Final Report

CONNECTICUT STATEWIDE BUS STUDY

PREPARED FOR

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Executive Summary

E1 Study Purpose

In 2015, the Governor announced *Let's GO CT*, a vision and call to action for the future of the state's transportation system which:

- recognizes bus service as the foundation of Connecticut's transit system, and
- calls for a complete evaluation of the state's bus system

This effort includes additional capital projects that will be advanced during a five-year ramp-up period from Fiscal Year (FY) 2016 to FY 2020. The plan includes a 30-year vision for bus service that seeks to:

- Expand bus service by 25 percent in urbanized areas, providing residents access to bus within half-mile of home
- Modernize state-owned bus maintenance facilities
- Extend CT*fastrak* east of Hartford, and study CT*fastrak* applications elsewhere in the state[1]
- Implement Bus Rapid Transit in southwest Connecticut
- Integrate services, information, customer service statewide
- Coordinate state-of-the art service and information delivery, i.e., real-time multimodal information and smart card fare collection systems

The Connecticut Statewide Bus Study assessed travel needs and evaluated performance of the state's fixed route bus system. This study provides an understanding of the current and future direct, fixed route transit travel needs of the state's residents and employees, and provides recommendations to better align the existing bus system to meet these needs while providing the planning framework for a more interconnected and user-friendly multi-modal transit network that supports economic growth and environmental goals.

[1] http://ctfastrak.com/about/expansion-study

The study included several types of analyses, including:

- The identification of service coverage gaps, an evaluation of interconnectivity between regional transit agencies, and identification of inconsistencies between fare structures, technology, and passenger amenities;
- Development of Statewide Bus Service Guidelines to evaluate performance of individual bus routes; and
- Performance analyses for the highest and lowest performing bus routes.

Based on the system and route level performance and gap analyses, areas of improvement and specific route recommendations were developed.

An assessment of paratransit, Americans with Disabilities and not-for-profit bus services are not included in the scope of this study.

E2 Existing Transit Service in Connecticut

Connecticut is served by a multi-modal system of passenger rail, fixed-route bus, paratransit, and van services. Several transit expansions are in the planning/implementation stage.

E 2.1 Passenger Rail Service

Rail service is operated on the New Haven Line and its branches (New Canaan Branch, Danbury Branch, and Waterbury Branch) by MTA Metro-North Railroad under contract to Connecticut Department of Transportation (CTDOT), and on the Shore Line East by Amtrak under contract to CTDOT. In general, rail service is primarily oriented towards serving the Connecticut – New York City commuter market.

Passenger rail is operated by Amtrak on the Northeast Corridor (Boston – Washington, D.C.) and on the New Haven-Springfield Line.

The Hartford Line is a planned interstate rail service between New Haven and Springfield, Massachusetts with stations in New Haven, Wallingford, Meriden, Berlin, Hartford, Windsor, Windsor Locks, and Springfield. The line will serve eight stations. The service is anticipated to begin in 2018. Upon completion of the Hartford Line project, rail service on the New Haven-Springfield Line will have improved frequency, span of service, and travel times.

E 2.2 Fixed Route Bus Service

CTDOT owns the local bus divisions in Hartford, New Haven, Stamford, Waterbury, New Britain, Bristol, Meriden and Wallingford, and operates them under the CTtransit brand name. The state is fully responsible for the costs of operating these local bus systems.

The state owns and holds title to all the buses that provide CTtransit services. The state owns bus storage and maintenance facilities for the CTtransit Hartford Division, the CTtransit New Haven Division, and the CTtransit Stamford Division. In addition, the state owns bus storage and maintenance facilities for the Southeast Area Transit District and the Windham Region Transit District. A new facility for the CTtransit Waterbury Division is under construction. The operators of the New Britain and Bristol Divisions operate out of shared facilities with their private operators.

In the other non- CTtransit service areas, local transit districts hold title to the buses used for their systems and are responsible for operation of bus services. The local districts provide these bus transit services under the direction of local Boards of Directors representing the member towns. CTDOT enters into transit operating assistance contracts with the transit districts to provide financial support to the transit districts.

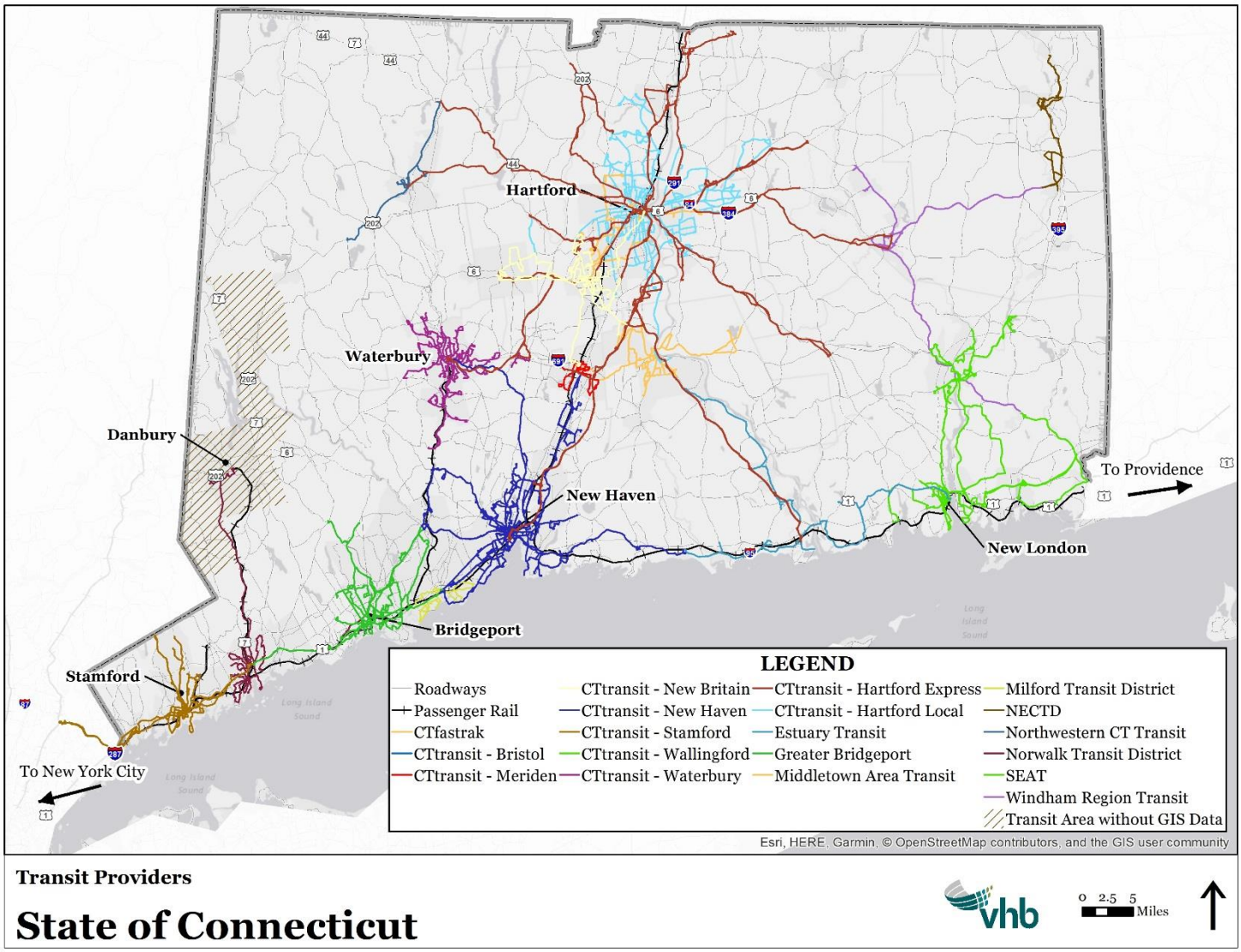
Within Connecticut, there are 19 transit systems (nine systems operated by the state under the CTtransit and CTfastrak brands and ten non-state systems) that provide fixed route public transportation, including local bus, express bus and Bus Rapid Transit (BRT) service. These 19 transit systems operate 271 routes. In addition, three private carriers, Greyhound Lines, Peter Pan Bus, and Stagecoach U.S.A. doing business as Megabus, offer intercity bus service within the state. The 19 transit systems, combined, provide more than 42 million bus passenger trips annually2, with anticipated growth in coming years. (See Figure E-1)

E 2.3 CT*fastrak*

CT*fastrak* is Connecticut's first Bus Rapid Transit (BRT) system. It is comprised of a system of bus routes that utilize a bus-only roadway for a portion of the entire trip. Ten BRT stations serve the core of the system and CT*fastrak* buses are able to exit the bus-only roadway at certain locations to deliver passengers to their destination/local stops. CT*fastrak* routes are integrated with the CT*transit* bus system to facilitate connections and transfers. All routes on the bus-only roadway circulate through the downtown Hartford area to provide access to downtown destinations. CT*fastrak* began service on March 28, 2015.

[2] Connecticut Department of Transportation 2014 ridership data

Figure E-1: Statewide Bus Service Map



E 2.4 Intercity Bus Operators

Intercity bus service in Connecticut is provided by Peter Pan Bus Lines, Inc.; Greyhound Lines, Inc.; and Stagecoach U.S.A. doing business as Megabus. Intercity bus service is operated using "over the road" type coaches.

Typical over-the-road coach bus

E 2.5 Paratransit/ADA Bus Services

As mandated by the Americans with Disabilities Act (ADA) of 1990, paratransit van services are provided within the service area of the regular fixed-route bus system for people who cannot use the local bus system due to their disability. Paratransit and ADA services are provided by 13 transit operators in various areas throughout the state.

An assessment of paratransit and ADA services in the state will be undertaken in a separate study and is not included in the scope of this study.

E 2.6 Park-and-Rides

There are 98 park and rides that are located throughout the state. These park and rides enable users to park their automobiles and transfer to local and express bus routes, allowing them to avoid traffic congestion and save on commuting costs.

Details of the Existing Conditions are provided in Chapter 2 of this Final Report.

E3 Bus Service Guidelines

CTDOT established the standards by which bus routes were evaluated. These standards provided the foundation of the Connecticut Statewide Bus Study performance analyses. All systems were evaluated consistently by the guidelines but each system's performance was compared with peer systems in the state. These evaluations informed the study's recommendations for each local and regional system as well as the full statewide system.

It is important to recognize that within every system there are high and low performing routes. Many transit properties make policy decisions to provide service on routes that may not produce high ridership, but provide a valuable service to select users or connectivity that supports higher-performing services. Sometimes routes are created to address a specific policy directive and may not be focused solely on ridership performance. By conducting the analysis on an agency level, the state can set the appropriate balance between the needs of riders, operational concerns, and funding constraints to maximize the effectiveness of the statewide system.

The guidelines identified also support the goals of the overall study, shown in Table E-1, and statewide transportation plan (Let's Go CT). The application of the recommended service guidelines for future evaluation efforts will require development of a policy by CTDOT.

Table E-1: 2016 Statewide Bus Study Goals

Goal
Enhance fixed route transit access to jobs
Develop recommended improvements to service frequency and span to relieve overcrowding, to improve reliability and to best meet the state's travel needs
Determine where connectivity between the bus and rail system in Connecticut can be enhanced
Provide cost-effective service consistent with travel needs and funding
Improve and expand urban bus service by 25% providing urban residents access to bus service with half-mile of home*
Upgrade and expand maintenance facilities to support improved fleet performance, system reliability and reduce non-revenue trips*
Provide state of the art service and information delivery*
Integrate operating service, information and customer service statewide*

* Let's Go CT goal

A more detailed description of the Bus Service Guidelines is provided in Chapter 3 of this Final Report.

E4 Process of Route Evaluation

A two-stage evaluation process was conducted. The Stage 1 Evaluation was applied to all fixed routes within the state. Upon completion of the Stage 1 evaluation, a subset of routes was evaluated in more detail in Stage 2.

Stage 1 Evaluation:

The Stage 1 evaluation assessed and ranked the statewide bus routes based on three key service guideline areas: **transit propensity** (to measure the effectiveness of network coverage), **passenger trips per revenue hour** (to evaluate operational efficiency of routes), and **on-time performance** (to assess overall route performance and identify routes which require modified running times). This approach provided an individual assessment of each route compared with other routes operated by that specific transit system, and other routes in the state. The routes were ranked, identifying the best and poorest-performing routes in assigned peer groups by system size (those routes within the top 10% of highest performing routes in each group and those within the lowest 10% of poor performing routes in each group). The best and poorest performing routes in each peer group were advanced for further analysis in Stage 2, since these are the routes that would be most worthy of adjustments and investment (best performing routes would be worthy of further investment, poor performing routes would be worthy of modification or adjustment).

Stage 2 Evaluation:

The Stage 2 Evaluation examined route and scheduling characteristics at a finer level of detail for those routes that are the highest and lowest performers. The Stage 2 evaluation applied all of the evaluation criteria and performance metrics from the service guidelines. This analysis identified specific strengths and weaknesses of the routes selected and informed the development of route-specific recommendations.

The performance measures and evaluation criteria best suited for this study were based upon the research conducted, the vision and goals for the state transportation plan (*Let's Go CT*), and the goals for the *Connecticut Statewide Bus Study*.

The proposed service guidelines were divided into four service standards: route design, schedule design, route productivity, and service delivery. These standards are consistent with industry best practices and the review of previous studies.

Details of the route evaluation process are provided in Chapter 3 of this Final Report.

E5 Bus Performance Analysis

This section provides an overview and summary of the analysis and evaluations performed.

E 5.1 Stage 1 Analysis and Evaluation

The Stage 1 evaluation utilized available data for each route upon which the three screening criteria were applied. There were cases where data in one or all categories

was not available for a particular route, therefore the route was not evaluated for that criterion.

Based on the data collected and the evaluation of bus routes and transit systems, the following conclusions about statewide bus service can be made.

- There were many bus routes that appear to have low to moderate utilization.
- On-time performance was an issue across all the transit systems. Either this data is not currently being collected, or for the systems that do collect this data, schedule adherence is an issue.

Smaller and rural transit systems may lack the resources to collect on-time performance data. However, medium and large transit systems (greater than 750,000 annual passenger trips) that do not currently measure on-time performance should collect this data to monitor and measure bus route and bus system performance.
The most accurate way to measure on-time performance is using Automated Vehicle Location (AVL) devices. Many transit systems within Connecticut do not currently have this technology on their vehicles, but the technology is being gradually added to bus fleets throughout the state (All CTfastrak, CTtransit Hartford Division (including express buses) New Haven Division, New Britain Division, Waterbury Division, and Meriden/Wallingford Division buses, Norwalk Transit District and Greater Bridgeport Transit buses are equipped with active AVL and Automated Passenger Counters (APCs).
CTDOT should make it a goal for all transit systems to have AVLs on each vehicle in service by 2025 so that this metric can be assessed for each route on a regular basis. Smaller and rural transit systems will likely require technical assistance in managing AVL systems onboard buses due to more limited resources compared to medium and larger transit systems.

E 5.2 Stage 2 Analysis and Evaluation

The goal of the Stage 2 evaluation was to further assess the 76 routes selected through Stage 1 and identify specific routes that could be improved. To achieve this objective, routes were assessed based on nine criteria from the Connecticut Statewide Bus Service Guidelines:

- bus service at major activity centers
- bus stop spacing
- bus stop amenities
- headway
- span of service
- passenger trips per revenue mile
- fare box recovery

- ratio of revenue miles to non-revenue miles
- average distance between failures
- fleet average age

Based on the analysis and evaluation of data for each Stage 2 bus route and transit system, the following conclusions were made:

Data Availability Issues
An extensive outreach effort was performed to obtain bus route level performance data, and follow-ups with transit systems were conducted in March 2016. While most transit systems were responsive and provided data, many indicated that they do not collect performance data at the route level.

A recurring challenge to the evaluation of routes was the availability of data, particularly at the route level and for the same years and time periods. The lack of standardized data suggests the need for more uniform collection and reporting of data by transit systems. Having complete and consistent data across all transit systems would enable a more "apples-to-apples" comparison of bus routes and a more comprehensive understanding of the strengths and weaknesses of transit across Connecticut.

For future studies, it might also be beneficial to have transit systems report data in formats that would allow for easier data manipulation, such as spreadsheets and databases. Data received for this study came in many different formats, with some data files like PDFs or Word documents requiring data conversion. Standardizing the format for data presentation would also aid in future evaluations of the bus system.

Finally, it was noted that larger transit systems could provide larger volumes of data, and in greater detail, than smaller transit systems for this study. This data disparity results in less assessment of routes from rural and small transit systems, which stand to benefit the most from such evaluations.

Bus Stop Spacing
Of the routes that were evaluated for this criterion, most had bus stop spacing that exceeded the recommended guidelines (i.e., they had too many stops for their route). Having too many stops can negatively affect travel time and operational efficiency.

Bus Stop Amenities, Headway, and Span of Service

All transit systems that provided data to evaluate service span fell within the benchmark, indicating that routes for those transit systems are offering service during appropriate hours. However, many of the routes had very low utilization on the first and last trips (or both) which may indicate spans of service that are too long.

From the evaluation of headway (the time interval between buses at a specific location or stop), three routes (CTtransit Waterbury Routes 22, 28, and 42) were identified as exceeding the maximum passenger load benchmark during peak service hours. This suggests that demand for travel on these routes is high and riders may be experiencing overcrowding on buses. CTtransit Waterbury should investigate these routes to determine if increasing service frequency is appropriate.

The evaluation for bus stop amenities was limited to Greater Bridgeport Transit since it was the only transit agency with boardings at the bus stop level data. It is recommended for all bus stops in the state, at a minimum, the following elements are provided: a bus stop sign and pole, a clear and stable waiting area, and static signage with bus route information.

Passenger Trips per Revenue Mile

Tracking passenger trips per revenue mile allows transit systems to understand route productivity. Routes with a low number of passengers per revenue mile may have low utilization. conversely, routes with too many passengers per revenue mile might suggest overcrowding on buses and the need to adjust service frequency.

Most transit systems track this metric, and nearly half of the routes that could be evaluated fell below the benchmark indicating low numbers of passengers per route mile. These routes were concentrated between two transit systems– Norwalk Transit District with seven routes and Middletown Area Transit with six routes. It is recommended that transit systems should examine the cause of the low passenger trips per revenue mile (whether it is service quality, overall low transit demand, or low demand along a specific segment) and determine if the cause can be addressed.

Route Productivity and Fare box Recovery Correlation

Both Passenger Trips per Revenue Hour and Passenger Trips per Revenue Mile measure route productivity, and it can be expected that routes with low passenger trips per revenue hour also have low passenger trips per revenue mile. The evaluation revealed that, indeed, nineteen of 24 routes identified in the Stage 1 evaluation as the poorest performing routes for passenger trips per revenue hour, also failed to meet the benchmarks for passenger trips per revenue mile in the Stage 2 evaluation. The five remaining routes did not have data available to evaluate passenger trips per revenue mile.

The strong connection between low passenger trips per revenue hour and low passenger trips per revenue mile is significant because it can indicate low route utility and therefore low fare box revenue. This assessment could only determine fare box

recovery at the transit system level, so no specific information was available about each route's fare box recovery rate, but five of the twelve transit systems that had low passenger trips per revenue hour also had fare box recovery ratios within the bottom 60th percentile of those systems that were evaluated in Stage 2.

On-Time Performance, Average Distance Between Failures, and Fleet Average Age Correlation

Six of the ten routes that performed poorly in Stage 1 for on-time performance also failed to meet average distance between failure and fleet average age in Stage 2. These criteria all address various aspects of service delivery and their correlation suggests that perhaps poor fleet reliability could be contributing to poor on-time performance for these routes. Since no data about the specific vehicles that were assigned to routes, transit systems with the following routes should review their on-time performance and maintenance records for their vehicles to determine if appropriate vehicle maintenance is being performed, if the same buses are being assigned to the same route daily, and if the buses are all the same age. These factors could help determine if vehicle condition could be a contributing factor for poor on-time performance.

Details of the Bus Performance Analysis are provided in Chapter 4 of this Final Report.

E6 Public Outreach

To ensure that the Connecticut Statewide Bus Study was informed by a broad range of stakeholders including the state's bus system users, residents, businesses, advocates, and planners, the study utilized a strategic and inclusive approach to engagement.

To coordinate with agency, transit service providers, Regional Planning Organizations (RPOs), and other public stakeholders, the study team met with those key stakeholders through a series of informational and working session meetings via standing quarterly RPO meetings hosted by CTDOT.

To provide clear, concise communication to the public and stakeholders and to provide the study team with public input and recommendations to inform the Study, a series of informational meetings/workshops were held at key milestones, and a study website was built to house information about the study and to host Virtual Public Workshops.

Additionally, the Study website, http://www.ctbusstudy.com, offered visitors the ability to submit comments, ask questions, and sign up for the study mailing list. The study mailing list was used to inform stakeholders about study progress and of opportunities to participate, including the Virtual Public Workshops.

Details of the Public Outreach Process are provided in Chapter 5 of this Final Report.

E7 Bus Service Recommendations

A purpose of the *Connecticut Statewide Bus Study* is to identify measures that advance the statewide bus system to be a more interconnected and user-friendly multi-modal transit network.

Recommendations have been divided into two categories, short-term and long-term:

- Short-term recommendations are intended to occur over the next five years
- Long-term recommendations are intended to occur between five and twenty years

All recommendations are dependent upon the availability of funding and consistency with state and federal guidelines.

E 7.1 Statewide Bus Study Global System and Vision-based Recommendations

The global system and vision-based recommendations are focused on the system as a whole. They include recommendations to:

- Improve bus service performance
- Establish new data collection processes
- Recommend future transit studies/investigations
- Make using the bus easier and more convenient
- Provide for increased system integration

New technologies, administrative and marketing recommendations are integrated within the global recommendations.

Table E2 provides a summary of the Global Recommendations by theme, individual recommendation, and implementation timeframe. Each recommendation is discussed in further detail in Chapter 6 of this Final Report.

Table E-2: Summary of Global Recommendations

Theme/Recommendation		Implementation timeframe
Improve Existing Bus Service Performance		
Recommendation 1	■ Adopt bus service guidelines for all transit systems	Short term
Recommendation 2	■ Form passenger advisory committees (all transit systems) ■ Consider implementation of on-line customer satisfaction surveys	Short term
Recommendation 3	■ Expand use of Automated Vehicle Location and Automated Passenger Counter technology to all bus systems in the state	Long term
Recommendation 4	■ Support review of high ridership corridors for improvements to reduce travel time	Long term
Implement Better Data Collection Processes, Tools and Reporting		
Recommendation 5	■ Collect and report data in a consistent format and level of detail ■ Create data reporting guidelines/templates	Short term
Recommendation 6	■ Establish a consistent and regular schedule for Statewide Performance Assessments	Short term
Recommendation 7	■ Create and maintain a statewide GIS database of transit agency bus systems	Short term
Conduct Future Transit Improvement Studies		
Recommendation 8	■ Investigate serving low-density/high transit propensity areas of the state	Short term
Recommendation 9	■ Align planning goals of individual transit agency development plans to Statewide transportation goals and initiatives	On-going

Table E-2: Summary of Global Recommendations (continued)

Theme/Recommendation		Implementation timeframe
Make Bus Service Easier and More Convenient to Use		
Recommendation 10	■ Expand the usefulness and capabilities of transit systems websites	Short term
Recommendation 11	■ Clearly state transfer policies between neighboring/connecting bus systems	Short term
Recommendation 12	■ Require transit systems to develop/maintain General Transit Feed Specification datasets and feeds	Short term
Recommendation 13	■ Provide real-time bus arrival information for all transit systems	Long term
Create an Integrated Statewide Bus System		
Recommendation 14	■ Conduct study to explore governance options to improve the ability to manage the state's transportation system	Short term
Recommendation 15	■ Provide consistent, understandable route numbering/identification across all bus systems	Short term
Recommendation 16	■ Adopt smart card technology to enable seamless travel across systems	Long term
Recommendation 17	■ Create a single, statewide fare policy across systems.	Long term
Better serve Special Transit Generators		
Recommendation 18	■ Supplement transit connectivity/span of service to state and community institutions and major employers	Short term
Recommendation 19	■ Create a statewide student transit fare discount policy for college and university students	Short term

E8 Route-Specific Recommendations

Route-specific recommendations were developed based on the analyses and findings of the Stage 2 Evaluation. Like the Global Recommendations, they are dependent upon the availability of funding and compliance with State and federal guidelines and

regulations. An overview of route level recommendations is presented below and are discussed in further detail in Chapter 6 of this Final Report.

For those routes that could be evaluated, the following recommendations are made to transit system operators:

- Undertake an examination of bus stop spacing to identify/eliminate low ridership stops to help speed bus running times.
- Identify high ridership stops for installation of benches and shelters, as appropriate.
- Adjust service frequency for routes where passenger loads are high to reduce crowding.
- Review spans of service to ensure travel needs are being met.
- Identify the specific causes for low productivity and portions of bus routes that are unproductive.
- Identify opportunities for improving fare box revenue by decreasing operating costs (such as adjusting routes with low utilization) or increasing ridership (through marketing or service improvements).
- Investigate exact causes for frequent mechanical breakdowns and take steps to correct.
- Review fleets and identify vehicles for replacement or rehabilitation.

E9 Conclusions

E9.1 Statewide Bus System Evaluation

Generally, existing bus routes/transit systems provide good coverage to a majority of the state's population, in particular to populations at or below the state poverty line and zero-car households. The state's bus network plays an important role in the statewide transportation system by providing connections to other modes of transportation, like an automobile or train. Connecticut travelers can transfer between buses or automobiles and trains at most Metro-North, Amtrak and Shore Line East rail stations. Also, the state maintains a system of park-and-rides where commuters can leave their cars in parking lots while they use carpools, vanpools, buses or trains to complete their trip.

However, there are parts of the statewide bus system where needs exist and improvements can be made, such as: system performance (for example, increasing on-time percentage, providing more frequent and longer spans of service); better integration of the state's multiple transit agencies and operators (creating a more

interconnected and user-friendly statewide system), and wider provision of state of the art technology to all fixed route transit operators in the state.

E 9.2 Statewide Bus System Recommendations

Recommendations for the statewide bus system include proposals to create a more efficient and unified bus system. Improvements to bus performance can be achieved by establishing standards for route and schedule design, route productivity, service delivery and financial performance. Expanding the implementation and use of Automated Vehicle Location and Automated Passenger Counter technologies to all of the state's transit systems will allow them to identify usage and ridership trends, improve planning and scheduling, and adjust bus service to meet demand. Finally, providing accurate and easy-to-access information about bus stop locations, bus schedules, connections to other transit systems, and real-time bus arrival information to all of the State's transit systems will play a large role in the bus rider's experience and makes bus (and other modes of transit) more attractive and convenient to use.

1 Introduction

1.1 Study Purpose

In 2015, the Governor announced *Let's GO CT*, a vision and call to action for the future of the state's transportation system which:

- recognizes bus service as the foundation of Connecticut's transit system, and
- calls for a complete evaluation of the state's bus system

This effort includes additional capital projects that will be advanced during a five-year ramp-up period from Fiscal Year (FY) 2016 to FY 2020. The plan includes a 30-year vision for bus service that seeks to:

- Expand bus service by 25 percent in urbanized areas, providing residents access to bus within half-mile of home
- Modernize state-owned bus maintenance facilities
- Extend CT*fastrak* east of Hartford, and study CTfastrak applications elsewhere in the state[1]
- Implement Bus Rapid Transit in southwest Connecticut
- Integrate services, information, customer service statewide
- Coordinate state-of-the art service and information delivery, i.e., real-time multimodal information and smart card fare collection systems

The *Connecticut Statewide Bus Study* assessed travel needs and evaluated performance of the state's fixed route bus system. This study provides an understanding of the current and future direct, fixed route transit travel needs of the state's residents and employees, and provides recommendations to better align the existing bus system to meet these needs while providing the planning framework for a more interconnected and user-friendly multi-modal transit network that supports economic growth and environmental goals.

[1] http://ctfastrak.com/about/expansion-study

The study included several types of analyses, including:

- The identification of service coverage gaps, an evaluation of interconnectivity between regional transit agencies, and identification of inconsistencies between fare structures, technology, and passenger amenities;
- Development of Statewide Bus Service Guidelines to evaluate performance of individual bus routes; and
- Performance analyses for the highest and lowest performing bus routes.

Based on the system and route level performance and gap analyses, areas of improvement and specific route recommendations were developed.

An assessment of paratransit, Americans with Disabilities and not-for-profit bus services are not included in the scope of this study.

2

Existing Conditions

2.1 Existing Transit Service in Connecticut

Connecticut is served by a multi-modal system of passenger rail, fixed-route bus, paratransit, and van services. Several transit expansions are in the planning/implementation stage. A summary of the statewide system is provided in this section. Detailed profiles of each of the state's fixed route bus systems and their operators is provided in Appendix A.

2.1.1 Passenger Rail Service

Rail service is operated on the New Haven Line and its branches (New Canaan Branch, Danbury Branch, and Waterbury Branch) by MTA Metro-North Railroad under contract to Connecticut Department of Transportation (CTDOT), and on the Shore Line East by Amtrak under contract to CTDOT. In general, rail service is primarily oriented towards serving the Connecticut – New York City commuter market.

CTDOT's Role in Bus Service

CTDOT plays a number of roles in the provision of statewide bus services. CTDOT owns the bus systems serving Hartford, New Haven, Stamford, Waterbury, New Britain, Bristol, Meriden and Wallingford which operate under the brand names "CT*transit*" and "CT*fastrak*." The bus service is provided through contracts with private operators. CTDOT contracts directly for federally-mandated complementary Americans with Disabilities Act (ADA) paratransit services in the CT transit service areas, and significantly subsidizes the transit district fixed-route and ADA operations in the non-CT transit service areas.

The CTDOT Capital Program funds infrastructure projects, including improvements to bus infrastructure such as bus fleet replacements, bus facility improvements, and construction of new bus maintenance facilities for the state-owned CT transit operations in eight urban areas, transit district-owned services in seven other urban areas, rural services in five areas around the state, and paratransit operations in 14 transit systems.

CTDOT enters into transit operating assistance contracts with local transit districts/agencies to cover operating deficits up to a predetermined budget amount. While some local transit districts/agencies contribute some financial support to their bus operations, the state supports approximately 96 percent of the deficit funding in the urban systems, and the state and federal government over 83 percent of the deficit funding in the rural systems.

Passenger rail is operated by Amtrak on the Northeast Corridor (Boston – Washington, D.C.) and on the New Haven-Springfield Line.

The Hartford Line is a planned interstate rail service between New Haven and Springfield, Massachusetts with stations in New Haven, Wallingford, Meriden, Berlin, Hartford, Windsor, Windsor Locks, and Springfield. The line will serve eight stations. The service is anticipated to begin in 2018. Upon completion of the Hartford Line project, rail service on the New Haven-Springfield Line will have improved frequency, span of service, and travel times.

2.1.2 Fixed Route Bus Service

CTDOT owns the local bus divisions in Hartford, New Haven, Stamford, Waterbury, New Britain, Bristol, Meriden and Wallingford, and operates them under the CT*transit* brand name. The state is fully responsible for the costs of operating these local bus systems.

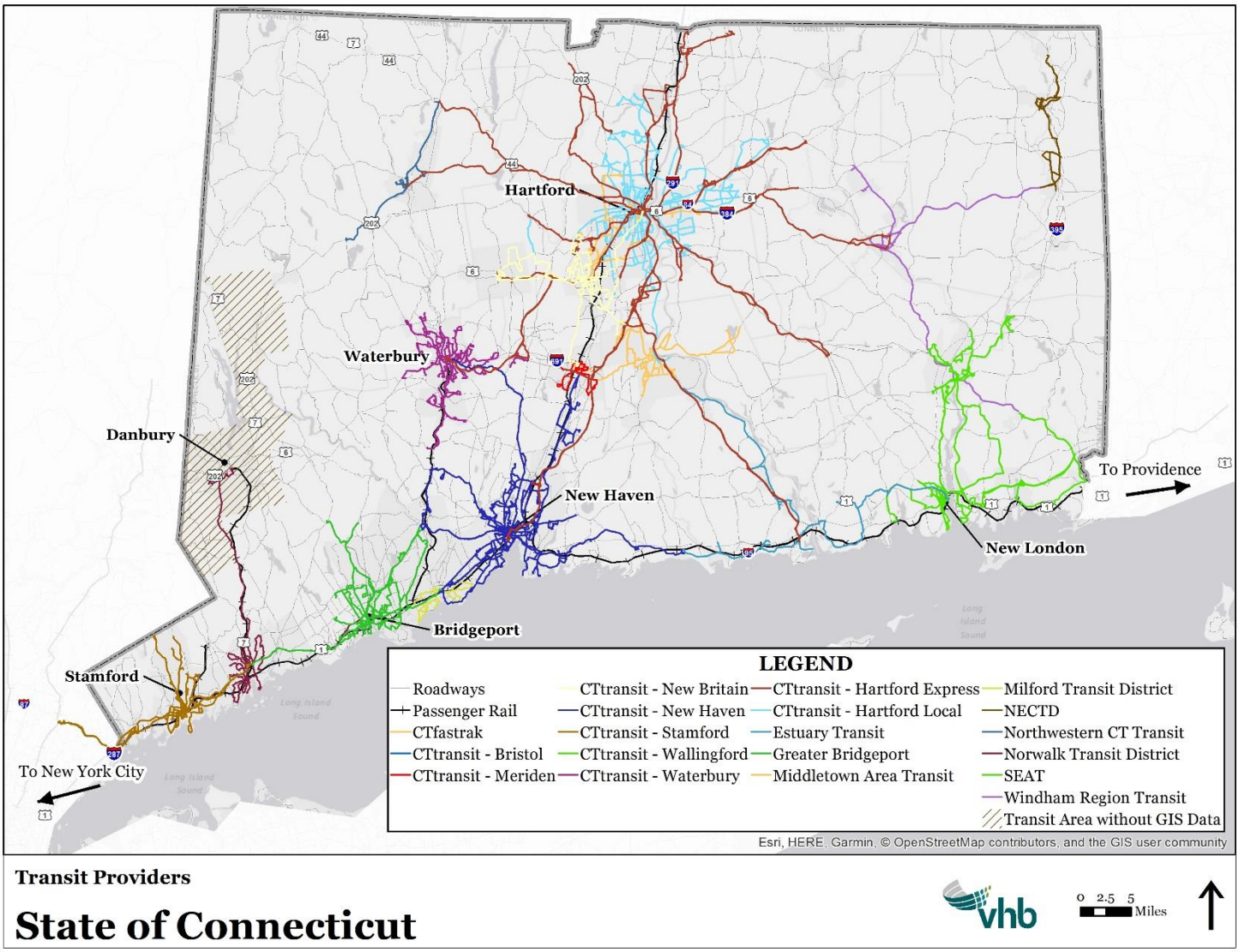
The state owns and holds title to all the buses that provide CT*transit* services. The state also owns bus storage and maintenance facilities for the CT*transit* Hartford Division, the CT*transit* New Haven Division, and the CT*transit* Stamford Division. The CT*transit* Meriden Division is maintained at a North-East Transportation Company owned facility in Waterbury, where the CT*transit* Waterbury Division buses are currently maintained. A new state-owned facility for the CT*transit* Waterbury Division is under construction in Watertown. In addition, the state owns bus storage and maintenance facilities for the Southeast Area Transit District and the Windham Region Transit District. The operators of the New Britain and Bristol Divisions operate out of shared facilities with their private operators.

In the other non- CT*transit* service areas, local transit districts hold title to the buses used for their systems and are responsible for operation of bus services. The local districts provide these bus transit services under the direction of local Boards of Directors representing the member towns. CTDOT enters into transit operating assistance contracts with the transit districts to provide financial support to the transit districts.

Within Connecticut, there are 19 transit systems (nine systems operated by the state under the CT*transit* and CT*fastrak* brands and ten non-state systems) that provide fixed route public transportation, including local bus, express bus and Bus Rapid Transit (BRT) service. (See Table 1) These 19 transit systems operate 271 routes. In addition, three private carriers, Greyhound Lines, Peter Pan Bus, and Stagecoach U.S.A. doing business as Megabus, offer intercity bus service within the state. The 19 transit systems, combined, provide more than 42 million bus passenger trips annually[1], with anticipated growth in coming years. (See Figure 1)

[1] Connecticut Department of Transportation 2014 ridership data

Figure 1: Statewide Bus Service Map



For the purposes of this study, the 19 transit systems have been classified by type (i.e., Urban bus systems and Rural bus systems) and further classified by the number of annual passenger trips. This was done to ensure transit systems of similar size were compared to their peers under the performance assessments undertaken as part of this study.

Urban bus systems with annual passenger trips over 5,000,000 include:

- CT*transit* – Hartford
- CT*transit* – New Haven
- Greater Bridgeport Transit (GBT)

Urban bus systems with annual passenger trips between 2,000,000 and 5,000,000 include:

- CT*transit* – Stamford
- CT*transit* – Waterbury

Urban bus systems with annual passenger trips from 750,000 to 2,000,000 include:

- CT*transit* – New Britain
- Norwalk Transit District (NTD)
- Southeast Area Transit District (SEAT)
- Housatonic Area Regional Transit (HART)

Urban bus systems with annual passenger trips less than 750,000 include:

- CT*transit* - Bristol
- CT*transit* – Meriden
- CT*transit* – Wallingford
- Milford Transit District (MTD)
- Middletown Transit District (MAT)
- Windham Region Transit District (WRTD)

Rural bus systems include:

- Estuary Transit District (ETD)
- Northwestern Connecticut Transit District (NWCTD)
- Northeastern Connecticut Transit District (NECTD)

The 19 transit systems are comprised of owners, operators, and managers. Their organizational structures are presented in Table 1. The owner is defined as the entity who owns the facilities and equipment. The manager is the entity responsible for overseeing and managing bus operations. The operator is the entity that is responsible for operating the bus service.

Owners include CTDOT, transit agencies, transit districts, or other governmental agencies responsible for providing transportation services. Bus system owners may manage and operate the bus system or contract with a private company to oversee transportation service providers and/or operate the bus service.

Table 1: Transit Systems in the State of Connecticut

Transit System	Service Area/Route	Owner	Operator	Manager
CT*fastrak*	New Britain, West Hartford, Newington, Hartford Routes 101, 102, 121, 128, 140, 144, 153, 161	Connecticut Department of Transportation (CTDOT)	HNS Management/ DATTCO	First Transit
CT*transit* – Bristol	Bristol Routes 541, 542, 543	CTDOT	New Britain Transportation (NBT)	NBT
CT*transit* – Hartford	Bloomfield, East Hartford, Farmington, Glastonbury, Hartford, Manchester, Middletown, Newington, New Britain, South Windsor, West Hartford, Wethersfield and Windsor Local Routes 30, 31, 32, 33, 34, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 50, 52, 53, 54, 55, 56, 58, 59, 60, 61, 62, 63, 64, 66, 69, 72, 74, 76, 80, 82, 83, 84, 85, 86, 87, 88, 91, 92, 94, 95, 96	CTDOT	HNS	First Transit
	Express Routes 901-916			
CT*transit* – Hartford	Express Route 917	CTDOT	Collins Bus Service	Collins Bus Service

Table 1: Transit Systems in the State of Connecticut (Continued)

Transit System	Service Area/Route	Owner	Operator	Manager
CT*transit* – Hartford	Express Routes 918, 950	CTDOT	Peter Pan/Arrow	Peter Pan/Arrow
CT*transit* – Hartford	Express Routes 919, 921, 923, 924, 925, 928	CTDOT	DATTCO	DATTCO
	Express Routes 926, 927		Kelley Transit	Kelley Transit
CT*transit* – Meriden	Meriden Routes A, B, C	CTDOT	Northeast Transportation (NET)	NET
	Express Route 919		DATTCO	Meriden Transit District
CT*transit* – New Britain	Berlin, New Britain, Cromwell, Newington, Plainville, Bristol and Meriden Route 41, 501,502, 503, 505, 506, 509, 510, 512	CTDOT	NBT/DATTCO/ HNS	NBT/DATTCO/ HNS
CT*transit* – New Haven	New Haven Metro Area Route B, C, D, F, G, J, L M, O, Q, S, Z, Union Station Shuttle, Commuter Connection Downtown	CTDOT	HNS	First Transit
CT*transit* – Stamford	Stamford Metro Area Route 11, 13,21, 22, 24, 26,27,31, 32, 33, 34, 35, 41, 42, 43, 45, Commuter Connection Central, I-Bus	CTDOT	HNS	First Transit
CT*transit* – Wallingford	Wallingford Route WL	CTDOT	NET	NET

Table 1: Transit Systems in the State of Connecticut (Continued)

Transit System	Service Area/Route	Owner	Operator	Manager
CT*transit* – Waterbury	Waterbury, Watertown, Naugatuck Route 11, 12, 15,16, 18, 20,22, 25 26/27/28, 31, 32, 33, 35, 36,40, 42, 44, J, N1, N2, T114, T17, T49, T74, T81	CTDOT	NET	NET
Estuary Transit District (ETD)	Chester, Clinton, Deep River, Durham, Essex, East Haddam, Haddam, Killingworth, Lyme, Old Lyme, Old Saybrook and Westbrook Routes 1, 2, 3, 4	ETD	ETD	First Transit
Greater Bridgeport Transit (GBT)	Bridgeport, Fairfield, Stratford, and Trumbull Routes 1, Coastal Link, 3, 4, 5, 6, 7, 8, 9, 10, 13, 14, 15, 16, 19X, 20, 22X, 23	GBT	GBT	GBT
Milford Transit District (MTD)	Milford, Stratford, Bridgeport Routes 1-Coastal Link, 2, 3, 4	MTD	MTD	MTD
Middletown Area Transit (MAT)	Routes A, B, C, D, E, F, H, I, M-Link	MAT	MAT	MAT

Table 1: Transit Systems in the State of Connecticut (Continued)

Transit System	Service Area/Route	Owner	Operator	Manager
Housatonic Area Regional Transit District (HART)	Danbury, Bethel, Brookfield, New Fairfield, New Milford, Newtown, Bethel, Redding, Roxbury, New Fairfield, and Ridgefield Routes 1, 2, 3, 4, 5, 6, 7, 7Link, Hospital –Danbury Mall Loop, Bethel-Newtown Rd Loop, New Milford Loop, Danbury-Brewster Shuttle, Ridgefield-Katonah Shuttle, New Fairfield-Southeast Shuttle	HART	HART	HART
Northeastern Connecticut Transit District (NECTD)	Brooklyn, Canterbury, Killingly, Putnam, Thompson, Eastford, Plainfield, Pomfret, Woodstock, and Union Routes Northern Loop, Southern Loop, North Shuttle, South Shuttle	NECTD	NECTD	NECTD
Northwestern CT District (NWCTD)	Litchfield, Torrington and Winsted Routes 1, 2, 3, 4, 5, Saturday route	NWCTD	Kelley Transit	NWCTD

Table 1: Transit Systems in the State of Connecticut (Continued)

Transit System	Service Area/Route	Owner	Operator	Manager
Southeast Area Transit District (SEAT)	Norwich, New London, Groton, Waterford, East Lyme, Griswold, Montville, Ledyard, and Stonington Route 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 101, 108	SEAT	SEAT	First Transit
Norwalk Transit District (NTD)	Norwalk, Westport, Wilton, Greenwich, and via the Coastal link to Fairfield, Bridgeport, Stratford, and Milford Routes 1, 2, 3, 4, 5/6, 7, 8, 9, 10, 11, 12, 13, Main Avenue and CT Avenue (evening and Sunday only), Merritt 7/Glover Avenue shuttle, Norwalk Hospital/Belden Avenue shuttle, 10/20 Westport Road shuttle, CT Avenue/Norwalk Community College shuttle, Norden Park shuttle, Westport Commuter shuttles (G1, G2, S1, S2, S3, S4, Imperial Avenue), Greenwich Commuter Central and West Loop, Coastal Link, Route 7 Link, 41	NTD	NTD	NTD
Windham Region Transit District (WRTD)	Southwest Windham County, southeast Tolland County, and northwest New London County Routes Willimantic City, Storrs-Willimantic, Willimantic-Danielson	WRTD	WRTD	First Transit

2.1.3 CT*fastrak*

CT*fastrak* is Connecticut's first Bus Rapid Transit (BRT) system. It is comprised of a system of bus routes that utilize a bus-only roadway for a portion of the entire trip. Ten BRT stations serve the core of the system. The buses are able to exit the bus-only roadway at certain locations to deliver passengers to their destination/local stops. CT*fastrak* routes are integrated with the CT*transit* bus system to facilitate connections and transfers.

There are several types of routes and services available to riders:

- **CTfastrak Route 101** operates between downtown Hartford and downtown New Britain, stopping at all ten stations on the busway.
- **CTfastrak Route 102** operates between downtown Hartford and downtown New Britain, making all stops on the busway, and then makes limited stops along Farmington Avenue in Hartford and all CT*fastrak* stations. From New Britain, Route 102 continues on semi-express route (making no stops) to Plainville Center and downtown Bristol via CT-72.
- **Circulator routes (Routes 121 and 128)** use the bus-only roadway for a portion of the trip, exiting the bus-only roadway at certain locations to provide service to destinations in Central Connecticut like UConn Health, Westfarms Mall, and Manchester Community College.
- **Connector routes** link stations with other destinations, such as St. Francis and Hartford Hospitals (Routes 161), West Hartford Center and Copaco in Bloomfield (Route 153), and Newington Center (Route 144).

All routes on the bus-only roadway circulate through the downtown Hartford area to provide access to downtown destinations. CT*fastrak* began service on March 28, 2015.

In response to public interest and in keeping with Governor Malloy's vision for a best-in-class transportation system, CTDOT initiated a study to evaluate options and seek public input on expansion of bus rapid transit service east of Hartford. The study identified an initial phase of service expansion that has been implemented in the summer of 2016. The second phase of the study is focusing on the identification of corridors for High-Occupancy Vehicle and on-street bus rapid transit enhancements (i.e., transit stations with real-time bus arrival information, CT*fastrak* shelters, traffic signal preference, and queue jumpers) to reduce travel time and improve the customer experience.

2.1.4 Intercity Bus Operators

Intercity bus service in Connecticut is provided by Peter Pan Bus Lines, Inc. (Peter Pan); Greyhound Lines, Inc. (Greyhound); and Stagecoach U.S.A. doing business as Megabus. Intercity bus service is operated using "over the road" type coaches.

Typical over-the-road coach bus

Peter Pan and Greyhound operate together under a revenue-pooling agreement, and so they each show the other carrier's schedules as part of a unified system. Peter Pan (which is headquartered in Springfield, Massachusetts) however is the dominant regional carrier with most of the service provided in the state, as shown in Table 2. Megabus has only two stops in the state, Hartford and New Haven. It should be noted that both Peter Pan and Greyhound provide full timetables showing all services, while Megabus shows only the buses with seats available on any particular day, and only for a specified origin-destination pair.

Table 2: Summary of Intercity Bus Services

Carrier	Route/Timetable	Frequency	Travel Time
Greyhound Lines	105 Boston-Hartford-New York Express	One daily round trip (RT) stops in Hartford (G 1908/G1966)	1:50 (1 hour and 50 minutes) Boston-Hartford, 2:30 Hartford-NY
Greyhound Lines	67-White River Junction-Hartford	One daily RT (multiple stops in Vermont and Massachusetts)	White River Junction-Hartford: 4:25
Greyhound Lines	104 Boston-NY via Hartford & New Haven	Boston-Hartford-New York: 1 daily RT Springfield-Hartford-NY: 1 daily	Springfield-Hartford: 0:35 Boston-Hartford: 2:30 Hartford-NYC Express: 2:30
Greyhound Lines	108 Boston/Providence-Foxwoods-NYC (stops in Foxwoods Casino, Mohegan Sun, New London, New Haven, Bridgeport, Stamford)	Boston-New York Local (all Connecticut Stops): 4 daily RT, plus one RT Providence-NYC with stops at Foxwoods and Mohegan Sun	Foxwoods-Stamford local: 2:50, New Haven-NYC: 2:50

Table 2: Summary of Intercity Bus Services (Continued)

Carrier	Route/Timetable	Frequency	Travel Time
Peter Pan Bus Lines	2017 Boston-Hartford-New Haven-Waterbury-New York	Boston-Hartford: 8 daily RT, plus 2 southbound (SB) 5 & 7 express, 2 SB express college; 19 daily RT Hartford-NYC (6 stop in New Britain, 6 stop in New Haven, 5 stop in Farmington, 8 in Waterbury, 6 in Southbury, 9 in Danbury)	Boston-Hartford: 2:30; Hartford-NYC: Express 2:30, Local 3:15-3:20 depending on stops
Peter Pan Bus Lines	2018 Greenfield-Amherst-Northampton-Springfield-Hartford-New Haven-Waterbury-New York	Greenfield-Hartford: 4 daily RT; Amherst-Hartford: 6 daily RT; plus 2 college specials, Hartford-New York: 19 daily RT Hartford-NYC (6 stop in New Britain, 6 stop in New Haven, 5 stop in Farmington, 8 in Waterbury, 6 in Southbury, 9 in Danbury)	Greenfield-Hartford: 2:25 (Local) Hartford-NYC: Express 2:30, Local 3:15-3:20 depending on stops
Peter Pan Bus Lines	6A, 6B and 17A services to Foxwoods Casino	6A: One daily RT Boston-Foxwoods 6B: One daily RT Concord, NH-Foxwoods 17A: One daily (plus one additional on Sat.) Amherst-UMass to Foxwoods (stop in Enfield, CT)	Varies by route
Peter Pan Bus Lines	2036 Providence-Mansfield-Storrs-Hartford-Waterbury-NYC	Providence-Hartford: 1 daily RT, plus 3 Mansfield, CT, plus 1 Friday only to UC-Storrs—connections in Hartford to New York schedules	Mansfield-Storrs: 0:45
Peter Pan Bus Lines	53A and 53B: Boston-Storrs	One Friday RT College Express (NB connects to Logan)	
Peter Pan Bus Lines	2042: Williamstown, MA to NYC via Canaan, Winsted, Torrington, Waterbury, Southbury, and Danbury	Williamstown-NYC: 2 daily RT	Canaan, CT-NYC: 3:15

Table 2: Summary of Intercity Bus Services (Continued)

Carrier	Route/Timetable	Frequency	Travel Time
Megabus	Stops in Hartford and New Haven only on routes from NYC to Burlington, VT, and on routes from Boston to Hartford through Rhode Island	Hartford-NYC: 3 RT New Haven-NYC: 1 RT Hartford-New Haven-Boston: 2 RT	Hartford-NYC: 3 hours Hartford-New Haven: 0:45

Source: Intercity Bus Operator websites

The basic Peter Pan /Greyhound service pattern involves two corridors which meet in Hartford. The Boston-Worcester-Hartford corridor generally is eight daily round-trips, with additional service on Fridays and Saturdays that are either express or college specials (with campus stops). The Greenfield-Amherst-Springfield-Hartford corridor is basically four services each from Greenfield and Amherst. These two corridors meet in Hartford, with the two corridors combining into 18-19 daily round trips to New York City. Six to eight of these round trips travel via Waterbury/Southbury/Danbury, and six stops in New Haven, and a number run as express service. In addition, Peter Pan operates between Providence and Hartford via the University of Connecticut in Storrs, with a stop in Mansfield, continuing on to New York City (as part of the 18-19 daily round trips). As can be seen in Table 2, Peter Pan also provides service to the Foxwoods Casino from Concord, New Hampshire; Amherst, Massachusetts; and from Boston. Greyhound also serves Foxwoods and Mohegan Sun (Uncasville and Ledyard) on trips from Boston and Providence. On the western side of the state, Peter Pan has two daily round-trips from Williamstown, Massachusetts to New York, with Connecticut stops in New Canaan, Winsted, Torrington, Waterbury, Southbury and Danbury. Megabus operates on through routes between New York and Boston, and New York and Burlington, Vermont.

Intercity bus fares are based on the demand for a particular schedule on a particular day. Generally walk-up fares are the highest, with lower fares for trips booked well in advance. Table 3 presents some sample fares. Greyhound and Peter Pan are part of the National Bus Traffic Association national interline system, and they sell through tickets to anywhere in the country served by member carriers. Megabus does not interline with other carriers.

In general Connecticut has extensive, frequent service to major regional cities such as Boston and New York. The route network however is not designed to facilitate intra-state trips unless they are between points on the major corridors. Trip making between corridors is more difficult—for example, a trip from Torrington to Storrs requires two transfers (at Waterbury and Hartford) and takes approximately six hours to complete the trip.

Table 3: Typical Intercity Bus Fares

Carrier	Origin-Destination	Fare Range for a Trip Tomorrow	Fare Range for a Trip in a Month
Greyhound/Peter Pan	Hartford-New York City	$13-$18	$10-$16
	Hartford-Boston	$12-$16	$9-$13
	Hartford-Providence	$24-$25	$12
	Hartford-Springfield	$8-$11	$7
Megabus	Hartford-New York City	$21	$15
	New York City-Hartford	$19	$15
	Hartford-New Haven	$13	$13

Source: Intercity Bus Operator websites

2.1.5 Paratransit/ADA Bus Services

As mandated by the Americans with Disabilities Act (ADA) of 1990, paratransit van services are provided within the service area of the regular fixed-route bus system for people who cannot use the local bus system due to their disability.

Paratransit and ADA services are provided by 13 transit operators in various areas throughout the state. These services include demand response/dial-a-ride and flexible route services as well as ADA van services.

Estuary Transit District
ETD serves Chester, Clinton, Deep River, Essex, Killingworth, Lyme, Old Lyme, Old Saybrook and Westbrook. ETD provides demand response and flexible fixed route services throughout the region with its 9 Town Transit bus services. Connections are made in Madison, Middletown and New London to neighboring bus services.

Greater Bridgeport Transit
GBT provides ADA paratransit service to qualified individuals who have both trip origins and destinations within a 3/4-mile radius of an operating GBT public bus route. Service outside this 3/4-mile area is not provided. Service is provided same as the fixed bus route schedule.

Greater Hartford Transit District
GHTD provides Elderly and Disabled transportation and ADA complementary service in the Hartford Region seven days a week. Communities served include Bloomfield,

Bristol, Cromwell, East Hartford, Ellington, Farmington, Glastonbury, Hartford, Kensington, Manchester, Middletown, New Britain, Newington, Plainville, Rocky Hill, South Windsor, Vernon, West Hartford, Wethersfield, Windsor, and Windsor Locks.

Greater New Haven Transit District
GNHTD provides complementary ADA service, under contract to CTDOT, to the New Haven area, including Branford, East Haven, Hamden, New Haven, North Branford, North Haven, Orange, West Haven, Woodbridge, as well as more limited service to Ansonia, Cheshire, Guilford, Madison, Seymour, Shelton, Wallingford and Waterbury.

Greater Waterbury Transit District
GWTD operates complementary ADA service to eight towns in greater Waterbury by Northeast Transportation.

HART
HART operates ADA paratransit seven days per week in Danbury, Bethel, Brookfield, and New Milford.

Middletown Area Transit
MAT provides paratransit (curb-to-curb) bus service to eligible individuals with disabilities that is similar to the level of service provided to individuals without disabilities who use the fixed route bus system. Service is provided Monday through Saturday.

Milford Transit District
Milford Transit operates ADA van service from Monday through Saturday.

Northeast Transportation Company
The Northeast Transportation Company operates ADA service to Meriden and Wallingford. Rides in Meriden are available Monday through Saturday between 6 a.m. and 6 p.m.

Norwalk Transit District
NTD operates ADA service to Norwalk, Stamford, Westport and 3/4-mile radius of an operating CTtransit bus route in Greenwich and Darien. Generally, service is available Monday through Saturday between 6 a.m. and 7:30 p.m. There is limited service along certain corridors Monday through Saturday 7 p.m. to 11 p.m. and Sundays from 8 a.m. to 7 p.m.

Southeast Area Transit District
SEAT operates ADA paratransit service within a 3/4-mile radius of an operating fixed SEAT bus route. Hours vary by town.

Valley Transit District
Valley Transit District's primary responsibility is to provide Dial-a-Ride service. Valley Transit District also provides complementary ADA paratransit service to the towns of

Ansonia, Derby, Seymour, and Shelton. Rides are available Monday through Friday between 6 a.m. and 5 p.m., and Saturday from 9 a.m. to 6 p.m.

Windham Region Transit District
WRTD operates fixed route rural bus service in Mansfield and Windham Monday through Saturday, and demand-response service in Ashford, Chaplin, Columbia, Coventry, Hampton, Lebanon, Mansfield, Scotland, Willington, and Windham. Complementary ADA paratransit service is contracted in the fixed route corridor.

An assessment of paratransit and ADA services in the state will be undertaken in a separate study and is not included in the scope of this study.

2.1.6 Bus Stops and Transfer Locations

Bus stops in Connecticut have a mix of signage types and passenger amenities. It is the responsibility of the transit system to install signage at bus stops. The stop types and their amenities range from a full package of amenities such as on the CT*fastrak* system (passenger shelters, real time bus information, ticket vending machines and bicycle parking) to basic amenities (bus stop signs and posts). Additionally, there are several transit centers in the state. These facilities typically feature sheltered waiting areas, bus route information, and bays for buses to layover. include:

Example of a basic bus stop

- SEAT Norwich Transportation Center
- Bridgeport Intermodal Transportation Center
- Stewart B. McKinney Transportation Center in Stamford
- Wheels Hub Norwalk
- CT*fastrak* Downtown New Britain Station

In addition to these formalized transfer locations, multiple transit agencies have informal transfer locations between routes on the street. Examples of this type of operation include downtown Waterbury and New Haven which have a pulse transfer between bus routes.

2.1.7 Intermodal Bus Connections

Rail

Intermodal connectivity between train and bus services complements both modes and promotes increased ridership and operating revenue on both modes. Intermodal connections between train stations and bus routes in the state are listed in Table 4.

Bus connections are provided at nearly all New Haven Line stations and some branch line stations (Metro-North Railroad Waterbury, Danbury and New Canaan branches). There are also bus connections available at Amtrak Springfield Line and Shore Line East stations.

Bicycles

Bicycles are an important transportation option and has a role in the overall transportation system. The following bus systems allow bicycles on-board its vehicles:

- CT*fastrak*
- CT*transit*
- GBT
- HART
- MAT
- NECTD

Airport

Bradley International Airport is served by CT*transit* Route 30 Bradley Flyer originating in Hartford.

Table 4: Bus Connections by Train Station

Train Station	Train Service	Bus Connections
Ansonia	Metro-North Waterbury Branch	CT*transit* F route/ Valley Transit (Call ride only)
Berlin	Amtrak Springfield Line	CT*transit* route 512
Bethel	Metro-North Danbury Branch	Housatonic Area Regional Transit (HART) route 5
Branchville	Metro-North Danbury Branch	Norwalk Transit Route 7 Link
Bridgeport	Amtrak Northeast Regional/Metro-North New Haven Line	Greater Bridgeport Transit routes 1, 3, 4, 5, 6, 7, 8, 9, 10,13,15,17, 19X, 22X, 23 Coastal Link, Greyhound, Peter Pan
Cannondale	Metro-North Danbury Branch	Norwalk Transit Route 7 Link
Danbury	Metro-North Danbury Branch	HART routes 1, 2, 3, 4, 5, 6, Route 7 Link, Danbury-Brewster Shuttle, Loop: Newtown Rd / South St, Mall/Hospital, New Milford (at Pulse Point)
Darien	Metro-North New Haven Line	CT*transit* routes 41 and 42
Derby–Shelton	Metro-North Waterbury Branch	CT*transit* F route/ Valley Transit (Call ride only)
East Norwalk	Metro-North New Haven Line	Norwalk Transit routes 8 and 12
Fairfield	Metro-North New Haven Line	Greater Bridgeport Transit routes 7 and Coastal Link
Fairfield Metro	Metro-North New Haven Line	Greater Bridgeport Transit routes 5 and 7
Glenbrook	Metro-North New Canaan Branch	CT*transit* route 42
Green's Farm	Metro-North New Haven Line	Norwalk Transit G1 and G 2 routes
Greenwich	Metro-North New Haven Line	CT*transit* route 11 and I-Bus/ Norwalk Transit
Hartford (Union Station)	Amtrak Springfield Line	CTtransit/CT*fastrak*/Greyhound/Peter Pan
Meriden	Amtrak Springfield Line	CT*transit* Route A1
Merritt	Metro-North Danbury Branch	Norwalk Transit Route 7 Link, route 3, Norwalk Commuter Connection - Merrit 7
Milford	Metro-North New Haven Line	CT*transit* route J/Milford Area Transit routes 2, 3, 4, Coastal Link/Milford Commuter Connection - Orange-Milford
Naugatuck	Metro-North Waterbury Branch	CT*transit* routes N1, N2, T-74 (Limited)
New Haven - State Street	Shore Line East/Metro-North New Haven Line	CT*transit* routes D, F, G, Q, Z, New Haven Commuter Connection - Downtown, Sargent Drive
New Haven - Union Station	Amtrak Springfield Line /Amtrak Northeast Corridor/ Shore Line East/Metro-North New Haven Line	CT*transit* J and 950, New Haven Commuter Connection - Downtown, Sargent Drive/Greyhound/Peter Pan
New London	Amtrak Northeast Regional/Shore Line East	Southeast Area Transit, Greyhound
Noroton Heights	Metro-North New Haven Line	CT*transit* route 42
Old Greenwich	Metro-North New Haven Line	CT*transit* route 24 B (Limited)
Old Saybrook	Amtrak Northeast Regional/Shore Line East	9 Towns Transit routes 1, 2, 3, 4, CT*transit* Hartford route 921
Rowayton	Metro-North New Haven Line	Norwalk Transit route 12

Table 4: Bus Connections by Train Station (Continued)

Train Station	Train Service	Bus Connections
Seymour	Metro-North Waterbury Branch	CT*transit* Route F
South Norwalk	Metro-North New Haven Line	Norwalk Transit NCC to CT Ave., Norwalk Hospital / Belden Ave, Merrit 7, Westport Road; routes 10, 11, 12, Evening Shuttle, Sunday Shuttle
Stamford	Amtrak Northeast Corridor/Metro-North New Haven Line	CT*transit* Stamford Commuter Connection - Central, Bulls Head, North, Rte 1 East; routes 11, 13, 21, 22/24, 26, 27, 31, 32, 33, 34, 35,41, 42, 43, 45, I-BUS/Greyhound/Peter Pan
Stratford	Metro-North New Haven Line	Greater Bridgeport Transit routes 16 and 23
Wallingford	Amtrak Springfield Line	CT*transit* route Wallingford Local
Waterbury	Metro-North Waterbury Branch	CT*transit* (New Haven) J, 28, T-17, T-47 (Ltd), T-49 (Ltd), T-74 (Ltd), T-81 (Ltd), T-114 (Ltd); CTtransit (Waterbury) 11, 12, 13, 15, 16, 18, 20, 22, 25, 26, 27, 31, 32, 33, 35, 36, 40, 42, 44, 45, CTtransit (Hartford) route 925
West Haven	Metro-North New Haven Line	CT*transit* route B - Congress Avenue
Westport	Metro-North New Haven Line	Norwalk Transit routes N, IL, S1, S2, S3, S4
Wilton	Metro-North Danbury Branch	Norwalk Transit route 7 Link
Windsor	Amtrak Springfield Line	CT*transit* routes 32 and 34
Windsor Locks	Amtrak Springfield Line	CT*transit* route 905

2.1.8 Park-and-Rides

There are 98 park and rides that are located throughout the state (See Table 5). These park and rides enable users to park their automobiles and transfer to local and express bus routes, allowing them to avoid traffic congestion and save on commuting costs.

Table 5: Park and Ride Locations with Bus Service

Park and Ride Lot	Location	Bus Connections	Parking Capacity (spaces)	Average Parking Occupancy
Andover	Route 6 and Route 316	CT*transit* 918	60	34%
Avon	Route 44 @ Walmart	CT*transit* 901	100	74%
Barkhamsted	Route 44 @ Winchester Town Line	Northwestern CT Candystriper 1, CT*transit* 926	90	44%
Bloomfield	Route 189, Sacred Heart Church	CT*transit* 56, 92	85	7%
Bolton	Route 6, 44 & I-384	CT*transit* 918	87	65%
Branford	Route 1 @ Cherry Hill	CT*transit* F, S	124	20%
Branford	I-95, Exit 55	CT*transit* F	70	50%
Bristol	Todd Street North of Route 72	CT*transit* 923	200	39%
Bristol	Route 229 @ Lake Avenue	CT*transit* 923	143	46%
Canton	Route 179 @ Route 44	CT*transit* 901	81	38%
Cheshire	I-84 Exit 26 @ Route 70	CT*transit* J4, CT*fastrak* 924	146	52%
Cheshire	I-691 @ Route 10	CT*transit* 924	118	37%
Chester	Route 9 @ Route 148	CT*transit* 921	75	56%
Colchester	Route 2 and 11	CT*transit* 914	223	44%
Colchester	Old Hartford Road @ Town Garage	CT*transit* 914	57	44%
Columbia	Route 6 @ Route 66	CT*transit* 918	53	79%
Coventry	Route 44 @ 2nd Congregational Church	Peter Pan Bus Lines	85	6%
Cromwell	I-91 Exit 21 @ Rout 372 & Sebeth Dr.	MAT E-Westlake	70	91%
Danbury	Route 7 @ Miry Brook Road	NTD 7 Link	171	30%
Danbury	Route 7 @ Federal Road	HART 4, 7	115	50%
Danbury	Route 7 @ White Turkey Road	HART Brewster Shuttle	75	46%
Danbury	I-84 @ Exit 1	HART 3	160	55%
Danbury	I-84 @ Exit 2@ Routes 6 & 202	HART 3	112	70%

Source: CTtravelsmart website, December 2017

Table 5: Park and Ride Locations with Bus Service (Continued)

Park and Ride Lot	Location	Bus Connections	Parking Capacity (spaces)	Average Parking Occupancy
Danbury	I-84 @ Exit 4 Segar St.	HART 6	50	18%
East Hampton	Route 66 @ Route 16	Middletown Area Transit F	27	29%
East Harford	Route 5 @ Main Street	CT*transit* 87, 95, CT*fastrak* 121	255	34%
East Haven	Route 1 @ Kimberly Avenue (West Lot)	CTtransit F	29	85%
East Haven	Route 1 @ Kimberly Avenue (East Lot)	CT*transit* F	20	55%
East Lyme	I-95 Exit 74 @ Route 161	Southeast Shuttle	60	71%
East Lyme	Route 161 @ Maintenance Garage	Southeast Shuttle	68	23%
Enfield	I-91 Exit 48	CT*transit* 905, Peter Pan	400	73%
Essex	Route 9 @ Exit 4	CT*transit* 921	100	27%
Farmington	I-84 Exit 39 & Route 4	CT*transit* 66	15	104%
Farmington	Route 4 @ St. Marys Church	CT*transit* 909	50	46%
Farmington	Route 4 @Town Farm Road	CT*transit* 66, 909	72	23%
Glastonbury	Route 2 & 3, Main Street	CT*transit* 91, 95, 904	323	31%
Glastonbury	St. Pauls Church, Main Street	CT*transit* 95, 904	165	25%
Glastonbury	St. Augustine's, Hopewell Road	CT*transit* 904	96	9%
Granby	Route 189, North Granby Road @1st Cong. Church	CT*transit* 911	65	24%
Hartford	Parkville Station	CT*fastrak* 101, 102, 121, 128, 923, 924, 925	9	-
Manchester	I-84 @ Buckland St.	CTtransit 82-84, 83, 91, 903	743	44%
Manchester	I-384 @ Spencer Street	CTtransit 83, 85, CTfastrak 121	245	30%
Mansfield	Route 195 @ South Frontage Road	WRTD Storrs-Willimantic	87	4%
Marlborough	Route 2 @ West Rd.	CTtransit 914	210	85%
Meriden	I-91 @ Bee St.	CTtransit 919	72	48%
Middletown	Industrial Park Road (off Route 372)	CTtransit 906	250	50%
Middletown	Route 9 @ Silver Street	CTtransit 921, MAT A	86	74%
Middletown	I-91 @ Country Club Road	CTtransit 950	50	100%

Source: CTtravelsmart website, December 2017

Table 5: Park and Ride Locations with Bus Service (Continued)

Park and Ride Lot	Location	Bus Connections	Parking Capacity (spaces)	Average Parking Occupancy
Milford	I-95 @ Old Gate Lane	CT*transit* O2	65	34%
New Britain	Route 71 south of Westfarms Mall	CT*transit* 37, 39, 902,	227	38%
New Britain	East Street Station	CT*fastrak* 101, 102, 140	23	-
New Britain	Corbin Park & Ride	CT*fastrak* 128	227	-
Newington	Route 15 @ DOT Headquarters	CT*transit* 907	157	24%
Newington	Newington Junction Station	CT*fastrak* 121, 101, 102	38	n/a
Newington	Cedar Street Station	CT*fastrak* 121, 101, 102, 144	45	
North Haven	Route 40 @ Devine Street (East Lot)	CT*transit* M3, 950	103	45%
North Haven	Route 40 @ Devine Street (West Lot)	CT*transit* M3, 950	109	58%
North Stonington	I-95 @ Route 2	SEAT 108	182	15%
Norwalk	Route 15 @ Route 123	Norwalk Transit 2	12	94%
Norwalk	I-95 Exit 16 @ Hendricks Avenue	Norwalk Transit 8	34	84%
Norwich	I-395 @ West Town St.	SEAT 5	186	48%
Norwich	I-395 @ Route 97	SEAT 6	83	45%
Norwich	W. Main Street @ Falls Avenue	SEAT 1, 2, 4, 5, 6, 7, 101	167	10%
Old Saybrook	Route 154 @ D.O.T. Maint. Garage	CT*transit* 921	37	50%
Orange	Route 15 @ Route 34	CT*transit* F	154	59%
Preston	Route 12, north of Route 2A	SEAT 2	71	11%
Ridgefield	Main St (Rt. 35) @ King Lane, United Methodist Church	Ridgefield-Katonah Shuttle	48	90%
Shelton	Route 8 @ Bridgeport Avenue	GBT 15	76	26%
Simsbury	Route 10 north of Rt. 185	CT*transit* 911	85	80%
Simsbury	Route 10 @ Hwy. Maint. Garage	CT*transit* 911	55	24%
Simsbury	Iron Horse Boulevard off Route 10/202	CT*transit* 911	179	26%
Southington	I-84 Exit 29 @ Route 10	CT*transit* 924	102	69%
Stamford	Route 15 @ Route 137	CT*transit* 31	50	82%

Source: CTtravelsmart website, December 2017

Table 5: Park and Ride Locations with Bus Service (Continued)

Park and Ride Lot	Location	Bus Connections	Parking Capacity (spaces)	Average Parking Occupancy
Stonington	I-95 @ Routes 2 & 78	SEAT 10	160	50%
Stratford	I-95 Exit 30 @ Route 113	GBT 10	67	9%
Torrington	W. Torringford & Charles St.	CT*transit* 927, NWTD 3, 4, 5	50	38%
Torrington	Route 8 Exit 44 @ Route 4 &Kinney St	NWTD 3	28	33%
Torrington	Route 8 Exit 44 @ Routes 4 & 202	NWTD 3, Peter Pan	47	41%
Trumbull	Route 8 Exit 8 @ Route 108	GBT 16	246	35%
Trumbull	Route 10 Exit 10 @ Route 111	GBT 14	100	24%
Trumbull	Route 25 @ Route 111	GBT 14	100	24%
Trumbull	Route 15 Exit 50 @ Route 127	GBT 18	73	55%
Vernon	I-84 @ Route 31	CT*transit* 917	245	51%
Vernon	I-84 @ Route 30	CT*transit* 917	183	91%
Wallingford	Route 5 East Exit 66 @ Route 15	CT*transit C2*	67	41%
Wallingford	Route 5 @ Wharton Brook Road	CT*transit C2*	79	53%
Waterbury	I-84 Exit 23 @ Route 69	CT*transit* 31	178	37%
Waterbury	I-84 Exit 18 @ Chase Parkway	CT*transit* 42	123	50%
Waterbury	I-84 Exit 25 @ Scott Rd. & E. Main St.	CT*transit* 27, 28	19	17%
Waterford	I-395 Exit 77 @ Route 85	SEAT 12	59	38%
West Hartford	Elmwood Station	CT*fastrak* 128, 121, 102, 101	48	-
West Hartford	Flatbush Avenue Station	CT*fastrak* 128, 121, 102, 101	31	-
West Haven	I-95 Exit 42 @ Route 162, Sawmill Road	CT*transit B4*	38	50%
Westport	Route 15 Exit 41 @ Route 33	NTD Transit S2	95	17%
Westport	Route 15 Exit 42 @ Route 57	NTD Transit S3	40	41%
Wethersfield	Wolcott Hill Road @ Jordan Lane	CT*transit* 47, 950	161	31%
Windsor	I-91 Exit 39 @ Archer Road	CT*transit* 30	88	5%
Windsor	I-91 Exit 38@ Route 75	CT*transit*, 32, 34, 36, 915	219	25%
Windsor Locks	I-91 Exit 42 @ Route 159	CT*transit* 905	342	44%

Source: CTtravelsmart website, December 2017

2.1.9 Fleet Characteristics

CTDOT is responsible for the purchase of vehicles for its operating divisions and allows other transit systems in the state to include their orders for vehicles under CT*transit* procurements. The total number of vehicles in the fleet by transit system, their length, propulsion and year of manufacture is shown in Table 6.

Table 6: Vehicles by Transit System

Transit System	Vehicle Type	Number of Vehicles	Vehicle Length	Manufacture Year
CT*transit* – Express (includes HNS, DATTCO, Collins, Nason/Kelley)	Commuter Bus	67	40-45 Feet	1993-2010
CT*transit* – Hartford	Motorbus	252	30-60 Feet	2001-2015
CT*transit* – New Britain/Bristol	Motorbus	22	35-40 Feet	2001-2010
CT*transit* – New Haven	Motorbus	129	40-60 Feet	1995-2014
CT*transit* – Stamford (includes I-Bus)	Motorbus	59	40-60 Feet	1995-2014
CT*transit* – Waterbury (includes CT*transit* Meriden and Wallingford)	Motor Bus	39	35-40 Feet	2004-2010
Northwestern CT*transit* District	Motor Bus	5	1 Bus (25 Feet) 4 Vans	2006-2012

Source: Fleet data provided by CTDOT

Table 6: Vehicles by Transit System (Continued)

Transit System	Vehicle Type	Number of Vehicles	Vehicle Length	Manufacture Year
Greater Bridgeport Transit	Motor Bus	55	35-40 Feet	1998-2012
Housatonic Area Regional Transit District	Motor Bus	45	30-40 Feet	2002-2014
Middletown Transit District	Motor Bus	7	30-35 Feet	2003-2015
Milford Transit District	Motor Bus	9	35-40 Feet	2003-2010
Southeast Area Transit District	Motor Bus	27	30-40 Feet	2003-2013
Norwalk Transit District	Motor Bus	64	30– 40 Feet	2003-2015
Windham Region Transit District	Motor Bus	5	30 Feet	2006-2008
Northeastern Connecticut Transit District	Motor Bus	10	25-27 Feet	2008-2010
Estuary Transit District	Motor Bus	10	30 Feet	2010-2015

Source: Fleet data provided by CTDOT

2.1.10 Vehicle Technology

CTDOT has completed the Statewide Bus Communications Project in 2014. This project developed a communication system that shares the backbone of the State Police radio system. It provides two-way communication between each bus and the bus operations control center. The enhanced communication system is used to provide real-time bus location information to the customer and to the bus operations centers.

In January 2017, CTDOT implemented a new Fare Collection System for the CT*transit* and CT*fastrak* systems. This included procurement of new fare-boxes, ticket vending machines and related equipment that offer a wide array of customer service improvements. This new technology makes it easier and faster for customers to use the system. The new fare box equipment, which in addition to reading/issuing magnetic stripe tickets and proximity cards, has the capability to accept smart cards. A smart card system is being developed.

Real-time bus information vehicle locations and arrival/departure predictions for CT*fastrak* and CT*transit*'s New Haven Division and Hartford Division bus routes are

now available route planning by its customers via the Transit app for iPhone and Android.

Automated Vehicle Location (AVL) technology and automated stop announcements developed for CT*fastrak* are being expanded to all divisions of CT*transit*. Automatic Passenger Count (APC) devices are being installed on CT*transit* buses, most recently on the Hartford Division. The devices will automatically count passengers boarding and alighting and will allow in-depth usage analysis by route.

All CTfastrak, CT*transit* Hartford Division (including express buses) New Haven Division, New Britain Division, Waterbury Division, and Meriden/Wallingford Division buses are equipped with active AVL and APC.

The CT*transit* Stamford Division bus fleet has AVL and APCs installed on vehicles, however, this equipment is not yet active, as this a separate City of Stamford contract and project.

GBT has AVL equipment on board all of its buses. Nearly one-quarter of its fleet is equipped with has APC equipment. Greater Bridgeport Transit desires to expand the number of buses with APC, but funding to purchase this equipment is a constraint.

The NTD has recently installed AVL equipment on all of its vehicles. Approximately 20 percent of the fixed-route fleet has APC equipment installed. However, all future fleet purchases will include APC equipment.

2.1.11 Fixed Route Vehicle Maintenance Facilities

Bus maintenance and storage facilities are located throughout the state. Each bus facility is listed in Table 7 and shown in Figure 2.

Table 7: Statewide Bus Facilities

System/Operator	Bus Garage or Facility Function	Location	Owner	Total Number of Vehicles	Storage Capacity	Year Opened
CT*transit* - Hartford Division	Bus maintenance and storage facility	100 Leibert Road, Hartford, CT 06141	State	270 buses and 34 support vehicles	199,700 s.f.	1990
CT*transit* - New Haven Division	Bus maintenance and storage facility	2061 State Street, Hamden, CT 06517	State	144 buses, 2 mini-buses, and 19 support vehicles	172,000 s.f.	2010
CT*transit* – Stamford Division	Bus maintenance and storage facility	26 Elm Court, Stamford, CT 06902	State	77 buses and 11 support vehicles	43,550 s.f.	2004
CT*transit* – Waterbury Division	Bus garage and maintenance facility	1717 Thomaston Avenue, Waterbury, CT 06704	Leased space	not available	not available	not available
South East Area Transit (SEAT)	Bus maintenance and storage facility	21 Route 12, Preston, CT 06365	State	32 buses and 9 support vehicles	15,600 s.f.	1982
Valley Transit District (VTD)	Bus maintenance and storage facility (State owns the property, not the building)	41 Main Street, Derby, CT 064418	State	14 mini-buses, 1 support vehicle	6,200 s.f.	1981
Windham Region Transit District (WRTD)	Bus maintenance and storage facility	25 South Frontage Road, Mansfield, CT 06250	State	5 buses and 15 mini-buses	14,500 s.f.	2015
Greater Bridgeport Transit (GBT)	Bus maintenance and storage facility	One Cross Street, Bridgeport, CT 06610	GBTA	61 buses, 27 mini-buses, and 19 support vehicles	60,000 s.f.	1987
Norwalk Transit District (NTD)	Bus maintenance and storage facility	275 Wilson Avenue, Norwalk, CT 06854	NTD	47 buses, 30 mini-buses, and 4 support vehicles	30,000 s.f.	2001
Housatonic Area Regional Transit (HART)	Bus maintenance and storage facility	62 Federal Road, Danbury, CT 06810	HART	30 buses, 37 mini-buses, and 10 support vehicles	71,000 s.f.	1997

Table 7: Statewide Bus Facilities (Continued)

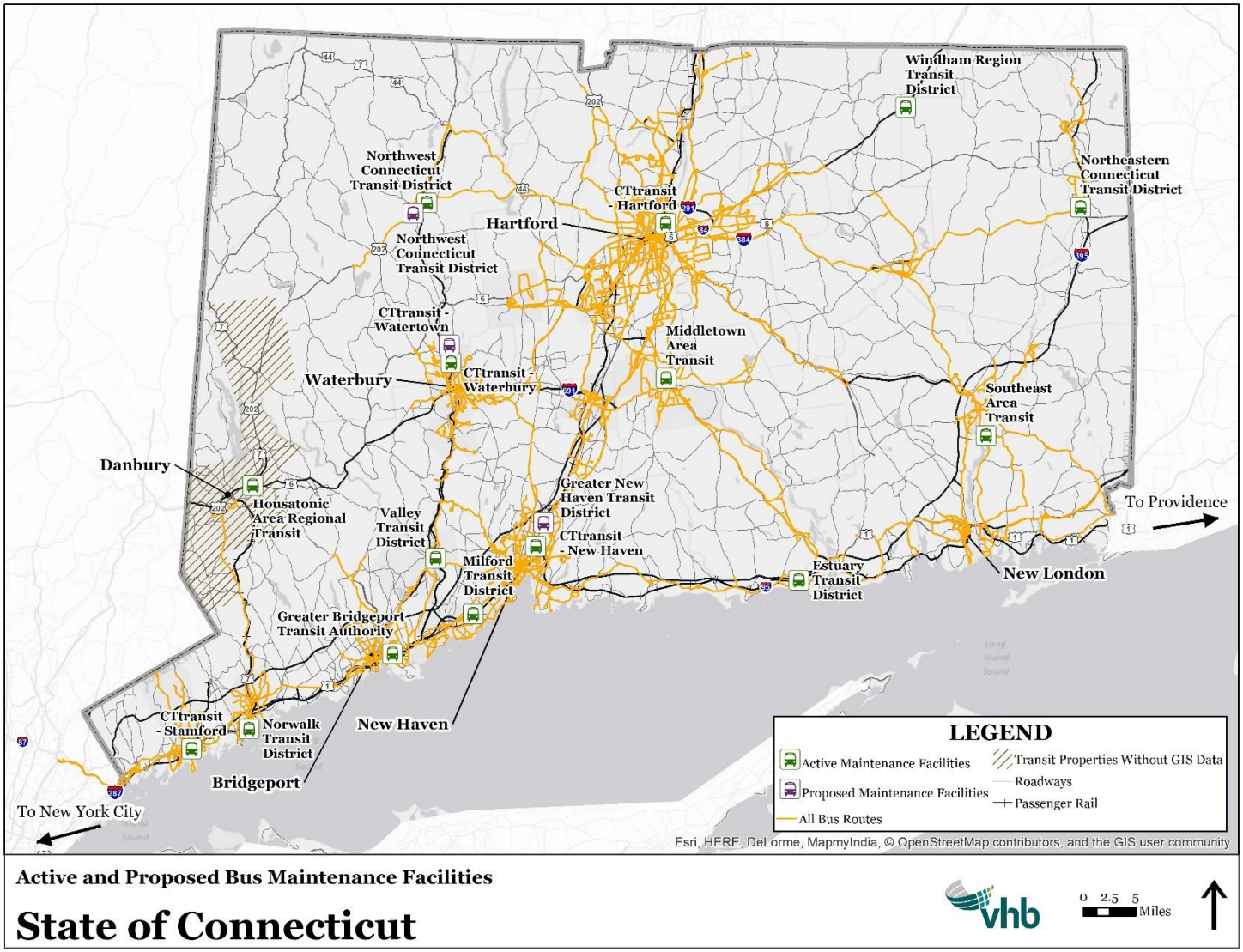
System/Operator	Bus Garage or Facility Function	Location	Owner	Total Number of Vehicles	Storage Capacity	Year Opened
Middletown Area Transit District (MAT)	Bus maintenance and storage facility	91 North Main Street, Middletown, CT 06457	MAT	10 buses, 10 mini-buses, and 2 support vehicles	12,000 s.f.	2014
Milford Transit District (MTD)	Bus maintenance and storage facility	259 Research Drive, Milford, CT 06460	MTD	9 buses, 18 mini-buses, and 3 support vehicles	19,000 s.f.	1999
Estuary Transit District (ETD)	The ETD maintenance agreement identifies Mal's Auto & Truck Repair as the "Contractor".	6 Center Rd, Old Saybrook, CT 06475	Leased space	13 mini-buses, 2 support vehicles	not available	not available
Northwest Connecticut Transit District (NWCTD)	Bus maintenance and storage facility	957 East Main Street, Torrington, CT 06790	Leased	23 mini-buses	not available	not available
Northeastern Connecticut Transit District (NECTD)	Bus garage and maintenance facility	125 Putnam Pike, Dayville, CT 06241-1626	NECTD	10 buses	10 buses	not available

Source: CTDOT

Bus Storage Facilities under construction or proposed	Status	Location	Owner	Total Number of Vehicles	Storage Capacity	Anticipated Opening Year
Greater New Haven Transit District (GNHTD) Sackett Point Road Facility	Environmental analysis at site underway	450/460 Sackett Point Road, North Haven, CT 06473	GNHTD		76,000 s.f.	not available
CT*transit* Waterbury Bus Maintenance and Storage Facility	Under construction. Will replace the existing bus storage facility on 1717 Thomaston Avenue in Waterbury. The project is expected to be completed in April 2017.	Frost Bridge Road in Watertown, CT 06787	State	82 buses	181,500	April 2017
Northwest Connecticut Transit District Torrington Bus Maintenance and Storage Facility	Was under design, on-hold since June 2014. The State is seeking acquiring two parcels, demolish the existing buildings and build a 10,000-square foot maintenance garage to be operated by the Transit District. Residents want to preserve the buildings. SHPO found demolishing the buildings would create an adverse effect.	200 Litchfield Street, Torrington, CT 06790	State		30 buses	not available

Source: CTDOT

Figure 2: Statewide Bus Facilities



2.2 Public Funding for Bus Projects

CTDOT provides funding for bus capital projects through local programs or by distributing federally allocated grant funds. The State of Connecticut funds the majority of operating deficits for all bus systems. More information on state specific subsidies for transit service are discussed in Appendix A.

CTDOT's Capital Plan for Transit for the Fiscal Years between 2016 and 2020 includes over $4 Billion in funding for capital projects. (See Table 8).

Table 8: CTDOT Capital Plan Bus and Rail Projects

Funding Source	2016	2017	2018	2019	2020
Federal Funding	$159,272,301	$143,954,061	$149,254,061	$149,254,061	$149,254,061
Carryover Federal Funding	$212,870,556	$11,844,850	$0	$0	$0
Subtotal Federal Funding	$372,142,857	$155,798,641	$149,254,061	$149,254,061	$149,254,061
State Funding	$646,875,387	$649,356,330	$440,690,000	$635,715,000	$767,440,000
Total Funding	$1,019,018,244	$805,154,971	$589,944,061	$784,969,061	$916,694,061
Programmed for Projects	**$997,519,835**	**$805,154,971**	**$585,444,061**	**$780,469,061**	**$897,194,061**

Source: CTDOT 2016-2020 Capital Plan

CTDOT has multiple bus-related capital projects planned and funded, including:

- The introduction of smartcard payment and pay by mobile phone technologies.
- Extending the Intelligent Transportation Systems (ITS) to the entire CT*transit* fleet to enable vehicle location, real-time bus arrival prediction, variable message signage at stops/stations, and on-board automated bus announcements.
- Construction of the new CT*transit* bus maintenance and storage facility in the Waterbury area.
- CT*transit* and (non-CT*transit*) Transit District bus replacements
- Construction of a bus facility in the Northwestern Connecticut Transit District and improvements to bus facilities for CT*transit* Hartford and Southeast Area Transit

2.3 Other Planning Efforts

Since the *2000 Statewide Bus Study*, multiple planning efforts have been undertaken by transit agencies, municipalities, and regional planning organizations. Additionally, there are a number of ongoing studies that cover topics related to the *Statewide Bus Study*. These studies include **service planning studies** that look at how and where bus service should operate, **corridor studies** that look at building physical infrastructure for transit (including both bus and rail service), **multimodal studies** (that cover non-transit infrastructure such as transit access plans), and finally, **other studies** that cover a variety of topics including funding and organizational issues.

Service Planning Studies

- Greater Bridgeport Transit. Transit Master Plan
- Capitol Region Council of Governments (CRCOG). Hartford Comprehensive Transit Service Analysis
- Naugatuck Valley Council of Governments (NVCOG). Waterbury Area Transit Study (WATS)
- Southeast Area Transit (SEAT). SEAT Bus Study. 2015
- Housatonic Area Regional Transit (HART). 7 Link Efficiency Study. January 2016
- Western CT Council of Governments (WestCOG). Westport Bus Service Operations and Needs Study. 2015
- WestCOG, Stamford Bus & Shuttle Study. 2015
- Southeastern CT Council of Governments. Southeast Area Transport Bus Study: Service Evaluations. January, 2015.
- CRCOG. Manchester Transit Study: Final Report. January, 2013
- CRCOG. Downtown Hartford Bus Circulation Study. December 2012
- CRCOG. Windsor TMA Final Report: Hartford Transit Enhancement Bus Study. August, 2012
- Southwest Regional Planning Association (SWRPA). Coastal Corridor Bus Study: Recommended Service Plan. May, 2012
- CRCOG. Enfield Transit Study: Final Report. August, 2012
- HART. HART Fixed Route Efficiency Study. 2011
- HART. Bus Service Plan. March, 2010
- Regional Plan Association and Transit for Connecticut Coalition. Missing Links: Prioritized Bus Service Expansion Plan. January, 2010
- HART. Expanding Bus Transit to Bridgeport and Waterbury: Final Report. December, 2007
- HART, Harlem Line Shuttle Bus Study, 2006

Corridor Studies

- CTDOT. CTfastrak Expansion Study. 2016
- CTDOT. I-84 Hartford Study. 2016
- South Western Regional Planning (SWRP). Greenwich-Norwalk BRT Feasibility Study
- CTDOT. Central Connecticut Rail Study
- SWRP. Greenwich/Norwalk Bus Rapid Transit Study. October, 2009
- City of New Haven. New Haven Alternatives Analysis

Multimodal Studies

- City of Stamford, Stamford Bicycle and Pedestrian Master Plan
- WestCOG. Darien Noroton Heights Train Station Access Study
- Tripnet. Connecticut Transportation by the Numbers: Meeting the State's Need for Safe and Efficient Mobility. December, 2014
- South Central Regional Council of Governments (SCRCOG). City of New Haven Two-way Conversion. Final Report. June, 2014
- Southeastern Connecticut Council of Governments (SECCOG). Intermodal Connections Study Southeast. February, 2005

Service Planning Studies

- Naugatuck Valley Council of Governments. Waterbury Area Transit Study
- Naugatuck Valley Council of Governments and North East Transportation Company. Waterbury Regional Bus Ridership Study. 2013

Other

- Statewide Governance Alternatives
- CTDOT. Connecticut Statewide Household Transportation Study. 2016

These studies were used to inform the identification of deficiencies and the development of recommendations in the *2016 Statewide Bus Study*. The number of studies pending, underway or completed show that there is great interest in improving the regional bus transit system. However, each of these studies focus primarily on a discreet segment of the system. The *2016 Statewide Bus Study* aims to look at the entire system comprehensively. Details of these studies can be found in Appendix B.

2.4 Statewide Demographics Analysis

2.4.1 Overview of Demographics Analysis

A focused review of the spatial distribution of population and households in relation to the state's bus network provides the foundation for how well the existing services are meeting the state's transportation needs. Identification of areas with a higher concentration of population that demonstrate characteristics linked to higher transit usage is useful in determining where transit service could be added if service is not currently available. While these analyses cannot determine the exact need for transit services, they can provide evidence for areas that could support new service or expanded service.

Demographic data for Connecticut was obtained from the US Census Bureau and household attribute and employment-related data is from the 2014 American Community Survey (ACS)[2]. This data can be used to identify the levels and locations of transit-dependent populations in the state. The ridership demand for a transit system is typically correlated to several demographic characteristics. Higher concentrations of persons demonstrating these demographic characteristics indicate areas with potentially high need for transit service. They are:

- Population Density
- Employment Density
- Older Adults
- Households under the poverty line – for the purposes of this study, this variable was computed using the state's poverty standards (roughly an annual income under $25,000 for a family of four.)
- Households without access to a vehicle

Additionally, *Let's Go CT* has set a goal to improve and expand urban bus service by 25 percent to the majority of urban residents within a half-mile of bus service.

Based on data provided by the transit systems, an analysis of existing bus network coverage was undertaken and compared with the demographic characteristics. The state's bus system has 271 bus routes. Bus service is primarily concentrated in urban areas with some limited intercity bus routes and routes with bus-rail connections.

The demographic analysis was conducted for all transit systems except for Housatonic Area Regional Transit and Middletown Area Transit because GIS data was not available. The development of a statewide GIS database is included in the Global Recommendations.

2.4.2 Population Density

Household density closely matches population density, and is useful in identifying areas where large concentrations of potential riders may be located (See Figure 3). Areas with higher household densities often have land use patterns that are supportive of fixed route transit, such as compact development and multi-family residences. In 2014, the state's population was 3,592,053 residents living in 1,356,206 households (See Figure 4). These households are largely geographically concentrated into urban centers in the southwestern portion of the state, most proximate to New York City. The areas with high densities of households per square mile are well served by existing bus routes.

2 The American Community Survey is ongoing statistical survey by the U.S. Census Bureau.

Figure 3: Bus and Rail Networks Compared to Household Density

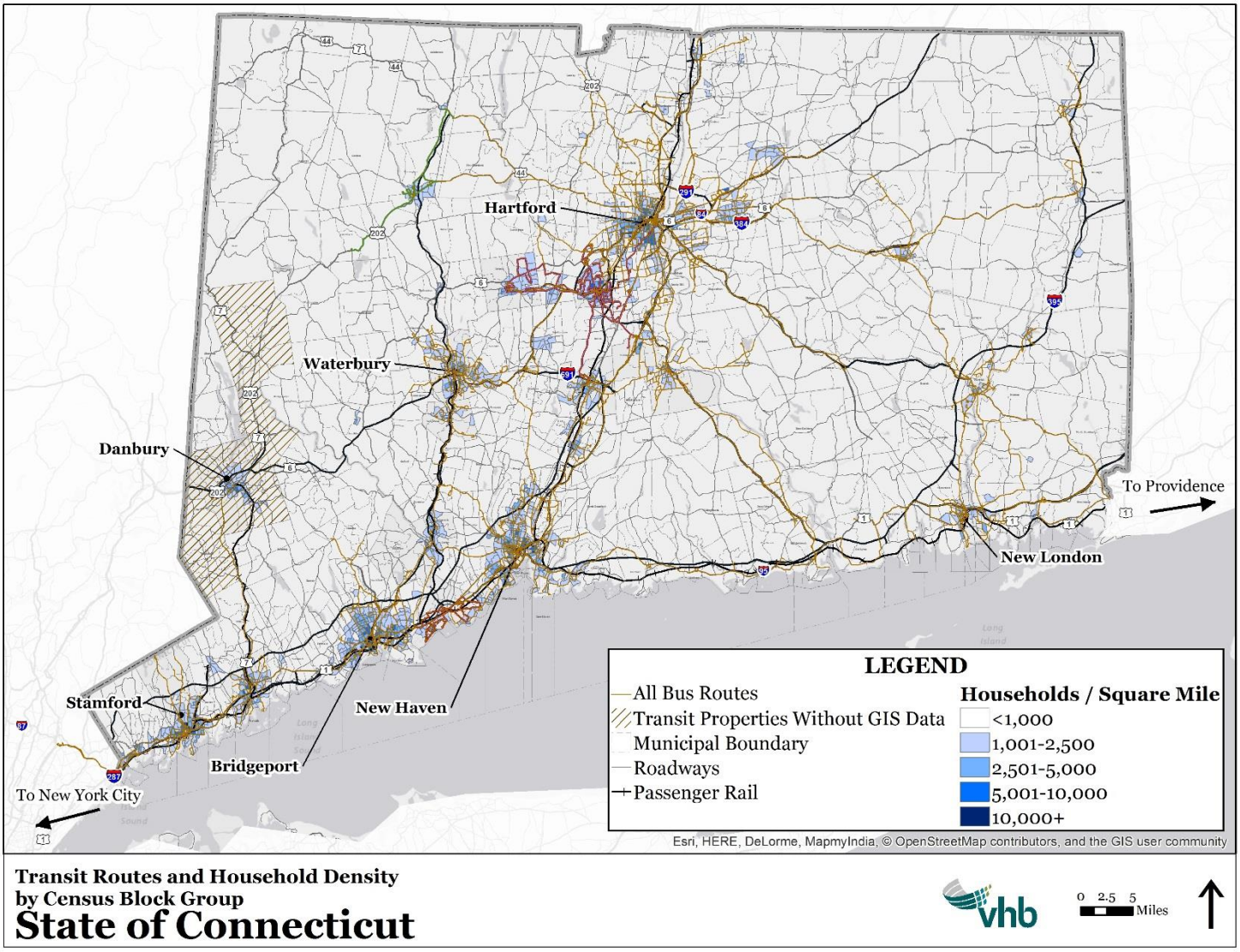
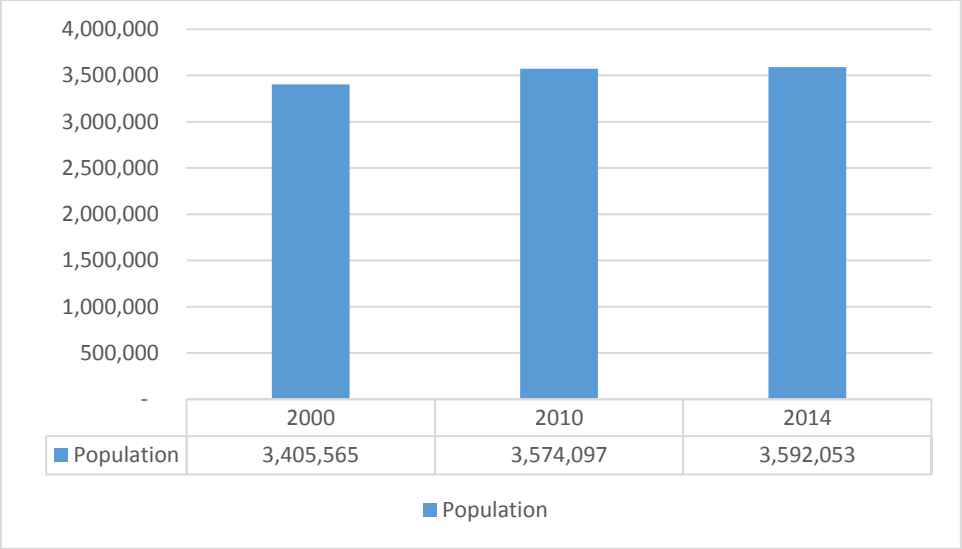


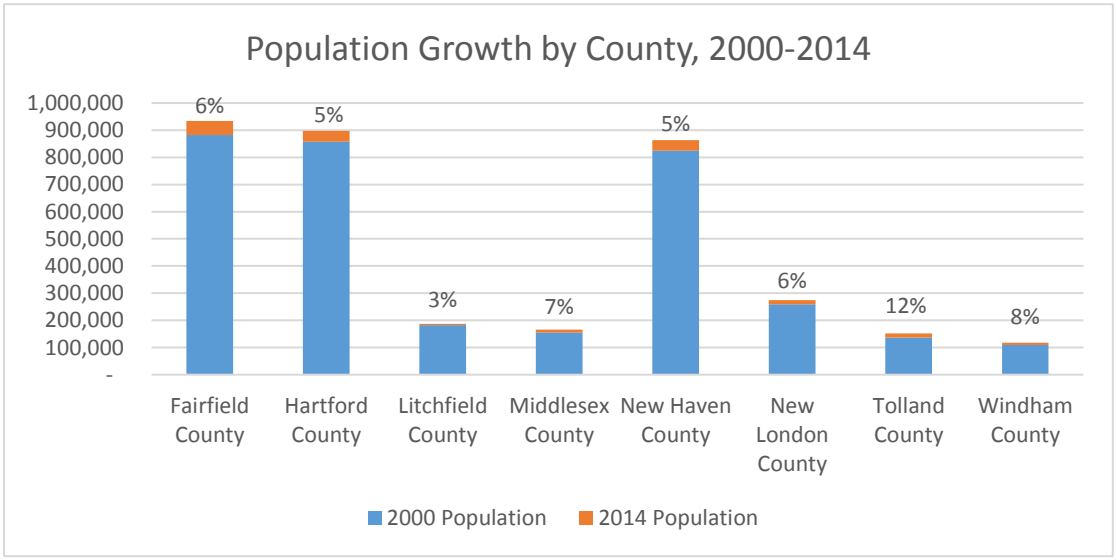
Figure 4: Connecticut Population by Year 2000-2014



Source: U.S. Census Bureau

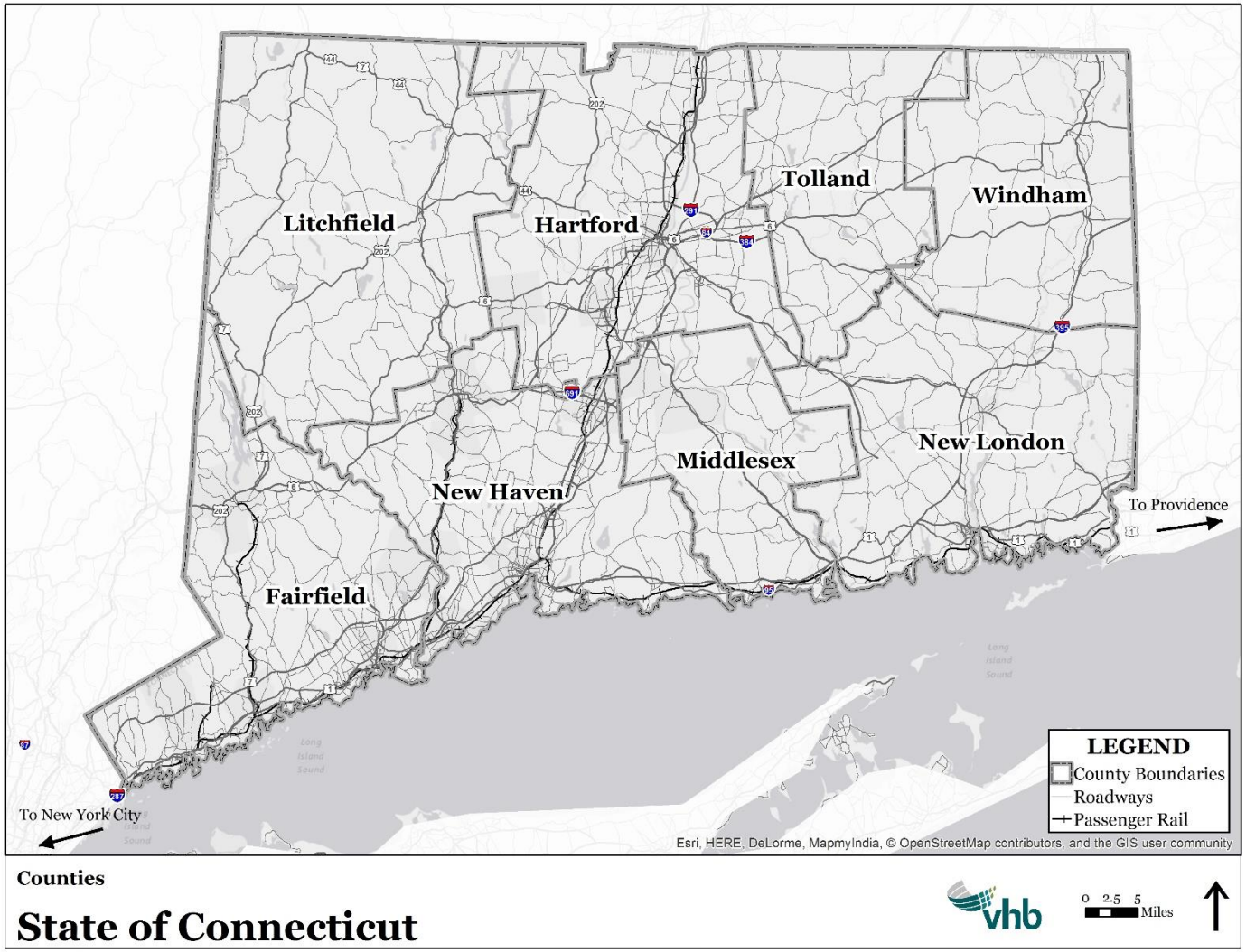
Over the last fifteen years, the state's population has not changed significantly, adding roughly 187,000 residents since 2000, representing a five percent increase, from 3,405,000 residents to 3,592,000 residents as illustrated in Figure 4. Fairfield County saw the greatest absolute change in population, adding nearly 52,000 residents. Hartford and New Haven Counties each grew by approximately 40,000 residents. The remaining counties experienced increases in population between 5,400 (Litchfield County) to 16,000 residents (Tolland County) (See Figure 5). A map of the Connecticut counties is shown in Figure 6.

Figure 5: Population Growth by County (2000-2014)



Source: U.S. Census Bureau

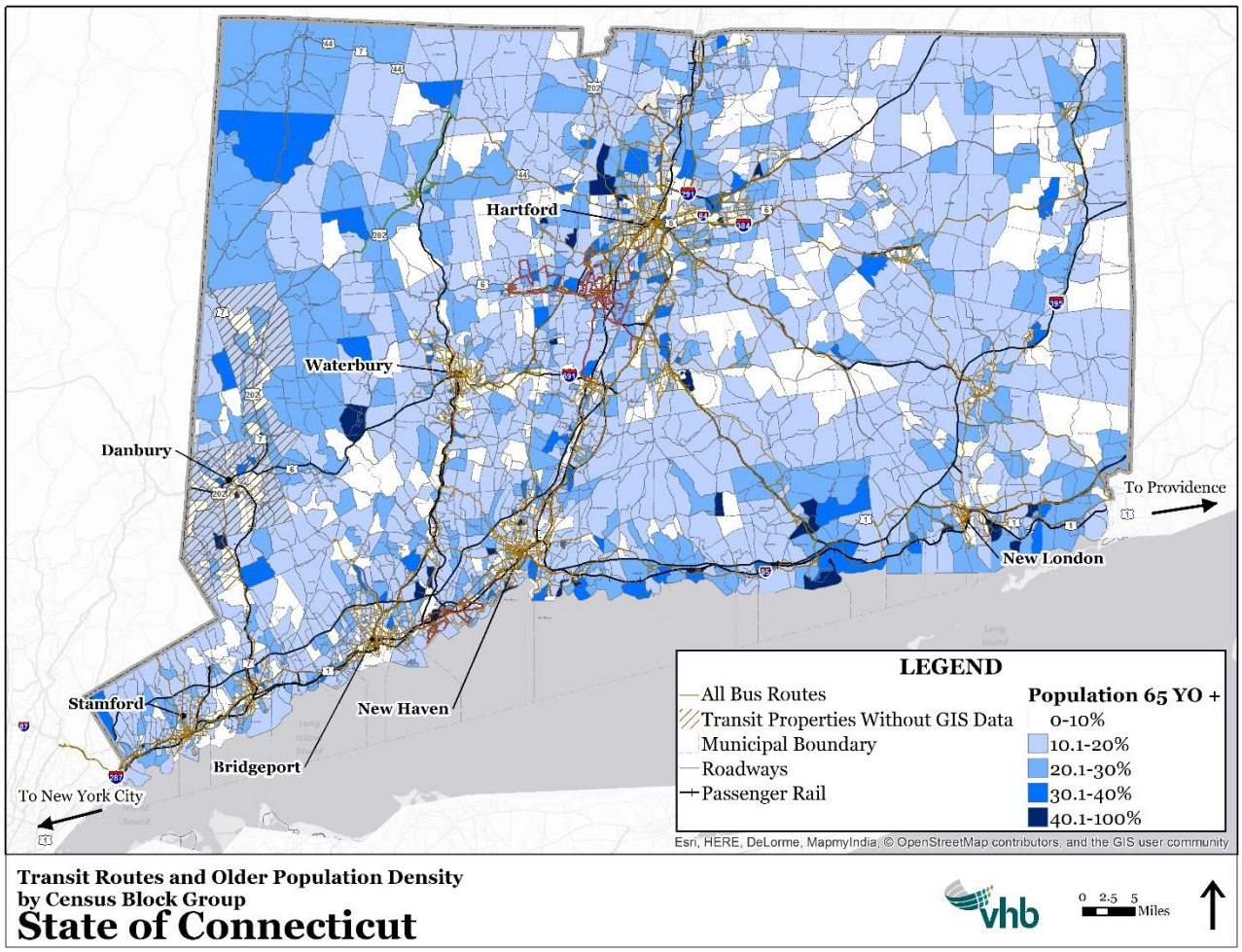
Figure 6: Counties Map



2.4.3 Older Adults

Older adults may be more reliant on public transportation due to physical or medical conditions or other reasons that make them unable to rely on automobiles for their main mode of transportation. Unlike other transit dependent users, older adults are located in various locations across the state, with large concentrations in rural/suburban areas outside of cities (including the suburbs west of Hartford, Litchfield County and Middlesex County). A total of 531,079 people in the state are over the age of 65.[3] (See Figure 7) In general, areas with high concentrations of older adults are well served by existing bus routes, however, there are some areas in the northwestern portion of the state that are not well served by fixed bus route services.

Figure 7: Bus and Rail Networks Compared to Locations with Populations Above 65 Years Old



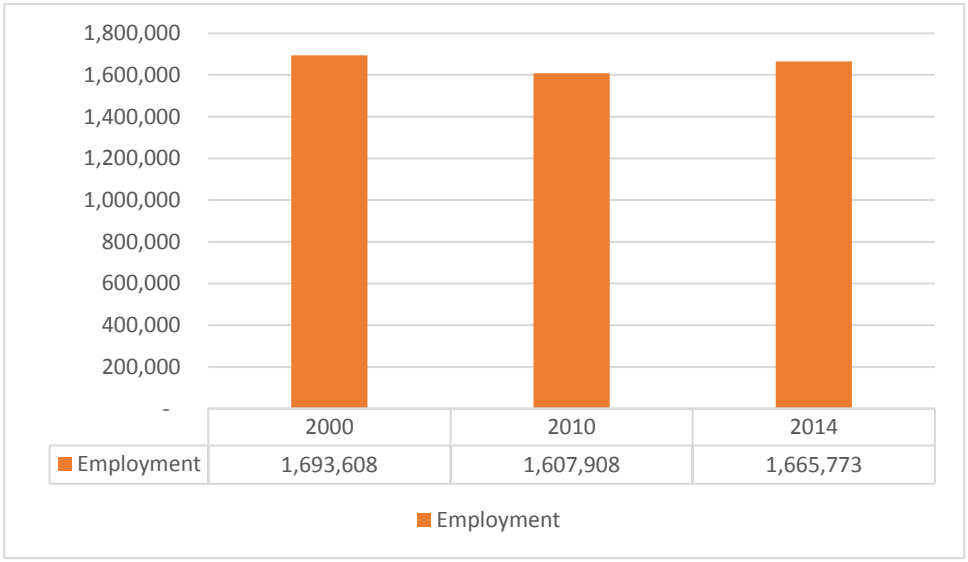
3 US Census, 2014 5-Year American Community Survey Data

2.4.4 Employment Density

Employment data was collected at the zip code level from the ACS. This data was joined to existing zip code boundaries to illustrate the number of jobs per zip code. A high concentration of jobs in one location indicates that the area functions as an employment center and has high potential transit service demand. Large populations of workers are found in the major urban centers of the state, notably Stamford, Bristol, New Haven, Danbury, West Haven, Bridgeport, Milford, Middletown, Hartford, and Wallingford.

