

Bus Network Improvement Project

General Information

MTA Core Bus Service, Metro Subway and Light Rail

July 22, 2013

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1 OVERVIEW OF SERVICE PROVIDED

1.1 Introduction

The Maryland Transit Administration is the largest public transportation provider in the State of Maryland. The agency operates local bus service in Baltimore and its suburbs (referred to in this report as Core Bus Service¹), a Light Rail and Heavy Rail system (Metro Subway) centered on Baltimore, paratransit, statewide commuter bus, and a commuter rail system. This report focuses primarily on MTA's "core system" consisting of Core Bus, Light Rail, and Metro Subway service.

The purpose of this report is to document the existing condition of the core system. The existing condition information will help inform the Maryland Transit Administration's *Bus Network Improvement Project* (BNIP), a major component of MTA's *Transit Modernization Program* (TMP). The BNIP will serve to determine how MTA's core system can better serve its market while making the most effective use of its resources.

1.2 The System at a Glance

The MTA forms a critical piece of the Baltimore region's transportation system. Every weekday approximately 370,000 trips are taken on MTA buses, Light Rail, and trains.² The vast majority of these trips are taken within the core service areas of the City of Baltimore and Baltimore County.

Excluding the commuter bus and train services, the Maryland Transit Administration operates three kinds of services: Core Bus, Light Rail, and Metro Subway. Core Bus forms the backbone of MTA's transit network and serves over 72 million trips a year. The MTA operates three kinds of bus services: local buses, neighborhood circulators, and QuickBus, a system of limited stop buses along major corridors. Core Bus service can be further sub-divided into the following categories:

- Radial Routes: Lines radiating from Downtown Baltimore;
- Crosstown Routes: Lines that directly connect activity centers outside Downtown Baltimore;
- Express Routes: Limited or non-stop peak period service between suburban areas and downtown;
- Feeder Routes: Lines that connect outlying areas to the Metro Subway and Light Rail;
- Circulator Routes: Lines that operate in a specific service area on a one-way loop; and
- QuickBus Routes: Lines that are overlaid on local routes with limited stops.

Table 1.1 summarizes the MTA Core Bus services, while Figures 1.1, 1.2 and 1.3 show various perspectives on the MTA Core Bus Service across the system and in Central Baltimore, and Figure 1.4 details the Metro and Light Rail routes.

In addition to bus service, the MTA operates a Light Rail and Heavy Rail line (Metro Subway). Baltimore's Metro Subway opened in 1983 and was originally conceived as a multi-line system, of which one line was built that operates between Johns Hopkins Hospital, just east of downtown, and Owings Mills in the city's northwestern suburbs. In 1992 the Metro Subway was joined by a Light Rail line that operates North-South from Hunt Valley to Glen Burnie and Baltimore-Washington International (BWI) Thurgood Marshall Airport. The Light Rail operates in multiple service patterns, as seen in Figure 1.4.

¹ "Core Bus" is used instead of "Local Bus" to emphasize that there are gradations of service offered that are not local bus but have some express elements to them. This will be further expanded upon in later study components where new services are recommended.

² NTD Report, 2011 (Most recent year of data available).

Table 1.1: Core Bus Service Routes

| Radial | | | |
|------------------|--|------------|--|
| 1 | Sinai Hospital / Mondawmin Metro Station to Fort McHenry | 23 | Rolling Road / Wildwood to Fox Ridge |
| 3 | Sheppard Pratt Hospital to Inner Harbor | 27 | Reisterstown Plaza Metro Station to Port Convington |
| 5 | Cedonia / Federal Street to Mondawmin Metro Station | 30 | Edmondson Village to City Hall / Hopkins Bayview |
| 7 | Mondawmin Metro Station to Canton | 35 | White Marsh Mall to UMBC / Blind Industries |
| 8 | Lutherville Light Rail Stop to University Hospital | 36 | Northern Parkway and York Road to Riverview / Monroe Street |
| 10 | Rolling Road/Paradise Avenue to Dundalk / Bullneck Road | 53 | Old Court Metro Station to Mondawmin Metro Station |
| 11 | Towson Town Center to Canton | 54 | Randallstown / Milford Mill Metro Station to Penn-North Metro Station |
| 15 | Security Square / Westview to Overlea / Perry Hall | 61 | Lake Avenue to Inner Harbor |
| 18 | Glen and Key Avenues to Velvet Valley / Copper Ridge / Scotts Hill / Owings Mills Center | 64 | Curtis Bay / Energy Parkway to North Avenue |
| 19 | Carney / Goucher and Taylor to State Center Metro Station | 91 | Sinai Hospital to City Hall |
| 20 | Security Square Mall to CCBC Dundalk / Marine Terminal | | |
| Crosstown | | | |
| 4 | CCBC Essex to Turner Station | 38 | North Bend Loop to Cold Spring Lane and Grandview |
| 13 | Walbrook Junction to Canton / Fell's Point | 44 | Security Square Mall to Rosedale Industrial Park |
| 16 | Mondawmin Metro Station to Brooklyn Homes | 51 | Rogers Avenue Metro Station to Patapsco Light Rail Stop |
| 21 | Mondawmin Metro Station to Fell's Point | 55 | Fox Ridge to Towson Town Center |
| 22 | Mondawmin Metro Station to Bayview Medical Center | 77 | Old Court Metro Station to Patapsco Light Rail Stop |
| 33 | Rogers Avenue Metro Station to Moravia | 99 | Old Court Metro Station to BWI Thurgood Marshall Airport |
| Feeder | | | |
| 9 | International Circle to Lutherville Light Rail Stop | 56 | Glyndon to Owings Mills Town Center |
| 12 | Stella Maris to Kirk and Bartlett | 57 | Security Square Mall to Rogers Ave Metro Station |
| 14 | Patapsco Light Rail Stop to Annapolis / Jumpers Hole | 58 | White Marsh to Reisterstown Plaza Metro Station |
| 17 | Patapsco Light Rail Stop to Parkway Center | 59 | Owings Mills Town Center / Redland Court to Reisterstown Plaza Metro Station |
| 24 | Whispering Woods to Moravia Park | 60 | Stevenson University to Reisterstown Plaza Metro Station |
| 52 | Milford Mill Road to Mondawmin Metro Station | | |
| Express | | | |
| 03X | Cromwell Bridge Road to Inner Harbor | 64X | North Avenue to Riviera Beach |
| 05X | Cedonia to Downtown Baltimore | 104 | Cromwell Bridge Road to Johns Hopkins Hospital |
| 10X | US Route 40 and Rolling Road to Light Street | 120 | White Marsh Park & Ride to Johns Hopkins Hospital |
| 15X | Perry Hall to Paca Street | 150 | Columbia to Downtown Baltimore |
| 19X | Carney / Goucher and Taylor to State Center Metro Station | 160 | Whispering Woods / Fox Ridge to Johns Hopkins Hospital |

| Circulator | | | |
|------------|--|----|---|
| 29 | Cherry Hill Light Rail Stop to Cherry Hill | 97 | Mondawmin Metro Station to Mondawmin Metro Station |
| 50 | Erdman and Belair to Erdman and Belair | 98 | Woodberry Light Rail Stop to Woodberry Light Rail Stop |
| QuickBus | | | |
| 40 | Security Boulevard at CMS to Middle River | 47 | Walbrook Junction to Overlea Loop |
| 46 | Paradise Avenue Loop to Cedonia Loop | 48 | Towson Town Center to University of Maryland Transit Center |

Figure 1.1: System Map

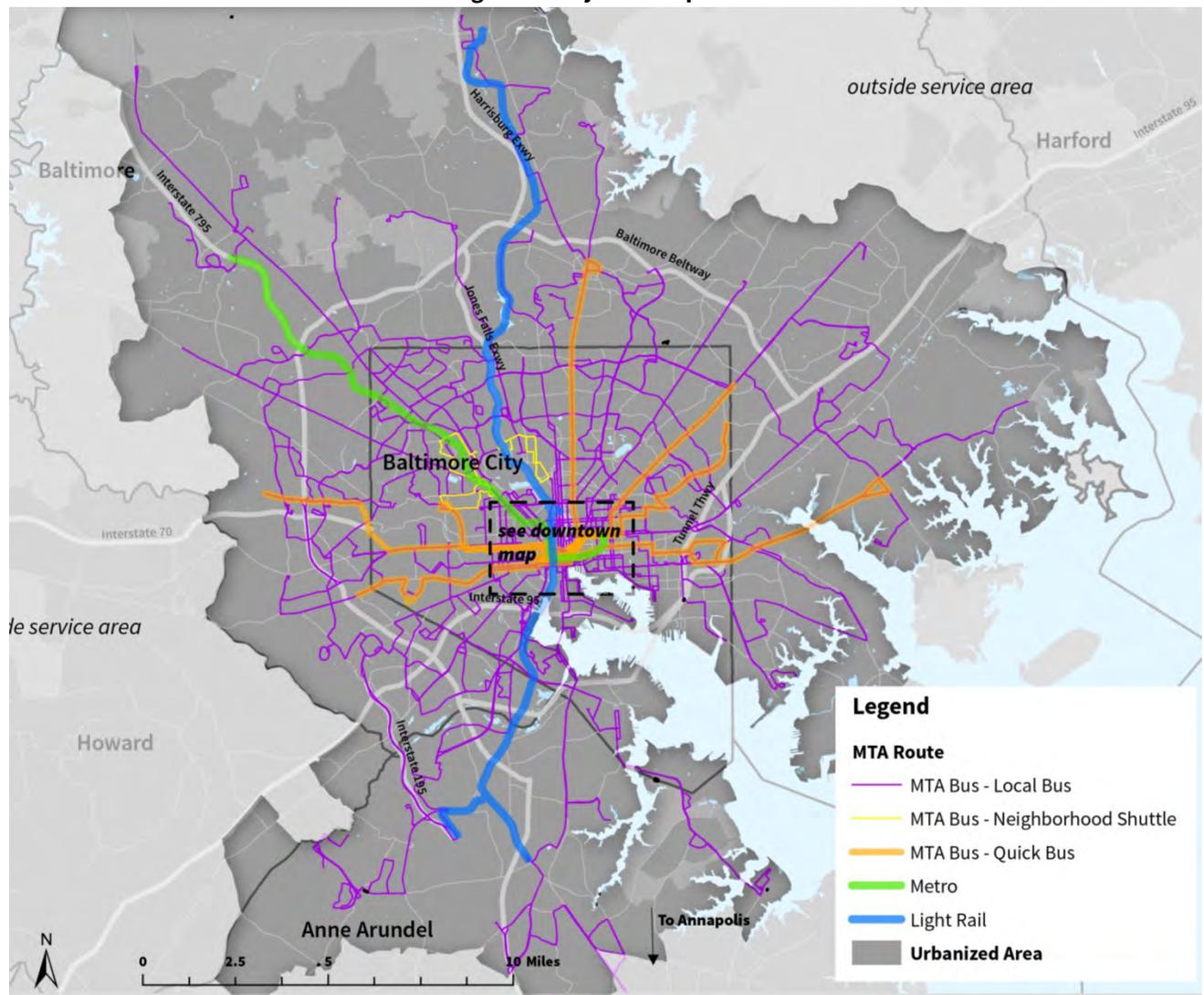


Figure 1.2: System Map (Central Baltimore)

