



REGIONAL TRANSIT FRAMEWORK STUDY UPDATE



MARKET ANALYSIS JUNE 2017

Cover Photo: Fara Illich, Downtown Phoenix Inc.



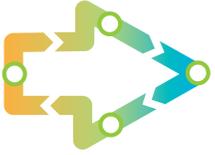
TABLE OF CONTENTS

1. INTRODUCTION	1
2. UNDERLYING DEMAND FOR TRANSIT.....	3
3. CURRENT TRANSIT DEMAND	5
Population and Employment.....	5
2015 Population and Population Density.....	5
Socioeconomic Characteristics and Transit Propensity	6
2015 Employment and Employment Density.....	16
2015 Composite Transit Demand	21
2015 Travel Flows	21
All Trips	23
Home-Based Work Trips.....	25
All Transit Trips	25
Home-Based Work Trips (Transit Only)	25
4. 2040 TRANSIT DEMAND	29
Population and Employment.....	29
2040 Population-Based Demand	29
2040 Employment-Based Demand.....	32
2040 Composite Transit Demand	35
2040 Travel Flows	38
All Trips	38
Home-Based Work Trips.....	38
5. SUMMARY	43

1. INTRODUCTION

Transit ridership is a function of the underlying demand for transit and the attractiveness of the service that is provided. These two elements go hand-in-hand, with successful High Capacity Transit (HCT) projects providing attractive service in areas with a high underlying demand for service.

The Regional Transit Framework Study (RTFS) Update is designed to first determine where there is sufficient demand for HCT, and then to determine the most appropriate types of HCT to service those markets. This market analysis focuses on the first component – to identify the areas that can now support HCT as well as those that will grow to be able to support HCT through 2040.

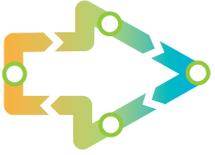


**REGIONAL TRANSIT FRAMEWORK
STUDY UPDATE**
Maricopa Association of Governments

2. UNDERLYING DEMAND FOR TRANSIT

The underlying demand for transit is driven by a number of factors, four of which are particularly important and are the focus of this market analysis:

- **Population and Employment Density:** Put simply, where larger numbers of people live and/or work in close proximity, transit demand is higher.
- **Socioeconomic Characteristics:** Different people have different “propensities” to use transit, with differences related to socio-economic characteristics. For example, households with many cars are much less likely to use transit than those with one or none. Similarly, Millennials and seniors are more likely to use transit than middle-aged residents, and low income residents use transit to a greater extent than high income residents.
- **Land Use and Major Activity Centers:** In all cities, there is a strong correlation between development patterns and transit ridership. In areas with denser development, mixed-use development, and a good pedestrian environment, transit can become very convenient, making it attractive and well used. Conversely, the use of transit is much lower in low density areas and those where getting to and from transit is uncomfortable and/or unsafe.
- **Travel Flows:** People use transit to get from one place to another. Major transit lines such as HCT services are designed to serve corridors with high volume travel flows.



**REGIONAL TRANSIT FRAMEWORK
STUDY UPDATE**
Maricopa Association of Governments

3. CURRENT TRANSIT DEMAND

POPULATION AND EMPLOYMENT

More than any other factor, population and employment density will determine the underlying demand for transit. This is because:

- The reach of transit is generally limited to within one-quarter to one-half mile of the transit line or station. 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 support only less frequent service.
- To attract travelers who have other options, such as automobiles, transit must be relatively frequent—at least every 30 minutes, and preferably every 10 to 15 minutes.

2015 Population and Population Density

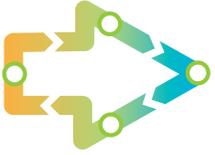
As described above, places with large numbers of people, jobs, and other activities produce the largest demands for transit service. The absolute numbers can be related to the demand for transit by converting them to densities, or the numbers of people and jobs per acre. The density figures, in turn, can be used to provide an indication of the type and frequency of service for which there would be demand (see Figure 1).

Figure 1 | Population and Employment Densities Related to Transit Demand



Source: Nelson | Nygaard compiled from various national sources

As indicated, there generally must be 10 to 15 residents per acre or 5 to 10 jobs per acre, or a combination thereof, to produce demand for hourly service, and 15 to 30 residents per acre or 10 to 15 jobs per acre. For HCT, there



generally must be more than 30 residents per acre or more than 15 jobs per acre or a combination thereof.

Note, however, that the density categories broadly indicate demand across contiguous and nearby areas and are meant to be considered in this context. Clusters of density throughout an area or along a corridor are strong indicators of demand, while a dense but small block group in an isolated area would not produce sufficient demand in and by itself. Demand can also accumulate along corridors to produce demand for more frequent service than the densities alone would indicate. As a general rule, long corridors where most blocks or block groups are sufficient densely developed to support 16 to 30 minute service will often produce accumulated demand for 15 minute service, which is one threshold for HCT.

As of 2015, the MAG region was home to 4.3 million residents, most of whom lived with the Loop 101 and 202 freeways. As shown in Figure 2, a large number of corridors have population concentrations that can support 30 minute service or better. The highest densities are in western and central parts of Phoenix, and in parts of Tempe, Mesa, and Glendale.

Socioeconomic Characteristics and Transit Propensity

In addition to population density, socioeconomic characteristics influence an individual's propensity toward transit use. National research shows that many population groups have a higher propensity for transit use than the overall population. These can include:

Low-income residents, who tend to use transit to a greater extent than those with higher incomes because transit provides significant cost savings over automobile ownership and use.

Approximately 336,287, or 21.4% of the region's households, have low incomes (below \$25,000 per year). These households are mostly focused within the area of Valley Metro's existing local services in Maricopa County, and especially along the light rail alignment. The highest concentrations are focused in the core areas of Phoenix, especially around Central Station and areas just to the northeast; in western Phoenix just southwest of 19th Avenue/Montebello Transit Center; in the western portions of Phoenix and Glendale north of I-10 and east of 75th Avenue; in central parts of Tempe; and along Main Street and Broadway Road in Mesa (see Figure 3).

Zero-vehicle households, which have limited transportation options other than transit. In large cities, many residents do not have an automobile by choice because transit is available, car ownership is a hassle, and there are plentiful options such as taxis, car sharing, and car rentals for the times

Population-Based Demand

(Based on Residents per Acre)

Potential Service Frequency Supported Based on Population Density



2015

- Transit Center
- Bus Route
- Light Rail



Data Sources: Census TIGER, APC, Valley Metro

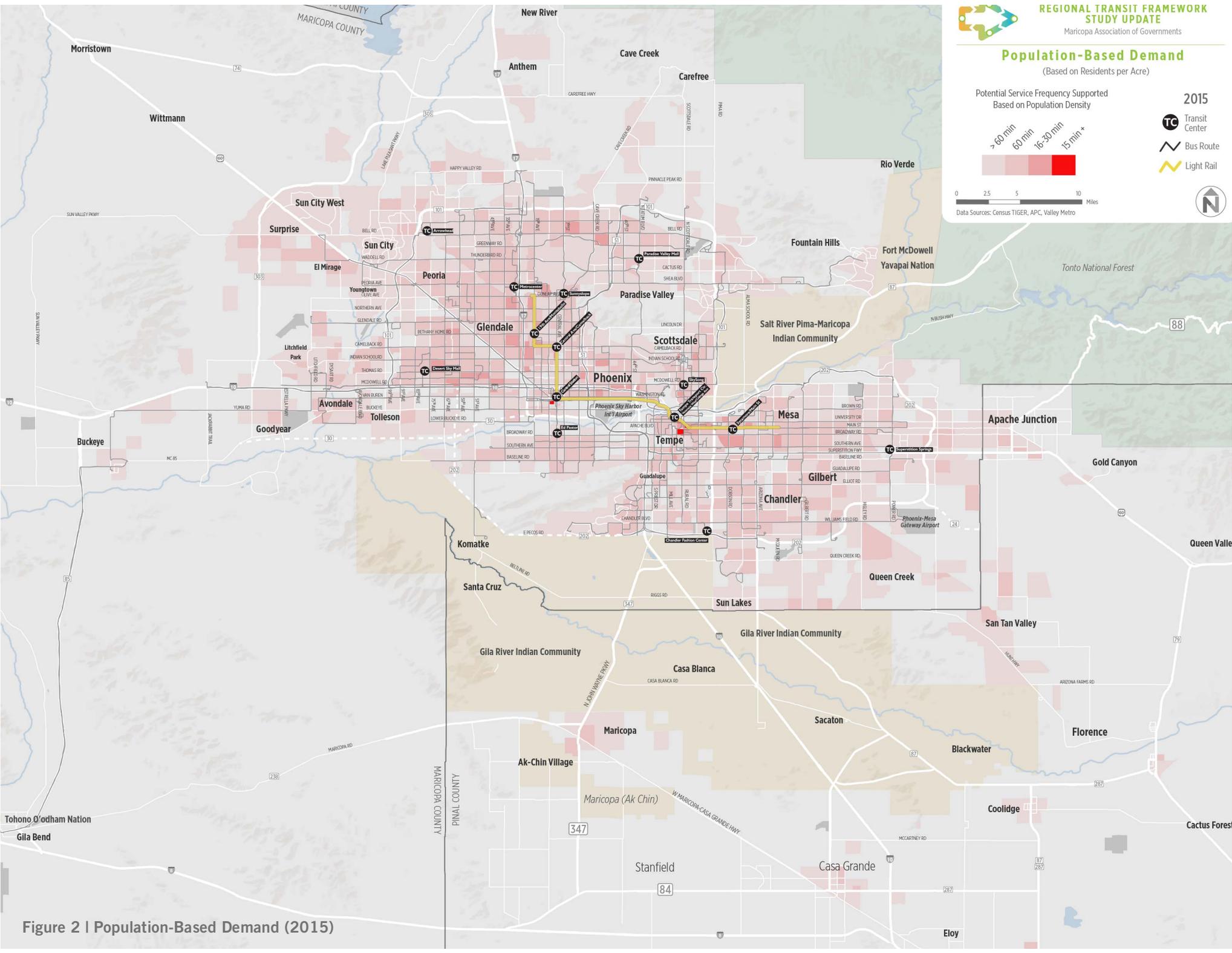


Figure 2 | Population-Based Demand (2015)

**Distribution of Low-Income Households
(below \$25,000 per year)**

2015

1 Dot = 100 Households

-  Transit Center
-  Bus Route
-  Light Rail



Data Sources: Census TIGER, APC, Valley Metro

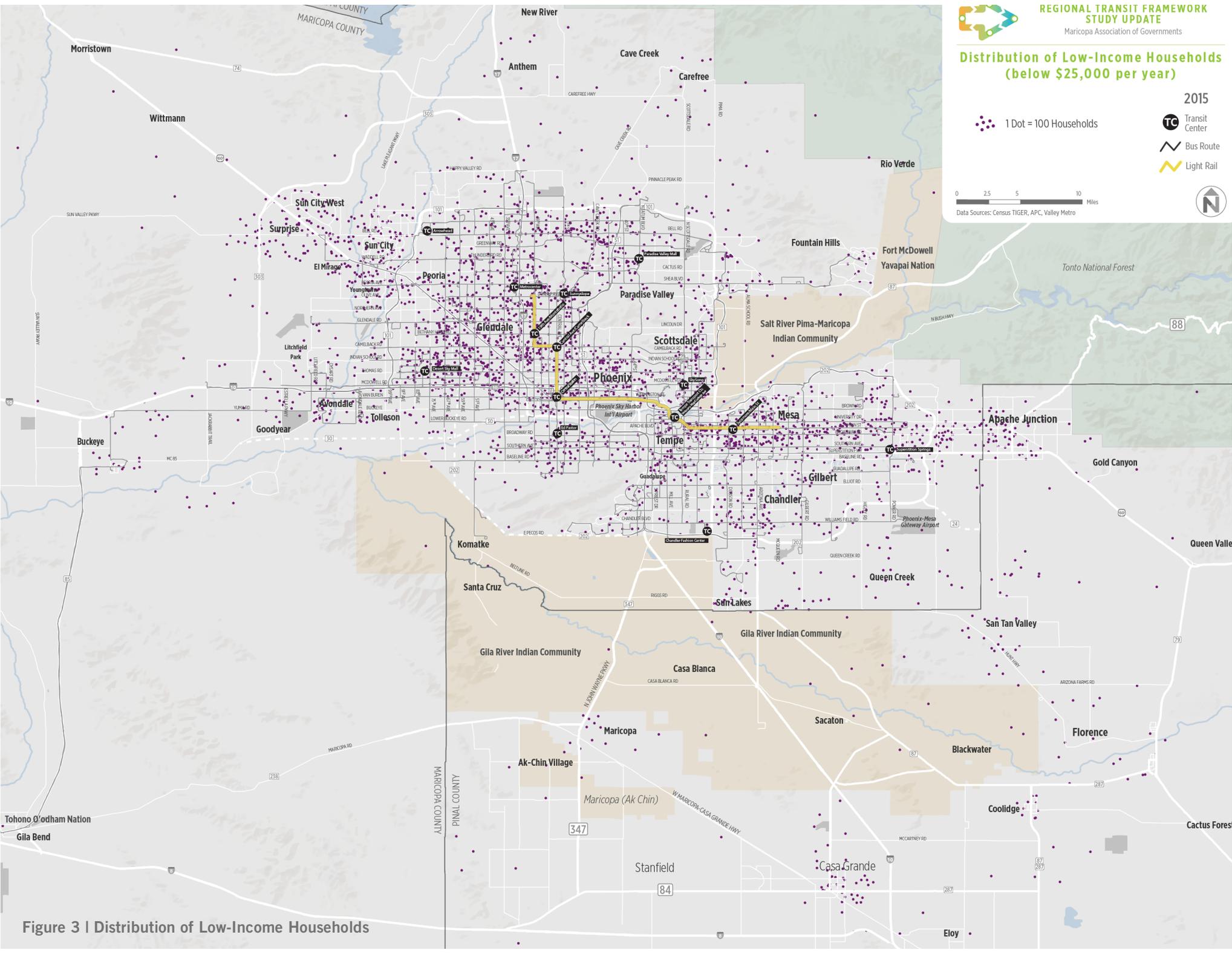


Figure 3 | Distribution of Low-Income Households

when a car is desired or needed. However, in urban areas such as Maricopa and Pinal counties that are more oriented toward automobile travel and where transit options are more limited, people without automobiles largely consist of those with lower incomes or those who do not drive.

