CAT 20/20

Network Redesign

Market Analysis

August 2019

NELSON NYGAARD

Table of Contents

Introduction

CAT 2020

Capital Area Transit System (CAT) is conducting a comprehensive assessment of its existing transit service and establishing a vision for what transit should be in 2020. This study is the first of its type in CAT's 45-year history, and it comes at an important time for CAT. With declining ridership and pending budget deficits, CAT must rethink the way transit services are provided and look for new ways to provide efficient and effective public transit.

Market Analysis

Just as businesses assess markets to identify customers, focus strategies, and prioritize investments, so do transit systems benefit from conducting market research to identify key market segments and demands.

This Market Analysis is an evaluation of where transit demand is located in the CAT service area. Specifically, this analysis examines:

- The underlying demand for transit services based on population density, job density, demographics, and other factors
- Major transit trip generators
- Where people are traveling from and where they are going

The Market Analysis is the first step in understanding the existing conditions in the CAT service area. This analysis identifies the target market segments for public transit and will guide investment priorities for CAT as part of the CAT 2020 effort.

Service Area

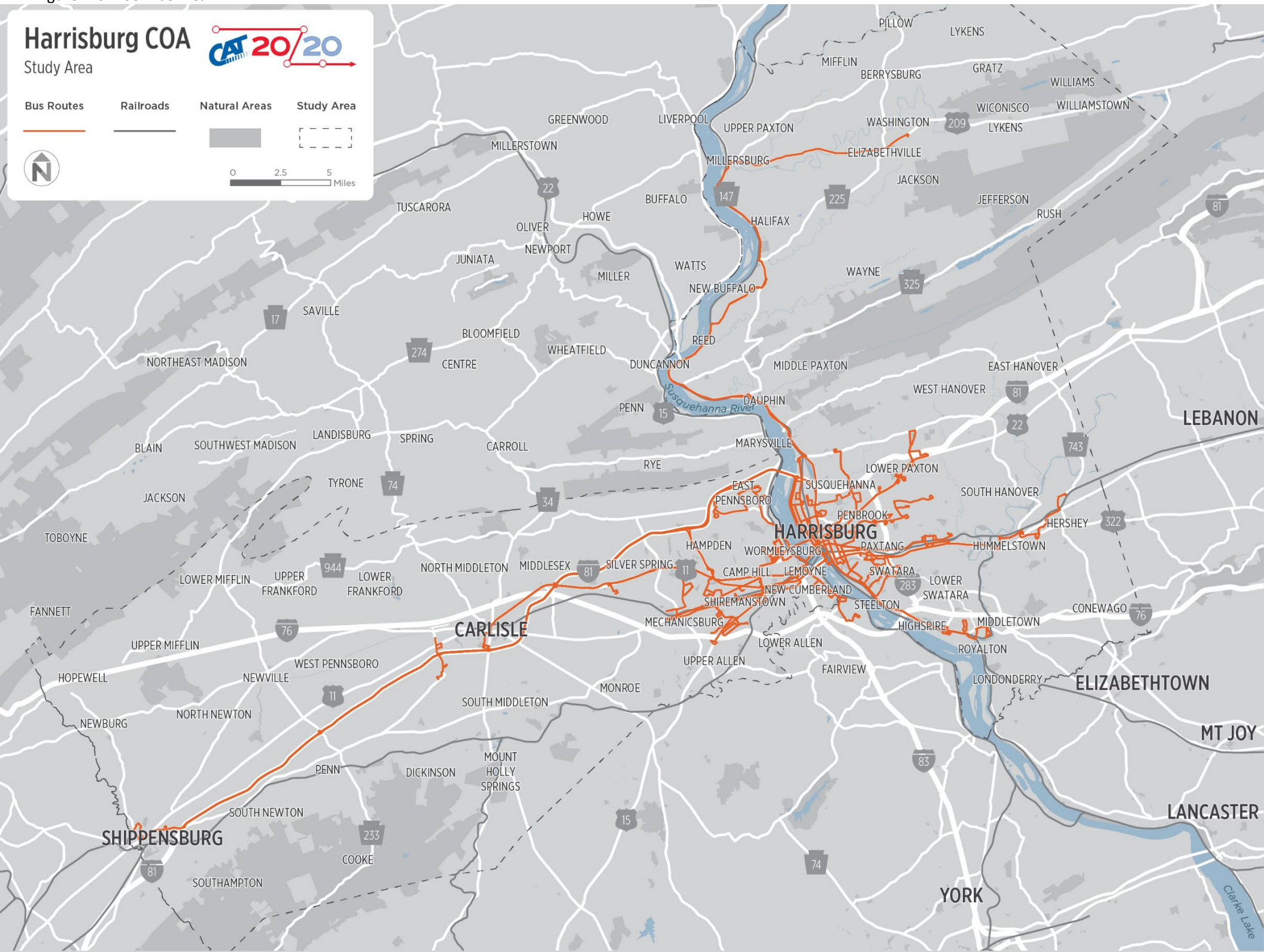
The CAT service area is comprised of Dauphin County and Cumberland County, spanning approximately 89,600 acres. The total population in the service area is 510,000, with 87% living in the urbanized area. The service area is a combination of dense urban areas and dispersed suburban and rural areas. Within the service area, there are several geographic boundaries, the most notable of which is the Susquehanna River, which splits the Harrisburg region into the East and West Shores. Additionally, there are numerous rail lines and yards, as well as ridges and mountains that divide the region.

89,600 acres

510,000 people

330,000 jobs

Figure 1: CAT Service Area



Overview of Transit Demand

Transit Demand Factors

Transit ridership is a function of the underlying demand for transit services and attractiveness of the service that is provided. The underlying demand for transit is driven by a number of factors.

Five key factors are particularly important and are the focus of this market analysis:

Population: Since transit relies on having people in close proximity to service, higher population density drives demand for higher levels of service.

Employment: The location and density of jobs is a strong indicator of transit demand, as traveling to and from work accounts for the most frequent type of transit trip.

Socioeconomic Characteristics: Different groups of people are more or less likely to use transit. For example, households with many cars are much less likely to use transit than those with one or none.

Major Activity Centers: Major activity centers, such as universities, large employers, and shopping centers, are places that attract large volumes of people and can generate a large number of transit trips.

Travel Flows: Travel flows illustrate where people travel between and the types of trips people make. They provide insight into what places should be connected.

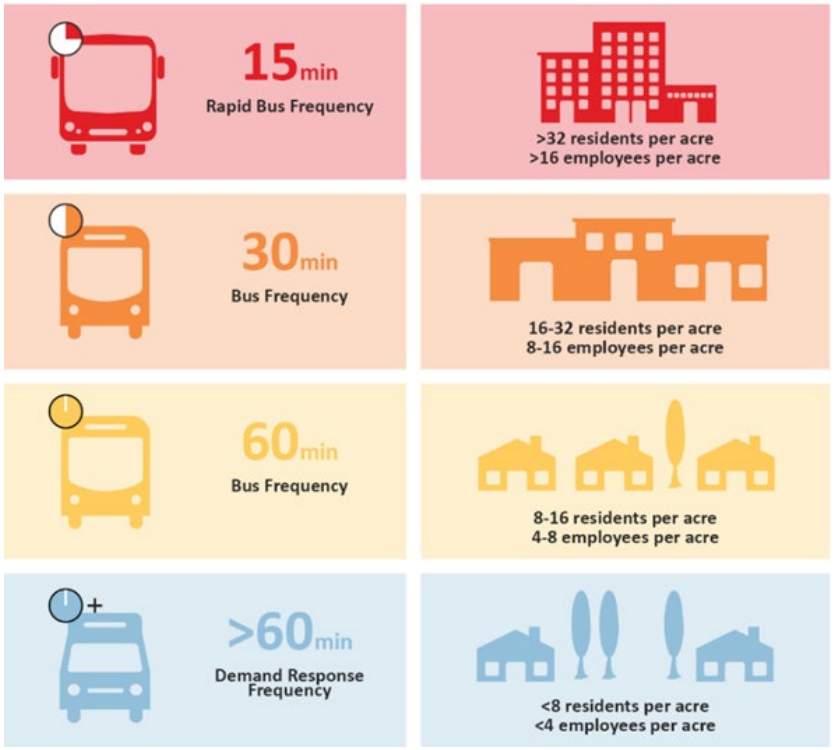
Density and Transit Demand

More than any other factor, population density and employment density are the primary drivers of transit demand and, as such, provide strong indications of underlying transit demand. This is because:

- The reach of transit is generally limited to within one-quarter to one-half mile of a transit route. As a result, the size of the travel market is directly related to the density of development in that area.
- Transit service frequencies, in turn, are closely related to market size. Bigger markets support more frequent service, while smaller markets can only support less frequent service.
- To attract travelers who have other options, such as automobiles, transit must be relatively frequent — at least every 30 minutes.