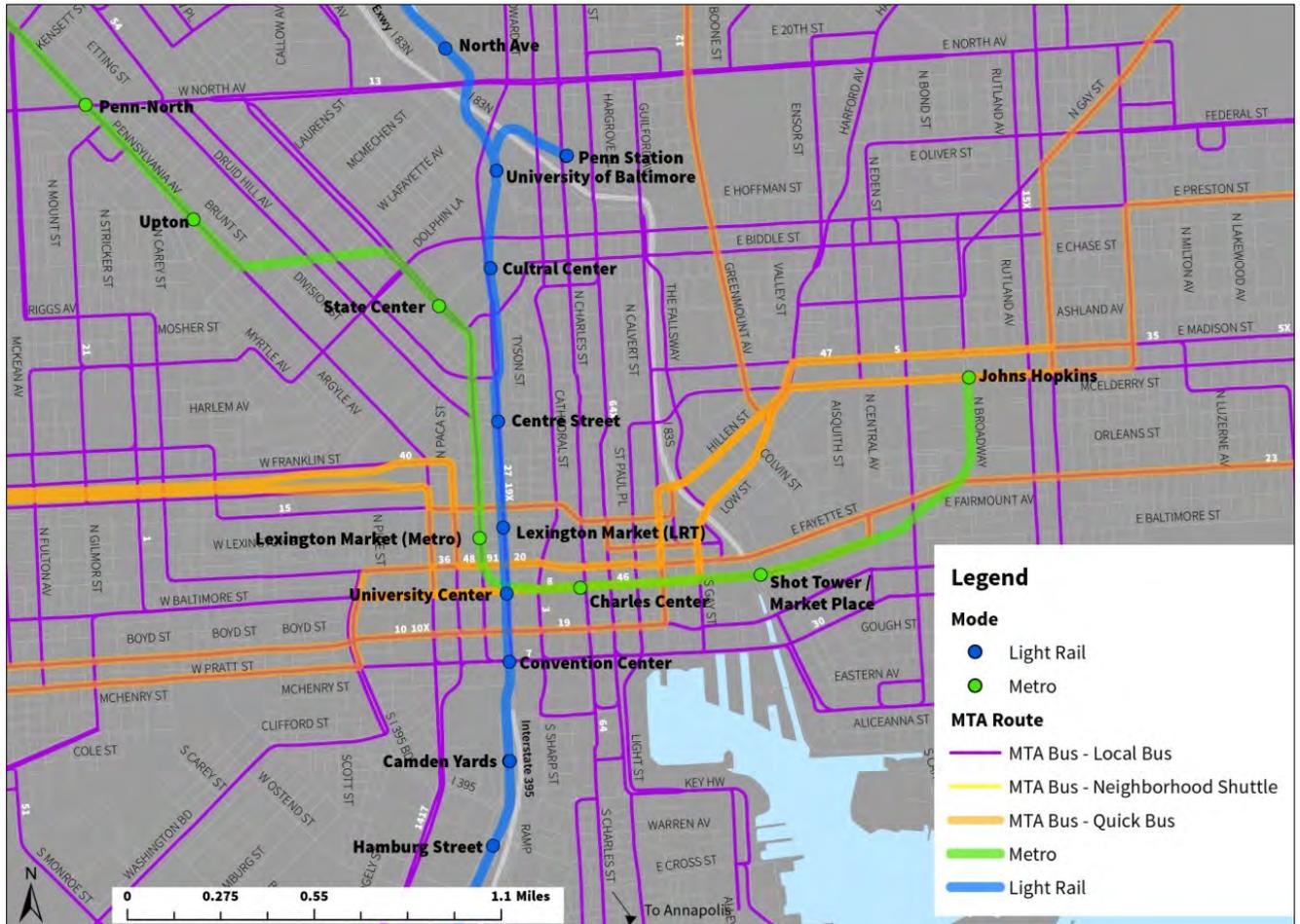


Figure 1.3: MTA Core Bus Services by Type of Service

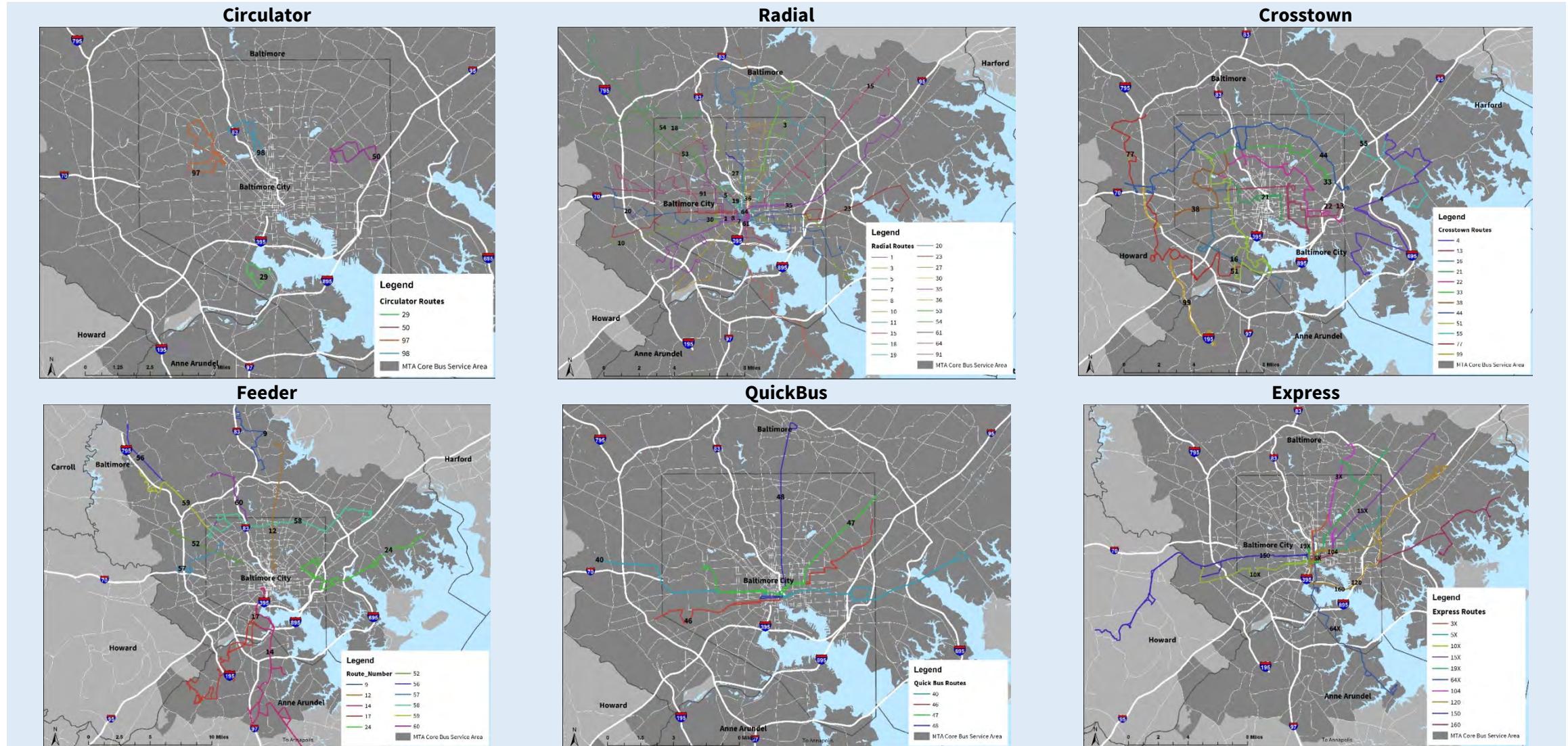
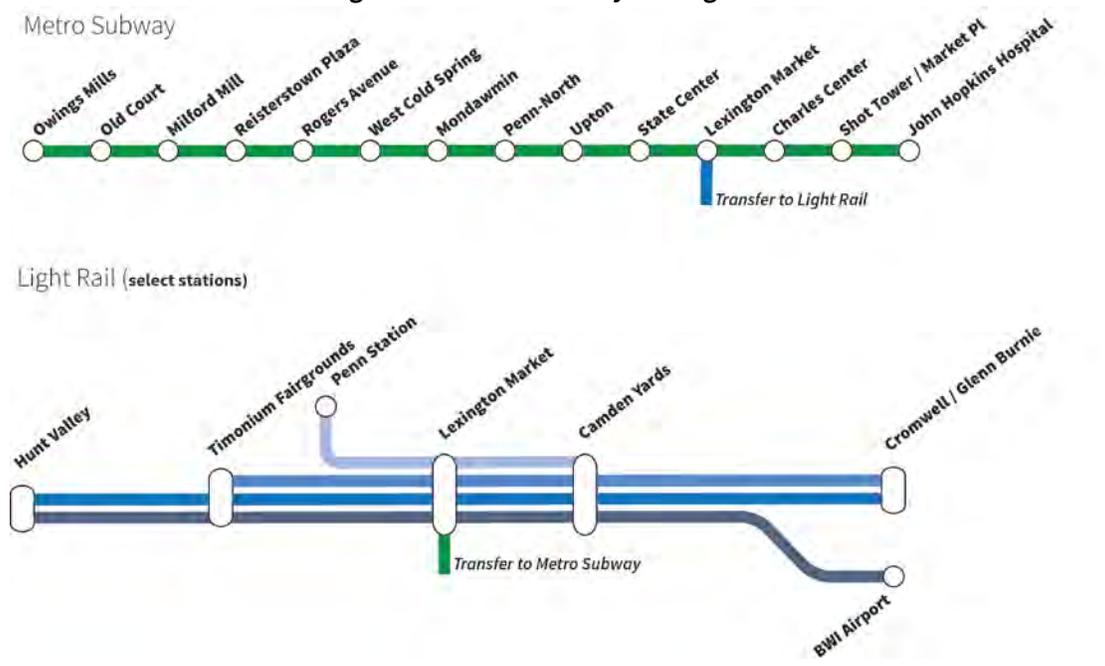


Figure 1.4: Metro Subway and Light Rail



2 EXISTING AND FUTURE LAND USE AND DEMOGRAPHICS

2.1 Existing Demographics

2.1.1 Population Density

Current population density was calculated for the MTA service area using 2010 Census population totals by census tract. Population density for tracts within the MTA service area range from a low of only 4 people per square mile for the tract containing BWI Thurgood Marshall Airport to a high of nearly 87,000 people per square mile for a tract just east of Downtown Baltimore, adjacent to I-83. Generally, tracts closer to Downtown Baltimore and along the Metro Subway in northwest Baltimore City have higher population densities, while tracts in northern Baltimore County have lower population densities. In order to be viable for transit service, densities in excess of 12,000 people per square mile are typically necessary and it is these areas that also have the highest need for transit service; those tracts with the highest densities all currently have some level of Core Bus service. Figures 2.1 and 2.2 illustrate population density within the MTA service area.

Figure 2.1: Population Density (People per Square Mile)

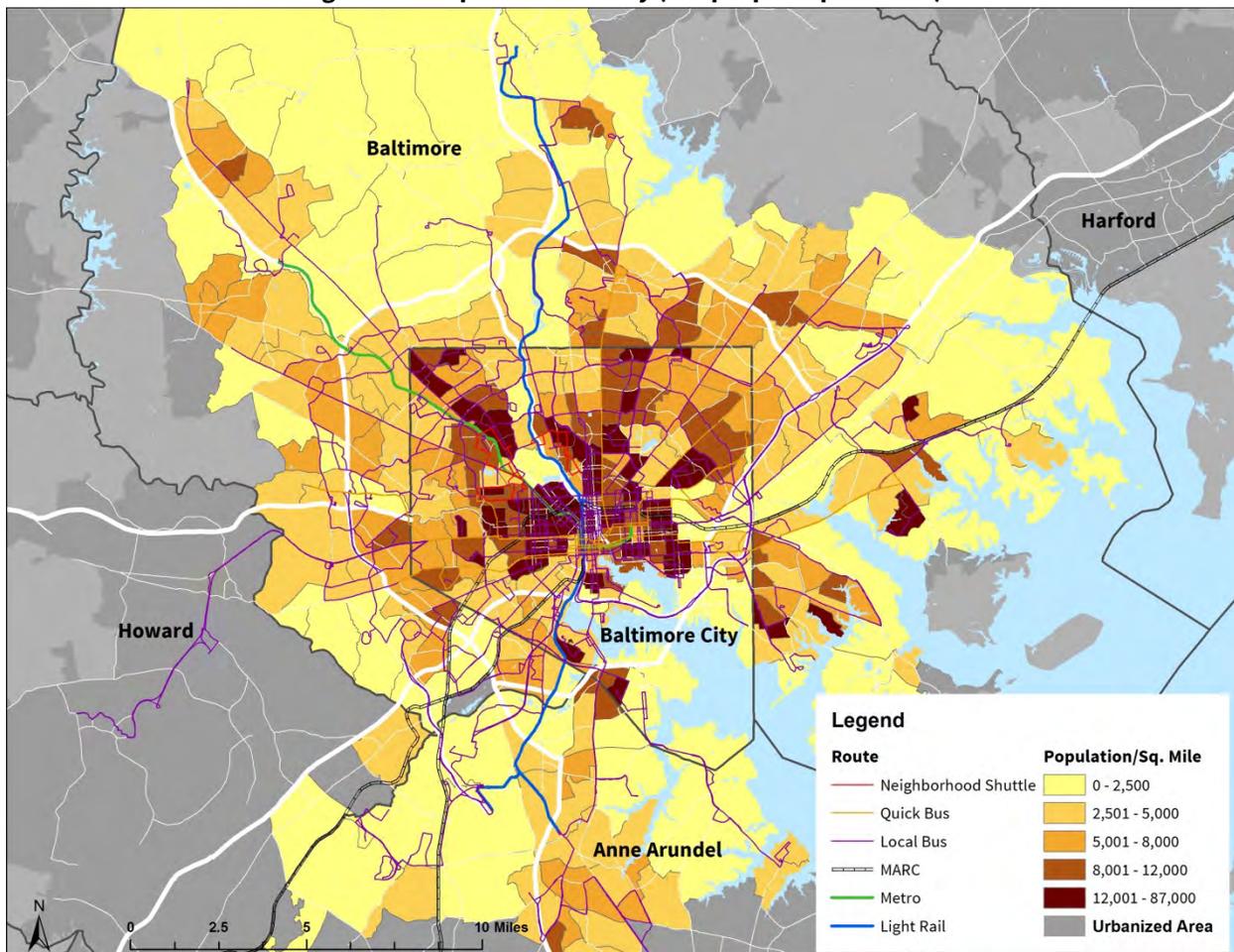
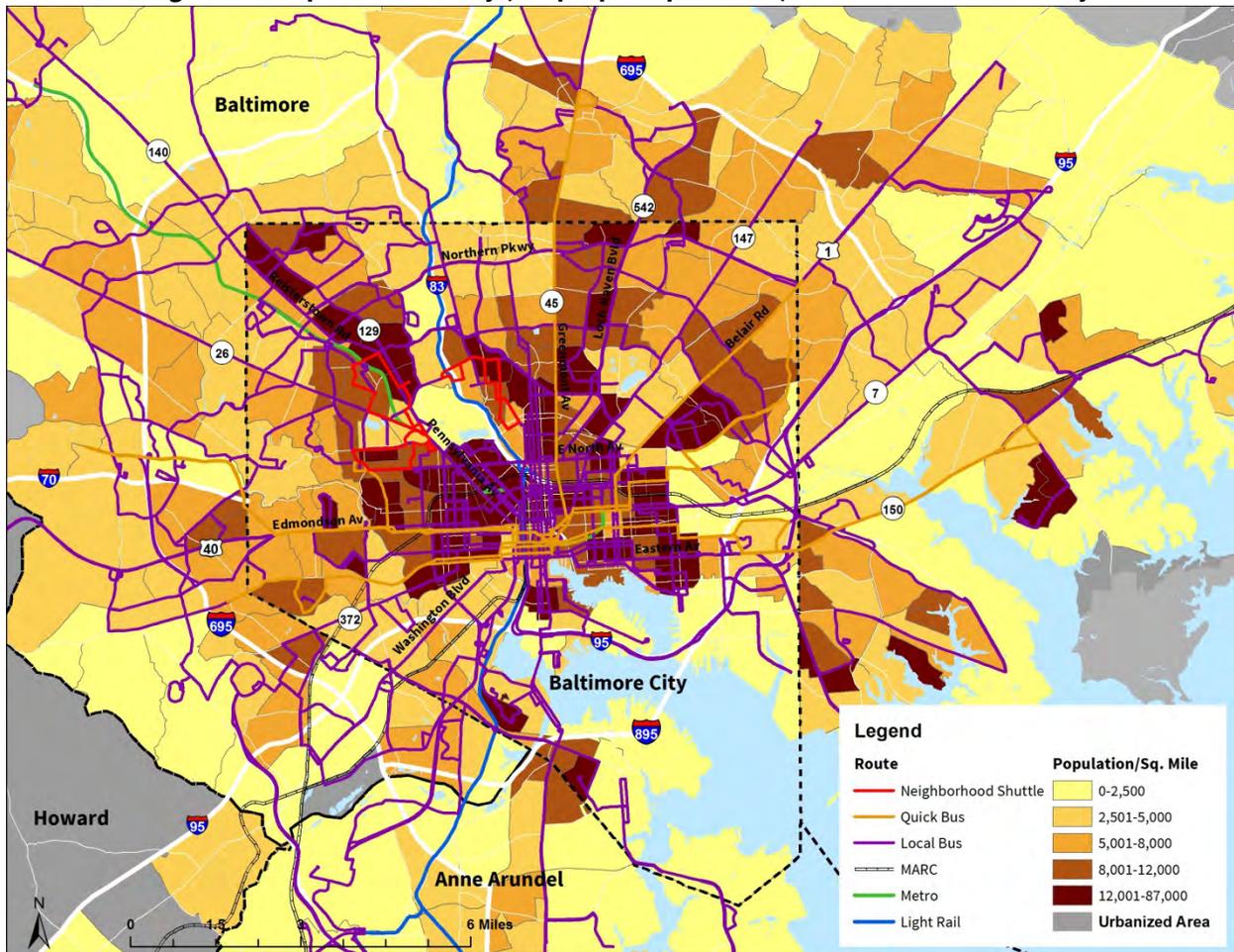


