# 5.     Market Evaluation

This chapter describes existing and projected socioeconomic characteristics of the area served by PVTA.

## 5.1   Service Area Overview

Understanding the demographics can help explain changes in transit demand and support recommendations for changes in future transit service. Specifically, people living below the poverty level, households without vehicles, seniors, and disabled individuals typically rely on transit; changes in these demographics can provide insight into transit demand trends. PVTA service is essential to maintaining mobility and promoting economic activity in many communities in the Pioneer Valley. PVTA's service area has a significant low-income population that depends solely on transit. In addition, the area has a large rural population that also depends on transit for lifeline connections to work, school, medical, shopping, and other trip purposes.

The US Census Bureau's ACS and Longitudinal Employer-Household Dynamics program are the primary sources of demographic data used in this analysis and provide valuable indications of trends and projections.

## 5.2   Demographics and Socioeconomics

Demographic and socioeconomic statistics are important in transit planning to understand the potential transit markets that exist in an area. Table 25 outlines the demographic and socioeconomic summary statistics for the PVTA service area in relation to the state of Massachusetts and the United States. Transit dependency is frequently related to level of income, age, vehicle availability, and disability status. Income is a key determinant in the type of transportation used to commute; people with lower incomes are more likely to need public transportation options than people with higher incomes who can afford private transportation.

The PVTA service area has a median household income of $57,778, which is comparable to the national median but significantly lower than the state median household income (Table 25). The poverty level is high in the PVTA service area, with 25.1 percent of people living below 150 percent of the poverty level compared to the state (17.4 percent) and nation (23.7 percent). The percentage of households without vehicles in the PVTA service area is 12.8 percent, slightly higher than the state but significantly higher than the national average. The percentage of population comprising minority people in the PVTA service area is 32.9 percent, which is higher than the state average but lower than the national average. The following sections examine how these demographics and socioeconomic characteristics vary greatly among the PVTA member communities served.

**Table 25. Current Demographic and Socioeconomic Profile (2017)**

| Area | Median Household Income | % People Living Below 150% of the Poverty Level | % Households without Vehicles | % Seniors | % Minority | % Disabled |
|---|---|---|---|---|---|---|
| PVTA Service Area | $57,778 | 25.1% | 12.8% | 15.4% | 32.9% | 14.8% |
| Massachusetts | $74,167 | 17.4% | 12.4% | 15.5% | 27.1% | 11.6% |
| United States | $57,652 | 23.7% | 8.8% | 14.9% | 38.5% | 12.6% |

*Source: US Census Bureau ACS 2017*

## 5.2.1    Population Density

Population density maps help identify where how populations are spread throughout the region into urban, suburban, and rural areas. Population density is particularly important when evaluating a transit market and can be helpful in transit planning when considering how and where services can best meet the transportation needs of various populations as transit and density are highly correlated. Population density in the region is mapped on Figure 51. Cities that are well served by PVTA transit routes have the densest population. The highest population density cities are located in the southern part of the PVTA service area and include Springfield, Westfield, Holyoke, and Chicopee. In the northern part of the PVTA region, most of the cities have low population densities except for Northampton and Amherst, which have pockets of dense population areas that are well served by the PVTA transit routes. Colleges and Universities too are more dense concentrations of population well served by transit.

Massachusetts is the third most densely populated state in the country with an average population density of 876 people per square mile. In the PVTA service area the population is roughly 586,000, equating to a density of 947 people per square mile. Of the 586,000 residents in the area, 83.9 percent of the population is within ¾ mile of a PVTA fixed bus route, served by a deviated fixed route zone, or has demand response service available. Forty-four percent of the population live within the vicinity of the PVTA frequent corridors (defined as having 20 minute or better service).

## 5.2.2    Older Populations

According to a report by Transportation for America on mobility and the baby boom generation, life expectancies are rising, more seniors are choosing to "age in place," and transit ridership among this cohort is rising.[39].Experts argue that as the average age increases, and the baby boom generation reaches 65 years and older, the percentage of the population without access to a vehicle will increase over time and these older adults will need affordable alternatives to driving in order to "age in place" and maintain independence.

Senior population typically correlates with areas of lower income levels and vehicle ownership. These individuals are often on fixed incomes, which can reduce their desire to own a vehicle. Additionally, health issues such as poor eyesight can deter them from driving. People 65 years and older make up 15.4 percent of the population in the PVTA region. Data from the *Draft PVPC Coordinated Human Services Plan 2015 Update* shows that the senior population in the Pioneer Valley region is projected to increase by 27 percent between 2015 and 2025[40]. Figure 52 illustrates the senior population in the region. As shown on the figure, the highest percentages of senior populations are located in Longmeadow, Springfield, West Springfield, Chicopee, West Springfield, Agawam, Wilbraham, Easthampton, Hadley, Amherst, Belchertown, and Ware.

## 5.2.3    Youth Population

The youth population, defined as individuals under the age of 18, are less likely to have access to or own a personal vehicle. Owning and maintaining a reliable car can be expensive; therefore, it is likely that many of those under 18 depend on others or utilize public transportation to meet their mobility needs. Figure 53 illustrates the youth population in the

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[39] "Aging in place, Stuck without Options: Fixing the Mobility Crisis Threatening the Baby Boom Generation," Transportation for America, https://t4america.org/docs/SeniorsMobilityCrisis.pdf.
[40] PVTA's Coordinated Public Transit- Human Service Transportation Plan
http://www.pvpc.org/sites/default/files/Pioneer%20Valley%20Coordinated%20Public%20Transit-Human%20Services%20Transportation%20Plan%20Draft%20for%20release%202_4_2015_0.pdf

PVTA region. The highest concentrations of youth population are located in small pockets of Springfield, Easthampton, Agawam, and Wilbraham.
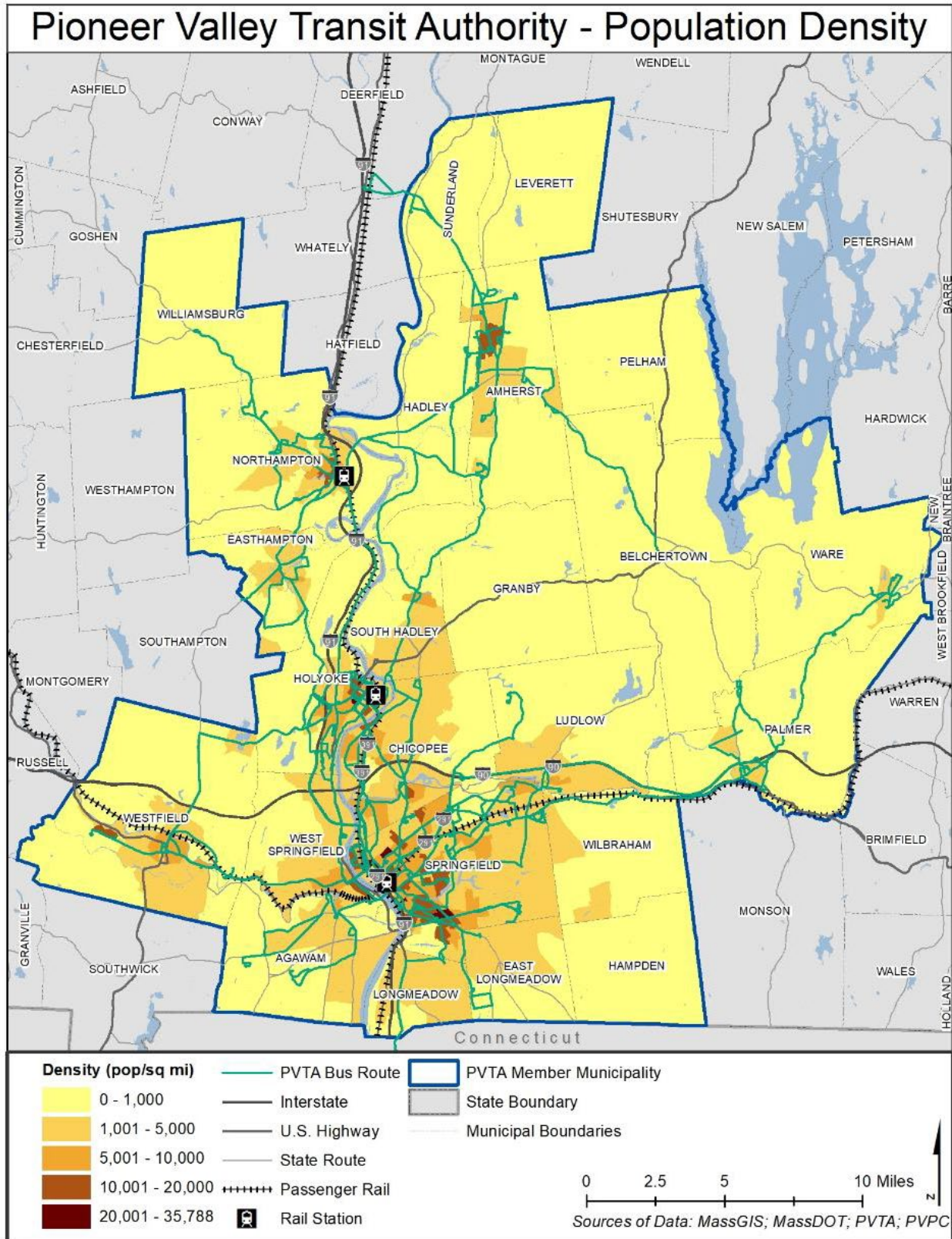
**Figure 51. Population Density**

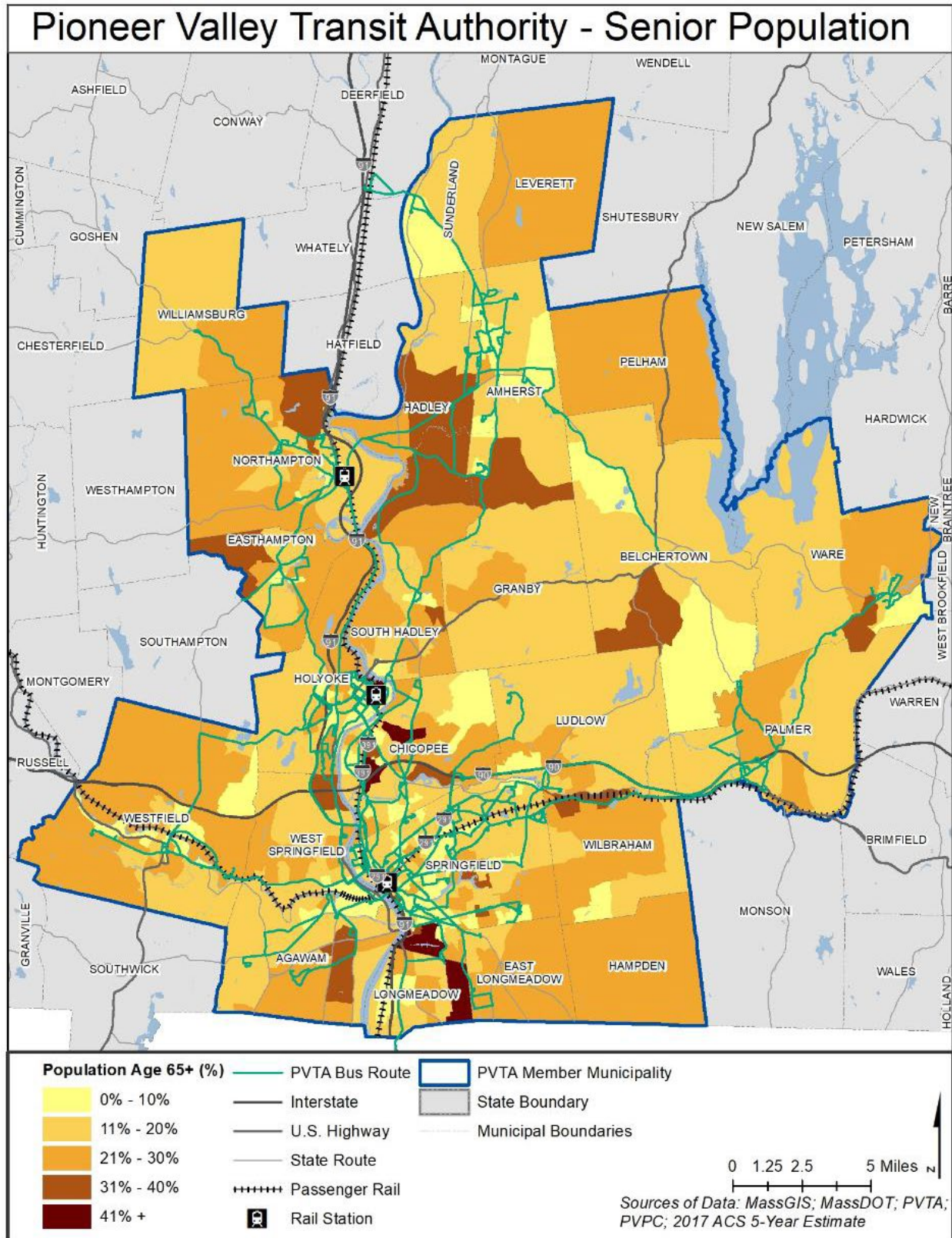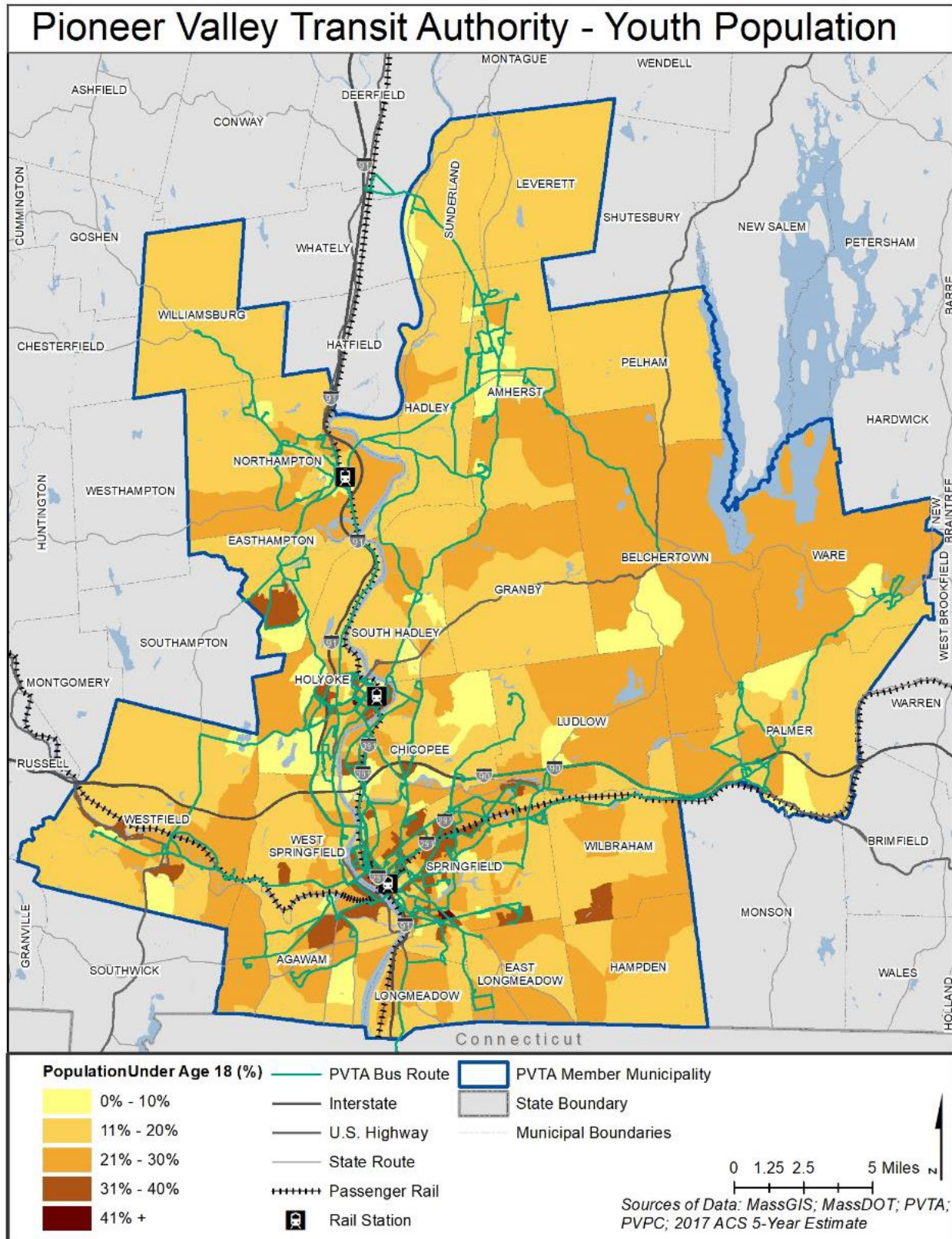**Figure 52. Senior Populations**

**Figure 53. Youth Populations**

## 5.2.4      People with Disabilities

People with disabilities are generally dependent on public transportation. The disabled population in the PVTA region is depicted on Figure 54. As shown in the figure, the disabled population in the region is highly concentrated in the City of Springfield particularly around Union Station. In the PVTA service area the percentage of those with a disability (14.8 percent) is greater than the state and national averages.

## 5.2.5      Measures of Income

Median household income and the percentage of those living below the poverty line are used as measures for propensity to use transit. Automobile ownership can be expensive, and as household incomes decline, so does the likelihood of having access to a private vehicle. Work-trip market shares from the ACS show that as income rises the percentage of people using transit decreases. Figure 55 shows the population in the PVTA service area living below 150 percent of the poverty level. In the PVTA service area, one out of four individuals are living below 150 percent of the poverty level. According to the 2019 Pioneer Valley Comprehensive Economic Development Strategy the region has experienced an increase in the number of households below the poverty level, particularly in Hampden County communities[41]. The percentage of people living below 150 percent of the poverty level is highly concentrated in Springfield, Holyoke, and Amherst. Northampton, Palmer, Agawam, Ware, and Westfield also have large areas with higher concentrations of persons living below 150 percent of the poverty level. Among the 24 member communities Amherst (33.6 percent), Springfield (28.7 percent), and Holyoke (26.4 percent) have the highest concentrations below 100 percent of the poverty level. The high poverty rate in Amherst may be associated with the large college community (33,500 students) with three colleges within Amherst. Furthermore, the most recent on-board customer surveys show that a disproportionate number of riders (55 percent) are below the poverty level compared to the region as a whole (25 percent) and as a result one out of every two PVTA riders is below the poverty line. While all the communities with large high poverty levels are around transit hubs or are served by PVTA bus routes, service levels vary greatly. Many of the residents who live in poverty are also vulnerable to environmental injustices and are eligible for environmental protections.

Figure 56 shows the median household income of residents in the PVTA region. The median household income in the region is $57,778, which is slightly higher than the US median household income but lower than the state average. Several cities in the region have median household income lower than that of the regional level. The areas with the lowest median household income are mostly concentrated in Springfield, Holyoke, Chicopee, and Amherst and are served by PVTA transit routes except for Chicopee where a large area of poverty is not served by the PVTA bus route in the northeast corner of the community. The southern portion of PVTA's system, Hampden County, and especially the principal cities of Springfield, Holyoke, Chicopee, and West Springfield, have a large proportion of low-income, transit-dependent households according to the Census Transportation Planning Products 2012–2016 5-year ACS data, 47 percent of bus commuters in PVTA's service area are from households with income levels less than $35,000. This is in line with results from the most recent on-board customer surveys, which show that among riders income is much lower than the regional average, as only 3 percent indicated having an income greater than $50,000 and 61.2 percent had an income less than $11,700.