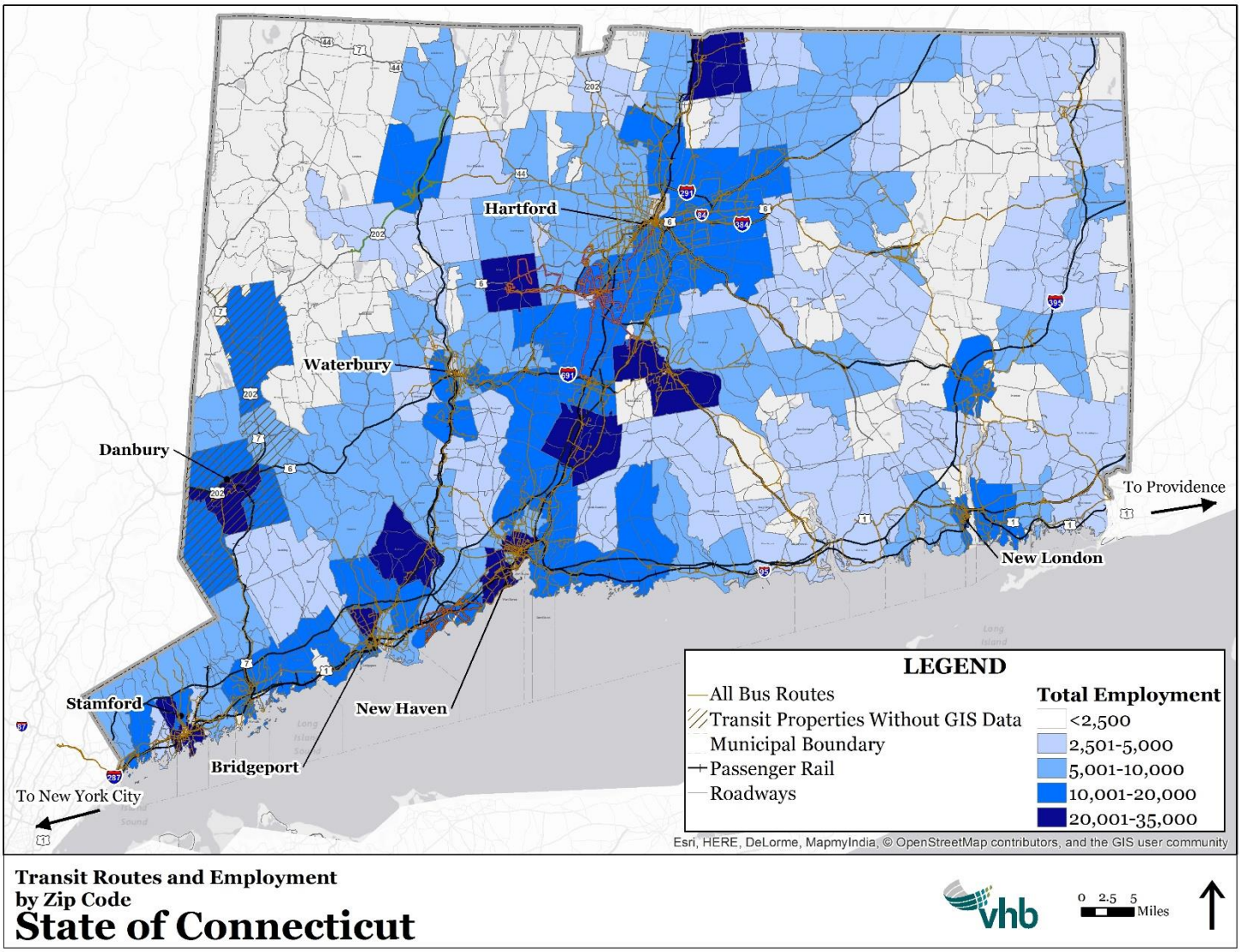
A review of historic employment data from the state's Department of Labor shows that Connecticut is still recovering the jobs it lost during the recession. Employment data from 2000 to 2014 shows that 2010 was the low point in terms of number of jobs with 1,608,000 jobs. However, more recent data from 2014 indicates that a trend towards adding jobs is occurring with nearly 58,000 jobs added between 2010 and 2014 (See Figure 8). A comparison of bus and rail networks to employment locations is shown in Figure 9. Areas with high employment densities (20,001 to 35,000 workers) and medium-high employment densities (10,001 to 20,000 workers) are well covered by bus and rail services.

Figure 8: Connecticut Employment 2000-2014



Source: Connecticut Department of Labor

Figure 9: Bus and Rail Networks Compared to Locations with Employment

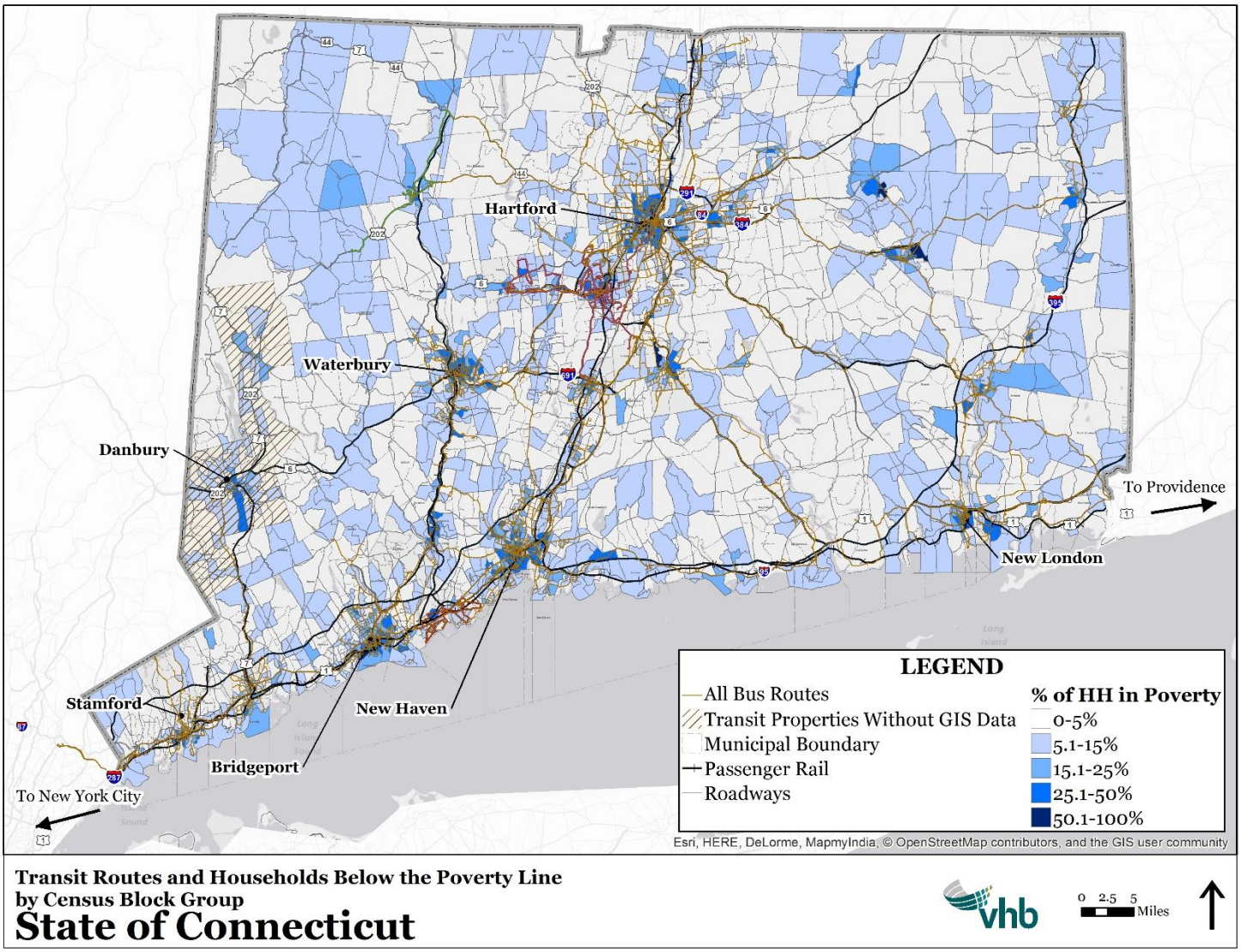


2.4.5 Households in Poverty

Lower income persons may have difficulty affording private transportation, such as a car, but still need to make daily trips for work and other purposes, which makes this population more likely to use transit. Since many people falling in this category may not have transportation options other than public transportation, often they will choose to live near existing bus routes. Households in poverty were largely concentrated in the following urban areas: Hartford, Bridgeport, New Haven, New London, Waterbury, and New Britain. Middletown, Groton, and Willimantic also had significant areas of poverty. Areas with high percentages of households in poverty (50.1 to 100%) and medium-high percentages (25.1 to 50%) are well covered by bus. A number of census block groups with households in poverty ranging from 5.1 to 15% are located in the northwestern portion of the state and do not have bus coverage. (See Figure 10) A total of 7.5 percent of all families in Connecticut fall below the poverty line.[4]

4 US Census, 2014 5-Year ACS Estimates

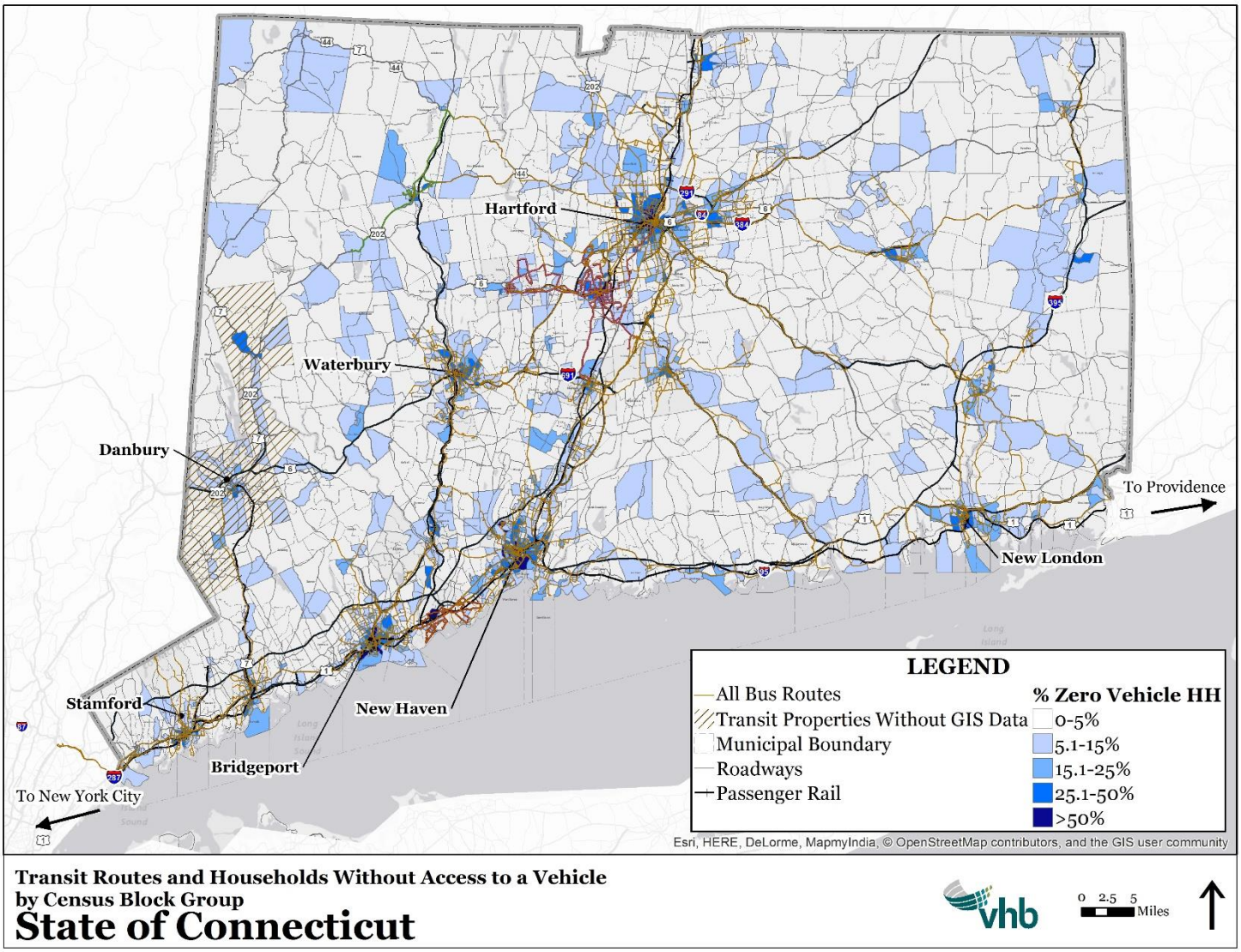
Figure 10: Bus and Rail Networks Compared to Locations of Households in Poverty



2.4.6 Households without Access to a Vehicle

A household without access to an automobile will almost certainly require its residents to use some form of alternative transportation—often transit—for travel. Residents without private vehicles will likely choose to live near transportation facilities that enable them to travel throughout the region, if they have a choice. Since this demographic characteristic is directly related to transportation resources—or lack thereof—it follows that the members of households without vehicles may travel only to areas served by existing transit, emphasizing the need for greater accessibility and coverage. (See Figure 11) A total of 123,437 households (9.1 percent) reported they owned no vehicle. These households were almost exclusively located in the urban centers of the state, including: Hartford, Bridgeport, New Haven, New Britain, and Waterbury. Several census block groups with low percentages of households without access to a vehicle (5.1 to 15%) are located in the northwestern portion of the state that do not have bus coverage.

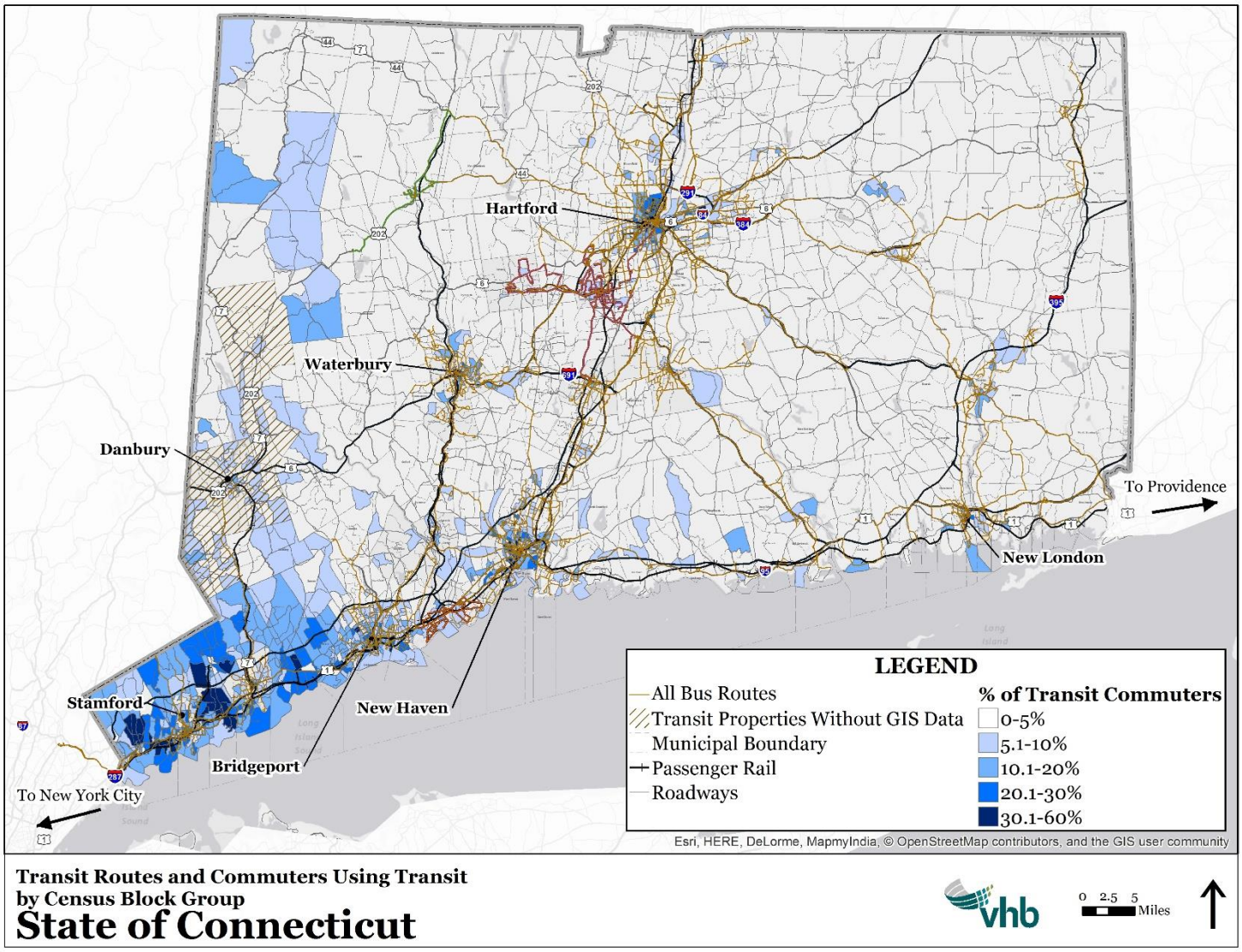
Figure 11: Bus and Rail Networks Compared to Locations of Zero Vehicle Households



2.4.7 Households with Commuters that Use Transit

According to census data, 1,734,798 workers commuted to work. The overwhelming majority of these workers use an automobile to travel to their place of work. However, 81,585 respondents (4.7 percent) reported using some mode of transit to commute to work, and of those, 44,878 (2.6 percent) reported using bus service. These rates of public transportation use for commuting are in line with national averages. The location of bus and rail networks in relation to the locations of transit users is shown in Figure 12. Census tracts with high percentages of households with commuters that use transit are concentrated in the southwestern portion of the state particularly in the vicinity of Bridgeport. Many of these households likely use transit to commute to New York City.

Figure 12: Bus and Rail Networks Compared to Locations of Transit Users



2.4.8 Existing Bus Coverage

Consistent with the *Let's Go CT* goal of "increasing bus service availability in urbanized areas by 25 percent," an analysis of the population in the state within 1/2-mile from bus service was conducted. Using GIS, a 1/2-mile boundary was drawn around each bus route. Census block groups that fell within the 1/2-mile buffer of the route were assumed to have some bus service; if a block group was located outside of a bus route buffer, it was considered not to have bus service.[5] (See Figure 13)

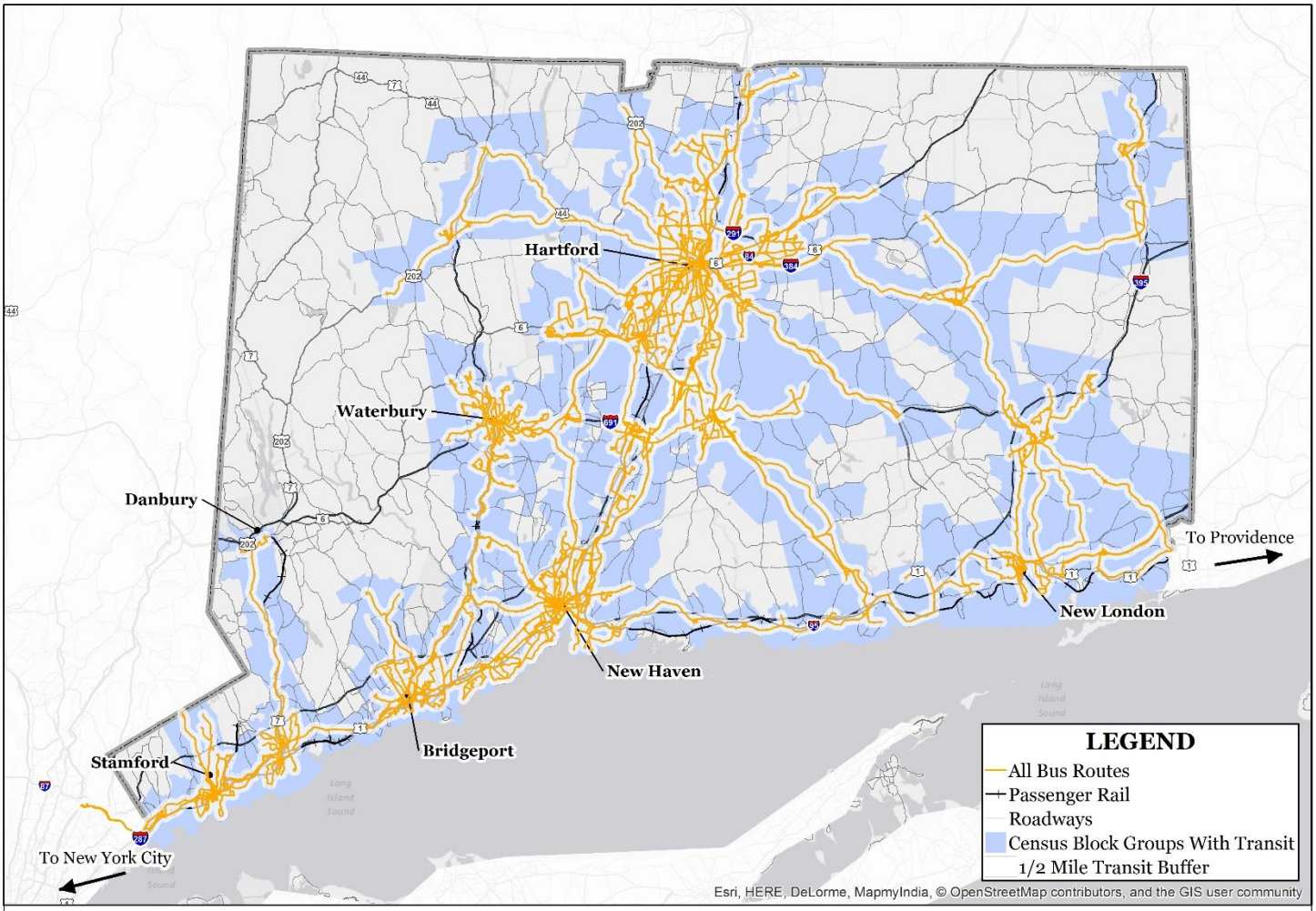
This analysis found that 2,547 square miles of Connecticut are located within 1/2-mile of bus service (based on census block groups). The areas with bus service within 1/2-mile of bus include 2,813,909 people (78.3 percent of total population) spread across 1,073,607 households (79.2 percent of the total).

Existing bus routes are located within 1/2-mile and serve 90.4 percent (126,575 households) of the populations at or below the state poverty line and serve 93.1 percent (114,974) of the zero-car households.

Generally, existing bus routes provide good coverage to a majority of the state's population, in particular to populations at or below the state poverty line and zero-car households. The exception is in the northwestern portion of the state where there are several census tracts with low percentages (5.1% to 10%) and medium-low percentages (10.1% to 20%) of households without access to a vehicle that are not well served by existing bus routes.

5 Due to the lack of information on population distribution in a block group, if a block group was only partially located within the 1/2-mile buffer, all of the population of that block group was assumed to be fully served.

Figure 13: Census Blocks Served by Transit



2.4.9 Future Population Growth

Since the last Census in 2010, the State of Connecticut has seen its total population grow by five percent. In the next 20 years, population is projected to grow by an additional five percent (see Table 9). The majority of this population growth in the ten-year period between 2000 and 2010 occurred in Middlesex, New London, Tolland and Windham County, which are largely rural and suburban areas of the state.

All counties are projected to grow by 2025 with rates ranging from two percent (Litchfield) to nine percent (Windham). While Tolland had the highest percentage of growth from 2000-2010, that growth only represented 16,000 residents versus Hartford County's growth of more than 36,000 residents.

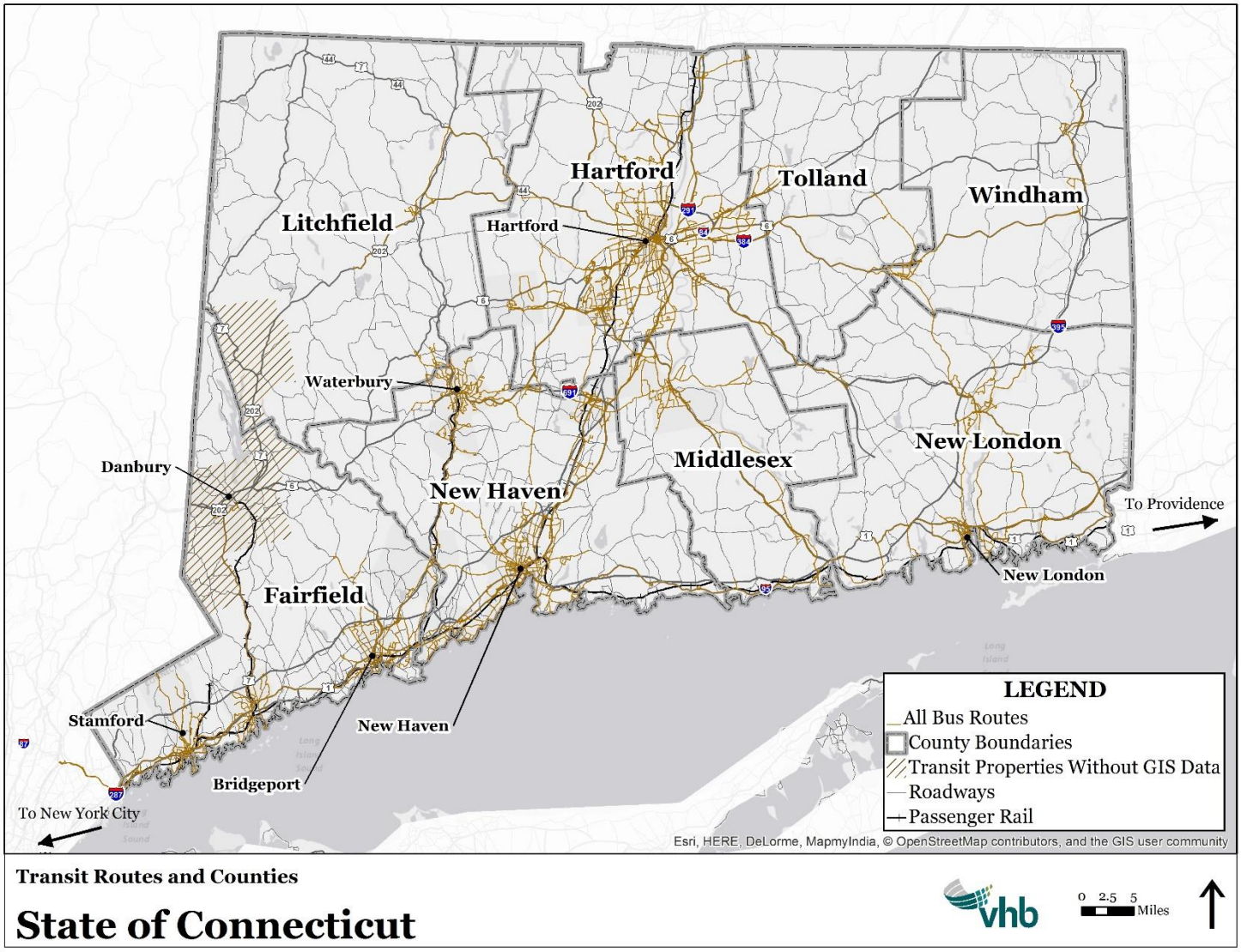
Figure 14 shows the areas currently covered by bus routes by county.

Table 9: Population Trends and Projected Growth in Connecticut

County	2000 Actual	2010 Actual	Historical Growth (2000 - 2010)		2015 Projected	2020 Projected	2025 Projected	Future Growth (2010 - 2025)		Future Growth (2015 - 2025)	
			Actual	%				Actual	%	Actual	%
Fairfield	882,567	916,829	34,262	4%	932,377	944,692	954,479	37,650	4%	22,102	2%
Hartford	857,183	894,014	36,831	4%	910,924	925,492	936,810	42,796	5%	25,886	3%
Litchfield	182,193	189,927	7,734	4%	192,188	193,116	193,112	3,185	2%	924	0.5%
Middlesex	155,071	165,676	10,605	7%	168,833	170,518	170,976	5,300	3%	2,143	1%
New Haven	824,008	862,477	38,469	5%	881,374	898,514	912,056	49,579	6%	30,682	3%
New London	259,088	274,055	14,967	6%	279,755	283,665	285,773	11,718	4%	6,018	2%
Tolland	136,364	152,691	16,327	12%	155,924	158,606	160,759	8,068	5%	4,835	3%
Windham	109,091	118,428	9,337	9%	122,718	126,432	129,527	11,099	9%	6,809	6%
Total	**3,405,565**	**3,574,097**	**168,532**	**5%**	**3,644,093**	**3,701,035**	**3,743,492**	**169,395**	**5%**	**99,399**	**3%**

Sources: US Census, 2000 and 2010 Decennial Census, UCONN, 2015-2025 Population Projections

Figure 14: Transit Routes by County



2.4.10 Future Employment Growth

The State of Connecticut's Department of Labor Office of Research creates ten-year industry employment forecasts. The employment forecasts consider historical trends and other forecasts to help project Connecticut's employment changes. The most recent employment projections range between 2012 and 2022.

Connecticut municipalities are grouped by Workforce Investment Areas covering geographical divisions. Each Workforce Investment Area and the municipalities included in them may be found on the Connecticut Department of Labor website (https://www.ctdol.state.ct.us/wia/TownListing.htm).

Overall, for all occupations, the Department of Labor projects a 9.4 percent increase by 2022. Nearly all of the Workforce Investment Areas are projected to grow between nine and ten percent (see Table 10). The Workforce Investment Area with the lowest growth in all occupations is the Eastern Workforce Investment Area with a nearly seven percent increase. The Northwest Workforce Investment Area is projected to experience the highest growth. The projected employment trends should be reviewed against existing bus service to identify areas where bus service may need to be re-configured or where new bus service may be warranted.

Table 10: Projected Employment Levels by Workforce Investment Area

All Occupations	2012 (Estimated)	2022 (Projected)	Percent Change
Eastern WIA	199,714	213,131	6.7%
North Central WIA	582,508	640,174	9.9%
Northwest WIA	237,065	261,012	10.1%
South Central WIA	365,401	400,578	9.6%
Southwest WIA	391,112	428,197	9.5%
State Total	**1,775,800**	**1,943,092**	**9.4%**

Source: Connecticut Department of Labor and VHB

2.5 Overview of Local Fixed Route Bus Service in Connecticut

2.5.1 Data Source

Ridership, cost and fleet data for Connecticut transit systems are based on data collected by CTDOT as reported by the transit system. Detailed profiles for each Transit System is included in Appendix C.

2.5.2 Ridership Trends

Annual ridership information from 2007 to 2014 is shown in Table 11 and illustrated in Figures 15 and 16. This data is based on total system annual boardings. Full year ridership data for CT*fastrak* was not available since the service started on March 28, 2015. According to the National Transit Database, in 2015, CT*fastrak* had 261,190 annual trips.

All CT*transit* Divisions have experienced a growth in ridership except for CT*transit* Meriden and CT*transit* Wallingford. Between 2007 and 2014, annual boardings on the CT*transit* Waterbury Division grew by over 68 percent, CT*transit* Bristol Division experienced growth by over 48 percent, and C*Ttransit* New Britain increased by 21.5 percent. The CT*transit* Hartford, New Haven and Stamford Divisions each experienced increases by 8.2 percent, 14.3 percent and 16.7 percent respectively. CT*transit* Meriden experienced a 22 percent decline in annual boardings and CT*transit* Wallingford fell by over four percent. With one exception, annual boardings on non-CT*transit* systems have increased over time. The exception is the Northwestern Connecticut Transit District, where annual boardings declined by 24 percent.

Between 2007 and 2014, boardings for the following non-CT*transit* systems increased as follows:

- Estuary Transit District experienced a 127 percent increase in annual boardings
- Northeastern Connecticut Transit District saw a 93 percent increase
- Windham Regional Transit District's annual boardings grew by over 81 percent
- Middletown Area Transit's annual boardings grew by nearly 47 percent
- Greater Bridgeport Transit increased by 40 percent
- Norwalk Transit District had a nearly 25 percent increase
- Milford Transit District's annual boardings rose by 22 percent
- Southeast Area Transit rose by 18 percent
- Housatonic Area Regional Transit experienced an almost 17 percent increase

Table 11: Annual Boarding Trends by Transit System

Transit Provider	2007	2008	2009	2010	2011	2012	2013	2014	% Change 2007-2014
CT*transit* - Hartford	13,911,614	14,299,660	13,937,559	13,740,479	14,438,683	15,122,918	14,863,495	15,054,976	8.2%
CT*transit* - New Haven	8,338,138	8,598,344	8,933,612	8,595,357	8,749,911	9,453,992	9,562,320	9,526,686	14.3%
CT*transit* - Stamford	3,080,685	3,285,089	3,341,841	3,227,449	3,167,948	3,422,864	3,630,949	3,595,554	16.7%
CT*transit* - Waterbury	1,267,836	1,391,994	1,411,312	1,327,923	1,386,742	1,876,481	2,044,917	2,138,580	68.7%
CT*transit* - Meriden	153,099	164,452	166,845	166,993	165,869	177,519	144,723	118,817	-22.4%
CT*transit* - Wallingford	15,182	15,428	13,791	13,407	14,033	14,261	14,388	14,521	-4.4%
CTtransit - New Britain	786,712	774,797	735,260	703,180	826,526	895,525	908,120	956,226	21.5%
CT*transit* - Bristol	43,898	39,280	49,038	44,489	49,749	66,014	5,086	65,111	48.3%
Greater Bridgeport Transit	4,427,697	4,064,480	4,790,572	4,726,733	4,946,257	5,259,599	5,298,806	6,197,806	40.0%
Norwalk Transit District	1,289,297	1,301,733	1,316,942	1,283,028	1,324,885	1,346,452	1,308,013	1,610,191	24.9%
South East Area Transit	833,180	910,452	895,205	886,695	891,890	1,027,633	894,591	986,877	18.4%
Housatonic Area Regional Transit	705,174	738,566	772,912	700,494	728,077	761,276	685,642	823,343	16.8%
Middletown Area Transit	268,834	331,310	339,993	311,767	301,448	295,570	378,072	394,744	46.8%
Windham Region Transit District	138,948	165,507	191,593	184,041	217,311	233,294	237,645	252,343	81.6%
Milford Transit District	125,473	129,034	128,617	145,846	156,670	155,404	140,078	153,268	22.2%
Northwestern Connecticut Transit District	113,794	114,572	106,167	90,081	90,557	87,410	76,555	86,098	-24.3%
Estuary Transit District	35,503	20,270	27,448	41,931	51,340	67,756	73,300	80,721	127.4%
Northeastern Connecticut Transit District	25,102	30,044	29,869	32,563	35,721	44,021	44,298	48,482	93.1%

Source: CTDOT
CT*fastrak* not included.

Figure 15: CT*transit* Annual Passenger Trips - 2007 to 2014

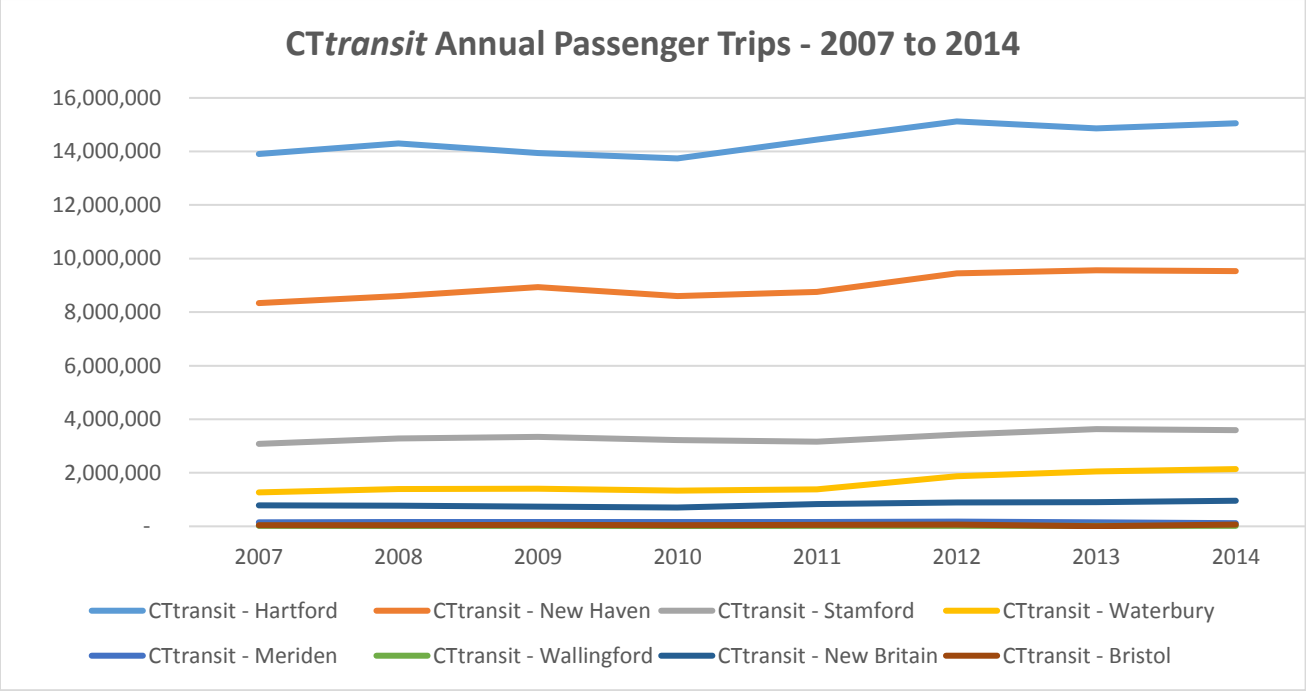
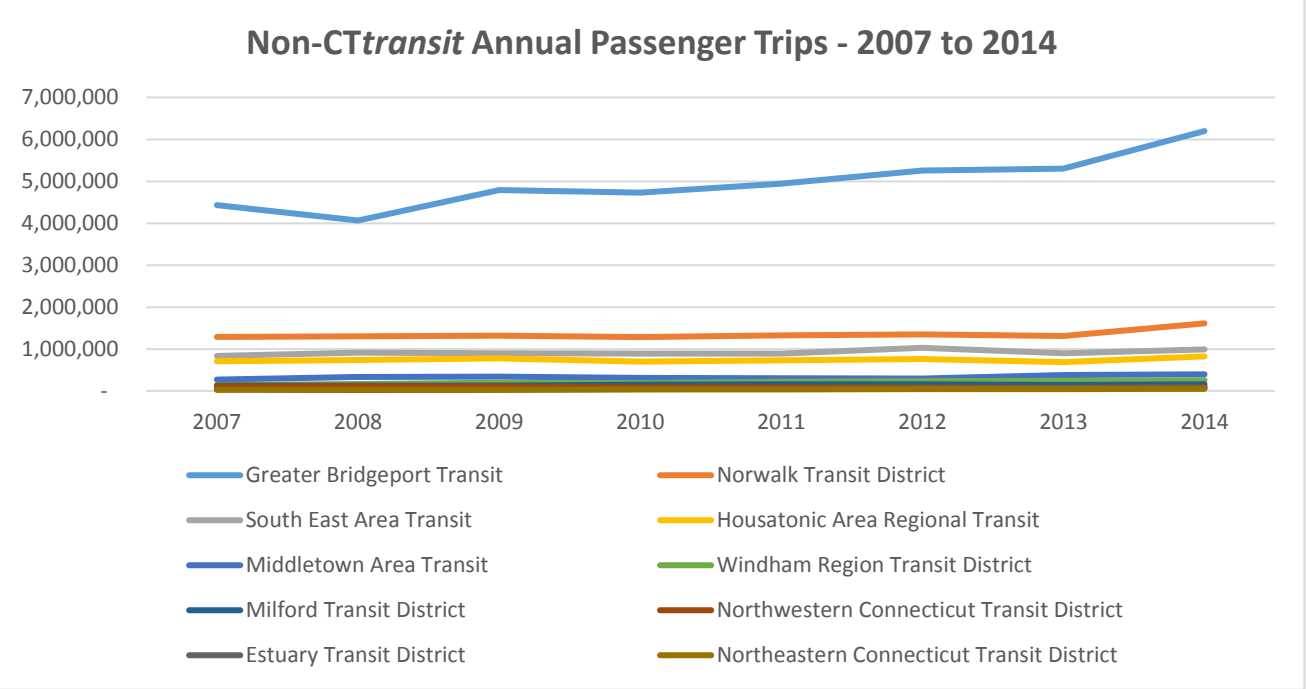


Figure 16: Non-CT*transit* Annual Passenger Trips - 2007 to 2014



2.6 Statewide Comparison of Transit Systems

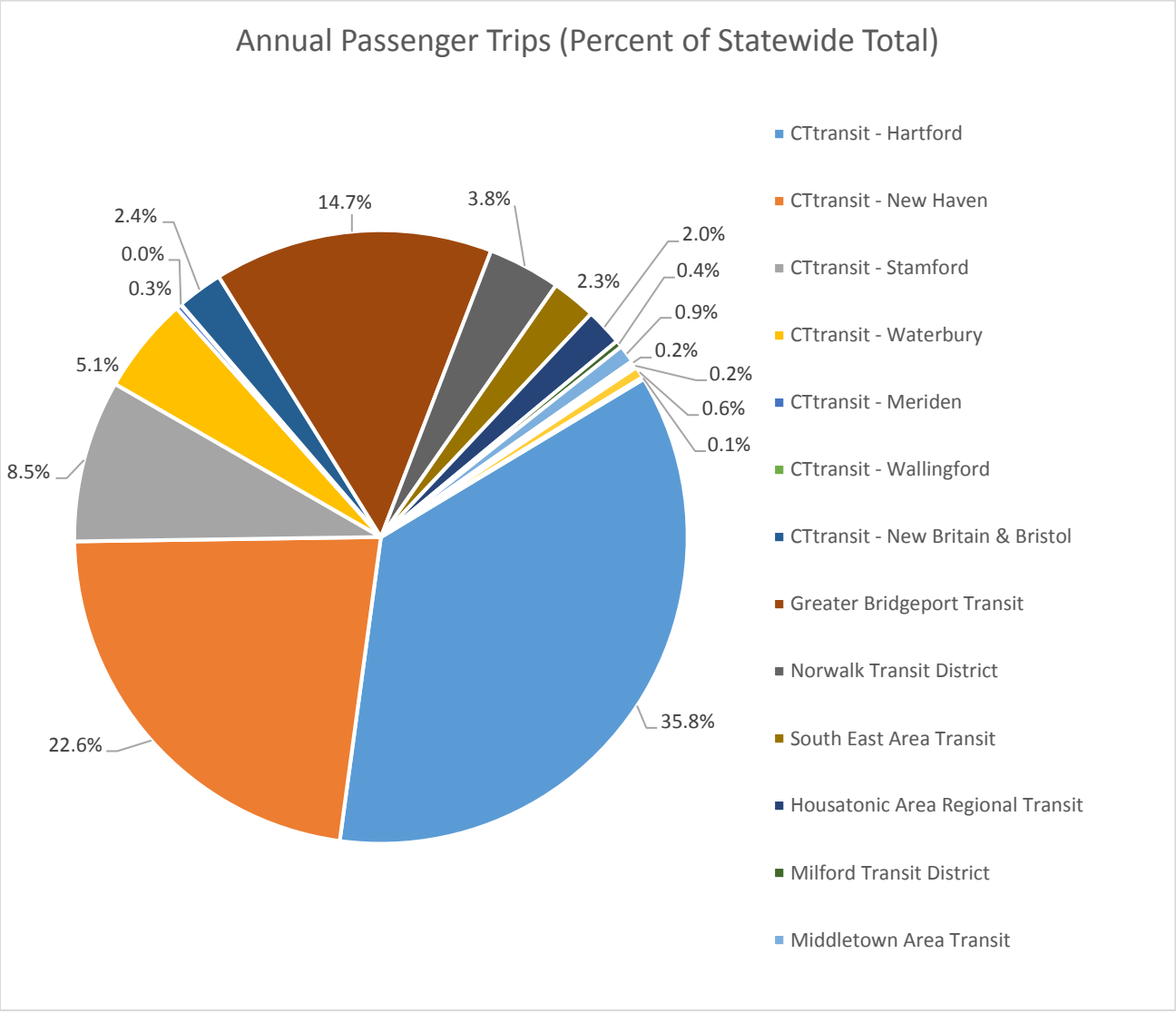
2.6.1 Transit System Summary

This section summarizes some key metrics of the transit systems that comprise the statewide system. Four metrics are used: Annual Ridership, Total Number of Routes, Fleet Size, and Total Annual Operating Budget.

2.6.2 Ridership

Annual passenger trips based on total (weekday and weekend) ridership is summarized in this section. CT*transit* Hartford and CT*transit* New Haven divisions (combined) provide for almost 60 percent of the statewide fixed route transit trips, while all seven of the CT*transit* divisions provided for slightly less than 75 percent of the total fixed route bus ridership in the State of Connecticut. CT*transit* provided for more than 31 million annual passenger trips in the 2014 reporting period. Greater Bridgeport Transit is an additional significant provider of trips, with nearly 15 percent of the total statewide fixed route bus transit trips. Conversely, the small and rural transit systems account for more than 467,000 annual passenger trips. A breakdown of ridership by transit system is shown in Figure 17.

Figure 17: 2014 Annual Passenger Trips (Percent of Statewide Total)



Source: CTDOT, 2014 Data
Note: CT*fastrak* not included and CT*transit* Bristol included in CT*transit* New Britain

2.6.3 Total Number of Routes

The total number of routes in a system is also a useful metric to compare system size, and is useful when compared to the total annual ridership to determine overall system efficiency (See Table 12). CT*transit* accounts for just over 60 percent of the routes in the state. The next transit system with the most routes are NTD and SEAT with 19 routes each.

Table 12: Comparison of Routes by Transit System and Annual Passenger Trips

Transit System	Number of Routes by Transit System	Percentage of Total Routes (Statewide)	Annual Passenger Trips
CT*transit* - Hartford	70	27%	35.8%
CT*transit* - New Haven	18	7%	22.6%
CT*transit* - Stamford	19	8%	8.5%
CT*transit* - Waterbury / Meriden / Wallingford	34	14%	5.4%
CT*transit* - New Britain / Bristol	15	6%	2.4%
Greater Bridgeport Transit Authority	17	7%	14.7%
Norwalk Transit District	19	7%	3.8%
Southeast Area Transit	18	8%	2.3%
Housatonic Area Regional Transit	7	3%	2.0%
Middletown Area Transit	12	5%	0.9%
Windham Region Transit District	4	2%	0.7%
Milford Transit District	4	2%	0.4%
Northwestern Connecticut Transit District	5	2%	0.3%
Estuary Transit District	4	2%	0.2%
Northeastern Connecticut Transit District	3	1%	0.1%

Source: CTDOT, 2014 Data

As shown in Figure 18, while CT*transit* and systems with 750,000 annual riders and above provide over 97.5 percent of total ridership, they operate 88 percent of the total routes in the state. This shows the relative efficiency of the larger systems that serve the major cities in the state (including Hartford, New Haven, and Bridgeport) over those serving the smaller, more suburban/rural part of the state. The non-CT*transit* systems with 750,000 annual riders and above systems are 24 percent of the total routes in the state, and 23 percent of total ridership.

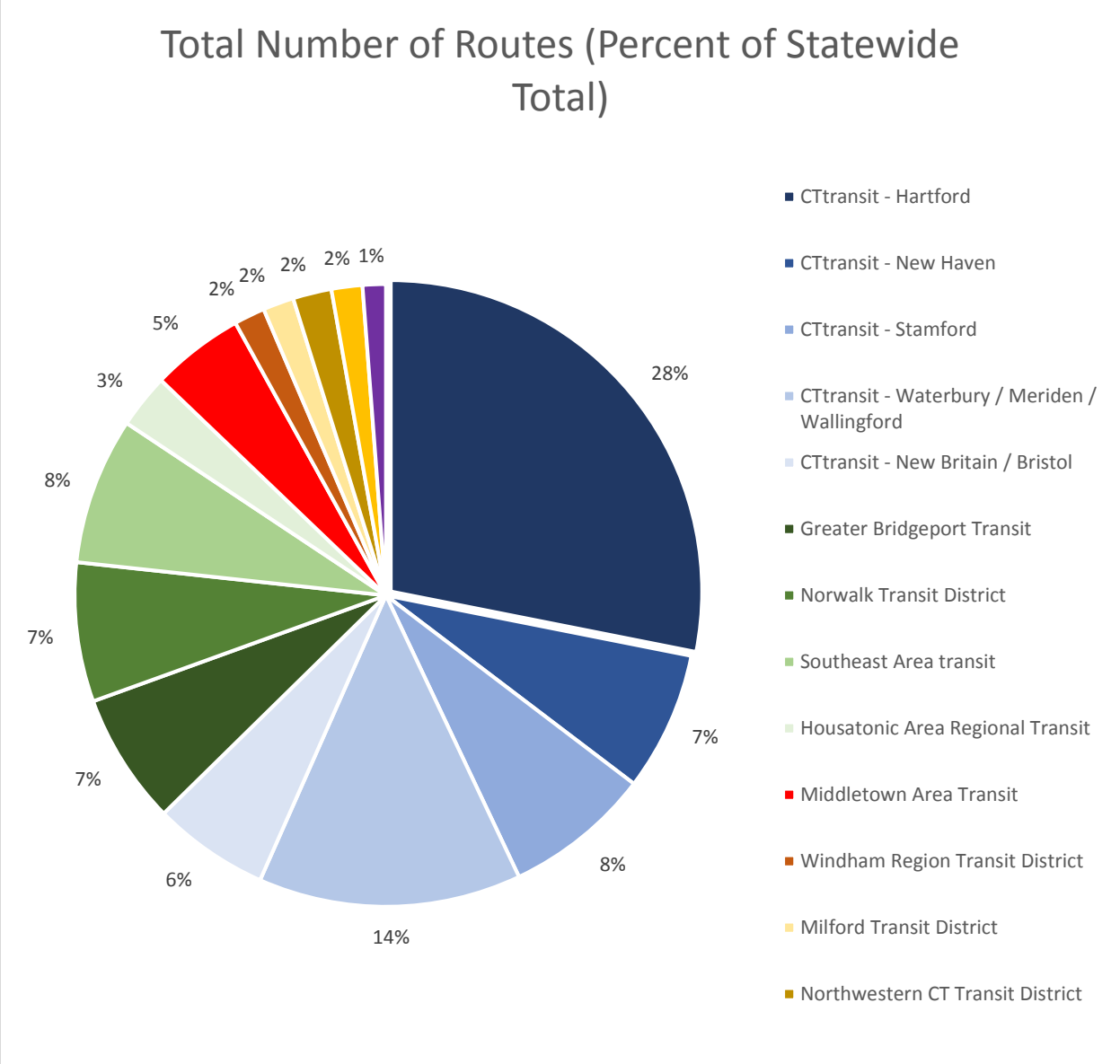
Finally, the smaller and rural properties in the state are 2.4 percent of total ridership and 13 percent of total routes.

It should be noted while no properties achieve an even balance between the number of routes operated and annual passenger ridership, some properties come close (within two percent), such as CT*transit* Stamford, CT*transit* New Britain/Bristol, Housatonic Area Regional Transit, and Milford Transit District. However, there are also imbalances throughout the state between the total number of routes operated by transit system and annual passenger trips. CT*transit* Waterbury/Meriden/Wallingford accounts for 14 percent of the total routes statewide, but the annual passenger trips are five and a half percent. A similar pattern can be seen with Southeast Area Transit and Middletown Area Transit. Both of these systems represent a modest share of total bus routes statewide (8 percent and 5 percent, respectively), but their share of annual passenger trips are low (2.3 percent for Southeast Area Transit and 0.9 percent for Middletown Area Transit).

Conversely, CT*transit* New Haven and Greater Bridgeport Transit experience a high level of annual passenger trips (23 percent and 15 percent, respectively) but they represent a modest percentage of total number of routes operated by transit system (each representing 7 percent).

The rural transit properties (ETD, NWCTD, WRTD, and NECTD) each account for only two percent of the total routes statewide (operating between four and five routes per system) and they have corresponding low percentages annual transit trips (less than one percent).

Figure 18: Total Number of Routes (Percent of Statewide Total)



Source: CTDOT, 2014 data

2.6.4 Fleet Size

Fleet size, or the total number of vehicles used by each system to provide service also describes overall system size. This metric, as shown in Figure 19 includes both vehicles used for revenue service and vehicles that are kept in reserve as spares.

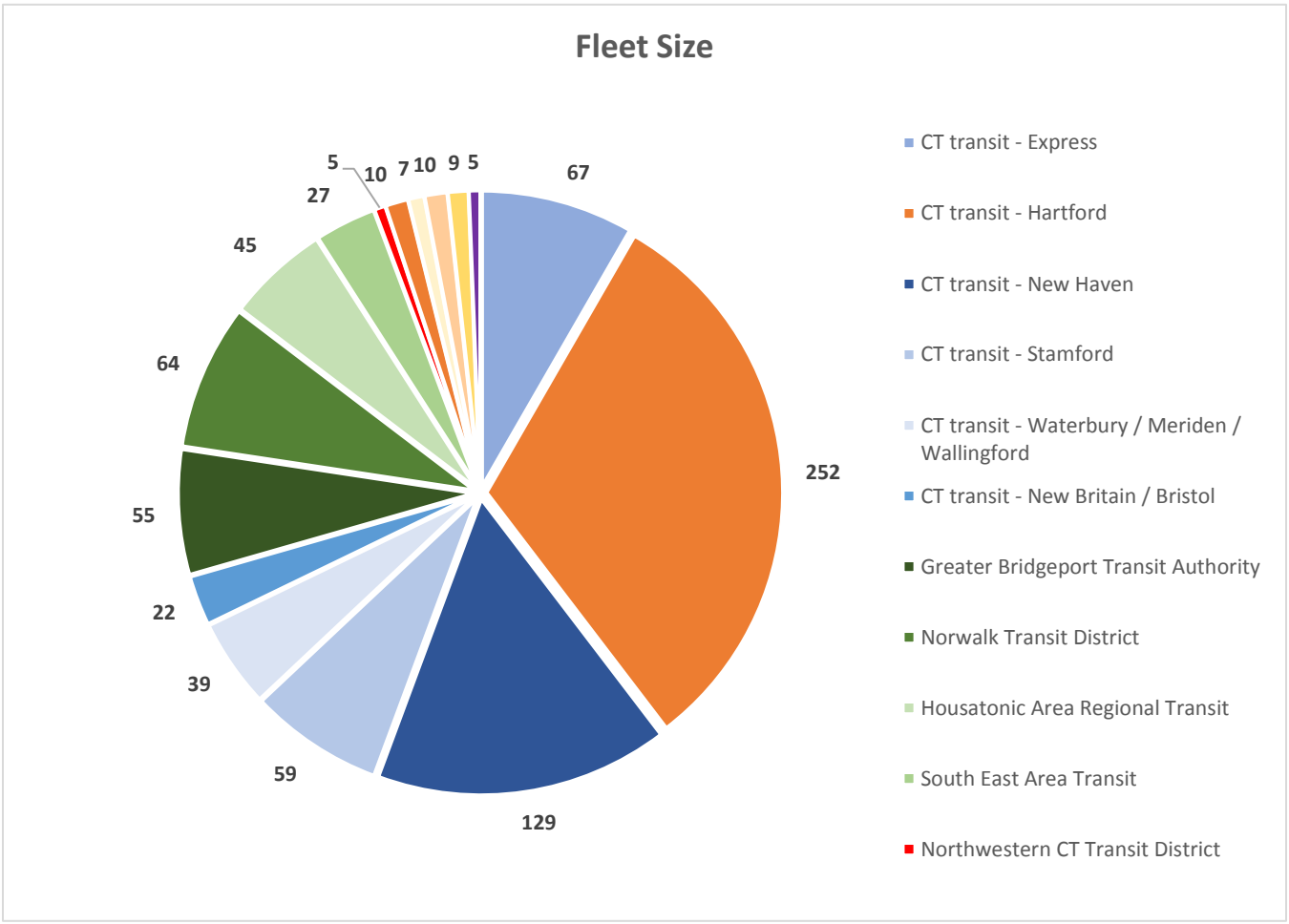
CT*transit* accounts for 71 percent of the total fleet in the state, compared to almost 75 percent of total ridership in the state.

Non-CT*transit* systems with 750,000 annual riders and above (GBT, NTD, SEAT, and HART) account for nearly 23 percent of total ridership in the state and 24 percent of the total fleet in the state.

Non-CT*transit* systems with less than 750,000 annual riders (MAT, WRTD, and MTD) account for two percent of total ridership in the state and three percent of the total fleet in the state.

The rural systems (NWCTD, ETD, and NECTD) account for only 0.5 percent of the total ridership in the state, but represent three percent of the total fleet in the state. The mismatch between fleet size and ridership for rural transit systems is likely due to varying vehicle sizes (smaller vehicles carry fewer people).

Figure 19: Fleet Size



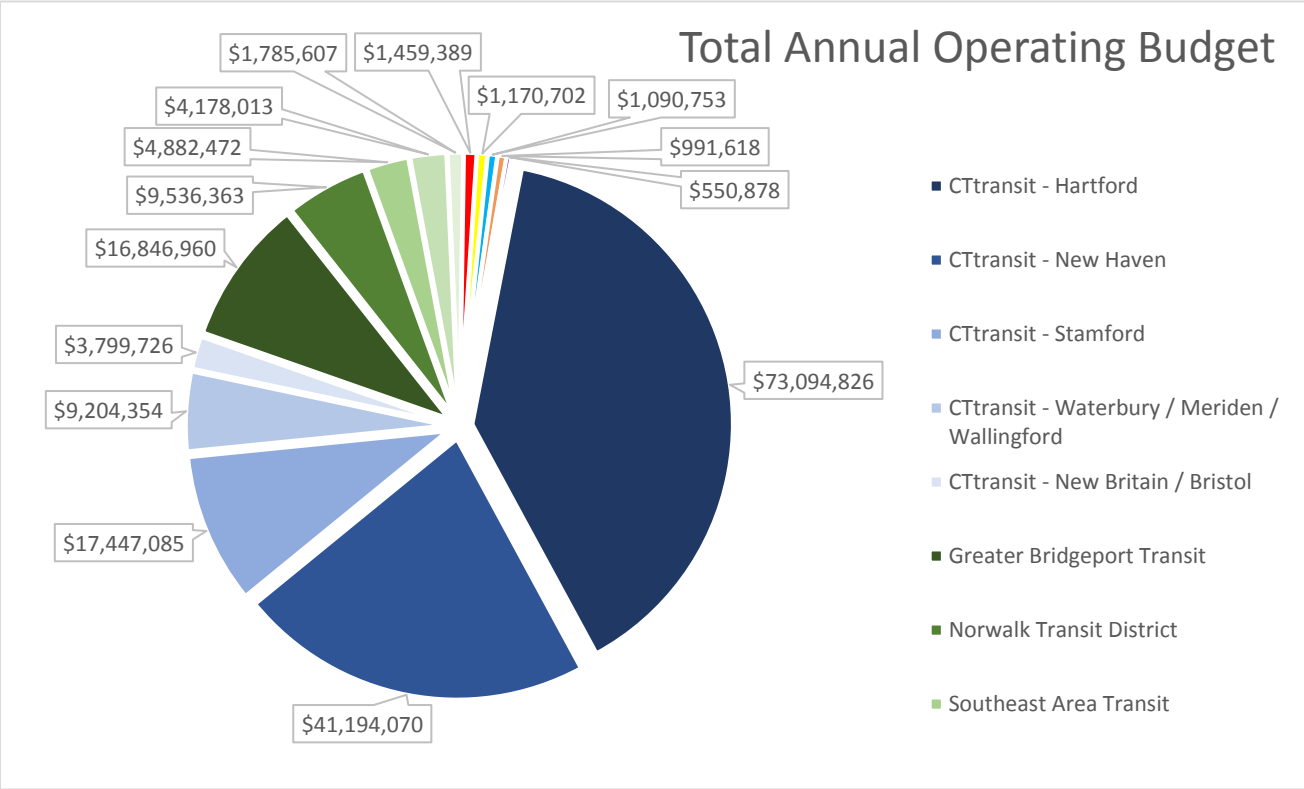
Source: CTDOT, 2014 Data

2.6.5 Total Annual Budget

This metric reflects the total cost of operating bus service. As with other metrics, CT*transit* makes up the majority of operating costs in the state, with the other large transit districts making up the next largest part of the cost.

As shown in Figure 20, the CT*transit* system is 77 percent of the total operating budget in the state, which is well matched to the amount of total ridership that they carry (75%). Non-CT*transit* systems with 750,000 annual riders and above are 19 percent of total budget, and 23 percent of total ridership, non-CT*transit* systems with less than 750,000 annual riders account for 2.4 percent of the total budget and 2 percent of the total ridership. Rural systems represent 1.4 percent of the total budget and 0.5 percent of the total ridership.

Figure 20: Total Annual Operating Budget



Source: CTDOT, 2014 Data

2.6.6 Fare

Fares are set by the transit systems and nearly all of the transit systems providing fixed route bus transit in the state charge an equivalent one-way fare of $1.75. Four systems differ, as follows:

- WRTD: $1.25
- NECTD: $1.00
- NWCTD: $1.25
- SEAT: $2.00

2.7 Conclusions

Connecticut is comprised of a wide range of bus service, from small transit systems serving rural areas to larger systems serving urban areas. The majority of service is provided by the five major transit division in the CT*transit* system. These divisions primarily serve urbanized areas. GBT, SEAT and NTD are also large systems which carry a significant percentage of the statewide ridership. The mid-sized and rural transit systems are more dispersed, serving fewer riders due to their non-urbanized geographies and demographics, but they play an important role in providing for access to transit throughout the state.

In general, the existing bus routes provide good coverage to a majority of the state's population, particularly for populations at or below the state poverty line and zero-car households. The exception is in the northwestern portion of the state where analysis has shown several census tracts with households without access to a vehicle that are not well served by existing bus routes.

Areas with high employment densities (20,001 to 35,000 workers) and medium-high employment densities (10,001 to 20,000 workers) are well covered by bus and rail services. In terms of future employment growth, the Department of Labor projects a 9.4 percent increase in all occupations by 2022. The projected employment trends should be reviewed against existing bus service to identify areas where re-configured or new bus service may be warranted.

In addition to meeting rider's needs, efforts have been made by the state's largest transit systems to modernize their bus services. Recent developments include:

- Completion of the Statewide Bus Communications Project
- New Fare Collection System for the CT*transit* and CT*fastrak* systems
- Real-time bus information for CT*fastrak* and CT*transit*'s New Haven Division and Hartford Division

- AVL technology on CT*fastrak,* CT*transit* Hartford, New Haven, Stamford, New Britain, and Bristol Divisions, Hartford Express buses as well as on GBT and NTD buses

Efforts to continue to rebuild, replace or improve the state's transit infrastructure include:

- Introduction of smartcard payment and pay by mobile phone technologies
- Extending the Intelligent Transportation Systems (ITS) to the entire CT*transit* fleet
- Construction of the new CT*transit* bus maintenance and storage facility in the Waterbury area.
- CT*transit* and (non-CT*transit*) Transit District bus replacements
- Construction of a bus facility in the Northwestern Connecticut Transit District and improvements to bus facilities for CT*transit* Hartford and Southeast Area Transit

3

Bus Service Guidelines

3.1 Context

The state is comprised of a range of demographic and land use patterns from urban to rural. Demographics (i.e., low-income, zero- and one-car households, populations over 65 years, residential and employment densities influence bus system and route design, the types of services operated, and the populations served (i.e., commuters or transit dependent populations). Densely populated and developed urban areas include the cities of Hartford, New Haven, Bridgeport, Stamford, and Waterbury. Suburban areas with lower population densities and less intense development patterns include areas like West Hartford and Wethersfield outside of Hartford, Darien, a suburb of Stamford, and Milford, located between New Haven and Bridgeport. Rural areas in the state include counties such as Litchfield and Windham.

CTDOT established the standards by which bus routes were evaluated. These standards provided the foundation of the *Connecticut Statewide Bus Study* performance analyses. All systems were evaluated consistently by the guidelines but each system's performance was compared with peer systems in the State. These evaluations informed the study's recommendations for each local and regional system as well as the full statewide system.

It is important to recognize that within every system there are high and low performing routes. Many transit properties make policy decisions to provide service on routes that may not produce high ridership, but provide a valuable service to select users or connectivity that supports higher-performing services. Sometimes routes are created to address a specific policy directive and may not be focused solely on ridership performance. By conducting the analysis on an agency level, the state can set the appropriate balance between the needs of riders, operational concerns, and funding constraints to maximize the effectiveness of the statewide system.

There are a wide range of industry-applicable performance measures that can be applied to Connecticut's statewide fixed route system including multiple measures that yield similar conclusions and information. The recommended service guidelines considered guidelines were derived from a review of national best practices as well as recently conducted transit performance analyses within Connecticut. The guidelines identified also support the goals of the overall study, shown in Table 13, and statewide transportation plan (*Let's Go CT)*. The application of the recommended service guidelines for future evaluation efforts will require development of a policy by CTDOT.

Table 13: 2016 Statewide Bus Study Goals

Goal
Enhance fixed route transit access to jobs
Develop recommended improvements to service frequency and span to relieve overcrowding, to improve reliability and to best meet the state's travel needs
Determine where connectivity between the bus and rail system in Connecticut can be enhanced
Provide cost-effective service consistent with travel needs and funding
Improve and expand urban bus service by 25% providing urban residents access to bus service with half-mile of home*
Upgrade and expand maintenance facilities to support improved fleet performance, system reliability and reduce non-revenue trips*
Provide state of the art service and information delivery*
Integrate operating service, information and customer service statewide*

* Let's Go CT goal

3.2 Process of Route Evaluation

A two-stage evaluation process was conducted based on the service criteria described in this chapter. The Stage 1 Evaluation was applied to all fixed routes within the state. Upon completion of the Stage 1 evaluation, a subset of routes was evaluated in more detail in Stage 2.

Stage 1 Evaluation:

The Stage 1 evaluation assessed and ranked the statewide bus routes based on three key service guideline areas: **transit propensity** (to measure the effectiveness of network coverage), **passenger trips per revenue hour** (to evaluate operational efficiency of routes), and **on-time performance** (to assess overall route performance and identify routes which require modified running times). This approach provided an individual assessment of each route compared

with other routes operated by that specific transit system, and other routes in the state. The routes were ranked, identifying the best and poorest-performing routes in assigned peer groups (those routes within the top 10% of highest performing routes in each group and those within the lowest 10% of poor performing routes in each group). The best and poorest performing routes in each peer group were advanced for further analysis in Stage 2, since these are the routes that would be most worthy of adjustments and investment (best performing routes would be worthy of further investment, poor performing routes would be worthy of modification or adjustment).

The Stage 1 evaluation assumed that data was available for each route upon which the three screening criteria were applied. When data in one or all categories was not available for a particular route, the route was not evaluated for that criterion.

Stage 2 Evaluation:

The Stage 2 Evaluation examined route and scheduling characteristics at a finer level of detail for those routes that are the highest and lowest performers. The Stage 2 evaluation applied all of the evaluation criteria and performance metrics from the service guidelines. This analysis identified specific strengths and weaknesses of the routes selected and informed the development of route-specific recommendations.

3.3 Proposed Service Guidelines

3.3.1 Overview

To develop guidelines a review of the CT*transit* Service Guidelines dated June 2009 was performed. The CT*transit* Service Guidelines define general service parameters regarding the types of routes operated by CT*transit*. The parameters include:

- Route spacing
- Through-routing
- Route design
- Directness of service
- Route deviations
- Scheduling

- Evaluation guidelines for existing service
- Development guidelines for new service
- Customer considerations (bus stop types and amenities, spacing, and design)
- Customer information
- Safety and perceived security
- Vehicles and vehicle maintenance.

While instructive and useful as a base for this study, these guidelines need to be expanded to include identify or define metrics (e.g., numerical thresholds for passengers per mile or fare box recovery) by which to evaluate the bus routes or the system as a whole. Additionally, the CT*transit* guidelines only cover specific services branded as CT*transit* and were not intended to apply to any of the other bus operators in the state.

For the purposes of this study, more comprehensive system-level guidelines, design criteria, and evaluation measures were developed. Building off of the CT*transit* Service Guidelines, system-wide bus service guidelines were reviewed for peer transit systems representing a range of transportation providers and properties of varying size (small to large), serving a mix of land uses (from urban to rural) and an assortment of bus route types (i.e., flex routes, local routes, limited stop routes, BRT's, and express routes). The peer systems include:

- Sarasota County Area Transit (SCAT) - Small transit property serving suburban and rural areas. Includes local, express routes.
- Southeastern Regional Transit Authority (SRTA) - Small transit property serving suburban and rural areas. Includes local routes.
- Greater Richmond Transit Company (GRTC) - Mid-size transit property serving suburban and urban areas. Includes local, and express routes.
- New York City Transit (NYCT) - Large transit property serving urban areas. Includes local, limited stop, BRT and express routes.
- New Jersey Transit (NJ TRANSIT) - Large transit property serving urban, suburban and rural areas. Includes local, limited stop, BRT and express routes.

From the review of these guidelines, a set of "best practices" performance criteria and evaluation measures used by the peer agencies were identified and are displayed in Table 14.

In addition to reviewing bus service guidelines from peer agencies, a review of recent bus studies completed by municipal, Metropolitan Planning Organizations (MPO) and transportation service providers in Connecticut was undertaken to identify the data collected, the evaluation measures used (if any), and the practicality of re-using any previously conducted system or route evaluations as

part of the *Connecticut Statewide Bus Study*. A matrix listing these studies along with the design criteria and the evaluation measures that were used for each study is included in Appendix D.

Table 14: Best Practices Review of Performance Criteria and Evaluation Measures

Performance Criteria/Evaluation Measure	CT*transit*	NYCT	SCAT	GRTC	SRTA	NJT
Route Design						
Route Coverage at the Production End		✓	✓	✓	✓	✓
Route Coverage at the Attraction End				✓		✓
Bus Stop Spacing	✓	✓		✓		✓
Overall Route Directness	✓			✓		✓
Route Coverage	✓	✓			✓	
Service Area Poverty Level					✓	
Bus Stop Location Guidelines	✓	✓				
Route Design Guidelines (limited stop, express)		✓				
Schedule Design						
Frequency/Headway Guidelines	✓	✓	✓	✓	✓	✓
Span of Service Guidelines	✓	✓		✓		✓
Vehicle Requirements						
Route Run Time						
Efficiency & Productivity						
Fare Structure				✓	✓	
Fare box Recovery		✓	✓	✓	✓	✓
Loading	✓		✓	✓		✓
Productivity	✓		✓	✓	✓	✓
Average Fare					✓	
Operating Efficiency/ Effectiveness					✓	
Service Delivery						
Running Speed				✓		✓
Vehicle Trips Operated				✓		
Pull-Outs Dispatched (Percentage Missed)				✓		
Miles per Road Call				✓	✓	
Rider Characteristics						
On-Time Performance	✓		✓			✓
Amenities						
Waiting Shelters/Benches/Area	✓			✓		✓
Bus Stop Signs	✓					✓
Public Information/Schedules						✓

Table 14: Best Practices Review of Performance Criteria and Evaluation Measures (Continued)

Performance Criteria/Evaluation Measure	CT*transit*	NYCT	SCAT	GRTC	SRTA	NJT
Maintenance and Equipment						
Revenue Equipment Condition	✓					✓
Revenue Miles between Failures						
Fleet Spare Ratio					✓	
Fleet Age					✓	

It is important to note that the studies reviewed above did not address the importance of developing performance measures so that the bus system/routes can be regularly assessed. This is a critical activity because regular assessments of the bus system and its routes ensures that any changes in travel behavior and service needs are addressed through regularly scheduled service changes. The intent of the *Connecticut Statewide Bus Study* is to recommend a set of comprehensive service guidelines that can be easily implemented to regularly evaluate bus system performance.

The performance measures and evaluation criteria best suited for this study were based upon the research conducted, the vision and goals for the state transportation plan (*Let's Go CT*), and the goals for the *Connecticut Statewide Bus Study*.

The proposed service guidelines were divided into four service standards: route design, schedule design, route productivity, and service delivery. These standards are consistent with industry best practices and the review of previous studies. Table 15 summarizes the relationship between the service standard, its corresponding criteria, the performance metric to be used in the evaluation process, and the project goal(s).

The proposed service guidelines are further detailed in the remainder of this chapter. Not every existing route in the system had sufficient data upon which each guideline can be applied at this time. All systems however should strive to collect and report this data annually.

Table 15: Proposed Statewide Bus Service Guidelines

Service Standards	Criteria	Purpose of Criteria	Performance Metric	Project Goal Addressed
Route Design	Transit Propensity*	Used to assess existing bus route service coverage and to identify areas where new bus service may be warranted	A combined metric measuring population density, density of zero-car households, and density to jobs for areas outside of ½ mile of existing bus routes	Enhance access to jobs Develop recommended expansions and modifications of fixed route and intercity service
	Provision of Service at Major Activity Centers	Used in determining which activity centers in each category should be given consideration for service (primarily extensions of existing routes)	■ Employers with 350 or more employees in a single location. ■ Shopping centers with more than 100,000 square feet of leased retail space. ■ Medical Facilities/Nursing Homes of 100 beds or more may be considered candidates for service. ■ Colleges and other post-secondary schools with residential populations and with an enrollment of at least 1,000 full-time students. ■ Public agencies, government centers and community facilities generate demand for bus service	Enhance access to jobs Develop recommended expansions and modifications of fixed route and intercity service
	Bus stop spacing	Used in siting of new bus stops and evaluation of existing bus stop spacing	Varies between 1 – 4 bus stops per mile (every 1,300 to 5,300 feet), no more than 4 stops per mile	Enhance access to jobs Develop recommended expansions and modifications of fixed route and intercity service

Table 15: Proposed Statewide Bus Service Guidelines (Continued)

Service Standards	Criteria	Purpose of Criteria	Performance Metric	Project Goal Addressed
Route Design	Bus stop amenities	Used for the provision of bus stop amenities	Priority for installation of benches should be given to stops with 50 daily boardings or more while priority for the installation of shelters should be given to stops with 100 daily boardings or more	Develop recommended expansions and modifications of fixed route and intercity service
	Bus passenger information	Used to provide customers with real-time information on bus service	Provide 100% real time info by 2025	Provide a modern, state-of-the art system including reasonable customer amenities
Schedule Design	Headway	Used in determining service levels based on ridership demand	Schedule service so there are 1.3 passengers for every seat on the bus in peak hours and one passenger per seat in off peak hours at the peak load point Adopt policy headway of between 30-60 minutes for local bus routes only. Other types of bus routes (e.g., express or shuttle bus routes) do not warrant headways of less than 60 minutes. This is an aspirational goal to create a service that meets rider's needs	Develop recommended expansions and modifications of fixed route and intercity service Enhance access to jobs Determine where connectivity between the bus and rail system in Connecticut can be enhanced
	Span of service	Used in determining hours of service, based on ridership during the first and last hours of service on the route	Provide service on all routes between 6:00 AM and 7:00 PM	Develop recommended improvements to service frequency and span to relieve overcrowding and best meet the state's travel needs

***** This criterion will be included in the Stage 1 Evaluation.

Table 15: Proposed Statewide Bus Service Guidelines (Continued)

Service Standards	Criteria	Purpose of Criteria	Performance Metric	Project Goal Addressed
Route Productivity	Passenger Trips per revenue mile	Used in evaluating efficiency of routes based on revenue miles (a useful counterpart to passenger trips per revenue hour)	Individual routes that have less than two passenger trips per revenue mile for local routes and one passenger trip per revenue mile for express routes should be examined for potential operating improvements	Develop recommended improvements to service frequency and span of service to relieve overcrowding and best meet the state's travel needs
	Passenger Trips per revenue hour*	Used in evaluating efficiency of route based on revenue hours (a useful counterpart to passenger trips per revenue mile)	Individual routes that have less than 20 passenger trips per revenue hour for local routes and less than 10 passenger trips per revenue hour for express routes should be examined for potential operating improvements	Develop recommended improvements to service frequency and span to relieve overcrowding and best meet the state's travel needs
	Fare box/cost recovery	Used in evaluating how much fare revenue covers the cost of providing service	Individual routes that have a fare box recovery in the bottom 60th percentile of the agency average should be examined for potential operating improvements	Provide cost-effective service consistent with travel needs and funding
	Ratio of revenue vehicle miles to non-revenue vehicle miles	Used in evaluating efficiency of scheduled service based on amount of non-revenue mileage	Individual local routes with non-revenue mileage that is more than five percent of revenue mileage and individual express routes with non-revenue mileage that is more than 10 percent of revenue mileage should be examined for potential operating improvements	Upgrade and expand maintenance facilities to support improved fleet performance, system reliability and reduce non-revenue trips Provide cost-effective service consistent with travel needs and funding

***** This criterion will be in the Stage 1 Evaluation.

Table 15: Proposed Statewide Bus Service Guidelines (Continued)

Service Standards	Criteria	Purpose of Criteria	Performance Metric	Project Goal Addressed
Service Delivery	On-time performance*	Used in evaluating overall route performance and identification of routes which require modified running times	Routes which fail to operate on-time for 90 percent or better of their runs will be evaluated for further improvements	Develop recommended improvements to service frequency and span to relieve overcrowding and best meet the state's travel needs
	Average time between vehicle failures	Used in evaluating overall fleet availability for revenue service	Systems with mean distance between failures (MDBF) that fall below the statewide average should be investigated for improvements	Upgrade and expand maintenance facilities to support improved fleet performance, system reliability and reduce non-revenue trips
	Fleet average age	Used in evaluating overall fleet performance and its availability for revenue service	Should the average age of the fleet exceed 2/3's of the recommended service life, that agency's replacement schedule and policies should be reviewed	Upgrade and expand maintenance facilities to support improved fleet performance, system reliability and reduce non-revenue trips

* This criterion will be in the Stage 1 Evaluation.

3.4 Route Design Guidelines

Route design guidelines are used to determine where bus routes should operate and how frequently they should operate. This includes service coverage, stop spacing, park and ride locations and reducing non-revenue vehicle miles.

3.4.1 Service Coverage

Service Coverage guidelines are used to identify the balance between coverage and frequency of service every transit system seeks. Because funding is limited, there is always a trade-off required between coverage (route miles) and frequency of service (route hours). The trade-off for users is the average distance walked to a stop versus the length of time between arriving buses.

In urban areas, a dense route structure with infrequent service can be a poorer quality service than a more moderate density of routes with more frequent service. Concentrating bus service in select corridors may mean more people have to walk slightly further, but they have more frequent service upon arrival at their stop, and therefore a reduced overall time before boarding a bus.

In rural or suburban areas with disparate land uses, land use densities make it difficult to serve all passenger trip ends with a dense fixed route network. Bus service should be designed to serve major activity centers, with the addition of park-and-ride locations and other elements that improve access to transit.

Given the infeasibility of providing a highly dense route structure with frequent service, a minimum target density of routes is needed. The following service coverage guidelines (in Section 3.4.1 and Section 3.4.2) provide detail.

3.4.2 Transit Propensity

To measure transit propensity, a transit score methodology and approach was utilized. Under this approach, factors for population density, density of zero car households, and density of jobs will be applied to each Census block and assessed as a combined metric.

Transit propensity scores were broken into five categories (High, Medium-high, Medium, Marginal, and Low). Areas that score higher and fall outside the ½ mile walkshed[1] of the existing bus routes will be identified as potential areas for service expansion. Areas within the existing bus walkshed scoring "low" will be reviewed. The proposed formula[2] that would be applied across the state is:

$$Transit\ Score = (0.41 \times Population\ per\ Acre) + (0.09 \times Jobs\ per\ Acre) + (0.74 \times Zero\ car\ Households\ per\ Acre)$$

To evaluate this guideline, the following data was required:

- Population density (population per acre) by census tract
- Jobs per acre by census tract
- US Census auto-ownership
- Bus route network GIS shapefiles

3.4.3 Provision of Service at Major Activity Centers

Commercial developments, employment centers and other uses (such as universities and medical centers) should be served by transit if they are large enough to attract and generate an adequate number of passenger trips to justify service. To assist in this determination, "threshold levels" have been established for different categories of activity centers. These threshold levels, which are based on

[1] A ½ mile walkshed is referenced in the *Let's Go CT: Connecticut's Bold Vision for a Transportation Future* (February 2015). The plan calls for a 25% expansion of bus service, providing residents in urbanized areas access to bus within half-mile of home.

[2] Source: Transit Score: New Jersey's Unique Planning Tool, plan smart nj and URS, March 2011.

past experience and judgment as well as best practices, will serve as guidelines in determining which activity centers in each category should be given consideration for service (primarily extensions of existing routes). In general, developments as described below could be expected to support transit service with a 30-minute headway or better. Other factors, such as proximity of the activity center to existing bus routes and other site-specific conditions should be considered before providing new service to a major activity center.

- **Businesses:** Employers with 350 or more employees warrant bus service. This guideline applies to either individual employers or groups of employers in a concentrated area (e.g., industrial or office park).
- **Shopping Centers:** Shopping trips constitute a major purpose for transit travel. Shopping centers (including malls and major plazas) with more than 100,000 square feet of leased retail space bus service.
- **Medical Facilities/Nursing Homes:** Institutions of 100 beds or more are candidates for service.
- **Colleges/Universities:** Colleges and other post-secondary schools with residential populations and with an enrollment of at least 1,000 full-time students warrant bus service. Commuter schools should be considered if it can be shown that there would be sufficient demand for service. Coordination with university provided transit service is recommended to avoid duplication of public/private services.
- **Social Service:** Community facilities generate demand for bus service. Since the nature and size of these facilities varies greatly, no numerical threshold was set. Judgment, as well as passenger trip purpose and characteristics of the users (e.g., elderly and low-income citizens) should be considered in deciding whether to serve such a facility.
- **Government Centers:** Public agencies and government centers and community facilities generate demand for bus service. Since the nature and size of these facilities varies greatly, no numerical threshold was set. Judgment as well as passenger trip purpose and characteristics of the users should be considered in deciding whether to serve such a facility.

To evaluate this guideline, the following data are required:

- Information on major non-residential land uses, including overall demand generated by the use.

3.4.4 Stop Spacing

Bus stop spacing guidelines seek to achieve a balance in operating an efficient bus service and providing a more reliable, convenient and attractive travel option to the public. Operating bus service that stops every block to board and discharge passengers limits the amount of walking required to access a bus stop. However, this stopping pattern degrades the overall speed of the bus and

increases route travel time, which reduces the attractiveness and convenience of bus travel. Transit agencies within Connecticut should provide local fixed route bus service at the following stop spacing based on the household densities shown in Table 16.

Table 16: Bus Stop Spacing Guidelines

Population Density (Households per Acre)			
	Over 10	**4 to 9.9**	**Under 4**
Stops per Mile	4 per mile	2 per mile	1 or less (or as needed)

To evaluate this guideline, the following data are required:

- GIS shapefiles for each route
- GIS shapefiles for each stop location

3.4.5 Bus Stop Amenities

Statewide, Connecticut should use ridership information to adopt a formal guideline for passenger amenities at bus stops. These could include (but are not limited to):

- Shelters
- Benches
- Garbage Cans
- Bicycle Storage
- Bus stop signage
- Public information displays (route maps, schedules, etc.)

Priority for installation of benches should be given to stops with 50 daily boardings or more while priority for the installation of shelters should be given to stops with 100 daily boardings or more. Priority should also be given to areas that serve a large number of elderly and disabled patrons, and areas that are located near major passenger trip generators. Bicycle racks should be prioritized at stops adjacent to bicycle facilities (bike lanes, trails, designated bike routes) and in dense, urbanized areas or areas with high concentrations of schools and universities. Guidelines should be provided to encourage connectivity of local sidewalks to stops with bus shelters consistent with the State of Connecticut's Complete Streets Policies. It is recognized that Complete Streets apply to State-owned roads. However, the state will desire Complete Street policies be followed on non-State-owned roads.

For express service, all park and ride lots should have shelters and benches. Stops in the central business district for express routes should adhere to the guidelines for local bus routes.

To evaluate this guideline, the following data are required:

- GIS shapefiles for each stop location
- Boardings at each stop
- Inventory of amenities at each stop

3.4.6 Bus Information

Providing accurate and easy-to-access information about bus stop locations, schedules, and real-time arrival information is critical to improving bus riders' experience. Prior to integrating technologies such as AVL, APC and other Intelligent Transportation Systems (ITS), (such as real-time bus information), transit properties should follow Connecticut's ITS guidelines. As discussed in Chapter 2, AVL and APC technologies are being expanded to all divisions of CT*transit,* the State-owned DATTCO bus fleet (Hartford Express), as well as the GBT and NTD bus fleets.

By 2025, all transit agencies should provide 100% real-time information on their systems.

3.5 Schedule Design

Schedule design guidelines describe minimum and maximum headways, spans of service and days of operation.

3.5.1 Headway

In general, headways (i.e., the time between buses at the same location) are established to provide enough vehicles past the maximum load point(s) on a route to accommodate the passenger volumes and stay within recommended vehicle loading guidelines.

CTDOT should adopt a statewide policy minimum headway of 30-minute service on weekdays for all local fixed routes in the peak hours, and 60 minutes in the off-peak hours (including weekends) for local routes. Where operationally necessary (such as in sections where short-turns make financial sense, or where buses run-on/run-off from the bus yard/garage), less frequent headways are permitted.

The Transit Capacity and Quality of Service Manual (TCRP Report 100) identifies level-of-service criteria as they relate to overall passenger comfort in terms of crowding, as shown in Table 17: Load Factor and Passenger Comfort. To efficiently allocate service, while maintaining passenger comfort, agencies in Connecticut should schedule bus service to meet 1.0 passengers per seat during off-peak times and 1.33 passengers per seat during peak times.

Schedules should be developed using the average peak occupancy rate at the maximum load point in the peak direction[3] for the time-period/day of the week. Every consideration should be made for variations in peak loading from the average. Routes which see high variation should be candidates for higher capacity vehicles.

Table 17: Load Factor and Passenger Comfort

Service Period	Maximum Load Factor (PASSENGERS PER SEAT)	Minimum Load Factor (PASSENGERS PER SEAT)
Weekday Peak	1.33	0.33
Weekday Midday	1.00	0.25
Evening	1.00	0.15
Nights (after 10:00PM)	1.00	0.15
Weekends	1.00	0.20

Source: Transportation Research Board, Transit Capacity and Quality of Service Manual

Routes operating Commuter Connection routes connecting with rail should have headways that enable the bus to meet each arriving and departing train without excessive wait times for passengers transferring to or from the bus.

Express routes should be scheduled to provide a level of service that allows customers to commute reliably via transit (i.e., multiple morning and evening departures that accommodate flexible schedules, no standees per State law[4]). Service should be scheduled to meet demand, but should also provide at a minimum between 2-4 departures in the morning and evening, but midday and off-peak service may be provided, if warranted.

To evaluate this guideline, the following data are required:

- Maximum passenger load by vehicle trip

[3] The average peak occupancy rate at the maximum load point (the point along the route that experiences the largest number of passengers) in the peak direction indicates the adequacy of the service provided. If less than 100%, there is surplus capacity in the system. If more than 100%, it may indicate that service is not adequate or there is excess demand with passengers having to wait excessive periods of time before being able to board a bus.

[4] Connecticut General Statutes 14-273 - Operation of motor vehicles requiring a passenger endorsement or passenger and school endorsement. Requires authority from DMV to allow standees. Express bus routes operated with motor coach equipment cannot accommodate standees.

- Rail transit schedules

3.5.2 Span of Service

Span of service is the hours that a bus route operates each day. The span of service for fixed local routes vary between the different transit agencies across Connecticut. While the size and budget of agencies plays a part in how many daily revenue vehicle hours can be afforded, CTDOT should recommend a minimum span of service for agencies to strive towards. A typical minimum span for local bus service on weekdays is 6:00 AM to 7:00 PM, with later service for primary local routes, and not later than 6:00 PM for express service. Weekend services can vary locally depending on the travel demand on Saturdays, Sundays, and holidays.

Express service spans vary more than those of local fixed routes. If the service is solely focused on commuters, the service can be provided only during peak hours. The span of service will depend on the travel time of the express service. These vehicle trips should aim to provide service that arrive in the central business district between 6:00 AM and 9:00 AM and depart the central business district between 3:00 PM and 6:00 PM.

When loads on the last or first vehicle trip are high (approaching 1.3 passengers per seat), or local agencies identify changes in land use/employment patterns, expanding the overall span of service should be explored.

Bus routes serving major activity centers (malls, houses of worship, and large employment centers) are candidates for weekend service. Limited service should be implemented, starting on Saturdays, and should be monitored closely to determine overall demand.

Routes operating as feeder service or Commuter Connection routes connecting with rail transit at stations should have spans that reasonably match heavy travel periods of the rail transit line.

To evaluate this guideline, the following data are required:

- Maximum load by vehicle trip
- Rail transit schedules

3.6 Route Productivity

Route productivity guidelines describe the overall cost to operate the route or system relative to various other metrics (including number of passenger trips and distance travelled). These guidelines will be used to identify routes that should be examined for potential improvements.

3.6.1 Passenger Trips per Revenue Mile

Passenger trips per revenue mile is a useful metric for measuring the overall efficiency of a route or system compared to the distance operated. This metric can be useful in identifying routes with low fare box recovery ratio[5], high operating costs/deficits, or low overall utilization. This statistic should be calculated on a route level based on route distance, for all routes of a specific type (i.e., express versus local routes), and for each agency as a whole. When comparing this metric across the state, agencies should be grouped by overall size, so that smaller systems are compared with other small systems and larger systems are compared with other large systems.

Based upon the best practices review of peer transit systems, individual routes that have less than two passenger trips per revenue mile for local routes and less than one passenger trip per revenue mile for express routes will be identified for further examination.

To evaluate this guideline, the following data are required:

- Total average weekday, Saturday and Sunday Passenger Trips
- Route statistics

3.6.2 Passenger Trips per Revenue Hour

Passenger trips per revenue hour is a useful metric for measuring the overall efficiency of a route or system. This metric can be useful in identifying routes with low fare box recovery, high costs/deficits, or low overall utilization. This statistic should be calculated on a route level, for all routes of a specific type (i.e., express versus local routes), and for each agency as a whole.

Based upon the best practices review of peer systems, individual routes that have less than 20 passenger trips per revenue hour for local routes and less than 10 passenger trips per revenue hour for express routes will be identified for further examination.

To evaluate this guideline, the following data are required:

- Total average weekday, Saturday and Sunday Passenger Trips
- Route statistics

[5] The fare box recovery ratio is the proportion of the amount of revenue generated by paying passengers as a fraction of the cost of the total operating cost.

3.6.3 Fare box/Cost Recovery

Fare box recovery is the amount of the cost per passenger trip that is covered by the fare paid by the passenger. This statistic should be calculated on a route level, for all routes of a specific type (i.e., express versus local routes), and for each agency as a whole, and consider fare policy

Individual routes that have a fare box recovery in the bottom 60th percentile of the agency average should be examined for potential operating improvements

To evaluate this guideline, the following data are required:

- Total average weekday, Saturday and Sunday Passenger Trips
- Route statistics

3.6.4 Ratio of Revenue Miles to Non-Revenue Miles

The ratio of revenue to non-revenue mileage is an important statistic that measures how efficiently the route is scheduled. Non-revenue mileage from the bus maintenance/storage facility to the start of the route is not productive as the transit agency is spending money on fuel and salaries while not carrying passengers or collecting fares. A high ratio of non-revenue to revenue mileage indicates that the route must travel a significant distance in non-revenue miles to begin or end revenue service.

Based upon the best practices review of peer systems, individual local routes where non-revenue mileage is more than five percent of revenue mileage and individual express routes where non-revenue mileage is more than 10 percent of revenue mileage should be examined for potential operating or capital improvements. Specifically, the location of the system's depot(s) with respect to the service area should be investigated for routes with high non-revenue to revenue mileage ratios. Route adjustments might be warranted, if feasible, since it is unlikely that new bus garages would be constructed to improve this metric.

To evaluate this guideline, the following data are required:

- Route statistics
- Location of depots

3.7 Service Delivery

Service delivery guidelines describe the operations of the routes, including travel time and on-time performance. The travel time and on-time performance affect a

customer's day-to-day impression of the system and are very important in providing an efficient, comfortable and reliable system. Similar to the Productivity Guidelines, service delivery evaluations should be performed annually by each agency. Maintenance performance measures are included here because these activities, if performed regularly, help minimize service disruptions due to equipment failure. Additionally, the age and condition of the fleet affects the perception of the system and the comfort of the passengers.

3.7.1 On-Time Performance

The passenger's experience with bus service depends highly upon on-time performance, especially on short-distance trips, where consistently late running buses impact travel times and the overall passenger experience. The best way to measure on-time performance is using AVL devices. Not all bus systems in Connecticut have AVL technology, but it is being gradually added to the fleet throughout the state (especially on CT*transit* routes). AVL not only measures on-time performance, but allows the real-time tracking of transit vehicles for improved management and participation in real-time mobile applications for riders. CTDOT should make it a goal for all bus systems to have AVLs on each vehicle in service by 2025 so that the on-time performance metric can be assessed at least annually for each route in the future.

For existing bus systems that utilize AVL technologies and have this data available (either at the route or system level), the on-time performance will be evaluated. It is recommended that the State require transit agencies measure on-time performance data at least annually at the route level, either using AVL technology or the traditional method based on collected data on the street key intermediate time points along the route by Transportation Supervisors or traffic specialists.

Routes which fail to operate on-time 90 percent or better on their runs will be evaluated for further improvements.

To evaluate this guideline, the following data are required:

- On-time performance by route or at system-level (depending on data availability)

3.7.2 Average Distance between Failures

A service failure is defined as a failure of some mechanical element of the revenue vehicle that prevents the vehicle from completing a scheduled vehicle trip or from starting the next scheduled vehicle trip because actual movement is limited or because of safety concerns. To measure these service failures, each agency should measure the mean distance between failures (MDBF) which is the average distance traveled between these service failures. This should be

evaluated by each agency annually, and when MDBF for an agency falls below the statewide average, the maintenance operations or age of the fleet (see below) should be investigated for potential improvements/replacements.

To evaluate this guideline, the following data are required:

- Mean distance between failures by age of fleet

3.7.3 Fleet Average Age

. Based on vehicle size, there are various categories of recommended vehicle service life, ranging from 12 year/500,000 miles to 4 year/100,000 miles. Each agency will be responsible for annually tracking the average age of their entire bus fleet, and for buses in each category for agencies that operate multiple size buses. Should the average age of the fleet exceed two-thirds of the recommended service life, that agency's replacement schedule and policies should be reviewed[6].

To evaluate this guideline, the following data are required:

- Average fleet age by type of vehicle

[6] For transit agencies with smaller service areas, CTDOT often replaces nearly the entire fleet at once.

4

Bus Performance Analysis

4.1 Stage 1 Evaluation

The Stage 1 evaluation assessed and ranked the statewide bus routes based on three key service guideline areas: **transit propensity** (to measure the effectiveness of network coverage), **passenger trips per revenue hour** (to evaluate operational productivity of routes), and **on-time performance** (to assess overall route performance and identify routes which require modified running times). This approach provided an individual assessment of each route compared with other routes operated by that specific transit agency, and other routes in the state. The routes were ranked, identifying the best and poorest-performing routes in assigned peer groups (those routes within the top 10 percent of highest performing routes in each group and those within the lowest 10 percent of poor performing routes in each group).

It is important to recognize that within every system there are high and low performing routes. Many transit systems make policy decisions to provide service on routes that may not produce high ridership, but provide a valuable service to select users or connectivity that supports higher-performing services. Sometimes routes are created to address a specific policy directive and may not be focused solely on ridership performance. By conducting the analysis on an agency level, the state can set the appropriate balance between the needs of riders, operational concerns, and funding constraints to maximize the effectiveness of the statewide system.

The Stage 1 evaluation utilized available data for each route upon which the three screening criteria were applied. There were cases where data in one or all categories was not available for a particular route, therefore the route was not evaluated for that criterion. This is discussed further in section 4.3.

4.2 Stage 2 Evaluation

Following completion of the Stage 1 Evaluation, the Stage 2 Evaluation examined route and scheduling characteristics at a finer level of detail for those routes that are the highest and lowest performers. The Stage 2 evaluation applied all of the evaluation criteria and performance metrics from the service guidelines. This analysis identified specific strengths and weaknesses of the routes selected informed the development of route-specific recommendations.

4.3 Data Used in the Analysis

An intensive data collection effort was conducted as part of this study. Each of the transit systems were contacted. A sample of the Data Request form is included in Appendix D. Route data was requested and analyzed from the following sources:

- **Schedule Information:** Information on schedules was obtained from public timetables as well as transit systems' internal run-cut and schedule information.
- **Ridership Information:** Ridership information was collected from internal fare box and ride-check data, as well as public reports.
- **Financial Information:** Financial information was taken from financial audits, the National Transit Database, and data from transit systems.
- **Service Delivery Information**: Service delivery information was derived from on-time performance reports.

4.4 Data Availability Issues

An extensive outreach effort was performed to obtain bus route level performance data, and follow-ups with transit systems were conducted in March 2016. While most transit systems were responsive and provided the requested data, many indicated that they do not collect on-time performance data at the route level.

On-time performance data at a route level was not available for CT*transit*, CT*fastrak* (as it was not yet in service in 2014) and the rural transit systems. Beginning in 2017, AVL and APC technology was installed on all CT*transit* bus division fleets. At the time of the final report, GBT and NTD were adding these technologies to their fleets. In addition, passenger trips per revenue hour data at the route level was not available for two rural transit systems.

4.5 Stage 1 Evaluation Results

The Stage 1 Evaluation considered three metrics: transit propensity, passengers per revenue hour, and on-time performance. The transit propensity evaluation used GIS data to analyze the relationship between existing transit routes and key demographic factors. The evaluation of passenger trips per revenue hour and on-time performance was a quantitative analysis. Routes that performed well for a specific measure could be candidates for service expansion or investment. The routes ranked poor, or performing below average, based on the service guidelines should be examined more closely to identify the causes for poor performance, and service improvements could be considered to correct them. The routes that are not highlighted are considered average performers that are not in need of priority attention or adjustment. The top ten percent of highly and poorly ranked routes were advanced to Stage 2 Evaluation by peer group.

4.5.1 Transit Propensity Evaluation

- **Purpose of Criteria**: Used to assess existing bus route service coverage and to identify areas where new bus service may be warranted
- **Performance Metric**: A combined metric measuring population density, density of zero-car households, and density of jobs for areas outside of ½ mile of existing bus routes
- **Goal Addressed**: Enhance access to jobs; Develop recommended expansions and modifications of fixed route and intercity service; Improve and expand urban bus service by 25% providing urban residents access to bus service with half-mile of home

To measure transit propensity, a transit score methodology and approach was utilized. A transit propensity analysis identifies areas where there is a potential demand for transit services. Demand is estimated using a function composed of variables associated with greater transit usage. The function for this analysis is based on population density, job density, and density of households with no vehicle available. These variables were selected based on their strong relationship to transit demand. Higher population densities are strongly correlated to higher ridership for transit. Commuting to work is the most prevalent trip purpose nationally. Similarly, the density of jobs is strongly correlated to higher transit ridership. Lastly, vehicle ownership is found to be a strong indicator of transit dependency. Combining these factors together in a single function provides for a score that accounts for pure density, concentrations of employment, and transit dependency.

$$Transit\ Score = (0.41 \times Population\ per\ Acre) + (0.09 \times Jobs\ per\ Acre) + (0.74 \times Zero\ car\ Households\ per\ Acre)$$

The scores from the propensity analysis were broken into five categories (High, Medium-high, Medium, Marginal, and Low). (See Table 18) Areas that scored Medium or higher (1.0 or better) and fall outside the ½ mile walkshed[1] of the existing bus routes were identified as potential areas for service expansion. Not all areas that met the guideline are necessarily candidates for transit service expansion. Small towns, or other remote areas that fall within the Medium and higher classification should be examined further to determine whether transit service is truly warranted. These areas may have high levels of zero-car households, but population densities too low to support fixed route service. Other forms of transportation may be appropriate.

Table 18: Transit Score Category Ranges

Transit Score Category	Transit Score Range	Count of Block Groups	Population	Employment	Households with No Vehicle	Land Area (Acres)
High	> 7.5	323	452,844	217,496	45,667	19943.9
Medium-High	2.5-7.5	658	848,984	365,066	40,430	102285.9
Medium	1.0-2.5	606	834,172	406,380	19,812	254715.2
Marginal	0.6-1.0	301	447,941	211,037	6,751	270191.7
Low	<0.6	693	1,008,112	313,132	10,777	2452157.0

[1] A ½ mile walkshed is referenced in the *Let's Go CT: Connecticut's Bold Vision for a Transportation Future* (February 2015). The plan calls for a 25% expansion of bus service, providing residents in urbanized areas access to bus within half-mile of home.

Figure 21: Transit Propensity by Census Block Group and Existing Route Network

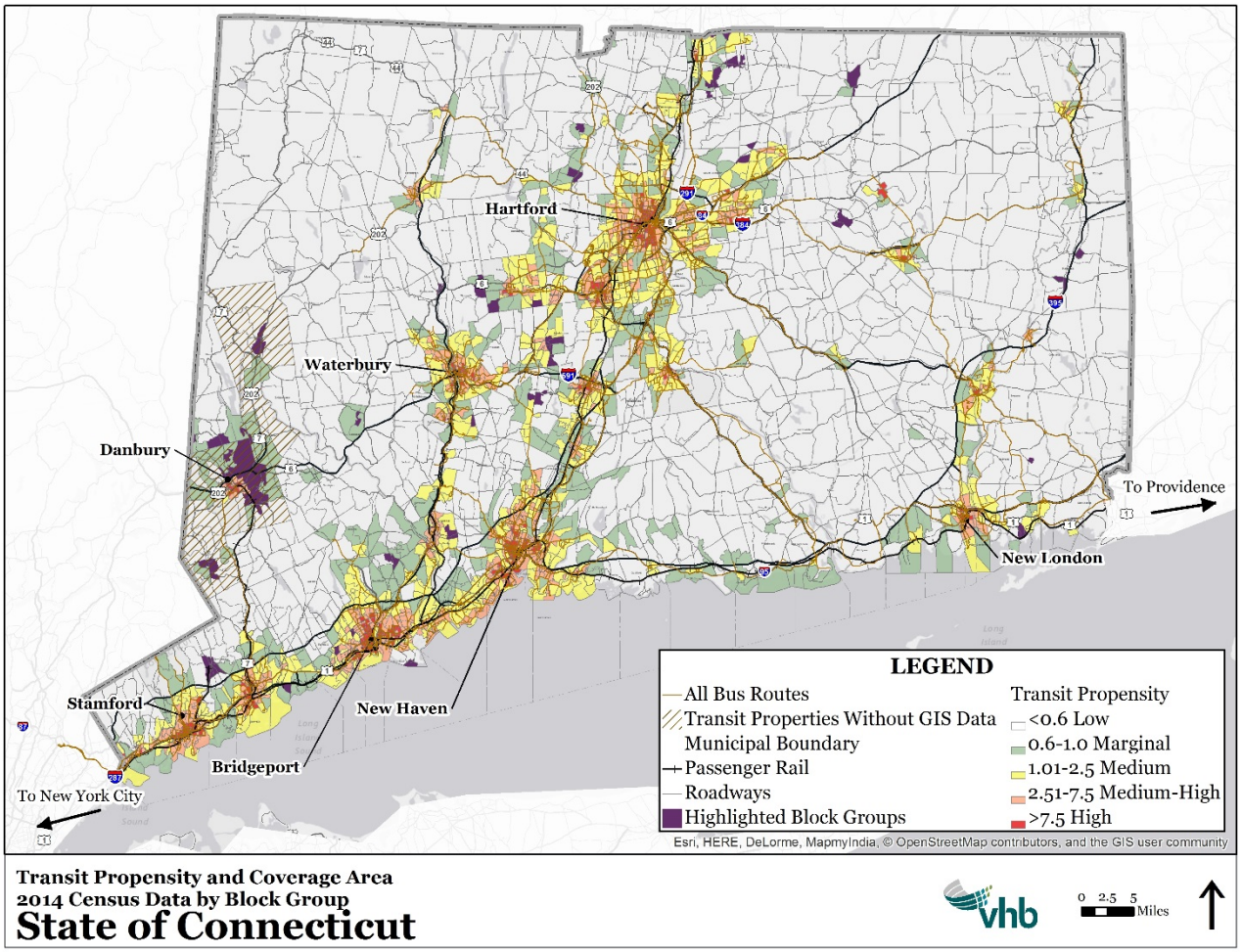


Figure 21 shows the transit propensity rankings within the state. Existing bus routes are in orange, and the propensity to use transit score by block group is displayed from red (high likelihood to use) to transparent/no highlighting (low likelihood to use). Block groups highlighted in purple were those with a transit score of Medium or higher that were located outside of the ½ mile buffer of existing bus routes. These block groups are highlighted to show potential opportunities to optimize transit expansion. Note that data for existing transit near Danbury was unavailable, highlighted block groups under the hashed area may presently be covered by existing transit service.

Of the 2,581 block groups analyzed, 1,587 block groups (61 percent) had a transit propensity score of Medium or higher. Of these, 76 block groups (2.9% of the block groups analyzed) had scores of Medium or higher and were not within a ½ mile buffer of an existing transit route. Thirty of these block groups are located in the HART service area, where route data has not been provided and thus transit propensity could not be accurately assessed. Of the remaining 46 block groups (1.8% of the

blocks groups analyzed) that have transit propensity scores over 1.01 but do not have transit service within ½ mile, the clear majority are located in small pockets adjacent to existing urban transit coverage areas. Expanding existing bus service into these areas may be more feasible than introducing a new bus route to areas without any adjacent service. These census block groups are displayed in Figure 21 and are shown in purple.

The block groups that have transit propensity over 1.01 but are isolated from other routes or urban areas, tend to have scored as having a high transit propensity by either being very small in land area and having an elevated population density (5-7 persons/acre), or by having a high share of households without a vehicle. For example, Southbury, located between Danbury and Waterbury, is a block group where despite relatively low population and employment densities, 106 out of 468 households do not have access to a vehicle. For these reasons, despite having a high transit propensity score, it does not necessarily mean that transit service is warranted. Further assessments of these areas will be performed.

All 2,581 block groups were ranked and assigned a transit propensity score. The top ten scores ranged from 28.87 to 40.05. All of these block groups are located in urbanized areas; one in in Bridgeport, one in Stamford, four in New Haven, and four in Hartford. These block groups all had either high population or employment densities, or high percentages of households without a vehicle. The bottom ten scores ranged from 0.019 to 0.028. These block groups are located rural areas with low employment and population densities. Of the 3,771 households in these combined block groups, 153 households do not have access to a vehicle (4 percent). Nine of these block groups are in Litchfield County to the northwest of Torrington and Winchester, and one is in Tolland County, near Union.

4.5.2 Route Productivity and Performance Evaluation Criteria

Passenger Trips per Revenue Hour Evaluation Criterion

- **Purpose of Criteria**: Used in evaluating efficiency of route based on revenue hours
- **Performance Metric**: Individual routes that have less than 20 passenger trips per revenue hour for local routes and less than 10 passenger trips per revenue hour for express routes should be examined for potential operating improvements
- **Goal Addressed**: Develop recommended improvements to service frequency and span to relieve overcrowding and best meet the state's travel needs

Passenger trips per revenue hour measures the number of passengers carried by one bus in one hour of revenue service. This metric does include layover time, but does not include dead-time to the depot. It is a consistent metric across all transit systems and indicative of a route's effectiveness and productivity. The higher the number of

passengers carried per trip for each hour the bus is in service, the more efficient and cost-effective the bus route tends to be. This criterion is defined further in Table 19.

Routes ranked within top 10 percent of the best and poorest performing routes in their peer group will be advanced to Stage 2. Those routes that consistently perform poorly (i.e. have a low number of passengers per revenue hour) will be identified for service changes to improve overall performance. These changes could include route extensions to increase ridership or service changes such as route changes, widened frequencies, shorter service spans, or eliminations if ridership increases are not possible.

The evaluation for this criterion is divided by system size to provide fair "peer group" comparisons. Statewide express bus routes and shuttle/commuter routes were each grouped and separated so they could be evaluated only against each other, despite being operated as part of larger systems.

Table 19: Passenger Trips per Revenue Hour – Evaluation Criterion

Criteria	Purpose of Criteria	Performance Metric	Project Goal Addressed
Passenger Trips per Revenue Hour	Used in evaluating efficiency of route based on revenue hours	Individual routes that have less than 20 passenger trips per revenue hour for local routes and less than 10 passenger trips per revenue hour for express routes should be examined for potential operating improvements	Develop recommended improvements to service frequency and span to relieve overcrowding and best meet the state's travel needs

On-Time Performance Evaluation Criterion

- **Purpose of Criteria**: Used in evaluating overall route performance and identification of routes which require modified running times
- **Performance Metric**: Routes which fail to operate on-time for 90 percent or better of their runs will be evaluated for further improvements
- **Goal Addressed**: Develop recommended improvements to service frequency and span to relieve overcrowding and best meet the state's travel needs

The on-time performance evaluation identifies routes with issues or strengths in service delivery. Issues with on-time performance can affect the way the public views the system or route's reliability. In addition, low on-time performance could suggest that these routes need to be examined for that issues effect on-time performance such as overcrowding on vehicles, traffic congestion along the route, or other factors impacting the ability to adhere to the schedule. A bus is considered not to be on time if it arrives at a time point one or more minutes ahead of schedule or departs more than five minutes later than scheduled. This criterion is defined further in Table 20.

Similar to the previous criterion, routes are grouped and evaluated according to transit system size, and those ranked within the top and bottom 10 percent of routes will be advanced to Stage 2.

Table 20: On-Time Performance – Evaluation Criterion

Criteria	Purpose of Criteria	Performance Metric	Project Goal Addressed
On-time performance	Used in evaluating overall route performance and identification of routes which require modified running times	Routes which fail to operate on-time for 90 percent or better of their runs will be evaluated for further improvements	Develop recommended improvements to service frequency and span to relieve overcrowding and best meet the state's travel needs

A request for data was sent to every transit agency in the state. The data received from the various transit systems came in different formats, and in many instances, was incomplete. In some cases, a calculation had to be performed using the received data to produce the desired metric. The analysis for this study assumed that the data provided from every agency was accurate, and that it was collected and reported in a consistent approach (i.e., on-time performance data provided calculates "on time" using the same methodology CT*transit* applied). Where data was not available no evaluation was performed. This is noted for each measure in the report.

On-time performance is critical to passenger experience, and it is a good metric of whether routes and systems are providing service reliably or if adjustments are needed to improve running times and schedule adherence. It is recommended that CTDOT collaborate with all transit systems in the state to enable them to track on-time performance.

The evaluation results for all transit systems by system size are displayed in the following section and tables.

4.5.3 Route Productivity and Performance Evaluation Results

Rankings for Urban Bus Systems with More Than 5,000,000 Annual Passengers

Three transit systems are included in this category:

- GBT
- CT*transit* Hartford
- CT*transit* New Haven

Express bus routes (CT*transit* Hartford Express and CT*transit* Stamford's I-BUS were grouped and ranked separately). CT*fastrak* routes were not ranked because revenue

service began in March 2015 and complete data was not available at the time of this report.

These transit systems account for 76 bus routes (excluding express bus routes and CT*fastrak* routes). The evaluation results for this category of Transit Systems are displayed in Table 21.

For all evaluation results tables, the green, shaded cells indicate the route is ranked in the top 10 percent for a particular metric. Pink, shaded cells indicate the route is ranked in the bottom 10 percent for a particular metric. Yellow indicates the route did not meet the criterion threshold, but did not fall within the bottom or the top 10 percent of all routes assessed for that criterion.

