



COMMUTER BUS FEASIBILITY STUDY

FINAL REPORT

October 2020



Cover photo: Valley Metro





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INTRODUCTION

The Valley has been experiencing increasing levels of congestion over the past several decades due to growth in population and jobs, a trend that is expected to continue in the years to come. Commuter buses can serve as a means to reduce congestion and offer commuters in the Maricopa Association of Governments (MAG) region a high-quality transit option to reach job centers.

The Commuter Bus Feasibility Study was designed to determine: how existing commuter bus services are performing and how they could be improved; where demand exists for new commuter bus services, considering both current and future demand; and the viability of those services based on market sizes, costs, and other factors.

BACKGROUND

This study is also intended to expand upon the recommendations made in the recently-completed MAG Regional Transit Framework Study Update (RTFSU). The RTFSU identified potential high-capacity transit corridors throughout the MAG region and found that while there is not sufficient demand to warrant high-capacity transit in all parts of the Valley, there may be opportunities in other areas for lower-capacity transit services, including commuter bus. Because of tremendous interest in this unique, typically peak-period mode, MAG committed to conducting an additional analysis of commuter bus at the conclusion of the RTFSU.

The RTFSU and the Commuter Bus Feasibility Study (CBFS) were undertaken primarily to inform the development of *Momentum*, the next Regional Transportation Plan (RTP), while reaffirming a commitment from MAG to facilitate strong regional transit investments. The timing of this study in tandem with the development of the RTP presents an opportunity to advance a strong regional commuter bus system as a regional investment priority.

The current funding structure for transit in the MAG region can be complex and difficult to navigate. Advancing commuter bus as a regional investment priority also provides an opportunity to streamline this funding structure, making study recommendations easier to implement and simplifying operations in the future.

IMPLEMENTATION TIMEFRAME

The market and alternatives analyses conducted as part of the CBFS identified new routes and modifications to existing routes that could be viable over the short term (i.e., the next 3-5 years). Commuter bus is a relatively flexible mode of transit, requiring far fewer capital investments than fixed-route alternatives. Also, as recently observed through pandemic impacts, commuter bus market conditions can change rapidly and unexpectedly, rendering it difficult to make long-term recommendations with confidence.

Although the new routes and modifications to existing routes identified in the study could be viable in the short-term, the focus of the final recommendations is the mid-term (e.g., 5-10 years), to allow time for the adoption and implementation of the next RTP. A longer-term planning horizon is also addressed in this report, taking into consideration projected population and job growth throughout the region.



EXISTING COMMUTER SERVICES

INTRODUCTION

Valley Metro is the Phoenix metropolitan area's unified brand for public transit, serving more than 2.2 million residents. Given the expanse of the area served, commuter-based services play a vital role in the Valley's transit system. The Valley Metro branded system includes three types of commuter and express services: Express, RAPID, and limited-stop. These services are intended to operate as faster, more efficient transit alternatives for high-demand and congested corridors, although these corridors may also be served by regional or local fixed-routes. Commuter services connect residential communities to downtown Phoenix and provide higher speed services for longer trips by operating, when possible, in high-occupancy vehicle (HOV) lanes with few stops.

Valley Metro operates three types of commuter services: Express, RAPID, and limited-stop. These services connect suburbs to downtown Phoenix.

CHARACTERISTICS OF EXISTING SERVICES

Commuter services are oriented towards work commute trips and generally operate only during weekday peak periods. The scheduled services are optimized for each individual route, and the number of trips, both inbound and outbound, correspond specifically to the needs of the sub-areas serviced. Generally, inbound commuter bus services begin

around 5:00 AM at the boundary locations with the last trips reaching the respective final downtown destinations between 8:45 and 9:00 AM. Similarly, outbound commuter bus services begin around 3:00 PM at the downtown locations, with the last trips reaching the respective final destinations between 6:45 and 7:15 PM.

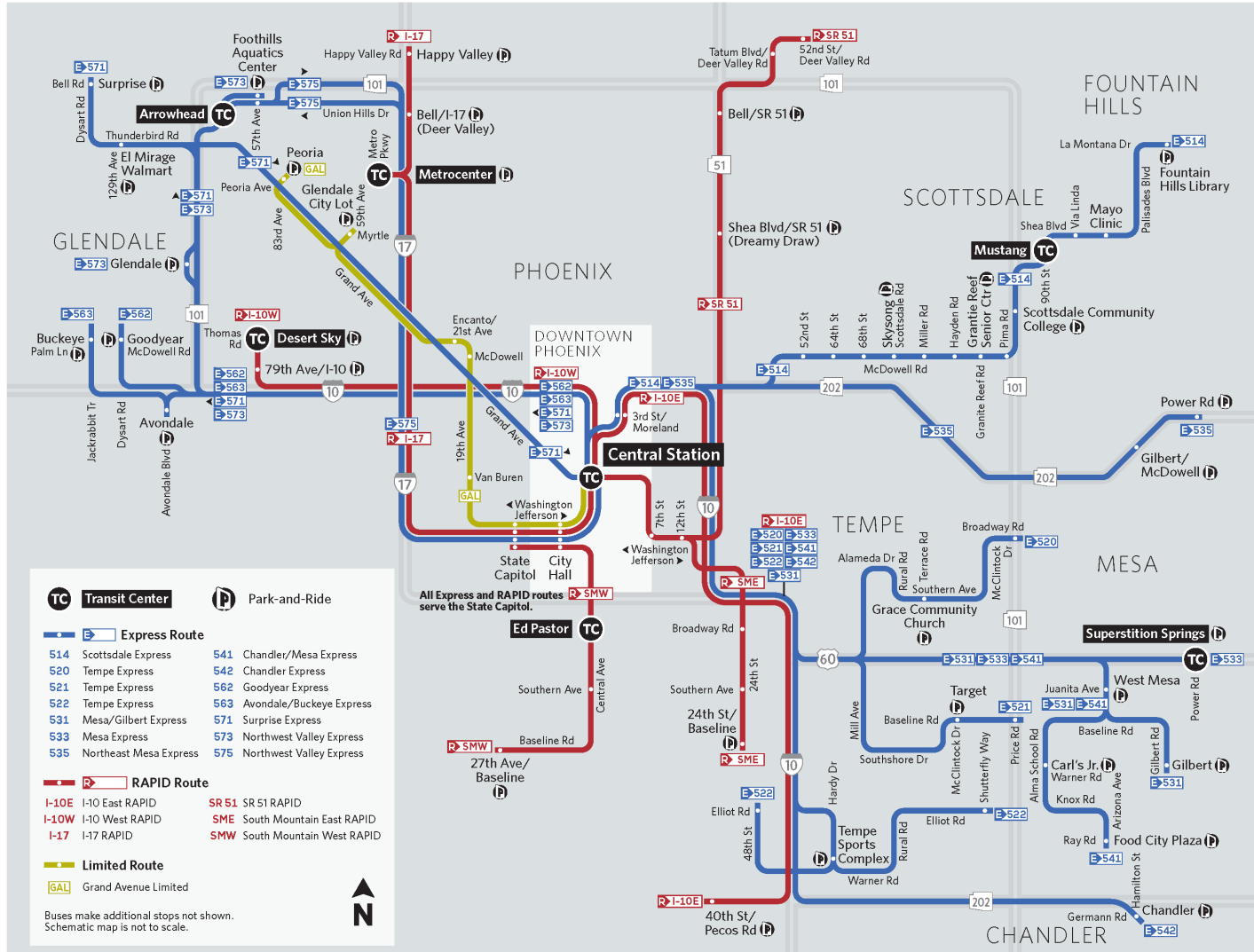
Figure 1 shows the existing network of commuter services with a list of routes. Express, RAPID, and limited-stop routes are all focused on providing quality services to commuters, including fast and direct trips, and generally cost more to operate compared to local buses. However, there are a few identifying characteristics between the three services.

Express services have the largest number of routes and coverage area, and generally stop at multiple locations within a suburb before traveling on freeways to downtown Phoenix. Fares are higher than for local services. There are two to eight trips in each peak direction per weekday (Figure 5). A combination of single-door express buses (Figure 2) and both 40-foot and 60-foot conventional Valley Metro buses are used. Valley Metro will be introducing new coach buses on express routes as early as 2021.

RAPID routes operate almost entirely on freeways within the City of Phoenix between park-and-rides and downtown, using branded RAPID buses with high-backed seats (Figure 3). RAPID services operate at a much greater frequency than Express routes, with up to 21 trips in each peak direction per weekday (Figure 5).

There is currently one limited-stop route: which runs between Glendale and downtown Phoenix. The service operates on Grand Avenue, an arterial street, and there are two trips in each peak direction per weekday. The service is branded as a local bus service and charges the local bus fare.

Figure 1 | Existing Commuter Services



Source: Valley Metro System Map



When possible, commuter buses travel in high-occupancy vehicle (HOV) lanes, which increases speed and reliability compared to traveling in general traffic. Additionally, RAPID stop facilities are equipped with real-time information signage, and park-and-rides include covered parking.

Figure 2 | Valley Metro Express Bus



Figure 3 | Buses Branded for RAPID Service



Figure 4 | Types of Services

	Express Routes	RAPID Routes	Limited-Stop Routes
Route	Operates on local roads to service park-and-rides and local stops within suburbs, then on freeways directly to downtown Phoenix	Operates almost entirely on freeways between park-and-rides and downtown Phoenix	Operates on arterial streets between park-and-rides and downtown Phoenix
Area	Large service area covering Phoenix, Scottsdale, Tempe, Chandler, Mesa, Fountain Hills, and Glendale	Along freeways (I-10, I-17, SR 51) and in South Mountain Village	Grand Avenue Corridor
Buses	Uses a combination of single-door express buses and 40' and 60' conventional Valley Metro buses	Uses branded RAPID buses with high-backed seats	Uses conventional Valley Metro buses
Fares	Express/RAPID (\$3.25/ride)	Express/RAPID (\$3.25/ride)	Local (\$2/ride)
Trips	2 to 8 roundtrips in peak direction on weekdays	Up to 21 roundtrips in peak direction on weekdays	2 roundtrips in peak direction on weekdays



Figure 5 | Number of Trips by Route

Route	AM Peak Trips	PM Peak Trips
Rapid Routes		
I-10 East RAPID	15	14
I-10 West RAPID	12	12
I-17 RAPID	21	20
South Mountain East RAPID	5	5
South Mountain West RAPID	5	5
SR-51 RAPID	14	15
Express Routes		
514 Scottsdale Express	2	2
520 North Tempe Express	2	2
521 Central Tempe Express	4	4
522 South Tempe Express	4	4
531 Mesa/Gilbert Express	6	6
533 Mesa Express	6	6
535 Northeast Mesa Express	5	5
541 Chandler/Mesa Express	4	4
542 Chandler Express	8	8
562 Goodyear Express	4	4
563 Avondale/Buckeye Express	4	4
571 Surprise Express	4	4
573 West Glendale Express	4	4
575 North Glendale Express	3	3
Limited-Stop Routes		
Grand Avenue Limited	2	2

SERVICE PERFORMANCE

Ridership

Ridership on commuter buses varies by route. Figure 6 shows the ridership on each route for the average weekday. The route with the highest ridership is I-17 RAPID (at 1,166 riders per day), and the route with the lowest ridership is 520 Tempe Express (at 28 riders per day). RAPID services tend to have higher ridership than Express or limited-stop services, likely because RAPID services operate more frequently.

Routes that have higher frequency tend to have higher ridership, especially for a service that attracts many choice riders who could otherwise drive, like commuter bus. A greater number of trips increases the chance that a bus lines up with a commuter's schedule. Higher frequency also allows for greater flexibility if a commuter misses a bus or decides to travel at a slightly earlier or later time.

Figure 7 shows the average number of riders per trip on each route. The routes in Mesa and Chandler have the highest ridership per trip, with an average of 32 riders for each 535 Northeast Mesa Express and 542 Chandler Express trip. 520 Tempe Express and South Mountain East RAPID have the lowest number of riders per trip.

Different routes may have different levels of ridership per trip due to many factors, including the number of potential riders the route serves, the routing and stop placement, and the overall convenience or attractiveness of the service as compared to driving alone or taking local transit services. For example, low ridership in Tempe may be due to the alternative connection to Downtown Phoenix via light rail.

Travel Times

In order to assess the effectiveness of commuter buses and understand mode choice decisions, the travel times of commuter bus routes were compared to drive times estimated by Google Maps during the AM peak

period, shown in Figure 8. Google Maps drive times are shown as a range due to variability in traffic. On a route-by-route basis, transit commuters experience substantial time savings on most routes when compared to the higher end of the drive time ranges. However, when compared to the average drive times, transit commuters may experience minor time savings or costs depending on the route. Since commuter bus and automobile travel times are generally comparable, people are likely considering other factors while making their mode choice decisions, such as comfort, amenities, and cost.