Places with large numbers of people, jobs, and other activities produce the greatest demands for transit service. As a result, population density (residents per acre) and employment density (jobs per acre) provide an indicator of just how much underlying demand there is for transit in a particular area. Higher population and job densities can support higher levels of transit service.

Figure 2: Density and Transit Demand



Population

Population densities are one of the two strongest indicators of both where the demand for transit is the highest and where it will work best. There are 510,000 people living in the CAT service area. Harrisburg is the largest city by population and has the greatest densities in the service area. There are also high population densities in Carlisle and Shippensburg.

Within the Harrisburg region the following neighborhoods have higher population densities:

- South Harrisburg
- Uptown
- Allison Hill
- Steelton

These areas are served by existing public transit services, although most are served with lower service frequencies than they may be able to support based on their population density.

Figure 3: Population Density (Core)

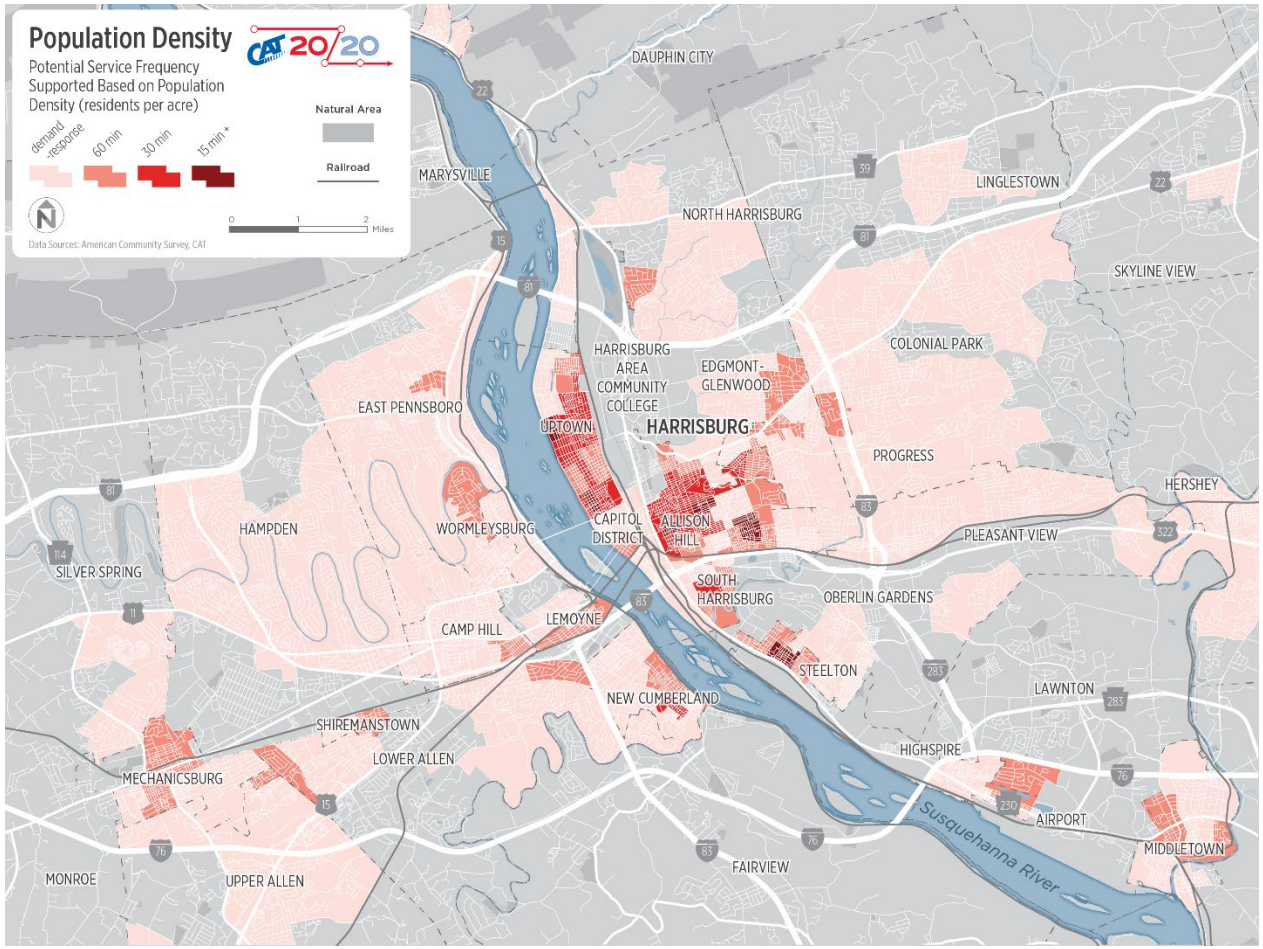
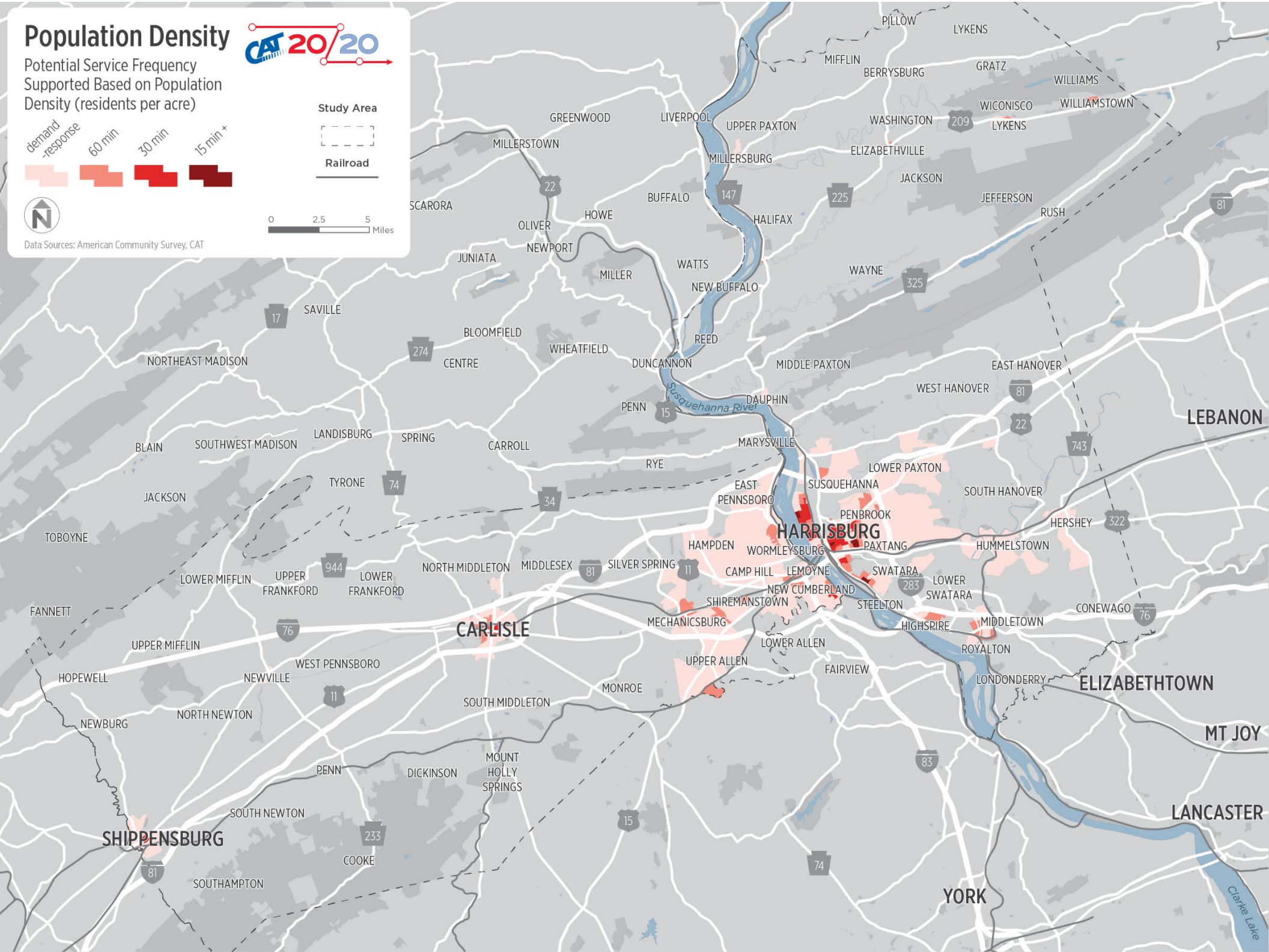