Table 21: Urban Bus Systems / Over 5 Million Annual Passenger Boardings – Evaluation Results

Agency	Route	Service Type	Passenger Trips per Rev Hour	Ranking - Passenger Trips per Revenue Hour	On Time Performance	Ranking - On Time Performance
Greater Bridgeport Transit	1	Local	52.45	15	69%	7
	2-Coastal Link	Regional	21.70	59	53%	16
	3	Local	27.44	54	65%	11
	4	Local	41.42	34	62%	12
	5	Local	46.89	22	66%	10
	6	Local	30.39	53	72%	6
	7	Local	14.96	64	57%	15
	8	Local	54.72	12	76%	2
	9	Local	55.79	10	75%	3
	9B	Local	Included in Route 9	Included in Route 9	Included in Route 9	Included in Route 9
	10	Local	39.37	37	74%	5
	13	Local	55.46	11	61%	13
	14	Local	30.46	52	67%	9
	15	Local	33.83	50	75%	4
	16	Local	Information not available	Information not available	86%	1
	17	Local	44.64	27	59%	14
	20	Local	15.32	64	68%	8
	23	Local	18.76	63	Information not available	Information not available

Table 21: Urban Bus Systems / Over 5 Million Annual Passenger Boardings – Evaluation Results (Continued)

Agency	Route	Service Type	Passenger Trips per Rev Hour	Ranking - Passenger Trips per Revenue Hour	On Time Performance	Ranking - On Time Performance
CT*transit* Hartford	30 Bradley Flyer	Local	26.14	55	Information not available	
	31 Park Street / New Park Ave	Local	76.47	1		
	32 Windsor Avenue	Local	50.87	16		
	33 Park Street	Local	(combined with 31)	(combined with 31)		
	34 Windsor Avenue / Rainbow	Local	Information not available	Information not available		
	36 Windsor / Day Hill Rd.	Local	(combined with 32)	(combined with 32)		
	37 New Britain Avenue via Jefferson	Local	45.95	22		
	38 Weston Street	Local	60.35	6		
	39 New Britain Avenue via Retreat	Local	(combined with 37)	(combined with 37)		
	40 North Main Street	Local	64.61	4		
	41 New Britain / Hartford	Local	39.93	35		
	42 Barbour Street	Local	(combined with 40)	(combined with 40)		
	43 Campfield Avenue	Local	37.05	42		
	44 Garden Street	Local	47.79	19		
	45 Berlin Turnpike Flyer	Local	13.55	65		
	46 Vine Street	Local	47.82	18		
	47 Franklin Ave	Local	59.47	7		
	50 Blue Hills Ave / Cottage Grove Rd	Local	47.50	20		
	52 Blue Hills Ave	Local	(combined with 50)	(combined with 50)		
	53 Wethersfield Ave	Local	47.39	21		

Table 21: Urban Bus Systems / Over 5 Million Annual Passenger Boardings – Evaluation Results (Continued)

Agency	Route	Service Type	Passenger Trips per Rev Hour	Ranking - Passenger Trips per Revenue Hour	On Time Performance	Ranking - On Time Performance
CT*transit* Hartford	54 Blue Hills Ave / Blue Hills Extension	Local	(combined with 50)	(combined with 50)	Information not available	
	55 Middletown	Local	(combined with 53)	(combined with 53)		
	56-58 Albany/Bloomfield Avenue	Local	42.85	33		
	59 Locust Street	Local	36.22	43		
	60-66 Farmington Avenue	Local	45.60	24		
	61 Broad Street	Local	43.12	32		
	63 Hillside Avenue	Local	43.14	31		
	69 Capitol Avenue	Local	36.09	44		
	72 Asylum Avenue	Local	35.70	46		
	74 Granby Street	Local	34.98	49		
	76 Ashley Street	Local	43.17	30		
	80 Buckland Flyer	Local	38.71	40		
	82-84 Tolland Street	Local	45.23	24		
	83 Silver Lane	Local	43.92	29		
	85 MCC Flyer	Local	69.48	3		
	86-88 Burnside Avenue-Manchester	Local	37.11	41		
	87 Brewer Street	Local	35.45	48		
	91 Forbest Street Crosstown	Local	22.68	58		
	92 Tower Avenue Crosstown	Local	20.25	60		
	94-96 Park Avenue / John Fitch Blvd	Local	35.76	45		
	95 Glastonbury	Local	39.50	37		

Table 21: Urban Bus Systems / Over 5 Million Annual Passenger Boardings – Evaluation Results (Continued)

Agency	Route	Service Type	Passenger Trips per Rev Hour	Ranking - Passenger Trips per Revenue Hour	On Time Performance	Ranking - On Time Performance
CTtransit New Haven	B Whalley Ave	Local	58.15	8	Information not available	
	B Congress Ave	Local	54.05	13		
	C North Haven	Local	25.97	56		
	D Grand Avenue	Local	70.18	2		
	D Dixwell Avenue	Local	60.71	5		
	F East Haven	Local	33.45	51		
	F West Chapel	Local	53.81	14		
	G Shelton Ave / East Chapel St.	Local	40.51	35		
	J Whitney Ave	Local	23.12	57		
	J Kimberly Ave	Local	56.83	9		
	L North Branford	Local	9.62	66		
	M Washington Ave / State St	Local	39.23	39		
	O Winchester Ave	Local	35.64	47		
	O Route 1 (includes 55x)	Local	49.28	17		
	Q State St / Edgewood Ave	Local	44.48	28		
	S Madison	Local	20.13	61		
	Z Goffe Street / Sargent Dr	Local	45.13	26		

Passenger Trips per Revenue Hour

For passenger trips per revenue hour, the best performing routes for Urban Bus Systems with More Than 5,000,000 Annual Passenger Boardings were:

- CT*transit* Hartford Route 31 Park Street / New Park Ave
- CT*transit* Hartford Route 38 Weston Street
- CT*transit* Hartford Route 40 North Main Street
- CT*transit* Hartford 47 Franklin Ave
- CT*transit* Hartford Route 85 MCC Flyer
- CT*transit* New Haven Route D Grand Avenue
- CT*transit* New Haven Route D Dixwell Avenue

All of these routes exceeded the threshold of 20 passenger trips per revenue hour. Many other routes also exceeded the criterion. In total, 65 routes were assessed for this criterion and 58 met or exceeded the threshold indicating the majority of the routes are productive for these urban bus systems.

The poorest performing routes were:

- GBT Route 7
- GBT Route 20
- GBT Route 23
- CT*transit* Hartford 45 Berlin Turnpike Flyer
- CT*transit* Hartford 92 Tower Avenue Crosstown
- CT*transit* New Haven L North Branford
- CT*transit* New Haven S Madison

All of these routes were significantly below the threshold for this criterion indicating poor productivity.

Generally, the 19 GBT bus routes performed well for passenger trips per revenue hour, with only the three routes noted above failing to meet the 20 passenger trips per revenue hour threshold.

The CT*transit* Hartford Division is comprised of 44 bus routes, with 41 routes providing local service and three routes providing commuter shuttle service (ranked separately). Nearly all bus routes met or surpassed the 20 passenger trips per revenue hour threshold, except for Route 45 Berlin Turnpike Flyer. Four routes ranked in the top 10 percent for this metric (Routes 31, 40, 47 and 85).

The CT*transit* New Haven Division performed well for the passenger trips per revenue hour metric. Two routes did not meet the threshold (Route L and Route S). Two routes

(Routes D, Grand Avenue and D Dixwell Avenue) are included in the top 10 percent for this metric.

On-time Performance

Of the transit systems in this category, only GBT provided on-time performance data. In terms of on-time performance, the best performing route was:

- GBT Route 16

This route however did not meet the 90 percent threshold, with an 86% on-time performance.

The poorest performing route was:

- GBT Route 2 – Coastal Link

None of GBT's routes have an on-time performance over 90 percent. On-time performance ranges from a low of 53 percent to a high of 86 percent.

The CT*transit* Hartford Division and CT*transit* New Haven Division did not provide on-time performance data and could not be evaluated.

Rankings for Urban Bus Systems with 2,000,000 to 5,000,000 Annual Passenger Boardings

Two transit systems with between two and five million annual passenger boardings are included in this category: CT*transit* Stamford and CT*transit* Waterbury. Together these transit systems account for 44 bus routes. The evaluation results for this category of Transit Systems are displayed in Table 22. Pink, shaded cells indicate the route is ranked in the bottom 10 percent for a particular metric. Yellow indicates the route did not meet the criterion threshold, but did not fall within the bottom or the top 10 percent of all routes assessed for that criterion.

Table 22: Urban Bus Systems / 2 Million to 5 Million Annual Passenger Boardings – Evaluation Results

Agency	Route	Service Type	Passenger Trips per Rev Hour	Ranking - Passenger Trips per Revenue Hour	On Time Performance	Ranking - On Time Performance
CT*transit* Stamford	11 Port Chester	Local	37.92	16	Information not available	
	13 West Broad St	Local	10.85	37		
	21 West Ave	Local	10.12	38		
	22-24 Greenwich & Fairfield Ave	Local	8.94	39		
	26-27 Pacific St - Shippan Ave	Local	5.94	41		
	31 Bedford St-High Ridge Rd	Local	32.75	20		
	32-35 Washington Blvd-Long Ridge Rd	Local	6.77	40		
	33 Strawberry Hill Ave	Local	11.80	36		
	34 Hope St	Local	18.90	29		
	41 Norwalk	Local	36.64	17		
	42 Darien	Local	12.69	35		
	43 Cove Rd	Local	18.96	27		
	45 NCC Flyer	Local	14.06	33		

Table 22: Urban Bus Systems / 2 Million to 5 Million Annual Passenger Boardings – Evaluation Results (Continued)

Agency	Route	Service Type	Passenger Trips per Rev Hour	Ranking - Passenger Trips per Revenue Hour	On Time Performance	Ranking - On Time Performance
CT*transit* Waterbury	11 Overlook	Local	50.7	8	81%	6
	12 Hill Street	Local	30.5	22	78%	10
	13 Oakville	Local	48.1	9	80%	8
	15 Bucks Hill - Farmcrest	Local	34.8	19	46%	17
	16 Bucks Hill - Montoe	Local	31.4	21	8%	23
	17 Thomason Ave/Waterville	Local	43.1	12	87%	3
	18 Long Hill	Local	44.3	11	82%	5
	20 Walnut	Local	41.2	13	100%	1
	22 Wolcott	Local	68.5	1	75%	11
	25 Hitchcock Lake	Local	35.1	18	71%	12
	26 Fairlawn/ East Main St	Local	38.8	15	92%	2
	27 Merline/East Main	Local	54.4	6	28%	21
	28 Scott Road/East Main	Local	59.6	4	13%	22
	31 East Mountain	Local	13.6	34	35%	18
	32 Hopeville / Sylvan	Local	16.2	30	70%	13
	33 Hopeville / Baldwin	Local	50.9	7	63%	15
	35 Town Plot / New Haven Ave	Local	46.9	10	68%	14
	36 Town Plot / Bradley	Local	55.8	5	35%	19
	40 Town Plot / Highland	Local	28.6	25	81%	7
	42 Chase Parkway	Local	68	2	50%	16
	44 Bunker Hill	Local	61.3	3	80%	8
	45 Watertown	Local	25.5	26	85%	4
	J Whitney Ave / Waterbury	Local	Information not available	Information not available	Information not available	Information not available
	N1 Naugatuck / Millville	Local	5.8	42	33%	20
	N2 Naugatuck / New Haven Rd	Local	2.0	43	0%	24

Table 22: Urban Bus Systems / 2 Million to 5 Million Annual Passenger Boardings – Evaluation Results (Continued)

Agency	Route	Service Type	Passenger Trips per Rev Hour	Ranking - Passenger Trips per Revenue Hour	On Time Performance	Ranking - On Time Performance
CTtransit Waterbury	T114 Beacon Falls	Local	29.3	23	Information not available	
	T17 Waterville	Local	15.7	31		
	T47 Watertown - Straits Turnpike	Local	19.0	28		
	T49 Watertown Industrial Park	Local	28.9	24		
	T74 Naugatuck Industrial Park	Local	40.0	14		
	T81 Cheshire Industrial Park	Local	14.1	32		

Passenger Trips per Revenue Hour

For passenger trips per revenue hour, the best performing routes for Urban Bus Systems with 2,000,000 to 5,000,000 annual passenger boardings were:

- CT*transit* Waterbury Route 22 Wolcott
- *CTtransit* Waterbury Route 28 Scott Road/East Main
- CT*transit* Waterbury 42 Chase Parkway
- CT*transit* 44 Waterbury Bunker Hill

All of these routes exceeded the threshold of 20 passenger trips per revenue hour. Many other routes also exceed the criterion. In total, 43 routes were assessed for this criterion and 27 met or exceeded the threshold indicating the majority of the routes are productive for these urban bus systems

The poorest performing routes were:

- CT*transit* Stamford 26-27 Pacific St – Shippan Avenue
- CT*transit* Stamford 32-35 Washington Blvd-Long Ridge Rd
- CT*transit* Waterbury N1 Naugatuck / Millville
- CT*transit* Waterbury N2 Naugatuck / New Haven Rd

All of these routes were significantly below the threshold for this criterion indicating poor productivity.

Three of CT*transit* Stamford Division's thirteen routes exceeded the threshold (Routes 11, 31, and 41), with two more falling just short (Routes 34 and 43). The remainder have low levels of passenger trips per revenue hour (nine to 14 passenger trips per revenue hour). Three Stamford Division bus routes fall within the bottom 10 percent for this metric.

The CT*transit* Waterbury Division generally meets or exceeds the 20 passenger trips per revenue hour threshold. Five routes are ranked in the top 10 percent (Routes 22, 28, 36, 42 and 44). Two routes fall in the bottom 10 percent for this metric (Routes N1 and N2).

On-time Performance

Only CT*transit* Waterbury provided on-time performance data. In terms of on-time performance, the best performing routes were:

- CT*transit* Waterbury Route 20 Walnut
- CT*transit* Waterbury Route 26 Fairlawn/East Main Street

The poorest performing routes were:

- CT*transit* Waterbury 16 Bucks Hill – Montoe
- CT*transit* Waterbury N2 Naugatuck / New Haven Rd

For CT*transit* Waterbury, two routes out of 24 routes exceed the threshold for this criterion. The CT*transit* Stamford Division could not be evaluated for this metric.

Rankings for Urban Bus Systems with 750,000 to 2,000,000 Annual Passenger Boardings

Four transit systems were included in this category: CT*transit* New Britain, NTD, SEAT, and HART. Together these transit systems account for 51 bus routes. The evaluation results for this category of Transit Systems are displayed in Table 23. Pink, shaded cells indicate the route is ranked in the bottom 10 percent for a particular metric. Yellow indicates the route did not meet the criterion threshold, but did not fall within the bottom or the top 10 percent of all routes assessed for that criterion.

Table 23: Urban Bus Systems / 750,000 to 2 Million Annual Passenger Boardings – Evaluation Results

Agency	Route	Service Type	Passenger Trips per Rev Hour	Ranking - Passenger Trips per Revenue Hour	On Time Performance	Ranking - On Time Performance
Norwalk Transit District	Route 1	Local	10.2	38	73%	12
	Route 2[2]	Local	6.1	46	64%	29
	Route 3[3]	Local	24.7	8	72%	13
	Route 4	Local	14.5	26	72%	14
	Route 5/6	Local	6.2	45	70%	19
	Route 7	Local	19.5	17	71%	15
	Route 8	Local	12.7	31	65%	24
	Route 9	Local	17.7	21	76%	7
	Route 10	Local	34	3	76%	6
	Route 11	Local	20.6	15	64%	28
	Route 12	Local	9.7	40	65%	24
	Route 13	Local	27.3	6	70%	16
	Coastal Link	Regional	4.3	47	51%	33
	Route 7 Link	Regional	7.9	43	53%	32

[2] Effective January 29, 2017, NTD Route 2 has been eliminated.
[3] Effective January 29, 2017, NTD Route 5/6 has been eliminated.

Table 23: Urban Bus Systems / 750,000 to 2 Million Annual Passenger Boardings – Evaluation Results (Continued)

Agency	Route	Service Type	Passenger Trips per Rev Hour	Ranking - Passenger Trips per Revenue Hour	On Time Performance	Ranking - On Time Performance
Southeast Area Transit District	Route 1	Local	23.9	9	74%	10
	Route 2	Local	16.8	22	74%	11
	Route 3	Local	14	29	44%	39
	Route 4	Local	26	7	46%	37
	Route 5	Local	31.7	4	33%	41
	Route 6	Local	38.1	1	70%	18
	Route 7	Local	34.9	2	56%	30
	Route 8	Local	8.6	42	50%	34
	Route 9	Local	27.4	5	54%	31
	Route 10	Local	2.2	48	82%	4
	Route 11	Local	21.4	14	36%	40
	Route 12	Local	23.3	12	65%	26
	Route 13	Local	19	18	49%	35
	Route 14	Local	23.8	10	64%	27
	Route 15	Evening	10.3	37	67%	22
	Route 108	Local	13.2	30	75%	9

Table 23: Urban Bus Systems / 750,000 to 2 Million Annual Passenger Boardings – Evaluation Results (Continued)

Agency	Route	Service Type	Passenger Trips per Rev Hour	Ranking - Passenger Trips per Revenue Hour	On Time Performance	Ranking - On Time Performance
Housatonic Area Regional Transit District	HART 1 Hospital	Local	11.3	34	92%	2
	HART 2 Stony Hill	Local	18.9	19	90%	3
	HART 3 Mill Plain/Brewster	Local	14.7	25	100%	1
	HART 4 Brookfield	Local	23.7	11	75%	8
	HART 5 Bethel Center	Local	14.4	28	67%	23
	HART 6 Lake Ave./Fair Mall	Local	19.7	16	69%	20
	HART 7 New Milford	Local	9.9	39	78%	5
	Danbury-Norwalk Route 7 LINK	Regional	0.10	49	47%	36
	Mall-Hospital LOOP	Evening and weekend	12.7	31	70%	17
	New Milford LOOP	Evening and weekend	7.7	44	46%	38
	Newtown Rd. - South St. LOOP	Evening and weekend	10.7	36	67%	21
CT*transit* New Britain	41 New Britain / Hartford	Local	Information not available	Information not available	Information not available	
	501 Arch Street	Local	14.4	27		
	502 Black Rock Avenue	Local	9.0	41		
	503 Corbin Avenue	Local	16.8	23		
	505 Burritt Street	Local	18.6	20		
	506 Farmington Ave	Local	22.3	13		
	507 Oak St	Local	15.7	24		
	509 East St	Local	11.0	35		
	510 South St	Local	Included with 509	Included with 509		
	512 Berlin Turnpike	Local	11.4	33		

Passenger Trips per Revenue Hour

For passenger trips per revenue hour, the best performing routes for Urban Bus Systems with 750,000 to 2,000,000 annual passengers were:

- NTD Route 10
- SEAT Route 5
- SEAT Route 6
- SEAT Route 7
- SEAT Route 9

All of these routes exceeded the threshold of 20 passenger trips per revenue hour. In total, 49 routes were assessed for this criterion and nine met or exceeded the threshold.

The poorest performing routes were:

- NTD Route 2[4]
- NTD Route 5/6[5]
- NTD Coastal Link
- SEAT Route 10
- HART Danbury-Norwalk Route 7 LINK

These routes were significantly below the threshold for this criterion indicating poor productivity.

On-time Performance

All of the transit systems in this category were able to provide on-time performance data except for CT*transit* New Britain. Among the routes with on-time performance data, the best performing routes were (although SEAT Route 10 did not meet the threshold):

- HART Route 1 Hospital
- HART Route 2 Stony Hill
- HART Route 3 Mill Plain/Brewster
- SEAT Route 10

The poorest performing routes were:

- SEAT Route 3
- SEAT Route 5

[4] Effective January 29, 2017, NTD Route 2 has been eliminated.
[5] Effective January 29, 2017, NTD Route 5/6 has been eliminated.

- SEAT Route 11
- HART New Milford LOOP

For on-time performance, three routes (HART Routes 1, 2 and 3) have on-time performance of 90 percent or better. For the remaining 41 routes where on-time performance data was provided (SEAT and NTD), schedule adherence is an issue. CT*transit* New Britain did not provide any on time performance data and could not be evaluated.

Rankings for Urban Bus Systems with Fewer Than 750,000 Annual Passenger Boardings

Six transit systems are included in this category:

- MTD
- MAT
- WTD
- CT*transit* Bristol
- CT*transit* Meriden
- CT*transit* Wallingford

Together these transit systems account for 25 bus routes. The evaluation results for this category of Transit Systems are displayed in Table 24. Pink, shaded cells indicate the route is ranked in the bottom 10 percent for a particular metric. Yellow indicates the route did not meet the criterion threshold, but did not fall within the bottom or the top 10 percent of all routes assessed for that criterion.

Table 24: Urban Bus Systems / Under 750,000 Annual Passenger Boardings – Evaluation Results

Agency	Route	Service Type	Passenger Trips per Rev Hour	Ranking - Passenger Trips per Revenue Hour	On Time Performance	Ranking - On Time Performance
Milford Transit District	Route 1 - Coastal Link	Regional	26.31	2	Information not available	
	Route 3	Local	7.28	8		
	Route 4	Local				
Middletown Area Transit District	Route A Saybrook Road	Local	4.1	10	95%	6
	Route B Wesleyan Hills	Local	1.4	16	97%	1
	Route C Washington Street	Local	5.4	9	97%	1
	Route D Newfield Street	Local	3.4	11	85%	10
	Route E Westlake Drive E	Local	3.3	12	95%	6
	Route F Portland-East Hampton	Local	0.4	22	97%	1
	Route H South	Evening and weekend	1.6	15	95%	6
	Route I North	Evening and weekend	1.2	18	90%	9
	Route M Link	Regional	1.0	21	50%	12
	S-1 Route (Saturdays Only)	Saturday	1.4	17	97%	1
	S-2 Route (Saturdays Only)	Saturday	1.1	20	97%	1
	S-3 Route (Sundays Only)	Sunday	1.6	14	80%	11
Windham Region Transit District	Willimantic City	Local	1.1	19	Information not available	
	Storrs-Willimantic	Local				

Table 24: Urban Bus Systems / Under 750,000 Annual Passenger Boardings – Evaluation Results (Continued)

Agency	Route	Service Type	Passenger Trips per Rev Hour	Ranking - Passenger Trips per Revenue Hour	On Time Performance	Ranking - On Time Performance
CTtransit Bristol	541 Bristol Local	Local	13.3	4	Information not available	
	542 Bristol Hospital	Local	2.7	13		
	543 West Street	Local	10.8	6		
CTtransit Meriden	A Westfield Shoppingtown	Local	71.1	1	Information not available	
	B Yale Acres - South Meriden	Local	17.1	3		
	C West Main St - East Main St	Local	9.5	7		
	C New Haven	Local	Included with C West Main	Included with C West Main		
CTtransit Wallingford	WL Wallingford Local	Local	10.9	5	Information not available	

Passenger Trips per Revenue Hour

For passenger trips per revenue hour, the best performing routes for Urban Bus Systems with fewer than 750,000 annual passenger boardings were:

- MTD Route 1 Coastal Link
- CT*transit* Meriden Route A Westfield Shoppingtown

The poorest performing routes were:

- MAT Route F Portland-East Hampton
- MAT Route M Link

In total, 22 routes were assessed for this criterion and 20 failed to meet or exceed the threshold indicating poor productivity for the majority of the routes for these urban bus systems.

CT*transit* Meriden, Wallingford, and Bristol Divisions generally performed toward the lower end of their peer group in terms of passenger trips per revenue hour. Of the eight routes comprising these three divisions, one route exceeded the passenger trips per revenue hour threshold (CT*transit* Meriden Route A).

On-Time Performance

Just Middletown Area Transit provided on-time performance data. The best performing routes (all with 97 percent on-time performance) were:

- MAT Route B Wesleyan Hills
- MAT Route C Washington Street
- MAT Route F Portland-East Hampton
- MAT S-1 Route (Saturdays Only)
- MAT S-2 Route (Saturdays Only)

The poorest performing route was:

- MAT Route M Link

MTD, WRTD, CT*transit* Bristol, CT*transit* Meriden, and CT*transit* Wallingford could not be evaluated for this metric.

Ranking for Rural Transit Systems

Three transit systems are included in this category: ETD, NWCTD, and NECTD. Combined, these transit systems include 13 bus routes. ETD provided data for passenger trips per revenue hour, but did not provide data on on-time performance. For NWCTD, passenger trips per revenue hour were available at the system level only and not at the route level, therefore an evaluation could not be performed. In addition, on-time performance data was not available as this data is not collected by these transit systems. NECTD did not respond to the data request and therefore this property could not be evaluated. The evaluation results for the Rural Transit Systems are displayed in Table 25. Pink, shaded cells indicate the route is ranked in the bottom 10 percent for a particular metric. Yellow indicates the route did not meet the criterion threshold, but did not fall within the bottom or the top 10 percent of all routes assessed for that criterion.

Table 25: Rural Bus Systems – Evaluation Results

Agency	Route	Service Type	Passenger Trips per Rev Hour	Ranking - Passenger Trips per Revenue Hour	On Time Performance	Ranking - On Time Performance
Estuary Transit District	Route 1 Shoreline	Local	7.00	2	Information not available	
	Route 2 Riverside	Local	2.30	5		
	Route 3 Southeast	Local	3.30	4		
	Route 4 Mid-shore	Local	3.36	3		
Northwestern Connecticut Transit District	Route 1 - Winstead	Local - morning and mid-day	7.3	1	Information not available	
	Route 2 - Litchfield	Local - morning and mid-day				
	Route 3 - Torrington Main St to East Side	Local				
	Route 4 - Torrington East Main to East Side	Local				
	Route 5 - Torrington Westside to Southend	Local				
Northeastern Connecticut Transit District	Southern Loop	Local	Information not available at route level	Information not available at route level	Information not available	
	Northern Loop	Local				
	South Shuttle	Local				
	North Shuttle	Local				

Passenger Trips per Revenue Hour

Based on the results of available data, the NWCTD system performed best in terms of passenger trips per revenue hour (7.3), and ETD Route 2 Riverside had the fewest trips per revenue hour at 2.3. For ETD, Route 1 Shoreline performed best in this group.

In terms of route productivity, none of the transit routes in this peer group reached the threshold of 20 passenger trips per revenue hour for local routes. Given these routes are located in less-densely developed and less-populated areas of the state, this result is expected. These bus routes provide transportation options and accessibility to major activity centers for populations that likely have no other means of travel.

All NWCTD routes and ETD Route 2 Riverside were selected to be advanced to Stage 2 as they represent both the highest and lowest performing routes.

No data on on-time performance was available for the systems in this peer group.

Ranking for Commuter Shuttle Bus Routes

Several transit systems operate shuttle bus routes. These routes tend to be unidirectional, operate primarily during peak hours, and serve a limited number of stops. These routes frequently connect with other transit hubs – rail stations, bus depots, park and ride lots, and shopping destinations (i.e., malls). With a few notable exceptions in Norwalk Transit, Greater Bridgeport Transit, and Housatonic Area Transit, these routes do not track on-time performance data. Combined, there are 31 shuttle bus routes. The results are presented in Table 26. Pink, shaded cells indicate the route is ranked in the bottom 10 percent for a particular metric. Yellow indicates the route did not meet the criterion threshold, but did not fall within the bottom or the top 10 percent of all routes assessed for that criterion.

Transit systems with shuttle bus routes include:

- CT*transit* Hartford
- CT*transit* Stamford
- CT*transit* New Haven
- NTD
- SEAT
- HART
- NECTD
- WRTD
- MTD

Table 26: Commuter Shuttle Routes – Evaluation Results

Agency	Route	Passenger Trips per Rev Hour	Ranking - Passenger Trips per Revenue Hour	On Time Performance	Ranking - On Time Performance
Windham Regional Transit District	Route 32 Commuter	1.09	24	Information not available	
	Willimantic-Danielson	1.09	25	Information not available	
Southeast Area Transit District	Route 101	(combined with Rte 1)	(combined with Rte 1)	(combined with Rte 1)	
	Three Rivers Community College shuttle	9.9	7	62%	10
Norwalk Transit District	Westport S1	5.3	16	74%	1
	Westport S2	4.2	17	73%	2
	Comm Shuttle - Norwalk Hospital/Belden	20.2	3	70%	4
	Westport S3	9.2	9	70%	4
	Westport S4	3.9	19	68%	6
	Comm Shuttle - Norden Park[6]	7.9	12	66%	8
	Comm Shuttle - Merritt 7/Glover	30.7	2	62%	10
	Westport G1	4.1	18	60%	13
	Imperial Ave Lot	8.7	11	60%	13

[6] Effective January 29, 2017, NTD Norden Park Shuttle has been eliminated.

Table 26: Commuter Shuttle Routes – Evaluation Results (Continued)

Agency	Route	Passenger Trips per Rev Hour	Ranking - Passenger Trips per Revenue Hour	On Time Performance	Ranking - On Time Performance
Norwalk Transit District	Comm Shuttle - 10/20 Westport Rd	14.3	5	60%	13
	Greenwich Comm - West Loop	3.9	20	59%	16
	Westport G2	2.8	22	57%	17
	Greenwich Comm - Central Loop	7.3	14	54%	18
	Comm Shuttle - CT Avenue	18.9	4	52%	20
Northeastern Connecticut Transit District	Windham-Danielson Connector	Information not available	n/a	Information not available	n/a
Milford Transit District	Route 2	7.28	15	Information not available	n/a
Housatonic Area Regional Transit	Shuttle - Ridgefield Katonah	9.1	10	67%	7
	Shuttle - Danbury Brewster	9.3	8	66%	8
	Shuttle - New Fairfield Southeast	2.5	23	54%	18

Table 26: Commuter Shuttle Routes – Evaluation Results (Continued)

Agency	Route	Passenger Trips per Rev Hour	Ranking - Passenger Trips per Revenue Hour	On Time Performance	Ranking - On Time Performance
Greater Bridgeport Transit	22x	Information not available	n/a	72%	3
	19x	7.84	13	61%	12
CTtransit Stamford	Commuter Connection Central	3.78	21	Information not available	n/a
CTtransit New Haven	Union Station Shuttle	63.88	1	Information not available	n/a
	Commuter Connection Downtown	13.27	6		
CTtransit Hartford	Asylum Hill Shuttle	Information not available	n/a	Information not available	n/a
	Columbus Blvd Shuttle				
	DASH				

Passenger Trips per Revenue Hour

For passenger trips per revenue hour, the best performing routes for Shuttle Bus routes were:

- NTD Community Shuttle - Norwalk Hospital/Belden
- NTD Community Shuttle - Merritt 7/Glover
- CT*transit* New Haven Union Station Shuttle

The poorest performing routes were:

- WRTD Route 32 Commuter
- WRTD Willimantic-Danielson
- HART Shuttle - New Fairfield Southeast

In total, 25 routes were assessed for this criterion and 22 failed to meet or exceed the threshold indicating poor productivity for the majority of these routes.

Other routes with limited service spans (i.e., shuttle, commuter – peak only, and evening and weekend service only) have lower levels of passenger trips per revenue hour, with between 2.5 to 18.9 passenger trips per revenue hour.

On-Time Performance

For the transit systems that provided on-time performance data, none of the routes exceeded the 90 percent or better threshold. The best performing routes were:

- NTD Westport S1
- NTD Westport S2

The poorest performing routes were:

- NTD Greenwich Community Shuttle - Central Loop
- NTD Greenwich Community Shuttle - CT Avenue
- HART Shuttle - New Fairfield Southeast

Ranking for Express Bus Routes

he larger transit systems in the state operate express bus routes. These routes operate on longer routes with fewer stops originating in areas outside of major cities serving downtown areas. These routes are oriented towards serving journey-to-work trips and therefore have more limited spans of service. CT*transit* Hartford Division operates all but one of the express bus routes using contract service providers. The results are presented in Table 27. Pink, shaded cells indicate the route is ranked in the bottom 10 percent for a particular metric. Yellow indicates the route did not meet the criterion threshold, but did not fall within the bottom or the top 10 percent of all routes assessed for that criterion.

Transit Systems operating express bus routes include:

- CT*transit* Hartford Division
- CT*transit* Stamford Division (I-Bus)

Table 27: Express Routes – Evaluation Results

Agency	Route	Passenger Trips per Rev Hour	Ranking - Passenger Trips per Revenue Hour	On Time Performance	Ranking - On Time Performance
Hartford Express	917 Tolland-Vernon Express	12.73	15	Information not available	n/a
	918 Willimantic/Coventry Express (Peter Pan)	5.91	19	Information not available	n/a
	919 Meriden Express(DATTCO)	5.41	20	Information not available	n/a
	921 Middletown/Old Saybrook Express	6.82	18	Information not available	n/a
	926 Winsted Express	Information not available at route level	n/a	Information not available	n/a
	927 Torrington Express	3.69	22	Information not available	n/a
	950 New Haven / Hartford Express	4.90	21	Information not available	n/a
	903 Buckland Express	76.19	1	Information not available	n/a
	910 Century Hills Express	33.07	2	Information not available	n/a
	905 Windsor Locks - Enfield Express	26.15	3	Information not available	n/a
	907 Newington Express	25.81	4	Information not available	n/a
	904 Glastonbury Express	24.84	5	Information not available	n/a
	909 Unionville Express	24.31	6	Information not available	n/a
	906 Cromwell Express	22.01	7	Information not available	n/a
	924 Southington-Cheshire Express	10.55	16	Information not available	n/a
	915 Windsor Exp TS 2015	19.84	8	Information not available	n/a

Table 27: Express Routes – Evaluation Results (Continued)

Agency	Route	Passenger Trips per Rev Hour	Ranking - Passenger Trips per Revenue Hour	On Time Performance	Ranking - On Time Performance
Hartford Express	902 Corbins-Farm Springs Express	19.60	9	Information not available	n/a
	914 Marlborough-Colshester Express	19.37	10	Information not available	n/a
	901 Avon-Canton Express	16.66	11	Information not available	n/a
	923 Bristol Express	15.01	12	Information not available	n/a
	912 Simbury-Granby Express	13.25	14	Information not available	n/a
	925 Cheshire-Waterbury Express	9.45	17	Information not available	n/a
	928 Southington-Cheshire-Waterbury Express	3.01	23	Information not available	n/a
CT*transit* Stamford	I-BUS	14.87	13	Information not available	n/a

Passenger Trips per Revenue Hour

For passenger trips per revenue hour, the best performing routes for Express Bus routes were:

- Hartford Express 903 Buckland Express
- Hartford Express 910 Century Hills Express

The poorest performing routes were:

- Hartford Express 927 Torrington Express
- Hartford Express 928 Southington-Cheshire-Waterbury Express

In total, 23 routes were assessed for this criterion with 16 routes meeting or exceeding the threshold for express service (10 passenger trips per revenue hour) indicating good productivity for the majority of these routes.

No on-time performance data was available for these routes; therefore, no evaluations were possible for this criterion in this peer group.

4.5.4 Stage 1 Conclusions

Based on the data collected and the evaluation of bus routes and transit systems, the following conclusions about statewide bus service can be made.

There were many bus routes that appear to have low to moderate utilization. Passenger trips per revenue hour data was provided for 233 routes, and 100 routes (38 percent) met or exceeded the 20 passenger trips per revenue hour threshold. Express bus service fared better, with seven routes having low to moderate utilization

On-time performance was an issue across all the transit systems. Either this data is not currently being collected, or for the systems that do collect this data, schedule adherence is an issue. On-time performance data was provided for 114 bus routes, across five transit systems (GBT, CT*transit* Waterbury, NTD, SEAT, HART, and MAT). Of these 114 routes, 12 percent had an on-time performance of 90 percent or better. MAT had nine routes, HART had three routes, and CT*transit* Waterbury had two routes that met the criterion.

Smaller and rural transit systems may lack the resources to collect on-time performance data. Medium and large transit systems (greater than 750,000 annual passenger trips) that do not currently measure on-time performance should collect this data to monitor and measure bus route and bus system performance.

The most accurate way to measure on-time performance is using AVL devices. Many transit systems within Connecticut do not currently have this technology on their vehicles, but the technology is being gradually added to bus fleets throughout the state (All CTfastrak, CT*transit* Hartford Division (including express buses) New Haven Division, New Britain Division, Waterbury Division, and Meriden/Wallingford Division buses, NTD and GBT buses are equipped with active AVL and APC).

CTDOT should make it a goal for all transit systems to have AVLs on each vehicle in service by 2025 so that this metric can be assessed for each route on a regular basis. Smaller and rural transit systems will likely require technical assistance in managing AVL systems onboard buses due to more limited resources compared to medium and larger transit systems.

4.6 Bus Routes Advanced to Stage 2 Evaluation

Based on the evaluation, the following routes were identified for the Stage 2 Evaluation. These routes encompass the best and poorest performing 10 percent of routes in both passengers per revenue hour and on-time performance. It should be noted that data on on-time performance were incomplete, and more data is needed to make a full assessment of on-time performance.

Urban transit systems with more than 5 Million Annual Passenger Boardings

Best performing routes for Passenger Trips per Revenue Hour

1 CT*transit* Hartford Route 31 Park Street / New Park Ave
2 CT*transit* Hartford Route 38 Weston Street
3 CT*transit* Hartford Route 40 North Main Street
4 CT*transit* Hartford Route 47 Franklin Ave
5 CT*transit* Hartford Route 85 MCC Flyer
6 CT*transit* New Haven Route D Grand Avenue
7 CT*transit* New Haven Route D Dixwell Avenue

Poorest performing routes for Passenger Trips per Revenue Hour

1 GBT Route 7
2 GBT Route 20
3 GBT Route 23
4 CT*transit* Hartford 45 Berlin Turnpike Flyer
5 CT*transit* Hartford 92 Tower Avenue Crosstown
6 CT*transit* New Haven L North Branford
7 CT*transit* New Haven S Madison

Best performing route for On-time Performance

1 GBT Route 16

Poorest performing route for On-time Performance

1 GBT Route 2 – Coastal Link

Urban Transit Systems with 2 million to 5 million annual passenger boardings

Best performing routes for Passenger Trips per Revenue Hour

1. CT*transit* Waterbury Route 22 Wolcott
2. *CTtransit* Waterbury Route 28 Scott Road/East Main
3. CT*transit* Waterbury 42 Chase Parkway
4. CT*transit* 44 Waterbury Bunker Hill

Poorest performing routes for Passenger Trips per Revenue Hour

1. CT*transit* Stamford 26-27 Pacific St – Shippan Avenue
2. CT*transit* Stamford 32-35 Washington Blvd-Long Ridge Rd
3. CT*transit* Waterbury N1 Naugatuck / Millville
4. CT*transit* Waterbury N2 Naugatuck / New Haven Rd

Best performing routes for On-time Performance

1. CT*transit* Waterbury Route 20 Walnut
2. CT*transit* Waterbury Route 26 Fairlawn/East Main Street

Poorest performing route for On-time Performance

1. CT*transit* Waterbury 16 Bucks Hill – Montoe
2. CT*transit* Waterbury N2 Naugatuck / New Haven Rd

Urban Transit Systems with 750,000 to 2 million annual passenger boardings

Best performing routes for Passenger Trips per Revenue Hour

1. NTD Route 10
2. SEAT Route 5
3. SEAT Route 6
4. SEAT Route 7
5. SEAT Route 9

Poorest performing routes for Passenger Trips per Revenue Hour

1. NTD Route 2[7]
2. NTD Route 5/6[8]
3. NTD Coastal Link

[7] Effective January 29, 2017, NTD Route 2 has been eliminated.
[8] Effective January 29, 2017, NTD Route 5/6 has been eliminated.

4. SEAT Route 10
5. HART Danbury-Norwalk Route 7 LINK

Best performing routes for On-time Performance

1. HART Route 1 Hospital
2. HART Route 2 Stony Hill
3. HART Route 3 Mill Plain/Brewster
4. SEAT Route 10

1. Poorest performing route for On-time Performance SEAT Route 3
2. SEAT Route 5
3. SEAT Route 11
4. HART New Milford LOOP

Urban Transit Systems with under 750,000 annual passenger boardings

Best performing routes for Passenger Trips per Revenue Hour

1. MTD Route 1 Coastal Link
2. CT*transit* Meriden Route A Westfield Shoppingtown

Poorest performing routes for Passenger Trips per Revenue Hour

1. MAT Route F Portland-East Hampton
2. MAT Route M Link

Best performing routes for On-time Performance
(All routes had OTP of 97%)

1. MAT Route B Wesleyan Hills,
2. MAT Route C Washington Street
3. MAT Route F Portland-East Hampton
4. MAT S-1 Route (Saturdays Only)
5. MAT S-2 Route (Saturdays Only)

Poorest performing route for On-time Performance

1. MAT Route M Link

Rural Transit Systems

1. ETD Route 2 Riverside
2. NWCTD Route 1 - Winstead
3. NWCTD Route 2 - Litchfield
4. NWCTD Route 3 - Torrington Main St to East Side
5. NWCTD Route 4 - Torrington East Main to East Side
6. NWCTD Route 5 - Torrington Westside to Southend

Shuttle Bus Routes

Best performing routes for Passenger Trips per Revenue Hour

1. NTD Community Shuttle - Norwalk Hospital/Belden
2. NTD Community Shuttle - Merritt 7/Glover
3. CT*transit* New Haven Union Station Shuttle

Poorest performing routes for Passenger Trips per Revenue Hour

1. WRTD Route 32 Commuter
2. WRTD Willimantic-Danielson
3. HART Shuttle - New Fairfield Southeast

Best performing route for On-time Performance

1. NTD Westport S1
2. NTD Westport S2

Poorest performing route for On-time Performance

1. NTD Greenwich Community Shuttle - Central Loop
2. NTD Greenwich Community Shuttle - CT Avenue/HART Shuttle - New Fairfield Southeast

Express Bus Routes

Best performing routes for Passenger Trips per Revenue Hour

1. Hartford Express 903 Buckland Express
2. Hartford Express 910 Century Hills Express

Poorest performing routes for Passenger Trips per Revenue Hour

1. Hartford Express 927 Torrington Express
2. Hartford Express 928 Southington-Cheshire-Waterbury Express

4.7 Stage 2 Evaluation Overview

The goal of the Stage 2 evaluation was to further assess the 76 routes selected through Stage 1 and identify specific routes that could be improved. To achieve this objective, routes were assessed based on nine criteria from the Connecticut Statewide Bus Service Guidelines:

- bus service at major activity centers
- bus stop spacing
- bus stop amenities
- headway
- span of service
- passenger trips per revenue mile
- fare box recovery
- ratio of revenue miles to non-revenue miles
- average distance between failures
- fleet average age

The following section outlines the results and the findings from the assessment of the 76 routes in the criteria areas.

4.7.1 Stage 2 Evaluation Results

The results of the Stage 2 evaluation are presented in the following sections.

4.7.2 Provision of Service at Major Activity Centers

- **Purpose of Criterion**: Used in determining which activity centers in each category should be given consideration for service
- **Performance Metric**: Based on the following threshold levels to determine which activity centers in each category should be given consideration for service (primarily extensions of existing routes).
  - Employers with 350 or more employees in a single location.
  - Shopping centers with more than 100,000 square feet of leased retail space.
  - Medical Facilities/Nursing Homes of 100 beds or more may be considered candidates for service.
  - Colleges and other post-secondary schools with residential populations and with an enrollment of at least 1,000 full-time students.

- Public agencies, government centers and community facilities generate demand for bus service

- **Study Goals Addressed**: Enhance access to jobs; develop recommended expansions and modifications of fixed route and intercity service

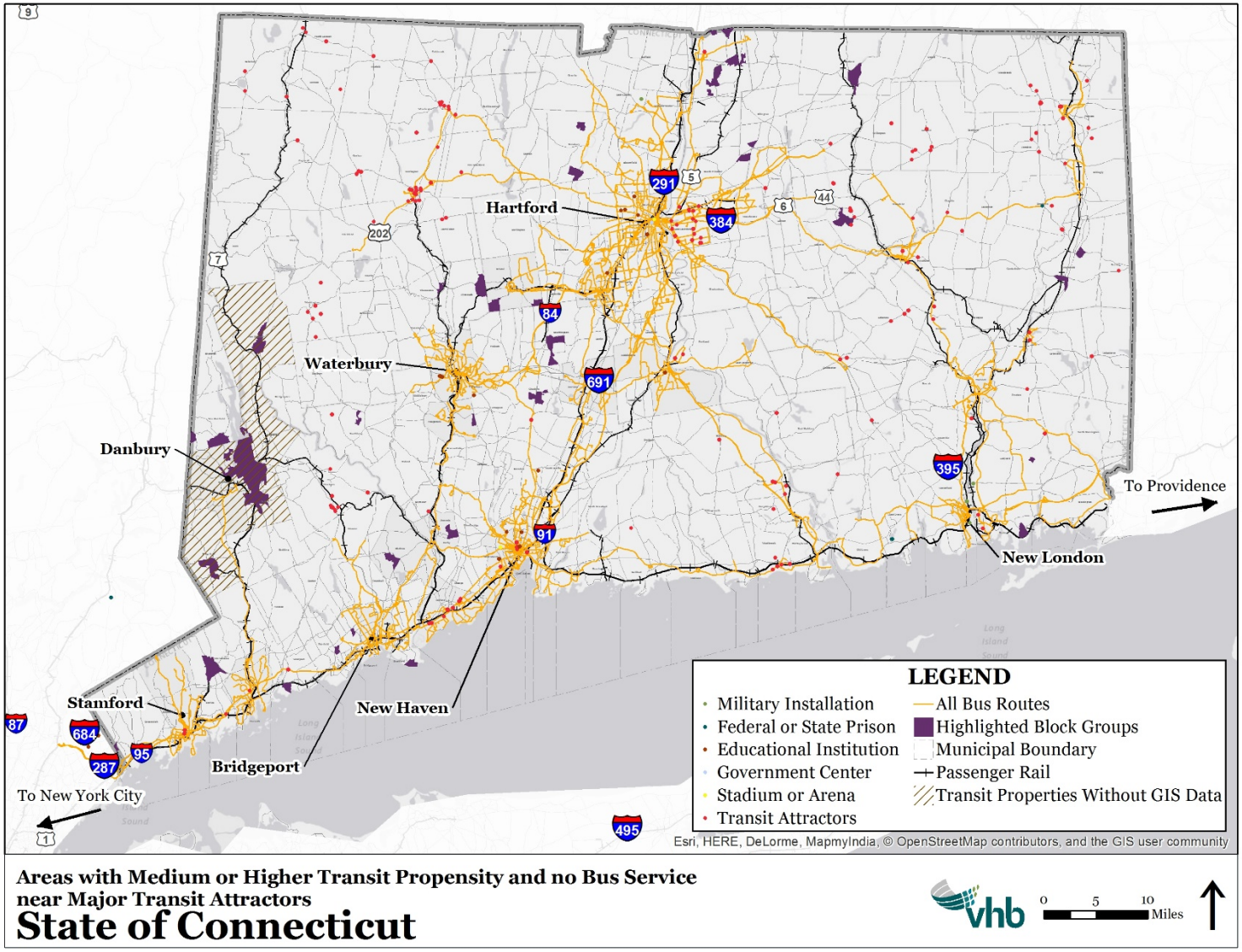
Evaluation Process

To evaluate this metric, using available data, 244 transit attractors (major employment centers, hospitals, colleges/universities, bus and rail terminals, and government offices) and census block groups highlighted as having medium or higher transit propensity but do not currently have bus service, were mapped and examined to determine if there were any overlaps indicating the need to extend or modify bus routes to serve these areas.

Findings

The analysis found that none of the transit attractors based on the thresholds defined for consideration for service overlapped with census block groups highlighted as having medium or higher transit propensity but do not currently have bus service. Figure 22 shows the transit attractors relative to highlighted census block groups.

Figure 22: Statewide Transit Attractors with Transit Propensity by Census Block Group



4.7.3 Bus Stop Spacing

- **Purpose of Criterion**: Used in siting of new bus stops and evaluation of existing bus stop spacing
- **Performance Metric**: Varies between 1 – 4 bus stops per mile (every 1,300 to 5,300 feet), no more than 4 stops per mile
- **Study Goals Addressed**: Enhance access to jobs; develop recommended expansions and modifications of fixed route and intercity service

The spacing intervals of bus stops along a route affects the transit system's accessibility and efficiency. Siting bus stops close together increases passenger accessibility to the service by reducing the distance they must walk to the bus stop. This close spacing of stops, however, requires the bus to make frequent stops, reducing its overall speed and increasing the route travel time. The converse situation - where bus stops are spaced far apart - can also have an adverse impact by making it inconvenient to walk to stops and potentially not serving areas of demand. Buses would be able to provide speedy service and complete their route quickly, but this would be achieved at the expense of passenger accessibility to the bus route. Bus stop guidelines recommend locating bus stops so that accessibility is balanced with efficiency.

Evaluation Process

To evaluate this metric, bus stop spacing was considered against household density because the household density of an area influences the siting of a bus stop. Areas with greater household density (such as urban residential neighborhoods) tend to generate a higher demand for transit service compared to areas with lower household density; and the denser areas may require more bus stops to meet increased demand. To ensure adequate transit access, areas with greater household density should have shorter distances between stops than less-densely populated areas.

Based on this understanding, the following density guidelines were developed to measure bus stop spacing. They provide bus stop spacing benchmarks for local transit routes relative to the household density of the area the route serves. The bus stop spacing guidelines are displayed in Table 28.

Table 28: Bus Stop Spacing Guidelines

Household Density (Households per Acre)			
	Over 10	**4 to 9.9**	**Under 4**
Stops per Mile	4 per mile	2 per mile	1 or fewer (or as needed)

To determine whether the stop spacing was compatible with the household density of the surrounding area, the 2014 American Community Survey 5-year Census data was consulted. All census block groups that fell within a quarter mile buffer of a given route were associated with that bus route. The average household density for those census block groups was then applied to each route to determine the appropriate stop spacing along that route. GTFS transit feed data was used to identify the bus stops along each route, which were then compared to the proscribed stop spacing guidelines in Table 28 to determine if they met the guidelines.

Findings

Few transit systems had bus stop by route data. Of the 76 routes advanced to Stage 2, 28 routes were evaluated. Table 29 shows bus stop spacing for each of the 28 routes with data based on household densities along those routes. No routes fell below the performance metric but several routes were above it (i.e. they have too many bus stops), as listed below and in Table 29.

- CT*transit* Hartford 31 Park Street / New Park Avenue – 3 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* Hartford 40 North Main Street – 3 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* Hartford 47 Franklin Avenue – 3 stops per mile (should be 1 stop per mile based on household density)
- CT*transit* Hartford 92 Tower Avenue Crosstown – 3 stops per mile (should be 1 stop per mile based on household density)
- CT*transit* New Haven D Grand Avenue – 3 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* New Haven D Dixwell Avenue – 5 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* New Haven L North Branford (Route 80) – 4 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* New Haven S Madison – 3 stops per mile (should be 1 stop per mile based on household density)
- CT*transit* Stamford 26-27 Pacific St/Shippan Ave – 5 stops per mile (should be 2 stops per mile based on household density)

- CT*transit* Stamford 32-35 Washington Blvd Long Ridge Rd – 3 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* Waterbury 16 Bucks Hill Montoe – 6 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* Waterbury 20 Walnut – 4 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* Waterbury 22 Wolcott – 4 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* Waterbury 26 Fairlawn/East Main St. – 3 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* Waterbury 44 Bunker Hill – 5 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* Waterbury N1 Naugatuck – 2 stops per mile (should be 1 stop per mile based on household density)
- CT*transit* Waterbury N2 Naugatuck – 3 stops per mile (should be 1 stop per mile based on household density)
- CT*transit* Meriden A Westfield Shoppingtown – 3 stops per mile (should be 2 stops per mile based on household density)
- NTD Route 2[9] – 4 stops per mile (should be 2 stops per mile based on household density)
- NTD Route 5/6[10] – 3 stops per mile (should be 1 stop per mile based on household density)
- NTD Route 10 – 8 stops per mile (should be 2 stops per mile based on household density)

[9] Effective January 29, 2017, NTD Route 2 has been eliminated.
[10] Effective January 29, 2017, NTD Route 5/6 has been eliminated.

Table 29: Bus Stop Spacing Evaluation of Stage 2 Routes

Agency	Route	Existing # of Stops per mile	Recommended Stops per Mile
CT*transit* Hartford	31 Park Street / New Park Ave (31-33)	3	2
	38 Weston Street	2	2
	40 North Main Street	3	2
	45 Berlin Turnpike Flyer	1	Not applicable[11]
	47 Franklin Ave	3	1
	85 MCC Flyer	0	Not applicable
	92 Tower Avenue Crosstown	3	1
Hartford Express	903 Buckland Express	1	Not applicable
	910 Century Hills Express	1	Not applicable
	927 Torrington Express	0	Not applicable
	928 Southington Cheshire Waterbury Express	0	Not applicable
CT*transit* New Haven	D Grand Avenue	3	2
	D Dixwell Avenue	5	2
	L North Branford (Route 80)	4	2
	S Madison	3	1
	Union Station Shuttle	11	Not applicable
CT*transit* Stamford	26-27 Pacific St/Shippan Ave	5	2
	32-35 Washington Blvd-Long Ridge Rd	3	2
CT*transit* Waterbury	16 Bucks Hill - Montoe	6	2
	20 Walnut	4	2
	22 Wolcott	4	2
	26 Fairlawn/ East Main St	3	2
	28 Scott Road/East Main	(combined with Rt 26)	(combined with Rt 26)
	42 Chase Parkway	2	2
CT*transit* Meriden	44 Bunker Hill	5	2
	N1 Naugatuck / Millville	2	1
	N2 Naugatuck / New Haven Rd	3	1
	A Westfield Shoppingtown	3	2
Milford Transit District	Route 1 - Coastal Link	1	1

[11] The bus stop spacing guidelines were developed for local routes only. Since express and flyer routes tend to connect riders to only key destinations, the bus stop spacing guidelines do not apply.

Table 29: Bus Stop Spacing Evaluation of Stage 2 Routes (Continued)

Agency	Route	Existing # of Stops per mile	Recommended Stops per Mile
Norwalk Transit District	Route Westport S1	Not available	Not available
	Route Westport S2	Not available	Not available
	Route 2[12]	4	2
	Route 5/6[13]	3	1
	Route 10	8	2
	Comm Shuttle - Norwalk Hospital/Belden	Not available	Not available
	Comm Shuttle - Merritt 7/Glover	Not available	Not available
	Comm Shuttle - CT Avenue	Not available	Not available
	Greenwich Comm - Central Loop	Not available	Not available
	Coastal Link	Not available	Not available

4.7.4 Bus Stop Amenities

- **Purpose of Criterion**: Used to guide the need for the provision of bus stop amenities
- **Performance Metric**: Priority for installation of benches should be given to stops with 50 daily boardings or more while priority for the installation of shelters should be given to stops with 100 or more daily boardings
- **Study Goals Addressed**: Develop recommended expansions and modifications of fixed route and intercity service

Bus stop amenities are a key component of passenger comfort and rider satisfaction. Bus stop infrastructure such as bus shelters and benches provide passengers with a weather-protected place to wait for the bus. Other amenities like bus stop signage and bus route information displays advertise the availability of bus service and help riders better plan their trip. These amenities are among the first elements that a passenger encounters on their trip and can influence their impressions of a transit operator's service.

Evaluation

This metric was evaluated using bus stop passenger volumes and inventories of bus amenities. While most transit systems supplied inventories of their bus amenities, just GBT collects passenger volume data at the bus stop level in a format that could be analyzed. All transit systems should collect passenger volume data at the bus stop level.

Findings

As this analysis could be performed only for GBT, bus stops with 50 daily boardings or more were identified and are listed in Appendix G. GBT serves a

[12] Effective January 29, 2017, NTD Route 2 has been eliminated.
[13] Effective January 29, 2017, NTD Route 5/6 has been eliminated.

total of 1,258 stops. Of these stops, roughly 4 percent (or 49 stops) had between 50 and 100 daily boardings. Approximately 2 percent of the total 1,258 stops had 100 daily boarding or more. Bus stops that experience between 50 and 100 daily boardings should be prioritized for installation of benches, if they do not have them already. Bus stops with 100 or more daily boardings were also identified (See Appendix G). These bus stops should be prioritized for installation of both benches and shelters, if they are not already installed.

While these passenger volume thresholds are guidelines, it is worth noting that the placement of benches and shelters is also influenced by other factors such as:

- Availability of space
- Ownership of the property where the bus stop is located,
- Availability of infrastructure capital and maintenance funding, and
- Site conditions on the property where the bench or shelter would be placed.

At a minimum, however, all bus stops in the state, regardless of transit operator and system size, should be required to include a bus stop sign and pole to indicate the existence of a stop to riders, a waiting area that is stable and clear of other obstacles, and static signage with bus route information.

4.7.5 Headway

- **Purpose of Criterion**: Used in determining if routes are operating at sufficient or excessive service levels (headway) based on ridership demand
- **Performance Metric**: Schedule service so there are 1.3 passengers for every seat on the bus in peak hours and one passenger per seat in off peak hours at the peak load point
- **Study Goals Addressed**: Develop recommended expansions and modifications of fixed route and intercity service; enhance access to jobs; determine where connectivity between the bus and rail system in Connecticut can be enhanced

Headway is the time interval between buses at a specific location or stop. Headways are usually shorter on routes with high passenger volumes so that buses run more often to accommodate riders without overcrowding vehicles. If headways are too long, buses may become overcrowded and lead to reduced passenger comfort, as well as delays caused by excessive bus boarding time. It is standard to have shorter headways during peak hours when ridership is typically high, and longer headways during off-peak hours, when demand is less.

The *Transit Capacity and Quality of Service Manual* (TCRP Report 100) recommends specific load factors for overall passenger comfort in terms of crowding. To efficiently allocate service and maintain passenger comfort, the

TCRP recommends scheduling service to meet 1.0 passengers per seat during off-peak times and 1.3 passengers per seat during peak times.

Evaluation

The occupancy rate at the maximum load point during weekday peak and off-peak hours for these routes was examined for the headway metric. Some transit systems (CT*transit* Hartford, New Haven, and Stamford) provided pre-calculated load factors.[14] For the remaining transit systems, it was assumed that 40-seat vehicles were assigned to all routes.

Of the 76 routes in Stage 2, 14 routes had data on passenger occupancy rates at the route level for both peak and off-peak service. CT*transit* Hartford, New Haven, and Stamford each collect this data.

Findings

The following Stage 2 routes from these divisions have 1.3 or more passengers per seat during peak hours and are candidates for an adjustment in peak service frequency:

- CT*transit* Waterbury Route 22 Wolcott: 1.85
- CT*transit* Waterbury Route 28 Scott Road/East Main: 1.73
- CT*transit* Waterbury Route 42 Chase Parkway: 1.65

Of the routes that had off-peak passenger loading data, none had a load factor of 1.0 or more passengers per seat during off-peak hours. This indicates that service headways are sufficient during the off-peak hours. It is noted, however, that of the six transit systems that had passenger loading data to measure this metric, three collected information related to off-peak hours. As a result, it is possible that there are some routes that may need to be examined for off-peak headway adjustment. While those routes could not be identified through this evaluation, transit systems should review their routes for this metric should they desire to improve productivity.

While this metric is typically used to identify routes with overcrowded buses and diminished passenger comfort, it can also serve as an indicator of routes with low productivity. If a route's passenger load factor is very low, it can mean that transit systems are providing too much service, resulting in buses that carry too few passengers and are potentially operating at a loss. The industry does not have standard load factor minimums. A review of the data, however, shows several routes operating with roughly 15 percent of buses filled. These routes include CT*transit* Stamford route 26/27, CT*transit* Waterbury N1, and HART New Fairfield Shuttle. They are candidates for further review to determine if they should be modified or eliminated.

[14] Load factors were provided via Trip Summary Reports.

4.7.6 Span of Service

- **Purpose of Criterion**: Used in determining whether bus routes provide sufficient hours of service (span), based on ridership during the first and last hours of service on the route
- **Performance Metric**: Provide service on all routes between 6:00 AM and 7:00 PM
- **Study Goals Addressed**: Develop recommended improvements to service frequency and span to relieve overcrowding and best meet the state's travel needs

The span of service refers to the hours that bus service operates each day. For local bus service on a weekday, a typical service span is 6:00 AM to 7:00 PM. When passenger loads on the last or first trip are high (i.e., the number of passengers on the vehicle are equal to or greater than 1.3 times the vehicle capacity), it indicates that there may be strong demand for earlier or later transit service. In these cases, expanding the span of service should be explored.

Evaluation

Passenger load data for the first and last trips of weekday service was used to evaluate the service span metric. Since information about the buses assigned on each specific route was not available, it was assumed that a 40-passenger bus ran each route, except on CT*transit* Hartford, New Haven, and Stamford Division routes.

Findings

Few transit systems had passenger load data by trip because they either did not collect it at the trip level or they lack the tools (e.g., APCs on buses) to gather this data. These systems include: GBT, HART, MAT, MTD, NWCTD, NTD, SEAT, ETD, WRTD, CT*transit* Waterbury, and CT*transit* Meriden. For these systems, no passenger loads were calculated. Consequently, 17 of the 76 routes in Stage 2 were evaluated for this criterion. The passenger load ratios for each of the 17 routes is shown in Table 30. CT*transit* Hartford, New Haven, and Stamford provided pre-calculated load factors.[15]

[15] Load factors for inbound and outbound trips for each route were provided through Trip Summary Reports. For this evaluation, the inbound and outbound load factors for the first trip were averaged to obtain a single load factor for the first trip on routes. The same approach was used to derive a single load factor for the last trip on routes.

Table 30: Passenger Load Data for First and Last Trips (Weekdays)

Transit System	Route	Passenger Load (first trip/last trip)
Norwalk Transit District	Comm Shuttle - Norwalk Hospital/Belden	0.30/0.03
	Comm Shuttle - Merritt 7/Glover	0.18/0.10
	Comm Shuttle - CT Avenue	0.16/0.08
CT*transit* Hartford	31 Park Street / New Park Ave	0.32/0.41
	38 Weston Street	0.54/0.02
	40 North Main Street	0.08/0.36
	45 Berlin Turnpike Flyer	0.24/0.11
	47 Franklin Ave	0.68/0.17
	85 MCC Flyer	0.29/0.39
	92 Tower Avenue Crosstown	0.18/0.20
CT*transit* New Haven	D Grand Avenue	0.22/0.04
	D Dixwell Avenue	0.32/0.10
	L North Branford	0.12/0.09
	S Madison	0.39/0.17
	Union Station Shuttle	0.10/0.02
CT*transit* Stamford	26-27 Pacific St/Shippan Ave	0.15/0.06
	32-35 Washington Blvd-Long Ridge Rd	0.03/0.11

Among these transit systems, none had a passenger per seat ratio that exceeded the 1.3 criteria. However, most routes had very low passenger loads on the first or last trip (or both) with buses operating with less than 10% of the seats filled, suggesting that perhaps the span of service is too long for those routes. The spans of those routes should be further reviewed by the transit agency to assess the need for modifications.

4.7.7 Passenger Trips per Revenue Mile

- **Purpose of Criterion**: Used in evaluating whether buses are carrying enough trips per revenue mile, and thus if they are operating efficiently (a useful counterpart to passenger trips per revenue hour)
- **Performance Metric**: Individual routes that have less than two passenger trips per revenue mile for local routes and one passenger trip per revenue mile for express routes should be examined for potential operating improvements
- **Study Goals Addressed**: Develop recommended improvements to service frequency and span of service to relieve overcrowding and best meet the state's travel needs

Comparing the number of passengers served against the distance operated allows transit operators to gauge route productivity. A route with a low number of passengers per revenue mile may indicate that the route has low utilization. Alternatively, a route with too many passengers per revenue mile might suggest overcrowding on buses and the need to adjust service frequency. In either case, the data is useful to transit systems in understanding their service productivity.

Evaluation

Route-level ridership counts and revenue mileage data provided by each transit system was used to calculate this metric for each agency in Stage 2. The data was provided directly by transit systems. Revenue mileage data was based on mileage and ridership information for weekdays. The age of the data varied by agency, with some systems providing current data (within the last year) and other systems providing older data (2008). Not all transit systems in Stage 2 collect ridership data at the route level. These transit operators include: HART, MTD, NWCTD, SEAT, ETD, and WRTD. For these systems, no passenger per revenue mile metrics were calculated. Consequently, 54 of the 76 Stage 2 routes could be evaluated.

Findings

The following local routes have less than two passenger trips per revenue mile. These routes are candidates for operating improvements:

Urban Bus Systems with over 5,000,000 Annual Passenger Trips

- CT*transit* Hartford 45 Berlin Turnpike Flyer: 0.55
- CT*transit* Hartford 92 Tower Avenue Crosstown: 0.95
- CT*transit* New Haven Route L North Branford: 0.57
- CT*transit* New Haven Route S Madison: 0.92
- GBT Coastal Link: 1.34
- GBT Route 7: 1.21
- GBT Route 20: 0.74
- GBT Route 23: 0.80

Urban Bus Systems with 2,000,000 - 5,000,000 Annual Passenger Trips

- CT*transit* Stamford Route 26-27 Pacific St/Shippan Ave: 0.05
- CT*transit* Stamford Route 32-35 Washington Blvd – Long Ridge Rd: 0.05
- CT*transit* Waterbury Route N1 Naugatuck / Millville: 0.40
- CT*transit* Waterbury Route N2 Naugatuck / New Haven Rd: 0.20

Urban Bus Systems with 750,000 - 2,000,000 Annual Passenger Trips

- NTD Route Westport S1: 0.54
- NTD Route Westport S2: 0.29
- NTD Route 2[16]: 0.60
- NTD Route 5/6[17]: 0.50
- NTD Commuter Shuttle Norwalk Hospital/Belden: 1.77
- NTD Commuter Shuttle Merritt 7 / Glover: 1.77
- NTD Commuter Shuttle CT Avenue: 1.77
- SEAT Route 3: 0.80
- SEAT Route 9: 1.50
- SEAT Route 10: 0.10
- SEAT Route 11: 1.40

Urban Bus Systems with less than 750,000 Annual Passenger Trips

- MAT Route B Wesleyan Hills: 0.49
- MAT Route C Washington Street: 1.74
- MAT Route F Portland-East Hampton: 0.23
- MAT Route M Link: 0.72
- MAT Route S-1: 0.94
- MAT Route S-2: 0.77

Rural Bus Systems

- ETD Route 2 Riverside: 0.12

The following express routes have less than one passenger trip per revenue mile. These routes are candidates for operating improvements:

Express Routes

- Hartford Express Route 927 Torrington Express: 0.35
- Hartford Express Route 928 Southington-Cheshire-Waterbury Express: 0.07

4.7.8 Fare box Recovery

- **Purpose of Criterion**: Used in evaluating how much fare revenue covers the cost of providing service

[16] Effective January 29, 2017, NTD Route 2 has been eliminated.
[17] Effective January 29, 2017, NTD Route 5/6 has been eliminated.

- **Performance Metric**: Individual routes that have a fare box recovery in the bottom 60th percentile of the agency's average should be examined for potential operating improvements
- **Study Goals Addressed**: Provide cost-effective service consistent with travel needs and funding

A transit operator's fare box recovery ratio measures the bus system's financial performance. It indicates the portion of a transit operator's operational cost that is covered by passenger fare revenue. It allows transit systems to determine if the service that they provide is cost-effective and financially sustainable.

Evaluation

Typically, fare box recovery ratio is calculated by dividing the total revenue received from passenger fares by the amount of operational costs. For this evaluation, however, CT*transit* provided a specific formula to calculate the fare box revenue ratio for its routes, and this formula was used to calculate the fare box revenue ratio of all transit systems to provide consistency.

$$\frac{T_p * F_a}{(M_r * C_m) + (H_r + H_l) * C_h} = Revenue\ Recovery\ Rate$$

Where:
$T_p = Unlinked\ Passenger\ Trips$
$F_a = Average\ Fare$
$M_r = Revenue\ Miles$
$C_m = Cost\ per\ Mile$
$H_r = Revenue\ Hours$
$H_l = Recovery\ Hours\ (Layover)$
$C_h = Cost\ per\ Hour$

The inputs for this formula (unlinked passenger data, revenue miles, and revenue hours, cost per hour, cost per mile) were sourced from the National Transit Database for consistency. The ratios are based on 2014 National Transit Database data, which is the most current year of data available on the database.

The ratio was calculated at the transit system level because insufficient data was available to apply the formula at the route level for each transit operator. The revenue recovery ratios for ETD, NWCTD, and CT*transit* Meriden could not be calculated because they do not have profiles in NTD. They do not have an NTD profile because they are either rural systems and nor do they have the same reporting requirements as urban bus systems. It is also possible they were combined with other CT*transit* Divisions when reported to NTD. As a result, 11 of the 15 transit systems with Stage 2 routes could be evaluated for this criterion.

Findings

Transit operators whose fare box recovery ratios fell within the bottom 60th percentile of the 11 evaluated systems are identified below. All 11 systems were compared against each other. These routes are poor performers for fare box recovery, and their fare box ratios are also low when compared to the national average ratio for fixed route bus service of 25.7 percent.[18]

- WRTD: 23%
- SEAT: 20%
- MTD: 19%
- MAT: 16%
- HART: 12%
- NTD: 10%

4.7.9 Ratio of Revenue Miles to Non-Revenue Miles

- **Purpose of Criterion**: Used to determine if route operations (and costs) are properly allocated to providing service to riders vs. travel to and from the depot. It provides an evaluation of the efficiency of scheduled service based on amount of non-revenue mileage
- **Performance Metric**: Individual local routes with non-revenue mileage that is more than five percent of revenue mileage and individual express routes with non-revenue mileage that is more than 10 percent of revenue mileage should be examined for potential operating improvements
- **Study Goals Addressed**: Upgrade and expand maintenance facilities to support improved fleet performance, system reliability and reduce non-revenue trips; provide cost-effective service consistent with travel needs and funding

Comparing a route's revenue miles against its non-revenue miles provides insight about how efficiently a route is scheduled. Non-revenue miles are incurred when a bus travels from its maintenance/storage facility to the starting point of the route, and inversely, from the end of the route back to the storage facility. These miles are non-productive because they require fuel and labor while not carrying passengers and collecting fares (revenue). Ideally, a bus should travel only a short distance to begin or end revenue service (i.e., a route should have a low ratio of revenue to non-revenue miles).

The number of non-revenue miles incurred on a route is typically linked to the location of the transit system's bus maintenance/storage facility. This Study's

[18] U.S. Department of Transportation, Federal Transit Administration, *2015 National Transit Summary & Trends.*

Existing Conditions evaluation provides the locations of fixed route vehicle maintenance/storage facilities. If a maintenance/storage facility is located too far from the service area, buses will have to travel further to begin or end revenue service. For transit systems, the siting of such facilities, unfortunately, also involves other factors like the availability and cost of land to build the facility, beyond its accessibility to the service area. The consideration of these other factors can mean that maintenance/storage facilities are not always ideally located for transit service.

Evaluation

To evaluate this metric, revenue and non-revenue mileage data provided by the transit systems was used. Local routes where the non-revenue mileage was more than five percent of revenue miles and express routes where the non-revenue mileage was more than 10 percent of revenue miles were flagged. These routes would be candidates for route improvement. While some transit systems provided data for this metric, most systems were unable to provide this information because they do not track non-revenue mileage or they do not track it at the route level. Thus, 24 of the 76 Stage 2 routes could be evaluated for this criterion. It is recommended that all transit systems track revenue and non-revenue mileage data at the route level.

Findings

The following local routes have non-revenue mileage that is more than five percent of revenue miles. These routes are candidates for route improvement.

Local Routes

- CT*transit* Hartford Route 45 Berlin Turnpike Flyer – 12%
- CT*transit* Hartford Route 47 Franklin Ave – 10%
- CT*transit* Hartford Route 85 MCC Flyer – 6%
- CT*transit* Hartford Route 92 Tower Avenue Crosstown – 14%
- CT*transit* New Haven Route D Grand Avenue – 8.3%
- CT*transit* New Haven Route D Dixwell Avenue – 7.3%
- CT*transit* New Haven Route L North Branford – 8.6%
- CT*transit* New Haven Route S Madison – 23%
- CT*transit* New Haven Union Shuttle – 8.7%
- SEAT Route 3 – 8%
- SEAT Route 6 – 6%
- SEAT Route 10 – 20%
- SEAT Route 11 – 13%

The following express routes have non-revenue mileage that is more than 10 percent of revenue miles. These routes are candidates for improvement.

Express Routes

- Hartford Express 903 Buckland Express – 54.6%
- Hartford Express 910 Century Hills Express – 11.8%

4.7.10 Average Distance between Failures

- **Purpose of Criterion**: Used in evaluating overall fleet reliability and availability for revenue service
- **Performance Metric**: Systems with mean distance between failures (MDBF) that fall below the statewide average should be investigated for improvements
- **Study Goals Addressed**: Upgrade and expand maintenance facilities to support improved fleet performance, system reliability and reduce non-revenue trips

Identifying the frequency that buses are taken out of service for repair helps transit systems to understand and improve their service reliability. As seen with the average age of the bus fleet, removing a vehicle from service can lead to unforeseen operational costs, diminished reliability and reduced customer satisfaction.

Evaluation

The average, or mean, distance between vehicle failures (MDBF) was calculated using the number of vehicle failures and total revenue miles reported by each transit operator in 2014 to the National Transit Database. The National Transit Database distinguishes between two types of mechanical failures – "major mechanical system failures" and "other mechanical system failures." Major mechanical system failures leave vehicles physically inoperative. Other mechanical system failures leave vehicles operational but prevent them from continuing service due to local policy. For this evaluation, both types of vehicular failures were considered. MDBF was calculated at the transit system level because the level of information needed to calculate for the route level was not available. Eleven of the 15 transit systems with Stage 2 routes had data available for evaluation. This includes, Collins Bus Service, one of two operators of Hartford Express. The other Hartford Express operator is DATTCO, which did not have data to calculate MDBF.

Findings

The following transit systems had fleets where the MDBF was lower than (i.e., more frequent than) the statewide average of 11,167[19] miles between failures:

Average Distance between Failures under statewide average

- CT*transit* Hartford: 1,303 miles between failures
- CT*transit* New Haven: 1,372 miles between failures
- CT*transit* Stamford: 2,101 miles between failures
- SEAT: 2,262 miles between failures
- GBT: 4,131 miles between failures
- NTD: 5,639 miles between failures
- CT*transit* New Britain: 9,931 miles between failures

The CT*transit* divisions reported significantly more mechanical failures (in the thousands) than other transit systems (which had failures in the hundreds or less than 100). Since the CT*transit* divisions have fleets that are similar in age to the other transit systems, it may be worth investigating the exact cause of CT*transit*'s high mechanical failure rate. One potential explanation for the large variance in the number of vehicle failures could be in transit systems' interpretations of a "mechanical failure." Some transit systems may have a broader interpretation of a vehicle failure than other transit systems, leading them to report more malfunctions. A high failure rate could also be attributable to stricter agency policies that require vehicles to be removed from service. If a transit system has a lower threshold for removing a vehicle from service than other transit systems, it will have a greater number of reported failures.

4.7.11 Fleet Average Age

- **Purpose of Criterion**: Used in evaluating overall fleet performance and its reliability and availability for revenue service
- **Performance Metric**: Should the average age of the fleet exceed two-thirds of the recommended service life, that agency's replacement schedule and policies should be reviewed
- **Study Goals Addressed**: Upgrade and expand maintenance facilities to support improved fleet performance, system reliability and reduce non-revenue trips

Tracking the average age of the bus fleet assists transit operators in ensuring they provide a reliable and comfortable service to its customers. Older buses are more likely to have mechanical components that are defective, worn-out or do

[19] The statewide average distance between failures was calculated using the average distance between failures for all transit systems in Stage 2.

not operate optimally. When buses experience failures that require them to be removed from service, it results in unforeseen operational costs associated with having to place a replacement vehicle into revenue service and invest more in maintenance of its fleet. It may also leave transit systems with fewer buses to serve customers, which can negatively affect rider satisfaction.[20] When a bus breaks down during revenue service, a rider's trip becomes disrupted, impacting their confidence in the service. Ultimately, riders become frustrated with the quality or reliability of service, and may begin seeking other ways to travel if they experience vehicle breakdowns on any regularity.

Evaluation

Average fleet age was calculated based on vehicle size. The Federal Transit Administration (FTA) sets minimum service-life guidelines for different vehicle size categories.[21] Table 31 below lists the age guideline for each size category.

Table 31: FTA Minimum Service-life categories from Buses and Vans

Asset	Vehicle Characteristics	Useful Life (whichever comes first)	
	Length	Years	Miles
Heavy-duty Large	35 to 48 ft. and 60 ft. articulated	12	500,000
Heavy-duty Small	30 ft.	10	350,000
Medium-duty	30 ft.	7	200,000
Light-duty Mid	25 to 35 ft.	5	150,000
Light-duty Small	16 to 28 ft.	4	100,000

The following assumptions were made when calculating each fleet's average age:

- If a transit operator's fleet was comprised of vehicles from different class sizes, the class size with the most vehicles was used to calculate the average age of the fleet.
- For consistency, it was assumed that each vehicle was put in service the same year it was manufactured (i.e., the model year).
- Since mileage data was not available for all fleets, fleets that have surpassed their useful life were identified based on their age only and not miles.

[20] According to the FTA, transit operators are required to maintain a certain number of spare vehicles in their fleets. The number of spares (also known as "spare ratio") is equal to 20 percent of the number of vehicles operated in maximum service. The spares are intended to be deployed when vehicles are removed from service for maintenance, repairs, etc. This spare ratio allows transit operators to continue scheduled service in the face of vehicle failures.

[21] Laver, Richard, et.al. (2007). *Useful Life of Transit Buses and Vans* (Report No. FTA VA-26-7229-07.1). Washington, D.C.: Federal Transit Administration.

- The Hartford Express routes have multiple average ages – one for each operator. DATTCO operates CT*transit* route 928. Collins operates CT*transit* routes 903 and 910. NASON (which conducts business as Kelley Transit) operates route 927 and did not have any fleet age information available.

Fleet average age was calculated at the transit operator level because information about the buses assigned to specific routes was not available. All 15 transit systems with Stage 2 routes had data available for evaluation of this criteria, including both contract operators for Hartford Express (DATTCO and Collins Bus Service).

Findings

The following transit operators have fleets where the average age exceeded two-thirds of the useful life per FTA:

Heavy-duty Large (Greater than 8 years)

- CT*transit* New Haven: 10.9 Years
- C*Ttransit* Hartford: 9.9 Years
- NTD: 10.7 Years
- GBT: 10.4 Years
- WRTD: 9.9 Years
- SEAT: 9.5 Years
- MTD: 8.8 Years

Light-duty Small (Greater than 2.6 years)

- NWCTD: 6.4 Years
- ETD: 3.3 Years

In 2015 and 2016, several transit operators received new buses for fleet replacement. The transit operators, the number of buses and their type are listed below:

- CT*transit* Hartford: 30-foot buses (11)
- CT*transit* Waterbury: small buses (22)
- HART: small buses (10)
- MAT: small buses (10), 30-foot buses (4), 35-foot buses (3)
- MTD: small buses (9)
- NTD: 30-foot buses (12), 40-foot buses (2)
- SEAT: small buses (5)
- Hartford Express (DATTCO): 45-foot commuter buses (6)

- ETD: small buses (4)

In 2017 and 2018, the following transit operators are anticipated to purchase replacement buses. The transit operators, the number of buses and their type are listed below:

- CT*transit* Hartford: 40-foot buses (136), 45-foot commuter buses (22)
- CT*transit* New Haven: 40-foot buses (87)
- CT*transit Waterbury*: 20 small buses, 40-foot buses (4)
- HART: small buses (9)
- MTD: small buses (3), 40-foot buses (3)
- NTD: 35-foot buses (3)
- SEAT: 30-foot buses (4), 35-foot buses (6), 40-foot buses (5)
- WRTD: small buses (2), 30-foot buses (2)
- Hartford Express (DATTCO): 45-foot commuter buses (5)
- ETD: small buses (5)
- NWCTD: small buses (4)
- CT*transit* – Bristol (NBT): 35-foot buses (3)
- Hartford Express (Kelley/Nason): 45-foot (1) commuter bus

Recommendations for fleet replacement are described in the next section.

4.8 Stage 2 Evaluation Conclusions

Following the evaluation of data and calculation of statistics for each Stage 2 bus route and transit system, the following conclusions can be made:

Data Availability Issues
An extensive outreach effort was performed to obtain bus route level performance data, and follow-ups with transit systems were conducted in March 2016. While most transit systems were responsive and provided data, many indicated that they do not collect performance data at the route level.

A recurring challenge to the evaluation of routes was the availability of data, particularly at the route level and for the same years and time periods. For example, of the 15 transit systems that advanced to Stage 2, six systems had passenger load data at the route level to evaluate the headway metric. Additionally, of these six systems, three had passenger load data available for both peak and off-peak hours. As a result of the inconsistency in data, just three transit systems could be properly evaluated for this metric.

The lack of standardized data suggests the need for more uniform collection and reporting of data by transit systems. Having complete and consistent data across all transit systems would enable a more "apples-to-apples" comparison of bus routes and a more comprehensive understanding of the strengths and weaknesses of transit across Connecticut.

For future studies, it might also be beneficial to have transit systems report data in formats that would allow for easier data manipulation, such as spreadsheets and databases. Data received for this study came in many different formats, with some data files like PDFs or Word documents requiring data conversion. Standardizing the format for data presentation would also aid in future evaluations of the bus system.

Finally, it was noted that larger transit systems could provide larger volumes of data, and in greater detail, than smaller transit systems for this study. This data disparity results in less assessment of routes from rural and small transit systems, which stand to benefit the most from such evaluations. CTDOT should consider instituting a policy and/or initiative that provides supplemental support to small and rural transit systems for the collection and reporting of data.

Bus Stop Spacing

Of the 28 routes that were evaluated for this criterion, 21 had bus stop spacing that exceeded the recommended guidelines (i.e., they had too many stops for their route). Having too many stops can negatively affect travel time and operational efficiency. The transit systems for the following routes should assess those routes to determine their bus stop spacing is appropriate.

- CT*transit* Hartford 31 Park Street / New Park Avenue – 3 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* Hartford 40 North Main Street – 3 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* Hartford 47 Franklin Avenue – 3 stops per mile (should be 1 stop per mile based on household density)
- CT*transit* Hartford 92 Tower Avenue Crosstown – 3 stops per mile (should be 1 stop per mile based on household density)
- CT*transit* New Haven D Grand Avenue – 3 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* New Haven D Dixwell Avenue – 5 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* New Haven L North Branford (Route 80) – 4 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* New Haven S Madison – 3 stops per mile (should be 1 stop per mile based on household density)

- CT*transit* Stamford 26-27 Pacific St/Shippan Ave – 5 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* Stamford 32-35 Washington Blvd Long Ridge Rd – 3 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* Waterbury 16 Bucks Hill Montoe – 6 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* Waterbury 20 Walnut – 4 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* Waterbury 22 Wolcott – 4 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* Waterbury 26 Fairlawn/East Main St. – 3 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* Waterbury 44 Bunker Hill – 5 stops per mile (should be 2 stops per mile based on household density)
- CT*transit* Waterbury N1 Naugatuck – 2 stops per mile (should be 1 stop per mile based on household density)
- CT*transit* Waterbury N2 Naugatuck – 3 stops per mile (should be 1 stop per mile based on household density)
- CT*transit* Meriden A Westfield Shoppingtown – 3 stops per mile (should be 2 stops per mile based on household density)
- NTD Route 2[22] – 4 stops per mile (should be 2 stops per mile based on household density)
- NTD Route 5/6[23] – 3 stops per mile (should be 1 stop per mile based on household density)
- NTD Route 10 – 8 stops per mile (should be 2 stops per mile based on household density)

Bus Stop Amenities, Headway, and Span of Service

All transit systems that provided data to evaluate service span fell within the benchmark, indicating that routes for those transit systems are offering service during appropriate hours. However, many of the routes had very low utilization on the first and last trips (or both) which may indicate spans of service that are too long.

From the evaluation of headway, three routes (CT*transit* Waterbury Routes 22, 28, and 42) were identified as exceeding the 1.33 passenger load benchmark during peak service hours. This suggests that demand for travel on these routes is high and riders may be experiencing overcrowding on buses. CT*transit* Waterbury should investigate these routes to determine if increasing service frequency is appropriate.

[22] Effective January 29, 2017, NTD Route 2 has been eliminated.
[23] Effective January 29, 2017, NTD Route 5/6 has been eliminated.

The evaluation for bus stop amenities was limited to GBT since it was the only transit agency with boardings at the bus stop level data. CT*transit* Hartford, New Haven, Stamford, and Hartford Express had stop level data, but in a format that could not be analyzed. It is recommended for all bus stops in the state, at a minimum, the following elements are provided: a bus stop sign and pole, a clear and stable waiting area, and static signage with bus route information.

The evaluation of the three metrics that involve passenger load data was limited because this data does not appear to be collected by most transit operators. CT*transit* Hartford, New Haven, Stamford, Waterbury Divisions, HART and NTD collected passenger load data during peak and off-peak times enabling an evaluation of headways.

Similarly, just NTD and the CT*transit* Hartford, New Haven and Stamford Divisions had passenger load data by trip to evaluate span of service. In addition, the CT*transit* Hartford, New Haven and Stamford Divisions and GBT had passenger load data organized by stop to assess bus stop volumes and amenities, with GBT possessing data in a format that could be analyzed. The lack of passenger load data underscores the need among transit systems to invest in passenger counting technology for buses (such as APCs) to more accurately monitor ridership patterns. As stated earlier, CT*transit,* GBT and NTD already have plans to install APCs and AVL on all their buses. Smaller and rural transit systems that may lack the resources to invest in APCs could benefit from some form of support (e.g., financial or resource support) to upgrade their buses.

Passenger Trips per Revenue Mile

Tracking passenger trips per revenue mile allows transit systems to understand route productivity. Routes with a low number of passengers per revenue mile may have low utilization. conversely, routes with too many passengers per revenue mile might suggest overcrowding on buses and the need to adjust service frequency.

Most transit systems track this metric, and 32 of the 54 routes that could be evaluated fell below the benchmark indicating low numbers of passengers per route mile. These routes were concentrated between two transit systems– NTD with seven routes and MAT with six routes. It is recommended that NTD and MAT should examine the cause of the low passenger trips per revenue mile (whether it is service quality, overall low transit demand, or low demand along a specific segment) and determine if the cause can be addressed.

Fare box recovery rate

While fare box recovery data at the route level could not be calculated, the transit operators evaluated at the system level that fell within the bottom 60% of ratios included HART, MAT, MTD, NTD, SEAT, and WRTD. These transit systems should review their routes more closely to understand which routes are impacting the

agency average and what are the causes (i.e., low utilization, fare subsidy agreements with State colleges, etc.). If the cause of low fare box recovery rates is due to low ridership on a particular route, these routes could be candidates for restructuring or possibly elimination. Other potential solutions to improving the recovery of operating costs could involve fare adjustments. It is recognized, however, that some routes exist to provide transportation access to communities that may not have other options for travel. Implementing a fare increase, or even the elimination of a low performing route to address fare box recovery, would adversely impact its riders. These factors should be carefully weighed when considering whether to improve a route's fare box recovery ratio, and how.

Revenue miles to non-revenue miles

Of the 24 routes evaluated, roughly half of the routes (SEAT, CT*transit* Hartford, and CT*transit* New Haven Route S Madison) had ratios that exceeded the benchmark.

It is recommended that these transit systems evaluate their routes for possible adjustment. An alternative option would be to share facilities with another transit jurisdiction, if practicable. This level of recommendation requires more detailed analysis on the part of each transit operator to understand the benefits and costs.

Fleet vehicles

It should be noted some of the transit systems that have older fleets are in the process of replacing them (i.e., CT*transit*, NTD, SEAT, WRTD, ETD, and NWCTD). A final consideration may be the implementation of a mid-life vehicle rehab that rebuilds a vehicle's engine and drivetrain halfway through its useful life. These rehabs extend the useful life of a vehicle without incurring the cost of a full vehicle replacement, and can be a method of extending limited maintenance and fleet replacement dollars.

Two metrics related to fleet vehicles were examined under this evaluation – fleet average age and average distance between failures. These metrics sought to provide an understanding of vulnerabilities in each transit system's fleet. Based on a review of the transit systems that provided fleet data for the study, 60 percent (or 9 of 15 transit systems that provided fleet age data) had fleets that had surpassed their FTA useful life, and 70 percent (or 7 of 10 transit systems that provided vehicle failure data) fell under the benchmark for average distance between failures.

While transit systems should not be expected to replace their entire fleet because of this assessment, those transit systems that exceed the benchmarks for either of the two metrics (and especially those systems that surpassed the benchmarks for both metrics) should review their fleet and maintenance practices.

It is recommended that transit systems examine their fleet for patterns in vehicle failures (e.g., specific models that consistently encounter mechanical issues) and reexamine their maintenance schedule for possible adjustments. Since bus mileage data was not reviewed as part of the fleet age evaluation, transit systems, it is recommended that transit systems review this data to determine if vehicles have exceeded their useful life based on mileage.

Route Productivity and Fare box Recovery Correlation

Both Passenger Trips per Revenue Hour and Passenger Trips per Revenue Mile measure route productivity, and it can be expected that routes with low passenger trips per revenue hour also have low passenger trips per revenue mile. The evaluation revealed that, indeed, nineteen of 24 routes identified in Stage 1 as the poorest performing routes for passenger trips per revenue hour, also failed to meet the benchmarks for passenger trips per revenue mile in Stage 2. The five remaining routes did not have data available to evaluate passenger trips per revenue mile.

The strong connection between low passenger trips per revenue hour and low passenger trips per revenue mile is significant because it can indicate low route utility and therefore low fare box revenue. This assessment could only determine fare box recovery at the transit system level, so no specific information was available about each route's fare box recovery rate, but five of the twelve transit systems that had low passenger trips per revenue hour also had fare box recovery ratios within the bottom 60th percentile of those systems that were evaluated in Stage 2. These transit systems include: HART, MAT, NTD, SEAT, and WRTD. HART and WRTD did not have data available to assess Passenger Trips per Revenue Mile. Transit operators should assess these routes for having a low fare box recovery rate.

Routes with Route Productivity and Fare box Recovery Issues

- HART
- MAT
- NTD
- SEAT
- WRTD

On-Time Performance, Average Distance Between Failures, and Fleet Average Age Correlation

Six of the ten routes that performed poorly in Stage 1 for on-time performance also failed to meet average distance between failure and fleet average age in Stage 2. These criteria all address various aspects of service delivery and their correlation suggests that perhaps poor fleet reliability could be contributing to poor on-time performance for these routes. Since no data about the specific vehicles that were assigned to routes, transit systems with the following routes

should review their on-time performance and maintenance records for their vehicles to determine if appropriate vehicle maintenance is being performed, if the same buses are being assigned to the same route daily, and if the buses are all the same age. These factors could help determine if vehicle condition could be a contributing factor for poor on-time performance.

- GBT Route 2 Coastal Link
- NTD Greenwich Community Shuttle – Central Loop
- NTD Greenwich Community Shuttle – CT Avenue/HART Shuttle – New Fairfield Southeast
- SEAT Route 3
- SEAT Route 5
- SEAT Route 11

Best Performing Routes, Service Span, and Headway

Routes that performed best for on-time performance or passenger trips per revenue hour in Stage 1 were evaluated for service span and headway in Stage 2. Of the 42 routes that were identified as the best performing ones in their group, nine had data to evaluate span of service and 19 had data to assess headway. For service span, no routes had passenger loads during their first and last trips that exceeded the benchmark criteria but several routes had passenger loads that were well below the benchmark. This suggests that service hours for those routes may be too long for their level of need. Six of the ten routes that performed poorly in Stage 1 for on-time performance also failed to meet average distance between failure and fleet average age in Stage 2. These criteria all address various aspects of service delivery and their correlation suggests that perhaps poor fleet reliability could be contributing to poor on-time performance for these routes. Since no data about the specific vehicles that were assigned to routes, transit systems for the following routes should review their on-time performance and fleet vehicles to confirm if vehicle condition could be a contributing factor for poor on-time performance.

These routes would be candidates for an adjustment in service frequency (more buses per hour). An alternative would be to use larger vehicles for the route, if possible.

Table 32 presents a summary of the Stage 2 Evaluation Criteria and results.

Table 32: Stage 2 Evaluation Results

Agency	Route	Stop Spacing	Bus Stop Amenities	Headway (peak / off peak)	Span of Service (first/last trips)	Passenger Trips per Revenue Mile	Fare box/Cost Recovery	Ratio of Revenue Miles to Non-Revenue Miles	Average distance between Failures	Fleet Average Age
CT*transit* Hartford	31 Park Street / New Park Ave	See Table 28.	Information not available.	0.60/0.42	0.32/0.41	7.58	32.24%	5.2%	1,303	9.9
	38 Weston Street			0.65/0.23	0.54/0.02	4.26		4.3%		
	40 North Main Street			0.43/0.34	0.08/0.36	6.76		5.4%		
	45 Berlin Turnpike Flyer			0.25/0.05	0.24/0.11	0.55		12.2%		
	47 Franklin Ave			0.65/0.34	0.68/0.17	5.67		10.4%		
	85 MCC Flyer			0.75/0.61	0.29/0.39	2.46		5.7%		
	92 Tower Avenue Crosstown			0.32/0.34	0.18/0.20	0.95		14.2%		
CT*transit* Meriden	A Westfield Shoppingtown	See Table 28.	Information not available.	Information not available.	Information not available.	Information not available.	Information not available.	Information not available.	Information not available.	6.8
CT*transit* New Haven	D Grand Avenue	See Table 28.	Information not available.	0.56/0.37	0.22/0.04	7.01	33.90%	8.3%	1,372	10.9
	D Dixwell Avenue			0.49/0.42	0.32/0.10	5.75		7.3%		
	L North Branford			0.20/0.00	0.12/0.09	0.57		8.6%		
	S Madison			0.57/0.21	0.39/0.17	0.92		23.4%		
	Union Station Shuttle			0.44/0.25	0.10/0.02	11.9		8.7%		
CT*transit* Stamford	26-27 Pacific St / Shippan Ave	See Table 28.	Information not available.	0.11/0.08	0.15/0.06	0.00	31.25%	3.1%	2,101	5.8
	32-35 Washington Blvd - Long Ridge Rd			0.22/0.13	0.03/0.11	0.70		3.0%		
CT*transit* Waterbury	16 Bucks Hill - Montoe	See Table 28.	Information not available.	0.83	Information not available.	3.80	Information not available.	Information not available.	21,143	6.8
	20 Walnut			0.93		6.50				
	22 Wolcott			1.85		7.10				
	26 Fairlawn/ East Main St			0.65		3.70				
	28 Scott Road/East Main			1.73		4.40				
	42 Chase Parkway			1.65		4.20				
	44 Bunker Hill			1.15		4.70				
	N1 Naugatuck / Millville			0.15		0.40				
	N2 Naugatuck / New Haven Rd			0.33		0.20				

Pink shaded cells indicate bus route failed to meet minimum threshold/standard for this criterion.

Table 32: Stage 2 Evaluation Results (Continued)

Agency	Route	Stop Spacing	Bus Stop Amenities	Headway (peak / off peak)	Span of Service (first/last trips)	Passenger Trips per Revenue Mile	Fare box/Cost Recovery	Ratio of Revenue Miles to Non-Revenue Miles	Average distance between Failures	Fleet Average Age
Hartford Express	903 Buckland Express	See Table 28.	Information not available.	Information not available.	Information not available.	2.43	Information not available.	54.6%	Information not available.	DATTCO - 4.8 / Collins 4.3. Information from NASON not available.
	910 Century Hills Express					1.39		11.8%		
	927 Torrington Express					0.35		Information not available.	Information not available.	
	928 Southington-Cheshire-Waterbury Express					0.07			32,782	
Estuary Transit District	Route 2 Riverside	Information not available.	Information not available.	Information not available.	Information not available.	0.12	Information not available.	Information not available.	Information not available.	3.3
Greater Bridgeport Transit	Coastal Link	Information not available.	See Appendix A.	Information not available.	Information not available.	1.34	28.06%	Information not available.	4,131	10.4
	7					1.21				
	16					Information not available.				
	20					0.74				
	23					0.80				
Housatonic Area Regional Transit District	HART 1 Hospital	Information not available.	Information not available.	0.38	Information not available.	Information not available.	11.91%	Information not available.	31,685	5.2
	HART 2 Stony Hill			0.48						
	HART 3 Mill Plain/Brewster			0.38						
	Danbury-Norwalk Route 7 LINK			0.48						
	New Milford LOOP			0.43						
	Shuttle - New Fairfield Southeast			0.15						
Middletown Area Transit District	Route B Wesleyan Hills	Information not available.	Information not available.	Information not available.	Information not available.	0.49	15.53%	Information not available.	40,954	1.6
	Route C Washington Street					1.74				
	Route F Portland-East Hampton					0.23				
	Route M Link					0.72				
	S-1 Route (SAT)					0.94				
	S-2 Route (SAT)					0.77				

Pink shaded cells indicate bus route failed to meet minimum threshold/standard for this criterion.

Table 32: Stage 2 Evaluation Results (Continued)

Agency	Route	Stop Spacing	Bus Stop Amenities	Headway (peak / off peak)	Span of Service (first/last trips)	Passenger Trips per Revenue Mile	Fare box/Cost Recovery	Ratio of Revenue Miles to Non-Revenue Miles	Average distance between Failures	Fleet Average Age
Milford Transit District	Route 1 - Coastal Link	See Table 28.	Information not available.	Information not available.	Information not available.	2.07	19.29%	1.5%	14,208	8.8
Northwestern Connecticut Transit District	Route 1 - Winstead	Information not available.	Information not available.	Information not available.	Information not available.	Information not available.	9.96%	Information not available.	Information not available.	6.4
	Route 2 - Litchfield									
	Route 3 - Torrington Main St to East Side									
	Route 4 - Torrington East Main to East Side									
	Route 5 - Torrington Westside to Southend									
Norwalk Transit District	Route Westport S1	See Table 28.	Information not available.	Information not available for WHEELS or regional routes.	Information not available.	0.54	9.73%	Information not available.	5,639	10.7
	Route Westport S2					0.29				
	Route 2[24]					0.60				
	Route 5/6[25]					0.50				
	Route 10					3.60				
	Comm Shuttle - Norwalk Hospital/Belden			0.30	0.30/0.03	1.77				
	Comm Shuttle - Merritt 7/Glover			0.53	0.18 / 0.10	1.77				
	Comm Shuttle - CT Avenue			0.18	0.16/0.08	1.77				
	Greenwich Comm - Central Loop			Information not available.	Information not available.	Information not available.				
	Coastal Link									
Southeast Area Transit District	Route 3	Information not available.	Information not available.	Information not available.	Information not available.	0.8	19.56%	8.0%	2,262	9.5
	Route 5					2.4		5.0%		
	Route 6					3.7		6.0%		
	Route 7					2.8		4.0%		
	Route 9					1.5		3.0%		
	Route 10					0.1		20.0%		
	Route 11					1.4		13.0%		
Windham Region Transit District	Route 32 Commuter	Information not available.	Information not available.	Information not available.	Information not available.	Information not available	22.75%	Information not available.	Information not available.	9.1
	Willimantic-Danielson									

Pink shaded cells indicate bus route failed to meet minimum threshold/standard for this criterion.

[24] Effective January 29, 2017, NTD Route 2 has been eliminated.
[25] Effective January 29, 2017, NTD Route 5/6 has been eliminated.

4.9 Evaluation of Ease of Access to Transit System Information

Providing information on how to use transit systems is an important factor in pre-trip planning and encouraging transit usage particularly for first-time users. Transit system information is provided on transit agency websites, but may also be found in other locations such as bus stops, train stations, town halls and libraries. Information on transit may also be available through municipal and state agency websites. For example, the CTDOT website has a "Travel Resources" page list which includes links to bus systems in the state.

Effective transit websites have the following characteristics:

- Focuses on providing service information to help plan trips (i.e., trip planning tools, route/system maps, bus route schedules, fare information, and information on transfer policies)
- Supports easy website navigation to access service information
- Makes the most frequently used information the most visible (i.e., schedules, maps, real-time information, trip planners)
- Accounts for different audiences and varying needs (regular riders vs. occasional or non-riders)
- Designed for user-side technology (i.e., mobile friendly design)

4.9.1 Findings

The assessment examined the availability of route and system maps, bus schedules, fare information, transfer policies for adjacent or connecting transit systems, links to other transit system websites, rider guides/tutorials, bicycle on bus policies, mobile phone friendly website design, and availability of GTFS data[26].

The findings of the assessment are presented in the following sections.

System and Bus Route Maps

- Half of the transit agency websites do not include bus system maps (ETD, NECTD, NWCTD, SEAT and WRTD). These websites only have individual route maps which are typically included on a bus schedule.

[26] The General Transit Feed Specification (GTFS) defines a common format for public transportation schedules and associated geographic information. GTFS "feeds" allow public transit systems to publish their transit data and developers to use that data to write applications such as trip planners such as Google Maps, mobile applications, timetable generation software, and tools for transit planning and operations analysis

Schedule and Fare Information

- All of the transit agency websites provide bus schedules and fare information on their websites.
- GBT bus route schedules identify stops where transfers can be made to other GBT and CT*transit* bus routes and as well as highlighting other key destinations such as rail stations and/or ferry services, shopping, schools/universities, and area attractions (parks, museums, hospitals, etc.) served by that bus route. The GBT website makes real-time bus location data available to website visitors.
- The SEAT website offers a link to a separate SEAT website providing real time bus information called seatbuslive.com. The seatbuslive.com website is configured to be accessed from mobile phones and tablets, and provides arrival predictions, live bus maps, and the ability to look up stop numbers.
- The NTD website offers a real-time bus information on its website through a link to www.mystop.norwalktransit.com and via the MyStop mobile app.

Transfer Policies between Bus System Systems

- CT*transit*, ETD, GBT, and HART have information concerning acceptance of transfers from other connecting systems. Even in cases where this information was included on the website, it was necessary to search the website to find this information because this information was not easily found. Table 33 displays transfer policies by transit agency.

Table 33: Transfer Policies between Transit Systems

Bus System	Transfer To/From	Passes Honored
CT*transit*	Middletown Area Transit	Yes
	Greater Bridgeport Transit	Yes
	Coastal Link	Passes not used
	Norwalk Transit District (WHEELS)	Passes not used
	Route 7 Link	Yes
	Milford Transit District	Passes not used
CT*fastrak*	Any local CT*fastrak* or CT*transit* bus	Yes
Estuary Transit District (9 Town Transit)	Coordinated connections and free transfers to other 9 Town Transit, SEAT, MAT, CT*transit*	Yes, MAT and CT*transit* monthly passes
Greater Bridgeport Transit (GBT)	Norwalk Transit District (WHEELS), Milford Transit, CT*transit*, and HART bus	Zip passes accepted when transferring from a GBT bus to one of these systems. On return trip, need to pay the fares required by the other systems.

Table 33: Transfer Policies between Transit Systems (Continued)

Bus System	Transfer To/From	Passes Honored
Housatonic Area Regional Transit (HART)	Free transfers between Danbury and Norwalk's local buses, and in Norwalk to the Coastal Link (Norwalk to Milford), or CT*transit* Stamford Division.	Yes, Metro-North Railroad Uniticket
Middletown Area Transit (MAT)	Connections to 9 Town Transit (ETD) and CT*transit*.	No information available
Milford Transit District (MTD)	All transfers are for the next connecting MTD bus only. Transfers are for one-way travel and expire one hour after issue. A transfer is not given for a transfer used to get on the bus. All transfers are FREE.	No information available
Northeastern Connecticut Transit District (NECTD)	No information available	No information available
Northwestern CT Transit District (NWCTD)	No information available	No information available
Southeast Area Transit District (SEAT)	No information available	No information available
Norwalk Transit District (NTD)	Norwalk: All WHEELS routes, Westport Service, Coastal Link, 7 Link and CT*transit* Route 41. CT*transit* transfers are not accepted for travel on WHEELS Route 13 at the WHEELS hub. Westport: Coastal Link and WHEELS. Coastal Link: Milford Transit District, Greater Bridgeport Transit, and CT*transit*. 7 Link: HART	No information available
Windham Region Transit District (WRTD)	Transfer for local routes only. Transfer is good for continuing one-way trip only.	No information available

Links to other Transit Systems

- CT*fastrak*, CT*transit*, NTD, ETD, HART, MTD and WRTD have links (or information such as a phone number and/or a website address) for other transit systems (as well as rail and ferry service, as applicable).
- WRTD informs its website visitors that connections can be made to Southeast Area Transit District (SEAT) and NECTD bus services. However, the SEAT and NECTD websites do not tell its visitors that connections can be made to WRTD buses.
- On GBT's website, bus schedules identify connections to rail stations or ferry terminals served by a GBT bus route. At Derby railroad station, a connection to CT*transit* F6 route – Ansonia – Seymour may be made. However, there are no web links to connecting systems.
- WRTD's Storrs-Willimantic and Willimantic City local bus schedules list phone numbers and website addresses for other area transportation services including: UCONN shuttle, CT*transit* Route 918 – Willimantic-Conventry Express and Peter Pan intercity bus to Hartford/Providence/Boston/New York. The Route 32 bus schedule advises that connections to SEAT can be made at the Norwich Transportation Center. The Willimantic-Danielson bus schedule advises that connections to NECTD can made at the Walmart in Brooklyn. It should be noted that neither the SEAT nor the NECTD websites inform riders of the systems that connections may be made to WRTD.

Rider Guides/Tutorials

- All the transit systems provide a rider guide/instructions on how to use the system except for MTD.
- CT*fastrak*'s website provides videos on accessing the system, CT*fastrak* routes, planning your trip, accessibility, and bikes on buses.
- CT*transit*'s website provides a tutorial on how to read timetables.
- ETD offers a detailed rider guide upon request.

Bicycles on Buses Policy

- Nine transit systems accommodate bikes either on board buses or on bicycle racks on the front of the bus. However, two transit systems, MTD and NWCTD do not appear to have a policy on this subject.

Mobile Phone-Friendly Website

- All the transit system websites were configured to be mobile phone friendly. As smartphones become an increasingly common medium to access information, having a mobile friendly website is becoming critical to having an online presence.

GTFS Data

- GTFS or General Transit Feed Specifications, are data streams that contain information on transit routes, stops, and schedule. These are generally used by developers to create web maps and tools that can be used for trip planning.
- CT*transit* offers GTFS data as a public service and free of charge to developers for the creation of web and transit apps, including Google Maps.
- CT*transit* offers a trip planner tool in Google Maps. Transit feeds for the CT*transit* and CT*fastrak* routes are available from the Hartford, Meriden, New Britain, New Haven, Shore Line East, Stamford, and Waterbury systems.
- NTD also has stop and schedule data within the GTFS that can be used for trip planning.

Trip Planning Tools

- All CT*fastrak* and CT*transit* routes and schedules can be accessed by Google Transit and the Transit App for iPhone and Android to assist in trip planning.
- The CT*transit* and CT*fastrak* websites have a trip planning tool, tailored to trips within the CT*transit* service area only. In addition, the CT*fastrak* website offers Google Transit as an option for trip planning. The release of real-time data feeds for CT*fastrak* is the first phase of an initiative which will make similar information available for CT*transit* services state-wide in the future.
- New Haven Union Shuttle passengers can download the Ride Systems app on their smartphones. By choosing New Haven as the location, passengers can access a timetable of stops informing them exactly where the free Union Station Shuttle is and will be for the next 10 minutes. A "live tracker" map pinpoints that location along the route and the location of the shuttle as it travels along the route.
- GBT offers a real-time bus tracker on its website which show the location of a bus and arrival times at major and minor bus stops along any GBT route.
- The SEAT website offers a link to a separate SEAT website providing real time bus information called seatbuslive.com. The seatbuslive.com website is configured to be accessed from mobile phones and PDAs and provides arrival predictions, live bus maps, and look up stop numbers.
- The NTD website offers an interactive bus map/trip planner, customizable bus alerts, and real-time bus information through www.mystop.norwalktransit.com. The myStop app is available on iPhone and Android devices. ETD's website provides an online trip planner using Google Maps.

Information from Transit Agency websites is displayed in Table 34.

Table 34: Information on Transit Agency Websites

Transit Agency	Route and System Maps	Bus Schedules	Fare Information	Information on Policies for Accepting Transfers from Other Systems	Links to other Transit Systems	How to Ride Bus Tutorial?	Bikes On-board Vehicles?	Website mobile phone friendly?	GTFS Data?
CT*fastrak*	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CTtransit	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Estuary Transit District	Route maps only	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Greater Bridgeport Transit	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
Housatonic Area Regional Transit District	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Middletown Transit District	Yes	Yes	Yes	No	No	Yes	Yes	Yes	No
Milford Transit District	Yes	Yes	Yes	No	Yes	Yes	No	Yes	No

Table 34: Information on Transit Agency Websites (Continued)

Transit Agency	Route and System Maps	Bus Schedules	Fare Information	Information on Policies for Accepting Transfers from Other Systems	Links to other Transit Systems	How to Ride Bus Tutorial?	Bikes On-board Vehicles?	Website mobile phone friendly?	GTFS Data?
Northeastern Connecticut Transit District	Route maps only	Yes	Yes	No	No	Yes	Yes	Yes	No
Northwestern CT Transit District	Route maps only	Yes	Yes	No	Yes	Yes	No	Yes	No
Southeast Area Transit District	Route maps only	Yes	Yes	No	No	Yes	Yes	Yes	No
Norwalk Transit District	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
Windham Region Transit District	Route maps only	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No

Source: Transit Agency websites and VHB.

4.10 Intercity Bus Needs Analysis

An analysis of the degree to which there are unmet needs for intercity bus service in Connecticut was undertaken. This was accomplished by examining the location and density of populations that are most likely to be transit dependent or to be users of intercity bus services (e.g., college students). These locations represent potential trip origins, and were compared to the existing intercity bus network in the state to determine if there were high needs locations that are not currently served. Similarly, the analysis looked at key potential destinations for intercity trips to determine if they are served by the intercity network. If either origins or destinations unserved directly by intercity bus were identified, local transit options were reviewed to determine if transit could be used to access the nearest intercity bus stop.

Gaps in services are defined as either intercity origins or destinations that are not within ten miles of an intercity bus stop, based on national data that shows that most intercity bus trips originate within ten miles of a stop, and that the majority of users access intercity bus services by car, taxi or transit (if available) with few users walking to a stop.

4.10.1 Trip Origins-Transit Dependent Populations in Relation to the Intercity Bus Network

The need for transit service, including intercity bus service, depends on the size and distribution of an area's population and on the demographic composition of that population. To identify areas in Connecticut with a high relative need for intercity transportation services, specific socio-economic characteristics (i.e., age, income, or automobile availability) were evaluated using 2010 U.S. Census and 2014 American Community Survey (ACS) data. Places that are likely to be intercity bus destinations were identified, such as: higher educational institutions (colleges/universities), medical centers, correctional facilities, commercial airports, recreational destinations, and military installations. These origins and destinations for regional services were then compared with the current intercity bus service network to identify if there are areas in need of new or increased intercity bus service.

Transit-dependent population segments are defined as those segments of the population that may require transit service to meet intercity mobility needs, due to demographic characteristics such as age, income, or automobile availability. For the purposes of this study, these population segments are defined as:

- Older Adults (above 65 years old)
- Households under the poverty line— this variable was computed using the state's poverty standards (roughly an annual income under $25,000 for a family of four.)
- Households without access to an automobile
- Population Density
- Employment Density

These same measures were used previously in this study to compare transit dependent populations to the availability of local transit services.

The analysis identified 76 census-block groups with concentrated populations with characteristics that reflect a higher propensity to use transit, including intercity bus services. As illustrated in Figure 23, of these 76 census block groups, eight were located more than 10 miles from an intercity bus stop and four of the block groups are in rural areas, two in Stafford and two in Plainfield.

