Duke Street Transitway

Existing Conditions Report

Prepared for:

The City of Alexandria

Prepared by:

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1. Executive Summary

Duke Street In Motion is a multi-phased planning effort with the goal of identifying a preferred Bus Rapid Transit (BRT) alternative along the Duke Street Corridor.

The Duke Street Corridor is defined as a half-mile buffer surrounding the portion of Duke Street between Van Dorn Street/the future WestEnd Alexandria development and Callahan Drive/King Street Metro Station. The Corridor provides vital regional connectivity, serving as a major linkage between Alexandria and surrounding Fairfax and Arlington Counties. Critical to this regional connectivity are the Washington Metropolitan Area Transit Authority (WMATA) and Alexandria Transit Company (DASH) transit routes that serve the corridor, including DASH 30 and Metrobus 29K/N and 28A.

This section summarizes existing conditions within the Duke Street Corridor. Those interested in additional details are encouraged to read the main body of the report.

Demographics and Land Use

Transit relies on appropriate development and demographic patterns to operate efficiently. Many riders live in households with no vehicles. Demographic data, including underserved populations, and land use data were analyzed to assess the degree that development patterns are transit-supportive within the Corridor and identify demographic patterns.

Land Use and Population Patterns: High-density residential development is mainly concentrated at the east and west ends of the Corridor, while low-density residential development is mainly concentrated in the center. Commercial land uses follow similar patterns, with the addition of commercial developments located directly on Duke Street throughout the corridor.

Population density generally corresponds with land use throughout the Corridor. Population is mainly concentrated at the eastern and western ends of the Corridor, while population is less dense in the center.

Underserved Population Patterns: Percentages of minorities, zero-vehicle households, households with more workers than vehicles, and low-income individuals generally decrease from east to west along the Corridor.

Traffic Analysis and Safety

Safety and traffic operations are important to a successful transportation system. Patterns in traffic volumes, traffic operations, and safety are analyzed throughout the Corridor. High traffic volumes, operational challenges, and safety issues are highly correlated in the Duke Street Corridor.

Safety: High crash areas are concentrated on the eastern and western ends of the Corridor, where significant traffic volumes are located. Pedestrian crashes tend to be more severe than crashes in general, with 17.8% of pedestrian crashes resulting in fatalities or serious injuries versus 2.2% of all crashes.

Traffic Volumes: Traffic volumes range from 22,600 to 36,300 average annual daily traffic (AADT) throughout most of the Corridor, with the heaviest traffic volumes found on the eastern and western ends of the Corridor. The section of Duke Street between I-395 and Van Dorn Street carries approximately 53,000 AADT, partially due to the access to and from the I-395 Express Lanes. The section of Duke Street between Telegraph Road and North Quaker Lane experiences particularly heavy congestion due to a combination of high volumes centered around the Telegraph Road interchange and lower capacities.

Traffic Operations: Operational challenges are mainly concentrated in the eastern and western ends of the Corridor. Due to persistently high traffic volumes, multiple intersections east of Quaker Lane experience significant congestion.

Significant left-turn volumes at Jordan St. and North Pickett Street/South Pickett Street present operational challenges as well.

Traffic Travel Speeds: Travel speeds vary considerably by time of day and direction. In general, traffic operates the slowest between Quaker Lane and Roth Street. Eastbound traffic between Jordan Street and Wheeler Avenue is considerably slower in the evening peak versus the morning peak, decreasing by approximately 15 MPH.

Transit Service

A clear understanding of how well transit is performing is critical to improving service. Service frequencies, ridership patterns, bus speeds, bus stop conditions, and walksheds around stops are analyzed to identify opportunities to improve service in the Corridor.

Service Frequency: The Duke Street Corridor effectively has low headways due to DASH 30 and Metrobus 29K/N and 28A running along the Corridor concurrently, with peak headways being shorter than off-peak headways. During peak times, riders can expect to wait a maximum of 10 minutes between buses. During off-peak times, expected wait times depend on a rider's location along the Corridor and whether they wish to board a DASH or Metrobus bus.

Ridership Patterns: Most boardings and alightings (ridership) are occurring at the eastern and western ends of the Corridor, where commercial and residential development is generally most intense. High ridership areas in the center of the Corridor are at key regional destinations, such as Alexandria Commons.

Effects of COVID-19 on Ridership: The DASH and Metrobus routes operating in the Corridor have rebounded strongly from COVID-19, with DASH 30 and Metrobus 29K/N and 28A all outpacing national trends in post-pandemic ridership recovery.

Bus Stop Conditions: There are 43 bus stops throughout the Corridor serving DASH 30 and/or Metrobus 29K/N and 28A. While 72% have all the basic elements expected (signage, a landing pad, and pedestrian accessibility), only 35% have a shelter and seating, both of which are amenities expected with BRT and other premium transit service. Bus stops with both shelter and seating are generally at higher ridership locations.

Transit Travel Speeds: Transit travel speeds are generally lower at the eastern and western ends of the Corridor, which correspond with areas of higher ridership, higher development intensity, and generally lower traffic speeds.

Walkshed Analysis: Walksheds in the central portion of the Corridor generally encompass fewer people than walksheds in the eastern and western portions. A likely contributor is that the central portion of the Corridor has comparatively lower street connectivity and more winding streets, as well as less dense residential development.,

Multimodal Service

Transit users rely on a safe and easy-to-navigate system of sidewalk and trails with safe intersections and crosswalks to access transit. The conditions of sidewalks and intersections were assessed to determine strengths of existing amenities and where additional investment is needed. Pedestrians along Duke Street can expect strong sidewalk connectivity hindered by varied sidewalk conditions and a lack of crosswalks and ramps at many intersections.

Sidewalk Conditions: Approximately 97% of Duke Street has continuous sidewalks aside from a small section near Jordan Street. However, 43% of sidewalks were noted as having some sort of deficiency, such as a narrow width or poor surface quality. There are also no bike facilities along Duke Street, thus bicyclists use the sidewalk and parallel streets to move about the corridor.

Intersection Conditions: Intersections throughout the Corridor are often missing curb ramps and crosswalks or these features need repair. As a result, more than two thirds of intersections were rated as "Poor" during a field review.

2. Introduction

This report was drafted as part of the **Duke Street In Motion** planning process, the goal of which is to identify a preferred Bus Rapid Transit (BRT) alternative along the Duke Street Corridor. To serve as a basis for planning and later implementation, existing conditions information is presented in the following sections. This information is intended to paint a clear picture of current challenges and opportunities along the Duke Street Corridor, as well as to serve as an object of discussion among policymakers, project staff, and other stakeholders as the project advances.

This report documents the existing conditions within the Duke Street Corridor in Alexandria, Virginia, all of which ultimately factor into planning, design, and implementing BRT. The following domains are covered as part of the discussion of existing conditions:

- Demographics and Land Use
- Traffic Analysis
- Transit Service
- Multimodal Facilities
- Safety

3. Study Area Overview

The Duke Street Corridor study area is approximately four miles long, along Duke Street (Route 236) in Alexandria, Virginia. The Corridor spans the southern half of Alexandria, from Van Dorn Street/the future WestEnd – Alexandria development to Callahan Drive/King Street Metro Station. The Corridor is defined with a half-mile buffer surrounding the portion of Duke Street between Van Dorn Street and Callahan Drive.

The corridor is divided into four segments, referred to as Segment 1, Segment 2A, Segment 2B, and Segment 3 (see **Figure 1**). The termini of the segments are as follows:

- Segment 1: Landmark Mall (future WestEnd – Alexandria) to Jordan Street
- Segment 2: Jordan Street to Wheeler Avenue
- Segment 2B: Wheeler Avenue to Roth Street
- Segment 3: Roth Street to King Street Metro Station

In the following sections, these segments are displayed on maps and graphics for reference purposes. These segments correspond with varied roadway geometries and land use throughout the corridor and are used to identify solutions specific to segments.

Numerous Alexandria Transit Company (DASH) and Washington Metropolitan Area Transit Authority (WMATA, also known as Metrobus) Metrobus lines operate in and around the corridor. This report focuses on the DASH 30 and Metrobus 28A and 29K/N lines, which operate on Duke Street. **Figure 2** displays a regional overview of transit lines, with DASH 30 and Metrobus 28A and 29K/N highlighted. **Figure 3** shows the routing of DASH 30, Metrobus 29K/N, and Metrobus 28A along the Corridor itself. While not the focus of this report, DASH 31 and Metrobus 7A stop within the corridor as well.

In addition to operating along Duke Street, DASH 30 continues east along King Street into downtown Alexandria, then runs along Fairfax Street and Montgomery Street/Madison Street into the Braddock Road Station. At its western terminus, DASH 30 runs south along Van Dorn Street and Whiting Street to the Van Dorn Street Metro Station.

Metrobus 29K and 29N share routing along Duke Street (Route 236) and west along the Little River Turnpike (Route 236). At Pickett Road, 29N runs north to the Vienna Metro Station. Meanwhile, 29K continues west and eventually terminates at George Mason University. In the eastbound direction, 29K/N rejoin Pickett Road and continue east.

Metrobus 28A begins at the Tysons Corner Station in Fairfax County then continues southeast mainly along Leesburg Pike and Broad Street. 28A eventually turns south along Jordan Street into the Duke Street Corridor. It runs east along Duke Street into King Street Metro Station, alongside Metrobus 29K/N and DASH 30.

The current routing of DASH 30 and Metrobus 28A includes routing adjustments implemented in 2021, resulting from of the Alexandria Transit Vision Plan[1]. Metrobus also increased 29K/N and 28A frequency along with other route adjustments post pandemic to respond to all day demand on the corridor.

[1] https://www.alexandriava.gov/transportation-planning/program/alexandria-transit-vision-plan

Figure 1: Duke Street Corridor Segments

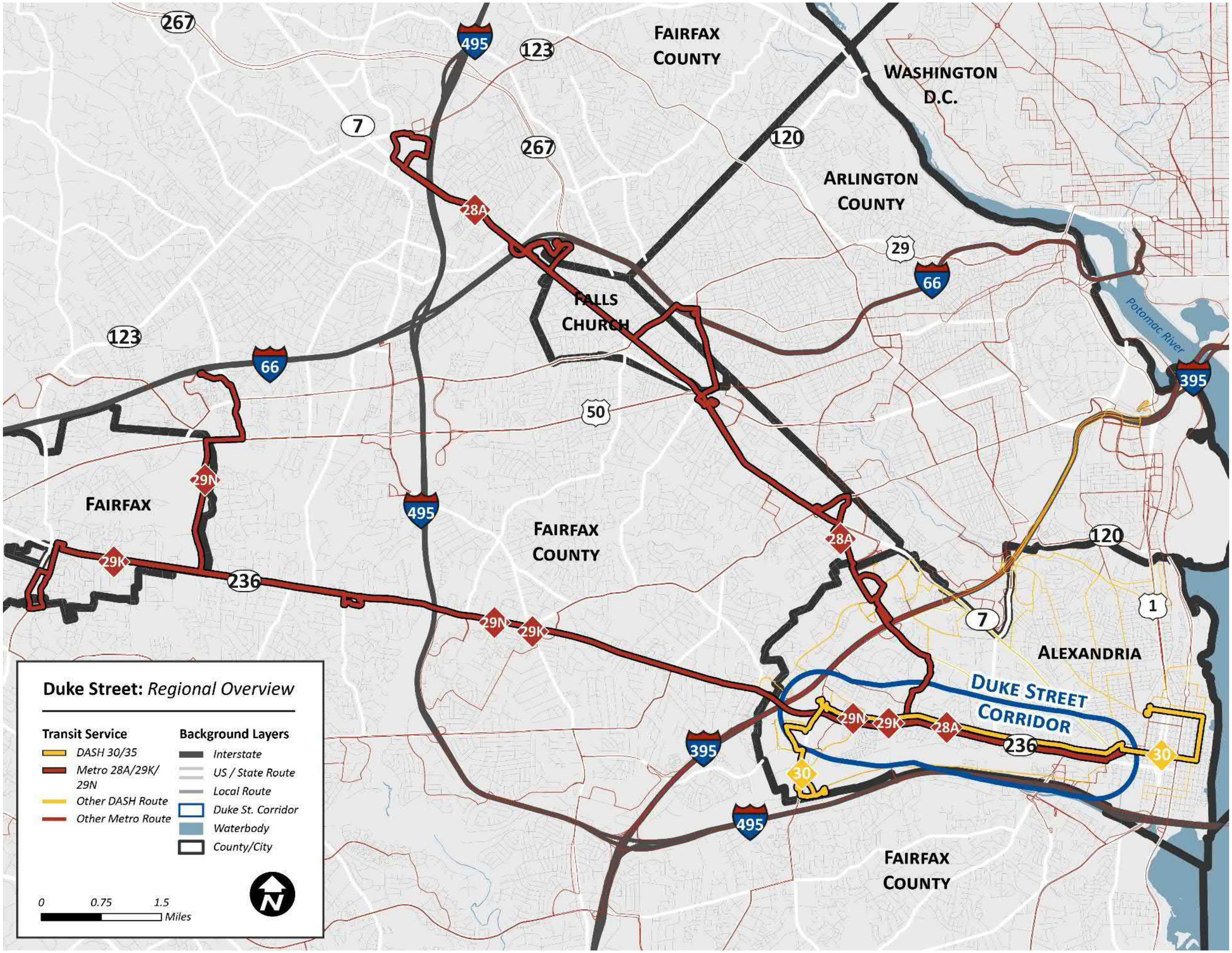


Figure 2: Regional Transit Service Overview (Data Sources: DASH and WMATA)