Figure 4: Population Density (Region)



Employment

Employment densities are the second of the two strongest indicators of underlying transit demand. As densities grow, the demand for transit grows, particularly with respect to more frequent service. Unlike population density, job density is more highly focused along key corridors and concentrated areas of the region. The highest job densities are focused in the following areas:

- East Pennsboro Township
- Progress
- Hershey
- Downtown Harrisburg

As with population density, many of these areas are currently served by public transit. However, the primary challenge is that the existing service does not match demand. Additionally, areas of employment are dispersed in the service area and not well connected or grouped by corridors, which poses a challenge to designing effective transit service.

Figure 5: Employment Density (Core)

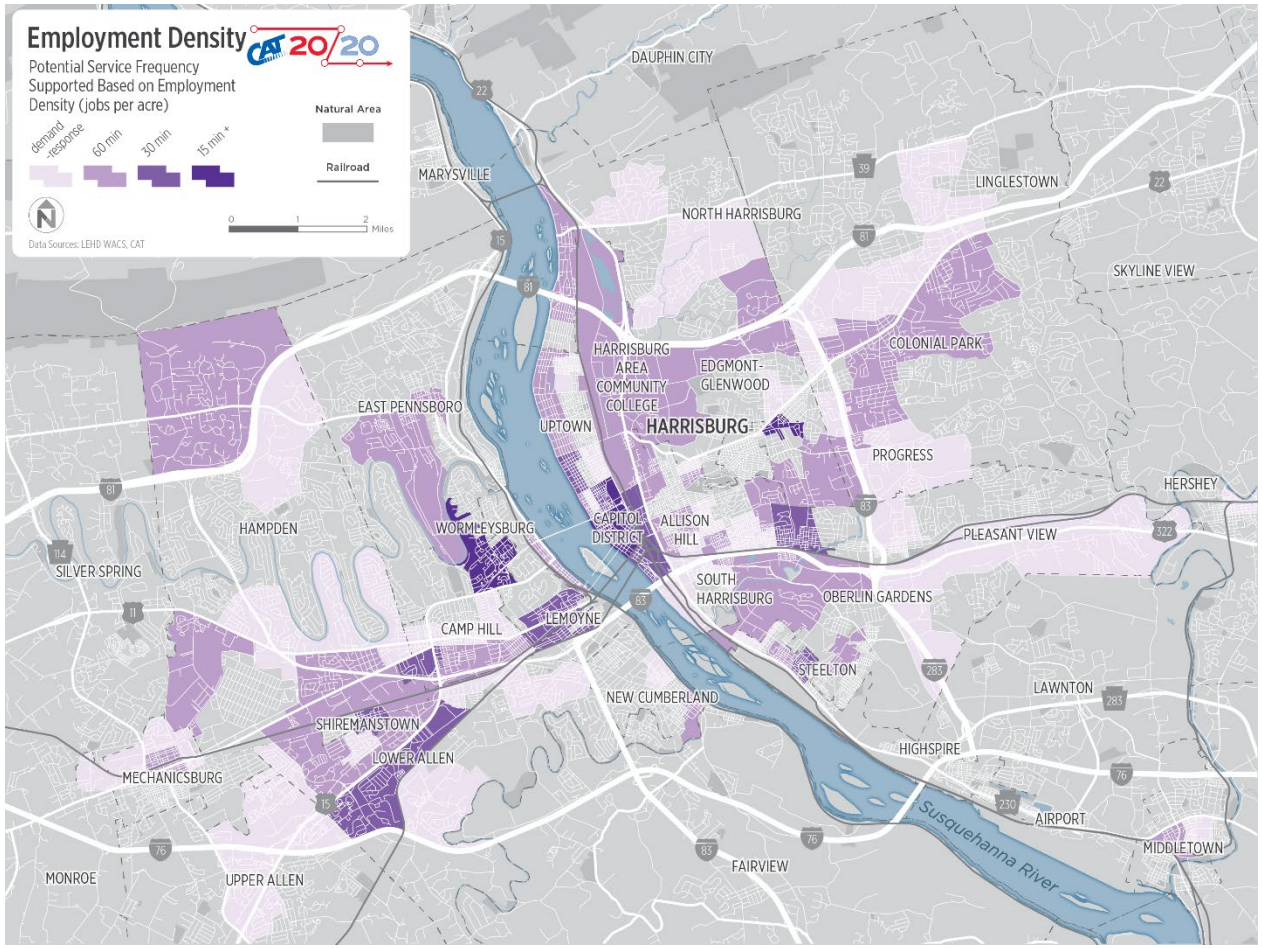
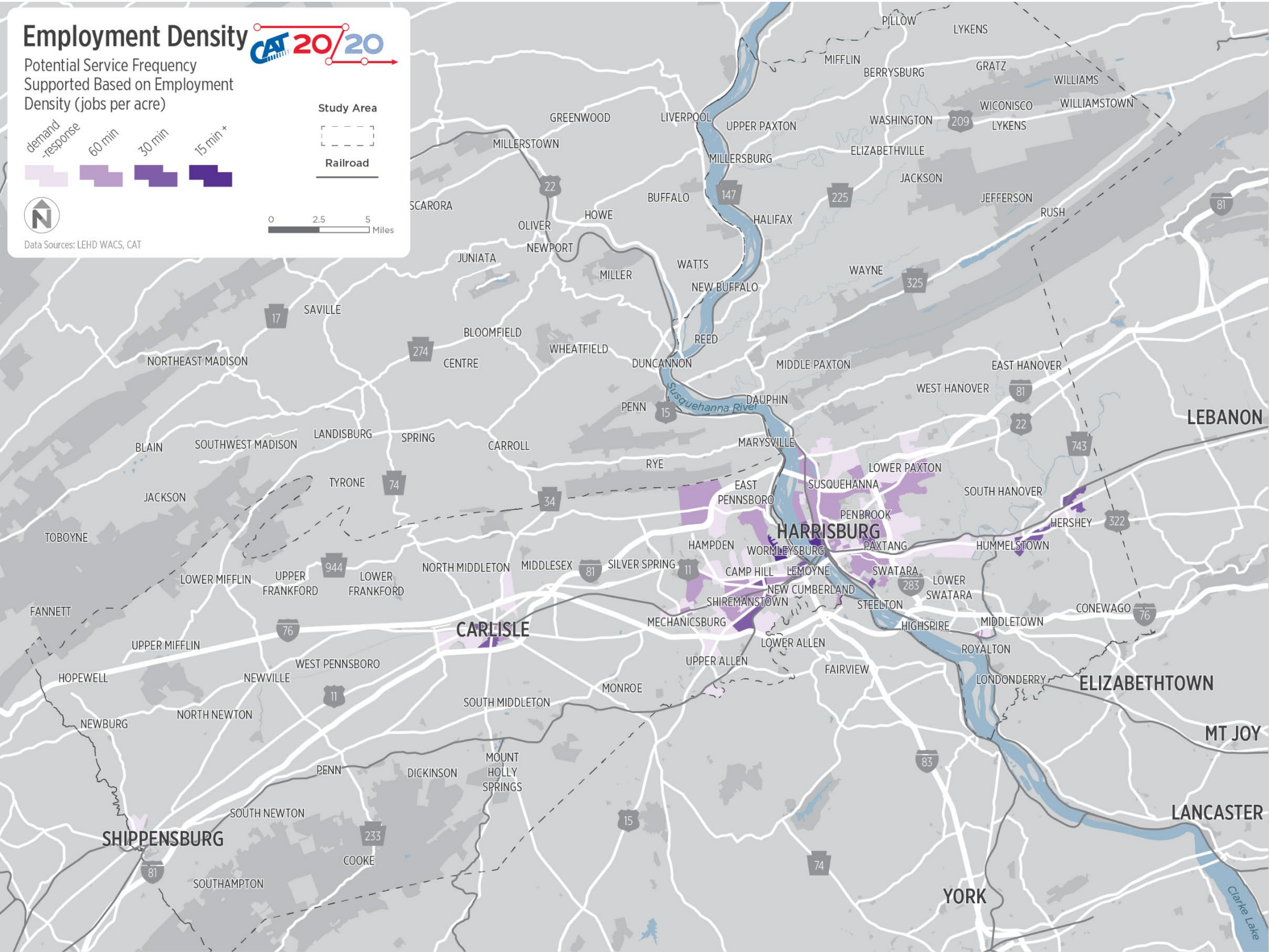