Figure 23: Transit Propensity and Proximity to Intercity Bus Services

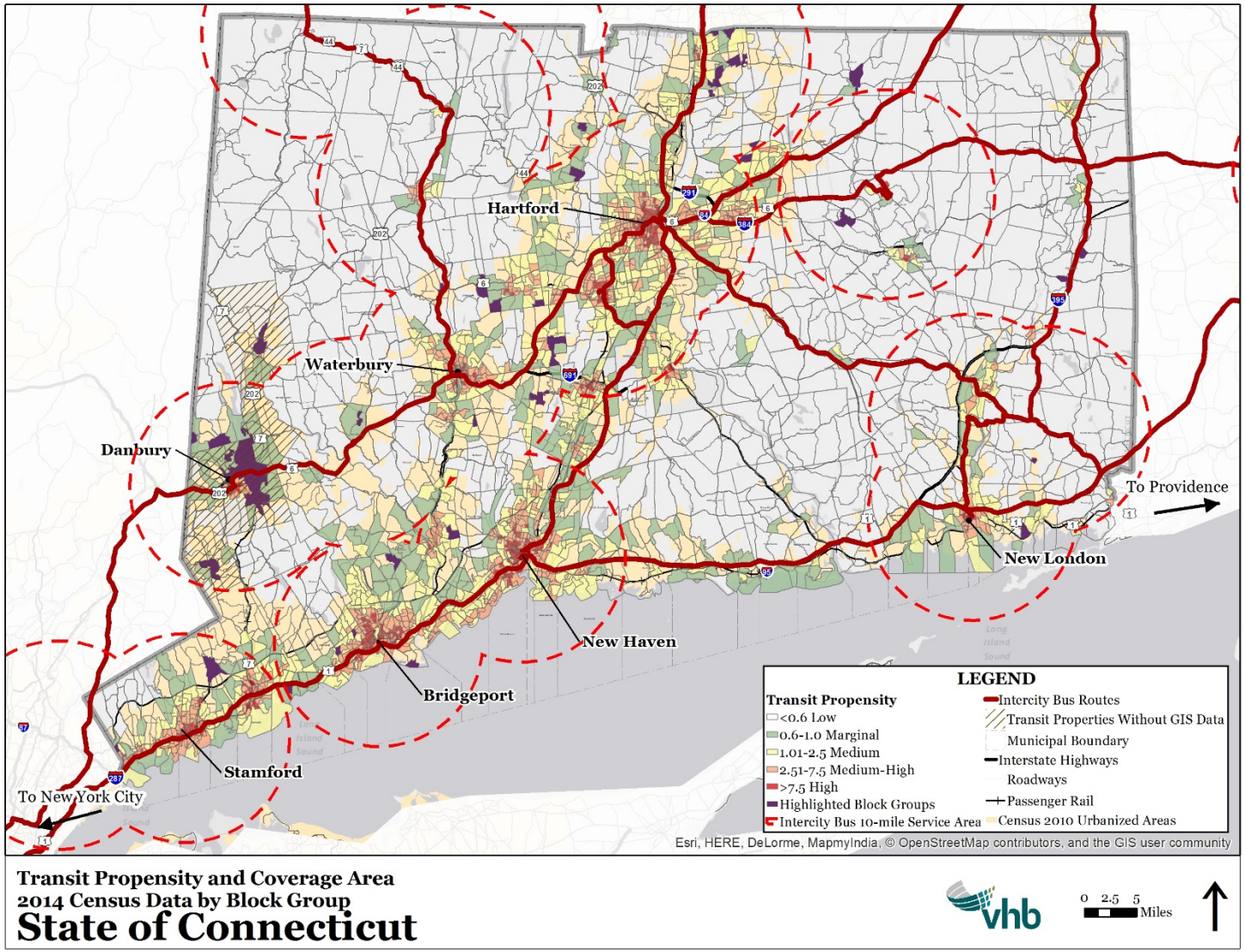


Table 35 lists the areas of the concentrated populations of block groups that indicate a potential need for intercity bus service currently not served by intercity transit.

Table 35: High Transit Propensity Block Groups Located More Than 10 Miles from an Intercity Bus Stop

Block Group	Town	In UZA?	UZA	Population in Block Group
090052531001	New Milford	Yes	Danbury	2,545
090052531002	New Milford	Yes	Danbury	852
090034663003	Simsbury	Yes	Hartford	1,108
090034872022	South Windsor	Yes	Hartford	1,294
090138901001	Stafford	No	n/a	1,759
090138901002	Stafford	No	n/a	1,188
090159072002	Plainfield	No	n/a	1,748
090159073001	Plainfield	No	n/a	1,223

All of these block groups are more than ten miles from an intercity bus stop, though the high need census-blocks in New Milford are part of the Danbury Urbanized Area (UZA), and those in Simsbury and South Windsor are in Hartford's UZA. The UZA designation is significant because the only source of federal funding for intercity bus service is Section 5311(f), which is part of the rural transit assistance program. Any service funded from this source must have some stops in a Non-Urbanized area (population under 50,000), and services that are entirely within an Urbanized Area are not eligible for funding. HART Route 7 connects New Milford to downtown Danbury, where the intercity bus station is adjacent to the HART pulse point, providing intercity access from New Milford. Simsbury is served by CT*transit* Express Routes 912 and 912 S, which link Simsbury with a stop in downtown Hartford in close proximity to Hartford Union Station, providing access to the intercity bus and rail networks. South Windsor, also in the Hartford UZA, is linked to the Hartford Union Station by CT*transit* Route 903, and it is a six-minute walk to the bus terminal at Union Station, again affording access even though South Windsor is more than ten miles away.

Based on the ten-mile coverage area displayed in Figure 23, the state has few areas of unmet needs for intercity bus service. Plainfield, Stafford and Union have population block groups which are not located in UZAs (see Table 35). None of these towns are served by fixed-route or route-deviation transit services. Since they are not located in UZAs, they would be eligible for Section 5311(f) subsidized intercity service. However, the low population levels of these towns

would need to be considered when designing intercity services, as connections to more populated areas would be essential for successful intercity routes.

The Town of Plainfield, located in the lower northeast portion of the state on Interstate 395 in Windham County, is comprised of four villages: Plainfield, Moosup, Wauregan, and Central Village. The Town of Plainfield is comprised of three Census Tracts: 9071, 9072, and 9073. Tracts 9072 and 9073 were identified as having block groups with populations whose characteristics reflect a higher propensity to use transit. These two census tracts have a combined population of 10,825 persons covering a total land area of 29.1 square miles with a population density of 371.99 persons/square mile. Census Tract 9071 has a population of 4,445 persons, with a total land area of 13.29 square miles and a population density of 334.46 persons/square mile.

The Town of Plainfield, has a total population of approximately 15,000[27] and is included in the elderly and disabled demand-response service area for the Northeastern Connecticut Transit District. However, this paratransit service is unlikely to provide a link to the nearest intercity bus service points which are located outside the Transit District's service area. In general, the total population is too small to warrant an intercity bus stop for privately operated intercity bus service.

The Town of Stafford, in Tolland County, located in the northeastern part of Connecticut, consists of the downtown area of Stafford Springs and eight villages: Crystal Lake, Ellithorpe, Hydeville, Orcuttsville, Staffordville, Stafford Hollow, Village Hill, and West Stafford. The two Census Tracts identified as having block groups with populations with characteristics that reflect a higher propensity to use transit include the Town of Stafford (Census Tract 9802.02) and Census Tract 8902.01 which includes the Town of Union. The Town of Union, directly west of the Town of Stafford, is one of the least populated towns in Connecticut with an estimated population of 854 and a total land area of 29.8 square miles. The Village of Stafford Springs (Census Tract 8901) contains nearly half of the population for the Town of Stafford, but it does not contain census block groups with high transit propensity characteristics.

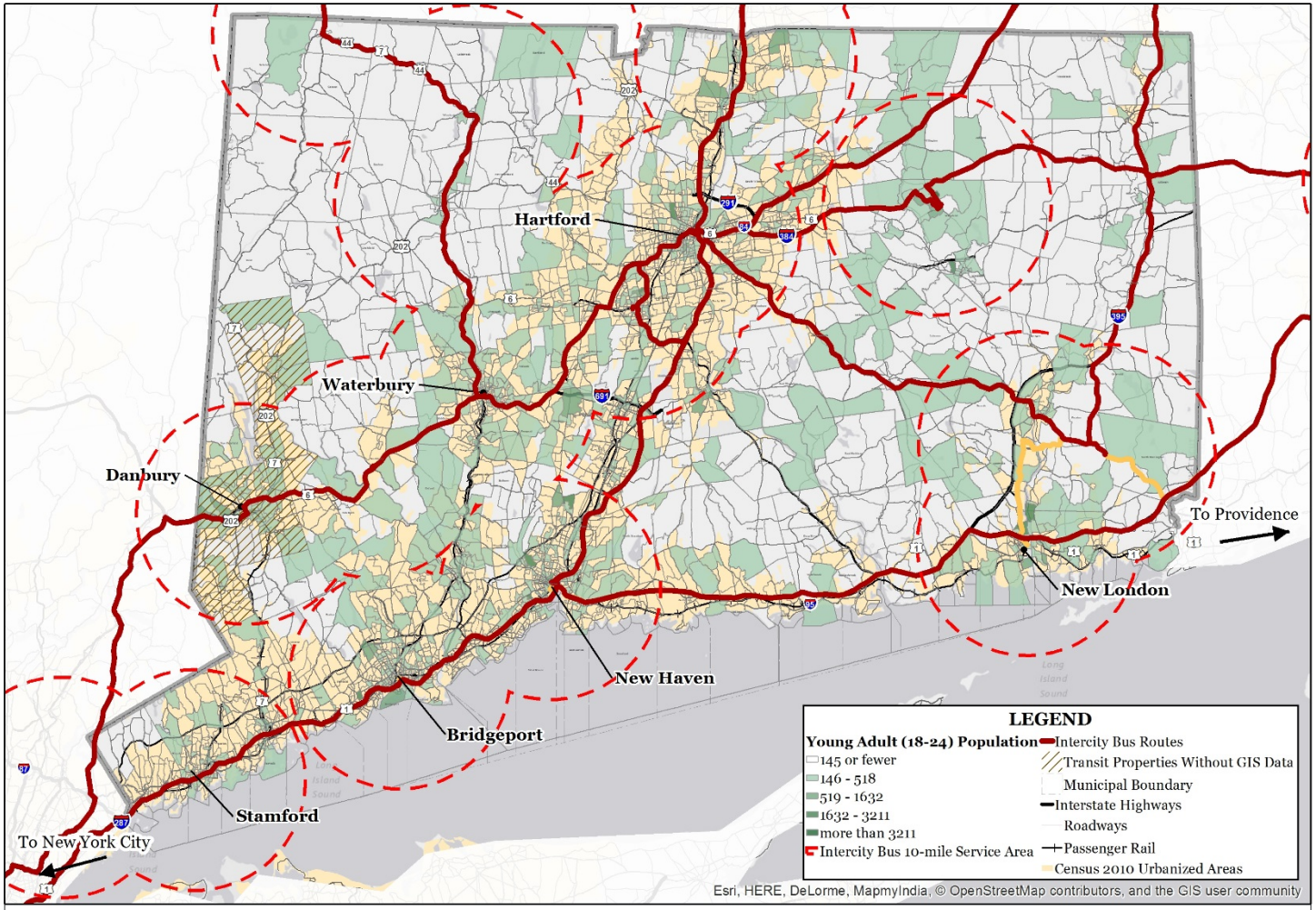
This area has a similar issue to the Town of Plainfield. The Town of Stafford, including the Village of Stafford, has a total population of 12,192. The two census tracts with block groups found to have a high transit propensity surround the Village of Stafford Springs, including the Town of Union; have a combined population of 8,828 people within a total land area of 83.48 square miles. The population density for these two census tracts is 88.93 persons/square mile. This population density is not concentrated enough to warrant an intercity bus stop for privately operated intercity bus service. Furthermore, there is no public transit

[27] All of the population and land mass areas are from US Census Bureau, American Community Survey. 2010-14. Source geography: Tract

service in the towns of Stafford or Union, although the Stafford Department of Social Services provides demand-response service to elderly and disabled persons who have no alternative means of transportation. Again, this paratransit service would not provide a link to the nearest intercity stops in Hartford and Springfield, Massachusetts.

Another population characteristic that is relevant for assessing intercity bus need and potential demand is the number and percentage of young adults of the state's total population. The 17-24 year age group account for a significant portion of intercity bus ridership, and the private carriers often focus on this population/market in deciding where to locate intercity bus stops outside of major cities. Generally speaking, areas that have a high concentration of young adults include university towns, urban areas, and areas with military bases, which are also reviewed below as key destinations. Figure 24 depicts areas in Connecticut with concentrations of young adults, with locations shown in relation to the intercity bus network. Areas with the highest numbers of young adults (top two ranking categories) are all within the intercity bus service areas.

Figure 24: Young Adult Population and Intercity Bus Coverage Area



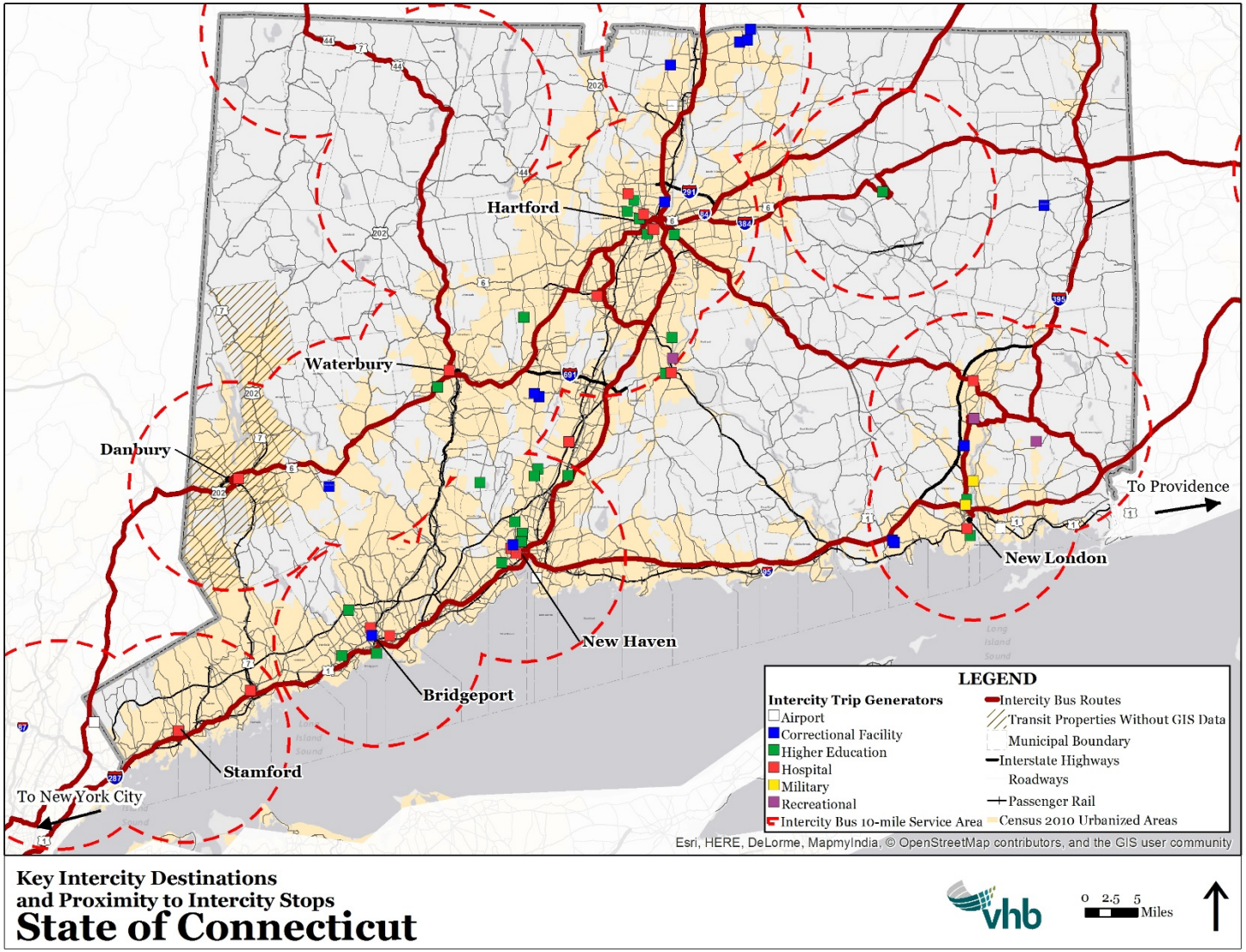
4.10.2 Potential Intercity Bus Destinations

An analysis of potential intercity bus service origins and destinations compared with currently available intercity bus service was undertaken. Destinations determined to be most used by intercity bus riders include:

- Colleges and universities,
- Hospitals and medical centers,
- Correctional facilities,
- Military bases,
- Major airports, and
- Recreational areas, such as casinos.

Figure 25 shows the geographic locations of these potential intercity transit origins or destinations and their distance to intercity bus stops. The ten-mile distance from intercity bus stops was used, the same criteria as the origins section above.

Figure 25: Key Intercity Destinations and Proximity to Intercity Stops



4.10.3 Educational Institutions

Eighteen educational institutions were identified as possible intercity bus origins/destinations. Table 36 lists the educational institutions included as potential intercity bus destinations. One of the criteria used in the selection of these educational institutions was the provision of on-campus housing. All of the colleges and universities in Table 36 are located within 10 miles of an intercity bus stop except for Wesleyan University in Middletown. Wesleyan is in the Hartford UZA and is served by local bus service that connects with intercity services. For example, there are four local bus routes within a mile of Wesleyan that connect with the New Haven Express bus run by CT*transit* Hartford to New Haven Station where passengers can connect with a Metro-North Railroad train to New York City Grand Central Terminal. A trip from Wesleyan to NYC, with two transfers averages 5 hours. In addition, it should be noted that Wesleyan University itself operates van service from the campus to the New Haven train station on Thursdays, Fridays, Saturdays and Sundays, one round-trip per day on a reservation basis. Based on the availability of CT*transit* services to either Hartford or New Haven, and the university's own shuttle, Wesleyan can be considered to have intercity access, even though there is no intercity bus stop in Middletown itself.

The Coast Guard Academy is included in this study, under the Military Installations in section 4.10.6.

Table 36: Educational Institutions Included as Intercity Bus Destinations

Educational Institution	Address	City
Albertus Magnus College	700 Prospect Street	New Haven
Connecticut College	270 Mohegan Avenue	New London
Fairfield University	1073 North Benson Road	Fairfield
Hartford Seminary	77 Sherman Street	Hartford
Mitchell College	437 Pequot Avenue	New London
Quinnipiac University	275 Mount Carmel Avenue	Hamden
Quinnipiac University	370 Bassett Road	North Haven
Quinnipiac University	305 Sherman Avenue	Hamden
Sacred Heart University	5151 Park Avenue	Fairfield
Trinity College	300 Summit Street	Hartford
University of Bridgeport	126 Park Avenue	Bridgeport
University of Connecticut	115 North Eagleville Road	Storrs
University of Hartford	200 Bloomfield Avenue	West Hartford
University of New Haven	300 Boston Post Road	West Haven
University of Saint Joseph	1678 Asylum Avenue	West Hartford
Wesleyan University	45 Wyllys Avenue	Middletown
Yale University	420 Temple Street	New Haven
Lincoln College of New England	2279 Mount Vernon Road	Southington
Post University	800 Country Club Road	Waterbury

4.10.4 Hospitals and Medical Centers

Although medical trips comprise a small percentage of intercity bus trips, the ability to make trips from rural and small towns to major medical facilities is often a policy consideration for maintaining bus services. It may be less of a consideration for travel by patients than for family and friends to visit, simply because most intercity bus services are not frequent enough to permit same-day trips for outpatient visits. Table 37 lists the 16 hospitals and medical centers identified as potential destinations for intercity bus service. Smaller medical facilities with less than 200 beds were excluded. The Middlesex Hospital in Middletown and the Masonicare Health Center in Wallingford are the only hospitals in this list that are not located within 10 miles of an intercity bus stop. Both of these hospitals are in the Hartford and New Haven UZAs, respectively and are served by local bus service that permits a connection to intercity services, and so these two facilities can be considered to have intercity access.

Table 37: Hospitals and Medical Centers Included as Intercity Bus Destinations

Medical Center	Address	City	Number of Beds
Backus Hospital	326 Washington St.	Norwich	213
Bridgeport Hospital	267 Grant St.	Bridgeport	359
Connecticut Children's Medical Center*	282 Washington St.	Hartford	187*
Danbury Hospital	24 Hospital Ave.	Danbury	417
Hebrew Health Care	1 Abrams Blvd.	West Hartford	302
Hartford Hospital	80 Seymour St.	Hartford	858
Lawrence Memorial Hospital	365 Montauk Ave.	New London	234
Masonicare Health Center	22 Masonic Ave.	Wallingford	434
Middlesex Hospital	28 Crescent St.	Middletown	229
Norwalk Hospital	34 Maple St.	Norwalk	302
Saint Francis Hospital & Medical Center	114 Woodland St.	Hartford	581
St. Vincent's Medical Center	2800 Main St.	Bridgeport	403
Stamford Hospital	30 Shelburne Rd.	Stamford	300
The Hospital of Central Connecticut at New Britain General	100 Grand St.	New Britain	308
Waterbury Hospital	64 Robbins St.	Waterbury	246
Yale-New Haven Hospital Saint Raphael Campus	1450 Chapel St.	New Haven	573
Yale-New Haven Hospital	20 York St.	New Haven	1,499

* The Connecticut Children's Medical Center was included as a destination for intercity transit because it is a specialty hospital offering services not available in other regions. They are one of only two freestanding children's hospitals in New England and the only one in Connecticut.

4.10.5 Correctional Facilities

As with hospitals, intercity bus service may be an essential service for visitors and employees of correctional facilities. The ability to make trips from rural areas and small towns to and from correctional facilities may be crucial to families, released

inmates, and employees. There are 16 correctional facilities in Connecticut and all but the Brooklyn Correctional Institution in Brooklyn, CT are within ten miles of an intercity bus stop. The Connecticut Department of Correction reported that the average confined inmate population at this facility is 506[28]. Although the Brooklyn Correctional Institute has local transit services nearby[29] these do not connect to a location that has intercity bus service. The Brooklyn Correctional Institute is the only trip generator identified as not within ten miles of an intercity stop that is also not in an UZA, therefore it can be considered as unserved. Table 38 lists the locations of the correctional facilities in Connecticut.

Table 38: Correctional Facilities Included as Intercity Bus Destinations

Facility Name	Address	City	Population
Bridgeport Correctional Center	1106 North Avenue	Bridgeport	991
Brooklyn Correctional Institution	59 Hartford Road	Brooklyn	506
Cheshire Correctional Institution	900 Highland Avenue	Cheshire	1,370
Corrigan/Radgowski Correctional Center	986 Norwich-New London Turnpike	Uncasville	1,503
Cybulski Community Reintegration Center	391 Shaker Road	Enfield	Annex
Enfield Correctional Institution	289 Shaker Road	Enfield	720
Garner Correctional Institution	50 Nunnawauk Road	Newtown	543
Hartford Correctional Center	177 Weston Street	Hartford	1,008
MacDougall-Walker Correctional Institution	1153 East Street	South Suffield	2,043
Manson Youth Institution	42 Jarvis Street	Cheshire	563
New Haven Correctional Center	245 Whalley Avenue	New Haven	725
Northern Correctional Institution	287 Bilton Road	Somers	237
Osborn Correctional Institution	335 Bilton Road	Somers	1,978
Robinson Correctional Institution	285 Shaker Road	Enfield	1,244
Willard-Cybulski Correctional Institution	391 Shaker Road	Enfield	1,152
York Correctional Institution	201 West Main Street	Niantic	1,086

[28] Connecticut Department of Correction Annual Report 2015, p. 6.

29 Service near the Brooklyn Correctional Institution is provided by the Northeastern Connecticut Transit District and the Windham Regional Transit District. The closest Northeastern Connecticut Transit District bus stop is two miles away at the Brooklyn Walmart. The Windham Regional Transit District's Willimantic-Danielson Deviated Fixed Route also has a pick up only stop about half a mile away from the correctional institute at the intersection of Routes 6 and 169.

4.10.6 Military Installations

Table 39 lists the major military bases in Connecticut. All three installations are located within 10 miles of an intercity bus stop and on local bus routes.

Table 39: Military Bases Included as Intercity Bus Destinations

Military Base	Address	City
Naval Submarine Station New London	1 Crystal Lake Road	Groton
Coast Guard Academy	31 Mohegan Avenue	New London
Camp Niantic Regional Training Institute	Old Pine Grove Road	Niantic

4.10.7 Major Airports and Rail Connections

People traveling from rural areas to commercial airports are potential markets for intercity bus service. This would be particularly true for Bradley International Airport in Windsor Locks and the New York State airports. Major airports within 100 miles of Connecticut are included. All of the airports are within 10 miles of an intercity bus stop, in urbanized areas and accessible by transit. Table 40 lists the airports serving Connecticut.

Table 40: Major Airports Serving Connecticut

Airport	Address	City
Tweed-New Haven Regional Airport (HVN)	155 Burr St.	New Haven, CT
Groton-New London Airport (GON)	155 Tower Ave.	Groton, CT
Albany International Airport (ALB)	737 Albany-Shaker Rd.	Albany, NY
Westchester County White Plains Airport (HPN)	148 Martine Ave.	White Plains, NY
Bradley International Airport (BDL)	11 Schoephoester Rd. (Exit 40 off I-91)	Windsor Locks, CT
T.F. Green Airport	2000 Post Rd	Warwick, RI
John F. Kennedy International Airport (JFK)	Airport Rd.	Jamaica, NY
LaGuardia Airport (LGA)	Airport Rd.	Flushing, NY

There is no direct intercity bus service to Bradley International Airport, though there is a CT*transit* Bradley Flyer route that connects Hartford Union Station (served by intercity bus and Amtrak) with the airport. None of the other airports listed have direct intercity bus service from Connecticut.

The state has an extensive commuter rail and intercity rail network, with linkages to the intercity bus network at several key rail stations. Hartford Union Station and New Haven Union Station are both served by Greyhound and Peter Pan intercity bus service. In Stamford, Greyhound stops at the Stamford Transportation Center. In Mansfield, the Nach-Zimmer Transportation Center is served by Peter Pan Bus Lines, WRTD, and UConn Transportation. Although not rail stations, in Farmington and Torrington, stops for Peter Pan are in these town's park-and-rides.

4.10.8 Recreational Attractions

Connecticut has two casinos, Foxwoods Resort Casino and Mohegan Sun. Both are served by intercity bus services. Tourists flying into the state may not have access to a car and therefore may decide to use intercity bus services to visit these recreational attractions. Connecticut has numerous tourist attractions; for study purposes, three tourist attractions were identified as potential intercity bus attractions, the two casinos and the Brownstone Exploration & Discovery Park in Portland, Connecticut. All of these attractions are within 10 miles of an intercity bus stop. Table 41 provides the recreational attractions locations.

Table 41: Major Recreational Attractions in Connecticut

Recreational Attraction	Address	Town
Brownstone Exploration & Discovery Park	161 Brownstone Avenue	Portland
Mohegan Sun	1 Mohegan Sun Boulevard	Uncasville
Foxwoods Resort Casino	350 Trolley Line Boulevard	Mashantucket

4.10.9 Summary of Potential Unmet Intercity Needs

The demographic and mapping analyses described in this document found that there are few areas in the state without transit coverage. The block groups with transit-dependent demographic characteristics not within 10 miles of an intercity bus stop include:

- New Milford

- Simsbury
- South Windsor
- Stafford
- Plainfield

Stafford and Plainfield were the only underserved areas that are not included in a UZA. The UZA designation is significant because the only source of federal funding for intercity bus service is Section 5311(f), which is part of the rural transit assistance program. Any service funded from this source must have some stops in a Non-Urbanized area (population under 50,000), and services that are entirely within an Urbanized Area are not eligible for funding.

Therefore, the only non-urbanized locations in the state that could be seen as having an unmet intercity need are the Town of Stafford and the Town of Plainfield, both of which have small populations. Neither has a transit connection to the nearest intercity service.

The analysis of potential intercity bus destinations (i.e., colleges and universities, hospitals and medical centers, Correctional facilities, etc.), identified four locations that were outside of the 10-mile intercity service area:

- Middlesex Hospital in Middletown, has local bus service and is in the Hartford UZA
- Wesleyan University in Middletown, has local bus service and is in the Hartford UZA
- Masonicare Health Center in Wallingford, has local bus service and is in the New Haven UZA
- Brooklyn Correctional Institution in Brooklyn, has limited local bus service and is not part of a UZA

All of these trip generators are served by local bus service, and all except Brooklyn Correctional Institution, are in UZAs. The Brooklyn Correctional Institution located in Brooklyn was the only intercity bus attraction that was not within 10 miles of an intercity bus stop and not in an UZA. However, it has a relatively small population (506 inmates) and its uses a van to transport released inmates who do not have transportation from a friend or relative.

This analysis has focused on the coverage provided by the intercity bus network in Connecticut, discussing unmet needs in terms of places that are not in proximity to the intercity bus stop locations. However, as noted above, it is likely that the actual need is not so much the intercity connections to the major cities, but for a connected network of regional services that could facilitate trips within the state, as well as providing links to the places that already have intercity bus service.

4.10.10 Connecticut and FTA Section 5311(F) Program

Section 5311(f) is a subsection of the overall Federal Transit Administration (FTA) Section 5311 program of assistance for rural public transportation. Section 5311 funding is provided to the states on a formula basis to provide public transportation to the residents of the rural parts of the state, defined as those areas not included in the Census-defined Urbanized Areas with over 50,000 in population. Section 5311(f) is the only federal transit funding available for intercity services. Under the Section 5311(f) program, intercity bus service is defined as bus service that is:

- for the general public
- operated with limited stops
- fixed route service
- connecting two or more urban areas not in close proximity
- capable of carrying passenger baggage
- makes meaningful connections with scheduled intercity bus service to points outside the service area

Each state is required to spend at least 15% of its annual Section 5311 allocation on intercity projects, unless it certifies to the Secretary of Transportation that there are no unmet rural intercity transportation needs. The certification must follow a documented consultation process. For Connecticut, the FY 2016 15% set-aside is estimated to have a value of $446,371. Like other FTA funds, it must be programmed within three years of receipt.

Previously Connecticut determined that it had no unmet rural intercity bus needs, and it sought to certify to the FTA that its rural intercity bus needs are completely or partially met. However, the determination that there is no unmet need was dependent on the fact that no intercity bus operators had applied for Section 5311 or 5311(f) funding. Much of the state is urbanized and served by state-operated or state-funded transit services that provide linkages between urban areas, the potential scope of Section 531(f) funded rural intercity projects has been limited. This is similar to the situation in Massachusetts, Rhode Island, New Jersey and other smaller states with a number of Urbanized Areas.

The analysis of unmet intercity bus needs summarized the available intercity bus services in Connecticut. In terms of coverage, there are potentially few areas that could be considered as having unmet needs for intercity bus services. This information is one potential source for the state to consider as it determines whether or not to certify to the FTA that all of its rural intercity needs are met. Other factors that Connecticut Department of Transportation

(CTDOT) should consider in its determination of no unmet rural intercity needs include the input received from stakeholders, including the private intercity carriers that provide service to the state. CTDOT conducted a consultation meeting with the carriers in 2015, with the result that at least one carrier identified a need for marketing support. That carrier, Peter Pan Bus Lines, subsequently applied for and received a grant for marketing assistance from CTDOT, awarded in July 2016.

4.11 CT*rail* Hartford Line Bus-Rail Connections Analysis

The Hartford Line is a planned rail service between New Haven and Springfield, Massachusetts. It will operate over Amtrak's New Haven–Springfield Line and supplement existing Amtrak intercity rail services.

A high-level analysis was undertaken to assess and identify opportunities to integrate/synchronize schedules between fixed bus routes and the following existing and future Hartford Line Stations: Windsor, Hartford Union Station, Berlin, Meriden, and Wallingford.

The analysis was limited to a comparison of existing bus route schedules and draft 2018 Hartford Line schedules, and an assessment of census block groups identified as having high transit propensity within a two-mile radius of the selected Hartford Line stations.

An inventory of local bus routes serving the selected rail stations was completed, followed by an analysis comparing train arrivals/departures to bus arrivals/departures at the stations. Train and bus schedules were compared to identify train and bus trips where bus/rail transfers and connections ("meets") occur or do not occur based on their corresponding schedules.

All of the rail stations and census tract block groups examined are currently served by bus routes. However, coordination/synchronization of existing bus and existing and proposed rail service can be improved. There are opportunities to expand spans of service and adjust bus schedules to better match rail services, if ridership demand justifies it, especially prior to start of the new rail service on the Hartford Line.

This analysis was the first step in better integrating/synchronizing bus/rail schedules. When station level ridership estimates by time period and mode split estimates become available, it is recommended that CTDOT and CT*transit* work together to identify, refine and prioritize specific bus/rail trips and/or times of day (e.g., peak periods) when ridership demand and station utilization is highest to ensure good connectivity.

More detail for the CT*rail* Hartford Line Bus-Rail Connections Analysis can be found in Appendix E.

5 Public Outreach

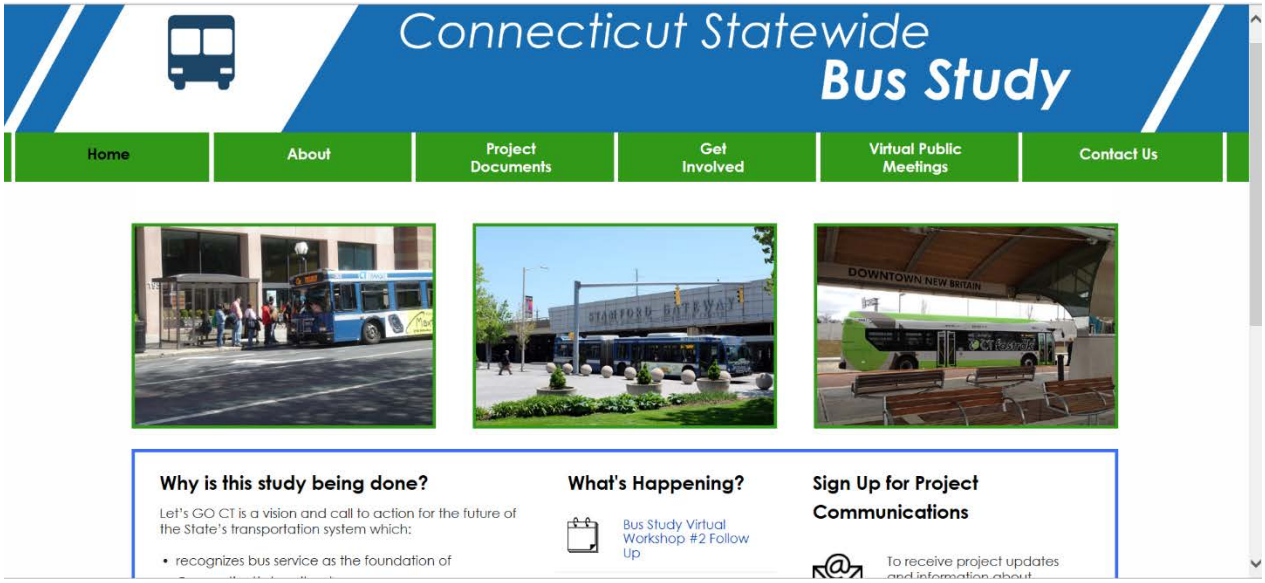
5.1 Public Outreach Overview

To ensure that the *Connecticut Statewide Bus Study* was informed by a broad range of stakeholders including the state's bus system users, residents, businesses, advocates, and planners, the study utilized a strategic and inclusive approach to engagement.

To coordinate with agency, transit service providers, Regional Planning Organizations (RPOs), and other public stakeholders, the study team met with those key stakeholders through a series of informational and working session meetings via standing quarterly RPO meetings hosted by CTDOT.

To provide clear, concise communication to the public and stakeholders and to provide the study team with public input and recommendations to inform the Study, a series of informational meetings/workshops were held at key milestones, and a study website was built to house information about the study and to host Virtual Public Workshops.

Additionally, the Study website, http://www.ctbusstudy.com, offered visitors the ability to submit comments, ask questions, and sign up for the study mailing list. The study mailing list was used to inform stakeholders about study progress and of opportunities to participate, including the Virtual Public Workshops.



Screenshot of Connecticut Statewide Bus Study website homepage

5.1.1 RPO Meetings

CTDOT holds regularly scheduled RPO Coordination meetings as part of its public involvement process. At key milestones in the *Connecticut Statewide Bus Study*, the project team was invited to provide updates on the study's progress and its findings.

RPO Meeting #1 – December 1, 2015

At this meeting, the project team presented the study's purpose and its goals; provided an overview of the *Connecticut Statewide Bus Study* and schedule; discussed existing bus service in the state; introduced the service guidelines to be used for evaluations; and discussed the evaluation methodology, potential recommendations, and participation opportunities.

RPO Meeting #2 – May 17, 2016

At this meeting, the project team summarized the data collection effort, the findings of the existing conditions report, the development of Bus Service Guidelines, the route evaluation process, and current and upcoming public outreach efforts (i.e., the establishment of a project website and the development of Virtual Public Workshop #1 for Summer 2016).

RPO Meeting #3 – October 18, 2016

At this meeting, the project team presented the feedback obtained from outreach efforts to date, including meetings with the State Mobility Ombudsmen, representatives of state colleges and universities, and the survey responses from Virtual Public Workshop #1. The feedback received from these outreach efforts provided a greater understanding of the travel needs and desires of constituents and transportation system users, stakeholders, and the general public. This data was used to help identify needs, inform on-going analyses and contribute to the development of study recommendations.

RPO Meeting #4 – December 20, 2016

At this meeting, the project team reviewed the project goals, explained the two categories of statewide need, Global (or statewide/system level) and route-level needs, explained how the bus service guidelines were developed and applied, provided an overview of the results of the performance analyses conducted for the statewide bus system, summarized key findings, and identified Global and route-level recommendations.

5.1.2 Virtual Public Workshops

Virtual Public Workshops provided a flexible and convenient way to hear the opinions of residents, businesses, stakeholders, and elected officials. Rather than attending an in-person public meeting, Virtual Public Workshops allowed the public the capability to participate online at their convenience. The Virtual Workshops featured a presentation with voiceover narration. At specific points in the presentation, the video and narration automatically paused and participants were asked to provide feedback through an online survey. Once that feedback was submitted, the video and narration resumed. Participants in the Virtual Public Workshops also had the opportunity to join the study mailing list and could provide freeform comments on the "Contact Us" page. The Virtual Public Workshops were promoted and advertised via the study mailing list, promotion by stakeholders through their organization networks, the study website, and CTDOT press releases.

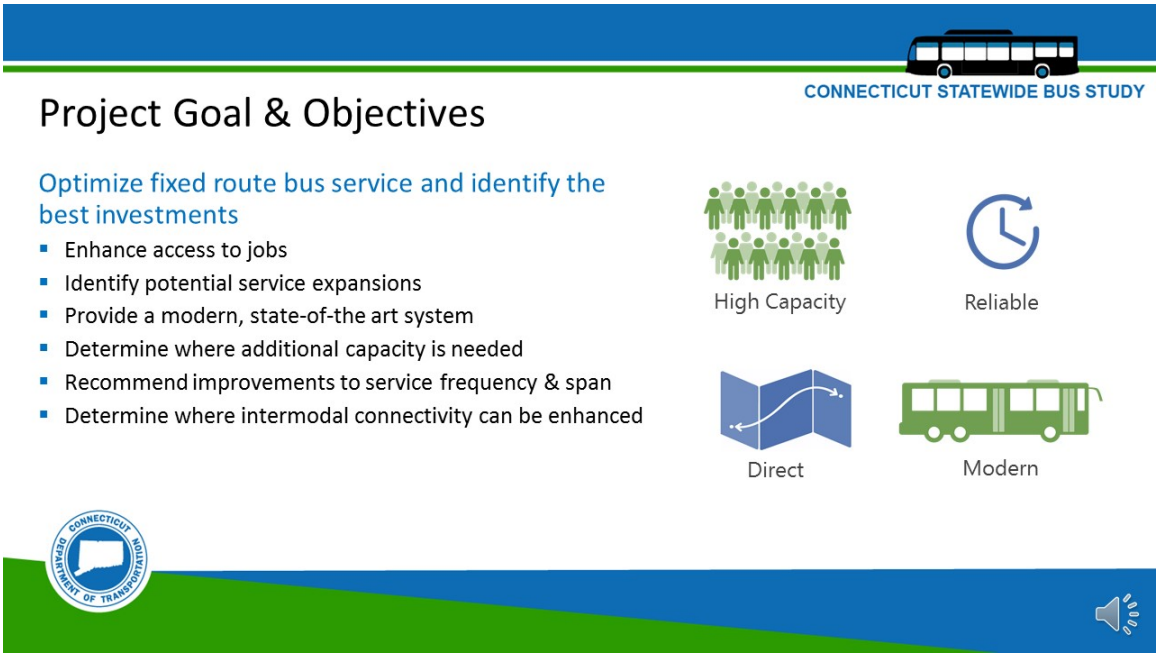
Virtual Public Workshop #1 – Summer 2016

From July 25 to August 15, 2016, the first *Connecticut Statewide Bus Study* Virtual Public Workshop was held to introduce the bus study, its goals and objectives; to provide an overview of the study; to summarize existing conditions for the state's bus system; to identify next steps; and to ask for input via the online survey. Over 360 members of the public participated in the first Virtual Public Workshop.

As part of the Virtual Public Workshop, participants were asked to answer questions on their travel behaviors and choices. Questions included:

- Whether or not they use transit for travel in Connecticut. If not, for what reasons? Choices included: buses do not go where I want to go, buses do not run when needed, wait times for buses are too long, etc.)
- What would encourage them to use the system in the future? (Choices included: direct service/one-seat rides, more frequent service, more service later in the day and on weekends, etc.)
- Where do they catch the bus, if their trip requires transfers, which systems do they transfer between to complete their trips?
- What are the top three needs in the transit system? (Choices included: better timed connections, more direct routes/less transfers, real-time bus information, etc.)

A memorandum summarizing the findings of the Virtual Public Workshop #1 Survey Results is included in Appendix F: Outreach Materials.



Screenshot from Virtual Public Workshop #1

Virtual Public Workshop #2 – Winter 2017

The second *Connecticut Statewide Bus Study* Virtual Workshop was held from January 9 through January 27, 2017. A total of 103 members of the public participated in the second Virtual Public Workshop. The purpose of the second Virtual Public Workshop's objective was to:

- Review the study's goals, existing conditions for the state's transportation system, and previous outreach efforts
- Identify Statewide transportation system and route-level needs
- Summarize the findings of the Stage 1 and Stage 2 evaluations

- Present Global, route-level and intercity recommendations

As part of the Virtual Public Workshop's online survey, participants were asked to answer questions regarding bus route reliability, bus service availability, bus stop accessibility and amenities, and conditions onboard buses. Finally, they were asked to choose the Global Recommendations most important to them (i.e., make bus service easier and more convenient to use, improve existing bus system performance, etc.)

A memorandum summarizing the findings of the Virtual Public Workshop #2 Survey Results can be found in Appendix F: Outreach Materials.

5.1.3 Stakeholder Meetings

Regional Mobility Ombudsmen – March 2016

A conference call with representatives of the State's Regional Mobility Ombudsmen (Eastern Connecticut Transportation Consortium, Know How To Go CT/Southwest, Way to Go CT/North Central, and the Kennedy Center) was held on March 23, 2016. The purpose was to provide an overview of the *Connecticut Statewide Bus Study* and provide input on transportation issues and the needs of their constituents. The Ombudsmen reported that issues and concerns expressed by their constituents included:

- A lack of bus system connectivity between regions,
- Limitations in bus service (i.e., inadequate spans of service for early morning or late-night trips),
- A lack of unified "one-stop" location for bus information leading to confusion on how to transfer between systems

As a result, their constituents indicated they were unable to take advantage of employment opportunities.

The input of the Mobility Ombudsmen was used to identify areas in need of improvement and to shape recommended solutions.

Connecticut Colleges and Universities – July 2016

A conference call with representatives of 13 colleges and four universities was held on July 6, 2016 to input on transportation issues and the needs of their students/faculty and to participate in a survey for the *Connecticut Statewide Bus Study*. Common themes from the conference call and the survey included:

- Expansion of span of service particularly in the evening
- Expansion of service coverage

- Lack of connectivity
- Direct access to campuses

The input of the colleges and universities was incorporated in the needs assessment and recommendations.

5.1.4 Comments Received via Study Website

As of the time of this report's publication, 55 written comments had been submitted via the project website. Many of the comments submitted were simple statements expressing gratitude for the opportunity to provide input. Other commenters asked to be informed of future opportunities to participate. The website's comment submission form includes an automatic email response that indicates that the message has been received, the commenter has been added to the mailing list, and that they will receive information regarding future input opportunities. The following section summarizes recurring themes of comments submitted (the comments received in their entirety are included in Appendix F):

General and background information: General comments about aspects of bus travel.

Desire to stay involved: Comments expressing interest in continued participation in the Study and offers to represent specific areas of expertise such as the disabled community, the senior community, or in a few cases, expertise in bus travel either through extensive bus riding in specific regions or through research and observation.

The bus riding experience: Comments delivering praise or complaints regarding specific aspects of the bus riding experience, fleet age and maintenance, standing room, and bus stop amenities.

Americans with Disabilities Act Issues: General and specific comments related to access for disabled and senior community members, and the importance of increased service on weekends and evenings, a key concern for the senior community.

Travel and Employment Issues: Comments concerning the impacts of limitations in bus service on employment opportunities related to route frequency and evening service.

Interstate Travel Issues: Desire for better interstate bus transportation for commuting to New York City, particularly during hours when there is little or no rail service.

Bus Service Needs/Improvements: Recommendations for specific locations and desire for increased service, new routes, and other improvements, as well as a suggested service cuts.

6

Bus Service Recommendations

6.1 Statewide Bus Study Global System and Vision-based Recommendations

A purpose of the *Connecticut Statewide Bus Study* is to identify measures that advance the statewide bus system to be a more interconnected and user-friendly multi-modal transit network. These global system and vision-based recommendations are focused on the system as a whole. They include recommendations to:

- Improve bus service performance
- Establish new data collection processes
- Recommend future transit studies/investigations
- Make using the bus easier and more convenient
- Provide for increased system integration

New technologies, administrative and marketing recommendations are integrated within the global recommendations.

Recommendations have been divided into two categories, short-term and long-term:

- Short-term recommendations are intended to occur over the next five years
- Long-term recommendations are intended to occur between five and twenty years

All recommendations are dependent upon the availability of funding and consistency with state and federal guidelines (See Appendix H for potential Title VI implications).

Table 42 provides a summary of the Global Recommendations by theme, individual recommendation, and implementation timeframe. Each recommendation is discussed in further detail in the following sections.

Table 42: Summary of Global Recommendations

Theme/Recommendation		Implementation timeframe
Improve Existing Bus Service Performance		
Recommendation 1	■ Adopt bus service guidelines for all transit systems	Short term
Recommendation 2	■ Form passenger advisory committees (all transit systems) ■ Consider implementation of on-line customer satisfaction surveys	Short term
Recommendation 3	■ Expand use of Automated Vehicle Location and Automated Passenger Counter technology to all bus systems in the state	Long term
Recommendation 4	■ Support review of high ridership corridors for improvements to reduce travel time	Long term
Implement Better Data Collection Processes, Tools and Reporting		
Recommendation 5	■ Collect and report data in a consistent format and level of detail ■ Create data reporting guidelines/templates	Short term
Recommendation 6	■ Establish a consistent and regular schedule for Statewide Performance Assessments	Short term
Recommendation 7	■ Create and maintain a statewide GIS database of transit agency bus systems	Short term
Conduct Future Transit Improvement Studies		
Recommendation 8	■ Investigate serving low-density/high transit propensity areas of the state	Short term
Recommendation 9	■ Align planning goals of individual transit agency development plans to Statewide transportation goals and initiatives	On-going

Table 42: Summary of Global Recommendations (Continued)

Theme/Recommendation		Implementation timeframe
Make Bus Service Easier and More Convenient to Use		
Recommendation 10	■ Expand the usefulness and capabilities of transit systems websites	Short term
Recommendation 11	■ Clearly state transfer policies between neighboring/connecting bus systems	Short term
Recommendation 12	■ Require transit systems to develop/maintain General Transit Feed Specification datasets and feeds	Short term
Recommendation 13	■ Provide real-time bus arrival information for all transit systems	Long term
Create an Integrated Statewide Bus System		
Recommendation 14	■ Conduct study to explore governance options to improve the ability to manage the state's transportation system	Short term
Recommendation 15	■ Provide consistent, understandable route numbering/identification across all bus systems	Short term
Recommendation 16	■ Adopt smart card technology to enable seamless travel across systems	Long term
Recommendation 17	■ Create a single, statewide fare policy across systems.	Long term
Better serve Special Transit Generators		
Recommendation 18	■ Supplement transit connectivity/span of service to state and community institutions and major employers	Short term
Recommendation 19	■ Create a statewide student transit fare discount policy for college and university students	Short term

6.2 Global Recommendation: Improve Existing Bus Service Performance

Goals Addressed: Provide cost-effective service consistent with travel needs and funding

Recommendation 1: Adopt bus service guidelines that provide consistent and measurable performance metrics across a wide-array of system service and network features. Communicate that the adopted guidelines must be used statewide.

Implementation timeframe: Short term

The *CT Statewide Bus Study* Bus Service Guidelines establish standards for route design, schedule design, route productivity, service delivery and financial performance, as summarized below.

Route Design: Route design guidelines are used to determine where bus routes should operate and how they should operate. They include metrics for service coverage, transit propensity, provision of service at major activity centers, stop spacing, bus stop amenities and bus information.

Schedule Design: Schedule design guidelines are used to develop consistent and reliable schedules that efficiently meet demand. They include metrics for headway and span of service.

Route Productivity: Route productivity guidelines describe the cost to operate bus service (by route) as well as the productivity of that service relative to other route data. Metrics include passenger trips per revenue mile, fare box/cost recovery and the ratio of revenue trips to non-revenue trips.

Service Delivery: Service delivery guidelines describe the operations of the routes. Metrics include on-time performance, average time between equipment failures, and fleet average age.

Recommendation 2: Require transit systems to form a passenger advisory committee to provide feedback on bus systems. Consider implementation of annual customer surveys statewide or for each agency.

Implementation timeframe: Short term

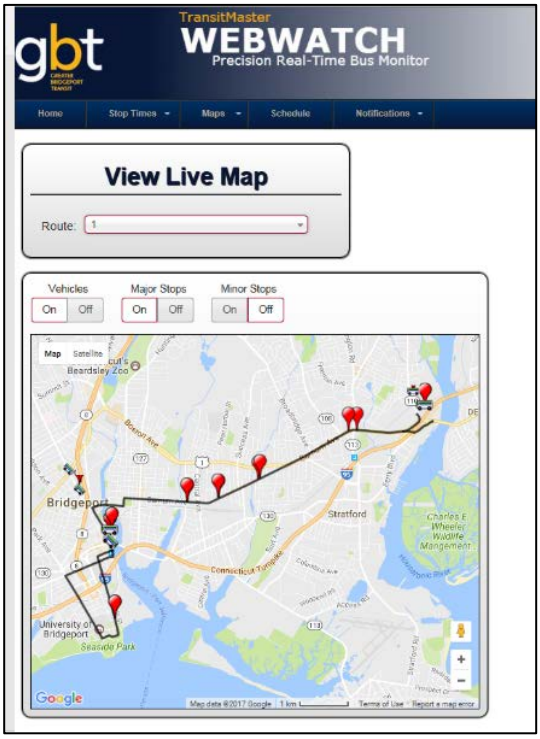
All transit systems, as applicable, should create a passenger advisory committee to provide a forum for passengers to provide input on existing bus service and plan for the future. A passenger advisory committee typically acts as an independent representative and advocate for bus riders. Generally, it is concerned with quality of bus service, fares, policies, financing and planning, and accountability. Membership can be open to the public and may include riders, advocates, and transit agency management and staff. Meetings should be held on a regular basis and may be open

to the public. GBT has organized a passenger advisory committee and may be used as a model for other transit systems.

Consider development of a statewide or agency-specific online customer satisfaction survey to be issued annually. A customer satisfaction survey will provide a mechanism for the broader public and bus users to provide feedback on bus system performance. Regularly issued surveys comprised of core questions will enable benchmarking on performance to understand where service has improved or degraded. Custom questions could be inserted to gauge feedback on a certain issue.

Recommendation 3: Expand Automated Vehicle Location (AVL) and Automated Passenger Counter (APC) technology to all fixed route transit systems in the state by 2025.

Implementation timeframe: Long term



Within the transit industry, AVL technology is becoming an essential element of a quality "transit product". By tracking buses along their route and analyzing the data collected, transit systems can monitor schedule ("on-time" performance), headway and running-time performance and take corrective actions, such as adjusting bus schedules or routes, as necessary. It may be used to respond to incidents more effectively (i.e., determining the location an accident or incident occurred and responding). For passengers, improved schedule adherence and operations make using the bus more reliable and convenient.

CT*fastrak*, CT*transit*, GBT and SEAT either have or are in the process of adding Global Positioning Systems (GPS)-based AVL technology to their bus fleets and incorporating it into their operations. GPS AVL technology supports the provision of real-time customer information across the fleet.

AVL technology may be integrated with Automated Passenger Counter (APC) systems. These devices are installed on-board buses, accurately record where and when passengers get off and get on the bus. This data may be used to monitor trends in usage and ridership, to improve planning and scheduling, the adjust bus service to meet actual demand and where to add or eliminate service, and to analyze data at finer levels of detail.

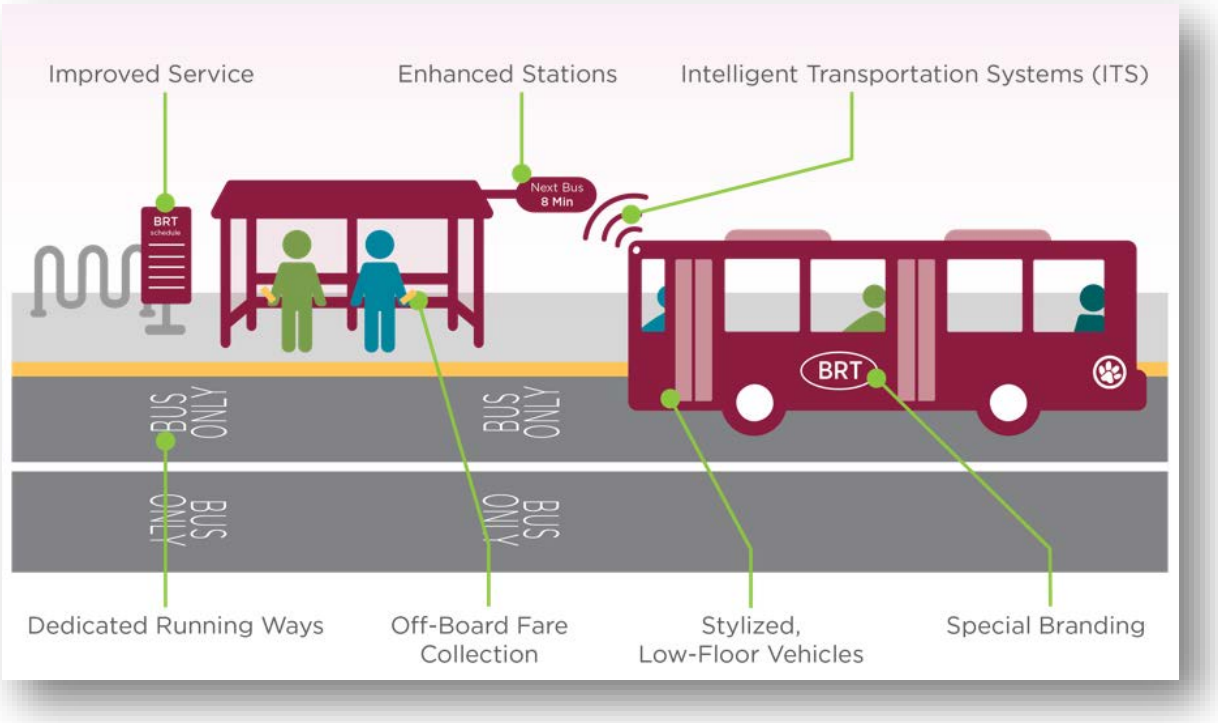
APC equipment has been installed or is in the process of being installed on CT*fastrak*, CT*transit,* and on portions of the fleets for GBT and NTD.

Recommendation 4: Support review of high ridership corridors for improvements to reduce travel time.

Implementation timeframe: Long term

Bus service throughout Connecticut is primarily comprised of fixed routes where buses stop at multiple, closely spaced stops. Except for CT*fastrak,* bus service in Connecticut does not operate with priority in dedicated lanes or through intersections equipped with traffic signals that enable transit priority. Buses also primarily stick to an "all stop" and consistent schedule throughout the day, providing no "skip-stop" or "limited" service to high demand stops. Priority infrastructure and service patterns enable fixed route transit service to move the greatest number of people as quickly as possible and with greater reliability. Such service often is introduced to supplement (overlay) all-stop local service in high transit volume corridors. Often, priority service is given the name "Bus Rapid Transit" (BRT), though BRT technically includes features beyond dedicated infrastructure and high-frequency service (Figure 26).

Figure 26: BRT Corridor Features



CTDOT is studying the feasibility of expanding Bus Rapid Transit (BRT) service. Under the CT*fastrak* Expansion Study, CTDOT is planning a multi-year strategy to expand transit service east of the Connecticut River with many of the bus rapid transit features available on CT*fastrak*. In addition, CTDOT is studying the feasibility of BRT service along the Route 1 Corridor between New Haven and Greenwich.

Building from these initiatives, it is recommended that CTDOT and other transit systems in the State investigate elevating other key high ridership bus routes and corridors to provide premium service.

As key premium corridors are implemented they may be tied together to improve regional connectivity.

6.3 Global Recommendation: Better Data Collection Processes, Tools and Reporting

Goal Addressed: Provide cost-effective service consistent with travel needs and funding

Recommendation 5: Require transit systems to collect and report performance and financial data at a consistent format and level of detail. CTDOT should work to create data reporting guidelines and templates for the transit systems use as well as key "report by" dates.

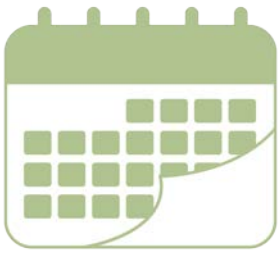
Implementation timeframe: Short term

The regular application of Bus Service Guidelines and the creation of performance assessments requires that all transit systems in the state are collecting consistent information in key data categories. As part of the Statewide Bus Study's data collection effort, an inconsistency in the type and format of data collected by the individual transit systems was revealed. In some instances, transit systems did not collect any data (such as on-time performance) while in other instances the data was based upon inconsistent assumptions or was only available at the program (not route) level. Additionally, discrepancies in the data being reported to CTDOT versus National Transit Database were revealed.

For some transit systems, where data will not be readily available in the format required, CTDOT should work to develop interim formats with the expectation that the transit agency will evolve to the consistent format. Examples include the collection of ridership information with and without APC counters and/or on-time performance reporting with and without AVL technology.

Recommendation 6: Establish a consistent and regular schedule for Statewide Performance Assessments.

Implementation timeframe: Short term



The last time a comprehensive look at the state's bus system was done was in 2000. The evaluation of the statewide bus service needs to occur at more frequent intervals. CTDOT should adopt a schedule of regular reviews of bus system performance and bus service plans. The following are suggested reporting intervals:

- **Annually:** Require transit systems submit updates on bus system financial performance, operating and capital plans, and service changes in addition to other

data already provided to CTDOT on an annual basis (i.e., expenses, revenue, subsidies, and operating costs).

- **Every Five Years:** CTDOT should conduct statewide bus system performance evaluations of all transit systems every five years. This would entail evaluating performance at the route level to ensure that bus service is being provided in an efficient and economically effective manner.

  State-funded transit systems should create a Transit Development Plan (TDP) every five years. The TDP serves as the basis for defining public transit needs and should be a prerequisite for receiving state funds. The TDP should be the transit systems planning, development and operational guidance document.

Periodically, the guidelines themselves should be reassessed to confirm that they are still relevant measures to apply to an evolving system. Should the goals of an agency change, or if regulations or other insights identify different outcomes or issues, then the performance monitoring program should adjust to respond accordingly. It is recommended that the State's performance measures ne reviewed and updated every two to three years, to ensure the Guidelines remain relevant and an active part of the statewide transit planning.

Recommendation 7: Create and maintain a statewide GIS database of transit agency bus systems.

Implementation timeframe: Short term

One of the challenges encountered in the *Connecticut Statewide Bus Study* data collection effort was the availability of Global Information System (GIS) data for the state's bus systems and their routes. In some cases, some transit systems did not have any GIS data for their bus system, while others had only limited data at the route-level.

CTDOT should create and maintain a statewide GIS database containing all bus routes from each of the transit systems. Having this GIS database will enhance the review of existing bus routes on a statewide level and would support for future statewide bus system evaluation efforts.

6.4 Global Recommendation: Future Transit Improvement Studies

Goal Addressed: Develop recommended expansions and modifications of fixed route and intercity service

Recommendation 8: CTDOT should investigate serving low-density high transit propensity areas of the State.

Implementation timeframe: Short term

The transit propensity evaluation performed for *Connecticut Statewide Bus Study* identified numerous census block groups that are isolated from existing bus routes or urban areas, but have a medium to high transit propensity score. These census block groups are located in the following towns and counties, shown in Figure 27.

Fairfield County

- Stratford
- Greenwich
- Fairfield
- New Fairfield
- New Canaan
- Stratford
- Westport

Fairfield County is primarily served by GBT and NTD.

Hartford County

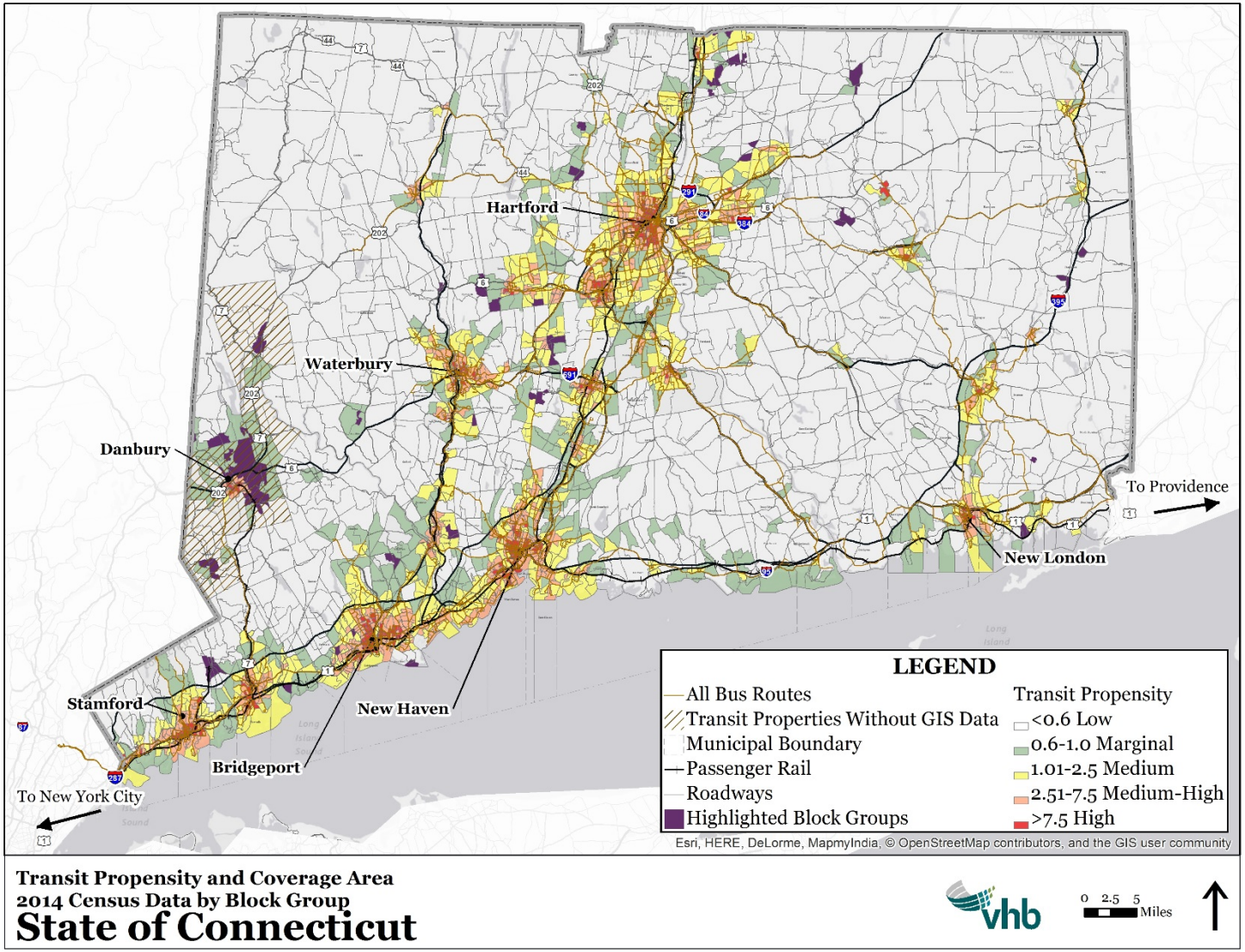
- Bristol
- Simsbury
- Southington
- South Windsor

Hartford County is served by the C*Ttransit* Hartford Division.

New Haven County

- Ansonia
- Cheshire
- Naugatuck
- Southbury

Figure 27: Transit Propensity by Census Block Group and Existing Route Network



New Haven County is served by the CT*transit* New Haven and Waterbury Divisions.

Litchfield County

- Plymouth
- Thomaston

Litchfield County is served by NWCTD.

Tolland County

- Coventry
- Ellington
- Strafford

Windham County

- Plainfield

Tolland and Windham Counties are served by WRTD.

It is recommended that CTDOT and/or the appropriate transit agency conduct a study to investigate alternate transportation options such as volunteer driver programs, use of smaller transit vehicles, flex bus service, and other options to serve these areas with census block groups that are isolated from existing bus routes.

Recommendation 9: Align Planning Goals of Individual Transit Agency Development Plans to Statewide Transportation Goals and Initiatives.

Implementation timeframe: Ongoing

It is recommended that any detailed studies of system improvement performed by the state's transit systems should be aligned to the needs/goals/recommendations in the *Connecticut Statewide Bus Study* and to any current or future State of Connecticut transportation visions/initiatives. Recommended transit improvements should focus on net-zero as well as cost-based improvements.

DRAFT

6.5 Global Recommendation: Make Bus Service Easier and More Convenient to Use

Goal Addressed: Integrate operating service, information and customer service statewide; Determine where connectivity between the bus and rail system in Connecticut can be enhanced; provide a modern, state-of-the art system including reasonable customer amenities

Recommendation 10: All transit systems should expand the usefulness and capabilities of their websites.

Implementation timeframe: Short term

Nearly all transit systems except for WRTD have a social media presence (i.e., Facebook, Twitter, YouTube or Instagram). Three transit systems (CTfastrak, CTtransit and GBT) provide apps for smart/mobile devices. It is recommended that all systems maintain a presence on social media and provide apps for their bus systems.

Several transit systems have incorporated trip planning search engines on their websites. The CT*fastrak* and CT*transit* websites feature a trip planner on their homepages, but it is limited only to trips made within the CT*transit* service area. Both websites also offer Google Transit as an option to assist in trip planning. GBT is currently testing its own version of a trip planning tool, but similar to CTtransit, it is limited to trips within the GBT service area only. In January 2017, CTDOT unveiled a real-time travel information website - "CT Travel Smart." The new system is accessible via computer or smart/mobile devices at www.CTTravelSmart.org. Future phases of the website will include options for multi-modal functionality.

It is recommended that all transit systems participate in the Google Transit Partner Program. Participating in the program provides benefits by:

- Raising awareness of public transportation and can help attract new riders
- Linking to the agency's website to increase rider awareness
- Connecting to neighboring systems' data to improve inter-agency connectivity
- Providing trip planning on both desktop and mobile devices

Recommendation 11: All transit agency websites should clearly state transfer policies between neighboring/connecting bus systems

Implementation timeframe: Short term

Providing accurate and easy-to-access information about bus stop locations, bus schedules, connections to other transit systems, plays a large role in the bus rider's experience.

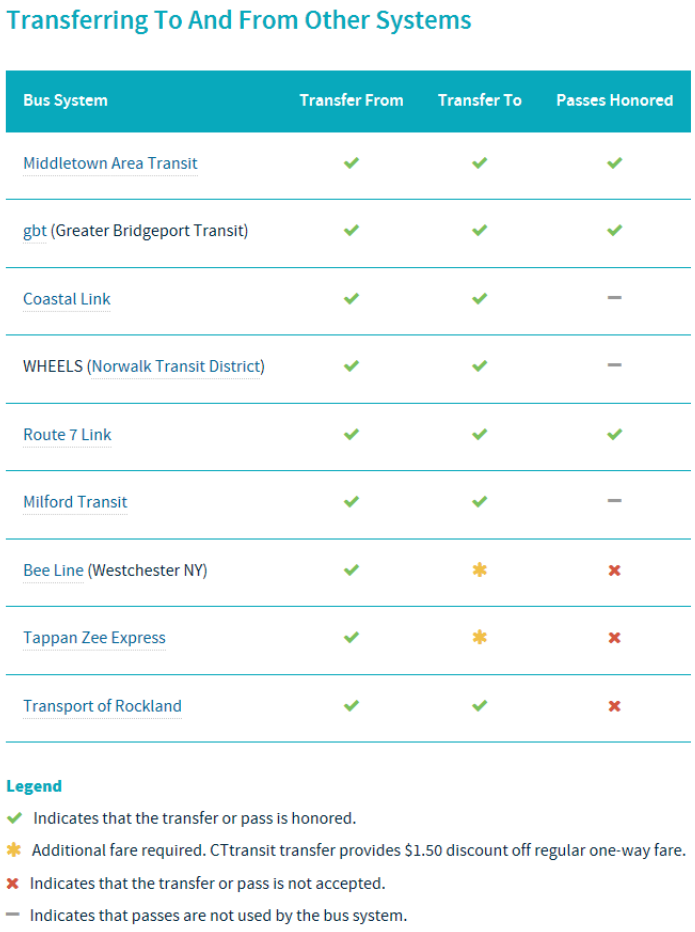
While all of the transit agency websites provide basic information on bus schedules and fare information on their websites; only a few transit agency websites make it clear that connections can be made to neighboring/connecting transit systems.

When this data is available, it is often limited to either a website link, phone number, or a static listing of a website address. Often this information is not highly visible or easily found on transit agency websites.

In order to encourage cross-system travel, it is important to know the transfer policies between bus systems. Are transfers and passes honored between systems or will transferring require payment of an additional fare? In the fare section of CT*transit*'s website, a table is provided that links to and clearly lists all neighboring/connecting bus systems, and summarizes the transfer policy for each system (Figure 28).

It is recommended that all transit agency websites use a similar approach to informing riders about their transfer policies and the availability of connections to other bus systems.

Figure 28: Connecting Systems page from CT*transit*'s website



Transferring To And From Other Systems

Bus System	Transfer From	Transfer To	Passes Honored
Middletown Area Transit	✓	✓	✓
gbt (Greater Bridgeport Transit)	✓	✓	✓
Coastal Link	✓	✓	–
WHEELS (Norwalk Transit District)	✓	✓	–
Route 7 Link	✓	✓	✓
Milford Transit	✓	✓	–
Bee Line (Westchester NY)	✓	*	✗
Tappan Zee Express	✓	*	✗
Transport of Rockland	✓	✓	✗

Legend

✓ Indicates that the transfer or pass is honored.

* Additional fare required. CTtransit transfer provides $1.50 discount off regular one-way fare.

✗ Indicates that the transfer or pass is not accepted.

– Indicates that passes are not used by the bus system.

Source: CT*transit* website

Recommendation 12: Require transit systems to develop and maintain General Transit Feed Specification datasets and feeds for their bus systems.

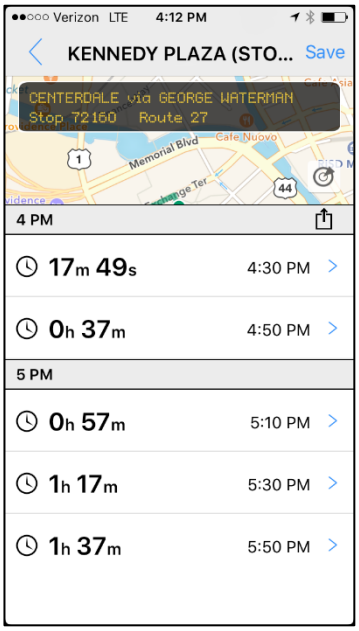
Implementation timeframe: Short term

It is recommended that all transit systems develop and maintain their bus system data in General Transit Feed Specification (GTFS) datasets. GTFS is a common format used for public transportation schedules and associated geographic information (e.g., maps). GTFS "feeds" are used in a variety of applications, such as in trip planning tools and next bus arrival times, on transit agency websites, for Google Maps, on third-party mobile device applications, and in bus operations analyses.

This recommendation could be accomplished by either having transit systems produce and maintain their own GTFS feeds in-house, or by creating a consolidated program that produces and maintains for GTFS feeds for all transit systems.

Recommendation 13: Provide real-time bus arrival information for all transit systems on a consistent Information Technology Platform.

Implementation timeframe: Long term



Real-time passenger information allows users to make informed decisions for trip planning purposes, reduces their anxiety during wait times, and can result in fewer customer complaints.

The provision of real-time bus arrival information requires AVL technology on buses and a mechanism for getting the information to passengers. Once the recommendation for the expansion of AVL technology to all transit agency bus systems has been implemented, it is recommended that all transit systems provide real time bus arrival information for their specific bus system and between connecting bus systems.

This information should be made available remotely via transit agency websites and online applications for mobile devices, and physically using variable messaging signs at larger stops and transportation hubs. At transportation hubs, this information may be incorporated other useful information such as travel times, delays, and/or bicycle sharing locations.

The provision of real-time bus arrival information should be provided on a platform consistent with the State of Connecticut's Intelligent Transportation Systems (ITS) architecture requirements.

6.6 Global Recommendation: Create an Integrated Statewide Bus System

Goal Addressed: Integrate operating service, information and customer service statewide

Recommendation 14: Conduct a study to explore governance options to improve the ability to manage the State's transportation system and improve efficiency.

Implementation timeframe: Short-term

The statewide bus system is comprised of a range of transit systems of varying sizes, complexity, resources, and capabilities. Some transit systems directly operate their bus systems while others outsource operations. Many mid-size and smaller transit systems lack the resources to fully address the demands and needs related to operating existing bus services, much less to make technological improvements that would generate even greater demands on them.

It is recommended that CTDOT undertake a study to assess governance options for all the State's fixed bus systems.

Recommendation 15: Improve bus system understandability by providing consistent, clean route numbering/identification across all bus systems.

Implementation timeframe: Short term

Many transit systems use their numbering scheme to indicate the type of service (local vs. express), the general geography served, or other characteristics important to the rider. A quality numbering scheme can provide riders visiting the area who aren't familiar with the system to understand certain aspects of the bus system easily.

A new numbering system may assign number ranges to certain types of routes or service areas or transit systems. For example, major corridor routes may be assigned a number beginning at 100. Regional routes may be given a designation between 200-299, local routes (300-series), and shuttle routes (400-series).

CT*transit* has implemented this approach on its system. All CTfastrak routes are in the 100-series, the New Haven Division will change from letter routes to the 200-series, Stamford bus routes are in the 300-series, Bristol and New Britain routes are in the 500 series, and express buses are in the 900 series. This change allows for the bus routes to work with new technologies such as real-time bus information and make the system easier to use for new and current riders.

It is recommended that transit systems consider developing a numbering scheme that is linked to route type or service area to provide a clear pattern to the customer.

Recommendation 16: Adopt smart card technology to enable seamless travel across systems.

Implementation timeframe: Long term

In January 2017, CTDOT implemented a new fare collection system for the CT*transit* and CT*fastrak* systems. This included procurement of up to 600 new fare-boxes, ticket vending machines and related equipment which will offer a wide array of customer service improvements. This new technology will increase payment options including smart cards and mobile payment, and make it easier and faster for customers to use the CT*transit* system.

The adoption of smartcard technology by other transit systems in the state would support instituting a single fare structure and policy for bus and rail.

Recommendation 17: Create a single, statewide fare policy across systems.

Implementation timeframe: Long term

As part of the governance study in Recommendation 14, it is recommended that the creation of an integrated fare policy and fare structure for all transit systems across the State be explored. A single, statewide fare policy would facilitate interconnectivity within the State's entire transportation system.

It is recognized that establishing an integrated fare policy and payment system is challenging and would require fundamental changes to individual agency operating practices, new partnership agreements and payment settlement processes, upgrades to fare box equipment and adopting common fare policies.

Adopting single fare structure and policy for bus and rail would simplify the fare payment process and encourage greater use of the State's entire transit network by making travel easier and convenient to use both rail and bus for travel.

6.7 Global Recommendation: Better serve Special Transit Generators

Goal Addressed: Enhance fixed route transit access to jobs

Recommendation 18: Transit systems should review transit connectivity/span of service to State and community institutions and major employers.

Implementation timeframe: Short term

As part of the *Connecticut Statewide Bus Study*, mobility ombudsmen and higher education institutions in the state were asked to identify their transportation needs. These entities indicated their constituencies have express the following needs and desires regarding bus service:

- Improved service frequency on high-demand routes
- Extended spans of service for key markets/routes
- Improved connectivity between regional/local universities and business centers

It is recommended that CT*transit* and other transit systems with bus routes serving institutions of higher education and major employers in suburban and rural areas undertake an evaluation. Particular focus should be given for expanding the service frequency and span of service during evenings and weekends to allow students and/or employees who use transit to take classes or work late shifts at night or on weekends. This effort should begin with a survey of students, staff and employees of major suburban/rural employers to assess demand for these services.

Recommendation 19: Create a statewide student transit discount policy for college and university students

Implementation timeframe: Short term

Currently, CT*transit* offers two transportation pass programs for participating college and university students who use the CT*transit* local buses to travel to school: the U-PASS and the 31-Day or Monthly Student Pass.

Under the U-PASS program, students are provided with a semester pass branded and programmed for the participating college and university. When using the pass, students are required to show their student ID. The participating school decides how to pay for the U-PASS program. Typical approaches include: charging students a transportation fee or administrative fee, or the school may choose to use its general fund as a funding source. Two universities, Trinity College and the University of New Haven currently participate in the program.

Under the 31-Day or Monthly Student Pass program, CT*transit* provides a 31-Day pass exclusively branded for students of the participating college or university. Under this

model, the full cost of the pass is paid by the students unless participating college or university introduces a coupon discount.

The outreach to the higher education institutions indicated that several colleges and universities outside of the CT*transit* service area have their own arrangements and partnerships with a transit agency and/or bus company (e.g., Peter Pan).

It is recommended that CTDOT explore and develop a statewide policy for transit discounts for college and university students for all transit systems. The U-Pass fare program approach may be used a model for creating a statewide student transit discount policy. CTDOT is looking to expand the program to the University of Connecticut and the Connecticut State Colleges & Universities system by the summer of 2017. New fare box technologies being implemented on the CT*transit* fleet will enhance the functionality and user-convenience of the UPass program.

6.8 Route-Specific Recommendations

The following route-specific recommendations are based on the analyses and findings of the Stage 2 Evaluation. Like the Global Recommendations, the following are dependent upon the availability of funding and compliance with State and federal guidelines and regulations. (See Appendix H for potential Title VI implications).

6.8.1 Bus Stop Spacing

The routes in Table 43 were identified as having too many bus stops and are recommended to be assessed to determine if their stop spacing is appropriate, with local consideration of the reason for the high stop density. If there are too many stops along a route, the route's travel time, running time, and operational efficiency can be compromised.

Table 43: Bus Stop Spacing Evaluation of Stage 2 Routes

Agency	Route	Existing # of Stops per mile	Recommended Stops per Mile
CT*transit* Hartford	31 Park Street / New Park Ave (31-33)	3	2
	38 Weston Street	2	2
	40 North Main Street	3	2
	47 Franklin Ave	3	1
	92 Tower Avenue Crosstown	3	1
CT*transit* Stamford	26-27 Pacific St/Shippan Ave	5	2
	32-35 Washington Blvd-Long Ridge Rd	3	2
CT*transit* New Haven	D Grand Avenue	3	2
	D Dixwell Avenue	5	2
	L North Branford (Route 80)	4	2
	S Madison	3	1
	Union Station Shuttle	11	Not applicable
CT*transit* Waterbury	16 Bucks Hill - Montoe	6	2
	20 Walnut	4	2
	22 Wolcott	4	2
	26 Fairlawn/ East Main St	3	2
	28 Scott Road/East Main	(combined with Rt 26)	(combined with Rt 26)
	42 Chase Parkway	2	2
CT*transit* Waterbury	44 Bunker Hill	5	2
	N1 Naugatuck / Millville	2	1
	N2 Naugatuck / New Haven Rd	3	1
CT*transit* Meriden	A Westfield Shoppingtown	3	2
Milford Transit District	Route 1 - Coastal Link	1	1
Norwalk Transit District	Route 2	4	2
	Route 5/6	3	1
	Route 10	8	2

Pink cells indicate the number of existing stops per mile on bus route exceeds the recommended number of stops per mile.

6.8.2 Bus Stop Amenities

An analysis of bus stop spacing could be performed only for GBT. Bus stops with 50 daily boardings or more were identified and are listed in Appendix G. Bus stops that experience between 50 and 100 daily boardings should be prioritized for installation of benches, if they do not have them already. Bus stops with 100 or more daily boardings were also identified. These bus stops should be prioritized for installation of both benches and shelters, if they are not already installed.

While these passenger volume thresholds are guidelines, it is worth noting that the placement of benches and shelters is also influenced by other factors such as:

- Availability of space

- Ownership of the property where the bus stop is located,
- Policies of the jurisdiction of where the bus stop is located since bus stop infrastructure maintenance is the responsibility of the host municipality,
- Availability of infrastructure capital and maintenance funding, and
- Site conditions on the property where the bench or shelter would be placed.

It is recommended that all bus stops in the state, regardless of transit agency and system size, should be required to include a bus stop sign and pole to indicate the existence of a stop to riders, a waiting area that is stable and clear of other obstacles, and static signage with bus route information.

6.8.3 Headway

The following bus routes exceed 1.3 or more passengers per seat during peak hours and are candidates for an adjustment in peak service frequency:

- CT*transit* Waterbury Route 22 Wolcott
- CT*transit* Waterbury Route 28 Scott Road/East Main
- CT*transit* Waterbury Route 42 Chase Parkway

6.8.4 Span of Service

Most routes for NTD, CT*transit* Hartford, CT*transit* New Haven and CT*transit* Stamford had very low passenger loads on the first or last trip (or both) with buses operating with less than 10% of the seats filled, suggesting that the span of service is too long on those routes. The spans of those routes should be further reviewed by the transit agency to assess the need for modifications.

For the routes listed in Table 44, passenger loads on the last or first trip were high (i.e., the number of passengers on the vehicle are equal to or greater than 1.3 times the vehicle capacity), indicating there may be strong demand for earlier or later transit service. It is recommended that transit systems consider expanding the span of service for these routes.

Table 44: Bus Route Candidates for Span of Service Expansion

Transit Property	Route
Norwalk Transit District	Comm Shuttle - Norwalk Hospital/Belden
	Comm Shuttle - Merritt 7/Glover
	Comm Shuttle - CT Avenue
CT*transit* Hartford	31 Park Street / New Park Ave
	38 Weston Street
	40 North Main Street
	45 Berlin Turnpike Flyer
	47 Franklin Ave
	92 Tower Avenue Crosstown
CT*transit* New Haven	D Grand Avenue
	D Dixwell Avenue
	L North Branford
	S Madison
	Union Station Shuttle
CT*transit* Stamford	26-27 Pacific St/Shippan Ave
	32-35 Washington Blvd-Long Ridge Rd

6.8.5 Passenger Trips per Revenue Mile

The following local routes were identified as having less than two passenger trips per revenue mile and have low utilization. It is recommended that transit systems whose routes are listed below identify the specific causes for low productivity. A more detailed ridership analysis may show that a specific segment of the route is unproductive and by eliminating that segment the overall route productivity would improve.

Other routes may require a more direct examination of the purpose of the route, and whether its continued operation is warranted. Routes that serve a specific community or population may be necessary, but alternative methods (i.e. flex routes or community shuttles to fixed transit) for providing transportation services should be explored and considered if they can provide the same level of service or better for less cost.

Urban Bus Systems with over 5,000,000 Annual Passenger Trips

CT*transit* Hartford 45 Berlin Turnpike Flyer
CT*transit* Hartford 92 Tower Avenue Crosstown
CT*transit* New Haven Route L North Branford
CT*transit* New Haven Route S Madison
GBT Coastal Link

GBT Route 7
GBT Route 20
GBT Route 23

Urban Bus Systems with 2,000,000 - 5,000,000 Annual Passenger Trips

CT*transit* Stamford Route 26-27 Pacific St/Shippan Ave
CT*transit* Stamford Route 32-35 Washington Blvd – Long Ridge Rd
CT*transit* Waterbury Route N1 Naugatuck / Millville
CT*transit* Waterbury Route N2 Naugatuck / New Haven Rd

Urban Bus Systems with 750,000 - 2,000,000 Annual Passenger Trips

NTD Route Westport S1
NTD Route Westport S2
NTD Route 2[1]
NTD Route 5/6[2]
NTD Commuter Shuttle Norwalk Hospital/Belden
NTD Commuter Shuttle Merritt 7 / Glover
NTD Commuter Shuttle CT Avenue
SEAT Route 3
SEAT Route 9
SEAT Route 10
SEAT Route 11

Urban Bus Systems with less than 750,000 Annual Passenger Trips

MAT Route B Wesleyan Hills
MAT Route C Washington Street
MAT Route F Portland-East Hampton
MAT Route M Link
MAT Route S-1
MAT Route S-2

Rural Bus Systems

ETD Route 2 Riverside

6.8.6 Fare box Recovery

Due to limited financial data at the route level to calculate fare box ratio, recommendations cannot be made for the specific routes identified in the Stage 2 analysis.

[1] Effective January 29, 2017, NTD Route 2 has been eliminated.
[2] Effective January 29, 2017, NTD Route 5/6 has been eliminated.

6.8.7 Ratio of Revenue Miles to Non-Revenue Miles

The following local routes were identified as having non-revenue mileage that is more than five percent of revenue miles. These routes are candidates for operating or capital improvements and are recommended to be examined for potential improvements, including running revenue service as often as practicable.

A long-term consideration would be to explore sharing resources between transit systems across jurisdictional boundaries. For instance, a storage or maintenance/storage facility that is located close to the boundary between two transit systems could be shared.

Local Routes

CT*transit* Hartford Route 45 Berlin Turnpike Flyer
CT*transit* Hartford Route 47 Franklin Ave
CT*transit* Hartford Route 85 MCC Flyer
CT*transit* Hartford Route 92 Tower Avenue Crosstown
CT*transit* New Haven Route D Grand Avenue
CT*transit* New Haven Route D Dixwell Avenue
CT*transit* New Haven Route L North Branford
CT*transit* New Haven Route S Madison
CT*transit* New Haven Union Shuttle

SEAT Route 1
SEAT Route 3
SEAT Route 6
SEAT Route 10

The following express routes have non-revenue mileage that is more than 10 percent of revenue miles. It should be noted that these services are competitively procured and/or budgeted, and while the non-revenue miles may be high, this does not affect the cost to the State.

Express Routes

Hartford Express 903 Buckland Express
Hartford Express 910 Century Hills Express

6.8.8 Average Distance between Failures

Based on the mechanical failure rate reported to National Transit Database, it is recommended CT*transit* review the exact causes for of CT*transit*'s high mechanical failure rate. Factors to be considered may include:

- Is there a specific make or model that consistently breaks down?

- Do maintenance schedules need to be adjusted (i.e., more regular maintenance)?
- Does CT*transit* have a broader interpretation of a vehicle failure than other transit systems in the State, leading it to report more malfunctions?
- Does CT*transit* have stricter agency policies that require vehicles to be removed from service resulting in a greater number of reported failures?

6.8.9 Fleet Average Age

The fleet average age metric highlights a potential vulnerability for transit systems. Those systems listed below should consider a review of their fleets to identify specific vehicles that exceed their useful life and may be candidates for replacement or rehabilitation.

Heavy-duty Large

CT*transit* New Haven
C*Ttransit* Hartford
NTD
WRTD
SEAT
MTD

Light-duty Small

NWCTD
ETD

It is important to recognize that transit systems not flagged under the evaluation may still want to review their fleet vehicles for replacement or rehabilitation opportunities. Per the Federal Transit Administration minimum service-life guidelines, vehicle mileage is another factor in a vehicle's useful life. If a bus is relatively new but has been used heavily and has incurred significant mileage, it could still be a candidate for replacement or rehabilitation despite its age. For these reasons, transit systems may want to consider a review of their fleet vehicles, even if they are not specifically identified in this assessment.

CT*transit* Hartford, New Haven and Stamford are receiving a combined total of 130 new buses in 2017 which replace buses that are mostly 14 to 16 years old.

6.9 Intercity Bus Service Recommendations

6.9.1 Continued Annual Consultation with Potential Intercity Bus Operators

While there are limited unmet intercity needs in rural areas and it might appear that a certification of no unmet need is possible, it is recommended that CTDOT continue to conduct a consultation process and an annual grant solicitation for its Section 5311(f) program. Based on discussion with intercity bus operators, there are opportunities to improve the availability, visibility and quality of intercity bus service in the rural areas of the state.

It is recommended that CTDOT continue to support the intercity bus infrastructure through policies that include the privately-operated intercity bus services in public intermodal facilities. The fact that intercity services are included in facilities such as the Hartford Union Station and the New Haven station provides Connecticut residents with increased mobility and more travel options, making connections to and from local transit and rail services convenient, enhancing the statewide network. This also applies to the ability to use state-owned or funded park and ride lots.

The amount of funding available to Connecticut under the existing Section 5311(f) program is limited, and fortunately the existing rural intercity bus services do not appear to need ongoing operating assistance. If the firms that operate these services can continue to do so with limited assistance to market the services and improve stops it could ensure that the rural parts of the state have connections to the services in the major cities without the need to develop and fund new publicly-operated services. Continued and/or improved access to intermodal facilities, as recognized in other CTDOT policies (such as the state rail passenger plan) also makes sense, as it expands the overall network available to the residents of the state.

7 Implementation Plan

7.1 Proposed Recommendations and Implementation Timeframes

The *Connecticut Statewide Bus Study* identified service coverage gaps, evaluated interconnectivity between transit agencies, developed Statewide Bus Service Guidelines, and analyzed the performance of the highest and lowest performing bus routes.

Based on these analyses, areas of improvement and specific route recommendations were developed. The following is a summary of the recommendations and the timeframes associated with activities required to implement them. Timeframes for implementation are dependent upon the availability of funding.

Global and route-specific recommendations have been divided into two categories, short-term and long-term:

- Short-term recommendations are intended to occur over the next five years.
- Long-term recommendations are projected with an implementation timeframe of between five and twenty years.

Table 45 presents the recommendations by category, area of improvement, recommendation, associated agency and bus route, and implementation timeframe.

Table 45: Proposed Recommendations and Implementation Timeframe

Category	Area of Improvement	Recommendation	Agency/Bus Route	Implementation Timeframe
Route Design	Transit Propensity	Investigate serving low-density high transit propensity areas of the state. (Global Recommendation 8)	CT*transit* Hartford, Greater Bridgeport Transit, Norwalk Transit District, CT*transit* New Haven, CT*transit* Waterbury, Northwestern CT Transit District, Windham Regional Transit District	Short term
	Bus Stop Spacing	Reduce stop spacing	CT*transit* Hartford routes: 31, 40, 47, 92	Short term
			CT*transit* Stamford routes: 26-27, 32-35	
			CT*transit* New Haven routes: D, L, S, Union Station Shuttle	
			CT*transit* Waterbury routes: 20, 22, 26	
			CT*transit* Meriden route: A	
			Norwalk Transit District routes: 2, 5/6, 10	
	Bus Stop Amenities	Install benches at stops with 50 and 100 daily boardings. Install benches and shelters at stops with 100 or more daily boardings.	Greater Bridgeport Transit	Short term
Schedule Design	Headway	Adjust peak service frequency	CT*transit* Waterbury routes: 22, 28, 42	Short term
	Span of Service	Expand span of service	Norwalk Transit District: Comm Shuttles - Norwalk Hospital/Belden, Merritt 7/Glover, CT Avenue	
			CT*transit* Hartford routes: 31, 38, 40, 45, 47, 92	
			CT*transit* New Haven routes: D, L, S, Union Station Shuttle	
			CT*transit* Stamford routes: 26-27, 32-35	

Table 45: Proposed Recommendations and Implementation Timeframe (Continued)

Category	Area of Improvement	Recommendation	Agency/Bus Route	Implementation Timeframe
Route Productivity	Passenger Trips per Revenue Mile	Evaluate routes for specific causes for low productivity	CT*transit* Hartford routes: 45, 92	Short term
			CT*transit* New Haven routes: L, S	
			Greater Bridgeport Transit routes: Coastal Link, 7, 20, 23	
			CT*transit* Stamford routes: 26-27, 32-35	
			CT*transit* Waterbury routes: N1, N2	
			Norwalk Transit District: S1, S2, 2, 5/6, Comm Shuttles - Merritt 7/Glover, CT Avenue	
			Southeast Area Transit routes: 3, 9, 10, 11	
			Middletown Area Transit routes: B, C, F, M, S-1, S-2	
			Estuary Transit District route: 2	
	Fare box Recovery	Evaluate bus routes to identify opportunities for improving fare box revenue	All transit agencies	Short term
	Ratio of Revenue Miles to Non-Revenue Miles	Examine routes for potential to operate more revenue service, and sharing maintenance/storage facilities	CT*transit* Hartford routes: 31, 40, 45, 47, 85, 92	Short term
			CT*transit* New Haven routes: D, L, S, Union Station Shuttle	
			Southeast Area Transit routes: 1, 3, 5, 6, 10	

Table 45: Proposed Recommendations and Implementation Timeframe (Continued)

Category	Area of Improvement	Recommendation	Agency/Bus Route	Implementation Timeframe
Service Delivery	On-Time Performance	Collect on-time performance data at route level	All transit agencies	Short term
	Average Distance between Failures	Review vehicles in fleet to identify patterns in vehicles failures or adjust maintenance schedule	CT*transit*	
	Fleet Average Age	Review fleets to identify specific vehicles exceeding useful life/candidates for replacement or rehabilitation	CT*transit* New Haven, Norwalk Transit District, Greater Bridgeport Transit, Windham Region Transit District, Southeast Area Transit, Milford Transit District, Northwestern Connecticut Transit District, Estuary Transit District	
Intercity Bus	Annual grant solicitation	Continue annual consultation with intercity bus operators	CTDOT	Ongoing
	New Intercity Bus Stops	Consider adding stops in eastern Connecticut to provide service directly to Eastern State University and at Stafford	CTDOT/Peter Pan Bus	Short term
Global Recommendation	Bus System Performance	Adopt bus service guidelines for all transit agencies (Global Recommendation 1)	CTDOT and all transit agencies	Short term
		Form passenger advisory committees and consider implementation of on-line customer satisfaction surveys (Global Recommendation 2)	All transit agencies	

Table 45: Proposed Recommendations and Implementation Timeframe (Continued)

Category	Area of Improvement	Recommendation	Agency/Bus Route	Implementation Timeframe
Global Recommendation	Data Collection Processes, Tools and Reporting	Collect and report data in a consistent format and level of detail (Global Recommendation 5)	All transit agencies	Short term
		Create data reporting guidelines/templates (Global Recommendation 5)	CTDOT	
		Establish a consistent and regular schedule for Statewide Performance Assessments (Global Recommendation 6)	CTDOT	
		Create and maintain a statewide GIS database of transit agency bus systems (Global Recommendation 7)	CTDOT	
Global Recommendation	Future Transit Improvement Studies	Align planning goals of individual transit agency development plans to Statewide transportation goals and initiatives (Global Recommendation 9)	All transit agencies	On-going

Table 45: Proposed Recommendations and Implementation Timeframe (Continued)

Category	Area of Improvement	Recommendation	Agency/Bus Route	Implementation Timeframe
Global Recommendation	Bus Service Convenience and Ease of Use	Expand the usefulness and capabilities of transit agencies websites (Global Recommendation 10)	All transit agencies	Short term
		Clearly state transfer policies between neighboring/connecting bus systems (Global Recommendation 11)	All transit agencies	
		Require transit agencies to develop/maintain General Transit Feed Specification datasets and feeds (Global Recommendation 12)	All transit agencies	
Global Recommendation	Integrated Statewide Bus System	Conduct study to explore governance options to improve the ability to manage the state's transportation system (Global Recommendation 14)	CTDOT	Short term
		Provide consistent, clean route numbering/identification across all bus systems (Global Recommendation 15)	All transit agencies	
Global Recommendation	Special Transit Generators	Review transit connectivity/span of service to state and community institutions and major employers (Global Recommendation 18)	All transit agencies	Short term
		Create a statewide student transit discount policy for College and University Students (Global Recommendation 19)	CTDOT	Short term

Table 45: Proposed Recommendations and Implementation Timeframe (Continued)

Category	Area of Improvement	Recommendation	Agency/Bus Route	Implementation Timeframe
Global Recommendation	Bus System Performance	Expand use of Automated Vehicle Location and Automated Passenger Counter technology (Global Recommendation 3)	All transit agencies	Long term
Global Recommendation	Bus Service Convenience and Ease of Use	Provide real-time bus arrival information for all transit agencies (Global Recommendation 13)	All transit agencies	Long term
		Create a single regional fare policy and adopt smart card technology (Global Recommendations 15 and 16)	CTDOT and all transit agencies	
Global Recommendation	Integrated Statewide Bus System	Improve system/fare connectivity between rail and bus networks including the Hartford Line (Global Recommendation 18)	CTDOT, CT*rail*, Shore Line East, Metro-North Railroad	Long term

7.2 Statewide Bus System Performance Assessment Process

Two key recommendations of the *Connecticut Statewide Bus Study* are the adoption of bus service guidelines to provide consistent and measurable performance metrics across a wide-array of system service and network features and establishing a consistent and regular schedule for Statewide Bus System Performance Assessments.

Then following provides an overview of the steps and actions necessary to conduct regularly scheduled Statewide Bus System Performance Assessments moving forward.

1. **Adoption of Bus Service Guidelines by CTDOT and all transit agencies**
   - CTDOT to create data reporting guidelines and templates for transit agency
   - CTDOT to establish key "report by" dates

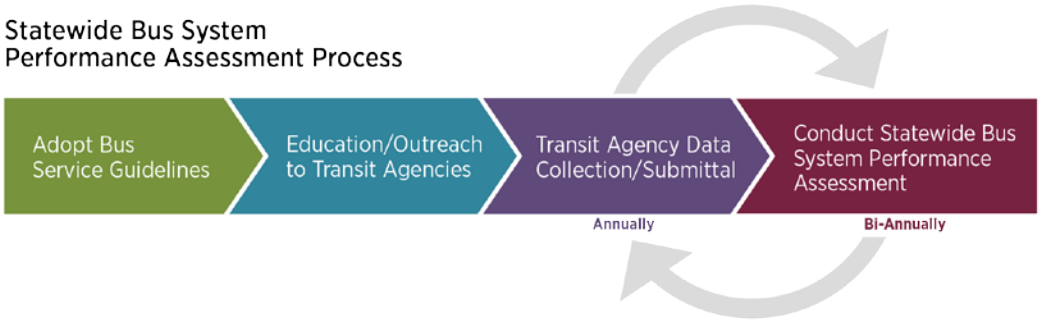
2. **Conduct an education/outreach campaign for transit agencies**
   - CTDOT to inform transit educate state-funded transit agencies on Statewide Bus System Performance Assessment process including:
     - ✓ Types and format of data collected by individual transit agencies
     - ✓ Reporting Protocols and procedures

3. **Initial/final submittal of performance and financial data**
   - Transit agencies to submit data to CTDOT annually

4. **Conduct Statewide Bus System Performance Study**
   - CTDOT to perform assessment of statewide bus system bi-annually

Regularly scheduled Statewide Bus System Performance will allow CTDOT and transit agencies to evaluate performance at the route level and on the system level and ensure that bus service is being provided in an efficient and economically effective manner.

Figure 29: Statewide Bus System Performance Assessment Flow Chart



8 Conclusions

8.1 Study Objectives

In 2015, the Governor announced *Let's GO CT*, a vision and call to action for the future of the state's transportation system which:

- recognizes bus service as the foundation of Connecticut's transit system, and
- calls for a complete evaluation of the State's bus system.

The purpose of the *Connecticut Statewide Bus Study* was to assess travel needs and evaluate performance of the State's bus system. The analyses performed under this study provides an understanding of the current and future direct, fixed route transit travel needs of the state's residents and employees, and provides recommendations to better align the existing bus system to meet these needs while providing the planning framework for a more interconnected and user-friendly multi-modal transit network that supports economic growth and environmental goals.

8.2 Overview of Current Statewide Bus System

Connecticut is served by a multi-modal system of passenger rail, fixed-route bus, paratransit, and van services. Within the state there are 19 transit systems (nine properties operated by the state under the CT*transit* and CT*fastrak* brands and ten non-state properties) that provide fixed route public transportation, including local bus, express bus and Bus Rapid Transit (BRT) service accounting for 271 routes. In addition, three private carriers, Greyhound Lines, Peter Pan Bus, and Stagecoach U.S.A. doing business as Megabus, offer intercity bus service. The 19 transit systems, combined, provide more than 42 million bus passenger trips annually[1], with

[1] Connecticut Department of Transportation 2014 ridership data

anticipated growth in coming years. In addition, several transit service expansions (i.e., the CT*fastrak* system expansion and CT*rail* Hartford Line) are in the planning/implementation stage.

8.3 Statewide Bus System Evaluation

Generally, existing bus routes/transit systems provide good coverage to a majority of the state's population, in particular to populations at or below the state poverty line and zero-car households. The state's bus network plays an important role in the statewide transportation system by providing connections to other modes of transportation, like an automobile or train. Connecticut travelers can transfer between buses or automobiles and trains at most Metro-North, Amtrak and Shore Line East rail stations. Also, the state maintains a system of park-and-rides where commuters can leave their cars in parking lots while they use carpools, vanpools, buses or trains to complete their trip.

There are parts of the statewide bus system where needs exist and improvements can be made, such as: system performance (for example, increasing on-time percentage, providing more frequent and longer spans of service); better integration of the state's multiple transit agencies and operators (creating a more interconnected and user-friendly statewide system), and wider provision of state of the art technology to all fixed route transit operators in the state.

8.4 Statewide Bus System Recommendations

Recommendations for the statewide bus system include proposals to create a more efficient and unified bus system. Improvements to bus performance can be achieved by establishing standards for route and schedule design, route productivity, service delivery and financial performance. Expanding the implementation and use of Automated Vehicle Location and Automated Passenger Counter technologies to all of the state's transit systems will allow them to identify usage and ridership trends, improve planning and scheduling, and adjust bus service to meet demand. Finally, providing accurate and easy-to-access information about bus stop locations, bus schedules, connections to other transit systems, and real-time bus arrival information to all of the State's transit systems will play a large role in the bus rider's experience and makes bus (and other modes of transit) more attractive and convenient to use.

Appendix A: Transit Properties Profiles

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1.1 Transit Properties Profiles

This section presents specific information on the fixed route transit properties in the state, including information about the service coverage area, number of routes, span of service, headways and fare structure, operating cost and ridership.

Transit properties have been grouped into the following categories based size: urban bus systems with over 5,000,000 annual passenger trips, urban bus systems with between 2,000,000 and 5,000,000 annual passenger trips, urban bus systems with between 750,000 and 2,000,000 annual passenger trips, urban bus systems with less than 750,000 annual passenger trips, and rural bus systems.

- **Urban bus systems with annual passenger trips over 5,000,000 (3 Properties)**. These major bus systems cover three of the state's largest cities and include CT*transit* – Hartford (15.0 million annual passenger trips), CT*transit* – New Haven (9.5 million annual passenger trips) and Greater Bridgeport Transit (6.2 million annual passenger trips).

- **Urban bus systems with annual passenger trips between 2,000,000 and 5,000,000 (2 Properties).** There are two large bus systems carrying significant numbers of passenger trips annually; CT*transit* – Stamford (3.6 million annual passenger trips) and CT*transit* – Waterbury (2.1 million annual passenger trips). These systems serve major cities in the state.

- **Urban bus systems with annual passenger trips from 750,000 to 2,000,000 (4 Properties).** Midsize urban bus systems include: Norwalk Transit District (1.6 million annual passenger trips), Southeast Area Transit District (986,000 annual passenger trips), CT*transit* – New Britain (1.0 million annual passenger trips), and Housatonic Area Regional Transit (823,000 annual passenger trips). These properties cover the remaining major cities in Connecticut, as well as some of the denser suburban areas.

- **Urban bus systems with annual passenger trips less than 750,000 (6 Properties).** Smaller urban bus systems include: Middletown Transit District (395,000 annual passenger trips), Windham Region Transit District (252,000 annual passenger trips), Milford Transit District (153,000 annual passenger trips), CT*transit* – Meriden (119,000 annual passenger trips), CT*transit* – Bristol (65,000 annual passenger trips), and CT*transit* – Wallingford (14,500 annual passenger trips).

- **Rural bus systems (3 Properties).** Rural bus systems include: Northwestern Connecticut Transit District (86,000 annual passenger trips), Estuary Transit

District (81,000 annual passenger trips), and Northeastern Connecticut Transit District (48,000 annual passenger trips).

1.1.1 CT*transit* Divisions

The CT*transit* is organized into the following divisions: Hartford, New Haven, Stamford, Waterbury / Meriden / Wallingford, New Britain, and Bristol. CT*fastrak* is included in this section as it is marketed similarly to the CT*transit* service, and it took over routes from CT*transit* systems.

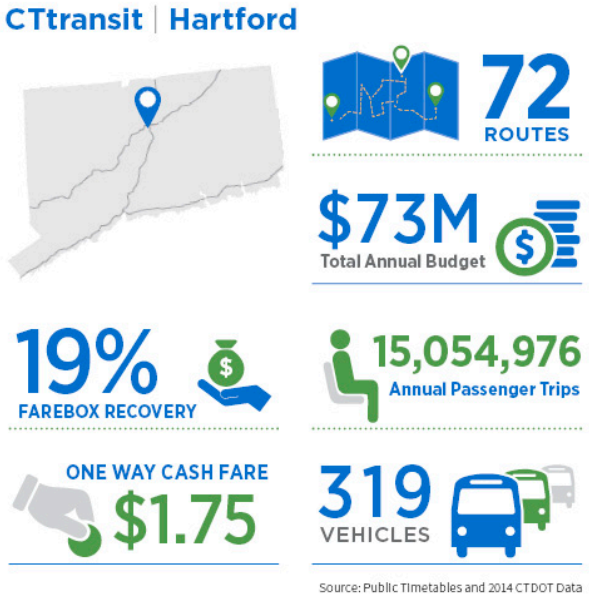
1.1.2 Urban Bus Systems with Over 5,000,000 Annual Passenger Trips

CT*transit* – Hartford Division

The CT*transit* Hartford Division (CTTH) services 26 towns in Connecticut's Capital Region in Hartford County, Connecticut. This region is approximately 664 square miles in size with a total population of 851,535.

CTTH is owned by CTDOT, operated by HNS, Collins Bus Service, Peter Pan/Arrow, DATTCO, and Kelley Transit; and is managed by First Transit.

CTTH operates 47 fixed local routes (see Figure 1:) and 24 express routes (see Figure 2) with connections to CT*transit* – New Britain-Bristol, CT*transit* Waterbury via routes 925 and 928, CT*fastrak*, and Middletown Area Transit. CTTH also operates a free circulator bus in downtown Hartford known as the "dash" bus. Bus service generally spans from 6:00 AM to 1:00 AM Monday through Friday, with most routes operating on weekends as well. Headways vary greatly by route and type



of service and can range anywhere between every 10 minutes to every 90 minutes.

Local bus route fares are the same for all CT*transit* buses with regular cash fares of $1.75, Children (Age 4 & under, maximum of three with each adult) ride free, reduced fare for children between 5-18 years of age of $1.40, and free transfers for unlimited rides on local buses going in any direction within two hours of the time of fare payment. CT*transit* also provides reduced fare for seniors and the disabled, 10-ride tickets packages, all-day passes, two-hour passes, 3-day passes, 5-day passes, 7-day passes, and monthly passes which are valid for unlimited rides during the specified time period.

The express bus routes have a zone fare structure (ranging from $3.20 to $6.00 per trip) with free transfers from an express to a local bus and an upcharge to the express fare on a transfer from a local to an express bus. Children (Age 4 & under, maximum of three with each adult) ride free and seniors and the disabled are charged a reduced fare. Passes in 10-trip and 31-day increments are available and priced within each zone.

CTTH has a fleet of 319 buses available for service (272 buses for local service and 67 buses for express service. In 2014, CTTH operated 9,646,988 annual revenue miles of service and 658,767 annual revenue hours of service. FY2014 annual fare revenues totaled $14,058,873, based on 15,054,976 annual passenger trips.[1]

[1] All data is from public schedules and timetables or provided by CTDOT unless otherwise noted.