Approximately 102,612 households, or 6.5% of the region’s households, do not have a vehicle available. Most zero-vehicle households are located within Valley metro’s existing local service area in Maricopa County, mostly in Phoenix, Tempe, and Glendale, and especially along the light rail line (see Figure 4). This is partially due to self-selection, as households without a vehicle may choose to live closer to existing transit services.

Minorities and Hispanic residents, who use transit more often than non-minorities because they tend to have more limited resources for transportation and live in denser neighborhoods closer to the urban core. This means that there is a large amount of overlap between minority populations and low-income households; however, the presence of high numbers of minority residents still provides an additional strong indicator of transit demand. The provision of effective transit service to minority populations is also particularly important to the Federal Transit Administration and is a requirement under Title VI of the Civil Rights Act of 1964.

Table 1 | Race/Ethnicity in the MAG Region

Race/Ethnicity	Percent
White alone (Not Hispanic or Latino)	57.8%
Black/African American alone	4.8%
Asian alone	3.4%
Other race or mixed race (not Hispanic or Latino)	4.1%
Hispanic/Latino	29.8%

A large proportion of the study area’s residents are Hispanic – 1.3 million Hispanic residents comprise 29.8% of the population. Hispanic residents generally live within Valley Metro’s existing local service area.

The highest concentrations are clustered north of I-10 and south of Glendale Avenue in southern Glendale and western Phoenix, just east of downtown Phoenix, in southern Phoenix around Broadway Road and Central Avenue, and in Mesa between Arizona Avenue and Gilbert Road (see Figure 6).

Non-Hispanic minority residents, who comprise 12.3% of the population, are similarly distributed throughout the region, but with proportionally greater concentrations in the Southeast Valley (see Figure 7).



Distribution of Zero-Vehicle Households

2015

1 Dot = 100 Households

- Transit Center
- Bus Route
- Light Rail



Data Sources: Census TIGER, APC, Valley Metro

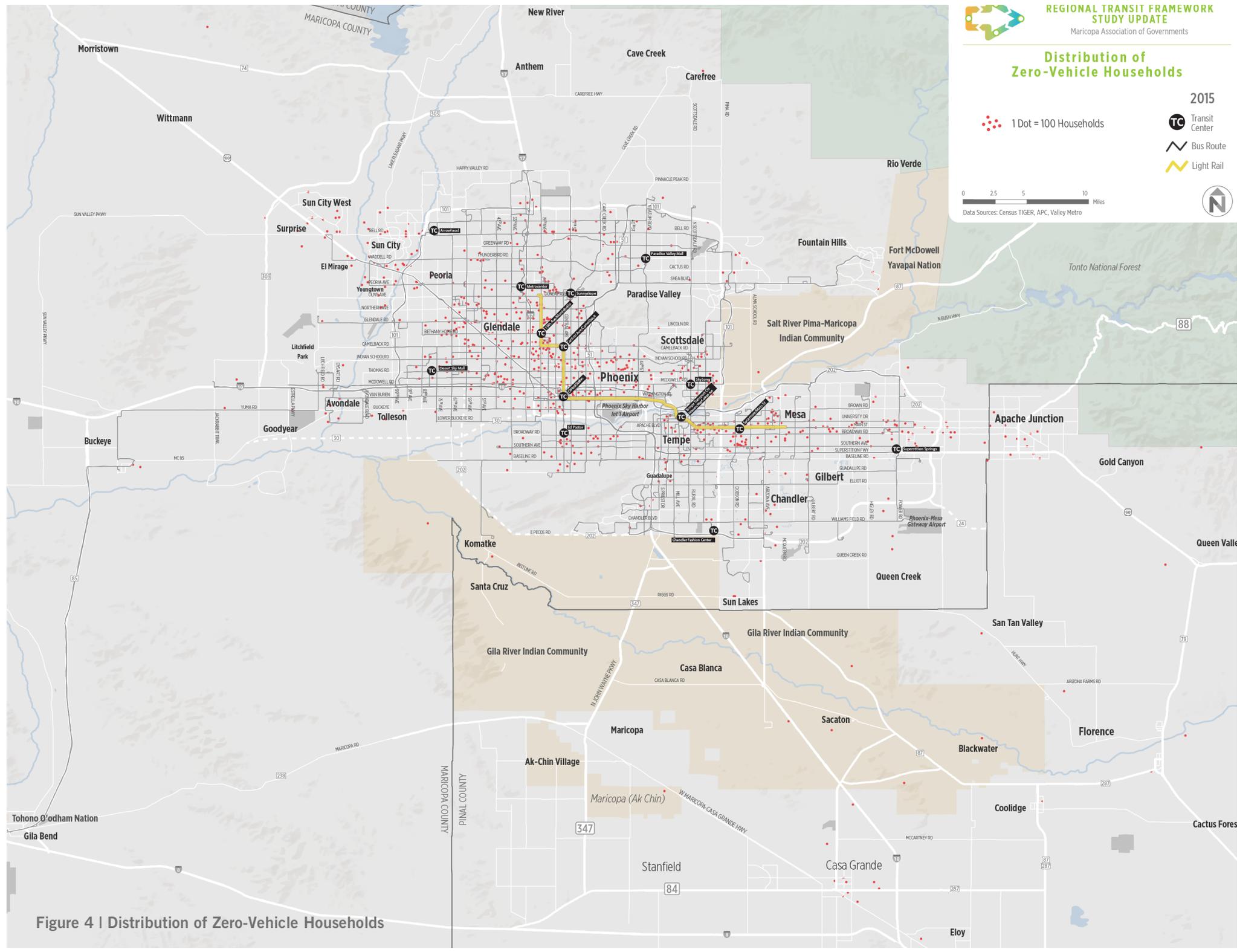


Figure 4 | Distribution of Zero-Vehicle Households

Distribution of Hispanic Individuals

2015

1 Dot = 500 Individuals

-  Transit Center
-  Bus Route
-  Light Rail



Data Sources: Census TIGER, APC, Valley Metro

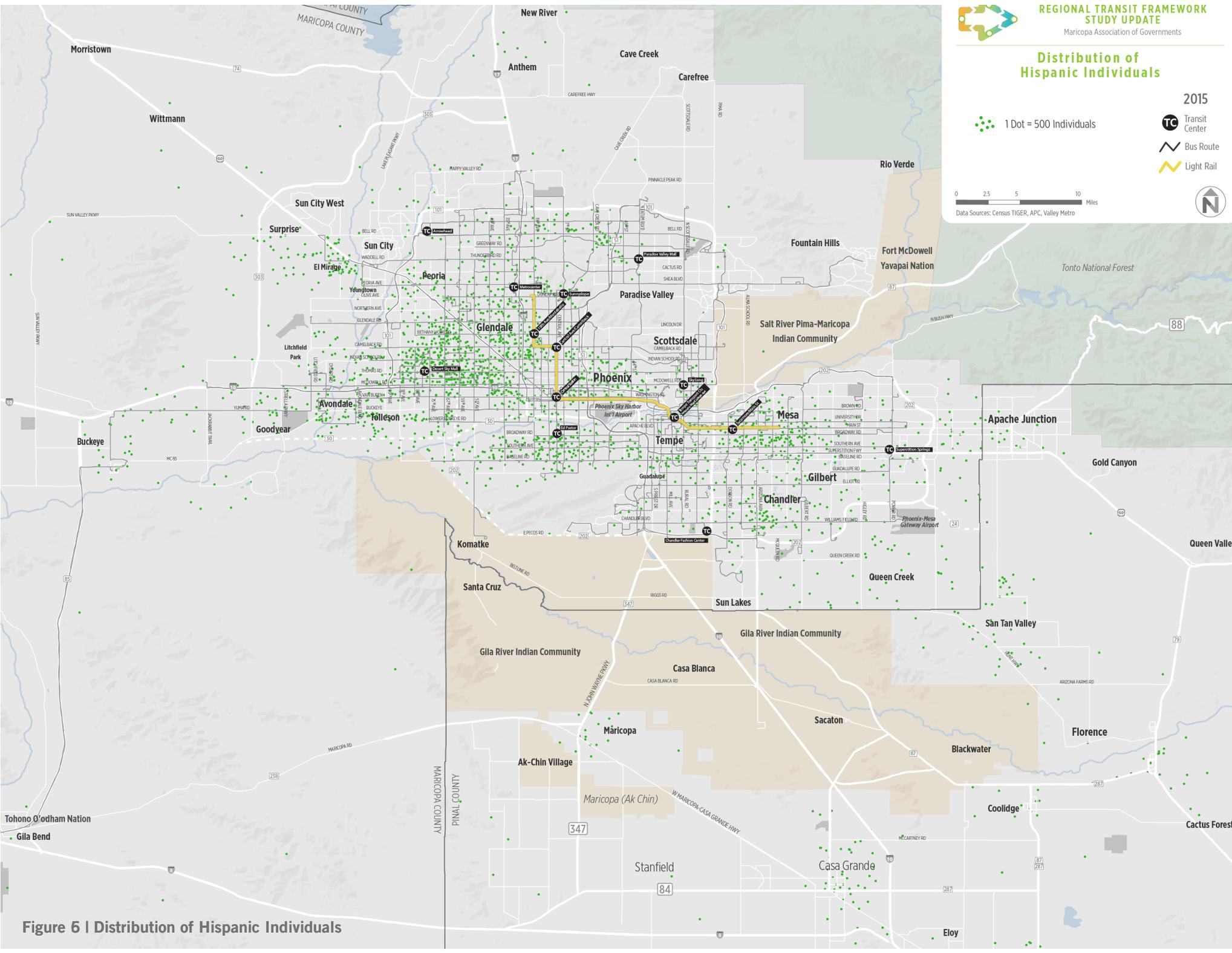


Figure 6 | Distribution of Hispanic Individuals

Distribution of Minority Individuals (non-White, non-Hispanic)

2015

1 Dot = 500 Individuals

-  Transit Center
-  Bus Route
-  Light Rail



Data Sources: Census TIGER, APC, Valley Metro

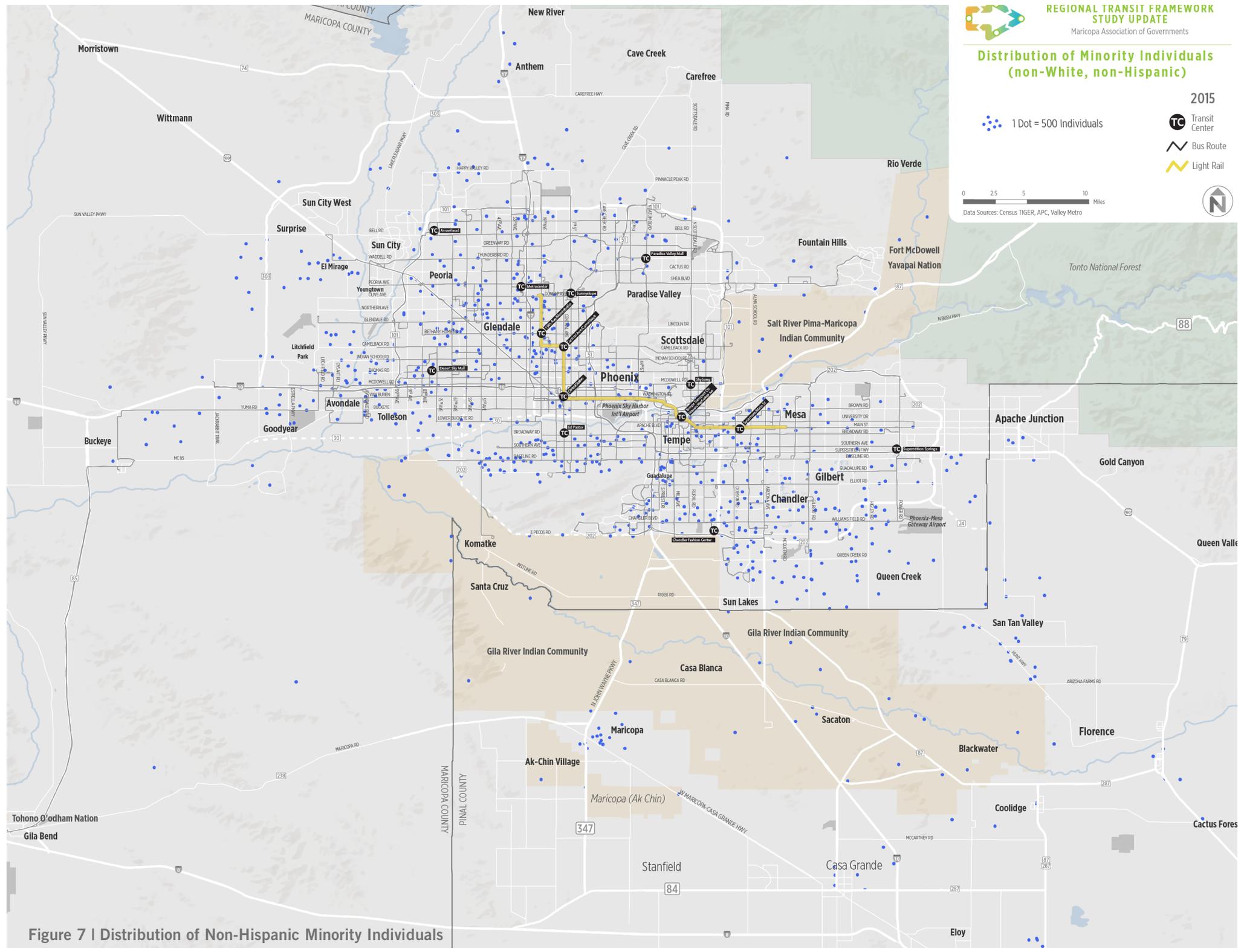


Figure 7 | Distribution of Non-Hispanic Minority Individuals

People with disabilities, many of whom may not be able to drive or have difficulty driving. Public transportation, including regular fixed-route bus service as well as specialized paratransit services, is an essential resource to ensure people with disabilities are able to remain active, productive, and part of the community.