Figure 6 | Total Average Weekday Boardings by Route

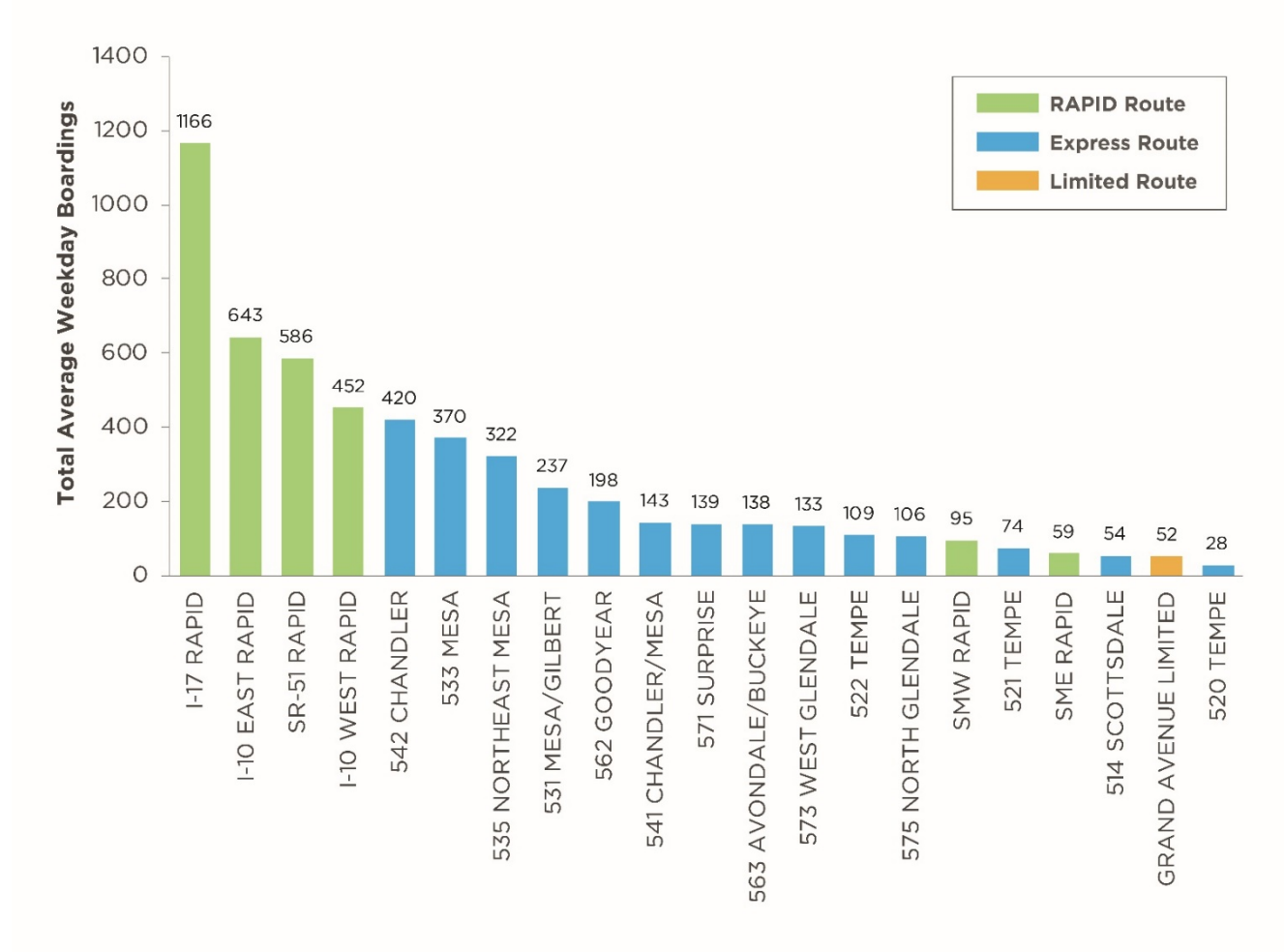


Figure 7 | Weekday Average Boardings per Trip by Route

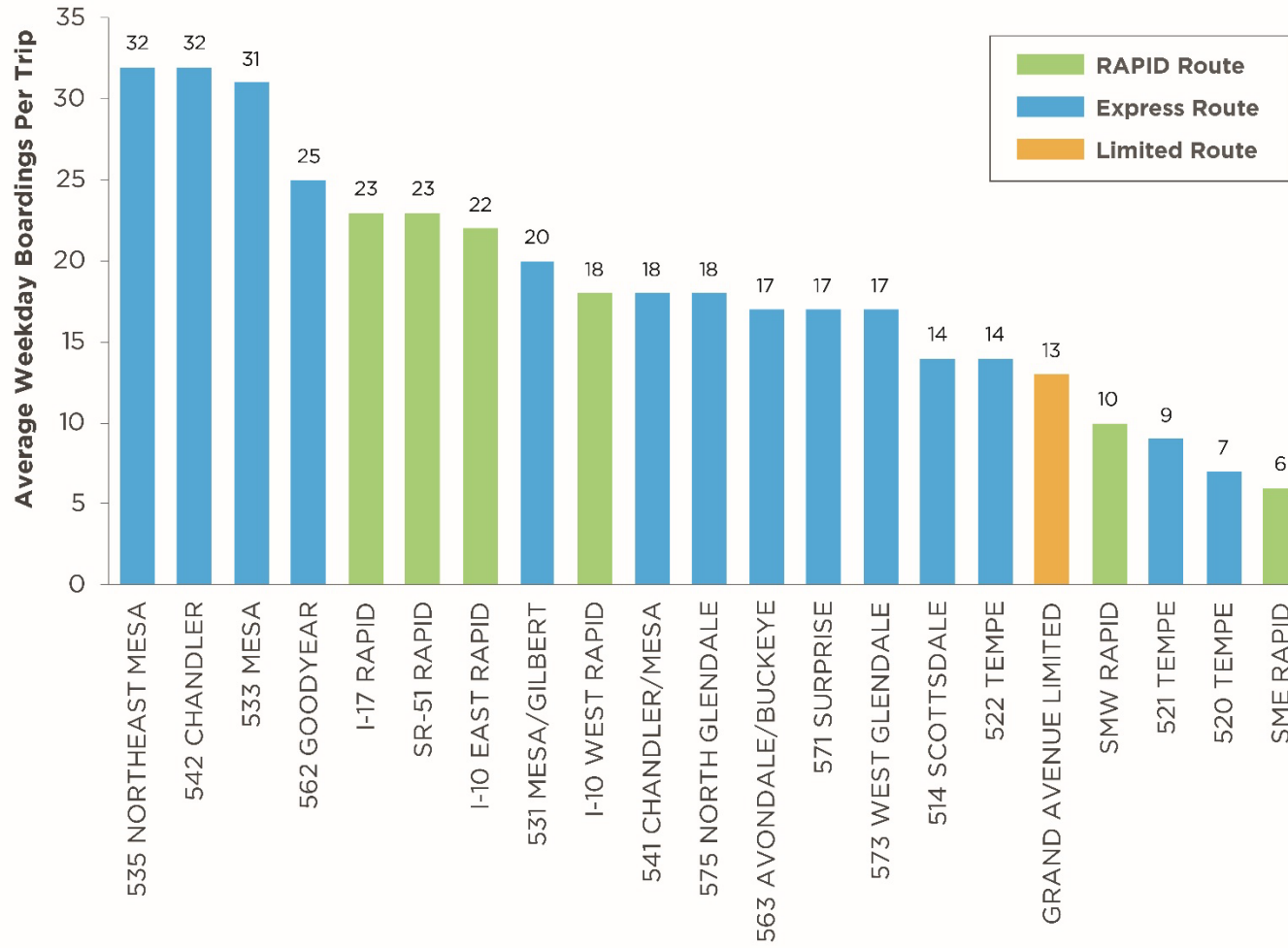




Figure 8 Travel Time Comparison: Weekday AM Peak - All Routes End at Central Station

Route	Start	Travel Time to Central Station (Minutes)	
		Scheduled Bus	Google Maps Driving
RAPID Routes			
I-10 East RAPID	40th St./Pecos Rd. Park-and-Ride (PNR)	41	30-70
I-10 West RAPID	Desert Sky Transit Center	51	24-60
I-17 RAPID	Happy Valley PNR	43	28-65
South Mountain East RAPID	24th St./Baseline PNR	30	14-30
South Mountain West RAPID	27th Ave./Baseline PNR	26	14-30
SR-51 RAPID	52nd St. & Deer Valley Rd.	40	24-45
Express Routes			
514 Scottsdale Express	La Montana Dr. & El Lago Blvd.	90	35-70
520 Tempe Express	Price Rd. & Broadway Rd.	55	18-40
521 Tempe Express	Price Rd. & Baseline Rd.	53	24-45
522 Tempe Express	Shutterfly Way & Elliot Rd.	53	24-50
531 Mesa/Gilbert Express	Gilbert PNR	62	35-75
533 Mesa Express	Superstition Mall PNR	57	35-65
535 Northeast Mesa Express	Power Rd. PNR	57	30-60
541 Chandler/Mesa Express	Arizona Ave. & Ray Rd.	63	30-70
542 Chandler Express	Chandler PNR	50	35-75
562 Goodyear Express	Goodyear PNR	60	28-70
563 Avondale/Buckeye Express	Buckeye PNR	60	35-80
571 Surprise Express	Surprise PNR	83	40-90
573 West Glendale Express	Foothills Recreation & Aquatics Center	80	30-70
575 North Glendale Express	Arrowhead Transit Center	65	35-80
Limited-Stop Routes			
Grand Avenue Limited	Peoria PNR	68	26-70

EXISTING COMMUTER SERVICES FINDINGS

The Valley Metro branded system currently includes three types of commuter buses—Express, RAPID, and limited-stop—that have varying service characteristics and performance. The following lists key findings from the above analysis of existing commuter services:

All three types of service connect suburbs to downtown Phoenix, only. RAPID routes are the most direct along freeways, while the limited-stop service utilizes arterial streets.

Ridership per weekday is the highest among RAPID routes, likely because of the greater number of trips per peak period.

Ridership per trip is highest among routes in Mesa and Chandler and lowest among routes in Tempe.

Commuter bus travel times are comparable to or slightly greater than private automobile travel times, so people are likely considering factors other than time savings while making their mode choice decisions.

PEER AGENCIES & BEST PRACTICES

Many transit agencies across the country run commuter bus service as an integral part of their respective transit systems. Understanding how other services operate can aid Valley Metro in running optimal commuter routes. For this reason, five comparable transit agencies were selected for a peer review and assessment. The commuter bus service offered by each of the agencies below differ in branding, service characteristics, operating conditions, vehicle types, and other factors.



Pace (Chicago)



Sound Transit (Seattle)



Metro Transit (Minneapolis)



RTD (Denver)



METRO (Houston)

Best Practices Findings

The five agencies covered in this section run reliable commuter services with high ridership and can serve as examples for this region. The following lists lessons learned across the five peer reviews:

Using transit priority lanes increases the speed and reliability of commuter buses, which can improve service quality and ridership.

Commuter buses in the peer cities travel on HOV lanes, Express lanes, and freeway shoulders.

Many of the commuter bus systems use coach and/or branded buses, to differentiate from local service. Especially for longer-distance trips, these buses provide greater comfort and the perception of a more premium service.

For the routes with the highest demand and ridership, **many agencies offer commuter service beyond the typical peak hours.** These buses run all day in both directions and sometimes on weekends as well.

Connections to park-and-rides and coordination with local buses and other agencies are crucial for an effective commuter bus system.

After bus-on-shoulder operations were permitted for Pace Express Routes 755 and 855, on-time performance improved from 63% to over 90% on these routes.



MARKET ANALYSIS

Commuter services generally operate between residential areas and major employment centers. The bulk of service typically runs during AM and PM peak periods, and trip lengths are significantly longer than local transit trips. Commuter buses usually travel most of their routes on highways or freeways. Unlike local service, many riders access commuter services by driving or being dropped off, and residential commuter service stops usually have park-and-ride infrastructure. The most successful commuter routes serve high density job centers with heavy congestion and high parking prices. These areas also tend to be walkable and have connections to other frequent transit services.


People who use commuter services tend to have higher incomes, own personal vehicles, and live in areas where high-quality fixed-route service is not viable. Therefore, riders are generally attracted to commuter services due to time or cost savings over commuting in a private vehicle. Commuter buses that use high-occupancy vehicle (HOV) lanes can offer additional time savings over single-occupancy vehicles (SOV) traveling in general purpose lanes.


Travel flows from residential areas to the employment areas determine the underlying demand for commuter service, and what type of service is best. The total number of people regularly traveling from the residential area to the employment area is the largest indicator of how many riders can potentially be captured on commuter transit services.


These elements of demand for commuter bus service are explored further in the following sections to identify which areas show the highest demand for commuter bus services in the Valley.


UNDERSTANDING THE DEMAND FOR COMMUTER BUS


Commuter bus service takes riders directly from a residential area to a major employment center. The characteristics of the residential and employment areas, how many people travel between these areas, and the conditions of the transit trip as compared to taking a private vehicle determine the demand for commuter bus. Considered together, these factors informed the service alternatives for this feasibility study.

 **Major Employment Centers:** Commuter bus routes usually serve employment centers with a high number and a high density of jobs. These areas tend to be walkable as most riders reach their final destination on foot.

 **Residential Areas:** The catchment area for commuter services in residential areas is much larger than local transit because many riders access service by driving to park-and-ride lots rather than walking.

 **Travel Flows:** The total number of people looking to travel between two areas, usually from a primarily residential area to a denser employment area, must be large enough to support commuter service.

 **Cost Competitiveness:** Parking prices at the employment centers and other costs influence the decision to take commuter services. Because most people who take commuter services live in a household with a vehicle, there must be a financial incentive to take transit for ridership on commuter services to be high.

 **Time Competitiveness:** Express services do well in areas with moderate to heavy levels of congestion. Successful commuter services often perform at speeds comparable to driving, or faster in cases of heavy auto congestion. Commuter services may also offer more reliable travel times and allow riders the freedom to do work or read for pleasure, rather than driving.



MAJOR EMPLOYMENT CENTERS

Based on the total number of jobs, job density, and areas most significant to regional stakeholders, the following major employment centers were identified by the project team. Figure 9 shows the eleven regional job centers identified for this study. These eleven job centers represent 393,500 jobs, or 34 percent of the region's total jobs in 2018.

Figure 9 | Regional Job Centers

Job Center	Total Jobs (2018)	Job Density per Acre (2018)
Downtown Phoenix	54,257	37.4
Downtown Tempe/ASU	24,881	33.5
Phoenix North Central	62,783	31.7
Downtown Scottsdale	22,683	29.1
Northwest Tempe	19,400	18.7
Camelback/Biltmore	27,062	17.5
Scottsdale Airpark	42,164	16.0
Broadway Innovation Corridor	21,774	15.5
Southwest Tempe	23,813	13.3
Price Corridor	36,170	9.9
Deer Valley	56,510	6.3

Source: MAG Travel Demand Model

Pedestrian Access at Major Employment Centers

Once commuter buses arrive at job centers, the majority of riders reach their final destination by foot. Dense and walkable job centers are the most conducive to commuter bus service since more jobs are within a short walk, and the walking environment allows direct paths to jobs in many directions. To understand which regional job centers are best suited for commuter bus service, pedestrian access within a 10-minute walk was studied.

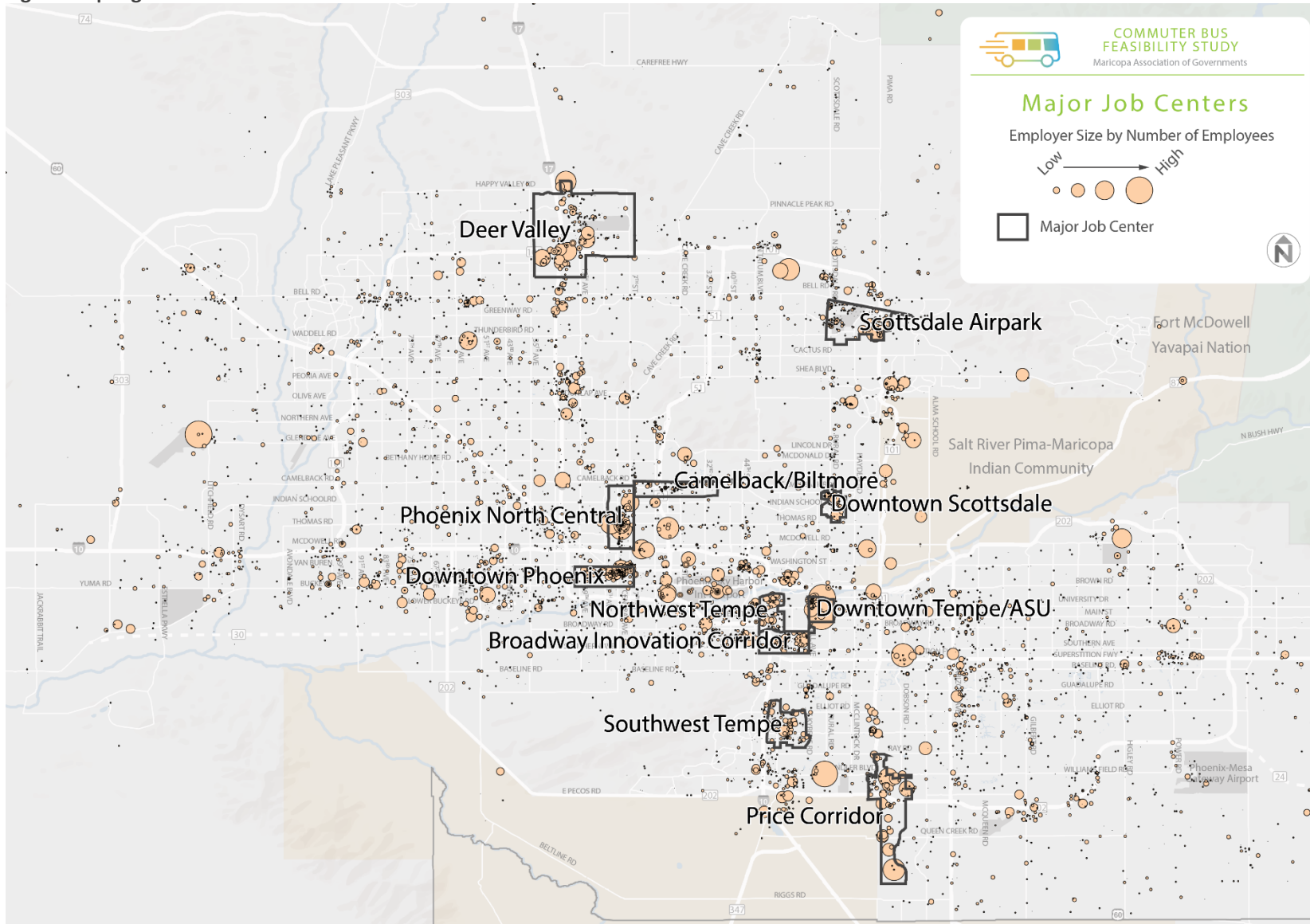
Downtown Phoenix, Phoenix North Central, Downtown Tempe, and Downtown Scottsdale have the highest job center density as well as the highest pedestrian access. Surface parking, while present, takes up a smaller portion of the total land area at these places than at other job centers. Northwest Tempe, Scottsdale Airpark, Camelback/Biltmore, Broadway Innovation Corridor, and Southwest Tempe have fewer jobs per acre, fewer street intersections, and more surface parking, making them more moderate in terms of pedestrian access. Deer Valley and Price Corridor have lower density and low pedestrian access.

