it was assumed that changes to services would not result in significant changes to the distribution of user types (adults, seniors, etc.) or fare types (cash, pass, etc.). All daily figures were converted to annual ones using the ratio of weekday to annual rides derived from the NTD.

The vehicle capital cost was based on figures provided by CTtransit for their new buses.

Figure 1 Assessment Assumptions

Parameter	Quantity	Units	Source
Average speed	10.9	mph	NTD (2014) [Includes recovery]
Revenue/ride	1.23	\$/trip	CTtransit
Operating costs	72.72	\$/hour	CTtransit
Vehicle capital cost	430,000	\$/vehicle	CTtransit
Annualization factor	301.3	Weekday:year	NTD (2014)
Frequency elasticity	0.5	N/A	Victoria Transport Policy Institute
Travel time elasticity	-0.9	N/A	Standard

Any estimates of ridership and revenue reflect mature conditions. New or improved services generally take a period of time to reach their full ridership, increasing the potential subsidy in the early years. (Ridership ramps up more quickly than for brand new routes than for improved services.) CTtransit may also need to invest in marketing or transportation demand management programs to support new services.

It should also be noted that the increase in service will require hiring more drivers, a process that takes more than four months and increases costs for CTtransit. Moreover, many of the options may require additional buses. The existing operations and maintenance facility is at capacity. Any additional storage space is not factored into the costs.

OPTIONS DISCUSSION

1) New Service Areas

Description

Exploring opportunities to serve areas with high potential that are currently not served by CTtransit, underserved, or served on a limited basis by employer shuttles.



Rationale

Land use, travel patterns and transportation options in Stamford and surrounding areas have evolved and need to be considered alongside the existing transit network. Adjusting the network to serve new areas with ridership potential can increase revenue and contribute to a more sustainable transportation network.

Benefits, Disbenefits, Costs

Expanding into new service areas provides the opportunity to capture new markets and improve ridership, and to add more transportation options to growing areas and the residents of Stamford. There are no significant disbenefits of serving new areas, unless it diverts money away from other improvements that would yield greater benefits.

Potential Stamford Application

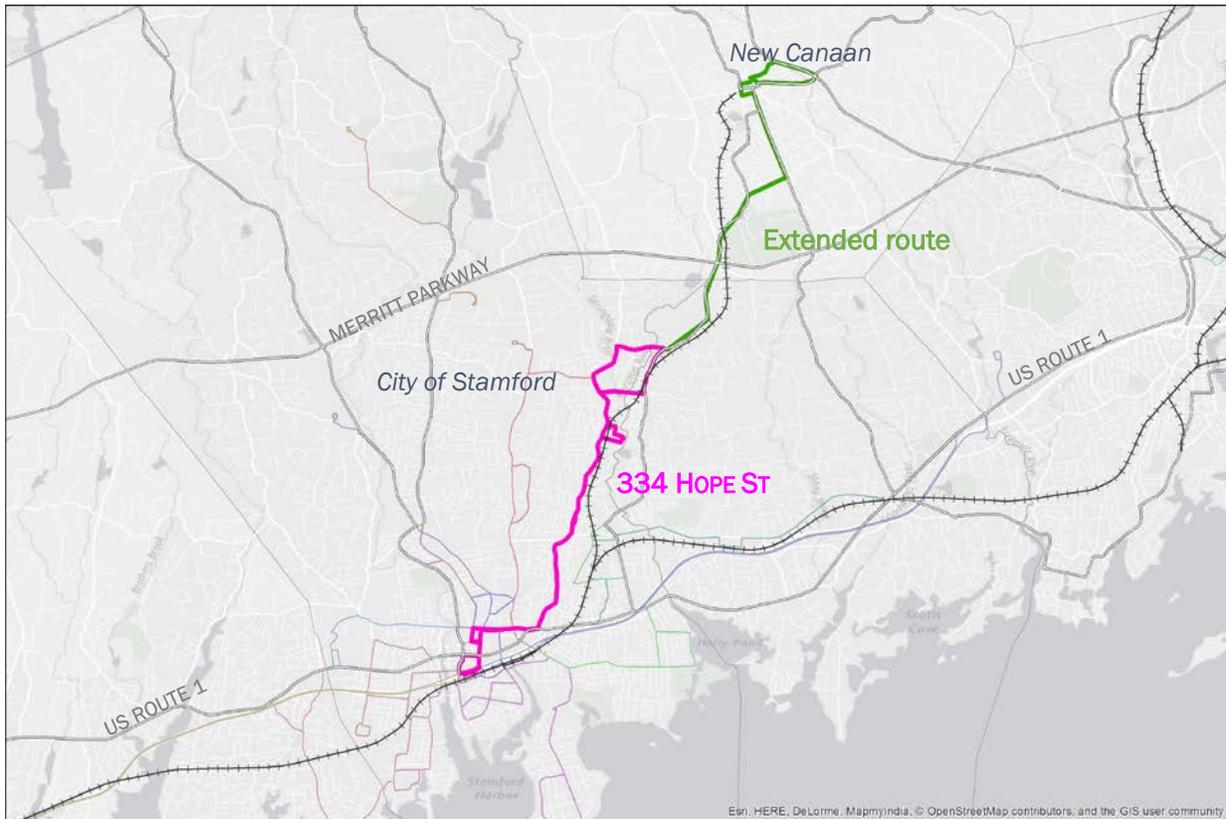
Most existing CTtransit services focus on providing direct links from Stamford Transit Center to various employment and destinations throughout Stamford. Improving internal circulation for Stamford area residents, especially with improved east-west options north of the downtown, and particularly north of Merritt Parkway, will contribute to a more useful and convenient network.

Serving areas such as New Canaan, which currently has no bus service, would be an opportunity to grow ridership. The Existing Conditions report's congruency analysis also revealed strong travel demand in the north-south direction to the east of downtown Stamford, particularly in the Springdale neighborhood. Extending any new north-south transit service to New Canaan is another possible way to capture new ridership.

In expanding service into new areas, ridership potential can be gauged using information from the existing network, the land use makeup in the new service areas, and overall travel demand in those areas. In the southwest Waterside Neighborhood area, new density and a mix of uses with limited transit options may be a good candidate to pilot new service options.

Service to New Canaan was analysed in more detail, using the routing shown in Figure 2. Extending route 334 HOPE ST to New Canaan would increase its (two-way) length from 9.6 to 18.5 miles. This is a 93% increase in route length, and hence the operating costs would be expected to also increase by a similar amount. Using US Census data, it was estimated that the population served by this route would increase 26%, and hence the ridership and revenue would increase by the same proportion. This would take (weekday) ridership from 807 rides/day to 1020 rides/day. Allowing for the additional revenue, the net operating costs would increase from \$470,000/year to about \$850,000/year – an increase of \$370,000/year to gain just over 200 daily riders. As a result, it is likely that focusing on the existing service area is likely to yield greater ridership gains for given investment.

Figure 2 **New Canaan Example Service**



2) Service Levels Increases

Description

Increase service frequency and service span, to accommodate existing high demand on certain routes, and to encourage additional ridership.

Rationale

Routes with high ridership are the best target for service increases, since this would provide a more effective transit service for more riders throughout the day. It will also improve the functionality of high-performing routes. Service increase can potentially be provided only to portions of routes, focusing on the higher demand sections.

Benefits, Disbenefits, Costs

Increases in service levels through higher frequencies generally result in higher ridership and revenues for the transit agency. Providing service to the high demand route sections and stops (without necessarily increasing service on the low demand sections) will maximize the benefit-cost ratio. There are no significant disbenefits to increased service levels, assuming any vehicle capacity issues around the STC can be resolved.



Potential Stamford Application

Potential routes

As shown in Chapter One, the south segments of 331 HIGH RIDGE and 335-336 WASHINGTON / LONG RIDGE (south of the Merritt Parkway to STC) perform considerably better than the northern segment in both inbound and outbound directions. This suggests that different service levels or service delivery methods could be appropriate for the northern and southern segments, during different time periods.

For example, service levels south of Merritt Parkway should increase along 331 HIGH RIDGE for both inbound and outbound trips during the mid-day (8:30am-2:30pm, with 5.9 and 10.5 boardings per revenue hour, respectively), as well as for inbound trips during the PM Peak (2:30pm-5:30pm, with 5.26 boardings per revenue hour). For both inbound and outbound trips, certain service routes could just cover the section between Stamford Transportation Center (STC) and the intersection of High Ridge Rd. and Buxton Farm Rd.

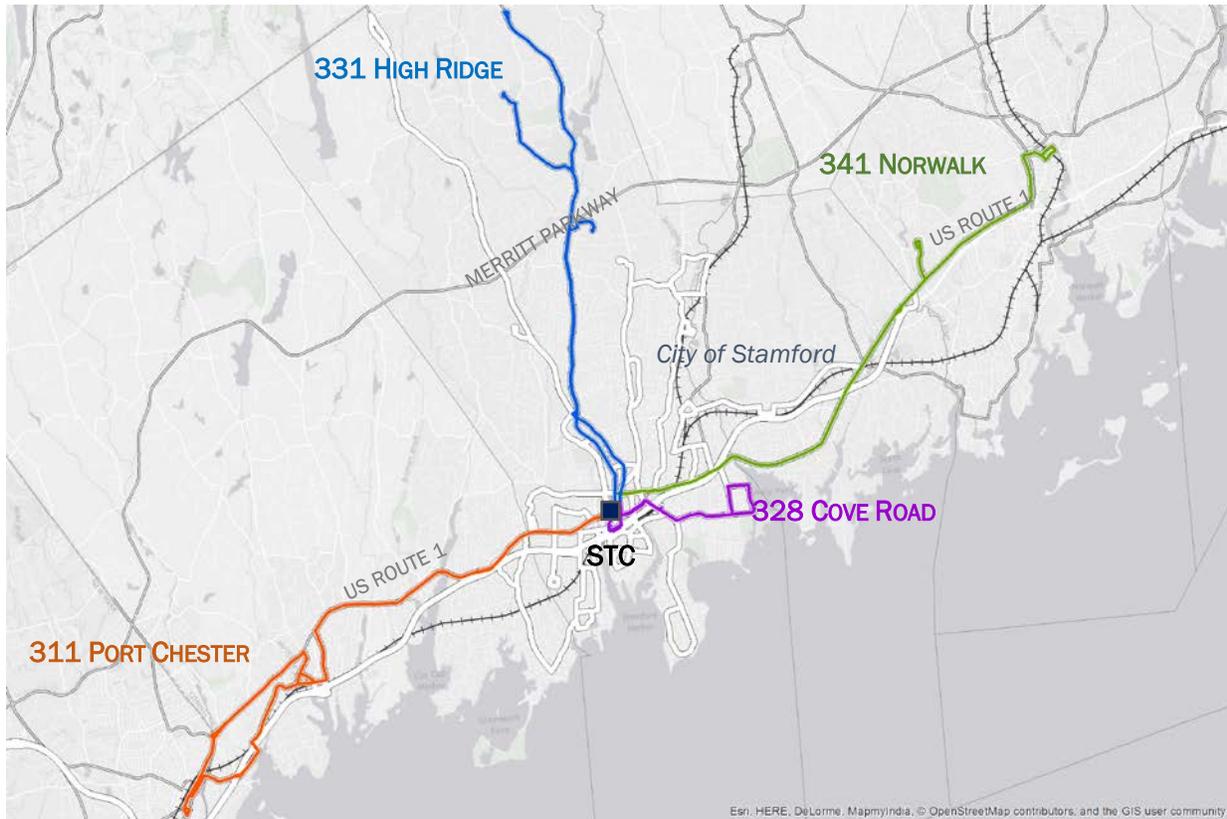
Although the north and south sections of 335-336 WASHINGTON / LONG RIDGE behave differently, the number of boardings per revenue hour suggests that no service increase might be required on the south section, but a decrease of service in the north section instead.

In addition to the above, some routes that could be considered for increasing service levels are 341 NORWALK and 328 COVE RD. Both of these routes average more than 20 boardings/hour on a weekday, and the latter averages about 25 boardings/hour in the PM peak period. Further, 311 PORT CHESTER forms part of the US Route 1 corridor (which is subject to a separate study), and hence should also be considered for frequency increases.

Example analysis

A more detailed analysis was conducted of service increases on the four routes shown in Figure 3. (The increase in 331 HIGH RIDGE covers the portion south of the Merritt Parkway only; the portion to the north has its service level reduced to better match service level with demand.)

Figure 3 Routes Used for Example Service Level Increases.



The analysis covered an increase of service of an extra bus per hour. This took routes from typical headways of 20 minutes in peak periods and 30 minutes in off-peak periods to 15 and 20 minutes, respectively. These higher peak frequencies minimize the need to consult a schedule – known as “turn-up-and-go” service.

The change in frequencies increased the number of service hours, priced at \$72/hour (based on information supplied by CTtransit). This increased the cost of these routes by 27%, or \$1.17m per year.

Changing off-peak headways from 30 to 20 minutes was estimated to increase (off-peak) ridership by 25%; changing peak headways from 20 to 15 minutes was estimated to increase (peak) ridership by 17%.

The combined effect of the various service levels changes was to increase ridership by 20.7%, providing an extra 499,000 riders/year. The percentage increase in revenue would be the same, providing an additional \$614,000/year. Details of the effects are shown in Figure 4.



Figure 4 Effects of Example Service Level Increases

		311 Port Chester	328 Cove Rd	331 High Ridge		341 Norwalk
				Full route	South part	
BEFORE	Peak/off-peak headway	20/30	20/30	20/30	N/A	20/30
	Revenue trip time	97	45	64	N/A	105
	Recovery time	23	15	11	N/A	15
	Cycle time	120	60	75	N/A	120
	Peak vehicles	6	3	3.75 <i>(interlined)</i>	N/A	6
AFTER	Peak/off-peak headway	15/20	15/20	30/60	15/20	15/20
	Revenue trip time	97	45	64	42	105
	Recovery time	23	15	11	3	15
	Cycle time	120	60	75	45	120
	Peak vehicles	8	4	4 <i>(combined)</i>		8

3) Express Services

Description

Overlay express service with fewer stops, in addition to the current service.

Rationale

Heavily used long-haul routes such as the 311 PORT CHESTER and 341 NORWALK provide effective transit service for riders throughout the day, are good candidates for increased service. However, they also have more than 60 stops each. These well-used routes may attract more riders along their nine-mile stretch with some form of express service. This would reduce travel times, attracting more riders.

The more heavily-used southern sections of the medium-haul routes like the 331 HIGH RIDGE, 335-336 WASHINGTON / LONG RIDGE may share the same opportunity.

Case Study / Example

The terminology relating to express services is varied, and for the purposes of this document, the following definitions will be used for stopping patterns:

- *Non-stop service* means the route only makes no stops along a significant portion of its length. In an extreme case, there are only two stops (start and end)



- *Local service* means the stops along the route are sufficiently close that anyone near the vehicle route is within walking distance of a stop
- *Limited-stop service* falls between the two – stops are widely spaced, such that not all areas near the vehicle route are within walking distance.

An express service is any route that is not entirely local service. There are two main types:

- **Route is express only** when the service acts as a non-stop or limited-stop service for its entire length, only serving some high-demand stops. The local service continues to operate as before. For example, Boston's MBTA operates three limited-stop routes under the Crosstown (CT) moniker.¹
- **Route combines local and express elements** when the service operates partly as an express route, and partly as a local route. This could be all-stops on the outer portion, and limited-stop on the inner portion. The local service can either continue to operate as before, or only operate alongside the limited-stops portion of the express route. In New York City, route M4, offers limited-stop during peak hours on weekdays, alongside a parallel all-stops service.²

Benefits, Disbenefits, Costs

Express service (particularly limited stop) would be expected to increase ridership on the corridor, which will also increase overall revenue. Further, vehicles on express routes will run at higher speeds, lowering costs per route-mile.

However, adding express service may result in a decreased service frequency for local routes, reducing ridership for local-only stops. Further, point-to-point (non-stop) express services will attract passengers who ride the whole length, and hence may perform less well financially.