Approximately 1.1% of the region's residents, or 47,933 people, have a disability. These individuals are distributed throughout the region in a similar manner as the overall population.

When significant numbers of individuals and households from these high-transit propensity groups cluster together, they can influence the underlying demand for transit to an extent that is not captured when only considering 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 total population alone would indicate.

To take this into account, the population-based transit propensity was adjusted based on relative transit use differences between these groups and the population as a whole. To do this:

1. Transit index factors were developed for each demographic characteristic 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. As shown in Table 2, the propensity of different demographic groups to use transit in the MAG region generally follows the trends discussed above. Annual income is inversely related to propensity to use transit, with propensity increasing as income declines. Minority residents have higher transit propensity than the general population, and people with a disability were nearly twice as likely as the general population use transit. Residents without a vehicle were 10 times as likely to use transit.
2. These factors were then applied to the population of the study area at the census block level, calculating a transit propensity factor for each Traffic Analysis Zone (TAZ) (shown in Figure 8) and producing an "adjusted" population density based on the population's transit propensity.
3. Finally, an updated map of population transit propensity was produced based on the findings of this analysis.

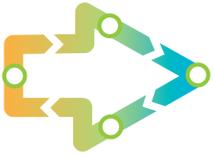


Table 2 | Transit Index Factors for Maricopa County and Pinal County by Demographic Group (Workers Age 16 and Older)

Demographic Group	Transit Propensity ¹
Race and Ethnicity	
White Alone (Not Hispanic/Latino)	0.63
Black or African-American (Not Hispanic/Latino)	3.16
Asian (Not Hispanic/Latino)	1.04
Other Race (Not Hispanic/Latino)	1.77
Hispanic/Latino	1.33
Vehicle Ownership	
No Car	10.67
One or More Cars	0.67
Disability	
With a Disability	1.91
Without a Disability	0.98
Annual Income	
Less than \$10,000	2.0
\$10,000-\$15,000	1.75
\$15,000-\$25,000	1.49
\$25,000-\$35,000	0.90
\$35,000-\$50,000	0.64
\$50,000 or Higher	0.44

Source: Calculations developed using 2009-2014 American Community Survey 5-Year Estimates and 2015 US Census

When these factors are considered, and as shown in Figure 8, residents of core urban areas have a higher propensity to use transit, while most of those in outer areas have a lower propensity to use transit. Areas where residents have a significantly higher propensity to use transit include:

- Along Washington Street in downtown Phoenix and just northeast of downtown.
- Southern Glendale, south of Glendale Avenue and north of Indian School Road.
- Southern and southeastern areas of Phoenix.
- Along Apache Boulevard/Main Street in Tempe and Mesa.

¹ These figures indicate the relative propensity of different groups to use transit. For example, transit propensity factor of 1.77 indicates that the group is 1.77 times more likely to use transit than the general population.

Transit Propensity Adjustment Factors

Adjustment factor applied to population based on transit propensity by socioeconomic characteristics

2015



- Transit Center
- Bus Route
- Light Rail



Data Sources: Census TIGER, APC, Valley Metro

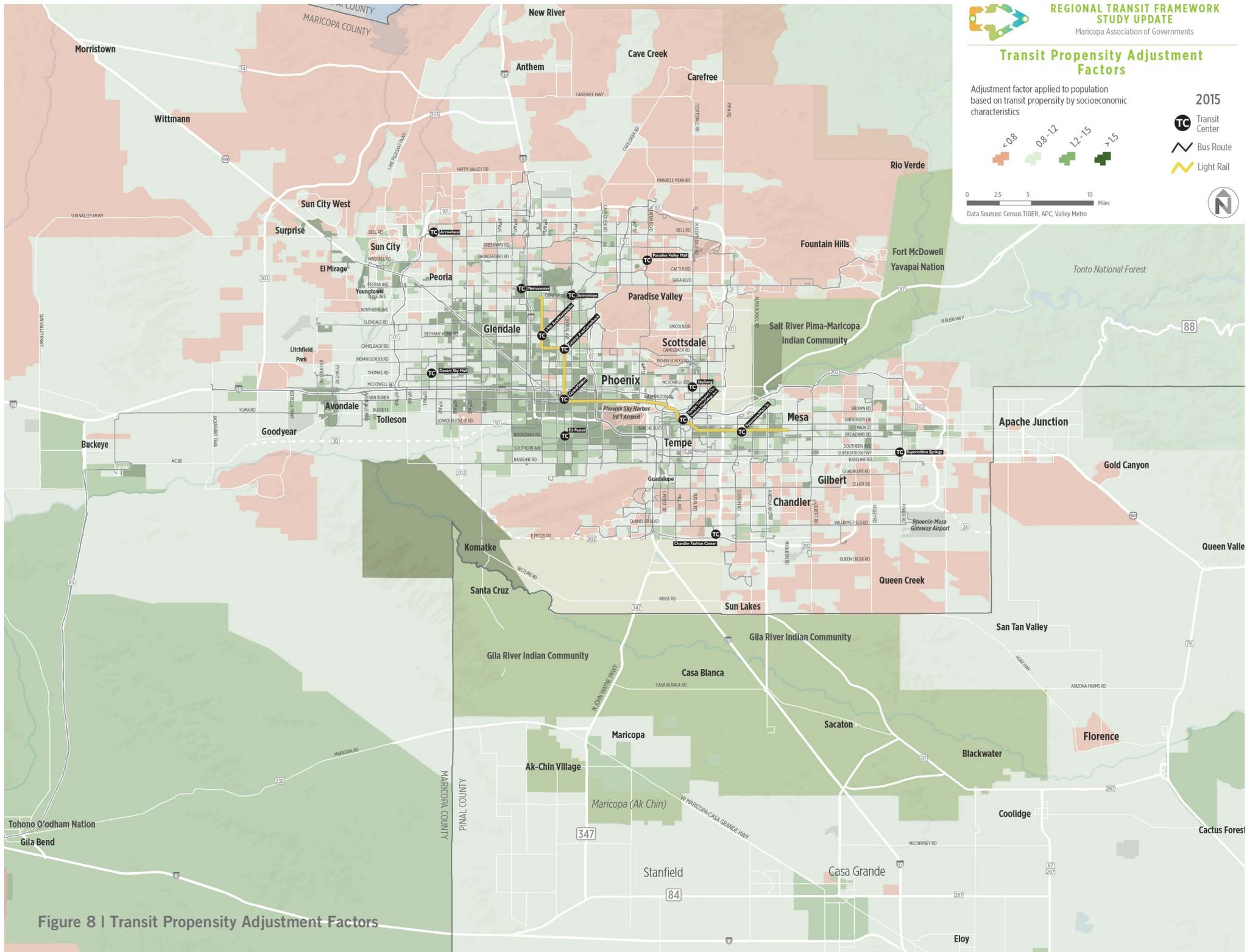
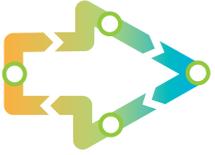


Figure 8 | Transit Propensity Adjustment Factors



Beyond these central areas, residents have a lower propensity to use transit, indicating that underlying transit demand may be lower in these areas than population density alone may suggest.

The population-based demand for each census block group was then adjusted based on these transit propensity factors, and the adjusted population-based demand is shown in Figure 9. In terms of individual census block groups, relatively few areas can support service every 15 minutes or better in isolation. However, since demand typically accumulates along routes (all except those that serve short trips and have very high levels of turnover), corridors where population densities can support 30-minute or better service throughout all or most of the corridor could likely support HCT. These corridors include:

- Along Washington Street and North 19th Avenue in Phoenix, both of which are currently served by light rail.
- Along McDowell Road in Phoenix, particularly West McDowell Road west of I-17 and East McDowell Road east of North Central Avenue.
- Along Apache Boulevard (in Tempe) and Main Street (Mesa), east of Arizona State University in Tempe.
- Along sections of 67th Avenue in Glendale and western Phoenix.
- Along 27th Avenue/I-17, just east of Grand Canyon University in Phoenix.
- Along West Bethany Home Road in Glendale.
- Just south of the Sycamore/Main Street light rail station between West Broadway Road and West Southern Avenue in Mesa.
- Along West Broadway Road through Mesa.
- Along West Indian School Road and Thomas Road in western Phoenix.
- Along East Bell Road in northern Phoenix.

2015 Employment and Employment Density

In the same manner as population densities, and as was shown previously in Figure 1, employment densities provide a second strong indication of underlying employment-based transit demand. Fifteen to 25 jobs per acre typically produce sufficient demand for Rapid Bus or BRT service, and >25 jobs per acre can support light rail.

In 2015, there were 1.8 million jobs in the MAG region. Compared to population, jobs were more closely focused along specific corridors and key areas. Most were located within the Loop 101 and Loop 202 highways around Phoenix and surrounding cities. Employment density in the region is highest in central parts of Phoenix, Tempe, and Scottsdale (see Figure 10).

Adjusted Population-Based Demand

(Based on Residents per Acre)

Potential Service Frequency Supported
Based on Population Density



2015

- Transit Center
- Bus Route
- Light Rail



Data Sources: Census TIGER, APC, Valley Metro

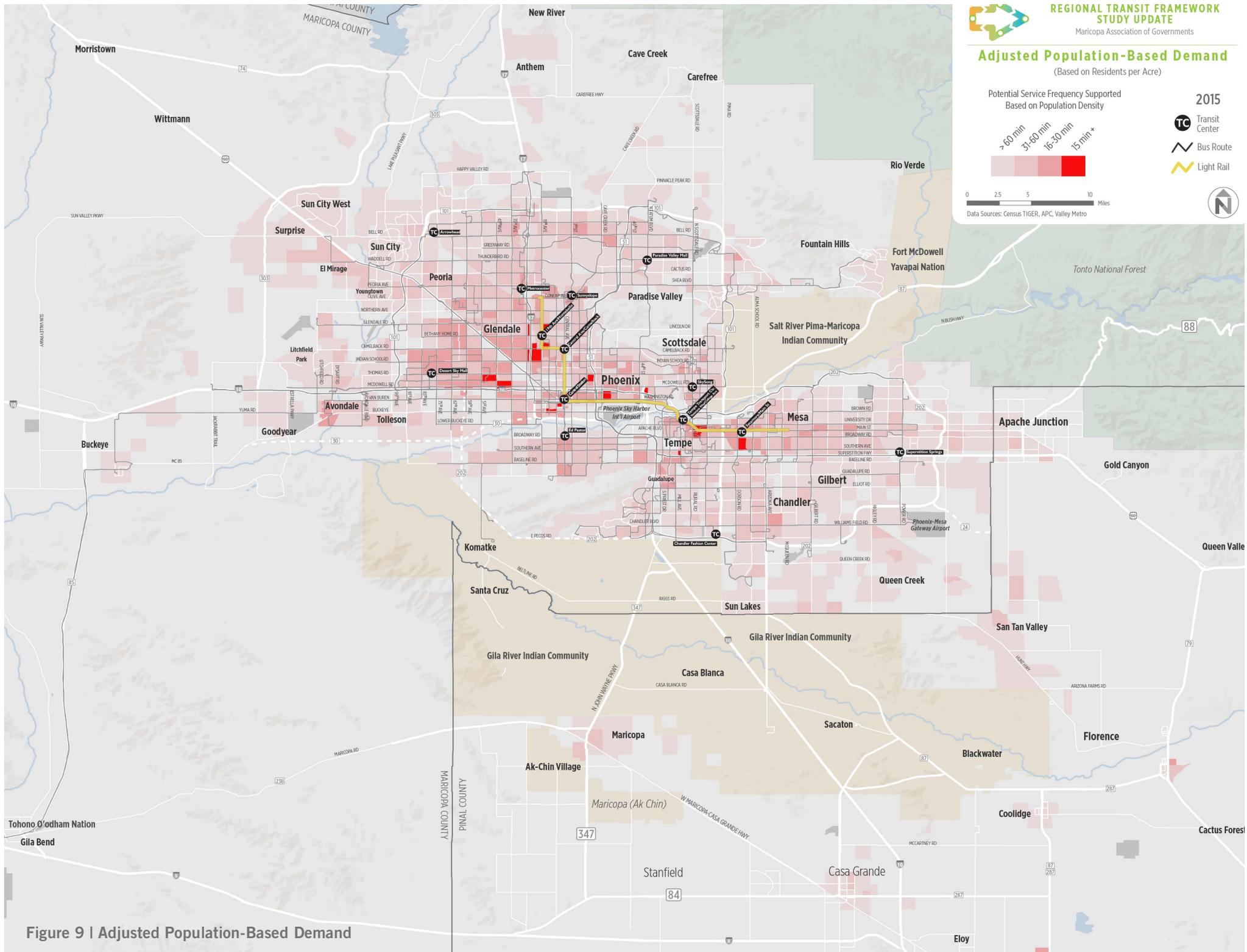


Figure 9 | Adjusted Population-Based Demand

Employment-Based Demand
(Based on Jobs per Acre)