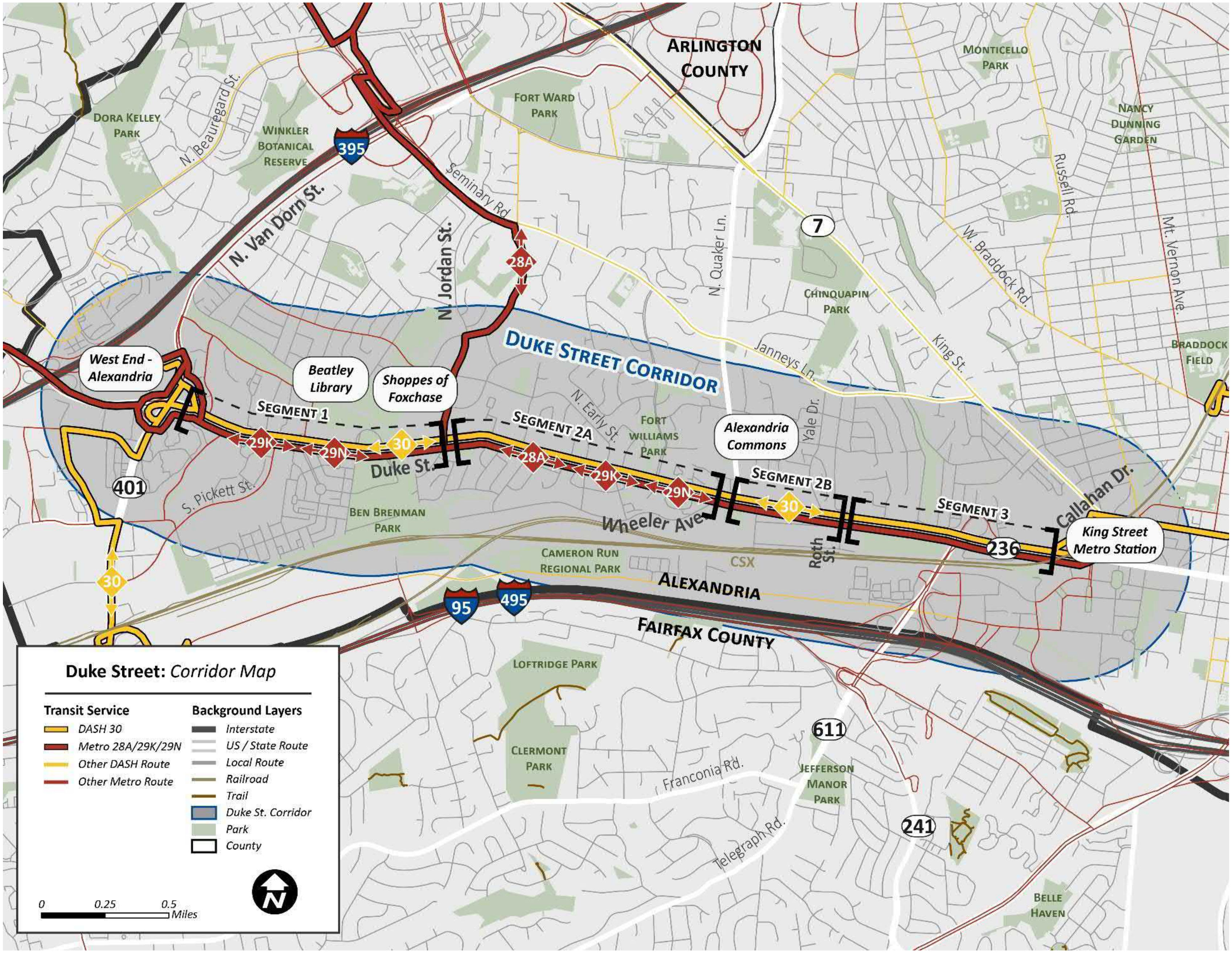


Figure 3: Corridor Map with DASH and Metrobus Routes (Data Sources: DASH and WMATA)

4. Existing Conditions

The following sections document existing multimodal conditions along the Duke Street corridor. The data and analysis provided in this report follows the assumptions outlined in the **Appendices:** Error! Reference source not found. **F ramework Document.**

4.1 Demographics and Land Use

Knowing the demographics and land use along the Duke Street corridor is crucial to meeting the needs of current and potential riders. To be competitive, transit operators need the requisite density of population and commercial activity to warrant service provision. Transit operators must also balance the need to run efficient service with the need to serve those who often do not have other options, such as low-income individuals and those without vehicles.

It is critical to understand where people live, where certain activities take place, and in what intensities these activities occur. Zoning, or land use regulations governing permitted land uses, intensities, and site design standards, is a critical driver of these factors, particularly pertaining to transit-oriented development (TOD). Additionally, transit-supportive plans and development regulations are a factor in who receives funding as part of multiple federal programs, such as the Federal Transit Administration's Capital Investments Grants Program, particularly if they include affordable housing.

This section discusses existing land use and demographics throughout the corridor to shed light on the land use and demographic conditions influencing service within the Duke Street Corridor today.

Land Use

Parcel data was obtained from the City of Alexandria's Open Data Portal, which includes parcel-level land use designations. Given the large number of land use classifications the City of Alexandria employs, these parcels were sorted into the following generalized land use categories:

- Single-family Residential
- Multi-family Residential
- Institutional
- Commercial
- Industrial
- Public Open Space
- Other Public Uses
- Utility/Transportation

Figure 4 shows generalized land use designations of parcels that are at least partially within the Duke Street Corridor. Single-family land uses predominate within the Corridor, with the vast majority of the area north of Duke Street consisting of single-family residential land use, as well as a significant amount along the southern edge of Segment 2A. Multi-family residential land uses predominate near the western end of the corridor, and there is a large pocket of multi-family residential land use between Segments 1 and 2A.

Commercial/office land uses are found throughout the Corridor but are particularly concentrated at each end, including West End Alexandria and King Street Metro Station. The Corridor also has public open space spread throughout, typically coincident with single-family residential or multi-family residential areas.

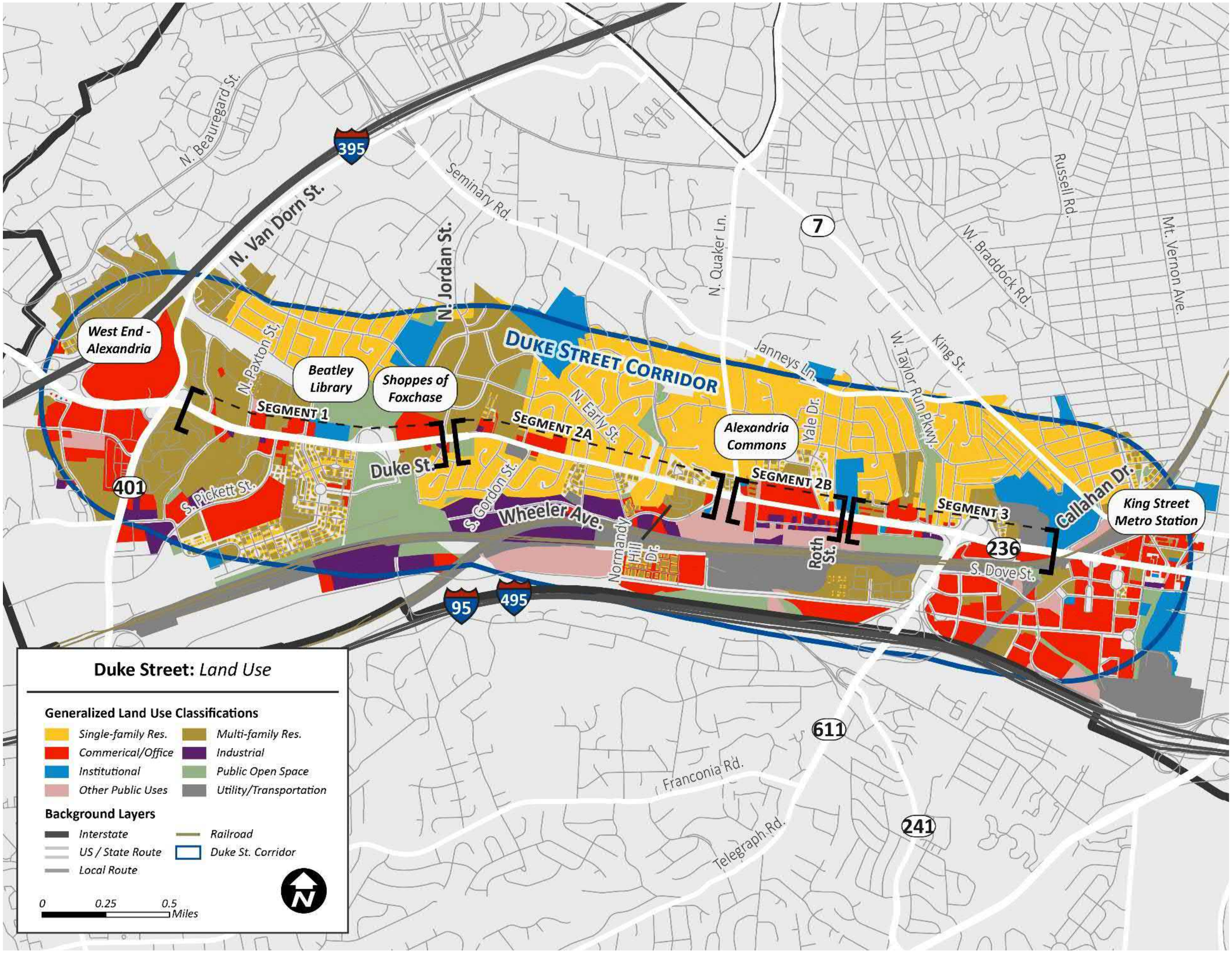


Figure 4: Generalized Land Use (Data Source: City of Alexandria)

Population Density

2020 population data was obtained from the United States Census Bureau's Decennial Census and is reported at the tract level. As this data is from the Decennial Census, it represents actual counts of individuals. Population counts were divided by the area of tracts in square miles to obtain population per square mile. See **Figure 5** below.

Residents are primarily concentrated along Segment 1 and to a lesser degree near King Street Metro Station. The high density along Segment 1 is primarily driven by apartment-style residences and interspersed townhouse development near Van Dorn Street. Along South Pickett Street is Cameron Station, which features closely spaced single-family homes, dense townhomes, and large apartment buildings. Near the Shoppes of Foxchase (along Jordan Street), there is a large apartment development contributing to the comparatively high density. Similarly, the high population density near King Street Metro Station is due to significant apartment-style development in and around downtown Alexandria.

By contrast, the comparatively low density along Segments 2A and 2B coincides with large swaths of single-family detached housing, as well as office, commercial and industrial uses.

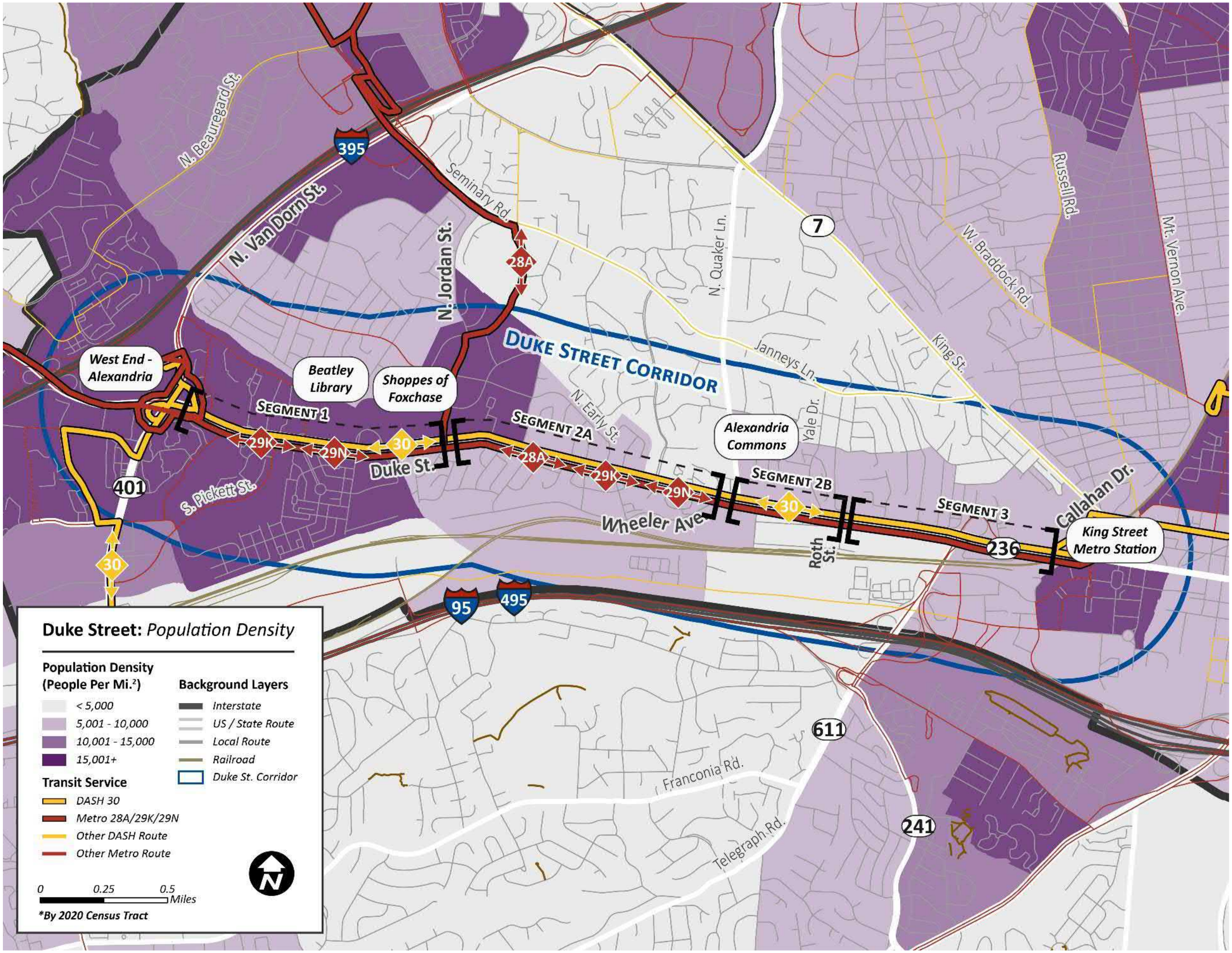


Figure 5: 2020 Population Density (Data Source: US Census Bureau, Decennial Census)

Minority Population Percentages

2020 population data was obtained from the United States Census Bureau's Decennial Census and is reported at the tract level. As this data is from the Decennial Census, it represents actual counts of individuals. Counts of those not identifying as White were divided by the total population of each tract to obtain the percentage of minorities per tract. This data is compared to population counts based on Census Bureau delineated city boundaries. See **Figure 6** below.

The Duke Street Corridor tends to become whiter from west to east, with the western and central portions of the Corridor being disproportionately non-White. Approximately 52% of Alexandria's population identifies as White alone, according to the latest Census estimates. As such, the portion of the Corridor along Segment 1 is disproportionately non-White, with multiple tracts near Van Dorn Street, Pickett Street, and Jordan Street having more than 60% of their population identifying as non-White. There are also significant percentages of minorities along Segments 2A, 2B, and 3, including multiple tracts where 40-60% of individuals identify as a race other than White. Along Segments 2B and 3 in particular, there are also tracts that are disproportionately White.