Overall, express services can be expected to increase ridership/revenue and costs (because of the need to retain a local service). Some ridership will shift from the local to the express service, even if the local service retains the same frequency. Consequently, it hard to make any general statements about the likely overall change in net operating costs. The more certain benefits of express service are therefore the better service and journey times for customers, along with the wider benefits of increased transit usage.

Potential Stamford Application

The express routes and service increases should target the high demand stops and time periods (on weekdays), following the analysis conducted in the previous phases of this study. Limited stop express service to the downtown area should be provided throughout the day on:

- **311 PORT CHESTER:** Inbound and outbound stops would serve the same locations, including: Stamford Transportation Center (STC), downtown Stamford, the E Putnam Ave intersection

¹ http://www.mbta.com/schedules_and_maps/bus/, accessed October 17, 2016.

² <http://web.mta.info/nyct/bus/schedule/manh/m004cur.pdf>, accessed October 14, 2016.



with Manson St, as well as the intersection between S Main Street and Westchester Ave (this last stop covers 15% of the current total demand).

- **341 NORWALK:** Like 311 PORT CHESTER, inbound and outbound stops would serve the same locations, including: Stamford Transportation Center (STC), downtown Stamford, E Main St up to the intersection with Boston Post Rd, as well as the intersection between Center St and Richards Ave, ending service at the Norwalk WHEELS Hub.

In the case of 331 HIGH RIDGE, limited-stop service could be implemented all day south of Merritt Parkway. Service north of Merritt Parkway could be replaced with alternative service delivery methods (see section “Alternative service methods”).

One potential service pattern would be a limited-stop overlay service on southern part of 331 High Ridge with 15-minute headways, with service on the “local route” reduced to 30-minute headways. This would increase costs by about \$400,000/year, a 37% increase.

The change in ridership was calculated using a standard elasticity method relating the change in frequency to the change in ridership. This was applied to the stop-level ridership, with stops served by the express service seeing an increase in frequency, and other stops seeing a decrease in frequency. It was assumed that no riders would switch stops, providing a conservative estimate of the ridership and revenue increase. The net result was that weekday ridership was estimated to increase by 13%, or 540,000 riders per year. Revenue would increase by the same proportion, providing an extra \$77,000/year.

New non-stop (or limited-stop) service from a park-and-ride site by the Merritt Parkway to downtown stops is also an option. This non-stop service would be designed to attract new riders, rather than the existing users, with the target market being people who currently drive to jobs in the downtown area via the Merritt Parkway. This target market would more likely to switch to transit if parking in the downtown area becomes more scarce or more expensive. (It is most common in Stamford today for employers to subsidize the cost of parking for their employees.) The park-and-ride site could be located either on Long Ridge Rd or High Ridge Road. Because this service is targeted primarily at new users, its ridership is hard to predict from available information. A survey of potential users would reveal likely ridership levels.

4) Premium Bus Service

Description

Premium bus service is where passengers are charged a higher fare in return for a service that is superior in some manner. The superior service could be faster (through some form of express service), offer better amenities for passengers, or have some other feature that warrants a higher price.

Rationale

One of the study requirements (as set out in the scope of work) was that premium bus service would be included as one of the options under consideration in this phase of work. The superior service offers the potential to attract new users to public transit, and the higher fare would help offset the



higher costs of the superior service. Further, it is likely that a higher fare would allow a premium service to be financially sustainable with a lower ridership than a regular service. This would allow transit to target smaller markets.

Case Studies / Examples

There are numerous instances of premium bus service in the USA. Some examples include:

- In Los Angeles, the transit agency charges a higher fare for its express bus services. These services include a long segment running on a freeway, offering reduced journey times compared with local services. Trips using these segments pay a cash fare of \$2.25, compared \$1.75 for standard bus services. (Riders using the non-freeway portions of these routes pay regular fares.)
- WMATA, the transit agency for Washington DC, also charges a higher fare for its express bus services, under the brand name “MetroExtra”. These serve fewer stops than regular routes in order to reduce journey times. Trips on these services cost \$4.00 (cash or smartcard), compared with \$1.75 for regular services.
- Houston’s bus network includes a number of routes that connect park-and-ride sites with the downtown or other major destinations. These typically use the city’s freeways for most of their trip. Fares depend on distance between the park-and-ride site and the destination, ranging from \$2.00 to \$4.50. The regular fare is \$1.25.

Benefits, Disbenefits, Costs

The primary benefit of a premium service is the ability to obtain higher revenue than a regular service. In many cases, the premium service will attract new users to transit, increasing the overall number of passengers served. If the service is a non-stop point-to-point express, then the premium fare will help offset the lower financial performance of such services.

The main disbenefit is that users who are unwilling or unable to pay the additional fare will be deterred from using the service, introducing equity concerns. If the introduction of a premium service is accompanied by reductions in a parallel regular service, this effect will be exacerbated.

The operating and capital costs of a premium are generally the same as regular bus services, unless additional amenities are offered. If this is the case, then the extra costs will depend on the level of amenities offered.

Potential Stamford Application

Any of the enhanced services proposed in this document could potentially have a premium fare, particularly the express services. However, if an express service has premium fare, then there would be a need for a parallel non-express version with a non-premium fare and comparable service levels. For some corridors, this duplication may not be financially sustainable, even with the higher fare.

The typical travel distances of CTtransit’s passengers are fairly short, and hence the benefits of any additional on-board amenities will be limited. Consequently, it is unlikely that a premium service with additional amenities is likely to attract significant numbers of new passengers.



5) Transit Priority Measures

Description

Provide various transit priority measures in Stamford, such as transit-only lanes, queue jump lanes, and transit signal priority.

Rationale

Investments in transit priority infrastructure will help mitigate the effects of congestion, decrease overall journey times, improve reliability and enhance the rider experience for both CTtransit and private shuttles.

Case Study / Example

There are three main types of transit priority measures:

- **Transit signal priority** results in signals altering their timing in response to the presence of a transit vehicle. This may involve extending the green phase (so the lights don't turn red just as the bus reaches the intersection), or reducing the red phase (so that the lights turn green sooner for the waiting bus). Alterations to subsequent signal cycles can ensure that the overall traffic capacity is not significantly affected.
- **Queue jump lanes** provide a short lane on the approach to an intersection that allows transit vehicles to bypass a queue at an intersection. They are sometimes designated as right turn-only for other road users. This may be combined with transit signal priority. (In some cases, the intersection layout may require this).
- **Transit-only lanes** provide a dedicated continuous lane for use by transit vehicles. These can be created by either converting an existing general traffic lane, or by widening the road to create a new lane. Transit signal priority is typically used, but is not always essential.

It is possible to deploy a mixture these types of measures within an urban area. The choice between them will depend on available road space, transit volumes, traffic volumes, wider policy considerations and available funding.

Within Stamford, the expectation is that any transit priority measures could be used by both CTtransit vehicles and privately-operated shuttles.

Benefits, Disbenefits, Costs

Transit priority measures will improve vehicle run times and journey time reliability. This leads to shorter journey times for passengers, and hence will typically increase passenger numbers and revenue (where a fare is charged). Further, shorter run times can decrease operating costs for operators.

The disbenefits depend on the type of transit priority measure. Queue jump lanes and transit signal priority have little effect on other road users. The conversion of general traffic lanes to bus-only lanes may affect journey times for other road users. However, this should be compared with journey time savings for transit users and wider road network capacity. Transit priority measures should be



pursued as tools to increase segment and intersection capacity on a person movement basis, rather than vehicle movements.

Queue jump lanes and transit signal priority have low costs per intersection. Bus-only lanes (when converted from general traffic lanes) cost \$2.5-2.9m per mile³.

Potential Stamford Application

Transit priority projects are highly scalable in effect and scope. They can range from signal priority at a few key intersections through to an extensive network of transit-only lanes across the area served by transit. It also possible to phase the roll-out of any plans in line with available financial and political support.

Given the existing transit conditions in the study area, there are two main targets for transit priority measures: the area around the STC and the downtown core, and along busy transit routes (especially the US Route 1 corridor).

Busy transit routes

Transit priority measures improve vehicle run times and reliability, both of which benefit passengers, and may reduce operating costs through more efficient and reliable scheduling. The benefits will depend on the amount of time saved, and the number of passengers. Consequently, busy transit routes will have greater benefits from transit priority measures than quiet routes.

The Existing Conditions report revealed that 341 NORWALK and 328 COVE RD were the busiest routes (as measured by boardings per revenue hour), followed by 331 HIGH RIDGE (particularly the southern portion), 311 PORT CHESTER and 334 HOPE ST. Any of these routes would be suitable for transit priority measures. The measures do not have to be applied along the whole route – they can be targeted at the portions with the highest average loads. In the case of 331 HIGH RIDGE, only the portion south of the Merritt Parkway would be suitable.

Given the route lengths and the typical road configuration along most of these routes, it is likely that transit signal priority and queue jump lanes would be the most suitable measures. A more detailed analysis would consider the typical delay (to buses) at each intersection and the average loads. From this, a prioritized list of intersections for signal priority or queue jump lanes would be developed.

There is a separate study underway examining options to improve transit service along the US Route 1 corridor. This corridor is used by 311 PORT CHESTER and 341 NORWALK. Consequently, any proposed for transit priority measures for these routes would need to take the results of that study into consideration.

STC/Downtown core

The area around the STC and the downtown core is used by all CTtransit transit routes, with many streets hosting multiple transit routes. These streets are also used by the private shuttles. As a result, any transit priority measures on these streets could benefit a large number of transit passengers. No distinction should be made between CTtransit service and privately-operated

³ Source: Orange County Complete Streets Handbook



shuttles. This will maximize the benefits to transit users (regardless of provider), and will help maximize support from the city's business community.

The streets in the downtown core are generally unable to accommodate transit-only lanes through road widening, nor would this study recommend widening. Consequently, creating transit-only lanes would require the conversion of existing general traffic lanes. The implementation of transit signal priority and queue jump lanes can be facilitated by using allowing transit vehicles to perform through movements from existing right-turn lanes.

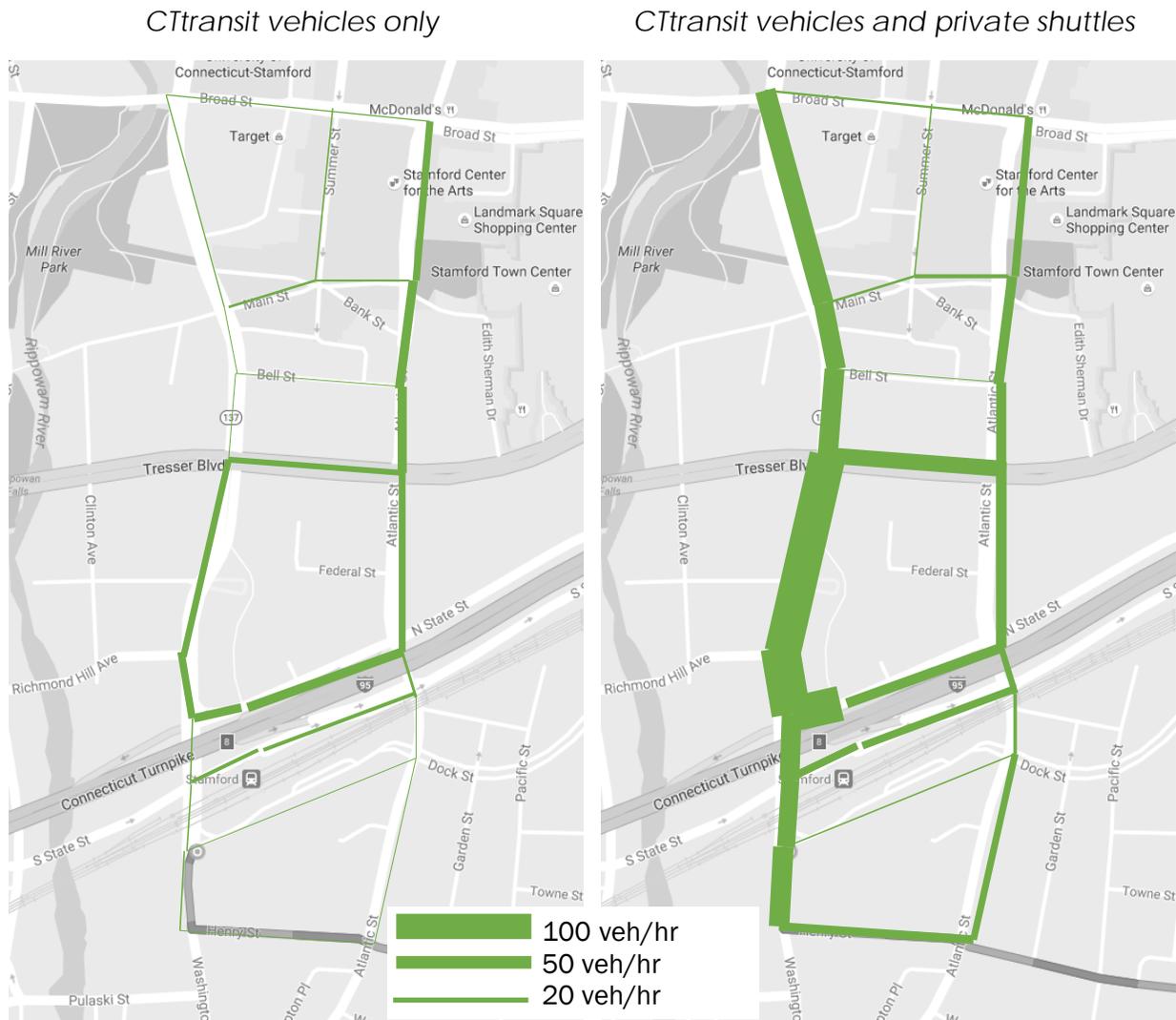
Analysis of the streets used by the private shuttles and CTtransit buses revealed that the segment of Washington Blvd between Henry St and Tresser Blvd is used by the most transit vehicles (buses and private shuttles). As shown in Figure 5, this segment is used by over 100 transit vehicles per hour in the AM peak period. Consequently, bus-only lanes or other transit priority measures here would produce significant benefits for many users.

Additionally, the project team considered how different street designs could improve the environment for transit and other modes on North State Street. A conservative tally of transit ridership on CTtransit, shuttle bus ridership, pedestrian movements, and vehicle traffic counts⁴ in the vicinity of the STC revealed that transit riders and pedestrians account for nearly 80% of mobility utilization on North State Street. At the same time, the current design of North State Street prioritizes and emphasizes personal vehicle movements with a three-lane right-of-way, limited pedestrian crossings, and limited transit access/egress at the STC. The study team developed concepts that highlight opportunities to redesign North State Street in a way that better serves those who use the street the most. Two primary concepts are considered: the first is a transit only-lane and the second is a transit-only street. These concepts for transit priority and pedestrian-focused design require further detailed study to maximize the benefits and minimize the impacts of repurposing this area and to better define the right balance between transit priority and traditional personal-vehicle focused roadway function. These concepts are discussed in more detail in the Phase A Shuttle Study final report (Chapter 3).

⁴ Sources: 2010 Stamford Transportation Center Master Plan (peak hour pedestrian counts), CTTransit (peak hour bus ridership at STC), Stamford Bus and Shuttle Study field data collection (shuttle ridership). Note that bus and shuttle vehicles were removed from traffic volumes on North State Street to accurately separate modes.



Figure 5 Transit Vehicle Volume



Analysis of the streets used by the private shuttles and CTtransit buses revealed that the segment of Washington Blvd between Henry Street and Tresser Boulevard is used by the most transit vehicles (buses and private shuttles). This segment is used by over 100 transit vehicles per hour in the AM peak period. Consequently, bus-only lanes or other transit priority measures here would produce significant benefits for many users.



6) Changes to Route Network

Description

New routes or route alternatives would fill and fix the gaps within the network; these would also help address poor performance of current routes.