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[41] Pioneer Valley Comprehensive Economic Development Strategy http://www.pvpc.org/plans/comprehensive-economic-development-strategy-ceds

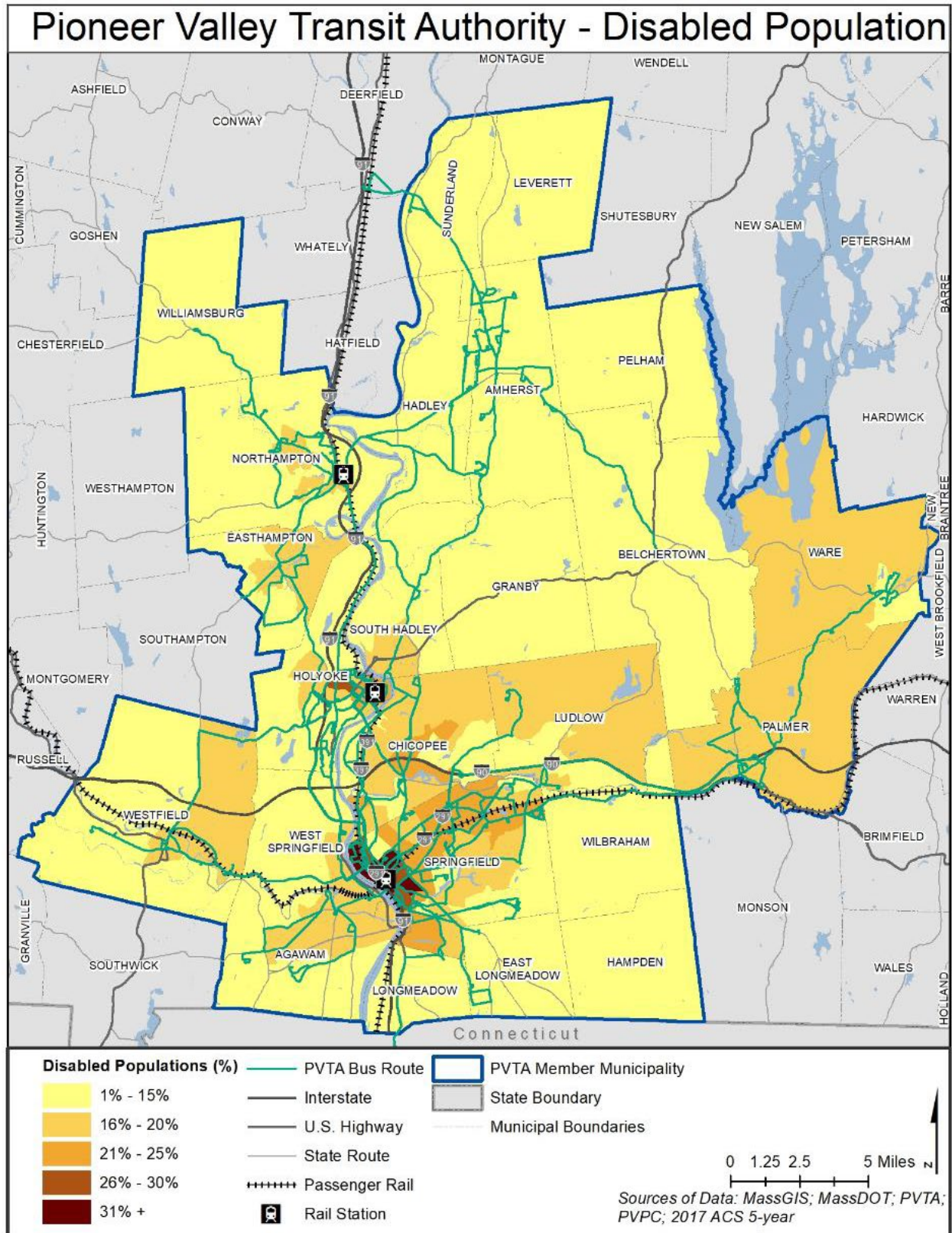**Figure 54. Disabled Populations**

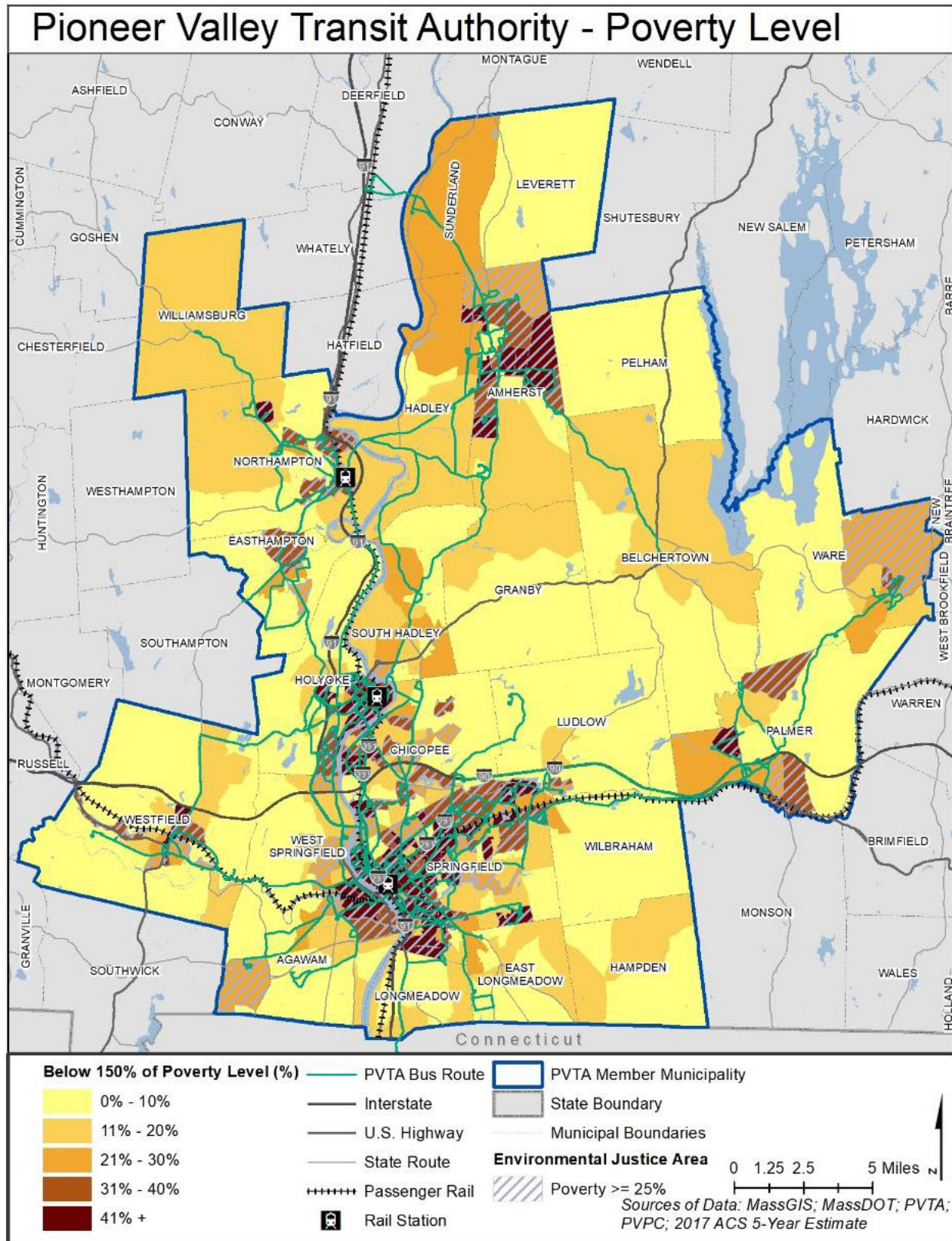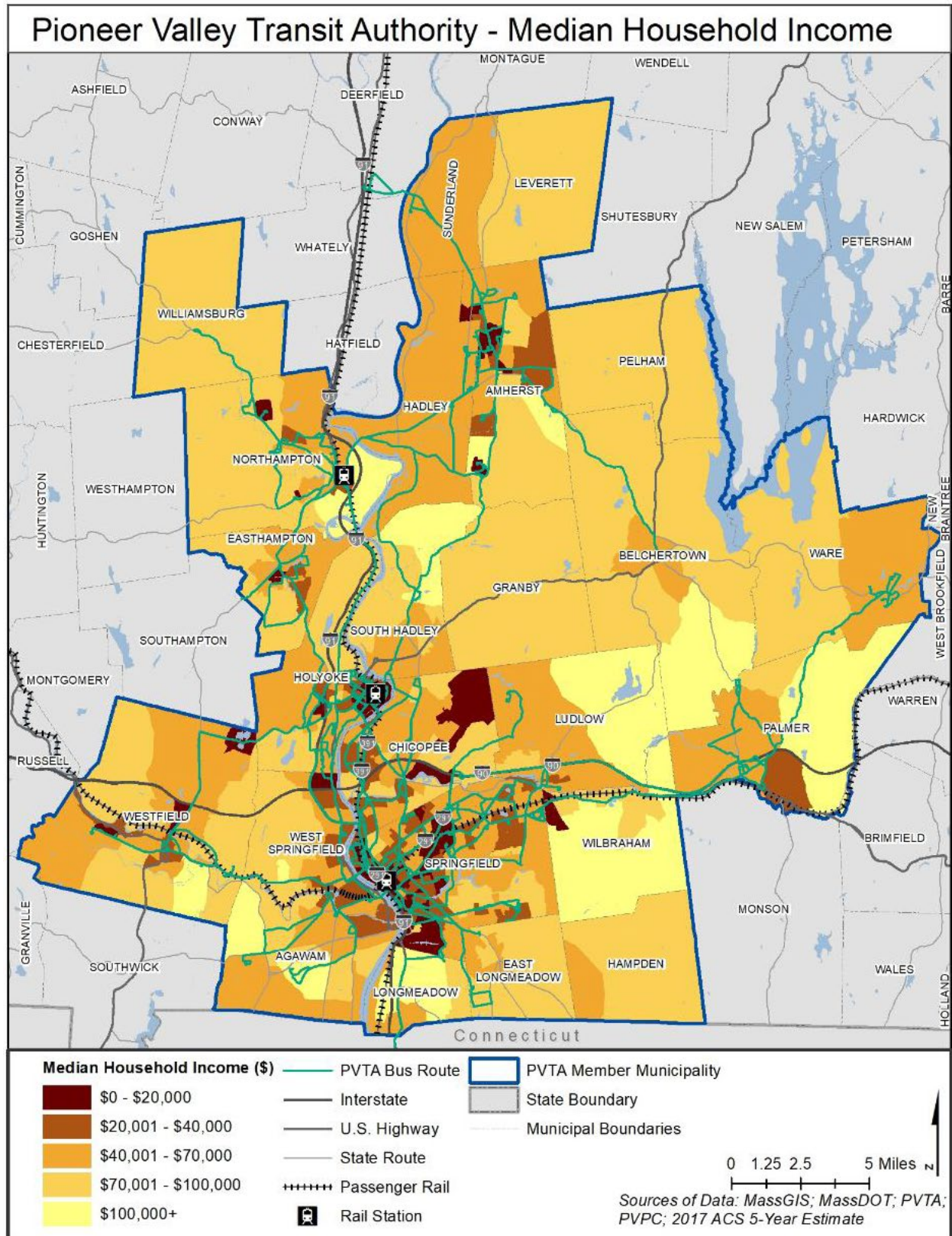**Figure 55. Persons Living Below the Poverty Level**

**Figure 56. Median Household Income**

## 5.2.6    Zero-Vehicle Households

Zero-vehicle households indicate a strong market for transit as they are considered to be entirely dependent upon alternate transportation sources, including carpooling/ridesharing, walking, bicycling, and public transportation. In the PVTA service area, 12.8 percent of the households do not have access to a personal vehicle. Zero-vehicle households are highly concentrated in Springfield, Holyoke, and Amherst where the median household income areas are also highly concentrated (Figure 57). Vehicle ownership is even lower among PVTA customers, with 59.7 percent of southern tier and 39.6 percent of northern tier users lacking access to a vehicle.[42]

## 5.2.7    Minority Populations

FTA defines minority persons as persons who identify themselves as American Indian and Alaska Native, Asian, Black or African American, Hispanic or Latino Populations, and Native Hawaiian and Other Pacific Islander. Minority populations, much like the youth populations, are also less likely to have access to an automobile. They also tend to live farther away from their jobs and therefore are more likely to use public transit for commuting to work.[43] Though any population may be subject to disproportionate impacts from a transportation project or investment, identifying minority and low-income populations is useful to understand the comparative effects throughout affected populations.

Figure 58 illustrates the minority population in the region along with the environmental justice areas where the minority population is equal to or more than the average of 32.9 percent. As shown on the map, minority populations are highly concentrated throughout the City of Springfield and in the southeastern portion of the City of Holyoke. Additionally, these areas represent environmental justice communities, defined by the United States Environmental Protection Agency as areas most impacted by environmental harms and risk. The United States Environmental Protection Agency defines environmental justice as "the fair treatment and meaningful involvement of all people regardless of race, color, national origin or income" and is entitled to equal protection from environmental harms and risks.[44] Currently, PVTA's fixed route and demand response serve these key areas.

# 5.3    Employment

The trip to work is often the most frequent trip taken; therefore, employment characteristics are important factors in the discussion of public transportation. Large employers are common destinations for significant numbers of people, which make them important to transit service planning.

Table 26 summarizes the major employers (greater than 500 employees) and the number of employees in the PVTA service area. Two employers in the region have over 5,000 employees, 14 have 1,000 to 4,999 employees, and 12 have 500-999 employees. Major employers predominantly reside in the southern tier region, with half of all major employers located in Springfield. Baystate Health Inc., University of Massachusetts – Amherst, and the Westover Aire Reserve Base are the top three major employers with the highest number of employees in the region.

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[42] Per the PVTA on-board customer surveys,
http://www.pvta.com/documents/planning/PVTA%202016%20Northern%20System%20Survey%2008-12-16%20FINAL.pdf and
http://www.pvta.com/documents/planning/PVTA%202015%20Southern%20System%20Survey%2004-20-16%20FINAL.pdf.
[43] Pew Research Center, "Who Relies on Public Transit in the U.S.," Monica Anderson, April 7, 2016.
[44] Environmental Protection Agency, "Environmental Justice," accessed April 2020, https://www.epa.gov/environmentaljustice.
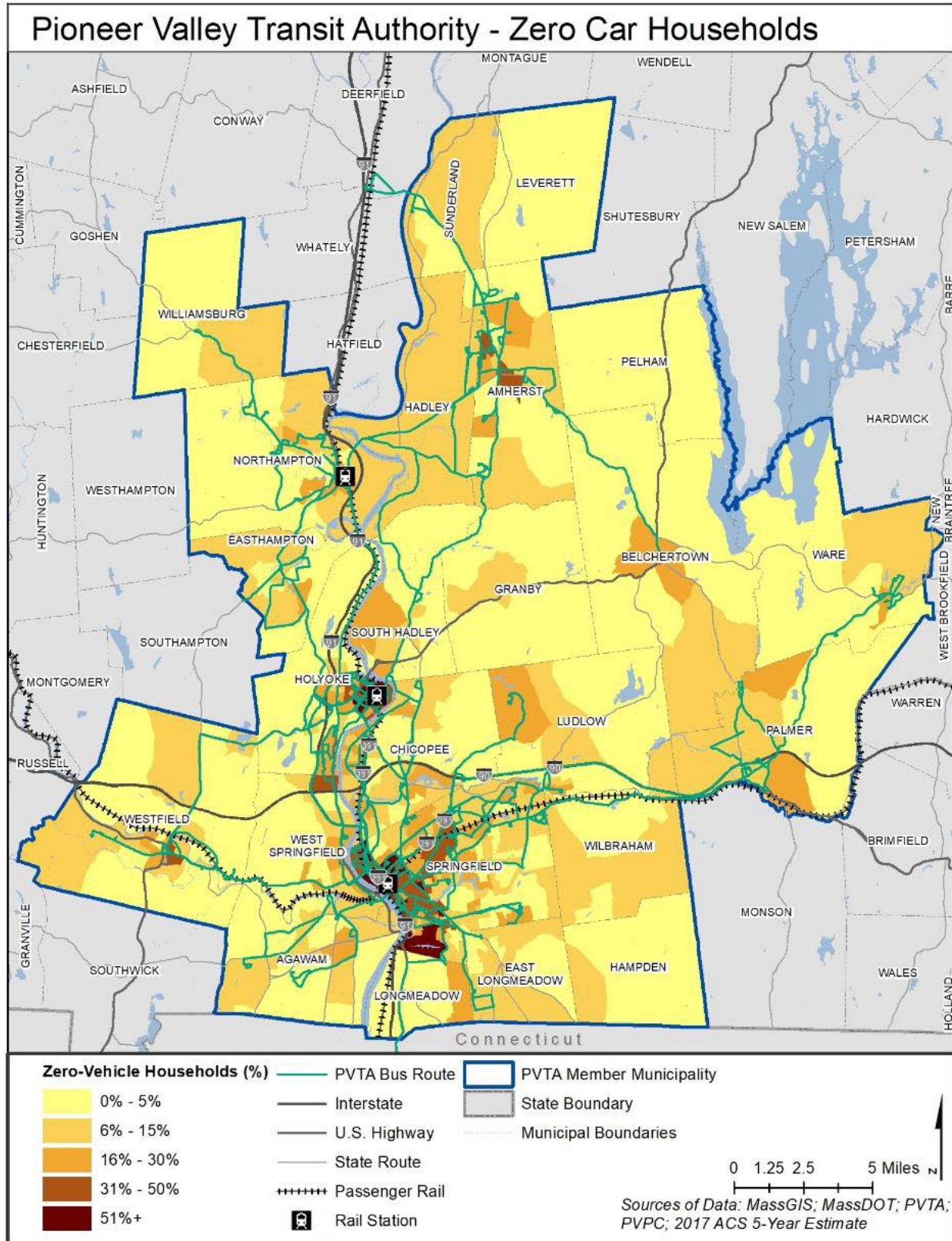
**Figure 57. Zero-Vehicle Households**

**Figure 58. Minority Population**
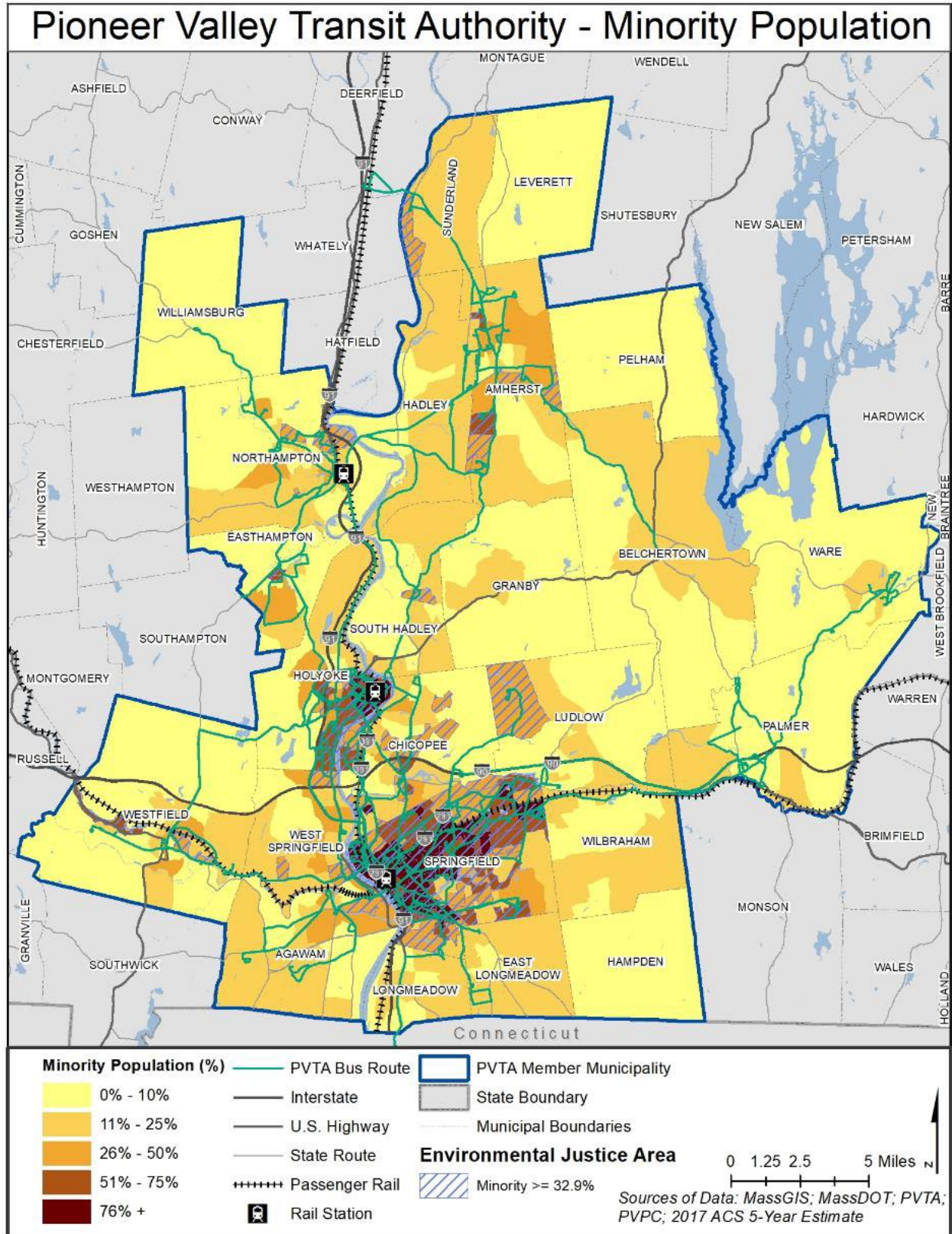
## Table 26. Major Employers in the PVTA Service Area in 2017

| Employer | Municipality | Number of Employees |
| --- | --- | --- |
| **5,000–9,000 Employees** | | |
| Baystate Health Inc. | Springfield | 8,859 |
| Massachusetts University – Amherst | Amherst | 8,440 |
| **1,000–4,999 Employees** | | |
| Westover Air Reserve Base | Chicopee | 4,600 |
| Massachusetts Mutual Life Ins | Springfield | 3,500 |
| Mercy Medical Center | Springfield | 3,415 |
| MGM Springfield | Springfield | 3,000 |
| Cooley Dickinson Hospital | Northampton | 1,899 |
| ServiceNet Inc | Northampton | 1,750 |
| Westfield State University | Westfield | 1,550 |
| Center for Human Development | Springfield | 1,500 |
| American Outdoor Brands Corp (formerly Smith and Weston) | Springfield | 1,480 |
| Holyoke Medical Ctr | Holyoke | 1,416 |
| Smith College | Northampton | 1,200 |
| Mt Holyoke College | South Hadley | 1,000 |
| Springfield College | Springfield | 1,000 |
| Verizon | Springfield | 1,000 |
| **500–999 Employees** | | |
| Holyoke Community College | Holyoke | 939 |
| J Polep Distribution Svc | Chicopee | 925 |
| Baystate Wing Hospital | Palmer | 913 |
| Western New England University | Springfield | 855 |
| Springfield Technical Community College | Springfield | 792 |
| Peter Pan Bus Lines | Springfield | 750 |
| Lenox | East Longmeadow | 650 |
| ISO New England Inc | Holyoke | 580 |
| TD Bank | Springfield | 575 |
| Baystate Noble Hospital | Westfield | 564 |

| Employer | Municipality | Number of Employees |
|---|---|---|
| Hampshire College | Amherst | 500 |

*Source: 2019 Pioneer Valley Comprehensive Economic Development Strategy, page 91, http://www.pvpc.org/sites/default/files/FINAL%202019%20CEDS%20Report%20web%20optimiz ed.pdf*

Figure 59 depicts the employment density in the PVTA region. Employment density in the region is 298 jobs per square mile. The areas with the highest concentration of employment density are located in Springfield, West Springfield, Amherst, and Northampton. This is as expected in Springfield, Amherst, and Northampton given the numerous large employers listed in Table 26. In West Springfield the area with high employment density is along Riverdale Street, a corridor with several shopping plazas and big box retail stores. Of the 270,000 jobs approximately, 90.6 percent are within ¾ mile of a PVTA fixed route, served by a deviated fixed route zone, or have demand response service available to all residents. Fifty-seven percent of the jobs are within the vicinity of a PVTA frequent corridor (defined as having 20 minute or better service).

## 5.4    Local and Regional Travel Patterns

Major trip generators are locations frequented by a significant number of people, traveling by all modes, within the study area. Common transit generators include municipal buildings, schools and universities, places of worship, hospitals and medical centers, and retail and shopping areas. These generators must be considered when evaluating transit service for a region. Figure 60 illustrates major trip generators in the PVTA service area. As shown on the figure, schools and colleges are the two major trip generators in the region followed by shopping centers. Many of the major trip generators are along PVTA bus routes.

## 5.5    Land Use and Growth

The *2020 Update to the Regional Transportation Plan (RTP) for the PVPC* provides population and employment forecasts for the Pioneer Valley region[45]. According to the RTP, population is projected to grow by approximately 6 percent from 621,570 people in 2010 to 656,992 people in 2040, and employment in the region is projected to grow by approximately 3 percent from 252,156 jobs in 2010 to 260,838 jobs in 2040 (Table 27).