Potential Service Frequency Supported Based on Employment Density

2015

- TC Transit Center
- Bus Route
- Light Rail

> 60 min
31-60 min
16-30 min
15 min +

0 2.5 5 10 Miles

Data Sources: Census TIGER, APC, Valley Metro

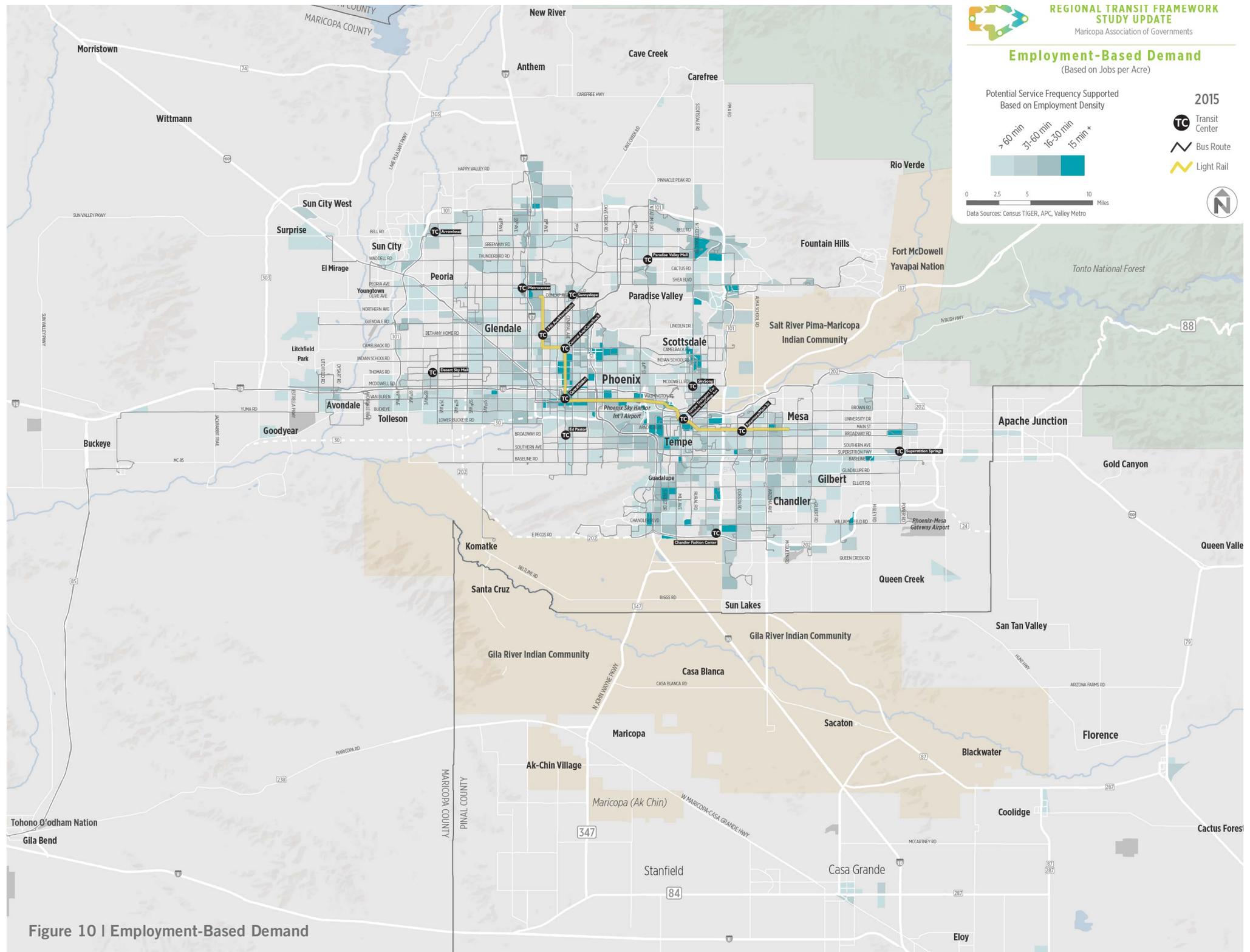


Figure 10 | Employment-Based Demand

Similar to population, corridors where employment densities can support 30-minute or better service throughout all or most of the corridor could likely support HCT. These corridors include:

- Corridors that are currently served at least partly by light rail, including North Central Avenue and Washington Street in Phoenix.
- East Camelback Road in Phoenix.
- North 44th Street in Phoenix.
- North Scottsdale Road in Scottsdale, north of the SkySong Transit Center.
- Areas in the western parts of Tempe just west of Arizona State University, along West University Drive.
- Dunlap Avenue at the northern end of the light rail line, adjacent to and including the Metrocenter Mall.

In addition to understanding employment generally, the market analysis also considers the service area's largest employers. Discrete sites of significant employment can generate additional demand for transit beyond the underlying demand of the surrounding area.

The largest employers in the MAG region (those with 3,000 employees or more at a single site) are listed below in Table 3 and shown on the map in Figure 11. Arizona State University is the largest employment site in the region, with over 8,000 employees at its campus in Tempe. However, Intel has over 11,000 employees between its Chandler and Ocotillo campuses. Large employers also

Table 3 | Largest Employers in the MAG Region (3,000 employees or more)

Employer	City	Employees at Site
Arizona State University	Tempe	8,811
Banner Health	Phoenix	7,713
Intel (Chandler Campus)	Chandler	6,335
Intel (Ocotillo Campus)	Chandler	4,933
Luke Air Force Base	-	4,467
U-Haul	Phoenix	3,964
St. Joseph's Hospital	Phoenix	3,757
Boeing	Mesa	3,717
Mayo Clinic Hospital	Phoenix	3,621
Bank of America	Phoenix	3,360
VA Medical Center	Phoenix	3,124
General Dynamics	Scottsdale	3,000
Honeywell	Phoenix	3,000
USAA Phoenix	Phoenix	3,000

Source: Maricopa Association of Governments (accessed at <http://geo.azmag.gov/maps/employment/#>)

Largest Employers

Employers with 3,000 or more employees on site

- 3,000 - 4,000 employees
- 4,000 - 8,000 employees
- 8,000 or more employees

2015

- TC Transit Center
- Bus Route
- Light Rail



Data Sources: Census TIGER, APC, Valley Metro

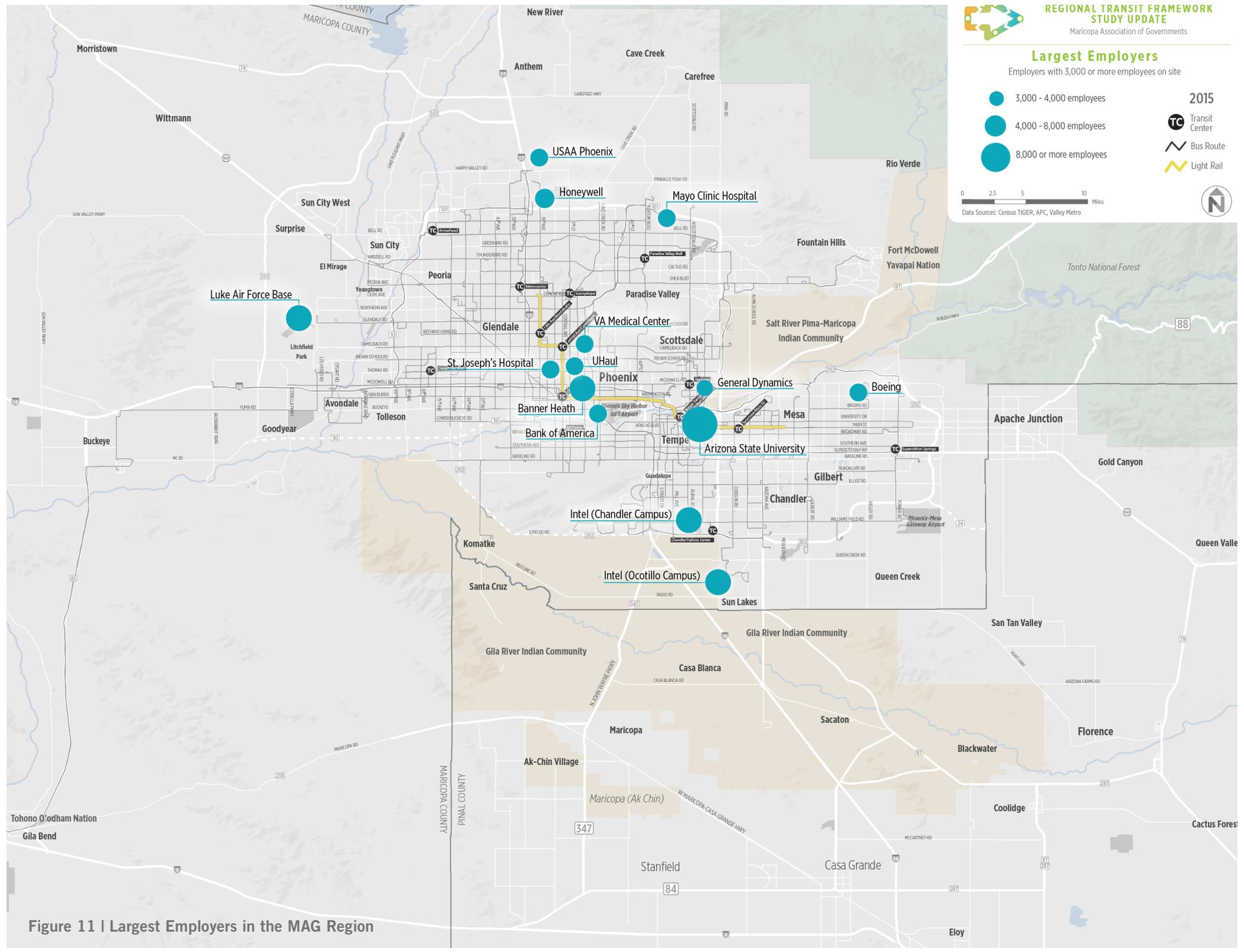


Figure 11 | Largest Employers in the MAG Region

include hospitals, health facilities and manufacturing, as well as military staff at Luke Air Force Base. Many of these sites are focused in central areas of Phoenix, and most are currently served by at least one Valley Metro transit route with some accessible by light rail.

2015 Composite Transit Demand

The previous sections of this analysis presented population adjusted for propensity and employment-based demand separately. However, when the two are combined, the demand will be significantly higher than the demand indicated by each individual measure, as show in Figure 12. When viewing the two measures together, the corridors with the strongest underlying demand for HCT emerge, including:

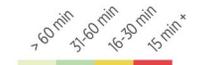
- Along the major corridors that are currently served by light rail along part of their length: North 19th Avenue, North Central Avenue, Washington Street, and East Apache Boulevard/East Main Street.
- North 19th Avenue past the end of the existing light rail line and past Metrocenter Mall, and north towards the commercial centers just south of West Happy Valley Road.
- East Camelback Road in Phoenix.
- Indian School Road, extending from Scottsdale west across Phoenix towards the Desert Sky Mall and Loop 101.
- Thomas Road, McDowell Road, and Van Buren Street across Phoenix.
- North-south corridors in western Phoenix to the south of Glendale, including 51st Avenue, 35th Avenue, and 19th Avenue
- North Scottsdale Road in Scottsdale.
- East Broadway Road in Tempe and Mesa.
- South Priest Drive in Tempe.
- Areas of Tempe adjacent to Arizona State University.
- Areas of southern Tempe and Guadalupe.

2015 TRAVEL FLOWS

For transit to be effective, it must take people from where they are to where they want to go. People also travel for many reasons, including to and from work and school, and for shopping, medical, recreation, social, and other purposes. Transit serves all types of trips, but for all transit systems, work trips are particularly important. This is the case for a number of reasons, including public policy and because many work trips are concentrated around times and places that can be very effectively served by transit (for example, peak period trips to and from downtown Phoenix). Transit serves work trips throughout the

Composite Transit Demand Index

Potential transit frequency supported by adjusted population and employment density



2015

- Transit Center
- Bus Route
- Light Rail



Data Sources: Census TIGER, APC, Valley Metro

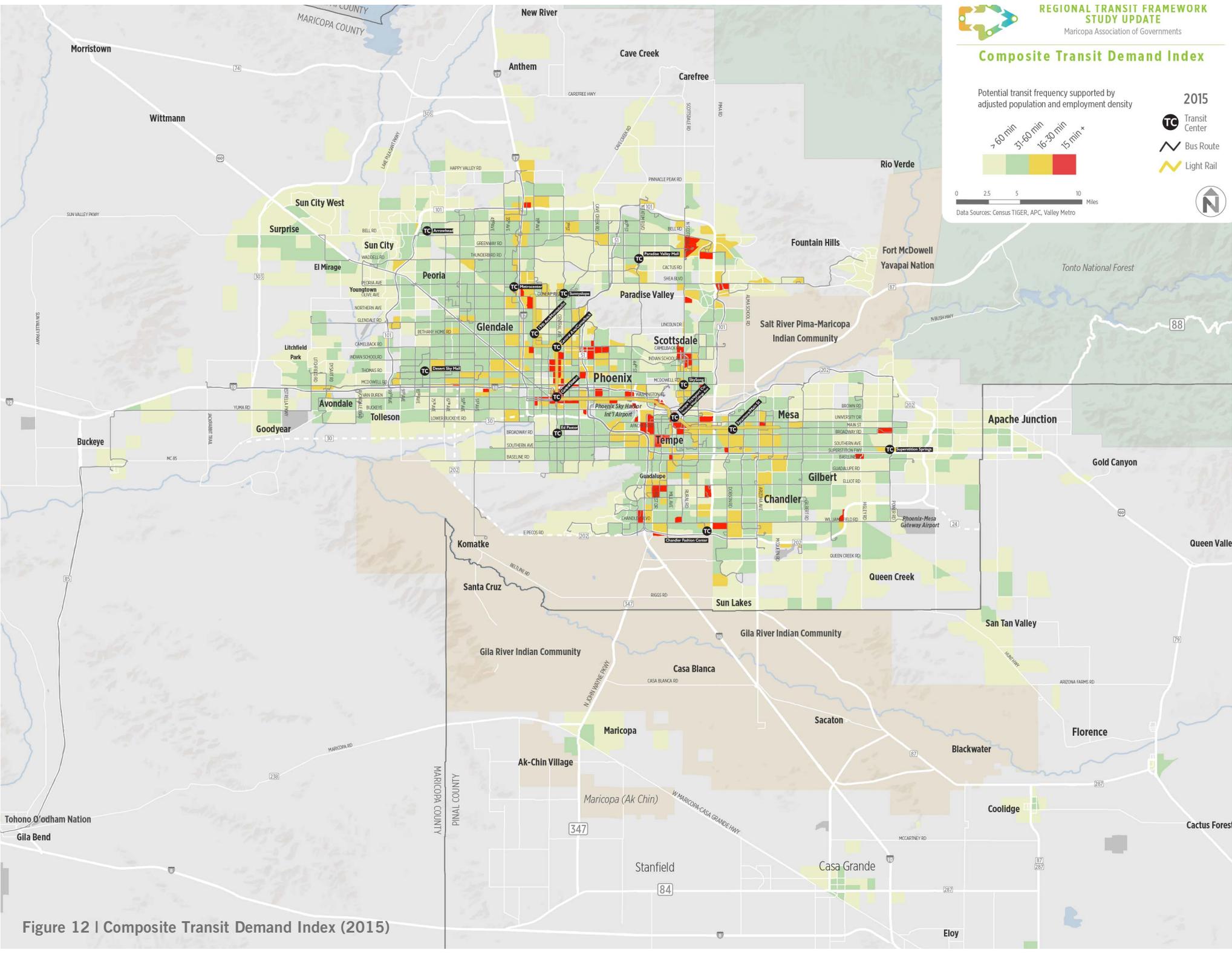


Figure 12 | Composite Transit Demand Index (2015)

day, but the highest numbers of trips are generally made during morning and late afternoon peak periods. Non-work trips typically comprise smaller volumes than work trips and typically occur during midday and evening hours, and these trips are generally made between more dispersed locations.