Figure 1: CT*transit* Hartford Local Routes

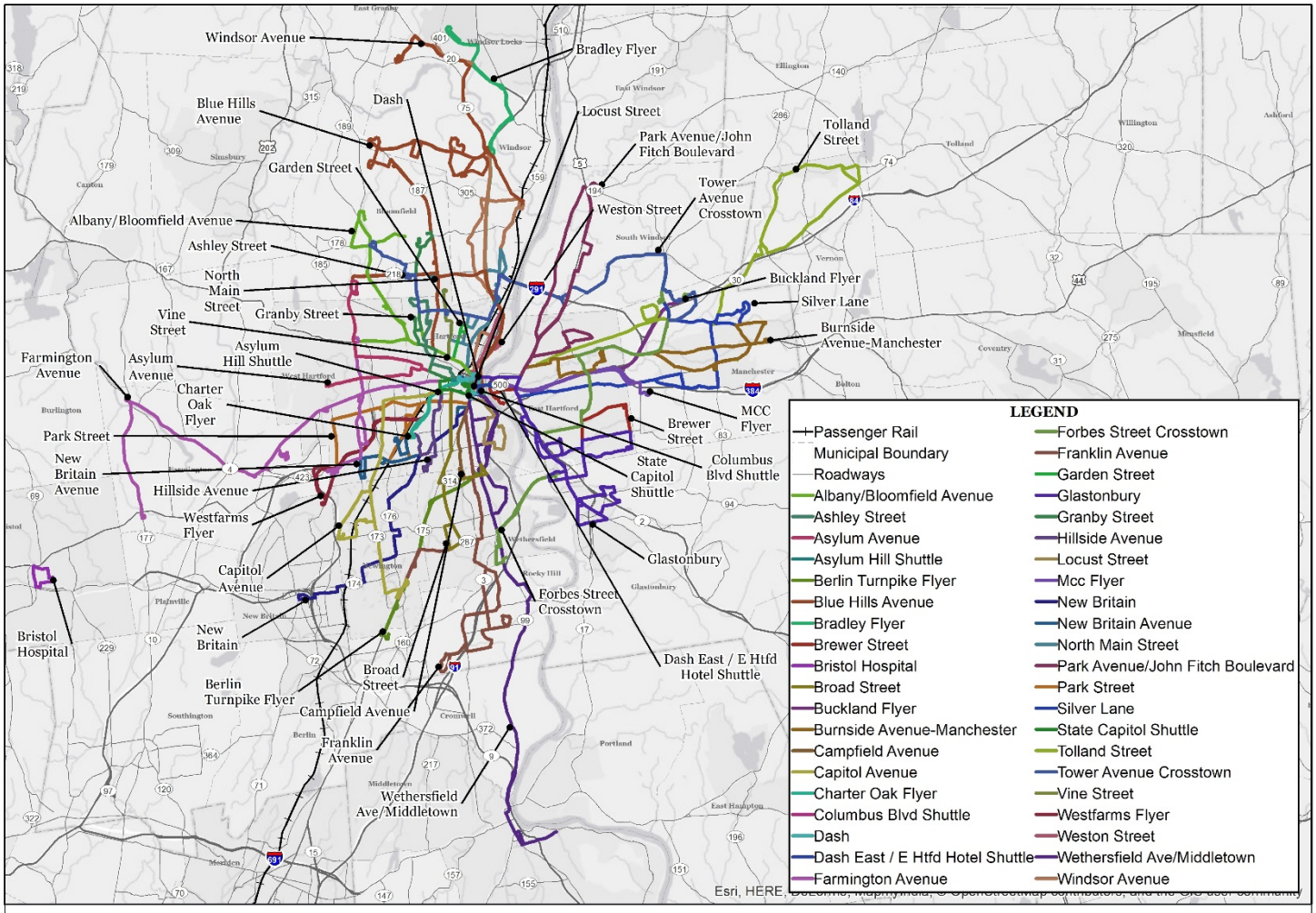
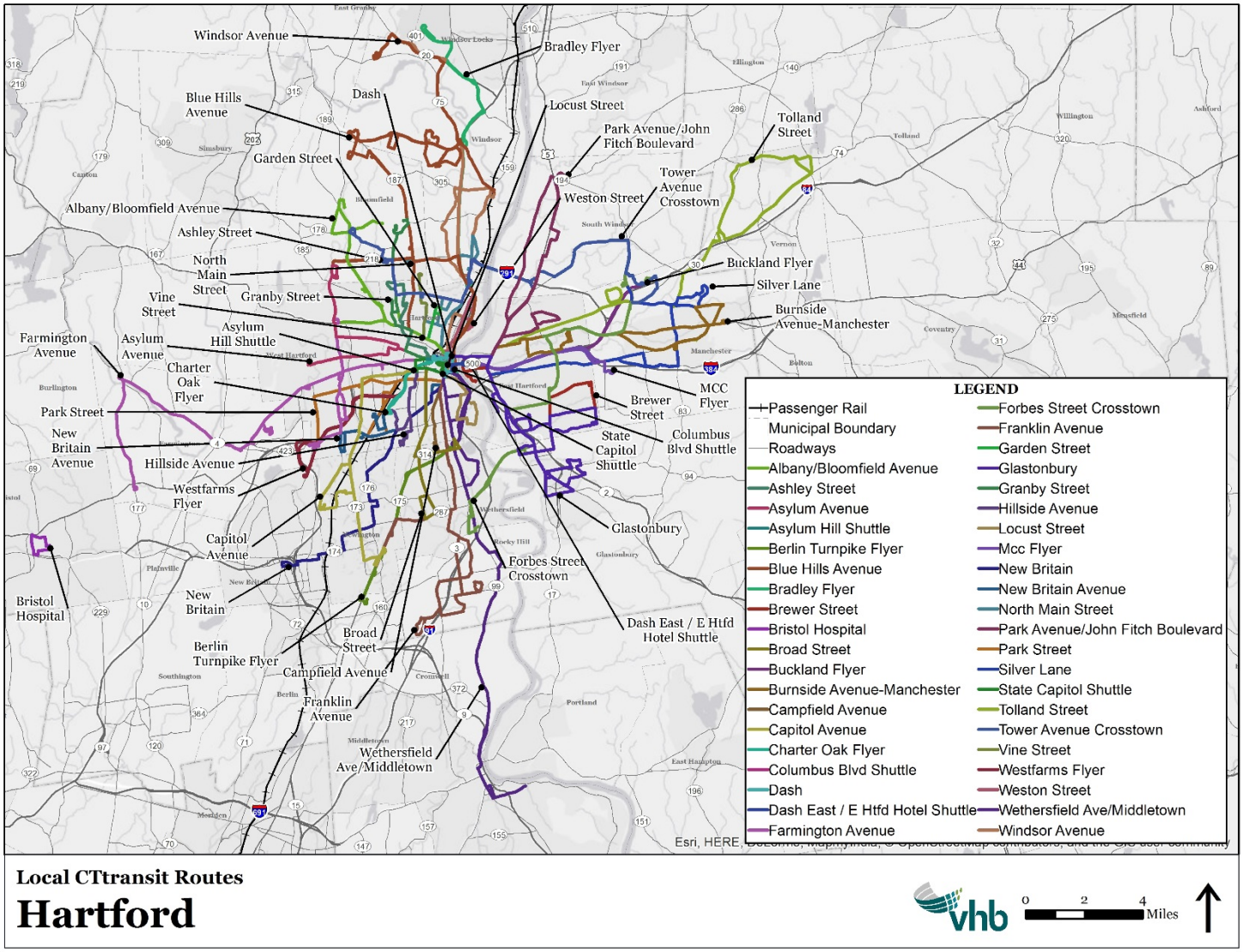


Figure 2: CT*transit* Hartford Express Routes



In 2014 CTTH's annual operating expenses totaled $73,094,826 for operations. CTTH received operational funding of $52,781,794 from the State of Connecticut (including CTTH's share of federal formula funds), and no operational funds from the local governments. Fare revenue covers 19.2 percent of operating expenses.

CT*fastrak*

CT*fastrak* is Connecticut's first bus rapid transit (BRT) system. Launching in March 2015, the regional system offers service to and from Waterbury, Cheshire, Southington, Bristol, Plainville, New Britain, Newington, West Hartford, Hartford and Manchester. It also connects to the New Haven-Waterbury branch rail in Waterbury, as well as Amtrak and the Bradley Flyer airport service. Since CT*fastrak* is a new service, information similar to that listed for other transit properties was not available from the National Transit Database. CT*fastra*k is owned by CTDOT, managed by First Transit and operated by HNS Management and DATTCO.

CT*fastrak* provides service along 13 routes, which consist of eight local routes and five express routes. Buses operate on a 9.4 mile dedicated busway with ten stations. Service begins as early as 4:05 AM, with the last bus ending service around 1:30 AM the following morning. Supplemental late night or off-peak service is also provided as needed, for special events. (See Figure 3).

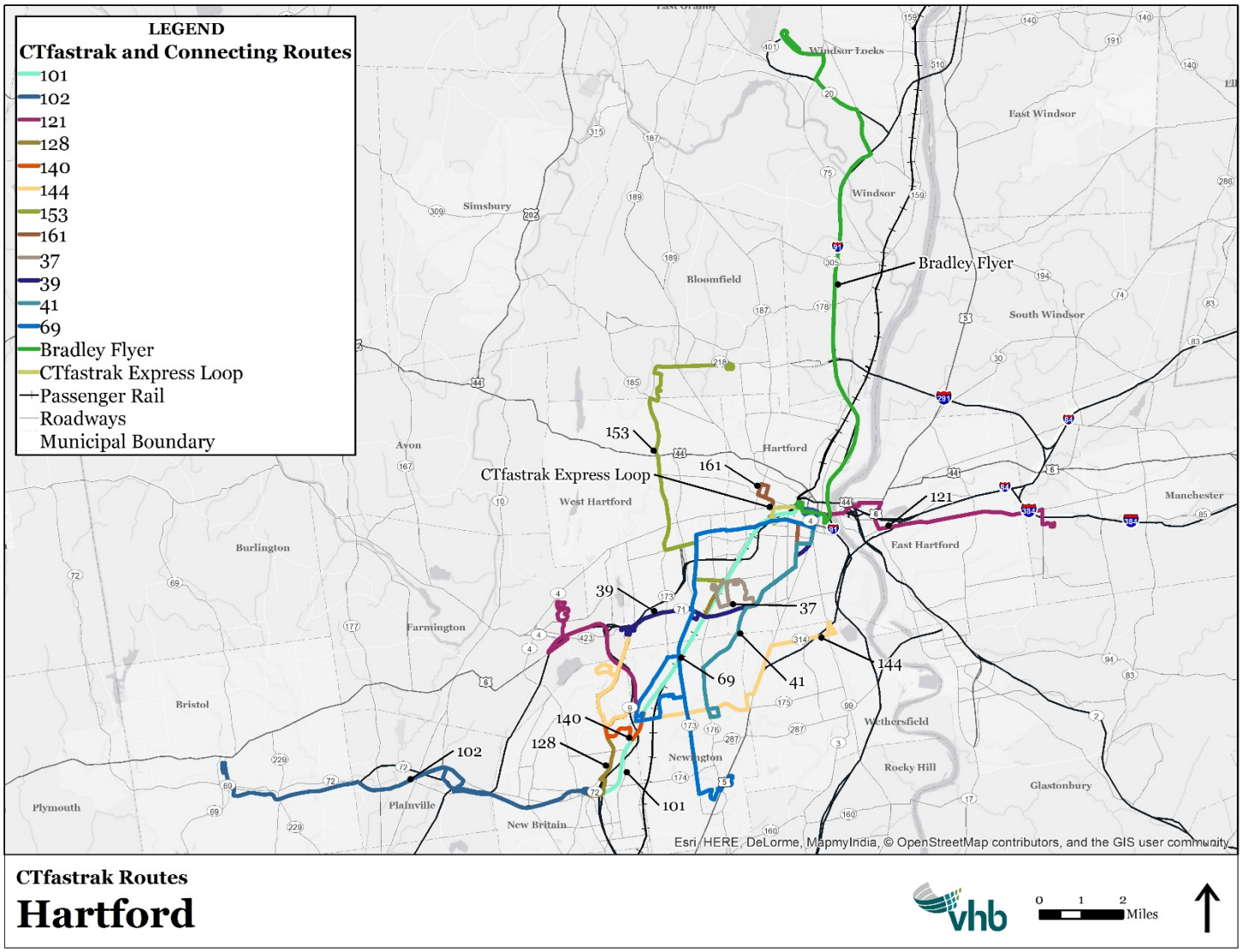
CT*fastrak* operates with 48 dedicated, low-floor, hybrid diesel-electric coaches ranging in size from 60 foot articulated buses, to 45 foot coaches, to 40 and 30-foot transit buses.

CT*fastrak* uses a proof-of-payment system, where passengers purchase tickets at CT*fastrak* stations prior to boarding. Periodic checks by fare inspectors ensure the correct fare is paid. Fares on local routes are the same as CT*transit* fare rates, which is currently $1.75 for a one-way ride (seniors and disabled passengers pay reduced rates).

Express route fares are based on a zone scheme. Travel within the Zone 2 area requires $3.20 fare. The fare increases to $4.10 for travel within Zone 3, to $5.00 for travel within Zone 4, and to $6.00 for travel within Zone 5. CT*transit* passes can also be used on CT*fastrak* routes and CT*fastrak* tickets can be used on CT*transit*.

CTDOT has been collecting monthly ridership information for CT*fastrak* since May 2015. A total of 1,917,315 passenger trips were made on CT*fastrak* from May through December 2015. The average number of passenger trips each month during this period (on both CT*fastrak* local and express routes) was 239,664.

Figure 3: CT*fastrak* System



CT*transit* New Haven

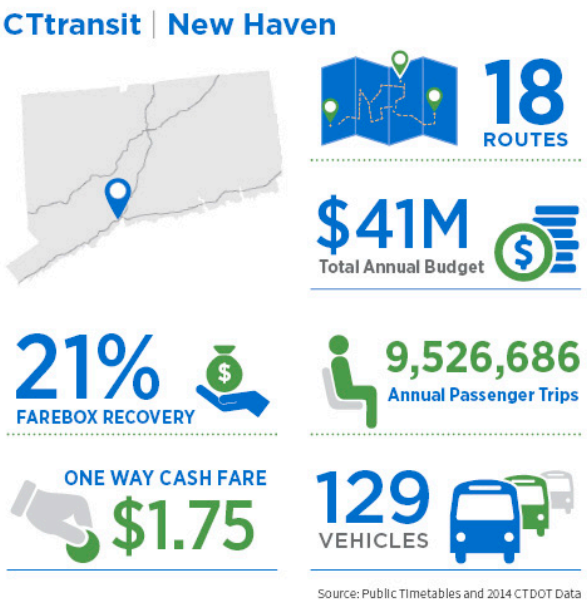
CT*transit* New Haven (CTTNH) is a division of CT*transit* that serves New Haven and its surrounding towns, including North Haven, East Haven, West Haven, Orange, Milford, Hamden, and Woodbridge. The service area is 456 square miles in size and has a population of 531,314.

CTTNH is owned by CTDOT, operated by HNS Management) and managed by First Transit.

CTTNH operates 18 local routes, including two commuter shuttles. (See Figure 4) It also offers connections with other bus service in Meriden, Waterbury, Wallingford, Milford, and lower Naugatuck Valley (including CT*transit,* 9 Town Transit, and Milford Transit District). The majority of routes operate seven days a week, with Weekday and Saturday service spanning 5:00 AM until 1:00 AM the next day and Sunday service spanning 6:00 AM to 11:59 PM or earlier. Headways range between 15 and 90 minutes.

Local service fares are the same for all CT*transit* buses with regular cash fares of $1.75, Children (Age 4 & under, maximum of three with each adult) ride free, reduced fare for children between 5-18 of $1.40, and free transfers for unlimited rides on local buses going in any direction within two hours of the time of fare payment. CT*transit* also provides reduced fare for seniors and the disabled, 10-ride tickets, all-day passes, two-hour passes, 3-day passes, 5-day passes, 7-day passes, and 31-day passes which are valid for unlimited rides during the specified time period.

The Route 950 express service uses a zone fare structure with free transfers from an express to a local bus and an upcharge to the express fare on a transfer from a local to an express bus. Children (Age 4 & under, maximum of three with each adult) ride free and seniors and the disabled are charged a reduced fare. 10-trip and monthly passes are available and priced within each zone.



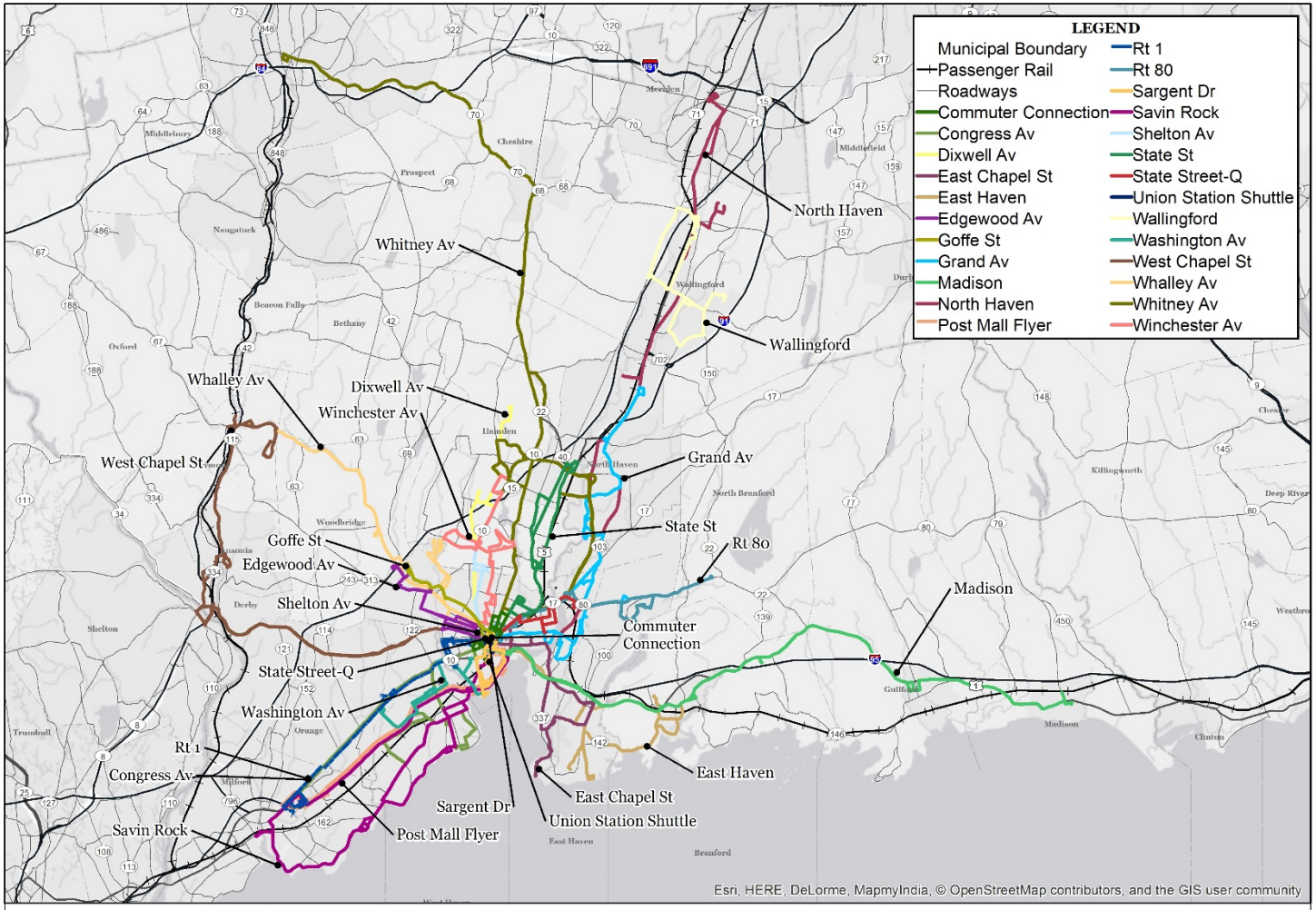
In 2014, CTTNH owned a fleet of 129 vehicles. This fleet operated 3,971,086 vehicle revenue miles and 348,183 vehicle revenue hours.

In FY2014, CTTNH earned $8,510,000 in fare revenue, based 9,526,686 annual passenger trips.[2]

Annual Expenses in the FY2014 for CTTNH totaled $41,194,070 for operations. CTTNH received operational funding of $30,579,939 from the State of Connecticut (including CTTNH's share of federal formula funds). Fare revenue covers 20.7 percent of operating expenses.

2 All data is from public schedules and timetables or provided by CTDOT unless otherwise noted.

Figure 4: CT*transit* New Haven Routes



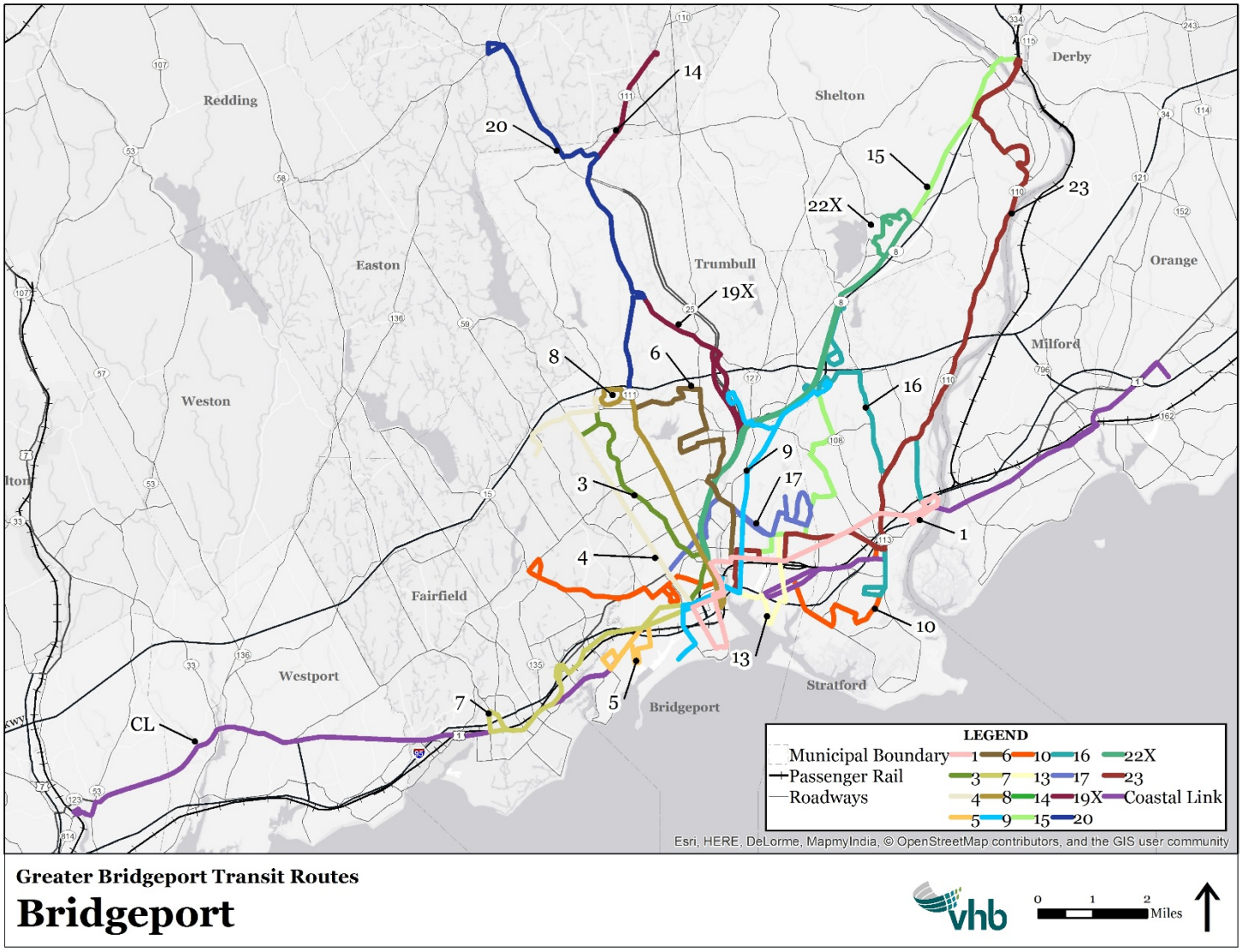
Greater Bridgeport Transit

Greater Bridgeport Transit (GBT) provides local and regional bus service, as well as paratransit service, in and around the City of Bridgeport. GBT service extends to Bridgeport and portions of Fairfield, Stratford, and Trumbull; there is limited service to parts of Milford, Monroe, Shelton, Derby, Westport, and Norwalk. This service area is approximately 90 square miles with a total population of 291,035.

GBT is owned, operated, and managed by GBT. GBT provides bus service along 19 routes, which include 16 local, two express, and one regional route. (See Figure 5) Most local routes operate weekdays from 5:30 AM through 11:30 PM, with some routes offering Saturday service from 5:00 AM through 11:30 PM, and Sunday service from 8:00 AM through 8:00 PM. Express routes operate weekdays only during peak morning (6:00 AM through 9:00 AM) and evening (2:30 PM through 6:30 PM) commuting periods. The regional route operates as part of the Coastal Link regional bus system (travelling along I-95), which provides service seven days a week. Headways vary greatly and can range anywhere between 20 and 60 minutes per hour.

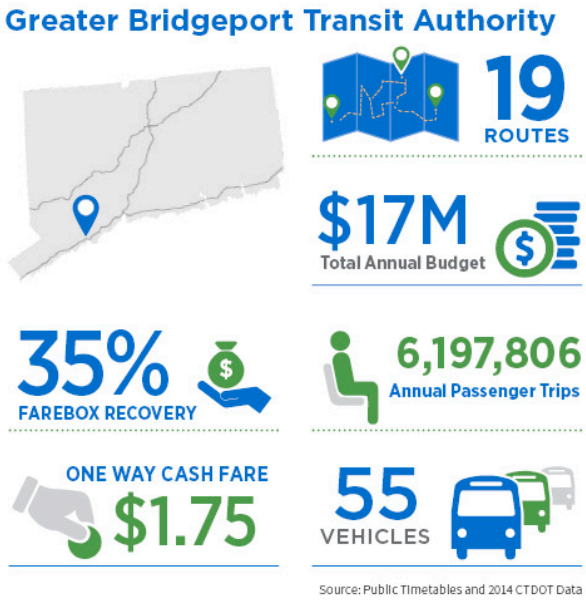
The cash fare for GBT is $1.75 for 90-minutes of unlimited travel. Passes are also available for 1-day, 7-day, or 31-day unlimited travel (these passes range from $4 - $70). Reduced fare passes are available for seniors, persons with disabilities, and youths under 17.

Figure 5: Greater Bridgeport Transit Routes



In 2014, GBT had a fleet of 55 vehicles. This fleet operated 2,262,091 revenues miles and 219,095 revenue hours. Fare revenue totaled $5,859,905, based on 6,197,806 annual passenger trips.[3]

Annual Expenses in FY2014 for GBT totaled $16,846,960 for operations. GBT received operational funding of $10,975,436 from the State of Connecticut, and $11,619 from the local government. Fare revenue covered 34.8 of operating expenses.



3 All data is from public schedules and timetables or provided by CTDOT unless otherwise noted.

1.1.3 Urban Bus Systems with 2,000,000 to 5,000,000 Annual Passenger Trips

CT*transit* – Stamford Division

The CT*transit* Stamford Division (CTTS) serves the City of Stamford and the surrounding towns. This region together is approximately 133 square miles in size with a total population of 281,327.

The CT*transit* Stamford Division is owned by CTDOT, operated by HNS Management and managed by First Transit.

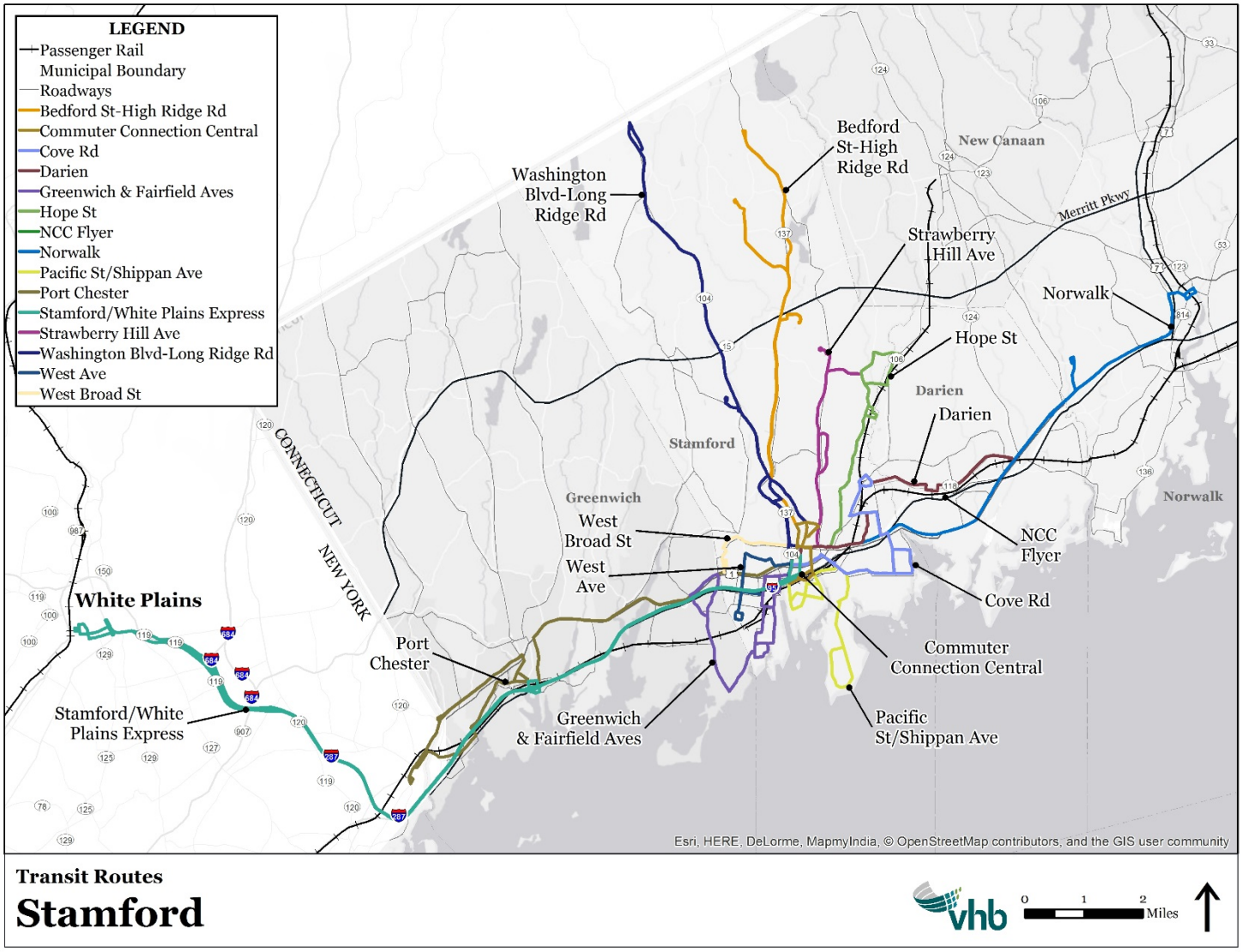
CTTS operates 16 local routes, the Commuter Connection Central route, and the I-BUS Express Service. The commuter connection only operates weekdays but many of the local routes and the I-BUS Express Services seven days a week. Service operates between 5:00 AM – midnight generally with a 30-minute headway on weekdays and weekends (see Figure 6).

CTTS connects with Norwalk Transit District's WHEELS bus routes in Norwalk, with the Harlem and New Haven Lines on Metro-North Railroad, and with Bee-Line buses in Westchester County, New York. CTTS is located in the southwest portion of Connecticut, in Fairfield County, near its border with New York State.

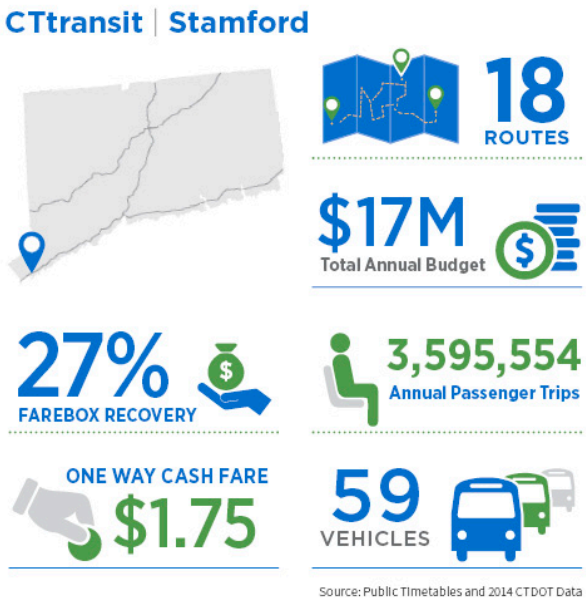
Local bus route fares are the same for all CT*transit* buses with regular cash fares of $1.75, Children (Age 4 & under, maximum of three with each adult) ride free, reduced fare for children between 5-18 years of age of $1.40, and free transfers for unlimited rides on local buses going in any direction within two hours of the time of fare payment. CT*transit* also provides reduced fare for seniors and the disabled, 10-ride tickets packages, all-day passes, two-hour passes, 3-day passes, 5-day passes, 7-day passes, and 31-day passes which are valid for unlimited rides during the specified time period.

The I-BUS Express operates on a zone fare structure charging $3.20 with free transfers from an express to a local bus and an upcharge to the express fare on a transfer from a local to an express bus. Children (Age 4 and under, maximum of three with each adult) ride free and seniors and the disabled are charged a reduced fare. In addition, 10-trip and 31-day passes are available and priced within each zone.

Figure 6: CT*transit* Stamford Routes



CTTS has a fleet of 59 vehicles. CTTS operates 1,785,486 annual revenue miles of service and 150,846 annual revenue hours of service. FY2014 annual fare revenues totaled $4,647,543 based on 3,595,554 annual passenger trips. [4]



Annual Expenses in the FY2014 for the district totaled $17,447,085 for operations. The transit district received operational funding of $11,007,805 from the State of Connecticut (including CTTS's share of federal formula funds). Fare revenue covered 26.6 percent of operating expenses.

4 All data is from public schedules and timetables or provided by CTDOT unless otherwise noted.

CT*transit* – Waterbury / Meriden / Wallingford Divisions

The CT*transit* Waterbury / Meriden / and Wallingford Divisions are all operated and managed by the Northeast Transportation Company (NET) and are summarized together in this report. The CT*transit* Waterbury Division provides service to the towns of Waterbury, Watertown, and Naugatuck. The CT*transit* Meriden and Wallingford Divisions provide bus service in Meriden and Wallingford and provides connections to the CT*transit* New Haven Division and to Middletown Area Transit in Meriden. This region together (Waterbury / Meriden / Wallingford) is approximately 90 square miles in size with a total population (in 2010) of 194,535.

All three divisions operate local fixed routes. CT*transit* Waterbury is owned by CTDOT, and managed and operated by NET under contract to CTDOT. CT*transit* Meriden/Wallingford is owned by CTDOT, and managed and operated by NET under contract to CTDOT. In addition to local service, CT*transit* Meriden operates an express bus service with DATTCO as the operator.

The Waterbury Division operates 22 local routes and six tripper (part-time) routes. Bus service spans from 5:30 AM to 11:59 PM Monday through Friday, with partial weekend service and varying headways between 10 and 90 minutes.

The Meriden Division operates three routes Monday through Friday with Saturday service on several routes. The weekday local routes have varying headways between 30 and 90 minutes with a service span from 6:30 AM – 6:00 PM. The Saturday routes have varying headways from every 40 to 90 minutes between 9:40 AM – 5:40 PM.

The Wallingford Division operates one route on 60 minute headways on Monday to Friday only from 9:00AM – 4:15 PM.

The routes for these divisions are shown in Figure 7 and Figure 8.

Figure 7: CT*transit* Waterbury Routes

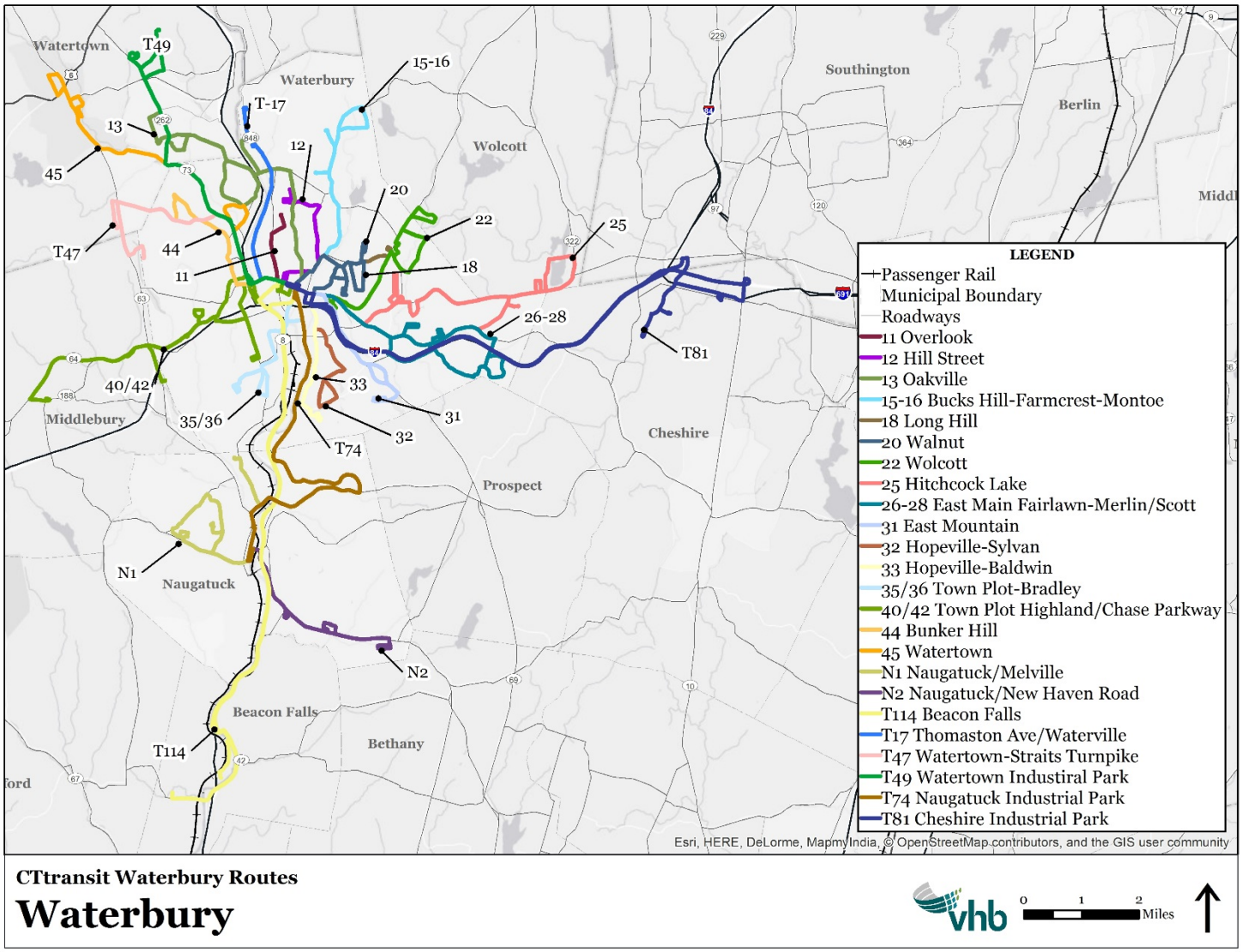
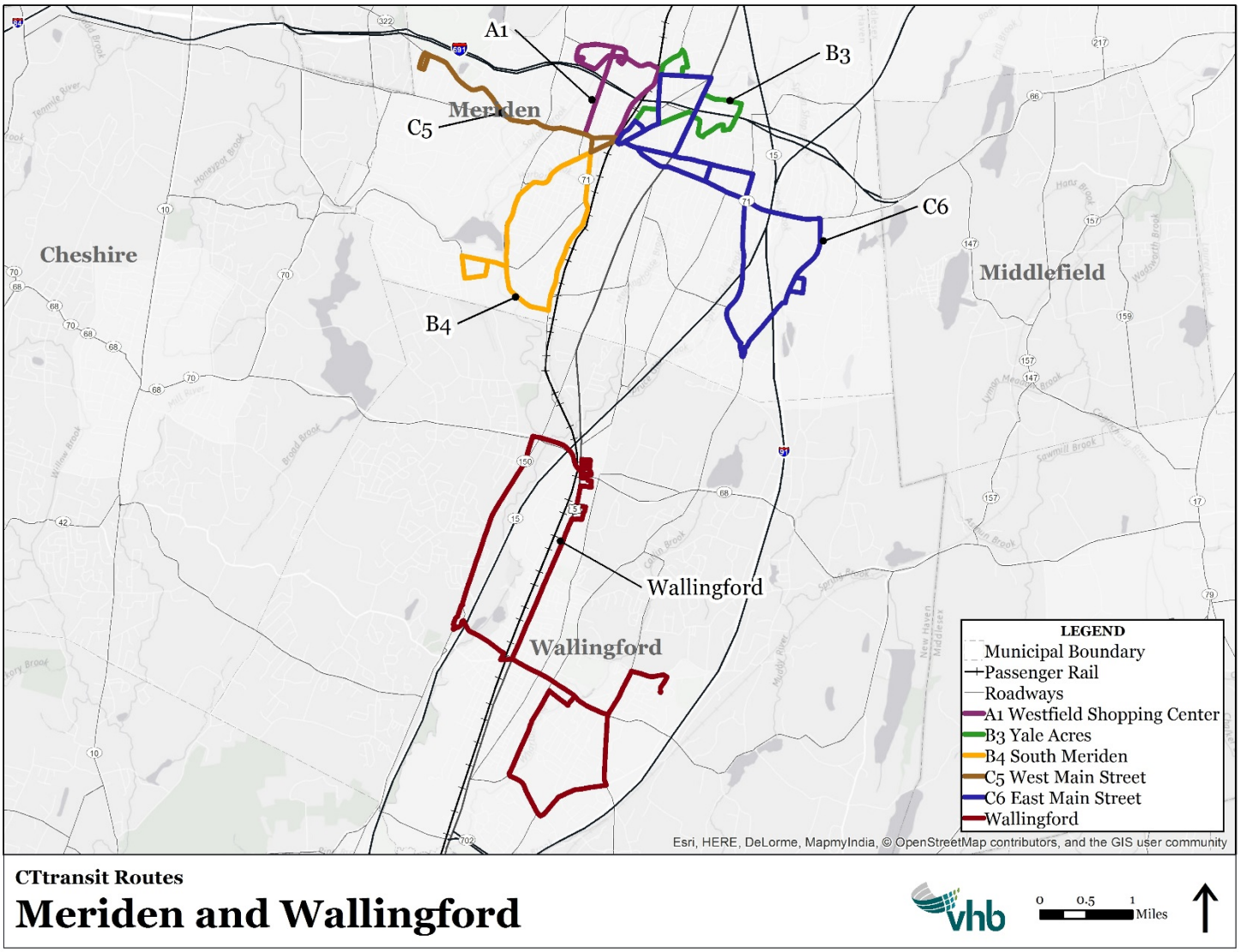
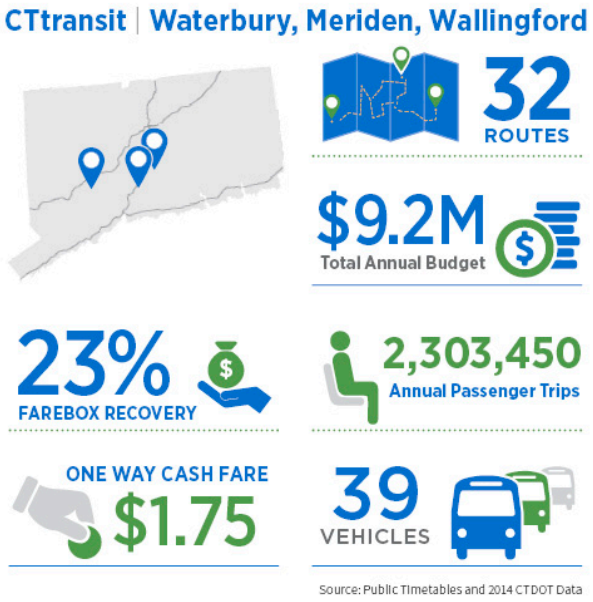


Figure 8: CT*transit* Meriden and Wallingford Routes



Local bus route fares are the same for all CT*transit* buses with regular cash fares of $1.75, Children (Age 4 & under, maximum of three with each adult) ride free, reduced fare for children between 5-18 years of age of $1.40, and free transfers for unlimited rides on local buses going in any direction within two hours of the time of fare payment. CT*transit* also provides reduced fare for seniors and the disabled, 10-ride tickets packages, all-day passes, two-hour passes, 3-day passes, 5-day passes, 7-day passes, and 31-day passes which are valid for unlimited rides during the specified time period.

Combined, the divisions have a fleet of 32 vehicles. In 2014, the divisions operated 1,392,242 annual revenue miles of service and 110,910 annual revenue hours of service. FY2014 annual fare revenues totaled $2,141,854 based on 2,303,450 annual passenger trips. [5]



For FY2014, Annual Expenses for the districts totaled $9,204,354 for operations. The transit districts received operational funding of $60,000 from local governments, $7,066,495 from the State of Connecticut (including the divisions' share of federal formula funds). Fare revenue covered 22.6 percent of operating expenses.

5 All data is from public schedules and timetables or provided by CTDOT unless otherwise noted.

1.1.4 Urban Bus Systems with 750,000 to 2,000,000 Annual Passenger Trips

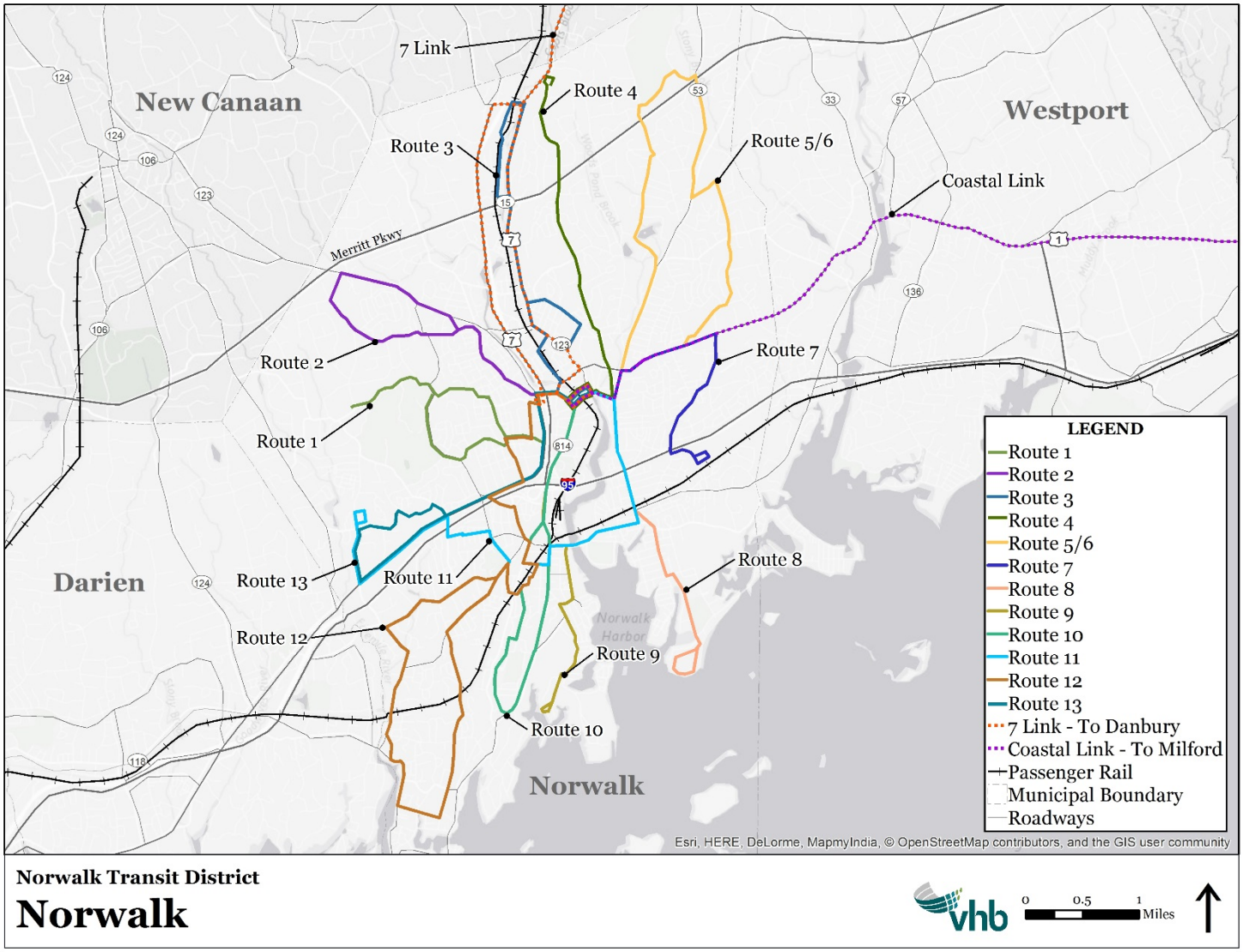
Norwalk Transit District

The Norwalk Transit District (WHEELS) serves Norwalk and Southwestern Connecticut, including Greenwich and Westport. This service area is 45 square miles in size with a total population of 111,994.

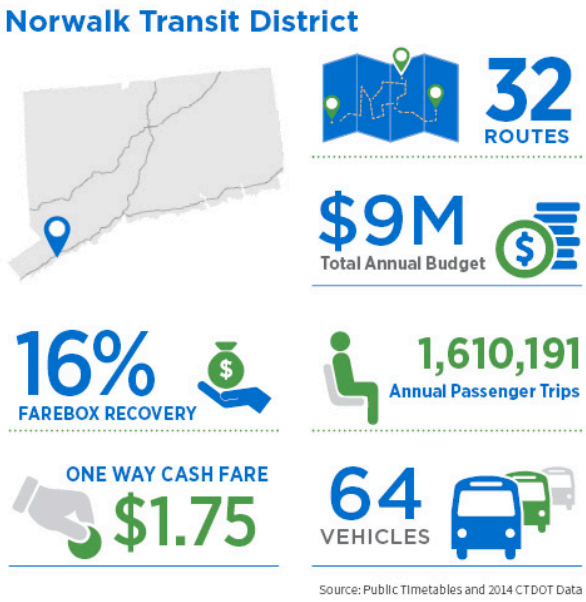
WHEELS is owned, operated, and managed by Norwalk Transit District. WHEELS operates 12 local bus routes, 14 shuttles, and two regional routes[6]. There is also a connection at the pulse point linking with CT*transit* Route 341 on varying headways during the course of the day. (See Figure 9) Local bus service operates within Norwalk and operates on weekdays and Saturdays from approximately 6:00 AM to 7:30 PM, with supplemental evening shuttle service until 10:30 PM. Two shuttle routes, Connecticut Avenue and Main Avenue also runs on Saturdays from 6:30 PM to 10:30 PM and Sundays from 9:00 AM to 6:40 PM. WHEELS Commuter shuttles serve an expanded area (Norwalk, Greenwich, and Westport) on weekdays only during peak morning and evening commuting hours. One of the regional routes that WHEELS operates is part of the Coastal Link regional bus system, which is a collaboration between the Norwalk Transit District, the Greater Bridgeport Transit Authority, and the Milford Transit District and runs parallel to I-95. The hours of operation are Monday through Saturday from 5:45 AM to 10:45 PM and Sundays from 9:00 AM to 7:00 PM. The route provides service seven days a week along the Route 1 corridor through Norwalk, Westport, Fairfield, Bridgeport, Stratford, and Milford. In cooperation with the Housatonic Area Regional Transit District, WHEELS operates the Route 7 Link, a fixed route bus service between Norwalk and Danbury. The service runs on a peak schedule on weekdays from 6:00 AM to 11:50 AM and 3:00 PM to 7:00 PM. The cash fare for WHEELS is $1.75 for 90-minute travel. Tokens are also available for 10-rides, 20-ride and 40-rides. Unlimited full fare passes are available for 1-day,7-days, and 31-days. Half-fare reduced passes are available for seniors and persons with disabilities.

[6] Effective January 29, 2017, service reductions and fare changes were enacted. The number of NTD routes are now ten local routes (Routes 2 and 5/6 were eliminated), 13 shuttle routes (Norden Park Shuttle was eliminated), and two regional routes (7 Link and Coastal Link).

Figure 9: Norwalk Transit District Routes



In 2014, the WHEELS fleet was comprised of 64 vehicles and several purchased transportation contractors adding to the fleet needs. Over the course of 2014, the fleet accounted for 104,009 revenue hours and 1,055,111 revenue miles of service. Fare revenue totaled $1,574,977 based on 1,610,191 annual passenger trips.[7]



Annual Expenses in the FY2014 for WHEELS totaled $9,536,363 for operations. WHEELS received operational funding of $25,000 from the Federal Government, $6,887,835 from the State of Connecticut, and $988,851 from local government. Fare revenue covered 16.5 percent of operating expenses.

7 All data is from public schedules and timetables or provided by CTDOT unless otherwise noted.

Southeast Area Transit

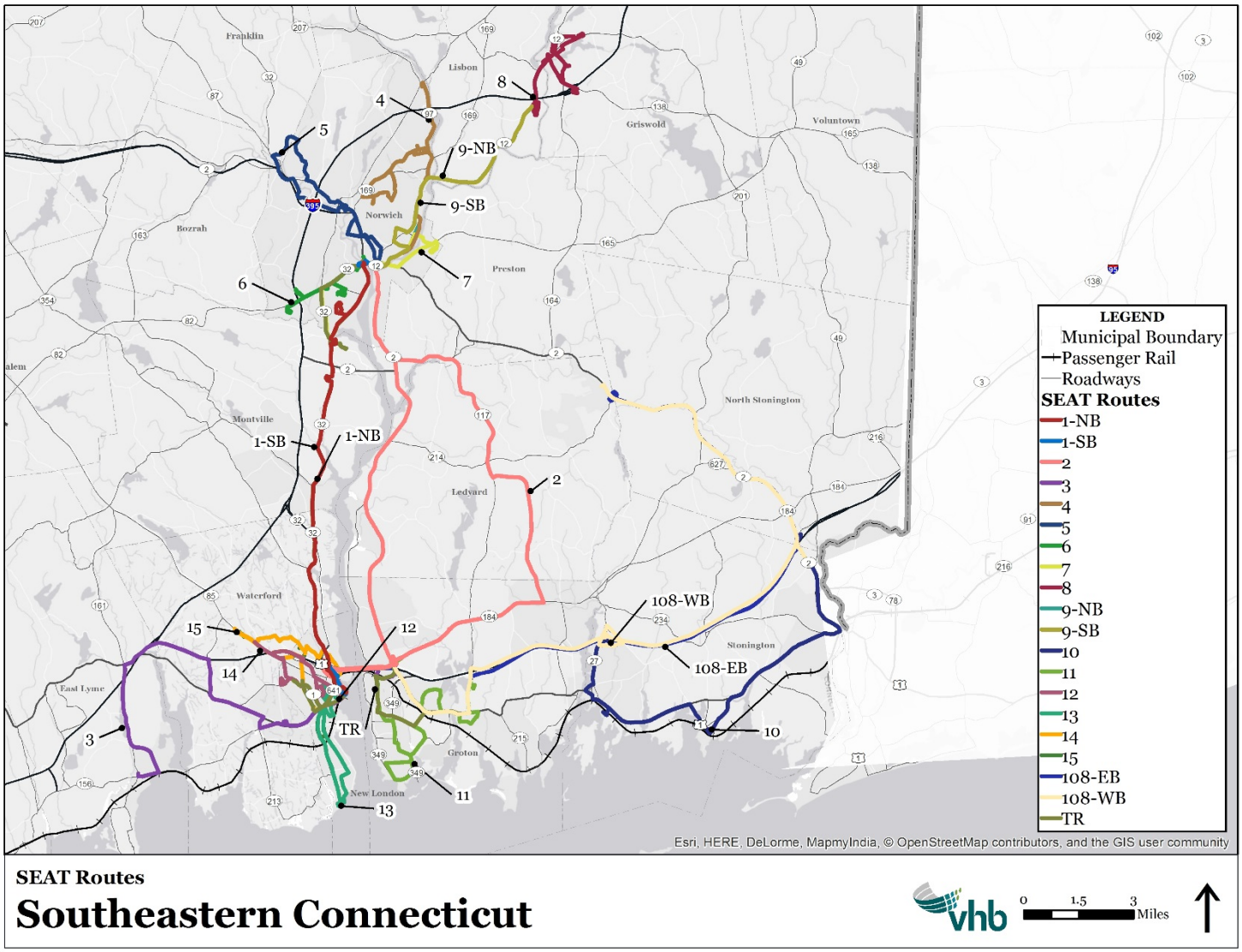
The Southeast Area Transit (SEAT) serves nine municipalities in the Southeast part of the state, including East Lyme, Griswold, Groton, Ledyard, Montville, New London, Norwich, Stonington, and Waterford. This transit district covers 305 square miles in size and has a population of 216,360.

The SEAT bus system is owned and operated by SEAT, and managed by First Transit. SEAT operates 17 local routes, including a shuttle bus to Three Rivers Community College, and paratransit service to passengers who live within three-quarters of a mile of a route but are unable to use the fixed-route services. (See Figure 10) Fixed-route service typically runs Monday through Saturday, with select routes operating on Sundays. Service hours and headways vary depending upon the area being served.

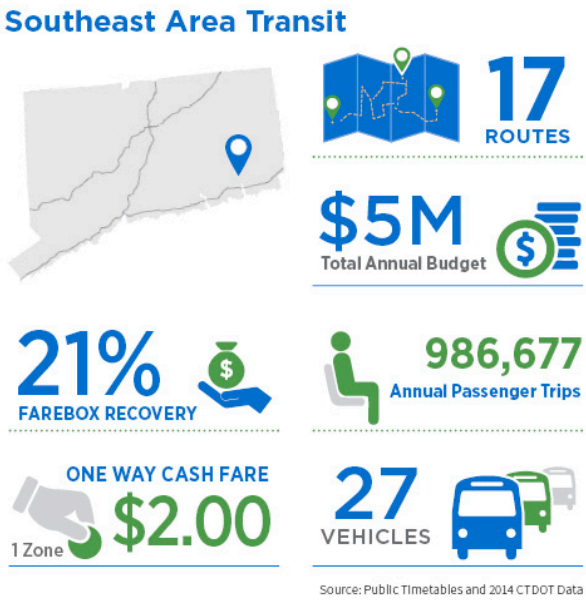
Routes serving major corridors operate Monday through Saturday between 6:00 AM to 10:00 PM. A single route (Route 101) provides service during morning peak commuting hours (6:00 AM to 9:00 AM) and late evening hours (7:00 PM to 11:00 PM). Routes serving New London operate Monday through Saturday between 8:00 AM to 7:00PM, with a single supplemental route providing evening service from 7:00 PM to 11:00 PM.

Routes serving Norwich typically operate Monday through Saturday from 6:00 AM to 7:00 PM, with a single route providing supplemental evening service until 11:00 PM. SEAT also operates a shuttle to Three Rivers Community College that operates weekdays when school is in session and during winter break. Morning service spans from 7:50 AM to approximately 9:00 PM, and evening service spans from 1:00 PM to 7:00 PM. Headways are generally 60 minutes in length.

Figure 10: Southeast Area Transit District Routes



Fares for SEAT bus service is $2.00 cash for one ride and $1.00 for Senior/Disabled riders. Ten-ride tickets are available for $10.00 ($9.00 for Senior/Disabled riders.) Children 5 and under ride free. 1-day, 5-day, and 31-day Unlimited Passes are available.



In 2014, SEAT's fleet was comprised of 27 vehicles. The fleet operated 863,429 revenue miles and 57,769 revenue hours. During FY2014, the property earned $1,026,391 in fare revenue, based on 986,877 annual passenger trips.[8]

Annual Expenses in the FY2014 for SEAT totaled $4,882,472 for operations. SEAT received operational funding of $3,423,416 from the State of Connecticut, and $377,907 from the local government. Fare revenue covered 21 percent of operating expenses.

CT*transit* New Britain (Including DATTCO and CT*transit* Bristol)

CT*transit* New Britain (CTTNB) provides fixed route bus service specifically to New Britain and surrounding towns. The service area within the jurisdiction is 81 square miles and has a population of 203,562. CTTNB also contracts with DATTCO to provide express bus service on certain routes (CT*transit* New Britain also operates service for CT*transit* Bristol.)

CTTNB is owned by CTDOT and managed and operated by the New Britain Transportation Company, DATTCO and HNS Management under contract to CTDOT.

CTTNB operates 12 local routes with connections to bus service in Hartford, and Meriden. (See Figure 11) Bus service is available seven days a week, typically from 5:00 AM to 1:00 AM the following day. Select routes have limited hours of service on Saturdays and Sundays. Headways range from between 30 and 60 minutes

8 All data is from public schedules and timetables or provided by CTDOT unless otherwise noted.

Local bus route fares are the same for all CT*transit* buses with regular cash fares of $1.75, Children (Age 4 & under, maximum of three with each adult) ride free, reduced fare for children between 5-18 years of age of $1.40, and free transfers for unlimited rides on local buses going in any direction within two hours of the time of fare payment. CT*transit* also provides reduced fare for seniors and the disabled, 10-ride tickets packages, all-day passes, two-hour passes, 3-day passes, 5-day passes, 7-day passes, and 31-day passes which are valid for unlimited rides during the specified time period.

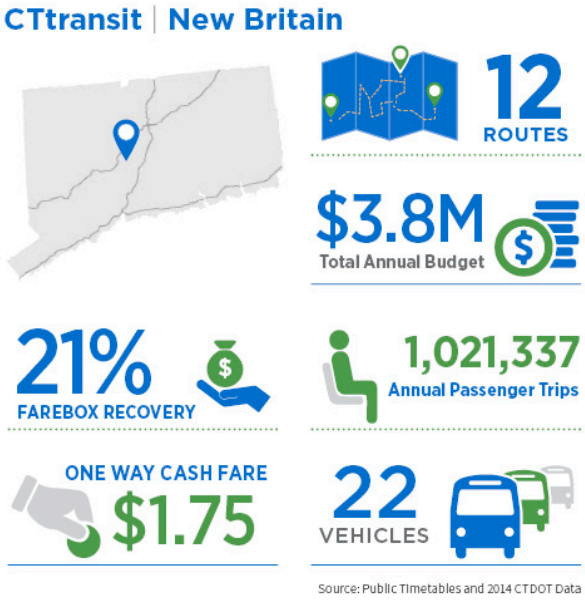
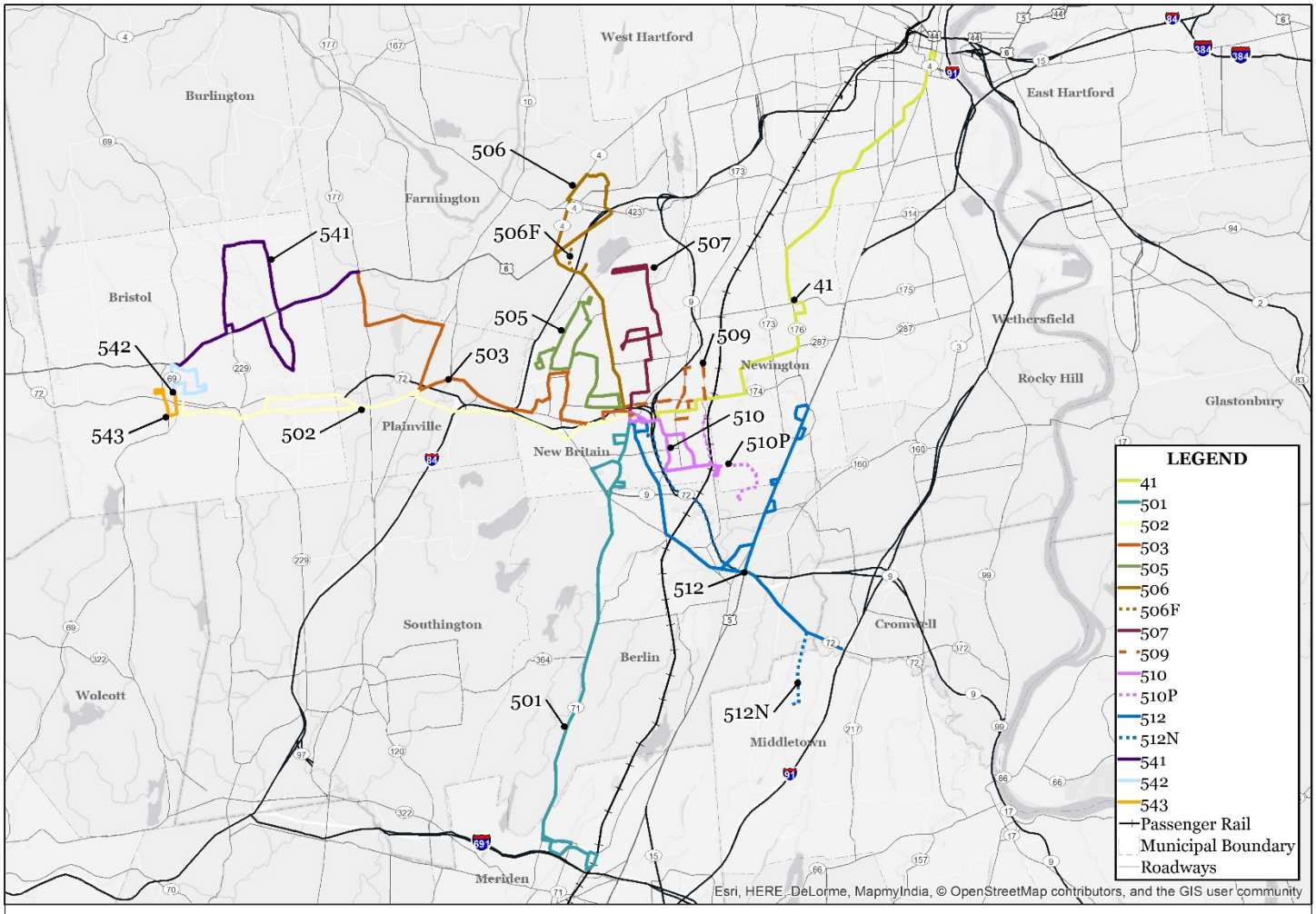


Figure 11: CT*transit* New Britain and Bristol Routes



In 2014, CTTNB had a fleet of 22 vehicles. CTTNB operated 819,002 vehicle revenue miles and 54,228 vehicle revenue hours over the course of the year. During FY2014, fare revenues totaled $787,178, based on 1,021,337 annual passenger trips.[9]

Annual Expenses in the FY2014 for CTTNB totaled $3,799,726 for operations. CTTNB received operational funding of $2,826,911 from the State of Connecticut (including CTTNB's share of federal formula funds). Fare revenue covered 20.7 percent of operating expenses.

9 All data is from public schedules and timetables or provided by CTDOT unless otherwise noted.

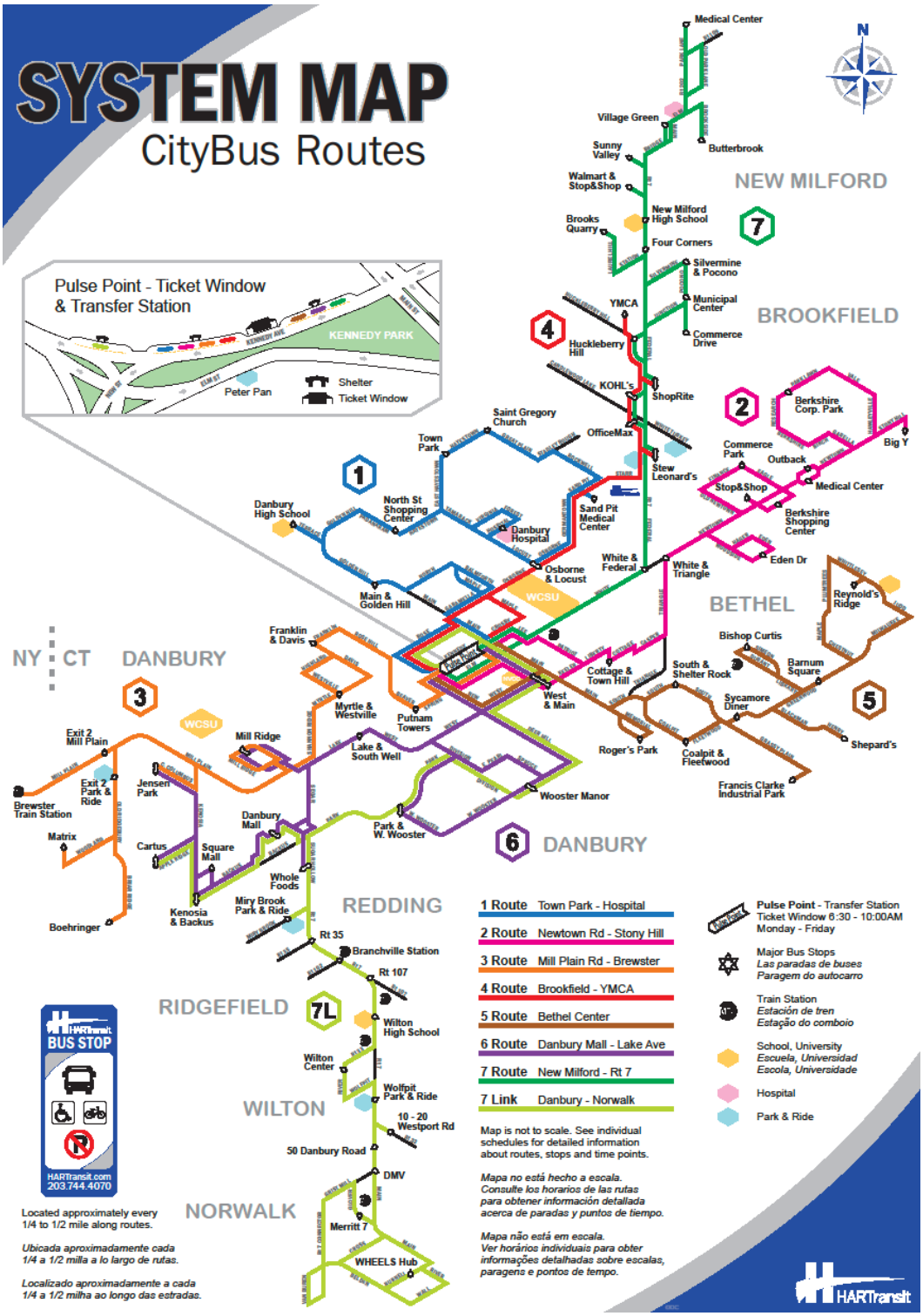
Housatonic Area Regional Transit

The Housatonic Area Regional Transit (HART) operates fixed routes and demand response service around the City of Danbury located in the northwest portion of Fairfield County, Connecticut, north of Norwalk on the border of New York State. The main roads in the service area are I-84, US Route 6, US Route 7, and US Route 202. This region together is approximately 124 square miles in size with a total population of 154,855.

HART is owned, operated, and managed by HART. HART operates seven local CityBus routes Monday through Friday with limited service Saturday, one CityBus Link to Norwalk Monday through Friday, three night-time LOOPs Monday through Friday with limited service Saturday and Sunday, and three Metro North connection shuttles Monday through Friday. (See Figure 12) CityBus Monday through Friday services generally have headways of 20 to 40 minutes, LOOPs and City Bus Link have headways of approximately 60 minutes, and the Shuttles have varying headways coinciding with Metro North New Haven Line Service. CityBus Routes generally operate from 6:00 AM to 6:00 PM Monday through Friday and from 8:00 AM to 5:00 PM Saturday. The CityBus Link route operates from 6:00 AM to 11:50 AM and 3:00 PM to 7:30 PM Monday through Friday. LOOPs generally operate from 6:30 PM to 10:30 PM from Monday through Friday, 5:30 PM to 10:30 PM on Saturday, and 9:00 AM to 7:00 PM on Sundays. Shuttle services generally operate from 5:20 AM to 8:30 AM and from 4:00 PM to 9:45 PM Monday through Friday

Regular single ride fares are $1.50 with children under five riding free, students (Kindergarten through Twelfth Grade) charged $1.10, and the elderly and persons with disabilities charged a reduced fare of $0.75. 10 ride passes and monthly passes are available at regular and reduced prices. Transfers are free at the pulse point to passengers who upon boarding the bus request a transfer from the driver. Free transfers are available to the WHEELS system, CT*transit*, the Coastal Link, the BeeLine, and the Putnam Area Rapid Transit (PART) system.

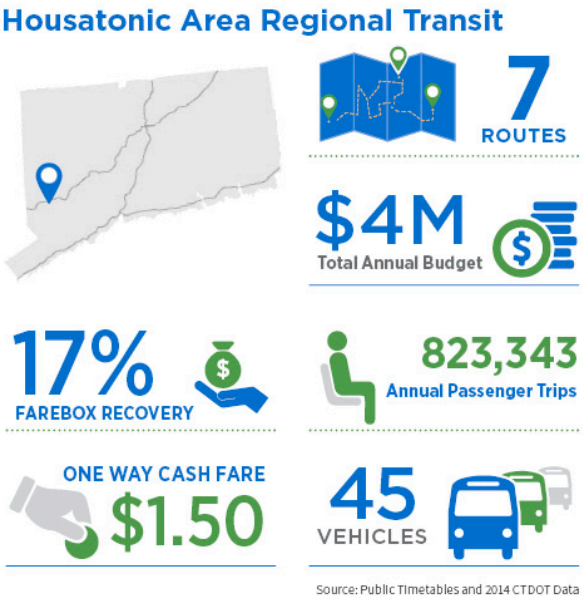
Figure 12: HART Routes



(GIS data was not available for mapping purposes)

In 2014, HART possessed a fleet of 45 vehicles. HART operated 914,645 annual revenue miles of service and 54,162 annual revenue hours of service. FY2014 annual fare revenues totaled $718,991 based on 823,343 annual passenger trips.[10]

Annual Expenses in the FY2014 for the district, totaled $4,178,013 for operations. HART received operational funding of $$2,788,249 from the State of Connecticut and $670,722 from the local government. Fare revenue covered 17.2 percent of operating expenses.



10 All data is from public schedules and timetables or provided by CTDOT unless otherwise noted.

1.1.5 Urban Bus Systems with less than 750,000 Annual Passenger Trips

Middletown Area Transit

Middletown Area Transit (MAT) operates fixed and demand response routes around the City of Middletown located in the northwest portion of Middlesex County of Connecticut, south of Hartford and east of Meriden. MAT is a quasi-municipal agency and serves the towns of Middletown, Middlefield, East Hampton, Portland, Durham and parts of Cromwell and Meriden with connections available to Higganum, Chester, Essex, and Old Saybrook via 9 Town Transit and to Wethersfield, Rocky Hill, Hartford, and New Haven via CT*transit*. This region together is approximately 193 square miles in size with a total population of 90,320.

MAT is owned, operated, and managed by MAT. MAT operates six weekday local routes, two Monday through Saturday PM routes, three Saturday only routes, and one Monday through Saturday M-Link Route. Local weekday services generally have headways of 45 minutes while the M-Link route, and the Saturday routes generally have headways of 60 minutes. Services generally span from 5:45 AM – 6:50 PM (see Figure 13).

Regular single ride fares are $1.75 with children under six riding free and the elderly and handicapped charged a reduced fare of $0.85. All day passes, 10 ride passes, and monthly passes are available at regular and reduced prices. Transfers are issued free of charge when requested by the passengers upon boarding but must be used for the next schedule connection at the first point where the route intersects.

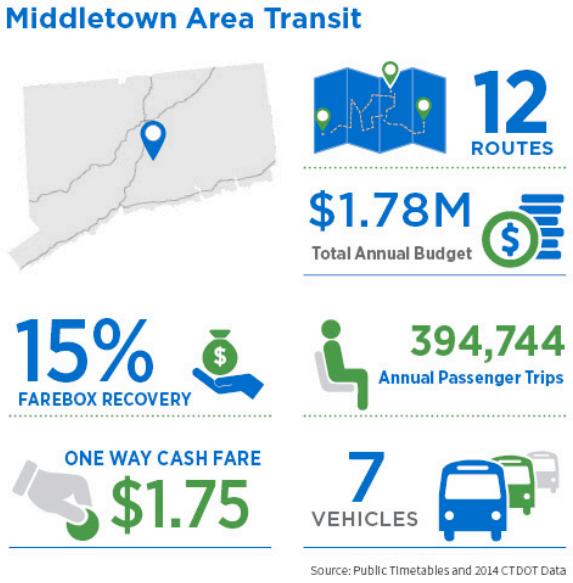
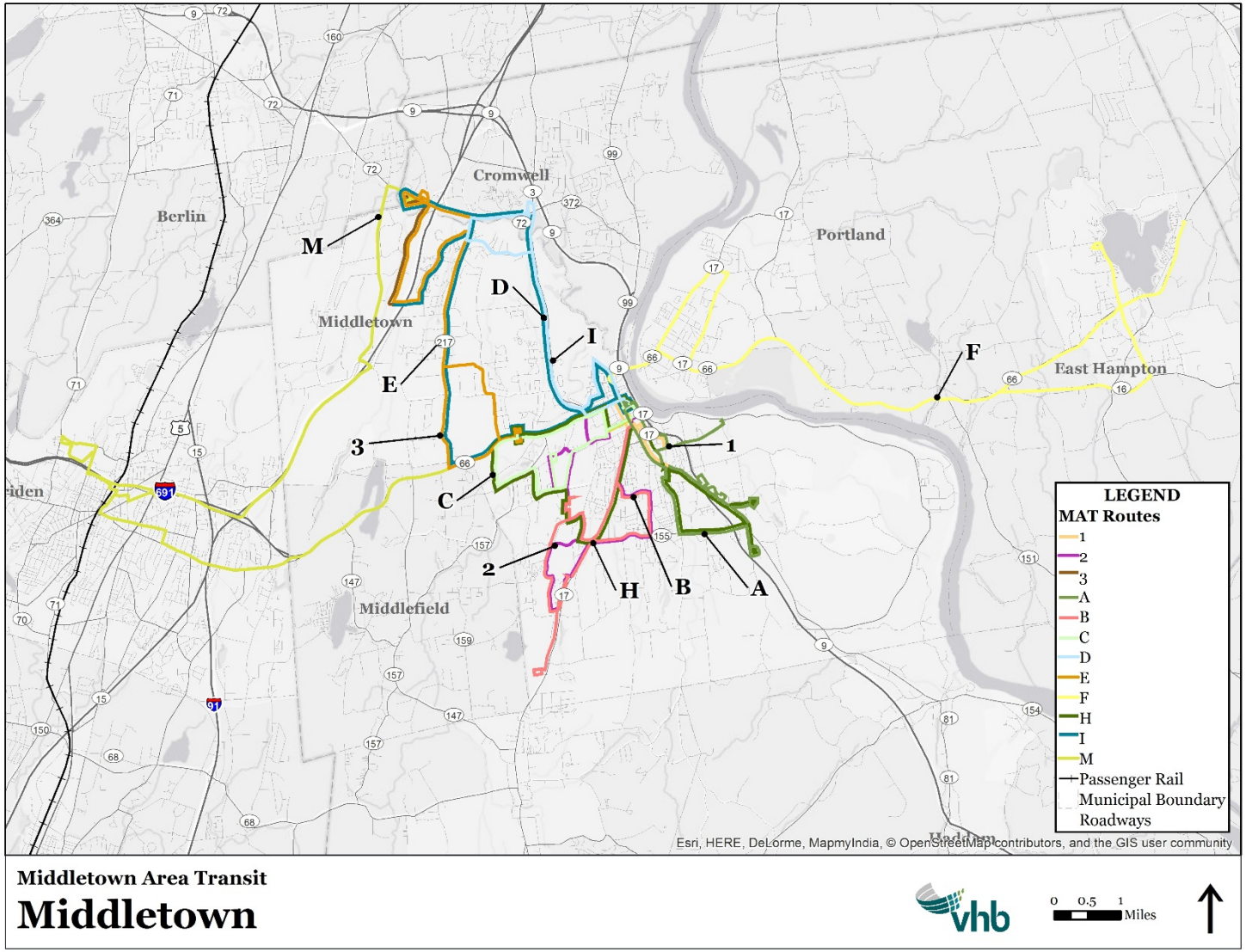


Figure 13: Middletown Area Transit Routes



In 2014, MAT possessed a fleet of 7 vehicles. MAT operated 444,939 annual revenue miles of service and 26,053 annual revenue hours of service. FY2014 annual fare revenues totaled $271,347 based on 394,744 annual passenger trips.[11]

Annual Expenses in the FY2014 for the district, totaled $1,785,607 for operations. MAT received operational funding of $318,403 from local government sources and $1,097,178 from the State of Connecticut. Fare revenue covered 15.2 percent of operating expenses.

Windham Region Transit District

The Windham Region Transit District (WRTD) provides service to the ten towns of the Windham Region of Connecticut, comprising the southwest portion of Windham County, the southeast portion of Tolland County, and the northwest portion of New London County. WRTD operates two local bus service routes and two commuter services routes. The towns included in the service area are: Ashford, Chaplin, Columbia, Hampton, Lebanon, Mansfield, Scotland, Willington, and Windham (see Figure 14). This region together is approximately 325.8 square miles in size with a total population of 91,240.

WRTD is owned and operated by WRTD and managed First Transit. The bus routes generally focus on the Village of Willimantic. Both commuter routes begin/terminate in Willimantic and the two local routes both serve Willimantic. One of the commuter routes operates a single morning run and a single afternoon run with, Monday through Friday. The other commuter route operates six trips beginning at 5:55 AM and terminating at 12:55 AM, with a two-hour headway, every day. Both local city routes operate Monday through Saturday from 6:00 AM to 9:35 PM with headways generally between 30 and 120 minutes depending on the route.

The one-way trip fare for adults is $1.00 on local routes and $2.50 on commuter routes. Children under 4 (maximum of three children per adult) and the elderly are not charged on either route. The local route offers free transfers but a charge of $1.50 is levied on customers for transfers to a commuter route and vise-versa. The district also provides local and commuter ten-rides and monthly tickets.

WRTD operates a fleet of five revenue vehicles for fixed route service. WRTD operated 416,207 annual revenue miles of service and 24,634 annual revenue hours of service for local service and commuter bus in 2014. FY2014 aggregate annual fare revenues totaled $197,662 based on 252,343 annual passenger trips.[12]

11 All data is from public schedules and timetables or provided by CTDOT unless otherwise noted.
12 All data is from public schedules and timetables or provided by CTDOT unless otherwise noted.

Annual Expenses in the FY2014 for the district, including demand response, totaled $1,459,939 for operations. WRTD received operational funding of $355,375 from the State of Connecticut, $386,001 from the local government and $482,051 from the federal government. Operating revenue (including fares, donations, and contract revenue) covered 13.5 percent of operating expenses.

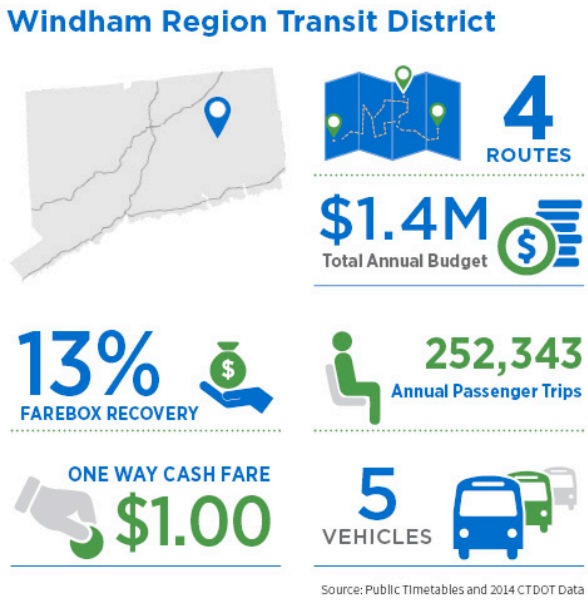
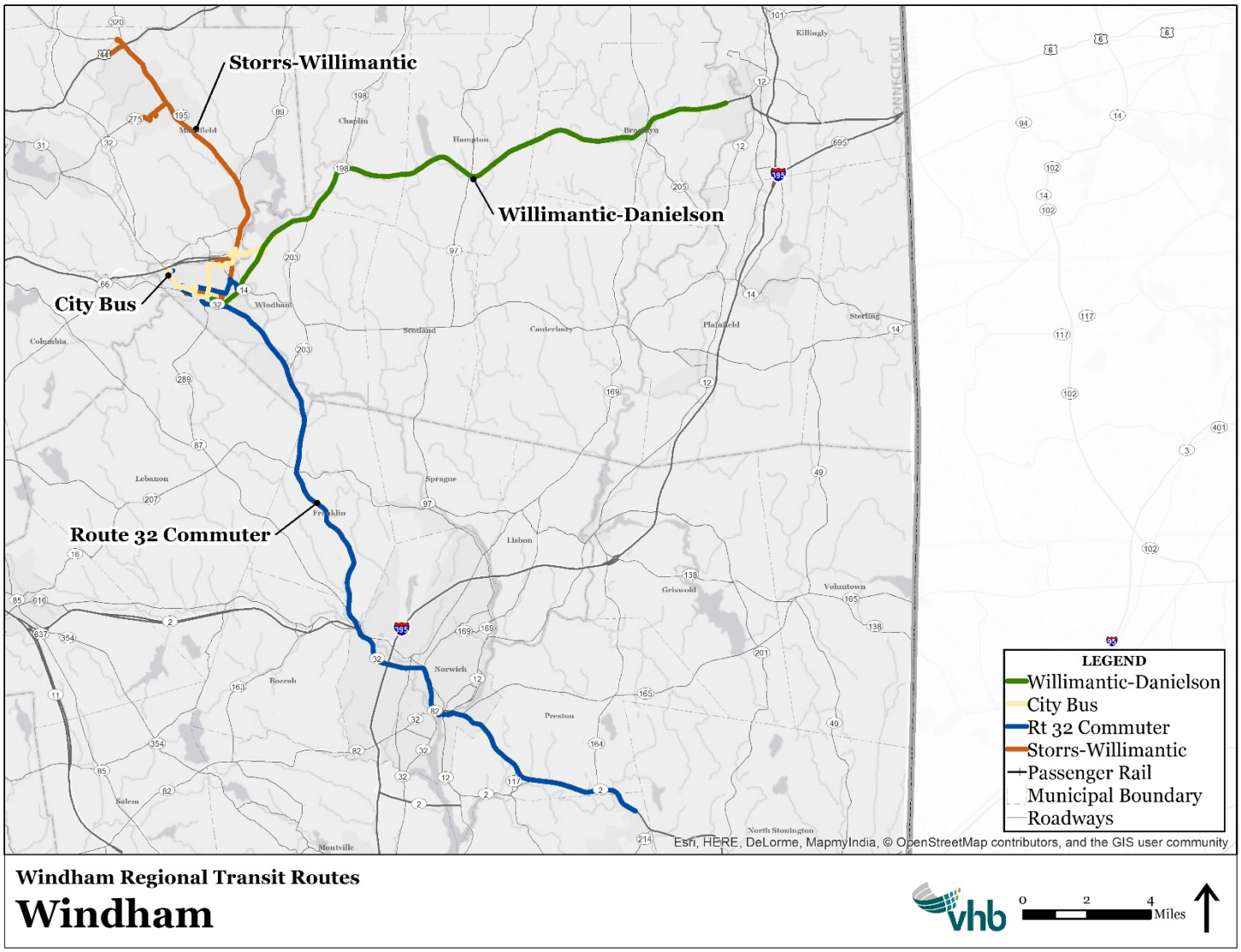


Figure 14: Windham Region Transit District Routes



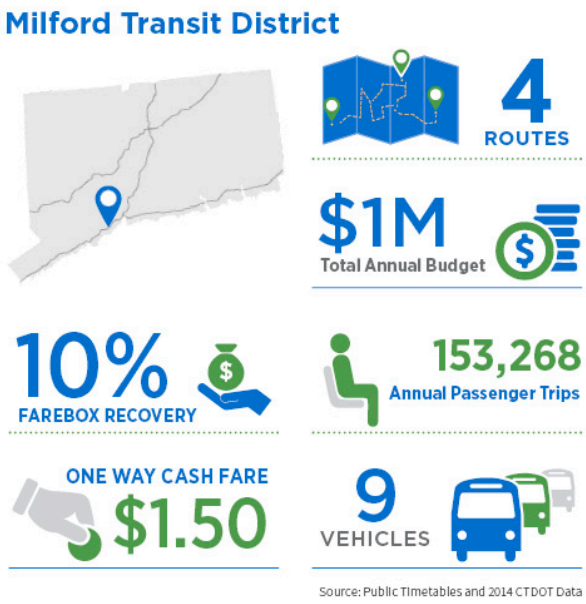
Milford Transit District

The Milford Transit District (MTD) operates local and regional fixed route bus service, as well as paratransit service, in the Milford, Stratford, and Bridgeport areas. This service area is 24 square miles, with a population of approximately 51,000.

MTD is owned, operated, and managed by MTD. MTD operates three local routes and one regional route, in addition to door-to-door paratransit service for the elderly (age 60 years and older) and persons with disabilities (See Figure 15). The three local routes operate from 6:00 AM to 10:30 PM on weekdays, and 8:00 AM to 5:00 PM on Saturdays. The remaining route is a regional route that functions as part of the Coastal Link regional bus service that generally follows the Route 1 corridor. The regional route operates seven days a week, with weekday and Saturday service typically spanning from 6:00 AM to 10:30 PM. Sunday service on this route is limited to between 9:00 AM and 7:00 PM. Headways vary from 20 to 60 minutes.

The cash fare for MTD is $1.50 for one-way travel. Passes are also available for 10-rides and monthly travel. Half-fare reduced passes are available for seniors, and persons with disabilities.

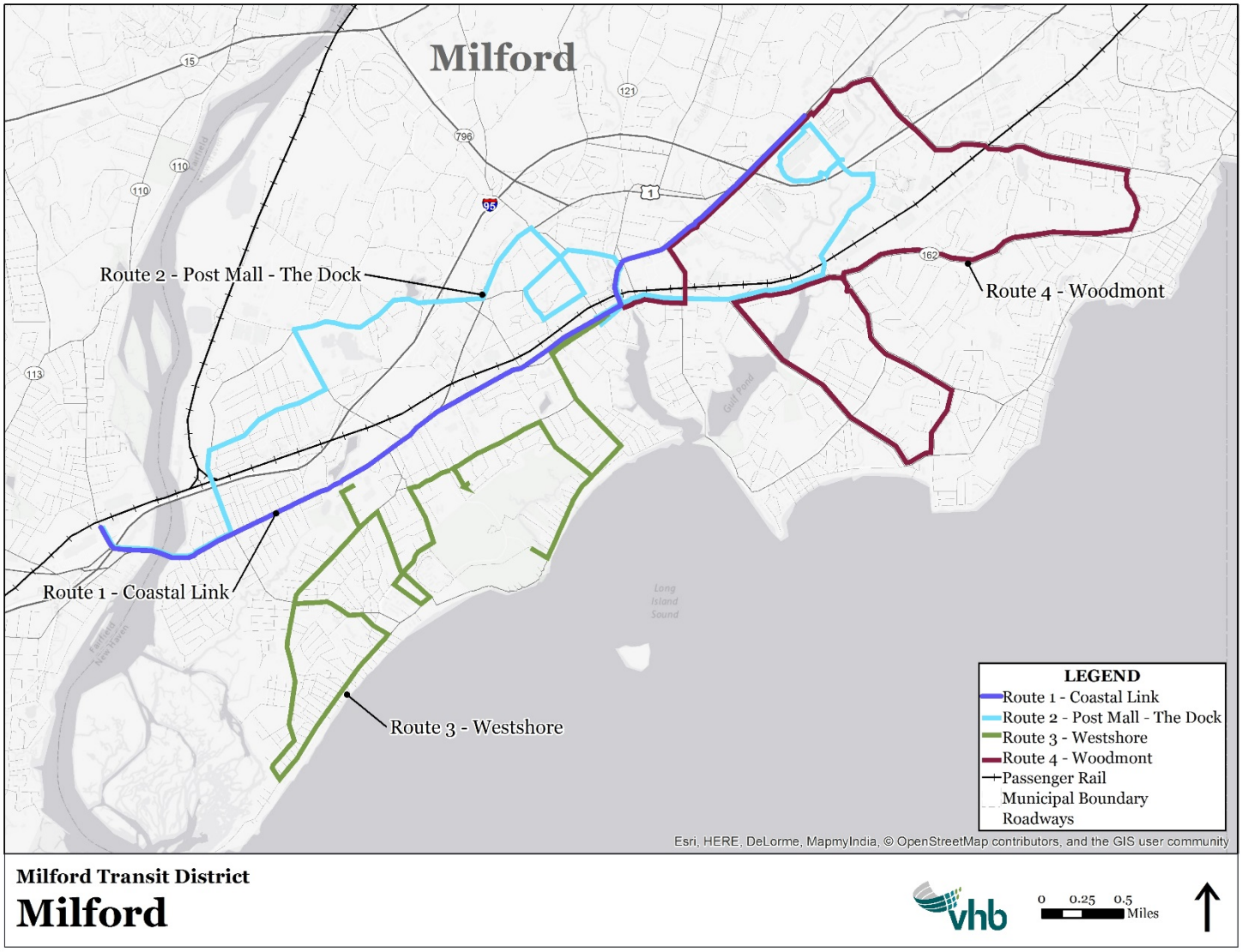
In FY2014, MTD's fleet included nine vehicles. This fleet accounted for 223,137 vehicle revenue miles and 14,962 vehicle revenue hours. In FY2014, the transit district earned $115,561 in fare revenue, based on 153,268 annual passenger trips.[13]



Annual Expenses in the FY2014 for MTD totaled $1,170,702 for operations. MTD received operational funding of $864,630 from the State of Connecticut and $190,422 from the local government. Fare revenue covers 9.9 percent of operating expenses.

13 All data is from public schedules and timetables or provided by CTDOT unless otherwise noted.

Figure 15: Milford Transit District Routes

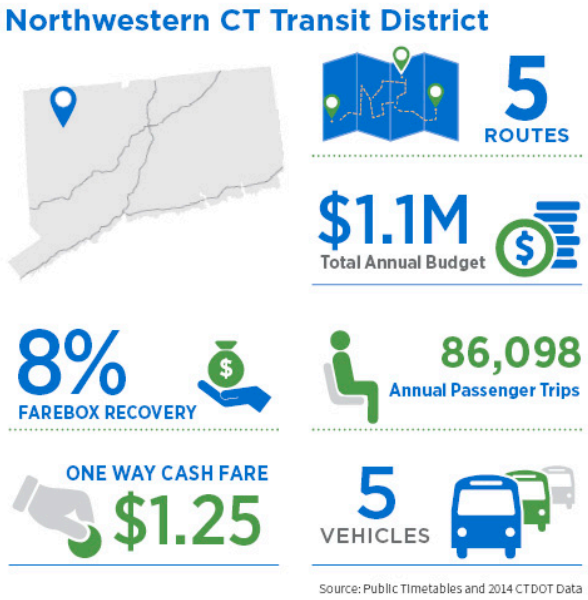


1.1.6 Rural Bus Systems

Northwestern Connecticut Transit District

The Northwestern Connecticut Transit District (NWCTD) provides service to a 17 town region in the northwest portion of Connecticut near its border with New York, northwest of the City of Hartford in Litchfield County. NWCTD operates a deviated flexible route service in Torrington, Winsted, and Litchfield and demand response service for all 17 towns. The towns included in the service area are: Barkhamsted, Canaan / North Canaan, Colebrook, Cornwall, Falls Village, Goshen, Harwinton, Kent, Litchfield, Morris, New Hartford, Norfolk, Salisbury, Sharon, Torrington, and Warren. This region together is approximately 597.4 square miles in size with a total population of 93,766.[14]

NWCTD is owned and managed by NWCTD and operated by Kelley Transit. NWCTD operates five deviated flexible bus routes, referred to as the "Candystriper." The Candystriper local bus service primarily serve the communities of Torrington, Winsted, and Litchfield with three of the five routes designated for Torrington, one designated for Litchfield, and one designated for Winsted. (See Figure 16)



The Candystriper service spans from 6:30 AM to 6:25 PM Monday through Friday, with a special Torrington route running Saturday from 8:00 AM to 3:55 PM. The Torrington routes generally have a headway of one hour (including the Saturday route) while the Winsted and Litchfield routes have a varying headway between 75 and 120 minutes.

One-way trip fares for adults are $1.25 with students and the elderly charged a reduce fare and children riding free. The commuter service is $2.00 and transfers are free. The

14 Information on population and land area aggregated and estimated based on land area and population of each town provided by 2010 census.

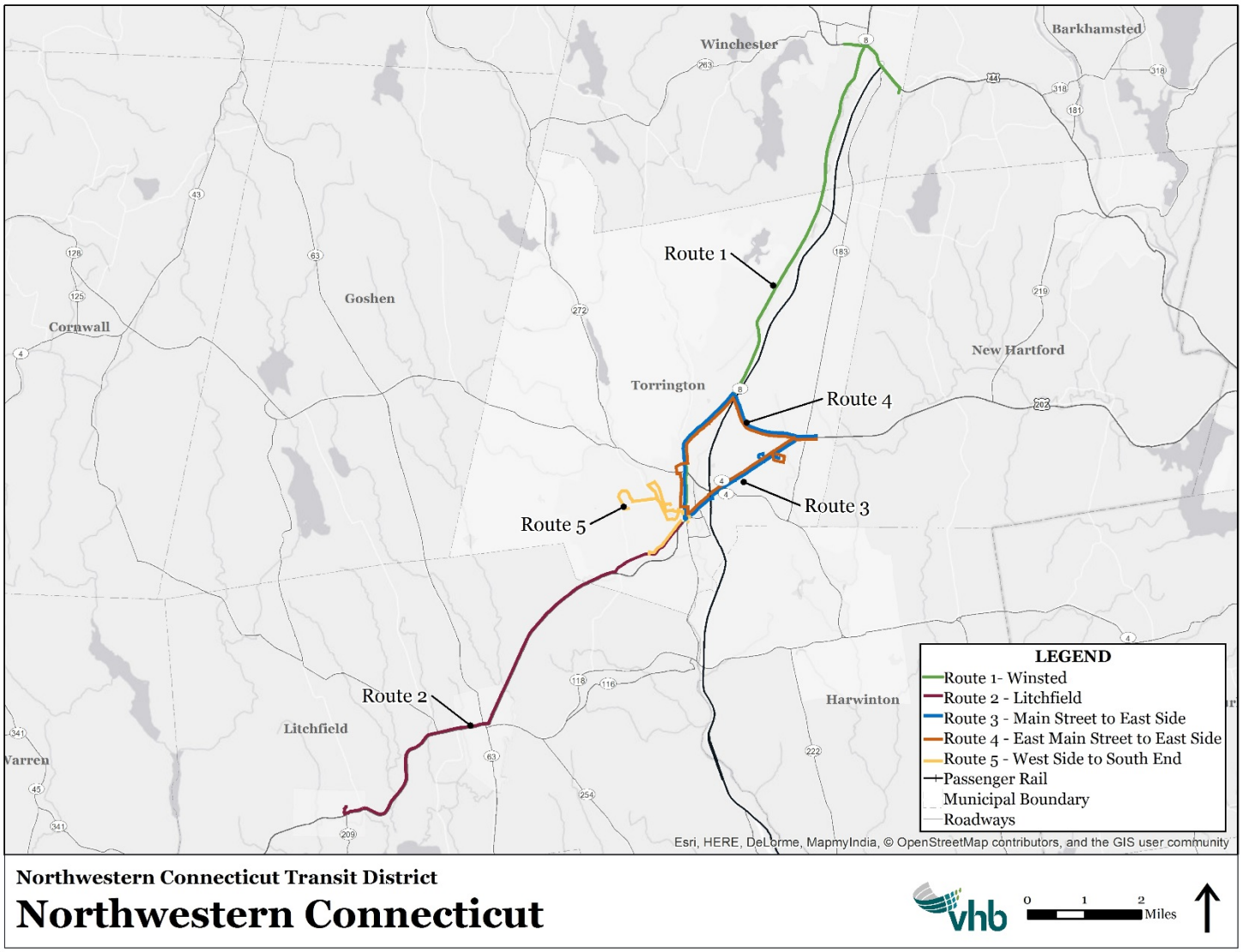
Candystriper service also provides a monthly unlimited ride fare of $47.00 and a reduced fare of $23.50.

NWCTD operates a fleet of 5 revenue vehicles for fixed route service. For their fixed service NWCTD operated 332, 707annual revenue miles of service and 28,065 annual revenue hours of service. FY2014 annual fare revenues totaled $88,788 based on 86,098 annual passenger trips. [15]

Annual Expenses in FY2014 for NWCTD, including demand response, totaled $1,090,753 for operations. NWCTD received operational funding of $279,875 from the State of Connecticut, $266,379 from the local government and $424,053 from the federal government. Fare revenue covered 8.1 percent of operating expenses.

15 All data is from public schedules and timetables or provided by CTDOT unless otherwise noted.

Figure 16: Northwestern Connecticut Transit District Routes

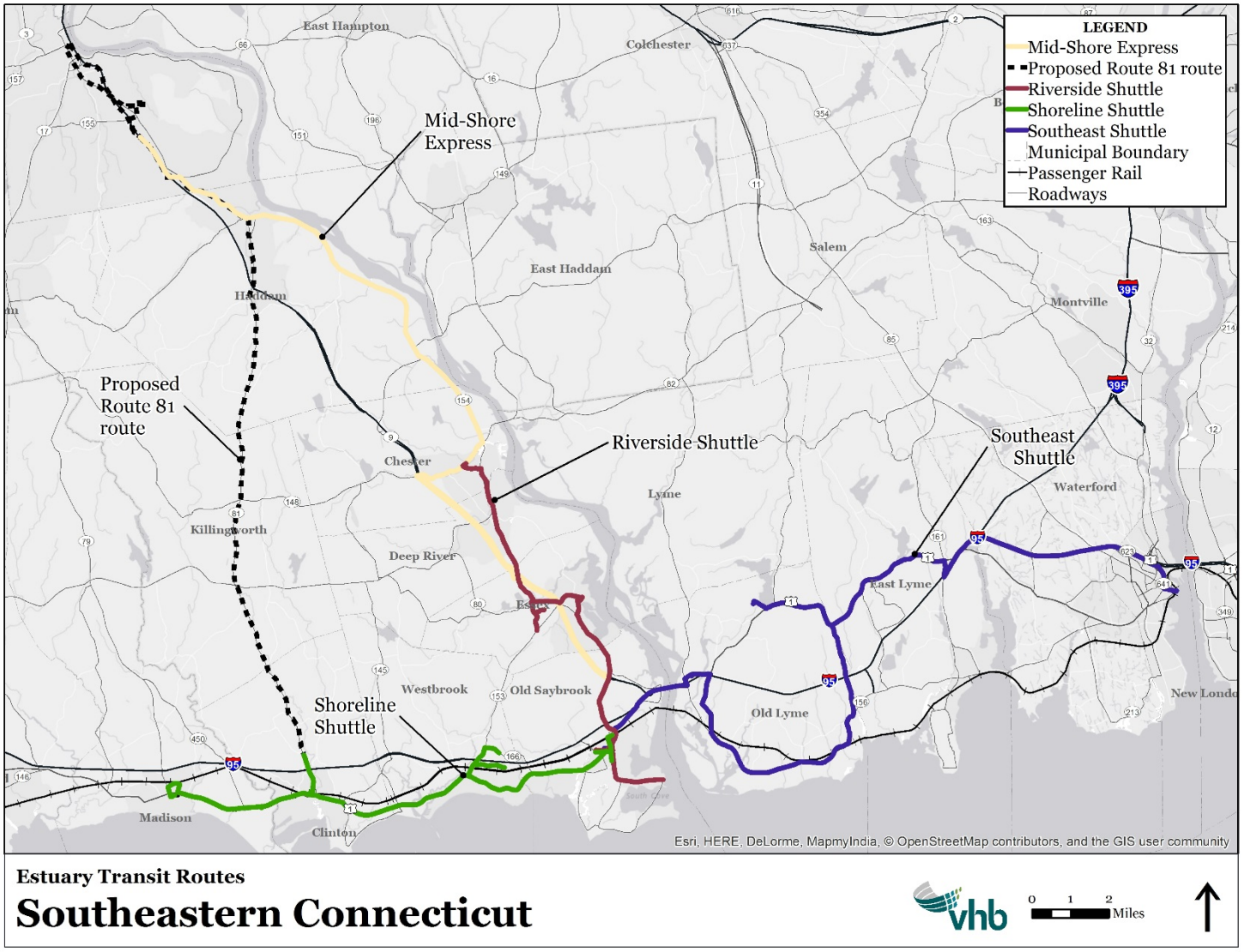


Estuary Transit District

The Estuary Transit District (known as 9 Town Transit) provides coordinated public transit service in the Connecticut River Estuary Region. The system serves the nine towns on the Connecticut Shoreline that created the agency: Chester, Clinton, Deep River, Essex, Killingworth, Lyme, Old Lyme, Old Saybrook, and Westbrook. The property also provides services on a contractual basis with the following towns: Durham, East Haddam, Haddam, and Madison. This service area is approximately 367.5 square miles, with a population of approximately 105,538.

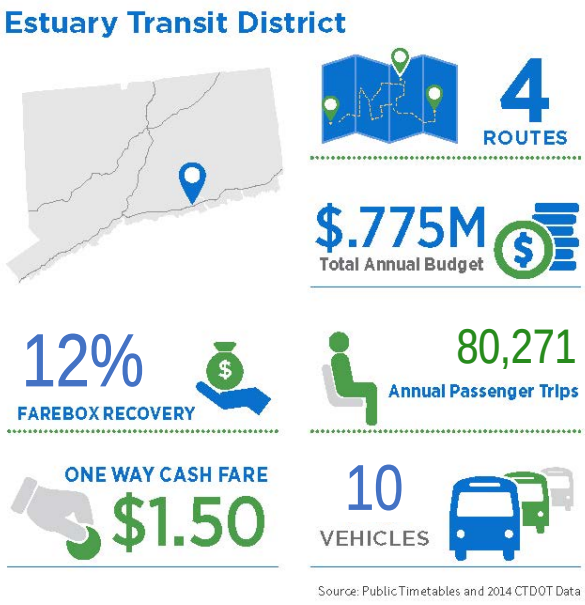
9 Town Transit is owned and operated by Estuary Transit District and managed by First Transit. 9 Town Transit operates four flexible routes (fixed stops with deviations) Monday through Friday between 6:30 AM and 7:30 PM. Saturday service from 7:30 AM to 6:00 PM is provided on two routes. 9 Town Transit also offers a demand response service (Dial-A-Ride) that operates Monday through Friday from 6:00 AM through 6:00 PM. (See Figure 17) Headways vary from 35 to 120 minutes.

Figure 17: Estuary Transit District Routes



The cash fare for 9 Town Transit is $1.75 for one-way travel. Passes are also available for 10-rides and monthly travel. Half-fare reduced passes are available for seniors, and persons with disabilities.

In FY2014, 9 Town Transit's fleet included 10 vehicles used for fixed route service, information on the number of vehicles required for maximum service was not available. This fleet accounted for 355,627vehicle revenue miles and 19,864 vehicle revenue hours. In FY2014, the transit district earned $115,135 in fare revenue, based on 80,721 annual passenger trips.[16]



Annual Expenses in the FY2014 for 9 Town Transit totaled $774,989 for operations. Nine Town Transit received operational funding of $464,526 from the State of Connecticut, $16,655 from the local government and $383,210 from the federal government. Operating revenue covered 11.6 percent of operating expenses.

16 All data is from public schedules and timetables or provided by CTDOT unless otherwise noted.

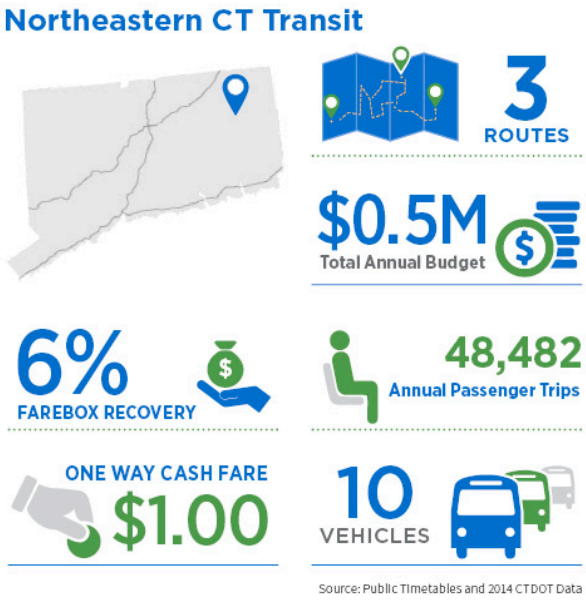
Northeastern Connecticut Transit District

The Northeastern Connecticut Transit District (NECTD) provides service to the northeast portion of Windham County, Connecticut and borders Rhode Island and Massachusetts. The district operates a flexible route bus and a dial-a-ride service. The towns included in the service area are: Brooklyn, Canterbury, Killingly, Putnam, Thompson, Eastford, Plainfield, Pomfret, Woodstock, and Union (see Figure 18). This region together is approximately 392.8 square miles in size with a total population of 79,753.

NECTD is owned, operated and managed by NECTD. NECTD operates four shuttle routes which provide service between the towns of Thompson and Brooklyn, the Northern Loop service for Putnam, and the Southern Loop service for Killingly/Brooklyn, the North Shuttle Route and the South Shuttle route.[17] The routes generally operate Monday through Friday with 60 minute headways. Service generally spans from 7:30 AM – 4:30 PM.

The cash fare for the transit district is $1.00 for one-way travel. Discounts are available for multiple rides.

NECTD operates a fleet of ten vehicles for fixed route service, information on the number of vehicles used in maximum service was not available. For their deviated fixed routes, the district operated 153,387 annual revenue miles of service and 9,641 annual revenue hours of service. FY2014 aggregate annual fare revenues totaled $31,656 based on 48,482 annual passenger trips.[18]



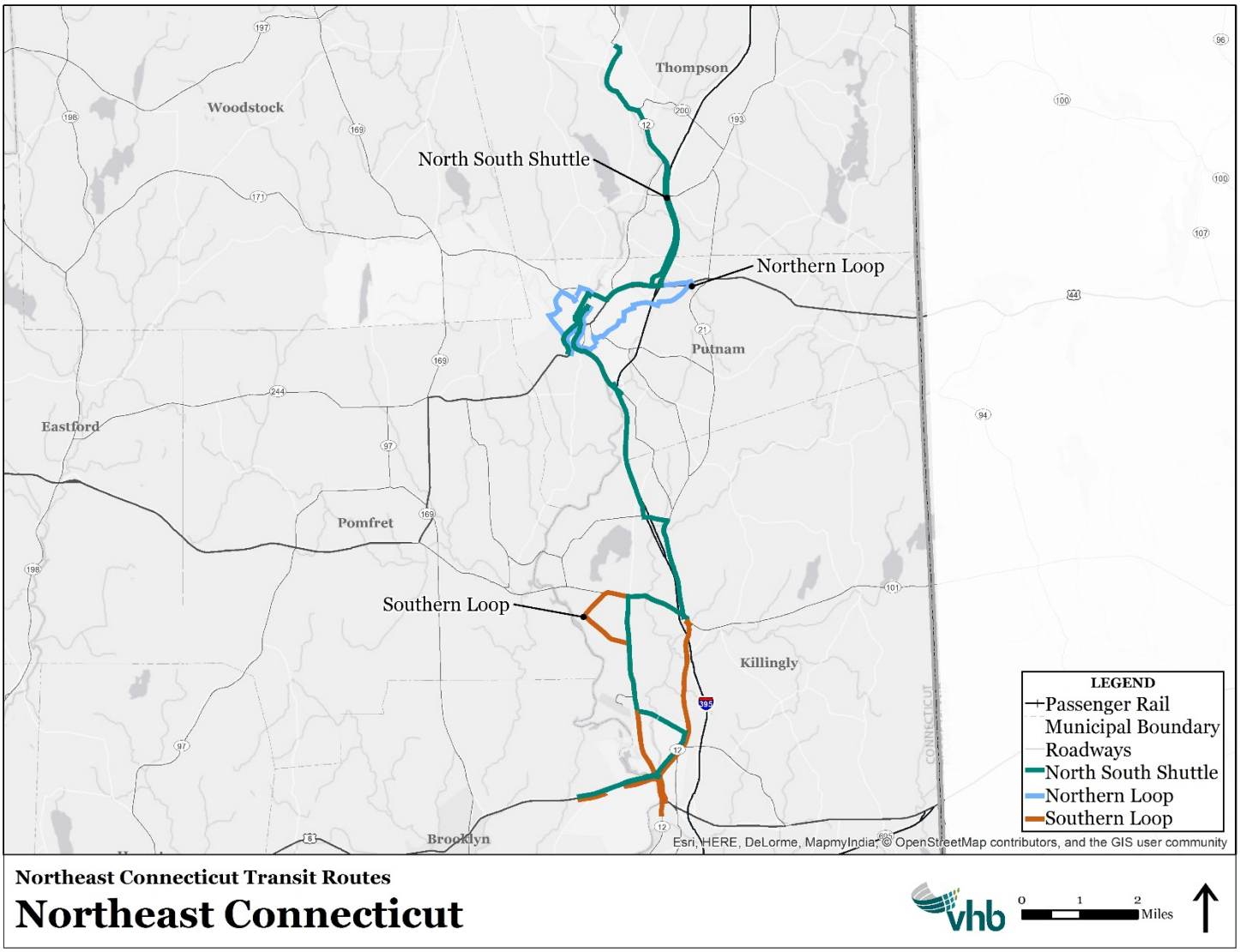
Annual Expenses in FY2014 for the district, including demand

17 Effective November 7, 2016, NECTD rebranded its bus routes for easier legibility and understanding, the Southern Loop is now the Green Line, the Northern Loop is the Blue Line, the South Shuttle is the Purple Line, and the North Shuttle is the Red Line.