First Mile/Last Mile Alternatives

Employment centers that have a high number of jobs but lack density are often still a priority for a region to serve with transit. However, these areas suffer from first mile/last mile access issues, because a small number of stops is unable to effectively serve all jobs within a reasonable walking distance. There are several strategies to connect fixed-route transit to jobs in lower-density areas. These include:

- Employer Shuttles
- Transportation Management Associations (TMAs)
- Mobility Hubs

Figure 10 | Regional Job Centers





RESIDENTIAL AREAS

Commuter services in the Valley originate at park-and-rides, and most riders access commuter buses by private vehicles. When determining the demand for a park-and-ride location, it is assumed in this study that the bulk of drivers access the park-and-ride from a given distance range. According to a recent Valley Metro survey, the majority of current riders accessed a park-and-ride within one to four miles of their residence. In the Valley, the dispersed land use patterns and relatively high travel speeds result in approximately 30 percent of riders accessing park-and-rides within a 2-mile radius, while the remaining 70 percent access from outside of that threshold.

Commuter Bus Rider Demographics

Transit ridership tends to be highest among residents with fewer resources. However, commuter buses serve residents with higher incomes and higher vehicle ownership rates than local transit in the Valley, due to several factors:

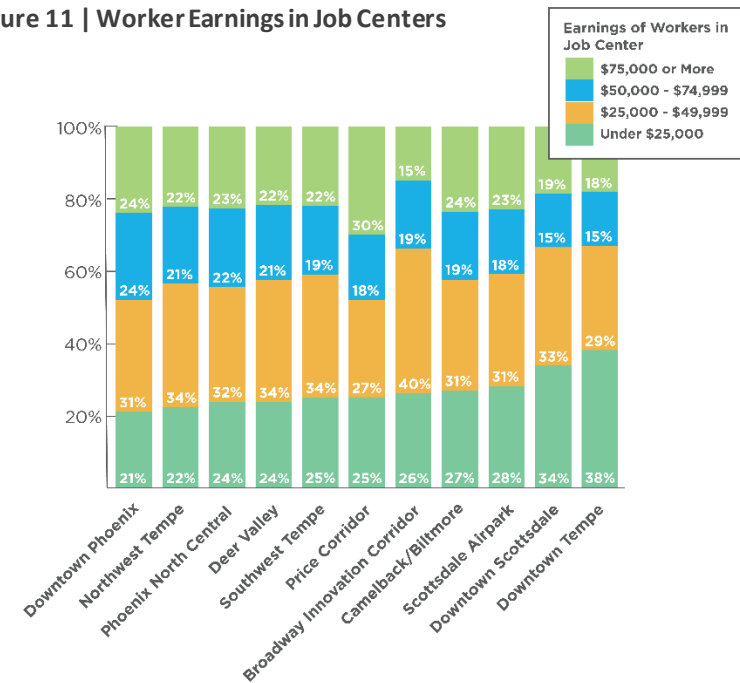
- Commuter buses often originate in higher-income areas
- Park-and-ride access generally requires a vehicle
- Higher-paying jobs tend to cluster and be in denser areas than lower-paying jobs
- Higher-paying jobs tend to conform more closely to a traditional peak schedule of travel
- Employees with higher-paying jobs tend to travel farther distances to reach their job

Because of these dynamics, commuter bus tends to be made up of and attract more *choice riders*, or those who find transit to be an attractive alternative to driving alone, rather than those who depend on transit out of economic necessity. It also means that commuter bus service will continue to be a small percentage of overall ridership (currently around 2

percent of total system ridership) because the services are designed to serve trips and areas of residents who have other travel options.

The different job centers being assessed have different proportions of worker earnings. Downtown Phoenix, where commuter bus currently operates, has around half (48 percent) mid- and high-earning jobs. Downtown Tempe, by contrast, only has one-third (33 percent) mid- and high-earning jobs (see Figure 11). Many of the workers making less than \$50,000 per year, and especially those making less than \$25,000 per year, are more likely to commute from closer, making them less suitable for long-distance commuter services. However, serving many job centers with a range of earner breakdowns and transit services means lower-income populations can benefit from these services as well as higher-income populations. Lastly, originating services at park-and-rides that are accessible by walking as well as driving can increase access to those who have limited or no access to a vehicle.

Figure 11 | Worker Earnings in Job Centers





TRAVEL FLOWS

For a commuter bus market to exist, enough people must be traveling between a residential area and an employment area to capture a significant number of them on transit.

The travel flows must meet the following criteria to be considered feasible for a commuter bus market:

- Be at least an 8-mile driving distance
- Not already be served by light rail
- Constitute at least 2,500 daily work and/or ASU student flows

The study area has an extensive number of park-and-ride lots that serve most communities in the region. As discussed in the previous section, the service area of a park-and-ride is quite large, with 30 percent of users coming from within a 2-mile radius, and the remainder outside. A subset of park-and-rides were chosen that did not have overlapping 2-mile radii. To calculate flows between each chosen park-and-ride and the eleven employment centers, the number of commuters and ASU student trips within a 2-mile radius of each park-and-ride traveling to each job center was scaled using this 30 percent-70 percent ratio. For the flow to be considered for commuter bus service, it had to originate outside an 8-mile drive radius of the job center.

Each job center has the following number of qualifying flows (see Figure 13):

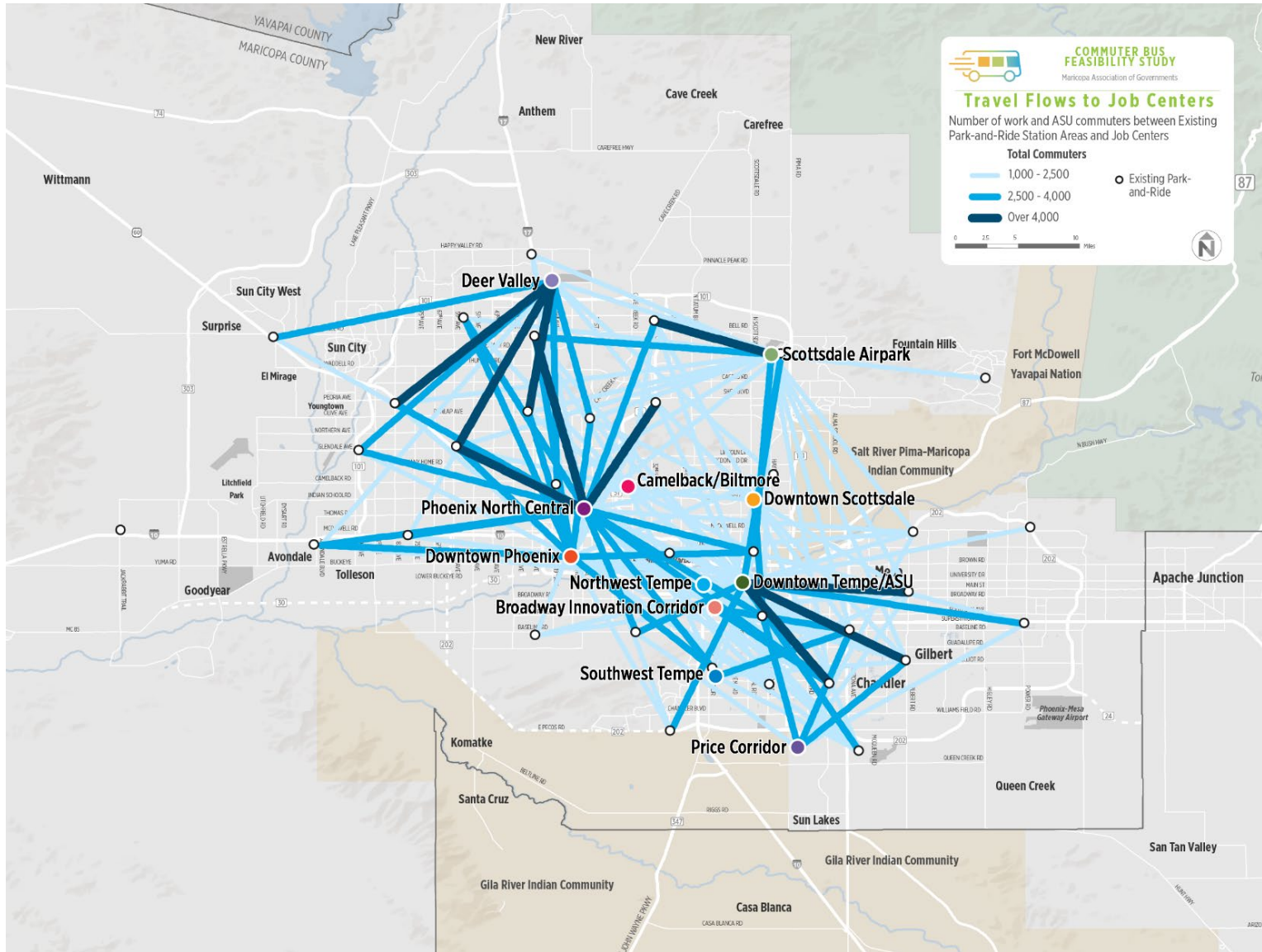
- Phoenix North Central has 14 flows
- Downtown Phoenix and Downtown Tempe each have eight flows
- Deer Valley has seven flows
- Scottsdale Airpark and Price Corridor each have three flows
- Broadway Innovation Corridor has two flows
- Southwest Tempe and Downtown Scottsdale each have one flow
- Camelback/Biltmore and Northwest Tempe both have no flows

The top 20 flows between any park-and-ride and any job center are detailed in Figure 12.

Figure 12 | Strongest 20 Travel Flows between Park-and-Rides and Job Centers

Park-and-Ride Area	Job Center	Worker & ASU Tempe Flows
Paradise Valley Community College	Scottsdale Airpark	6,707
Carl's Jr.	Downtown Tempe	6,299
Metrocenter Transit Center	Deer Valley	6,163
Gilbert Rd/Main St P&R	Downtown Tempe	5,930
Peoria P&R	Deer Valley	5,408
Gilbert P&R	Downtown Tempe	4,438
Glendale City Lot	PHX North Central	4,301
Glendale City Lot	Deer Valley	4,295
Shea/SR-51 (Dreamy Draw) P&R	PHX North Central	4,136
Bell/I-17 (Deer Valley) P&R	PHX North Central	4,069
Superstitions Springs P&R	Downtown Tempe	3,959
19th Ave and Camelback P&R	Deer Valley	3,811
Sunnyslope Transit Center	Deer Valley	3,745
Metrocenter Transit Center	Downtown Phoenix	3,658
Paradise Valley Community College	PHX North Central	3,627
Foothills Recreation & Aquatic Center	PHX North Central	3,566
Bell/I-17 (Deer Valley) P&R	Scottsdale Airpark	3,558
Sunnyslope Transit Center	Downtown Phoenix	3,554
West Mesa P&R	Price Corridor	3,535
Gilbert P&R	Price Corridor	3,423

Figure 13 | Travel Flows between Park-and-Rides and Job Centers





A Note on Serving University Student Trips

Students often have high rates of transit use and serving student trips is in many cases a priority for a regional transit system. Arizona State University (ASU) also has its own shuttle service, which provides service between different campuses. While ASU is served by local bus, light rail, and the shuttles, implementing commuter services would unlock a new transit market currently unserved connecting students and workers from residential areas further away into Main Campus.

Serving student trips to ASU with commuter bus entails several challenges and opportunities that set them apart from worker trips to the other job centers. Student schedules do not conform to the peak-based schedule that best serves higher-wage professional workers who traditionally are the target market for commuter bus service. Also, students do not always travel to campus four to five days a week. Despite these challenges, three flows to ASU/Downtown Tempe, when combining work trips and student trips, are large enough to warrant all day service. Two flows from Chandler and one from Gilbert have approximately 5,000 or more daily flows to ASU/Downtown Tempe. Additionally, because ASU controls both transit pass subsidies and parking permit pricing for its students and staff, the university has a large influence over the cost competitiveness of transit compared to driving alone. Creating significant financial incentives for taking transit is one way to increase transit mode share. Currently, a Valley Metro student pass for an academic year costs \$150, while on-campus parking for the same period costs between \$210 and \$480.



ASU Downtown Devil

\$ COST COMPETITIVENESS

Commuter services are often most successful when they serve employment areas with limited parking and/or high parking prices. Like many Sunbelt Cities, parking in the Valley is widely available and generally free. Even in areas with higher density and land value, it is usually expected that employers provide parking for their employees. In a study of the largest 50 metropolitan areas in the U.S. conducted in 2016, the Phoenix metropolitan area was the fifth least expensive, with an average monthly rate of \$65 in Downtown, or approximately \$2 a day. Downtown Phoenix and Downtown Tempe/ASU are the only employment centers with a significant number of paid parking garages, while Phoenix North Central has very few. Parking is free in all the other major job centers (see Figure 14) and at all Valley Metro park-and-ride lots.

Figure 14 | Regional Job Center Parking Prices

Job Center	Daily Parking Garage Rates
Downtown Phoenix	\$9 - \$24
Phoenix North Central	\$10
Downtown Tempe/ASU	\$5 - \$15
Camelback/Biltmore, Scottsdale Airpark, Deer Valley, Downtown Scottsdale, Northwest Tempe, Broadway Innovation Corridor, Southwest Tempe, and Price Corridor	N/A

Source: Best Parking App

Another element that affects cost competitiveness is transit fare and pass pricing. Removing or reducing the \$104 cost of a monthly commuter bus pass (e.g., through a free or subsidized pass provided by employers) can increase the financial incentive to use transit. Unless parking prices increase significantly, there will continue to be little financial incentive to use transit to commute for most residents in the region, and commuter mode share will continue to remain low.