Figure 2.2: Population Density (People per Square Mile) Within Baltimore Beltway



2.1.2 Low Income Households

Low-income household information for the MTA service area was compiled by census tract using 2007-2011 American Community Survey (ACS) data on percentage of households living below the poverty line for the previous 12-month period. This percentage ranges from less than 1% in several Baltimore County tracts north of the city of Baltimore to 60-65% in several tracts in East Baltimore near downtown and in the Cherry Hill neighborhood of South Baltimore. The two census tracts containing the University of Maryland-Baltimore County and Towson University also display a high percentage of households below the poverty level. However, this is not an accurate portrayal of poverty, but rather reflective of the large student population. Generally, tracts within the City of Baltimore have a higher percentage of households below the poverty level, while those in Baltimore County and Anne Arundel County have lower percentages. The majority of high poverty tracts within the City of Baltimore corresponded well with the existence of some level of Core Bus routes, as well as the Metro and Light Rail alignments. Figures 2.3 and 2.4 illustrate low income household census tracts within the MTA service area.

Figure 2.3: Low Income Households

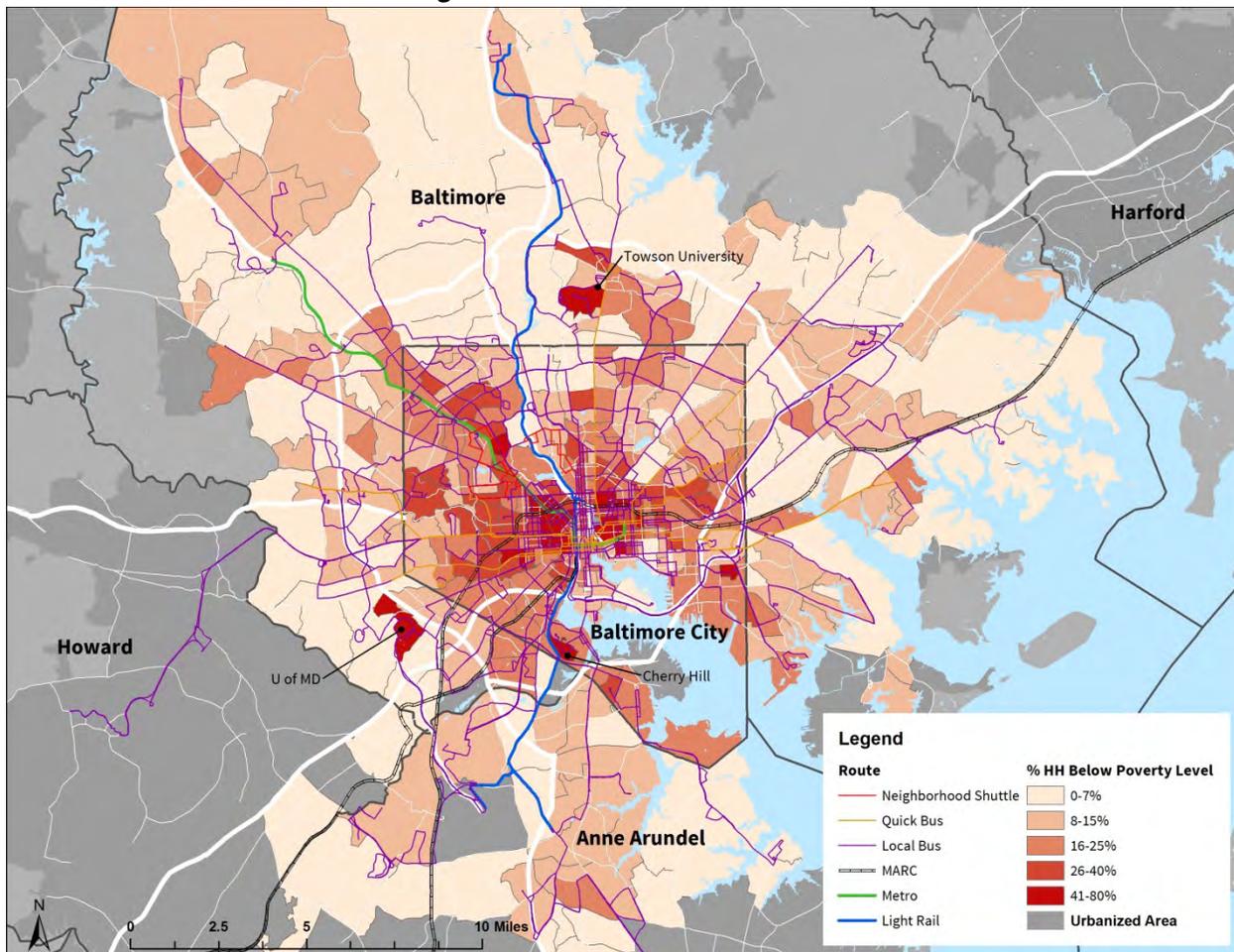
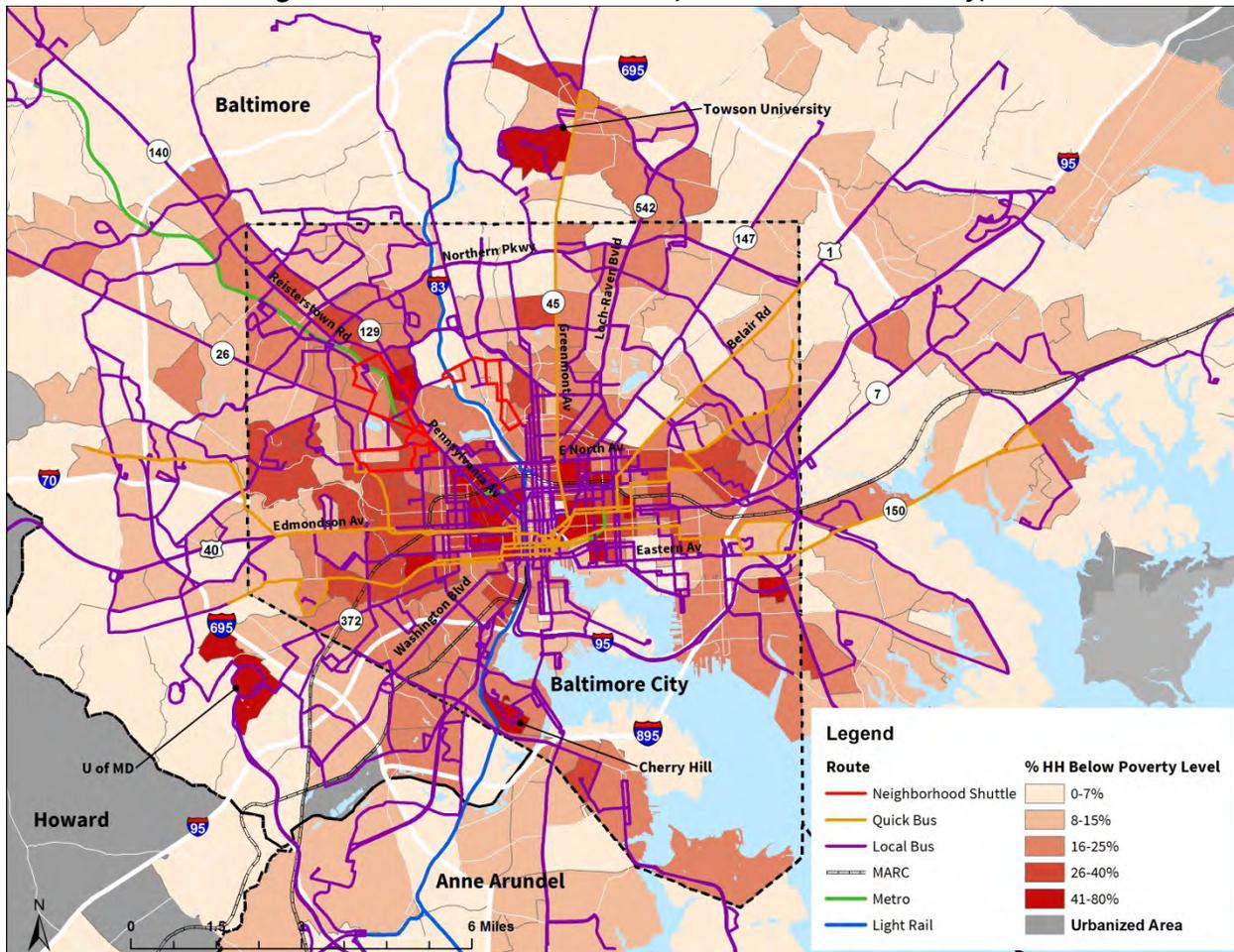


Figure 2.4: Low Income Households (Within Baltimore Beltway)



2.1.3 Zero-Car Households

Information on households that do not own or have access to a vehicle was compiled by census tract using 2007-2011 ACS vehicle ownership data. Overall, the boundaries of the City of Baltimore correspond closely with the extent of the area with high percentages of zero-car households. The percentage of zero-car households ranges from less than 1% in several tracts in Baltimore, Howard and Anne Arundel counties to greater than 75% in several tracts in the East Baltimore and Cherry Hill neighborhoods of the City of Baltimore. Generally, tracts adjacent to Downtown Baltimore and in southeast Baltimore have a much higher percentage of zero-car households, while those in Baltimore County, Anne Arundel County and Howard County had lower percentages. The tracts with higher percentages corresponded well with Core Bus routes and the Metro Subway alignment. Figures 2.5 and 2.6 illustrate the percentage of zero-car households by census tract for the MTA service area.