Figure 6: Employment Density (Region)



Demographics and Transit Propensity

When significant numbers of individuals and households from high-transit propensity groups cluster together, they can influence the underlying demand for transit to an extent that is not captured when only considering the total population. In a given location, groups of people from transit-supportive demographic groups may be too small individually to indicate significant demand for transit service, but their clustering may result in potentially high levels of transit use. Similarly, in a location where transit-supportive demographic groups have low representation, the level of potential transit demand may actually be lower than the total population alone would indicate.

To take this into account, a measure called the Transit Propensity Factor was developed to measure relative demand for transit in different areas as compared to the overall region. Transit propensity factors take into account demographic characteristics for the population aged 16 and over who are employed. These factors measure the likelihood of certain demographic groups to use transit relative to the study area's general population. The propensity of different demographic groups to use transit in the study area generally follows the trends discussed earlier.

Differences in transit propensity are based on race and ethnicity, vehicle ownership, and the household poverty rate. Those experiencing poverty are more likely to use transit, as are minority residents and foreign-born residents. Residents living in a household with no vehicle were the most likely demographic group to use transit, with over eight times the propensity of an average resident, and those living in a household with only one vehicle were also more likely to use transit, as many households have more than one worker.

Figure 7: Transit Propensity Index Factors

Demographic Group	Transit Propensity
Ethnicity – Hispanic/Latino	
Non-Hispanic/Latino	0.82
Hispanic/Latino	3.43
Race	
White or Caucasian	0.39
Black or African American	2.97
Other Race	2.46
Vehicle Ownership	
No Car	8.68
One Car	1.24
Two or More Cars	0.39
Household Poverty	
Below 100% Poverty	4.92
At 100% to 149% Poverty Line	2.62
At 150% of the Poverty Line or Above	0.63

When the socioeconomic characteristics described above are considered, residents of the central urban area have a higher propensity to use transit, and most residents of outer areas have a lower propensity to use transit.

Urban Propensity

In the Harrisburg region, the areas where residents have the highest propensity to use transit include:

- South Harrisburg
- Capitol District
- Uptown
- Area around Harrisburg Area Community College

Other communities where residents have a very high propensity to use transit (more than 1.25 times more likely to use transit than the general population) include:

- Allison Hill
- East Pennsboro
- Mechanicsburg
- Lemoyne
- Wormleysburg
- Progress
- Steelton
- Airport

Regional Propensity

Regionally, the trend of residents in more urban areas having a higher propensity to use transit holds true. Most areas in the larger region have very low transit propensity, meaning individuals living in these areas are unlikely to use transit compared to the average population. However, there are a few exceptions in the counties of Cumberland and Dauphin. Areas that are 1.0 to 1.4 times more likely to use transit outside of Harrisburg include:

- Shippensburg
- Carlisle
- Hershey

The transit propensity findings indicate that several places in the core of the service area are much more likely than average to use transit, specifically within Harrisburg. As an urban environment, these areas are ideal for fast and frequent transit service. The map also indicates notable transit propensity outside of the core urban area. These areas are more suburban, with a more disconnected street network, neighborhood streets that may be too narrow to serve with regular buses, and large plots of land and further setbacks. These areas are more challenging to serve with fixed-route transit, however, the level of transit demand shows that those areas are important to serve. Although it may be difficult and expensive to operate service to outlying areas such as Shippensburg, the residents do have a higher likelihood to ride transit compared to the total population.

Figure 8: Transit Demand (Core)