TIME COMPETITIVENESS

The total time spent commuting and travel time variability affect the demand for commuter bus services. Services are much more appealing if they offer appreciable time savings and predictability. Congestion in the Valley is projected to worsen as regional population and employment increase. Sections of most major freeways are currently congested during peak periods, with average speeds less than 75 percent of posted speed (see Figure 15). Elements that affect time competitiveness include:

- High-Occupancy Vehicle (HOV) Lanes
- Direct HOV (DHOV Facilities)
- High-Occupancy Toll (HOT) Lanes
- Bus-on-Shoulder Operations
- Travel Time Consistency
- Reclaiming Time

High-Occupancy Vehicle (HOV) Lanes

HOV lanes are intended to maximize the person throughput of the region's freeway system. These lanes operate on Interstates 10 and 17; Loops 101, 202 and 303; and State Route 51 in Maricopa County. Currently, commuter buses traveling in HOV lanes offer a moderate time savings benefit over single-occupancy travel. However, changing regional HOV policies (according to MAG modeling efforts) or enforcement levels could make commuter bus service much more time competitive. Many sections of the region's freeways have average peak period speeds of less than 40 miles per hour (Figure 15). Where general purpose lanes have slow travel speeds, HOV lanes do as well.

DHOV Facilities

Another strategy to make HOV lanes faster than general purpose lanes is through Direct-HOV facilities (DHOV), which are interchanges that allow vehicles to access HOV lanes directly, such as from park-and-rides to adjacent freeways, rather than needing to cross all general purpose lanes. DHOV ramps can significantly improve the speed of commuter bus service. There are several existing DHOV ramps in the region, and many other locations appropriate for future DHOV facilities have been identified¹. Investing in DHOV facilities can improve the efficiency and thus attractiveness of commuter bus services.

Travel Time Consistency

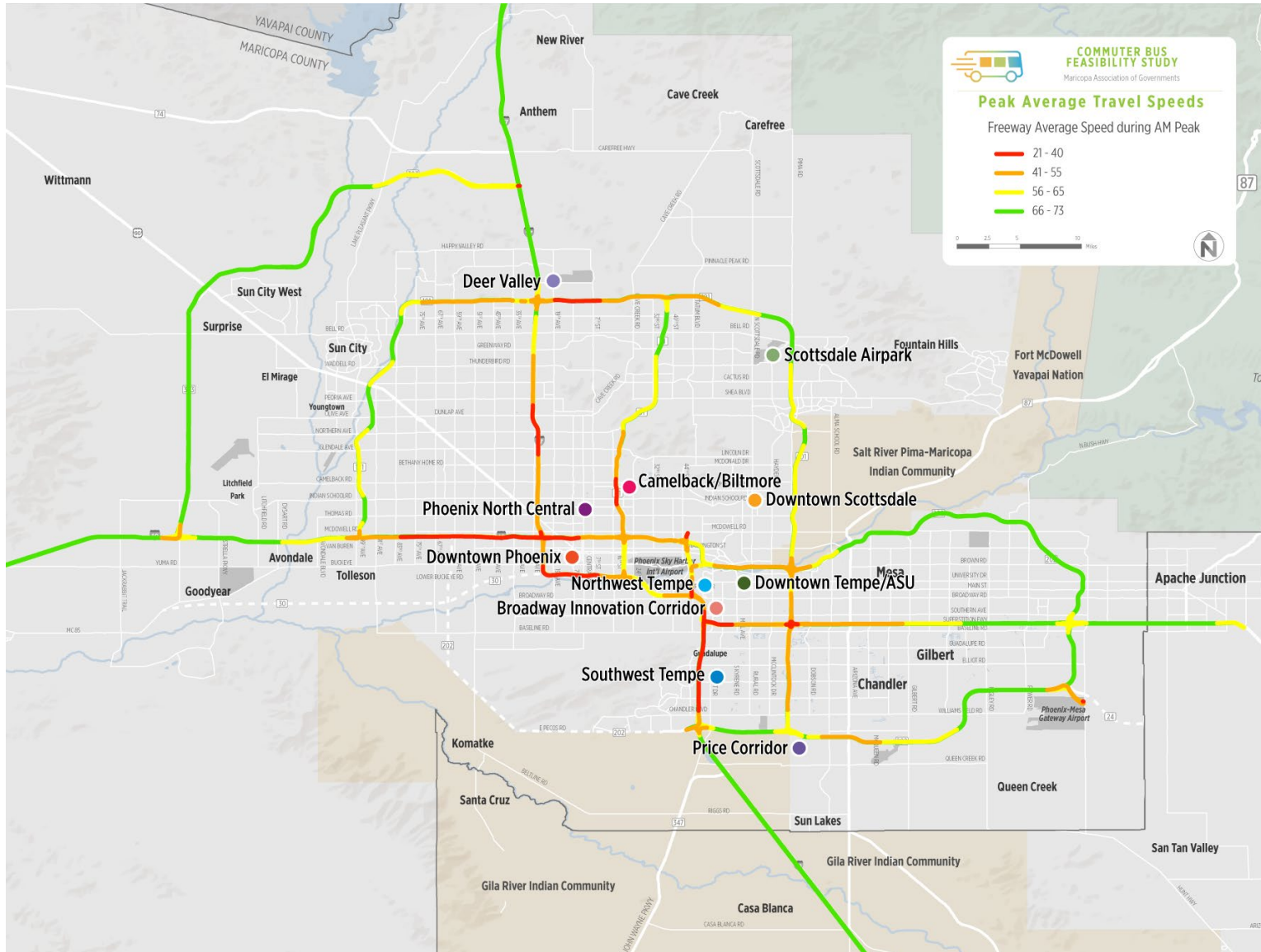
Commuter services will be more attractive if they offer consistent travel times and have high on-time performance. HOV lanes, bus-on-shoulder, and other transit priority treatments can offer more consistent travel times, making commuter services more attractive.

Reclaiming Time

Time competitiveness is not only time travel savings but can also be thought of in terms of how time is spent. When riding a high-quality commuter service instead of driving a private vehicle, passengers may have time to do work or other activities like reading for pleasure, and they may feel like they "gain time" back in their day that would otherwise be spent driving. Driving in traffic has also been shown to cause high levels of stress, so while the time spent commuting may be the same, commuter services can provide quality of life benefits.

¹ Central Phoenix Transportation Framework Study. Technical Memorandum: Direct High Occupancy Vehicle (DHOV) Strategies and Park-and-Ride Connectivity. Maricopa Association of Governments. 2014.

Figure 15 | Freeway Average Speeds





MARKET ANALYSIS FINDINGS

The Valley's commuter buses currently serve only Downtown Phoenix. As this chapter has described, Downtown Phoenix, along with ten other job centers, were assessed for their suitability for commuter bus service. These job centers include: Phoenix North Central, Camelback/Biltmore, Deer Valley, Downtown Tempe/ASU, Downtown Scottsdale, Scottsdale Airpark, Northwest Tempe, Broadway Innovation Corridor, Southwest Tempe, and Price Corridor.

The number of current commuters and ASU students traveling from different park-and-rides around the region to the eleven job centers and the ASU Tempe campus was used to understand which current travel flows are large enough to potentially support new commuter service. Because most riders reach their final destination by walking, the pedestrian environment at each job center was also assessed. Where pedestrian access was low, the possibility of alternatives such as employer shuttles, Transportation Management Associations (TMAs), and mobility hubs were explored. To assess cost competitiveness, parking costs at each job center were detailed. Levels of congestion and potential changes in HOV policy were assessed to determine time competitiveness between commuter bus and driving alone.

Downtown Phoenix, Phoenix North Central, Downtown Tempe, Scottsdale Airpark, and Broadway Innovation Corridor have the most potential for traditional freeway or arterial-based commuter service in the Valley. Deer Valley and Price Corridor have several strong commuter flows, but due to low density and low-quality pedestrian environment, would be difficult to serve with traditional fixed-route transit. Camelback/Biltmore and Northwest Tempe do not on their own have strong enough markets to serve with commuter bus service.

The following are findings about commuter bus demand in the Valley, along with a map of the flows best served by commuter bus (see Figure 17) and a summary table for each job center (see Figure 16).

Downtown Phoenix is the only job center in the Valley currently served by commuter bus. It has many strong flows and elements of successful commuter bus services, but it is only one of many job centers in the region that have strong potential for successful commuter services.

Although currently not served by commuter bus, **there are just as large of flows between a majority of park-and-ride service areas to Phoenix North Central, just two miles north of Downtown Phoenix.** While North Central is accessible by commuter bus to Downtown via a transfer to light rail, the current transfer rate from commuter services to other transit services is very low. In addition, the current headways on light rail are 12 minutes which could add significant time to commuter trips, acting as a transfer penalty and deterrent. Thus, providing commuter bus service directly to Phoenix North Central could attract significant additional ridership.

Downtown Tempe/ASU has promising elements of commuter service demand, including high levels of congestion and density, and has many large combined flows of students and workers. Downtown Tempe has a transit-rich environment and several flows large enough to support all-day service that better serves the inconsistency of student schedules. ASU is also in a unique position to increase the cost competitiveness of transit by changing transit pass subsidies and parking permit prices.

While Deer Valley has large travel flows and a high number of jobs, it is a challenging environment to serve with traditional commuter service. Deer Valley is a major job center, but it is sprawling with low pedestrian access and is difficult to circulate in a vehicle due to its quadrisection by the 101 and I-17. The major flows from the southwest direction to Deer Valley are mostly on relatively uncongested corridors to jobs with ample free parking, which creates little time or cost competitiveness. There could be a potential for a Transportation Management Association (TMA) to serve this area, using employer-coordinated vanpools.

Price Corridor also has several strong travel flows with a challenging operating environment. Without first mile/last mile solutions, commuter services in Price Corridor are not viable. The City of Chandler's



Transportation Master Plan has identified Price Corridor for on-demand services due to its operating environment, which in combination with traditional commuter bus could serve this market.

Scottsdale Airpark's most promising commuter corridors are along major arterials and the eastern and northern sections of the 101 Loop.

Traditional freeway commuter service on the 101 could be used to serve Scottsdale Airpark. Alternatively, Bell Road, running east-west into Scottsdale Airpark, and Scottsdale Road, running north-south into Scottsdale Airpark, are strong contenders for limited-stop arterial service, rather than freeway service, because of the strong demand along the entirety of both corridors and the mix of jobs and residents along this corridor. While these flows are served by local transit, they are slow services that take up to five times longer than driving and have stops approximately every half mile. A limited-stop arterial service, with stops every half mile to one and a half miles would provide faster service and allow riders to access the service by walking as well as driving.

The strongest demand for Downtown Scottsdale is along a major arterial, Scottsdale Road. This entire corridor could be considered for limited-stop Service. A Rural Road-Scottsdale Road limited-stop service would also serve the flow from Scottsdale into Downtown Tempe. Otherwise, there is not qualifying demand from other areas to Downtown Scottsdale.

Southwest Tempe has one potential commuter bus travel flow, from within the East Valley. This job center has high congestion and moderate pedestrian access, making it potentially time competitive but it lacks the density and walkability of other job centers.

Broadway Innovation Corridor has two potential commuter bus travel flows. It has high levels of congestion and moderate pedestrian access. While Northwest Tempe does not have any flows large enough to support service on its own, the park-and-ride service areas in Mesa and Chandler are strong enough to support service to Broadway Innovation Corridor and could potentially serve Northwest Tempe as part of an even stronger combined market.

Camelback/Biltmore does not have a strong commuter bus market. No travel flows are strong enough to support commuter service to Camelback/Biltmore. Parking costs and congestion around the area are also low. Camelback Road and 32nd Street can both support strong local transit services which can better serve travel markets than commuter bus.

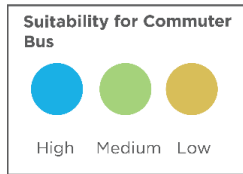
Changing HOV policy from 2+ occupants to 3+ occupants could make commuter bus significantly more competitive with the private automobile as congestion increases in the region. Changing HOV policy to 3+ occupants could result in time savings of over 40 percent when traveling by commuter bus rather than driving alone from some areas of the Valley.

Free and ample parking will continue to keep commuter bus mode shares low. High parking prices are one of the major contributors to high commuter transit mode shares in other areas of the country. Low gas prices, free or very low-cost parking, and high vehicle ownership levels in most places served by commuter service means cost will usually not be what attracts riders in the Valley to commuter bus.

Commuter services are currently primarily designed for choice riders. Most commuter bus riders access commuter buses by driving alone to a park-and-ride. Commuters who travel longer distances and work in major job centers are more likely to have higher earnings and conform to a traditional peak travel schedule, which are the majority of riders captured on commuter buses. Peak-only service also does not effectively serve students, whose schedules vary from traditional peak patterns.



Figure 16 | Summary of Commuter Bus Criteria and Findings



Job Center	Pedestrian Access at Job Center	Worker/ASU Flows	Cost Competitiveness (Based on Parking Prices)	Time Competitiveness (Based on Congestion)
Phoenix North Central				
Downtown Phoenix				
Downtown Tempe/ASU				
Deer Valley				
Scottsdale Airpark				
Price Corridor				
Broadway Innovation Corridor				
Southwest Tempe				
Downtown Scottsdale				
Northwest Tempe				
Camelback/Biltmore				



LOOKING FORWARD TO 2040

Between 2018 and 2040, the population in the MAG region is projected to grow by 38 percent, from 4.7 million to 6.5 million, and jobs are projected to grow by 45 percent, from 2.2 million to 3.2 million. The eleven job centers assessed are projected to increase by 28 percent, a lower rate than the region as a whole. Downtown Tempe, Price Corridor, and Downtown Scottsdale are the fastest growing of the job centers, and Phoenix North Central will remain the job center with the highest number of total jobs, followed by Deer Valley and Downtown Phoenix.

Congestion in 2040

Along with population and employment, congestion is expected to increase significantly, with the majority of the freeway system being congested during the peak. If significant mode share shifts do not become a reality, future congestion could significantly impact the economic vitality and quality of life in the region by creating even longer and more variable travel times to jobs and other activities. New HOV lanes will be added on the 202 Loop, and changes in HOV policy from 2+ occupants to 3+ occupants, as discussed previously, could be a strategic way to make transit more time competitive and reliable than driving alone.

Travel Flows

While all job centers are expected to experience growth in the coming decades, employee travel patterns are expected to remain similar to today. The largest increase in flows originate in the southeast portion of the region into Downtown Phoenix, Phoenix North Central, Downtown Tempe, and Scottsdale Airpark. Phoenix North Central is projected to have 18 flows that meet the 2,500-commuter threshold, Downtown Phoenix will have 15, Downtown Tempe will have 12, and Deer Valley will have eight. Scottsdale Airpark will have five flows and Price Corridor is projected to have four flows that meet the threshold. Broadway Innovation Corridor is only projected to have two, and Northwest Tempe, Downtown Scottsdale, and

Southwest Tempe will each have one flow in 2040. There are no flows over 2,500 commuters for Camelback/Biltmore.

Findings (2040)

Figure 18 illustrates that five employment centers (Phoenix North Central, Downtown Phoenix, Downtown Tempe/ASU, Deer Valley, and Scottsdale Airpark) will be highly competitive for commuter bus service in 2040.