Figure 2.5: Zero-Car Households

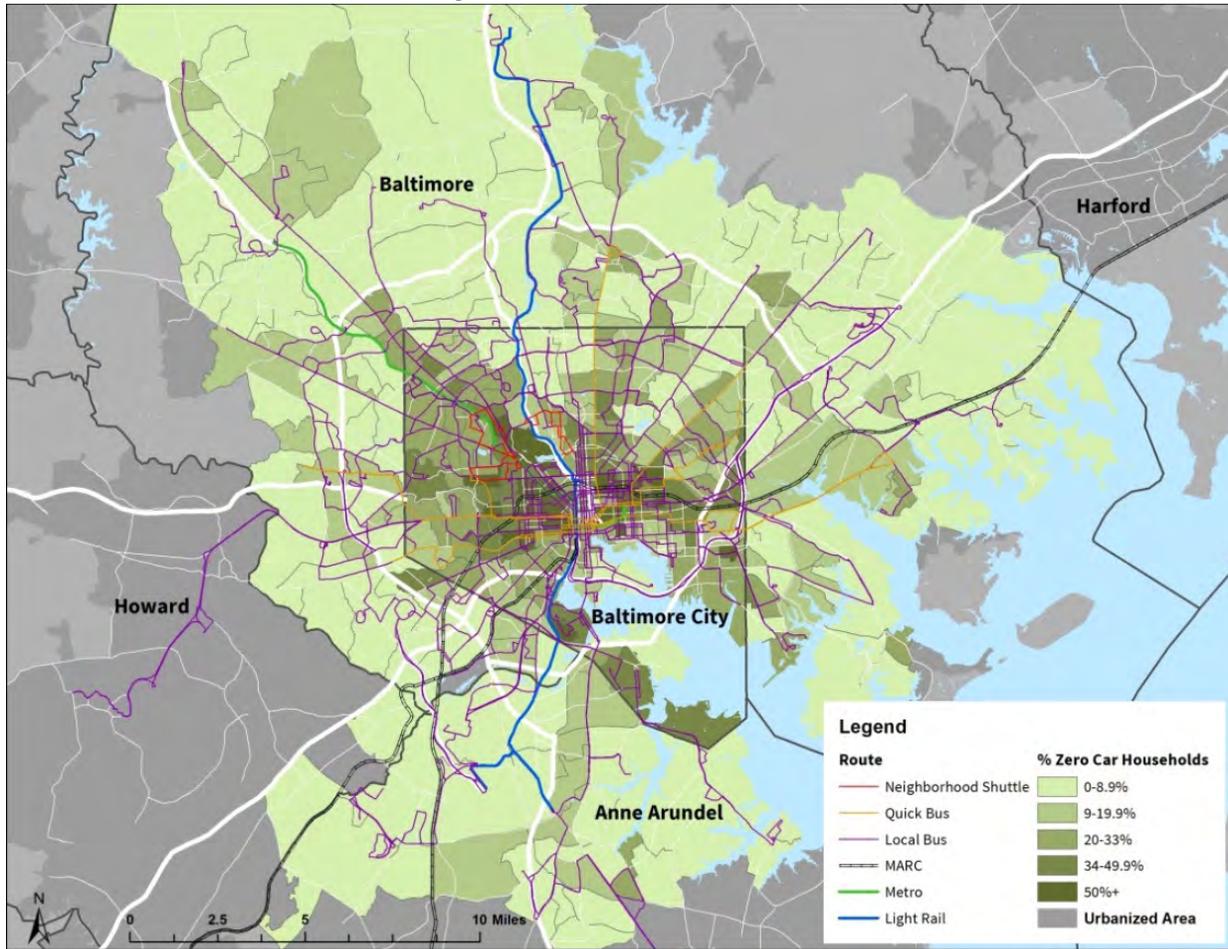
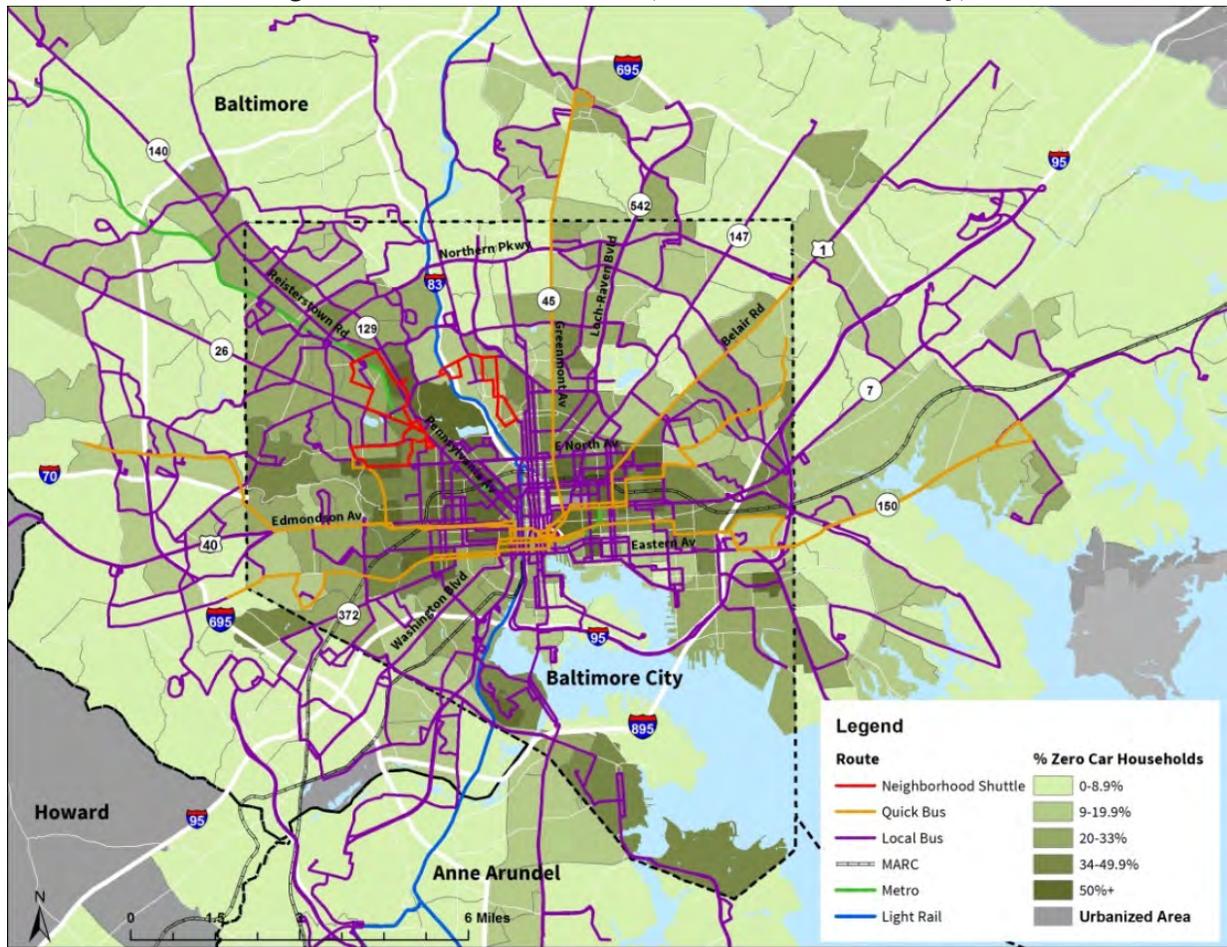


Figure 2.6: Zero-Car Households (Within Baltimore Beltway)



2.1.4 Age

Population by age information for the MTA service area was compiled by census tract using 2007-2011 ACS data. Populations 65 and over and under the age of 18 have a higher need for public transportation due to their lower levels of vehicle ownership. Concentrations of populations 65 and over were generally found outside of Baltimore City in Baltimore County and Anne Arundel County in areas with limited transit routes. The percentage of the population age 65 and over was nearly 58% in Catonsville near the MD-372/I-695 interchange and nearly 46% in the Cross Keys neighborhood of Baltimore City. Elsewhere in Baltimore County, western Towson near MD-139 and the Oregon Ride Park, Loch Raven Reservoir and Pikesville areas all had high percentages of population age 65 and over. In Anne Arundel County, there were high concentrations near BWI Thurgood Marshall Airport. Cross Key, Pikesville and BWI areas all have access to MTA rail service; however the location of housing within ¼ mile of stations is limited. Figures 2.7 and 2.8 illustrate the percentage of the population age 65 and over by census tract for the MTA service area.

Figure 2.7: Percentage of Population Age 65 and Over

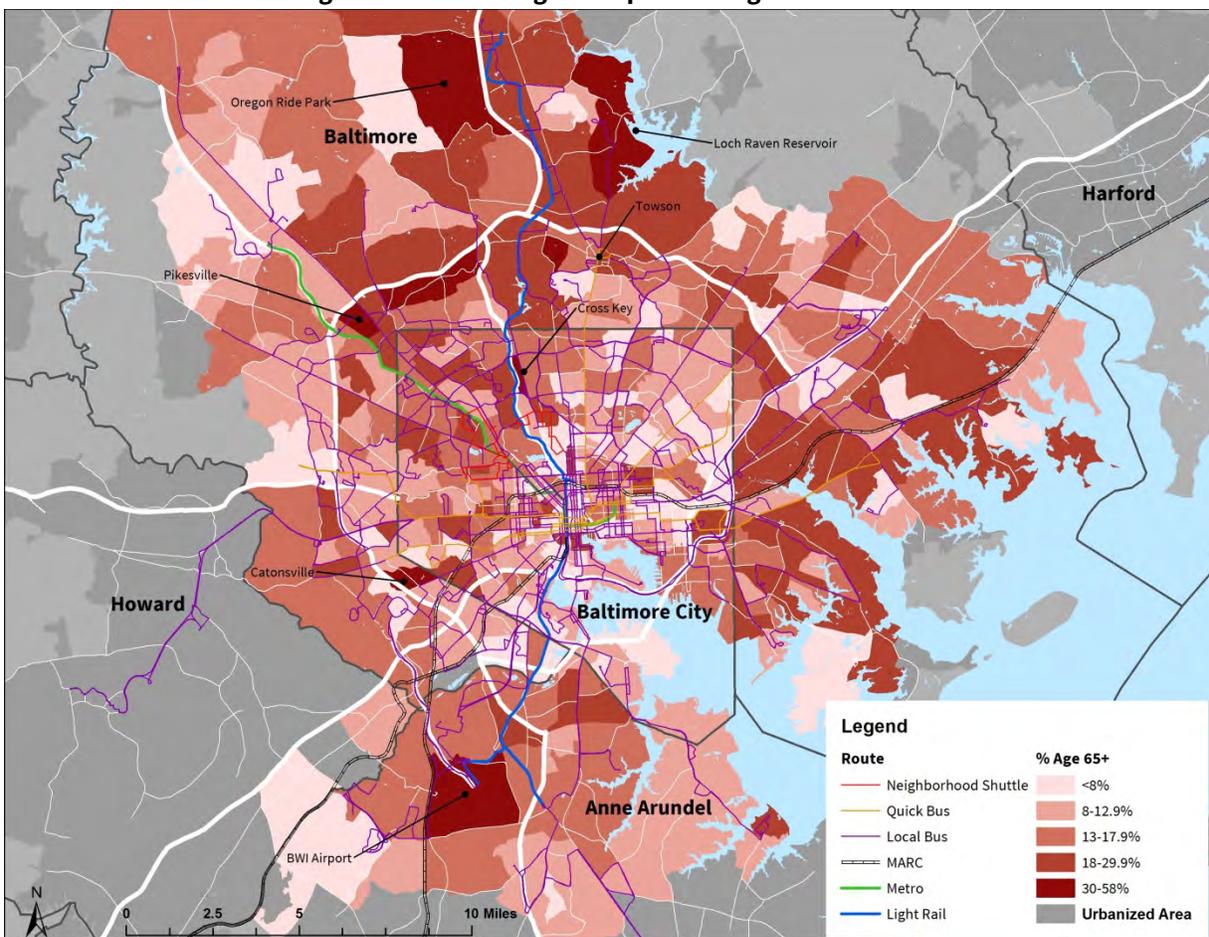
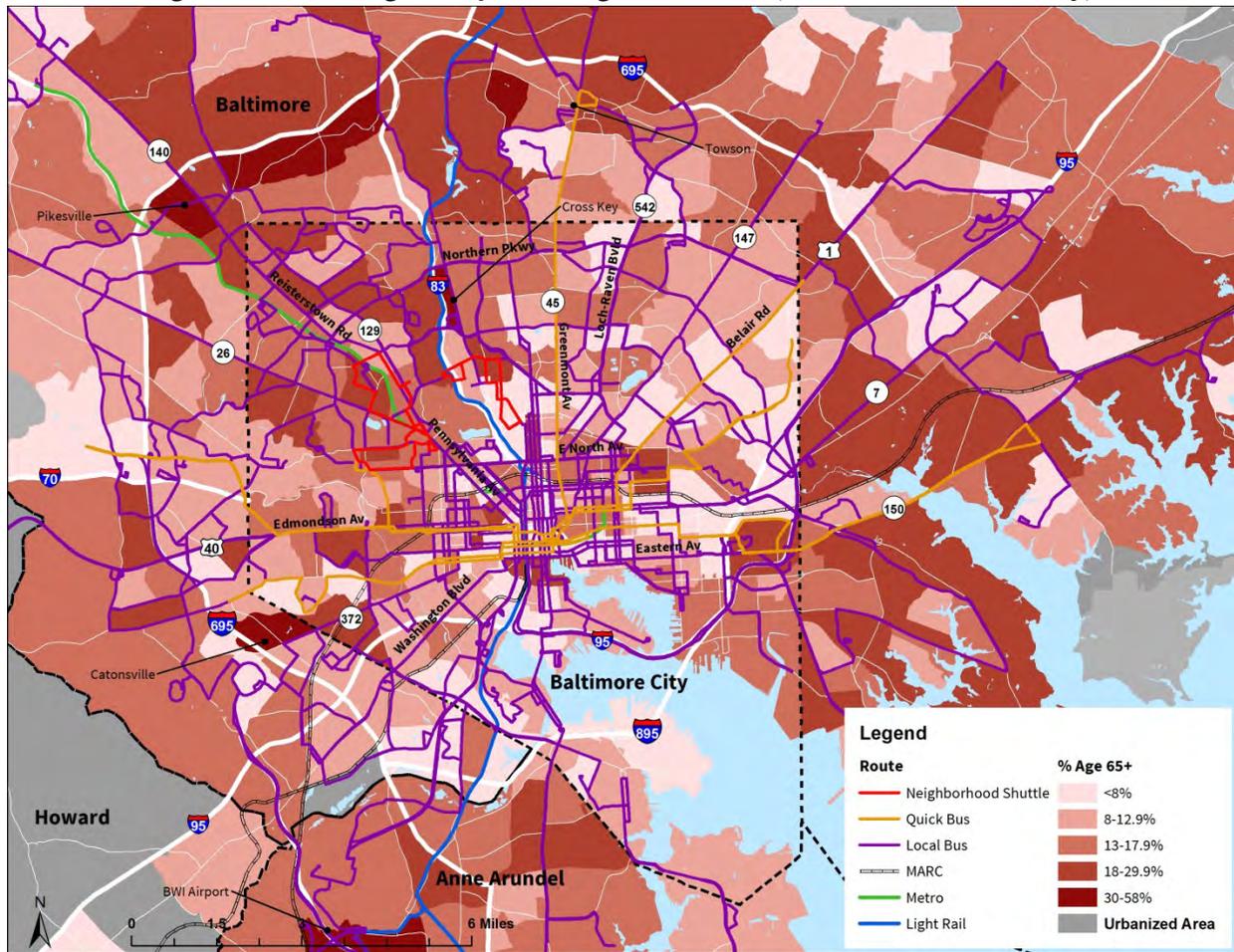