18 All data is from public schedules and timetables or provided by CTDOT unless otherwise noted.

response, totaled $550,878 for operations. NECTD received operational funding of $166,285 from the State of Connecticut, 12,381 from the local government and $251,947 from the federal government. Fare revenue covered 5.7 percent of operating expenses)

Figure 18: Northeastern Connecticut Transit District Routes



Appendix B: Previous Studies

CT Statewide Bus Study - Summary of Previous Studies

Project Status as of October 2016

Study	Route Recommendations	Website Address
Service Planning Studies		
Norwalk Transit District (NTD). Comprehensive Operations Analysis & Facility Needs Assessment. (Study has not begun)	According to the RFP for this study, it was supposed to have started in November 2015. No further information is available and nothing appears on NTD website	
Greater New Haven Transit District (GNHTD). Greater New Haven Alternatives Analysis. (Study has not begun)	No information available	
Greater Bridgeport Transit (GBT). Transit Master Plan. (ongoing)	Recommendations are scheduled for release at a public meeting on March 23, 2016. Only presentation boards are available on web site, no detail.	http://gogbt.com/
Capitol Region Council of Governments (CRCOG). Hartford Comprehensive Transit Service Analysis. (ongoing)	Study is on-going and anticipated to be completed in Fall of 2016. The last round of public meetings was held in January 2016. Three service design concepts are being considered: Scenario 1 - Streamline Existing Service, Scenario 2 - Create a Regional BRT Network, Scenario 3 - Hybrid Approach – Strengthening key transit-supportive corridors in the Hartford area, and refocusing the bus network around these corridors. Potential changes to Hartford bus routes under Scenarios 1 and 2 have been developed. No final recommendations have been made at this time.	http://hartfordtransitstudy.com/
Naugatuck Valley Council of Governments (NVCOG). Waterbury Area Transit Study (WATS). (ongoing)	Study is on-going. Draft short-term recommendations were submitted to NVCOG and the Steering Committee for review and comment in January 2016. The proposed changes to bus service in Waterbury seek to address crowding, growing ridership, and improve overall operational efficiency. Recommendations include a new route on Lakewood Route, restructuring bus service in Naugatuck, reducing headways on the four routes serving North Main Street and the Town Plot section of Waterbury, Convert Route 28- Scott Road to a bi-directional route and operate all day from 7 AM to 6 PM, discontinue Route 26 and operate all East Main Street trips as Route 27, combine Routes 31 and 32 and increase headway, reduce headway on Route 40 and interline it with combined Routes 30/31, and remove part time deviations on Routes 15, 25, and 42. On weekends, early morning service with low ridership will be reduced on North Main Street and Town Plot and the revenue hours would instead be added to operate an additional round trip at 8:30 AM for Routes 13, 22 and 25. Also, it is proposed to combine Routes 27 and 28 into a standalone route and truncate Route 13.	http://www.waterburybusstudy.com/

Study	Route Recommendations	Website Address
Southeast Area Transit (SEAT). SEAT Bus Study. 2015.	The study was a Service Improvement Plan for the SEAT bus system. Three alternatives were evaluated in detail and presented to the Board. The Alternatives are under review. Two Alternatives are cost neutral (A and B), and the third has additional costs (C). Alternative A increases frequency and service, but reduces geographic coverage, focusing on the core of the system and reducing service in low ridership areas. Alternative B retains some of the service in the low ridership areas, and has less frequency on the rest of the system in general. Alternative C provides for additional express service, additional service on Sundays (on 5 more routes), extended hours of operation (on 9 routes), a new route to Foxwoods resort Casino, a new route serving Groton and a seasonal Mystic shuttle. SEAT Bus Study evaluated each of its routes and developed service improvement options (http://seatbusstudy.com/service-evaluations/).	http://seatbusstudy.com/
HART. 7 Link Efficiency Study. January 2016.	The purpose of this study was to evaluate the status of the Danbury-Norwalk Route 7 Link (7 Link) bus route and identify areas for improvement. The study summarized existing conditions, information survey results, and short- and long-term service enhancements.	https://westcog.org/wp-content/uploads/2016/02/7LINK-Bus-Route-Study.pdf
West Council of Governments (WestCOG). Westport Bus Service Operations and Needs Study. 2015.	The study assessed the transit service in Westport through an extensive public outreach program. Existing service was comprised of six commuter routes to the MTA Metro-North Railroad New Haven Line in the morning and evening, and a now discontinued after school service. The study recommended: extension of the existing Westport commuter route service spans by one hour in the morning and one hour in the evening, introduction of a daytime town circulator between Saugatuck station and downtown Westport, implementation of a downtown circulator if the previous two changes are successful, and additional marketing and communications support.	No specific project website, but it is included in ongoing studies by westcog and the draft final documents are available from a link on this page: https://westcog.org/transportation-studies/
CT Department of Transportation (CTDOT), Stamford Bus & Shuttle Study, 2015.	Study underway since Summer 2015. No reports on the website.	http://stamfordbusandshuttle.com/index.php
Southeastern CT Council of Governments, ASG Planning, and Connecticut DOT. Southeast Area Transport Bus Study: Service Evaluations. January, 2015.	The link, http://seatbusstudy.com/service-evaluations/, provides a connection to route specific evaluations for SEAT routes: 1-15, 101, 108, and Three Rivers Community College.	Appears to be the same project at the link: http://seatbusstudy.com/
Southeastern CT Council of Governments, ASG Planning, and Connecticut DOT. Southeast Area Transport Bus Study: Transit Market Analysis. December, 2014.	This document focused on community characteristics that are strong indicators of demand. These included: population and employment densities and socioeconomic characteristics for the SEAT service area.	Part of the SEAT bus study. The document for the specific transit market analysis can be found here: http://seatbusstudy.com/wp-content/uploads/2014/12/SEAT-Market-Anaylsis-Web.pdf

Study	Route Recommendations	Website Address
CRCOG. Manchester Transit Study: Final Report. January, 2013.	The report examined transit service in Manchester as an extension of congestion management activities. The report contains a route by route evaluation including service imrpvement options and several recommendations to improve transit service, including: creation of a transit hub at Buckland Hills, the realignment of existing CTTransit bus routes to serve Buckland Hills park-and-ride and the Shoppes at Buckland Hills, including the creation of a feeder/circulator bus route for Buckland Hills area, updating bus schedules to converge at Common Buckland Hills park-and-ride and the Shoppes at Buckland Hills, creation of a mini-transit hub on Spencer Street and adjusting service, realignment of Route 83 and service span changes, separation of routes 82 and 84, the elimination of several unproductive route segments, creation of a University Pass system, and improved marketing.	http://www.sustainableknowledgecorridor.org/site/sites/default/files/Manch_FINAL.pdf
CRCOG. Downtown Hartford Bus Circulation Study. December 2012.	The transit circulation concept propsed to develop an east-west spine of transit service along Asylum and Pearl streets creating two east-west transit priority streets, one for local and express bus service and one for the new CTfastrak busway service.	http://www.crcog.org/transportation/studies/downtownbus.html
CRCOG. Windsor TMA Final Report: Hartford Transit Enhancement Bus Study. August, 2012.	The study focused on the development of a TMA in the Windsor area. The study recommended that the corporate area develop a transportation management association which could provide shuttle bus service to the office locations from a proposed transit hub. This study examined the potential for, and the current corporate interest in, establishing a transportation management association. The final report recommended that the region move forward in a stepwise fashion, beginning with an informal association progressing to a full Transportation Management Association. An employer based shuttle service in Windsor could be feasible based on certain external factors such as: NHHS regional rail service begins service, the Great Pond Mixed Use development has 1,000 completed units, gas prices rise and increase pressure to use transit, and Knowledge Corridor employment continues to grow.	No project specific website, description of the project here: http://www.sustainableknowledgecorridor.org/content/transit-enhancement-bus-study and the final report here: http://www.sustainableknowledgecorridor.org/site/sites/default/files/2012-0810%20Windsor%20TMA%20Final%20Report_FINAL2.pdf
Southwest Regional Planning Association (SWRPA). Coastal Corridor Bus Study: Recommended Service Plan. May, 2012.	Comprehensive look at bus service between Port Chester NY, and Madison CT. Recommends two types of bus service, local similar to current routes, and an overlay of express bus/limited stop service with variable operating patterns. Proposed limited stop/express include a streamlined Route 11A between Port Chester and Stamford (seven days per week all day); a limited-stop overlay service between Stamford and Bridgeport (operating peak periods); a limited-stop/express overlay service between Bridgeport and New Haven (incorporating Route 55x as the middle, express portion of the route), extended to Hamden via Dixwell Avenue (operating weekday peak periods and weekend middays/afternoons); and an express Route S operating nonstop along the segment where Route F provides local service, then local to Madison (weekdays).	http://66.165.136.235/Default.aspx?Transport=257

Study	Route Recommendations	Website Address
CRCOG. Enfield Transit Study: Final Report. August, 2012.	The Town of Enfield has a relatively large population of people with a higher proclivity to use transit. Enfield has no local bus service. It is served by CTTRANSIT's No. 5 express service between Enfield and Hartford. n An intermodal facility is proposed for the Thompsonville section of Enfield and would be located on the proposed New Haven-Hartford-Springfield (NHHS) rail line. A recommended service plan was developed that is comprised of two loop routes. The Primary Loop – the primary "clockwise loop" that will operate in the clockwise direction only between 7:00 AM and 11:00 PM. The primary loop also operates all day on Saturday. Peak Period Loop – a secondary "counter-clockwise loop" that will operate along the same alignment as the primary loop but in the opposite direction. This service will operate during peak periods only (7:00 AM – 10:00 AM and 3:30 PM to 7:00 PM).	project is complete, no website found. Final documentation located here: http://www.crcog.org/publications/TransportationDocs/Transit/CompTransitServiceAnalysis/1EnfieldReport.pdf
Housatonic Area Regional Transit (HART), HART Fixed Route Efficiency Study. 2011.	The purpose of the fixed route efficiency study of the Housatonic Area Regional Transit (HART) system was to review individual route performance and determine how well each route functioned as part of the entire system. Study goals included a review of operating efficiency and effectiveness of individual routes, and identified corrective and remedial measures to improve bus services. Systemwide corrective actions included: Improving on-time performance through installation of AVL on buses, consider replacing fleet with 12 year 30-foot buses, conisder purchasing one or more diesel/electric or gasoline/electric hybrid buses to better understand the operational and financial impacts of this technology, and expanding its expand its marketing efforts to reach the spanish speaking population. In addition, route specific recommendations were made.	No project website found. Final documentation here: https://westcog.org/wp-content/uploads/2015/09/HART_Fixed_Route_Efficiency_Study_2011.pdf
HART. Bus Service Plan. March, 2010.	This plan proposed future transit improvements for bus routes serving the following municpalities in the HART service area: Bethel, Bridgewater, Danbury, New Fairfield, New Milford, Newtown, Redding, Ridgefield, and Sherman. It also	No information found
Regional Plan Association and Transit for Connecticut Coalition. Missing Links: Prioritized Bus Service Expansion Plan. January, 2010.	This study proposed thirteen new routes where transit service could best replace vehicle travel. The study analyzed trip data from the Connecticut Department of Transportation that shows that adding these routes could replace up to 64,000 car trips. The final report and its appendices are not available on RPA's website. Only a summary of recommendations was available.	http://www.rpa.org/article/missing-links-plan-for-bus-expansion-in-connecticut
HART. Expanding Bus Transit to Bridgeport and Waterbury: Final Report. December, 2007.	The purpose of this study was to determine the need for and possible structure of public transit connections between the Housatonic Valley Region and the urban centers of Waterbury and Bridgeport. It examined existing conditions and disscussed potential options to improve connections between the Housatonic Region and the neighboring regions in Greater Bridgeport and the Central Naugatuck Valley and corridor specific transit improvements.	No project website found, but it is included in a summary of projects described here: https://westcog.org/bus/ and the final documentation is here: https://westcog.org/wp-content/uploads/2015/09/HART-bridgeport-waterbury-bus-study1.pdf

Study	Route Recommendations	Website Address
HART, Harlem Line Shuttle Bus Study, 2006.	This study examined the possibility for further enhancements for Connecticut residents between Connecticut and the Harlem Line. The study examined existing conditions, summarized results from a survey of ridses at six Harlem Line stations not served by shuttle bus, and recomended enhancements to existing shuttle bus services such as improved marketing, use of higher capacity vehicles as needed, adding shuttle trips to meet earlier trains.	No project website found, but it is included in a summary of projects described here: https://westcog.org/bus/ and the final documentation is here: https://westcog.org/wp-content/uploads/2015/09/HART_Harlem_Line_Shuttles1.pdf
Corridor Studies		
State Rail Plan Update (has not started)	No information available	Previous state rail plan: http://www.ct.gov/dot/cwp/view.asp?a=1386&q=437648
CTDOT. CTfastrak Expansion Study. 2016	Open house public meetings in January 2016, alternatives were presented. Recommendations in Summer 2016. The plan for enhancements will be complete by September 2016.	http://ctfastrak.com/about/expansion-study
CTDOT. I-84 Hartford Study. 2016.	This study to address I-84's structural deficiencies, improve traffic operations and safety, and reduce congestion is underway. Public meetings held in February 2016. Reviewing existing conditions, no specific recommendations. The Connecticut Department of Transportation is conducting surveys on all CTfastrak and CTtransit Hartford routes from March 8th through April 30th, 2016. Survey results will help the project team better understand travel patterns and choices of transit riders.	http://www.i84hartford.com/
Greenwich-Norwalk BRT Feasibility Study (on-going)	A study was completed in 2009. According to an article in the Stamford Advocate article dated Febraury 23, 2015, the State is reexamining this plan. The only information avaiable is from the 2009 study. Proposed a Enhanced Bus Service Plan based on BRT on Route 1 and ITS components on CT Transit Route 41 (Stamford-Norwalk) buses.	http://66.165.136.235/default.aspx?Transport=247
CTDOT. Central Connecticut Rail Study (on-going)	Study has been ongoing for several years. An August 2015 update indicated passenger (rail and bus) analysis was wrap up, and a new focus on imprviong freight rail on the Pan Am Southern was identified. IN April 2013, two focus group meetings were held with residents, and employers and employees and to provide an opportunity for concentrated input about travel behavior and desires from distinct stakeholder groups.	http://centralctrailstudy.com/
City of New Haven. New Haven Alternatives Analysis. August, 2014. – This study will consider both corridor and service planning issues.	The only available information are the New Haven AA Final Report Appendices which present public engagement activities and materials.	No project website found, final documentation here: http://www.cityofnewhaven.com/TrafficParking/pdfs/Alternatives%20Analysis.pdf
Connecticut Association for Community Transportation. Riding the Bus: The Pace of Investment in Public Transportation. February, 2011.	General report suggesting increased investment in transit statewide, and laying the case for that investment. There are no specific recommendations for individual systems or routes.	Final report included in a webpage summarizing reports prepared by CACT: http://www.cact.info/legislativecact.php
South Western Regional Planning. Greenwich//Norwalk Bus Rapid Transit Study. October, 2009.	Study of BRT/Enhanced Bus Service in mixed traffic on US 1 corridor - Stamford to Norwalk. Proposed branding, enhanced equipment, operations improvements - signal pre-emption etc. Anticipated 142,500 additional annual riders.	http://66.165.136.235/default.aspx?Transport=247

Study	Route Recommendations	Website Address
Multimodal Studies		
Stamford Bike & Pedestrian Plan (Study has not begun)	Not applicable	No information found
WestCOG. Darien Noroton Height Train Station Access Study. (Study has not begun)	No information available	No information found
Tripnet. Connecticut Transportation by the Numbers: Meeting the State's Need for Safe and Efficient Mobility. December, 2014.	Focus is on highways and roadway needs, little if any, mention of transit. No specific route or other recommendations.	Final report: http://www.tripnet.org/docs/CT_Top_Transportation_Issues_TRIP_Report_Nov_2015.pdf
South Central Regional Council of Governments (SCRCOG), Greater New Haven Branch of the NAACP, Workforce Allinace. December 2014. How Transportation Problems Keep People Out of the Workforce in Greater New Haven	Analyzed how limitations in the public transportation system, particularly in terms of bus service (i.e., long commute times, reduced bus service at night on weekends and long distances between bus stops and employment desitations), limits opportuinites for residents particpate in the workforce in Greater New Haven.	http://ctdatahaven.org/reports/how-transportation-problems-keep-people-out-workforce-greater-new-haven
SCRCOG. City of New Haven Two-way Conversion. Final Report. June, 2014.	Assessed the impact of converting existing one-way street pairs in downtown into two way streets. The conversion was found to be very favorable for transit. No specific recommendations were made for revisions to the route structure or transit related costs identified.	http://www.cityofnewhaven.com/TrafficParking/presentations.asp
Connecticut Business and Industry Association and UIL Holdings Corporation. 2013 Connecticut Transportation Study. 2013.	Survey of the business community relating to transportation issues. No specific recommendations. Highway expansion was identified as the most beneficial focus for state transportation funding (55%), with expanding commuter rail systems as the second most beneficial use (17%).	No specific web page, link to final document located here: http://www.stamfordchamber.com/
Town of New Milford, Transportation Management Plan: Final Report. October, 2013.	Limited transit service in downtown New Milford. No recommendations for enhancement or improved/modified service.	No specific webpate, but the public works department provides links and brief overview of project: http://www.newmilford.org/dpw
Southeastern Connecticut Council of Governments. Long Range Regional Transportation Plan FY 2011-2040 for Southeastern Connecticut. April, 2011.	No specific route plans mentioned, however the plan strongly supports the implementation of the Intermodal Connections Study (2005) and the SEAT Transit Plan (1997). The need for a New London Transit Center was also highlighted. Four of the top regional projects were transit oriented; expansion of the regional bus network, provision of regular route, frequent Shoreline East (SLE) passenger rail service, and use New London Union Station as a multimodal transportation facility	No specific webpage, but the project documents are listed on this webpage under transportation
CTDOT. Locally Coordinated Public Transit – Human Services Transportation Plan for the State of Connecticut. July, 2007.	No specific routes were identified. The Plan did specify various gaps in service across the state, but no specific detailed route alignment or service recommendations were noted.	2009 update plan documenttation: http://www.ct.gov/dot/lib/dot/2009_Update_to_Coordinated_Plan.pdf
Southeastern Connecticut Council of Governments (SECCOG). Intermodal Connections Study Southeast. February, 2005.	Four routes suggested - Between New London Intermodal center and Mohegan Sun (express) with continuing service to Mystic (Local); Between Foxwoods Casino and New London Intermodal Center (Express); Between Foxwoods Casino and Mystic (Local); and between Mohegan Sun and Foxwoods Casino (Express).	http://www.seccog.org/imcs_05.html

Study	Route Recommendations	Website Address
Other Studies		
Statewide Governance Alternatives (has not started)	No information available	No information found
CTDOT. Connecticut Statewide Household Transportation Study. 2016.	Survey began in March 2016.	https://cttransportationstudy.org/web/pages/home?locale=en-US
CRCOG. TOD Desire & Readiness Study (on-going)	An open house will held on April 6, 2016 in West Hartford. No other information or documents are available.	No documentation or webpage found
Central Naugatuck Valley Council of Governments and North East Transportation Company. Waterbury Regional Bus Ridership Study. 2013.	The existing Waterbury bus system consists of 24 fixed routes, and six tripper routes connecting to industrial parks consistent with the shifts at the locations. The analysis suggested modifications of several routes, and adjustment of schedules on several others related to on time performance. Route changes were recommended on the following routes: 42, 15, 32,35 and 25. Headway modifications were recommended on the following routes: 28, 15, 16, 27, 31, and 36. It was recommended that the Naugatuck/Waterbury Shuttle be converted to a full time route, and combining the N1 and N2 routes. Changes were also recommended on the evening and shopping center routes. Bus operations issues were also noted. The study recommended using small buses on low volume routes to reduce costs.	http://www.nvcogct.org/publication/waterbury-regional-bus-ridership-study-2013
Waterbury Area Transit Study Market Analysis. 2013.	Transit market analysis including ridership, transfers, productivity and efficiency. Comparison with peer transit agencies is also included. No recommendations for route modifications are included.	http://www.waterburybusstudy.com/
New Haven City Planning Commission. Comprehensive Plan Update, Databook. June, 2013.	Plan reviews transit service available in New Haven, but does not make any recommendation for additional or enhanced service.	http://www.cityofnewhaven.com/cityplan/comprehensive.asp
CTDOT. Connecticut State Management Plan: Section 5311 Program Public Transportation for Non-urbanized Areas. August, 2010.	All procedural, no mention of specific routes or services.	http://www.ct.gov/dot/cwp/view.asp?a=1386&q=464108

Appendix C: Transit Service Guideline Matrix Analysis

This matrix presents the service standards and criteria used to measure bus system performance by various studies undertaken by the state's transportation providers. The data provides an insight into available data and identifies the metrics that were considered key indicators of performance.

Service Guidelines Matrix REPORT:	2000 Connecticut Statewide Bus Study	2005 Intermodal Connections Study Southeast	2006 HART Harlem Line Shuttle Bus Study	2007 HART Expanding Bus Transport to Bridgeport and Waterbury	2010 HART Bus Service Plan	2010 Missing Links: Prioritized Bus Service Expansion Plan	2011 HART Fixed Route Efficiency Study	2011 Long Range Regional Transportation Plan FY 2011-2040 for Southeastern Connecticut	2011 Riding the Bus: The Pace of Investment in Public Transportation	2012 Coastal Corridor Bus Study	2012 Enfield Transit Study	2012 Windsor Transportation Management Area Final Report	2012 CT*transit* Service Guidelines	2013 City of New Haven Comprehensive Plan Update	2013 Connecticut Transportation Survey	2013 Manchester Transit Study	2013 Town of New Milford Transportation Management Plan	2013 Waterbury Regional Bus Ridership Study	2014 City of New Haven Two-Way Conversion	2014 Connecticut Transportation by the Numbers: Meeting the State's Needs for Safe and Efficient Mobility	2014 CT*transit* CSA Analysis Existing Conditions & Service Overview	2014 SEAT Bus Study: Transit Market Analysis	2015 Waterbury Area Transit Study: Market Analysis	2015 Westport Bus Operations and Needs Study	% Usage
Route Design																									
Route coverage at the production end	✓	✓	☐	✓	☐	☐	✓	☐	☐	☐	✓	☐	☐	✓	☐	✓	☐	☐	☐	☐	☐	✓	☐	☐	33%
Route coverage at the attraction end	✓	✓	☐	✓	☐	☐	✓	☐	☐	☐	☐	☐	☐	✓	☐	✓	☐	☐	☐	☐	☐	✓	☐	☐	29%
Bus Stop Spacing	☐	☐	☐	☐	☐	☐	✓	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	4%
Overall Route Directness	✓	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	✓	☐	✓	☐	✓	☐	☐	☐	☐	☐	☐	☐	☐	17%
Route coverage	☐	☐	☐	☐	☐	☐	✓	☐	☐	✓	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	8%
Service area poverty level	✓	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	✓	☐	☐	☐	☐	☐	✓	☐	☐	13%
Bus stop location guidelines	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	✓	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	4%
Route design guidelines (limited stop, express)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	0%
Schedule Design	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Frequency/ Headway Guidelines	✓	✓	✓	✓	☐	☐	✓	☐	☐	☐	✓	✓	☐	☐	☐	✓	☐	✓	☐	☐	☐	☐	✓	✓	46%
Span of Service Guidelines	✓	☐	☐	☐	☐	☐	☐	☐	☐	✓	✓	✓	☐	☐	☐	✓	☐	☐	☐	☐	☐	☐	☐	☐	21%
Vehicle Needs	☐	☐	☐	☐	☐	☐	☐	☐	☐	✓	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	4%
Route Run Time	✓	☐	☐	☐	✓	☐	☐	☐	☐	✓	✓	☐	☐	☐	☐	☐	☐	✓	☐	☐	☐	☐	☐	☐	21%
Efficiency & Productivity	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Fare Structure	☐	☐	☐	✓	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	4%
Fare box Recovery	✓	☐	☐	☐	☐	☐	✓	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	✓	☐	☐	✓	17%
Loading	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	✓	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	4%
Productivity	☐	☐	✓	✓	✓	☐	✓	☐	☐	✓	✓	✓	☐	✓	☐	☐	☐	✓	☐	☐	☐	☐	✓	✓	46%
Average Fare	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	0%
Operating Efficiency/ Effectiveness	✓	☐	☐	☐	✓	☐	✓	☐	✓	☐	✓	✓	☐	✓	☐	☐	☐	✓	☐	☐	✓	☐	✓	✓	46%

Service Guidelines Matrix REPORT:	2000 Connecticut Statewide Bus Study	2005 Intermodal Connections Study Southeast	2006 HART Harlem Line Shuttle Bus Study	2007 HART Expanding Bus Transport to Bridgeport and Waterbury	2010 HART Bus Service Plan	2010 Missing Links: Prioritized Bus Service Expansion Plan	2011 HART Fixed Route Efficiency Study	2011 Long Range Regional Transportation Plan FY 2011-2040 for Southeastern Connecticut	2011 Riding the Bus: The Pace of Investment in Public Transportation	2012 Coastal Corridor Bus Study	2012 Enfield Transit Study	2012 Windsor Transportation Management Area Final Report	2012 CT*transit* Service Guidelines	2013 City of New Haven Comprehensive Plan Update	2013 Connecticut Transportation Survey	2013 Manchester Transit Study	2013 Town of New Milford Transportation Management Plan	2013 Waterbury Regional Bus Ridership Study	2014 City of New Haven Two-Way Conversion	2014 Connecticut Transportation by the Numbers: Meeting the State's Needs for Safe and Efficient Mobility	2014 CT*transit* CSA Analysis Existing Conditions & Service Overview	2014 SEAT Bus Study: Transit Market Analysis	2015 Waterbury Area Transit Study: Market Analysis	2015 Westport Bus Operations and Needs Study	% Usage
Service Delivery & Maintenance	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Running Speed	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	0%
Vehicle Trips Operated	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	✓	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	4%
Pull-Outs Dispatched	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	0%
Miles per Road Call	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	0%
Waiting Shelters/Benches/Area	✓	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	✓	☐	☐	☐	☐	✓	☐	☐	☐	☐	☐	☐	☐	☐	13%
Bus Stop Signs	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	0%
Revenue Equipment Condition	✓	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	4%
Public Information/Schedules	✓	✓	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	8%
Revenue Miles between Failures	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	0%
Fleet Spare Ratio	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	0%
Rider Characteristics	☐	☐	☐	✓	☐	☐	☐	☐	☐	✓	☐	☐	☐	✓	✓	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	17%
Performance	✓	☐	☐	☐	☐	☐	✓	☐	☐	✓	☐	☐	☐	☐	☐	☐	☐	☐	✓	☐	☐	☐	☐	☐	☐	17%
Fleet Age	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	0%
TOTAL per REPORT	**13**	**4**	**2**	**6**	**3**	**0**	**9**	**0**	**1**	**7**	**7**	**8**		**6**	**1**	**6**	**1**	**5**	**0**	**0**	**2**	**3**	**3**	**4**	☐

Appendix D: Transit Property Data Request Form

Operating Division/Transit Property Name: _____
Date _____

Subject Area	Item Requested	File Name	Comments
Schedule Characteristics	Existing and Historic System Maps (three years)		
	Existing and Historic Route Timetables (three years)		
	Existing internal/operator Timetables for each route (showing pull in/pull out, interlining, layover etc.)		
	GTFS Data for each route		
	GIS data for each route		
	Turn-by-Turn Route Instructions		
	Schedule/Frequency of Routine Service Changes for each division/property		
Financial Data	Current and Historic Total Operating Costs by Route		
	Current statistics (miles, hours, vehicles) by route		
	Division/Property O&M Models (used to estimate the cost of providing service)		
	Audited Financial Reports for each division/property (Three Years)		
Ridership Information	Stop level ridership by route, stop and trip (ride check/APC data)		
	Transfer Data by route		
	Ridership Trends by route for average weekday, Saturday and Sunday ridership (three years)		
	Loading Data (maximum riders on bus by time of day) by Route and Location		
	Origin-Destination Study Data		
Performance Assessments	On-time performance by route		
	Previous operational analyses		
	Service Guidelines for each division/property		

Subject Area	Item Requested	File Name	Comments
Fare System Info	Fare policy (last three years)		
	Fare System Infrastructure		
	Fare Structure		
	Farebox Recovery and Revenue by Route		
	Planned fare system changes		
Fleet Information	Number and type of vehicles used for revenue service (manufacturer, propulsion, vehicle size, ADA accessibility, and vehicle age)		
	Fleet assignments by route		
Maintenance Facility Data	Location, capacity and utilization for each maintenance facility		
Passenger Infrastructure Data	Transit-hub locations and description		
	Bus stop information (location) and amenities (benches, shelters, signs)		
	GIS data for all stations/stops		
	Passenger communication systems (signage/other info)		
	Design standards		
Operator Information	Contractor agreements		
	Labor agreements		
	O&M funding sources		
Plans and Policies	Capital Improvement Plans		
	Transit Development Plans		
	Fleet Management Plans		
	Fastrak Service Planning Studies		
	Division/Property Specific TDPs, COAs, and other planning studies		

Appendix E: Hartford Line Rail/Bus Connections

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1 Introduction

Providing intermodal connections between bus and rail service offers several benefits including:

- Expanded transportation options and increased mobility to residents
- Reduced dependence on automobiles for travel
- Reduced or moderated parking demand at rail stations
- Increased reach and wider service coverage for rail and bus services by connecting these modes

Increased intermodal connectivity between bus and rail service helps achieve the following Statewide Bus Study goals:

- Enhance fixed route transit access to jobs
- Develop recommended improvements to service frequency and span to relieve overcrowding, improve reliability and best meet the state's travel needs
- Determine where connectivity between the bus and rail system in Connecticut can be enhanced

The purpose of this task was to assess and identify opportunities to integrate/synchronize schedules between fixed bus routes and the following Hartford Line Stations: Windsor, Hartford Union Station, Berlin, Meriden, and Wallingford.

The Hartford Line is a planned rail service between and Springfield, Massachusetts. It will operate over Amtrak's New Haven–Springfield Line and supplement existing Amtrak intercity rail services between the two cities. It will also provide new rail service to communities in the central portion of the state. The service is anticipated to begin in 2018.

Please note that the Hartford Line rail schedule presented in this document is considered DRAFT until approved for release by the Commissioner of Connecticut Department of Transportation.

2 Available Data

This analysis was limited to a comparison of existing bus route schedules and draft 2018 Hartford Line schedules, and an assessment of census block groups identified as having high transit propensity within a two-mile radius of the selected Hartford Line stations.

No station level ridership estimates by time period, mode split estimates, or origin and destination data were available for this analysis.

All bus schedules and all bus route maps were obtained from the CT*transit* website and represent most current data available.

3 Approach

An inventory of local bus routes serving the selected rail stations was completed, followed by an analysis comparing train arrivals/departures to bus arrivals/departures at the stations. Train and bus schedules were compared to identify train and bus trips where bus/rail transfers and connections ("meets") occur or do not occur based on their corresponding schedules.

An extensive search for rules governing bus-rail transfers was undertaken but did not yield formal industry rules. However, the Los Angeles County Metropolitan Transportation Authority developed an implementation plan to better coordinate transit agencies' schedule development and transfers. In a memorandum dated, March 21, 2013 to the System Safety and Operations Committee, a methodology was shared to facilitate bus-rail transfers. This methodology is detailed below.

In absence of formal rules, this methodology was adopted and applied as a guideline for the purposes of this task. Transit agencies may choose to alter these guidelines as they see fit. For the purposes of this analysis the standards were strictly applied.

To facilitate transfers between rail and bus services, adequate time between meets is necessary to allow transferring passengers to access bus stops/rail platforms and to purchase tickets, without excessive waiting times.
The following criteria were used as a measure of coordination and to identify bus/rail meets requiring schedule adjustment or if no connection/transfer can be made. Tables that follow are color-coded to correspond with these guidelines.

- 3 minutes or less between a bus or train arrival or departure is considered a missed connection (pink)
- 4 or 5 minutes between a bus or train arrival or departure is considered a connection that needs a minor schedule adjustment to improve the connection (gold)
- A 6 to 15-minute window between a bus or train arrival or departure is considered a good connection needing no modifications (green)

- 16 to 17 minutes between a bus or train arrival or departure is considered a connection that needs a minor schedule adjustment to improve the connection (gold)
- 18 minutes or more between a bus or train arrival or departure is considered a missed connection (pink)

These criteria were applied in the assessment of bus and rail schedules and are shown in the tables in the next section. Recommendations for further actions to improve bus and rail connectivity are identified.

4 Schedule and Transit Propensity Analysis

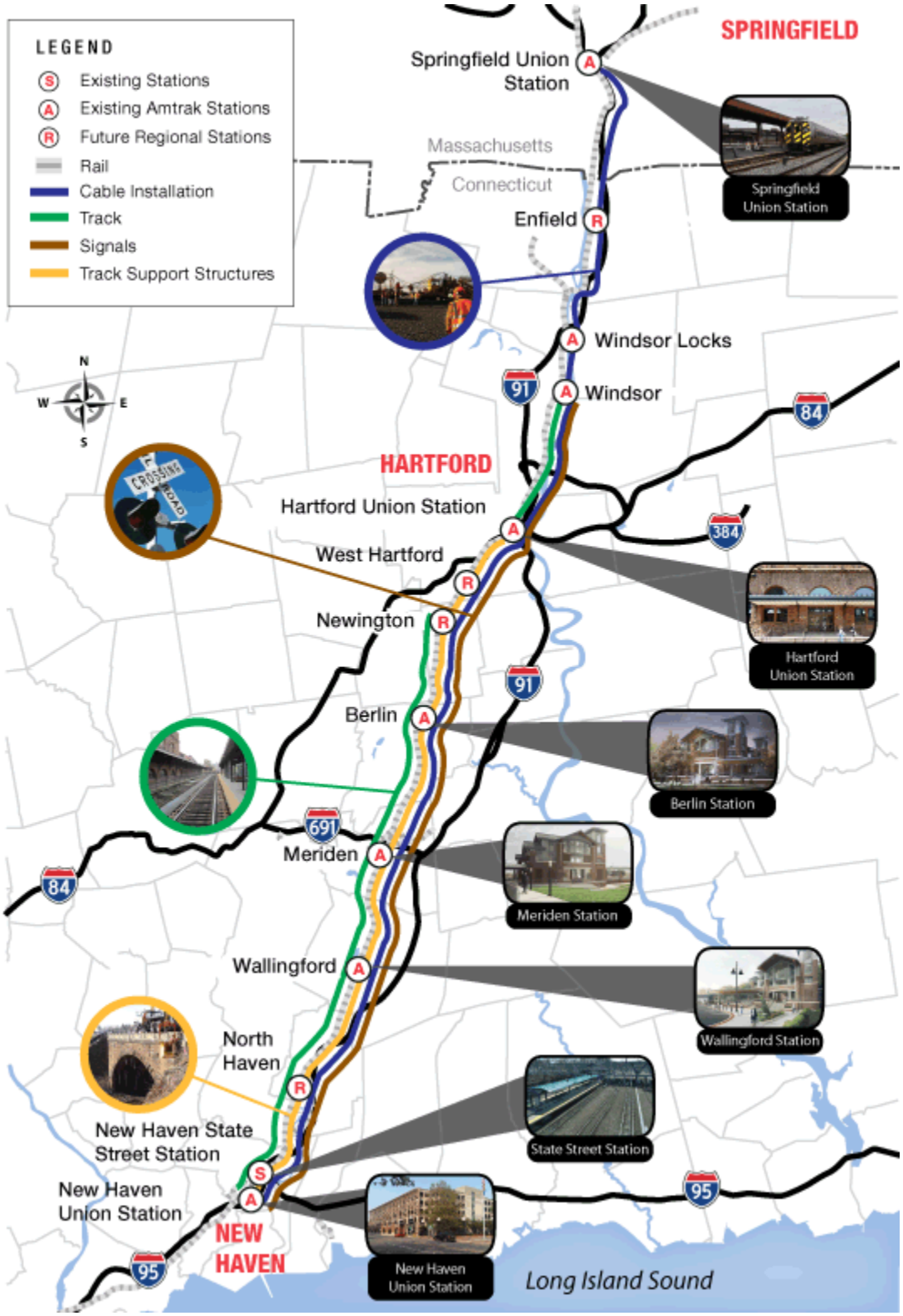
4.1 Hartford Line

The Hartford Line (see Figure 1) is a planned rail service between and Springfield, Massachusetts. It will operate over Amtrak's New Haven–Springfield Line and supplement existing intercity rail services between the two cities. It will also provide new rail service to communities in the central portion of the state. The line will initially serve nine stations including six existing stations (five in Connecticut) and three replacement/new stations in Berlin, Meriden and Wallingford. Four additional stations are contemplated in Enfield, West Hartford, Newington and North Haven.

Currently, Amtrak intercity rail service is provided to Springfield, Massachusetts, Windsor, Windsor Locks, Hartford, Berlin, Wallingford and New Haven. New CT*rail* regional train service will serve these stations as well as Enfield (in future phase), West Hartford (in future phase), Newington (in future phase) and North Haven (in future phase.)

The CT*rail* regional train service is anticipated to begin in January 2018. Upon completion of the Hartford Line regional rail project, rail service on between Springfield and New Haven will have improved frequency, span of service, and travel times.

Figure 1: Hartford Line and Stations



4.2 Windsor Station

Windsor Station is located at 41 Central Street and is currently served by Amtrak intercity rail service. The nearest bus stops are located at Central Street and Broad Street and Mechanic Street south of Central Street. Transfers to the rail station require a short walk of 300 – 350 feet based on bus stop locations as shown in Google maps. The bus stops are served by three CT*transit Hartford Division* bus routes: Route 32 Windsor Avenue, Route 34 Windsor Avenue/Rainbow, and Route 36 Windsor Avenue/Day Hill Road. These routes operate between Windsor and Downtown Hartford.

Route 32 operates on weekdays and Saturdays. This route has four route variations, 32 Windsor Center, 32A Windsor Center via Weston Street, 32B Windsor Center-Bloomfield Avenue via Weston Street, and 32M Windsor Center via Matianuck Avenue and Weston Street.

- Route 32 has limited service on weekdays (six daily trips) and is primarily oriented toward Hartford in the morning with three trips serving the stops in the vicinity of the rail station (6:24 AM, 7:10 AM, and 7:46 AM) and to Windsor in the afternoon and evening (3:52 PM, 4:47 PM, 6:48 PM).
- Route 32A operates on weekdays and Saturdays. During the week, it operates between 7:30 AM to 6:30 PM on 60 minute headways. On Saturdays, the Route 32A runs from 7 AM to 8 PM on 60 minute headways.
- Route 32B provides two trips on weekdays only from Hartford to Windsor at 6:58 AM and 7:58 AM.
- Route 32M operates on weekdays only and has three trips in the morning at 5:48 AM, 6:58 AM, and 7:58 AM, and two trips in the late afternoon/evening at 4:51 PM and 6:10 PM.
- Route 34 is a weekday only service with four trips in each direction from 6:00 AM to 9:00 AM and five trips in the afternoon and evening.
- Route 36 operates on weekdays only with 60 minute headways from 8 AM to 3 PM and 90 minute headways from 3 PM to 11 PM.

The CT*transit* Route 32 Map is displayed in Figure 2, Route 34 Map is shown in

Figure 3, and the Route 36 Map in Figure 4. A comparison of weekday and weekend bus and train meets at Windsor Station is displayed in Table 1 and Table 2. Census Tracts by Transit Propensity in Windsor is displayed in Figure 5.

Figure 2: CT*transit* 32 Route Map

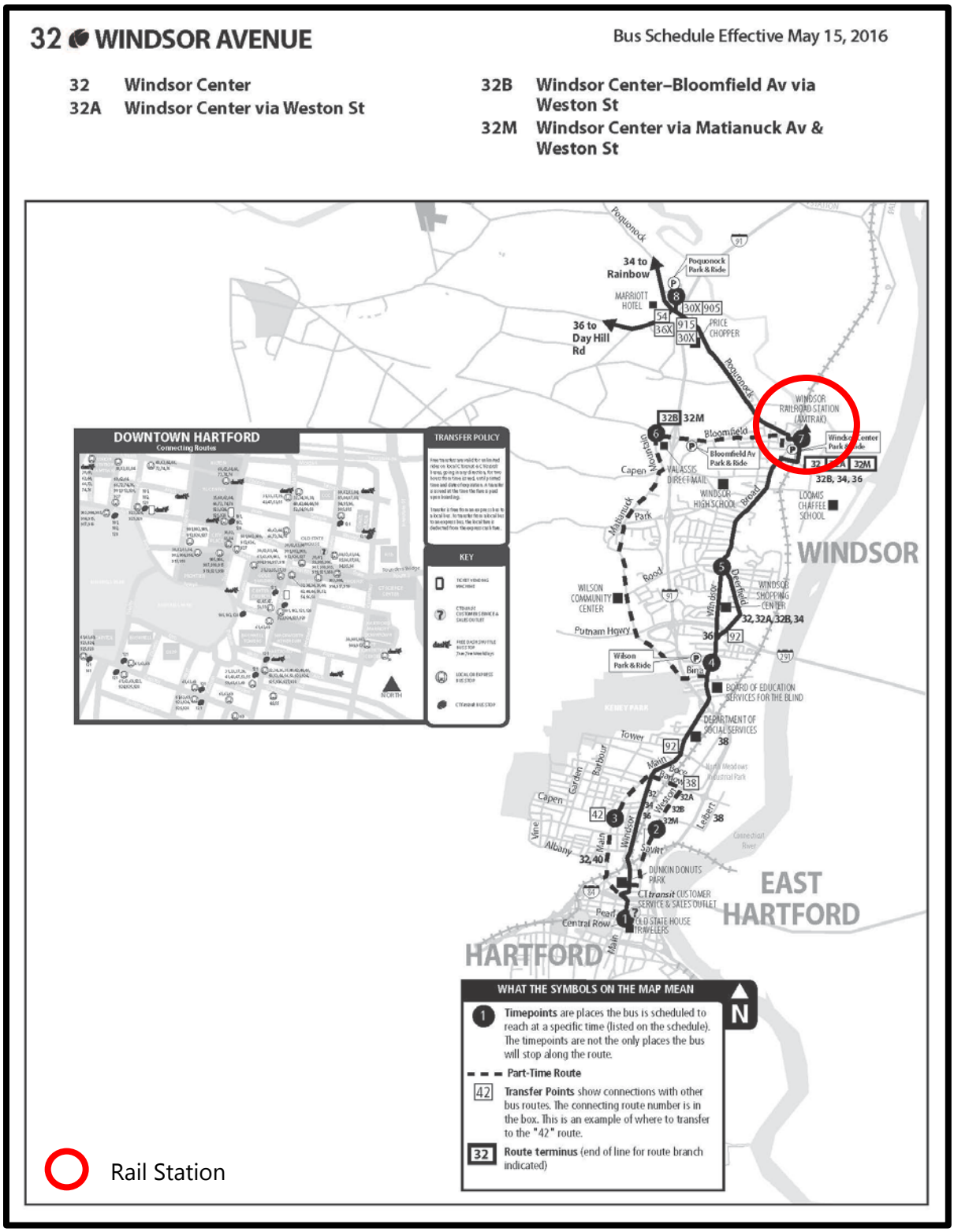


Figure 3: CT*transit* 34 Route Map

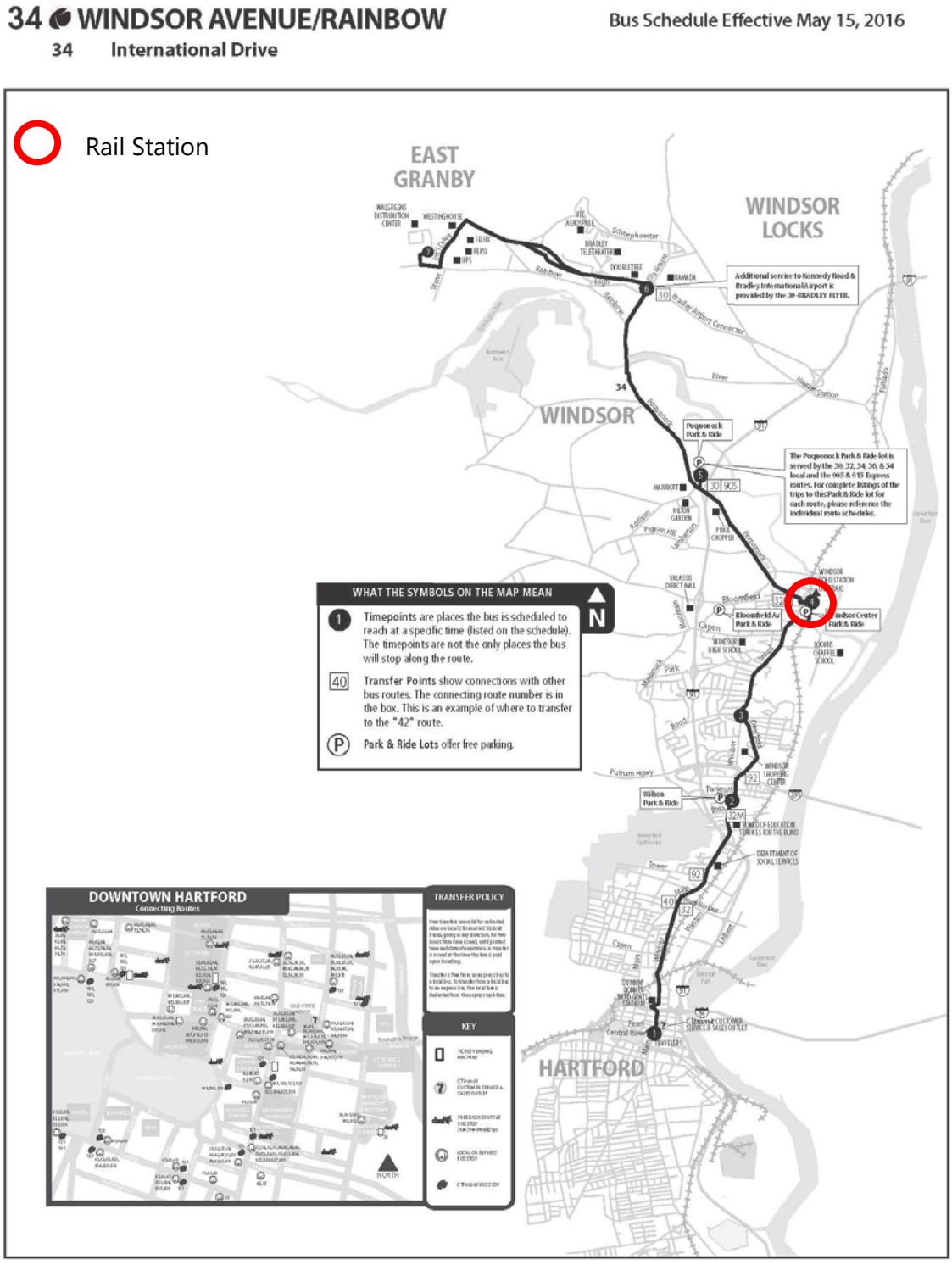


Figure 4: CT*transit* 36 Route Map

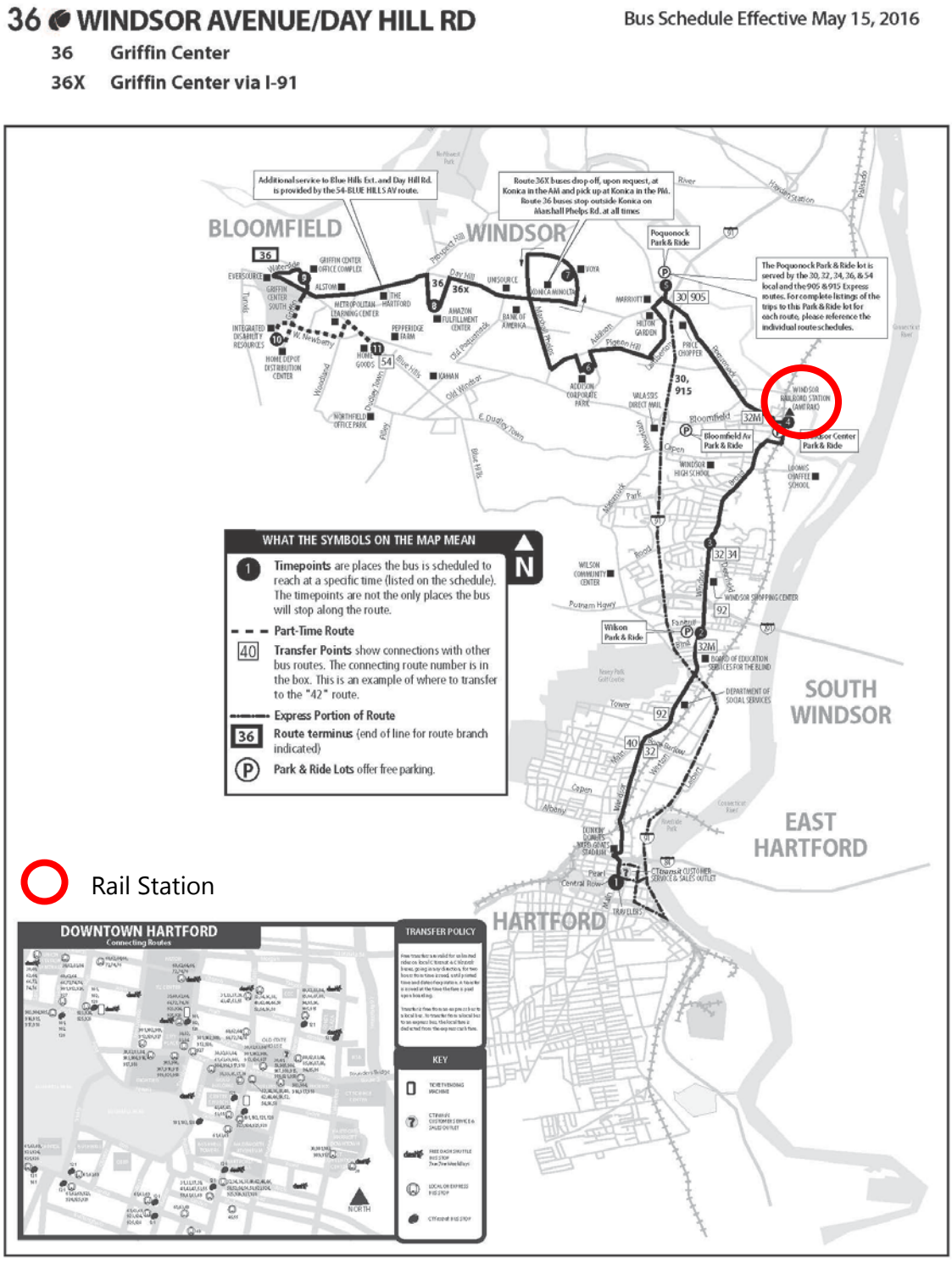


Table 1: Windsor Station Weekday 2018 Rail Schedule (with bus meets)

Windsor Station		CT*transit* Route 32/32A/32B/32M	CT*transit* Route 32/32A/32B/32M	CT*transit* Route 34	CT*transit* Route 34	CT*transit* Route 36	CT*transit* Route 36
Train #	Departure	From Hartford to RR Station	From RR Station to Hartford	From Hartford to International Drive	From International Drive to Hartford	From Hartford to Day Hill Road	From Day Hill Road to Hartford
CTrail 4400	5:46 AM	No bus service	5:48 AM (32M)	5:45 AM	No bus service	No bus service	5:35 AM
Amtrak Springfield Shuttle 451	5:53 AM	No bus service	5:48 AM (32M)	5:45 AM	No bus service	No bus service	5:35 AM
Amtrak Northeast Regional 141	6:21 AM	No bus service	6:24 AM (32)	6:20 AM	No bus service	No bus service	No bus service
Ctrail 4401	7:04 AM	6:55 AM (32), 6:58 AM (32B)	7:10 AM (32)	7:20 AM	6:50 AM	No bus service	No bus service
CTrail 4452	-						
Amtrak Springfield Shuttle 495	7:39 AM	7:43 AM (32A)	7:46 AM (32)	7:20 AM	7:26 AM	No bus service	No bus service
Amtrak Springfield Shuttle 490	9:27 AM	9:31 AM (32A)	9:44 AM (32A)	8:20 AM	9:16 AM	8:57 AM	8:52 AM
CTrail 4453	-						
CTrail 4454	-						
Amtrak Springfield Shuttle 471	9:35 AM	9:31 AM (32A)	9:44 AM (32A)	No bus service	No bus service	8:57 AM	8:52 AM
Amtrak Springfield Shuttle 470	11:04 AM	10:31 AM (32A)	10:44 AM (32A)	No bus service	No bus service	10:57 AM	11:17 AM

Even train numbers – Northbound (New Haven, CT to Springfield, MA), Odd train numbers - Southbound (Springfield, MA to New Haven, CT)
Pink shaded cells – missed or no connection, Green shaded cells – good connection, Gold shaded cells requires minor schedule adjustment, Grey shaded cells- train trip does not serve this station

Table 1: Windsor Station Weekday 2018 Rail Schedule (with bus meets) - continued

Windsor Station		CT*transit* Route 32/32A/32B/32M	CT*transit* Route 32/32A/32B/32M	CT*transit* Route 34	CT*transit* Route 34	CT*transit* Route 36	CT*transit* Route 36
Train #	Departure	From Hartford to RR Station	From RR Station to Hartford	From Hartford to International Drive	From International Drive to Hartford	From Hartford to Day Hill Road	From Day Hill Road to Hartford
CTrail 4455A	-						
Amtrak Springfield Shuttle 473	12:24 PM	12:31 PM (32A)	12:44 AM (32A)	No bus service	No bus service	12:57 PM	12:17 PM
CTrail CT 4406	12:34 PM	12:31 PM (32A)	12:44 AM (32A)	No bus service	No bus service	12:57 PM	12:17 PM
Amtrak Vermonter 56	-						
CTrail 4407	2:01 PM	1:31 PM (32A)	1:44 PM (32A)	No bus service	No bus service	1:57 PM	2:17 AM
Amtrak Springfield Shuttle 486	3:23 PM	3:52 PM (32)	2:44 PM (32A)	No bus service	3:41 PM	3:22 PM	3:17 PM
CTrail 4458	-						
Amtrak Vermonter 55	-						
CTrail 4461	-						
CTrail 4462	-						
Amtrak Springfield Shuttle 475	4:43 PM	4:47 PM (32), 4:51 PM (32M)	4:51 PM (32A)	4:27 PM	5:23 PM	4:07 PM	No bus service
Amtrak Springfield Shuttle 476	6:09 PM	6:10 PM (32M)	6:10 PM (32A)	5:44 PM	6:23 PM	5:22 PM	6:33 PM
CTrail 4463	-						

Even train numbers – Northbound (New Haven, CT to Springfield, MA), Odd train numbers - Southbound (Springfield, MA to New Haven, CT)
Pink shaded cells – missed or no connection, Green shaded cells – good connection, Gold shaded cells requires minor schedule adjustment, Grey shaded cells- train trip does not serve this station

Table 1: Windsor Station Weekday 2018 Rail Schedule (with bus meets) - continued

Windsor Station		CT*transit* Route 32/32A/32B/32M	CT*transit* Route 32/32A/32B/32M	CT*transit* Route 34	CT*transit* Route 34	CT*transit* Route 36	CT*transit* Route 36
Train #	Departure	From Hartford to RR Station	From RR Station to Hartford	From Hartford to International Drive	From International Drive to Hartford	From Hartford to Day Hill Road	From Day Hill Road to Hartford
Amtrak Springfield Shuttle 417	6:15 PM	6:10 PM (32M)	6:10 PM (32A)	No bus service	6:23 PM	No bus service	6:33 PM
CTrail 4414	7:17 PM	6:48 PM (32)	7:48 PM (32/40)	No bus service	6:40 PM	No bus service	7:48 PM
Amtrak Springfield Shuttle 479	8:09 PM	7:45 PM (32/40)	7:48 PM (32/40)	No bus service	No bus service	No bus service	No bus service
Amtrak Springfield Shuttle 494	8:19 PM	7:45 PM (32/40)	7:48 PM (32/40)	No bus service	No bus service	No bus service	No bus service
Amtrak Springfield Shuttle 472 (M-TH)	9:30 PM	No bus service	No bus service	9:48 PM	No bus service	8:42 PM	No bus service
CTrail 4415	9:37 PM	No bus service	No bus service	9:48 PM	No bus service	8:42 PM	No bus service
Amtrak Northeast Regional 136 (Fri Only)	9:39 PM	No bus service	No bus service	9:48 PM	No bus service	No bus service	No bus service
CTrail 4466	-						
Amtrak Springfield Shuttle 478	10:36 PM	No bus service	No bus service	9:48 PM	11:05 PM	11:07 PM	No bus service
CTrail 4467	-						
Amtrak Northeast Regional 148	11:52 PM	No bus service	No bus service	No bus service	11:05 PM	11:07 PM	No bus service

Even train numbers – Northbound (New Haven, CT to Springfield, MA), Odd train numbers - Southbound (Springfield, MA to New Haven, CT)
Pink shaded cells – missed or no connection, Green shaded cells – good connection, Gold shaded cells requires minor schedule adjustment, Grey shaded cells- train trip does not serve this station

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Table 2: Windsor Station Weekend 2018 Rail Schedule (with bus meets)

Windsor Station		CT*transit* Route 32A, 32/40	CT*transit* Route 32A, 32/41
Train #	Departure	From Hartford to RR Station	From RR Station to Hartford
Amtrak Northeast Regional 143	6:56 AM	No bus service	7:05 AM
Amtrak Springfield Shuttle 405	7:49 AM	7:42 AM	7:05 AM
Amtrak Northeast Regional 157 (SUN ONLY)	8:26 AM	No bus service	No bus service
CTrail 6400	8:55 AM	8:42 AM	8:05 AM
Amtrak Northeast Regional 147 (SAT ONLY)	9:02 AM	8:42 AM	9:05 AM
Amtrak Springfield Shuttle 450	9:37 AM	9:42 AM	9:05 AM
CTrail 6452	-		
CTrail 6401	10:18 AM	9:42 AM	10:05 AM
Amtrak Springfield Shuttle 461	11:04 AM	10:42 AM	11:05 AM
Amtrak Springfield Shuttle 460	11:37 AM	11:42 AM	11:05 AM
CTrail 6453	-		
CTrail 6454	-		
Amtrak Vermonter 54	-		
Amtrak Springfield Shuttle 463	1:04 PM	12:42 PM	1:05 PM
CTrail 6455	-		
CTrail 6456	-		
Amtrak Springfield Shuttle 464	3:44 PM	3:42 PM	3:05 PM
Amtrak Vermonter 57	-		
CTrail 6458	-		
CTrail 6457	-		
Amtrak Springfield Shuttle 465 (SUN ONLY)	4:39 PM	No bus service	No bus service

Even train numbers – Northbound (New Haven, CT to Springfield, MA), Odd train numbers - Southbound (Springfield, MA to New Haven, CT)
Pink shaded cells – missed or no connection, Green shaded cells – good connection, Gold shaded cells requires minor schedule adjustment, Grey shaded cells - train trip does not serve this station

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Table 2: Windsor Station Weekend 2018 Rail Schedule (with bus meets) - continued

Windsor Station		CT*transit* Route 32A, 32/40	CT*transit* Route 32A, 32/41
Train #	Departure	From Hartford to RR Station	From RR Station to Hartford
Amtrak Springfield Shuttle 488	5:37 PM	5:42 PM	5:05 PM
CTrail 6459	-		
Amtrak Springfield Shuttle 467 (SAT ONLY)	6:09 PM	5:42 PM	6:05 PM
Amtrak Northeast Regional 140	7:20 PM	7:37 PM	8:37 PM
Amtrak Springfield Shuttle 497 (SUN ONLY)	7:59 PM	No bus service	No bus service
CTrail 6402	8:10 PM	No bus service	No bus service
Amtrak Springfield Shuttle 416 (SUN ONLY)	8:36 PM	No bus service	No bus service
CTrail 6405	9:34 PM	No bus service	No bus service
Amtrak Springfield Shuttle 432 (SUN ONLY)	10:06 PM	No bus service	No bus service
Amtrak Northeast Regional 146 (SAT ONLY)	10:47 PM	No bus service	No bus service

Even train numbers – Northbound (New Haven, CT to Springfield, MA), Odd train numbers - Southbound (Springfield, MA to New Haven, CT)
Pink shaded cells – missed or no connection, Green shaded cells – good connection, Gold shaded cells requires minor schedule adjustment, Grey shaded cells- train trip does not serve this station

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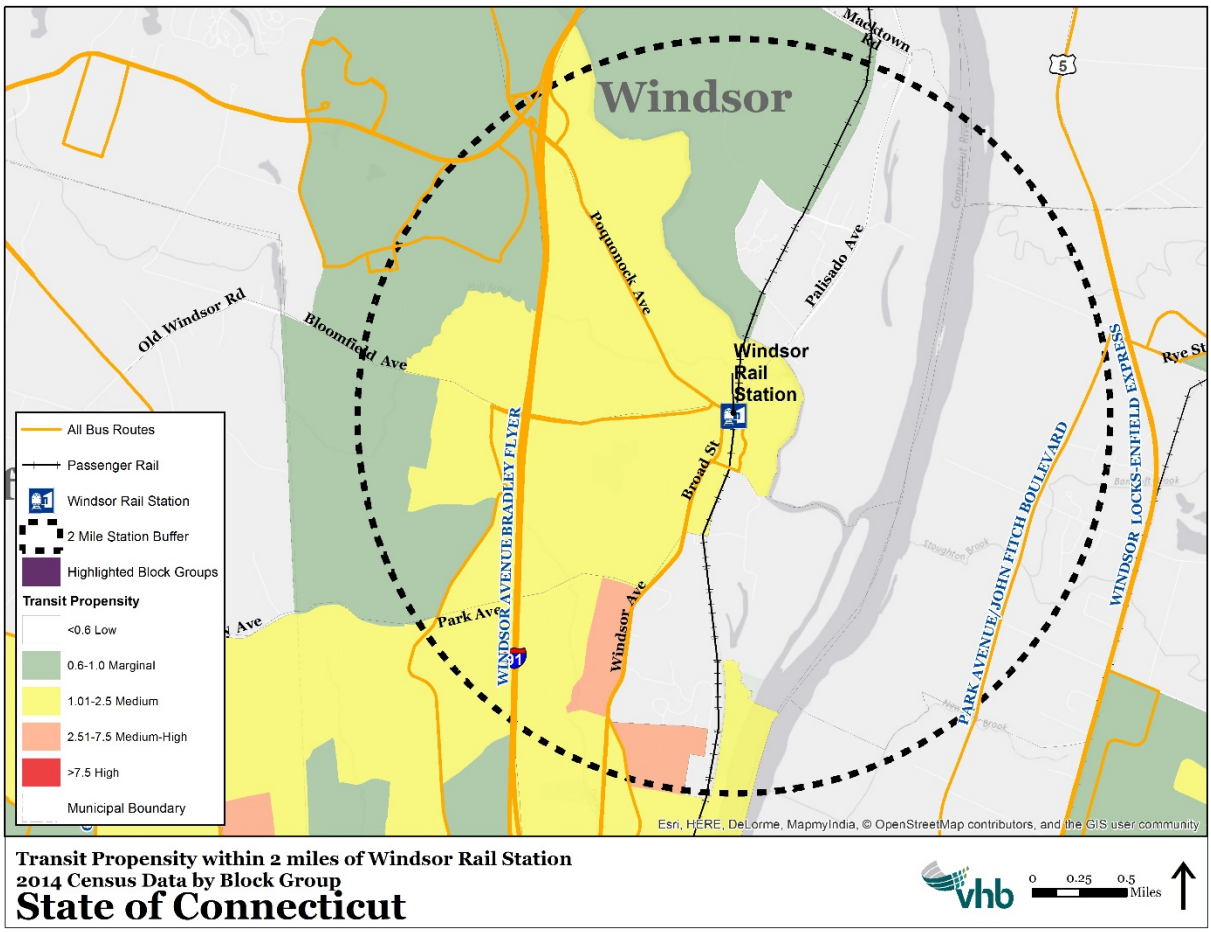
Figure 5: Census Tracts by Transit Propensity in Windsor



4.2.1 Findings

On weekdays there are 22 planned Hartford Line and Amtrak train trips to Windsor Station from Monday to Thursday. (On Fridays only, Amtrak Northeast Regional 136 serves this station bringing the total train trips to 23 trips).

Of these train trips from Monday to Thursday, four trains are met by Route 32 buses in both directions, seven trains are served by a Route 32 bus in one direction, two Route 32 bus trips have the potential to be modified to meet the train. Eight train trips are not met due to bus schedule conflicts in both directions on Route 32 buses. There is no bus service after 8:00 PM which means four train trips (five on Fridays) are not met because the bus does not operate when those trains stop at the station.

On weekends, train service is operated 7:00 AM to 11:00 PM, but service on Route 32 only operates between 7:00 AM to 8:30 PM. There are 16 train trips on

Saturday and 18 train trips on Sunday. No trains are met by Route 32 bus service in both directions, five trains are by a Route 32 bus in one direction, five Route 32 bus trips have the potential to be modified to meet the train. Four train trips are not met due to bus schedule conflicts in both directions. There is no bus service after 8:00 PM which means three train trips on Saturday nights and five trips on Sunday nights are not met because the bus does not operate during this time period.

Route 34 is a weekday only service with four trips in both directions in the morning and five trips both directions in the afternoon and evening. The northern terminus of Route 34 serves several large light industrial uses including Westinghouse, FedEx, Pepsi, UPS and the Walgreen Distribution center.

None of the trains are met by Route 34 bus service in both directions. Eight trains are met by a Route 34 bus in at least one direction, and two bus trips have the potential to be modified to meet the train. Thirteen train trips are not met due to bus schedule conflicts in both directions and/or no bus service when those trains stop at the station.

Route 36 is a weekday only service. Only one train trip is met by Route 36 bus service in both directions and three train trips have Route 34 bus service in one direction only. Three bus trips have the potential to be modified to meet the train. Thirteen train trips are not met by the Route 34 due to bus schedule conflicts in both directions and/or no bus service when those trains stop at the station.

Overall, on weekdays, with the three routes operating in Windsor, there are 14 trains with a bus meet on at least one route in one direction. Six trains have no bus meets at all due to a missed connection or the fact that the bus does not operate when that train is scheduled to operate in Windsor

There are several census tracts near Windsor Station identified as having medium and medium-high transit propensity. These tracts are served by the CT*transit* 32, 34 and 36 bus routes.

Once station level ridership estimates by time period become available, a determination of the need to adjust the bus schedules to increase bus/rail meets for the missed connections can be undertaken to determine the need to adjust bus schedules to meet train schedules.

4.2.2 Recommendations

- For those bus routes with trips that require slight adjustments to their schedule to meet the requirements of a good meet, these routes and trips should be investigated for service adjustments.

- For trains with missed bus connections, the bus route should be investigated for modification to facilitate connections, and if not feasible, new service should be considered.
- For trains that operate outside of the scheduled bus spans of service, CT*transit* will need to decide whether funding is available to expand the span of service for the routes to meet the trains.

4.3 Hartford Union Station

Hartford Union Station is a major existing rail station served by Amtrak (and by 2018 the C*trail* Hartford Line), CT*fastrak*, Greyhound and Peter Pan intercity bus lines, and by eight CT*transit* Hartford bus routes: Hartford dash Shuttle, 30 Bradley Flyer, 60 Farmington Avenue (West Hartford Center), 62 Farmington Avenue (Bishops Corner), 64 Farmington Avenue (64 Webster Hill Boulevard/64W West Farms Mall), 66 Farmington Avenue (66 Westgate, 66F Unionville, 66H UConn Health Center, and 66 Tunxis Community College), 72 Asylum Avenue, and 76 Ashley Street. A map of bus services in Downtown Hartford is shown in Figure 6.

Hartford dash Shuttle operates on weekdays from 7:00 AM to 7:00 PM departing every 15 minutes.

Route 30 Bradley Flyer operates seven days per week between Hartford and Bradley International Airport from 4: 00 AM to 1:00 AM on weekdays, from 4: 00 AM to 12:30 AM on Saturdays, and Sundays. Headways are generally every 60 minutes.

Route 60 Farmington Avenue (West Hartford Center) runs on Weekdays only from 5:00 AM to 1:00 AM

Route 62 Farmington Avenue (Bishops Corner) operates seven days a week from 6:00 AM to 8:00 AM on weekdays, from 7:00 AM to 9:15 PM on Saturdays, and from 8:00 AM to 8:40 PM on Sundays. Headways are generally every 30 minutes on weekdays and Saturdays and every 60 minutes on Sunday.

Route 64 Farmington Avenue (64 Webster Hill Boulevard/64W West Farms Mall) provides service on weekdays from 5:50 AM to 1:05 AM with 30-40 minute headways and Saturdays from 6:30 AM to 11:30 PM with 30 minute headways.

Route 66 Farmington Avenue (66 Westgate, 66F Unionville, 66H UConn Health Center, and 66 Tunxis Community College) operates seven days a week. On weekdays service is available from 5:35 AM to 8:40 PM with 30 minute headways, from 7:30 AM to 7:40 PM on Saturdays with 60 minute headways, and between 7:30 AM to 5:45 PM on Sundays with 70 minute headways.

Route 72 Asylum Avenue operates weekdays only from 6:00 AM to 7:00 PM. Combined headways for the Route 72 bus route variations range are between 15-30 minutes.

Route 76 Ashley Street runs on weekdays only from 5:20 AM to 12:15 AM. Headways are 15-20 minutes all day until 6PM and become 30 to 60 minutes between 7PM and midnight.

This concentration of bus services will provide numerous opportunities for bus/rail connections serving employment destinations, educational facilities, and entertainment venues throughout the day on weekdays and weekends.

It should be noted that the Capitol Region Council of Governments (CRCOG), in partnership with CT*transit* and CTDOT, is nearing completion of a comprehensive service analysis of CT*transit* bus service in the Hartford region under the *Metro Hartford Comprehensive Service Analysis*. Recommendations will include route adjustments, creation of transit priority corridors, first/mile last mile connections, improvements to the Bradley Flyer, and assessing the Transit-Oriented Development potential for the Buckland Hills park-and-ride. Route specific adjustments were not available at the time of this writing.

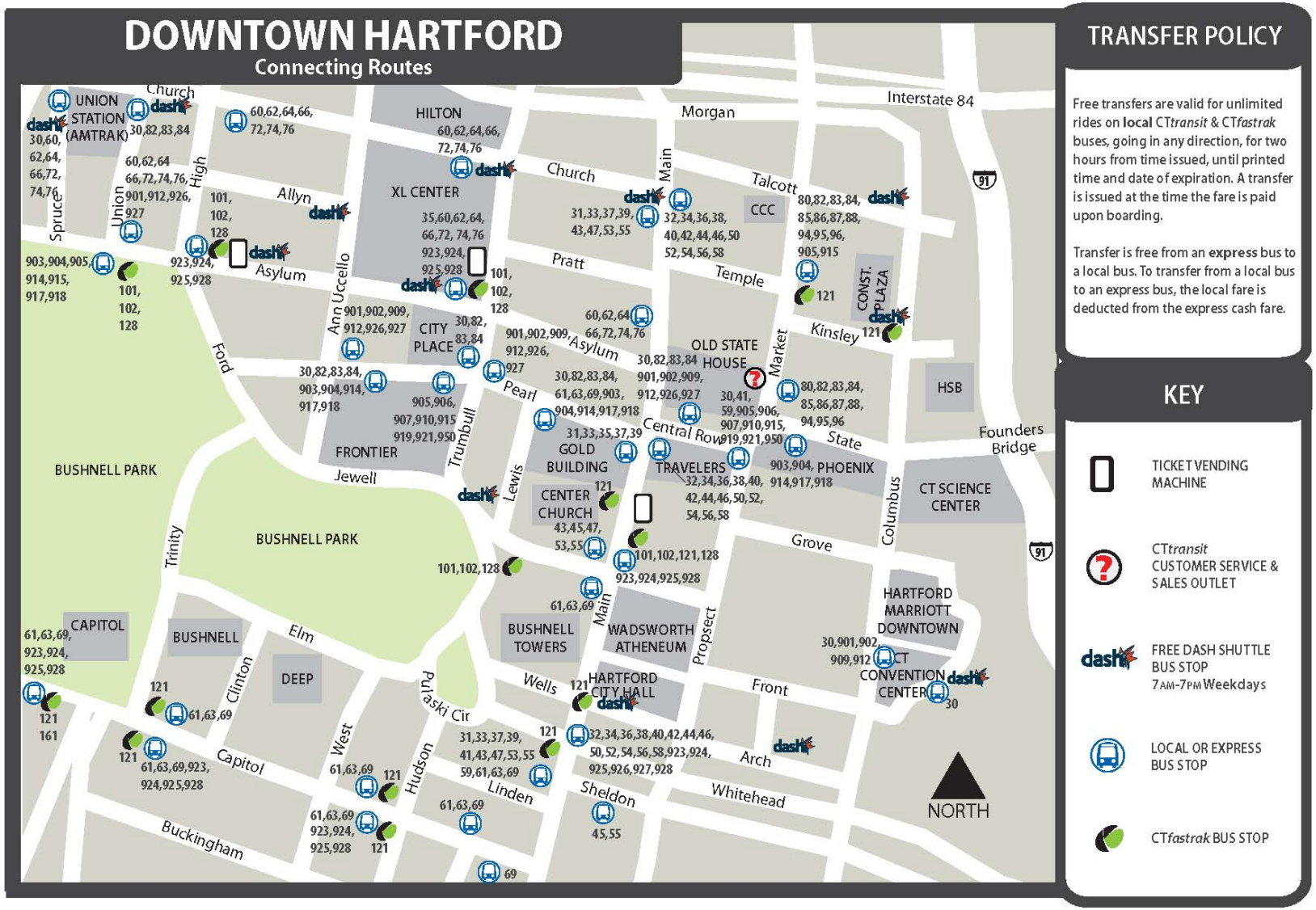
Study recommendations for the Bradley Flyer (Route 30N/30X) are described below:

- Short-term, the study recommends distinguishing the local (Route 30N) service from the faster, limited-stop service of the Route 30X to allow for enhancements to be made to the latter. It is recommended that the local service be combined with a modified Route 34[1] to offer local service to the airport. The limited-stop, airport-focused Bradley Flyer would remain as Route 30 and be marketed as a convenient way for travelers to get to and from the airport.
- In the mid-term, the opportunity to extend the Bradley Flyer from its current terminus at Union Station in Hartford to New Britain via the CT*fastrak* guideway should be evaluated.
- In the long-term, based on mid-term findings, consideration could be given to implementing an extension of the Bradley Flyer service to New Britain.

Bus/Rail connections in Hartford should be re-examined once an implementation strategy from the CRCROG Study become available.

[1] Currently, CT*transit* Route 34 serves Windsor Station. Assuming the station will continue to be served under the *Metro Hartford Comprehensive Service Analysis* recommendation to combine Route 30N (Bradley Flyer Local) with a modified Route 34, there will be a bus/rail connection for passengers on the Hartford Line to travel to Bradley International Airport.

Figure 6: Downtown Hartford



4.4 Berlin Station

Berlin Station is located at 51 Depot Road and is currently served by Amtrak intercity rail service. The nearest bus stop pair is located at the intersection of Farmington Avenue and Depot Road. Transfers to the rail station require a walk of approximately 600 feet from the bus stops to the rail station building, based on bus stop locations as shown in Google maps.

The bus stops are served by CT*transit New Britain Division Route* 512 – Berlin Turnpike. This route serves Downtown New Britain, Berlin and Cromwell. It operates on weekdays with generally 60 to 90 minute headways from 5:30 AM to 12:19 AM.

The CT*transit* 512 Route Map is displayed in Figure 7. A comparison of weekday and weekend bus and train meets at Berlin Station is displayed in Table 3 and Table 4. Census Tracts by Transit Propensity in Berlin is displayed in Figure 8.

Figure 7: CT*transit* 512 Route Map

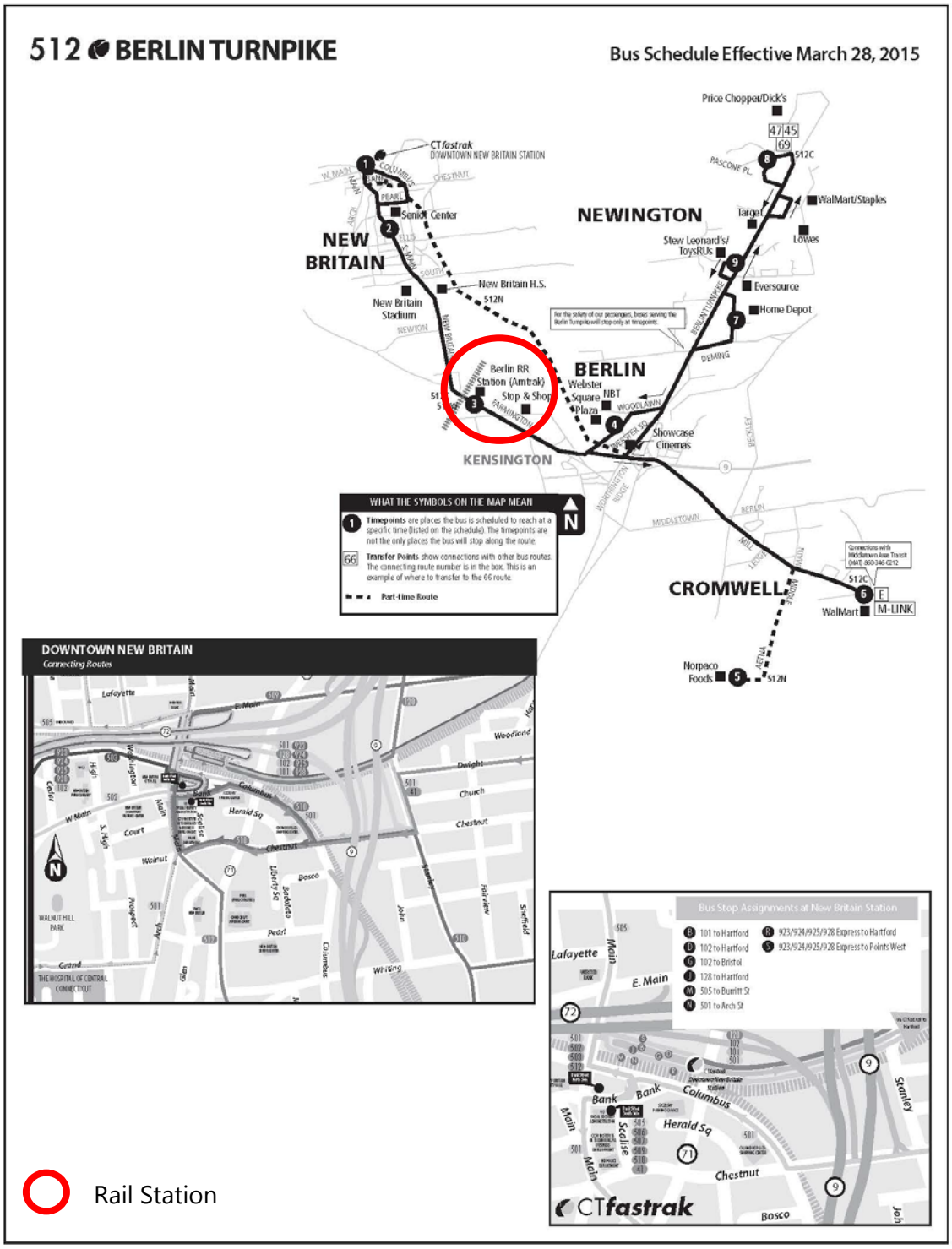


Table 3: Berlin Station Weekday 2018 Rail Schedule (with bus meets)

Berlin Station		CT*transit* 512 Berlin Tpke	
Train #	Departure	RR Station on Farmington	Bus Direction
CTrail 4400	5:24 AM	5:40 AM	Outbound
Amtrak Springfield Shuttle 451	6:10 AM	6:10 AM, 6:13 AM	Outbound, Inbound
Amtrak Northeast Regional 141	6:42 AM	7:05 AM	Outbound
Ctrail 4401	7:23 AM	7:13 AM	Inbound
CTrail 4452	7:50 AM	8:05 AM	Outbound
Amtrak Springfield Shuttle 495	7:57 AM	8:05 AM	Outbound
CTrail 4453	9:00 AM	8:43 AM, 9:05 AM	Inbound, Outbound
Amtrak Springfield Shuttle 490	9:08 AM	9:05 AM	Outbound
CTrail 4454	9:45 AM	9:43 AM	Inbound
Amtrak Springfield Shuttle 471	9:54 AM	9:43 AM	Inbound
Amtrak Springfield Shuttle 470	10:44 AM	10:35 AM	Outbound
CTrail 4455A	11:20 AM	11:13 AM	Inbound
CTrail CT 4406	12:10 PM	12:05 PM	Outbound
Amtrak Springfield Shuttle 473	12:44 PM	12:43 PM	Inbound
CTrail 4407	2:23 PM	2:13 PM	Inbound
Amtrak Springfield Shuttle 486	3:03 PM	3:05 PM	Outbound
CTrail 4458	3:42 PM	3:13 PM	Inbound
CTrail 4461	4:35 PM	4:13 PM	Inbound
Amtrak Springfield Shuttle 475	5:02 PM	5:13 PM	Outbound
CTrail 4462	5:06 PM	5:13 PM	Outbound
Amtrak Springfield Shuttle 476	5:49 PM	6:05 PM	Outbound
CTrail 4463	5:50 PM	6:05 PM	Outbound
Amtrak Springfield Shuttle 417	6:33 PM	6:13 PM	Inbound
CTrail 4414	6:56 PM	7:05 PM	Outbound
Amtrak Springfield Shuttle 494	7:58 PM	8:05 PM	Outbound
Amtrak Springfield Shuttle 479	8:27 PM	8:13 PM	Inbound
Amtrak Northeast Regional 136 (Fri Only)	9:16 PM	9:05 PM	Outbound
Amtrak Springfield Shuttle 472 (M-TH)	9:11 PM	9:05 PM	Outbound
CTrail 4466	9:50 PM	9:43 PM	Inbound
CTrail 4415	9:56 PM	9:43 PM	Inbound
Amtrak Springfield Shuttle 478	10:17 PM	10:35 PM	Outbound
CTrail 4467	10:55 PM	10:35 PM	Outbound
Amtrak Northeast Regional 148	11:30 PM	11:13 PM	Inbound

Even train numbers – Northbound (New Haven, CT to Springfield, MA), Odd train numbers - Southbound (Springfield, MA to New Haven, CT)
Pink shaded cells – missed or no connection, Green shaded cells – good connection, Gold shaded cells requires minor schedule adjustment, Grey shaded cells- train trip does not serve this station

Table 4: Berlin Station Weekend 2018 Rail Schedule (with bus meets)

Berlin Station		CT*transit* 512 Berlin Tpke (Saturdays)	CT*transit* 512 Berlin Tpke (Sundays)	
Train #	Departure	RR Station on Farmington	RR Station on Farmington	Bus Direction
Amtrak Northeast Regional 143	7:17 AM	6:43 AM	No bus trip connection	Inbound
CTrail 6400	8:04 AM	8:13 AM	8:13 AM	Inbound
Amtrak Springfield Shuttle 405	8:07 AM	8:13 AM	8:13 AM	Inbound
Amtrak Northeast Regional 157 (SUN ONLY)	8:47 AM	No bus trip connection	8:13 AM, 9:05 AM	Inbound, Outbound
Amtrak Springfield Shuttle 450	9:18 AM	9:05 AM	9:05 AM	Outbound
Amtrak Northeast Regional 147 (SAT ONLY)	9:23 AM	9:05 AM, 9:43 AM	No bus trip connection	No bus trip connection
CTrail 6452	9:49 AM	9:43 AM	9:43 AM	Inbound
CTrail 6401	10:37 AM	10:35 AM	10:35 AM	Outbound
Amtrak Springfield Shuttle 460	11:18 AM	11:13 AM	11:13 AM	Inbound
Amtrak Springfield Shuttle 461	11:22 AM	11:13 AM	11:13 AM	Inbound
CTrail 6453	12:25 PM	12:05 PM	12:05 PM	Outbound
CTrail 6454	12:49 PM	12:43 PM	12:43 PM	Inbound
Amtrak Vermonter 54	-			
Amtrak Springfield Shuttle 463	1:22 PM	1:35 PM	1:35 PM	Outbound
CTrail 6455	2:25 PM	2:13 PM	2:13 PM	Inbound
Amtrak Vermonter 57	-			
CTrail 6456	2:44 PM	3:05 PM	3:05 PM	Outbound
Amtrak Springfield Shuttle 464	3:23 PM	3:05 PM, 3:43 PM	3:05 PM, 3:43 PM	Outbound
CTrail 6458	4:19 PM	4:35 PM	4:35 PM	Outbound
CTrail 6457	4:30 PM	4:35 PM	4:35 PM	Outbound
Amtrak Springfield Shuttle 465 (SUN ONLY)	4:57 PM	No bus trip connection	4:35 PM	Outbound
Amtrak Springfield Shuttle 488	5:18 PM	5:13 PM	5:13 PM	Inbound
CTrail 6459	6:00 PM	6:05 PM	6:05 PM	Outbound
Amtrak Springfield Shuttle 467 (SAT ONLY)	6:27 PM	6:05 PM		Outbound
Amtrak Northeast Regional 140	6:58 PM	6:43 PM	6:43 PM	Inbound
CTrail 6402	7:47 PM	7:35 PM	7:35 PM	Outbound
Amtrak Springfield Shuttle 416 (SUN ONLY)	8:17 PM	No bus trip connection	8:13 PM	Inbound

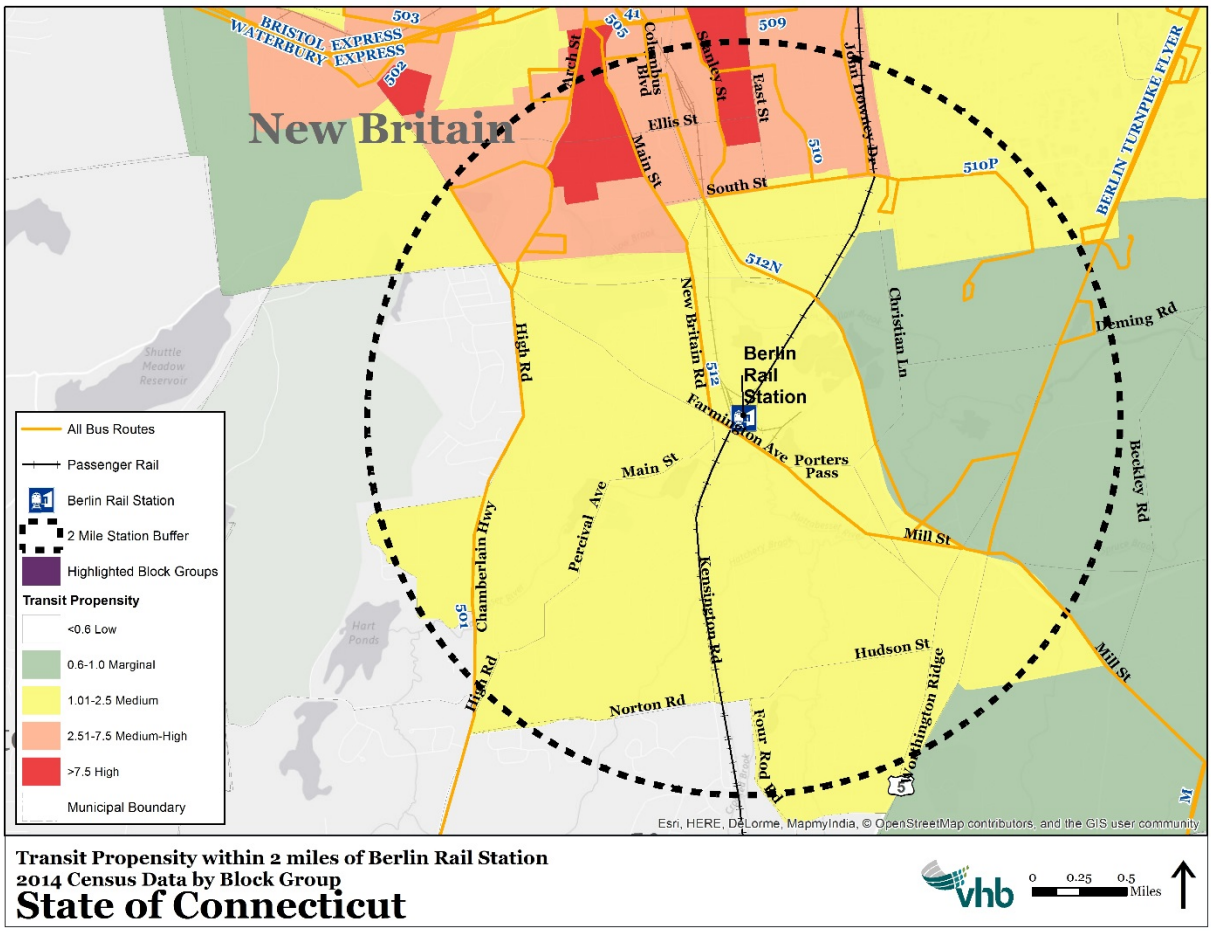
Even train numbers – Northbound (New Haven, CT to Springfield, MA), Odd train numbers - Southbound (Springfield, MA to New Haven, CT)
Pink shaded cells – missed or no connection, Green shaded cells – good connection, Gold shaded cells requires minor schedule adjustment, Grey shaded cells- train trip does not serve this station

Table 5: Berlin Station Weekend 2018 Rail Schedule (with bus meets) – continued

Berlin Station		CT*transit* 512 Berlin Tpke (Saturdays)	CT*transit* 512 Berlin Tpke (Sundays)	
Train #	Departure	RR Station on Farmington	RR Station on Farmington	Bus Direction
Amtrak Springfield Shuttle 497 (SUN ONLY)	8:19 PM	No bus trip connection	8:13 PM	Inbound
Amtrak Springfield Shuttle 432 (SUN ONLY)	9:47 PM	No bus trip connection	No bus trip connection	
CTrail 6405	9:53 PM	9:43 PM	No bus trip connection	Inbound
Amtrak Northeast Regional 146 (SAT ONLY)	10:25 PM	No bus trip connection	No bus trip connection	

Even train numbers – Northbound (New Haven, CT to Springfield, MA), Odd train numbers - Southbound (Springfield, MA to New Haven, CT)
Pink shaded cells – missed or no connection, Green shaded cells – good connection, Gold shaded cells requires minor schedule adjustment, Grey shaded cells- train trip does not serve this station

Figure 8: Census Tracts by Transit Propensity in Berlin



4.4.1 Findings

In general, the span of service for bus operates for a longer duration than available rail service. Rail service operates on weekdays from 5 AM to 11:15 PM, and on weekends from 6:30 AM to 11: 30 PM. Route 512 operates on weekdays from 5:30 AM to midnight, on Saturdays from 6:00 AM to1 AM, and on Sundays from 8 AM to 7:30 PM.

On weekdays there are 33 train trips to Berlin Station. Route 512 has 18 bus trips that meet the train (seven bus trips in the inbound direction, ten bus trips in the outbound directions, and one trip in both directions). In addition, five bus trip arrivals may be slightly adjusted by one or two minutes from its current schedule to facilitate a train meet. The remaining ten missed connections occur in the 6:00 AM hour, the 9:00 AM hour, between 3:00 and 4:30 PM, and the 10:00 PM hour..

On Saturdays, Berlin Station is served by 31 train trips, with 12 bus/train meets (eight bus trips in the inbound direction, three bus trips in the outbound directions, and one trip in both directions). In addition, three bus trips can be slightly adjusted to facilitate additional bus/train meets.

On Sunday, there are 27 trips, with 13 bus/train meets (nine bus trips in the inbound direction, four bus trips in the outbound directions), and 4 bus trips requiring minor adjustment to meet trains.

There are several census tracts identified as having high and medium-high transit propensity. These tracts are served by the Route 512 and CT*transit* Routes 502, 505, and 510.

According to the Connecticut Department of Labor website, there are no large employers with 500 or more employees in Berlin.

4.4.2 Recommendations

- For those bus trips that require slight adjustments to their schedule to meet the requirements of a good meet, these should be investigated for service adjustments.
- For trains with missed bus connections, the bus route should be investigated for modification to facilitate connections, and if not feasible, new service should be considered.
- For trains that operate outside of the scheduled bus spans of service, CT*transit* will need to decide whether funding is available to expand the span of service for the routes to meet the trains.

4.5 Meriden Station

Meriden Station is located at 60 State Street and is currently served by Amtrak intercity rail service. The nearest bus stop pair is located at State Street adjacent to the rail station. Transfers to the rail station require a walk of approximately 200 feet from the bus stops to the rail station building, based on the bus stop location as shown in Google maps.

Meriden Station is a hub for the following CT*transit* Meriden Division buses: Routes A1 Westfield Shoppingtown, B3/B4 Yale Acres/South Meriden, C5/C6 West Main Street/East Main Street, C1 Meriden - Grand Av - Quinnipiac Av - Universal Dr - Wallingford Ctr – Meriden Station, and C1x I-91 Express). The following bus routes provide local service:

- Route A1 operates on weekdays and Saturdays. Weekday headways are generally 30 minutes in the AM, 60 minutes during midday, and 30 minutes in the afternoon until 5:30 PM.
- Route B3/B4 operates on weekdays only with 60 minute headways from 6:30 AM to 4:30 PM.
- Route C5/C6 West Main Street/East Main Street operates on weekdays and Saturdays. Weekday headways are generally 60 – 90 minutes from 8 AM to 5 PM.

The CT*transit* Meriden Route map is displayed in Figure 9. A comparison of weekday and weekend bus and train meets at Meriden Station is displayed in Table 5 and Table 6. Census Tracts by Transit Propensity in Meriden is displayed in Figure 10.

Figure 9: CT*transit* Meriden Local Bus Routes Map

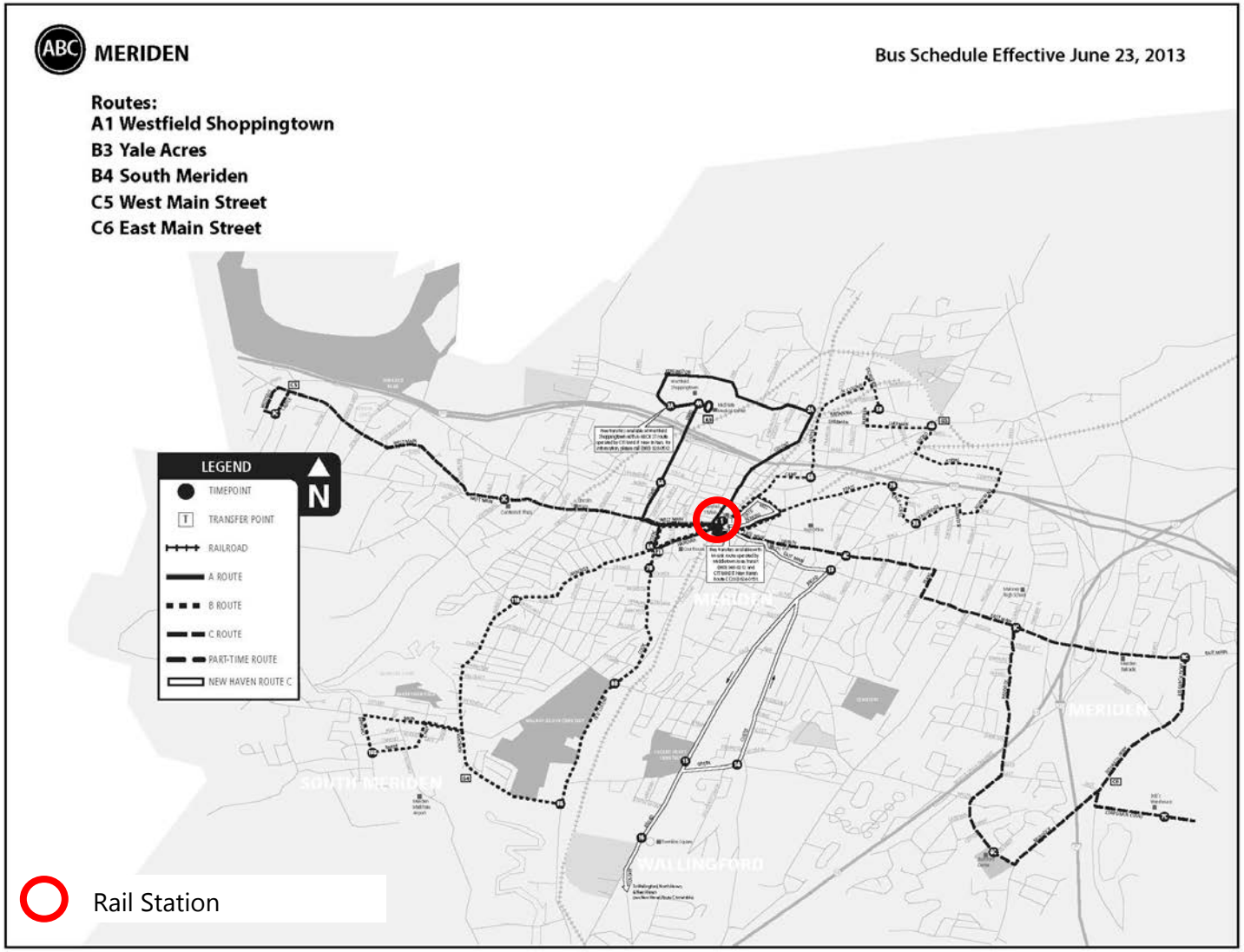


Table 5: Meriden Station Weekday 2018 Rail Schedule (with bus meets)

Meriden Station		CT*transit* Meriden Route A1 (Loop)	CT*transit* Meriden Route B3/B4 (Loop)	CT*transit* Meriden Route C5	CT*transit* Meriden Route C6
Train #	Departure	RR Station	RR Station	RR Station	RR Station
CTrail 4400	5:16 AM	No bus service	No bus service	No bus service	No bus service
Amtrak Springfield Shuttle 451	6:17 AM	No bus service	No bus service	No bus service	No bus service
Amtrak Northeast Regional 141	6:51 AM	No bus service	6:30 AM	No bus service	6:30 AM
Ctrail 4401	7:29 AM	7:00 AM	7:30 AM	No bus service	7:15 AM
CTrail 4452	7:41 AM	7:30 AM	7:30 AM	No bus service	No bus trip connection
Amtrak Springfield Shuttle 495	8:05 AM	8:00 AM	8:30 AM	8:00 AM	8:00 AM
Amtrak Springfield Shuttle 490	9:00 AM	8:30 AM, 9:00 AM	8:30 AM	9:00 AM	9:00 AM
CTrail 4453	9:08 AM	9:00 AM	8:30 AM	9:00 AM	9:00 AM
CTrail 4454	9:36 AM	9:30 AM	9:30 AM	9:30 AM	9:30 AM
Amtrak Springfield Shuttle 471	10:01 AM	10:00 AM	9:30 AM	9:30 AM	10:00 AM
Amtrak Springfield Shuttle 470	10:35 AM	10:00 AM	10:30 AM	10:30 AM	10:30 AM
CTrail 4455A	11:29 AM	11:00 AM	11:30 AM	11:30 AM	11:30 AM
CTrail CT 4406	12:01 PM	12:00 PM	11:30 AM	11:30 AM	11:30 AM
Amtrak Springfield Shuttle 473	12:51 PM	1:00 PM	12:30 PM	12:30 PM	1:00 PM
Amtrak Vermonter 56	1:45 PM	1:30 PM	1:30 PM	1:30 PM	1:30 PM
Amtrak Springfield Shuttle 486	2:26 PM	2:30 PM	2:30 PM	2:30 PM	2:30 PM
CTrail 4407	2:32 PM	2:30 PM	2:30 PM	2:30 PM	2:30 PM
CTrail 4458	3:33 PM	3:30 PM	3:30 PM	2:30 PM, 3:50 PM	3:00 PM

Even train numbers – Northbound (New Haven, CT to Springfield, MA), Odd train numbers - Southbound (Springfield, MA to New Haven, CT)
Pink shaded cells – missed or no connection, Green shaded cells – good connection, Gold shaded cells requires minor schedule adjustment, Grey shaded cells- train trip does not serve this station

Table 5: Meriden Station Weekday 2018 Rail Schedule (with bus meets) - continued

Meriden Station		CT*transit* Meriden Route A1 (Loop)	CT*transit* Meriden Route B3/B4 (Loop)	CT*transit* Meriden Route C5	CT*transit* Meriden Route C6
Train #	Departure	RR Station	RR Station	RR Station	RR Station
Amtrak Vermonter 55	3:57 PM	4:00 PM	3:30 PM	3:50 PM	3:50 PM
CTrail 4461	4:44 PM	4:30 PM	4:30 PM	3:50 PM, 4:15 PM	4:15 PM
CTrail 4462	4:56 PM	5:00 PM	4:30 PM	5:00 PM	4:55 PM
Amtrak Springfield Shuttle 475	5:09 PM	5:00 PM	No bus service	5:00 PM	4:55 PM
Amtrak Springfield Shuttle 476	5:42 PM	5:30 PM	No bus service	No bus service	5:30 PM
CTrail 4463	5:59 PM	No bus service	No bus service	No bus service	No bus service
Amtrak Springfield Shuttle 417	6:40 PM	No bus service	No bus service	No bus service	No bus service
CTrail 4414	6:46 PM	No bus service	No bus service	No bus service	No bus service
Amtrak Springfield Shuttle 494	7:50 PM	No bus service	No bus service	No bus service	No bus service
Amtrak Springfield Shuttle 479	8:34 PM	No bus service	No bus service	No bus service	No bus service
Amtrak Northeast Regional 136 (Fri Only)	9:08 PM	No bus service	No bus service	No bus service	No bus service
Amtrak Springfield Shuttle 472 (M-TH)	9:04 PM	No bus service	No bus service	No bus service	No bus service
CTrail 4466	9:41 PM	No bus service	No bus service	No bus service	No bus service
CTrail 4415	10:04 PM	No bus service	No bus service	No bus service	No bus service
Amtrak Springfield Shuttle 478	10:10 PM	No bus service	No bus service	No bus service	No bus service
CTrail 4467	11:04 PM	No bus service	No bus service	No bus service	No bus service
Amtrak Northeast Regional 148	11:22 PM	No bus service	No bus service	No bus service	No bus service

Even train numbers – Northbound (New Haven, CT to Springfield, MA), Odd train numbers - Southbound (Springfield, MA to New Haven, CT)
Pink shaded cells – missed or no connection, Green shaded cells – good connection, Gold shaded cells requires minor schedule adjustment, Grey shaded cells- train trip does not serve this station

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Table 6: Meriden Station Weekend 2018 Rail Schedule (with bus meets)

Meriden Station		CT*transit* Meriden Route C5 (Saturdays)	CT*transit* Meriden Route C6 (Saturdays)
Train #	Departure	RR Station	RR Station
Amtrak Northeast Regional 143	7:26 AM	No bus service	No bus service
Amtrak Springfield Shuttle 405	8:15 AM	No bus service	No bus service
CTrail 6400	8:25 AM	No bus service	No bus service
Amtrak Northeast Regional 157 (SUN ONLY)	8:56 AM	No bus service	No bus service
Amtrak Springfield Shuttle 450	9:10 AM	No bus service	No bus service
Amtrak Northeast Regional 147 (SAT ONLY)	9:32 AM	9:40 AM	No bus service
CTrail 6452	9:40 AM	9:40 AM	No bus service
CTrail 6401	10:45 AM	No bus trip connection	10:20 AM
Amtrak Springfield Shuttle 460	11:10 AM	11:10 AM	11:10 AM
Amtrak Springfield Shuttle 461	11:30 AM	11:10 AM	11:10 AM
CTrail 6453	12:33 PM	12:40 PM	12:40 PM
CTrail 6454	12:40 PM	12:40 PM	12:40 PM
Amtrak Vermonter 54	-		
Amtrak Springfield Shuttle 463	1:30 PM	12:40 PM	1:20 PM
CTrail 6455	2:34 PM	2:10 PM	2:10 PM
CTrail 6456	2:35 PM	2:50 PM	2:50 PM
Amtrak Springfield Shuttle 464	3:15 PM	3:30 PM	3:30 PM
Amtrak Vermonter 57	4:02 PM	3:30 PM	4:10 PM
CTrail 6458	4:10 PM	4:10 PM	4:10 PM
CTrail 6457	4:39 PM	4:45 PM	4:45 PM
Amtrak Springfield Shuttle 465 (SUN ONLY)	5:05 PM	No bus trip connection	No bus trip connection
Amtrak Springfield Shuttle 488	5:10 PM	4:45 PM	5:20 PM
CTrail 6459	6:08 PM	No bus service	No bus service

Even train numbers – Northbound (New Haven, CT to Springfield, MA), Odd train numbers - Southbound (Springfield, MA to New Haven, CT)
Pink shaded cells – missed or no connection, Green shaded cells – good connection, Gold shaded cells requires minor schedule adjustment Grey shaded cells- train trip does not serve this station

DRAFT

Table 6: Meriden Station Weekend 2018 Rail Schedule (with bus meets) - continued

Meriden Station		CT*transit* Meriden Route C5 (Saturdays)	CT*transit* Meriden Route C6 (Saturdays)
Train #	Departure	RR Station	RR Station
Amtrak Springfield Shuttle 467 (SAT ONLY)	6:34 PM	No bus service	No bus service
Amtrak Northeast Regional 140	6:49 PM	No bus service	No bus service
CTrail 6402	7:38 PM	No bus service	No bus service
Amtrak Springfield Shuttle 416 (SUN ONLY)	8:10 PM	No bus service	No bus service
Amtrak Springfield Shuttle 497 (SUN ONLY)	8:26 PM	No bus service	No bus service
Amtrak Springfield Shuttle 432 (SUN ONLY)	9:40 PM	No bus service	No bus service
CTrail 6405	10:01 PM	No bus service	No bus service
Amtrak Northeast Regional 146 (SAT ONLY)	10:16 PM	No bus service	No bus service

Even train numbers – Northbound (New Haven, CT to Springfield, MA), Odd train numbers - Southbound (Springfield, MA to New Haven, CT)
Pink shaded cells – missed or no connection, Green shaded cells – good connection, Gold shaded cells requires minor schedule adjustment Grey shaded cells- train trip does not serve this station

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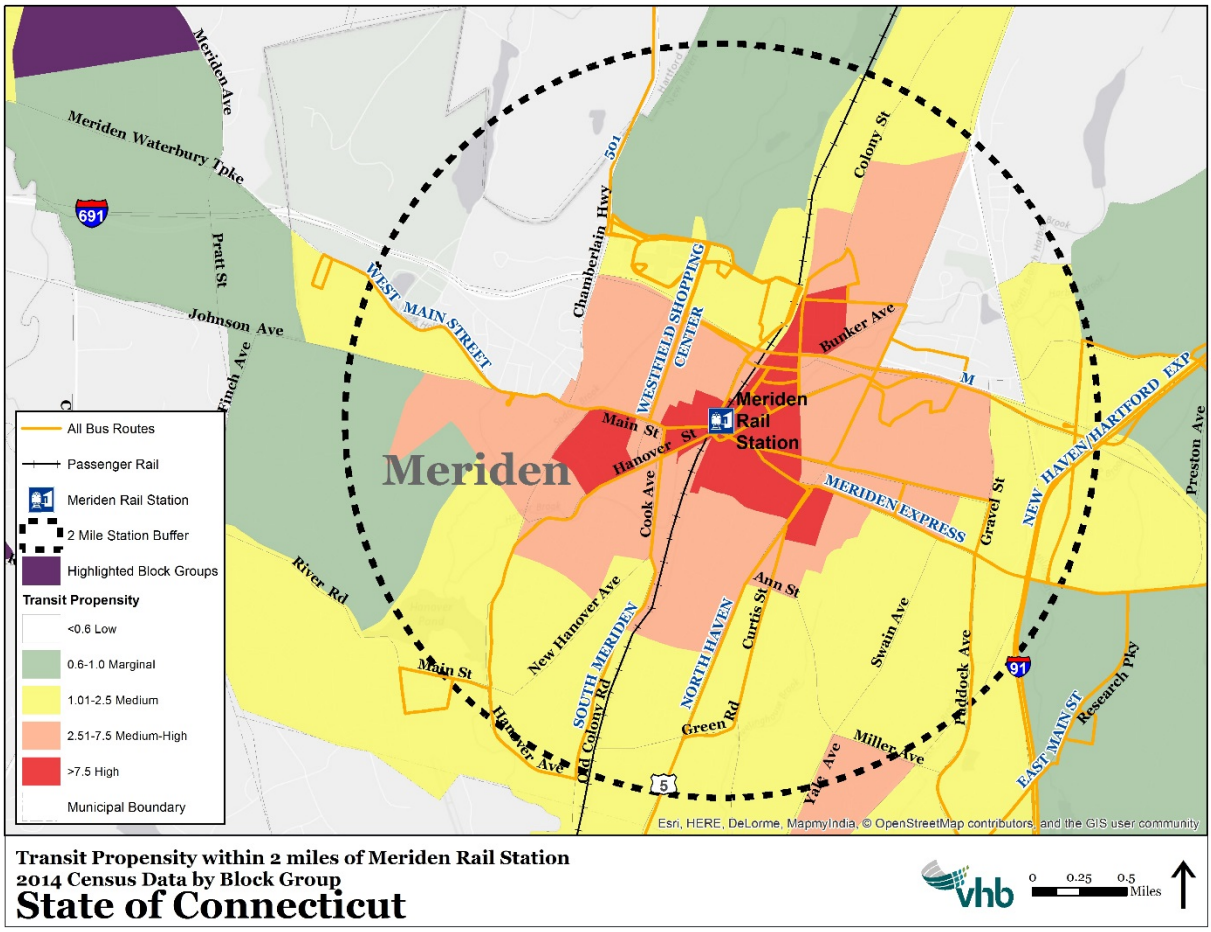
Figure 10: Census Tracts by Transit Propensity in Meriden



4.5.1 Findings

Meriden Route A1

On weekdays there are 34 planned Hartford Line and Amtrak train trips to Meriden Station from Monday to Friday. Of these train trips, nine trains are met by Route A1 bus trips, two bus trips have the potential to be modified to meet the train. Nine train trips are not met due to bus schedule conflicts on Route A1 buses. This route has no bus service before 7 AM and after 5:30 PM on weekdays and no service on weekends which means 14 train trips are not served

Meriden Route B3/B4

This route begins service at 6:30 AM and ends at 5:30 PM on weekdays. There is no weekend service on this route.

Only six train trips are met by Route B3/B4. Thirteen train trips have missed bus connections due to bus schedule conflicts. Due to the limited span of service on this route, 15 train trips have no bus service.

Meriden Route C5/C6

This route originates at the bus stop in front of Meriden rail station as the C5 route and serves destinations to the west on West Main Street before returning to the rail station and continuing as the C6 route traveling east on East Main Street and returning to the rail station.

Route C5 begins weekday service at 8:00 AM and ends at 5:00 PM. It operates nine trips with seven trips that meet the train, and two bus trips have the potential to be modified to meet the train. Eight train trips have missed bus connections due to bus schedule conflicts.

The first trip on route C6 starts at 6:30 AM and ends at 6:00 PM. It has 12 trips on weekdays with 10 trips meeting the train, ten train trips have missed bus connections due to bus schedule conflicts, and one bus trip may be modified to meet the train.

Both routes operate on Saturdays but not on Sundays. On Saturdays, the C5 has five trips that meet the train and nine train trips have missed bus connections due to bus schedule conflicts. Due to the limited span of service on this route, 15 train trips have no bus service. The C6 route has seven trips that meet the train and six train trips have missed bus connections due to bus schedule conflicts. Seventeen train trips have no bus service.

There are several census tracts identified as having high and medium-high transit propensity. These tracts are served by the Meriden Local bus routes, A1 Westfield Shoppingtown, B3/B4 Yale Acres/South Meriden, C5/C6 West Main Street/East Main Street, C1 Meriden - Grand Av - Quinnipiac Av - Universal Dr - Wallingford Ctr – Meriden Station, and C1x I-91 Express.

The span of service for rail operates for a longer duration than bus service. Rail service operates on weekdays from 5 AM to 11:15 PM, and on weekends from 6:30 AM to 11: 30 PM. The Meriden Local routes generally operate on weekdays with no service after 6 PM and very limited service on the weekends via the C5/C6 bus routes.

Routes A1 and C6 offer the most connectivity to train trips, but there could be better coordination of AM peak period trips and more bus service after 6 PM.

The C5/C6 is a relatively long route and should be considered to be split separate routes with the railroad station being the first and last stop being the railroad station.

There are several census tracts identified as having medium-high transit propensity, however, these tracts are already served by the CT*transit* Meriden bus routes.

The MidState Medical Center is the largest employer in Meriden and is served by Route A1.

4.5.2 Recommendations

The following actions are recommended to improve bus/rail connectivity at Meriden Station:

- Adjust bus schedules to meet AM peak trains if demand warrants it and funds can be made available
- Expand bus span of service, particularly PM peak and evenings if demand warrants it and funds can be made available.
- Consider operating weekend bus service if ridership demand justifies it.
- Consider splitting the C5/C6 into separate routes with the first and last stop at the railroad station to allow for more frequent service and shorter travel times from areas at the ends of this route to the rail station.