Figure 18 | Summary of Commuter Bus Criteria (2040)

Job Center	Worker Flows	Time Competitiveness
Phoenix North Central		
Downtown Phoenix		
Downtown Tempe/ASU		
Deer Valley		
Scottsdale Airpark		
Price Corridor		
Broadway Innovation Corridor		
Southwest Tempe		
Downtown Scottsdale		
Northwest Tempe		
Camelback/Biltmore		

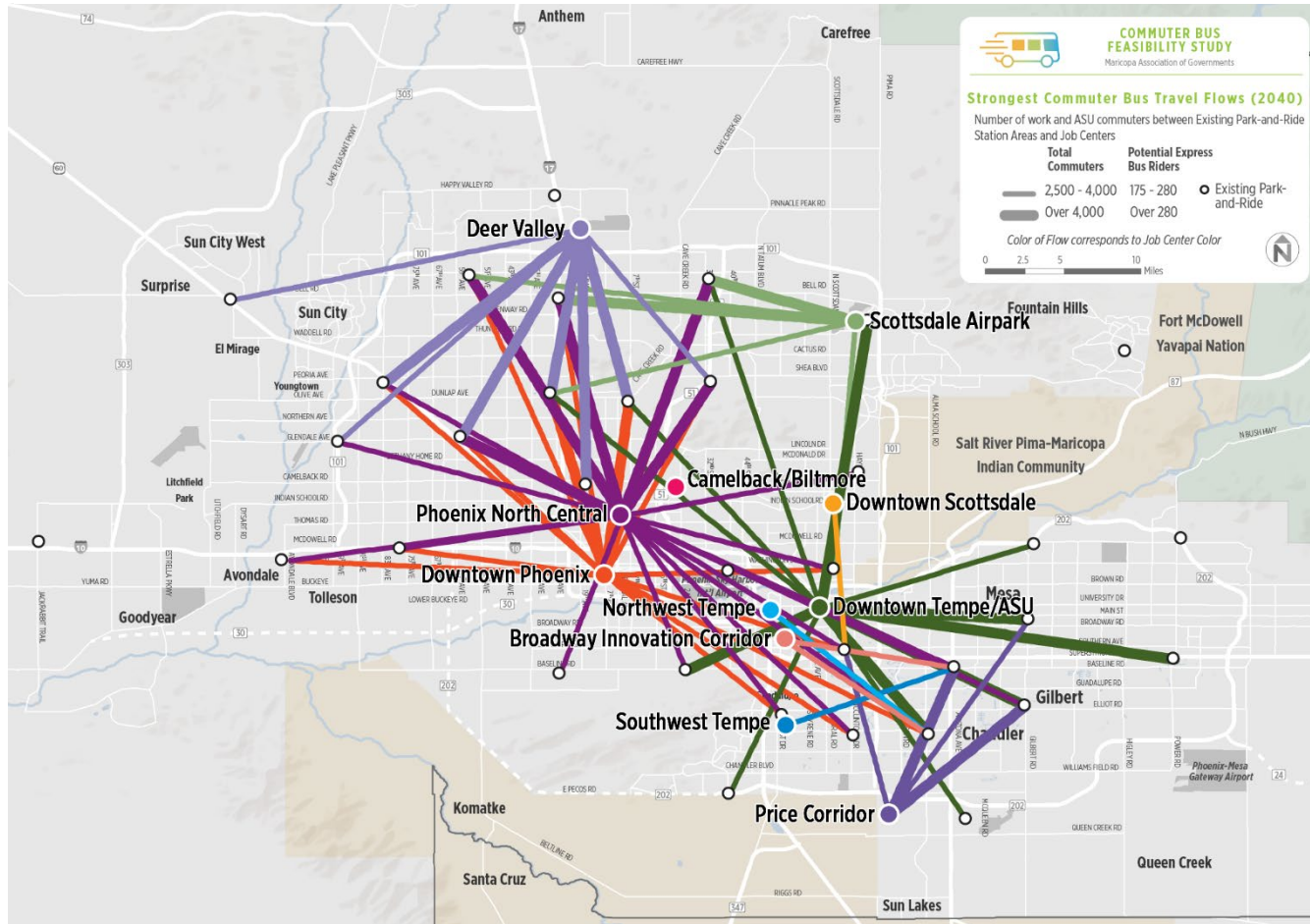
Suitability for Commuter Bus

High Medium Low

Into 2040, Downtown Phoenix, Phoenix North Central, Downtown Tempe, Price Corridor, and Scottsdale Airport continue to have the highest number of commuter flows in the Valley that are large enough to support commuter bus. Broadway Innovation Corridor and Southwest Tempe continue to show moderate demand for commuter services. Northwest Tempe has demand for one flow in 2040. While Deer Valley and Price Corridor will increase in density, the pedestrian environments still are not likely to support traditional commuter bus service in 2040.

Congestion is projected to be high around all eleven job centers in 2040. This increase in congestion will result in the Valley's current and future HOV infrastructure being one of the most important assets in offering time savings on commuter bus.

Figure 19 | Potential Commuter Bus Service Travel Flows (2040)





EVALUATION OF INITIAL SERVICE CHANGES & ALTERNATIVES

Based on the results of the market analysis and a review of the existing Valley Metro commuter bus services, evaluation was conducted on the following:

- **Initial service changes to the current commuter bus network** serving Downtown Phoenix
- **New potential commuter bus routes to the other job centers**, known as alternatives, based on market size and land use patterns

The results of these evaluations, along with stakeholder feedback and input, are the basis for the recommended services explored in the next chapter of the report.

DOWNTOWN PHOENIX INITIAL SERVICE CHANGES

All of Valley Metro's commuter bus routes currently bring riders from residential areas to Downtown Phoenix. Some of these routes are productive—having relatively high ridership and a direct route that is time efficient. Many routes, however, have opportunities for improvement through a variety of factors, such as providing more trips, serving only park-and-rides as opposed to local stops, and rerouting service.

Based on Valley Metro service standards and the market analysis conducted earlier in the Commuter Bus Feasibility Study, the following initial service changes to the current commuter bus network, described further in the following sections, are assessed (see Figure 20):

- **Combine:** Routes 520 and 521, as well as 562 and 563
- **Alter:** Routes 514, 522, 531, 541, 571, 575, I-17 RAPID, and Grand Avenue Limited
- **Discontinue:** Routes 573, SME RAPID, and SMW RAPID

- **Maintain with No Changes:** Routes 533, 535, 542, I10E RAPID, I10W RAPID, and SR51 RAPID

Valley Metro outlines service standards for its commuter bus services, which are the minimum levels at which service should be provided. The Downtown Phoenix routes are assessed according to the following minimum service standards:

- **Ridership Per Trip:** an average of 20 or greater boardings per trip
- **Non-Downtown Stops:** four or fewer non-downtown stops
- **Number of Trips:** at least four AM trips and four PM trips
- **Distance from Downtown:** travel beyond an 8-mile driveshed of Downtown Phoenix

The initial service changes result in service being discontinued to low-ridership areas and increased in high-ridership and high-market areas. Almost all routes are brought up to service standards and the changes would ideally result in an increased average ridership per trip for the current commuter bus system.

Combined Routes

Two sets of routes have been combined as part of the initial service changes (Figure 21). Routes 520 and 521 Tempe Express serve the same area of Tempe and currently have low ridership. There are too many stops before the bus reaches downtown, and Route 520 only has two trips each morning. In the initial service changes, Routes 520 and 521 have been combined and simplified to serve one park-and-ride. Routes 562 Goodyear and 563 Avondale/Buckeye have also been combined. Route 562 currently meets or exceeds the service standards in all categories. Route 563 also meets the standards, except for relatively lower ridership. By combining

Figure 20 | Downtown Phoenix Initial Service Changes

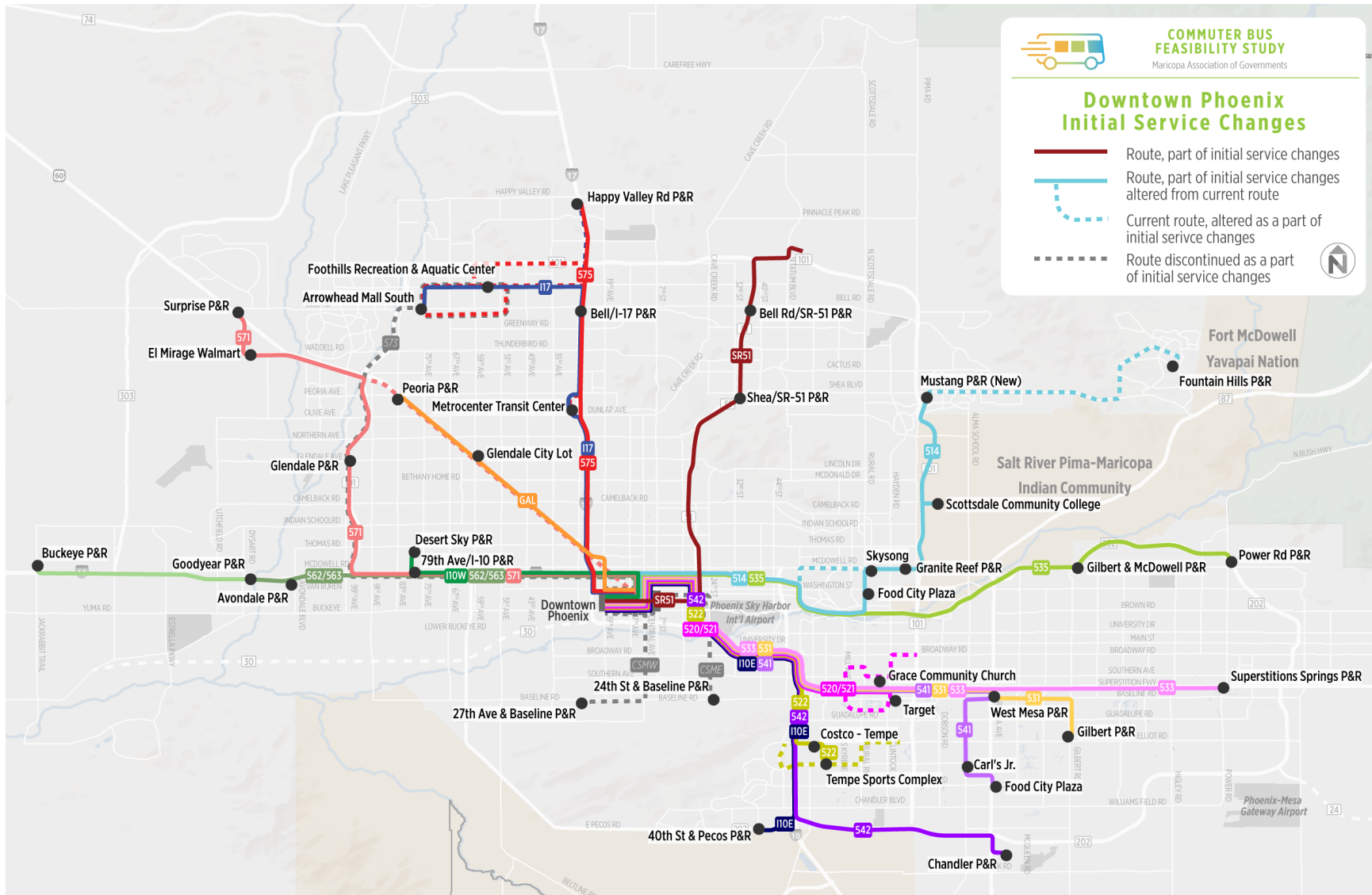




Figure 21 | Downtown Phoenix Alternatives - Combined services

Existing Route	Proposal
520 Tempe 521 Tempe	Combined and simplified to serve only 1 park-and-ride
562 Goodyear 563 Avondale/ Buckeye	Combined and frequency increased to eight morning and eight afternoon trips serving Goodyear and Avondale, with half of those trips extending to Buckeye

Figure 22 | Downtown Phoenix Alternatives - Altered

Existing Route	Proposal
514 Scottsdale	Altered to only serve five P&Rs, cut service east of Mustang, increased to four morning/four afternoon trips
522 Tempe	Cut 48th St/Elliott variant, altered to only serve two P&Rs
531 Mesa/Gilbert	Altered to only serve two P&Rs
541 Chandler/Mesa	Altered to only serve three P&Rs
571 Surprise	Altered to reflect Grand Ave Plan, serve Glendale P&R
575 North Glendale	Altered to serve Happy Valley Road, increased to four morning/four afternoon trips
Grand Avenue Limited	Increased to four afternoon/four morning trips
I-17 RAPID	Altered to serve Foothills and Arrowhead

the two, frequency can be doubled to Goodyear and Avondale and maintained at Buckeye.

Altered Routes

Based on the service standards and market analysis, eight routes are altered through the initial service changes (Figure 22). Route 514 Scottsdale currently has numerous stops throughout Scottsdale and into Fountain Hills. The route is altered to only serve five park-and-rides (including a new one at Mustang), cut service east of Mustang, and increase the number of trips.

Route 522 Tempe currently has many non-downtown stops, as well as a variant of the route that circulates through a residential area. The route is simplified and altered to only serve two park-and-rides. Routes 531 Mesa/Gilbert and 541 Chandler/Mesa also have more than four non-downtown stops, so they are changed to only serve park-and-rides. Additionally, the number of trips on the Grand Avenue Limited is doubled to meet Valley Metro service standards.

Discontinued Routes

Three routes are discontinued through the initial service changes (Figure 23). The Route 573 West Glendale service area can be served by nearby routes. RAPID Routes South Mountain East and South Mountain West have very low ridership and originate within eight miles of Downtown. These trips could be better served by improving local service on light rail, and local bus service on Central Avenue and Baseline Road.

Figure 23 | Downtown Phoenix Alternatives - Discontinued

Existing Route	Proposal
573 West Glendale	Discontinue , serve with 571 and I-17
South Mountain East	Discontinue , serve with local transit
South Mountain West	Discontinue , serve with local transit

Routes Kept the Same

No changes are made during the initial service changes on six routes that meet Valley Metro service standards and have relatively high ridership. These routes are 533 Mesa Express, 535 Northeast Mesa Express, 542 Chandler Express, I10E RAPID, I10W RAPID, and SR51 RAPID.