Figure 2.8: Percentage of Population Age 65 and Over (Within Baltimore Beltway)



Concentrations of populations under the age of 18 were generally found within Baltimore City or within Baltimore County to the west of Baltimore City. In Baltimore City, the Druid Heights, Uptown, West Hills and Cherry Hill neighborhoods had the highest percentages, while in Baltimore County the Baltimore Highlands, Windsor Mill, Woodlawn and Howard Park neighborhoods had the highest percentages. The Cherry Hill and Uptown neighborhoods of Baltimore City had the highest overall percentages, between 45% and 50%. Overall, areas with high percentages of youths were situated in areas with several existing MTA Core Bus routes and/or rail routes. Figures 2.9 and 2.10 illustrate the percentage of the population under the age of 18 by census tract for the MTA core service area.

Figure 2.9: Percentage of the Population under the Age of 18

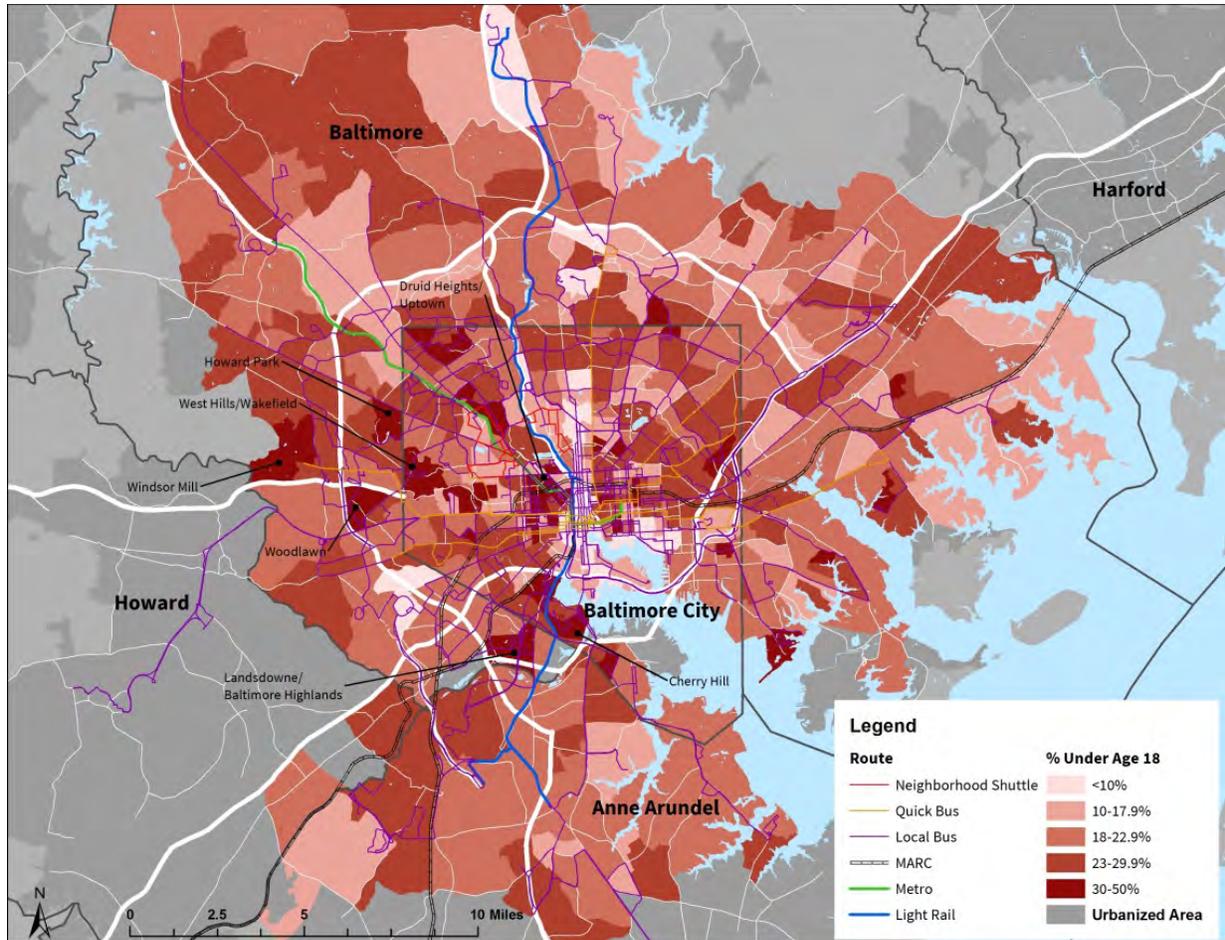
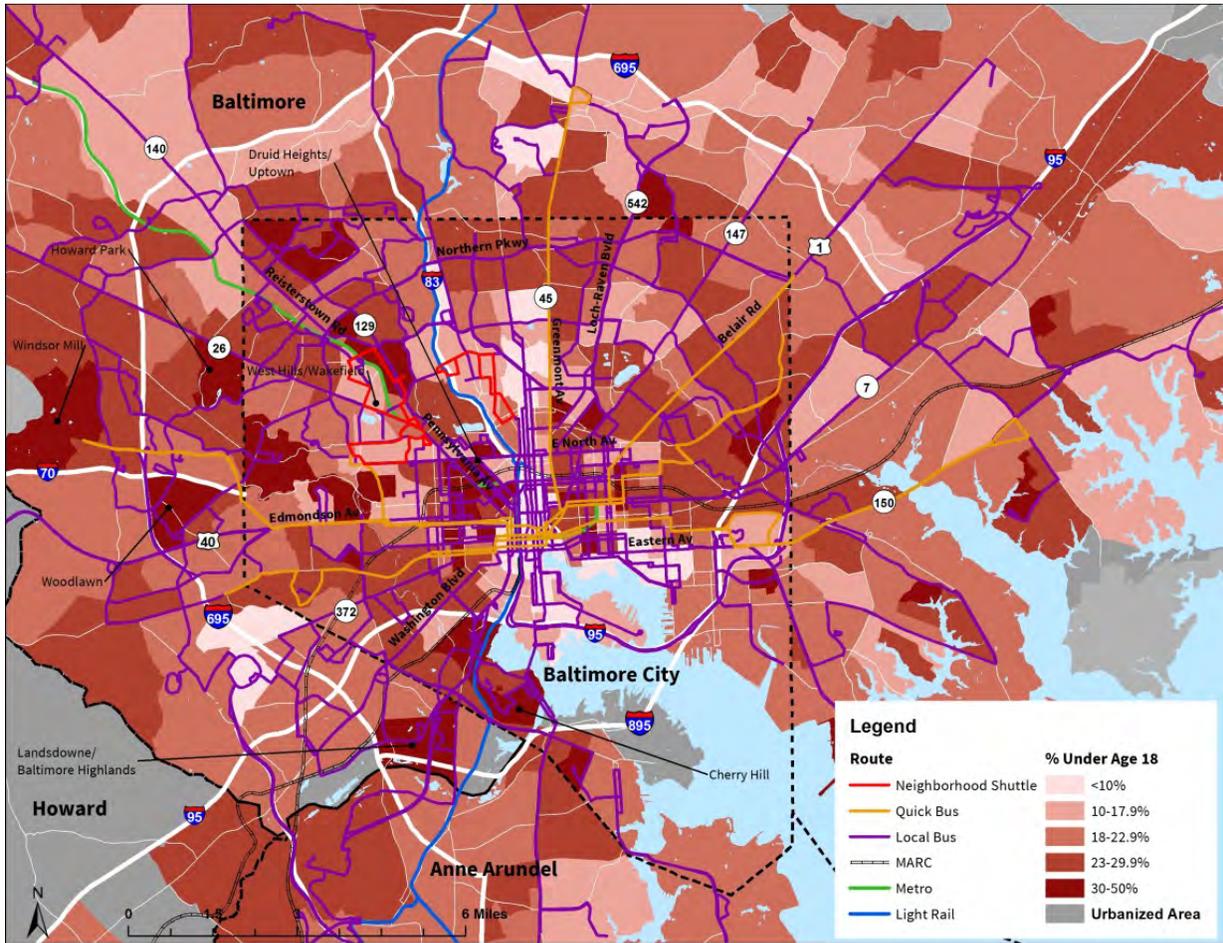


Figure 2.10: Percentage of the Population under the Age of 18 (Within Baltimore Beltway)



2.1.5 Employment Density

Employment density by census tract was compiled using 2011 Census Local Employment Dynamics (LED) data. Employment density was not as centralized as population density, with several high employment density census tracts located outside of the city of Baltimore in Baltimore County and Anne Arundel County. Overall, tracts with the highest employment densities were in Downtown Baltimore, Towson, Pikesville, the Southdale area of Glen Burnie and near the BWI Business Park. All of these high employment density census tracts are served by Local Bus routes, the Metro Subway or the Light Rail, though in the case of the Metro Subway and Light Rail, many actual employment locations are a considerable distance away from actual stations. Those high employment density census tracts closest to Downtown Baltimore have the most transit service (in terms of number of routes), often served by multiple MTA modes. Figures 2.11 and 2.12 illustrate employment density in the MTA Core service area.