Travel flows, which show the places that people travel within Maricopa and Pinal counties, are one resource to determine where direct or relatively easy connections should be made within an area. Travel flows within the study area were mapped based on trips taken between Regional Analysis Zones (RAZ)², which are defined by the Maricopa Association of Governments. The flows with the largest number of daily trips are highlighted in the following maps and discussed below for All Trips, Home-Based Work Trips, All Transit Trips, and Home-Based Work Transit Trips.

All Trips

The highest travel volumes are focused on a few cities across the study area, but primarily in Maricopa County within Valley Metro's existing service area. The travel flows with the most daily trips (over 50,000) as shown in Figure 13 are generally focused in the following areas:

- Within the core areas of Phoenix, especially between downtown Phoenix and the area just to the north close to the hospitals.
- Within the western portions of Phoenix
- Between the core area of Tempe and Scottsdale.
- Between Tempe and the eastern part of Chandler.
- Within the town of Gilbert just east of Chandler.

Additional notable flows with high daily trip volume (30,000-50,000 daily trips) include:

- Between Tempe and Mesa, and within Mesa.
- Between Mesa and Chandler.
- Within Glendale and between Glendale and western areas of Phoenix.
- In parts of northeast Phoenix, including areas near Paradise Valley Mall and the Mayo Clinic Hospital

² Note that the sizes of RAZs are determined more by population than by geographical area. As a result, outer area RAZs are typically much larger than inner area RAZs. Because the travel flow maps illustrate flows from the centroid of each RAZ, flow to and from outer area RAZs often appear to be higher and more concentrated than they actually are.



Regional Travel Flows

(All Modes, All Trip Types)

2015



Data Sources: Census TIGER, APC, Valley Metro

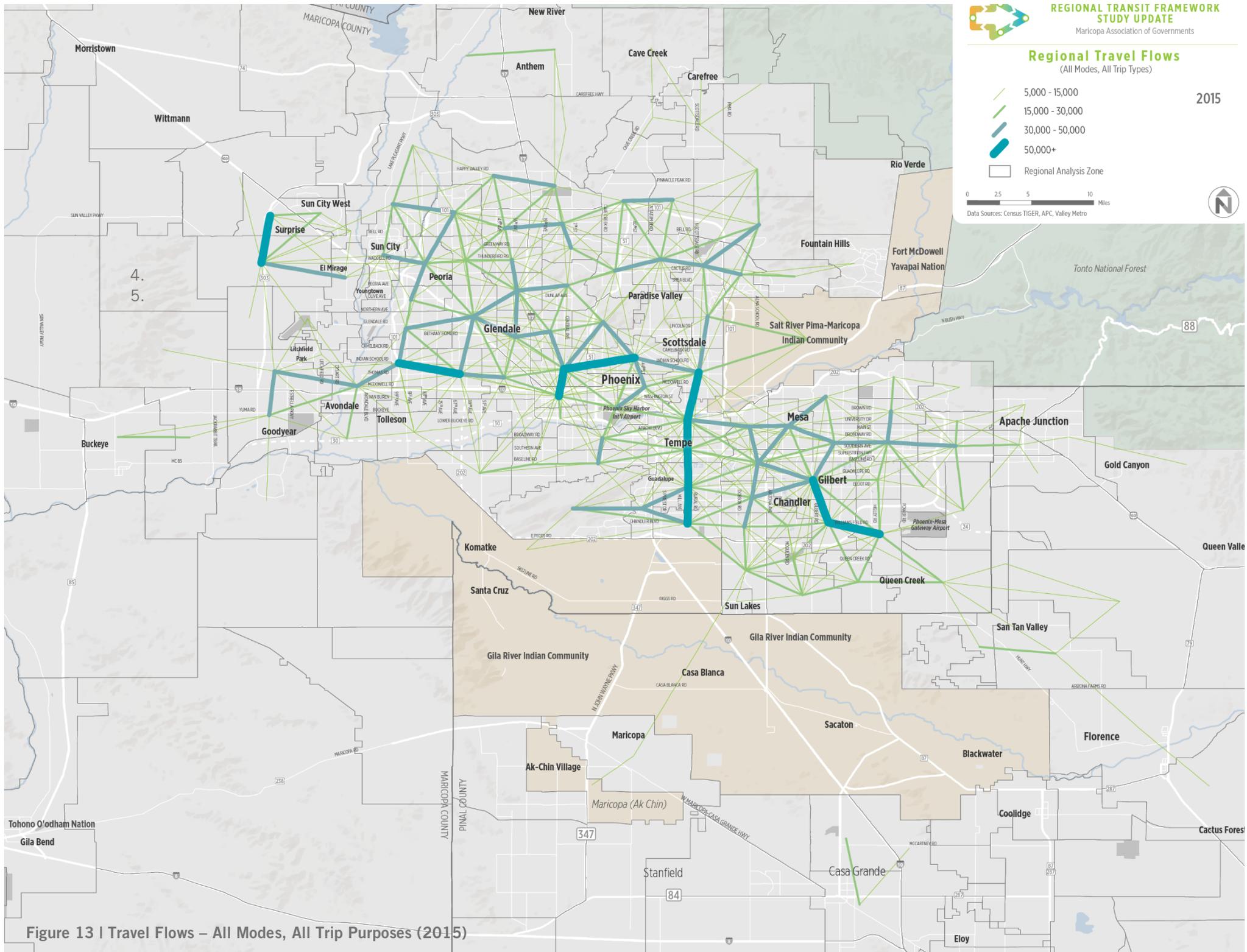


Figure 13 | Travel Flows – All Modes, All Trip Purposes (2015)

Home-Based Work Trips

The largest flows of home-based work trips in 2015 were focused on a few key links: between central and eastern areas of Phoenix, between Tempe and southern Scottsdale, and between Tempe and southwestern Chandler (see Figure 14). Other notable trip flows included:

- Between the core areas of Phoenix and western portions of the city.
- Between central Phoenix and southeast Glendale.
- Between zones in Mesa, Chandler, and Gilbert.

All Transit Trips

Transit trips for all trip purposes in 2015 were heaviest within the core of Valley metro's existing service area, primarily in Phoenix and Tempe (see Figure 15). Notable travel flows include:

- Between downtown Phoenix and downtown Tempe.
- Within the central areas of Phoenix, between downtown and neighborhoods just north of downtown.
- Between downtown Tempe and Scottsdale.

Additional heavy travel flows generally begin or end in central Phoenix near downtown, and in central Tempe.

Home-Based Work Trips (Transit Only)

Travel flows for home-based work transit trips were much smaller compared to the volume for all modes. Looking only at home-based work trips using transit, the predominant flow was north-south within the core areas of Phoenix, and carried over 1,000 trips per day (see Figure 16). Other flows with over 500 trips per day include:

- Between downtown Phoenix and western areas of the city, and between downtown and the Airport.
- Between areas just north of downtown around the hospitals and eastern parts of the city adjacent to Scottsdale.
- Between central parts of Tempe and Scottsdale to the north and Chandler to the south.



Regional Travel Flows

(Transit Only, Home-Based Work Trips Only)

2015

- 100 - 250
- 250 - 500
- 500 - 1,000
- 1,000+
- Regional Analysis Zone



Data Sources: Census TIGER, APC, Valley Metro

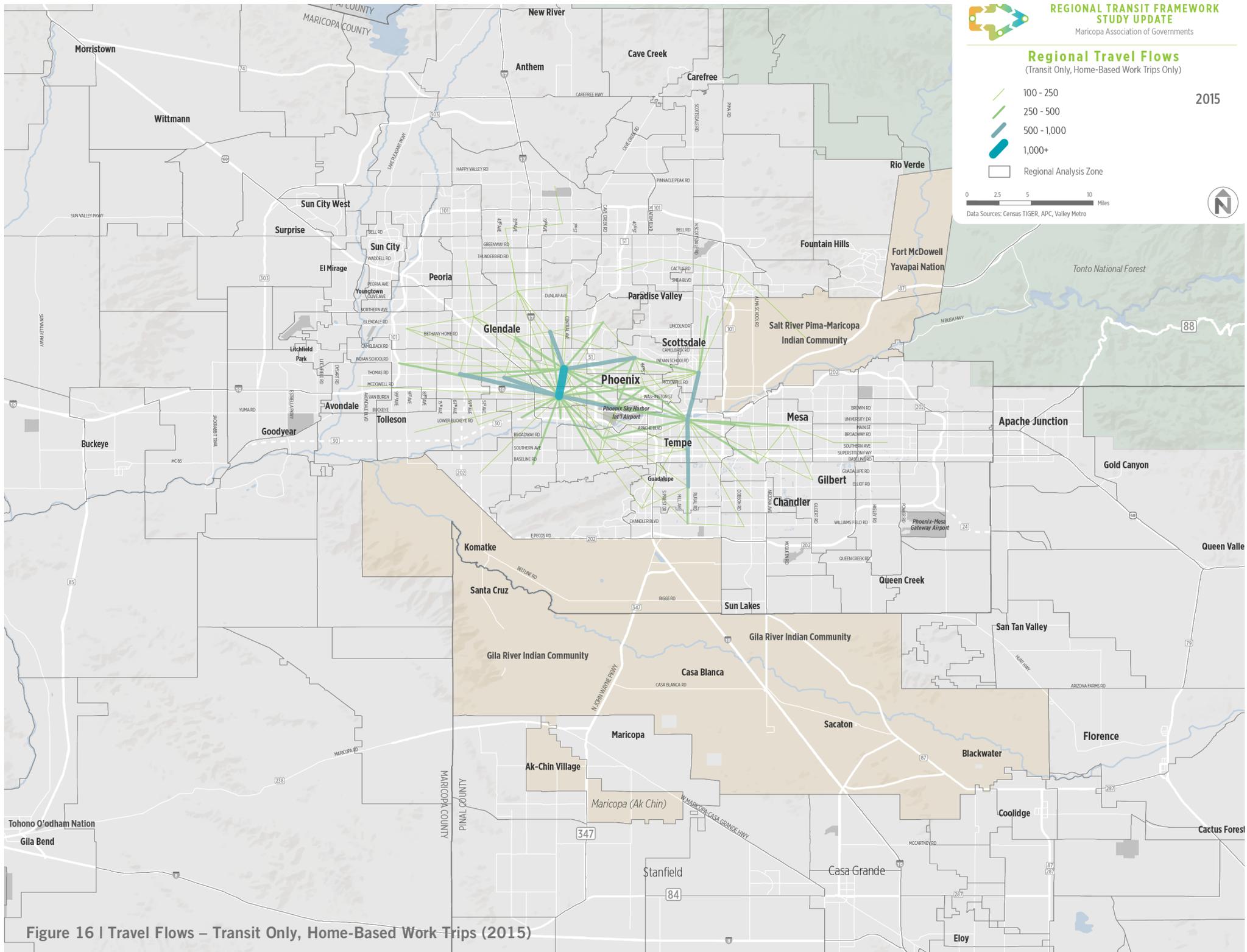
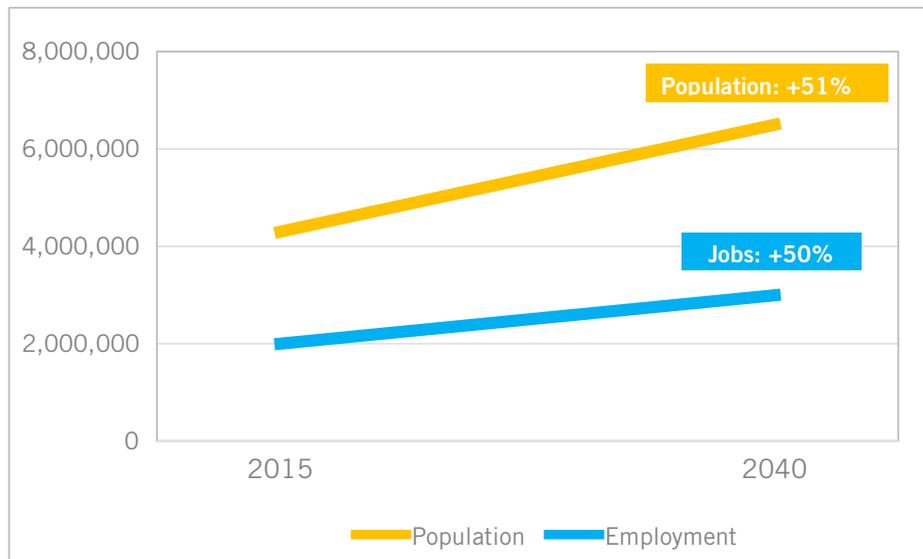


Figure 16 | Travel Flows – Transit Only, Home-Based Work Trips (2015)

4. 2040 TRANSIT DEMAND

Between 2015, population in the MAG region is projected to grow by 51% from 4.3 million to 6.5 million, and jobs are projected to grow by 50% from 2 million to 3 million. These increases will produce greater demand for HCT in areas where it now exists, plus new demand in emerging areas.