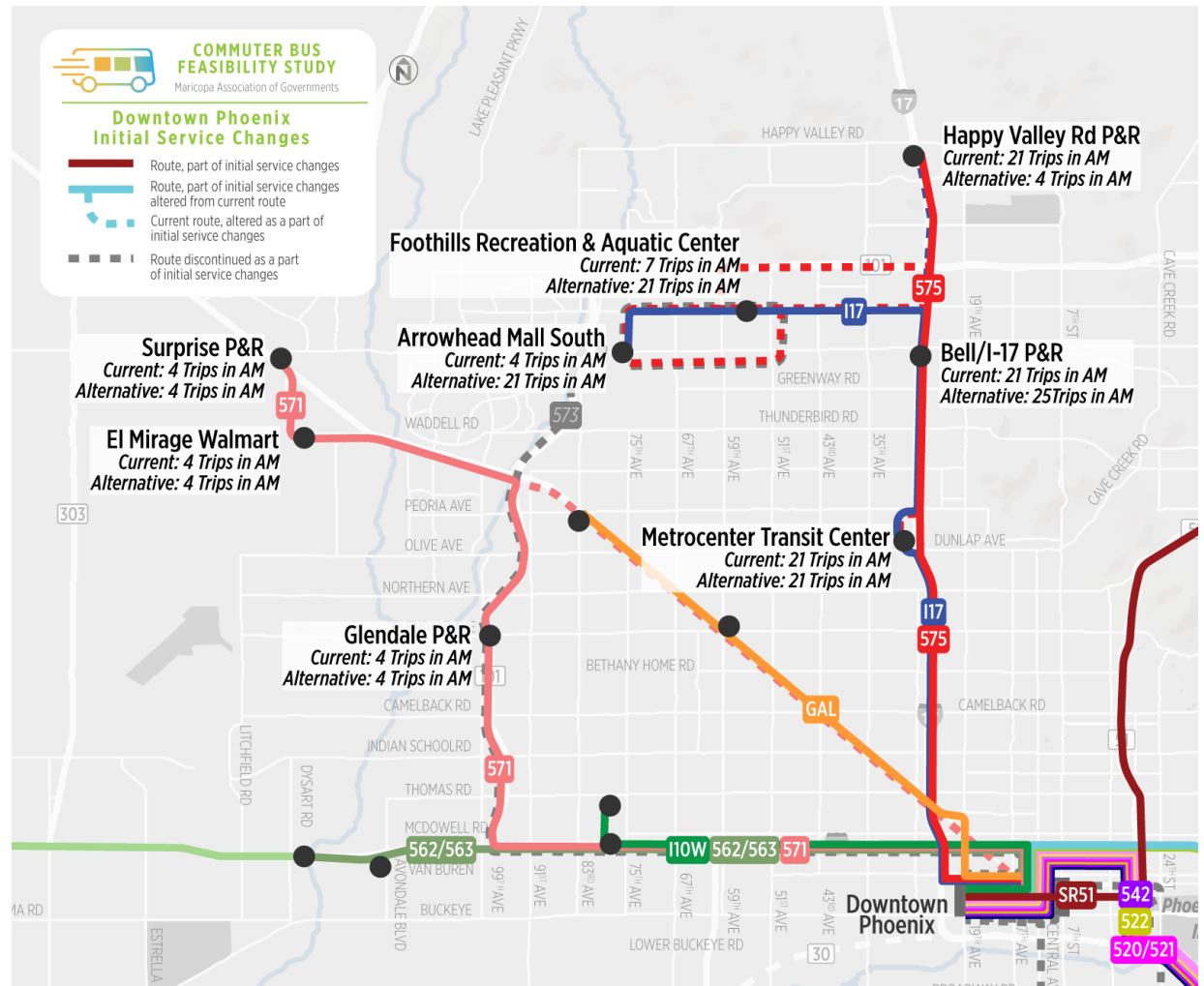
West Valley & Northern Phoenix Alterations

Routes 571, 573, 575, and I-17 RAPID currently serve a combination of seven park-and-rides. Routes 573 and 571 run along the 101, and Route 575 and I-17 RAPID run along I-17.

Initial service changes include discontinuing Route 573 and altering Route 571 to run on the 101 both inbound and outbound, matching the alignment in the Grand Avenue Transit Feasibility Study. All park-and-rides along these routes can have the same level of service with fewer vehicle revenue hours.

According to the market analysis, there is more than twice the amount of demand into Downtown Phoenix from Foothills Recreation Center as there is from Happy Valley Road Park-and-Ride. However, Foothills is served with only 25 percent of the amount of service at Happy Valley. As shown in Figure 24, by swapping the northern termini of Route 575 and I-17 RAPID, all park-and-rides served by these two routes would receive a higher number of daily trips, except for Happy Valley Road Park-and-Ride, which has the lowest market demand into Downtown Phoenix.

Figure 24 | Downtown Phoenix Alternatives - Routes I-17, 571, 573, and 575 Park-and-Rides





DOWNTOWN PHOENIX INITIAL SERVICE CHANGES EVALUATION

Market Size

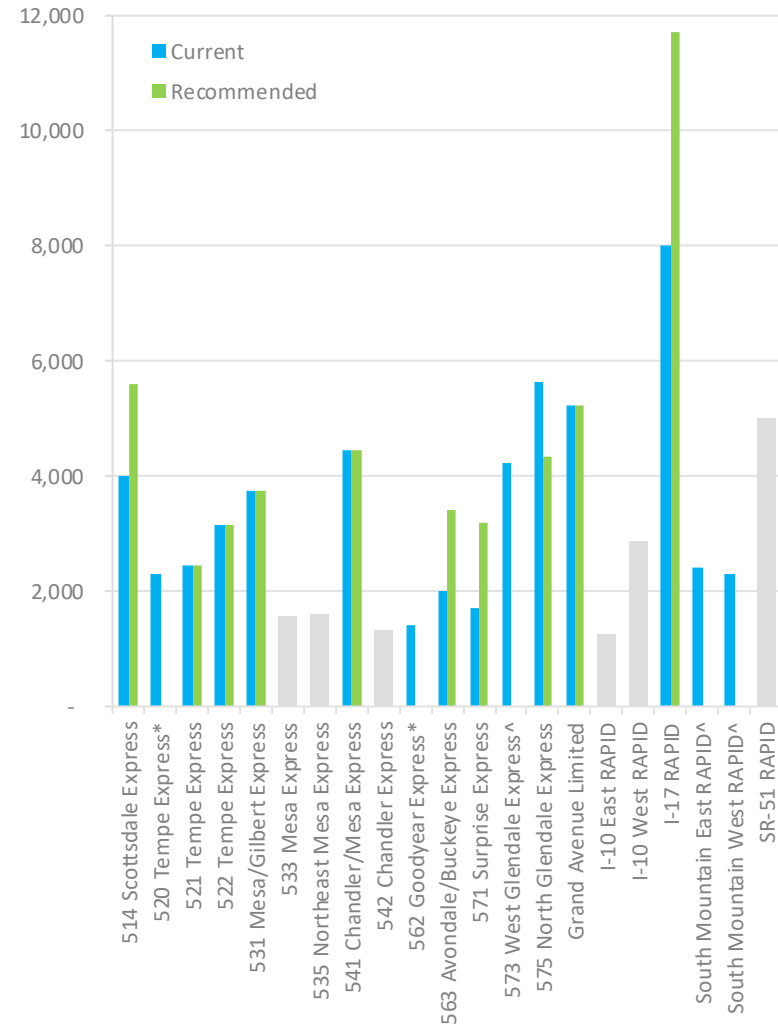
Commuter services should maximize the number of potential customers for the service, while still ensuring that the route is direct and efficient. Since an overwhelming majority of commuter bus customers drive and park at the bus stop, having local stops (non-park-and-ride) often does not expand the potential market size. Many of the initial service changes propose removing local stops between park-and-rides and Downtown Phoenix, and as shown in Figure 25, the market size does not change.

The Route 514 Scottsdale, 571 Surprise, and I-17 RAPID initial service changes have greater market sizes than their existing counterparts, since they would serve a greater number of park-and-rides. As discussed in the previous section, the market size for 575 North Glendale decreases because it now serves Happy Valley Road Park-and-Ride instead of Arrowhead Mall and Foothills Recreation Center. Because Route 575 has fewer trips than I-17 RAPID, increased frequency is more appropriately matched to higher market sizes.

Operating Costs

Express and RAPID routes are more expensive to operate than local routes, since fares are only collected in one direction for each trip and traveling long distances increases the wear on a transit vehicle. The costs to run an individual trip would increase for some services but decrease for others based on the length of the trip (see Figure 26). The daily route cost would increase for many services due to increase in frequency to bring routes up to service standards (Figure 27). However, because many routes are either combined or discontinued as part of the initial service changes, the possibility of shifting existing costs between routes could result in little change in operational funding.

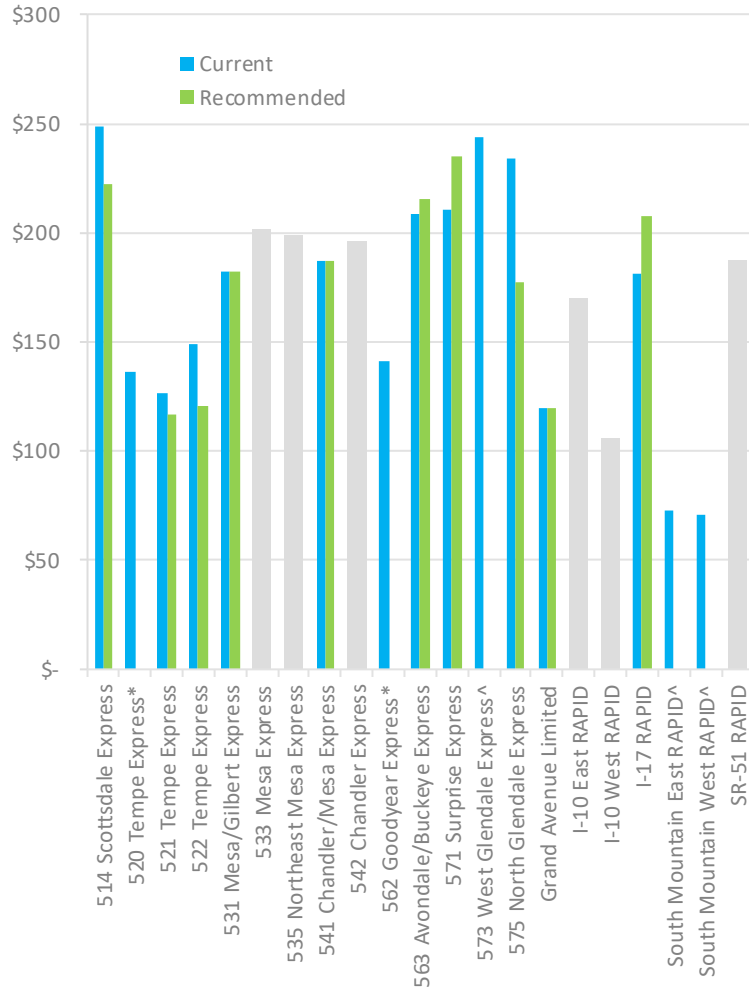
Figure 25 | Downtown Phoenix Routes Market Size



*combined routes (Route 520 with Route 521 and Route 562 with Route 563)
 ^discontinued routes

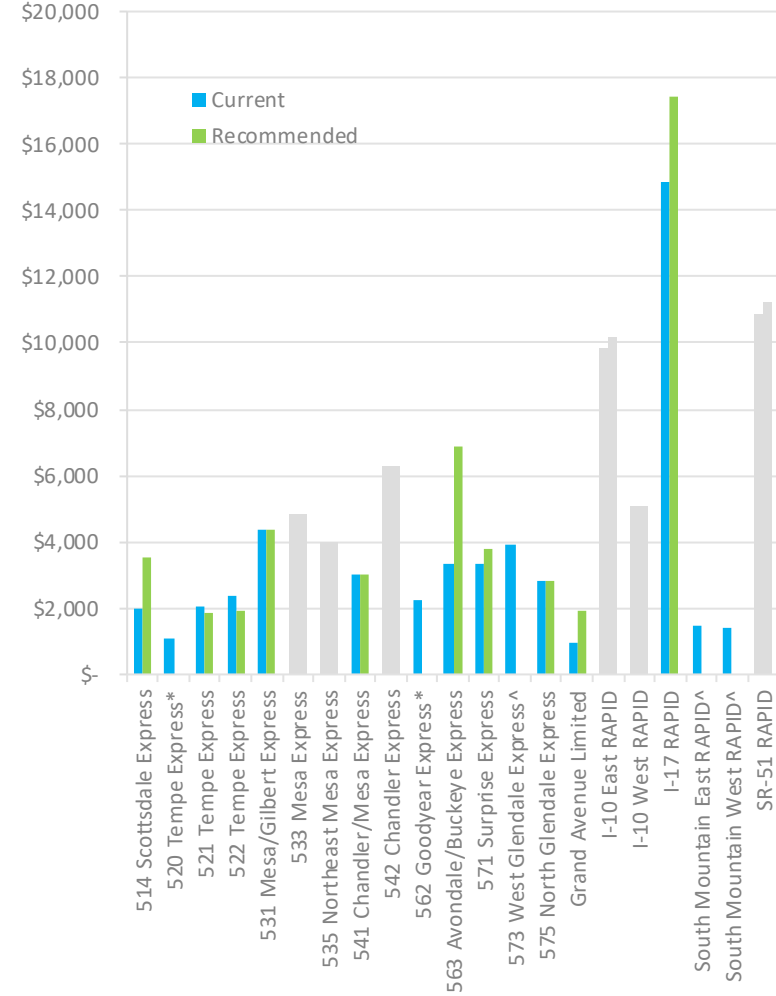


Figure 26 | Downtown Phoenix Routes Cost per Trip



*combined routes (Route 520 with Route 521 and Route 562 with Route 563)
 ^discontinued routes

Figure 27 | Downtown Phoenix Daily Route Cost



*combined routes (Route 520 with Route 521 and Route 562 with Route 563)
 ^discontinued routes

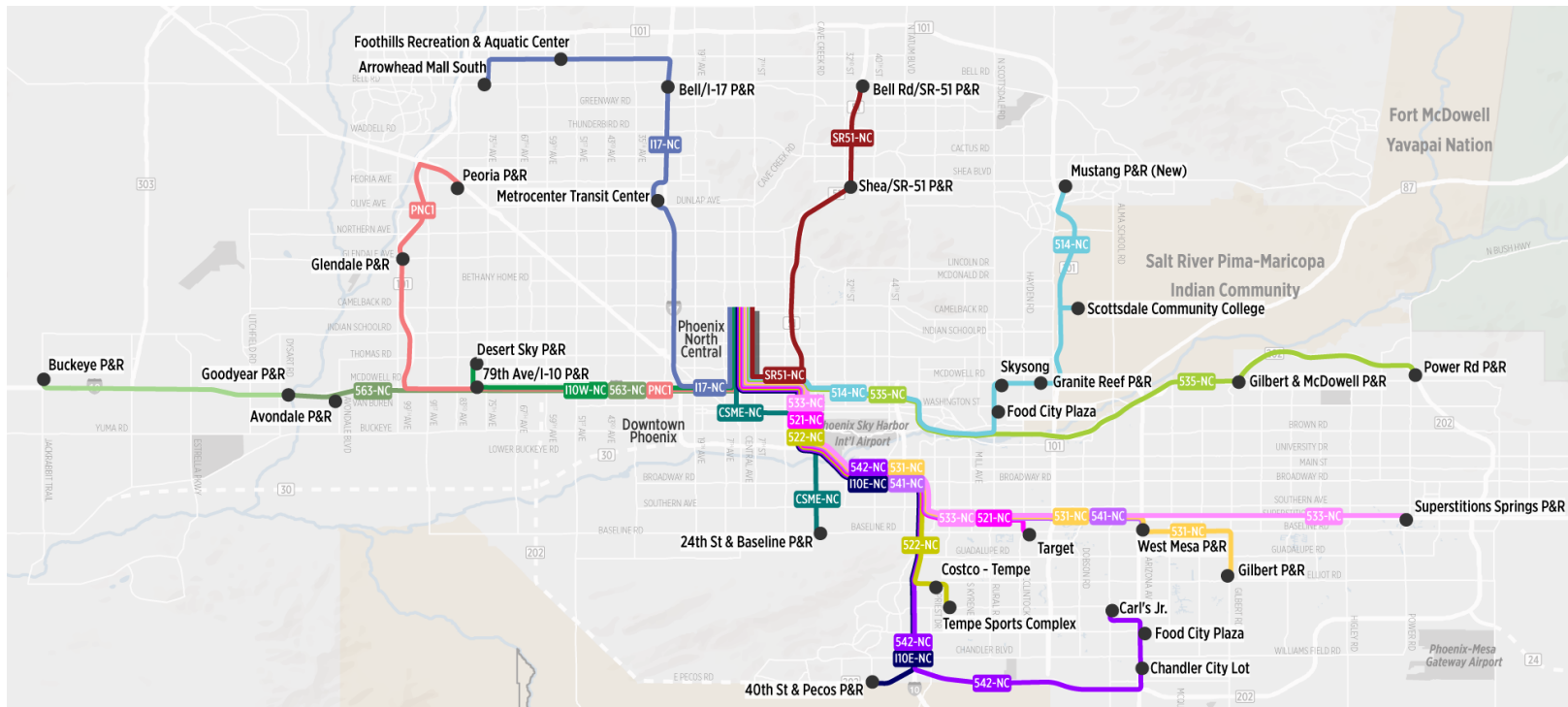
NEW JOB CENTER EXPRESS BUS ALTERNATIVES

The market analysis results laid the foundation to create alternatives of possible new commuter routes. These alternatives are assessed against a set of criteria, and in a later section of this report, categorized into high, medium, and low performance potential. Based on these results, alternatives that perform well will inform the recommended services in the next chapter of the study. Two types of express bus alternatives are assessed in this section:

- **Express bus** – Routes serve one to three park-and-rides at least eight miles away before running directly on a highway into the job center.
- **Express bus with shuttle connections** – Several of the job centers are too large and of low enough density that no bus can efficiently serve the entire job center. Instead, several shuttles meet at different stops to radiate out to different parts of the job center.