Figure 2.11: 2011 Employment Density

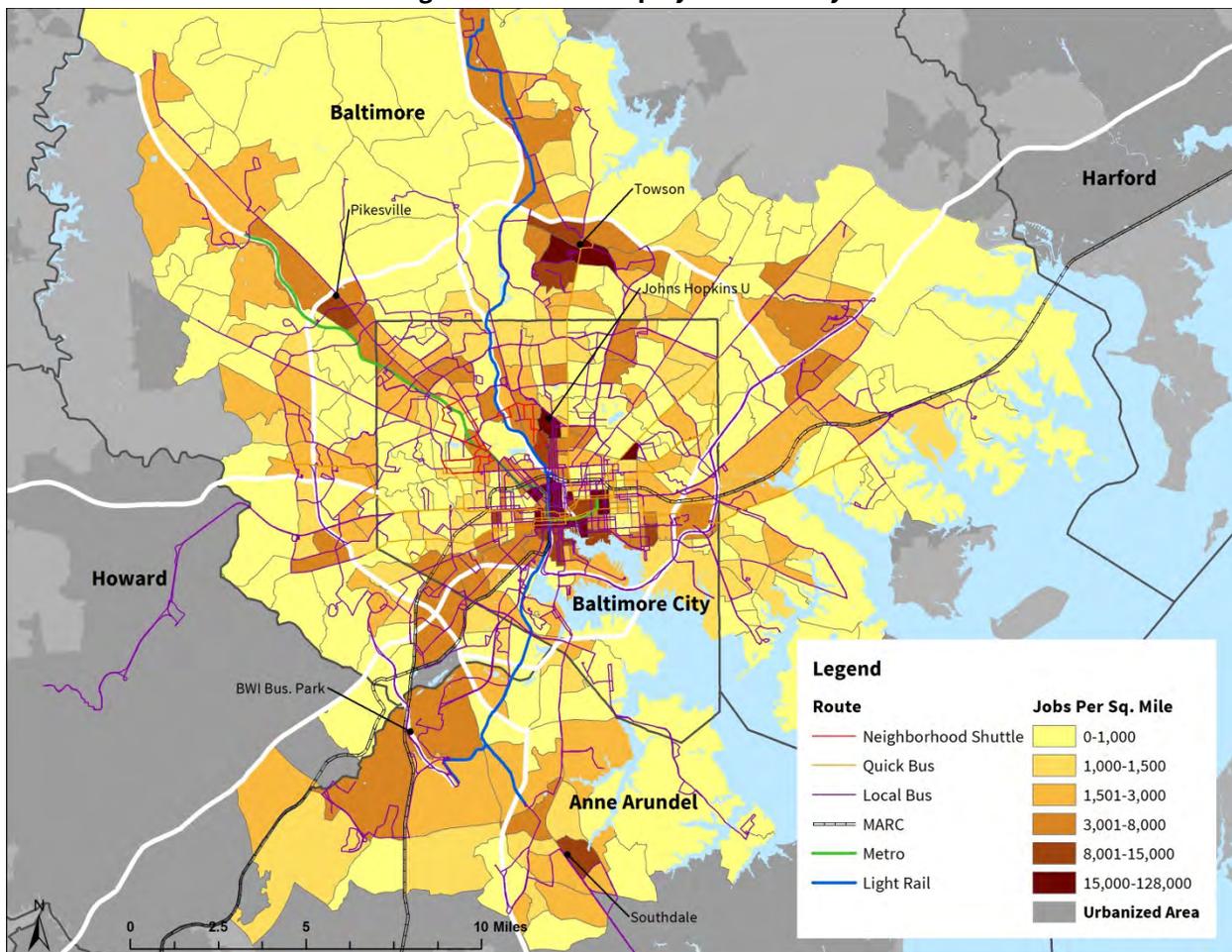
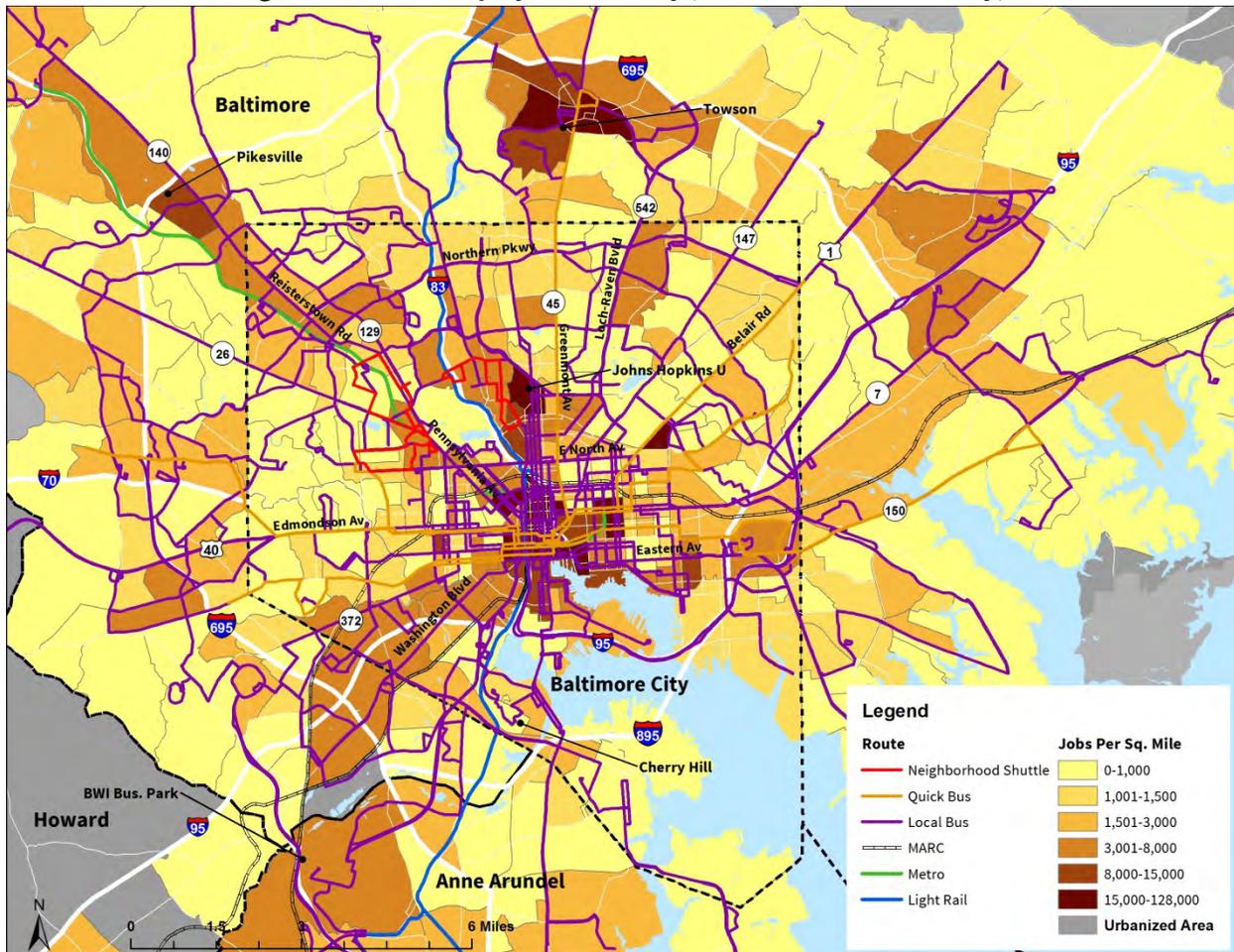


Figure 2.12: 2011 Employment Density (Within Baltimore Beltway)



2.1.6 Transit Propensity

In order to identify those areas where transit demand is highest, demographic data from the ACS was compiled into a transit propensity index for each census tract within the MTA Core Bus service area. Inputs into this index fell into the categories of population, age, households, income, vehicle ownership, labor force size and commute mode. Overall, 33 different metrics were analyzed, including reviews of the data in the aggregate, by density and as a percentage of the total population. Rates such as the percentage of senior citizens of the total population and density of senior citizens are useful in understanding the composition of each census tract, while the aggregate measures, such as the total senior citizen population, indicate the absolute potential for travel in general and transit trip making in particular. Table 2.1 summarizes all of the different metrics involved in generating this index. All densities listed are per square mile.

Table 2.1: Transit Propensity Index Methodology

| | |
|--------------------------|--|
| Population | <ul style="list-style-type: none"> • Total Population • Population Density |
| Age | <ul style="list-style-type: none"> • Total Seniors (65+) • Senior Density • Seniors % of Population • Total Youth (<18) • Youth Density • Youths % of Population |
| Households | <ul style="list-style-type: none"> • Total Households • Household Density |
| Income | <ul style="list-style-type: none"> • Median Household Income • Total Households in Poverty • % Households in Poverty • Households in Poverty Density • Total Households between Poverty and Median Income • % Households between Poverty and Median Income • Households between Poverty and Median Income Density |
| Vehicle Ownership | <ul style="list-style-type: none"> • Total Zero-Car Households • % Zero-Car Households • Zero-Car Household Density • Total One-Car Households • % One-Car Households • One-Car Household Density |
| Labor Force | <ul style="list-style-type: none"> • Labor Force Size • Labor Force Density • Employed Persons • Employed Person Density • % Employed |
| Commute Mode | <ul style="list-style-type: none"> • Total Commuters • Commuter Density • Total Transit Commuters • % Transit Commuters • Transit Commuter Density |

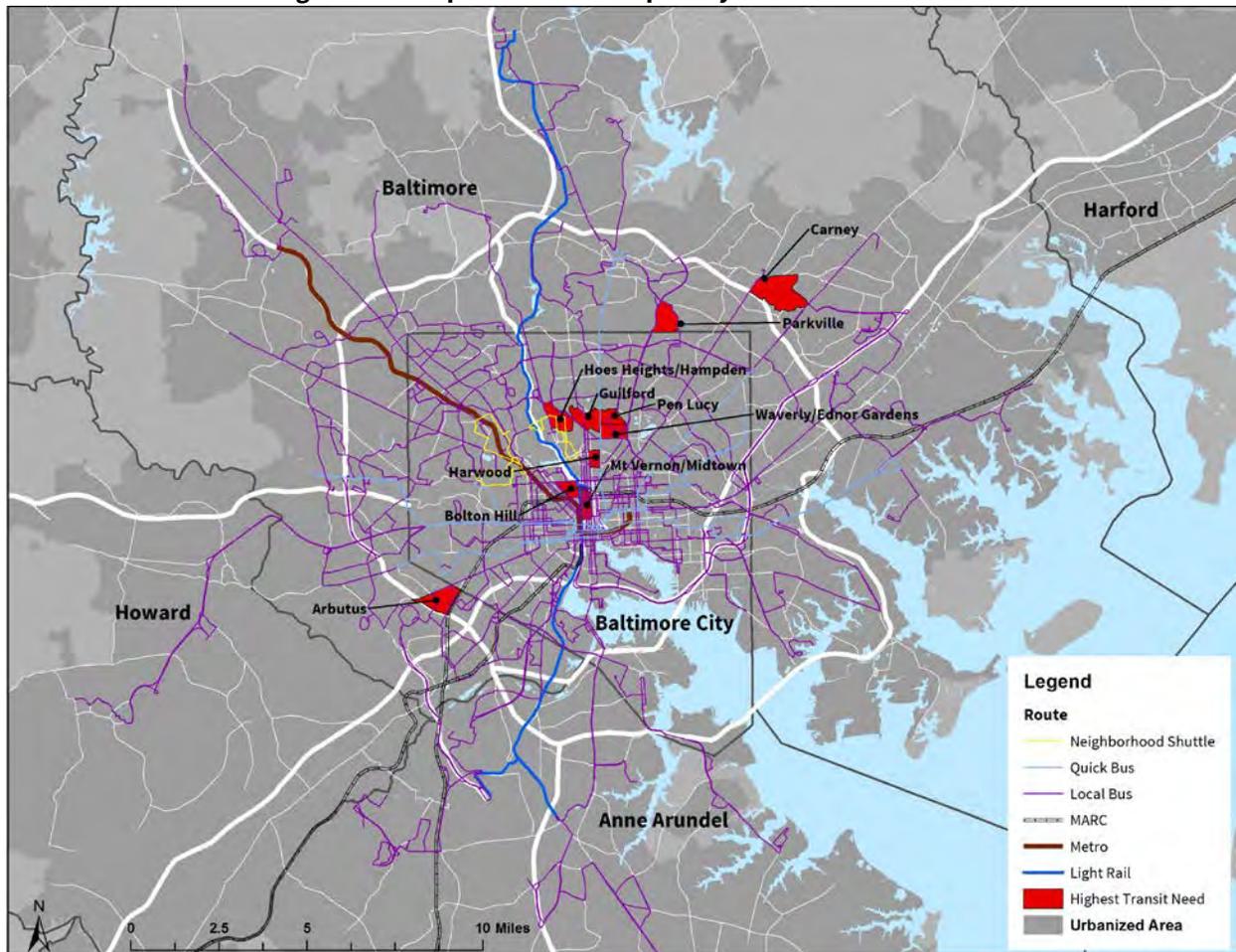
For all variables with the exception of Median Household Income, higher values are indicative of greater need and likelihood of transit use. For example, a census tract with a higher senior citizen density or a high number of zero-car households exhibits a greater mobility need and a propensity for transit use. In this analysis, a standardized score has been used to combine the different variables. With this approach for each variable, the block group with the lowest value is assigned a score of zero, while the block group with the highest value is assigned a value of 100. The other areas are computed by interpolating between maximum and minimum values. These scores can then be added for the 33 variables, where the highest possible score would be 3,300.

The overall scoring of the transit propensity metrics ranged from a low of 335 to a high of 3,167. In order to display the results on a map, the scores were geocoded and the index was then broken up into four categories: low, medium, high and very high. An equal number of census tracts were placed into each category to adjust the index to the service area. Overall, neighborhoods in Baltimore City north of Downtown had the highest transit propensity, along with three areas in Baltimore County: Arbutus, Carney and Parkville. Table 2.2 details the ten highest areas of need by census tract, while Figure 2.13 illustrates their locations.