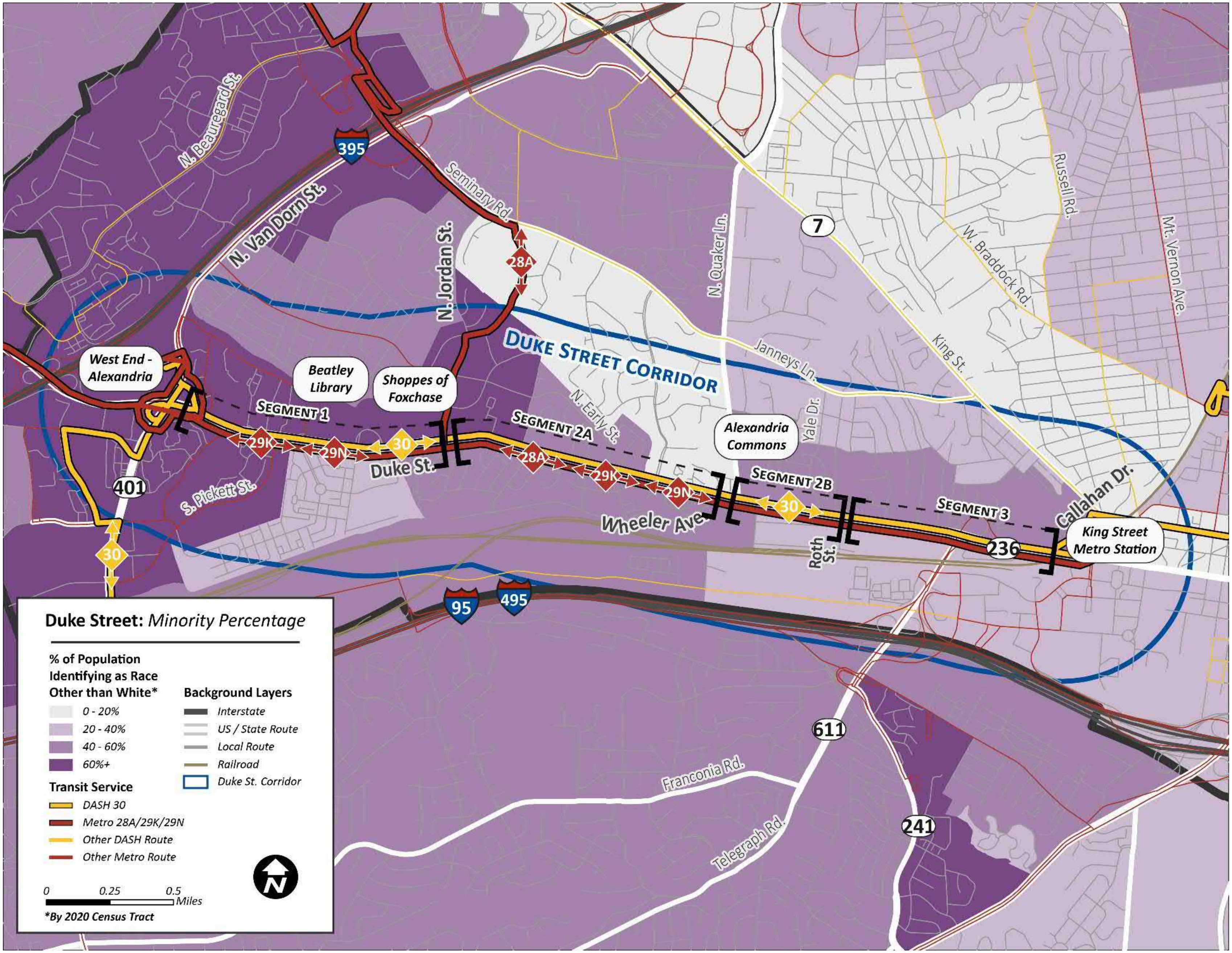


Figure 6: 2020 Minority Percentage (Data Source: US Census Bureau, Decennial Census)

Zero-vehicle Household Percentages

2020 5-year household estimates were obtained from the United States Census Bureau's American Community Survey (ACS) and are reported at the tract level. These estimates are divided by the total estimated households within each tract to determine the percentage of households with no access to a vehicle. This data is compared to 2020 household estimates of zero-vehicle households based on Census Bureau delineated city boundaries. See **Figure 7** below.

Note that this data does not necessarily distinguish between those who are vehicle-less by choice and those who cannot afford a vehicle. With that in mind, both groups of people benefit from strong transit.

An estimated 6.4% of households in Alexandria do not have access to a vehicle. Relative to Alexandria as a whole, most of the Corridor has relatively high levels of vehicle ownership, particularly along Segment 2A. Along Segment 1, there are Census tracts where 5-10% of households do not own a vehicle. Additionally, there are multiple tracts along Segments 2B and Segment 3 where 10-15% of households do not own a vehicle.

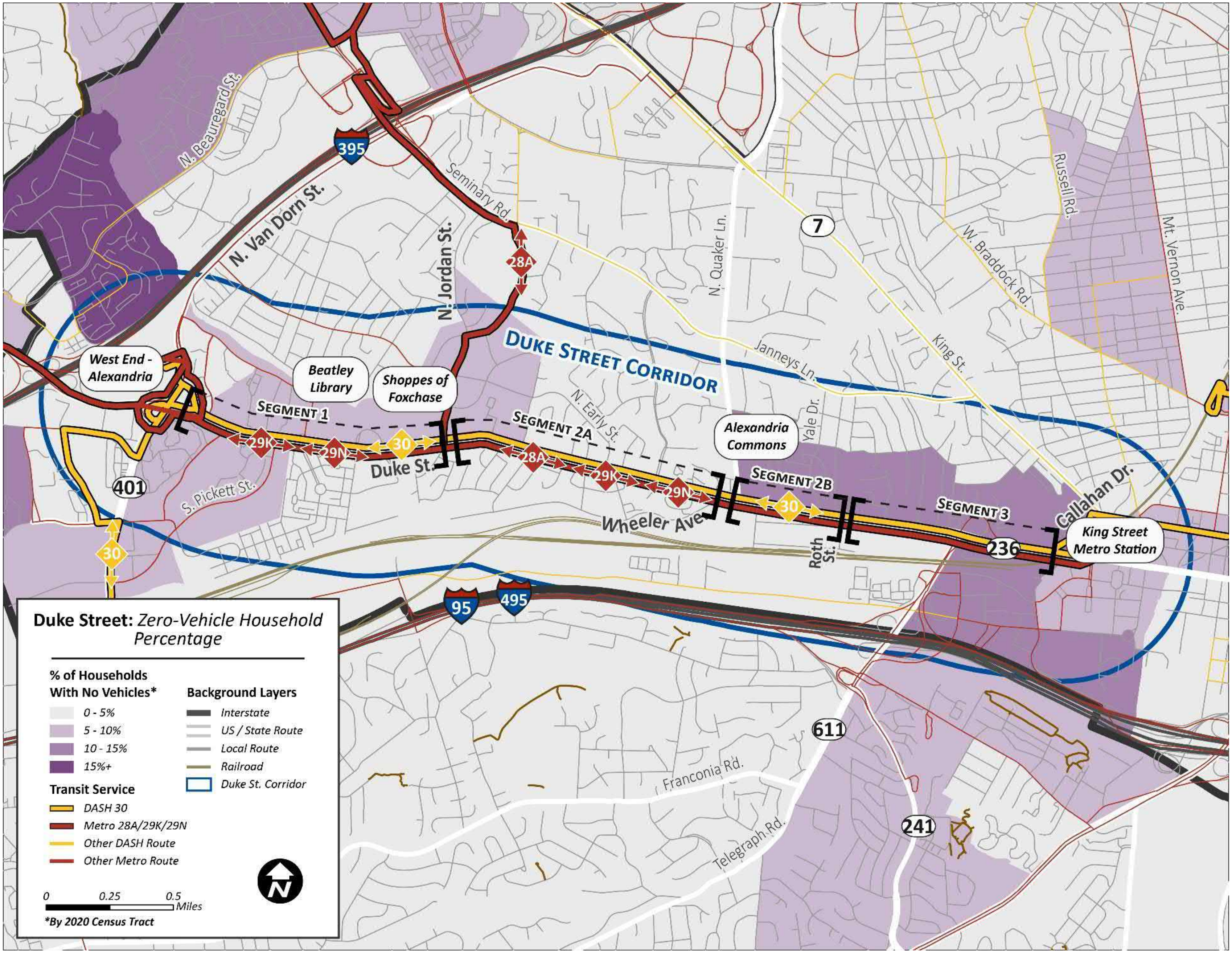


Figure 7: 2020 Zero-vehicle Household Percentage (Data Source: US Census Bureau, American Community Survey)

Households with More Workers than Vehicles Percentage

2020 5-year household estimates were obtained from the United States Census Bureau's ACS and are reported at the tract level. These estimates are divided by the total estimated households within each tract to determine the percentage of households where there are more workers than vehicles. In addition to zero-vehicle households, this is another way of identifying potential mobility needs that bus service can meet. See **Figure 8** below.

Households with more workers than vehicles are generally concentrated at the eastern and western ends of the corridor. Particularly along Segment 3, there are multiple Census tracts where more than 15% of households have more workers than vehicles. Segment 2B is surrounded by tracts where between 10-15% of households have more workers than vehicles. By contrast, Segments 1 and 2B, in the western half of the Corridor, have lower percentages of households with more workers than vehicles.

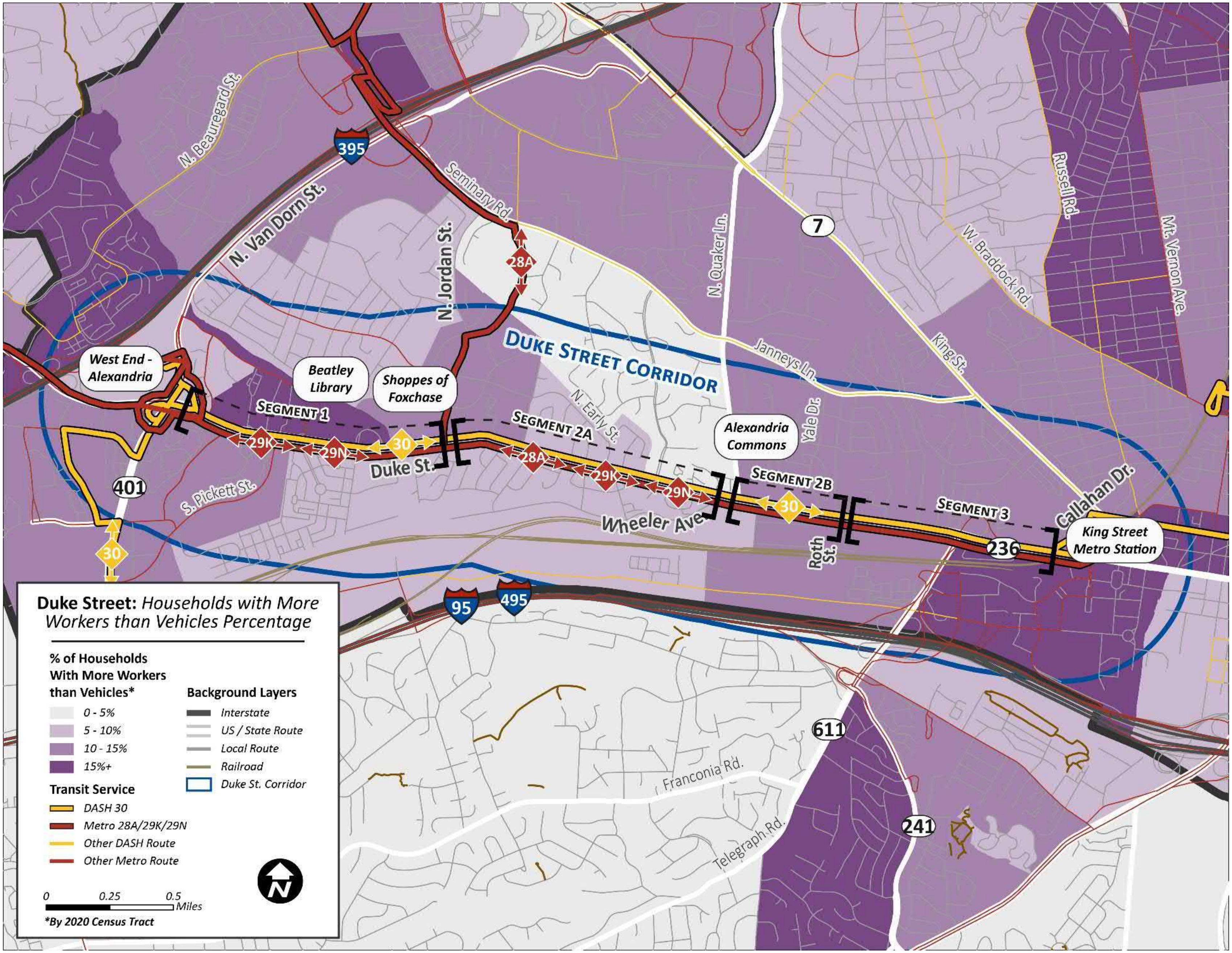


Figure 8: 2020 Households with More Workers than Vehicles Percentage (Data Source, US Census Bureau, American Community Survey)

Low-income Population Percentages

2020 5-year population estimates were obtained from the United States Census Bureau's ACS and are reported at the tract level. These estimates are divided by the total population for whom poverty status has been determined to obtain the percentage of those with income at or below 125% of the poverty line. This data is compared to 2020 population estimates of low-income individuals based on Census Bureau delineated city boundaries. See **Figure 9** below.

The percentage of low-income individuals generally decreases from east to west along the Corridor. Approximately 13% of Alexandria residents have incomes below 125% of the poverty line. Large portions along Segments 1 and 2A have greater concentrations of low-income individuals than Alexandria as a whole. There are two Census tracts directly on Duke Street with very high concentrations of low-income individuals, including one at the intersection of Van Dorn Street and Duke Street and one at the intersection of Jordan Street and Duke Street. Segment 2A is almost entirely enclosed by Census tracts where more than 15% of residents are classified as low-income.