The following job centers were assessed for express bus service: Phoenix North Central, Downtown Tempe, Deer Valley, Broadway Innovation Corridor/Northwest Tempe, Price Corridor, and Southwest Tempe.

Figure 28 | Phoenix North Central Alternatives



Phoenix North Central Alternatives

Fifteen alternatives were assessed for Phoenix North Central, which is located two miles north of Downtown Phoenix, as shown in Figure 28. Because of the proximity of Downtown Phoenix and Phoenix North Central, all Phoenix North Central routes were based on the alignments and names of the current or recommended commuter bus routes for Downtown Phoenix. One exception is Phoenix North Central Alternative 1 (PNC1) originating in Peoria, which does not share an alignment with an existing commuter route. Creating alternatives that served both job centers were also explored. However, the east-west orientation of Downtown Phoenix, the north-south orientation of Phoenix North Central, and the configuration of the highways made serving both job centers too time-consuming to compete against driving.

Like service to Downtown Phoenix, the Phoenix North Central alternatives originate all over the Valley. Phoenix North Central has more jobs than Downtown Phoenix, so in many cases, the potential for ridership is higher to Phoenix North Central than Downtown Phoenix.

Downtown Tempe Alternatives

Six alternatives were assessed for service to Downtown Tempe, home of Arizona State University (ASU) Main Campus and the densest job center in Tempe. The alternatives span much of the East Valley, as shown in Figure 29. Most of the alternatives serve just one park-and-ride and run express directly into Downtown Tempe. Downtown Tempe Alternative 3, however, serves three park-and-rides and has enough market demand to stop more frequently in higher density areas.

Deer Valley Alternatives

Six alternatives were assessed for service to Deer Valley, the major job center in northern Phoenix. The alternatives span northern Phoenix and the northern section of the West Valley, as shown in Figure 30.

Because of Deer Valley's breadth and challenging pedestrian environment, the six alternatives were also designed with connecting shuttles that operate as first mile/last mile services. While these shuttles make all jobs in Deer Valley accessible by transit, they do add increased costs, and additional transfer and transit time for passengers.

Figure 29 | Downtown Tempe Alternatives

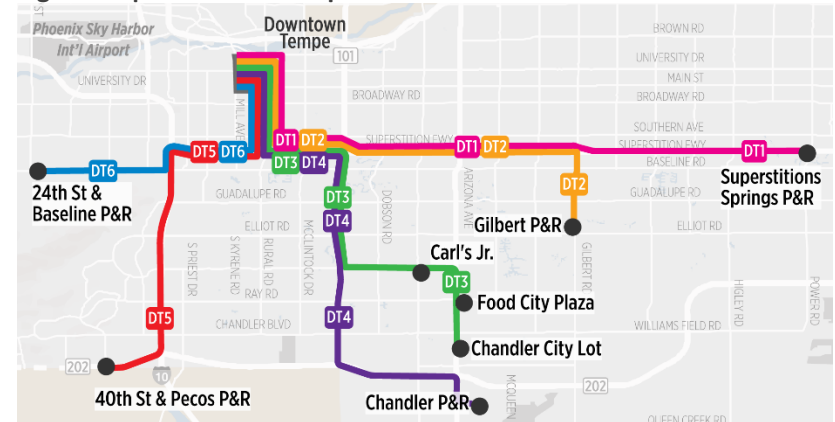
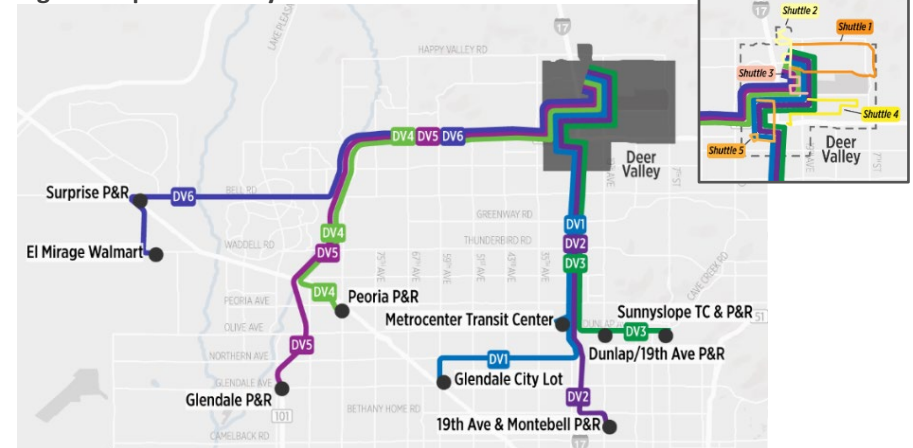


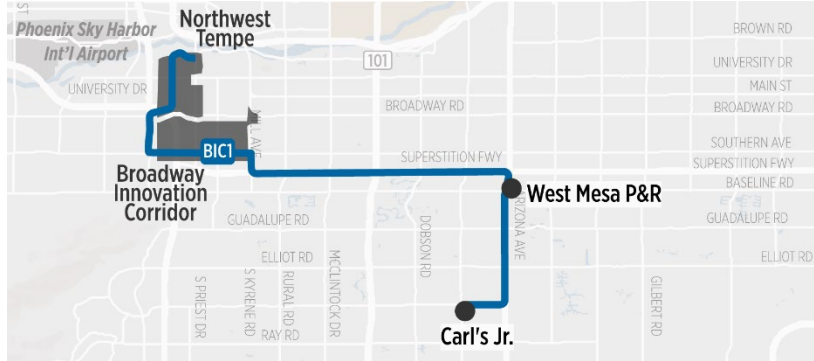
Figure 30 | Deer Valley Alternatives



Broadway Innovation Corridor/Northwest Tempe Alternatives

One alternative was assessed for service to Broadway Innovation Corridor and Northwest Tempe, due to the combined high demand from West Mesa Park-and-Ride and Carl's Jr. in Chandler, as shown in Figure 31.

Figure 31 | Broadway Innovation Corridor/Northwest Tempe Alternative



Price Corridor Alternatives

Three alternatives were assessed for service to Price Corridor in Chandler. Like Deer Valley, the large size of the job center and challenging pedestrian environment make shuttles necessary for transit to serve the majority of the jobs within Price Corridor. The three alternatives originate in the East Valley (Figure 32).

Southwest Tempe Alternatives

Two alternatives were assessed for service to Southwest Tempe. The two alternatives originate in Mesa and Chandler and run express from the respective park-and-ride straight to Southwest Tempe (Figure 32).

Figure 32 | Price Corridor Alternatives

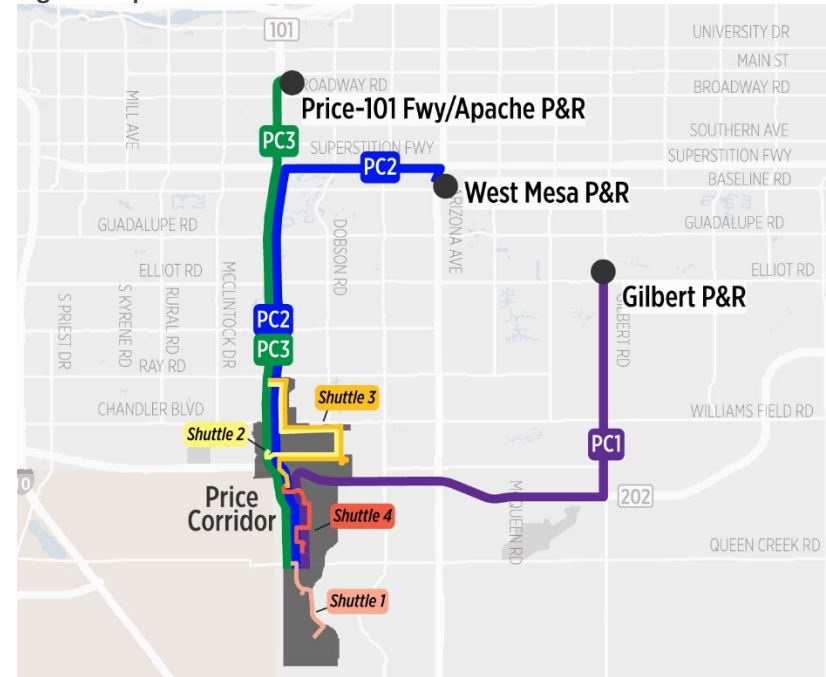
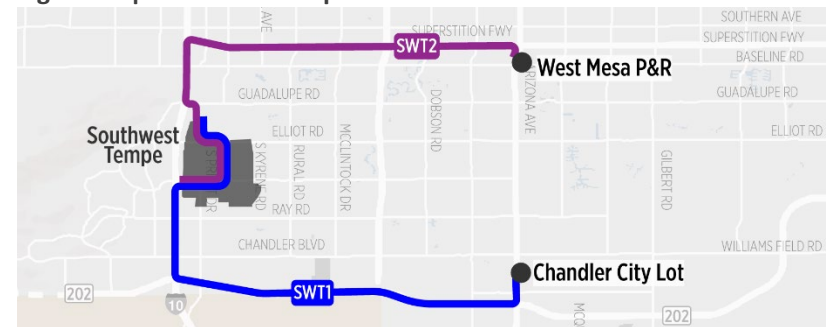


Figure 33 | Southwest Tempe Alternatives





NEW JOB CENTER EXPRESS BUS EVALUATION

Each of the alternatives above was evaluated according to the criteria listed in Figure 34. Many of the evaluation criteria are based on the concepts used in the market analysis. The alternatives were given between 0.5 and five points if they met each criterion.

Figure 34 | Evaluation Criteria

Category	Evaluation Criteria	Max Score
MARKET SIZE	Travel Flows	5
COST COMPETITIVENESS	Number of jobs in job center(s) with high potential for subsidized transit passes	1.5
	Operating cost per trip (one-way)	1
TIME COMPETITIVENESS	Commuter bus vs. driving travel time	2
	Percentage of route running on high occupancy vehicle (HOV) facilities	1
ACCESSIBILITY	Connection to areas currently not served	0.5
JOB CENTER CONDITIONS	Pedestrian environment at job center (number of square miles within 10-min walk)	1.5
CURRENT PERFORMANCE	Current commuter bus has high ridership (PHX North Central Only)	1

Travel Flows

The total number of commuters who travel from the residential area to the job center is the single most important determinant for the feasibility of a

commuter bus. Only areas with travel flows to the job center with a market size of over 2,500 were considered as part of this analysis. Those alternatives with even larger flows than 2,500 have the potential for higher ridership. The alternatives were assigned a score of zero to five points based on their market size (number of commuters).

The following alternatives have the largest market size, greater than 5,000 commuters (five points):

- Phoenix North Central: SR51, I-17, 514
- Downtown Tempe: Alternative 3
- Deer Valley: Alternatives 1, 3, and 4
- Broadway Innovation Corridor: Alternative 1

Employees/Students with Potential for Subsidized Transit Passes

If an employer or university subsidizes transit passes, transit becomes more cost competitive for riders. In 2019, 54 percent of surveyed riders on a Valley Metro commuter service used an employer subsidized pass to pay their fare. The alternatives were assigned a score of zero to 1.5 points based on the number of employees or students with potential for subsidized transit passes, using the following qualifications: an employer with 500 or more employees (although an employer with 50 or more employees may choose to subsidize passes as part of their Travel Reduction Plan), a government job, or student enrollment or staff at ASU Main Campus. All Downtown Tempe alternatives have the highest potential to serve jobs that subsidize passes and received 1.5 points.