### Table 27. Population and Employment Forecasts for the Pioneer Valley Region

|  | 2010 | 2020 | 2030 | 2040 | % Growth 2010–2040 |
|---|---|---|---|---|---|
| Population Forecast | 621,570 | 632,012 | 647,277 | 656,992 | 6% |
| Employment Forecast | 252,156 | 261,527 | 260,253 | 260,838 | 3% |

*Source: 2020 Update to the Regional Transportation Plan (RTP), 2019*

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[45] 2020 Update to RTP for PVPC http://www.pvpc.org/projects/2020-regional-transportation-plan-update

**Figure 59. Job Density**



Pioneer Valley Transit Authority - Job Density

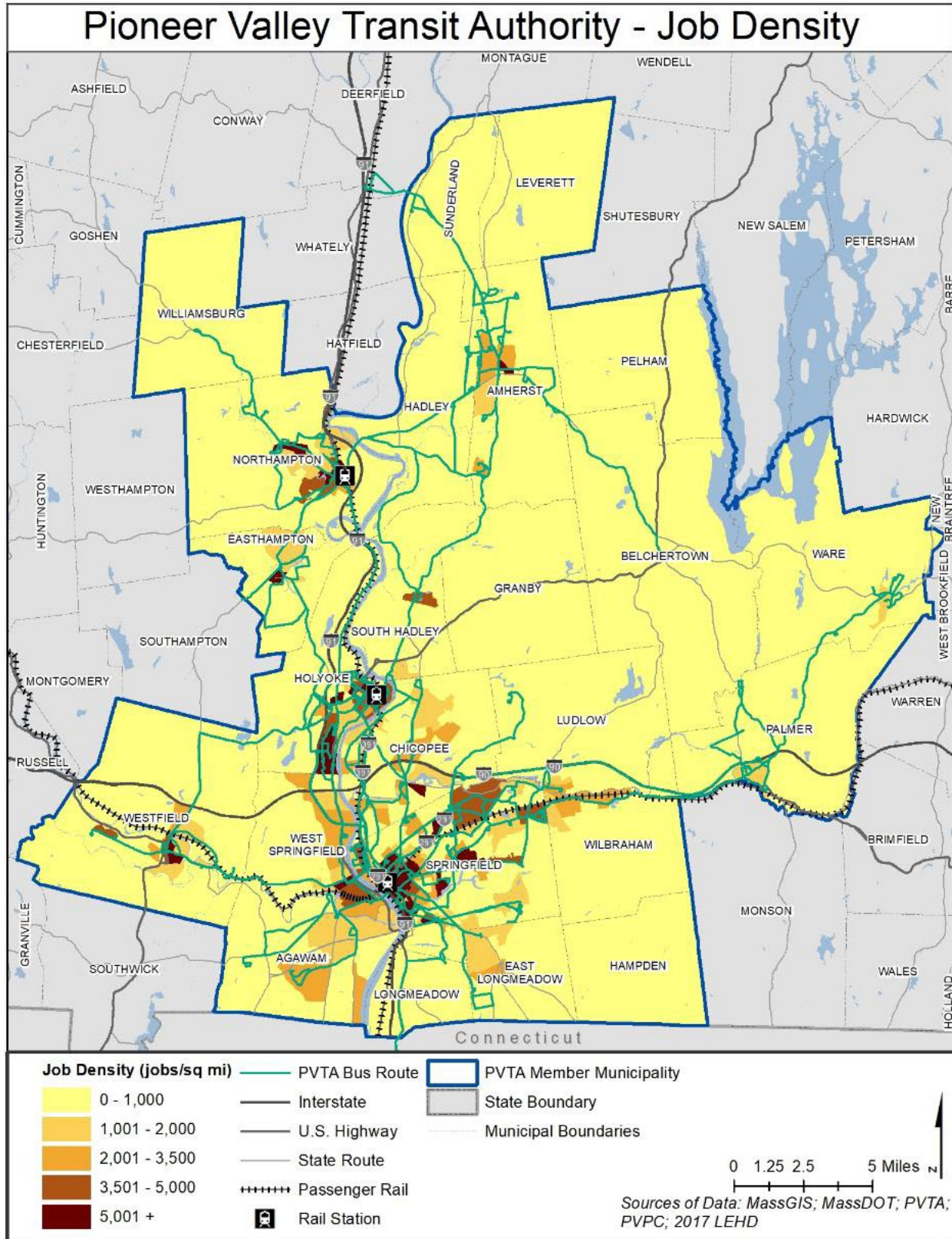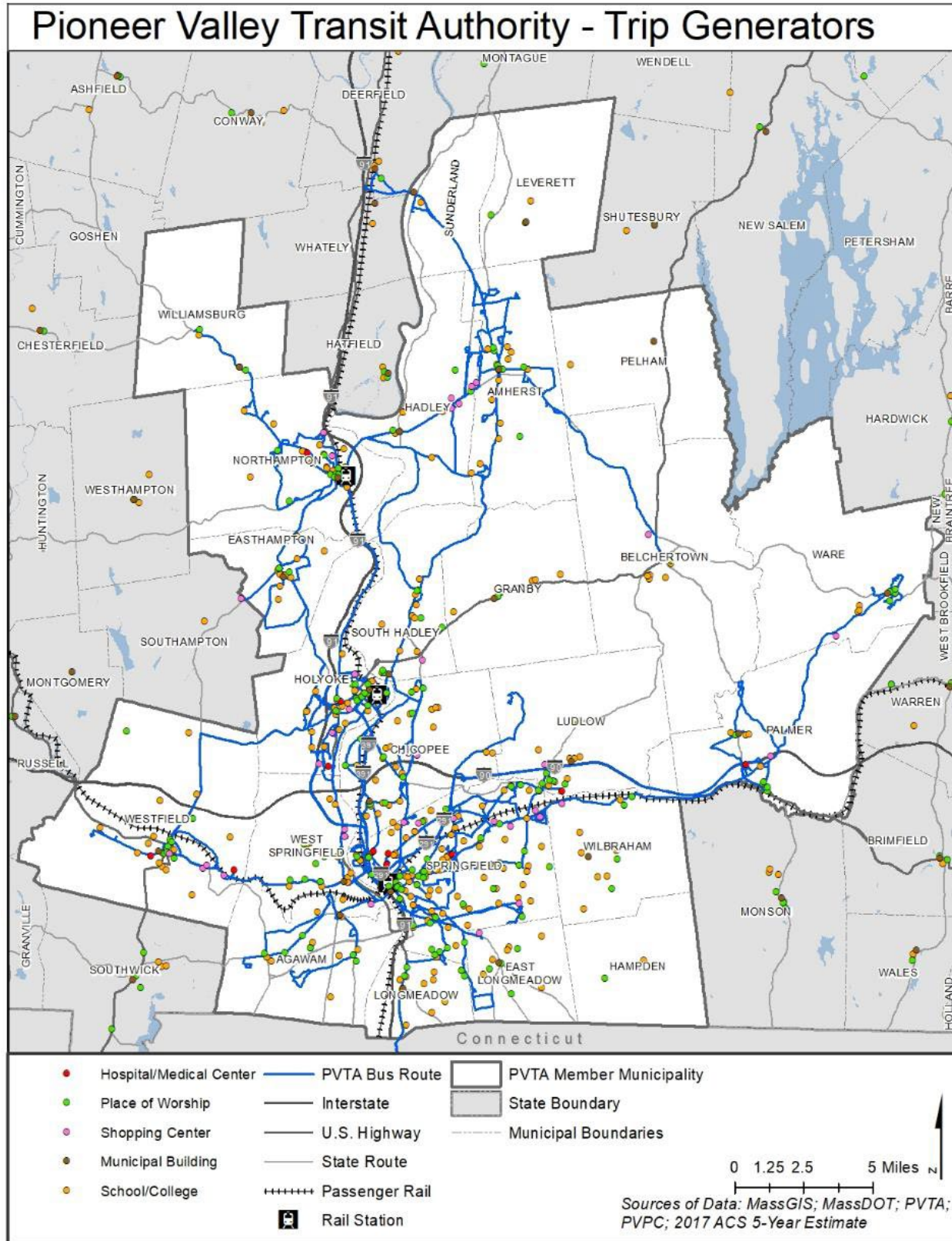**Figure 60. Major Trip Generators**



Pioneer Valley Transit Authority - Trip Generators

The *2014 PVPC Valley Vision 4: The Regional Land Use Plan for the Pioneer Valley*[46] recommends the following strategies that promote land uses complementary to a multimodal transportation system:

- Encourage transit oriented developments (TODs) and traditional neighborhood developments. TOD zones are within walking distance of major transit lines in urbanized areas and allow for higher density and mixed-use. TODs typically consist of a mixed-use core commercial area adjacent to the transit stop.

- Build an intermodal pedestrian and bicycle network. Bike paths should be designed to link the region's urban centers, shopping, and employment areas. Transportation Enhancement funds can support construction of bike paths.

- Promote improved transportation land use connections with complete streets policy and trip reduction strategies.

  — Complete streets are roadways designed and operated to enable safe, attractive, and comfortable access and travel for all users, and include the following features: bike lanes; sidewalks; traffic calming devices; pedestrian crosswalks and features; street furniture; bus shelters; bike racks; trees; sidewalk pavers; interconnected streets.

  — Adopt local zoning, within the Site Plan Approval process, to require trip reduction strategies for large commercial uses, including carpooling and vanpooling programs, transit access, bicycle facilities, flexible work hours, and on-site housing or services.

## 5.6   Transit Score

The transit score map is created to spatially analyze several transit-oriented demographic and socioeconomic characteristics at the same time (the characteristics discussed individually in this chapter so far). The transit score is a relative measure of how successful a fixed route transit system is expected to be in a particular region. Used in conjunction with a congruency analysis of major transit generators, the transit score can be used to evaluate existing service and to identify areas of potential demand.

Demographic and socioeconomic information is collected from the US Census Bureau for a region divided into smaller geographic units such as tracts, block groups, or blocks. Block groups and census tracts were used for this analysis. Transit-oriented variables used for the analysis include:

- Overall Population Density

- Overall Job Density

- Density of the Population under the age of 18

- Density of the Population over the age of 65[47]

- Percentage of the Population Living Below the Poverty Level

- Percentage of Zero-Car Households

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[46]2014 Valley Vision 4 http://www.pvpc.org/plans/valley-vision-4-land-use

[47] Note that the federal definition of senior as aged 65 or over is used in this case, but age in relation to transportation need is more nuanced than a strict age cutoff implies. In 2017, Governor Baker signed Executive Order 576 establishing the Governor's Council to Address Aging in Massachusetts. As part of this effort, the Council looked at different methods and solutions to create an age-friendly Commonwealth and conducted research and listening sessions across the state, during which transportation was identified as a key challenge facing older adults. Additionally, research presented from this effort showed a trend toward people staying in the workforce longer than previous generations. This research shows that the topic of transportation for older adults is one that is evolving and will require more attention in transportation planning in the future.

Figure 61 illustrates the transit score in the PVTA service area. Certain areas of a community have very low to very high transit scores based on the existing transit routes. As shown on the figure, transit scores are very high in the communities that are served by many PVTA bus routes and are served by rail stations. The communities with very high transit scores include Springfield, Holyoke, Amherst, and Northampton. As shown on the figure, areas that are not served by any PVTA bus routes have very low transit scores.

**Figure 61. Transit Score**
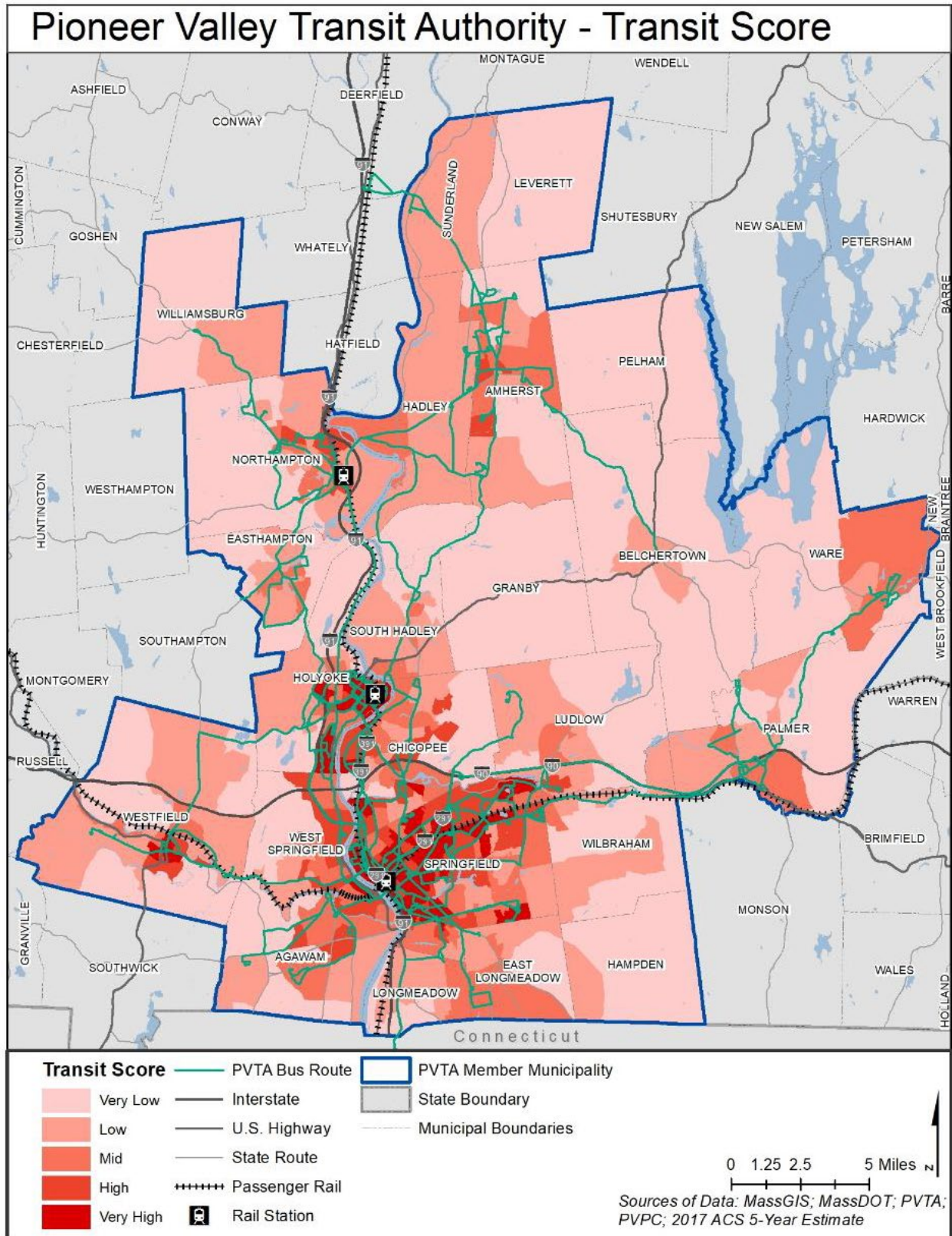
# 6.   Performance

Performance-focused management is a critical priority for the Commonwealth and regional transit providers. The federal government has also led the transportation industry to become more performance-driven in the last decade by mandating that federally funded agencies implement a performance-based approach to planning and programming. This broad emphasis on the importance of having a strong enterprise-wide, data-driven and transparent performance management framework as the foundation for making decisions, particularly in the service planning and financial areas, is especially relevant to the RTAs as they work to sustain success in the face of the challenges of COVID-19 and other market uncertainties.

The purpose of this chapter is to outline PVTA's current performance practices, track performance results for the PVTA/MassDOT Bilateral MOU that the Authority monitors and make recommendations to enhance the PVTA's performance framework to support data-driven performance-focused decision-making.

## 6.1   Current Performance Measurement Practices

PVTA's performance management system includes reporting a broad range of performance results to its Advisory Board, federal and state funding partners, transparent sharing of performance results with the public, and a commitment to tracking and reporting key metrics to MassDOT under the bilateral 2-year MOU that PVTA signed with MassDOT in August 2019.

PVTA also conducts weekly internal performance monitoring based on data-driven, industry best practices to support management and planning decisions. Although PVTA has a base to build on, it will be very beneficial for the Authority to continue to strengthen their performance management practices to support data-driven enterprise-wide decision-making. Recommendations for improving PVTA performance management practices are provided at the end of this chapter and in Chapter 8.

### 6.1.1  State and Federal Monitoring Requirements

Besides using performance monitoring to inform service planning, PVTA is required to report a variety of performance metrics to both FTA and the Commonwealth on a monthly, quarterly, and annual basis as part of their funding agreements. FTA requires transit providers that receive federal funding to submit data (including service, financial, and asset inventory and condition) both monthly and annually to be posted on the National Transit Database (NTD).

The Commonwealth also requires PVTA and other RTAs to report service and asset data through the state's GrantsPlus system. The Commonwealth has taken other steps in recent years to promote industry best practices, including a more data-driven approach to service planning. In 2019, MassDOT convened a stakeholder group, including RTA administrators, to develop a performance measurement strategy that could be tailored to each RTA's needs and challenges. The results of this effort were laid out in individual MOUs signed by MassDOT and the RTA administrators.

In addition to reporting to meet federal and state requirements, PVTA operators report monthly data to show annual trends that PVTA compiles into a year-over-year spreadsheet for the board. Each monthly operator report also includes performance metrics for the month and trend lines for year-to-date. For each route PVTA monitors monthly ridership, farebox revenue, revenue hours and miles, missed trips, road calls, and preventable accidents. This data feed into annual Microsoft Excel spreadsheets that PVTA use to monitor passengers per hour at the route level. For demand response PVTA organizes data into annual spreadsheets to monitor by operator at the monthly level the number of unlinked passenger trips by town, registered passengers,

revenue miles and hours, costs, fare revenue, contract/grant funds, number of trip denials, lates, cancellations, preventable accidents, and number of road calls.

PVTA has determined that it must use its resources effectively and all routes should achieve a minimum level of productivity. A route's productivity is measured in terms of passengers per revenue vehicle hour for most service and passengers per trip for regional and express services that typically carry passengers for long distances with little passenger turnover. PVTA performance measures are outlined in the Authority website under Performance and Efficiency and outlines performance measures by fiscal year (by month) and by quarter of the fiscal year (Figure 62).[48] PVTA also provides website links to historical performance measures.

Additional performance measures that PVTA tracks systemwide are the following:

- Ridership by fiscal year and month of the year

- Customer complaints

- Customer safety (preventable accidents per 100,000 miles)

- Scheduled trip adherence (percent of trips operated and percent of trips not operated)

- Maintenance (miles between breakdowns)

- Finance (cost per passenger and state contract assistance per passenger)

**Figure 62. Example of PVTA's Quarterly Systemwide Performance Measures as Posted on the Website**



**Scheduled Trip Adherence**

| % of Trips Operated | % of Trips not Operated |
|---|---|
| 99.94% | 0.06% |

**Customer Complaints**

| | 4th Qtr FY18 | 4th Qtr FY19 | FY19 Goal |
|---|---|---|---|
| Complaints per 100k Passengers | 3.98 | 2.59 | 2.38 |

**Customer Safety**

| | 4th Qtr FY18 | 4th Qtr FY19 | FY19 Goal |
|---|---|---|---|
| Preventable Accidents per 100k Miles | 0.71 | 1.69 | 1.75 |

**Maintenance**

| | 4th Qtr FY18 | 4th Qtr FY19 | FY19 Goal |
|---|---|---|---|
| Miles between Breakdowns | 1,078 | 10,578 | 20,759 |

**Finance**

| Year | FY17 | FY18 |
|---|---|---|
| Cost/Passenger | $3.00 | $3.15 |
| State Contract Assistance/Passenger | $2.00 | $2.06 |

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[48] PVTA Performance Measures http://pvta.com/performanceEfficiency.php

Aside from collecting, monitoring, and reporting systemwide and modal data, PVTA has established route level goals for passengers per hour based on the route classification type (Table 28). These were revised in 2019 from the 2014 CSA suggested classifications to better reflect what is operated.

**Table 28. PVTA Service Tiers and Productivity Goals**

| Service Tier | Passenger per Revenue Hour Goal |
| --- | --- |
| 1 (Every 15 Minutes) | 30 |
| 2 (Every 20 Minutes) | 20 |
| 3 (Every 30 Minutes) | 15 |
| 4 (Every Hour) | 10 |
| 5 (More than Hourly) | 5 |

## 6.1.2 Performance Metrics and Targets from MassDOT Memorandum of Understanding

New to the PVTA's performance monitoring obligations is a commitment to monitor and report on a selection of performance metrics, baselines, and targets established by PVTA and MassDOT in the categories of ridership, customer service and satisfaction, asset management, and financial performance. This commitment is contained in a bilateral MOU signed by PVTA and MassDOT in August 2019. The MOU states that PVTA's performance in FY 2020 and FY 2021 is to be measured by comparing established baselines against FY 2020 and FY 2021 targets. With a few exceptions, the baselines are averages of data collected in FY 2016 to FY 2018. The performance measures included in the PVTA MOU, along with their baselines and targets, are in Table 29 and Table 30 for FY 2020 and FY 2021, respectively.