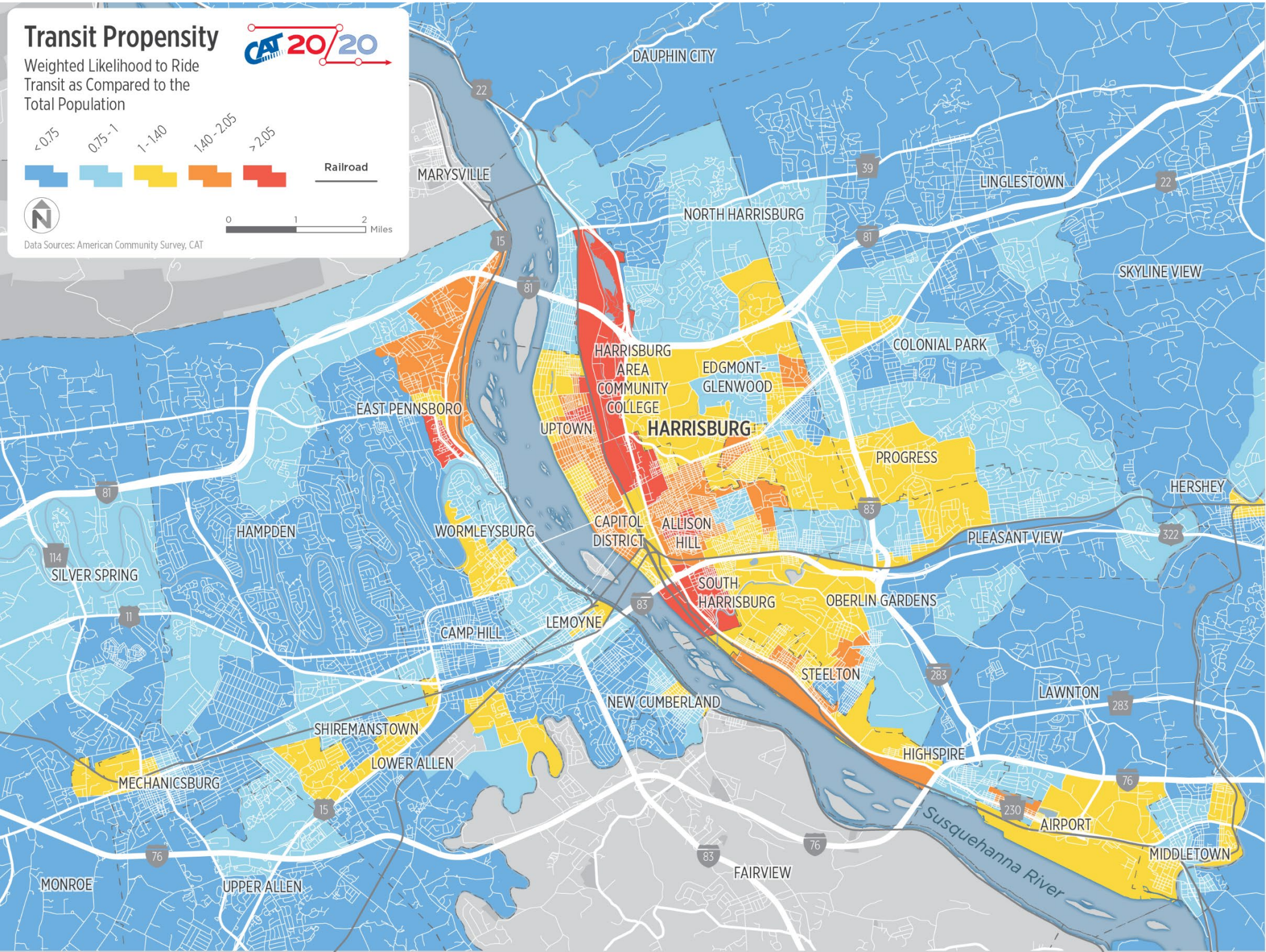
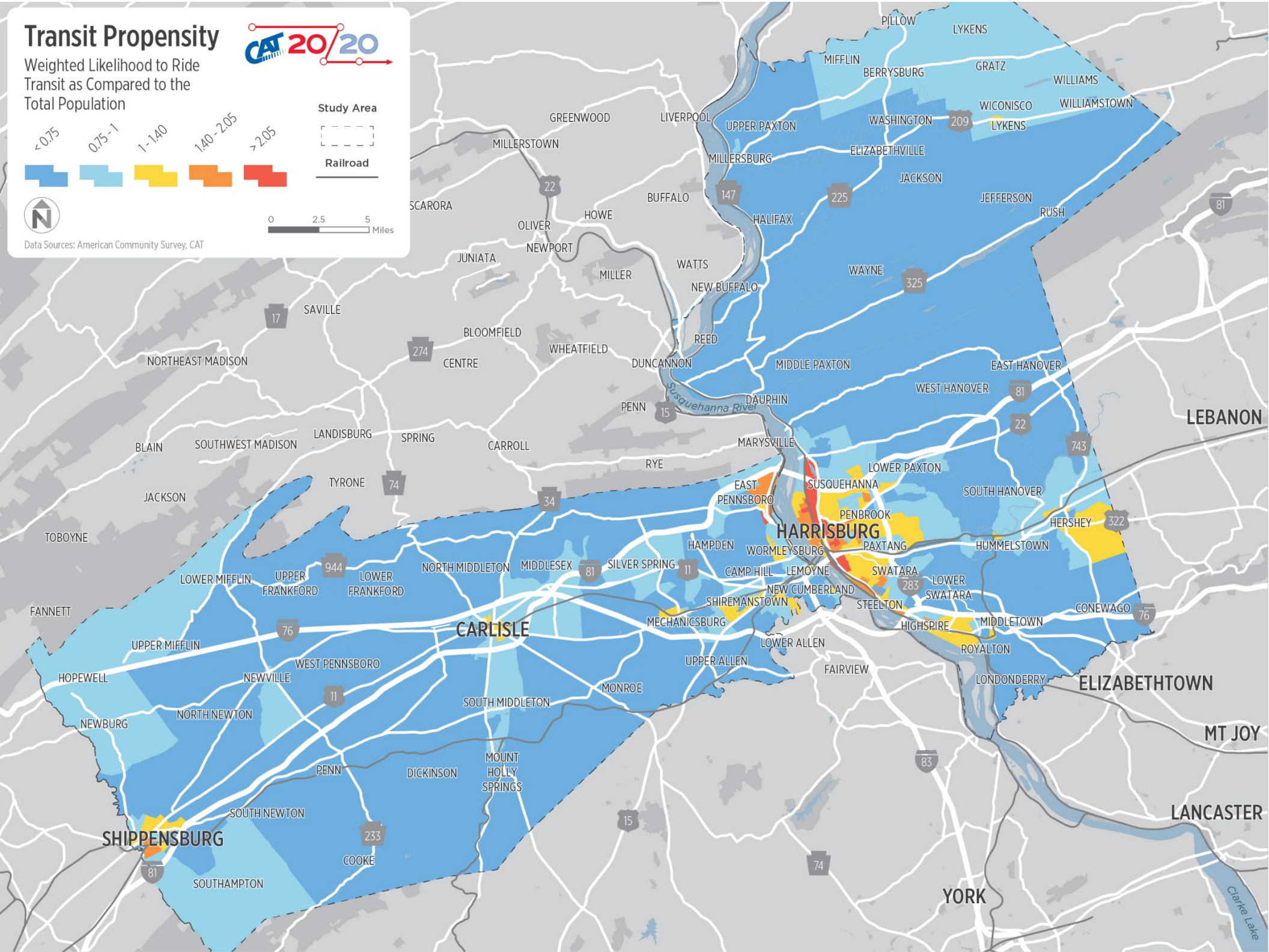


Figure 9: Transit Demand (Region)



Underlying Transit Demand

Population density and employment density each provide an indicator of potential transit demand, but when the two are combined and considered together, the demand in many areas will be significantly higher than when looking at each factor alone. This also captures areas with a mix of uses (residential, job centers, commercial areas) that can generate particularly high transit ridership.

When population and employment-based demand are considered together, it is clear that the underlying demand for transit is very high in core urban area, and generally declines with distance from the core, although with some exceptions. These exceptions include Central Carlisle, areas near Shiremanstown, and areas near Hummelstown.

As described in the previous sections, CAT provides service in all of these areas. However, much of that service is infrequent and does not directly connect to key destinations based on the radial route network.

Figure 10: Composite Transit Demand (Core)