Figure 17 | Population and Job Growth in the MAG Region

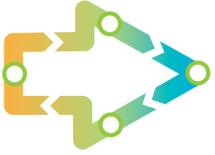


POPULATION AND EMPLOYMENT

2040 Population-Based Demand

By 2040, population is projected to grow in several areas across the MAG region. Areas with increased population density that will support frequent transit include core areas of Phoenix, southern and southwestern Phoenix, across Glendale, across northern Tempe and Mesa, Scottsdale, and portions of Chandler. As shown in Figure 18, a few key corridors stand out as potentially supportive of HCT in 2040 based on population density alone:

- Camelback Road across Phoenix.
- 19th Avenue along the existing light rail line and south towards Thomas Road.
- Apache Boulevard/Main Street across Tempe and Mesa.
- North Scottsdale Road between core areas of Tempe and Scottsdale.



**REGIONAL TRANSIT FRAMEWORK
STUDY UPDATE**
Maricopa Association of Governments

As with 2015 population, the projected population density for 2040 was adjusted by applying the transit propensity index factors to account for the

Population-Based Demand

(Based on Residents per Acre)

Potential Service Frequency Supported
Based on Population Density



2040

- Transit Center
- Bus Route
- Light Rail



Data Sources: Census TIGER, APC, Valley Metro

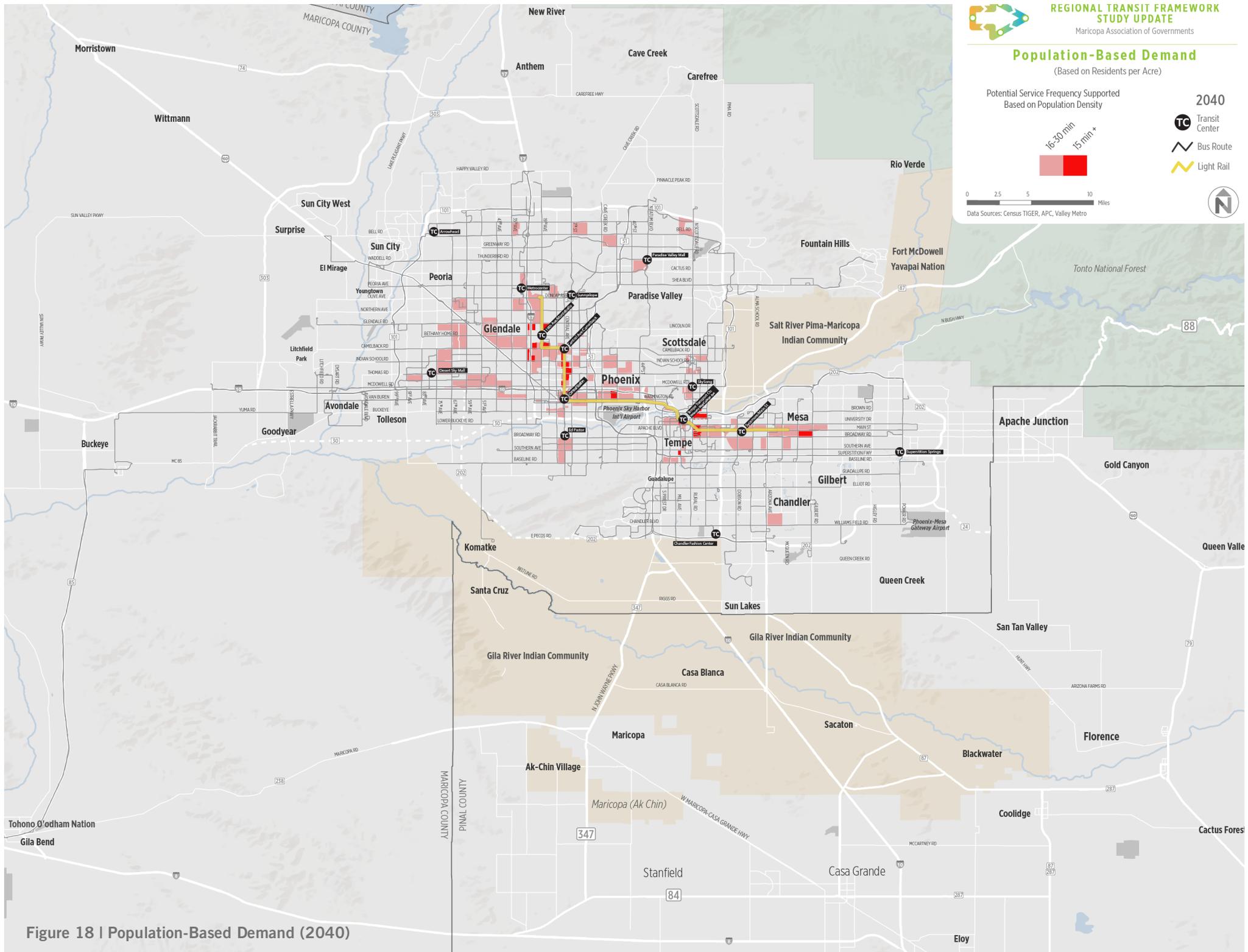


Figure 18 | Population-Based Demand (2040)

transit propensity of certain socioeconomic groups. After applying these factors, many more areas stand out as potentially supportive of HCT service (see Figure 19). Based on population growth between 2015 and 2040, the most significant increases in population-based demand will occur along 19th Avenue, Apache Boulevard/Main Street and Broadway Road in Tempe and Mesa, and in the area southwest of Central/Camelback Transit Center. Corridors that stand out as supportive of high capacity transit in 2040 include:

- 19th Avenue in Phoenix between Metrocenter and I-10.
- Camelback Road and Indian School Road across Phoenix.
- Central Avenue between Camelback Road and Ed Pastor Transit Center.
- Washington Street across southeastern Phoenix.
- Apache Boulevard/Main Street and Broadway Road through Tempe and Mesa.
- Thomas Road across western Phoenix and Glendale.
- North Scottsdale Road between core areas of Tempe and Scottsdale.

2040 Employment-Based Demand

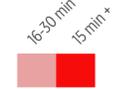
Employment will continue to be focused in a few key areas and corridors in 2040, with growth focused in eastern and southern Phoenix, Glendale, Tempe, and Scottsdale. The most pronounced increases in job density will be in the core areas of Phoenix (especially along Central Avenue/7th Street and Camelback Avenue/Indian School Road), across Tempe, in northern Scottsdale and northeast Phoenix around Scottsdale Airport, in northern Phoenix around Metrocenter and north towards Loop 101, and in areas of Chandler (see Figure 20).

Based on employment density, several corridors stand out as potentially supportive of high capacity transit:

- Camelback Road and Indian School Road in eastern Phoenix.
- Central Avenue along the existing light rail line.
- Washington Street along the existing light rail line.
- Areas around Arizona State University in Tempe and north along North Scottsdale Road.
- South Priest Drive in Tempe.
- In northeast Phoenix/northern Scottsdale along Loop 101, especially around Scottsdale Airport and several shopping centers.

Adjusted Population-Based Demand
(Based on Residents per Acre)

Potential Service Frequency Supported
Based on Population Density



2040

- Transit Center
- Bus Route
- Light Rail



Data Sources: Census TIGER, APC, Valley Metro

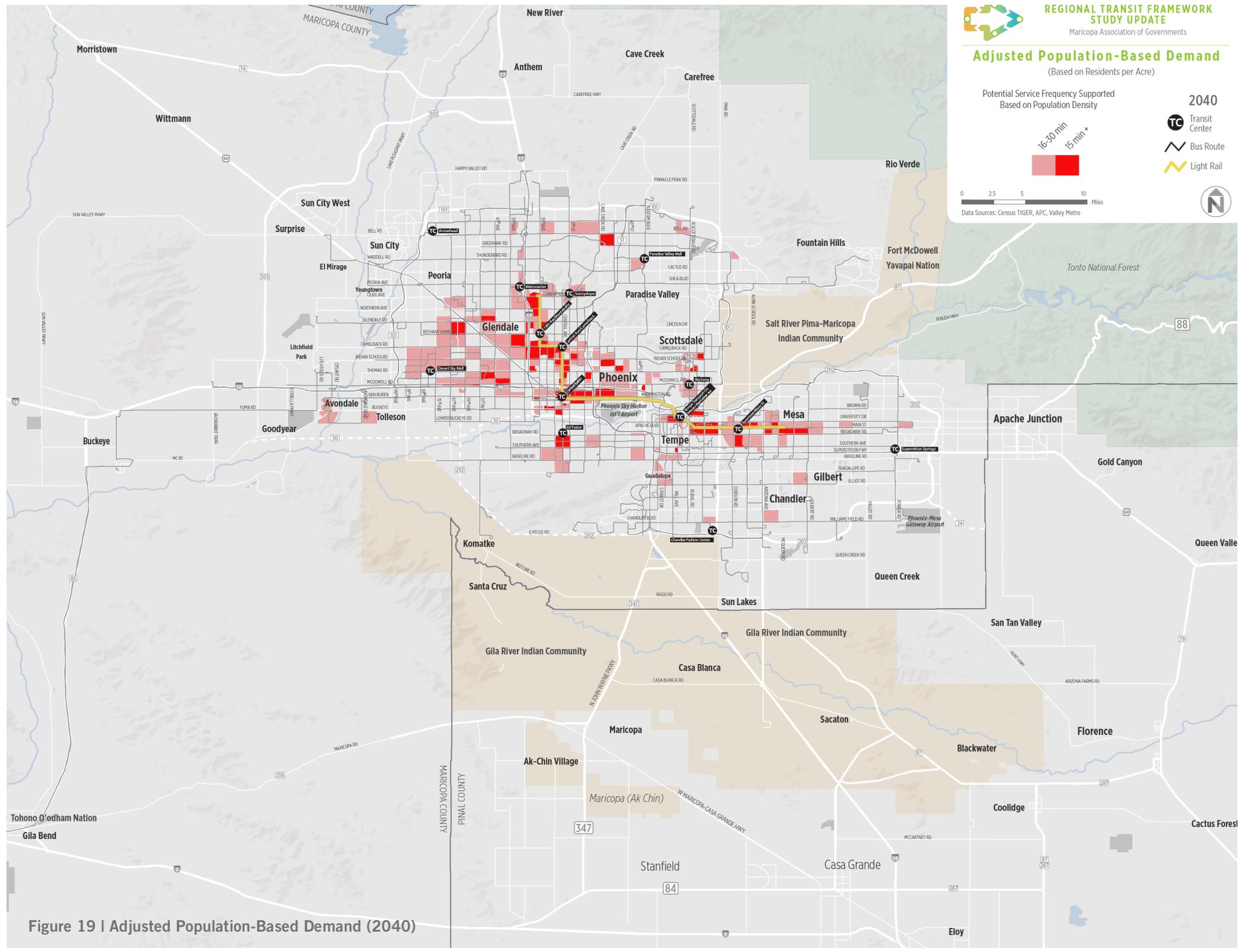


Figure 19 | Adjusted Population-Based Demand (2040)

Employment-Based Demand
(Based on Jobs per Acre)

Potential Service Frequency Supported
Based on Employment Density



2040

- Transit Center
- Bus Route
- Light Rail



Data Sources: Census TIGER, APC, Valley Metro

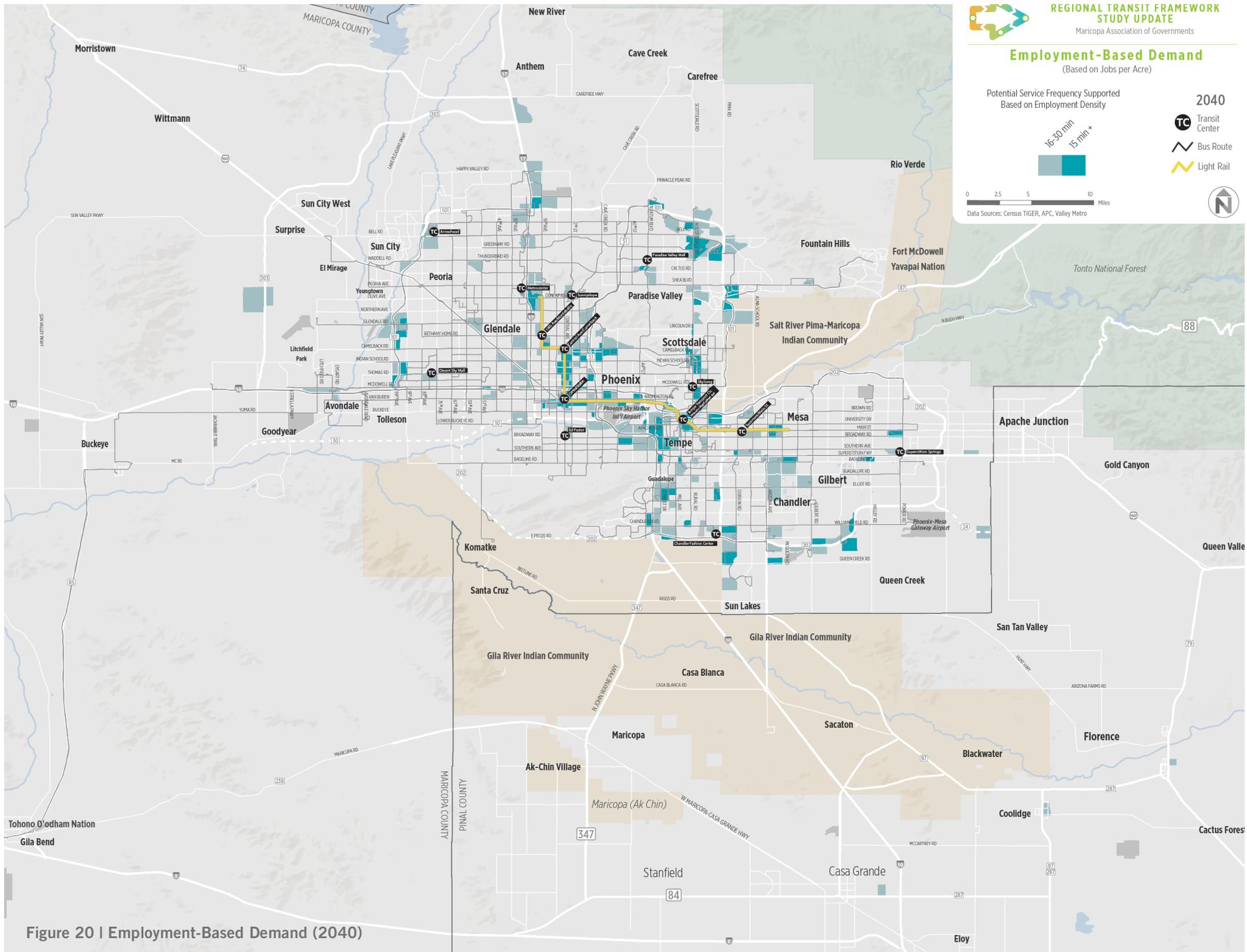
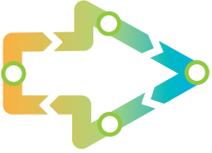