**Table 29. FY 2020 Performance Measure Targets in the MOU**

| Metric | Fixed Route | Demand Response | Systemwide |
| --- | --- | --- | --- |
| Unlinked Passenger Trips (UPT) | 10,600,000 | 261,007 | 10,831,626 |
| UPT/ Vehicle Revenue Mile (VRM) | 2.08 | 0.09 | 1.38 |
| UPT/ Vehicle Revenue Hour (VRH) | 27.89 | 1.38 | 19.07 |
| Farebox Recovery Ratio | 20.20% | 8.68% | 17.85% |
| Operating cost/ VRM | $6.86 | $3.23 | $5.58 |
| Operating cost/ VRH | $92.11 | $47.39 | $77.22 |
| Net cost per vehicle service hour | $73.50 | $43.28 | $63.44 |
| On-time performance | 80% | 90% | 85% |
| Trips within peak load standards | 85% | 100% | 92.5% |
| Vehicle service hours/complaint | 1,310.3 | 1,415.1 | 1,560.6 |
| ADA calls answered in 2 minutes | N/A | 95% | N/A |
| Abandoned calls | N/A | 2.15% | N/A |

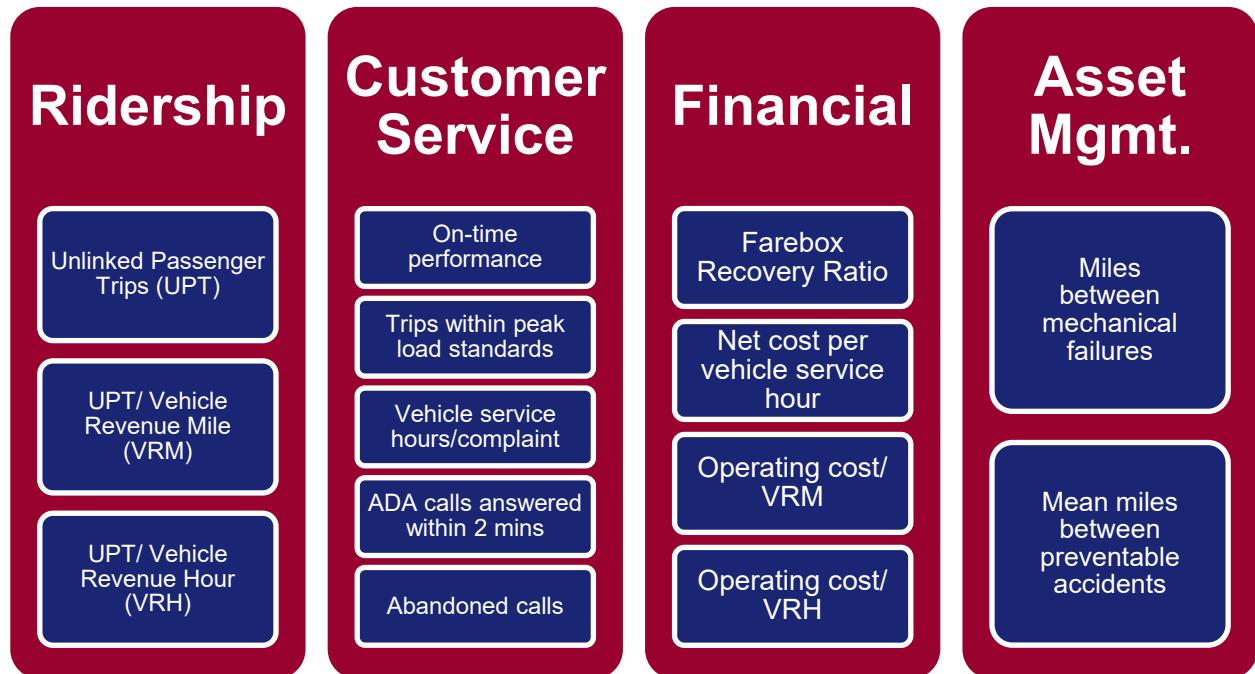| Metric | Fixed Route | Demand Response | Systemwide |
|---|---|---|---|
| Miles between mechanical failures | 11,000.0 | 45,000.0 | 14,621.2 |
| Mean miles between preventable accidents | 44,348 | 185,387 | 68,529 |

*Source: MassDOT MOU with PVTA*

**Table 30. FY 2021 Performance Measure Targets in the MOU**

| Metric | Fixed Route | Demand Response | Systemwide |
|---|---|---|---|
| Unlinked Passenger trips (UPT) | 10,706,000 | 258,397 | 10,964,397 |
| UPT/ Vehicle Revenue Mile (VRM) | 2.19 | 0.09 | 1.44 |
| UPT/ Vehicle Revenue Hour (VRH) | 28.29 | 1.39 | 19.48 |
| Farebox Recovery Ratio | 19.97% | 8.33% | 17.65% |
| Operating cost/ VRM | $7.36 | $3.27 | $5.89 |
| Operating cost/ VRH | $94.87 | $48.65 | $79.73 |
| Net cost per vehicle service hour | $75.92 | $44.59 | $65.66 |
| On-time performance | 85% | 90% | 87.50% |
| Trips within peak load standards | 87.0% | 100% | 93.5% |
| Vehicle service hours/complaint | 1,381.8 | 1,380.6 | 1,637.7 |
| ADA calls answered in 2 minutes | N/A | 95.00% | N/A |
| Abandoned calls | N/A | 2.00% | N/A |
| Miles between mechanical failures | 11,000.0 | 45,000.0 | 14,711.5 |
| Mean miles between preventable accidents | 49,000 | 183,333 | 66,522 |

*Source: MassDOT MOU with PVTA*

Figure 63 outlines the four categories identified by MassDOT and the 14 metrics within the categories as chosen by PVTA. PVTA elected to use a 2-year average of FY 2018 and FY 2019 data for unlinked passenger trips (UPT) and UPT/vehicle revenue mile (VRM) metrics and a 3-year average of FY 2017 through FY 2019 data for the remaining metrics as a baseline, as these measures are the most representative of PVTA's current performance and allow for more accurate forecasting. The trips within peak load standards and ADA calls answered within 2 minutes are new metrics and do not have identified baselines.

**Figure 63. MOU Metrics by Category**



| Ridership | Customer Service | Financial | Asset Mgmt. |
|---|---|---|---|
| Unlinked Passenger Trips (UPT) | On-time performance | Farebox Recovery Ratio | Miles between mechanical failures |
| UPT/ Vehicle Revenue Mile (VRM) | Trips within peak load standards | Net cost per vehicle service hour | Mean miles between preventable accidents |
| UPT/ Vehicle Revenue Hour (VRH) | Vehicle service hours/complaint | Operating cost/ VRM | |
| | ADA calls answered within 2 mins | Operating cost/ VRH | |
| | Abandoned calls | | |

The performance measures included in the MOU, along with their baselines, targets, and PVTA's progress (through the third quarter of FY 2020), are included in the following sections. Given that the COVID-19 pandemic did not significantly impact operations until the last two weeks of the third quarter, the data suggest that PVTA appeared to be on track to meet some of these goals before transit operations were interrupted.

When developing performance targets, it is typical to take into account external factors that are influencing performance, but it is not common practice to consider unforeseen disruptions that have the potential to greatly upset the status quo, like COVID-19. When PVTA and MassDOT developed the performance targets in the MOU, they developed baselines against which to measure PVTA's performance between FY 2019 and FY 2021. With few exceptions, these baselines are averages of data collected in FY 2017 to FY 2019. MOU targets reflected the reasonable expectation that PVTA could improve upon these baselines for the next 2 years. Since the outbreak of the pandemic, all parties acknowledge that meeting ridership and service efficiency goals will be challenging.

As MassDOT notes in their July 2020 *Annual Report on the Regional Transit Authority Performance Management Program*, the Performance Management Program will be a valuable tool in identifying progress, best practices, and innovative adaptations to the inevitable challenges the RTAs may face. In that report MassDOT states that, "the Q4 data submittal will provide MassDOT and the RTA stakeholders with a better understanding of the depth of impact the COVID-19 pandemic has had on public transportation in Massachusetts." PVTA will use FY 2021 as a time to reevaluate targets and performance metrics as transit demand stabilizes and PVTA and MassDOT continue to discuss how to best reflect the impact of the pandemic on ridership, operations, and efficiency. This is discussed in greater detail below.

**6.1.2.1 Ridership Measures**

The following performance measures are calculated on a monthly and annual basis using farebox data, scheduling software, and operations data recorded by drivers and dispatchers. Prior to the pandemic PVTA was meeting or close to meeting the ridership targets for FY 2020 but was ultimately unable to meet the targets due to a loss in ridership associated with the pandemic.

- **Total Ridership (Unlinked Passenger Trips):** This measures passenger trips taken on PVTA vehicles (transfers counted as individual trips, rather than one multi-segment trip). These data are collected from PVTA's fareboxes for fixed route, through the Adept dispatch software for demand response and monthly reports from the COAs.

- **Unlinked Passenger Trips per Vehicle Revenue Hour:** This is calculated by the number of total trips divided by the corresponding revenue hours. Revenue hours are calculated through the Hastus and Adept software in addition to the monthly COA reports.

- **Unlinked Passenger Trips per Vehicle Revenue Mile:** This is calculated by the number of total trips divided by the corresponding revenue hours. Revenue miles are calculated through the Hastus and Adept software in addition to the monthly COA reports.

**Table 31. MOU Ridership Measures**

| Operating Statistic | Baseline (FY 2016–FY 2018 Average) | Target FY 2020 | FY 2020 (First Quarter–Third Quarter) | FY 2020 (Full Year) |
|---|---|---|---|---|
| **Total Ridership (Unlinked Passenger Trips)** | | | | |
| Fixed Route | 10,570,619 | 10,600,000 | 7,361,499 | 8,131,759 |
| Demand Response | 261,007 | 261,007 | 183,491 | 196,590 |
| Systemwide | 10,831,626 | 10,861,007 | 7,544,990 | 8,328,349 |
| **Unlinked Passenger Trips per Revenue Mile** | | | | |
| Fixed Route | 2.10 | 2.08 | 2.02 | 1.81 |
| Demand Response | 0.09 | 0.09 | 0.09 | 0.09 |
| Systemwide | 1.39 | 1.38 | 1.35 | 1.27 |
| **Unlinked Passenger Trips per Revenue Hour** | | | | |
| Fixed Route | 27.83 | 27.89 | 26.61 | 23.92 |
| Demand Response | 1.38 | 1.38 | 1.36 | 1.31 |
| Systemwide | 19.02 | 19.07 | 18.32 | 17.00 |

*Source: PVTA and MassDOT MOU (2019), PVTA*

### 6.1.2.2 Customer Measures

The following performance measures are calculated on a monthly and annual basis using phone data, scheduling software, customer service calls reported, and operations data recorded by drivers and dispatchers. Prior to the pandemic PVTA was exceeding the target for peak load standards, and was able to meet this target for FY 2020 systemwide and for fixed route. Answered ADA calls and abandoned calls are specific to demand response. At the end of the third quarter PVTA was meeting the target for answered calls but not abandoned calls. These trends did not change at the end of FY 2020. OTP between the end of the third quarter and the end of FY 2020 improved slightly systemwide and for fixed route and demand response. Ultimately the target was met for demand response only. Vehicles hours per complaint decreased across the system between the end of quarter three and the fiscal year. While the

target was being met for demand response at the end of the third quarter, the value decreased by 43 percent and the target was not reached.

- **Trips Operated within Peak Load Standards:** This measures the average number of trips operated within peak load standards. Peak is defined as 120 percent of seating capacity and 100 percent of seating capacity if off-peak. Seating capacity varies by bus size.

- **ADA Request Calls Answered within 2 Minutes:** This measures the percent of ADA telephone calls answered within 2 minutes. ADA passengers are required to call and reserve a trip.

- **Abandoned Calls:** This measures the percent of calls that are abandoned, which is when a customer calls the call center and decides to hang up before a conversation occurs.

- **On-Time Performance**: This measures the percentage of fixed route trips that operate late or are missed.

- **Vehicle Service Hours Per Verified Complaint**: This measures the average number of vehicle revenue hours per number of valid complaints.

**Table 32. Customer Service Measures**

| Operating Statistic | Baseline (FY 2016–FY 2018 Average) | Target FY 2020 | FY 2020 (First Quarter–Third Quarter) | FY 2020 (Full Year) |
|---|---|---|---|---|
| **Trips Operated within Peak Load Standards** | | | | |
| Fixed Route | New Activity | 85.00% | 97.33% | 97.98% |
| Demand Response | New Activity | 100% | 100% | 99.99% |
| Systemwide | New Activity | 92.50% | 98.26% | 98.68% |
| **ADA Request Calls Answered within 2 Minutes** | | | | |
| Demand Response | New Activity | 95% | 98.17% | 98.17% |
| **Abandoned Calls** | | | | |
| Demand Response | 2.23% | 2.15% | 7.78% | 7.78% |
| **On-Time Performance** | | | | |
| Fixed Route | 77.33% | 80.00% | 75.76% | 77.04% |
| Demand Response | 82.00% | 90.00% | 92.14% | 93.66% |
| Systemwide | 79.67% | 85.00% | 81.43% | 81.98% |
| **Vehicle Service Hours Per Verified Complaint** | | | | |
| Fixed Route | 1,273 | 1,310 | 1,197 | 1,114.5 |
| Demand Response | 1,415 | 1,415 | 1,735 | 991.1 |
| Systemwide | 1,505 | 1,561 | 1,333 | 1,279 |

*Source: PVTA and MassDOT MOU (2019), PVTA*

**6.1.2.3 Financial Efficiency Measures**

These measures are calculated on a monthly and/or annual basis using data from fareboxes, pass sales, contracted service agreements, schedule data, and operations data recorded by drivers and dispatchers. Prior to the pandemic PVTA was meeting or close to meeting the financial targets for FY 2020. Due to cost increases associated with the pandemic and temporary suspension of fares, PVTA was unable to meet the financial targets.

- **Farebox Recovery Ratio:** This metric is the percentage of operating costs covered by fares, calculated by the fares collected divided by the cost to operate the route.

- **Operating Expenses per Revenue Hour:** This is the cost of service divided by revenue hours.

- **Operating Expenses per Vehicle Revenue Mile:** This is the cost of service divided by revenue miles.

- **Net Cost Per Vehicle Service Hour:** This is the total operating cost minus farebox revenue divided by total number of vehicle revenue hours.

**Table 33. MOU Financial Efficiency Measures**

| Operating Statistic | Baseline (FY 2016–FY 2018 Average) | Target FY 2020 | FY 2020 (First Quarter–Third Quarter) | FY 2020 (Full Year) |
|---|---|---|---|---|
| **Farebox Recovery Ratio** | | | | |
| Fixed Route | 20.03% | 20.20% | 18.5% | 14.59% |
| Demand Response | 8.68% | 8.68% | 8.3% | 7.03% |
| Systemwide | 17.70% | 17.85% | 16.47% | 13.21% |
| **Operating Expenses per Vehicle Revenue Hour** | | | | |
| Fixed Route | $91.73 | $92.11 | $92.11 | $104.88 |
| Demand Response | $47.39 | $47.39 | $49.24 | $53.08 |
| Systemwide | $76.97 | $77.22 | $81.18 | $89.02 |
| **Operating Expenses per Vehicle Revenue Mile** | | | | |
| Fixed Route | $6.93 | $6.86 | $7.34 | $7.95 |
| Demand Response | $3.23 | $3.23 | $3.43 | $3.80 |
| Systemwide | $5.62 | $5.58 | $5.98 | $6.63 |
| **Net Cost Per Vehicle Service Hour** | | | | |
| Fixed Route | $73.35 | $73.50 | $72.94 | $82.54 |
| Demand Response | $43.28 | $43.28 | $41.38 | $43.95 |
| Systemwide | $63.34 | $63.44 | $62.52 | $70.44 |

*Source: PVTA and MassDOT MOU (2019), PVTA*

**6.1.2.4 Asset Measures**

FTA has developed national standards for rating the condition of transit equipment and facilities. FTA categorizes vehicles, equipment, and facilities into asset classes and those classes have either a ULB or a condition rating on the TERM scale. While FTA has default ULBs for expected service years for vehicle classes, agencies are permitted to submit their own ULBs for approval from FTA if they choose. Although the MOU lists the following asset management metrics and targets, PVTA set ULB goals for their rolling stock, equipment, and facilities in their FY 2018 TAM Plan, while the targets for the metrics in the previous sections were set in the MOU.

- **FTA Reportable Revenue Vehicles Asset Class Meeting FTA TAM Plan ULB**: This metric is the percentage of vehicles within a particular asset class that have met or exceed their ULB. This target was met for all vehicle classes.

- **FTA Reportable Equipment Asset Class Meeting FTA TAM Plan ULB:** This metric is the percentage of equipment within a particular asset class that has met or exceed their ULB. This target was met for trucks and other rubber vehicle tires but not for automobiles. The target was for 25 percent, but 60 percent met or exceeded their ULB.

- **FTA Reportable Facilities Asset Class Meeting FTA TAM Plan ULB:** This metric is the percentage of facilities with a condition rating below 3.0 on the FTA TERM scale. This target was met.

In addition to the asset measures developed as part of the TAM Plan, PVTA has created additional metrics that pertain to asset management and vehicles as identified in the MOU. At the end of the third quarter PVTA was meeting all targets except that for demand response preventable accidents. At the end of FY 2020 the same held true despite a decrease across the individual mode metrics for all but fixed route mechanical failures.

- **Mean Miles Between Mechanical Failures:** This metric measures the mean distance or actual vehicle miles between mechanical failures.

- **Mean Miles Between Preventable Incidents:** This metric measures the mean distance or actual vehicle miles between preventable incidents.

**Table 34. MOU Asset Measures**

| Operating Statistic | Baseline (FY 2016–FY 2018 Average) | Target FY 2020 | FY 2020 (First Quarter–Third Quarter) | FY 2020 (Full Year) |
|---|---|---|---|---|
| **Mean Miles Between Mechanical Failures** | | | | |
| Fixed Route | 10,298 | 11,000 | 17,646 | 23,322 |
| Demand Response | 40,643 | 45,000 | 67,048 | 57,170 |
| Systemwide | 13,792 | 14,621 | 22,268 | 23,265 |
| **Mean Miles Between Preventable Accidents** | | | | |
| Fixed Route | 41,995 | 44,348 | 69,383 | 57,130 |
| Demand Response | 101,120 | 185,387 | 160,513 | 150,175 |

| Operating Statistic | Baseline (FY 2016– FY 2018 Average) | Target FY 2020 | FY 2020 (First Quarter–Third Quarter) | FY 2020 (Full Year) |
|---|---|---|---|---|
| Systemwide | 60,048 | 68,529 | 84,343 | 85,808 |

*Source: PVTA and MassDOT MOU (2019), PVTA*

### 6.1.3  How PVTA's Market Has Been Affected by COVID-19

Months into the COVID-19 pandemic, Americans are still trying to understand what the "new normal" will look like. Transit providers are uncertain how many former customers will return (ridership has dropped as much as 80 percent in some systems) and what that timeline looks like. They are also grappling with how to ensure a safe workplace and retain employees as the risk associated with transit operations (and driving a vehicle in particular) has increased significantly since March 2020.

Since the outbreak became widespread in Massachusetts in mid-March 2020, many institutions and industries that fuel the region's economy, and therefore PVTA's ridership, have been severely altered for the foreseeable future. Some of the most significant include:

- Virtual classes at the region's public schools, and at the University of Massachusetts Amherst, Amherst College, Smith College, Mount Holyoke College, Hampshire College, Holyoke Community College, Springfield Technical Community College, Westfield State University, other local colleges and communities

- Decline in customers and workforce at restaurants and retail/shopping outlets

- Industry/business closures

- Increase in remote working resulting in less transit trips

- Reduction in commuter rail services or intercity bus

- Government mandates on gathering capacity

- Promotion of essential trips only via transit

- Executive Office of Health and Human Services regulations regarding transportation to Adult Day Health and other human services programs

- Reduction of on-site human service programs

- Discouraging seniors and immunocompromised individuals from traveling

These institutions and services are not only major trip generators, but they also contribute to area employment and sales tax receipts that impact PVTA's local revenue streams. As the timeline for eradicating the virus, and the impact that pandemic-related trends such as increased telework, distance learning, telemedicine, and online shopping could have on future transit demand are extremely uncertain, PVTA will need to continue to be flexible in its ability to adjust service according to demand and funding availability.

When the pandemic hit in March 2020, ridership dropped sharply to just 22 percent of FY 2019 levels in April (Figure 64). Overall, PVTA experienced a 20 percent decline in fixed route ridership between FY 2019 and FY 2020 and 24 percent for demand response (Table 35). Revenue hours and miles dropped in line with changes in demand response ridership. However, ridership in January and February was up by 6.8 percent and 5.9 percent, respectively, Interestingly, ridership in the first two weeks of March was significantly higher than the same weeks in FY 2019. In fact, by the second week in March, the cumulative ridership increased from calendar year 2020 had already offset the losses from the first half of FY 2020.

At the onset of the pandemic, fixed route revenue miles were decreased by almost 40 percent in response to the ridership decline. PVTA adjusted their service on many routes by operating a modified Saturday schedule and suspended service on a number of routes. However, as ridership began to recover, and to ensure adequate social distancing and safety of drivers and essential workers who were still riding the bus, revenue miles and hours on some routes were increased. Comparing FY 2020 to FY 2019, fixed route revenue miles were decreased by 10 to 11 percent compared to the 20 percent decline in ridership as a result of the pandemic (Table 36).

**Figure 64. PVTA Monthly Ridership (FY 2019 versus FY 2020)**
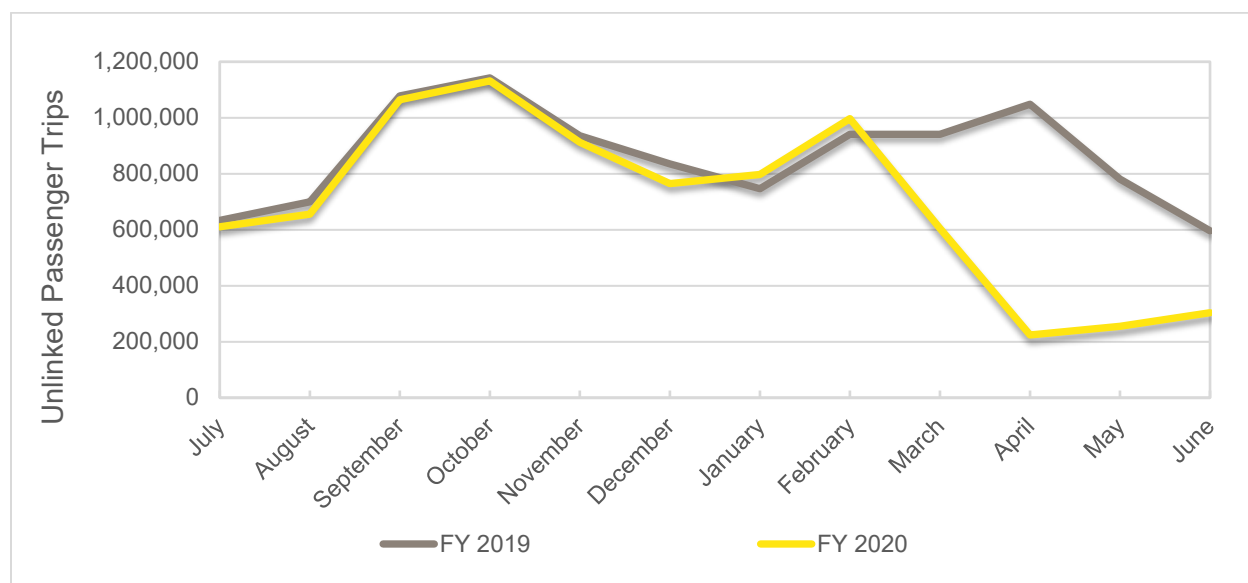


**Table 35. PVTA Service Changes (FY 2019 and FY 2020)**

|  | FY 2019 | FY 2020 | Percent Change (FY 2019 to FY 2020 |
|---|---|---|---|
| **Unlinked Passenger Trips** |  |  |  |
| Fixed Route | 10,120,344 | 8,127,931 | -20% |
| Demand Response | 259,978 | 196,581 | -24% |
| Total | 10,380,322 | 8,324,512 | -20% |
| **Revenue Hours** |  |  |  |
| Fixed Route | 367,241 | 330,100 | -10% |
| Demand Response | 187,109 | 150,038 | -20% |
| Total | 554,350 | 480,138 | -13% |
| **Revenue Miles** |  |  |  |
| Fixed Route | 4,856,166 | 4,344,719 | -11% |
| Demand Response | 2,761,353 | 2,095,563 | -24% |
| Total | 7,617,519 | 6,440,282 | -15% |

**Table 36. PVTA Service Changes in Response to COVID-19 Pandemic**

| Route/Service | Change |
| --- | --- |
| **Modified Service** | March 23, 2020: Instituted modified Saturday service levels on the fixed route and paratransit systems |
| | Fall 2020 Updates: |
| | • UMass Routes:<br>  – Modified schedules: R29, 30,31,33,34,35,38,45,46 |
| | • Springfield Area Routes:<br>  – G1: Revised weekday schedule with modified departure times and updated travel times.<br>  – G3: Early morning departures modified<br>  – R10: Weekday No School schedule will be used on all weekday service days<br>  – P11: Will not operate during Holyoke Community College's fall semester.<br>  – R14: Revised weekday timetable, select weekday trips will skip certain stops, some service eliminated, and street deviations occurring. |
| | • Northampton Area Routes:<br>  – B48: Due to overcrowding modified stops are in place.<br>  – B43: Ends on Monday-Wednesday times on all weekday service days, and ends earlier on Saturdays<br>  – B43 Express trips are now their own Route B43E. |
| **Service Discontinued** | Route 10s service eliminated. |
| | The Loop will not operate until further notice. |
| | Survival Center Shuttle will not operate until Survival Center resumes normal operation. |
| | Routes 39 and 39E not operating for fall 2020. |
| **Capacity Restrictions** | PVTA implemented 10 passengers per bus policy. Instead of drivers bypassing riders at stops, riders are asked to make a choice if they want to ride on a bus that already has 10 people onboard or wait for the next bus (which may or may not have already 10 people onboard). |
| **Demand Response Policy** | ADA eligibility determination is conducted via phone. |

| Route/Service | Change |
|---|---|
| **Passenger Policies** | Passengers riding at the end of the line will be asked to deboard the bus. |
| | PVTA recommends passengers weak a mask. |
| | PVTA vehicle board using only the rear doors. Seniors and people with disabilities who need to use the front doors may continue to do so. Social distancing is recommended and passengers to only use transportation for essential services. |
| | July 19, 2020: Front door boarding resumes in Springfield and Northampton service areas. Rear door boarding remains in the UMass service area. |
| **Facility Modifications** | Customer service window at Union Station and HTC were modified and are open from 11:00 AM to 2:00 PM. |
| | Fall 2020: Customer service window at Union Station and HTC were modified and are open from 9:00 AM to 2:00 PM. |
| **Fleet Modifications** | Cleaning and disinfecting vehicles daily before being placed into service. |
| | Acquired new disinfecting systems to disinfect vehicles more frequently |
| | Drivers clean high contact areas of the vehicle throughout their shifts. |
| | Driver space and fareboxes disinfected daily. |
| | Area where wheelchair accessible seats are located have been cordoned off to provide the driver with the minimum 6 feet of distancing. |
| | Driver barriers are installed, and drivers are provided with sanitizer, gloves, and disinfecting wipes to use on the vehicle. |
| **Fares** | PVTA stops enforcing fare collection. |
| | July 19, 2020: PVTA resumes enforcement of fare collection. PVTA riders encouraged to use mobile fare payment app-MassDOT BusPlus. |

## 6.2   Considerations for the Next 5 Years: Moving to a Data-Driven Performance-Focused Decision-making Framework

Building on the PVTA's current performance management practices, there are some critical enhancements in the areas of data and performance measurement that the PVTA should adopt over the next 5 years. These changes will support enterprise-wide, and data-driven performance-based decision making by PVTA, and aid in the navigation of the uncertainties brought on by COVID-19 and other market trends. Ultimately, adopting a data-driven performance-focused decision-making framework will sustain continued success.