Rationale

CTtransit provides several options for north-south travel throughout Stamford, connecting mostly at STC. However, east-west transit options are limited and create barriers for trips that do not go downtown. Radial routes spread outward and do not connect. An opportunity exists to improve these trips and capture travel demand by connecting routes.

Case Study / Example

Service design opportunities include:

- **Reduce vehicle travel times** by straightening the route
- **Reduce walk access times** by diverting the route away from the major road.
- **Better serve a major trip generator** by diverting the route away from the major road.
- **Offer better connections** between routes by extending or diverting a route.
- **Address operational issues**, such as delays at intersections, by adjusting routes
- **Reduce overlap** between routes' service areas

In some cases, these reasons conflict with one another – straightening a route to reduce vehicle travel times may result in increased walk access times. Consequently, the potential changes for Stamford's route network are intended to balance the various advantages.

Benefits, Disbenefits, Costs

Providing new direct connections to serve markets with low transit usage would increase ridership, and broaden the overall transit user base.

Routes that do not serve the downtown area would enable many transit trips to be more direct (and hence quicker), increasing transit usage. These routes would also be likely to have faster average vehicle speeds, as they avoid the congestion that affects downtown route sections.

Potential Stamford Application

The congruency analysis in the Existing Conditions report found there was strong ridership potential for new connections between the (residential) Springdale area and employment centers. These services would improve transit use for other east-west trips north of the US Route 1 corridor, as they will not have to take an indirect route through the downtown core.

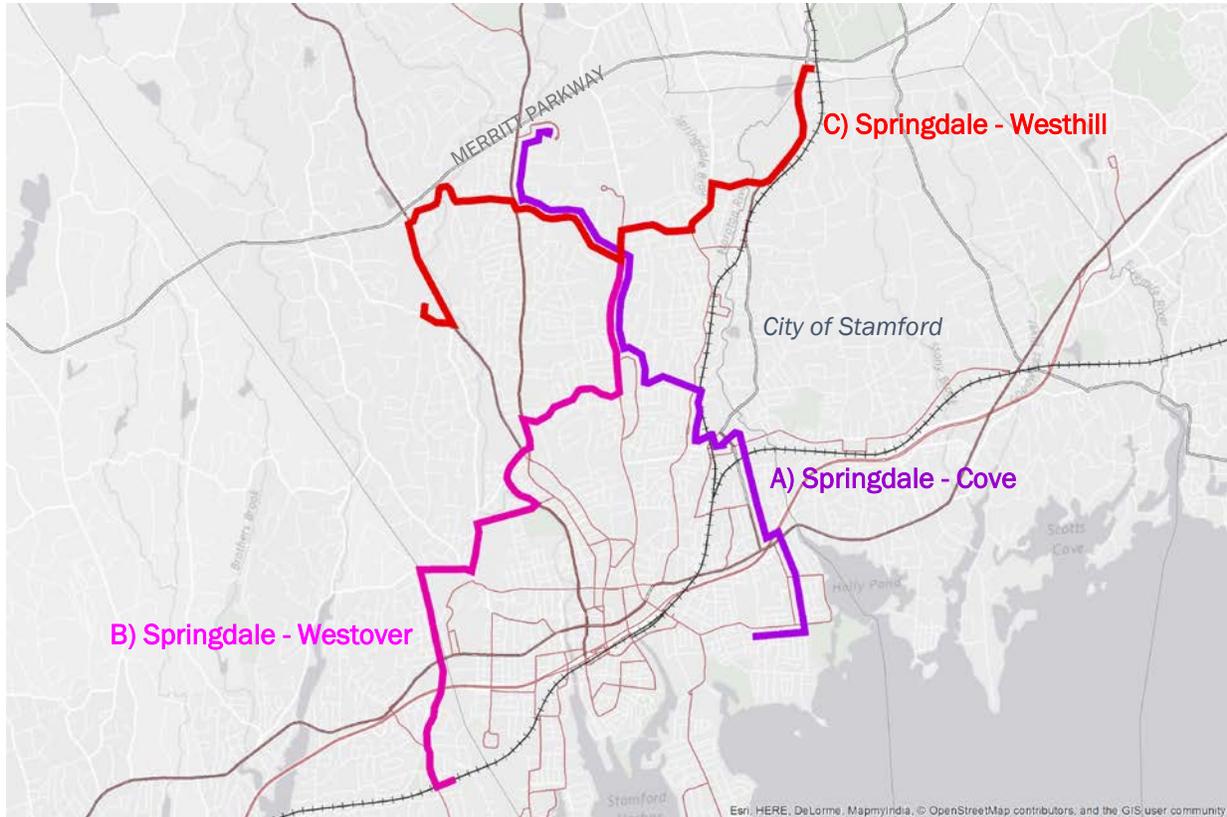
Additionally, connecting the east end of the 328 COVE RD could connect to the 341 NORWALK or 344 GLENBROOK would provide better connections and east-west options throughout the service area at minimal cost.

A broader analysis of passengers' origins and destinations would help determine which stops should be linked through a new connecting route, to avoid and complement the current radial CTtransit network.

New Market Routes

Three examples of potential routes serving new travel markets were assessed in more detail. These routes are shown in Figure 6.

Figure 6: Example New Market Routes - Map



The assessment assumed peak headways of 20 minutes and off-peak headways of 30 minutes, matching typical headways in Stamford. These three routes are of similar length (6.3 to 7.1 miles), and hence all would require three vehicles in the peak period. They would each cost about \$800,000 per year to operate.

The estimated ridership and revenue for these routes is shown in Figure 7. The cost recovery ratio of these routes is comparable with the bottom third of CTtransit's existing Stamford routes. This indicates that routes of this nature could be justified, subject to funding availability.



Figure 7 Example New Market Routes - Performance

Route	Weekday ridership	Annual revenue
A) Springdale - Cove	570	\$210,000
B) Springdale - Westover	560	\$210,000
C) Springdale - Westhill	410	\$150,000

STC-related route changes

The Existing Conditions report identified congestion issues at the STC as a problem. It also suggested two pairs of routes that could be altered to not serve the STC as a potential means to mitigate this issue. The two pairs of routes were 341 NORWALK / 311 PORT CHESTER (which are currently interlined) and 334 HOPE ST / 313 WEST BROAD (which are not currently interlined).

Routes 341 NORWALK and 311 PORT CHESTER serve US Route 1, which is designated as Tresser Boulevard through downtown Stamford. The combined route would use Tresser Boulevard rather than serving the STC. This would save about 10 minutes of travel time on each round trip, plus the 10 minutes used by the interlined service for layover at the STC.

A combined 334 HOPE ST and 313 WEST BROAD would operate along Broad Street, rather than going via the STC. This would save about 17 minutes of travel time on each round trip.

These new routes would still serve Stamford’s downtown, and would still intersect with most routes that currently serve the STC. The primary disbenefit would be to users travelling to Stamford rail station and to stops that are longer served. (Such users could transfer to multiple other routes, but this would still increase their journey time). Stop-level boarding/alighting data revealed how many people used these stops and hence would be negatively affected. However, this figure will be an upper limit – some of the people alighting at the STC are transferring to other routes, which they would still be able to do (just at a different location). Additional data collection would resolve this.

Figure 8 summarizes the findings for these potential route changes. Overall, the evidence presented here indicates that combing 334 HOPE ST and 313 WEST BROAD is probably not worth pursuing, and that 341 NORWALK / 311 PORT CHESTER along US Route 1 is under consideration as part of the Route 1 BRT Feasibility Study to assess trade-offs.



Figure 8 STC-related Route Changes

Routes	313 West Broad / 334 Hope St	311 Port Chester / 341 Norwalk
Time saved per round trip	17 min. travel time	10 min. travel time + 10 min. STC layover
Daily riders negatively affected (upper limit)	648 (52% of riders)	831 (23% of riders)
Next steps	Probably not worth pursuing	Coordinate with Route 1 BRT Feasibility Study to assess trade-offs

Other options for moving some existing or proposed routes out of the STC are potentially available; the methodology used here can be used by CTtransit when considering such changes.

7) Alternative Service Methods

Description

Explore creative alternatives to fixed route services in areas of lower density and with lower demand. In particular, replacing fixed-route service with point-to-point service provided by taxis or other privately-operated small-scale vehicles. These services would run between the fixed-route network and the users' origin/destination (within a prescribed area).

Rationale

Revising service on more lightly travelled routes, or route segments, may lead to more useful transportation solutions for residents, as well as being more cost effective for CTtransit.

Case Studies

GO Transit / RideCo Pilot in the Town of Milton

The Town of Milton is a small community located about 25 miles from downtown Toronto in Ontario, Canada. The area is served by a commuter train service operated by GO Transit. In 2015, ridesharing startup RideCo starting offering service in Milton to the GO Transit station as part of a pilot project. RideCo allows users to book a ride through their free app on a shuttle service.

The pilot was sponsored by Metrolinx (the parent body of GO Transit), to help support its goal of reducing single occupancy vehicle use, reducing demand for station parking, and giving commuters more convenient travel options.

Because rides are shared with other commuters and have a known destination, costs are lower than other app based ride-sharing options - C\$1.45 for pickups at a nearby intersection or C\$1.95 for door-to-door service. RideCo has reported that its fare recovery is better than the fixed route shuttles it had replaced.



Trans-Cab and Hamilton Street Railway

Hamilton is a large city in Ontario, Canada approximately 40 miles from Toronto. The city has a diverse downtown and growing transit system, along with outlying low-density residential areas that are not conducive to productive fixed route transit options. In light of this, the City of Hamilton's public transit provider, Hamilton Street Railway, introduced a service called Trans-Cab.

Trans-Cab is a shared-ride taxi service available to all passengers of Hamilton Street Railway (HSR) services, and is offered in areas where buses do not currently provide service. Customers can call ahead to arrange a ride, and pay the cab driver the bus fare plus a 50 cent premium for the service. In the reverse direction, passengers inform the bus operator on boarding that they will require a Trans-Cab, and pay the regular fare plus the 50 cent premium. Passengers then give the cab driver their HSR transfer. Trans-Cab does not replace existing service (as passengers must maximize their travel on regular HSR routes), but rather acts as a first/last mile connection.

Similar examples exist in Welland, Sudbury, Peterborough and Niagara Falls (Ontario).

Benefits, Disbenefits, Costs

Alternative service delivery methods have the potential to increase ridership by offering more convenient on-demand solutions for customers north of Merritt Parkway. They would also allow CTtransit to reallocate resource savings that can be reinvested into the system to provide additional service where it will yield greater benefits.

Depending on the strategy, alternative service delivery can cost-neutral or cost-saving. The cost savings will be CTtransit's marginal hourly operating cost rate, and the outlay for taxis/private-operated vehicles will depend on the typical local rates and negotiations with the taxi company/operator.

The only significant disbenefit is that reducing fixed route coverage is not always straightforward. For example, there will need to be consideration of ADA and Title VI impacts, plus efforts to inform passengers of new arrangements. (This can be mitigated by highlighting the benefits of the alternative service delivery methods to passengers. For example, the Trans-Cab example described above provides service to the door, rather than a nearby stop.) In addition, the new style of service will need careful consideration of the contractual and financial agreements with the third-party operator.

Potential Stamford Application

Some routes in Stamford, such as 331 HIGH RIDGE and 335-336 WASHINGTON/LONG RIDGE, have uneven ridership levels, with both productive and unproductive portions of their routes. In particular, ridership north of Merritt Parkway is much lower than south of the Merritt Parkway. This is because land use in this area is primarily low-density residential (single family homes on large lots), served by a disconnected, curvilinear street pattern. Additionally, topology considerations play a large role in the walkability and bikeability of the area, as a steep grade from the coast upward makes north-south travel by active transportation difficult.

A potential solution for these routes with poor ridership north of the Merritt is to consider options other than fixed route service. Resources that are currently used to extend 331 HIGH RIDGE and 335-336 WASHINGTON/LONG RIDGE past the Merritt Parkway could be reinvested into the core of their



routes to provide more frequent service in the highest-demand areas. Further, infrastructure such as park-and-ride locations, rideshare drop-off points, or carpool and vanpool designated parking at the truncation of these routes could encourage multi-modal travel to an even more reliable, faster and convenient service to downtown. This means that savings in operations will be reinvested into the areas where people make the most trips, making the whole system more useful and attractive for riders.

Many transit agencies are increasingly working to partner with transportation network companies to offer discounts on rideshare trips that begin or end at a transit stop. These options provide more convenient options for commuters as they are demand based, door-to-stop, and, if resources are reinvested in the remainder of the route, connecting to a more frequent and reliable service. For areas north of Merritt Parkway and on lines like 331 HIGH RIDGE and 335-336 WASHINGTON/LONG RIDGE, this could be a more attractive service solution compared to the traditional fixed route options. However, some regulatory and accessibility hurdles remain for such an arrangement in Connecticut.

The concept of serving the area north of the Merritt Parkway with an alternative service method (and hence shortening 331 HIGH RIDGE and 335-336 WASHINGTON/LONG RIDGE) was assessed in more detail.

Passengers travelling *from* north of Merritt would use a taxi, paying the taxi driver the regular CTtransit fare and obtaining a transfer (or showing their pass). The cab may be shared with other transit users. They would then be taken to the northern end of the shortened 331 HIGH RIDGE or 335-336 WASHINGTON/LONG RIDGE. They would then continue their journey on conventional CTtransit services.

Passengers travelling *to* north of Merritt would inform their bus driver upon boarding and obtain a transfer. The driver would alert dispatchers, who would arrange for a taxi to pick them up at northern end of 331 HIGH RIDGE or 335-336 WASHINGTON/LONG RIDGE.

The cab company would be paid by CTtransit a fixed amount per boarding. Currently, the subsidy⁵ is \$32/boarding for 331 HIGH RIDGE and \$38/boarding for 335-336 WASHINGTON/LONG RIDGE on the northern portions. Consequently, any taxi-based solution cheaper than that per boarding will reduce CTtransit's costs. (Providing that dispatching can be accommodated within current staffing/infrastructure, such as by using paratransit dispatch staff, or if the costs of new staff are small compared with overall revenues.)

Further, it would be possible to operate higher frequencies on 331 HIGH RIDGE with no cost increase on the amount paid to taxi companies is under \$15/trip. Similarly, higher frequencies on 335-336 WASHINGTON/LONG RIDGE require only modest cost increases (about \$150k/year).

⁵ Subsidy is costs minus fare revenue. The costs were calculated from the service hours on the northern segments multiplied by the marginal cost per service hour; the revenue was the average revenue per boarding multiplied by the number of boardings on the northern segments.



8) Stop Consolidation

Description

Reduce the number of bus stops by removing those close to other stops, or combining pairs of nearby stops into one

Rationale

The average stop spacing on most CTtransit routes is close, with around half of routes averaging less than 750 feet between stops. Wider stop spacing (and fewer stops) increases average vehicle speed. This potentially reduces transit users (overall) journey time, even if they have a longer walk to their stop. The shorter overall journey time will make transit more attractive, increasing ridership and revenue.

Higher vehicle speeds can also reduce annual operating costs, as many operating costs relate to service hours (rather than distance travelled).

Benefits, Disbenefits, Costs

The journey time benefits to individual passengers will depend on the number of stops removed and the increases in walk distance (and hence walk time) to their nearest stop. The benefits can be quantified using existing vehicle loading data, a comparison of new and old run-times, and the change in stop spacing. Typically, a 1% decrease in journey time will produce (approximately) a 1% increase in demand, assuming all other factors remain unchanged.

In addition, there can be improvements in the *perception* of journey time, other and above that caused by actual changes. If there is minimal in-vehicle time between stops, then passengers will regard the time spent serving those stops (other than their own) as wasted. Hence, increasing average stop space will have a powerful positive effect on passengers' perception.

Passengers would generally face longer walk distances to and from stops. This would have disproportionate effect on some groups, such as the elderly or those with mobility issues. This risk can be mitigated by considering the origins and destinations of such users when picking new stop locations.

The costs of stop consolidation would be limited to staff time, and the removal of any existing stop infrastructure. There would be modest savings in maintenance costs.