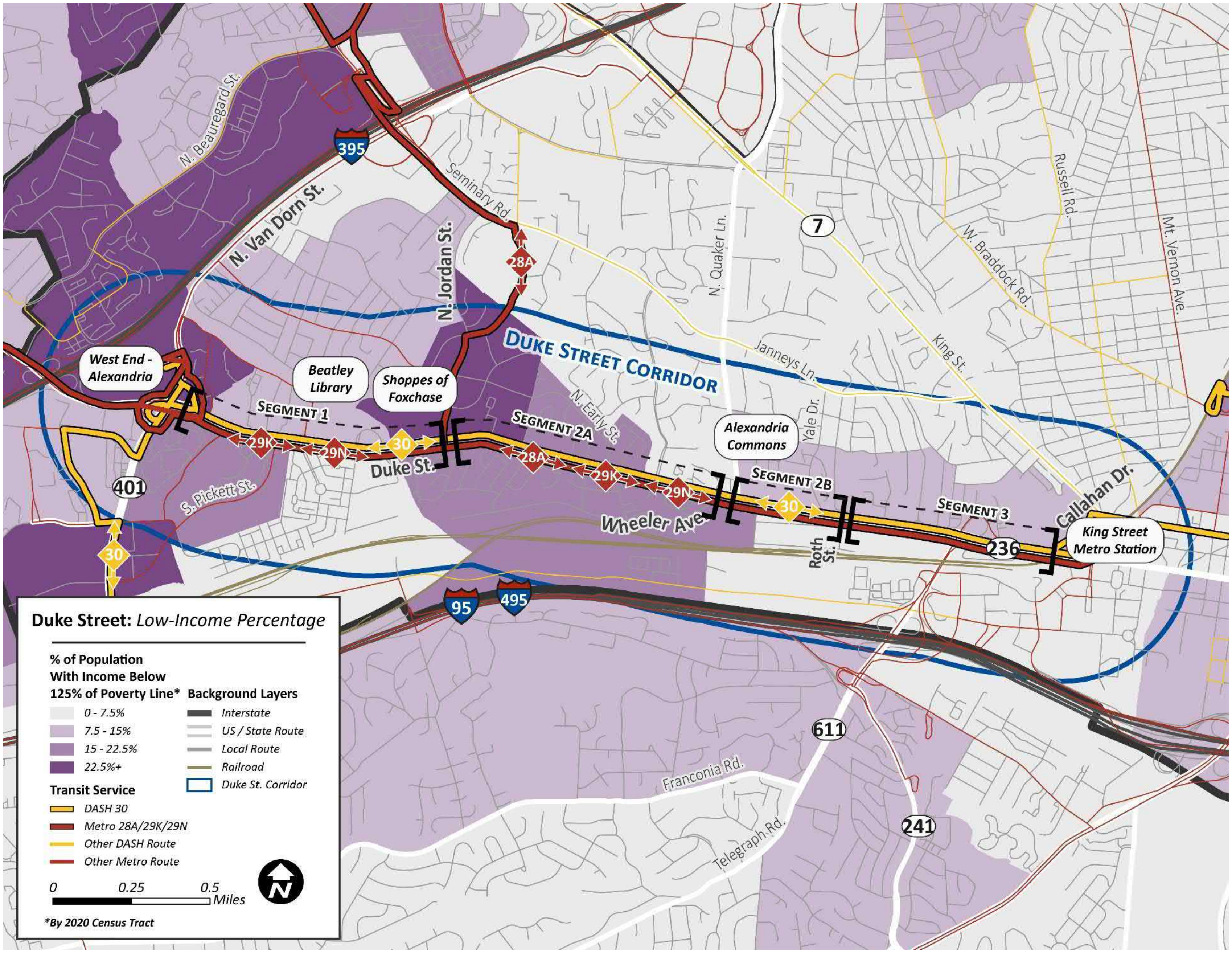


Figure 9: Low-income Percentage (Data Source: US Census Bureau, American Community Survey)

4.2 Traffic Analysis

Transit service along Duke Street currently operates in mixed traffic and is therefore subject to prevailing traffic conditions. Congestion and other operational challenges experienced along the Corridor negatively affects bus speed and reliability. As a result, understanding traffic patterns along Duke Street provides insight into the traffic conditions buses experience and the challenges motorists face. Prevailing traffic conditions are described to identify operational challenges along the Corridor.

Traffic Conditions and Operations

Traffic counts and vehicular travel times and speeds were obtained from field data collection in May 2022 to examine traffic conditions along Duke Street and to identify contributors to existing operational challenges.

The Corridor carries between 22,600 and 36,300 average annual daily traffic (AADT), remaining at or near pre-COVID-19 levels. The highest traffic volumes and ensuing operational challenges, including congestion and slow travel speeds, are generally concentrated in the eastern half of the Corridor. One exception is the section of Duke Street between I-395 and Van Dorn Street, an accessway that is critical to regional mobility. The addition of the I-395 Express Lanes has contributed to this section reaching 53,000 AADT.

Figure 10 and **Figure 11** display AM and PM peak vehicular travel times and speeds, respectively. EB and WB conditions are displayed separately.

Higher traffic volumes are largely associated with slower travel speeds throughout the Corridor, with the eastern half of the Corridor generally having slower travel speeds than the western half. During the AM Peak, Segments 2B and 3 are the primary bottlenecks along Duke Street, with average speeds in both directions varying between 15 and 19 MPH. While Segment 3 traffic flows considerably faster during the PM Peak, Segment 2B traffic flows considerably slower, at 10 MPH WB and 5 MPH EB.

Major interchanges and activity generators are likely contributors to the significant traffic volumes and slow speeds experienced along Segment 2B and Segment 3. The Telegraph Road interchange provides regional and city-wide connectivity. Additionally, Alexandria Commons is located along Segment 2B, while other shopping establishments and schools are located along Segment 2B and Segment 3. As a result, turning volumes are elevated due to vehicles entering and leaving establishments along Duke Street and entering the Telegraph Road interchange. This is compounded by low roadway capacity relative to the traffic this portion of Duke Street carries. The West Taylor Run Parkway intersection and Cambridge Road/Roth Street intersection also experience significant operational challenges.

By contrast, traffic generally flows faster along the western half of the corridor and experiences fewer operational challenges. Segments 1A and 2B WB maintain relatively high speeds in the AM and PM peaks, with Segment 2A WB only dropping to 19 MPH during the AM peak. These segments also have high EB speeds during the AM peak, with Segment 2A reaching 29MPH. That said, EB traffic slows considerably along Segment 2A, dropping to 14MPH.

Significant traffic volumes are also found on the western portion of the Corridor, such as at Van Dorn Street interchange due to the regional connectivity it provides to surrounding freeways. Comparatively minor operational challenges are also present at major signalized intersections such as Jordan Street, and North and South Pickett Street, mainly due to heavy left-turn volumes at these intersections.

Further details on existing traffic volumes and operations can be found in **Appendices: 0 Existing Vissim Calibration Memorandum**.

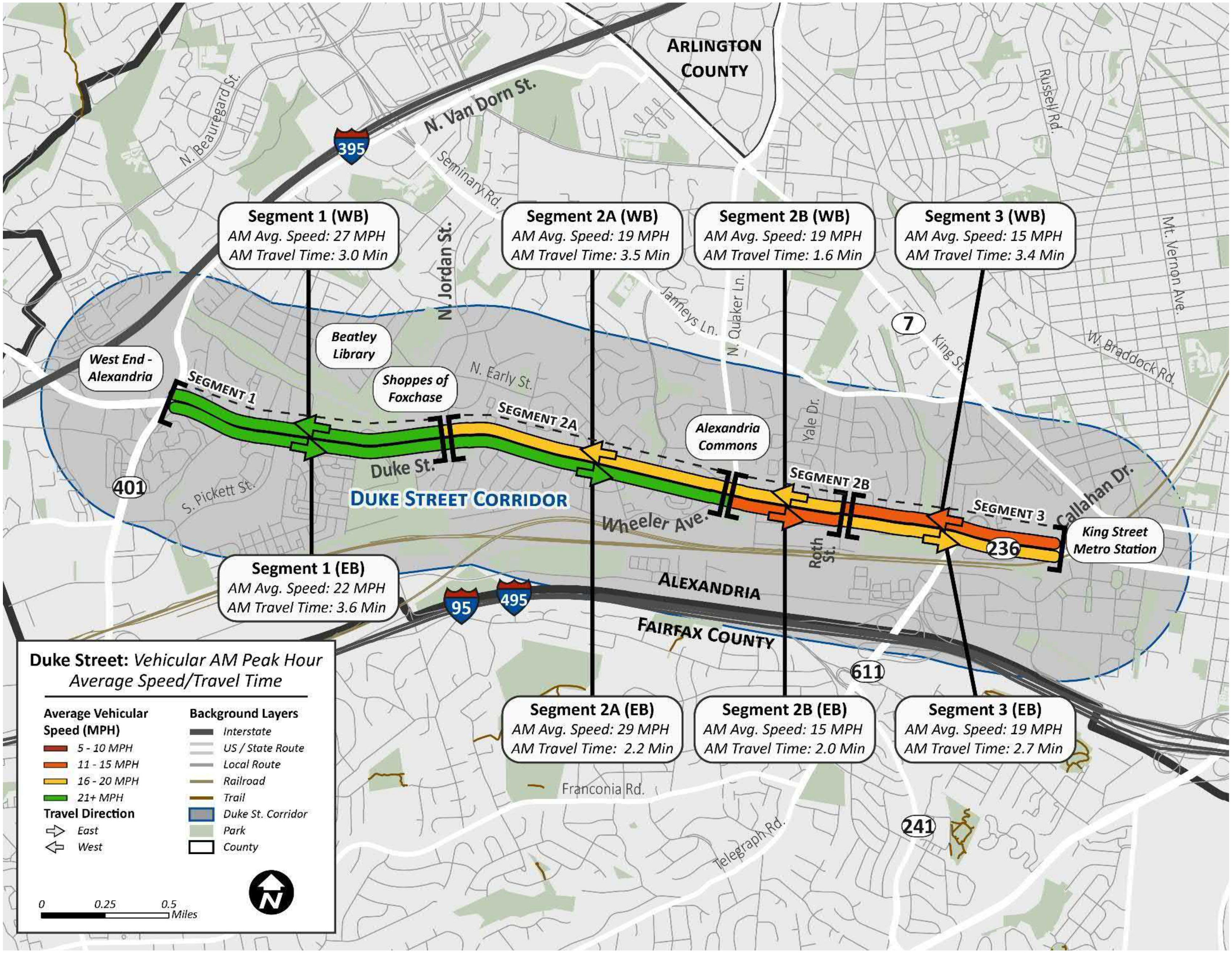


Figure 10: Average AM Peak Automobile Travel Time/Speed by Segment (Data Source: Field Travel Time Runs, May 2022)

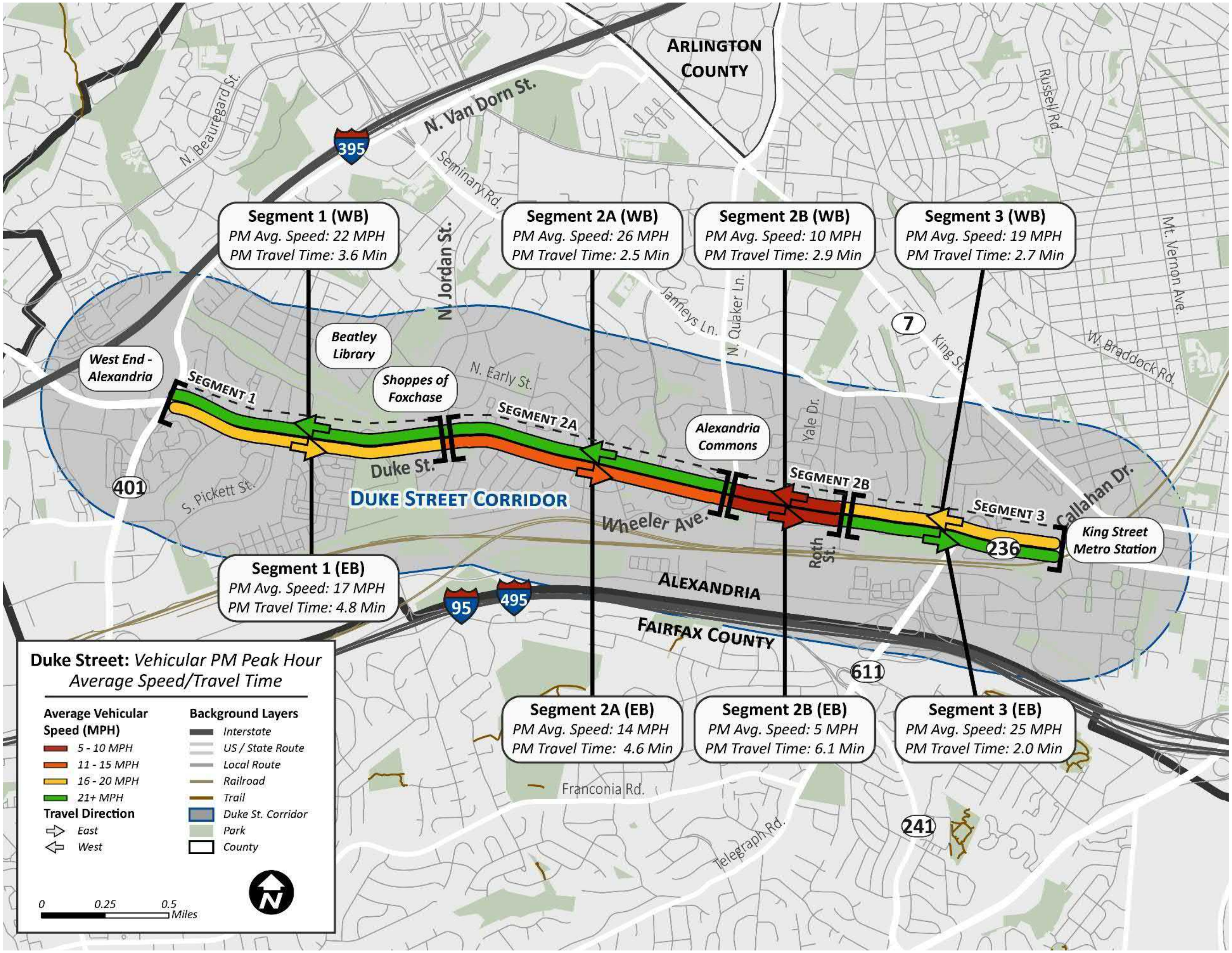


Figure 11: Average PM Peak Automobile Travel Time/Speed by Segment (Data Source: Field Travel Time Runs, May 2022)

4.3 Transit Service

A clear understanding of existing service conditions, ridership, stop condition, and stop accessibility is critical to planning for BRT implementation. Concentrations of ridership must be identified to determine where continued high-quality service should be provided. Similarly, the areas currently served by bus stops should be identified, both to measure the quality of existing service and to identify where, despite currently being served, certain areas may not be a source of ridership. Finally, riders expect high-quality, consistent service while transit in the Duke Street Corridor currently operates in mixed traffic. As such, it is limited by prevailing traffic conditions, a problem that BRT tends to address through separated transit lanes.

This section discusses the following aspects of transit service along Duke Street:

- Service Frequency
- Ridership
- Bus Stop Conditions
- Transit Travel Speeds
- Walkshed Analysis

Service Frequency

The Duke Street Corridor effectively has high-frequency transit service due to multiple lines running along it, some of which are high-frequency themselves. This is particularly the case east of Jordan Street, where Metrobus 28A turns onto Duke Street.

Table 6 shows the peak and off-peak headways (or frequency) of DASH 30 and Metrobus 28A and 29 K/N. During peak periods, DASH 30 has a 10-minute headway and Metrobus 28A has a 12-minute headway. Metrobus 29K/N, between the two routes, have a 20-minute headway.

Route	Peak Headway (Frequency)	Off-Peak Headway (Frequency)
DASH 30	10 Minutes	30 Minutes
Metrobus 28A	12 Minutes	12 Minutes
Metrobus 29K/N	20 Minutes	20 Minutes

Table 1: Route Headways
(Data Sources: DASH and WMATA)

Headways are longer during off-peak periods compared to peak periods. Metrobus 28A and Metrobus 29K/N run at the same frequency as peak times, 12 minutes and 20 minutes, respectively. However, DASH 30 operates every 30 minutes instead of every 10 minutes.

Riders travelling along Duke Street can expect to wait a maximum of 10 minutes at a bus stop during peak times due to DASH 30's 10-minute peak headway. During off-peak times, expected wait times vary depending on location along the Corridor and which DASH or Metrobus route a rider wishes to board. Riders can expect to wait a maximum of 30 minutes for a DASH 30 bus through the entire Corridor, 12 minutes at Metrobus 28A stops, and 20 minutes at Metrobus 29K/N stops.