## 6.2.1 Data

The first critical need that PVTA should fulfill to enhance performance management is in the area of data collection and evaluation. While PVTA collects, analyzes, and reports performance data, the Authority would greatly benefit from strengthening its data collection tools to better support performance-driven decision-making. It will be critical for PVTA to evaluate its data collection and evaluation tools and invest in technology driven solutions to provide real-time information on key system indicators and reaffirm the key metrics that will best inform PVTA decisions, particularly in the service planning, cost control, and financial business lines.

Principles for data collection and evaluation include:

- **Data Collection:** A transit agency must have the data collection systems in place from which to draw the information for making decisions. These systems can be automated, such as APCs, or are drawn from manual observations or samples. Validation of the information collected is a crucial aspect of data-driven decision making. As transit operations equipment has become more technologically sophisticated, vast amounts of operations data have become available to service providers. Authorities should have technology driven data analysis tools and strategies that ensure that the data collected both inform operations, service, and financial planning and facilitate the RTA's reporting requirements. PVTA already has data collection systems as vehicles are equipped with AVL systems, including mobile data terminals, validated APC, and farebox data that are being collected.

- **Data Analysis:** Transit operators have ample data produced on a daily or even hourly basis from the systems used in delivering service. Information from AVLs, APCs, fareboxes, phone systems, and other technology can be voluminous, and having appropriate levels of data analysis capacity is essential to distilling the information into key decision-driving reports. PVTA already has a strong data foundation to build on as vehicles are equipped with AVL systems, including mobile data terminals. This information is used in a mobile app that provides customers with information about PVTA and next bus information. PVTA already has APCs installed on their vehicles and regularly analyzes ridership and performance data in Microsoft Excel, SQL, R, and GIS to support data-driven management and planning decisions.

## 6.2.2 Performance Metrics

PVTA should continue to assess its performance metrics and identify a select group of key enterprise-wide measures that evaluate important service, cost, and financial indicators. It is important for PVTA to keep in mind that these key performance measures should be:

- Easily measurable with realistic, aspirational targets that will lead to successful outcomes

- Identifiable thresholds for corrective actions

- Clear and intuitive to transit staff as well as to non-transportation professionals

- Acceptable and useful to transportation professionals

- Comparable across time and between geographical areas

- Reported on a regular schedule (monthly, quarterly, or annually), depending on the state and federal requirements and the nature of the data

- Functionally related to actual system operations so that changes are reflected with minimal lag time in operating statistics

- Based on statistically sound measurement techniques, where appropriate

- Consistent with measures identified for other systems

- Readily available, when possible, to facilitate flexibility and agility in service planning

- Framed around actionable language, setting thresholds when additional analysis or service changes are warranted

PVTA has quantitative thresholds and actionable guidelines for these key performance metrics:

- Passengers per hour

- Subsidy per passenger

- Cost per revenue hour

- Farebox recovery ratio

- Cost per revenue hour

- Late trips

- Service/road calls

- Accidents per 100,000 miles

## 6.2.3  Service Guidelines

One of the critical performance metrics that PVTA should utilize in making service decisions is service guidelines. PVTA established service guidelines as part of their 2014 CSA. The following sections outline the established service guidelines, and the recommendations are a combination of existing practices and new guidelines.

### 6.2.3.1 Service Delivery Guidelines

In order to establish service guidelines in the pursuit of establishing a monitoring program in the future, service must first be monitored and data collected. Routes should be defined by the function they service in order to accurately measure the health of a route. PVTA classifies routes using a tier system based on the headway. Table 37 provides an overview of the service tier, definition, and routes.

**Table 37. PVTA Route Classifications**

| Service Tier | Definition | Routes |
|---|---|---|
| 1 | Frequency of 15 minutes or less | B7, 30, 31, 34, 35, OWL |
| 2 | Frequency of 20 minutes | G1, B6, P20, B43 |
| 3 | Frequency of 30 minutes | G2, G3, B4, B7S, 10S, P20E, P21, X90, Loop, 30R, 30R, 33, 38, 39, B43ns, B48 |
| 4 | One-hour frequency | 36, G2E, G5, R10, P11, R14, B17, P21E, B23, R24, 39 R, 39E, R41, R42, R44, X92, S |
| 5 | More than hourly | B12, R29, 398R, 39R, 45, 46, R44A, R44B, NE, WP |

Six guidelines are used by PVTA in determining when service should be provided, at what level, and how; they include (1) service spans, (2) principles of design, (3) service coverage, (4) vehicle loading factors, (5) stop amenities, and (6) stop spacing.

**Service Spans**

It is important to establish minimum levels of service for each route type. These include service span and frequency. Table 38 outlines suggested minimum service spans for each route type. Service can begin earlier or end later if demand warrants. Adjustments to the times can also be made based on the hours of centers served and the passengers' needs but should be within the financial capacity of PVTA.

**Table 38. Minimum Service Spans**

| Day Type | Tier 1 | Tier 2 | Tier 3 | Tier 4 | Tier 5 | Express Routes |
|---|---|---|---|---|---|---|
| Weekday | 6:00 AM-11:00 PM | 6:00 AM-10:00 PM | 7:00 AM-9:00 PM | 8:00 AM-6:00 PM | 8:00 AM-5:00 PM | 7:00 AM-7:00 PM |
| Saturday | 6:00 AM-10:00 PM | 6:00 AM-9:00 PM | 7:00 AM-8:00 PM | 9:00 AM-6:00 PM | --- | --- |
| Sunday | 9:00 AM-9:00 PM | 9:00 AM-7:00 PM | 9:00 AM-7:00 PM | 10:00 AM-5:00 PM | --- | --- |

**Principles of Design**

The 2014 CSA outlines the following principles and service design guidelines. PVTA should continue to follow these guidelines when evaluating routes:

- Service should be simple: Service should be easy to understand, intuitive, and logical.

- Service should be fast and direct: To remain competitive with the automobile routes service should be direct and speed maximized.

- Route deviations should be minimized: Routes should stay on the direct path unless it meets the requirement for a deviation listed below.

- Stops should be spaced appropriately: Stops spaced too closely decreases speed, but spaced too far apart can deter riders, especially in areas with poor pedestrian access.

- Routes should be symmetrical: Routes should operate along the same alignment in both directions, unless it is a loop route.

- Major routes should operate along arterials: Express routes and Tier 1 and 2 routes should operate along major roadways, deviating only when passenger activity signals a deviation.

- Routes should serve well-defined markets: Routes should serve areas with defined demand.

- Service should be consistent: Headways should be consistent where possible and routes should operate along consistent alignments.

- Service should be well-coordinated: Often routes operate through the same corridor but are traveling to different destinations. Timing of the routes should be coordinated to minimize redundancy.

- Service design should maximize service: Service should be designed to maximize revenue hours and minimize non-revenue hours.

- Vehicle type should be appropriate for service: PVTA has a range of vehicle sizes, the size vehicle utilized on the route should match the demand.

**Service Coverage**

Population and employment densities are the strongest indicators of potential transit demand and can be used to evaluate demand as denser areas often warrant higher levels of service. Table 39 outlines the different levels/types of transit services that may be warranted given the density.

**Table 39. Transit Supportive Densities**

| Job & Population per Acre | Type of Transit |
| --- | --- |
| 30 households / 50 jobs | Light Rail |
| 20 households / 50 jobs | Rapid Street car |
| 20 households / 25 jobs | Commuter Rail |
| 10 households / 20 jobs | Bus Rapid Transit |
| 5 households / 15 jobs | Frequent Bus |
| 3 households / 6 jobs | Fixed Route |

**Vehicle Loading Factors**

PVTA has set vehicle load factors as a target in their MOU. This was also established as part of the service delivery guidelines. The load factors are based on the size of the vehicle and the time of day with a 100 percent load factor in the off-peak and 120 percent during the peak (Table 40).

**Table 40. Vehicle Load Factors from 2014 CSA**

| | 60 foot Articulated Bus | 40 foot Bus | 35 foot Bus | 30 foot Bus | 24 foot Mini-Bus |
| --- | --- | --- | --- | --- | --- |
| 100% of Seating Capacity | 55 | 40 | 32 | 23 | 18 |
| 120% of Seating Capacity | 66 | 50 | 39 | 28 | 22 |

**Stop Amenities**

PVTA requires bus shelter placement at stops with ridership of at least 60 boardings per day in urban locations, ridership of at least 40 boardings per day in suburban locations, and ridership of at least 15 boardings per day in rural locations (Table 41). Shelter placement at stops with lower ridership may be considered if the location experiences a particularly large number of transfers, development is proposed for the area that will likely increase ridership, or  elderly or mobility challenged passengers in the area wo would benefit from the addition of a shelter. Benches should be placed at stops meeting half of the guideline for shelters.

**Table 41. Guidelines for Bus Stop Amenities**

| Amenity | Urban | Suburban | Rural |
| --- | --- | --- | --- |
| Shelter | 60+ boardings per day | 40+ boardings per day | 15+ boardings per day |
| Bench | 30+ boardings per day | 20+ boardings per day | 8+ boardings per day |

**Stop Spacing**

The following bus stop spacing guidelines should be used based on the environment for which the route is operating in.

**Table 42. Stop Spacing Guidelines**

| | Urban Core | Urban Core Adjacent | Suburban | College/ University Campus | Village Connector | Rural | Express |
|---|---|---|---|---|---|---|---|
| **Minimum Stop Spacing (feet)** | | | | | | | |
| Moderate to high density areas | 900 | 900 | 900 | 660 | 660 | 900 | 900 |
| Low density areas | 1,100 | 1,300 | 1,300 | 1,100 | 1,100 | 1,100 | 1,100 |
| **Maximum Stops per Mile** | | | | | | | |
| Moderate to high density areas | 6 | 6 | 6 | 8 | 8 | 6 | 6 |
| Low density areas | 4 | 4 | 4 | 5 | 5 | 5 | 5 |

**6.2.3.2 Service Benchmarks**

The aforementioned performance measures can be used to create benchmarks for service operation. The benchmarks help PVTA track progress and set goals for the performance of the route. These benchmarks should be seen as short-term goals that should be re-evaluated at set intervals to ensure that the expectations for the route are consistently evolving. If a specific benchmark is greatly exceeded, the criteria should be changed to provide a progressive target for the service. The following route level benchmarks for PVTA are used (Table 43): passengers per revenue hour and farebox recovery. These benchmarks were determined by the base type of service, national best standards, existing policies, best practices, and historical performance.

**Table 43. Service Benchmarks**

| Service Tier | Passengers Per Revenue Hour | Farebox Recovery |
|---|---|---|
| 1 (every 15 minutes) | 30 | 20% Weekdays/15% weekends |
| 2 (every 20 minutes) | 20 | 20% Weekdays/15% weekends |
| 3 (every 30 minutes) | 15 | 20% Weekdays/15% weekends |
| 4 (every hour) | 10 | 20% Weekdays/15% weekends |
| 5 (less than hourly) | 5 | 5% Weekdays/5% weekends |

In addition to the route level metrics previously described, PVTA should continue to monitor system and modal level performance per the MOU and consider adding the following measures for internal tracking purposes and to drive the evaluation of mode-level performance:

- **Subsidy per Passenger:** The cost per passenger after accounting for fare revenue and any contract revenue. It is recommended for quarterly and annual reports.

- **Percentage of Fares Covered by Contracts and Partnerships:** This is an internal measurement to track the true farebox recovery as PVTA holds contracts with several organizations who pay a portion of the operating cost or fares for passengers.

### 6.2.3.3 New Service Warrants

PVTA often receives requests for new service; new service warrants will help PVTA evaluate proposals and determine service levels. The development of the new services should follow the new service warrants and after 2 years be able to meet or exceed the performance measures outlined in Section 6.2.3.2. Once a new route or service has been implemented, it should be monitored for an initial period to evaluate its performance. At the onset the route may not meet the benchmarks set forth for existing routes, but as the service becomes more popular it may. New services should be implemented for a period of at least 1 year in order to garner ridership and monitor monthly fluctuations. While minor changes such as timing can be made to the route within the initial period, large changes should be avoided. On-time data should be checked randomly to ensure that performance remains acceptable; a new service that has low on-time performance will have a difficult time attracting ridership. Approximately halfway through the initial period (6 months) a passenger survey of the route should be conducted to understand the effectiveness of the route. The route should continue to be monitored as a new route beyond 1 year if ridership has had continual growth. Once ridership has plateaued the route can be evaluated against the aforementioned benchmarks with the other routes.

When analyzing new service requests and proposals the following should be considered:

- **Area Coverage:** When service is proposed the new route should be evaluated for its ability to connect to other routes, meet service thresholds, and operate cost effectively. Routes that extend the service area may have a demand, but the increased miles per hours may cause the subsidy to be greater than those recommended in the performance measures.

- **Transit-Dependent Populations:** The presence of transit-dependent populations should be considered when evaluating new service proposals. If there is a high but remote transit-dependent population, alternative service types such as Dial-A-Ride or flex routes might be warranted.

- **Special Markets:** New service is often proposed for special markets such as a new shopping center, island gateways, or employment centers. These markets often produce demand but the cost to service them can be high and ridership potential undetermined. PVTA should work with these destinations to secure some dedicated funding, which can help bring down the cost of the route.

A **route deviation** is when the bus either only occasionally serves an area or must leave the primary road to serve a location such as a shopping plaza. The 2014 CSA recommends minimizing the use of route deviations and following the thresholds listed below for implementing route deviations:

- The deviation will increase in overall route productivity.

- The number of new passengers that would be served is equal to or greater than 25 percent of the number of passengers who would be inconvenienced by the additional travel time on any particular deviated trip.

- The deviation would not interfere with the provision of regular service frequencies and/or the provision of coordinated service with other routes operating in the same corridor.

### 6.2.3.4 Actions for Low Performing Routes

The 2014 CSA recommended that in cases where routes do not meet minimum performance guidelines, changes should be made to improve route performance. These changes can include a variety of measures, including reconfiguring the route alignment to attract more passengers, targeted marketing, eliminating particularly unproductive segments, and reducing service levels. If no changes can be identified that improve performance, steps may be taken to discontinue

the route unless it serves a demonstrable critical need that is not served by other routes or services (including paratransit service). In cases where service expansion is considered, ridership and productivity estimates should be developed that indicate that there is a reasonable certainty that the new service will meet the performance guidelines within 24 months of implementation. As post-pandemic ridership stabilizes, implementing thresholds for when actions such as more extended analysis or service changes are warranted would simplify service planning and boost transparency if PVTA shared the guidelines with the public.

### 6.2.4  Public Transparency

PVTA's website includes an "Open Government" page, which includes annual payroll and audited financial statements from 2010 to 2020. Advisory Board meeting minutes are located under PVTA's "Governance – Meeting Minutes " page. Quarterly performance metrics (system, and mode) are located under the "Performance & Efficiency" page. The purpose of providing this information is to boost public trust in PVTA and allow the public to better understand the service and key decision making. The PVTA website also includes links to planning documents (such as the 2014 CSA and other reports) under the "Planning at PVTA" page. PVTA should consider the following options for presenting key route-level operating statistics in one location on its website:

- Key route-level operating statistics can be formatted in Microsoft Word or a similar word processing tool and then saved as a static PDF file. This report can be combined with or presented separately from the similarly formatted fixed route and demand response performance metrics report.

- If possible, use of Microsoft references or strategic visual basic may allow for a more automated update of a customized dashboard template using standard data formats, reducing PVTA staff burden in creating the publicly facing performance dashboard.

- Several platforms exist for creating customizable data visualization dashboards that allow the public to interactively explore operational data.

  — Tableau: Most commonly used tool for transit providers that maintain a performance dashboard. Requires proficiency in SQL queries.

  — Microsoft Power BI: Drag and drop dashboard format that is integrated with other Microsoft software. Does not work well for complex data associations. Free version may be suitable for limited data analysis.

  — Domo: Selection of pre-built graphics allows for less technical staff to develop some visualizations, while more technical staff may customize more complex visualizations using SQL.

If feasible, PVTA should consider the option to allow download of limited raw data sets, making the data easy to access so that analysis can be included in efforts to educate the public, academic studies, or planning studies.

# 7.    Transportation Service Needs

Transportation needs were identified for the PVTA service area through discussions with PVTA staff, review of previous studies and relevant documents, analysis of the transit services operated during the period of FY 2015 to FY 2019, and an outreach effort conducted as part of this plan development process. As previously noted, this plan was developed in 2020 when the COVID-19 pandemic began to be widespread across the United States, thus impacting transit agencies and their provision of service. In order understand the immediate impact of the pandemic on PVTA's service, transportation needs and their accompanying recommendations consider the early portions of FY 2020 in addition to the original FY 2015–FY 2019 review. Transportation needs are discussed in context of ridership rebound in response to the change in ridership faced by PVTA and other RTAs. Core needs are needs that are important regardless of how fast ridership rebounds, and ridership needs are those needs that are dependent on the level of ridership rebound before it is logical for PVTA to address.

## 7.1    Needs Identification Process

Transportation needs that have been identified for PVTA are documented in this section. This includes the review of existing conditions, relevant previous documents, and outreach, including the public survey findings, stakeholder correspondence, and a driver survey.

To identify needs the team began by examining the existing conditions to determine opportunities for improvement and the enhancement of service. This included a review of routes and whether the performance data indicated a need for expansion or reduction of service (hours, days, frequencies), alignment changes, or mode shift. Assets were analyzed to determine the fleet condition and constraints, whether there was a need for facility expansions or upgrades, or technology that would improve service delivery, customer service, operations, safety, or the ability to monitor performance. Existing policies/procedures were analyzed to determine gaps, inconsistencies, and adherence. Peers were evaluated to understand PVTA's performance relative to similar systems and whether any had implemented practices/services that PVTA might consider. The market analysis was used to identify regional trends, service gaps, and service saturation levels.

### 7.1.1  Review of Previous Studies

In addition to the existing conditions analysis the team reviewed other existing documents/resources that were published within the last 5 years, including the 2014 CSA, to identify previously identified mobility and transit needs for the region. This work supplemented the existing conditions analysis, and the documents reviewed can be identified in Table 44.

**Table 44. Existing Documents Reviewed**

| Document Title | Year Published |
|---|---|
| Intercity Bus Study-Stakeholder Survey (Intercity Bus Study) | 2020 |
| Palmer Ware Outreach | 2020 |
| Pioneer Valley Long Range Transportation Plan (Regional Transportation Plan) | 2019 |
| Transit Mobility Alternatives – Northampton, Hadley, and Amherst (Route 9 BRT Study) | 2018 |
| Transit Asset Management Plan (TAM Plan) | 2018 |

| Document Title | Year Published |
|---|---|
| ADA Paratransit Survey Results | 2017 |
| PVTA Bus Rapid Transit Alternative Analysis (State Street BRT Study) | 2016 |
| PVTA Onboard Customer Survey Northern Service Region (PVTA Northern Tier) | 2016 |
| PVTA Onboard Customer Survey Southern Service Region (PVTA Southern Tier) | 2016 |
| PVTA Comprehensive Service Analysis (Previous RTP) | 2014 |
| Pioneer Valley Coordinated Public Transit-Human Services Transportation Plan (HST Plan) | 2015 |
| PVTA Paratransit Service Analysis Study (PVTA Paratransit Study) | 2014 |

## 7.1.2  Outreach Effort

Public outreach was conducted through an online public survey, stakeholder correspondence, and driver survey to better understand the needs for the Pioneer Valley region. Due to COVID-19, no in-person outreach was possible. A summary of the outreach results can be found below; a more detailed report of the outreach findings can be found in Appendix C.