Potential Stamford Application

The approach would require detailed examination of each route to determine segments with a large number of stops in a short distance. The stops to be retained should ideally be close to major trip generators/attractors, while also keeping stop spacing within a reasonable limit (such as 400 yards). In some cases, it may be appropriate to add a new stop in place of two or more existing stops, which would require coordination with the local municipality.

For example, 321 WEST AVE averages just 495 feet between stops. The route operates (in part) along Stillwater Avenue, where a 650 yard segment has five stops. The local area could be effectively served with just two stops at Spruce Street (near the hospital) and Liberty Street, 350 yards apart.



Two routes in Stamford were examined in more detail: 328 COVE RD and 334 HOPE ST. Eliminating stops with low-to-moderate boardings and alightings was estimated to save just under three minutes on the round trip time for both routes. This represents a small journey time benefit, and hence the time saved would most likely be used to improve reliability. Increasing the stop spacing would also significantly improve passengers' perception of travel time.

The main cost of stop consolidation is political, rather than financial, although stop consolidation may point to a need for investment in sidewalk improvements (or installation) in some parts of Stamford.

9) Pedestrian Environment

Description

Improvements to the pedestrian realm along transit routes and throughout downtown Stamford, with a particular focus on sidewalk provision.

Rationale

Field observations by study team members indicate a lack of sidewalks along many of the major roads used by transit routes, especially north of the downtown area. As all transit users are also pedestrians, this is a significant impediment to transit use. Further the number of travel flows with "unrealized potential" involving downtown zones suggests that greater transit use in the downtown requires improvements to the pedestrian realm.

Benefits, Disbenefits, Costs

The costs for pedestrian infrastructure are typically more modest than other transportation investments:

- A sidewalk costs four feet wide about \$100 per linear foot, or about \$500,000 per mile⁶.
- Signalizing an intersection costs about \$500,000; adding pedestrian signals to an existing signalized intersection costs about \$1,000.
- Painting a crosswalk across a four-lane road (50 feet wide) costs about \$250; adding all four possible crosswalks at a typical intersection would therefore costs about \$1,000.

The benefits of improving the pedestrian environment include improved safety, increased transit use, greater satisfaction for existing transit users, and increased active transportation activity. The latter will yield health and economic benefits.

The disbenefits of active transportation infrastructure are typically very small, limited to minor delays to vehicular traffic where signalized crossings are installed.

⁶ Source for all costs in this section: Orange County's *Complete Streets Initiative Design Handbook*



Potential Stamford Application

Installation of sidewalks along all roads with transit routes. Transit users must walk to/from the bus stops they use, and the absence of sidewalks will be a significant deterrent to transit use. Stamford's bus routes often run along busy roads, exacerbating this effect. Route segments with a lack of sidewalks include:

- 335 LONG RIDGE north of Cold Springs
- 331 HIGH RIDGE north of Merritt Parkway
- 324 FAIRFIELD (whole route)
- 327 SHIPPAN near the waterfront

There is also a need to provide safe crossing points at intersections near bus stops. Generally, half of people using a transit stop will have their origin/destination on the opposite side of the road. One example of a route that poses major challenges to pedestrians is Route 313 on West Broad Street. Between Schuyler Street/West Broad Street and Palmer Hill Road/Stillwater Avenue, there are no pedestrian crossings across Broad or Stillwater, a distance of 0.8 miles. Crossing points provide a means to travel between their origin/destination and the bus stop safely. The type of crossing would depend on traffic volumes and road configuration, in accordance with local practice.

The downtown area would benefit from the provision of wayfinding facilities. This would assist with general navigation around the downtown area, and help potential user find bus stops. A wayfinding system would encourage visitors and newcomers to explore the downtown area, benefiting the local economy and increasing awareness of local attractions.

Finally, there is a need for improvements to streetscaping along arterial roads in the downtown area. These roads are used by transit routes and serve major destinations, and hence are important pedestrian routes. Good streetscaping will make these routes more pleasant, helping mitigate the negative effects of high traffic volumes.

CONSULTATION SUMMARY

Public Open House

On February 8, 2017, an open house event was held at the STC to engage CTtransit riders. More than 30 people attended and shared their priorities and concerns. This event followed the January 25, 2017 "pop-up" outreach, in which 118 CTtransit riders participated in the survey. The comments fell into three main categories: safety and comfort, service delays, and information availability.



More than 30 transit users in Stamford attended the February 2017 Open House.

Regarding traffic safety and station comfort, many participants suggested that pedestrian and bicycle infrastructure around the STC was insufficient. One person said the walk from the STC to their office, while only four blocks long, felt unsafe. Another person said the STC needs better pedestrian markings because buses come around corners at high speed. There is also interest in improved on-street bicycle facilities. One person said they ride on the sidewalk instead of the street because they do not trust drivers and do not feel the existing sharrows improve safety. Another person said they would consider cycling if there were bike lanes. Many people reported that waiting for the bus in winter or during inclement weather was very uncomfortable. The STC feels very cold in winter and many of the bus stops are exposed to the elements.

Additionally, passengers perceive delays around the STC are causing them to miss transfers and experience longer wait times. One person reported that congestion at the STC adds 10 minutes to the trip length. Another suggested that North State Street should be closed to car traffic, allowing buses and shuttles only. Some felt that bus boarding and alighting is excessively long. Several people mentioned how cumbersome it is to need exact change for the farebox.



We want to hear from you!

JOIN US FOR AN OPEN HOUSE

¡Queremos oír su voz!

ÚNASE A NOSOTROS PARA UN EVENTO PÚBLICO

Wednesday, February 8, 2017

4:00 PM – 7:00 PM

In the event of a snowstorm on February 8th, the event will be held on February 9th.

Stamford Transportation Center
CTransit Bus Area

Washington Boulevard & North State Street
Stamford, CT 06902



The Stamford Bus & Shuttle Study is identifying opportunities to improve the CTransit service in Stamford. Members of the Stamford Bus & Shuttle Study team are seeking your input. We will have boards with ideas we're considering and want your feedback!

Spanish interpreters will be available.

Can't make the event?
Feel free to fill out the rider survey online:
<https://www.surveymonkey.com/r/StamfordTransp>
or email your comments to
info@stamfordbusandshuttle.com.

www.stamfordbusandshuttle.com

Miércoles, el 8 de febrero del 2017

4:00 PM – 7:00 PM

En caso de una tormenta invernal el 8 de febrero, el evento se llevará a cabo el 9 de febrero.

El Centro de Transporte Stamford
Zona de autobuses CTransit

Bulevar Washington & Calle North State
Stamford, CT 06902

El Estudio de Autobuses y Autobuses Lanzadera de Stamford está identificando oportunidades de mejorar el servicio CTransit en Stamford. Miembros del equipo del Estudio de Autobuses y Autobuses Lanzadera están buscando sus comentarios.

Tendremos algunos pósters que representan unas ideas que estamos considerando y queremos oír sus opiniones!

Intérpretes de español serán disponibles.

¿No puede asistir al evento?
Siéntase libre de llenar la encuesta de pasajeros en línea:

www.surveymonkey.com/r/StamfordTranspEsp
o envíe sus comentarios por correo electrónico a
info@stamfordbusandshuttle.com.

Open house and pop-up events were advertised on buses and at the STC in English and Spanish.

Display boards were used to explain study concepts and solicit feedback on user experience and priorities.

STAMFORD BUS AND SHUTTLE STUDY



Lastly, many passengers experience barriers to information. Many people asked for real-time bus arrival information, both in the station and online. One person said that displayed times at the STC need to be clearly identified as scheduled and not actual. Ticketing also presented problems. One person said that many passengers do not realize they need exact change when paying in cash. Many are unprepared and struggle with large bills, slowing down the boarding process. Another person said they did not know where or how to get a transit pass for disabled persons.

Signage in the STC also creates confusion. One attendee mentioned that bus bay labels are inconsistent with information posted elsewhere (see images below). There was interest among many at the open house in a mobile app for purchasing tickets, real-time arrival data, and general station and service information.



As noted by one of the Open House attendees, the display board at the STC (left) lists the bay number, but the boarding area signage displays letters (right).



E-Survey and Questionnaire Results

Between November 2016 and February 2017, the Stamford Bus & Shuttle Team led a community engagement campaign to learn about the needs, motivations, and experiences of CTtransit bus passengers in Stamford. This section summarizes data from two related survey instruments. The first was administered in person at the STC and Atlantic Square. The other was part of the e-survey, which also included questions regarding other non-bus modes of transportation. (The e-survey was available on the project website and was distributed through the listservs of project partners.) These surveys were designed to gain data and insights not available through existing sources.



This chapter takes a high-level look at the most illustrative trends among bus riders. Additionally, a summary of non-bus data from the online survey has been included.

Survey Summary Statistics

There were 175 total bus-specific surveys completed, two thirds of which were conducted in person as intercept surveys at the STC or Atlantic Square. Fourteen percent were filled out by open house attendees at the STC. The remaining 19% were completed online. Of the intercept surveys, 83% were conducted at the STC and the remainder at Atlantic Square. Fifty-three percent of the intercept surveys were completed during the early afternoon, and 47% were done during the PM peak. Thirteen percent of e-surveys conducted in Spanish.

Figure 9 Online and Paper Survey Split

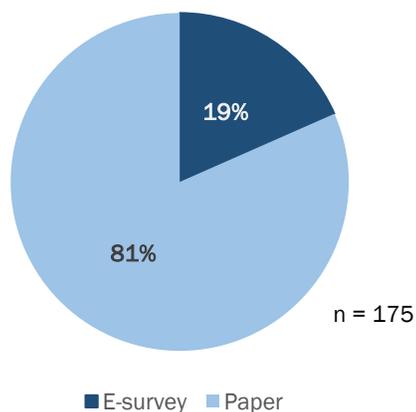
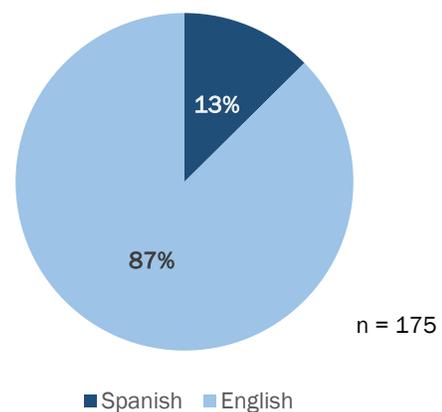


Figure 10 Survey Language Distribution

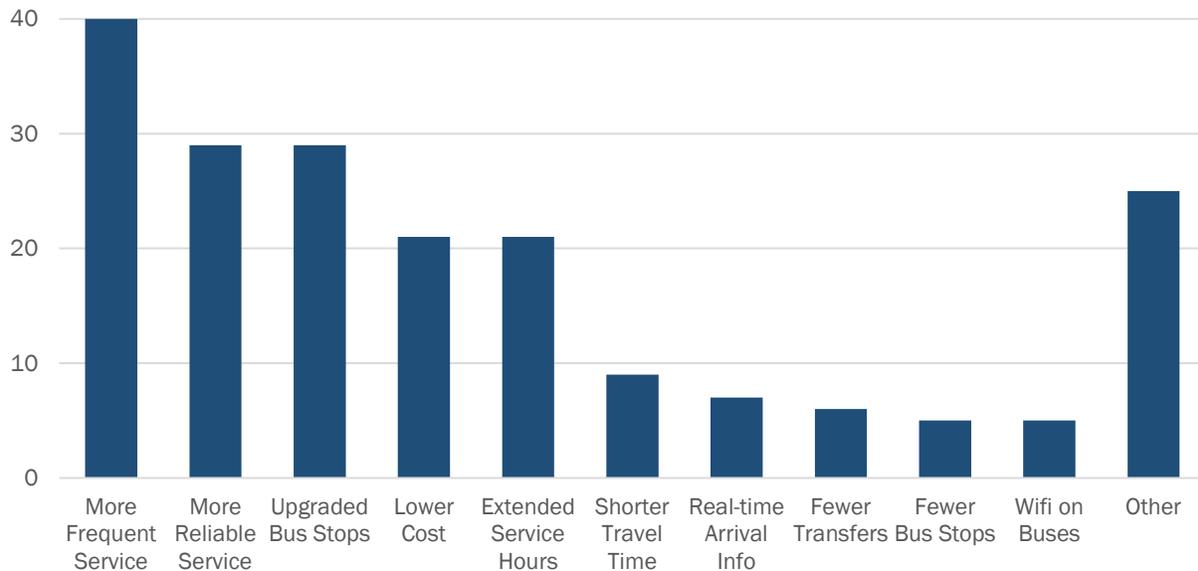




Passenger Needs

Survey respondents were asked to name up to three things that would improve their bus trip. They could pick from a list of ten choices or provide their own answer. As shown in Figure 11, there is a distinct division between the top five choices and the bottom five choices, excluding self-described improvements (i.e., “other”), suggesting a degree of consensus regarding passenger needs.

Figure 11 What Would Improve Your Bus Trip?



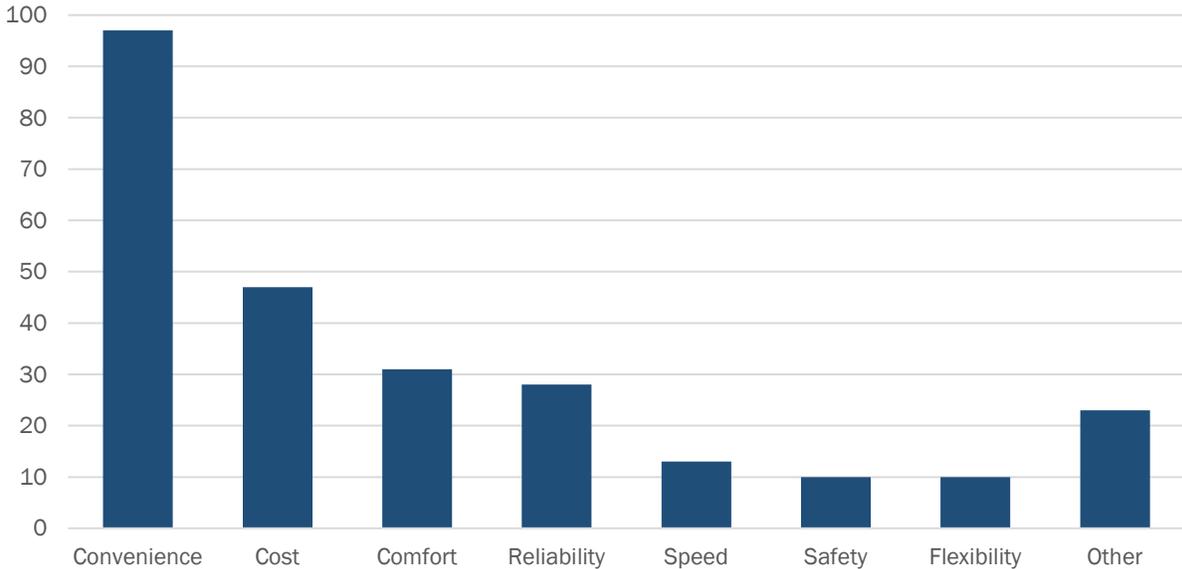
According to the survey results, passengers prioritize being able to catch a bus quickly, predictably, and at more times. They would also like improved bus stops (heated shelters, benches, etc.) and lower costs. They ranked shorter travel time, fewer transfers, and fewer bus stops lower, suggesting that passengers are less concerned with increasing bus speeds.

Why Do Passengers Ride?

To understand passengers’ motivation for choosing CTtransit bus, survey participants were asked several questions about why they ride and what other transportation modes are available to them. Figure 12 shows the qualities of CTtransit service that influence their decision. The most common answer, chosen by 73% of respondents, was convenience.