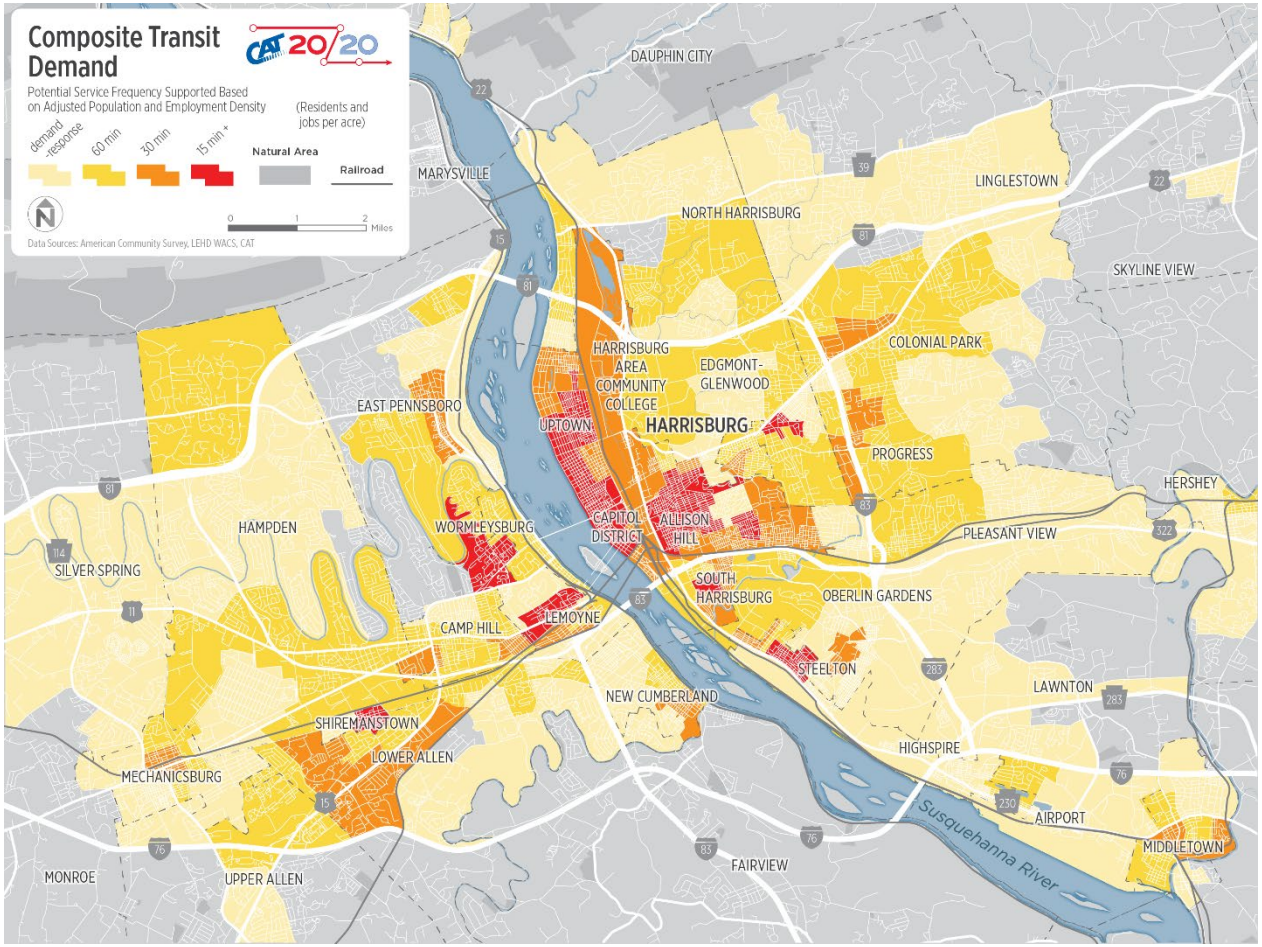
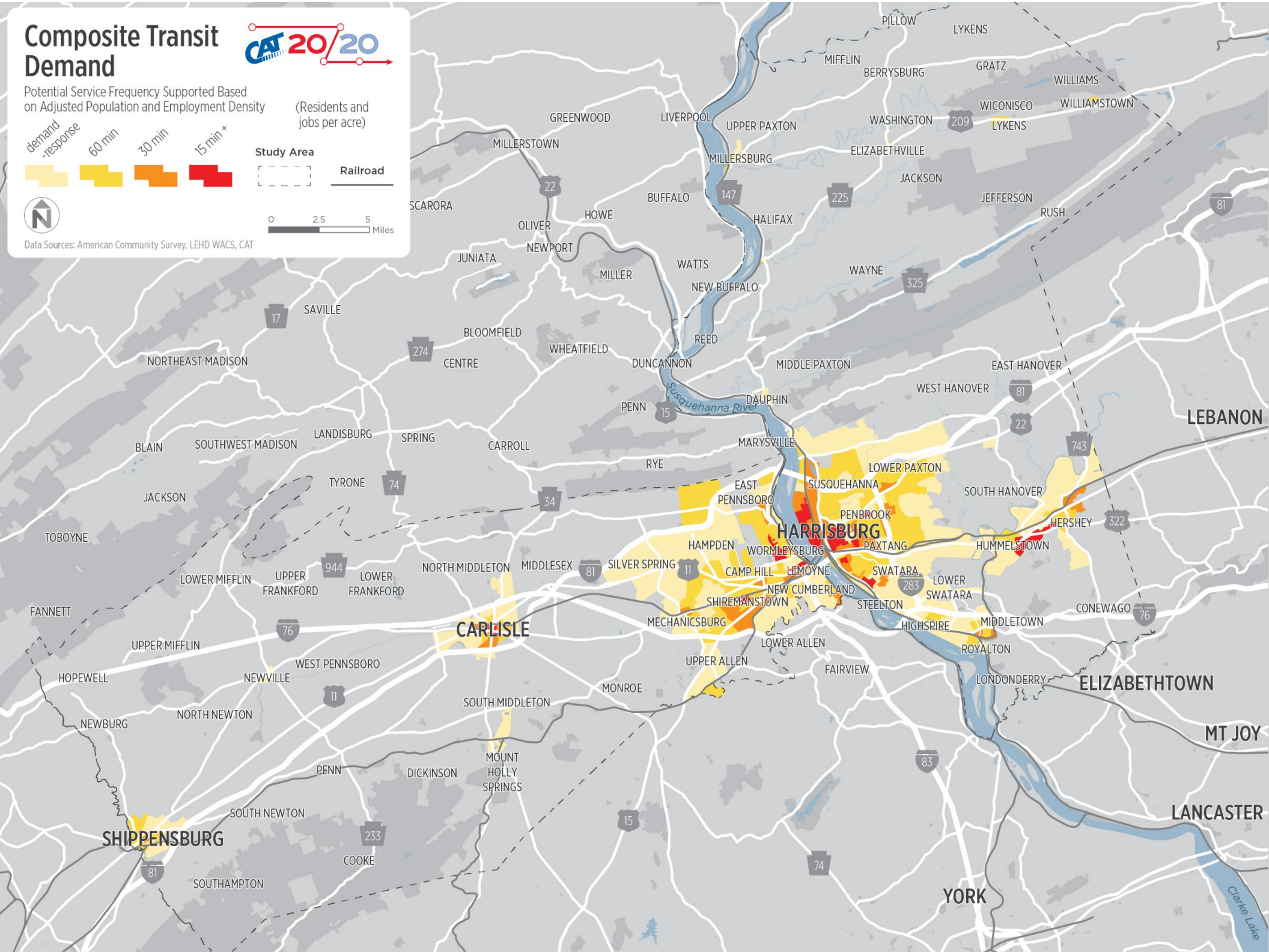


Figure 11: Composite Transit Demand (Region)