Measuring bus frequency in terms of buses per hour is another way understanding how bus frequency and ensuing wait times differ throughout the Corridor. **Figure 12** and **Figure 13** display peak and off-peak buses per hour throughout the Corridor, respectively.

During peak times Segments 2A, 2B, and 3 have the highest buses per hour at 14 due to Metrobus 28A turning onto Duke Street at Jordan Street. West of Jordan Street, along Segment 1, nine buses per hour travel along the Corridor.

By comparison, buses per hour travelling along the Corridor are lower during off-peak times due to overall lower headways. Segments 2A, 2B, and 3 again have the highest buses per hour due to 28A turning into Duke Street at Jordan Street with 10 buses per hour. West of Jordan Street, 5 buses per hour travel along the Corridor.

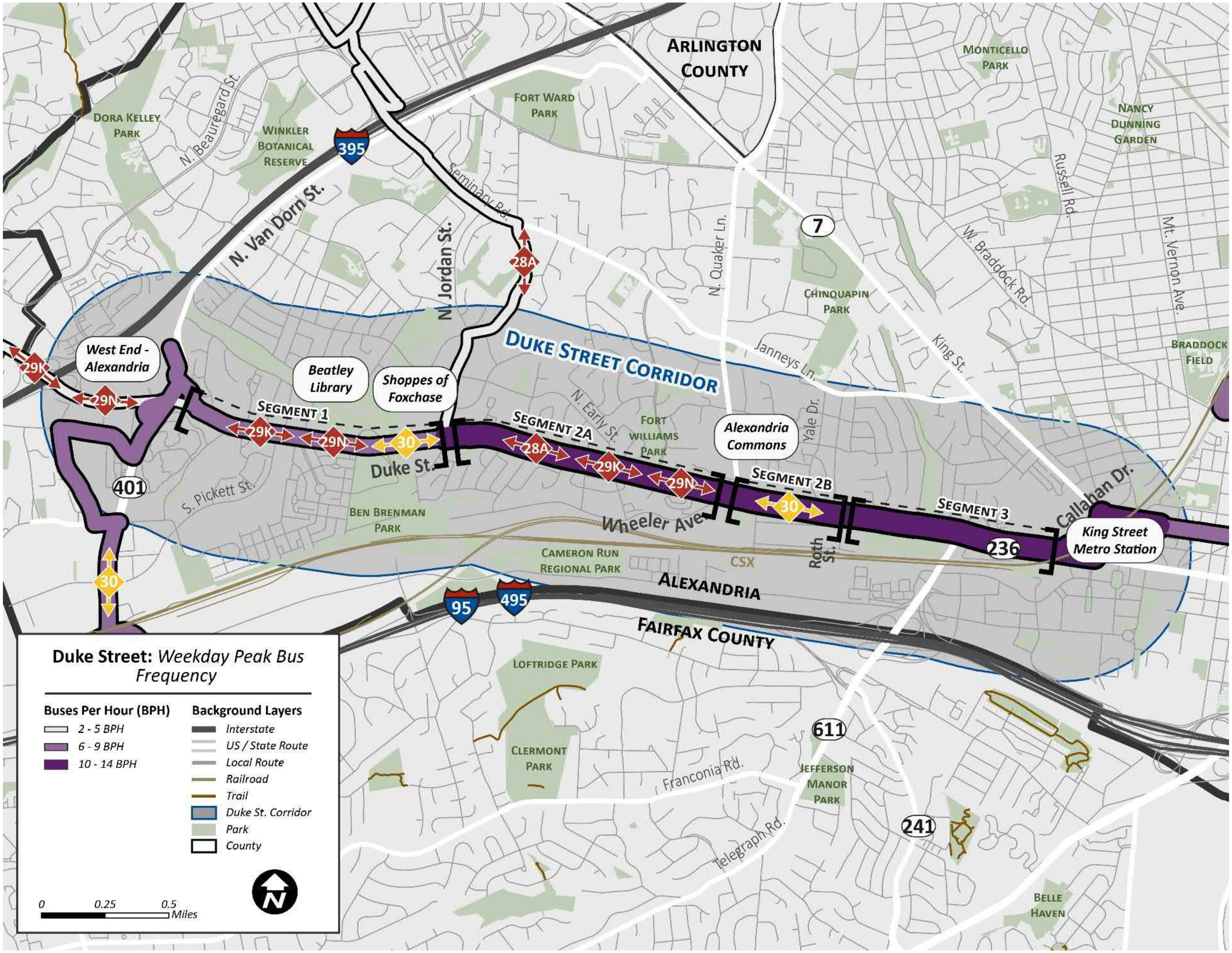


Figure 12: Weekday Peak Bus Frequency, Buses Per Hour (Data Sources: DASH and WMATA)

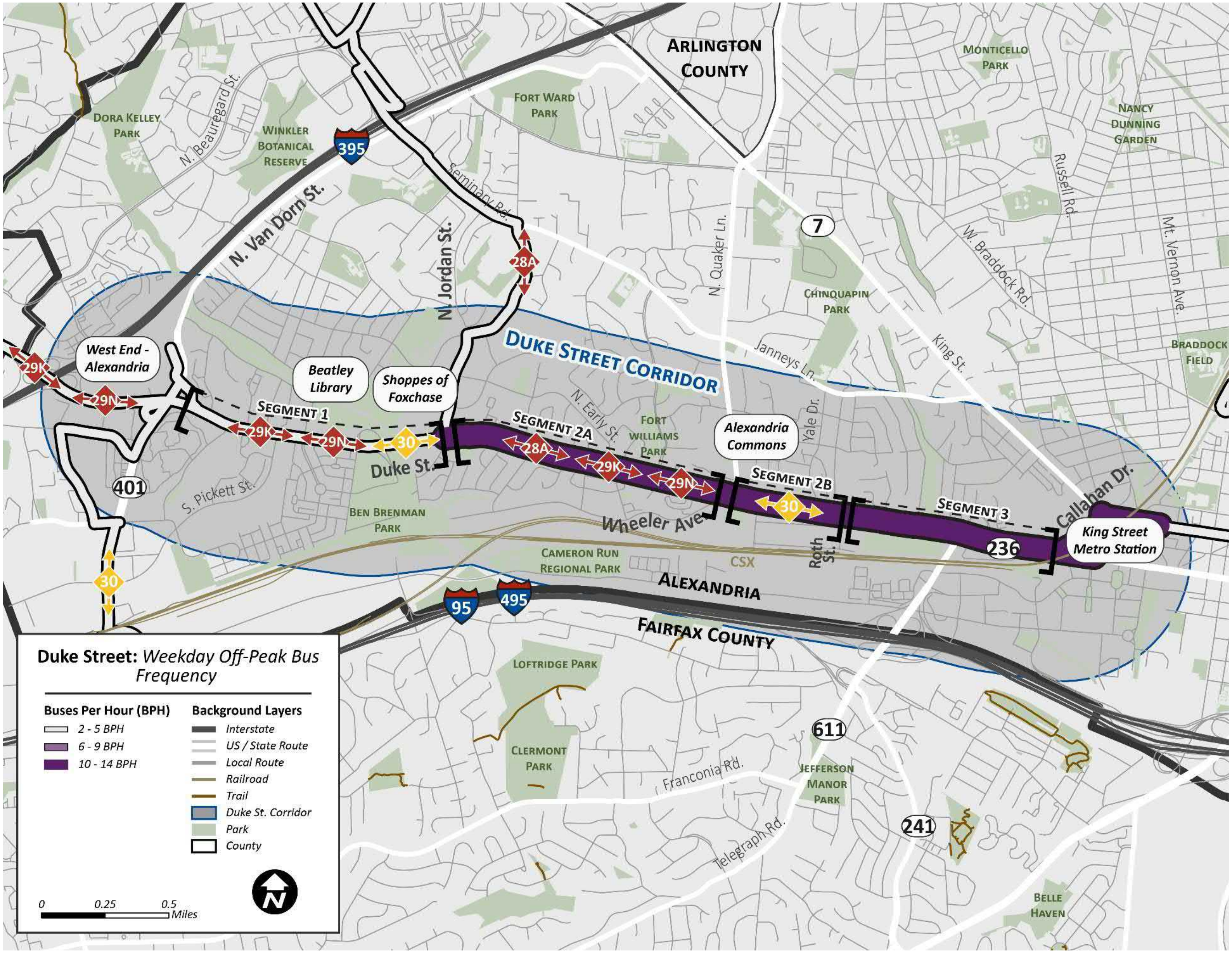


Figure 13: Weekday Off-Peak Bus Frequency, Buses Per Hour (Data Sources: DASH and WMATA)

Ridership

Average weekday boarding and alighting data (henceforth referred to as "ridership") was analyzed to quantify overall ridership within the corridor and to identify specific patterns. Existing and historical boardings data are also compared to describe how well DASH and Metrobus services have recovered from the COVID-19 pandemic. Ridership data was obtained from DASH and WMATA and is from the following time frames:

- DASH 30:
  - Calendar Year 2018[2]
  - July 2022
- Metrobus 28A:
  - Fall 2022
- Metrobus 29K/N:
  - Fall 2018
  - Fall 2022

Between DASH 30, Metrobus 28A, and Metrobus 29K/N, a weekday average of 5,154 riders either board or alight within the corridor. The following are boardings and alightings per route:

- DASH 30: 2,810
- Metrobus 28A: 1,120
- Metrobus 29K/N: 1,224

This report includes slightly updated ridership figures compared to the data used in the STOPS model. The STOPS model uses Metrobus Summer 2022 ridership as input while this report uses Fall 2022 Metrobus ridership.

Boarding data was analyzed to determine how well the DASH and Metrobus routes have recovered from COVID-19, see **Table 2**. Both DASH 30 and Metrobus 29K/N exceeded national trends in post-COVID-19 ridership recovery. According to the American Public Transportation Association's (APTA) ridership recovery estimates, national transit ridership in July 2022 varied from 55% to 60% of pre-COVID-19 levels[3]. By comparison, DASH 30's boardings within the Duke Street Corridor were at approximately 77% of pre-pandemic levels in July 2022, with 1,503 versus 1,948 annually in 2018. Similarly, Metrobus 29K/N's boardings within the Duke Street Corridor were at approximately 93% of pre-COVID-19 levels in Fall 2022, with 619 riders versus 666 in Fall 2018. According to APTA estimates, national transit ridership in Fall 2022 varied between 59% and 68% of pre-COVID-19 ridership.

Metrobus 28A route was modified to stay on Duke Street between Jordan Street and King Street Metro Station starting in September 2021. In the Fall of 2022, Metrobus 28A averaged 637 weekday boardings.

[2] DASH 2018 Ridership Survey

[3] https://transitapp.com/APTA

Transit Route & Provider	2018	2022	% of Pre-pandemic Ridership
DASH 30	1,948	1,503	77%
Metrobus 29K/N	666	619	93%
Metrobus 28A	N/A	637	N/A
Total	2,614	2,759	106%

Table 2: Average Weekday Passenger Boarding (Data Sources: DASH and WMATA)

Ridership was also analyzed to identify specific locations with high ridership activity. High ridership stops are primarily located between Jordan Street and Van Dorn Street, as well as near Alexandria Commons (see **Figure 14**). Both areas contain a combination of significant multi-family development and commercial development. Between Van Dorn Street and Jordan Street, there are multiple dense residential developments, including the Cameron Station Community, Canterbury Square, and several condominiums and apartments along Brookvalley Park. This same area also includes the Beatley Library and Shoppes of Foxchase, the latter of which contains a grocery store and drug store.

Similarly, there is high ridership near Alexandria Commons, a major commercial development. Alexandria Commons includes multiple business likely to attract many trips, such as a Giant Food grocery store. It also contains a mix of restaurants and other services such as an urgent care facility.

King Street Metro Station and the current Landmark Transit Center (site of the future WestEnd Alexandria development) also have significant boarding and alighting activity and are also major transfer locations. Both are likely to continue to be major hubs. The WestEnd Alexandria development, slated to finish construction in 2025[4], is planned to include significant commercial, residential, and open space. It is also the site of the future Inova Alexandria Hospital campus. King Street Metro Station is already a hub of residential, commercial, office, and park uses. The Station itself and the surrounding area include a grocery store, a drug store, and numerous restaurants and other employers.

[4] The public schedule of the West End – Alexandria development can be viewed here: https://westendva.com/lookingahead

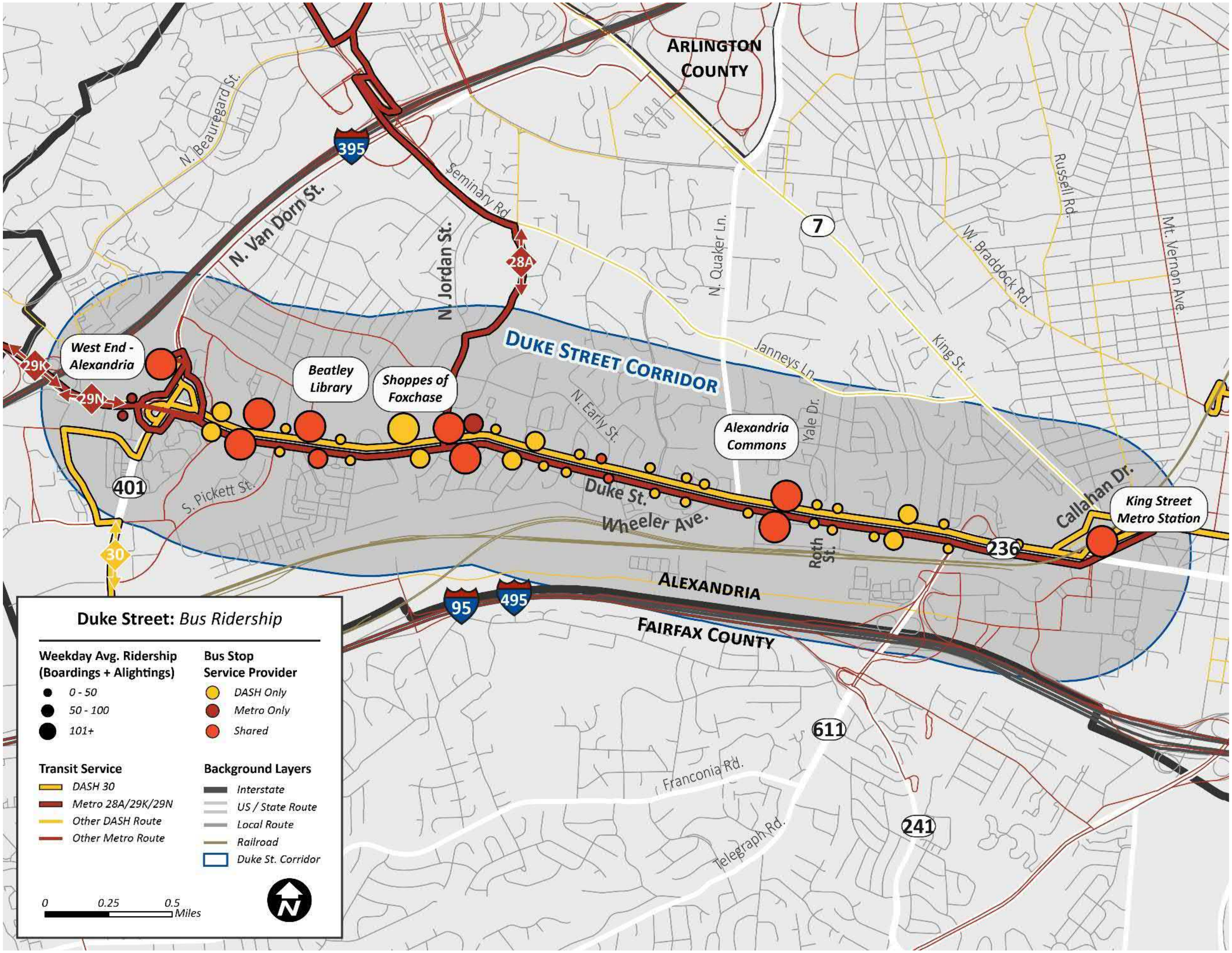


Figure 14: Existing Bus Ridership (Data Sources: DASH and WMATA)

Bus Stop Conditions

The project team also evaluated bus stop accessibility and amenities. The accessibility of bus stops via sidewalks was evaluated by observing if the landing pad was directly connected to the sidewalk. Amenities were also observed visually to determine if they were present or not, including basic elements (e.g., signage, landing pad, pedestrian connections), a shelter and seating, or additional amenities that may have been present. The findings are summarized in **Table 3** and **Table 4** below.