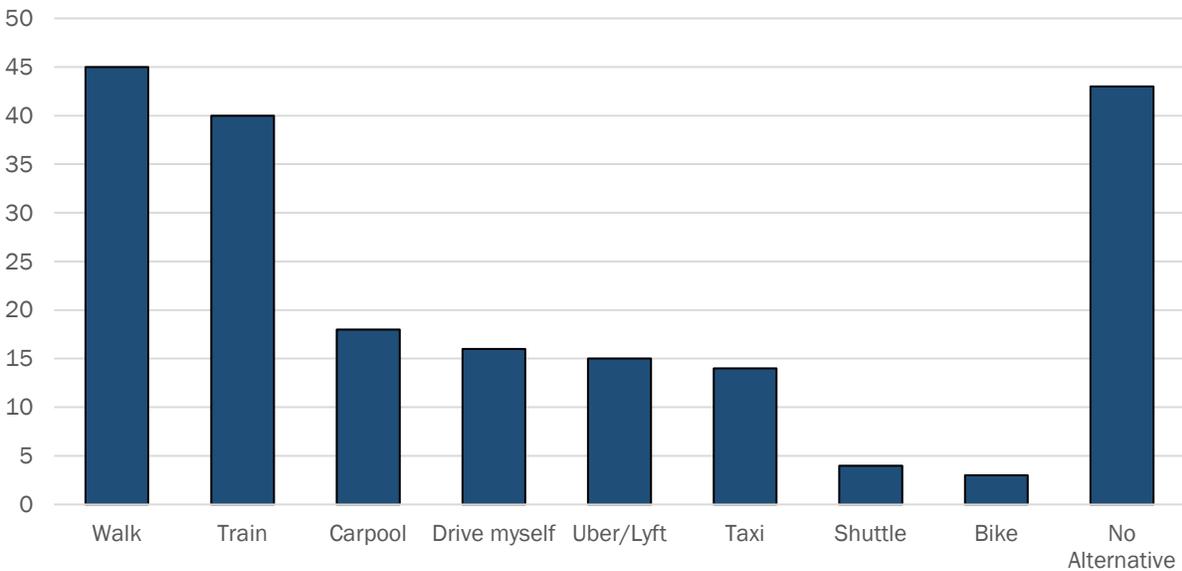


Figure 12 Why Do You Ride the Bus?



It's difficult to interpret the data in Figure 12 without also considering passengers' travel alternatives, shown in Figure 13. The most common choices, accounting for over half of all answers, were walking, taking the train, and having no alternatives. Only 9% of survey respondents said that driving alone was an alternative to taking the bus. In light of this, "convenience" Figure 12 most likely means that taking the bus was the only practical option for the respondent's particular trip. The write-in answers for "other" also suggest this. Nearly half of the people providing their own answers explicitly stated that they ride the bus because they had no other viable choices.

Figure 13 What Alternatives to the Bus Do You Have?





How Do Passengers Ride?

Survey participants were asked a series of questions to understand the characteristics of their bus trips, including trip length, whether and where they transferred, and how they paid. More than three quarters of respondents provided a trip duration ranging from 5 minutes up to two hours. The median trip length was 20 minutes. Nearly two-thirds of respondents report that they transfer between bus lines. See Figure 14 for the most common transfer pairs.

Figure 14 Most Common Transfer Pairs

Rank	Pair
1	328 Cove Road and 331 High Ridge Road
2	311 Port Chester/312 West Main Street and 328 Cove Road
2	331 High Ridge Road and 341 Norwalk/342 East Main Street
4	311 Port Chester/312 West Main Street and 331 High Ridge Road
4	311 Port Chester/312 West Main Street and 344 Glenbrook Road
4	331 High Ridge Road and 333 Newfield Avenue

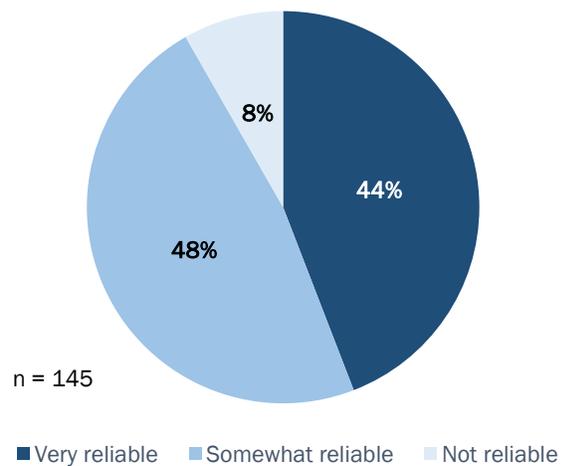
Over half of people surveyed reported paying the bus fare in cash. The next most popular payment method was the 10-ride ticket, followed by the monthly pass. These three options made up nearly 80% of all responses. Survey participants were also asked about their bike usage. Only 5% of people who answered the question reported having taken a bike on a CTtransit bus.

Passenger Experience & Reliability

The overwhelming majority of survey participants felt that their bus service was very or somewhat reliable (Figure 15).

They were also asked to identify the most common sources of bus delay. Over half of people said congestion on local roads was the leading cause. Aside from that, answers were incredibly diverse. Many people mentioned weather, but many also said they simply didn't know why buses were delayed.

Figure 15 How Reliable Are Your Typical Bus Trips?





Other Modes

The e- survey also had questions about other modes of transportation, including shuttle buses, walking, biking, driving, and the train. Nearly 90% of survey participants said they regularly used a personal car to get around Stamford. Drivers had similar issues with congestion on local roads and found their travel times to be very inconsistent. One third of people report walking regularly. Pedestrians stressed the importance of traffic safety and good pedestrian infrastructure. About one fifth of survey respondents regularly take the train. Upon arriving at Stamford Station, train riders most frequently continue their travels with personal cars or CTtransit bus service. Lastly, 15% of people report regularly using a transportation networking company like Uber or Lyft.

CONCLUSION

The following chapter for this study will cover the prioritization of the various transit service options, included an overall set of recommended options. This will be followed by a final chapter bringing together the recommendations for the shuttle system with those with CTtransit services in an integrated implementation plan.

URBAN TRANSIT STUDY

CHAPTER THREE

Transit Alternatives Evaluation & Recommendations





INTRODUCTION

The Stamford Bus and Shuttle Study aims to improve the existing CTtransit Stamford Division service and position the system for growth and stability in the future. In previous chapters, the project team has analyzed existing conditions (Chapter One) and developed nine alternatives for addressing the study goals (Chapter Two). The nine alternatives include the following:

- New service areas
- Service level increases
- Express services
- Premium bus services
- Transit priority measures
- Changes to route network
- Alternative service methods
- Stop consolidation
- Improving pedestrian environment

In this chapter, these alternatives are evaluated in terms of transit performance, the overall transportation system performance, economic benefits, and the results of the public involvement. (See callout box for more detailed breakdown of what is included within each of these categories.) As with the Phase A Shuttle Study, it's important to note that the evaluation process was largely discussion-based. Members of the Technical Committee (TC) and the public had multiple opportunities to provide feedback. Their input, supported by the analysis provided in the existing conditions chapter, has guided the overall planning process.

PERFORMANCE METRICS

The nine alternatives developed in the previous chapter are evaluated with respect to the following performance metrics:

- Transit performance
 - Ridership changes
 - Headways
 - Intermodal connectivity
 - Reliability
 - Environmental justice
- Transportation system performance
 - Walkability and access to transit
 - Increased mobility/accessibility
- Economics
 - Costs (capital & operating)
 - Access to jobs and transit customers
 - Development compatibility
- Public Involvement
 - Technical Committee (TC) prioritization
 - Community input

The sections below are organized by each of the alternatives. Each alternative has an individual matrix, detailing the ratings under each of the performance metrics. This chapter concludes with a summary matrix, where the alternatives moving forward for implementation considerations are discussed.

EVALUATION OF ALTERNATIVES

The nine alternatives were developed and explained in Chapter Two. The sections below summarize the alternatives and evaluate them based on the performance metrics. The tables below apply a rating (good, fair, or poor) to each performance metric. Low cost alternatives are scored as good, and high cost as poor, although this process is intended to show relative value rather than simply assume that expensive alternatives are not to be pursued. Thus, cost must always be considered together with impact. These individual ratings are followed by an explanation of the analysis. This exercise attempts to synthesize the results of the public outreach with the technical analysis conducted.



New Service Areas

This alternative considers the expansion of CTtransit to areas that are not currently served by the system. The current system serves all the major housing and employments centers in Stamford. Based on the previous analysis, the only area being considered for future expansion of the bus network is New Canaan, located northeast of downtown Stamford.

Each metric is rated and summarized in Table 1. Explanation of why the alternative received the ratings is provided below.

Table 1 New Service Areas Evaluation

Performance Metrics		Rating	Performance Metric Summary
<i>Transit Performance</i>	Ridership changes	●	●
	Frequency	◐	
	Intermodal connectivity	◐	
	Reliability	◐	
	Environmental justice	○	
<i>Transportation System Performance</i>	Walkability and access to transit	●	●
	Increased mobility/accessibility	●	
<i>Economic Considerations</i>	Costs	◐	●
	Access to jobs/customers	●	
	Development compatibility	◐	
<i>Public Involvement</i>	Technical Committee	○	○
	Community input	◐	

(● = good, ◐ = fair, ○ = poor)

Transit Performance

Extending bus service to New Canaan would add an estimated 400 rides per day to the system by providing service where there is none currently. This alternative, however, raises some environmental justice concerns if the new services result in cuts elsewhere in the system. According to 2015 American Community Survey five-year estimates, New Canaan has a lower poverty rate (1.7%) relative to the rest of Fairfield County (6.4%). Although users of the new service could theoretically help low income residents reach new job opportunities, expansion of the system should not come at the cost of the communities in the current service area.



The remaining transit performance metrics (improved frequency and reliability) are likely unaffected by this alternative unless the new service is not matched with additional vehicles to maintain existing headways and reliability. Intermodal connectivity would theoretically be improved by providing a new transit option accessible to more people on foot or bike, but the alternative does not inherently improve the environment for those modes.

Transportation System Performance

The addition of local bus service to New Canaan will provide a new choice, increasing the community's ability to access amenities, jobs, and the City of Stamford without a car. Although this alternative does not improve the pedestrian environment, it may have local stops, increasing the number of riders in Fairfield County who are within walking distance of a local bus route. This service is not designed to compete with existing commuter rail service; rather, it is intended to provide new bus connections and offer travel options complementary to rail.

Economic Considerations

The new 400 rides per day will bring in about \$175,000 in new revenue. Operating costs, however, would increase by about \$370,000 per year. Relative to the other alternatives, this alternative is lower cost. However, the additional revenue needed to operate in a new service area may come at the cost of the existing system.

The other economic consideration is the access to jobs that this service would provide. Bus service sees some use in wealthier areas, perhaps bringing household workers to their jobs in single-family homes. It is possible that New Canaan would open up new opportunities for workers or provide a more convenient alternative to the existing rail. Moreover, some developments may see the added bus service as an attractive benefits to potential tenants.

Public Involvement

The TC did not see expanded service to New Canaan as an alternative worth considering. The relatively low ridership anticipated to be generated from this service as well as the need to focus on improving existing service led the TC to this conclusion. Moreover, the public input from transit riders suggested that the current system serves their access needs.

Outcome

Providing new service to New Canaan has some accessibility and ridership benefits. Yet, the potential for service expansion to come at the cost of the existing system is a major concern. Following the recommendation of the TC, this alternative will not be considered further for this study.



Service Level Increases

Increasing service frequency and service span was considered in the previous chapter on all routes. Ideally service level increases could be implemented on every route; however, the emphasis on the highest demand routes is being considered going forward. The four routes with the highest demand include Routes 311 Port Chester, 328 Cove Road, 331 High Ridge Road, and 341 Norwalk. The service level increases would lower peak headways from 20 minutes to 15 minutes and off-peak headways from 30 minutes to 20 minutes.

Table 2 Service Level Increases Evaluation

Performance Metrics		Rating	Performance Metric Summary
<i>Transit Performance</i>	Ridership changes	●	●
	Frequency	●	
	Intermodal connectivity	◐	
	Reliability	●	
	Environmental justice	●	
<i>Transportation System Performance</i>	Walkability and access to transit	◐	●
	Increased mobility/accessibility	●	
<i>Economic Considerations</i>	Costs	◐	◐
	Access to jobs/customers	●	
	Development compatibility	◐	
<i>Public Involvement</i>	Technical Committee	●	●
	Community input	●	

(● = good, ◐ = fair, ○ = poor)

Transit Performance

Increasing service levels on the four routes would increase peak ridership by about 17% and off-peak ridership by 20.7%. This would result in an increase of 2,000 daily bus trips. This could provide a noteworthy benefit to the environmental justice communities currently served by these routes, and the service increases would bolster the system’s overall quality of service. Transit performance may help improve intermodal connectivity by reducing wait times at the train station, but increasing service frequency would not necessarily improve walking and biking.



Transportation System Performance

Service level increases are anticipated to improve system-wide mobility, particularly through expanded service hours. In some respects, the expanded service hours could make some residents have access to transit that currently do not consider it an option.

Economic Considerations

The cost of offering increased service levels on Routes 311, 328, 331, and 341 is \$1.17 million per year. This represents an increase of about 27% and would require five additional peak hour vehicles. Keeping in mind ridership revenue would increase by an estimated \$614,000 per year, this opportunity is not quite as costly as some of the others. One of the greatest economic benefits will be to people who need to access jobs outside of the existing service hours. The benefits to developments are likely minimal.

Public Involvement

Throughout the community engagement process, members of the TC and public have emphasized this opportunity as a top priority. Existing bus riders welcome shorter waits, particularly those who frequently miss their transfers as the STC. The Technical Committee agreed that reducing headways would benefit existing riders, and they saw the ridership growth as an added opportunity.

Outcome

Stemming from the enthusiastic support of the TC and public, this alternative will move forward to the implementation phase of the study.



Express Services

As noted above, Routes 311 Port Chester and 341 Norwalk would provide noteworthy benefits through increasing service levels. These routes were also considered as candidates for limited stop or express service. With more than 60 stops each, these services can attract more riders along their routes with an option that skips many of the stops and reduces travel time for longer trips, typically in conjunction with an underlying local serving all stops. Additionally, the southern sections of routes like 331 High Ridge and 335-336 Washington/Long Ridge may see similar benefits. Routes 311 and 341 were the subject of potential service enhancements as part of the Route 1 BRT Feasibility Study. The Stamford Bus and Shuttle Study endorses the results of that study and further recommends such enhancements in this key corridor. As an interim step, CTtransit may consider a limited 311/241 overlay service to pilot the potential service.

Table 3 Express Service Evaluation

Performance Metrics		Rating	Performance Metric Summary
<i>Transit Performance</i>	Ridership changes	●	●
	Frequency	◐	
	Intermodal connectivity	◐	
	Reliability	●	
	Environmental justice	●	
<i>Transportation System Performance</i>	Walkability and access to transit	◐	●
	Increased mobility/accessibility	●	
<i>Economic Considerations</i>	Costs	◐	●
	Access to jobs/customers	●	
	Development compatibility	●	
<i>Public Involvement</i>	Technical Committee	◐	●
	Community input	●	

(● = good, ◐ = fair, ○ = poor)

Transit Performance

This opportunity has many benefits for transit performance. Express service would improve the quality of service for many, particularly riders who currently travel the full length of the routes. Assuming the new service does not take away from existing system routes, express could benefit many of the environmental justice communities that are served by these routes. Ridership is also expected to



increase as trips from Port Chester and Norwalk become more reasonable options relative to other modes. This opportunity does not necessarily have any impacts on intermodal connectivity, nor does it inherently mean there will be reduced headways or expanded service hours.

Transportation System Performance

The impact of express service system on the transportation system performance overall is limited. Express service may help improve mobility and accessibility by making bus service a more reasonable option for people who regularly travel between Port Chester, Norwalk, and Stamford. Walkability and access to transit would not see major changes, however.

Economic Considerations

Although new ridership revenue is anticipated, the cost of operating this service without making cuts elsewhere is significant. There may be some economic benefits that come with improved mobility and accessibility. For instance, the express service may help riders access jobs. Depending on the type of express service that is implemented, there may be potential for development in communities adjacent to express service.