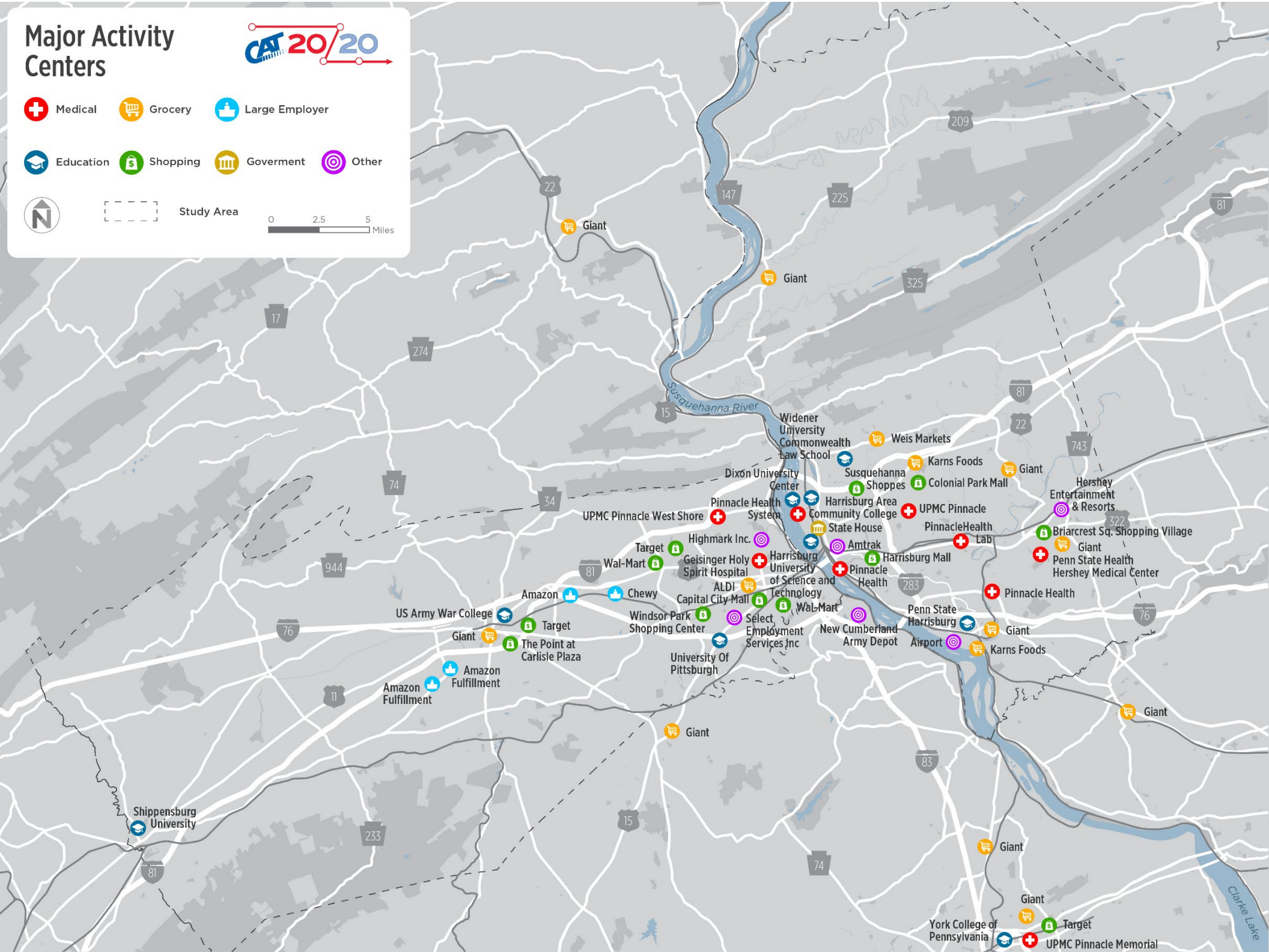
Major Activity Centers

Activity centers generate additional demand for transit. These include large employers, hospitals and healthcare centers, universities, and entertainment destinations. While some of these major activity centers are located in areas with a high transit propensity, many are not. These locations represent points that may warrant transit service despite having a lower transit propensity.

The CAT system was designed with a focus on Downtown Harrisburg, which was the traditional center for employment and the commercial heart of the region. As a result, transit routes were designed in a radial pattern to take people to and from Downtown. Today, while Downtown does remain an employment center due to the presence of the State Capitol Complex, many employers and the majority of commercial centers exist outside of Harrisburg. The existing radial bus network makes serving these outer locations challenging.

The primary barrier is simply distance, as many residential areas are separated from activity centers by the geography of the area and the limits of the existing transit network. Grocery stores are a primary example of this challenge. With no grocery store in Downtown Harrisburg, residents who do not live near a grocery store are required to travel a significant distance to access food. For individuals relying on transit, this travel is made more difficult by low frequency service and indirect routing.

Figure 12: Major Activity Centers (Region)



Travel Patterns

For transit to be effective, it must take people from where they are to where they want to go. Travel flows, which show the places that people travel within the study area, are one resource to determine where direct or quick transfer connections should be established within an area. Travel flows within the study area were mapped based on work trips taken between travel analysis zones, which are defined by county subdivisions and city neighborhoods.

The map on the following page shows all travel flows across Harrisburg and its immediate vicinity. The map on the page after that shows the larger region with travel flows across Dauphin County and Cumberland County.

The maps show daily weekday work trips made by all modes, including both transit and automobile trips. The data was retrieved from the Longitudinal Employment Household Dynamics (LEHD) survey from the US Census. It is important to note that this data is based on household tax returns, indicating the place of residence and the place of work of the population in the area.

Core Travel Flows

Downtown Harrisburg has traditionally been and remains the primary business district and employment center in the region. Thus, most CAT services are oriented toward serving the downtown core. However, there are major travel flows that do not begin or end in Downtown Harrisburg. For instance, the connection between Oberlin Gardens and Colonial Park or between Woodridge Estates and Colonial Park.

Regional Travel Flows

Beyond the urban center, there are significant travel flows to and from Hershey. There are also notable travel flows into Carlisle from the north and south, as well as between Woodridge Estates and Lower Paxton. There are moderate travel flows between Silver Springs and Hamden, Shepherdstown and Hamden, and Enola and Hamden.

There are significant travel flows between Harrisburg and the following areas:

- Woodridge Estates
- Lower Paxton
- Hampden
- East Pennsboro
- Swatara

Travel flows within the service area indicate that travel is complex. While there is a clear demand to access Downtown Harrisburg, this demand is generated from across the region, including within the central urban areas and the suburbs. In addition to Harrisburg, Hershey generates trips to and from various locations in the region, including Harrisburg. Throughout the study area, there are several notable suburb-to-suburb travel flows. These types of travel flows indicate potential demand for crosstown transit services, which do not pass through the core.

Figure 13: Travel Flows (Core)