### 7.1.2.1 Public Survey

Due to the pandemic, in-person outreach was not possible and instead an online survey was conducted and a call-in number was provided, which allowed individuals to leave a message about how they would like to see service improved. While efforts were made to reach the public, note that PVTA has traditionally relied upon in-person outreach to gather feedback, in particular those without access to technology. As such, these individuals and those who were not riding due to the pandemic may have been missed. The online survey began on June 15, 2020, and was available through August 3, 2020, in English and Spanish. Due the pandemic, the survey was conducted during a period when many of the typical riders were not riding, and college students and staff, who are the majority of northern riders, were not in the area. The survey was open to all individuals who live, work, or visit the PVTA service area and was open to both riders and non-riders. To promote the survey a flyer was posted on all vehicles, an email blast was sent to stakeholders, car cards were printed and put on buses, information was distributed through social media, press releases sent out, and automatic calls sent out to all register demand response individuals. A total of 643 individuals responded to the survey and 84 percent were PVTA riders, while the remaining 16 percent were not (Figure 65). Of the riders who responded the majority, 72 percent, use the fixed route bus system, 8 percent use the demand response, and the remaining 4 percent use both.

**Figure 65. Survey Responses**
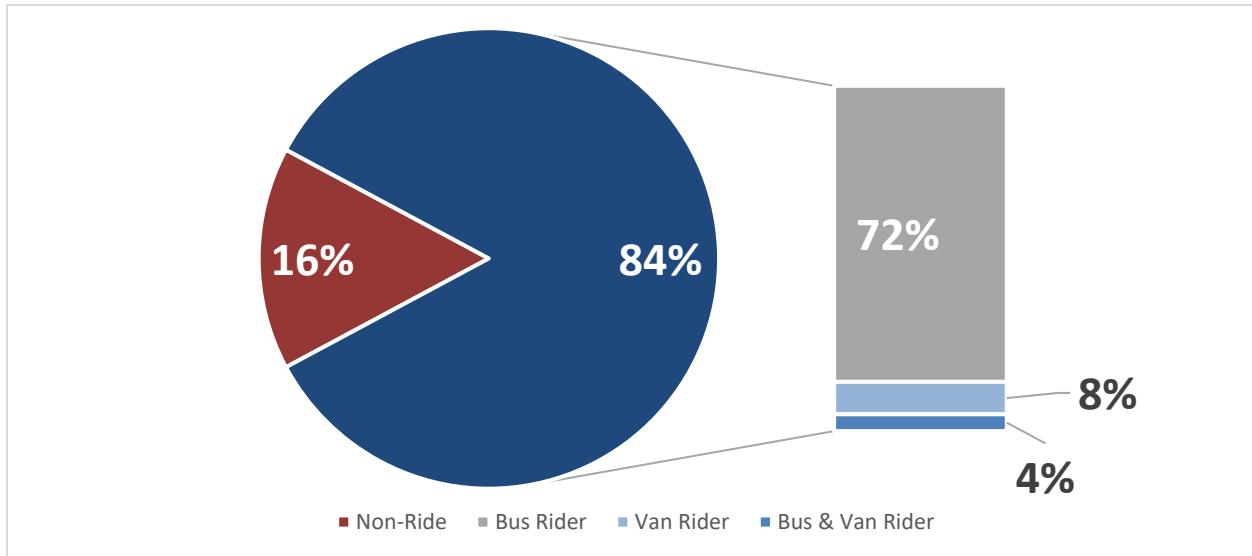


## Bus Riders

Responses were received from 25 different communities with 48 percent of the respondents living in the northern tier, 34 in the southern, 7 outside the PVTA area, and the remaining 11 percent did not indiciate. The greatest number of responses from bus riders were from Amherst followed by Springfield (Figure 66). The top three places individuals travel to most correlates to the top places individuals reside and include Amherst, Northampton, Springfield, Holyoke, and Hadley. Note that the distribution of the survey respondents are skewed to the northern tier, but that is not uncommon for PVTA.

**Figure 66. Top Five Respondent Towns - Bus Riders**
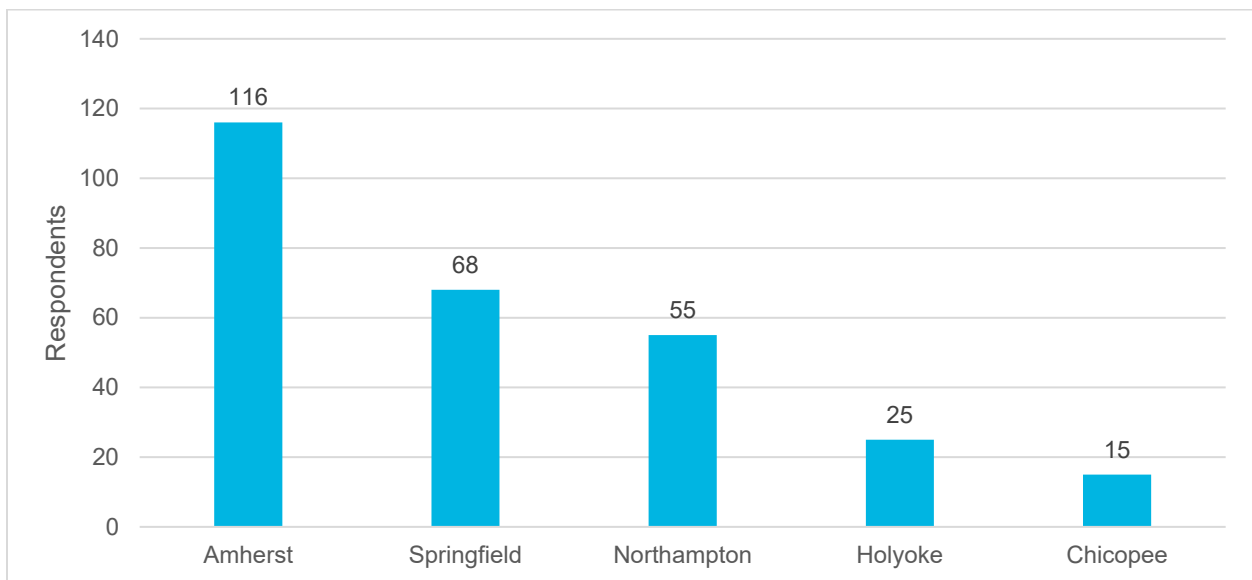
Bus riders were asked what routes they use, the improvements they would like to see on those routes, systemwide improvements, and a series of trade-off questions about how they would like PVTA to invest in service. The routes individuals used did correspond to the town they lived in, and as such, northern tier routes had a higher response rate as there were a greater number of respondents in these communities (Figure 67).The top towns that bus riders traveled to are shown in Figure 68. In Springfield, bus riders travel to Metro Center and Boston Road most frequently. In Amherst, bus riders travel to Amherst neighborhood and UMass most frequently.The routes used most often were Routes B43, 38, and P20 (Figure 69) and on average individuals use 5.7 different PVTA routes. Every route had at least five individuals who use it. The routes that had the highest response rate by ridership tended to be the routes with lower ridership, with 1 response per 500 passengers or less carried (Routes S, W, B7S, G2E, 46, 39E, P20E, and R29).

**Figure 67. Northern versus Southern Tier Users**
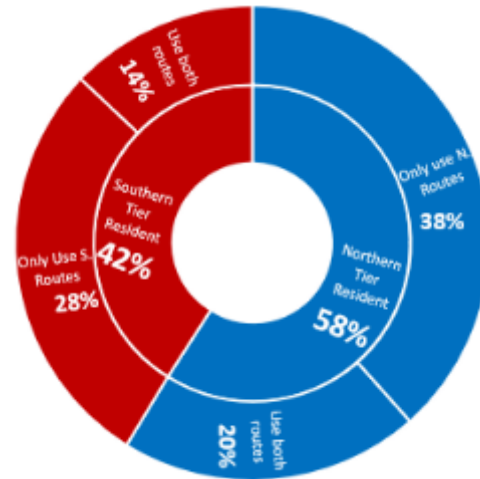
**Figure 68. Top Towns Bus Riders Travel To**



PVTA — Top Towns Bus Riders Travel To

**Springfield**

| Neighborhood | Count |
|---|---|
| Atwater Park | 0 |
| Bay Area | 7 |
| Belmont Heights | 2 |
| Boston Road | 30 |
| Brightwood | 3 |
| East Forest Park | 11 |
| East Springfield | 13 |
| Forest Park | 13 |
| Forest Park Heights | 1 |
| Hungry Hill | 1 |
| Indian Orchard | 0 |
| Liberty Heights | 8 |
| McKnight | 3 |
| Metro Center | 52 |
| Old Hill | 0 |
| Pine Point | 1 |
| Six Corners | 3 |
| South End | 6 |
| Upper Hill | 1 |

**Amherst**

| Neighborhood | Count |
|---|---|
| Amherst | 80 |
| North Amherst | 14 |
| South Amherst | 14 |
| Amherst Center | 68 |
| UMass | 80 |

**Palmer**

| Neighborhood | Count |
|---|---|
| Three Rivers | 1 |
| Thorndike | 1 |
| Bondsville | 0 |

**Top Destinations**

- 0 - 2
- 3 - 13
- 14 - 35
- 36 - 109
- 110 - 256

— PVTA Bus Route
— Interstate
— U.S. Highway
— State Route
++++++ Passenger Rail
🚊 Rail Station

☐ PVTA Member Municipality
⬜ State Boundary
----- Municipal Boundaries

0   2.25   4.5     9 Miles

Sources of Data: MassGIS; MassDOT; PVTA; PVPC; 2017 ACS 5-Year Estimate
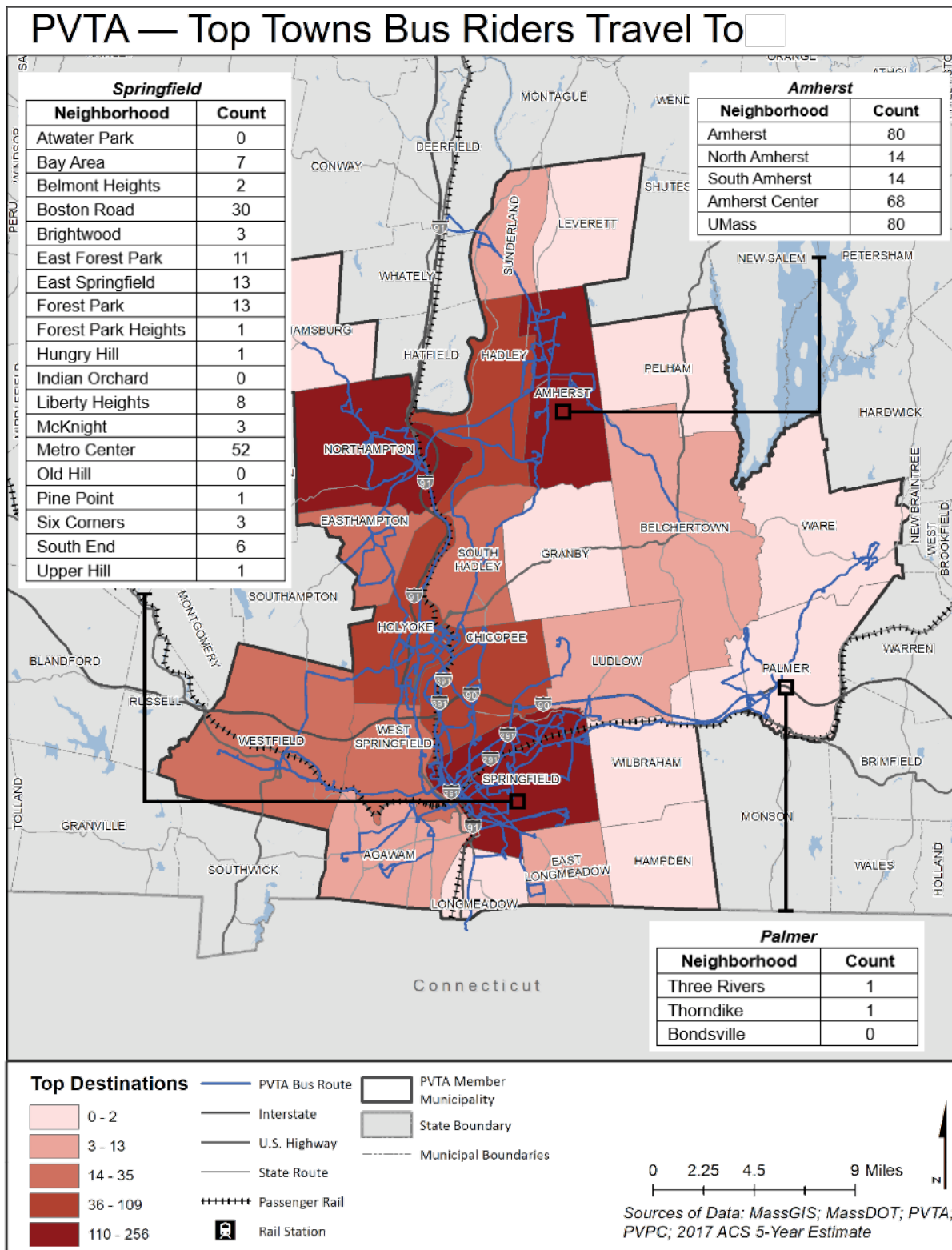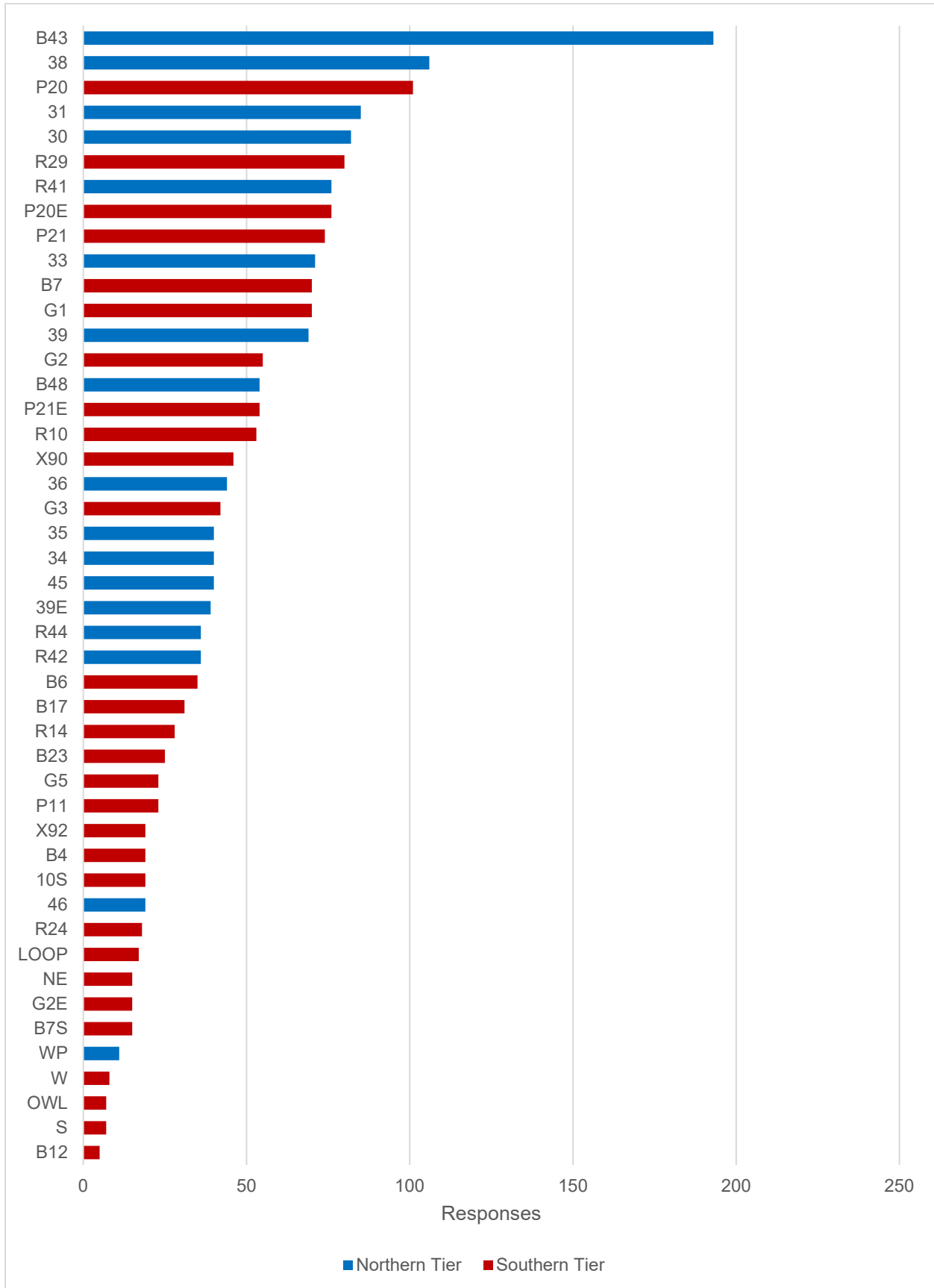
**Figure 69. PVTA Routes Used by Survey Respondents**

The survey found that on most routes there was a desire for increased frequency; in particular for Tiers 3,4, and 5, which have headways that are 30 minutes or greater. Other desires were for longer service hours on both weekdays and Saturdays for the southern tier routes that end earlier then those of the northern tier; and weekend service on routes that do not currently operate on weekends (Figure 71). Riders were also asked whether there are locations they wish PVTA would go that it currently does not, and 96 individuals provided responses. Responses were categorized and over half were to locations outside of the PVTA service area with the top response being Greenfield. Specific businesses were cited as shown in Figure 70. Most of these locations are within PVTA member communities and 57 percent are currently served by at least one route. The top business cited that currently does not have PVTA bus service was Six Flags.

**Figure 70. Left: Types of Places Individuals Would Like PVTA to Serve; Right: Specific Locations Individuals Would Like PVTA to Serve**
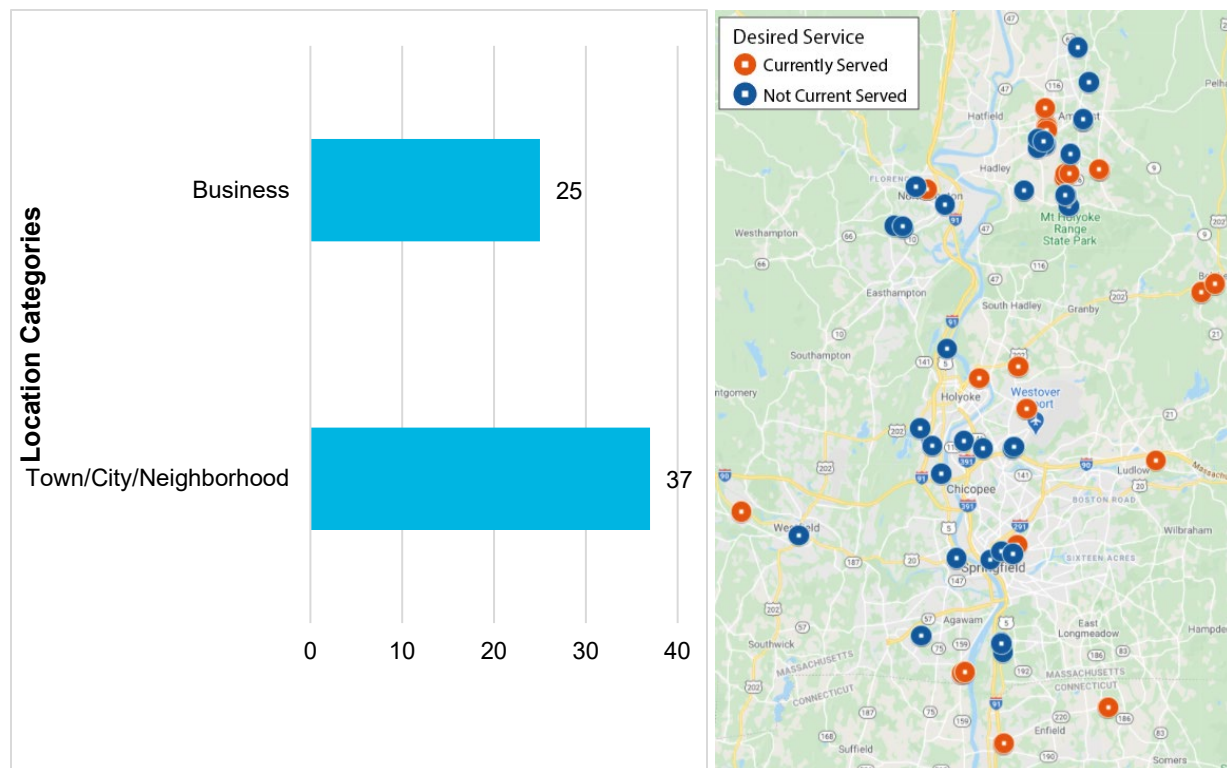
**Figure 71. Route Desired Frequency Improvements**



| Route | Total |
|-------|-------|
| G2E | 9 |
| B12 | 2 |
| OWL | 4 |
| WP | 8 |
| R44 | 25 |
| 46 | 12 |
| NE | 11 |
| 45 | 23 |
| R10 | 35 |
| B23 | 14 |
| 39E | 23 |
| R29 | 50 |
| 39 | 37 |
| B43 | 113 |
| B4 | 12 |
| W | 4 |
| S | 4 |
| 38 | 63 |
| 33 | 44 |
| X92 | 11 |
| Loop | 7 |
| 36 | 21 |
| R42 | 20 |
| G2 | 33 |
| P21E | 33 |
| R41 | 44 |
| P11 | 14 |
| B17 | 25 |
| P21 | 36 |
| X90 | 30 |
| 34 | 21 |
| R24 | 13 |
| G5 | 13 |
| P20E | 39 |
| R14 | 18 |
| 35 | 18 |
| B48 | 33 |
| B6 | 20 |
| G1 | 51 |
| 30 | 37 |
| 31 | 46 |
| 10S | 9 |
| G3 | 19 |
| B7 | 42 |
| B7S | 10 |
| P20 | 55 |

■ Yes ■ No
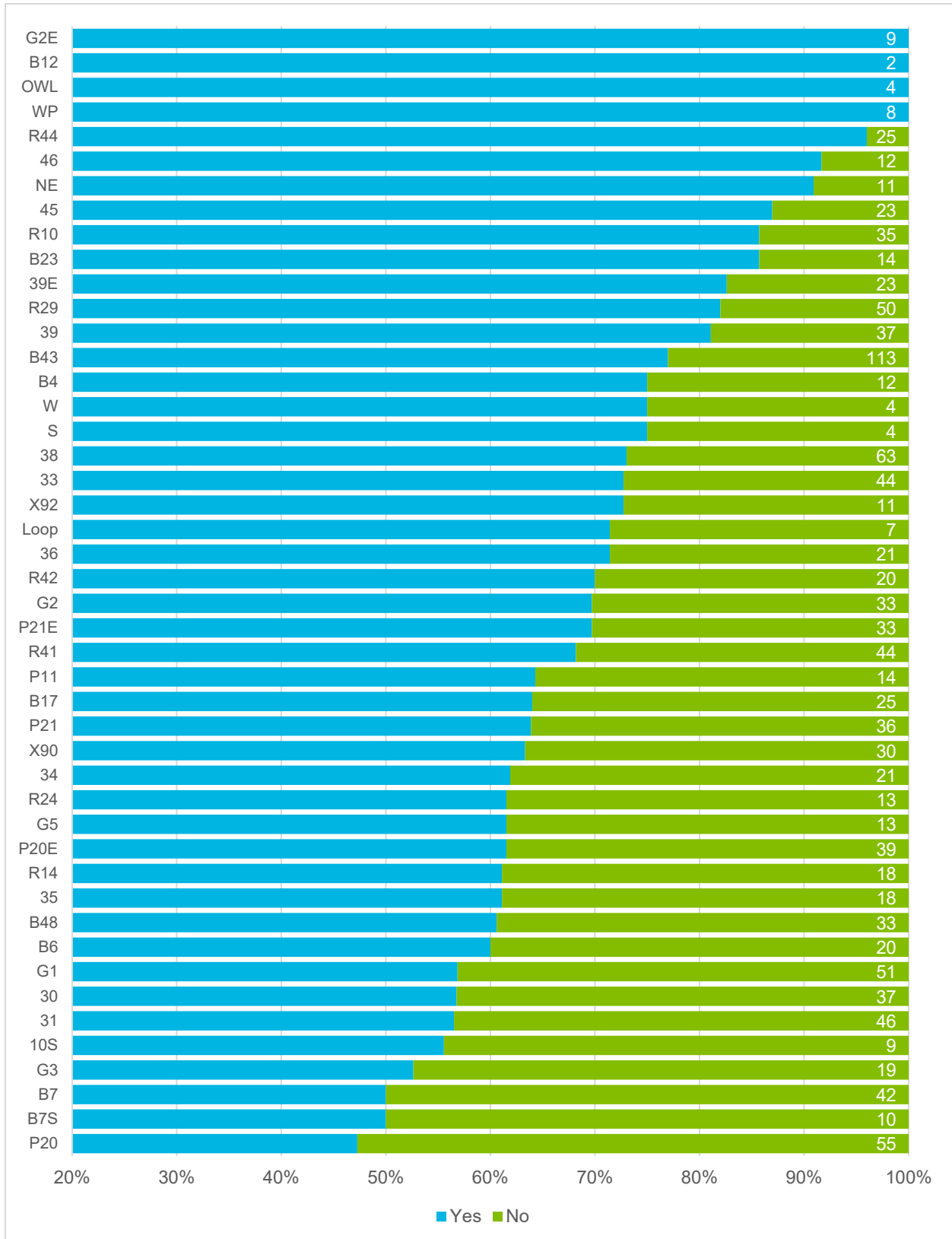
*The number on the far right column denotes the total number of responses for that route.*

The top two non-service-related improvments were more accurate real-time departure information and better OTP (Figure 72). Fixed route riders were asked three trade off-questions regarding how they prefer PVTA invest in the system and about 60 percent of the survey respondents indicated they prefer faster, direct, and more frequent service. Conversely, 40 percent of respondents indicated that they would prefer the bus went to more places and had wider coverage. (Figure 73).