Public Involvement

Members of the public who participated in one of the outreach events suggested that faster, more reliable service would benefit their trips on CTtransit. The TC expressed interest in this opportunity but in light of some of costs and challenges did not view it as a top priority.

Outcome

Because of the support of the public and the potential to improve the quality of the system, particularly in environmental justice communities, this opportunity is going forward for additional consideration in the implementation phase.



Premium Bus Services

Premium bus services are where riders are charged a higher fare for service that is faster or offers amenities not offered on other services. In terms of speed, premium bus service can operate like express bus service. Premium bus service adds amenities, such as wifi or more comfortable seats, in exchange for the higher fee.

Table 4 Premium Bus Service Evaluation

Performance Metrics		Rating	Performance Metric Summary
<i>Transit Performance</i>	Ridership changes	●	●
	Frequency	●	
	Intermodal connectivity	●	
	Reliability	●	
	Environmental justice	○	
<i>Transportation System Performance</i>	Walkability and access to transit	●	●
	Increased mobility/accessibility	●	
<i>Economic Considerations</i>	Costs	●	●
	Access to jobs/customers	●	
	Development compatibility	●	
<i>Public Involvement</i>	Technical Committee	○	●
	Community input	●	

(● = good, ● = fair, ○ = poor)

Transit Performance

Premium bus service theoretically provides an improved quality of service for riders, though the reliability of the route would still largely depend on the traffic conditions. With fewer stops, it is assumed that there would be less of a cause for delay. This opportunity, however, would have minimal impact on key transit performance metrics, such as increasing ridership, reducing headways, or benefiting intermodal connectivity. Moreover, the service has equity implications because many people from environmental justice communities would not utilize this new investment due to the higher fare.



Transportation System Performance

Without the potential for higher ridership, this option would not have major benefits for the transportation system as a whole. Whereas there may be some modest mobility and accessibility benefits for some, this opportunity would not improve overall access to transit. Some transit agencies have sought to use premium transit to appeal to riders who have access to a vehicle but may opt instead to take transit if comfortable enough. This concept, however, is outdated. Relative to improving reliability and frequency of service, premium services do little to improve overall ridership and transportation system performance.

Economic Considerations

Premium bus service is one of the cheaper opportunities included in this chapter. Premium buses come at roughly the same operating cost of regular buses. The ridership level increase is unknown, but a substantial increase in revenue is not anticipated. This opportunity by itself would likely not improve access to jobs or result in any major developments.

Public Involvement

The public did not have an expressed interest in this form of an investment. Although some suggested wifi would be a welcome addition to their ride, other amenities offered by premium bus service went unmentioned. The TC expressed environmental justice concerns and did not support implementation.

Outcome

Premium bus service lacks many of the benefits that other alternatives offer. As recommended by the TC, this opportunity will not be considered further under this study.



Transit Priority Measures

Transit priority measures work to increase the speed and offer more reliable service through new infrastructure, including transit-only lanes, queue jump lanes, and transit signal priority. Although transit priority measures are becoming increasingly common across the country, the concept of transit priority measures would be new to Stamford. To implement, municipal coordination will be key because signals are often controlled by multiple entities.

Table 5 Transit Priority Measures Evaluation

Performance Metrics		Rating	Performance Metric Summary
<i>Transit Performance</i>	Ridership changes	●◐	●
	Frequency	●	
	Intermodal connectivity	●	
	Reliability	●	
	Environmental justice	●◐	
<i>Transportation System Performance</i>	Walkability and access to transit	●◐	●
	Increased mobility/accessibility	●	
<i>Economic Considerations</i>	Costs	○	●◐
	Access to jobs/customers	●	
	Development compatibility	●◐	
<i>Public Involvement</i>	Technical Committee	●	●
	Community input	●	

(● = good, ●◐ = fair, ○ = poor)

Transit Performance

The greatest benefit of transit priority measures is increased reliability and quality of service. Without personal automobiles blocking existing lanes, public transit can more reliably arrive at bus stops. In some cases, transit priority measures can bolster intermodal connectivity by offering opportunities for safer bicycling and walking. Transit priority measures may lead to ridership growth, however this largely depends on the extent of the improvements. Environmental justice communities could also see noteworthy benefits, but this also depends on the location and extent of the improvements.

Transportation System Performance



Transit priority measures can have important benefits to the transportation system. In Stamford, a transit-only lane could allow corporate shuttles, which could support more organized and efficient peak hour mobility, particularly surrounding the Stamford Transportation Center. Transit priority measures alone will not necessarily improve the pedestrian environment, however, transit priority investments are often paired with pedestrian infrastructure improvements in a Complete Streets approach. In some cities, transit lanes also welcome people on bicycles or provides space for bicycles adjacent to the transit lane.

Economic Considerations

The greatest challenge to transit priority measures is often cost. Bus-only lanes, for instance, can cost nearly \$3 million per mile with capital improvements, and transit signal prioritization or queue jump lanes could come with significant costs as well. Cities have implemented these enhancements through a combination of local, state, and federal grants, so funding for this alternative would come from multiple sources. Not all implementation will require significant cost, however. Roadway striping and redesign, particularly on North State Street between Atlantic Street and Washington Boulevard, can bring tangible benefits without significant capital investment. Pilot projects are strongly recommended to test approaches, gather public feedback, and refine designs for interim implementation before long-term capital investment is made.

More reliable service will improve access jobs within Stamford and the region. Robust transit improvements can play a direct role in fostering development, as well as a sustainable approach to multimodal mobility in the city's core.

It should be noted that some bus stops may need to be relocated if TSP is implemented. TSP works best in cases where the stops are located on the far-side of the intersection.

Public Involvement

Reliability of the transit network was a key concern the public shared at all events. No other alternative addresses the reliability factor quite as well. The TC committee suggested that the benefits of transit priority measures make this alternative worth considering further. Members of the business community also echoed a desire to improve transit performance around the STC and a willingness to rethink roadway function and hierarchy in the area.

Outcome

This opportunity is going forward for further consideration.



Changes to Route Network

The previous chapter described potential new market routes as well as combining existing routes that currently connect at the STC. Of the STC-related routes considered, the 341 Norwalk/311 Port Chester route is worth further study. This option will not be considered further as a part of this study because it is receiving careful attention as part of the Route 1 BRT Feasibility Study. The three potential new market routes, however, are evaluated below. These routes include Springdale-Cove, Springdale-Westover, and Springdale-Westhill. These are crosstown routes that do not connect to the STC.

Table 6 Changes to Route Network Evaluation

Performance Metrics		Rating	Performance Metric Summary
<i>Transit Performance</i>	Ridership changes	●	●
	Frequency	◐	
	Intermodal connectivity	◐	
	Reliability	◐	
	Environmental justice	●	
<i>Transportation System Performance</i>	Walkability and access to transit	●	●
	Increased mobility/accessibility	●	
<i>Economic Considerations</i>	Costs	○	◐
	Access to jobs/customers	●	
	Development compatibility	◐	
<i>Public Involvement</i>	Technical Committee	●	●
	Community input	◐	

(● = good, ◐ = fair, ○ = poor)

Transit Performance

Relative to transit performance, the three routes provide generally positive benefits, assuming their implementation does not come at the cost of existing service. Each of the three new routes would add between 400 and 600 new rides to the system each day. Additionally, these services would benefit environmental justice communities that fall along these routes. Assuming the services would maintain service levels seen on other medium-haul routes, the other transit performance metrics would remain roughly the same.



Transportation System Performance

This alternative would improve the overall transportation system performance by helping people cross Stamford more directly and efficiently, including eliminating some transfers at the STC. The new routes would promote walkability and access to transit as well by providing service on some streets not currently served by transit.

Economic Considerations

With the new service areas comes the possibility to improve access to jobs and new customers. The estimated operating cost for three new routes totals \$800,000 per year. Developments may see benefits to more efficient transit, though these benefits are minimal.

Public Involvement

The riders surveyed said they could access what they needed with the existing route map. As an intercept survey, non-riders were not included in the sample. Keeping this in mind, the TC considered the potential of new customers an opportunity worth pursuing.

Outcome

This opportunity should go forward for further consideration. Although the costs are high relative to the other options, this alternative has the potential to reduce transfers of existing riders and open new markets for CTtransit.



Alternative Service Methods

This alternative considered the use of transportation network companies (TNCs) on to complete the trip for riders north of the Merritt Parkway on routes 331 High Ridge and 335-336 Washington/Long Ridge. These routes see a drop in ridership north of the Merritt Parkway, so the use of TNCs or taxis may result in some cost savings.

Table 7 Alternative Service Methods Evaluation

Performance Metrics		Rating	Performance Metric Summary
<i>Transit Performance</i>	Ridership changes	◐	◐
	Frequency	●	
	Intermodal connectivity	◐	
	Reliability	●	
	Environmental justice	○	
<i>Transportation System Performance</i>	Walkability and access to transit	●	●
	Increased mobility/accessibility	●	
<i>Economic Considerations</i>	Costs	●	●
	Access to jobs/customers	●	
	Development compatibility	◐	
<i>Public Involvement</i>	Technical Committee	◐	◐
	Community input	◐	

(● = good, ◐ = fair, ○ = poor)

Transit Performance

This option would improve reliability and quality of service for riders in those areas. Users would receive “door-to-stop” service rather than having to walk to a stop. The cost savings from using a transportation network company would allow for more frequent service on the routes south of the Merritt Parkway. There are no expected ridership changes. A key drawback of this option is the Title VI implications. Also, not all transportation network companies could accommodate disabled passengers, so paratransit options would need to be further explored. Participation in the service model by TNCs or taxi companies should be contingent upon the ability to consistently and reliably provide fully accessible vehicles.



Transportation System Performance

This alternative would generally improve mobility for the system. New vehicles may be introduced to the roads north of the Merritt Parkway, but these areas do not typically see major traffic congestion. Improving the access to transit is a major benefit of this alternative.

Economic Considerations

Access to jobs and customers is an important economic benefit. Yet, the greatest benefit may be the cost savings, which could be used to invest in the existing routes south of the Merritt Parkway and the administration of the more effective and responsive on-demand options.

Public Involvement

The existing riders were generally satisfied with the existing system, and most said they tend to use private vehicles instead of taxis or transportation network companies. After initially supporting this alternative, the TC raised concern with the Title VI implications and how this alternative would impact the disabled community upon further discussions. Additionally, TC members noted that the coordination necessary (including operating agreements, policy changes, etc.) among multiple agencies and entities would increase the complexity of implementation.

Outcome

This alternative is going forward for further evaluation. Many of the Title VI concerns could be addressed through cost savings and improved frequency, reliability, and availability of connecting services.



Stop Consolidation

In some cases, bus stops that are too close together may collectively have a corridor-wide impact on timing, reliability, and operating costs. This alternative considers reducing the number of bus stops after a detailed examination of each route.

Table 8 Stop Consolidation

Performance Metrics		Rating	Performance Metric Summary
<i>Transit Performance</i>	Ridership changes	●	●
	Frequency	○	
	Intermodal connectivity	○	
	Reliability	●	
	Environmental justice	●	
<i>Transportation System Performance</i>	Walkability and access to transit	●	●
	Increased mobility/accessibility	●	
<i>Economic Considerations</i>	Costs	●	●
	Access to jobs/customers	●	
	Development compatibility	●	
<i>Public Involvement</i>	Technical Committee	○	●
	Community input	●	

(● = good, ● = fair, ○ = poor)

Transit Performance

The main transit performance benefit to this alternative is improving reliability of service. In some cases, headways and service levels could improve. This alternative is not expected to impact intermodal connectivity or ridership. The environmental justice considerations are complicated. Many would be served by more reliable service; however, others would face challenges when stops are removed. Older adults or those with mobility impairments may have to travel farther to reach their stops.

Transportation System Performance

This alternative alone will have a minimal benefit to the overall transportation system. Fewer bus stops may improve traffic flow in certain areas for all road users.



Economic Considerations

Reducing stops is not an overly costly initiative. This alternative would require additional study before implemented, however. This alternative does not address access to jobs/customers or development compatibility.

Public Involvement

The TC ranked this alternative as low-priority relative to the other options. Riders did not express an overabundance of stops as the cause of bus delays. Instead, they highlighted congestion around the STC as the source of their missed transfers.

Outcome

Many of the potential benefits are not known until further study is conducted. Going forward with further study of stop consolidation will be included in the implementation phase.



Pedestrian Environment

Although Downtown Stamford has a number of sidewalks, there are many missing links throughout the city and large, difficult intersections. This alternative aims to address missing sidewalks, particularly in the areas that are closest to transit stops.

Table 9 Pedestrian Environment Evaluation

Performance Metrics		Rating	Performance Metric Summary
<i>Transit Performance</i>	Ridership changes	●◐	●◐
	Frequency	○	
	Intermodal connectivity	●	
	Reliability	○	
	Environmental justice	●	
<i>Transportation System Performance</i>	Walkability and access to transit	●	●
	Increased mobility/accessibility	●	
<i>Economic Considerations</i>	Costs	●◐	●◐
	Access to jobs/customers	●	
	Development compatibility	●◐	
<i>Public Involvement</i>	Technical Committee	○	●◐
	Community input	●◐	

(● = good, ●◐ = fair, ○ = poor)

Transit Performance

This alternative will work to improve intermodal connectivity by improving the pedestrian environment. Assuming the improvements come in communities throughout Stamford, these could improve the conditions in environmental justice communities. This alternative is not expected to have major increases in ridership, and it will not address headways or the reliability of service.

Transportation System Performance

This alternative will benefit the transportation system as a whole. Sidewalk improvements would improve safety for all people walking Stamford, not just transit users. Moreover, improved crossings could also improve visibility, making travel within Stamford safer for all road users.



Economic Considerations

Improving the pedestrian environment may make access to jobs easier. To do a full build-out of the sidewalk network would be an expensive endeavor; however, the costs could be paid for by new developments in some areas.

Public Involvement

Transit riders did not share too many complaints about the conditions of the sidewalks, and the TC did not place a high priority on improving the pedestrian realm as part of this study. Although there are many benefits, the TC saw the other alternatives as better ways to address the explicit goals of this study.

Outcome

This alternative is not going forward for further analysis as a part of this study. Many stakeholders emphasized the need for an improved pedestrian environment in Stamford. The concurrent Stamford Bicycle and Pedestrian Plan is evaluating gaps in the network and opportunities for improved safety and multimodal connectivity. For this study, all partners recognize and emphasize the importance of non-motorized transportation. The pedestrian environment is foundational to the transit network, although not viewed as the primary driver of new ridership and system growth. Emphasis should be placed on safety and seamless pedestrian connections to and around the STC in an effort to prioritize walking and bicycling trips over short and inefficient transit or taxi trips, i.e., last mile connectivity.

CONCLUSION

This chapter evaluated the nine alternatives developed in Chapter Two. In total, six of the nine alternatives are going forward for discussion in the following chapter. The three that are not moving forward – new service areas, premium bus service, and improving pedestrian environment – either do not adequately address the goals of this study or would require detailed analysis falling outside the study's scope. The remaining six alternatives include the following:

- Service level increases
- Express services
- Transit priority measures
- Changes to route network
- Alternative service methods
- Stop consolidation

These six alternatives are shown with their ratings in the summary table below. These ratings illustrate relative anticipated impacts and performance of each. Effectiveness, and value for investment, is considered in concert with Technical Committee, public, and stakeholder feedback on priorities.



Table 10 Alternative Summary Table

Performance Metric	Service level increases	Express services	Transit priority measures	Changes to route network	Alternative service methods	Stop consolidation
<i>Transit Performance</i>	●	◐	●	◐	◐	◐
<i>Transportation System Performance</i>	●	●	●	●	●	◐
<i>Economic Considerations</i>	◐	●	◐	◐	●	◐
<i>Public Involvement</i>	●	●	●	●	◐	◐

(● = good, ◐ = fair, ○ = poor)

The following and final chapter will examine the remaining six alternatives in terms of their implementation feasibility, priority, cost, and timeline, as well as designate champions to take a leadership role in the implementation process.