Figure 20 | Employment-Based Demand (2040)



2040 Composite Transit Demand

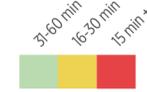
Based on the growth in both population and employment densities, underlying demand for transit is projected to increase most significantly in the core areas of Phoenix and Tempe, as well as across Glendale and Mesa (see Figure 21). Several corridors are projected to potentially support high capacity transit by 2040, as shown in Figure 22 and listed below:

- Camelback Road across Phoenix and Glendale.
- Indian School Road, Thomas Road, and McDowell Road across Phoenix and into Scottsdale.
- Washington Street across central Phoenix, especially along the existing light rail line.
- Central Avenue and 7th Street between Camelback Road and Southern Avenue, especially along and parallel to the existing light rail line.
- 19th Avenue between Olive Avenue and Buckeye Road, and north of Metrocenter towards Happy Valley Road.
- Apache Boulevard/Main Street and Broadway Road through Tempe and Mesa, including east of the existing light rail line terminus.
- South Priest Drive in Tempe.
- University Drive in Tempe.
- North Scottsdale Road through Tempe, Scottsdale, and northeast Phoenix.
- North-south corridors through western Phoenix and Glendale including 35th Avenue, 43rd Avenue, 51st Avenue, and 59th Avenue.
- 27th Avenue between Metrocenter and Buckeye Road.
- Glendale Road between central Phoenix and Westgate Entertainment District in Glendale.
- Along US-60/Grand Avenue from Surprise and Sun City West through Glendale and Phoenix.
- Southern Avenue and Baseline Road through Tempe and Mesa.
- Chandler Boulevard/Williams Field Road through Chandler and Gilbert.
- Arizona Avenue and McQueen Road through Mesa, Gilbert, and Chandler.
- Bell Road across northern Phoenix and Scottsdale between Arrowhead Transit Center and Scottsdale Airport.

Composite Transit Demand Index

Potential transit frequency supported by adjusted population and employment density

2040



- Transit Center
- Bus Route
- Light Rail



Data Sources: Census TIGER, APC, Valley Metro

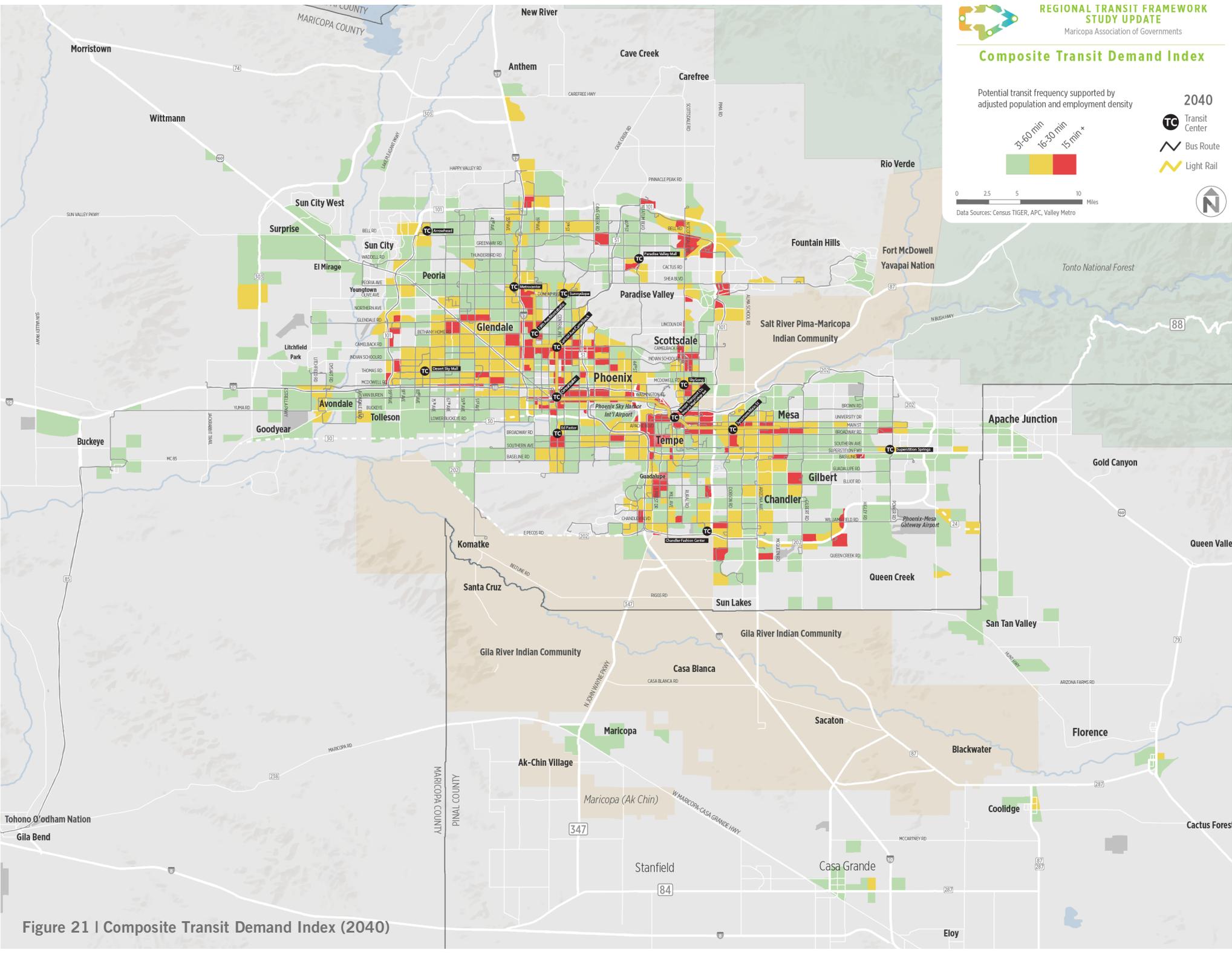


Figure 21 | Composite Transit Demand Index (2040)

Potential High Capacity Transit Lines

Potential High Capacity Transit Lines Based on Underlying Transit Demand
 Potential transit frequency supported by adjusted population and employment density
 60 min
 16-30 min
 15 min +

TC Transit Center
 Bus Route
 Light Rail

0 2.5 5 10 Miles
 Data Sources: Census TIGER, APC, Valley Metro

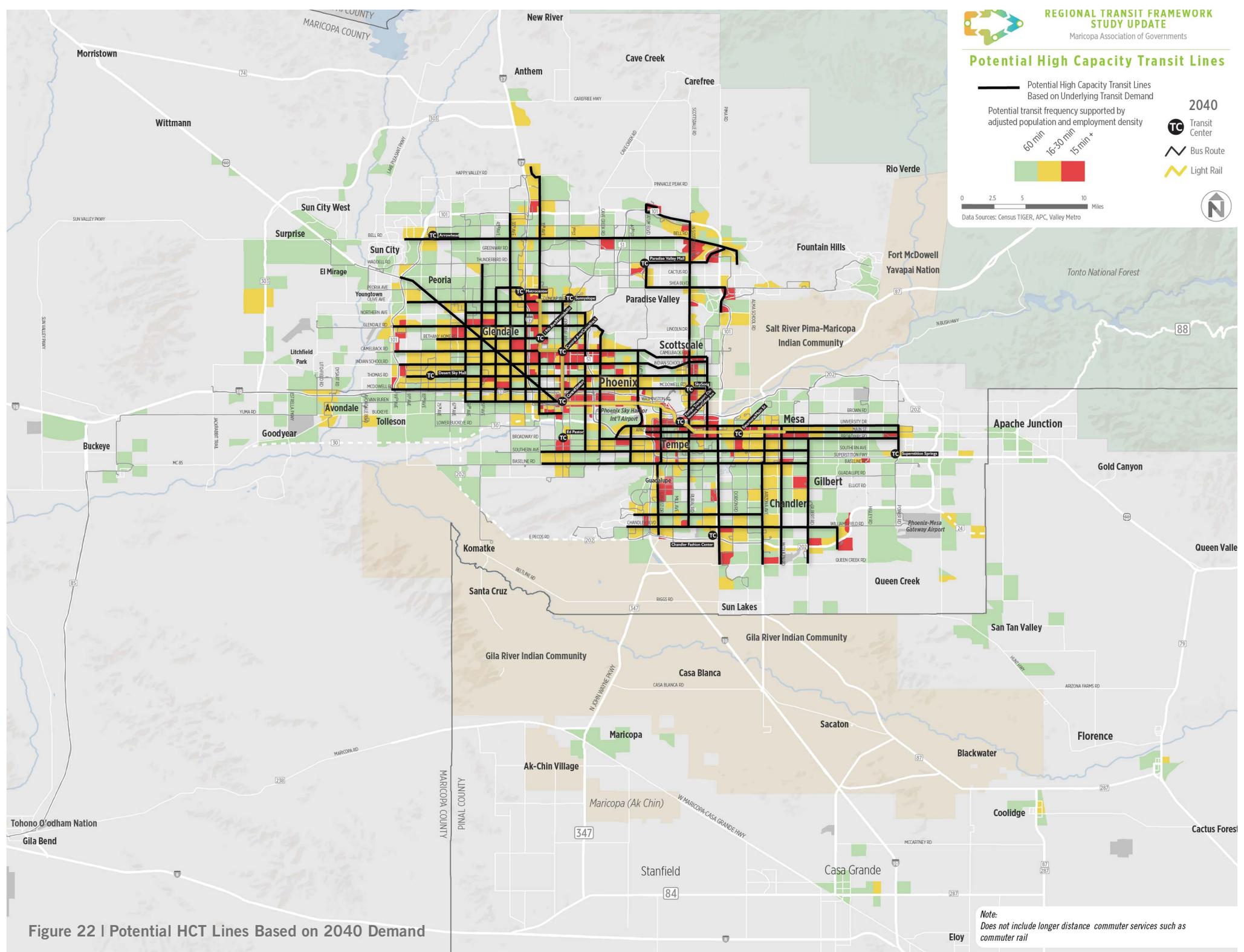


Figure 22 | Potential HCT Lines Based on 2040 Demand

Note: Does not include longer distance commuter services such as commuter rail

2040 TRAVEL FLOWS

All Trips

Travel flows are projected to increase significantly, with more flows carrying upwards of 50,000 daily trips by 2040 (see Figure 23). The highest travel flows will continue to be focused around Phoenix and Tempe, with increasing daily trips around and across Glendale, Scottsdale, Mesa, and Chandler, with most of the largest trip flows located within Valley Metro's existing service area.

The travel flows with the most daily trips (over 50,000) are generally focused in the following areas:

- Within the core areas of Phoenix, especially between downtown Phoenix and the area just to the north (close to the hospitals).
- Within the western portions of Phoenix.
- Between eastern Phoenix and Sky Harbor.
- Between the core area of Tempe and Scottsdale.
- Between Tempe and the eastern part of Chandler.
- Between Tempe and Mesa, and within Mesa.
- Between Mesa and Chandler.
- Across Glendale and between Glendale and the core areas of Phoenix.
- Between western Glendale and western areas of Phoenix.
- In parts of northeast Phoenix, including areas near Paradise Valley Mall and the Mayo Clinic Hospital.

Home-Based Work Trips

By 2040, the heaviest flows of home-based work trips are projected to be more dispersed across the study area. Several trip flows that carried 8,000 or more daily trips in 2015 will remain high in 2040, including travel flows between central and eastern areas of Phoenix, between Tempe and southern Scottsdale, and between Tempe and southwestern Chandler. As shown in Figure 24, major travel flows include:

- Between the core areas of Phoenix and western portions of the city.
- Between central Phoenix and southeast Glendale.
- Between zones in Mesa, Chandler, and Gilbert.

Home-based work travel is also projected to surpass 8,000 daily trips in the following areas:

- Within core areas of Phoenix, including between downtown and zones just to the north.

- Between western Phoenix and Scottsdale.