For reference, **Figure 15** and **Figure 16** below show examples of stops with all basic elements, with one stop also featuring a shelter and seating. These photos were obtained during field review.

Figure 15: Example of Stop with All Basic Elements, Seating, and Shelter (Photo Source: Toole Design)

Figure 16: Example of Stop with All Basic Elements (Photo Source: Toole Design)

Bus Stop Amenities		
Amenities Present	**Number of Bus Stops**	**Percent of Bus Stops**
Total Bus Stops	43	-
All Basic Elements (signage, landing pad, accessible pedestrian connection)	31	72%
Accessible Pedestrian Connection	35	81%
Shelter and Seating	15	35%

Table 3: Bus Stop Amenities Present (Data Source: Toole Design)

Bus Stop Accessibility		
Accessibility Features	**Number of Bus Stops**	**Percent of Bus Stops**
Total Bus Stops	43	-
Accessible Pedestrian Connection	35	81%
Accessible Land Area	36	84%

Table 4: Bus Stop Accessibility Features (Data Source: Toole Design)

72% of stops had all the basic elements expected, which are signage, a landing pad, and pedestrian accessibility to the landing pad. Similarly, most stops had either an accessible pedestrian connection between the landing pad and sidewalk or the stop was accessible via sidewalk despite not having a landing pad. Only 35% of bus stops had both a shelter and seating, both of which are amenities often expected with BRT and other high-quality transit service. Bus stops with both shelter and seating have a variety of ridership levels, though they tend towards high ridership locations, such as near Alexandria Commons (Stop ID: 4000058), South Jordan Street (Stop ID: 4000120), and North Paxton Street (Stop ID: 4000138).

Bus stop amenities are a strong consideration in whether potential riders decide to use transit or not. Attractive amenities, seating, and access from sidewalks contribute to the rider experience. Convenient access and a safe environment are key aspects of BRT.

Additional details are available in **Appendices:** Error! Reference source not found. **Duke Street Corridor Pedestrian C onditions Inventory**.

Transit Travel Speeds

Travel time and speed data was obtained from DASH to analyze the transit operating conditions along Duke Street, including average peak travel times and speeds along each segment. Average travel speeds and times for the AM and PM periods are shown in **Figure 17** and **Figure 18**, respectively. Westbound and eastbound conditions are symbolized separately.

DASH 30's average travel speeds are universally lower than that of general automobile traffic. As DASH 30 operates in mixed traffic, it is subject to prevailing traffic conditions and is affected by operational challenges throughout the Corridor. Additionally, DASH 30 buses must decelerate and accelerate to pick up passengers and dwell at stops, which slows down travel speeds along the Corridor. These factors highlight the importance of BRT, as dedicated transitway and various measures meant to streamline boarding and alighting reduce delays and make transit more competitive. Removing transit from general traffic, upgrading vehicles, and upgrading stops can enable transit to reach speeds close to general traffic.

AM Peak times along Duke Street are generally worse compared to the same portion of the Corridor during the PM Peak. During the AM Peak, Segments 1, 2B, and 3 are significant bottlenecks, with average speeds clustering around 6-9 MPH. There is generally no large difference in average speed in the EB or WB direction. However, there is a significant difference along Segment 2B. The average WB speed is 11 MPH while the average EB speed is nearly half at 6 MPH. The speed reductions in the EB direction in Segments 2B and 3 can be attributed to the heavy traffic movement from EB Duke Street to SB Telegraph Road, which connects to the Capital Beltway (I-495/I-95). Quaker Lane to Duke Street particularly serves as a connector for cut-through traffic from I-395 to I-495/I-95, and this is reflected in the deterioration in bus speeds in the EB direction in the AM. Segment 2A runs faster than the other segments, averaging 13 MPH in both directions.

During the PM Peak, Segments 1 and 2B are again significant bottlenecks, although Segment 3 speeds improve noticeably. Segment 1 speeds are relatively similar to the AM Peak, with 10 MPH WB and 8 MPH EB. Segment 2B speeds worsened compared to the AM Peak, dropping to 7 MPH WB and 4 MPH EB. Again, the speed reductions in Segment 2B can be tied to the cut through traffic between Telegraph Road and Quaker Lane and the connection it provides for cut through traffic between major interstates. Segment 2A again has comparatively high speeds, although the speeds decreased slightly in the EB direction compared to the AM Peak (13 MPH in the AM vs. 11 MPH in the PM).

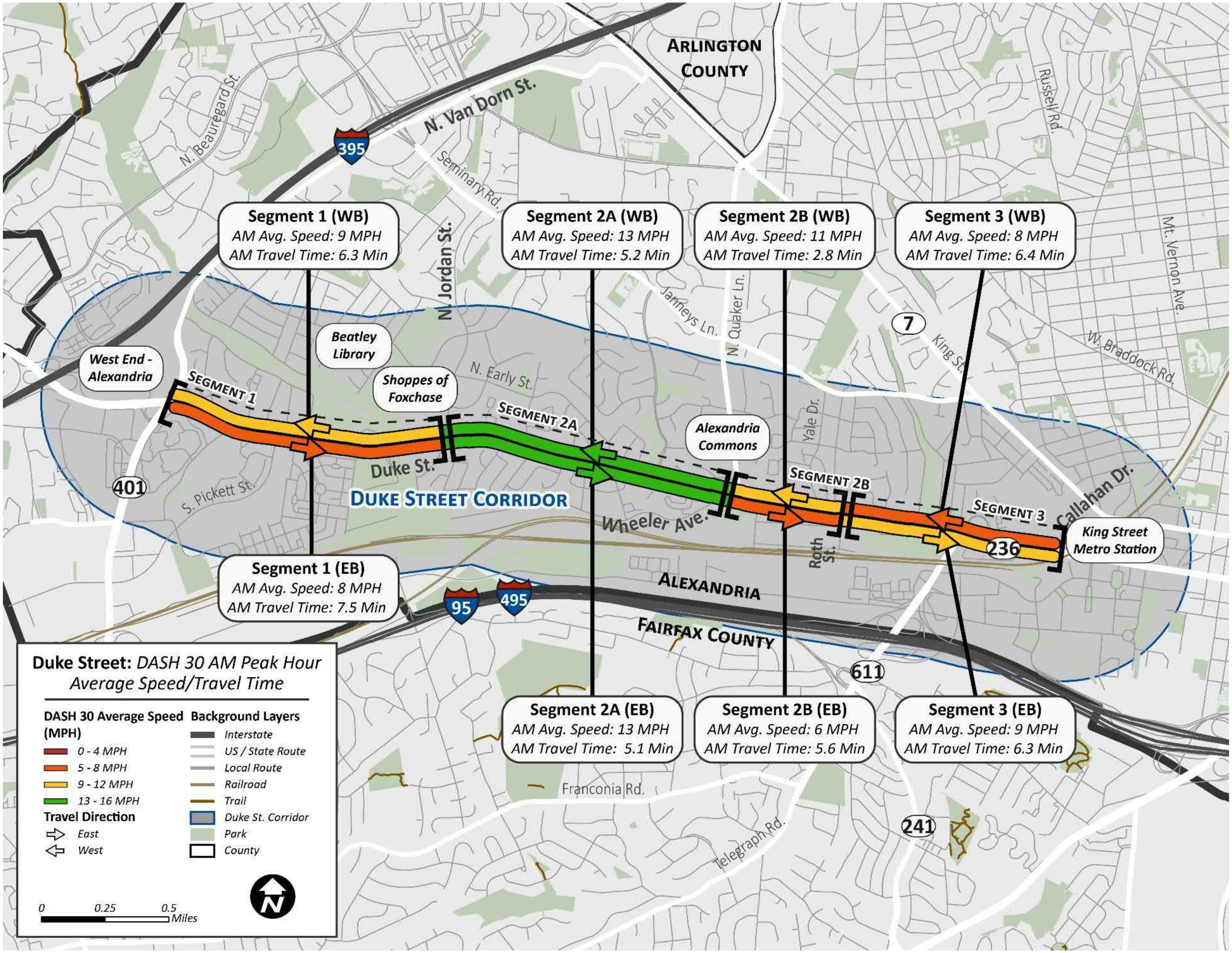


Figure 17: Average AM Peak DASH 30 Travel Time/Speed by Segment (Data Source: DASH)

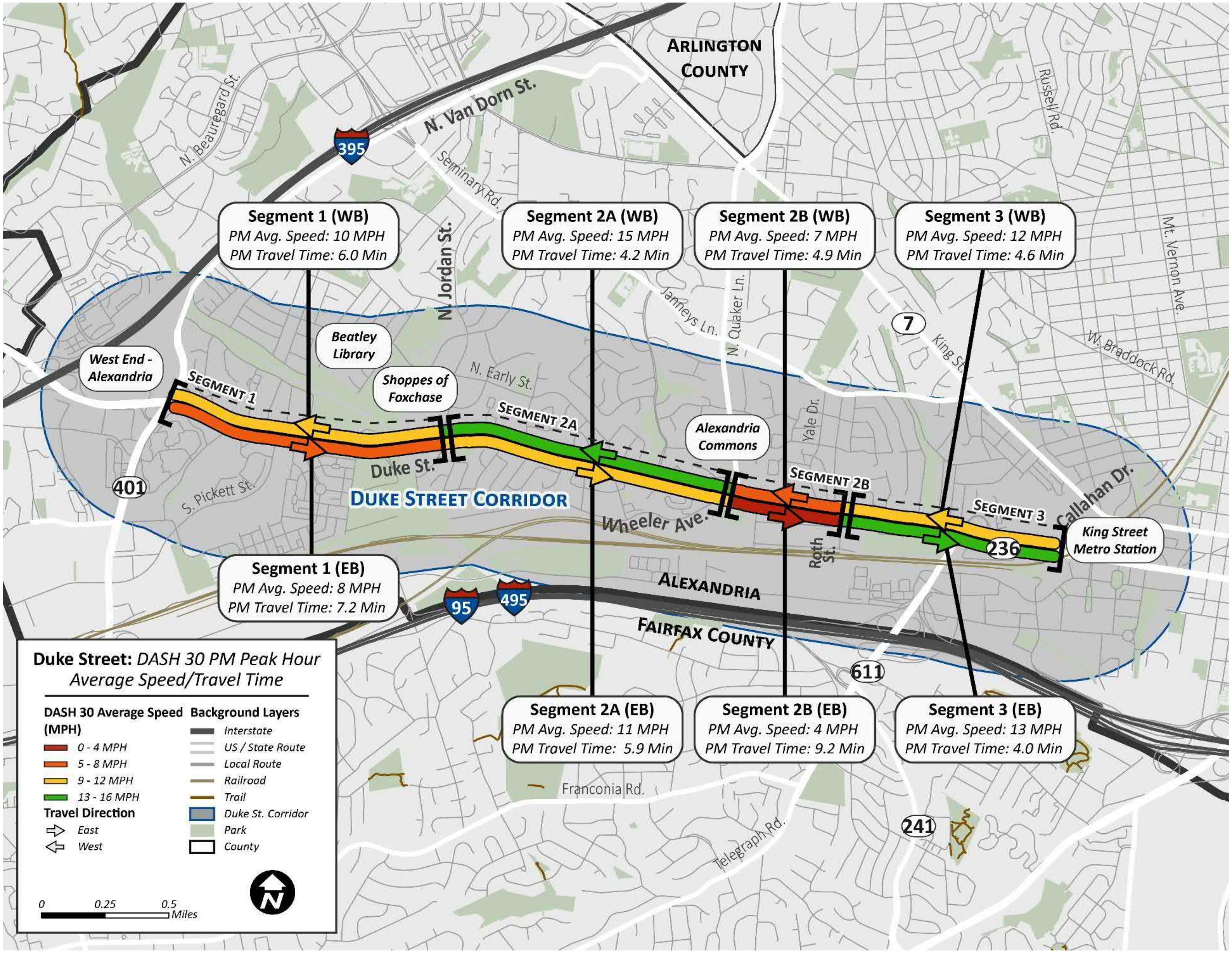


Figure 18: Average PM Peak DASH 30 Travel Time/Speed by Segment (Data Source: DASH)

Walkshed Analysis

5 and 10-minute walksheds were generated around each stop within the Duke Street Corridor to estimate the population served by each stop. These estimates were created by overlaying the walksheds with coincident Census tracts. Using the 2020 Decennial Census population counts, population was attributed to the walksheds based upon the percentage of the tract that was within the walksheds. For example, if 50% of a tract was within the walkshed, 50% of its population was attributed to walkshed.

Table 5 summarizes estimates of populations served within each set of walksheds. Within a 5-minute walk of existing bus stops, an estimated 18,524 people are served. Within a 10-minute walk of existing bus stops, an estimated 35,126 people are served.

Figure 19 displays the 5 and 10-minute walkshed around stops within the Corridor. Both sets of walksheds achieve greater coverage at the far east and west ends of the Corridor, particularly east near King Street Metro Station, where sidewalk connectivity and intersection density are particularly high. The walksheds have comparatively less coverage in the middle of the corridor, between North Jordan Street and Dove Street. A likely contributor to this is the comparative lack of sidewalk connectivity and winding, disconnected geometry of the roadway network, particularly south of Duke Street. At the western end of the Corridor, I-395 presents a major physical barrier to pedestrians as evidenced by the walksheds abruptly stopping at I-395.