URBAN TRANSIT STUDY

CHAPTER FOUR

Urban Transit Implementation Plan





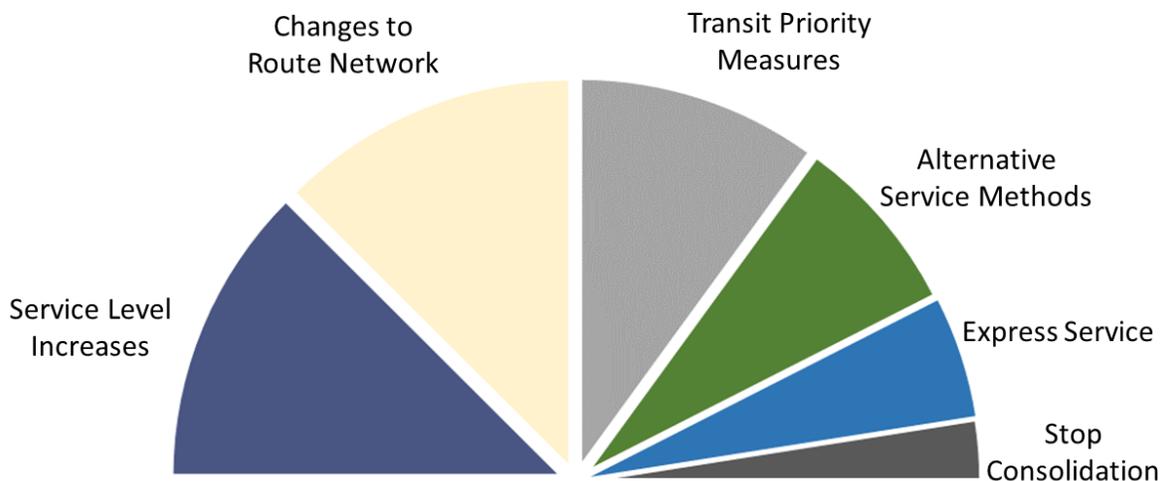
INTRODUCTION

The Stamford Bus and Shuttle Study aims to improve the existing CTtransit Stamford Division service and position the system for growth and stability in the future. In previous chapters, the project team has analyzed existing conditions (Chapter One), developed nine alternatives for addressing the study goals (Chapter Two), and evaluated each of those alternatives on a variety of performance metrics (Chapter Three). The previous chapter recommended the implementation of six alternatives. This chapter takes the six recommended alternatives and considers the costs, priorities, phasing, and champions needed to advance these efforts.

IMPLEMENTATION PLAN

The implementation plan outlines the path forward for each of the six preferred alternatives, including proposals for implementation priority. This section is organized by each alternative in suggested priority order. Each section describes the cost in terms of capital requirements and estimated operating costs, discusses implementation issues including prerequisites, and outlines the key roles from supporting agencies. The entirety of the Stamford Bus and Shuttle Study has focused on a multi-faceted approach, recognizing the potential for implementation, complexity, and potential level of benefit from its recommendations.

MULTI-FACETED APPROACH



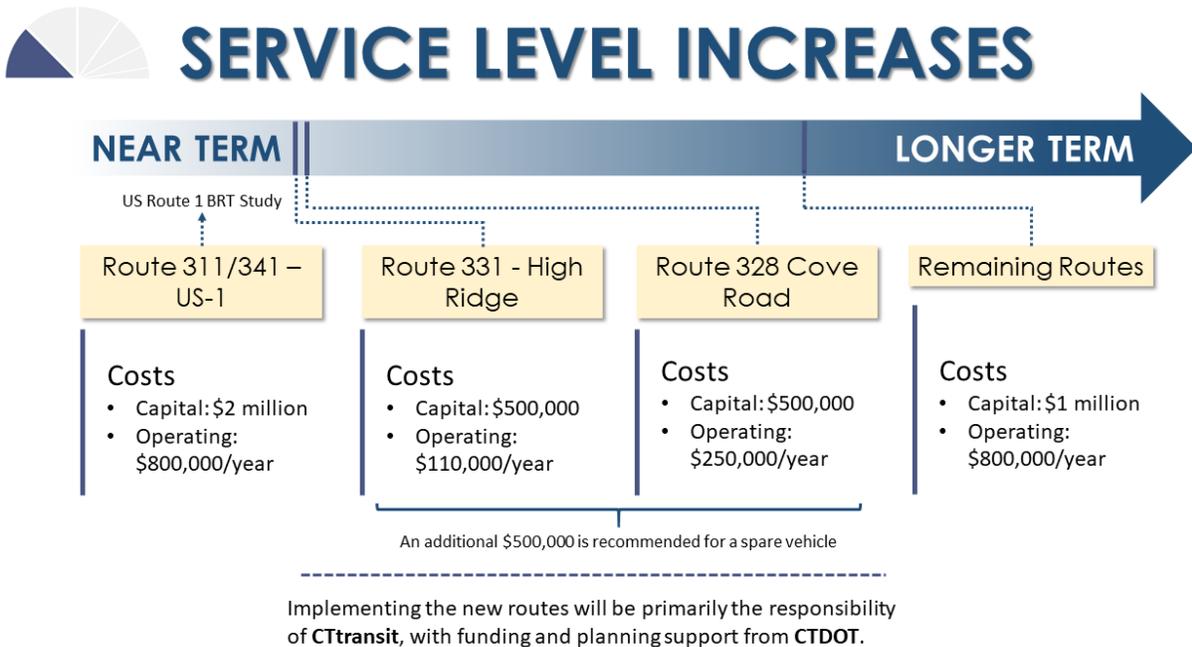
Service Level Increases

With the optimal network in place, the next priority is to enhance service on existing routes. Increasing service frequency and service span was considered on all routes. Ideally service level increases could be implemented on every route; however, the emphasis on the highest demand routes is considered the key priority.

The four routes with the highest demand include Routes 311 Port Chester, 328 Cove Road, 331 High Ridge Road, and 341 Norwalk. The service level increases would lower peak headways from 20 minutes to 15 minutes and off-peak headways from 30 minutes to 20 minutes.



In examining Route 331 – High Ridge, it was evident that the portion of the route north of Merritt Parkway has considerably poorer performance than the portion between Merritt Parkway and downtown. For this reason, the segments were considered separately, and only the southern portion is recommended for service improvements. A separate recommendation with respect to the north portion of the route (as well as Route 336 – Long Ridge) is described in the section regarding alternative service delivery.



Costs

Capital Costs

Increasing the service levels on these routes will require additional peak buses. The combination of Route 311 / Route 341 will require four additional vehicles (subject to the Route 1 BRT Feasibility Study conclusions¹) and the other route increases will each require one additional vehicle, for a total of six vehicles. With current CTtransit practice with respect to spare vehicle ratios, one additional vehicle would be required, for a total of seven vehicles

On 331 High Ridge, service increases are proposed for the south portion only, with increases from 20-minute service to 15-minute service in peaks and from 30-minute service to 20-minute service in the off-peak. For the portion north of Merritt Parkway, service is proposed to be reduced from 20-minute peak service to 30-minute peak service and from 30-minute service to 60-minute service in the off-peak. As an alternative to this service change north of Merritt Parkway, an alternative service delivery concept is also proposed later in this chapter.

¹ The Route 1 BRT Feasibility Study report is available at http://www.ct.gov/dot/lib/dot/documents/dptransportation/route_1_brt_feasibility_study_final_report.pdf.



Routes 311/341:	4 vehicles - \$2 million
Route 328:	1 vehicle - \$500,000
Route 331:	1 vehicle - \$500,000
Spare:	1 vehicle - \$500,000
Total Vehicle cost:	\$3.5 million

In addition to the new vehicles, a new turn-around facility will be required at Merritt Parkway for the short-tuning vehicles operating on the southern portion only. This facility can be incorporated into the existing left-turn loop immediately north of Merritt Parkway, at minimal cost.

Operating Costs

Total operating costs for these changes are proportional to the increase in peak vehicle requirements:

- Route 311 / Route 341: \$1.2 million
- Route 328: \$330,000
- Route 331: \$ 225,000

Net operating costs (accounting for ridership revenue),

- Route 311 / Route 341: \$800,000
- Route 328: \$250,000
- Route 331: \$ 110,000

For Route 331 – High Ridge, the total operating cost decreases from \$450,000 to \$240,000 for north of Merritt (saving \$210,000) and increases from \$750,000 to \$1.18M south of Merritt Parkway (an increase of \$430,000), for a net increase of \$230,000. Net operating costs (including revenue), are projected to decrease from \$420,000 to \$220,000 (a savings of \$200,000) north of Merritt Parkway and increase from \$180,000 to \$490,000 south of the Merritt Parkway, for a total net cost increase of about \$110,000.

Priority/Phasing

No recommendation is made regarding the timing or priority of the combined Route 311 / Route 341, since this will be determined by the separate Route 1 BRT Feasibility Study.

Between the proposed changes for Route 328 and Route 331, the Route 331 – High Ridge is recommended as a priority step (if both routes cannot be implemented simultaneously) since it results in higher net ridership increases and better tailors the allocation of resources based on demand.

Key Roles

Implementing the new routes will be primarily the responsibility of CTtransit, with funding and planning support from CTDOT. The City of Stamford and elected officials, on behalf of local residents and businesses, can offer vital political support for the funding necessary for such service expansion.

Changes to Route Network

Changes to the route network are proposed to address gaps within the network and help improve the performance of existing routes. Proposed changes include new connections between the Springdale area and employment centers, and reconfiguration of the interlined pair Route 311 / Route 341.

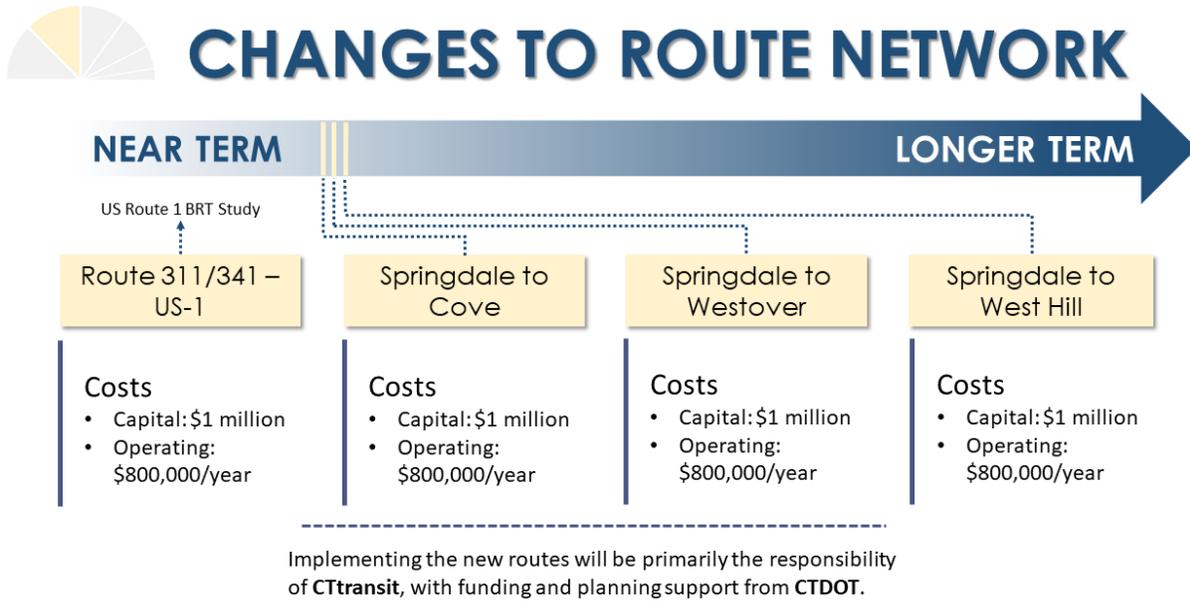
Route network changes are proposed as the first priority so that the proper network can be established to accommodate travel patterns and provide necessary access. Once the correct



network patterns are established, other proposed changes can be implemented to enhance the service.

Reconfiguration of the Route 311 / Route 341 service on US Route 1 has been the subject of a separate study, which will guide the specific recommendations and implementation process. An overview of the route assessment from this Bus and Shuttle study is provided here for context.

The proposed new routes include Springdale-Cove, Springdale-Westover, and Springdale-Westhill. These are crosstown routes that do not connect to the STC.



Costs

Capital Costs

Route 311 / Route 341

Reconfiguration of the Route 311/341 will reduce route length and will not require additional vehicle resource. Relocating the Route 311 / Route 341 route through the Main / Atlantic node may require modifications to the layover spaces in the area to accommodate the dwell time that may will now occur in this area rather than at the STC. These costs, including sidewalk and curb modifications, additional of shelters and communication equipment have not been specifically identified, but would likely be less than \$1 million.

New Routes

Each of the three proposed new routes will require three new peak period vehicles, for a total of nine vehicles. With current CTtransit practice with respect to spare vehicle ratios, one additional vehicle would be required, for a total of ten vehicles. These vehicles would have a capital cost of approximately \$10 million.

In addition to vehicles, each route will require the installation of stops, shelters, signage and such. Capital expenditures for these items have not been specifically assessed, so are estimated at \$1 million per route.



Operating costs

Each of the three proposed routes have a similar service design, resulting in similar annual operating costs of approximately \$800,000 for an aggregate of \$2.4 million annually.

In terms of net operating costs, the three routes differ slightly in their ridership projections and so have different net costs after revenue. The Springdale - Cove route has the lowest projected net cost, followed by the proposed Springdale - Westover route (about 1 percent higher), then the Springdale - Westhill route (about 10 percent higher)

Priority/Phasing

This timing of changes for the Route 311 / Route 341 service are not included in this assessment, since they will be defined by the Route 1 BRT Feasibility Study conclusions.

For the new market routes recommended in this study, each plays an important role in improving the network, and should be implemented as a package. However, if available funding dictates a staged approach, the chief difference among these routes is their financial performance, and so they could be implemented in that order:

- Springdale - Cove
- Springdale - Westover
- Springdale - Westhill

Key Roles

Implementing the new routes will be primarily the responsibility of CTtransit, with funding and planning support from CTDOT. Targeted public and stakeholder outreach can help further assess priorities and build support for new services.

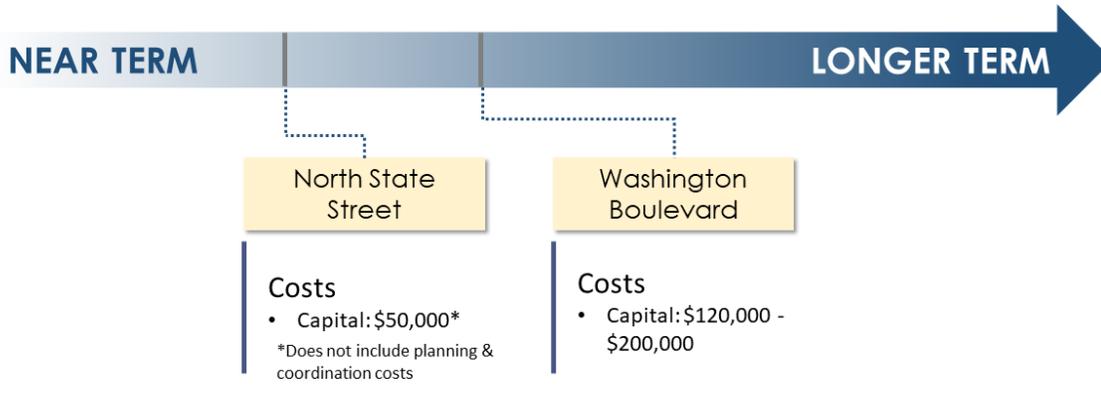
Transit Priority Measures

Transit priority measures could be beneficial throughout the network but are recommended as priority elements on North State Street, especially between Atlantic Street and Washington Boulevard, and on Washington Boulevard from Henry Street to at least Tresser Boulevard and preferably to Broad Street.