4.6 Wallingford Station

Wallingford Station is located at 15 Center Street and is currently served by Amtrak intercity rail service. The nearest bus stop pair is located at Quinnipiac Street and South Colony Road. Transfers to the rail station require a walk of approximately 400 feet from the bus stops to the rail station building, based on the bus stop locations as shown in Google maps.

This station is served by the CT*transit* Wallingford Local bus route via the bus stop at Quinnipiac Street and North Colony Road. Under the existing schedule, the stop is served 18 minutes after the hour in the inbound direction (from Burke Heights/McGuire Court to Masonic Hospital with a stop at the rail station) and 45 minutes on the hour in the outbound direction (Masonic Hospital with a stop at the rail station to Burke Heights/McGuire Court).

This route is operated on weekdays only from 9:00 AM to 4:00 PM (the last trip at 4 PM is a request only stop). The route operates on 60 minute headways.

The CT*transit* Wallingford Local Route Map is displayed in Figure 11. A comparison of bus and train meets at Wallingford Station is displayed in Table 7. Census Tracts by Transit Propensity in Wallingford are displayed in Figure 12.

Figure 11: CT*transit* Wallingford Local Route Map

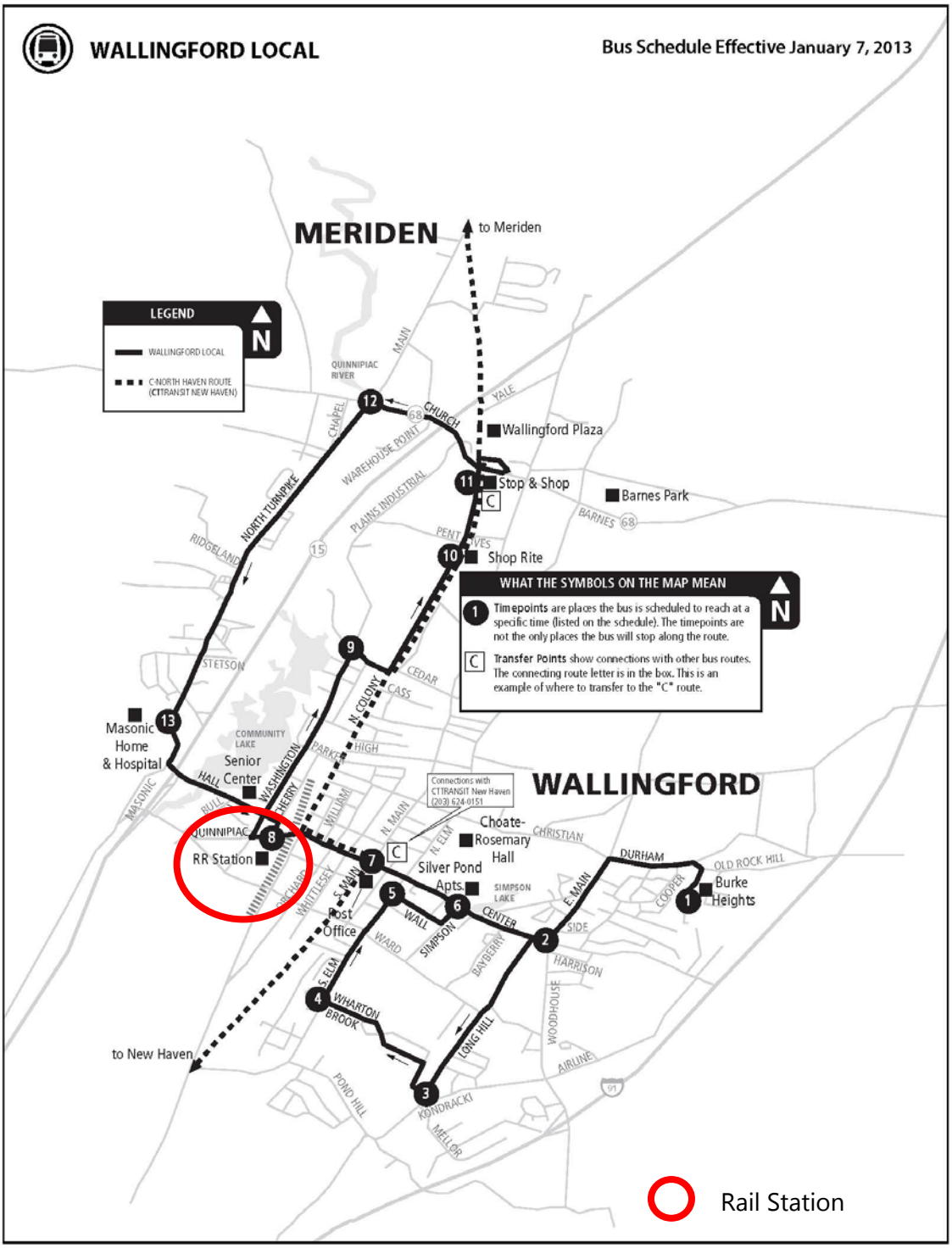


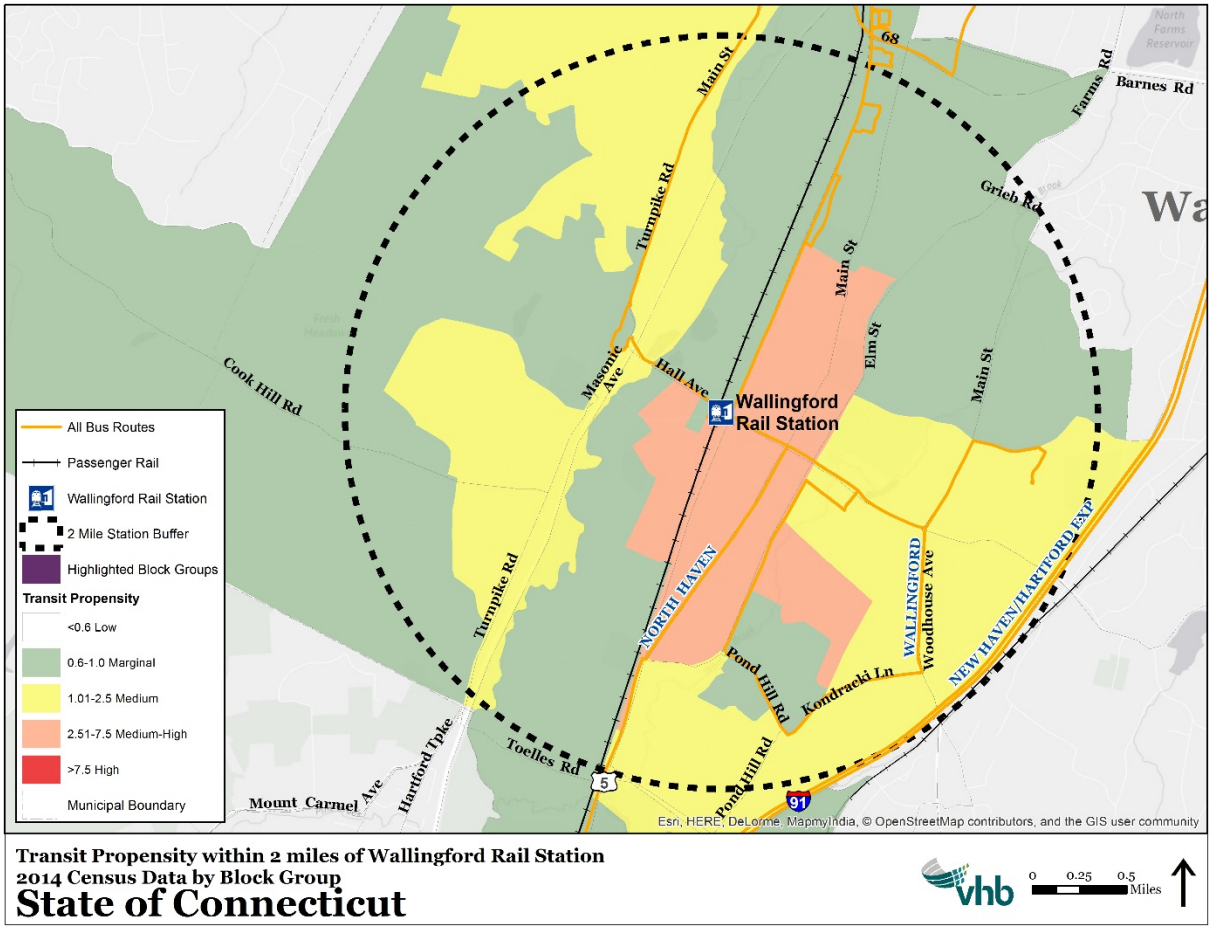
Table 7: Wallingford Station Weekday 2018 Rail Schedule (with bus meets)

Wallingford Station		CT*transit* Wallingford Local Bus	
Train #	Departure	RR Station Quinnipiac & Washington	Bus Loop Direction
CTrail 4400	5:09 AM	No bus service	
Amtrak Springfield Shuttle 451	6:25 AM	No bus service	
Amtrak Northeast Regional 141	7:00 AM	No bus service	
CTrail 4452	7:34 AM	No bus service	
Ctrail 4401	7:41 AM	No bus service	
Amtrak Springfield Shuttle 495	8:13 AM	No bus service	
Amtrak Springfield Shuttle 490	8:52 AM	No bus service	
CTrail 4453	9:17 AM	9:18 AM	Inbound
CTrail 4454	9:29 AM	9:18 AM	Inbound
Amtrak Springfield Shuttle 471	10:09 AM	10:18 AM	Inbound
Amtrak Springfield Shuttle 470	10:28 AM	10:18 AM	Inbound
CTrail 4455A	11:36 AM	11:18 AM	Inbound
CTrail CT 4406	11:54 AM	11:45 AM	Outbound
Amtrak Springfield Shuttle 473	12:59 PM	12:45 PM	Outbound
CTrail 4407	2:39 PM	2:18 PM	Inbound
Amtrak Springfield Shuttle 486	2:48 PM	2:18 PM	Inbound
CTrail 4458	3:26 PM	3:18 PM	Inbound
CTrail 4462	4:49 PM	4:45 PM	Inbound
CTrail 4461	4:51 PM	4:45 PM	Inbound
Amtrak Springfield Shuttle 475	5:17 PM	No bus service	
Amtrak Springfield Shuttle 476	5:34 PM	No bus service	
CTrail 4463	6:06 PM	No bus service	
CTrail 4414	6:39 PM	No bus service	
Amtrak Springfield Shuttle 417	6:48 PM	No bus service	
Amtrak Springfield Shuttle 494	7:42 PM	No bus service	
Amtrak Springfield Shuttle 479	8:42 PM	No bus service	
Amtrak Northeast Regional 136 (Fri Only)	8:59 PM	No bus service	
Amtrak Springfield Shuttle 472 (M-TH)	8:56 PM	No bus service	
CTrail 4466	9:34 PM	No bus service	
Amtrak Springfield Shuttle 478	10:02 PM	No bus service	
CTrail 4415	10:15 PM	No bus service	
CTrail 4467	11:11 PM	No bus service	
Amtrak Northeast Regional 148	11:13 PM	No bus service	

Even train numbers – Northbound (New Haven, CT to Springfield, MA), Odd train numbers - Southbound (Springfield, MA to New Haven, CT)

Pink shaded cells – missed or no connection, Green shaded cells – good connection, Gold shaded cells requires minor schedule adjustment, Grey shaded cells- train trip does not serve this station

Figure 12: Census Tracts by Transit Propensity in Wallingford



4.6.1 Findings

The span of service for rail operates for a longer duration than bus service. Rail service operates on weekdays from 5 AM to 11:15 PM, and on weekends from 6:30 AM to 11: 30 PM. The Wallingford Local operates on weekdays only from 9:00 AM to 4:00 PM and has no service on the weekends. Additionally, there is no peak period bus service to provide connections to peak period trains.

On weekdays there are 32 planned Hartford Line and Amtrak train trips to Wallingford Station from Monday to Friday. Of these train trips, seven trains are met by Wallingford Local bus trips, one bus trip has the potential to be modified to meet the train. Four train trips are not met due to bus schedule conflicts on Route A1 buses. This route has no bus service before 9 AM and after 5 PM on weekdays and no service on weekends which means 21 train trips are not served

There are several census tracts identified as having medium-high transit propensity. These tracts are served by the Wallingford Local bus route.

There are three major employers[2] in Wallingford not currently served by the Wallingford Local bus route that may be considered candidates for private shuttle bus services to the train station, if demand occurs:

- Quest Diagnostics Laboratory located at 3 Sterling Drive
- Community Health Network located at 11 Fairfield Boulevard
- Gaylord Hospital 50 Gaylord Farm Drive

4.6.2 Recommendations

The following actions are recommended to improve bus/rail connectivity at Wallingford Station:

- Expand span of service, particularly in AM and PM peak, at a minimum if ridership warrants it and funds are available
- Adjust bus schedules to meet AM and PM peak trains if demand warrants it and funds can be made available
- Explore potential for employer sponsored shuttle bus services to major employers

[2] Major employers are defined as having more than 500 employees and were identified based on data from Connecticut Department of Labor, 100 largest employers in New Haven County, https://www1.ctdol.state.ct.us/lmi/EmpSearchTopList.asp?intCurrentPage=2.

5 Conclusions

All of the Hartford Line rail stations are currently served by bus routes. However, coordination/synchronization of existing bus and existing and proposed rail service can be improved. Improved connectivity could occur with the expansions of existing bus spans of service and with adjustments to bus schedules to better match rail services, if forecasted ridership demand justifies it and funds could be made available especially prior to start of the new rail service on the Hartford Line in 2018.

This analysis is the first step in better integrating/synchronizing bus/rail schedules. When station level ridership estimates by time period and mode split estimates become available, it is recommended that CTDOT and CT*transit* work together to identify, refine and prioritize specific bus/rail trips and/or times of day (e.g., peak periods) when ridership demand and station utilization is highest to ensure good connectivity.

Once specific trips and/or times of day are identified and appropriate analyses have been conducted, a Memorandum of Understanding or similar agreement should be established between transit agencies to coordinate their schedules and continue coordination when scheduling service changes in the future. This will ensure that the state's transportation system is seamless and convenient to its users.

5.1 Title VI Implications of Recommendations

Some of the changes to fixed route bus schedules to integrate/synchronize them with the planned Hartford Line train service at the Windsor, Hartford Union Station, Berlin, Meriden, and Wallingford stations may rise to the threshold of major service changes under Title VI of the Civil Rights Act of 1964, particularly if they are implemented as a package (or within a 12-month period). Potential improvements that merely adjust the schedules to better serve the rail stations (i.e., Windsor and Berlin) probably will not be considered major service changes. However, changes being recommended for the remaining stations could potentially be considered major service changes and would require service equity analyses during the planning phase:

- Harford – extending the Bradley flyer from terminus at Union Station to New Britain via CT*fastrak* (a *Metro Hartford Comprehensive Service Analysis* recommendation).
- Meriden – adjusting schedules, expanding span of service and operating weekend service.
- Wallingford – expanding service span and increasing frequency in morning and evening peaks.

Appendix F: Title VI Implications

1 Title VI Implications of Recommendations

The federal enabling legislation for transit funding requires that recipients of those funds not engage in discriminatory practices. Title VI of the Civil Rights Act of 1964 prohibits discrimination on the basis of race, color, or national origin. Under Title VI, FTA requires that recipients evaluate all fare changes and "major service changes", prior to implementation, to determine whether the proposed changes will have a discriminatory impact based on race, color, or national origin, and whether low-income populations will bear a disproportionate burden of the changes. Equity analyses are required regardless of whether proposed changes would be detrimental or beneficial to riders.

All **fare** changes require a fare equity analysis. Of particular note for this study, if a new fare media such as a "smart card" is introduced, a fare equity analysis must be conducted, even if the existing fares remain the same.

The fare policy changes recommended in this study, including creation of new fare categories or fare media, will require fare equity analyses prior to implementation. All of the service changes recommended should be reviewed during the service planning stage to determine whether they meet the "major service change" definition. If so, service equity analyses should be conducted.

Service equity analyses are only needed for those changes that are determined to be major service changes. CTDOT defines a "major service change[1]" as:

1. A proposal to abandon all service on an entire bus route or rail line, or elimination of a route or a branch that reduces the span of service by more than five percent (5%);
2. A proposal to eliminate service on a portion of a bus route or rail line that represents more than twenty percent (20%) of the route miles of the particular route or line. (No major service change will be considered if alternative transit service is available on existing duplicative service provided by another transit provider or by transfer to another route, and if the elimination does not trigger any other threshold for a major service change);
3. A proposal to substantially reduce service on a bus route or rail line, specifically where the reduction of service increases the headway of the peak period service by more than fifty percent (50%) or more than doubles the off-peak headway.

[1] When a service change is proposed, there shall be a twelve-month look-back to ascertain if the aggregate of any changes in the prior twelve months would have triggered one of these major service change criteria and therefore an equity analysis.

4. The addition of, or reduction in, more than ten percent (10%) of the rail or bus system's overall vehicle revenue hours through one or more route changes.

Most of the service recommendations from this study involve service additions or improvements which may trigger a Title VI analysis under Item 4 above. The potential service reductions would be examined for all four items. But, as noted, service equity analyses are required for both service reductions and improvements.

Considerations for each of the recommendations with possible Title VI implications are presented below.

1.1 Global Recommendations: Improve Existing Bus Service Performance

Fare Policy and Media Improvements - Recommendations #18, #19 and #21

The study includes a number of recommendations that involve changes to the fare structure/policy or new electronic fare media. If new fare media such as a "smart card," are introduced, a fare equity analysis must be conducted, even if the existing fares remain the same because new fare media may have an adverse impact on minority and low-income populations, depending on where it can be obtained by the public. An analysis of who is using current fare media and projecting who would use the new fare media is required so the transit agency can determine whether there are adverse or disproportionate burdens on minority or low-income populations.

CTDOT will need to conduct fare equity analyses to assess whether the benefits of new fare categories and new electronic payment media are being shared equitably by low income and minority populations.

- Recommendation #18 – create single fare policy and apply smart card technology for all transit systems across the state
- Recommendation #19 - integrate the fare structure and fare media between the bus and rail systems.
- Recommendation #21 - a statewide student discount policy.

Recommendation #20 – Improve Services to Higher Education and Major Employers

As CT*transit* and other transit agencies evaluate the possibility of expanding the service frequency, span and days to higher institutions and major employers, the agencies will be required to analyze whether the potential changes, or groups of changes, meet the CTDOT threshold as a "major service change." If so, then a service equity analysis will need to be conducted and any disparate impacts or

disproportionate burdens mitigate. It is likely that most, if not all, of these possible expansions will not rise to the level of a major service change.

1.2 Route Specific Recommendations

Bus Stop Spacing and Amenities

There could be Title VI implications to improving bus stop amenities since the CTDOT Title VI Plan includes bus stop amenity guidelines. Every three years, as the agency monitors its service for the Title VI plan, the distribution of stop amenities such as bus stop shelters within a system is one factor in determining the overall equity of a system. This analysis links bus shelter availability at individual stops provided by the DOT with route and stop information from GTFS.

There also could be Title VI implications to bus stop spacing since the CTDOT Title VI Plan includes bus stop spacing guidelines ("*In general, bus stop spacing should not be less than 0.125 miles (700 feet). In urban areas, bus stops should not be positioned more than 0.250 miles (1400 feet) apart*"). However, it does not appear that CTDOT uses this standard when the agency monitors the service availability in its triennial Title VI plan.

Headways

The planning for potential increases in frequency on the three routes where passenger loads exceed 1.3 passengers per seat in the peak (section 6.8.3) should include an analysis as to whether the change, or group of changes, meet the threshold for major service changes – namely that they would add more than 10% of the bus system's overall vehicle revenue hours (through one or more route changes). This appears unlikely given the number of routes included but, if so, a service equity analysis would be required.

Span of Service

The planning for potential **decreases** in the span of service on routes identified with low passenger loads on the first or last trip (Section 6.8.4) should include an analysis as to whether the change, or group of changes, meet the threshold for major service changes – namely that they would 1) eliminate a route or branch that reduces the span of service by more than 5%, or 2) reduce the bus system's overall vehicle revenue hours by more than 10% (through one or more route change). If so, a service equity analysis would be required.

The planning for potential **increases** in the span of service on routes with high passenger loads on the first or last trip should include an analysis as to whether the change, or group of changes, meet the threshold for major service changes – namely that they would add more than 10% of the bus system's overall vehicle

revenue hours (through one or more route change). If so, a service equity analysis would be required.

Other Service Reductions

As with reductions in the span of service (above), the planning for potential elimination or decreases in service on routes with low productivity or utilization (section 6.8.5) should include an analysis as to whether the change, or group of changes, meet the threshold for major service changes. Depending on the reduction being proposed, the analysis should examine whether the change would 1) abandon the route or branch that reduces the span of service by more than 5%, 2) eliminate more than 20% of the route miles, 3) reduce headways 50%, or 4) reduce the bus system's overall vehicle revenue hours by more than 10% (through one or more route change). If so, a service equity analysis would be required.

Farebox Recovery

Any fare changes associated with measures to improve farebox recovery would require a fare equity analysis.

Reduction in Deadhead Miles

One suggestion for decreasing deadhead miles is to build new facilities that reduce non-revenue miles. Under Title VI, CTDOT would have to complete a Title VI equity analysis during the planning stage for facilities such as storage facilities, maintenance facilities, operations centers, etc.

Feeder Bus Service to CTrail Hartford Line

Some of the fixed route bus schedules changes to the Windsor, Hartford Union, Berlin, Meriden, and Wallingford stations that are intended to integrate/synchronize with the planned Hartford line may rise to the threshold of major service changes, particularly if they are implemented as a package (or within a 12-month period). Potential improvements that merely adjust the schedules to better serve the rail stations (Windsor and Berlin) probably will not be considered major service changes. However, changes being evaluated for the remaining stations could potentially be considered major service changes and would require service equity analyses during the planning phase:

- Harford – extend the Bradley flyer from terminus at Union Station to New Britain via CTfastrak. Maybe an extension of the Bradley Flyer to New Britain
- Meriden – adjust schedules but also expand span and consider operating weekend service
- Wallingford – expand service span and increase frequency in morning and evening peaks.

Appendix G: Greater Bridgeport Transit Bus Stops Prioritized for Amenities

GBT Bus Stops with 50 or more Daily Boardings

The following GBT bus stops are recommended for installation of benches.

- ARCTIC ST. at EAST MAIN ST. - S.B. - NS
- ATLANTIC ST. at IRANISTAN AVE. - N.B. - NS
- BARNUM AVE. at 1475 BARNUM AVE. - S.B. - NS
- BARNUM AVE. at BISHOP AVE. - S.B. - NS
- BARNUM AVE. at BRUCE AVE. - S.B. - NS
- BARNUM AVE. at CENTRAL AVE. - S.B. - NS
- BARNUM AVE. at MAIN ST. - S.B. - FS
- BOND ST. at BOSTON AVE. - S.B. - NS
- BOSTON AVE. at WILLIAM ST. - N.B. - FS
- Broad St & University Ave
- CENTRAL AVE. at OGDEN ST. EXT. - S.B. - NS
- CONNECTICUT AVE. at FIFTH ST. - S.B. - NS
- CONNECTICUT AVE. at HOLLISTER AVE. - S.B. - FS
- CT Post Mall
- DOCK SHOPPING CENTER at SIDE OF STOP & SHOP
- EAST MAIN ST. at ARCTIC ST. - S.B. - NS
- EAST MAIN ST. at BEARDSLEY PARK TER. - S.B. - NS
- EAST MAIN ST. at BURROUGHS ST. - S.B. - NS
- EAST MAIN ST. at PUTNAM ST. - S.B. - NS
- EAST MAIN ST. at SILLIMAN PL. - S.B. - NS
- EAST MAIN ST. at STILLMAN ST. - S.B. - FS
- EAST MAIN ST. at STRATFORD CROSSING DRIVEWAY - S.B
- FAIRFIELD AVE. at CLINTON AVE. - S.B. - NS
- FAIRFIELD AVE. at ELLSWORTH ST. - N.B. - NS
- FAIRFIELD AVE. at HOWARD AVE. - S.B. - NS
- GRANT ST. at CENTRAL AVE. - S.B. - NS
- HUNTINGTON TPK. at PRISCILLA ST. (OPP.) - S.B. - M
- IRANISTAN AVE. at STATE ST. - N.B. - NS
- JOHN ST. at BROAD ST. - S.B. - FS
- MAIN ST. at CAPITOL AVE. - N.B. - NS
- MAIN ST. at HAWLEY AVE. - N.B. - FS
- MAIN ST. at HAWLEY AVE. - S.B. - NS

- MAIN ST. at HILLHOUSE AVE. - N.B. - NS
- MAIN ST. at NORTH AVE. - N.B. - FS
- MAIN ST. at WHEELER AVE. - S.B. - NS
- NOBLE AVE. at EAST WASHINGTON AVE.
- OCEAN TER at OCEAN PL -SB -NS
- Park & State
- PARK AVE. at BEECHWOOD AVE. - S.B. - NS
- PARK AVE. at BENHAM AVE. - S.B. - NS
- PARK AVE. at LAUREL AVE. - N.B. - NS
- PARK AVE. at NORTH AVE. - N.B. - NS
- PARK AVE. at SACRED HEART UNIVERSITY ENTRANCE - S.
- PEARL HARBOR ST. at SUCCESS AVE. - S.B. - NS
- STATE ST. at HOUSATONIC COMMUNITY COLLEGE
- STATE ST. at IRANISTAN AVE. - N.B. - NS
- STATE ST. at WEST AVE.
- STEWART ST. at BOND ST. - S.B. - NS
- TUNXIS HILL RD. at SUPER STOP & SHOP - N.B. - MB

GBT Bus Stops with 100 or more Daily Boardings

The following Greater Bridgeport Transit bus stops are recommended for installation of benches and bus shelters.

- CONNECTICUT AVE. at CENTRAL AVE. - S.B. - NS
- Departure BTC
- DOCK SHOPPING CENTER at SIDE OF STOP & SHOP - S.B.
- FAIRFIELD AVE. at WORDIN AVE. - N.B. - NS
- Generic Berth at BTC
- HAWLEY LANE MALL at FRONT OF TARGET - S.B. -
- JOHN ST. at BROAD ST. - N.B. - FS
- JOHN ST. at PARK AVE. - N.B. - NS
- JOHN ST. at PARK AVE. - S.B. - NS
- MAIN ST. at BEECHMONT AVE. - N.B. - FS
- MAIN ST. at CAPITOL AVE. - S.B. - NS
- MAIN ST. at ELIZABETH ST. (OPP.) - N.B. - FS
- MAIN ST. at FAIRFIELD AVE. - N.B. - FS
- MAIN ST. at KAECHELE PL. - N.B. - NS

- MAIN ST. at NORTH AVE. - S.B. - NS
- Norwalk Wheel Hub
- PARK AVE. at ATLANTIC ST. - N.B. - NS
- PARK AVE. at LINDEN AVE. - N.B. - NS
- POST RD. EAST at MORNINGSIDE DR. NORTH - S.B. - FS
- POST RD. EAST at MORNINGSIDE DR. SOUTH - N.B. - NS
- SAINT STEPHEN'S RD. at SHELL ST. - N.B. - FS
- STATE ST. at CLINTON AVE. - N.B. - NS
- STATE ST. at HOWARD AVE. - N.B. - NS
- WATER ST. at JOHN ST. - B.D. - NS
- Westfield Shoppingtown Trumbull
- WESTFIELD TRUMBULL MALL at BUS CONCOURSE - S.B. –

Appendix H: Public Outreach Materials

CONNECTICUT STATEWIDE BUS STUDY

Kick-Off Presentation
Regional Planning Organization Meeting

December 1, 2015

Why conduct a Statewide Bus Study?

- Last study completed 15 years ago
- Changing CT transit network
- Changing travel patterns
- Governor Malloy committed to enhanced transportation

- **TransformCT**
  CT's strategic long-range transportation plan
- **Let's Go CT!**
  Governor's plan for $100 billion investment in transportation over 30 years

Let's GO CT! Bus Program

- Improve & expand bus service by 25%
- Urban access to transit within half-mile
- Integrate operating services
- Upgrade bus maintenance facilities
- State-of-the-art service & information delivery

Regional Studies

CONNECTICUT STATEWIDE BUS STUDY

- Build on previous and ongoing efforts
- Provide a uniform effectiveness assessment
- Provide evaluation of gaps in statewide bus service

CONNECTICUT DEPARTMENT OF TRANSPORTATION

Project Goals

CONNECTICUT STATEWIDE BUS STUDY

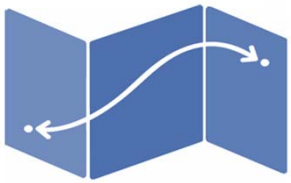
Optimize fixed route service and identify best investments

- Enhance access to jobs
- Recommend expansions of intercity service
- Provide bus service within ½ mile of urban residents
- Determine where services need additional capacity
- Determine where new service is needed
- Connect to commuter services and important generators outside of CT (in NY, RI, CT and MA)

A separate study will analyze paratransit service

High Capacity

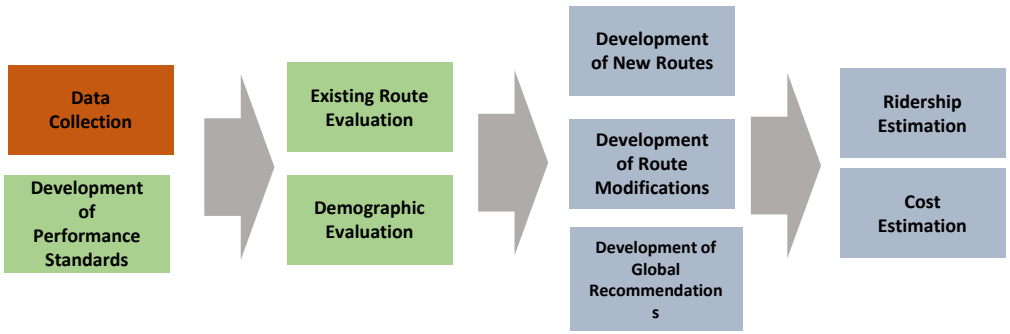
Reliable

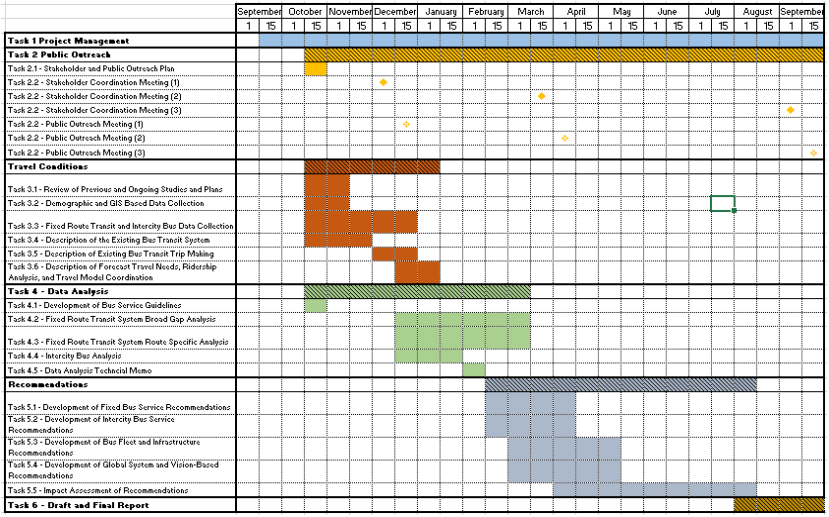


Direct

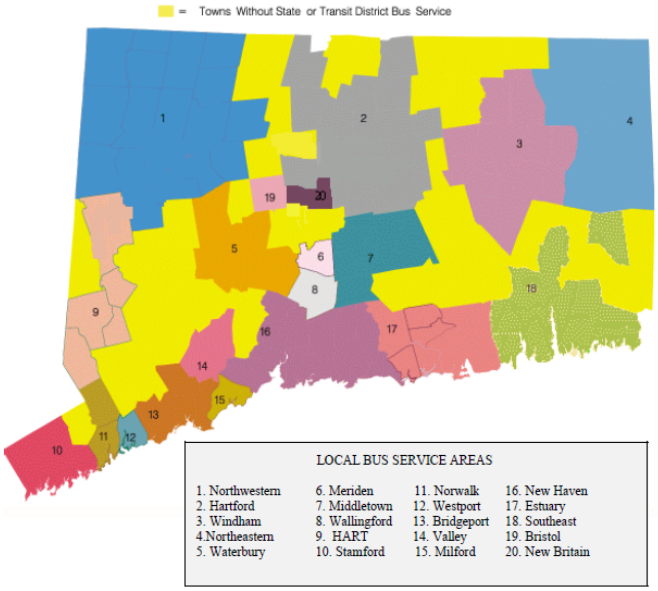
Modern

Study Overview and Project Schedule





Bus Service in CT



LOCAL BUS SERVICE AREAS

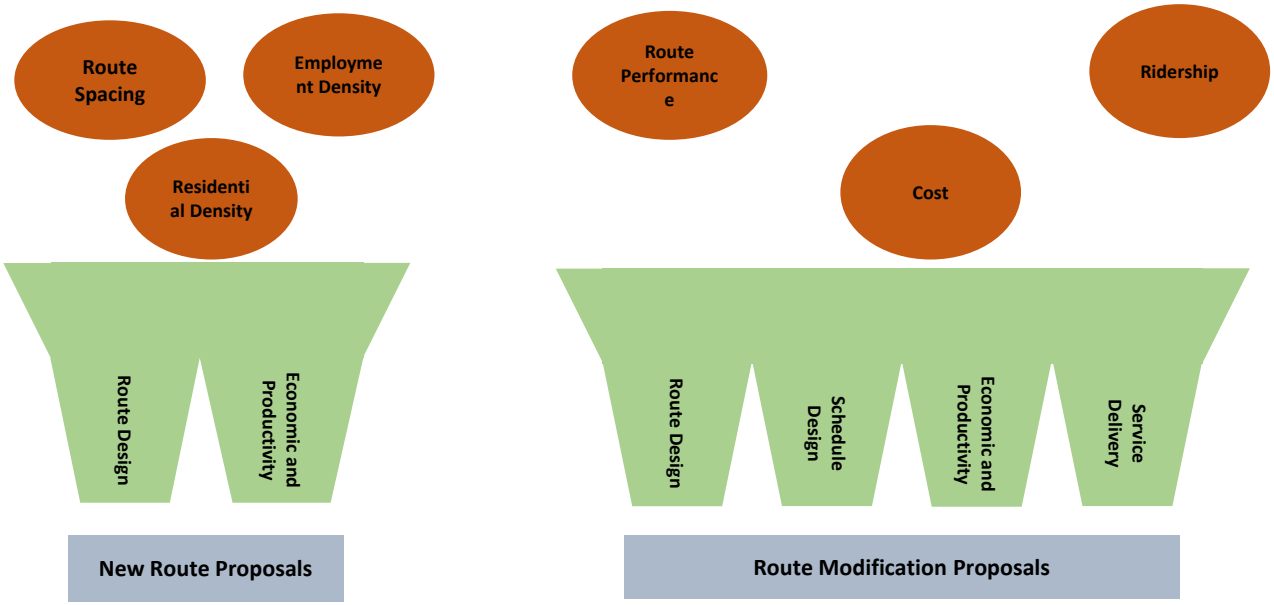
1. Northwestern	6. Meriden	11. Norwalk	16. New Haven
2. Hartford	7. Middletown	12. Westport	17. Estuary
3. Windham	8. Wallingford	13. Bridgeport	18. Southeast
4.Northeastern	9. HART	14. Valley	19. Bristol
5. Waterbury	10. Stamford	15. Milford	20. New Britain

- 20 Bus Service Areas
- Multiple Providers: CT*ransit,* GBTA, Estuary Transit District, HART, MAT, Milford Transit District, Northeastern CT Transit District, Northwestern Transit District, Norwalk Transit District, SEAT, Valley Transit District, Windham Regional Transit District
- Over 25M Revenue Miles
- 42 Million Annual Bus Trips
- 2014 Operating Budget is $189M

Service Guidelines Drive the Evaluation

- Route Design
  Where do routes operate?
- Schedule Design
  How often do routes operate?
- Economic and Productivity
  How efficient should routes be?
- Service Delivery
  How well are routes operating?

Route Evaluation



Data

Service Guidelines

Recommendations

Potential Recommendations

- New fixed routes
- Modifications to fixed routes
- New intercity routes
- Modifications to intercity routes
- Maintenance Facility Improvements
- Global changes (customer information, fare payment, best practices)

Participation Opportunities

- Stakeholder Advisory Committee
- Stakeholder Interviews
- Online Public Meetings/Virtual Workshops
- Project Website: **www.ctbusstudy.com**
- Through other ongoing transit efforts throughout the state

CONNECTICUT STATEWIDE BUS STUDY

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Regional Planning Organization Meeting

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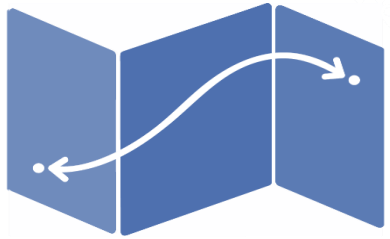
Reliable



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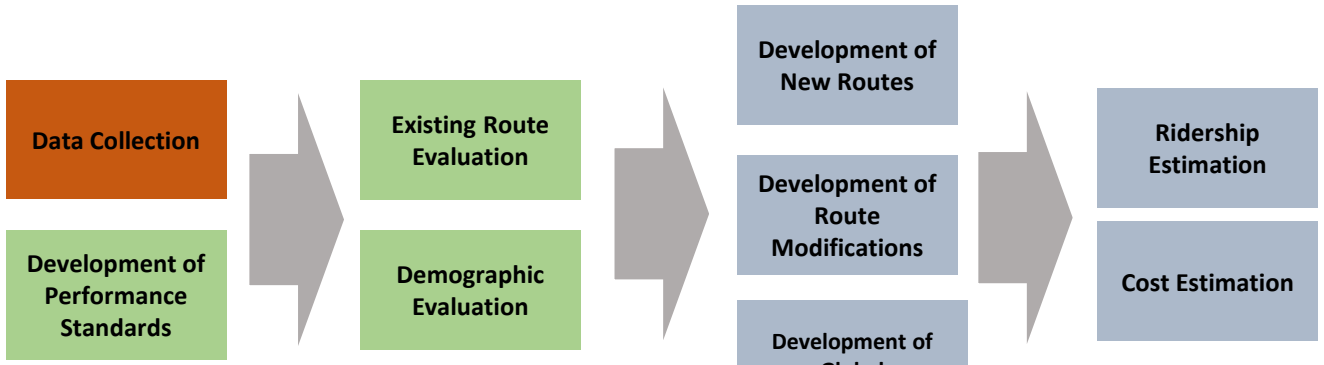

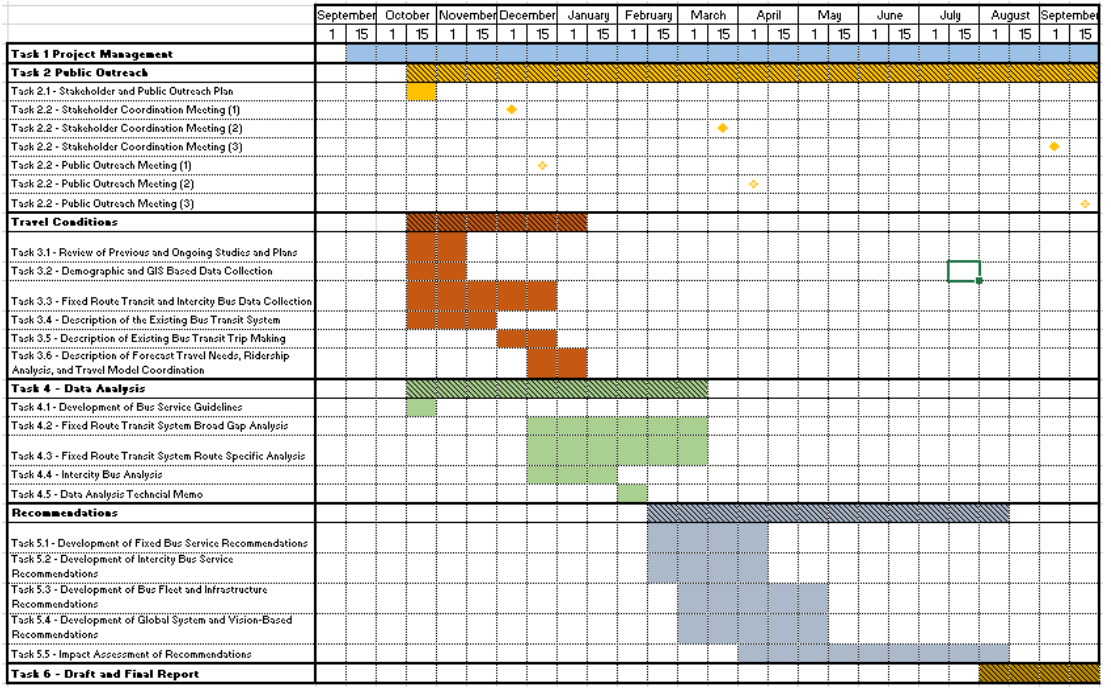

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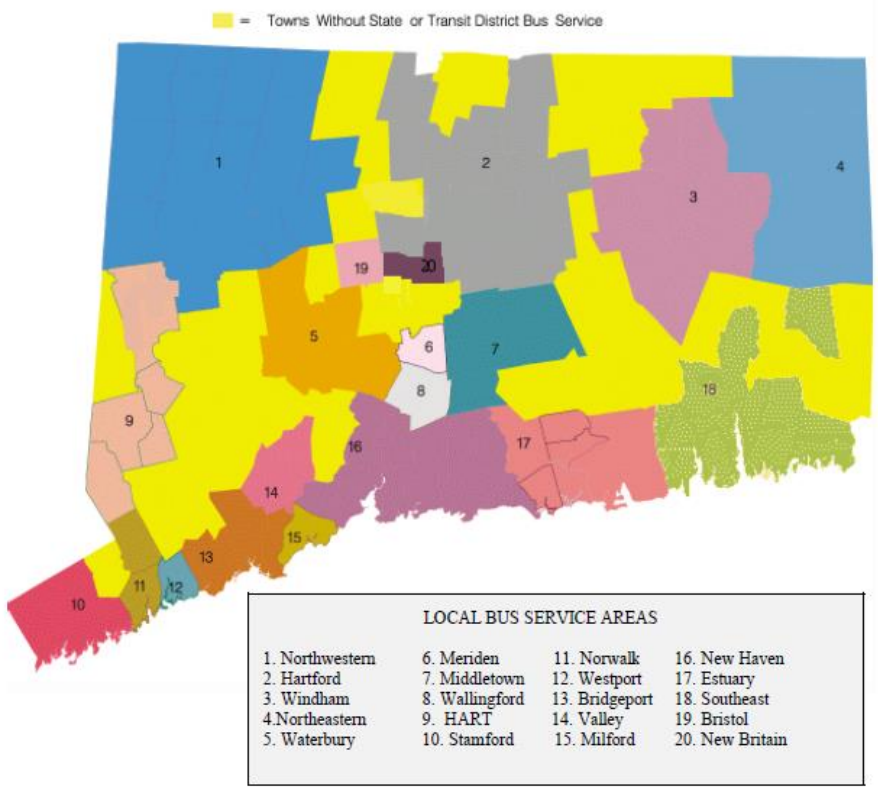

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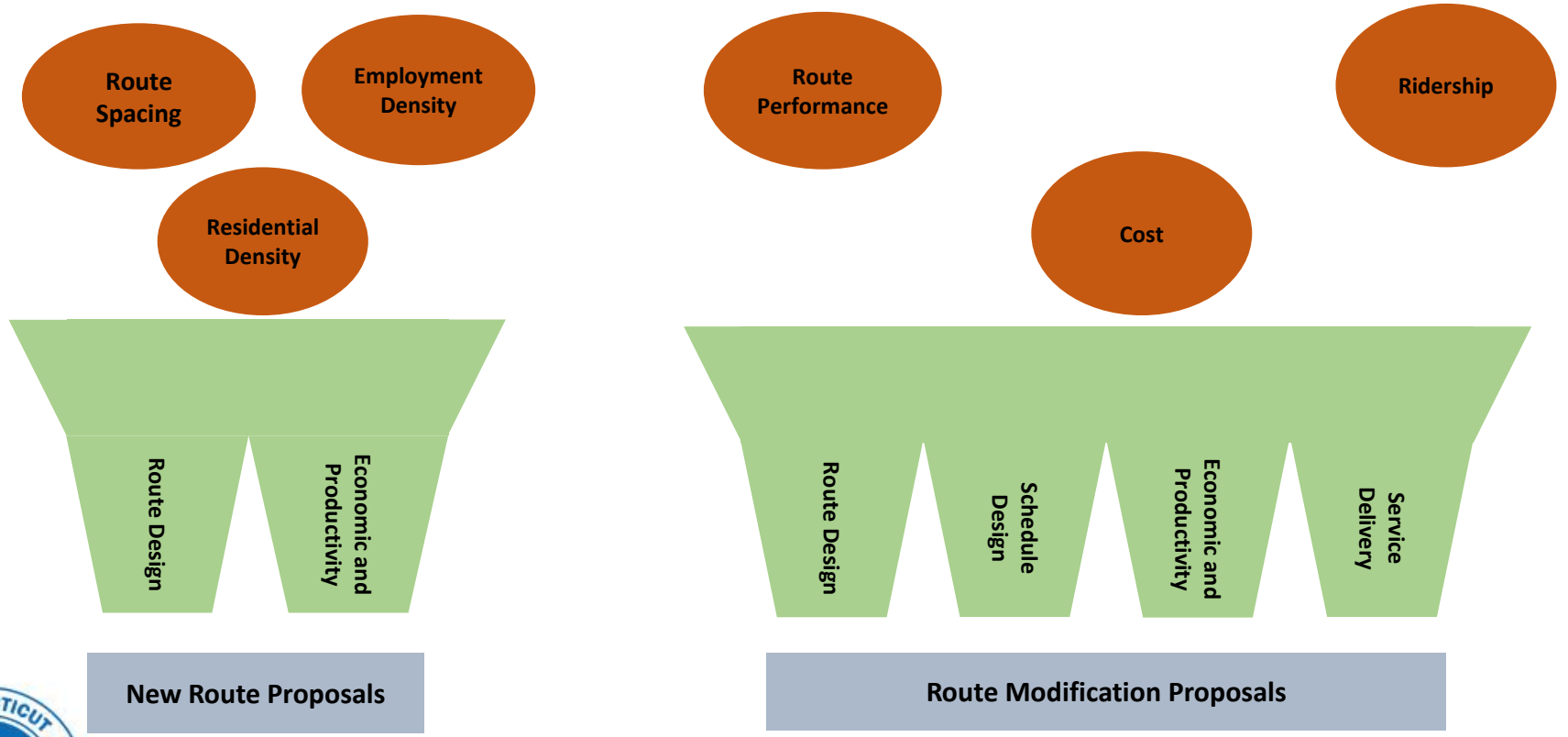
- Service Delivery
  - How well are routes operating?

Route Evaluation



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Participation Opportunities

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- Stakeholder Interviews
- Online Public Meetings/Virtual Workshops
- Project Website: **www.ctbusstudy.com**
- Through other ongoing transit efforts throughout the state

CONNECTICUT STATEWIDE BUS STUDY

Regional Planning Organization Meeting
Statewide Bus Study Update

October 18, 2016

Study Overview

- Last study completed 16 years ago
- Changing transit network
- Changing travel patterns
- The Governor has committed to enhanced transportation

Study Goals

Optimize fixed route service and identify best investments

- Enhance access to jobs
- Recommend expansions of intercity service
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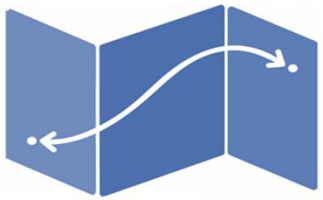


Direct

Modern

A separate study will analyze paratransit service

Bus Service Guidelines

- Provides a single set of service guidelines for statewide fixed bus route system
- Measures cost effectiveness, service performance, and support of stated goals
- Builds on “best practices”, *Let’s Go CT* vision, and study goals
- Establishes service standards, criteria, performance metrics, and goals
- Requires consistent data across providers for evaluation
- Recommends regular bus system performance evaluations (every 2 years)
- Guides future changes and investment
- Performance assessments are required in Statewide Transportation Plans (FAST Act, 2015)

Service Guidelines Drive the Performance Evaluation

- Route Design
  - Where do routes operate?
- Schedule Design
  - How often do routes operate?
- Economic and Productivity
  - How efficient should routes be?
- Service Delivery
  - How well are routes operating?

Stakeholder Outreach Efforts

- Stakeholder Interviews
  - ✓ Mobility Ombudsmen Meeting – March 2016
  - ✓ State College and Universities Meeting – August 2016

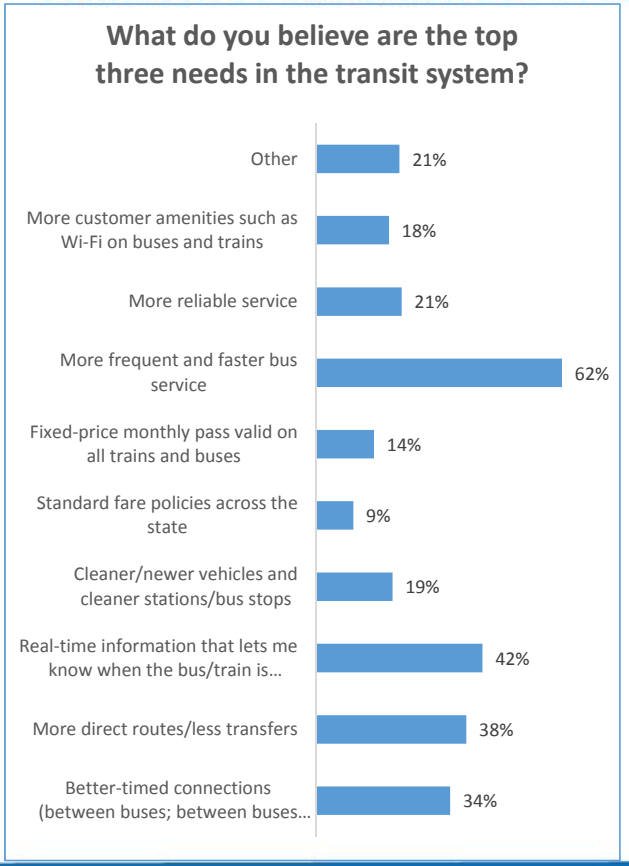
  - ❖ Feedback
    - ➢ Expand span of service
    - ➢ Expand service coverage
    - ➢ Improve connectivity between stations
    - ➢ Provide direct access to colleges, universities, and suburban/rural employment destinations

- RPO Meetings/Calls
  - ✓ December 2015
  - ✓ May 2016
  - ✓ October 2016

Public Outreach Efforts

- Virtual Public Workshop – July and August 2016
  - ✓ Attracted over 360 members of the public
  - ✓ Enabled public feedback about transit use, intermodal connections, and transit needs
  - ✓ Provided insight into travel behavior, choices and needs
- Project Website: www.ctbusstudy.com is generating comments
- Summary of findings
  - ✓ 74% of respondents use transit to travel in CT
  - ✓ Reasons for not using transit: Buses don't go where I want to go, Buses don't run when needed, and Wait times are too long.
  - ✓ Almost half of respondents board buses on the street, while 18% board at a park and ride
  - ✓ 33% of respondents make at least one transfer on their trip

CONNECTICUT STATEWIDE BUS STUDY



Next Steps

- Complete route-based performance evaluation
- Development of system and route recommendations
- Continue outreach:
  - ✓ Final Public Meeting/Virtual Workshop - first week of December
  - ✓ Through other ongoing transit efforts throughout the state
- Draft Final Report
- Final RPO Meeting – December 20, 2016

CONNECTICUT STATEWIDE BUS STUDY

Regional Planning Organization Meeting
Statewide Bus Study Update

December 20, 2016

Study Goals

Optimize fixed route service and identify best investments

- Enhance access to jobs
- Recommend expansions of intercity service
- Provide bus service within ½ mile of urban residents
- Determine where services need additional capacity
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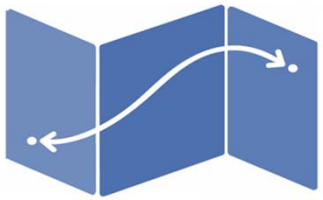

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Two Categories of Statewide Need

- Global

  These are statewide or individual system needs with a focus on creating a more unified, user-friendly bus statewide network that increases ridership

- Route-level

  These are needs identified for individual systems or for specific routes within a system with a focus on performance, coverage and user interface

Needs were identified through stakeholder/public outreach, research and performance evaluations

Statewide Global Needs

Analysis of the statewide transit system and feedback received from the public identified these needs:

- Lack of performance assessments or consistent guidelines
- Inadequate/inconsistent bus data collection processes and reporting
- Lack of seamless connectivity between adjacent direct bus systems
- Capacity and frequency issues on high-demand routes
- Spans of service that are incompatible with evening and weekend employment, education and recreational travel needs
- No single, combined source of public information regarding the statewide bus services
- Inconsistency in planning or implementing new technologies, such as real time bus information
- Insufficient connectivity between colleges, universities and key travel destinations in the state

New CT Statewide Bus Service Guidelines were Developed

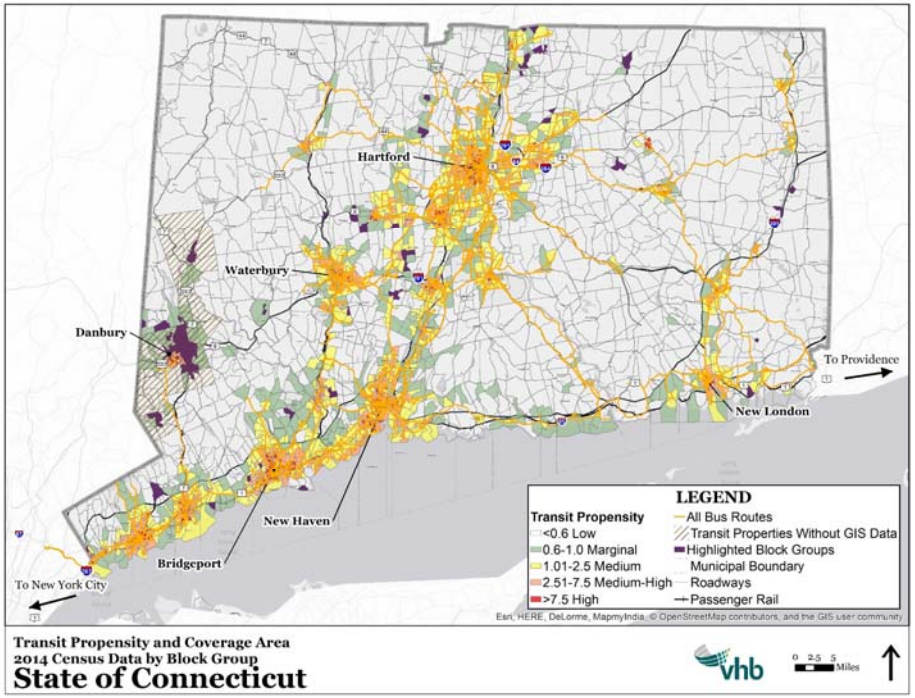
- Builds upon “best practices”, *Let’s Go CT* vision, and study goals
- Consider the diversity of the state’s bus system
- Establishes service standards, criteria, and performance metrics
- Enables evaluation of cost effectiveness, service performance, and support of stated goals
- Requires consistent data across providers for evaluation
- Provides aspirational guidelines for system evolution

How well is the Statewide System Performing?

- Collected high-level bus system data from each service provider
- Applied service guidelines using the data provided; similar-sized systems were compared with each other
- Conducted a two-stage evaluation
  - Stage 1 Evaluation
    - ✓ All routes using some metrics
  - Stage 2 Evaluation
    - ✓ Select routes based on Stage 1 Evaluation results using remaining metrics

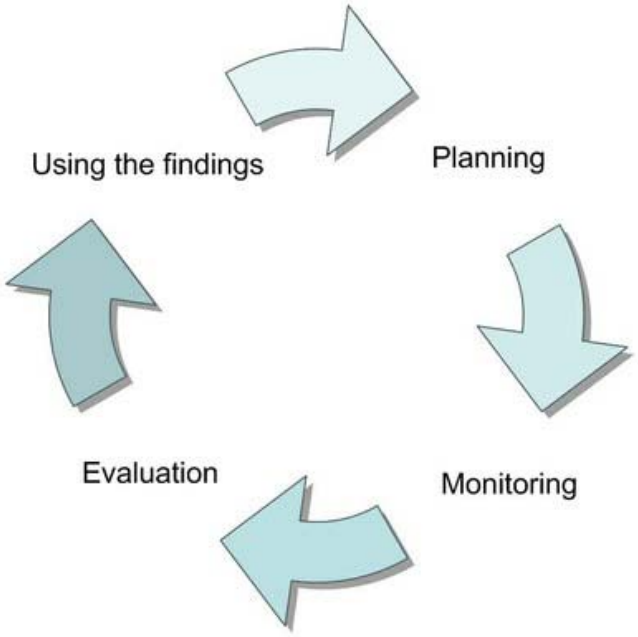
Stage 1 Evaluation

- Evaluation of all statewide routes was attempted; many systems either didn't have or couldn't provide data
- Some small towns/remote areas not served by transit should be examined
- Evaluated On-Time Performance, Transit Propensity, Passenger Trips per Revenue Hour
- Transit propensity showed that mostly we are serving areas in need with some small areas subject to further investigation
- Many bus routes have low to moderate usage
- On-time performance (reliability) may be an issue for all transit properties
- 76 routes were advanced for Stage 2 Evaluation



Stage 2 Evaluation

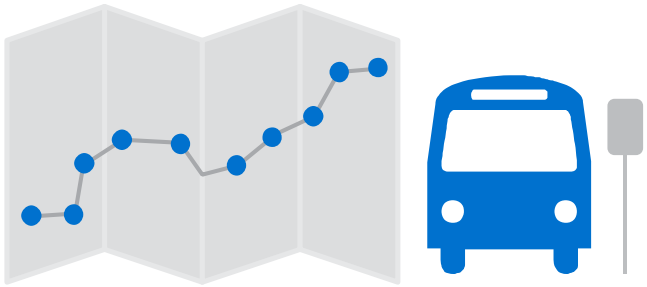
- 9 metrics were applied
  - ✓ Bus stop spacing
  - ✓ Bus stop amenities
  - ✓ Headways
  - ✓ Span of service
  - ✓ Passenger trips per revenue mile
  - ✓ Farebox recovery
  - ✓ Ratio of revenue miles to non-revenue miles
  - ✓ Average distance between failures
  - ✓ Fleet average age
- Data at the route level was often not available
- Routes (or systems) with data were evaluated



Route Design

Bus Stop Spacing

- Evaluated distance between bus stops
  - ✓ Data available for only 32 routes
  - ✓ Bus stops spaced too closely on 22 routes



Bus Stop Amenities

- Candidate shelters and bench locations were identified based on daily boardings at stops
  - ✓ Only Greater Bridgeport Transit (GBT) collects this data
  - ✓ Some GBT candidate stops identified for compliance with the metric

Schedule Design

Headways

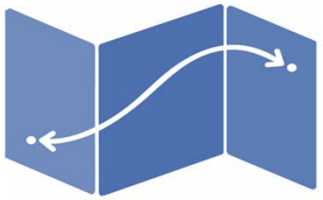
- Used to determine how often to operate bus service based on number of riders per trip
  - ✓ Only 14 routes had information necessary to assess headways
  - ✓ Three CT*transit* Waterbury Routes 22, 28 and 42 – candidates for headway adjustment

Span of service

- Used to determine time and duration of service based on ridership
- Based on passenger loads on first and last trip
  - ✓ Most agencies do not collect this data
  - ✓ Only 16 routes could be evaluated
  - ✓ For these routes spans of service are appropriate

Route Productivity

Passenger Trips per Revenue Mile



- Low numbers indicate low utilization; high numbers indicate crowding
- Only 43 of 76 routes evaluated due to data availability
  - ✓ 32 routes were poor performers

Fare box Recovery

- Calculated how much of the cost to operate buses is covered by the fare collected
- Data not available at route level; evaluated at system level
- Windham Region, Southeast Area, Milford, Housatonic Area, Middletown, & Norwalk Transit Districts have low fare box recovery ratios

Route Productivity

Revenue to Non-Revenue Miles Ratio

- Measured efficiency of scheduled service to out-of-service mileage
- Only 24 routes could be evaluated
- Several agencies had routes with non-revenue miles more than 5% of revenue miles
  - 6 C*Ttransit* Hartford routes
  - 5 C*Ttransit* New Haven routes
  - 5 SEAT routes
  - 2 Hartford Express routes

Service Delivery

Average Distance between Bus Failures

- Data not available at route level
  - ✓ 11 of 15 systems evaluated at system level
- Systems with more frequent breakdowns
  - ✓ CT*transit* Hartford, CT*transit* New Haven, SEAT, GBT, NTD, MTD

Fleet Average Age

- Compared average age of bus fleet to useful service life per FTA
- Systems with fleets exceeding useful life
  - ✓ **CT*transit* New Haven**, **NTD**, GBT, **WRTD, SEAT**, **MTD, NWCTD**, ETD
  - ✓ FFY 2017 – 2018 bus purchases:
    - ❖ CT*transit* Hartford, New Haven, and Waterbury
    - ❖ HART
    - ❖ MTD
    - ❖ NTD
    - ❖ SEAT
    - ❖ WRTD
    - ❖ NWCTD

Identified Route Level Needs

- Several routes have too many bus stops and stops with low ridership
- There is a lack of consistent and basic information at bus stops (signs and route information)
- Station/stop amenities (such as shelters at high ridership bus stops) are needed
- Many routes have low ridership/utilization
- There are systems with low fare box recovery rates (10% to 23% vs. national average of 25.7%)
- Several systems have older bus fleets with frequent breakdowns
- Some buses travel long distances without passengers to get to the depot

Key Finding: Data Collection is an issue

- Agencies were responsive and provided the data they had
- Many agencies were missing some or most data needed to conduct a complete performance assessment
  - ✓ A lack of on-time performance data was almost universal throughout the state
- Data was collected and provided in varied and inconsistent formats and time periods
- There was a lack of consistency in data collection measures and practices
- Smaller and rural agencies reported a lack resources for comprehensive data collection

Intercity Bus Needs

- Assessed attractions outside of 10 miles from an intercity bus stop and not in an urbanized area
- Evaluated transit dependent populations and areas with no intercity bus service or transit service to an intercity bus stop
- Few areas in state are without access to intercity bus service
- Potential intercity bus destinations not currently served or lacking direct service
  - ✓ Towns of Stafford and Plainfield
  - ✓ Brooklyn Correctional Institution (Windham County)
  - ✓ Eastern Connecticut State University Campus
- Expanded marketing support to advertise intercity bus service

Global Recommendations

Applies to Statewide Bus System

- Improve Existing Bus Service Performance
  - ✓ Adopt bus service guidelines
  - ✓ Expand AVL & APC technology beyond 8 CT*transit* divisions
- Create Better Data Collection Processes, Tools and Reporting
  - ✓ Collect & report data in a consistent format/level of detail
  - ✓ Will be based upon the LEAN process
  - ✓ Regular Statewide Performance Assessments
  - ✓ First data check in 6 months, all routes providing data in 18 months
- Conduct Future Transit Improvement Studies
  - ✓ Investigate serving low-density/high transit propensity areas
  - ✓ Tie Transit Development Plans to Statewide Goals and Initiatives

Global Recommendations

- Make Bus Service Easier and More Convenient to Use
  - ✓ Expand usefulness & capabilities of transportation providers websites
  - ✓ Create a one-stop source for information and trip planning
  - ✓ Provide real-time bus arrival information

- Create an Integrated Statewide Bus System
  - ✓ Explore the feasibility of consolidating bus operations under a single entity
  - ✓ Conduct a governance study
  - ✓ Create a single regional fare policy and adopt consistent smart card technology
- Better serve Special Transit Generators
  - ✓ Review transit connectivity/span of service to state and community institutions & major employers
  - ✓ Create a statewide student transit discount policy (expand on Upass)

Route Level Recommendations

- Bus stop spacing
  - ✓ Many bus routes require an examination of bus stop spacing
- Bus stop amenities
  - ✓ All bus stops with 50 to 100 boardings should be considered for benches
  - ✓ All bus stops with 100+ boardings should be considered for shelters
- Headways
  - ✓ Three CTt*ransit* Waterbury bus routes are candidates for service frequency adjustments
- Span of service
  - ✓ For the bus routes evaluated, spans of service were appropriate
  - ✓ Public feedback indicates span of service an issue requiring review by transportation providers

Route Level Recommendations

- Bus route productivity
  - ✓ Numerous routes experience low productivity
  - ✓ Detailed ridership analysis needed to identify and eliminate unproductive route segments
- Fare box Recovery
  - ✓ Bus systems with fare box recovery ratios below 25% need to decrease operating costs or increase ridership
- Fleet condition
  - ✓ Transportation providers with frequent vehicle failures need to identify patterns and/or adjust maintenance schedules
  - ✓ Vehicles whose average age is over 2/3's of useful life should be considered for replacement or rehabilitation

Intercity Bus Recommendations

- Statewide intercity bus system serves key destinations in neighboring states
- Encourage intercity bus providers to apply for federal funds for rural public transportation and intercity services
- Continue annual consultation with intercity bus operators to assess their needs
- Assess intercity bus operator interest to provide new service
  - ✓ Direct service to Eastern State University Campus (Willimantic)
  - ✓ Reinstate service to Brooklyn Correctional Institution (potential on-demand stop only)
- Seek federal funding for marketing, shelters and signage at intercity bus stops
- Continue to support policies that encourage intercity bus service at intermodal facilities
- Create an interconnected network in areas served by intercity bus

Next Steps

- Stage 1 and Stage 2 Evaluation Report
- Draft Final Report
- Virtual Public Workshop #2

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MEMORANDUM

To: VHB

Project: CT Statewide Bus Study

From: FHI

Date: 03.23.16

Subject: Conference Call with Regional Mobility Ombudsmen

In attendance:
Lisa Rivers, CTDOT
Alicia Leite, CTDOT
Maureen Lawrence, CTDOT
Ginger Morse, ECTC
Danielle Herbert, WayToGo CT
Christine Maguire, The Kennedy Center
Margaret Mixon, The Kennedy Center
Rick Davis, The Kennedy Center
Lisa DiTaranti, VHB
Joe Romeo, VHB
Ryan Walsh, FHI

Introduction

- Lisa DiTaranti (VHB) provided an overview of the Connecticut Statewide Bus Study; to assess the State's bus transportation system as a whole, to identify areas in need of improvement, and to recommend solutions.

Mobility Ombudsmen Input

- Each mobility ombudsman was asked to provide input to assist in the development an interactive presentation for the public. The following issues were identified by the Mobility Ombudsmen:
- There is a lack of connectivity between the regions.
- Bus travel between urban and rural areas is difficult. These trips typically require multiple transfers between bus routes/systems, and result in long waiting and travel times. These factors combine to create significant obstacles to using bus

for travel and makes using the bus a less attractive travel option. The lack of connectivity limits employment opportunities for State residents.

  - For jobs located in areas outside of cities or in rural areas, using the bus to access these employment destinations is difficult, because either bus routes do not directly serve those centers or the travel times are excessively long. For example, travel from New Haven to Clinton Crossing Premium Outlets by bus is difficult.
  - In the past, casinos have been a large source of employment, and the casinos used to subsidize buses for their employees. However, as their business has declined, the casinos withdrew their subsidies.

- In addition to lack of connectivity, other issues identified include:
  - Limited spans of service (for example, bus service to Connecticut Post Mall ends at the mall's closing time at 9PM, but there are mall employees who work past closing time and still need to travel to and from the mall),
  - Excessive walking distances for transfers between bus routes/systems,
  - Lack of passenger amenities, such as bus shelters,
  - Lack of transit service, particularly in Southington and East Windsor,
  - Crowding and reliability issues on certain bus routes such as the Coastal Link. The Coastal Link is a heavily used route and experiences crowding to such a degree that bus stops along the route are skipped leaving waiting riders unserved, (it was noted that the Coastal Link route is the subject of an active BRT study),
  - Confusion about transferring between different bus systems and whether or not transfers are honored between them,
  - A lack of a unified "one-stop" location for transit information and trip planning, (it was noted that GBT is making efforts to coordinate with other transit districts)
  - Know How to Go (the southwestern Connecticut Regional Mobility Manager) recently received a grant to purchase electronic touch information kiosks. It will install these kiosks at transit hubs and public libraries to provide information on available bus services and how to use these bus systems.
- The Ombudsmen were asked about any outreach or surveys they may have undertaken recently.
  - Last year, SEAT completed a public outreach effort. The results of this effort are available at www.SEATbusstudy.com
  - The Ombudsmen in conjunction with any public outreach efforts they perform, either administer surveys prior to the outreach or ask for feedback afterwards. They agreed to summaries of their outreach.
  - UCONN is conducting a study of travel patterns in the state for CTDOT. A household travel demand survey is being developed. Further information about the study is available at: https://cttransportationstudy.org/web/pages/home?locale=en-US

- A study is being conducted by Nutmeg Senior rides and other service providers in in in Somers, Enfield, East Windsor to identify transportation gaps and barriers for seniors and vision-impaired adults over the age of 18.
- The Ombudsmen agreed to provide Lisa Rivers (CTDOT) with any feedback from constituents, public outreach feedback and other information.
- The Ombudsmen were asked about what issues they are interested in hearing about?
    - The first mile/last mile portions of transit trips should be considered. Having direct or transit service with walking distanced can influence the decision to use transit. For example, in Essex, there is an assisted living facility and the closest bus stop is ¾ of a mile away.
    - In addition, bicyclists may not be aware that some bus systems have bike racks on their buses.
    - New medical facilities have been built, but they are in locations not served by buses. The Connecticut Statewide Bus Study should consider how to align bus services to those activity centers?
    - It was also suggested that the study consider better utilization of existing capital resources. For examples, during off-peak periods, when buses are being stored during the midday, can they be used to address other transportation needs? It must be recognized that Bus service and their fleets are typically planned around providing peak period service. While during the off-peak, buses may be available for other uses, this will result in increased operating costs to the transit provider and alternate sources of operating funds would need to be identified.
- Lisa Rivers (CTDOT) asked the Omsbudsmen to assist in advertising the Virtual Public Meeting when it is scheduled and to encourage input from their constituents.

CT Statewide Bus Study
Summary of College/University Survey Responses

College/University	Location	Relationship with Existing Transit Provider	Transit Pass Discount to Students/Faculty	Transportation Needs
Asnuntuck Community College (CC)	Enfield, CT	Asnuntuck CC pays $10K per year for a blanket agreement with Magic Carpet Bus Service. Also, seeking discounted transportation for Massachusetts residents via Pioneer Valley Transit Authority (PVTA).	Free fare (Magic Carpet Bus Service)	Provide increased transit services to Enfield, Connecticut from greater Springfield, Massachusetts.
Capital Community College (CC)	Hartford, CT	Participation in CT*transit* UPASS program.	About 45-55% of students use the UPASS each semester.	Reassess bus schedules to and from Capital CC, especially the evening schedule. Students are impacted by reduced night service, resulting in longer wait times for the bus during the evening. As a result, some students are not able to take the last class and utilize public transportation.
Central CT State University	New Britain, CT	Central CT State University has a CT*transit* agreement.	Provided 1,000 passes per semester during the 2015-2016 academic year at $0.98 per ride.	(1) Provide improved access from CCSU to Middletown/Shoreline, eastern CT, Waterbury area, New Haven train station, other college and universities in New Haven, and access to/from the airport. (2) Recommend last bus on certain evenings of the current CTfastrak service travel through campus and surrounding neighborhoods to drop students off as opposed to leaving students at CTfastrak station to disperse into campus and neighborhoods.
Manchester Community College (CC)	Manchester, CT	There are currently no partnerships. Manchester CC is currently exploring partnerships with the Middlesex CC Foundation in the form of grants/scholarships or subsidizing	No discounts are currently available.	(1) Recommend additional weekend bus service if the College pursues weekend classes. (2) Students with significant financial need continue to find the cost of transportation to be a challenge. (3) Students residing in rural areas may encounter difficulty accessing bus routes that serve Manchester CC. (4) Students traveling to the college from select towns may be impeded by the number of transfers required to get to campus.
Middlesex Community College (CC)	Middletown, CT	Middlesex CC received funding from the CUNO Foundation to pay for subsidized transit for students who live in Meriden.	MxCC has received funding from the CUNO Foundation to provide bus passes to students who live in Meriden and take classes. All other students pay full fare.	(1) One-way travel time between Meriden Center and the Middletown campus of MxCC is 1.5 hours. Students must transfer at Middletown's downtown transportation center in order to access the campus by bus. (2) Students from Meriden are unable to take evening classes on the Middletown campus if traveling by bus, because the last bus to Meriden from downtown Middletown departs at 5pm. (3) Limited to no direct public transportation routes from city centers other than Middletown to the college. Public transportation options from rural towns/cities (for instance, Portland or Haddam) is limited. Recommend additional routes from surrounding city centers to Middletown and to MxCC, as well as from rural areas, such as Durham, Portland, Haddam-Kilingworth, East Hampton, and the Shoreline. (4) Limited span of bus service affects the ability of students to enroll in courses, especially in the mornings and evenings. (5) Recommend reduced fare bus service for students. Students from Middletown, Meriden, New Haven, and Hartford have requested reduced fare bus passes. Many community colleges attract students from outside of the their service area due to special programs or personal preference of the student. As a result, students must travel greater distances, and from one town to another, which further complicates student travel and adds to commuting time.
Naugatuck Valley Community College (CC)	Waterbury, CT	Naugatuck Valley CC has agreements with CT*transit* Waterbury (NET) (Waterbury UPASS), Housatonic Area Regional Transit (HART) (Danbury UPASS), and Peter Pan bus company (provides connection between Danbury and Waterbury campuses).	About 850-900 students participate in the UPASS during the semester. There is a $10/semester fee to all registered students allowing unlimited travel on the CT*transit* system. The Peter Pan express ride between campuses is discounted at $8 a ride. Students pay $2 and the student government association pays the balance.	(1) Recommend CT*transit* Waterbury (NET) route expansion to Naugatuck and Watertown. Currently, bus coverage is limited. (2) Naugatuck Valley CC is requesting subsidy from CTDOT for one-way Peter Pan ticket between the Danbury and Waterbury campuses.
Northwestern Connecticut Community College (CC)	Winchester, CT	Northwestern Connecticut CC has a partnership with the Northwestern Transit District.	No discounted transit pass was mentioned.	(1) Recommend expanding the route schedule to include evening service. Northwestern CC is requesting Northwestern Transit District provide additional service from Torrington to Winsted during the evenings, from Monday to Thursday, until after 10PM, to accommodate student access to evening classes. Bus service ends at 3:55PM on campus yet 46% of Northwestern CC's classes are after 4PM.
Norwalk Community College (CC)	Norwalk, CT	Currently working with Norwalk Transit District to create a shuttle bus route between the campus and Norwalk rail station, and CT*transit* for a bus pass system for students.	Norwalk CC currently has no transit discounts. The college is seeking partnerships for transit discounts.	(1) Recommend extended evening hours to accommodate 7-9PM classes. The college is served by 3 bus routes that end service by 7:35PM. A Stamford bus runs about a 5 minute walk from the campus until 11:35PM but requires walking in the dark. (2) Currently seeking a reduced cost monthly bus pass for students and employees. (3) Costly and time consuming public transportation affect class attendance. For example, travel on Metro-North to South Norwalk train station, then transferring to bus, can take a minimum of 1-2 hours each way.
Quinebaug Valley Community College (CC)	Danielson, CT	Quinebaug has no partnerships. Approximately 20 students ride the bus.	No discounts.	(1) Service between the Danielson campus and the Willimantic Center is limited. Recommend one bus route between Danielson and Willimantic with more departure options that includes evening service.
Southern Connecticut State University	New Haven, CT	Southern Connecticut has a partnership with First Transit, CT*transit* , NuRide (ride-matching service), and RIDES (Metro Taxi).	Participates in CT*transit* U-Pass program.	(1) Recommend more frequent service with better connection to bus or shuttle service to Metro-North/Shoreline East with more service at night. (2) Add stations or bus service east of Old Saybrook, either on Shoreline East, or extend Metro-North east of New Haven. (3) Assess the transit connection between Bridgeport and New Haven. (4) Address student comments about public transit within New Haven. Students have commented that it can take 45 to 90 minutes to get to campus from home due to bus transfers and uncoordinated bus schedules. (4) Request discounted Metro-North/Shoreline East passes for college students. Many of the University's students utilize Metro-North/Shoreline East train service to get to and from New Haven.
Three Rivers Community College (CC)	Norwich, CT	Three Rivers CC has a partnership with Southern Area Transit (SEAT) express service to and from Groton and New London.	No discounted fare for students. Bus Scholarship program based on need provided.	(1) Improve bus route connections to the Towns of Colchester and Jewett City. (2) Lack of affordable transportation. (3) Reassess whether bus routes are appropriately located.
Tunxis Community College (CC)	Farmington, CT	Tunxis CC has no partnerships. Student Government Association offers full financial support for purchase of bus passes.	Student Government Association offers full financial support for purchase of bus passes.	(1) Re-evaluate bus schedules to better accommodate student's AM and PM classes. Due to schedule constraints, bus riders are discouraged from taking the first and last classes of the day.
Western Connecticut State University	Danbury, CT	Western Connecticut State University has no partnerships. The University requested a student discount through Housatonic Area Regional Transit (HART) but they were not able to provide a discounted fare.	The University does not receive a discount but is seeking a reduced transit fare for students. The University requested a student discount through Housatonic Area Regional Transit (HART) but they were not able to provide a discounted fare.	(1) Lack of connectivity to satellite campus in Waterbury and to the sister schools. (2) WCSU has reached out to HART to improve schedules that better accommodate students and to advertise more on campus. (3) For several years, Student Affairs purchased 100 10-ride tickets from HART and gave them away at orientation to new students. These were well received. Although, the program stopped due to cost.

CDOT Statewide Bus Study

Survey Results for Connecticut Colleges and Universities, July 2016

Overview

In July 2016, thirteen colleges and four universities participated in a bus study survey for Connecticut DOT's Statewide Bus Study. All seventeen colleges and universities responded to both the survey questions and data requests, with the exceptions of Charter Oak Community College, Eastern Connecticut State University, Gateway Community College, and Housatonic Community College. These four colleges responded to the data request, but did not participate in the survey questionnaire. None of the large private universities responded to the bus study survey, such as Yale University, Wesleyan University, Fairfield University, Sacred Heart, University of Bridgeport, and Quinnipiac University. The University of Connecticut did not participate as well. The following is a summary of the questionnaire responses and data collection for the survey.

Survey Questions Common Themes

The survey asked whether the educational institutions had a relationship with a transit provider, if transit pass discounts for students and/or faculty are offered, and what the students/faculty transit needs are. Almost half of the colleges and universities have a partnership with a transit agency and/or bus company (e.g., Peter Pan and Naugatuck Valley Community College or First Transit and Southern Connecticut State University. Six colleges that do not have a transit partner are divided into three categories:

Transit discounts funded by the school: Middlesex Community College and Tunxis Community College provide transit discounts to students through their Student Government Association or the CUNO Foundation.

Seeking transit agency partnerships: Manchester Community College, Norwalk Community College, and Western Connecticut State University are currently seeking transit agency partnerships.

Does not offer student transit discounts: Quinebaug Valley Community College does not have student discounts for transit and it did not mention that it is seeking a transit agency partnership.

The transit needs section of the bus study survey produced several common themes among the educational institutions, as highlighted below:

- **Recommend expansion of span of service**, particularly in the evenings to allow students using transit to take classes at night. The current limited to no evening transit service at some of the colleges makes it difficult for transit-dependent students to take classes at night since there is no service when the night class ends. Early classes can be difficult to access as well. Limited transit service for weekend classes was also mentioned.
- **Expand service coverage** for students traveling from a variety of origins (i.e., home and/or work locations) and destinations (traveling from/to work before/after class).
- **Lack of connectivity.** Survey responses discussed a lack of connectivity to some neighboring towns and cities, rail stations, and satellite campuses.
- **Re-evaluation of routes** to provide direct access to colleges and universities. Survey feedback discussed longer travel times due to the need to transfer between bus routes to complete trips and uncoordinated bus schedules, which affects ability to enroll in classes.

- **Provide bus stops within the campus and surrounding neighborhoods** in the evenings when safety is a concern, as opposed to stopping at the edge of campus.

Data Response

The key data requested included: class schedules, aggregate employee and student zip code data to assess where staff and students are commuting from to access the educational institution and an estimate of times and days when the commutes occur. The following table highlights participating colleges and universities that did not provide requested data.

College/University	Aggregate Employee Information by Zip Code	Aggregate Student Information by Zip Code	Class Schedule for Fall/Winter/Spring
Charter Oak (CC)			No Response
Eastern Connecticut State University			No Response
Naugatuck Valley (CC)	No Response	No Response	
Northwestern Connecticut (CC)	No Response		
Quinebaug Valley (CC)	No Response	No Response	
Tunxis (CC)	No Response	No Response	

Connecticut Statewide **Bus Study**

Do you ride the bus?
Have ideas to make it a better experience?

Please join CTDOT for an online bus workshop anytime during the period from July 25th - August 5th.

To play a part, visit **www.ctbusstudy.com**. Watch a video about bus travel in Connecticut. Answer questions about how you get around, where you go, and what could make bus travel better.

The information you provide will be used as part of the CTDOT Statewide Bus Study to help make the bus transit system better meet the needs of Connecticut's residents and employees.

What: Bus Study Virtual Workshop
When: July 25th - August 5th
Where: Online at **www.ctbusstudy.com**
Why: To provide input and learn about improvements to CT's bus system
How: Visit the website anytime of day or night, watch the video and answer the questions as prompted. The workshop materials are viewable on most devices and should take about 20 minutes to complete.

Connecticut Estudio Estatal de Autobús

¿Viaja en autobús? ¿Tiene ideas para mejorar la experiencia?

Por favor, acompañe a CTDOT para un taller de autobús virtual, durante el periodo del 25 de julio al 5 de agosto.

Para participar, visite **www.ctbusstudy.com**. Mire un video sobre viajes en autobús. Conteste preguntas sobre cómo viaja, donde va y que se puede hacer para mejorar el sistema de autobús.

La información que proporcione será utilizada como parte del CTDOT Estudio Estatal de Autobús, para ayudar al sistema de autobús servir mejor las necesidades de los residentes y empleados de Connecticut.

Qué: Estudio de autobús taller virtual
Cuándo: El 25 de julio hasta el 5 de agosto
Dónde: Por nuestro sitio web en **www.ctbusstudy.com**
Porqué: Para proporcionar a las aportaciones y aprender sobre mejoras en el sistema de autobús de Connecticut.
Cómo: Viste el sitio web en cualquier momento del día o noche, mire el video y conteste preguntas como se le indique. Los materiales del taller son accesibles a través de la mayoría de dispositivos y debería tomar aproximadamente 20 minutos para completar.

Virtual Public Workshop #1

Why conduct a Statewide Bus Study?

- Last study completed 16 years ago
- Changing transit network
- Changing travel patterns
- The Governor has committed to enhanced transportation

TransformCT

- CT's strategic long-range transportation plan

Let's Go CT!

- Governor's plan for $100 billion investment in transportation over 30 years

Let's GO CT! Bus Program

- Improve & expand bus service by 25%
- Urban access to transit within half-mile
- Integrate operating services
- Upgrade bus maintenance facilities
- State-of-the-art service & information delivery

Project Goal & Objectives

Optimize fixed route bus service and identify the best investments

- Enhance access to jobs
- Identify potential service expansions
- Provide a modern, state-of-the art system
- Determine where additional capacity is needed
- Recommend improvements to service frequency & span
- Determine where intermodal connectivity can be enhanced

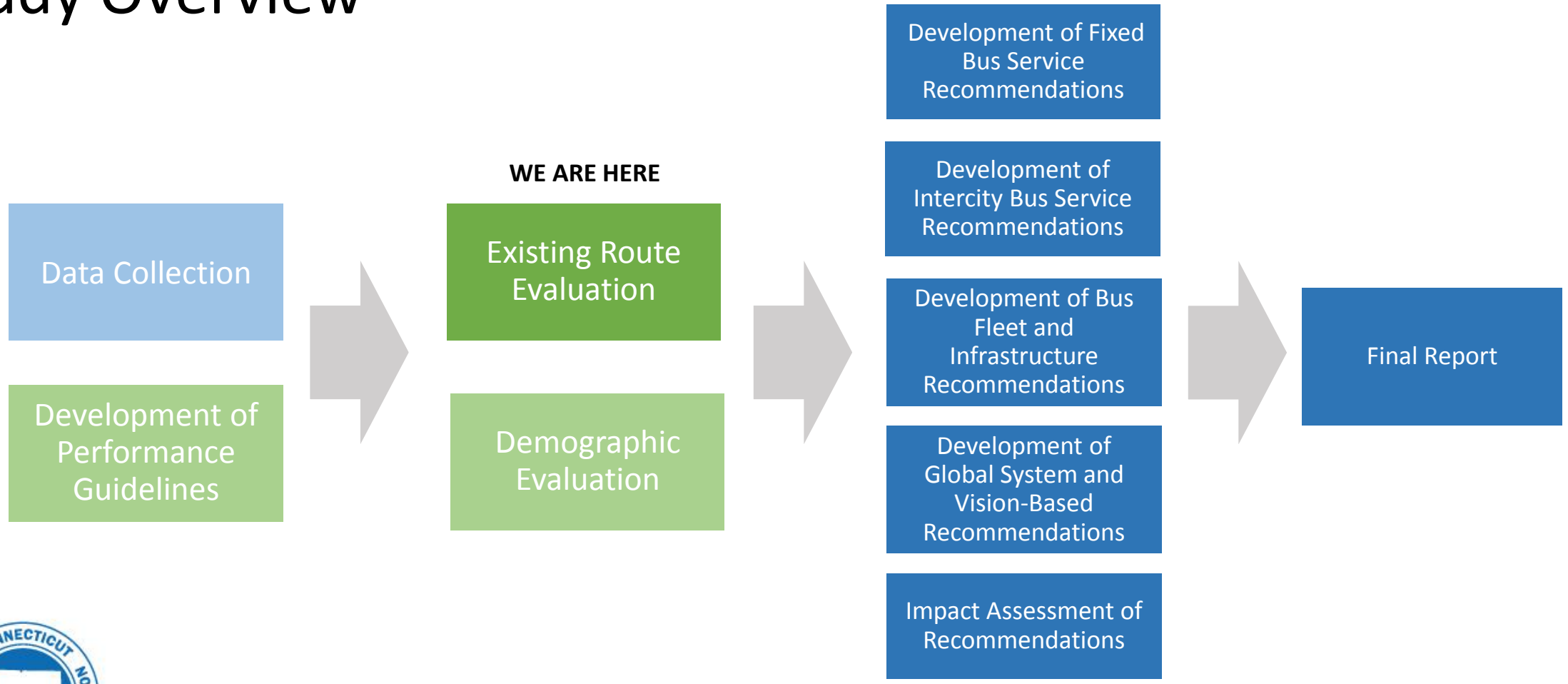
High Capacity

Reliable

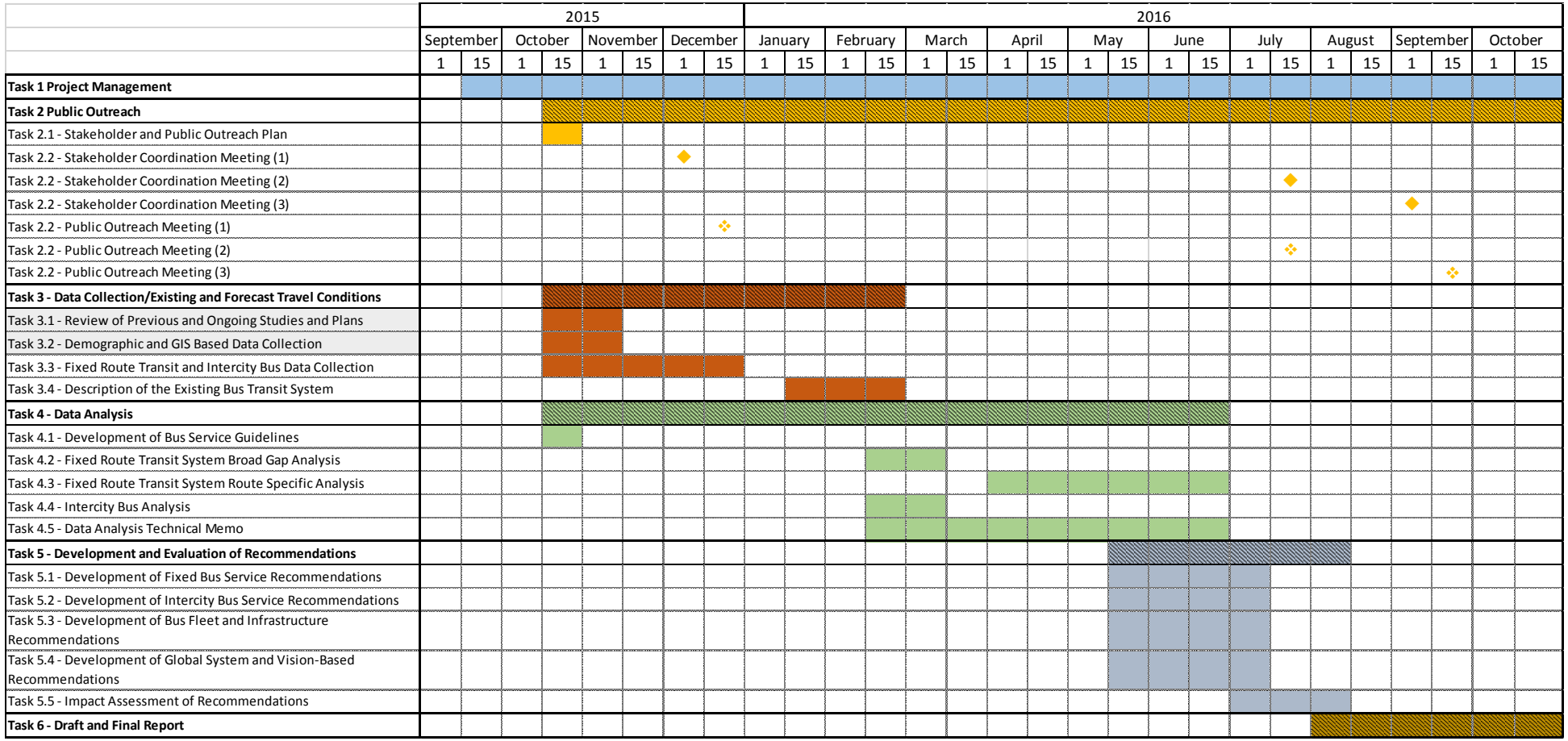
Direct

Modern

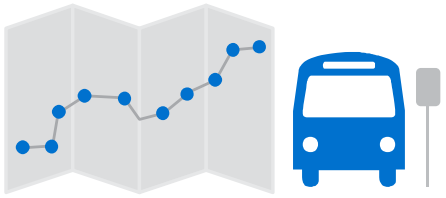
Study Overview



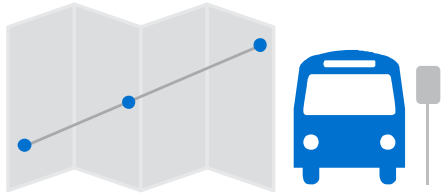
Project Schedule



What types of transit operate in CT?

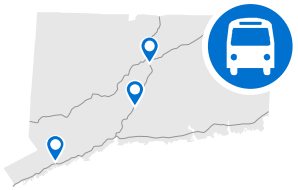


- **Fixed Route Local Bus Service:** A bus service operating on a fixed schedule along a designated route making multiple stops



- **Express Bus Service:** A bus service generally connecting residential areas and activity centers via a high speed, non-stop connection. (e.g., a highway) with limited stops at each end for collection and distribution

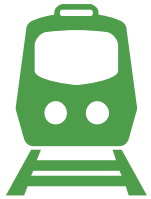
- **Bus Rapid Transit (BRT):** BRT is a bus-based transit system that provides frequent, high capacity service using dedicated lanes, and uses off-board fare collection, and limited stops to reduce travel time



- **Intercity Bus Service:** A bus service using coaches to carry passengers significant distances between different cities, towns, or other populated areas

What types of transit operate in CT?

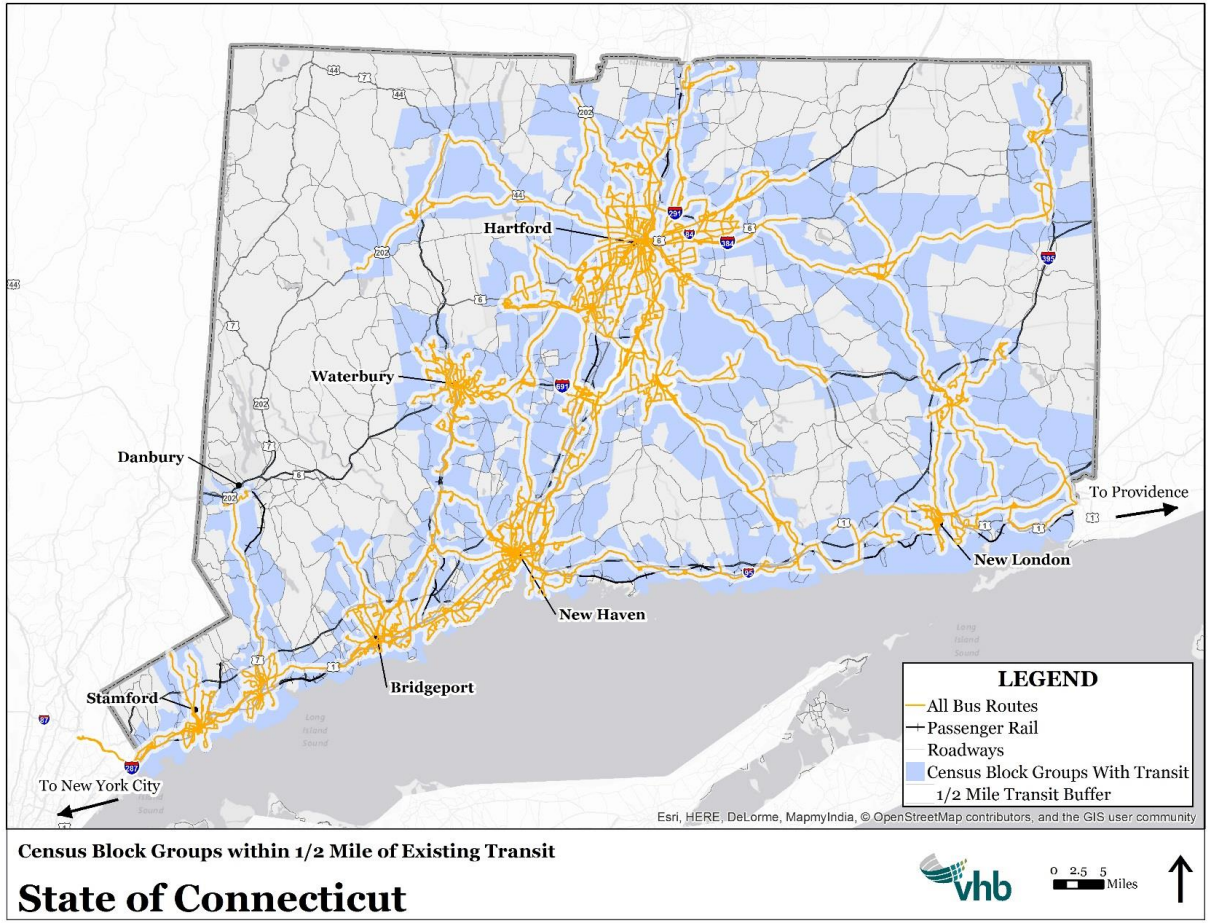
These transit services connect with Connecticut's buses



- **Commuter Rail Service:** A passenger rail service that primarily operates between a city and its suburbs generally serving journey-to-work travel
- **Intercity Rail Service:** A passenger rail service that primarily operating long distances between two or more cities
- **Paratransit:** Paratransit services in the State will be the subject of a separate study

Fixed Route Service Coverage

- Transit is needed in areas with high population and employment densities and areas with low auto-ownership
- Census block groups within ½ mile of bus service account for 50% of state land area
- Census block groups within ½ mile of bus service account for 78% of the total population
- Transit services in CT are concentrated in dense areas
- As population & employment increases, additional transit may be needed



Fixed Route Bus Service in CT

19 transit properties provide 271 fixed/direct transit bus routes

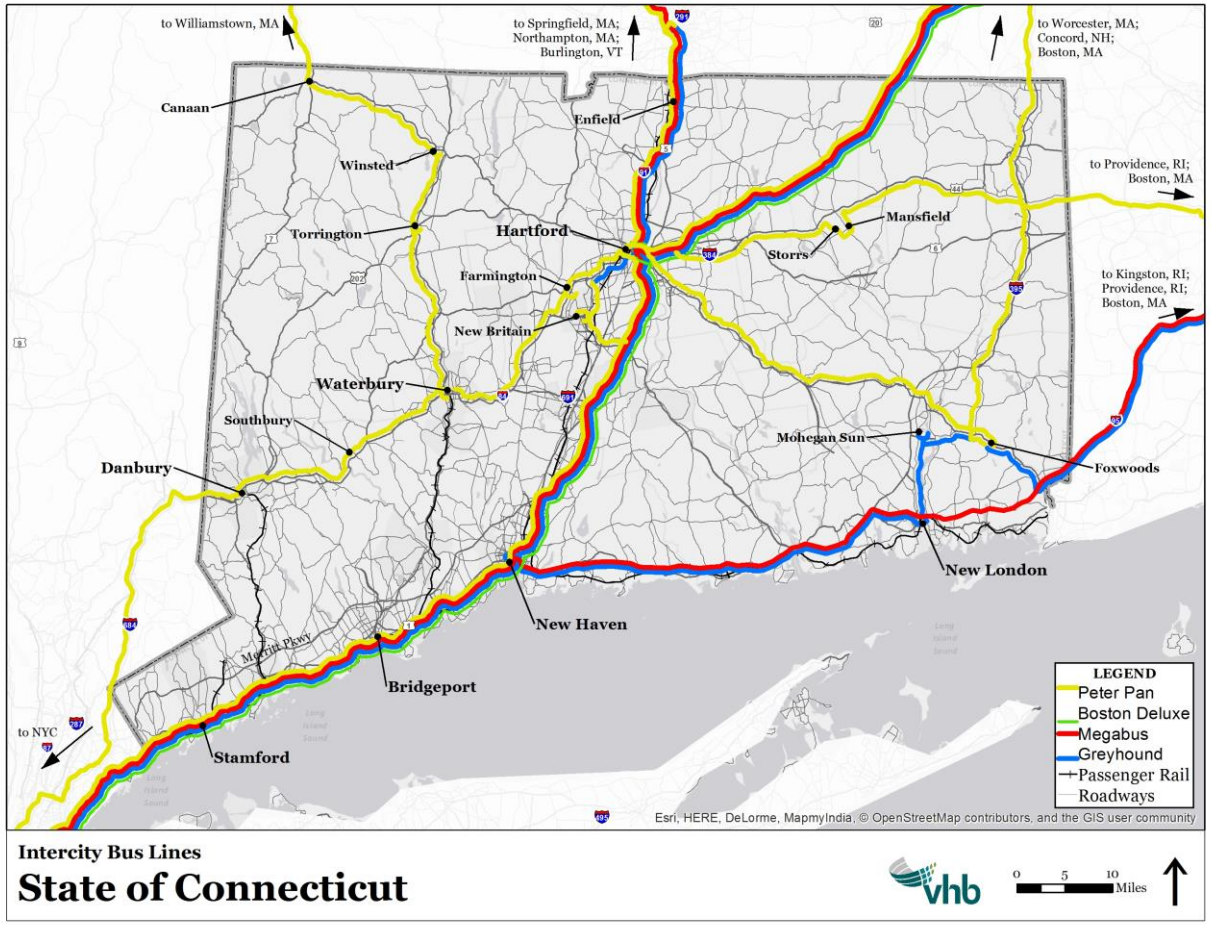
Fixed Route Systems and Intercity Bus Service

LARGE URBAN SYSTEMS (2,000,000 to 5,000,000+ annual passenger trips)	MID-SIZED URBAN SYSTEMS (750,000 to 2,000,000 annual passenger trips)	SMALL URBAN SYSTEMS (less than 750,000 annual passenger trips)	RURAL SYSTEMS	INTERCITY BUS SERVICES
Greater Bridgeport Transit CT*transit* Hartford CT*transit* New Haven CT*transit* Stamford *CTtransit* Waterbury	Norwalk Transit District, South East Area Transit, Housatonic Area Regional Transit, CT*transit* New Britain	Milford Transit District, Middletown Area Transit, Windham Regional Transit District, CT*transit* Meriden, CT*transit* Bristol, CT*transit* Wallingford	Estuary Transit District, Northeastern CT Transit District, Northwestern CT Transit District	Peter Pan, Greyhound, Megabus serving New York City, Boston, Providence, Springfield, & Burlington

A separate study will analyze paratransit service

Intercity Bus Service

- Intercity bus provides connections to New York City, Boston, Providence, Springfield, & Burlington
- Intercity bus service hubs in CT include: Hartford, Waterbury, New London, New Haven, Bridgeport, Stamford, Foxwoods Casino, Mohegan Sun
- Intercity bus operators:
  - Peter Pan
  - Greyhound
  - Stagecoach U.S.A. (d.b.a. Megabus)
  - Boston Deluxe
- Fares vary by trip

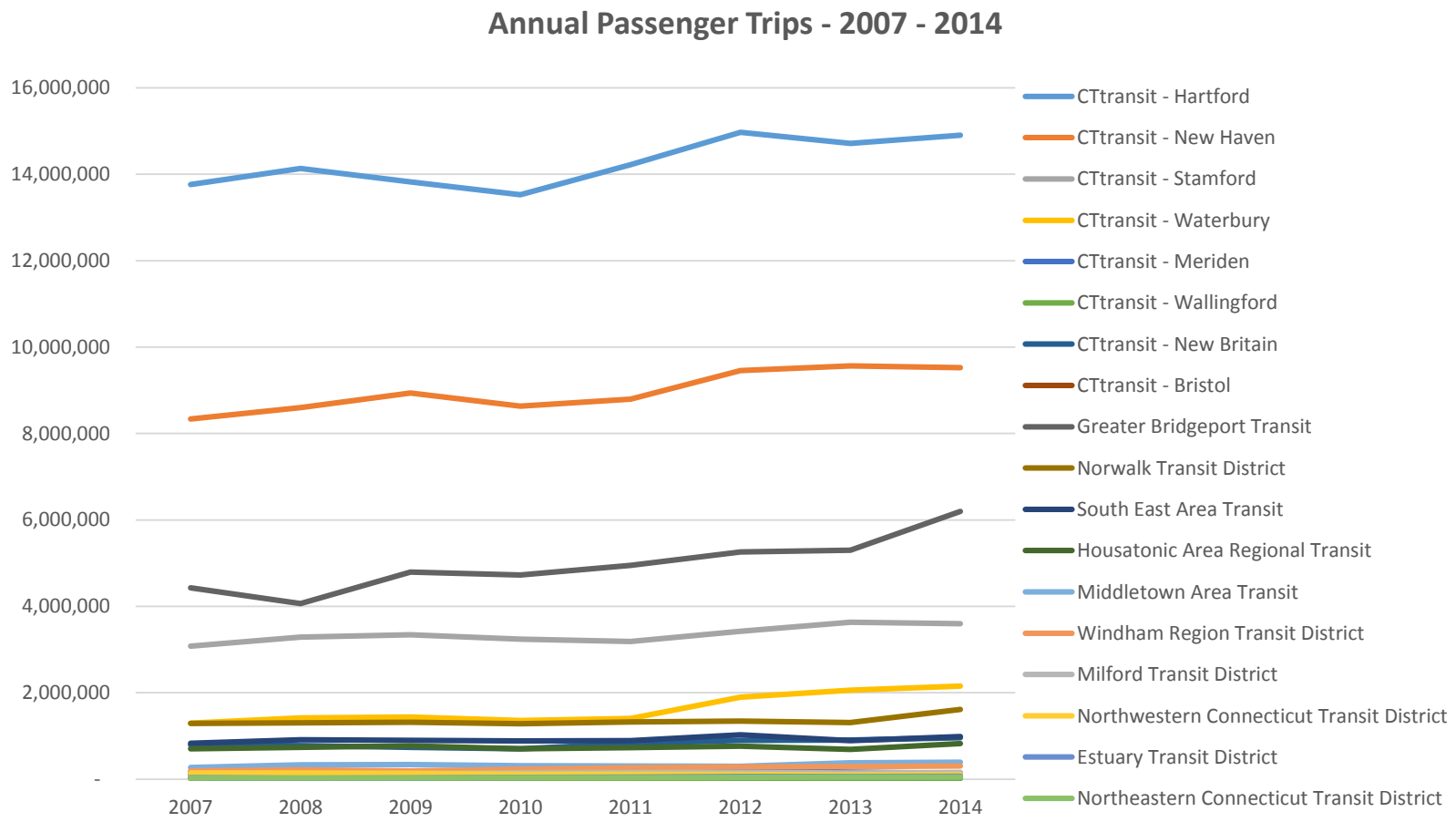


Questions for Transit

- Do you use transit for travel in CT? (Which service do you use most often?)
- If you don't use the bus system, please let us know why (pick your top 3 reasons)
  - Buses do not go where I want to go
  - Buses do not run when I need it
  - Buses are too crowded
  - Buses are unreliable
  - Transfers between bus routes are difficult
  - Waiting times are too long
  - I don't live near a bus route
  - Other: _____
- What would encourage you to use the system in the future?
  - Direct service/not having to transfer
  - Buses coming more often
  - Buses that go where I want to go
  - Buses operating later in the day or on weekends
  - Real-time travel information
  - Free wi-fi
- Have you used Intercity Bus Service? If so, which route/provider?
  - Greyhound (Boston-Hartford-New York Express)
  - Greyhound (White River Junction-Hartford)
  - Greyhound (Boston-NY via Hartford & New Haven)
  - Greyhound (Boston/Providence-Foxwoods-NYC)
  - Peter Pan (Boston-Hartford-New Haven-Waterbury-New York)
  - Peter Pan (Greenfield-Amherst-Northampton-Springfield-Hartford-New Haven-Waterbury-New York)
  - Peter Pan (To Foxwoods Casino)
  - Megabus (Hartford-NYC)
  - Megabus (New Haven-NYC)
  - Megabus (Hartford-New Haven-Boston)
  - Boston Deluxe (Boston – NYC)

Ridership Trends – 2007 to 2014

- Overall, the state experienced a 18.3% growth in annual passenger trips during this time
- Greater Bridgeport Transit, CT*transit* Stamford & New Haven experienced significant growth
- Most Small Urban and Rural bus properties saw tremendous growth in this time period
- CT*fastrak* services began in March 2015 and are therefore not shown in this graph

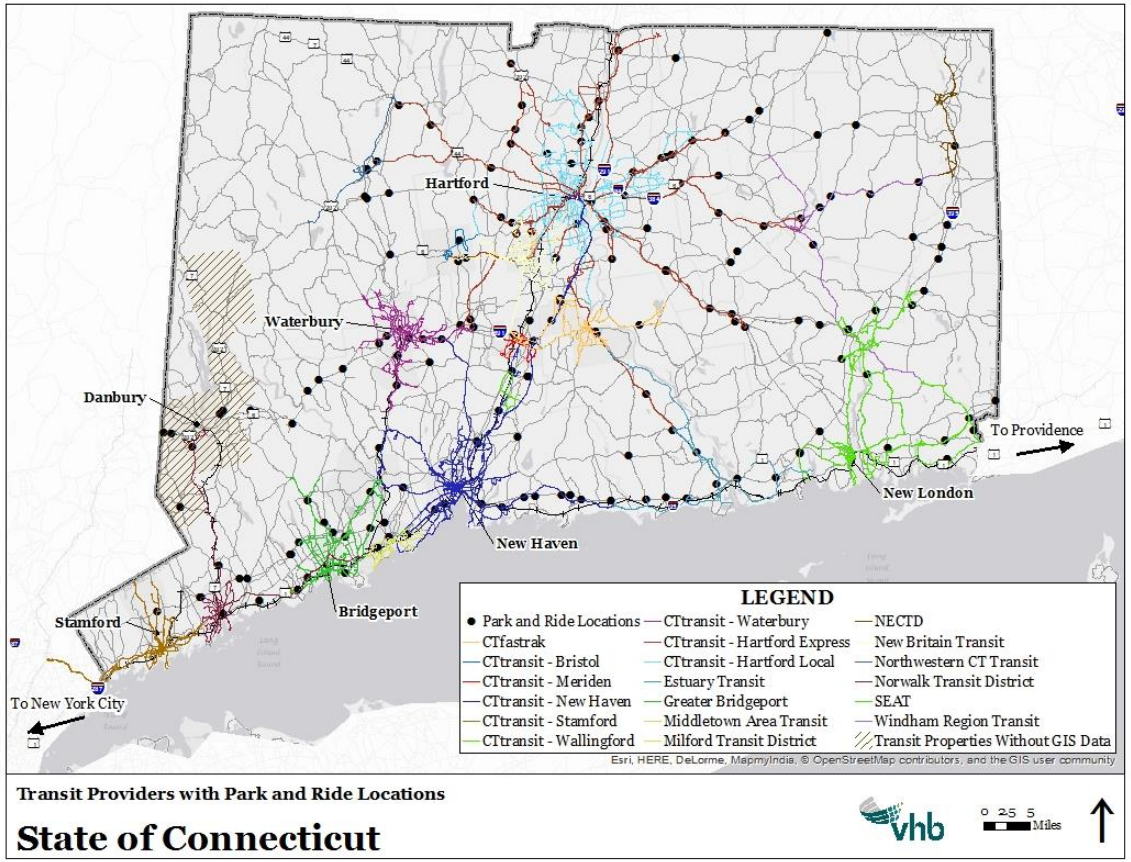


Bus Funding in CT

- Bus operations, fleet and infrastructure are mostly funded by CTDOT through local programs, federally allocated grants and the CTDOT Capital Plan
- Fares pay for small percentage of operating costs ranging between from 6% to 35%
- Some local funds also support bus operations
- Most agencies one-way fare is $1.50, except:
  - Greater Bridgeport Transit - $1.75
  - Windham Region Transit - $1.00
  - Northeastern Connecticut Transit District - $1.00

Intermodal Connections and Park & Rides

- The state has good bus coverage & provides connections to the rail system
- Intermodal connections:
  - Most Metro-North rail stations
  - Some Amtrak and Shore Line East rail stations
- 82 park & rides located throughout the state
- Bike racks are provided at train stations and intermodal centers
- Bikes can be brought on buses
- Connections can be made to Bradley International Airport



Questions for Intermodal connections

- Where do you catch your bus (on street, at a transportation hub, at a rail station?)
- If your trip requires transfers where do you transfer?
- Please tell us the transfer location (bus stop or closest streets and city):

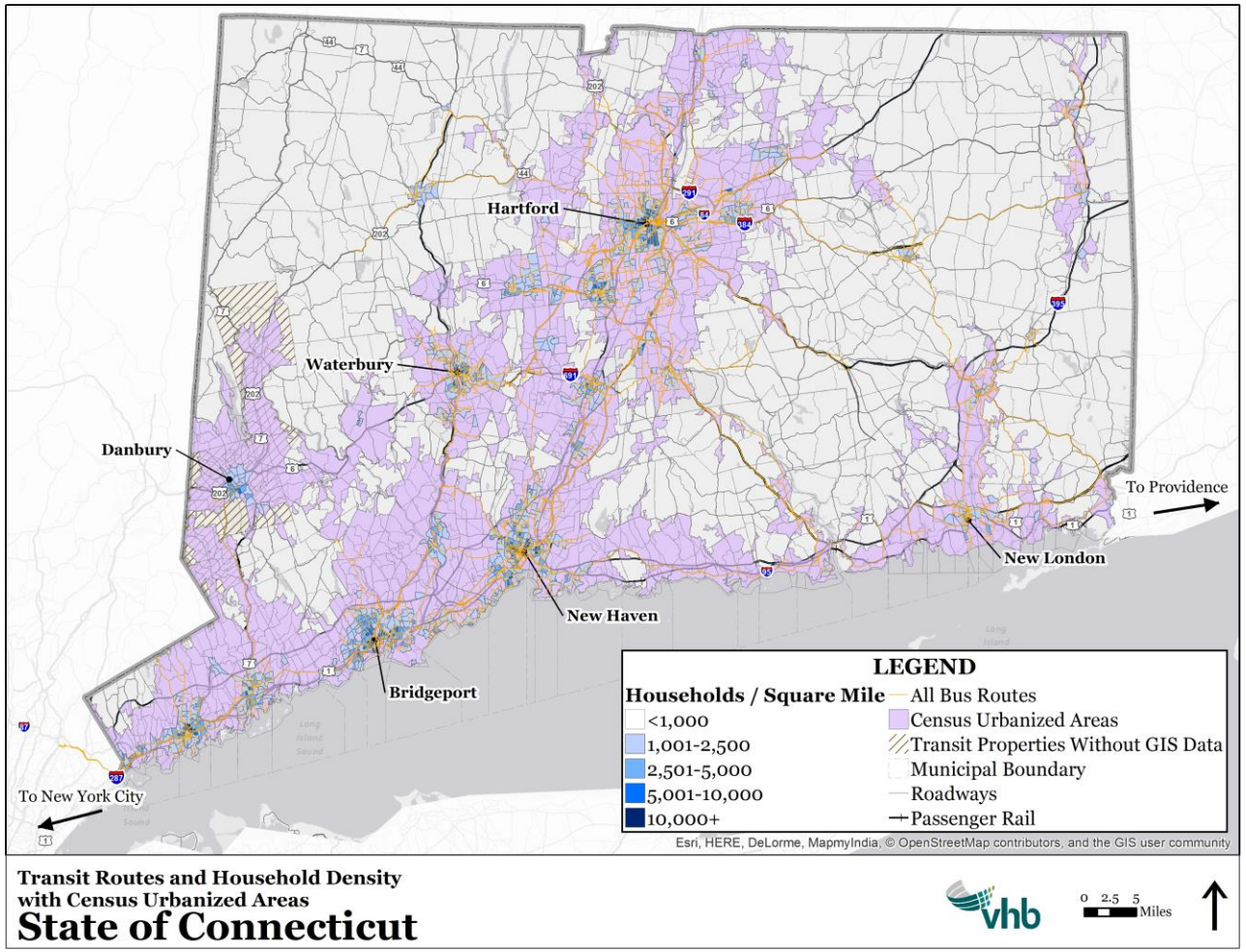
  _____
- Please tell us the number of times you transfer during your trip.
- If you transfer between different systems (for example, from Greater Bridgeport Transit to Norwalk Transit or from bus to rail), please tell us which systems:

  From: To:

CT*fastrak,* CT*transit* – Bristol, CT*transit* – Hartford, CT*transit* – Meriden, CT*transit* – New Britain, CT*transit* – New Haven, CT*transit* – Stamford, CT*transit* – Wallingford, CT*transit* – Waterbury, Estuary Transit District (9Town Transit), Greater Bridgeport Transit (GBT), Milford Transit District (MTD), Middletown Area Transit (MAT), Housatonic Area Regional Transit District (HART), Northeastern Connecticut Transit District (NECTD), Northwestern CT District (NWCTD), Southeast Area Transit District (SEAT), Norwalk Transit District (WHEELS), Windham Region Transit District (WRTD)

Demographic Analysis

- Provides data on where people live, where jobs are located, and if populations that use transit are being served by existing bus routes
- Analysis included transit coverage by:
  - Population density
  - Employment density
  - Older Adults
  - Households under the poverty line
  - Households without access to a vehicle
- Service is primarily oriented towards areas with high population density, a critical factor in providing transit service



Population and Employment Growth

- In the next 10 years, CT population is forecast to grow by 5%
- Population is expected to grow in all counties
- Projected population growth in urban areas (New Haven, Hartford and Fairfield) indicates a need to keep investing in transit systems
- Projected population growth in rural counties (Windham and Tolland) may indicate need for new transit service if accompanied by density
- For all occupations, CT Dept. of Labor projects a 9.4% increase in employment by 2022

Route Evaluation: Methodology

- Collected high level bus system data from all service providers
- Established service guidelines for evaluation of bus route and system performance
- Will conduct a two-stage evaluation
  - Stage 1 Evaluation
    - All routes, some metrics
  - Stage 2 Evaluation
    - Select routes based on Stage 1 Evaluation

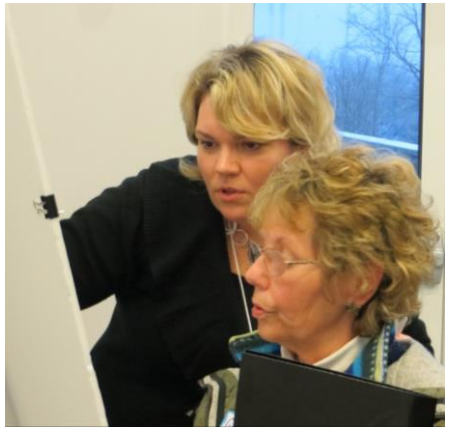
Questions for Transit Needs

- What do you believe are the top three needs in the transit system? (Choose 3)

  - Better-timed connections (between buses; between buses and trains)
  - More direct routes/less transfers
  - Real-time information that lets me know when the bus/train is coming
  - Cleaner/newer vehicles and cleaner stations/bus stops
  - Standard fare policies across the state
  - Fixed-price monthly pass valid on all trains and buses
  - More frequent and faster bus service
  - More reliable service
  - More customer amenities, such as Wi-Fi on buses and trains
  - Other: _____

Next Steps

- System-wide evaluation
- Route-specific analysis
- Development of system and route recommendations
- Continued public outreach:
  - Online Public Meetings/Virtual Workshops
  - Project Website: www.ctbusstudy.com
  - Through other ongoing transit efforts throughout the state



Thank you for your participation

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Fax (917) 339-1068

MEMORANDUM

To:	Connecticut DOT	Project:	Connecticut Statewide Bus Study
From:	FHI, VHB	Date:	9/8/2016
Subject:	Virtual Public Workshop Survey Results		

From July 25th to August 15th the first 2016 Connecticut Statewide Bus Study Virtual Public Workshop was held to introduce the bus study, its goals and objectives, provide an overiew of the study, summarize existing conditions for the state's bus system, ask for input via an online survey, and identify next steps. Just over 360 members of the public participated in the virtual workshop.