Table 2.2: Top Ten Transit Propensity Scores

| Census Tract | Overall Transit Need Score (33 Factors) | Location |
|--------------|---|---------------------------------------|
| 24510140100 | 3,167 | Bolton Hill, Baltimore City |
| 24510130700 | 3,091 | Hoes Heights/Hampden, Baltimore City |
| 24510090100 | 2,979 | Pen Lucy, Baltimore City |
| 24510120100 | 2,967 | Guilford, Baltimore City |
| 24510120300 | 2,914 | Harwood, Baltimore City |
| 24005411407 | 2,886 | Carney, MD |
| 24510110200 | 2,870 | Mt Vernon/Midtown, Baltimore City |
| 24510090300 | 2,869 | Waverly/Ednor Gardens, Baltimore City |
| 24005430900 | 2,853 | Arbutus, MD |
| 24005491401 | 2,825 | Parkville, MD |

Figure 2.13: Top Ten Transit Propensity Score Census Tracts

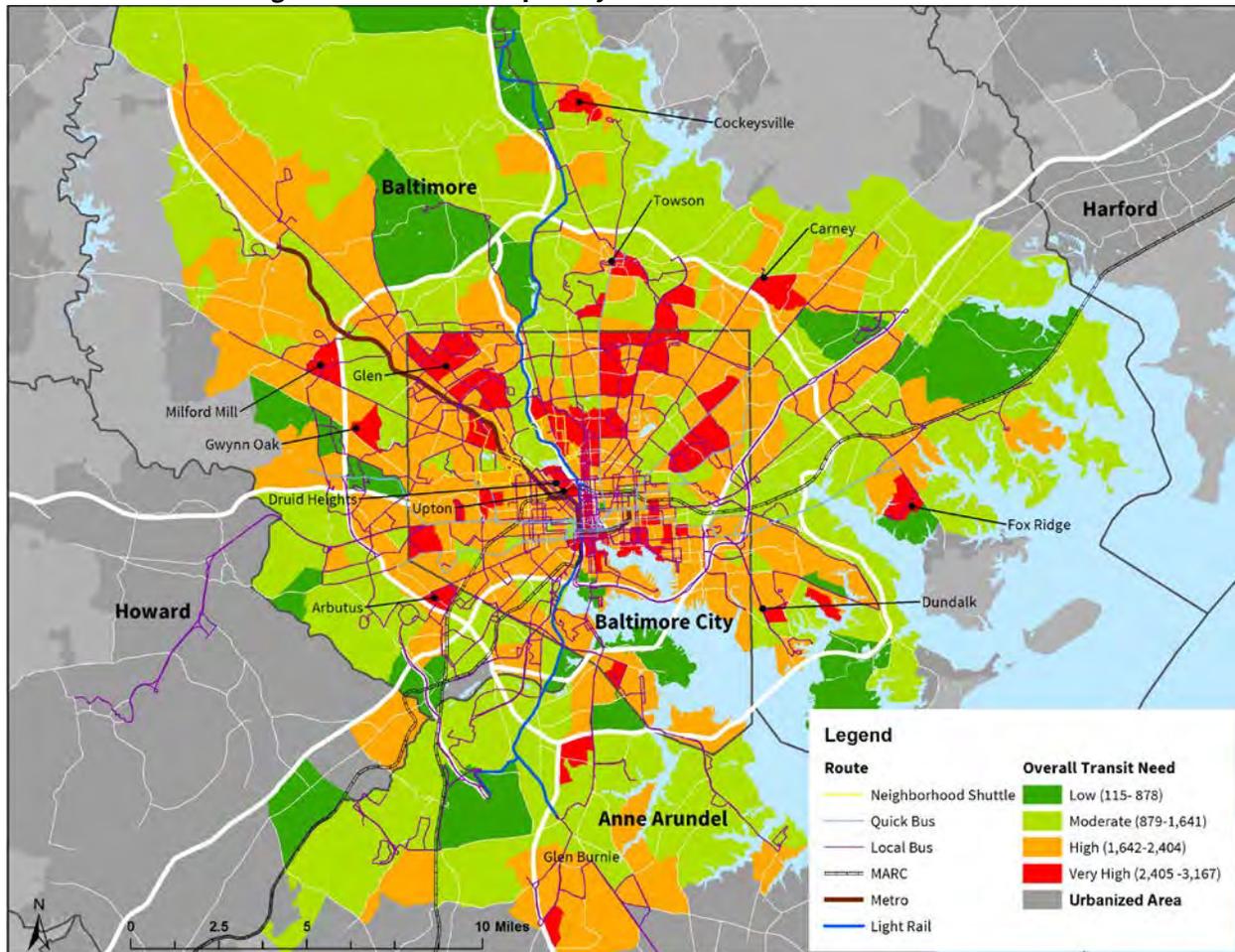


Overall, as shown in Figure 2.14, the majority of census tracts with a very high propensity for transit fell within Baltimore City where population densities are highest and incomes and vehicle ownership is lowest. Outside of those areas with the top ten scores, neighborhoods just west of downtown (including Upton and Druid Heights) and in northwest Baltimore (Glen) had the highest transit propensities. Several outlying areas in Baltimore

County and Anne Arundel County outside of the top ten also had very high transit propensities, including Dundalk, Fox Ridge, Cockeysville, Milford Mill, Gwynn Oak and southern Glen Burnie.

One limitation of the transit propensity analysis is that, particularly outside of Baltimore City, the census tracts are quite large. Therefore, even if a part of the tract would have a high propensity, that gets outweighed by the majority of the tract that does not have a high propensity. Because census tract boundaries usually coincide with the jurisdictional boundary, transit propensity just outside the city line may be understated.

Figure 2.14: Transit Propensity in the MTA Core Bus Service Area



2.2 Future Population Density and Employment

Population and employment projections for the year 2020 are based on the Round 7c Cooperative Forecasts from the Baltimore Metropolitan Council (BMC). These projections are made at the Traffic Analysis Zones (TAZs) level for travel demand modeling purposes. TAZs in the BMC district generally represent geographies smaller than census tracts, with exact sizes determined by population and employment density.

2.2.1 Future Population Density

In order to highlight areas where population densities are projected to increase, the raw change in population per square mile was calculated. Overall, the MTA service area is projected to increase in population by approximately 387,000 between 2010 and 2020, though this increase is not uniform across the region. Many TAZs are projected to lose population, while others are expected to gain a significant amount of population. Within the city of Baltimore, much of the northeast and northwest portions of the city are projected to have decreases in population and therefore population density, while neighborhoods closer to Downtown such as West Baltimore and Brewers Hill are expected to increase in density. Given that the MTA system centers on the Downtown, much of the increase in population density will be within TAZs with existing service. Outside of the city of Baltimore projected changes in population density are more uniform, with much of Baltimore County, Anne Arundel County and Howard County projected to have modest increases in population density up to 100 people per square mile. Figures 2.15 and 2.16 illustrate projected change in population density between 2010 and 2020.

Figure 2.15: Projected Change in Population Density, 2010-2020

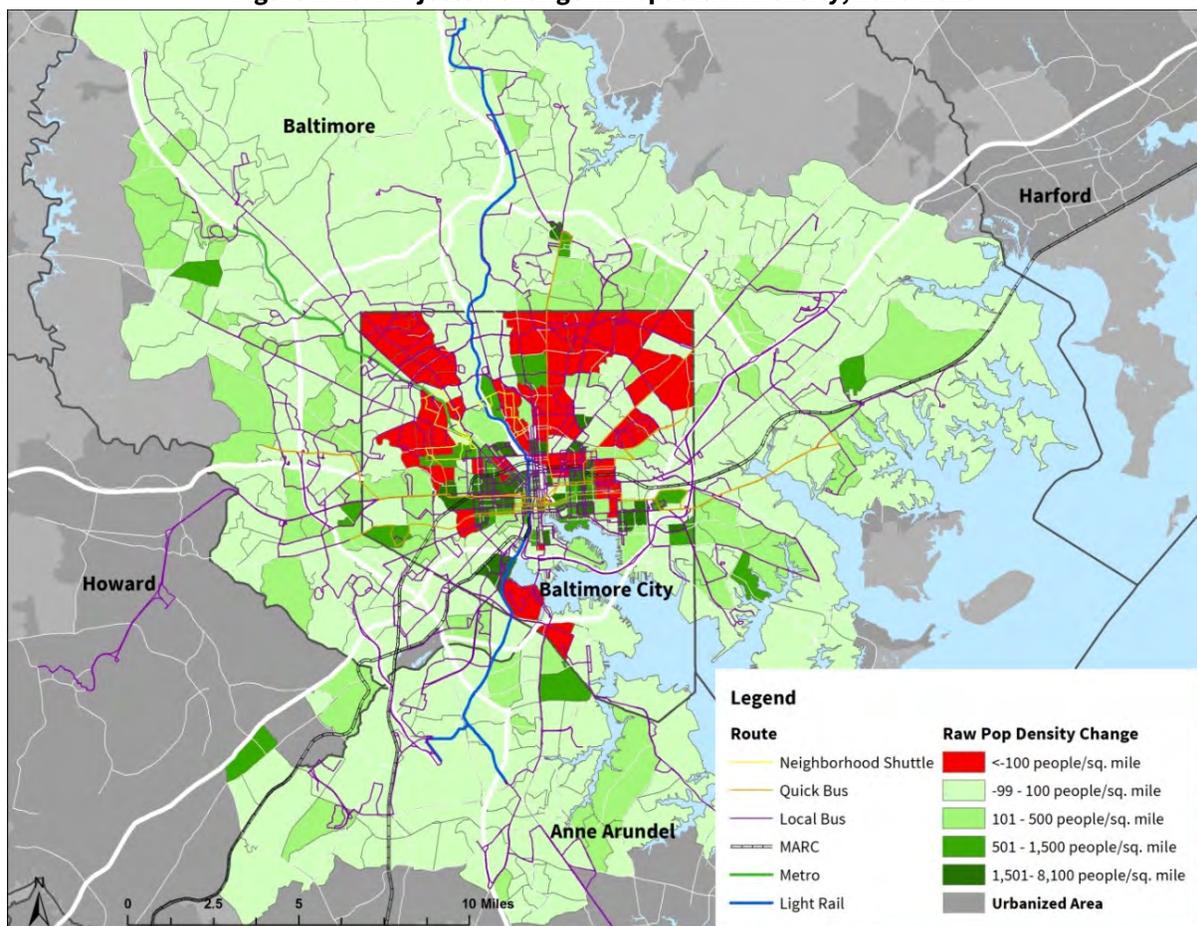
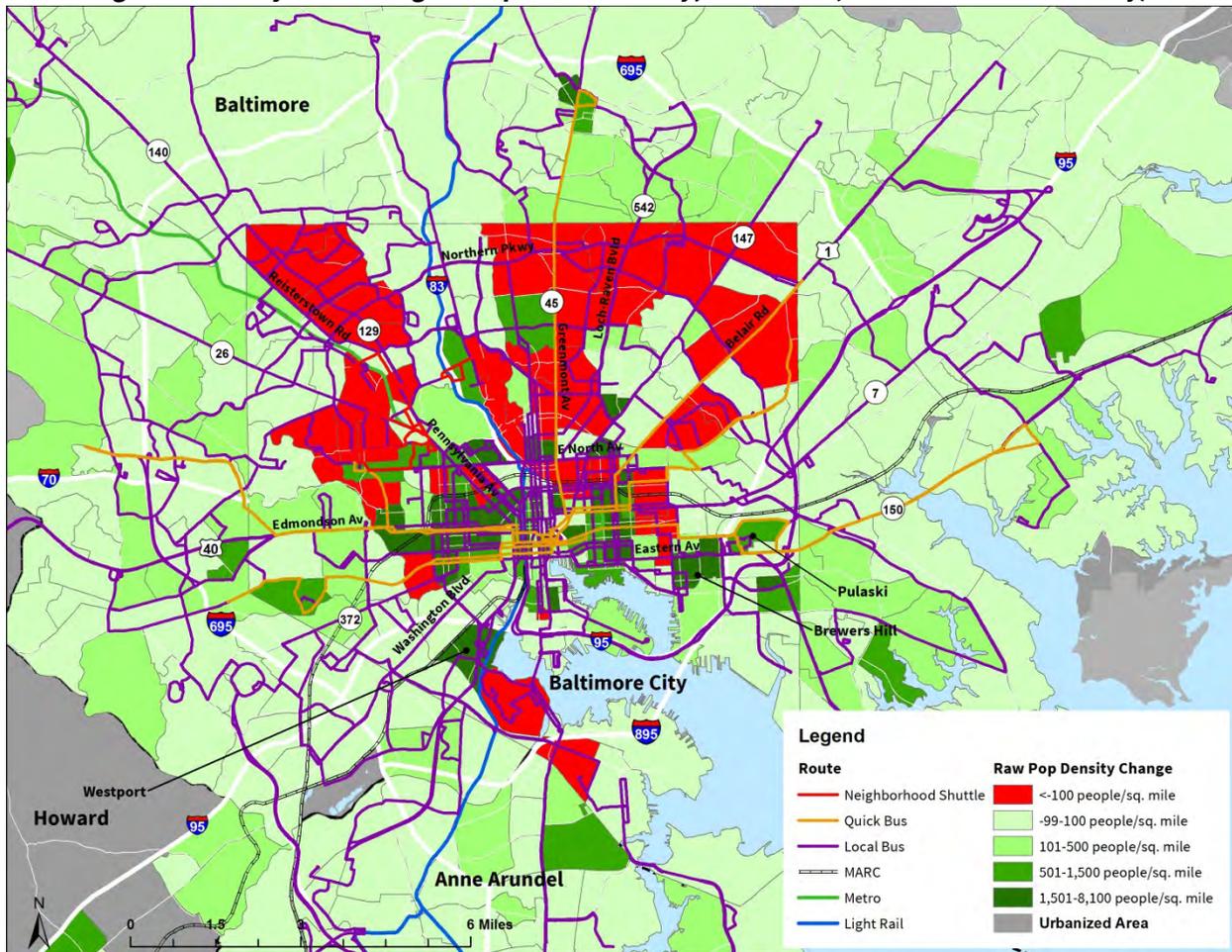


Figure 2.16: Projected Change in Population Density, 2010-2020 (Within Baltimore Beltway)



2.2.2 Future Employment

Projected changes in employment were calculated to show high and low employment growth areas in the MTA service area. Overall, the region is expected to add approximately 364,000 jobs between 2010 and 2020, though like population, this growth is not uniform across the region. Significant increases in employment are projected in several outlying TAZs that have limited MTA service in both Baltimore and Anne Arundel Counties. These areas include Reisterstown and Martin Airport in Baltimore County and Curtis Bay and west of BWI Thurgood Marshall Airport in Anne Arundel County. Within the city of Baltimore, employment is projected to decrease or grow little within much of the city outside of Downtown, Fell’s Point, Canton, Pulaski, Westport and the Johns Hopkins Hospital area. Figures 2.17 and 2.18 illustrate raw increases in employment projected between 2010 and 2020.