Options on both of these streets can be accomplished within the existing right-of-way only by re-allocating lane capacity from general traffic to bus and shuttle only. Initially, this could be done in peak periods only, and as a pilot program to test feasibility and local acceptance.



TRANSIT PRIORITY MEASURES



Implementing the transit priority measures will be primarily the responsibility of the **City of Stamford**, with support and coordination with **CTDOT**.

Costs

Capital Costs

Capital costs for transit priority lanes on North State Street are \$50,000 to \$80,000 depending on the number of lanes painted. These totals include costs for repainting and signage. While this distance is very short, transit delays in this area can be substantial, particularly for buses existing the STC facility to North State Street.

On Washington Boulevard, new signals would be required (North State Street, Richmond, Tresser, Main and Broad). Assuming an equipment cost of \$40,000 (since electrical infrastructure is already in place) per intersection,² the capital cost for signals would be \$120,000 to Tresser Boulevard and \$200,000 to Broad Street.³ Coordination with ongoing signal optimization work in the City of Stamford is highly recommended.

Priority and Phasing

Since the North State Street improvements may be implemented much more easily (and with wider acceptance) than the Washington Boulevard changes, transit priority lanes on North State Street should be considered first. This could also be framed as a pilot project to test the feasibility and impacts for wider application. Outreach to transit customers, employers, and local property owners is vital to advancing such a pilot project. It should be noted that transit signal priority will require the relocation of stops to the far side of the intersection, so planning for stop relocation is a timeline consideration.

² TCRP Synthesis Report 83

<https://www.itskrs.its.dot.gov/ITS/benecost.nsf/0/2706A0BD21F048F585257B65005F20B0?OpenDocument&Query=Home>

³ Note that the cost estimates do not include engineering, planning, or construction costs.



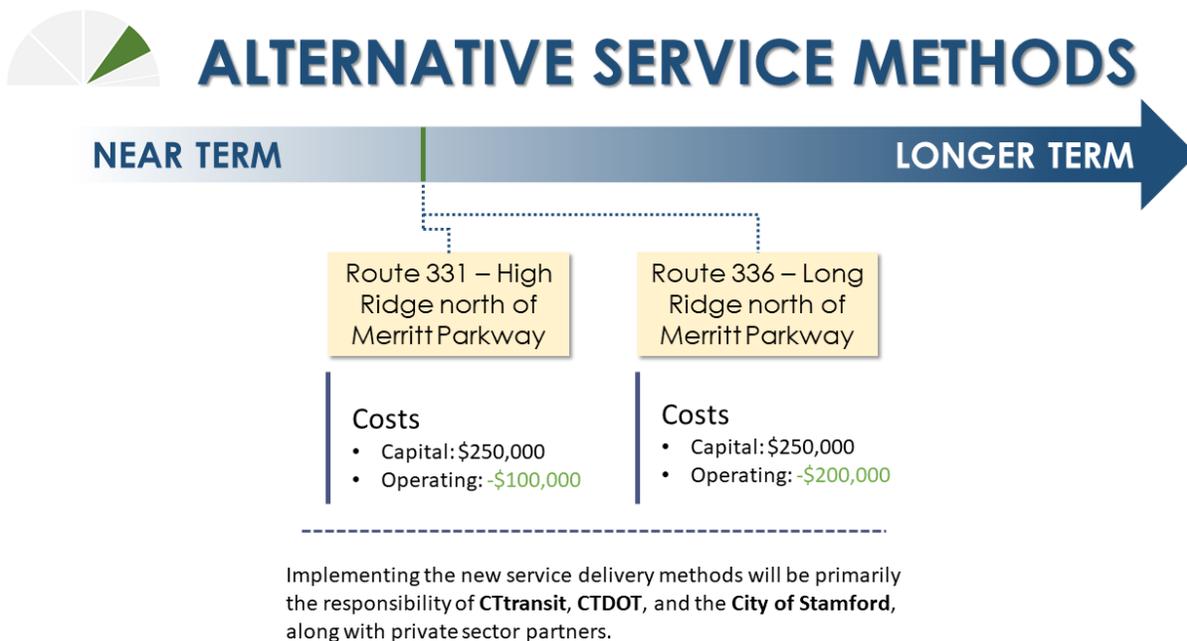
Key Roles

Implementing the transit priority measures will be primarily the responsibility of the City of Stamford, with support and coordination with CTDOT. The local street network is an enormous asset for the City of Stamford. Emphasizing the efficient movement of people over the movement of vehicles, i.e., facilitating improved transit performance in key locations, is an environmentally and fiscally sustainable approach to managing growth (and related congestion) and improving mobility for residents and visitors. The City of Stamford, CTDOT, and CTtransit will need to coordinate with neighboring transit districts (e.g., Norwalk Transit District) to maximize investment and consider other planned or implemented intelligent transportation system (ITS) solutions.

Alternative Service Methods (area north of Merritt Parkway)

Alternative service Concepts are proposed for the area north of Merritt Parkway to better tailor the resources and service levels to the demand in this area. These alternative service methods for the area north of Merritt Parkway would be implanted in conjunction with the service level changes recommended for Route 331 High Ridge south of Merritt Parkway, as an alternative to the reduced service levels on the fixed route service.

In this concept, CTtransit would enter into a contract with a taxi company, transportation networking company (TNC), or other provider to provide on-demand service north of Merritt Parkway, in the areas currently serviced by Route 331 – High Ridge and 336 Long Ridge. These on-demand services would connect with transfers to the fixed route service at Merritt Parkway on Long Ridge Road and High Ridge Road.



Costs

Capital costs

Implementing this type of service on the Route 331 and Route 336 services will reduce the vehicle requirements by one bus on each route. Each of these two buses could be allocated to one of the other



priority options requiring additional peak vehicles, reducing the capital costs in those cases by \$1 million.

Accommodating the transfer between CTtransit conventional buses on Route 331 and Rote 336 will require the development of a safe and secure transfer facility at each of the two route locations near Merritt Parkway. This could be a simple layby area allowing the taxi or TNC vehicle (typically a sedan) to wait to meet the arriving bus. (whether picking upon dropping off a passenger, the on-demand service vehicle should be at the stop prior to the buses arrival). ADA accessibility and equity are key considerations for any such contract operation.

Cost of these facilities have not been specifically assessed but would typically be expected to cost about \$250,000 each, or \$500,000.

Operating Costs

Implementing these services will keep the operating costs south of Merritt Parkway unchanged from the original – unless the savings from north of Merritt Parkway were re-allocated to this section of the route.

Based on an assumed subsidy of \$7 per trip (based on standard fare and average cab fare north of Merritt Parkway within service area⁴), and no change in ridership, the revised fixed route service would cost approximately \$100,000 less on Route 331 – High Ridge and about \$200,000 less on Route 336 – Long Ridge.

Comparing the savings to the cost of the service increase on Routes 331, it is clear that these changes in service delivery north of Merritt Parkway could finance the costs of service increases south of the parkway.

Priority and Phasing

Because of the potential for savings with this change, consideration should be given to combination with other priority items, especially service level increases, to offset the cost. Policy groundwork must also be laid to enable this change in service delivery and potential impacts on transit operating contracts.

Key Roles

Implementing the new service delivery methods will be primarily the responsibility of CTtransit, CTDOT, and the City of Stamford, along with private sector partners. Alternative service delivery requires significant policy considerations at the local and state level and coordination among multiple operators. Flexible transit, subsidized taxi services, or TNCs present an opportunity for cost savings and service improvement. All parties will need to coordinate, as these flexible services are viewed as a complement to CTtransit, not a replacement.

Express Services

Three express route options have been considered in this study. First, an express option on US Route 1 affecting the Route 311 / Route 341 service has been deferred in favor of the separate Route 1 BRT Feasibility Study.

⁴ It was determined that a shared vehicle would cost about \$7-10 per ride using the Uber app during peak periods. .

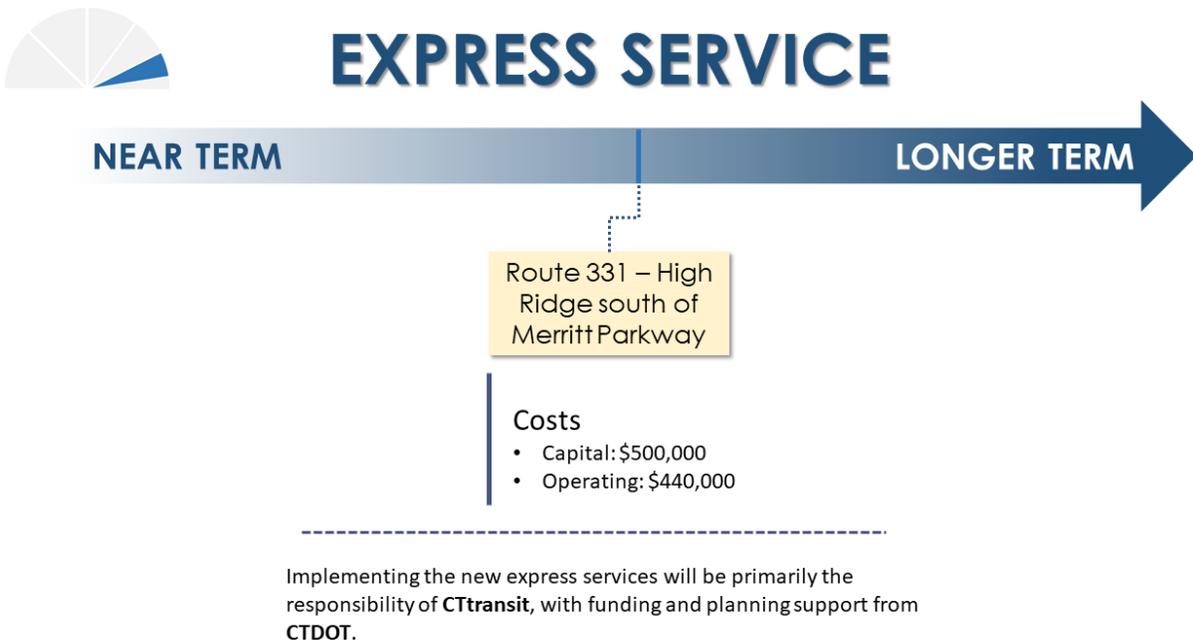


The second two options include Route 331 – High Ridge – one as a limited stop overlay service which would partially replace the existing local service, and the second as a non-stop express. The non-stop express would operate from the Merritt Parkway park-and-ride providing a direct connection to downtown Stamford.

Maximizing the potential of this service would require additional parking spaces at an expanded park-and-ride lot. Since there is no obvious solution to this issue and alternatives require additional study, this option is not recommended as a priority at this time but should be considered if opportunities arise.

An overlay express operating from the same point with limited stops between Merritt Parkway and downtown would benefit more customers and can more easily be implemented without additional infrastructure.

A service operating every 15 minutes south of Merritt Parkway (with the existing route service reduced to 30-minute service) could benefit a majority of riders along the route, and attract new riders to the service.



Costs

Capital Costs

Compared to the proposed service changes scenario for Route 331 – High Ridge, the express service would require one additional peak vehicle (in addition to the one vehicle required for the service increases).

Operating costs

Compared to the proposed service changes scenario for Route 331 – High Ridge, the express service would increase total operating costs by \$440,000 and net operating costs (including revenue) by \$350,000.



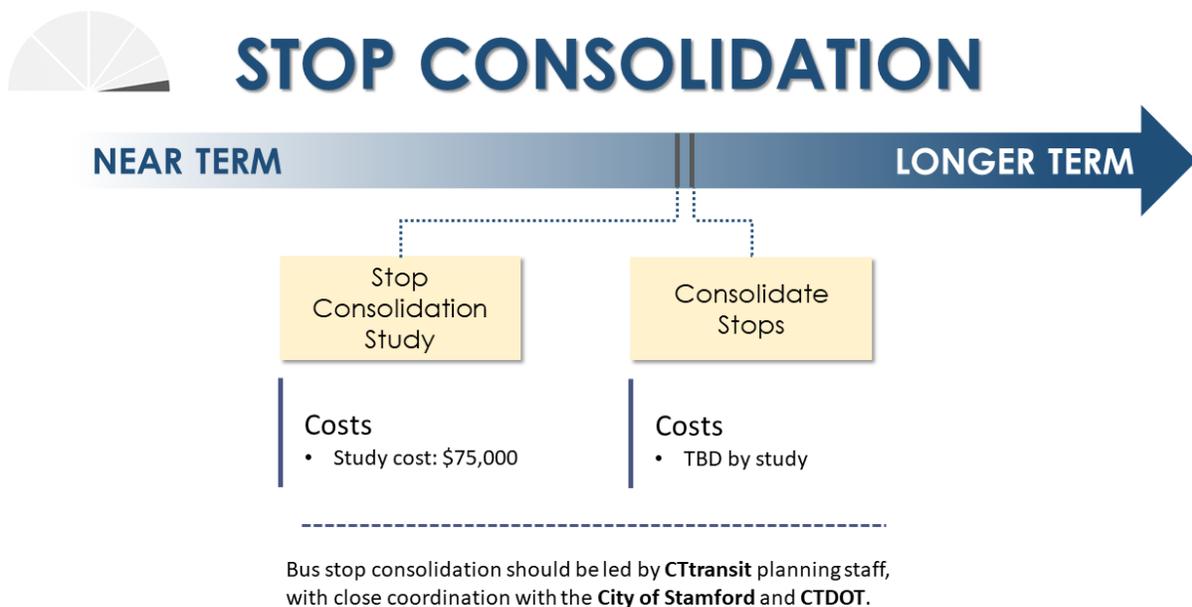
Key Roles

Implementing the new express services will be primarily the responsibility of CTtransit, with funding and planning support from CTDOT.

Stop Consolidation

The final measure among the recommended priorities is the consolidation of little used stops throughout the network. The elimination of unused stops could also be part of this program, though this will have negligible impact on the service. The greatest potential time savings will come from a reduction in the number of stops with low to moderate activity and the policy direction for appropriate, efficient spacing.

Eliminating stops with low (but not zero) use can have some impact in terms of travel time and reliability, making the service more attractive and generating additional ridership as a result. Ideally stop consolidation can occur when other tasks are being implemented, however, the system as a whole would benefit from a study identifying where stops can be removed and why.



Costs

As indicated in the previous chapter, stop consolidation will require additional study. This study should focus on evaluating current stops with low to moderate demand, ensuring proper connectivity from these stop locations to other stops on the route (sidewalks, paths and such), and identifying stops with consistent boarding activity that may be spaced too closely together. The process must ensure that stops with strategic value (regardless of total activity) are not eliminated.

Estimated cost of this study is \$75,000.



Priority / Phasing

As part of the proposed study, routes should be examined to determine where even small decreases in travel time or increases in service reliability might be important, and prioritize these routes. For instance, if a route is experiencing running time and schedule adherence issues to the point where a service adjustment is required, a stop consolidation program may eliminate or at least defer this unwanted change.

Key Roles

Bus stop consolidation should be led by CTtransit planning staff, with close coordination with the City of Stamford and CTDOT. Public and stakeholder outreach is critical to successful implementation of a stop consolidation approach, as criteria, methodology, and data-driven needs must be clearly explained to put forward an acceptable plan and demonstrate the benefits therein.

CONCLUSION AND NEXT STEPS

This chapter concludes the technical study associated with the Stamford Bus and Shuttle Study. The implementation plan considers the range of improvement alternatives selected throughout the Stamford transit network and highlights opportunities, anticipated timing and costs, priorities, and potential champions to advance and enact these recommendations. The direction laid out in this plan is directly informed by the Technical Committee, the business community, and the public.

A series of short summary documents will be provided to summarize in user-friendly fashion the core components of the Stamford Bus and Shuttle Study and provide local and regional agencies and policy-makers with concise information and direction, as well as communications tools ready for sharing to further these discussions.

As a mid-long range plan, this document provides a framework and sufficient analysis and direction to program subsequent study and commitment to the associated improvements. Taken together, these recommendations will build on the strengths of the CTtransit and urban transportation network in Stamford and position the City and the region for continued success.