Walkshed Radius	Estimate of Population Served
5 Minutes	18,524
10 Minutes	35,126

Table 5: Summary of Population Served by Walkshed Radius

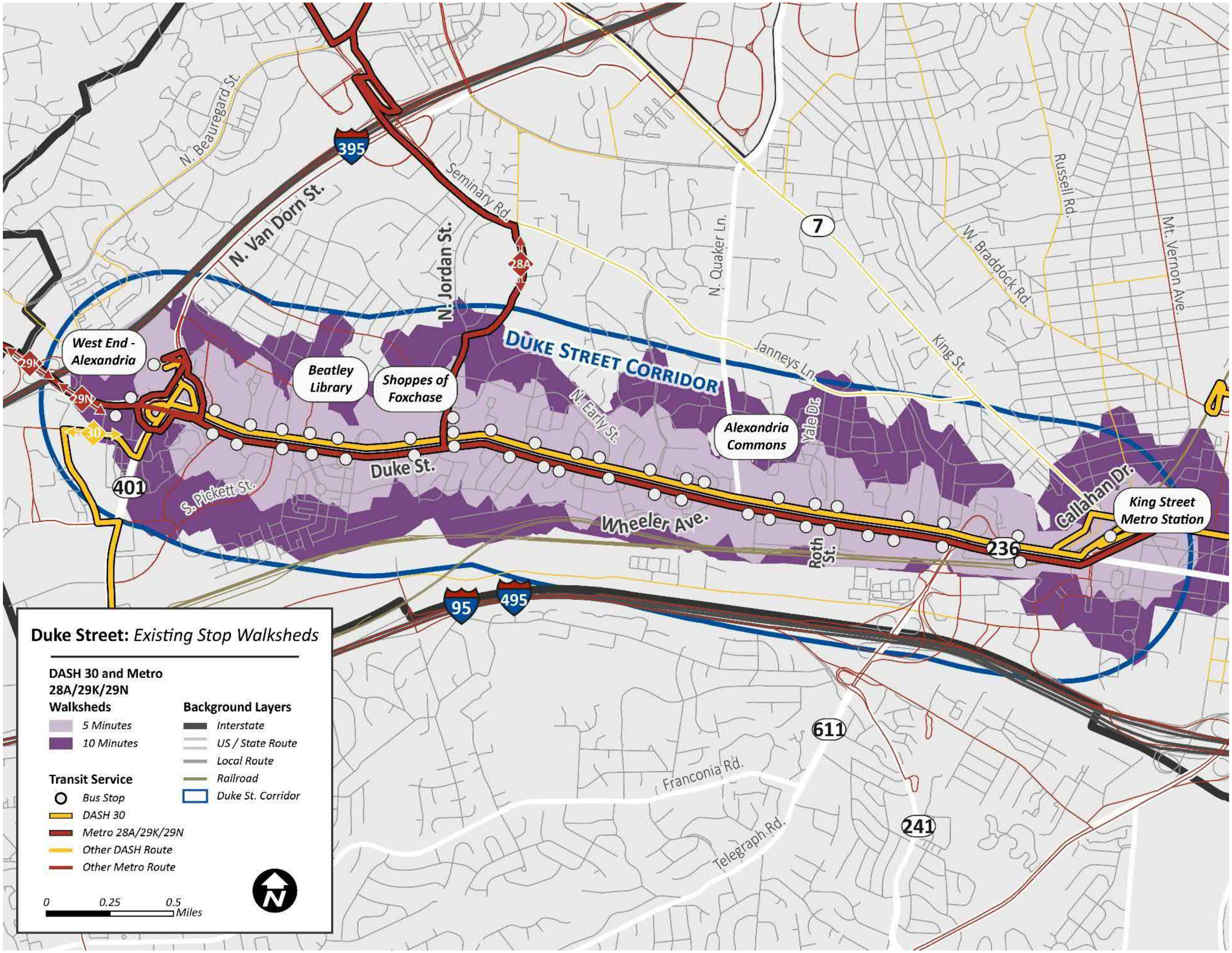


Figure 19: 5 and 10-Minute Walkshed Comparison, Existing Stops

4.4 Multimodal Facilities

Nearly all urban transit trips start or end as walking trips, as transit users typically access their destination by walking to it. As such, creating a safe and well-connected sidewalk system is critical to ensuring the success of transit systems, particularly a BRT system. Just as automobile users rely on well-designed intersections or driveways to access different roadways, so do pedestrians rely on safe, well-marked intersections to access streets and cross roadways. Poorly marked intersections are often a significant barrier to pedestrians accessing sidewalks and reaching their destination. This is exacerbated by high speeds, wide streets, and lack of appropriate traffic control.

This section describes the existing multimodal facilities around Duke Street and the service frequencies of the bus lines currently operating throughout the Duke Street corridor.

Sidewalk Condition

Each block along Duke Street was assessed individually for connectivity, pavement quality, sidewalk width, roadway proximity, presence of obstructions, and curb cut density. Note that sidewalks along frontage roads intended for pedestrian circulation along Duke Street are included in this analysis. Using these factors, sidewalks are sorted into three categories: Partially Missing, Needs Improvement, and Fair Condition. These categories are defined as such:

- Partially Missing: Indicates a segment where at least part of the segment has no sidewalks
- Needs Improvement: Indicates when a segment has at least one of the following conditions: poor surface quality, narrow width, lack of buffering from street, physical obstructions, or multiple curb cuts for driveways
- Fair Condition: Indicates a segment where connectivity was continuous, and sidewalks did not suffer from any of the conditions listed under "Needs Improvement"

For reference, see **Figure 20** and **Figure 21** for examples of sidewalks rated as "Needs Improvement" and "Fair", respectively, that were observed during the field review.

Figure 20: Example of Sidewalk Near Foxchase Apartments Rated as "Needs Improvement" (Photo Source: Toole Design)

Figure 21: Example of Sidewalk Near the Library Rated as "Fair" (Photo Source: Toole Design)

Figure 22 below displays sidewalk conditions along Duke Street as of July 6, 2022. Duke Street largely has continuous sidewalk coverage, although there are small gaps directly east of Jordan Street, where both sides of Duke Street do not have sidewalks for a short distance due to the presence of a frontage road. Aside from this section, sidewalks are continuous along the rest of the corridor, with approximately 97% of the corridor having continuous sidewalks (see **Table 6**). Sidewalks along Segments 2A and 2B particularly suffer from the issues identified under the "Needs Improvement" category above. Significant portions of Segments 1 and 3 were rated as being in "Fair Condition." Issues were identified near the Van Dorn Street interchange and Telegraph Road interchange along Segments 1 and 3, respectively. Interchange ramps tend to be inhospitable for pedestrians, who require special accommodation in such areas in face of large traffic volumes, higher speeds, and insufficient traffic control devices.

Additional details are available in **Appendices:** Error! Reference source not found. **Duke Street Corridor Pedestrian C onditions Inventory**.

Sidewalk Condition	North Side of Duke St.		South Side of Duke St.		Total	
	Linear Feet of Sidewalk	Percent of North Side	Linear Feet of Sidewalk	Percent of South Side	Linear Feet of Sidewalk	Percent of Total Sidewalks
Fair Condition	9,756.8	52.3%	10,501.7	56.3%	20,258.5	54.3%
Needs Improvement	8,114.3	43.5%	7,734.9	41.5%	15,849.2	42.5%
Partially Missing	776.3	4.2%	410.8	2.2%	1,187.1	3.2%

Table 6: Sidewalk Condition Summary Table (Data Source: Toole Design)

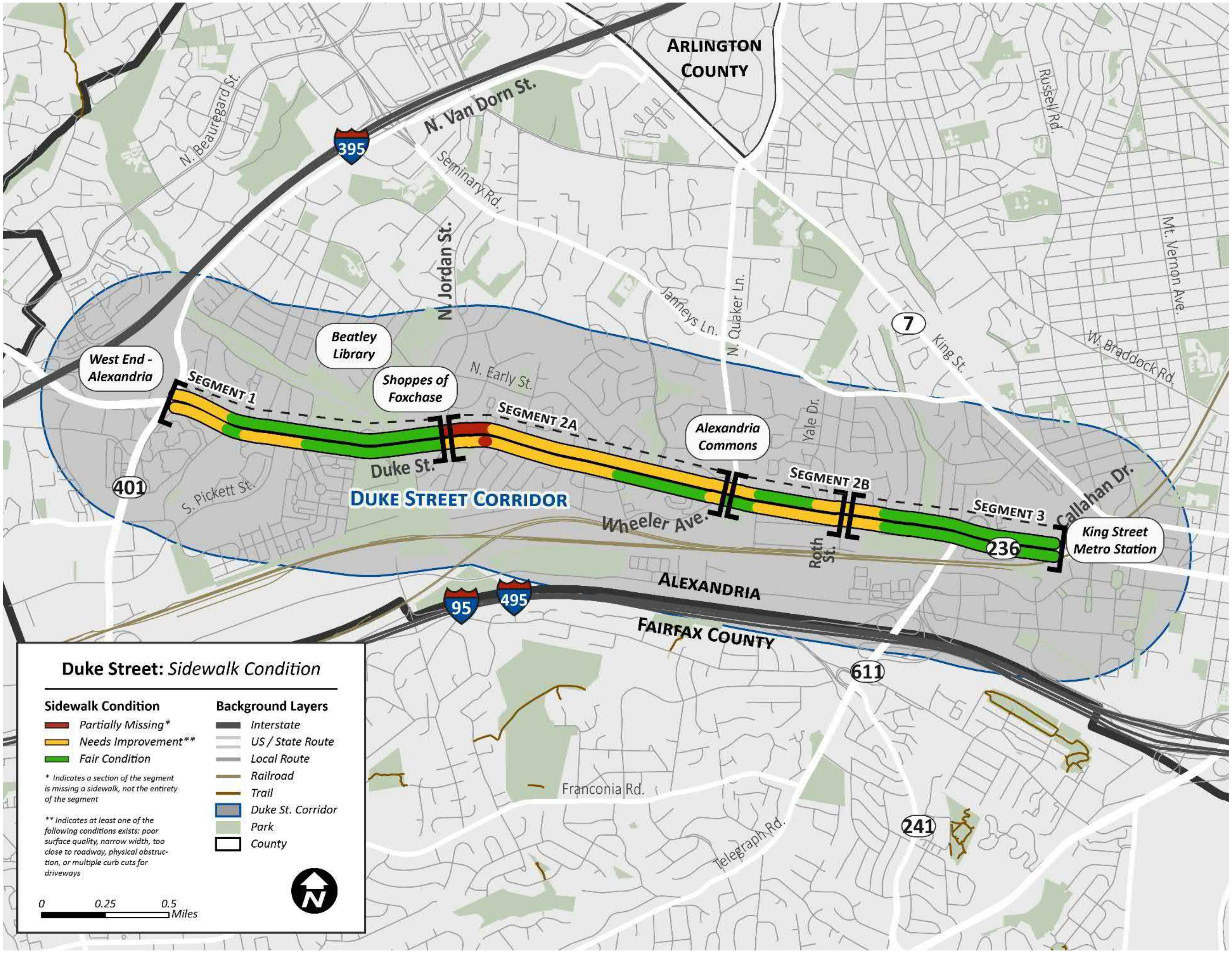


Figure 22: Sidewalk Condition (Data Source: Toole Design)

Intersection Conditions

In the *Pedestrian Conditions Inventory*, the project team also evaluated the quality of intersections and the distance between marked crossings across Duke Street. The assessment of intersection quality was based on:

- Presence of crosswalks, including how many legs had crosswalks
- Curb ramp presence and condition
- Crossing distance
- Visibility of existing crosswalk markings
- Type of crosswalk markings, i.e., high-visibility vs. transverse crosswalks
- Presence of slip lanes and associated traffic control

Using these factors, each intersection was rated as Good, Fair, or Poor. Signalized, unsignalized, and other (minor unsignalized, frontage, slip ramps) intersections were evaluated separately.

The assessment of signalized intersections used the following definitions of Good, Fair, and Poor:

- Good: Intersection had all of the following:
  - All legs of the intersection had crosswalks
  - All crosswalks were in good condition
  - All curb ramps were present and in good condition
- Fair: Both of the following statements were true:
  - All legs of the intersection had crosswalks though not all were in good condition OR some legs were missing crosswalks though all were in good condition, AND
  - All curb ramps were present and at least half were in good condition
- Poor: Intersections were rated poor if they could not satisfy both statements under the “Fair” rating

Unsignalized intersections near signalized intersections were not penalized for lacking crossings across Duke Street if the nearby signalized intersection had sufficient crossings. Minor unsignalized intersections were not penalized if they were located in areas with few destinations or if a median blocked access via left-turns.

Table 7 displays the result of this assessment at a summary level, displaying intersections by type and the percentage of poorly rated intersections, as well as the percentage of intersections missing crosswalks or curb ramps. 100% of signalized intersections and 82% of unsignalized intersections were rated as poor, driven heavily by missing crosswalks and missing curb ramps. By comparison, 32% of other intersections (minor unsignalized, frontage, slip ramps) were rated poorly, likely driven by the relative frequency of physical medians and that these intersections are typically in lower activity areas.

Intersection Type	Number of Intersections	Percent Poorly Rated Intersections	Percent of Intersections Missing a Crosswalk	Percent of Intersections Missing 1 ≥ Curb Ramp
Signalized	25	100%	84%	76%
Unsignalized	11	82%	73%	63%
Other (Minor unsignalized, frontage, or slip ramp)	19	32%	37%	32%

Table 7: Intersection Ratings by Intersection Type (Data Source: Toole Design)

The distance between marked crossings was also measured, the results of which are displayed in **Table 8** below. On average, Segments 1 and 2A/2B had similar distance between marked crossings, at 820 feet and 752 feet respectively. Segment 3 had significantly higher average distance between marked crossings, at 1,715 feet. When converted to an average walking speed assumed at 3 MPH, it would take a pedestrian approximately three minutes to walk between marked crossings on Segments 1 and 2A/2B and 6.5 minutes along Segment 3.

Corridor Segment	Segment Length (miles)	Number of Intersections with Marked Crossings Across Duke Street	Average Distance Between Marked Crossings (feet)	Average Walking Time Between Crossings (minutes)
Segment 1: Ripley Street to Jordan Street	1.3	6	820	3.1
Segment 2A/2B: Jordan Street to Roth Street	1.5	11	752	2.9
Segment 3: Roth Street to King Street Metro	1	3	1,715	6.5

Table 8: Distance Between Crossings by Segment (Data Source: Toole Design)

Pedestrian access along sidewalks and at intersections will always be critical in ensuring that riders can complete their trips. Further details and an intersection-by-intersection analysis are available in **Appendices:** Error! Reference source not found. **Duke Street Corridor Pedestrian Conditions Inventory**.

4.5 Safety

The City of Alexandria has a Vision Zero goal of eliminating traffic fatalities and serious injuries by 2028 and as this project makes changes to the roadway, opportunities for safety improvements will be identified with a focus on addressing where crashes are occurring today. Historic crash data was obtained from the Alexandria Vision Zero Viewer for the 5-year period between 2016 and 2020. This data was analyzed to understand prevailing crash factors and crash severities in the Corridor, as well as to identify crash factors at critical locations.