### Figure 72. Non-Service-Related Improvements
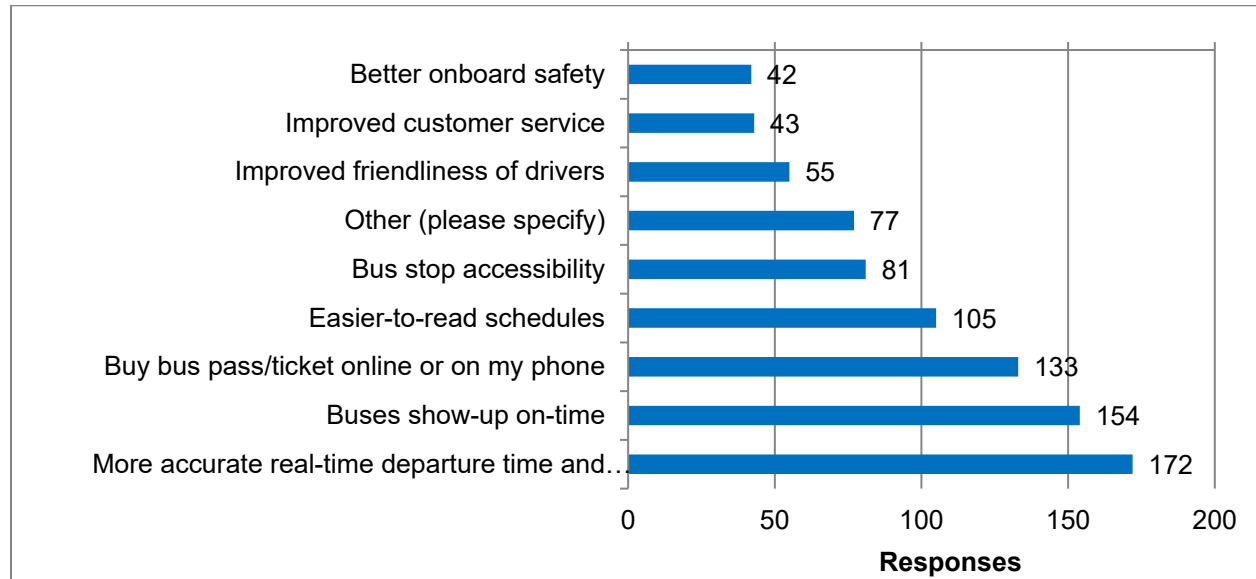


### Figure 73. PVTA Trade-off Questions
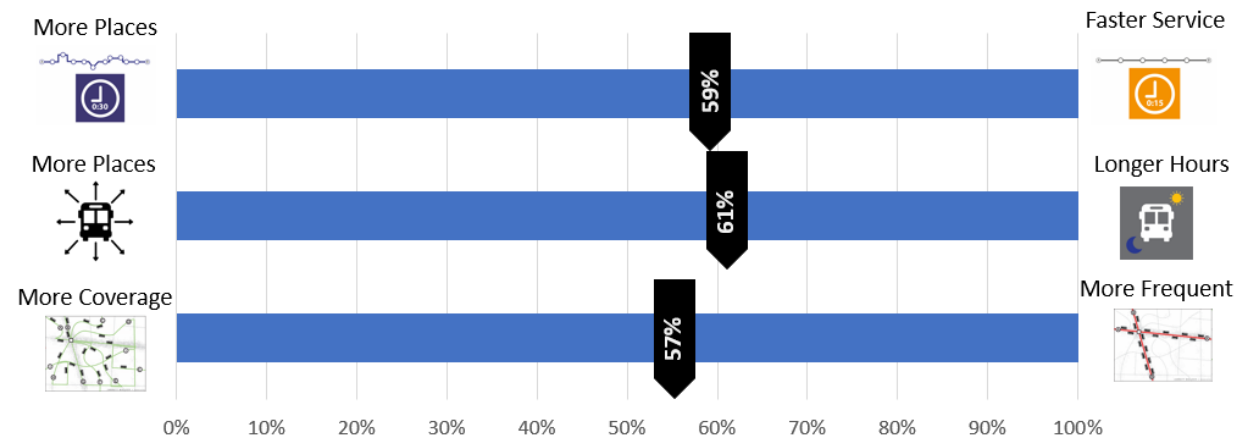


## Demand Response

Demand response users responded from 16 different communities and were asked what services they use, how they pay their fare, and the improvements they would like to see. The greatest number of responses were from Springfield followed by Holyoke, Chicopee, and Amherst (Figure 74). The top three places individuals travel to most often were Springfield, Amherst, Holyoke, and Hadley.
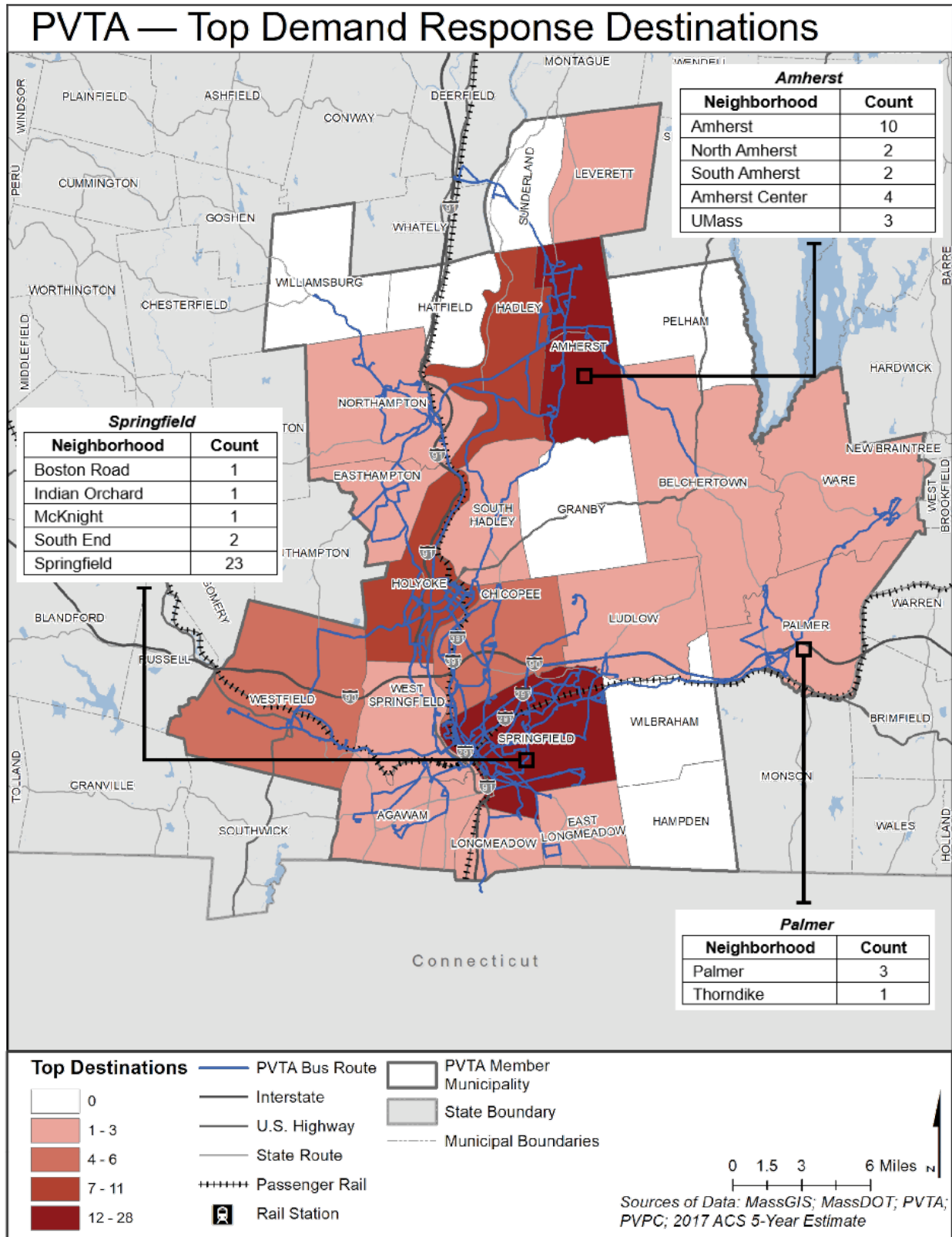
**Figure 74. Top Towns Demand Response Van Riders Travel To**



PVTA — Top Demand Response Destinations

**Amherst**

| Neighborhood | Count |
|---|---|
| Amherst | 10 |
| North Amherst | 2 |
| South Amherst | 2 |
| Amherst Center | 4 |
| UMass | 3 |

**Springfield**

| Neighborhood | Count |
|---|---|
| Boston Road | 1 |
| Indian Orchard | 1 |
| McKnight | 1 |
| South End | 2 |
| Springfield | 23 |

**Palmer**

| Neighborhood | Count |
|---|---|
| Palmer | 3 |
| Thorndike | 1 |

**Top Destinations**

| | |
|---|---|
| 0 | PVTA Bus Route |
| 1 - 3 | Interstate |
| 4 - 6 | U.S. Highway |
| 7 - 11 | State Route |
| 12 - 28 | Passenger Rail |

PVTA Member Municipality
State Boundary
Municipal Boundaries

Rail Station

0  1.5  3  6 Miles

Sources of Data: MassGIS; MassDOT; PVTA; PVPC; 2017 ACS 5-Year Estimate

Demand response riders were asked what service they use; the improvements they would like and what they were willing to pay for service improvements; their experience using the service; the future use of technology; and any other unment needs. Twenty-one responses were received from senior van users and 55 responses from ADA users. The top improvement desired was for a shorter wait time window followed by same day service (Figure 75). Those who desired service improvements were asked if they would pay a higher fare for the service. Approximately half would pay a higher fare ($5 to $6) for later evening service, 43 percent for earlier morning service, 62 percent for same day service, 57 percent for weekend service, and 60 percent for service beyond ¾ mile of a fixed route. An even greater percentage (approximately 72 percent) indicated that they would pay a higher fare to be able to have same day service and were willing to pay more than $6.00.

**Figure 75. Top Demand Response Improvements Desired**
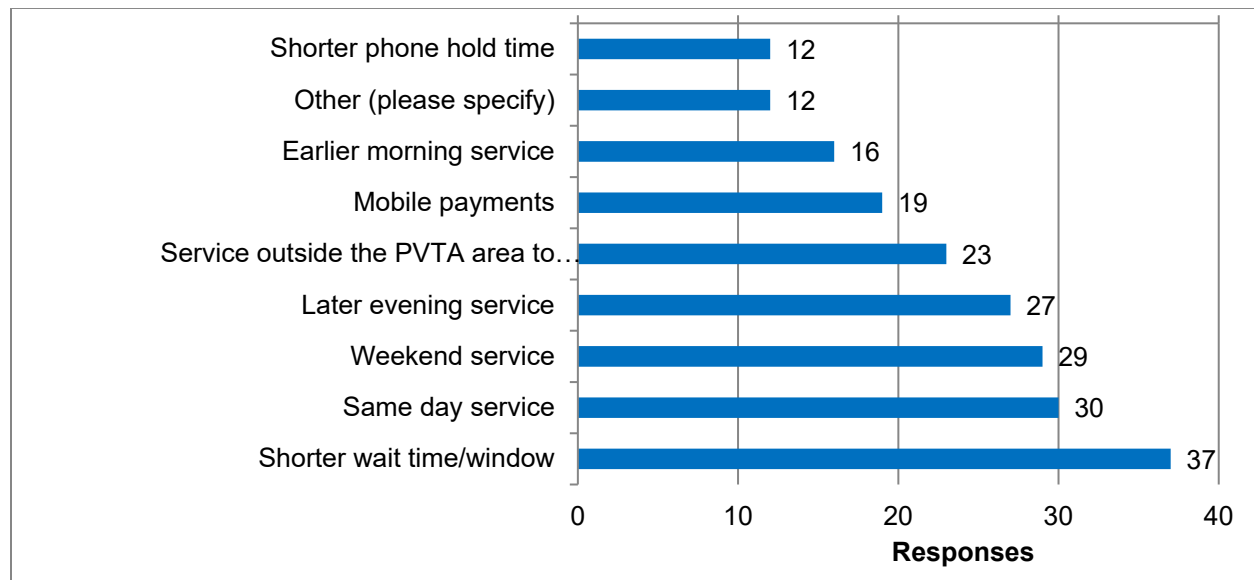


Respondents gave PVTA a 7.4 out of 10 regarding their experience riding PVTA, and a 7.5 out of 10 for booking their trip. Seventy-nine percent of individuals are able to book a trip for the time and days that they need. Regarding improvements, 75 percent of respondents would schedule their trip online or through their smart phone if the technology was made available and 53 percent would also use mobile payments to pay their fare (Figure 76).

**Figure 76. Right: Use of Online Trip Scheduling; Left: Use of Mobile Payments**
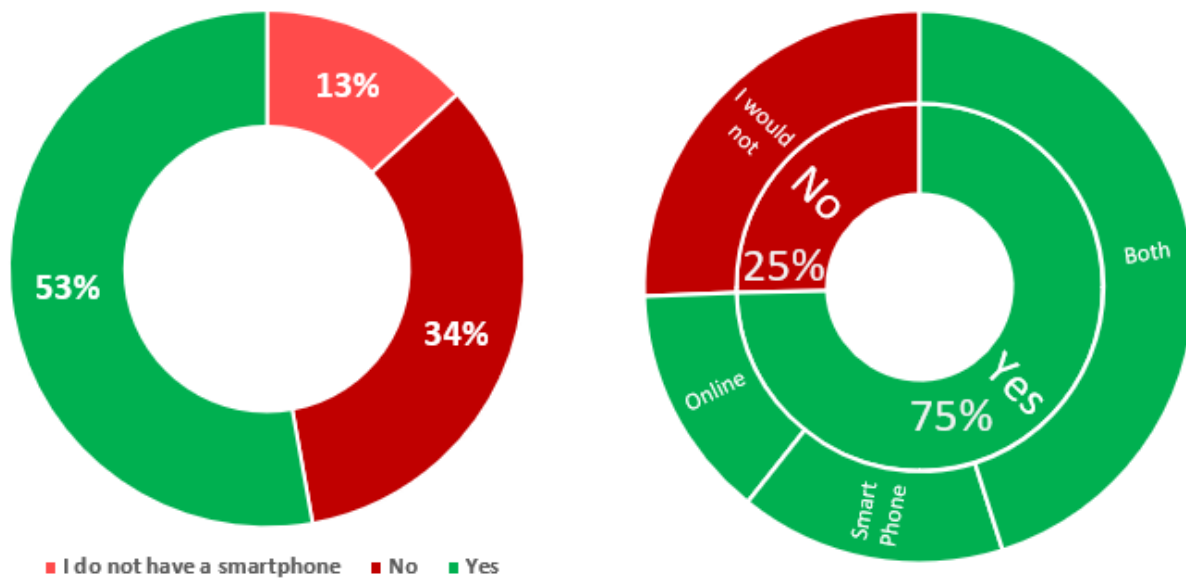


Respondents were asked to explain any additional concerns they may have about using the PVTA paratransit service, and 31 respondents provided feedback. A total of eight respondents stated they do not have additional concerns. The remaining respondents submitted concerns that include enough time to board/sit down, running late, van arrival times, no same-day service, no access to Hatfield, connections with PVTA, staff training, flexible pick-up/drop-off times, payment options, long wait time for return trips, high fares, use of texts instead of calling, efficient booking and scheduling, limited service area/destinations, and mobile tickets and payment options.

**Non-Riders**

Non Riders were asked how they currently get around, the value PVTA brings to the region, why they do not use PVTA, and what changes would get them to begin riding. Despite not currently using PVTA, non-riders understand the importance it plays in the community as 93 percent indicated that it is a valuable resource. One-third of respondents stated that the primary reason they do not use PVTA is because they have access to their own personal vehicles, 13 percent stated that the routes do not fit their schedule, 14 percent do not live near a bus stop, and 13 stated the routes do not fit their need (Figure 77). When asked what improvements would get them to use PVTA, 42 percent said if the service was more frequent, 32 percent said if there were more bus stops, and 31 percent said if service hours were extended (Figure 78). This indicates that if improvements were made current non-riders might begin using PVTA. However, 10 percent stated they would not use PVTA regardless of improvements made. When asked for reasons they would use PVTA, the top two reasons respondents selected were if it was convenient followed by if they did not have access to a vehicle (Figure 79).