Figure 2.17: Projected Change in Employment, 2010-2020

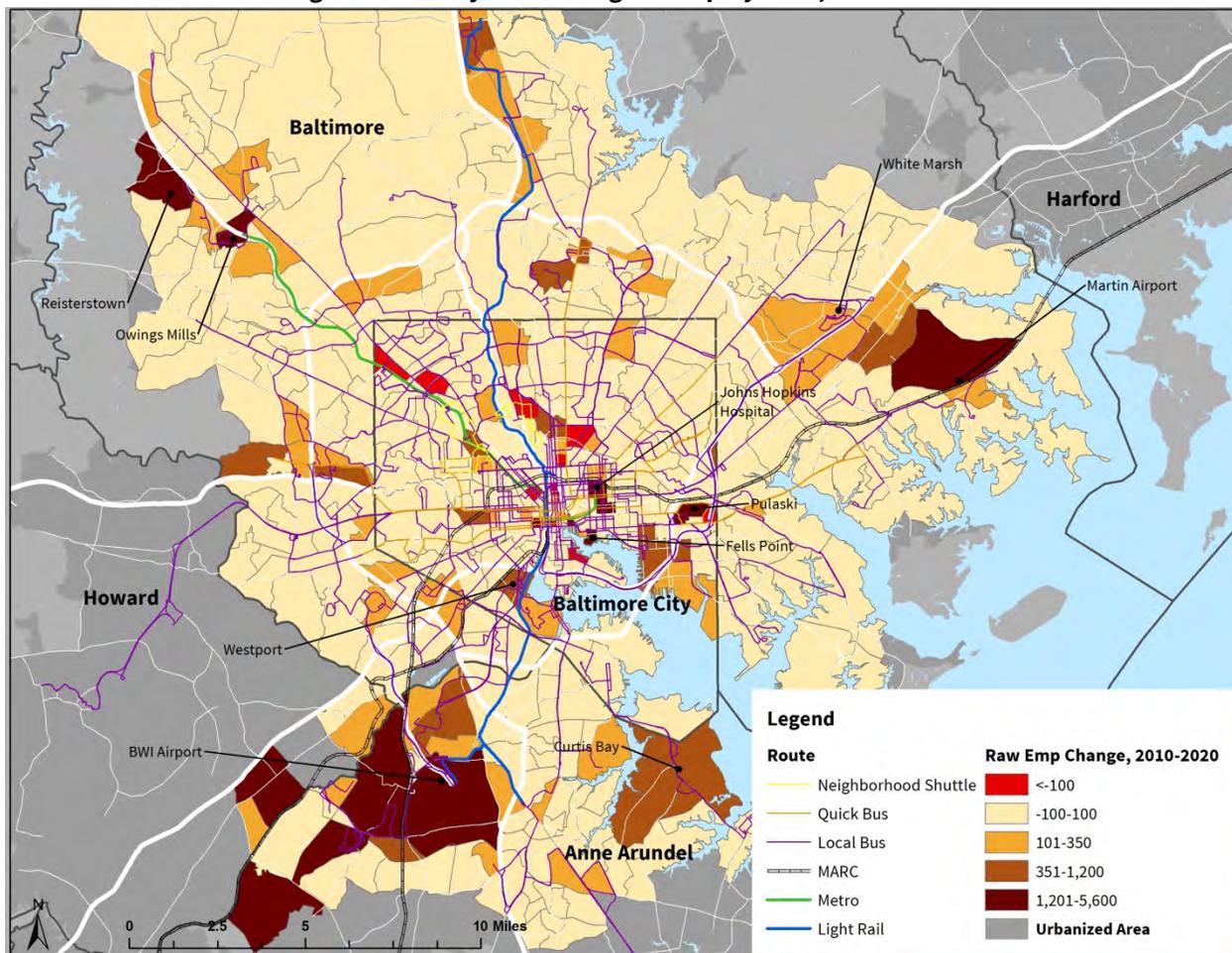
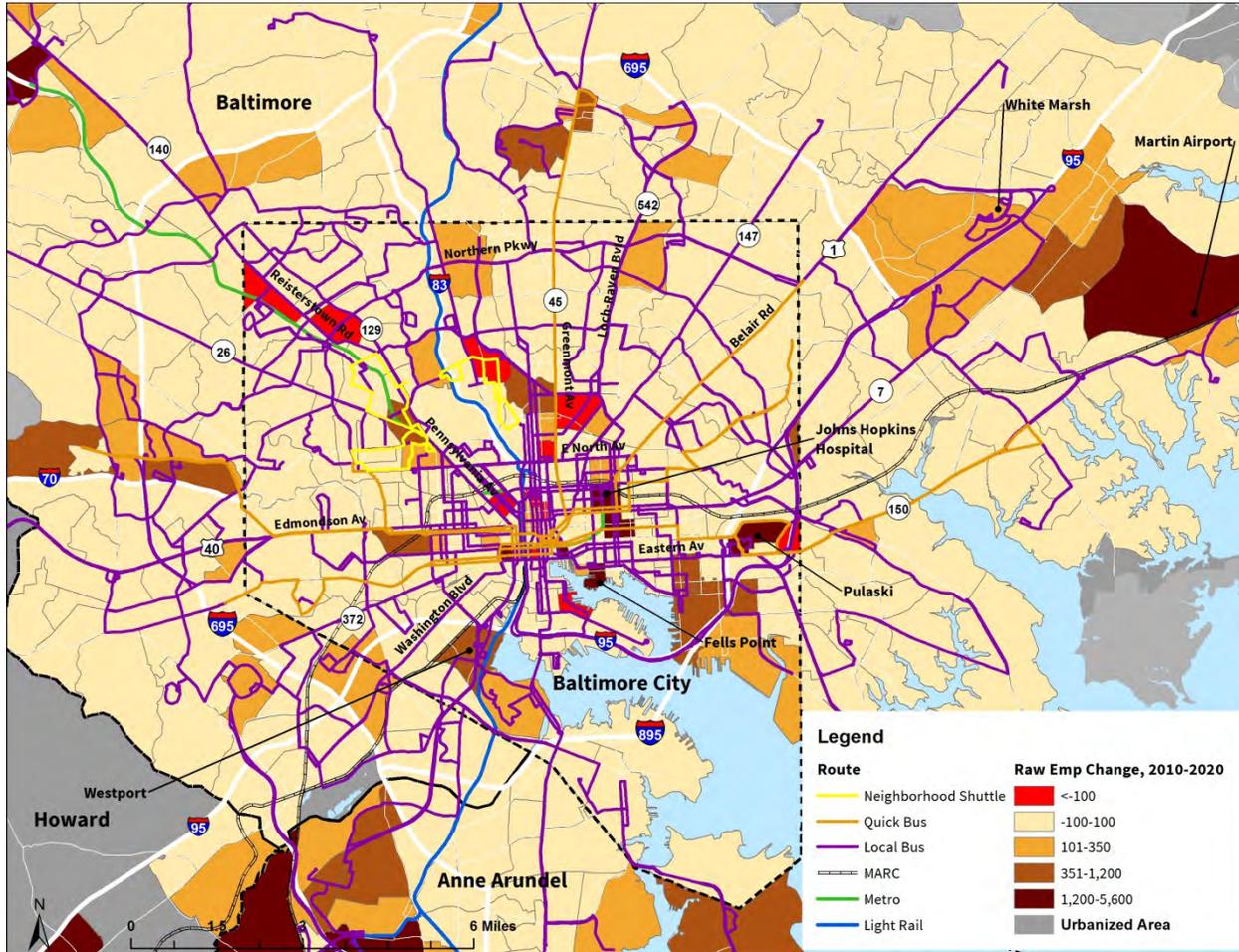


Figure 2.18: Projected Change in Employment, 2010-2020 (Within Baltimore Beltway)



Changes in future employment density between 2010 and 2020 tell a similar story, with large increases projected for several outlying areas and within close proximity to the Baltimore Beltway, including Martin Airport, Reisterstown, Owings Mills, BWI Thurgood Marshall Airport and Towson. Within Baltimore City, large increases in employment density are projected in Fells Point, Pulaski, Johns Hopkins Hospital, Westport, Cherry Hill, Mondawmin, Johns Hopkins University and downtown. Figures 2.19 and 2.20 illustrate projected increases in employment density between 2010 and 2020 for the Core Bus service area.

Figure 2.19: Projected Change in Employment Density, 2010-2020

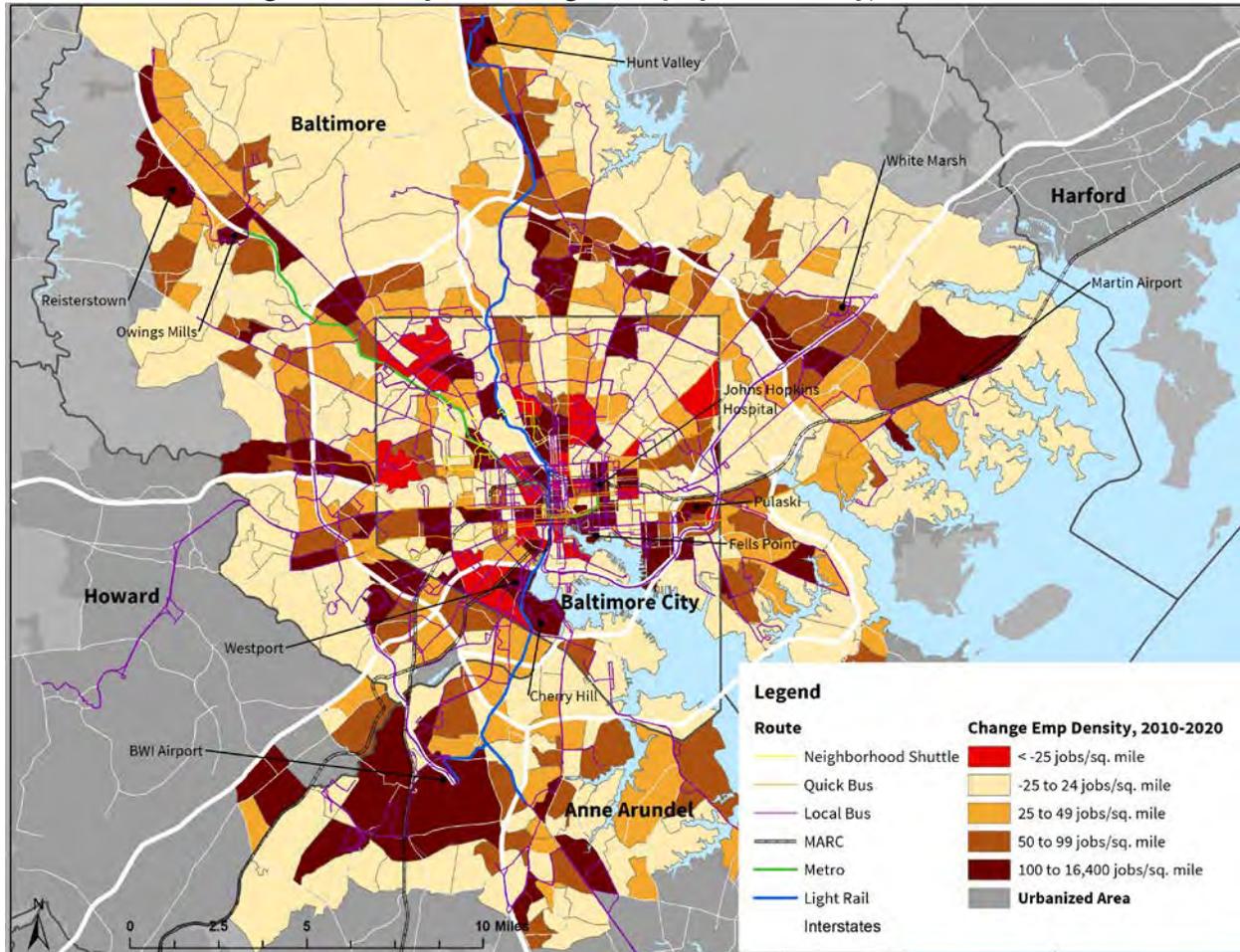


Figure 2.20: Projected Change in Employment Density, 2010-2020