Table 9 summarizes crashes by injury type in the Corridor. Throughout the 5-year period, there were 742 reported crashes, of which 241 resulted in an injury. Three crashes were fatal (0.4%), and 17 crashes resulted in a severe injury (1.8%). Pedestrian crashes tend to be more severe than crashes in general. While 3.7% of crashes involved a pedestrian, 17.8% of pedestrian crashes resulted in fatalities or serious injuries, compared to 2.2% of all crashes. Three crashes involved bicycles, however none of them involved serious injuries or fatalities.

Crash Injury Severity	Number of Crashes	Percent of Crashes
All Crashes	742	100%
All Injury Crashes (including Fatal)	241	32.4%
Serious Injury Crashes	17	1.8%
Fatal Crashes	3	0.4%

Table 9: Crashes by Injury Severity. 2016 – 2020 (Source: City of Alexandria, Vision Zero Viewer)

Spatial patterns of crashes throughout the Corridor were also analyzed**. Figure 23** shows densities of crashes resulting in at least a possible injury throughout the Corridor. Fatal and serious injury crashes were distributed throughout the Corridor, with two at each of the following intersections with Duke Street: Quaker Lane, Fort Williams Parkway, and Jordan Street. The intersections with the highest concentration of injury-involved crashes were:

- Yale Drive
- Quaker Lane
- West Taylor Run
- North Paxton Street
- North Pickett Street and South Pickett Street
- North Ripley Street
- South Walker Street

While crash-specific conclusions cannot be drawn, there are various conditions near the aforementioned intersections which may partially explain the elevated crash incidence in these areas relative to the rest of the Corridor. Many of these intersections are relatively complex, with slip lanes, service roads, and ramps located in close proximity to each other. Specific examples include the West Taylor and Quaker Lane intersections. Multiple intersections also have significant driveway density, potentially driving rear end and angle crashes as vehicle turn into and out of businesses. For example, the Yale Drive intersection has six driveways located within 250 feet of the middle of the intersections, with five of those six located on the eastbound side.

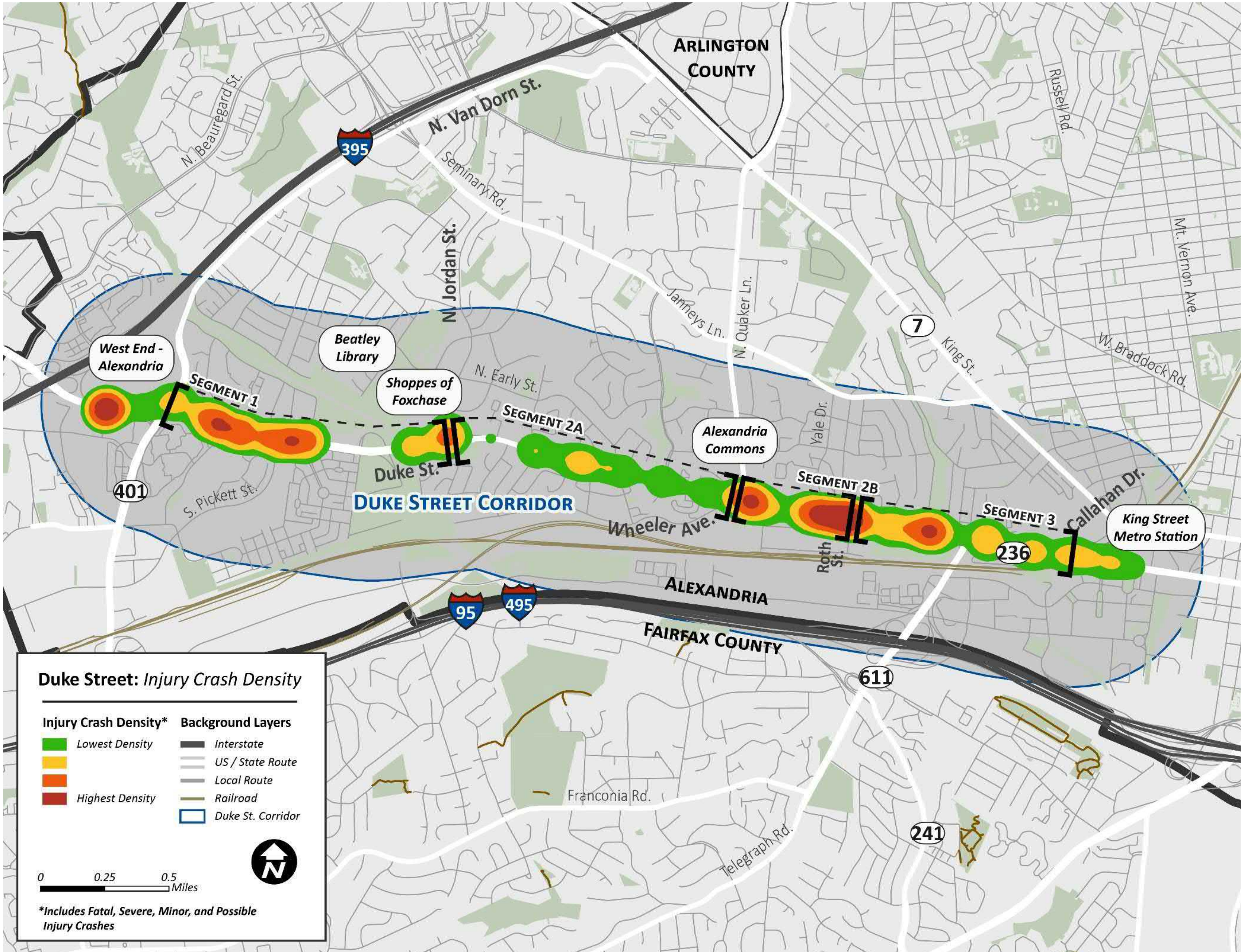
Pedestrian crashes may also be driven by concentrated residential development near certain intersections. For example, there are numerous multi-family developments with direct access to the North Ripley Street intersection and there are five pedestrian crashes directly associated with the intersection.

The sections of Duke Street between North Pickett Street and South Pickett Street, as well as between North Paxton Street and North Ripley Street, also have significant concentrations of crashes resulting in injuries.

Between North Pickett Street and South Pickett Street, there were 21 crashes in total, of which 16 were either rear end or angle crashes. Seven driveways are located along this segment, near the South Pickett Street intersection, which may be a contributing factor to the high crash count along this segment. Another contributing factor may be the presence of DASH stops near each intersection, which may contribute to rear end crashes. Of the 21 total crashes between South Pickett Street and North Pickett Street, three crashes involved pedestrians and one crash resulted in a fatal injury.

Pedestrian crashes are particularly prevalent along the section of Duke Street between North Ripley Street and North Paxton Street. 27 crashes in total occurred along this segment, 10 of which involved pedestrians. Nine of the pedestrian-involved crashes occurred within 150 feet of a DASH bus stop. Poor lighting and visibility may be a contributing factor, as seven of the 10 pedestrian-involved crashes occurred in either darkness or at dawn.

Further details on crash volumes and patterns can be found in **Appendices 5.2: Existing Crash Data Summary.**


Duke Street: Injury Crash Density
Injury Crash Density*
Lowest Density
Highest Density
Background Layers
Interstate
US / State Route
Local Route
Railroad
Duke St. Corridor
0 0.25 0.5 Miles
*Includes Fatal, Severe, Minor, and Possible Injury Crashes
Arlington County
N. Van Dorn St.
395
N. Beauregard St.
Seminary Rd.
N. Jordan St.
Jameys Ln.
N. Quaker Ln.
7
King St.
Russell Rd.
Mt. Vernon Ave.
W. Braddock Rd.
West End - Alexandria
Beatley Library
Shoppes of Foxchase
N. Early St.
Segment 1
Segment 2A
Alexandria Commons
Yale Dr.
Segment 2B
Segment 3
Callahan Dr.
King Street Metro Station
Duke St.
401
S. Pickett St.
Duke Street Corridor
Wheeler Ave.
Roth St.
236
Alexandria
95
495
Fairfax County
611
Franconia Rd.
Telegraph Rd.
241

5. Appendices

5.1 Stop-by-stop Ridership Summary

Average weekday boardings (B), alightings (A), and total ridership (TR) from the following time periods are reported below:

- DASH 30: July 2022
- Metrobus 28A: Fall 2022
- Metrobus 29K/N: Fall 2022

Stop ID	Stop Name	DASH 30			Metrobus 28A & 29K/N			Total		
		B	A	TR	B	A	TR	B	A	TR
4000029	Duke St + Dove St	3	9	12	N/A	N/A	N/A	3	9	12
4000030	Duke St + Roberts Ln	9	7	16	N/A	N/A	N/A	9	7	16
4000034	Duke St + Moncure Dr	17	8	25	N/A	N/A	N/A	17	8	25
4000035	Duke St + Moncure Dr	3	3	6	N/A	N/A	N/A	3	3	6
4000038	2712 Duke St	65	5	70	N/A	N/A	N/A	65	5	70
4000039	Duke St + W Taylor Run Pkwy	17	68	85	N/A	N/A	N/A	17	68	85
4000041	Duke St + Witter Dr	3	1	3	N/A	N/A	N/A	3	1	3
4000044	Duke St + Roth St	21	6	26	N/A	N/A	N/A	21	6	26
4000050	Duke St + Cambridge Rd	6	27	33	N/A	N/A	N/A	6	27	33
4000053	Duke St + Sweeley St	24	20	44	N/A	N/A	N/A	24	20	44
4000055	Duke St + Yale Dr	11	19	31	N/A	N/A	N/A	11	19	31
4000056	Duke St + Alexandria Commons	20	23	43	14	63	77	34	86	120
4000058	Duke St + Alexandria Commons	38	26	64	118	47	165	156	73	229
4000061	Duke St + S Quaker Ln	6	9	15	N/A	N/A	N/A	6	9	15
4000071	Duke St + Normandy Hill Dr	14	18	32	N/A	N/A	N/A	14	18	32
4000072	Duke St + Carriage House Circle	5	6	11	N/A	N/A	N/A	5	6	11
4000076	Duke St + Cockrell St	4	1	5	N/A	N/A	N/A	4	1	5
4000078	Duke St + Fort Williams Pkwy	2	16	18	N/A	N/A	N/A	2	16	18
4000083	Duke St + S Early St	0	0	0	7	24	31	7	24	31

Table 10: Stop-by-stop Ridership Summary (1/3)

Stop ID	Stop Name	DASH 30			Metrobus 28A & 29K/N			Total		
		B	A	TR	B	A	TR	B	A	TR
4000093	Duke St + S French St	11	11	22	N/A	N/A	N/A	11	11	22
4000094	Duke St + N French St	7	14	21	N/A	N/A	N/A	7	14	21
4000103	Duke St + S Gordon St	8	10	17	N/A	N/A	N/A	8	10	17
4000108	Duke St + S Gordon St	19	42	61	N/A	N/A	N/A	19	42	61
4000110	Duke St + Somervelle St	12	6	18	N/A	N/A	N/A	12	6	18
4000113	4600 Duke St/Shops at Foxchase	40	51	91	N/A	N/A	N/A	40	51	91
4000114	Duke St + Ingram St	66	21	87	N/A	N/A	N/A	66	21	87
4000115	Shops at Foxchase	61	48	109	N/A	N/A	N/A	61	48	109
4000117	Duke St + Cameron Sta Blvd / N Pickett St	27	14	42	6	10	16	33	24	57
4000118	Beatley Library	3	8	11	N/A	N/A	N/A	3	8	11
4000120	Duke St + S Jordan St	81	28	108	35	144	179	116	172	288
4000121	Duke St + S Ingram St	13	32	45	N/A	N/A	N/A	13	32	45
4000122	Duke St + N Jordan St	39	52	91	50	15	65	89	117	156
4000123	Duke St + N Pickett St / Cameron Sta Blvd	18	32	50	32	11	43	50	43	93
4000127	Duke St + S Pickett St	37	8	45	N/A	N/A	N/A	37	8	45
4000131	Duke St + S Pickett St	6	30	36	N/A	N/A	N/A	6	30	36
4000136	Duke St + N Paxton St	91	16	107	12	27	39	103	43	146
4000138	Duke St + N Paxton St	21	77	97	68	23	81	89	100	189
4000148	Duke St + N Ripley St	57	32	89	N/A	N/A	N/A	57	32	89
4000149	Duke St + N Ripley St	17	75	92	N/A	N/A	N/A	17	75	92
4000161	Rt 236 Duke St + Walker St	N/A	N/A	N/A	3	32	35	3	32	35
4000167	Duke St & Walker St	N/A	N/A	N/A	117	51	168	117	51	168

Table 11: Stop-by-stop Ridership Summary (2/3)

Stop ID	Stop Name	DASH 30			Metrobus 28A & 29K/N			Total		
		B	A	TR	B	A	TR	B	A	TR
4001085	Duke St + Arell Ct/Wheeler Av	6	15	21	N/A	N/A	N/A	6	15	21
4001086	Duke + N Early St	7	18	24	N/A	N/A	N/A	7	18	24
4001128	Duke St Service Rd & N Jordan St	N/A	N/A	N/A	59	22	81	59	22	81
Landmark Mall*		81	88	169	37	45	81	118	133	251
King St Metro*		507	312	818	699	578	1277	1206	890	2096
*** EB and WB combined**										

Table 12: Stop-by-stop Ridership Summary (3/3)

5.2 Existing Crash Data Summary

The table below summarizes crashes from N. Ripley Street to Diagonal Road. Crash data are from 2016-2020.

Emphasis Area	**K**	**A**	**B**	**C**	**O**	**Total**
Occupant Protection	0	0	9	1	2	12
Impaired Driving	1	6	45	5	100	157
Bicycle Involved	0	0	3	0	0	3
Pedestrian Involved	2	3	18	4	0	27
Speeding	1	2	12	1	42	58
Older Driver	1	4	34	2	77	118
Young Driver	0	3	9	3	53	68
Roadway Departure	0	0	2	0	2	4
Intersections	3	13	145	22	353	536
Signalized Intersections	3	10	124	20	319	476
Total Crashes	3	16	168	22	423	632

The table below shows a breakdown of left turn crash types at **signalized intersections**. The limits are from N. Ripley Street to Diagonal Road. Crash data are from 2016-2020.

Crash Condition	**K**	**A**	**B**	**C**	**O**	**Total**
Left-Turn Crashes at Signalized Intersections	1	2	33	4	65	105
Left-Turn **Angle** Crashes at Signalized Intersections	0	1	21	1	53	76

The table below shows left-turn crashes at **all intersections**. The limits are from N. Ripley Street to Diagonal Road. Crash data are from 2016-2020.

Crash Condition	**K**	**A**	**B**	**C**	**O**	**Total**
Left-Turn Crashes at All Intersections	1	4	38	4	73	120
Left-Turn **Angle** Crashes at All Intersections	0	3	25	1	60	89