**Figure 77. Reasons Non-Riders do Not Use PVTA**
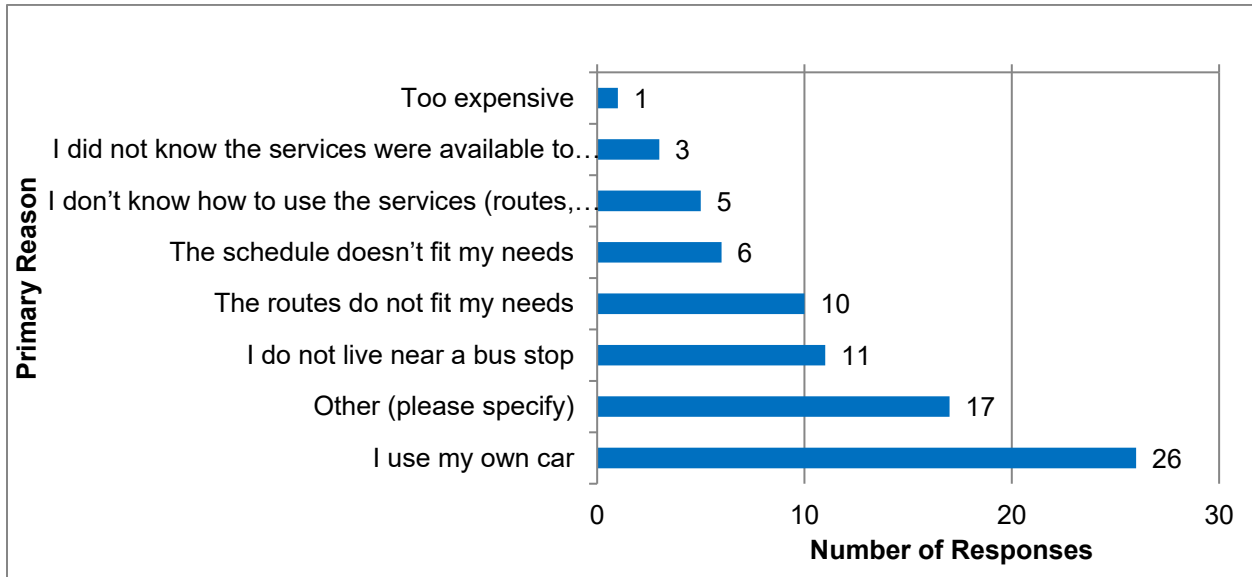


**Figure 78. Improvements PVTA Could Make**
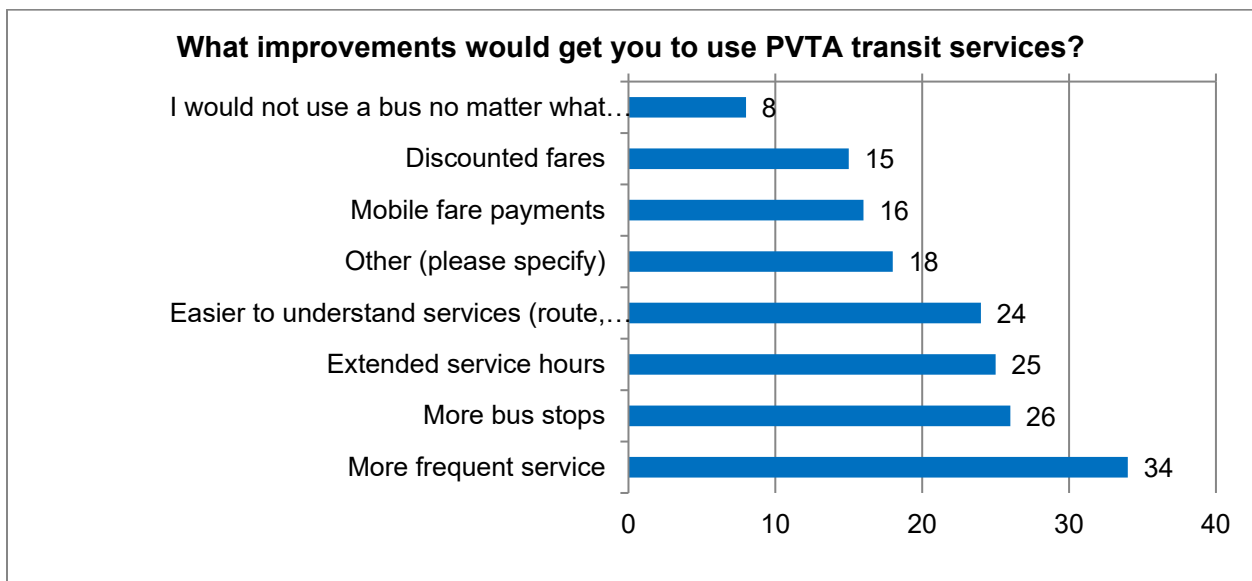
**Figure 79. Reasons Non-Riders Would Use PVTA**
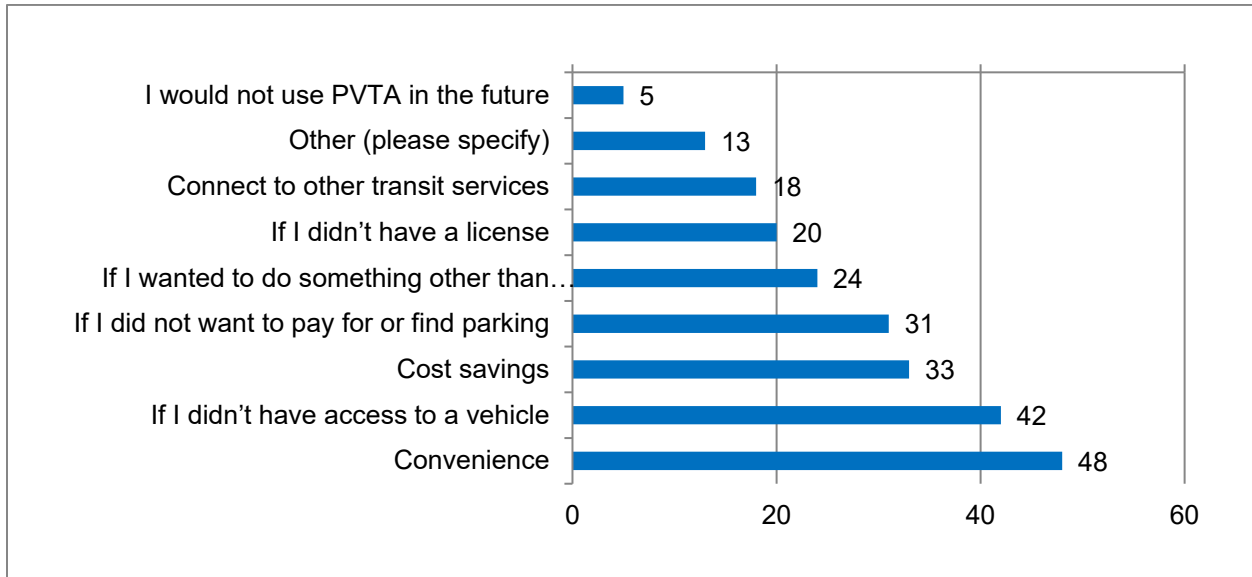


## 7.1.2.2 Driver Survey

A survey was sent out to all PVTA operators. Responses were received from 132 operators. Fixed route operators identified specific route changes that should be made, fleet issues, new connections that should be made, and technology and infrastructure improvements that would benefit all. They also provided information on some of the daily challenges they face such as tight timing between stops, the need for consolidated bus stops, passenger difficulties, tight turns, and issues with technology functioning properly.

**Figure 80. Top Service Changes Identified by Fixed Route Operators**
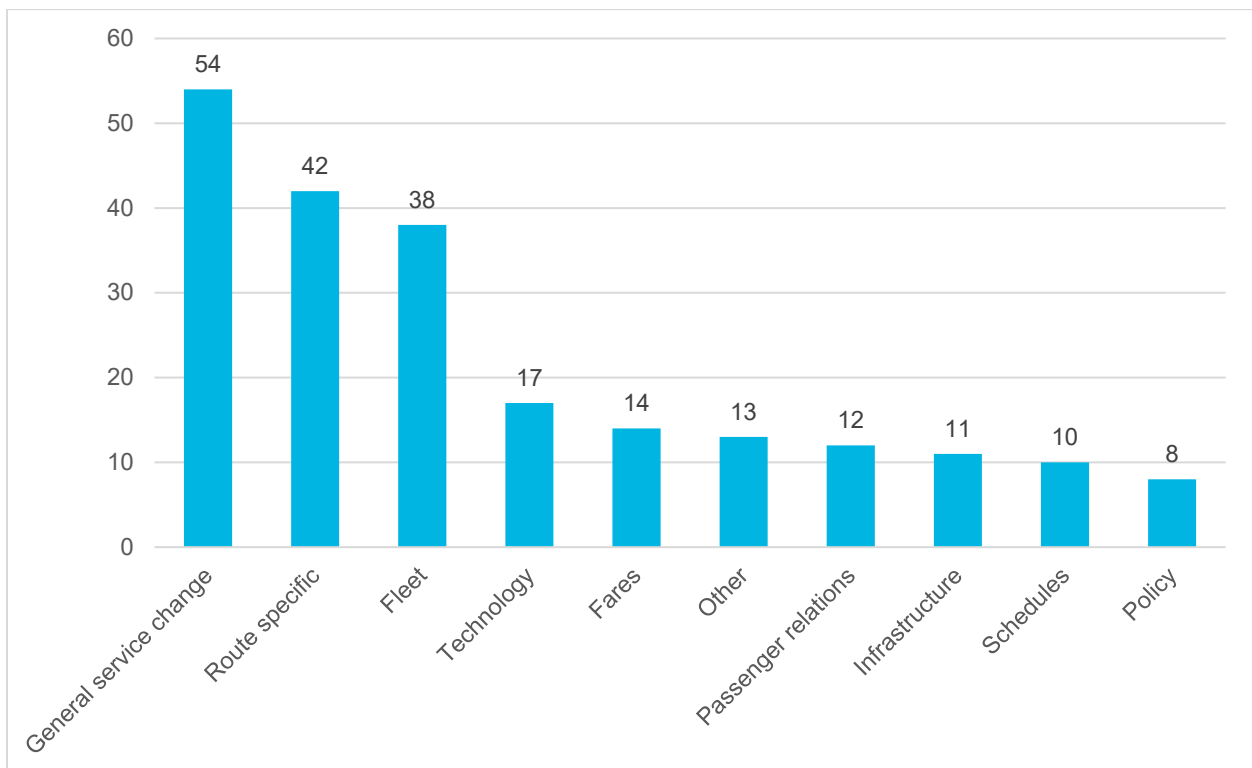
Demand response operators reported that the top issues they hear from customers are that they are picked up too early for appointments, they are unable to get the trip time requested and must negotiate a time within the 1-hour window, and will-call return pick-ups have excessive wait times. Operators face operational challenges such as tight schedules, radio dead zones, and poor vehicle handling in winter weather.

### 7.1.2.3 Stakeholder Interviews

Two interviews were held with members of the PVTA paratransit council who elected to participate. The findings from the two interviews were as follows:

- The changes in schedules because of the colleges impacts the ADA users as the hours are shortened and in some cases, service does not operate when school is not in session. This makes the service unreliable to use year-round.

- There is a need to connect to the rural areas in the hilltowns.

- The ability to schedule a trip online is desirable.

## 7.2    List of Identified Needs

Through the needs identification process, which included reviewing previous documents, the existing conditions analysis, and the outreach process, 197 needs were identified. The list was presented to PVTA and then workshopped to identify recommendations to address the need[49]. An overview of recommendations can be found in Chapter 8, with details in Appendix E.

Needs were grouped into 11 categories as follows: existing fixed route, demand response, new service, bus stop, fleet, infrastructure, fare, policy, operational, technology, and other (Figure 81). The largest category of need was for modifications to existing fixed routes. The following sections outline the needs by category. Additional information on why each was identified can be found in Appendix D.

**Figure 81. Category of Needs**



| 121 Existing Fixed Route Needs | 4 Demand Response Needs | 14 New Service Needs | 10 Bus Stop Needs | 5 Fleet Needs |

| 8 Infrastructure Needs | 4 Fare Needs | 4 Policy Needs | 10 Operational Needs | 10 Technology Needs |

| 7 Other Needs |

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[49] The initial list of needs included broad systemwide needs that were further developed into specific fixed route, demand response and new service needs.

### 7.2.1 Existing Fixed Route Needs

Service improvements were identified for 27 of PVTA's fixed routes from the performance analysis and outreach effort (Table 45). The improvements include the need for later evening service, improved frequency, earlier morning service, and service on routes that do not currently operate on weekends. Improvements to existing routes were identified through the public outreach and driver surveys and then verified by examining APC data, which show stop, route, and time of day data. Expanded hours were identified primarily on southern tier routes, where frequency improvements were identified throughout the system.

**Table 45. Existing Fixed Route Needs: Service Improvement**

| Need | Weekday | Saturday | Sunday |
|---|---|---|---|
| Expanded evening hours | G1, G2, P21, 34, R41, B48 | G3, G5, B6, P20E, P20, P21, R41 | G1, G2, P20, P21, B7, B6, R44 |
| Improved daytime frequency | G1, G2, B17, P20, P21, R44, B48, 30, 31, 33, 35 | G1, G2, R29, B48, 30, 31, 33 | G1, G2, R29, 30, 31 |
| Improved AM and/or PM peak frequency only | X92, 45, 46, | ___ | ___ |
| Improved evening frequency | 30, 31 | 30, 31 | 30, 31 |
| Consistent frequencies | G3, R10 | ___ | B6 |
| Earlier service | P11, B48, 30, 31 | P20E, P21, B48 | G2, B6, B7, R10, P20, P21, R44, 30, 31 |
| New service | ___ | B23, R24, W, WP, 34 | G5, B17, X92, P20E, W, R41, R42, WP |

Drivers identified poor performing route segments; ridership data were examined to confirm their reporting. Table 46 outlines proposed reductions in service in order to better meet demand on 15 routes. No routes are proposed for elimination but rather conversion to a new service model, a reduction in frequency, or a shortened span of service.

**Table 46. Existing Fixed Route Needs: Service Reductions**

| Need | Weekday | Saturday | Sunday |
|---|---|---|---|
| Earlier service end | LOOP, 38, 39, B43(F) | 39 | LOOP, 30, 38 |
| Reduced frequency all day | B6, 39 | ___ | ___ |
| Reduced evening frequency | G1, G2, G3, B6, B7, R10, P20, P21, 38 | ___ | ___ |
| Reduced morning frequency | G3 | ___ | ___ |
| Conversion to on-demand | B12 | B12 | ___ |

There are 19 routes for which changes to the alignment were proposed based on feedback from the operators and public. The proposed changes would eliminate unused deviations, convert low ridership areas to microtransit, streamline routing, and discontinue special variants that only occur on the weekends (Table 47).

**Table 47. Existing Fixed Route Needs: Alignment Changes**

| Route | Alignment Change |
|---|---|
| G1 | Serve the Chicopee Big Y and Marketplace Plazas on all trips. |
| G2 | Eliminate the Dwight Road variant and deviation to industrial park and replace with on-demand feeder service; all trips to service Big Y. |
| G3 | Remove the Sunday only Chicopee Falls deviation; on the eastern section of the route convert to a loop using Wilbraham Road instead of an out and back. |
| G5 | Eliminate Enfield/Longmeadow deviation; replace with Enfield Express Route and microtransit. |
| B6 | Eliminate Sunday only service to Eastfield Mall; convert Health South to by-request only. |
| B7 | Discontinue Express via I-90 weekend variant; separate route into two routes, a local route that serves all stops and deviations, and a limited stop route that ends at Walmart, does not deviate and services specific stops only. Limited stop service and stops to be rebranded. |
| R10 | Service WSU on all trips, eliminate different school schedules; convert Hospital and East Mt. View Apartments to on-request only; eliminate Union Street; service Walmart on all trips in all directions during open hours. |
| R10s and OWL | Combine into one route. |
| R14 | Convert the Industrial Park variant and North Street to a microtransit zone. Service Big Y and Pheasant Hill on all trips. |
| B23 | Remove Soldier Home deviation; extend route to Big Y in Westfield. |
| X90 | Eliminate Montcalm deviation; replace with South Hadley microtransit; access Holyoke via Willimansett Bridge; extend to HTC on Sundays. |
| R42 | Discontinue service to Nash Hill. |
| B43 | Convert express trips back to non-express trips and reestablish Route M40. |
| R44 | Convert High Street deviation to on-demand only; eliminate circular routing on weekdays and use Saturday routing instead; serve Rocky Hill Co-housing on-request using Route NE. |
| B48 | Create express trip variants via I-91. |
| 30 | Convert Valley Medical to on-demand. |
| 33 | Eliminate Cushman Center deviation; Saturdays extend to Hampshire Mall. |
| 39 | Eliminate evening and weekend trips to Hampshire Mall. |

| Route | Alignment Change |
|-------|------------------|
| WP | Provide additional trips to Springfield; break the route into two routes with each servicing the Ware Walmart to create transfers. |

In addition to changes in headways, hours of service, and alignment three other needs are specific to a route or corridor as listed below:

- Conduct an on-board rider study for the northeast area to better understand travel patterns and needs. Redesign route accordingly.

- Conduct further research on the need to connect South Amherst to Route 9.

- Update the B4 schedules to add Wason and Plainfield timepoints.

## 7.2.2 Demand Response Needs

As outlined in Figure 82, four demand response service needs were identified. Three of the needs focus on creating connections to areas outside of the PVTA service area and the fourth would introduce technology that would allow individuals to schedule their trips online. By creating connections with FRTA, whose service area borders western and northern PVTA communities, it will improve mobility through the region, allowing individuals in the rural FRTA communities better access to services in the PVTA urban areas. The Quaboag Connector serves towns in the Quaboag region that are members of PVTA or Worcester Regional Transit Authority (WRTA). This service provides the needed connection between PVTA and WRTA municipalities.

**Figure 82. Demand Response Needs**

| Demand response connections to FRTA | Connect Sunderland to the South County Senior Center | Online trip scheduling for Demand Response | Demand Response: Coordination with Quaboag Connector |
|---|---|---|---|

## 7.2.3 New Service Needs

Fourteen new service needs were identified as shown in Table 48. These needs include express service between major municipalities; methods to bridge the first-mile/last-mile gap so that everyone has access to transit; a way to serve second and third shift workers and others who need to travel outside of PVTA's current service hours; connections to areas outside of PVTA such as Connecticut and for out-of-area medical trips; and more localized service in communities including Agawam, Palmer, Ware, South Hadley, Westfield, and East Longmeadow. As the demand increases there may also be a need for more community circulators or demand response service in additional towns and neighborhoods in order to meet the needs of residents.

**Table 48. New Service Needs**

**New Service Needs**

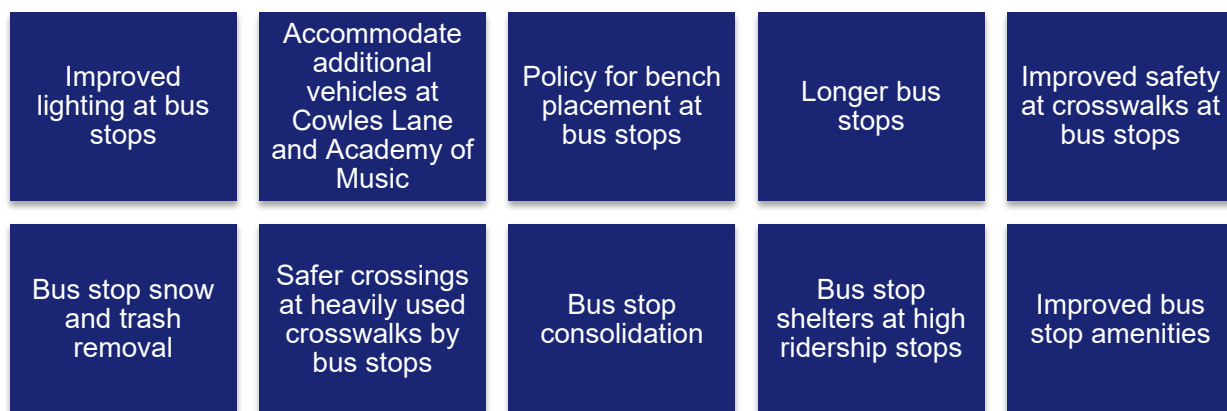| New Service Needs |
|-------------------|
| First-mile/last-mile service |
| Late night service |
| Same day demand response service |

**New Service Needs**

| |
|---|
| Service to Six Flags |
| Connection to CTtransit |
| Out of service area medical trips |
| Service to Venture Way, Hadley |
| Express service between Northampton and Springfield |
| Express service between Amherst and Springfield |
| Service deeper into East Longmeadow |
| Transit service in South Hadley Falls |
| Connection between Westfield neighborhoods and industrial area |
| Additional Agawam service |
| Additional service in Palmer and Ware |

## 7.2.4  Bus Stop Needs

To improve bus stops, 10 needs have been identified (Figure 83). Improving the bus stops would create safe, inviting, and usable spaces where individuals could wait. This would include installing shelters and benches, improving lighting, and removing snow and trash in a timely manner. It also includes the need for policies for amenities and guidelines PVTA can share with member municipalities on how to construct safe, ADA compliant, and useable bus stops during infrastructure projects. In high pedestrian areas such as urban cores and the UMass Campus, a need was identified for improved safety at crosswalks, in particular those that are heavily utilized. Lastly, drivers identified a need for longer bus stops in the areas served by articulated buses and at Cowles Lane and the Academy of Music.

**Figure 83. Bus Stop Needs**

| Improved lighting at bus stops | Accommodate additional vehicles at Cowles Lane and Academy of Music | Policy for bench placement at bus stops | Longer bus stops | Improved safety at crosswalks at bus stops |
|---|---|---|---|---|
| Bus stop snow and trash removal | Safer crossings at heavily used crosswalks by bus stops | Bus stop consolidation | Bus stop shelters at high ridership stops | Improved bus stop amenities |

## 7.2.5  Fleet Needs

Five needs for PVTA's fleet have been identified and are described in Figure 84. Vehicles with increased capacity are needed to accommodate the large loads on the UMass campus. Given the current pandemic and recommendation for air flow, vehicles that have windows that open

are needed. Electric buses would reduce the carbon footprint in the Valley but would require signficiant investments in facility infastructure first.

**Figure 84. Fleet Needs**

| Increased vehicle capacity | Buses with windows that open | Electric bus | Newer buses | Inform other drivers that PVTA buses do not turn on red and stop frequently |

## 7.2.6  Infrastructure Needs

To improve or enhance PVTA's infrastructure, eight needs have been identified (Table 49). The infrastructure needs require coordination with member municipalities or university campuses as well as MassDOT. Roadway treatments that would speed up travel time are needed in high ridership corridors such as State Street in Springfield, North Pleasant Street on the UMass campus, and Route 9 in Hadley. Minor roadway improvements such as improving curb radii or adding protected left turns would also improve the travel time on several routes. As UMass infills the campus with buildings and removes parking, and increases enrollment, there will be a need for additional parking either off-campus or on the periphery. Park and ride lots may be needed. PVTA's maintenance facilities in the northern tier are not structured to properly and safely maintain the articulated bus fleet purchased in 2013. The facilities need to be expanded and upgraded to accommodate a longer vehicle fleet as well as electric buses.

**Table 49. Infrastructure Needs**

**Infrastructure Needs**

| Infrastructure Needs |
| --- |
| BRT infrastructure on Route 9 |
| BRT infrastructure on State Street |
| Protected left turns in order to increase OTP |
| Improved curb radii in order to reduce the need to use the oncoming lane or rubbing the tire on the curb |
| Elimination of regular car traffic on North Pleasant Street on campus. Allow buses, emergency, and university plated vehicles only on weekdays during the day. |
| Expansion of the UMass Maintenance Facility and the VATCo Maintenance Facility |
| Additional park and rides throughout the region |
| reduced number of crosswalks on North Pleasant Street, UMass Campus |

## 7.2.7  Fare Needs

Four needs have been identified to improve PVTA's fare process (Figure 85). These needs focus on reducing cash handling through promoting mobile and smart card fare payments. PVTA would need a new fare collection system to achieve this, including accepting Elderly & Disabled (E&D) cards.

**Figure 85. Fare Needs**

| Cash less fare options in addition to magnetic stripe cards | New fare collection system | Additional locations to obtain a PVTA E&D card | Cashless fare option for demand response |
| --- | --- | --- | --- |

## 7.2.8 Policy Needs

Four policy needs are outlined in Figure 86. These are operational policies.

**Figure 86. Policy Needs**

| Minimum span of service guidelines that reflect new route classification structure | Identification of flag stop corridors | Electric scooter policy | Data driven framework for determining service levels |
| --- | --- | --- | --- |

## 7.2.9 Operational Needs

To improve PVTA's operations 10 needs are outlined in Table 50. These needs are adjusting timing on routes, improving communications, coordinating service, and creating a safer environment.

**Table 50. Operational Needs**

**Operational Needs**

UMTS: Improved timing on route segments

Additional road supervisors

Improved communication between drivers and drivers/management and PVTA

Improved transfer communication

Continually monitoring OTP

Improved cleanliness of vehicles

Coordinated service along State Street

Adjusted timing on routes

30/31/45/ Additional time from UMass Graduate Research Center (GRC) to Cowles Lane

Improved travel time and OTP through the center of Amherst

## 7.2.10     Technology Needs

Ten technology needs are highlighted in Table 51. Upgrading systems and deploying technology uniformly across the operators would benefit both PVTA and the customers.

**Table 51. Technology Needs**

**Technology Needs**

New AVL software

Improved real-time information at stations

AVL and APC data for the community shuttles

Transit signal priority

New demand response scheduling and CAD software

New fixed route scheduling software

Route planning software

Upgraded parts management and maintenance work order software

Integrated service alert system with social media

Vehicle-mounted collision warning and tracking systems

## 7.2.11      Other Needs

Seven other needs that do not fit into the previous categories are highlighted in Figure 87. These include measures that would improve customer relations and education on how to use the system.

**Figure 87. Other Needs**

| How to ride guide | Improved customer communication | Printed schedules | Better enforcement of code of conduct |
| | Connections to Franklin County | Method for public to provide feedback | Improved schedule format |