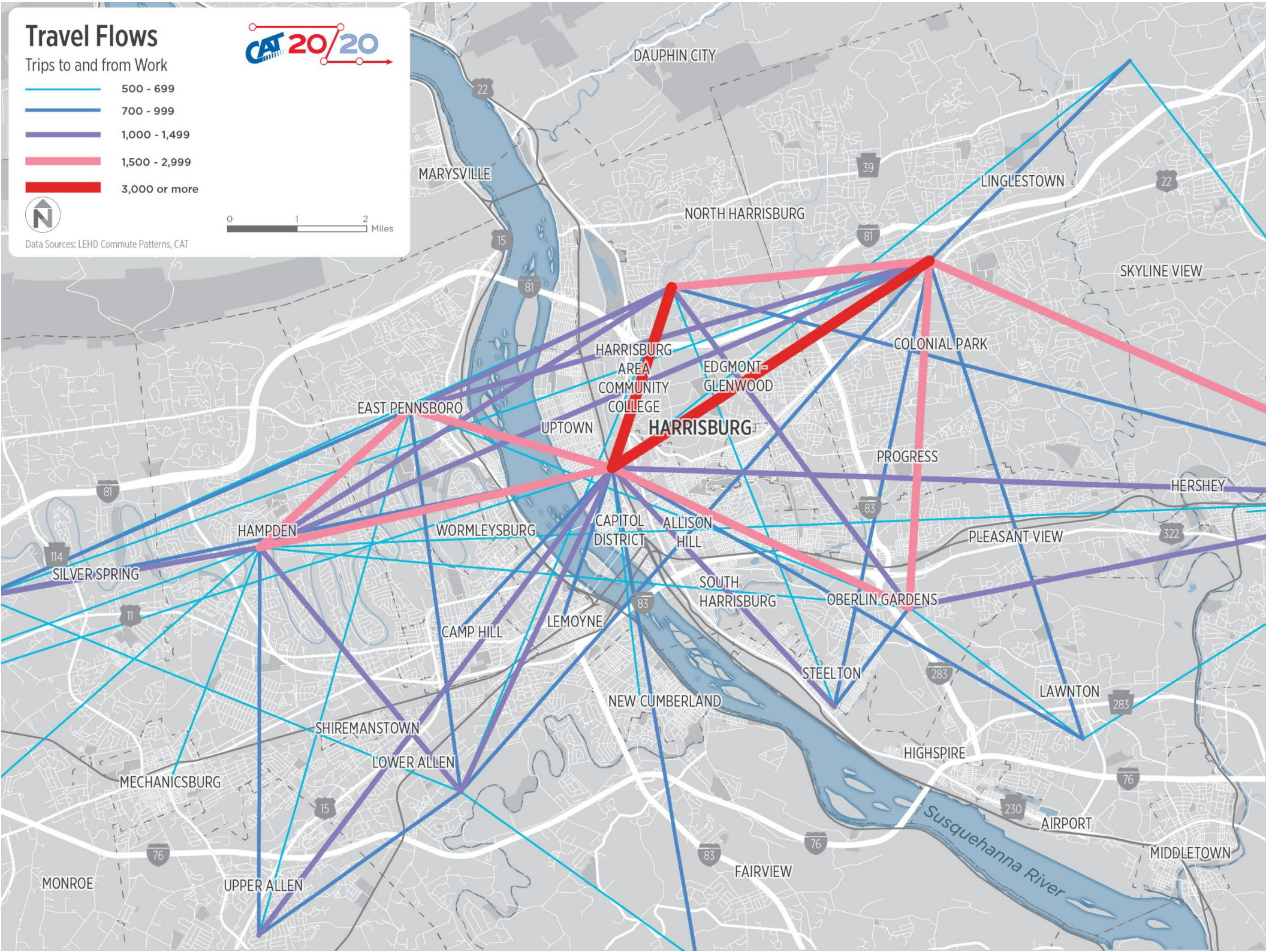
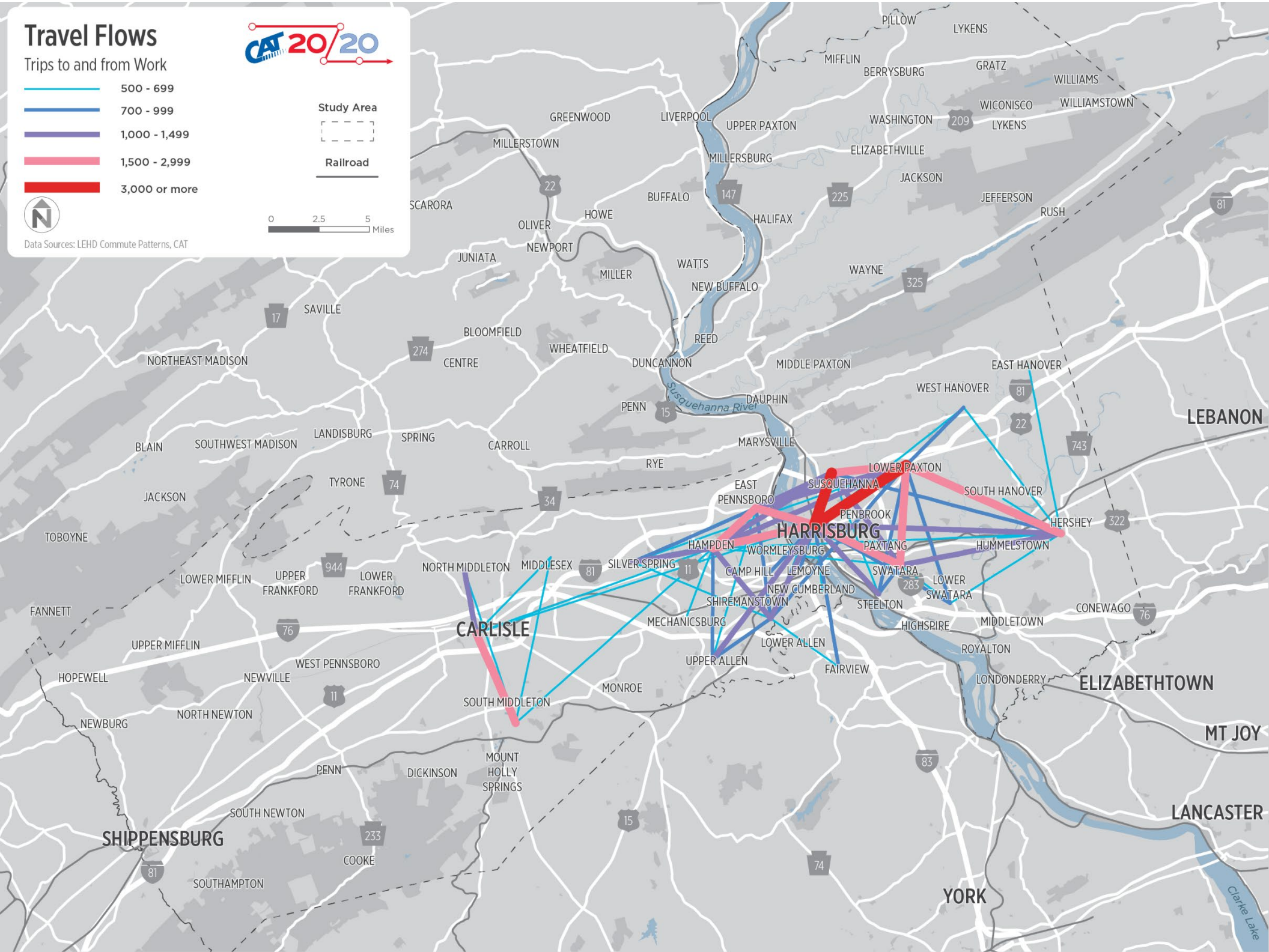


Figure 14: Travel Flows (Region)



Summary

Gaps between existing CAT service and market demand for transit include both areas that are underserved and connections that are unserved due to inconvenient service or lack of service. Some locations in the service area, even those close to the urban core, are served by lower levels of service than is warranted by demand, as indicated by population density, demographics, and job density. Some existing services do not adequately serve crosstown trips, especially to job opportunities and activity centers outside of Downtown Harrisburg.

- There are significant geographic barriers within the service area. These barriers include hills and mountains, which not only limit where routes can go, but also how customers walk to service. The Susquehanna River divides the East and West Shores. The railroad and rail yards require bridges to traverse and while bridges do exist, there are only a few, providing limited options for where routes can go.
- There is a lack of crosstown connections. Travel flows indicate key connections outside of Harrisburg. The most notable are travel flows to Hershey and travel flows into Carlisle. Connections between Woodridge Estates and Lower Paxton and between Oberlin Gardens and Lower Paxton also stand out. Beyond these crosstown connections, there is a notable lack of crosstown connection between the East Shore and West Shore.
- Areas of high demand are underserved. Within the central urban area, there is notable demand for frequent transit along the East Shore. Transit demand is particularly high from Steelton to Harrisburg Area Community College, including South Harrisburg, Capitol District, Uptown, and Allison HIll. Along the West Shore, East Pennsboro stands out as having particularly high demand for transit. Outside of the central urban area, Shippensburg, Carlisle, and Hershey have relatively high demand for transit.
- There are vast areas of low transit demand. While there are notable areas of transit demand in the region, there are also large areas with little or no transit demand. This type of environment is challenging to serve with transit, because service must pass through areas of very low productivity to connect to areas of demand. This naturally dilutes the overall productivity of transit service.
- Access to major activity centers is limited. Across the service area major activity centers are clustered, providing easy access to localized populations. However, in areas with no access to major activity centers, such as grocery stores, there are barriers to accessing food. The primary barriers are long travel distances, geographic barriers that separate many residential areas from activity centers, and the limitations of the existing transit network.

NELSON NYGAARD