The virtual workshop featured a presentation with voiceover narration, that could be played and paused at specific points, to provide participants with an opportunity to provide feedback through the online survey regarding transit use, intermodal conections, and transit needs. The responses to the survey questions are summarized below.

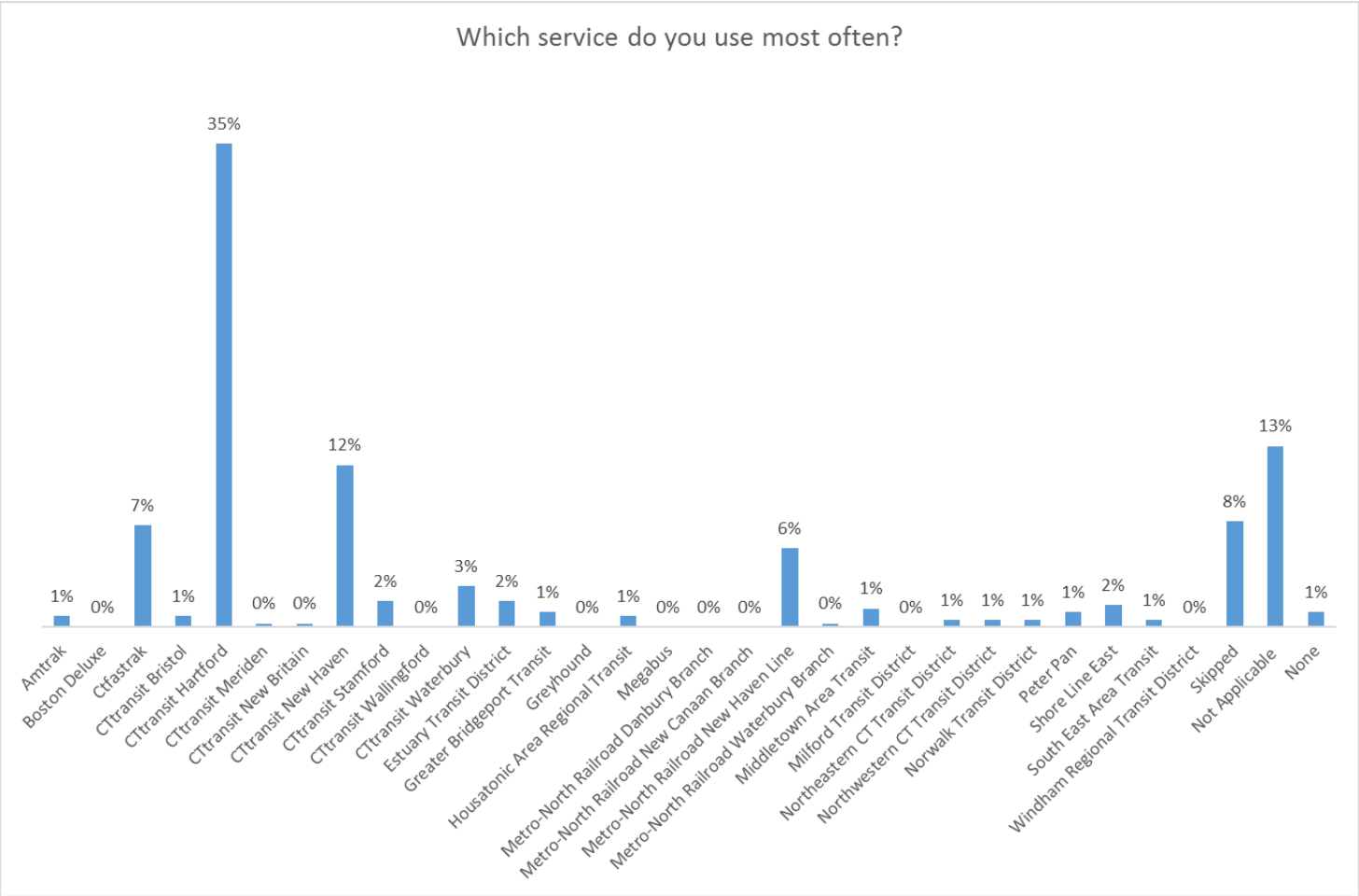
Transit Usage Questions and Repsonses

The first question for transit usage asked if the respondent uses transit for travel. Of the 362 participants who responded to this question, 74% (269 respondents) indicated that they use transit for travel throughout Connecticut, while 23% (81 respondents) do not use transit, and 3% (12 respondents) decided to skip the question.

For participants who indicated they use transit, they were asked to identify which transit service provider they use the most frequently. The most frequently cited transit service providers were: CT t*ransit* Hartford (35%) and CT *transit* (12%) New Haven.

Numerous transit service providers were not cited by any participants in this survey. Fixed route bus systems that were not cited include:CT*transit* Wallingford, CT*transit* Meriden, CT*transit* New Britain, Milford Transit District, Windham Regional Transit District. Three intercity bus service providers, Boston Deluxe, Greyhound, and MegaBus were not selected either, nor were the Metro-North Danbury Branch, New Canaan Branch, and Waterbury Branch (See Figure 1). However, this should not be taken as an indication of ridership for these services.

Figure 1. Transit Usage Question 1: Which service do you use most often?



Respondents who indicated they do not use transit were asked to cite the three primary reasons why; 139 respondents cited at least one reason, more than the number of respondents that described themselves as non-transit users. The top three reasons cited included “Buses do not go where I want to go,” (13%), “Buses do not run when needed,” (12%), and “Wait times for buses are too long,” (8%). (See Figure 2).

Respondents were given an option to choose “Other” and provide their own reason for not using transit. Responses to the “Other” category included the use of other modes of transportation (such as cars, and walking), long trip times on buses, unsanitary conditions on the bus, perceived safety concerns, and unfamilarity with the bus system. (See Table 1).

Figure 2. Transit Usage Question 2: If you don't use the bus system, please let us know why (pick your top three reasons).

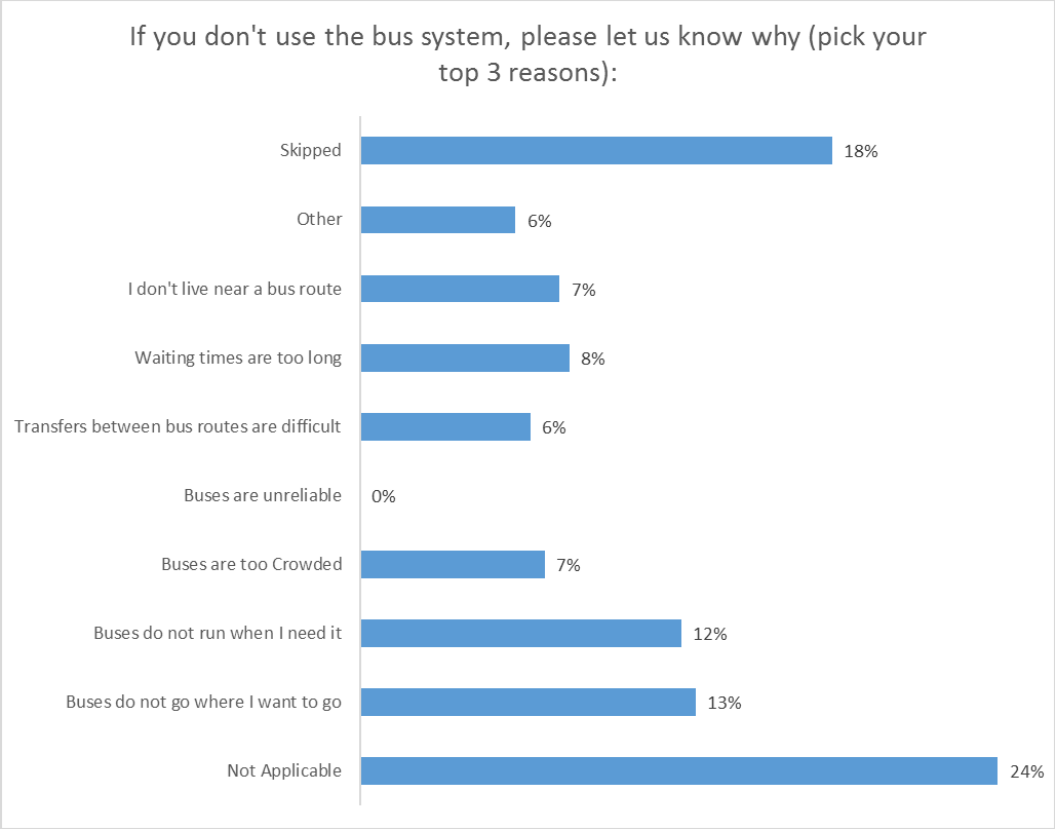
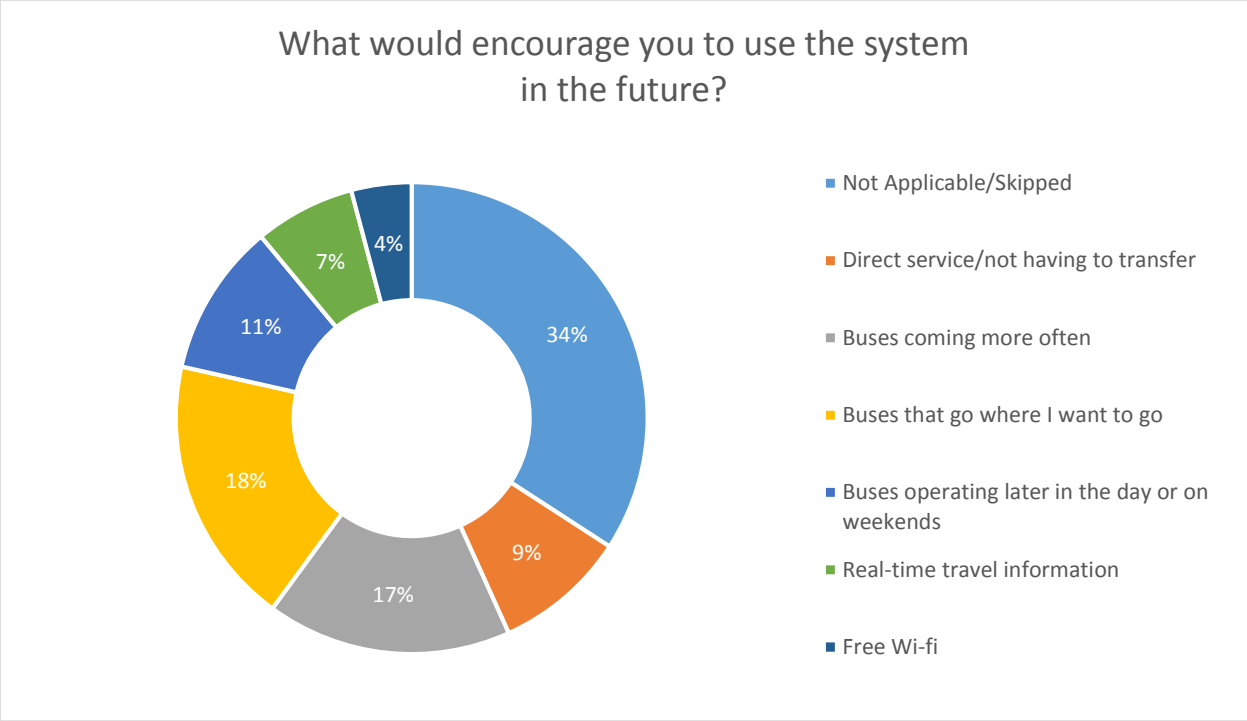


Table 1. Question 2: Responses to "Other" Category.

Bus Maintenance (unsanitary)	2
Bus Route does not run regularly	2
Bus Route longer, does not meet needs	3
Bus Route not fast enough	4
Bus Route not followed by drivers	1
Bus System is intimidating	1
Bus System not needed	2
Difficult to travel with young children	1
Lack of Bus amenities	2
Lack of information to access system	2
Long Distances between bus stops and to bus stops	2
Other mode of transportation (Car)	4
Other modes of transportation (Walk)	1
Safety	1
Unfamiliar with Bus Route	1

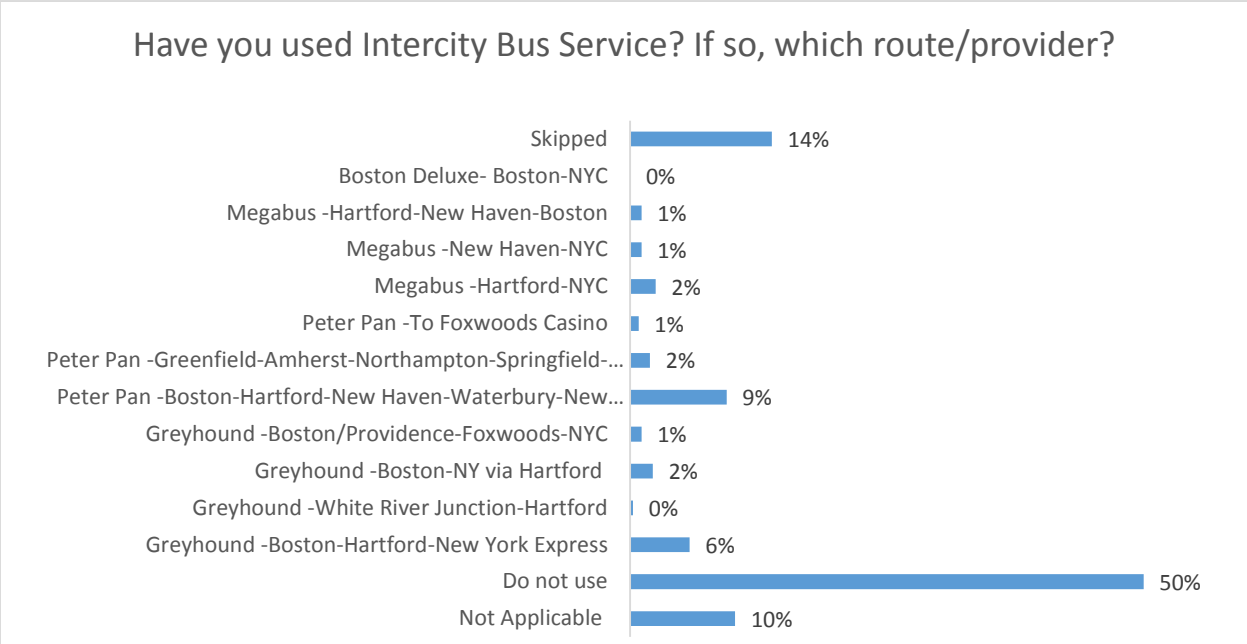
The third transit usage question asked participants about what improvements would encourage them to use the bus system in the future. The most popular responses included, “Buses that go where I want to go,” (18%), “Buses coming more often,” (17%), and, “Buses operating later in the day or on weekends,” (10%). (See Figure 3).

Figure 3. Transit Usage Question 3: What would encourage you to use the system in the future?



Half of respondents answered that they do not use the intercity buses and another 14% skipped this question. For those repsondents who use intercity bus for travel, they primarily use two routes, Peter Pan's-Boston-Hartford-New Haven-Waterbury-New York (9%), and the Greyhound's-Boston-Hartford-New York Express (6%). (See Figure 4).

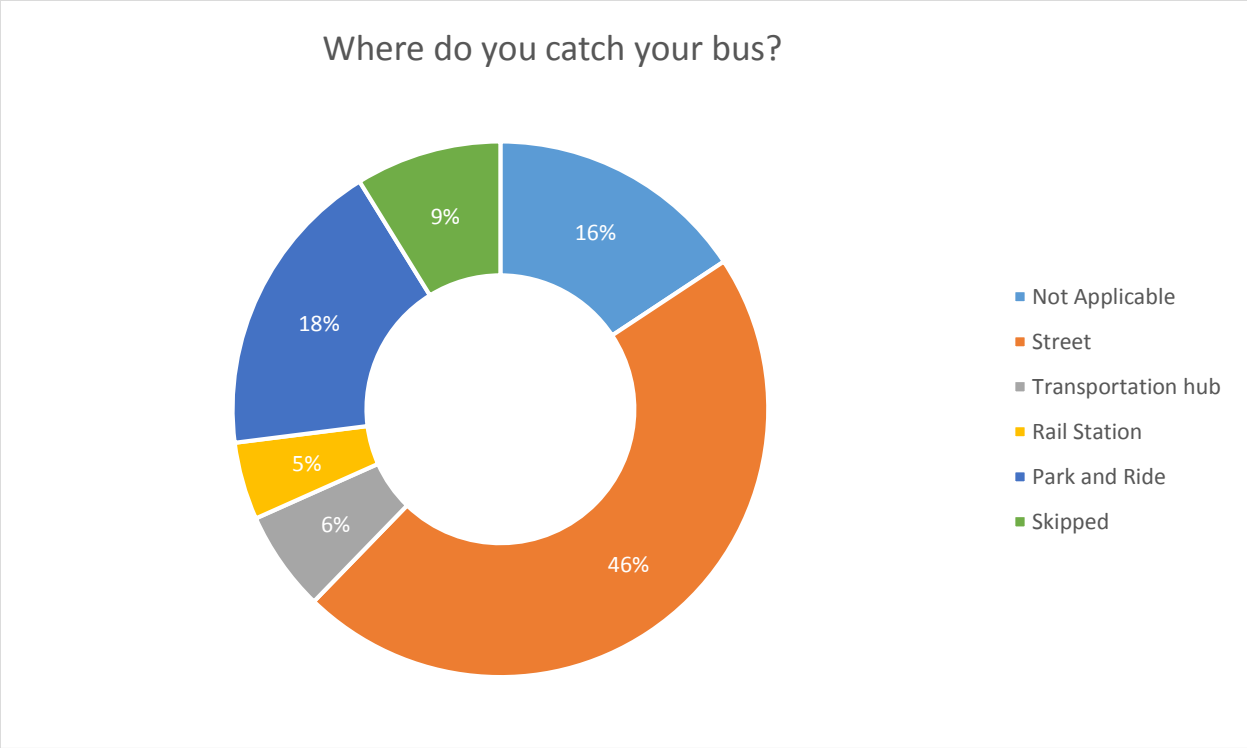
Figure 4. Transit Usage Question 4: Have you used Intercity Bus Service? If so, which route/provider?



Intermodal Connections Questions and Reponses

Respondents were asked where they catch the bus when they use the system. 275 respondents provided an answer to this question. These respondents overwhelmingly caught the bus on the street (46%), while another significant group catches the bus at a park and ride (18%), or at a transportation hub (6%), (See Figure 5).

Figure 5. Intermodal Connections Question 1: Where do you catch the bus?



Participants were asked whether their typical bus trip includes a transfer, how many transfers, and where those transfers occur. Of the 282 responses to the question regarding the number of times a transfer is made during a trip, 23% (82) said their trip required only one transfer between transit systems, while 45% (165) of respondents do not make a transfer during their trip. (See Figure 6) In total, 33% of the respondents made at least one transfer on their trip, with some indicating that at least two or three transfers were made.

Just 60 of the 282 respondents to this question indicated what type of tranfers were made (within a single system or between systems.) Of the 60 respondents, 18 transferred to another bus within the same system and the remainder (42) transferred from one system to another, indicating a need for regional connectivity. A full list of system-to-system transfers made is presented in Table 2. Participants were asked to describe the specific location of their transfer including closest cross street or bus stop. 99 respondents provided an answer, though few specific locations were actually cited. Most respondents that provided an answer cited general locations such as “Downtown Hartford,” or “at CT*fastrak* stations.” Large transfer hubs such as the New Haven Green were also frequently cited.

Figure 6. Intermodal Connections Question 2a: Please tell us the number of times you transfer during your trip.

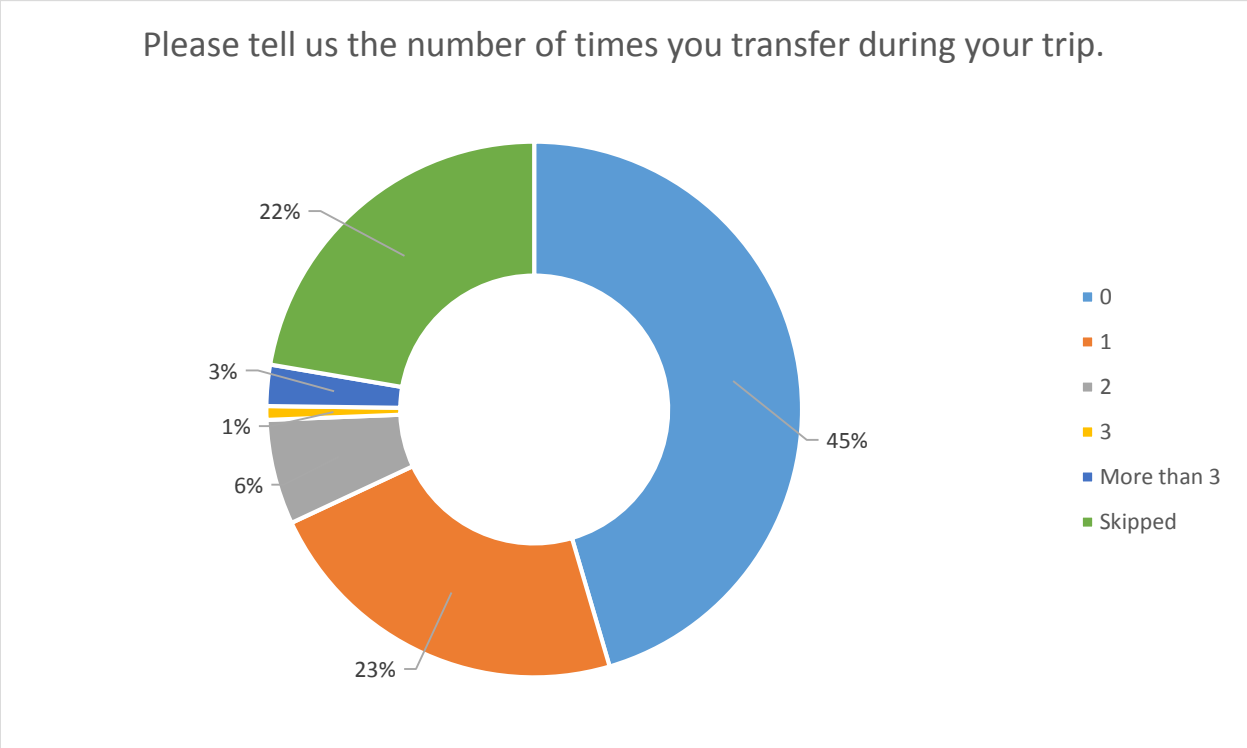


Table 2. Intermodal Connections Question 2b. If you transfer between different systems, please tell us which systems:

CT*transit* - Bristol TO CT*transit* - Hartford	2
CT*transit* - Hartford TO CT*transit* - Bristol	2
CT*transit* - Hartford TO CT*transit* - Hartford	12
CT*transit* - Hartford TO CT*transit* - New Britain	6
CT*transit* - Hartford TO CT*transit* - Waterbury	1
CT*transit* - Hartford TO skipped	1
CTtransit - Hartford TO Windham Region Transit District (WRTD)	1
CT*transit* - Meriden TO CT*transit* - Hartford	1
CT*transit* - Meriden TO CT*transit* - Wallingford	1
CT*transit* - Meriden TO Middletown Area Transit (MAT)	1
CTtransit - New Britain TO CTtransit - Hartford	1
CT*transit* - New Britain TO Middletown Area Transit (MAT)	1
CT*transit* - New Haven TO CT*transit* - New Haven	4
CT*transit* - New Haven TO Estuary Transit District (9Town Transit)	1
CT*transit* - New Haven TO Greater Bridgeport Transit (GBT)	3
CTtransit - New Haven TO Norwalk Transit District (WHEELS)	2
CT*transit* - New Haven TO Windham Region Transit District (WRTD)	1
CT*transit* - Stamford TO Greater Bridgeport Transit (GBT)	2
CT*transit* - Stamford TO skipped	1

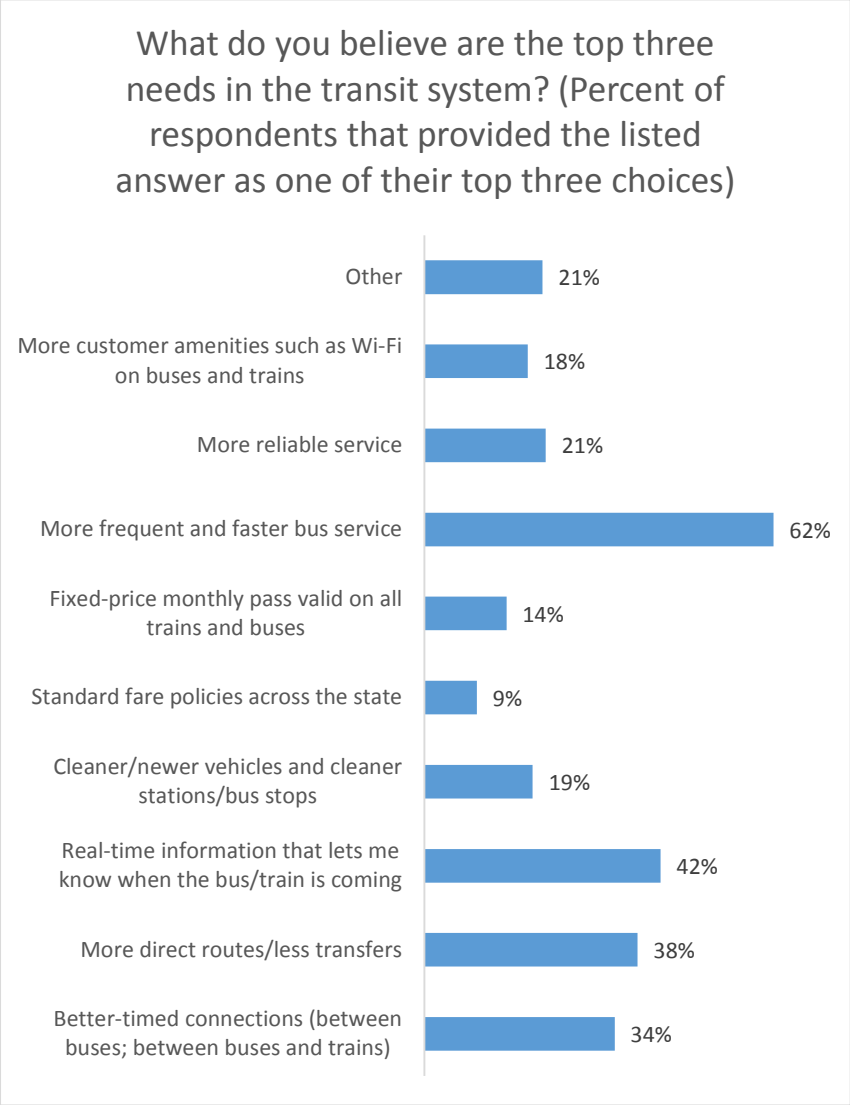
Table 2 (Continued). Intermodal Connections Question 2b. If you transfer between different systems, please tell us which systems:

CT*transit* - Waterbury TO CT*transit* - Hartford	1
CT*transit* - Waterbury TO CT*transit* - New Haven	2
CTtransit - Waterbury TO CT*transit* - Waterbury	1
CTtransit - Waterbury TO skipped	1
Estuary Transit District (9Town Transit) TO Greater Bridgeport Transit (GBT)	1
Estuary Transit District (9Town Transit) TO Northeastern Connecticut Transit District (NECTD)	1
Greater Bridgeport Transit (GBT) TO CTtransit - New Haven	1
Greater Bridgeport Transit (GBT) TO Norwalk Transit District (WHEELS)	1
Housatonic Area Regional Transit District (HART) TO Housatonic Area Regional Transit District (HART)	1
Middletown Area Transit (MAT) TO CTtransit - Hartford	2
Middletown Area Transit (MAT) TO CTtransit - Meriden	1
Northwestern CT District (NWCTD) TO skipped	1
skipped TO skipped	303
Southeast Area Transit District (SEAT) TO Estuary Transit District (9Town Transit)	2

Transit Needs Questions and Reponses

Participants were asked to choose their top three priorities for improving the Statewide Bus System. 346 respondents provided at least one response. A majority (62%) of respondents cited “More frequent and faster bus service,” while 42% cited “Real-time information for bus services,” and 38% cited “More direct routes/less transfers.” “Better-timed connections between transit systems,” was also popularly cited by 34% of respondents (See Figure 7). The majority of responses indicated a desire for operational/schedule changes vs. improved amenities.

Figure 7. Transit Needs: Question 1: What do you believe are the top three needs in the transit system?



Respondents provided additional comments in the “other” portion of this question these included an extension of the bus schedule to run later in the day and during the weekend, a need for additional bus routes, better bus to bus connections, and more bus station amenities including parking, bus shelters, and bike racks (See Table 3).

Table 3. Question 11: “Other” Portion

Better bus to bus connections	8
Bus Amenities	5
Bus Route Suggestion	2
Bus Station Amenities (parking, and bus shelters)	8
Extension of Bus Schedule	19
Fuel Efficient Buses	2
Light Rail	1
Maintenance	2
Need for Additional Bus Routes	16
Priority for Buses on Roads	1
Safety	3
Time Reliability	3
Train Service	1

Conclusion

After completeing the survey, respondents were thanked for their participation and encouraged to visit the project website for updates and future participation opportunities. It is notable that though participants had the opportunity to skip questions or could exit the presentation and survey at any time, the final question received affirmative 363 responses, indicating that at least that many had completed the entire virtual workshop.

Connecticut Statewide **Bus Study**

Do you ride the bus?
Have ideas to make it a better experience?

Please join CTDOT for an online bus workshop anytime during the period from January 9th - January 20th.

To play a part, visit **www.ctbusstudy.com**. Watch a video about bus travel in Connecticut. Answer questions about how you get around, where you go, and what could make bus travel better.

The information you provide will be used as part of the CTDOT Statewide Bus Study to help make the bus transit system better meet the needs of Connecticut's residents and employees.

What: Bus Study Virtual Workshop
When: January 9th - January 20th
Where: Online at **www.ctbusstudy.com**
Why: To provide input and learn about improvements to CT's bus system
How: Visit the website anytime of day or night, watch the video and answer the questions as prompted. The workshop materials are viewable on most devices and should take about 30 minutes to complete.

Connecticut Estudio Estatal de Autobús

¿Viaja en autobús? ¿Tiene ideas para mejorar la experiencia?

Por favor, acompañe a CTDOT para un taller de autobús virtual, durante el periodo del 9 al 20 de enero.

Para participar, visite **www.ctbusstudy.com**. Mire un video sobre viajes en autobús. Conteste preguntas sobre cómo viaja, donde va y que se puede hacer para mejorar el sistema de autobús.

La información que proporcione será utilizada como parte del CTDOT Estudio Estatal de Autobús, para ayudar al sistema de autobús servir mejor las necesidades de los residentes y empleados de Connecticut.

Qué: Estudio de autobús taller virtual
Cuándo: El 9 de enero hasta el 20 de enero
Dónde: Por nuestro sitio web en **www.ctbusstudy.com**
Porqué: Para proporcionar a las aportaciones y aprender sobre mejoras en el sistema de autobús de Connecticut.
Cómo: Viste el sitio web en cualquier momento del día o noche, mire el video y conteste preguntas como se le indique. Los materiales del taller son accesibles a través de la mayoría de dispositivos y debería tomar aproximadamente 30 minutos para completar.

Connecticut Statewide **Bus Study**

Do you ride the bus?
Have ideas to make it a better experience?

The Virtual Public Workshop has been extended until January 27th. To play a part, visit www.ctbusstudy.com today!

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Qué: Estudio de autobús taller virtual
Cuándo: Hasta el 27 de enero
Dónde: Por nuestro sitio web en **www.ctbusstudy.com**
Porqué: Para proporcionar a las aportaciones y aprender sobre mejoras en el sistema de autobús de Connecticut.
Cómo: Viste el sitio web en cualquier momento del día o noche, mire el video y conteste preguntas como se le indique. Los materiales del taller son accesibles a través de la mayoría de dispositivos y debería tomar aproximadamente 30 minutos para completar.

Virtual Public Workshop #2

Overview, Existing Conditions and Outreach

Study Overview

- Last study completed 16 years ago
- Changing transit network
- Changing travel patterns
- The Governor has committed to enhanced transportation

Study Goals

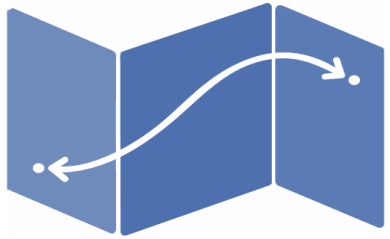
Optimize fixed route service and identify best investments

- Enhance access to jobs
- Recommend expansions of intercity service
- Provide bus service within ½ mile of urban residents
- Determine where services need additional capacity
- Determine where new service is needed
- Modernize the bus system
- Connect to commuter services and important generators outside of CT (in NY, RI and MA)

A separate study will analyze paratransit service

High Capacity

Reliable

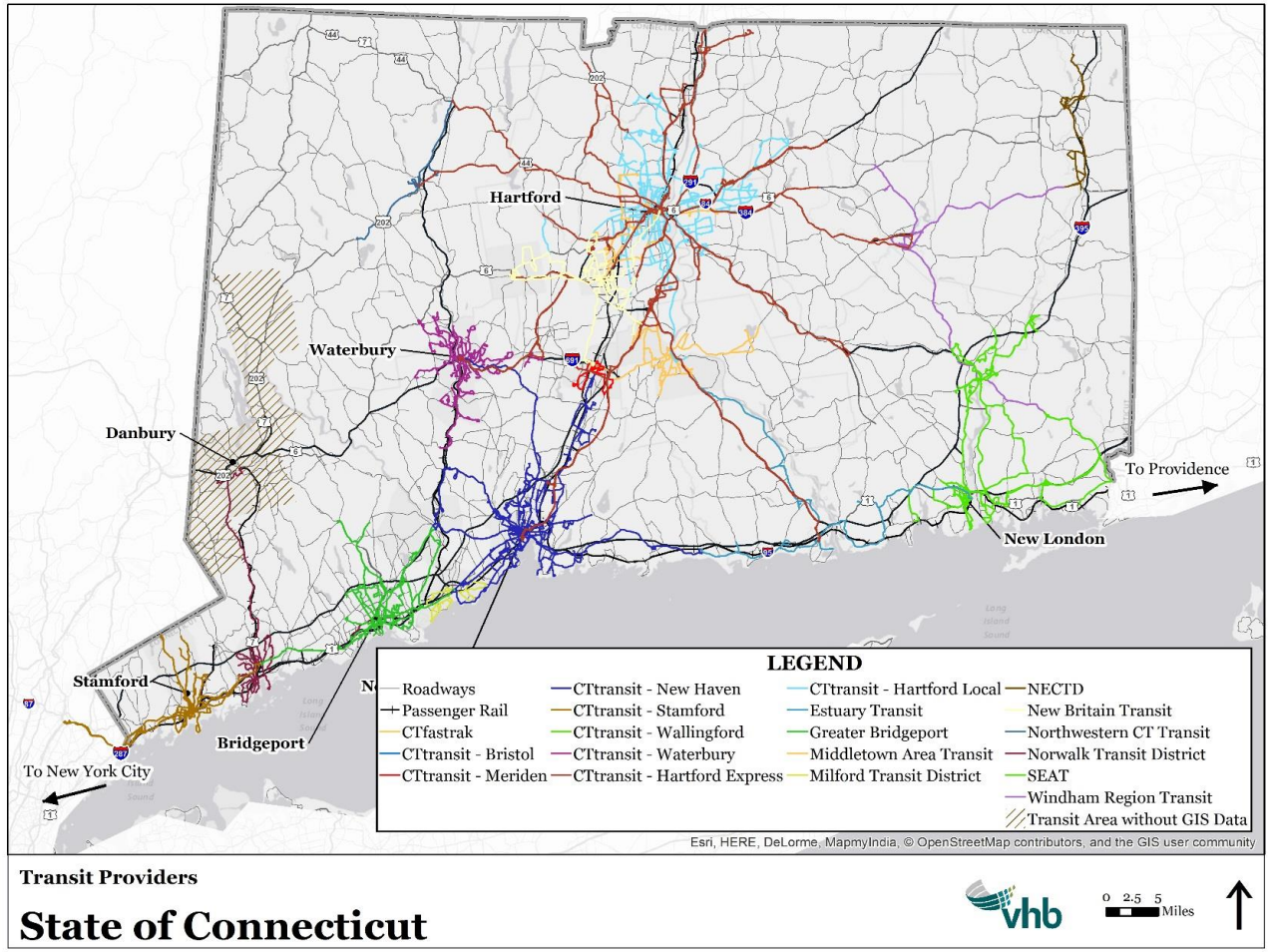


Direct

Modern

Existing Conditions

- 19 transit properties provide 271 fixed/direct bus routes
- Over 42 million bus passenger trips annually
- Ridership anticipated to grow in the future
- Fixed bus network provides good coverage to areas where transit is most needed
- Intermodal connections are provided (bus to rail, auto to bus)
- Intercity service is provided by three companies with 15 routes



Stakeholder Outreach Efforts

- Stakeholder Interviews
  - ✓ Mobility Ombudsmen Meeting – March 2016
  - ✓ State College and Universities Meeting – August 2016
  - ❖ Feedback
    - ➢ Expand span of service
    - ➢ Expand service coverage
    - ➢ Improve connectivity between stations
    - ➢ Provide direct access to colleges, universities, and suburban/rural employment destinations
- RPO Meetings/Calls
  - ✓ December 2015
  - ✓ May 2016
  - ✓ October 2016
  - ✓ December 2016

Public Outreach Efforts

- Interactive Virtual Public Workshop – Summer 2016
- Project Website: www.ctbusstudy.com is generating comments

"Bus service is not helpful for people that live east of exit 2 on I-84 "

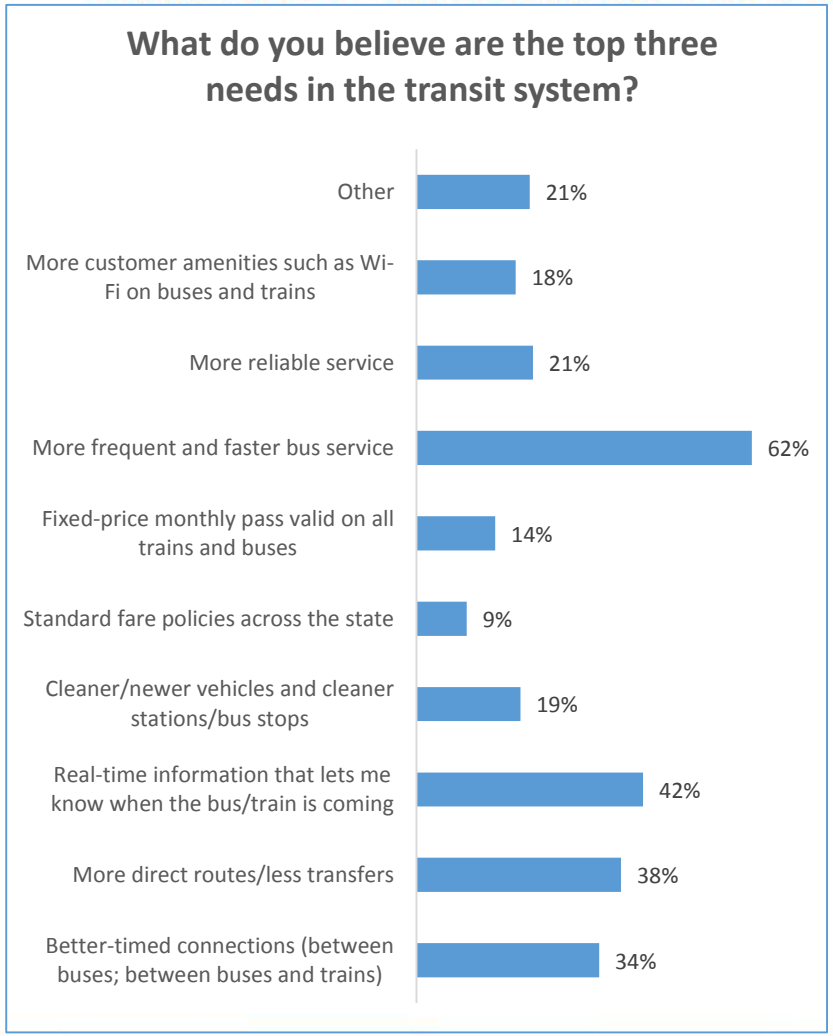
"There is a lack of seating at bus stops in Waterbury"

"All we want as commuters is a reliable bus, reasonably functioning, and a ride that gets us to work ON TIME and home safely."

"When standing on the bus, there is nothing to hold on to "

"Bus drivers are responsible, helpful, courteous, friendly "

"The lack of service after 10 PM presents a burden for those that work at night."



Two Categories of Statewide Need

- Global

  These are statewide or individual system needs with a focus on creating a more unified, user-friendly bus statewide network that increases ridership

- Route-level

  These are needs identified for individual systems or for specific routes within a system with a focus on performance, coverage and user interface

Needs were identified through stakeholder/public outreach, research and performance evaluations

Statewide Global Needs

Analysis of the statewide transit system and feedback received from the public identified these needs:

- Lack of performance assessments or consistent guidelines
- Inadequate/inconsistent bus data collection processes and reporting
- Lack of seamless connectivity between adjacent direct bus systems
- Capacity and frequency issues on high-demand routes
- Spans of service that are incompatible with evening and weekend employment, education and recreational travel needs
- No single, combined source of public information regarding the statewide bus services
- Inconsistency in planning or implementing new technologies, such as real time bus information
- Insufficient connectivity between colleges, universities and key travel destinations in the state

Need for Statewide Bus Service Guidelines

- No Statewide Bus Guidelines exist
- To provide quality and cost-effective bus service, system and route-level **performance evaluations** are needed
- Statewide Guidelines provide **consistent metrics** to evaluate performance throughout the state
- Performance assessments can help **guide system changes and investment**
- Performance assessments are **required by U.S. law** (FAST Act, 2015)
- Guidelines provide **targets for system evolution**; most systems/routes will not meet guidelines at first but would be expected to improve

New CT Statewide Bus Service Guidelines were Developed

- Builds upon “best practices”, *Let’s Go CT* vision, and study goals
- Consider the diversity of the state’s bus system
- Establishes service standards, criteria, and performance metrics
- Enables evaluation of cost effectiveness, service performance, and support of stated goals
- Requires consistent data across transit operators for evaluation
- Provides aspirational guidelines for system evolution

What will the Service Guidelines measure?

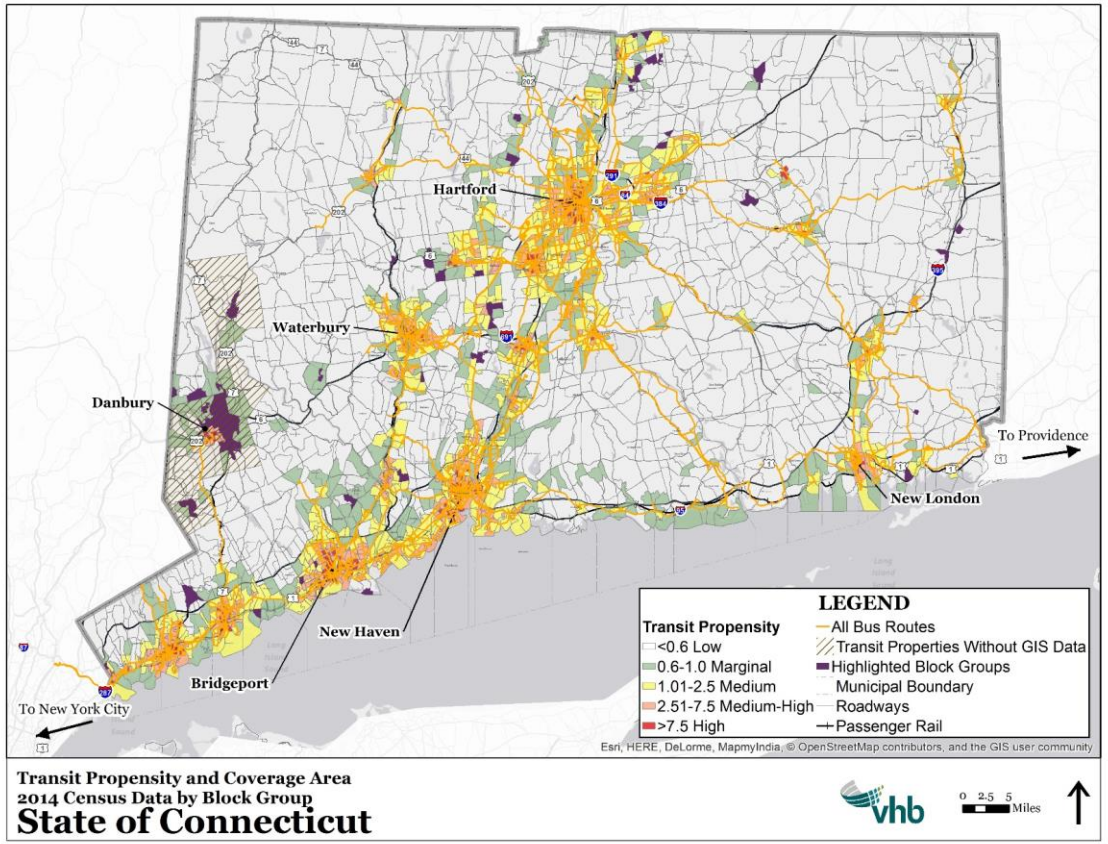
- Route Design
  - **Where do routes operate?**
- Schedule Design
  - **How often do routes operate?**
- Economic and Productivity
  - **How efficient are the routes?**
- Service Delivery
  - **How well are the routes operating?**

How well is the Statewide System Performing?

- Collected high-level bus system data from each transit operator
- Applied service guidelines using the data provided; similar-sized systems were compared with each other
- Conducted a two-stage evaluation
  - Stage 1 Evaluation
    - ✓ All routes using some metrics
  - Stage 2 Evaluation
    - ✓ Select routes based on Stage 1 Evaluation results using remaining metrics

Stage 1 Evaluation

- Evaluation of all 271 statewide routes was attempted; many systems either didn't have or couldn't provide data
- Some small towns/remote areas not served by transit should be examined
- Evaluated On-Time Performance, Transit Propensity, Passenger Trips per Revenue Hour
- Transit propensity showed that mostly we are serving areas in need with some small areas subject to further investigation
- Some bus routes smaller and mid-size systems have low to moderate usage
- On-time performance (reliability) may be an issue for all transit properties
- 76 routes were advanced for Stage 2 Evaluation



Stage 1 Evaluation Questions

- Please tell us which bus system and route you ride:

_____

Is the bus route you use reliable?

- ✓ Yes
- ✓ No

- If not, please tell us why by choosing from the following reasons:
  - ✓ Bus arrives too early
  - ✓ Bus arrives too late
  - ✓ Bus does not operate per schedule
  - ✓ Bus misses stops
  - ✓ Passengers take too long to board the bus/pay fares
  - ✓ Bus trip is slow/delayed due to traffic
  - ✓ Bus has mechanical issues
- Do you feel that bus service is available in the areas where you live and work?
  - ✓ Yes
  - ✓ No
- If not, please tell us where you live (City or town or zip code):

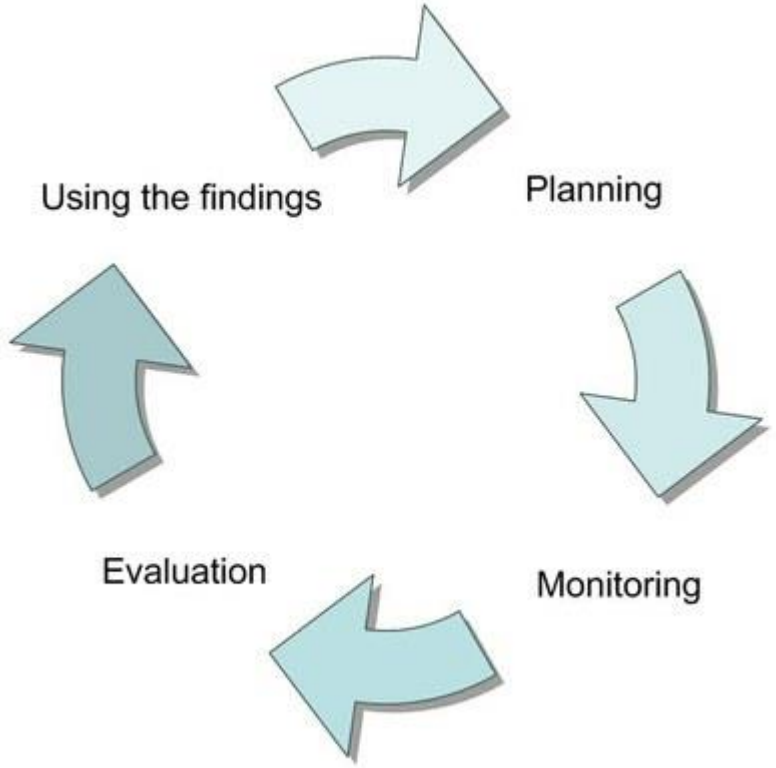
_____

- Please tell us where you work (City or town or zip code):

_____

Stage 2 Evaluation

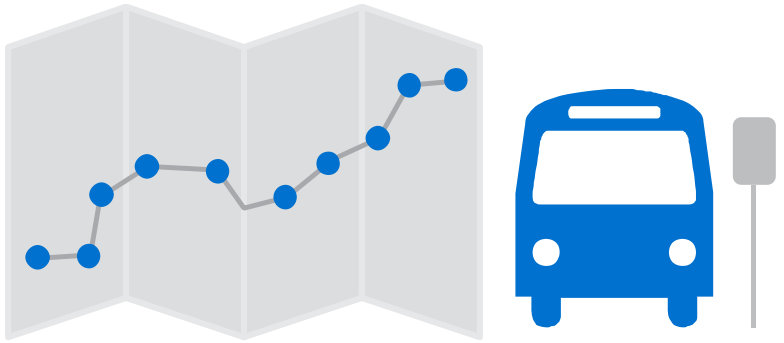
- 9 metrics were applied
  - ✓ Bus stop spacing
  - ✓ Bus stop amenities
  - ✓ Headways
  - ✓ Span of service
  - ✓ Passenger trips per revenue mile
  - ✓ Farebox recovery
  - ✓ Ratio of revenue miles to non-revenue miles
  - ✓ Average distance between failures
  - ✓ Fleet average age
- Data at the route level was often not available
- Routes (or systems) with data were evaluated



Route Design

Bus Stop Spacing

- Evaluated distance between bus stops
  - ✓ Data available for only 32 routes
  - ✓ Bus stops spaced too closely on 22 routes



Bus Stop Amenities

- Candidate shelters and bench locations were identified based on daily boardings at stops
  - ✓ Only Greater Bridgeport Transit (GBT) collects this data
  - ✓ Some GBT candidate stops identified for compliance with the metric

Schedule Design

Headways

- Used to determine how often to operate bus service based on number of riders per trip
  - ✓ Only 14 routes had information necessary to assess headways
  - ✓ Three CT*transit* Waterbury Routes 22, 28 and 42 – candidates for headway adjustment

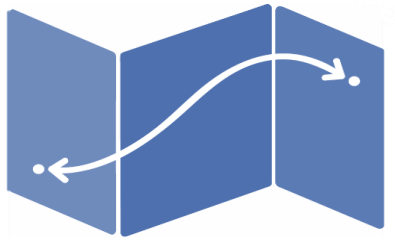
Span of service

- Used to determine time and duration of service based on ridership
- Based on passenger loads on first and last trip
  - ✓ Most transit operators do not collect this data
  - ✓ Only 16 routes could be evaluated
  - ✓ For these routes spans of service are appropriate

Route Productivity

Passenger Trips per Revenue Mile

- Low numbers indicate low utilization; high numbers indicate crowding
- Only 43 of 76 routes evaluated due to data availability
  - ✓ 32 routes were poor performers



Fare box Recovery

- Calculates how much of the cost to operate buses is covered by the fare collected
- Data not available at route level; evaluated at system level
- Windham Region, Southeast Area, Milford, Housatonic Area, Middletown, & Norwalk Transit Districts have low fare box recovery ratios

Route Productivity

Revenue to Non-Revenue Miles Ratio

- Measured efficiency of scheduled service to out-of-service mileage
- Only 24 routes could be evaluated
- Several agencies had routes with non-revenue miles more than 5% of revenue miles
  - 6 C*Ttransit* Hartford routes
  - 5 C*Ttransit* New Haven routes
  - 5 SEAT routes
  - 2 Hartford Express routes

Service Delivery

Average Distance between Bus Failures

- Data not available at route level
  - ✓ 11 of 15 systems evaluated at system level
- Systems with more frequent breakdowns
  - ✓ CT*transit* Hartford, CT*transit* New Haven, SEAT, GBT, NTD, MTD

Fleet Average Age

- Compared average age of bus fleet to useful service life per FTA
- Systems with fleets exceeding useful life
  - ✓ C*TTransit* New Haven, NTD, GBT, WRTD, SEAT, MTD, NWCTD, ETD
  - ✓ FFY 2017 – 2018 bus purchases:
    - ❖ CT*transit* Hartford, New Haven, and Waterbury
    - ❖ HART
    - ❖ MTD
    - ❖ NTD
    - ❖ SEAT
    - ❖ WRTD
    - ❖ NWCTD

Stage 2 Evaluation Questions

- Please tell us which bus system and route you ride:

_____

- Tell us where (which stop) you board the bus at (road, intersection and town):

_____

- Is where you board the bus within a comfortable walking distance of where you live or work?
  - ✓ Yes
  - ✓ No
- Does your bus stop the following? (Select all that apply)
  - ✓ Bus stop pole and sign with route identification
  - ✓ Bus route information (map, schedule)
  - ✓ Bench
  - ✓ Shelter
  - ✓ Lighting
- Do you feel safe and secure at your bus stop?
  - ✓ Yes
  - ✓ No

Stage 2 Evaluation Questions

- Is the bus you ride usually clean?
  - ✓ Yes
  - ✓ No
- Is the bus temperature comfortable?
  - ✓ Yes
  - ✓ No
- Are seats usually available when you board?
  - ✓ Yes
  - ✓ No
- If seats are not available is there a place to stand securely?
  - ✓ Yes
  - ✓ No
- Are drivers courteous and knowledgeable?
  - ✓ Yes
  - ✓ No

Identified Route Level Needs

- Several routes have too many bus stops and stops with low ridership
- There is a lack of consistent and basic information at bus stops (signs and route information)
- Station/stop amenities (such as shelters at high ridership bus stops) are needed
- Some routes have low ridership/utilization
- There are systems with low fare box recovery rates (10% to 23% vs. national average of 25.7%)
- Several systems have older bus fleets with frequent breakdowns
- Some buses travel long distances without passengers to get to the depot

Key Finding: Data Collection is an issue

- Agencies were responsive and provided the data they had
- Many agencies were missing some or most data needed to conduct a complete performance assessment
  - ✓ A lack of on-time performance data was almost universal throughout the state
- Data was collected and provided in varied and inconsistent formats and time periods
- There was a lack of consistency in data collection measures and practices
- Smaller and rural agencies reported a lack resources for comprehensive data collection

Intercity Bus Needs

- Assessed attractions outside of 10 miles from an intercity bus stop and not in an urbanized area
- Evaluated transit dependent populations and areas with no intercity bus service or transit service to an intercity bus stop
- Few areas in state are without access to intercity bus service
- Potential intercity bus destinations not currently served or have direct service
  - ✓ Towns of Stafford and Plainfield
  - ✓ Brooklyn Correctional Institution (Windham County)
  - ✓ Eastern Connecticut State University Campus
- Expanded marketing support to advertise intercity bus service

Global Recommendations

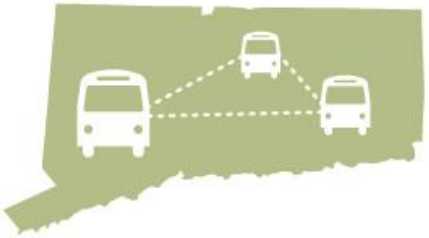
Applies to Statewide Bus System

- Improve Existing Bus Service Performance
  - ✓ Adopt bus service guidelines
  - ✓ Expand AVL & APC technology beyond 8 CT*transit* divisions
- Create Better Data Collection Processes, Tools and Reporting
  - ✓ Collect & report data in a consistent format/level of detail
  - ✓ Will be based upon the LEAN process
  - ✓ Regular Statewide Performance Assessments
  - ✓ First data check in 6 months, all routes providing data in 18 months
- Conduct Future Transit Improvement Studies
  - ✓ Investigate serving low-density/high transit propensity areas
  - ✓ Tie Transit Development Plans to Statewide Goals and Initiatives

Global Recommendations

- Make Bus Service Easier and More Convenient to Use
  - ✓ Expand usefulness & capabilities of transit operator's websites
  - ✓ Create a one-stop source for information and trip planning
  - ✓ Provide real-time bus arrival information

- Create an Integrated Statewide Bus System
  - ✓ Explore the feasibility of consolidating bus operations under a single entity
  - ✓ Conduct a governance study
  - ✓ Create a single regional fare policy and adopt consistent smart card technology



- Better serve Special Transit Generators
  - ✓ Review transit connectivity/span of service to state and community institutions & major employers
  - ✓ Create a statewide student transit discount policy (expand on Upass)

Global Recommendations Input

Please choose the top two Global Recommendations that are most important to you:

- ✓ Improve Existing Bus Service Performance
- ✓ Create Better Data Collection Processes, Tools and Reporting
- ✓ Conduct Future Transit Improvement Studies
- ✓ Make Bus Service Easier and More Convenient to Use
- ✓ Create an Integrated Statewide Bus System
- ✓ Better serve Special Transit Generators

Route Level Recommendations

- Bus stop spacing
  - ✓ Many bus routes require an examination of bus stop spacing
- Bus stop amenities
  - ✓ All bus stops with 50 to 100 boardings should be considered for benches
  - ✓ All bus stops with 100+ boardings should be considered for shelters
- Headways
  - ✓ Three CTt*ransit* Waterbury bus routes are candidates for service frequency adjustments
- Span of service
  - ✓ For the bus routes evaluated, spans of service were appropriate
  - ✓ Public feedback indicates span of service an issue requiring review by transit operators

Route Level Recommendations

- Bus route productivity
  - ✓ Numerous routes experience low productivity
  - ✓ Detailed ridership analysis needed to identify and eliminate unproductive route segments
- Fare box Recovery
  - ✓ Bus systems with fare box recovery ratios below 25% need to decrease operating costs or increase ridership
- Fleet condition
  - ✓ Transit operators with frequent vehicle failures need to identify patterns and/or adjust maintenance schedules
  - ✓ Vehicles whose average age is over 2/3's of useful life should be considered for replacement or rehabilitation

Intercity Bus Recommendations

- Statewide intercity bus system serves key destinations in neighboring states
- Encourage intercity bus operators to apply for federal funds for rural public transportation and intercity services
- Continue annual consultation with intercity bus operators to assess their needs
- Assess intercity bus operator interest to provide new service
  - ✓ Direct service to Eastern State University Campus (Willimantic)
  - ✓ Reinstate service to Brooklyn Correctional Institution (potential on-demand stop only)
- Seek federal funding for marketing, shelters and signage at intercity bus stops
- Continue to support policies that encourage intercity bus service at intermodal facilities
- Create an interconnected network in areas served by intercity bus

Next Steps

- Stage 1 and Stage 2 Evaluation Report
- Draft Final Report

Thank you for your participation

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MEMORANDUM

To:	VHB, Connecticut DOT	Project:	Connecticut Statewide Bus Study
From:	FHI	Date:	02.08.17
Subject:	CT Bus Study Survey Results		

From January 9th to January 27th the second Connecticut Statewide Bus Study Virtual Public Workshop was held to summarize existing conditions, study goals, and study outreach efforts to date, and to discuss proposed recommendations for route and schedule design, route productivity, fare box recovery, route efficiency, service delivery, and next steps. In total, 103 members of the public participated in the Virtual Public Workshop and provided input on the existing statewide bus system.

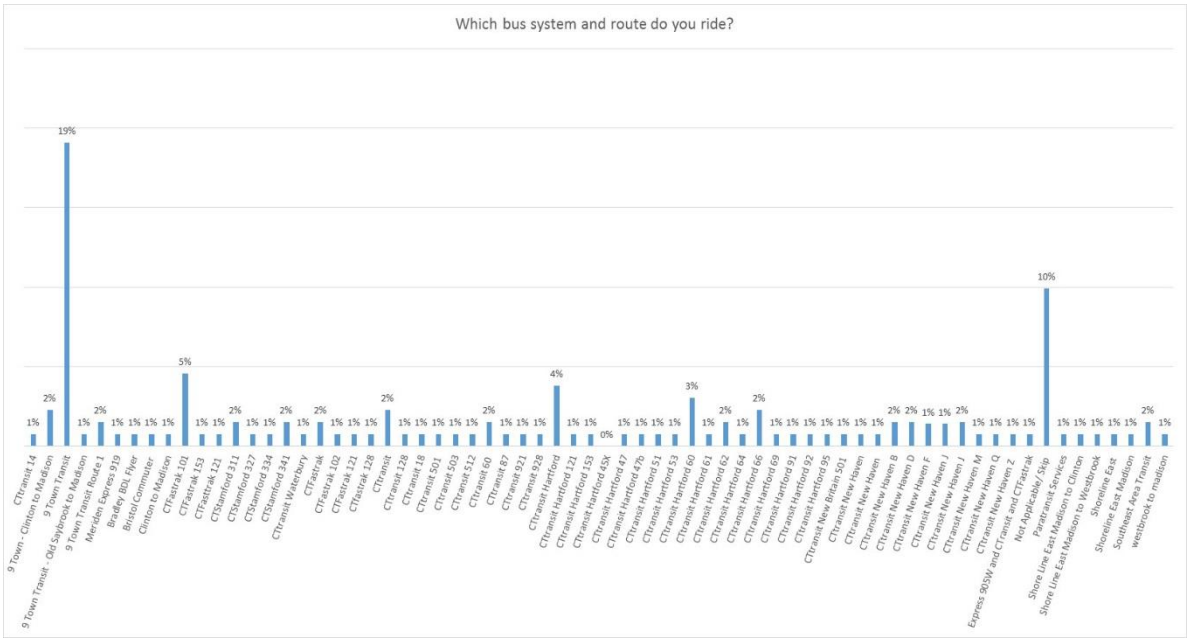
Methodology

Participation in the Virtual Public Workshop featured a presentation with voiceover narration, that could be played and paused at specific sections to provide feedback through the online survey questions. The responses to the survey questions are summarized below:

Overall Bus System and Route Usage

Of the 103 participants, 88% of respondents cited usage of at least one bus system, while 12% either do not use transit or chose not to answer. The bus systems most frequently used were those operated by CT*transit* 58% , and 9 Town Transit 19% . Bus routes cited as most frequently used were CT*fastrak* Route 101 used by 5% of respondents, and CT*transit* Hartford Route 60 utilized by 4% of respondents. (See Figure 1) A full list of all the 69 bus systems and routes cited by participants is included in Appendix A.

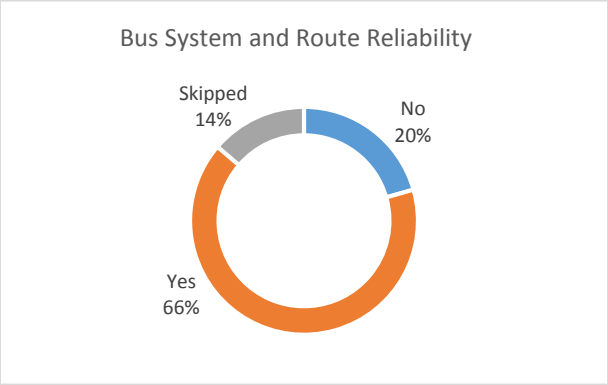
Figure 1. Transit Usage Question 1: Which bus system and route do you use?



Transit Reliability

Participants were asked if the bus route they most frequently used was reliable. 66% of the respondents felt that their bus route was reliable, while 20% felt their current bus system and route was unreliable, and 14% chose to skip the question. (See Figure 2).

Figure 2. Transit Reliability Question 2: Is the bus route you use reliable?

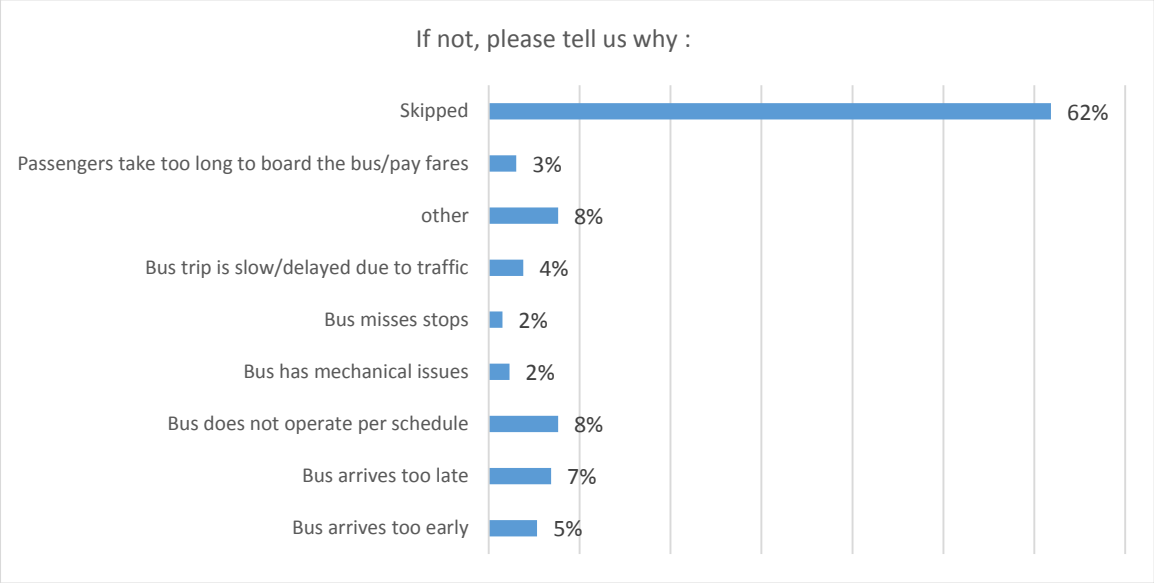


Participants who indicated their bus system or route was unreliable cited three primary reasons: “Buses did not operate per schedule” represented 8% of responses, “Buses arrived too late” accounted for 7% responses, and “Buses arrived too early” 5% of repsondents (See Figure 3). Most participants 62% skipped this follow up question. It is likely that these participants are part of the 66% of respondents who indicated they were satisfied with their bus system and route reliability.

Participants provided additional information in the “other” choice of this question. Reasons for unreliable bus service included:

- Bus does not go into Meriden
- Not enough bus routes
- Schedule does not align with work schedule
- Unacceptable frequencies during pm peak (5pm-8pm)
- Road construction prevents bus from making all stops
- Hartford to Windsor Route - drivers typically do not pick up passengers on the last few stops if there are no passengers on the bus.

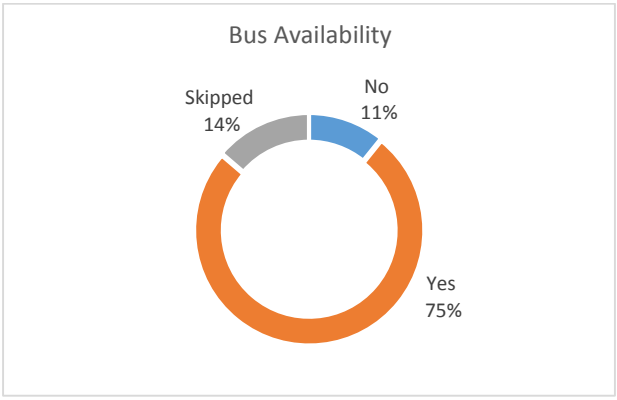
Figure 3. Transit Reliability Question 2 follow up: If not, please tell us why by choosing from the following reasons:



Bus Service Availability

Participants were asked if bus service is available in the areas where they live and work, 75% of repsondents) replied “Yes”, 11 % replied “No”, and 14% skipped the question. (See Figure 4).

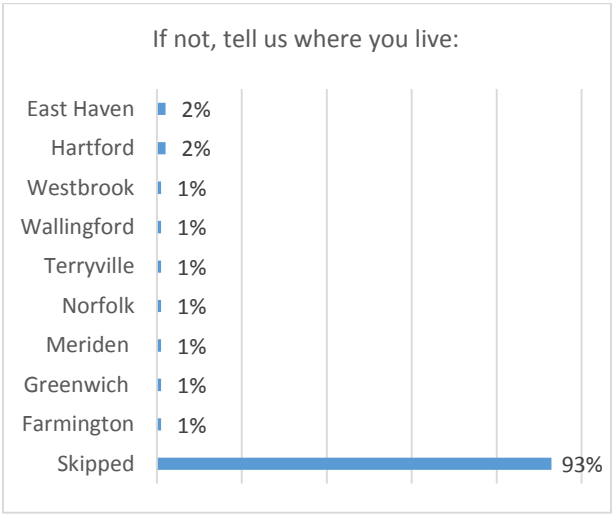
Figure 4. Bus Service Availability Question 3: Do you feel that bus service is available in the areas where you live and work?



Participants used bus stops throughout Connecticut to board the bus. A comprehensive list of the bus stops cited and the number of respondents using that bus stop is provided in Appendix B.

Participants who responded that the current bus system was not accessible to them were asked for the city, town, or zip code of their residence and work. Of the 11 respondents that replied that bus service was not available where they live or work, all provided a response to where they live. The complete list of locations based on where they live is included in Figure 5.

Figure 5. Bus Service Availability Question 3 follow up: If not, please tell us where you live (City or town or zip code):



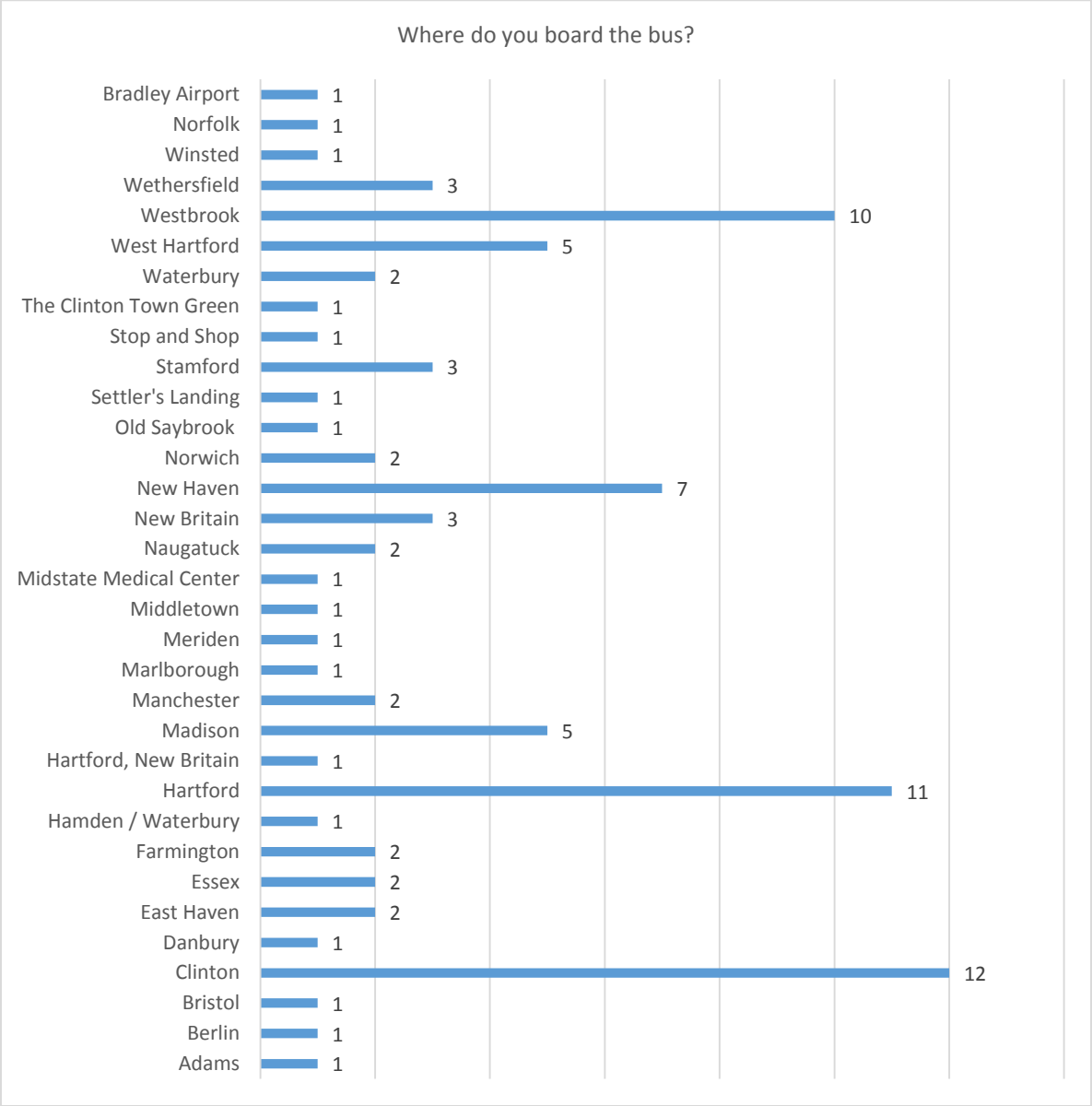
Of the 11 respondents who replied that bus service was not available where they work, eight provided a response indicating where they work. Those origin-destination pairs for these locations included:

- Meriden – Berlin Turnpike/Jordan Lane/Downtown Hartford
- Wallingford – Hartford
- Downtown Hartford – Suffield
- Greenwich – Clinton
- Terryville – Bradley Airport
- Westbrook – Madison
- Maple Ave, Hartford – Berlin Turnpike, Meriden
- Norfolk - Torrington

Bus Boarding

Participants were asked where did they board the bus. The locatiosn with the highest percentages of boarding are as follows: 13% of repsondents indicated they board the bus in Clinton, followed by Hartford (12% of respondents), Westbrook (11% of repsondents), New Haven (8% of repsondents) and West Hartford (6% of repsondents). Eleven percent of the participants did not provide work location information. (See Figure 6).

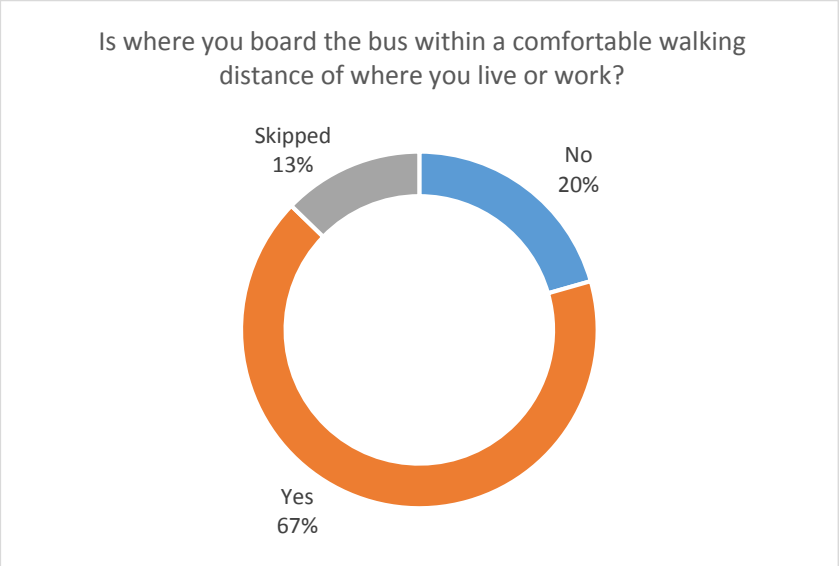
Figure 6. Bus Service Availability Question 3 follow up: If not, please tell us where you live (City or town or zip code):



Bus Stop Accessibility

Respondents were asked if the bus stops they use for their trips were within comfortable walking distance from where they live and work. Of the 103 respondents 67% replied “Yes”, 20% replied “No”, and 13% skipped the question. (See Figure 7).

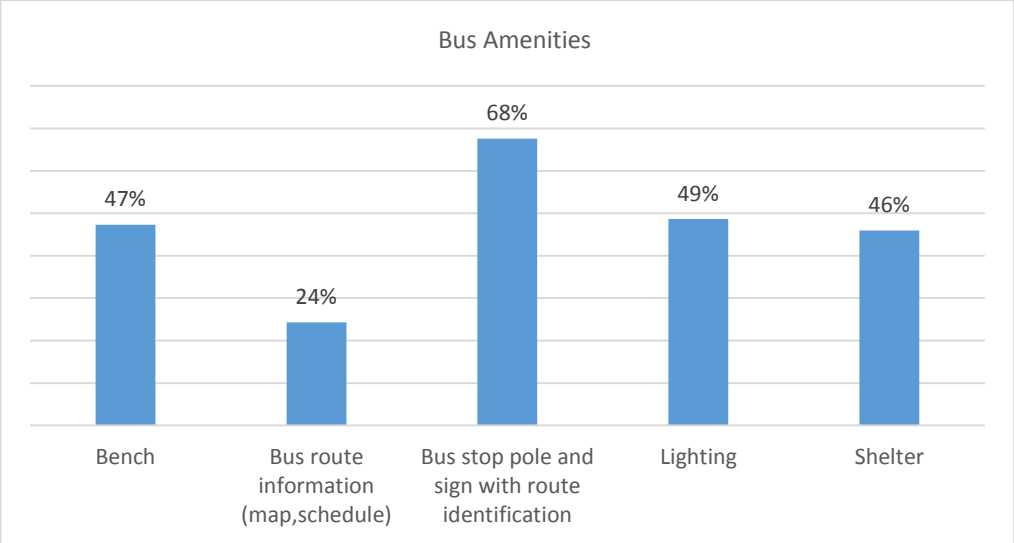
Figure 7. Bus Service Availability Question 4: Is where you board the bus within a comfortable walking distance of where you live or work?



Bus Stop Amenities

Participants were asked whether their typical bus trip included the following amenities: bench, bus route information (map, schedule), bus stop pole and sign with route identifications, lighting, and shelter. Of the 74 respondents that answered the question, a majority (68% of respondents) indicated their bus stops had a "Bus stop and sign with route identification" at their bus stop. Many participants also indicated their bus stops included: lighting 49%, a bench 47%, and shelters 46% at their bus stop. Less than a quarter of repsondents indicated that their bus stop featured basic bus route information (i.e., bus route map and schedule). (See Figure 8).

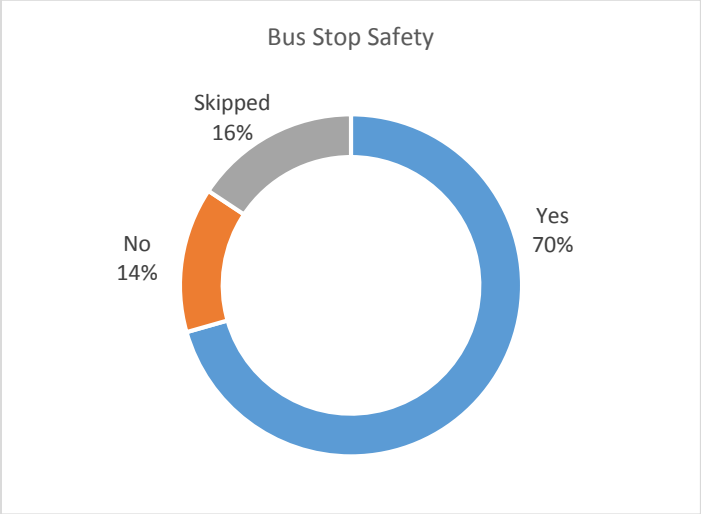
Figure 8. Bus Stop Amenities Question 5: Does your bus stop have the following? (Select all that apply)



Bus Stop Safety

Participants were asked if they felt safe and secure at their bus stop. The majority of respondents indicated that they feel safe (71% of repsondents), 14% replied "No," and 16% skipped this question. (See Figure 9).

Figure 9. Bus Stop Safety Question 6: Do you feel safe and secure at your bus stop?



Vehicle Comfort

Participants were asked a series of questions related to on-board bus comfort including: cleanliness, temperature control, seating availability and standing room, and driver knowledge. Overall, most participants are comfortable with their on-board bus environment. Repsonses are shown in Figure 10.

Cleanliness

Participants were asked whether the bus they usually ride was clean 73% of respondents believed their bus was clean, 9% believed their bus was not clean, and 19% skipped the question.

Bus Temperature

Participants were asked whether the bus temperature on-board buses was comfortable. 73% of participants believed the bus temperature was comfortable, 9% believed their bus temperature was not comfortable, and 19% skipped the question.

Seat Availability

Participants were asked whether seats are usually available when they board. 78% have a seat available, 4% cannot find an available seat, and 18% skipped the question.

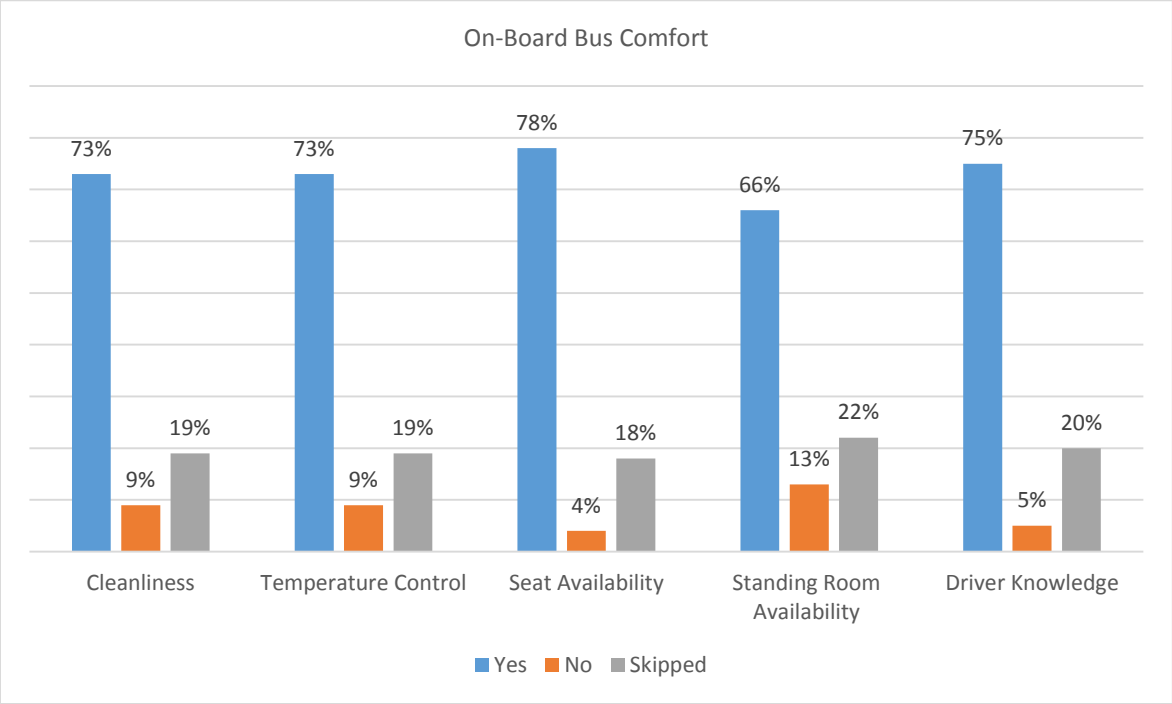
Standing Room Availability

When participants were not able to find a seat, 66% felt secure standing, 13% were not able to find a secure standing area, and 22% skipped the question.

Driver Knowledge

When boarding a bus 75% of participants believed their bus driver to be courteous and knowledgeable, only 5% felt the opposite, and 20%skipped the question.

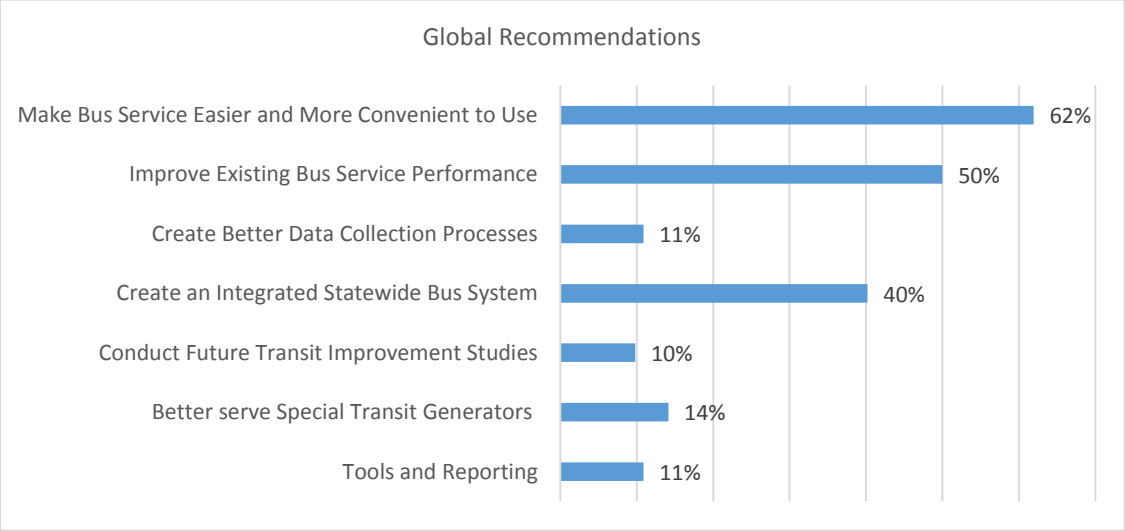
Figure 10. Vehicle Comfort Questions 7,8,9,10,11: Regarding Bus Comfort



<u>Top Priorities for Statewide Bus System Improvements</u>

Participants were asked to choose their top two recommendations for improving the Statewide Bus System. 91% of respondents provided at least one response. Of those that responded, 62% of respondents cited “Make Bus Service Easier and More Convenient to Use” as the top recommendation, followed by “Improve Existing Bus Service Performance” (50% of repsonses) and “Create an Integrated Statewide Bus System” (40% of repsonses) as top recommendations. (See Figure 11).

Figure 11. Questions 12: Global Recommendations for CT Statewide Bus System

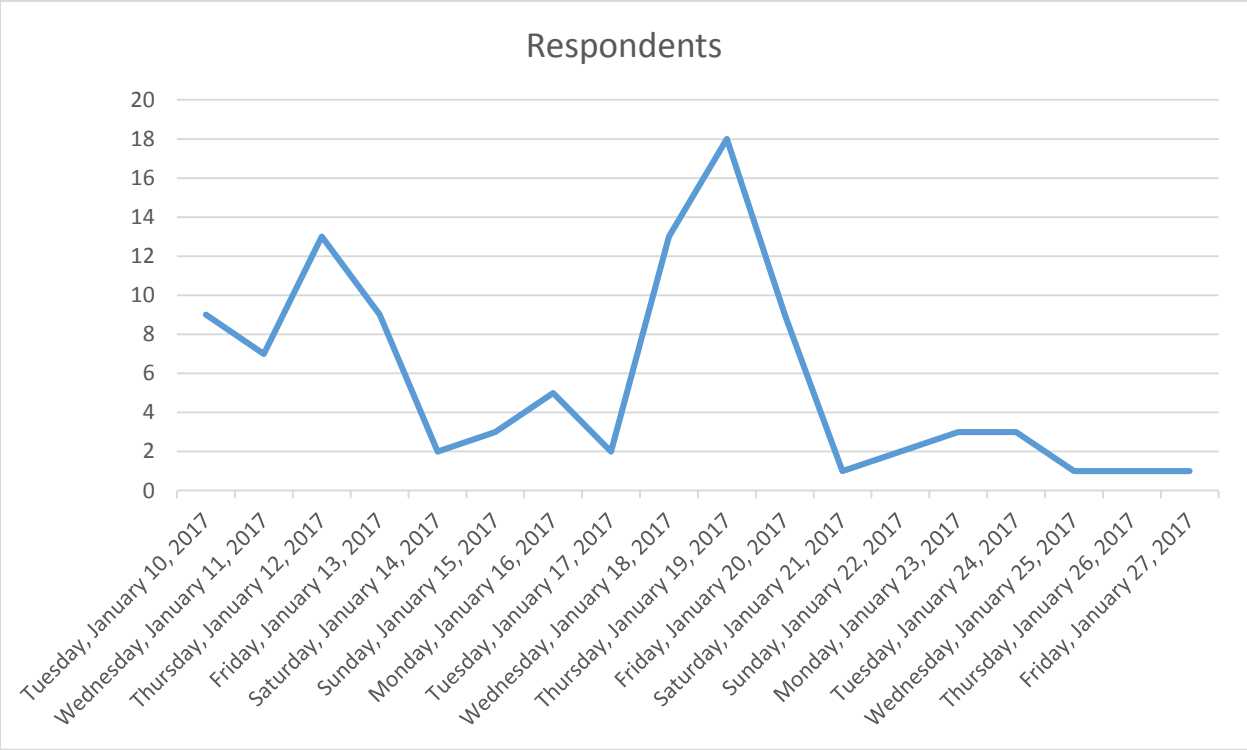


Conclusion

After completing the survey, respondents were thanked for their participation and encouraged to visit the project website for updates and future participation opportunities.

Participation occurred throughout the three-week window that the workshop was open. However, there were several trends notable for future Virtual Public Workshop outreach efforts. Activity dropped significantly during the weekends. There were also peaks in activity that likely coincided with the initial notification of the Virtual Public Workshop's availability and a reminder notification that stated the workshop's end date. (See Figure 13).

Figure 13. Virtual Public Workshop Particpation over time



Appendix A

Transit Usage Question 1: Please tell us which bus system and route you ride:

CTtransit 14	1
9 Town - Clinton to Madison	3
9 Town Transit	25
9 Town Transit - Old Saybrook to Madison	1
9 Town Transit Route 1	2
Meriden Express 919	1
Bradley BDL Flyer	1
Bristol Commuter	1
Clinton to Madison	1
CTFastrak 101	6
CTFastrak 153	1
CTFastrak 121	1
CT Stamford 311	2
CTStamford 327	1
CTStamford 334	1
CTStamford 341	2
CTtransit Waterbury	1
CTFastrak	2
CTFastrak 102	1
CTFastrak 121	1
CTfastrak 128	1
CTtransit	3
CTtransit 128	1
CTtransit 18	1
CTtransit 501	1
CTtransit 503	1
CTtransit 512	1
CTtransit 60	2
CTtransit 87	1
CTtransit 921	1
CTtransit 928	1
CTtransit Hartford	5
CTtransit Hartford 121	1
CTtransit Hartford 153	1
CTtransit Hartford 45X	0
CTtransit Hartford 47	1
CTtransit Hartford 47b	1
CTtransit Hartford 51	1
CTtransit Hartford 53	1
CTtransit Hartford 60	4
CTtransit Hartford 61	1
CTtransit Hartford 62	2
CTtransit Hartford 64	1
CTtransit Hartford 66	3
CTtransit Hartford 69	1

CTtransit Hartford 91	1
CTtransit Hartford 92	1
CTtransit Hartford 95	1
CTtransit New Britain 501	1
CTtransit New Haven	1
CTtransit New Haven	1
CTtransit New Haven B	2
CTtransit New Haven D	2
CTtransit New Haven F	1
CTtransit New Haven J	1
CTtransit New Haven J	2
CTtransit New Haven M	1
CTtransit New Haven Q	1
CTtransit New Haven Z	1
Express 905W and CTtransit and CTFastrak	1
Not Applicable/ Skip	13
Paratransit Services	1
Shore Line East Madison to Clinton	1
Shore Line East Madison to Westbrook	1
Shoreline East	1
Shoreline East Madison	1
Southeast Area Transit	2
Westbrook to Madison	1

Appendix B

Bus Service Availability Question 3: : Tell us where (which stop) you board the bus:

Allyn St	1
Bassett Rd	1
Bee St	1
Berlin Tpke	1
Birch St	1
Bishops Corner	1
Bliss St	1
Boston Post Rd	2
Broad Street	2
Church and Chapel St	1
Coe Ave	1
Downtown New Haven	3
Eastern Dr	1
Farmington Ave	1
Farmington Ave at Ardmore Rd	1
Farmington Ave, East of Main St	1
Fawn Hill Dr	1
Fern St	1
Fern St and Main St	1
Goffe Terrace and Winthrop Ave	1
Grove Street	1
Hartford Road, in front of Fairway Apartments	1
High St	3
Jordan Ln	1
Kennedy Road, Windsor	1
Lake Ave	1
Lakeview Apts	1
Leavenworth and W Main St	1
Lewis Ave	1
Liberty Square	3
Lombard St and Poplar St	1
Madison	1
Main street	6
Mill Plain Rd	1
New Britian Rd	1
New State Rd	1
Nicoll St and Willow St	1
Not Applicable/Skip	12
Old Mountain Road	1
Post Office Square	2
Quaker Ln South	1
Ridge Rd and Crest St	1
Route 1	3
Route 1 south main St	2
Route 44	1

Sachem and Washington	1
Settlers Landing W	1
Shell Station	2
Shippan Ave	1
Silas Deane Hwy	1
Silver St	1
South Main St	2
Spencer St Park & Ride	1
St. Augustine St	1
State St and Edwards St	1
Stop and Shop	2
Subway	4
Union St	1
Vista	1
Wall St	1
West Farms	1
West Rd	1
Wethersfield Ave	1
Whalley Ave and Fowler St	1
Whitney Ave	1
Whitney Ave and Cold Spring St	1
Whitney Ave southbound at East Rock Road	1
Winchester St	1
Wolcott Hill Rd near Jordan Ln	1

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MEMORANDUM

To:	VHB, CTDOT	Project:	CT Statewide Bus Study
From:	FHI	Date:	02.08.17
Subject:	Summary Update of Website Submitted Comments		

To date, (55) written comments have been submitted via the project website. Many of the comments submitted have been simple statements expressing gratitude for the opportunity to provide input. Other commenters asked to be informed of future opportunities to participate. The website's comment submission form includes an automatic email response that indicates that the message has been received, the commenter has been added to the mailing list, and that they will receive information regarding future input opportunities.

The following section summarizes recurring themes of comments submitted and where relevant includes direct passages from substantive comments.

General and background information

Several comments have provided general information about aspects of bus travel that they like. Specifically, the Shoreline Shuttle, DATTCO, and Shoreline East lines were called out for providing good service.

One commenter noted a South Central Regional Council of Governments (SCRCOG) commissioned jobs and transportation access study that involved interviews with CT Transit bus riders and GIS analysis of bus line and job locations. The commenter suggested that the report be added to the list of Background Studies listed on the "About" section of the website. The report is available: http://ctdatahaven.org/reports/how-transportation-problems-keep-people-out-workforce-greater-new-haven

One commenter noted that the highest priority need for the state is not bus-related but more travel lanes on I-95 from New York to Rhode Island.

Desire to stay involved

Several commenters have expressed interest in continued participation in the Study. Several commenters offered to represent specific areas of expertise such as the disabled community, the senior community, or in a few cases, expertise in bus travel either through extensive bus riding in specific regions or through research and observation. Notably, a representative from the Central Massachusetts Regional Planning Commission asked to be included on project updates as they would like to work with CTDOT to consider transit connections between Connecticut and Massachusetts. He can be reached at: Todd Fontanella, tfontanella@cmrpc.org

A rider of the HART Danbury-Brewster Shuttle bus requested a focus group interview with riders of that service and explained that the service is not helpful for people that live east of exit 2 on I-84.

The Bus riding experience

Several commenters have delivered praise or complaints regarding specific aspects of the bus riding experience. Three commenters noted that their bus drivers are responsible, helpful, courteous, friendly, and in the case of CTFastrak drivers, very safe. One noted that the SEAT bus fleet is old and frequently suffers from breakdowns. Another commenter noted that when standing on the bus, there is nothing to hold on to. This commenter suggested a return to fixed metal handles for safe standing.

One commenter noted that there is a lack of bus shelters in Bridgeport and continued to note that wealthier communities and demographically whiter communities do have bus shelters.

Another commenter explained the need for greater reliability, ease of use, and efficiency for the statewide bus system. They commented on reliability and increase ridership in foreign public transit.

ADA Issues

Several commenters raised both general and specific issues related to access for disabled and senior community members.

One commenter provided a preview abstracted from a 1200-word op-ed that he is in the process of writing: "*Regarding CSA Transit (cross service area transit), which CONNDOT launched in early July 2016 without, among other things, transparency, public input, providing riders guides/instructions to ADA certified passengers, establishing standards common for all providers, and one central number for riders to call. CONNDOT, which is acting as if it is in charge, should have acted as oversight and established uniform standards with the mandate that all Connecticut ADA service providers implement them and include them in their riders' guides. And I would expect CONNDOT uses standards to comply with FMVSS regarding wheelchair and passenger securement. If there were uniform standards, all 10 ADA transit providers would have riders' guides with the same policies.*" –Joseph Luciano, Disability Rights Action Group

Another commenter who identified himself as a disabled male noted a lack of seating at bus stops in Waterbury.

One commenter explained why increased service on weekends and evenings are so important to the senior community. Reasons cited included the high cost of taxis; the inability of many seniors to drive at night; strong desire to travel for religious services, theater, workshops and fairs, and volunteer jobs that may occur outside the hours of dial-a-ride; and the desired security of a door-to-door trip in the face of crime threats.

Employment Issues

Several commenters have noted the impact of bus service on their employment opportunities. One commenter noted that, "As a MAT transit rider, and looking for employment on shoreline, I had to refuse job offer because 9 Town Transit/Estuary Transit did not have night time hours to help me return home to Middletown from Old Saybrook for a 3-11pm shift."

Another commenter explained that the lack of service after 10 PM presents a burden for those that work at night.

Issues with the Workshop

Several commenters wrote during the duration of the Virtual Public Workshop to report technical difficulties with the workshop or to provide feedback on the workshop content. Two commenters explained that the workshop was not working for them. Two other commenters suggested that the video was too long. One suggested that there were not enough questions regarding ridership needs and that it would have been helpful to have an opportunity to submit general comments or additional information during the workshop. One commenter wondered why the workshop was not being advertised in Fairfield County.

Interstate Issues

One commenter has written in to highlight the need for better interstate bus transportation. He suggested that bus service should be provided for commuting to New York City, particularly during hours when there is little or no rail service. Because there is not return option by rail, the commenter noted that he must drive to New York City during the day. The commenter also suggested that private bus providers should be encouraged to offer more stops along the routes from New Haven to Boston, Burlington, and New York City. In addition to employment opportunities, these stops would be helpful to parents and students.

Needs

Numerous commenters provided recommendations for specific locations and include increased service, new routes, and other improvements, as well as a suggested service cuts. These recommendations are edited for clarity but provided in their entirety:

- In Torrington, there is a serious lack of reliable bus transit between the city and places like Hartford, Farmington and Waterbury. The options available to

residents are extremely limited, not easily accessible and unacceptable. Local efforts for community transit are likewise limited, especially for the elderly and the physically challenged. This transportation issue needs to be improved as soon as is possible.

- For the last 20 years, I have lived on North Street in Watertown, I have seen a large, noisy, empty bus travel by my home 7 days a week 12 hours a day. Bus service may be needed on Main Street, but it is not needed in our neighborhood.
- I currently live in Middletown, CT and regularly commute via transit to New Haven. There is no direct route (unless the expensive express bus on weekdays) to get to New Haven by a regular bus. It is incredibly inconvenient to have to take two buses on the weekend to get to and from New Haven. And when the express commuter is available on weekdays it is not accessible by local Middletown transit. This is quite ridiculous. Basically, there is no easy way to get to New Haven and it is very frustrating. There needs to be some sort of bus that is regular/consistent 7 days a week- with more buses during work week times and access to and from New Haven from downtown Middletown. I take the 55 bus to Hartford and it is relatively easy to catch in downtown Middletown and runs often enough (though it would be great if it ran at night too).
- Start a shuttle service from Monroe via White Plains Road to Trumbull starting early in the morning and in the afternoon. Riders will use the service if they are aware this service is available. I have been suggesting this for a long time ago but no one listens. Hopefully, something will happen this time.
- The Meriden-Hartford Express ridership has significantly decreased. I have been a commuter on this bus route for nine years. I know the ridership has decreased previously due to the lack of heated/air-conditioned and properly functioning buses. Currently (in the last year) ridership has decreased due to the timing of the routes. All we want as commuters is a reliable bus, reasonably functioning, and a ride that gets us to work ON TIME and home safely. Due to the number of regular commuters, we could use a much smaller bus to be more efficient. Also, the use of texts or an alert system would be appreciated if the bus is not functioning, or notification if the bus will be late. Thank you for listening.
- It would be great to have two Waterbury/New Haven bus routes. One on Route 10 and one on Route 63.
- I am incensed that the Busway is losing millions of dollars a year. It should never have been put in, a project of a deranged governor. I was visiting my parents in New Britain yesterday on Stanley Street and saw three buses go by with in 6 minutes, and they all had only 2 or 3 people aboard.
- As a frequent rider of both CTFastrak and CT transit, point to point buses would be an asset for riders traveling from downtown Hartford to West Farms Mall, between Hartford and outlying towns such as Manchester, Bristol, Waterbury and towns of the Farmington Valley. Bus sizes could be smaller, depending upon the number of riders expected for any given route. Current riders often complain about the time spent en route due to constant stopping and starting to pick-up or discharge passengers. I would like to take the time to express thanks to the many drivers who assist elderly, offer help on schedules and routes. I give CT transit an A- for its bus system, pricing and scheduling. Offering daily express service point to point can only increase ridership an offer additional service.
- We need more connections starting at Manchester going outside of Hartford county poor service on Sunday.

- I did notice that you never asked about people who must take Yale shuttle buses and walk to a CT Transit bus stop - does that count as a transfer or does it only count as a transfer if it is a CT company bus? Also, the "O" bus route in New Haven needs to be rethought - it does not need to cut up Division street to Prospect and then return to Winchester. It can just continue on Winchester because there is a new population of bus riders that would benefit from that. Also, there needs to be more buses running during 8-9AM and 5-6 PM. I take one bus route in the AM and in the PM, take a Yale Shuttle and walk to a CT transit bus stop to wait 20-25 mins for a bus home.
- We are very interested in getting commuter bus service through East Windsor.
- Public bus transportation here in southeastern Connecticut in my estimation is not very good. If I wanted to go, say, to Hartford, I would have to take a SEAT Bus from Norwich to New London; then take a Greyhound to New Haven. From New Haven, transfer to Hartford. It was not always this bad in past years. Thank you.
- Connect 909 to use CTfastrak via Cedar Street - Much quicker, especially on the return from Hartford.
- The 22 Wolcott Bus is continuously full and on several occasions, has driven past bus stops without picking people up. Could this service run an 1/2 hourly service? For the most part the service is excellent.
- Articulated buses are needed here on Route 8 and CL to alleviate overcrowding conditions.
- I am fortunate in living close to the route of the Old Saybrook to New London 9 Town Transit bus. Unfortunately, a fair portion of the time I or my wife is obliged to drive somewhere that the bus could take us because it only goes each direction once every two hours. Ridership on this line is limited, I know, so I am not sure how good of an idea it is to increase service, but we would use the bus more. The other consideration is coordinating the bus schedule with the train, which would make it more useful.
- Add weekend Service to 14(Marlborough-Colchester). Make 31 Park St-New Park Ave Night-Saturday routing along with 31A routing as Universal Route. Make 83B from 8:38 am to 12:43PM Serve MCC (Monday through Friday), Make 7:38PM (Mon-Fri) Serve MCC along with all 83D on Saturday.
- 7 Newington Express serves Newington Center (Constance Leigh Dr/Market Sq.), add weekend Service to 14(Marlborough-Colchester), make 31 Park St-New Park Ave Night-Saturday routing along with 31A routing as Universal Route.
- Five comments were received related to relocating National Historic landmark church, Trinity on the Green, specifically the bus stop near the corner of Temple and Chapel streets to the corner of Elm and Temple street. Solutions included moving down one block to the much wider Elm street and still giving the buses a thru route right up Temple street without stopping thereby improving traffic flow greatly. Reasons expressed are below:
    - The constant long term parking and standing of these buses effectively closes off the right lane of Temple street right near the corner and the traffic light causing long delays at this very busy intersection by cutting off the right lane access.

- This location poses a pedestrian hazard. Bus users are constantly jay-running to catch their busses at this bus stop.
- We constantly use our apron in front of our building for parking.
- We see many near accidents between busses, cars on the street and bus users.
- The present bus stop at Trinity Church on the Green in New Haven causes people to cross Temple St. hurriedly, through traffic, to make connections; causes people to stand on the shared sidewalk/driveway/parking lot; results in litter on the property and the use of the side of the building and even the space between the cars as a urinal; attracts drug and cigarette sales because of the permanent transient customer base; causes a complete blind spot for exit whenever a bus is present; causes a significant increase of requests to use the bathroom in the church.
- I have been a member of this church for many and have always watched people hanging out near that stop that are not using the bus.
- It is very dirty and always has garbage around it.
- Even if it was 50 yards back from its present location it would be in front of the open lot between the 2 churches on Temple St. I realize that stop has been there a long time but the homeless rate in the downtown area seems to have escalated causing all the extra foot traffic.