Regional Travel Flows

(All Modes, All Trip Types)

2040

- 5,000 - 15,000
- 15,000 - 30,000
- 30,000 - 50,000
- 50,000+
- Regional Analysis Zone



Data Sources: Census TIGER, APC, Valley Metro

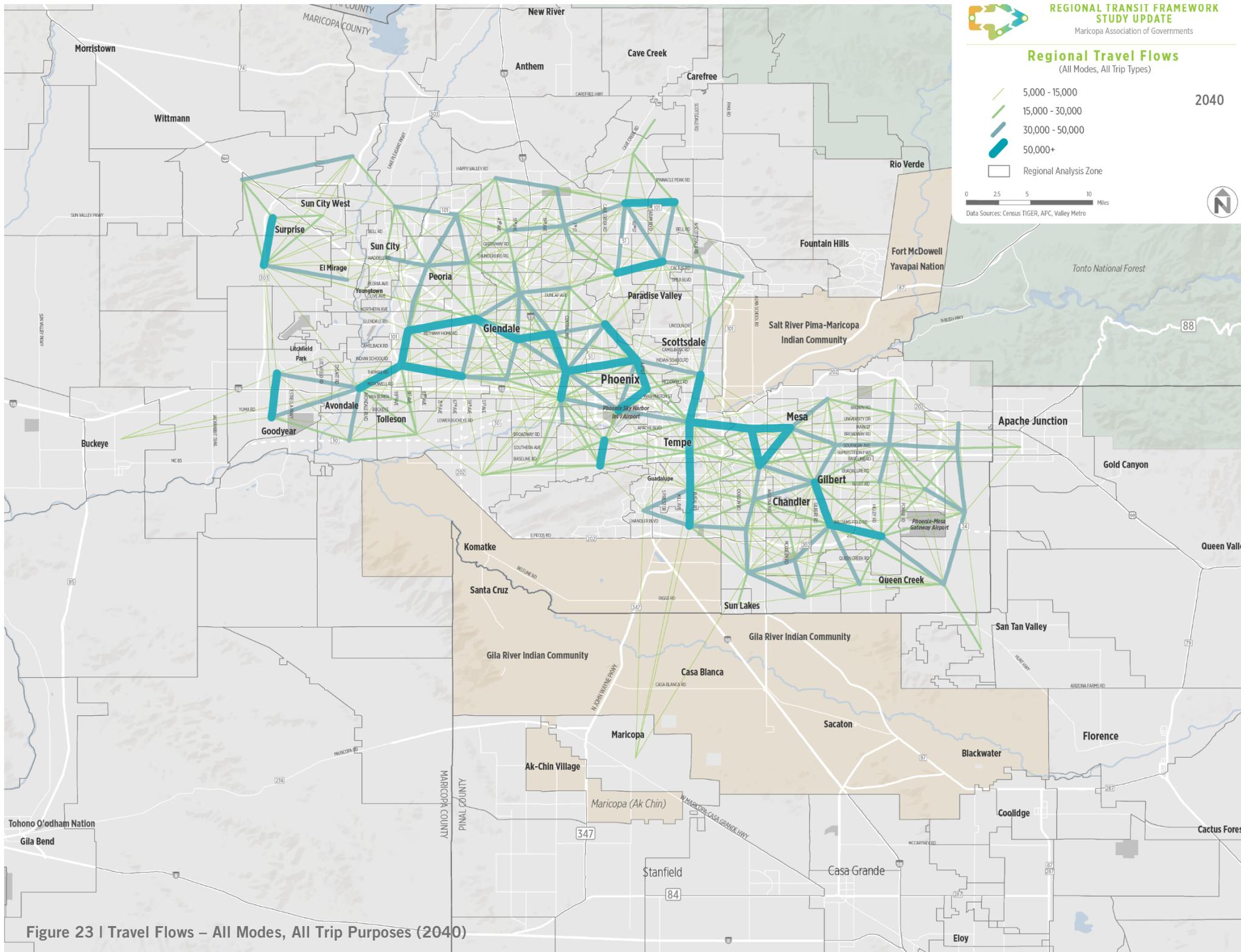


Figure 23 | Travel Flows – All Modes, All Trip Purposes (2040)

Regional Travel Flows
 (All Modes, Home-Based Work Trips Only)

2040

- 2,000 - 3,000
- 3,000 - 5,000
- 5,000 - 8,000
- 8,000+
- Regional Analysis Zone

0 2.5 5 10 Miles
 Data Sources: Census TIGER, APC, Valley Metro

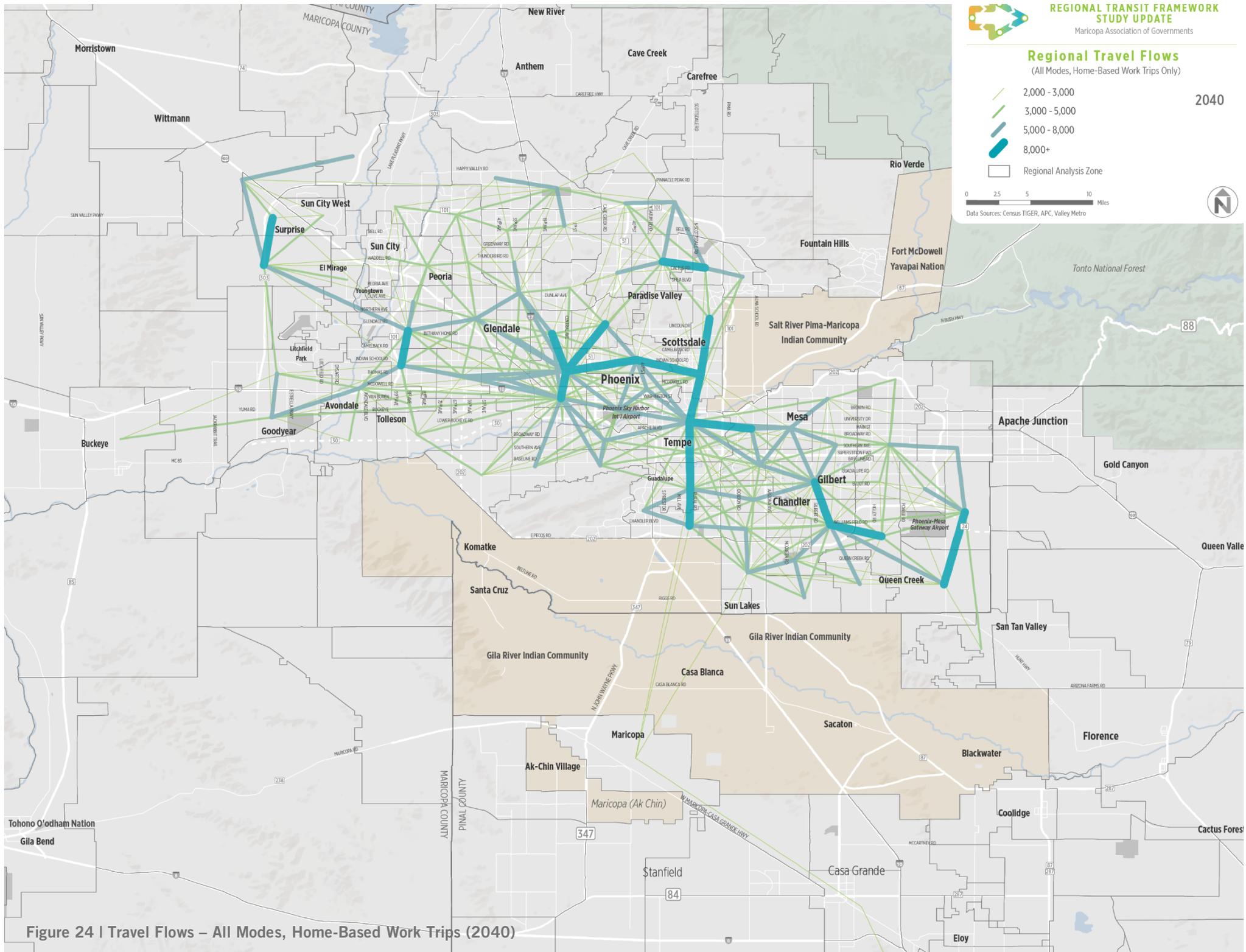
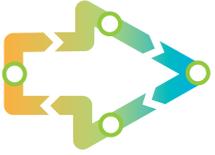


Figure 24 | Travel Flows – All Modes, Home-Based Work Trips (2040)



- North-south trips across Scottsdale.
- Across and between Chandler and Gilbert.

Standout travel flows outside of the local transit service area include:

- Between zones in northeast Phoenix.
- West of U.S. Route 60, between zones in Surprise/Sun City West and Citrus Park.

5. SUMMARY

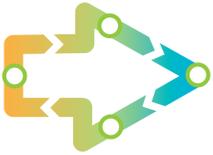
MAG region will experience significant growth between now and 2040, with a 63% increase in population and 61% increase in employment projected between 2015 and 2040. Although growth will occur across the MAG region, there are several areas that will experience increases in population and job density, and several corridors are projected to emerge as potentially supportive of HCT.

The most recent data that is available that is reflective of current conditions is 2015 data, which shows that:

- The MAG region was home to 4.3 million residents in 2015, most of whom lived within the Loop 101 and Loop 202. The highest population densities were located in western and central parts of Phoenix, and in parts of Tempe and Mesa. There are also clusters of higher population density in Glendale, Chandler, and El Mirage.
- As of 2015, there were 1.8 million jobs in the MAG region, which were mostly located within the Loop 101 and Loop 202 around Phoenix and surrounding cities. Employment density in the region is highest in central parts of Phoenix, Tempe, Chandler, and Scottsdale.
- Arizona State University is the largest employment site in the region, with over 8,000 employees at its campus in Tempe, while Intel has over 11,000 employees between its Chandler and Ocotillo campuses. Other large employers include hospitals, health facilities and manufacturing, and many of these sites are focused in central areas of Phoenix, with most currently served by at least one Valley Metro bus route and some accessible by light rail.

Specific populations that have a very strong propensity to use transit are generally focused in the core urban areas of the region, while most residents in outer areas have a lower propensity to use transit:

- Low-income households comprise 21.4% of the region's households. These households were mostly focused in the core areas of Phoenix, western portions of Phoenix and Glendale, central parts of Tempe, and Guadalupe.
- Approximately 6.5% of the region's households do not have a vehicle available. Most zero-vehicle households were located within Phoenix, Tempe, and Glendale, and especially along the existing light rail line.
- Approximately 1.3 million residents are Hispanic, comprising 29.8% of the population. These residents are clustered in southern Glendale and western Phoenix, just east of downtown Phoenix, in southern Phoenix, and in Mesa between Arizona Avenue and Gilbert Road. Non-Hispanic minority residents, who comprise a total of 12.3% of the population,



are similarly distributed throughout the region, but with proportionally greater concentrations in the Southeast Valley.

When population and employment are considered together, many more corridors emerge as potentially supportive of high-capacity transit service:

- Along the major corridors that are currently served by light rail along part of their length: North 19th Avenue, North Central Avenue, Washington Street, and East Apache Boulevard/East Main Street.
- Several east-west corridors in Phoenix, including Camelback Road, Indian School Road, Thomas Road, McDowell Road, and Van Buren Street.
- Buckeye Road between western Phoenix and Sky Harbor.
- North-south corridors in western Phoenix to the south of Glendale, including 51st Avenue, 35th Avenue, and 27th Avenue.
- North Scottsdale Road/Rural Road in Scottsdale and Tempe.
- East Broadway Road in Tempe and Mesa.
- South Priest Drive in Tempe.
- Along US-60/Grand Avenue through Glendale and Phoenix.

Looking at travel flows, the highest trip volumes in 2015 were focused on a few cities across the study area, but primarily in Maricopa County within Valley Metro's existing service area. The travel flows with the most daily trips were generally focused in the following areas:

- Within the core areas of Phoenix, especially between downtown Phoenix and the area just to the north (close to the hospitals).
- Within the western portions of Phoenix.
- Between the core area of Tempe and Scottsdale.
- Between Tempe and the eastern part of Chandler.
- Within the town of Gilbert just east of Chandler.

Transit trips in 2015 were heaviest in Phoenix and Tempe. Notable travel flows include:

- Between downtown Phoenix and downtown Tempe.
- Within the central areas of Phoenix, between downtown and neighborhoods just north of downtown.
- Between downtown Tempe and Scottsdale.

Looking forward to 2040, there will be more people and jobs in areas across the region, including significant growth in key areas and corridors that currently or will potentially support frequent transit service. Transit-supportive corridors are located in and across several cities in the MAG region, providing the potential for a robust network of HCT that connects the MAG region.

Demand will remain high in several areas of Phoenix, Tempe, Mesa, and Scottsdale. More areas that could support HCT will also emerge in Glendale,

Scottsdale, Chandler, and Gilbert. Several corridors stand out with the highest underlying demand for transit service:

- In Phoenix, the highest demand will continue be in the core areas of the city, along corridors that are already served by the existing light rail line, including 19th Avenue, Central Avenue, Camelback Road, and Washington Street. Additional corridors that can potentially support HCT in 2040 include Glendale Road, Indian School Road, Thomas Road, McDowell Road, 27th Avenue, 16th Street, and 24th Street.
- Across Tempe and Mesa, demand for HCT is highest along Apache Boulevard/Main Street, which is served by the light rail line, as well as University Drive and Broadway Road.
- North Scottsdale Road/Rural Road, which connects Tempe, Scottsdale, and northeast Phoenix, also stands out as a major corridor with very high transit demand in 2040.

Travel flows across the MAG region are projected to increase significantly by 2040. The largest travel flows will continue to be focused around Phoenix and Tempe, with increasing daily trips around and across Glendale, Scottsdale, Mesa, and Chandler, with most of the largest trip flows located within Valley Metro's existing service area. Among home-based work trips, existing trip flows are projected to grow between central and eastern areas of Phoenix, between Tempe and southern Scottsdale, and between Tempe and southwestern Chandler.