Operating Cost Per Trip

The operating cost per trip determines if Valley Metro can efficiently run a service from a cost effectiveness perspective. \$150 was used as the break point as it is a natural break for the costs of existing commuter routes. The following alternatives have an operating cost of \$150 or less per one-way



trip, representing a high potential for the cost effectiveness and receiving one point:

- Phoenix North Central: SR51, 521, 522, I10W, CSME
- Downtown Tempe: All Alternatives (1-6)
- Broadway Innovation Corridor: Alternative 1
- Price Corridor: Alternative 2 and 3
- Southwest Tempe: Alternatives 1 and 2

Commuter Bus vs. Driving Travel Time

Customers are more likely to ride commuter services if it is time competitive with driving a single-occupancy vehicle. The alternatives received a score of zero to two points based on the ratio of bus travel time to the equivalent route's single occupancy vehicle travel time. The following alternatives are the most time competitive routes, receiving a score addition of two points:

- Phoenix North Central: 521, 522, 531, 533, 535, 541, and I10E
- Downtown Tempe: Alternatives 1 and 4

Routes Running on HOV Facilities

The Valley has an extensive network of high-occupancy vehicle (HOV) facilities. HOV facilities generally offer time savings over general purpose lanes due to lower levels of congestion. HOV facilities could even be more time competitive if HOV policies were to change to be more restrictive or levels of enforcement were to increase. The alternatives were given a score of zero or one point based on the percentage of the route running on an HOV facility. The following alternatives receive a score of one point:

- Phoenix North Central: 521, 522, 533, 535, 541, 542, 563, SR51, I10E, and PNC1
- Downtown Tempe: Alternatives 1 and 4
- Price Corridor: Alternatives 2 and 3
- Deer Valley: Alternative 5

Connection to New Areas

Commuter routes can have higher ridership if serving trips not already served by transit, as the new service will not face any competition with existing routes. Connecting new areas also increases the overall connectivity of the region. An outlying park-and-ride qualified as being served by existing transit to the job center if there was any transit option less than a 60-minute ride and with one or no transfers. The following alternatives that connect new areas received a score addition of 0.5 points:

- Phoenix North Central: 514, 521, 531, 533, 535, 536, 563, I17, and PNC1
- Downtown Tempe: Alternatives 1, 3, 4, and 5
- Broadway Innovation Corridor: Alternative 1
- Deer Valley: Alternatives 1, 4, 5, and 6
- Price Corridor: Alternatives 1, 2, and 3

Pedestrian Environment

The walkability of a job center directly influences how many jobs can be reached on foot once alighting the bus. The alternatives were given a score of zero to 1.5 points based on the pedestrian environment. The following alternatives received a score addition of 1.5 points:

- Phoenix North Central: All Alternatives
- Downtown Tempe: All Alternatives

Current Commuter Bus has High Ridership

Current commuter bus services only serve Downtown Phoenix. Phoenix North Central is proximal to Downtown, and North Central alternatives share the majority of their alignments with Downtown Phoenix routes. Thus, performance on North Central routes can be predicted using performance of current Downtown routes. A current commuter route to Downtown Phoenix is considered to have high ridership if it has an average



of 20 passengers per trip or more (see Figure 7). The following Phoenix North Central Alternatives received a score addition of one point:

- Phoenix North Central: 531, 533, 535, 542, 563, SR51, I17, and I10E

Total Evaluation Score

Out of a total possible score of 13.5 points, the final scores of the alternatives ranged broadly from one to 10.5, as shown in Figure 35. Eight alternatives had a score of nine points or higher and are considered to have high performance potential:

- Phoenix North Central: 531, 542, 563, SR51, and I17
- Downtown Tempe: Alternatives 1, 2, and 3

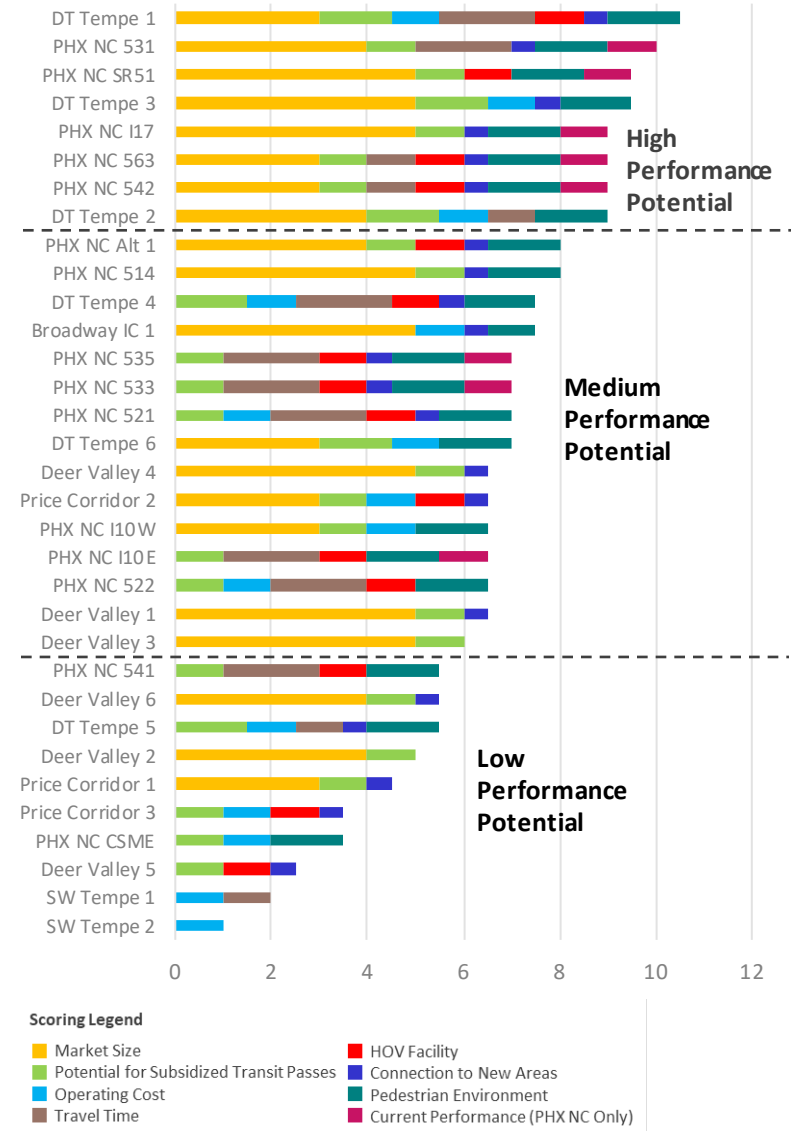
Fourteen alternatives had a score of 6.5 to eight and are considered to have medium performance potential:

- Phoenix North Central: 514, 521, 522, 533, 535, I10E, I10W, and PNC1
- Downtown Tempe: Alternatives 4 and 6
- Broadway Innovation Corridor: Alternative 1
- Deer Valley: Alternatives 1 and 4
- Price Corridor: Alternative 2

Eleven alternatives had a score of six or lower and are considered to have low performance potential:

- Phoenix North Central: 541 and CSM East
- Downtown Tempe: Alternative 5
- Deer Valley: Alternatives 2, 3, 5, and 6
- Price Corridor: Alternatives 1 and 3
- Southwest Tempe: All Alternatives (1-2)

Figure 35 | Total Evaluation Scores



High Performance Potential

Of the eight high performing routes, five are to Phoenix North Central and three are to Downtown Tempe, as shown in Figure 36. These job centers are both walkable, with a high concentration and total number of jobs, and in Tempe’s case, a major university with a combined student/staff population nearing 100,000. Downtown Tempe Alternative 1 has points in all seven possible categories (as it cannot score in the current performance category). Downtown Tempe Alternatives 2 and 3 score in five out of seven

possible categories. The five Phoenix North Central Routes score in five to seven out of the eight possible categories.

The combination of scoring in most or all categories means these routes have high potential for successful commuter bus from both a ridership and agency perspective. The high scores also mean that these routes were more likely to get the maximum score in many of the categories. These routes have a large overall market size, in addition to the ability to make the service competitive from several different contexts.

Figure 36 | Alternatives with High Performance Potential



Medium Performance Potential

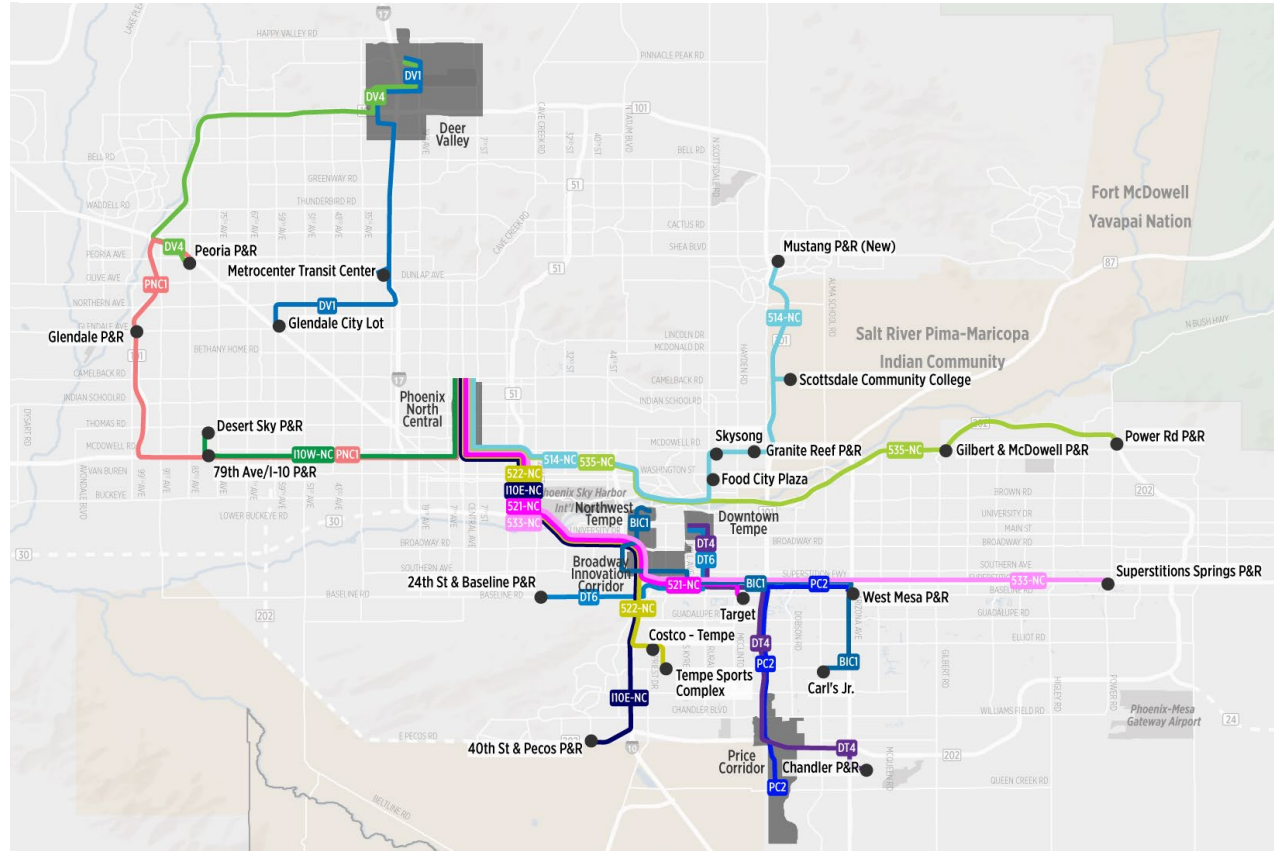
Fourteen routes have medium performance potential with a small range of scores between 6.5 and eight, as shown in Figure 37. Eight are to Phoenix North Central, two to Downtown Tempe, one to Broadway Innovation Corridor and Northwest Tempe, two to Deer Valley, and one to Price Corridor. While all the highest performance routes performed well in the market size category, some medium performance routes did not score any points based on market size.

While the medium performance routes all have their strengths, they do so for different reasons. Comparing Phoenix North Central 521 to Downtown Tempe Alternative 6, both with a score of seven, the former scores in six categories, where the later scores in four. This example highlights the importance of Downtown Tempe Alternative 6 having a large market size, with less strength in other areas, whereas Phoenix North Central 521 has a smaller market size but is competitive in other areas.

Low Performance Potential

Eleven alternatives have low performance potential: Deer Valley Alternatives 2, 3, 5, and 6; Phoenix North Central 541 and CSME; Downtown Tempe Alternative 5, Price Corridor Alternatives 1 and 3, and

Figure 37 | Alternatives with Medium Performance Potential



Southwest Tempe Alternatives 1 and 2. Deer Valley and Price Corridor form very challenging pedestrian environments for commuter bus service to be effective. Although many of the routes have large market sizes, these services are often not competitive for riders nor cost effective, especially due to their reliance on shuttle services. Southwest Tempe also poses a challenging environment to run commuter services, and neither alternatives have large markets or other means of making them competitive transit services.

LIMITED-STOP ALTERNATIVES

Limited-stop arterial service connects to major job centers and other dense areas along major arterials. Generally, stops are spaced much further apart than local bus service, which increases speed. Four limited-stop alternatives were created, connecting different job centers along dense arterials, as shown in Figure 38.

- **Limited-Stop Alternative 1** – serving Downtown Tempe and Downtown Scottsdale
- **Limited-Stop Alternative 2** – serving Downtown Scottsdale and Scottsdale Airpark
- **Limited-Stop Alternative 3** – serving Scottsdale Airpark
- **Limited-Stop Alternative 4** – serving Downtown Scottsdale, Camelback/Biltmore, Phoenix North Central, and Downtown Phoenix

The limited-stop alternatives were assessed against a similar set of criteria as the express service alternatives, listed in Figure 39.

Composite Density

Limited-stop services, unlike traditional express and commuter bus, rely on the composite density of residents and jobs within the immediate vicinity of the stops along the route. This is because limited-stop services connect high density areas to one another, usually with further stop spacing than local bus. The alternatives were assigned a score of zero to three points based on the average composite density within a half-mile of stops along the route. Limited-Stop Alternative 4 received a score addition of three points, and Limited-Stop Alternatives 1 and 2 received a score addition of two points.

Figure 38 | Limited-Stop Alternatives

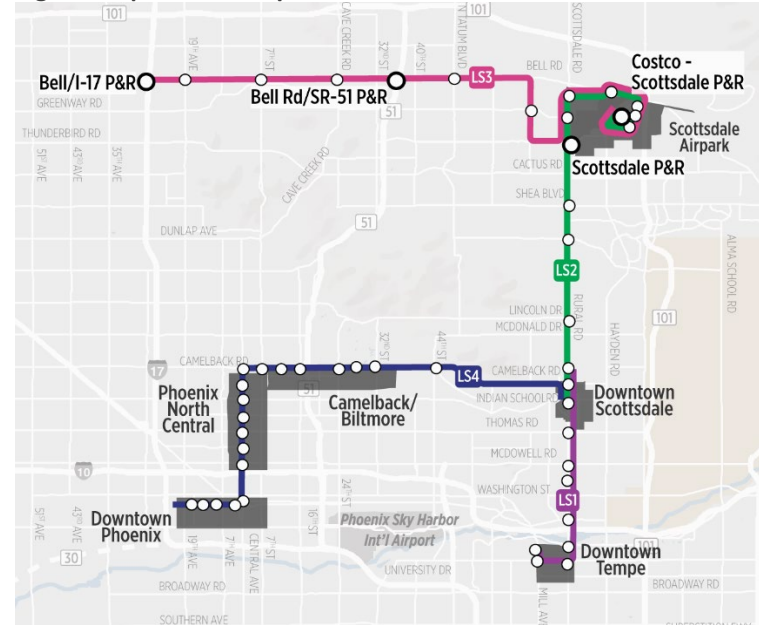


Figure 39 | Limited-Stop Evaluation Criteria

Category	Evaluation Criteria	Max Score
MARKET SIZE	Composite density (population and employment)	3
COST COMPETITIVENESS	Number of jobs in job center(s) with high potential for subsidized transit passes	1.5
	Operating cost per trip (one-way)	1
TIME COMPETITIVENESS	Stop spacing of no more than one per mile	2
ACCESSIBILITY	Pedestrian environment at stops (number of square miles within 10-min walk)	1



Employees/Students with Potential for Subsidized Transit Passes

Limited-stop services, just as express services, are more likely to be competitive if a university or employer subsidizes the ride. The alternatives were assigned a score of zero to 1.5 points based on the number of employees or students with potential to receive subsidized transit passes gauged through employers with 500 or more employees (although an employer with 50 or more employees may choose to subsidize passes as part of their Travel Reduction Plan), government jobs, student enrollment, or staff at ASU Main Campus. Limited-Stop Alternatives 4 and 1 received 1.5 points.

Operating Cost per Trip

The operating cost per trip determines if Valley Metro can efficiently run a service. A value of \$125 was used as the natural break in the data. Limited-Stop Alternatives 1, 2, and 4 received a score addition of one point.

Stop Spacing

The amount of time the bus spends stopped to pick up and drop off passengers is a major source of delay for local bus service. The Valley Metro Service Standards identify stop spacing of no more than one per mile as ideal for limited-stop services as a means of increasing service speeds. Limited-Stop Alternatives 1 and 2 received a score addition of two points because they both have an average stop spacing of no more than one stop per mile.

Pedestrian Environment at Stops

Because most riders walk to and from their origins and destinations when traveling via limited-stop services, the average amount of ground they can cover walking determines how many different locations they can reach

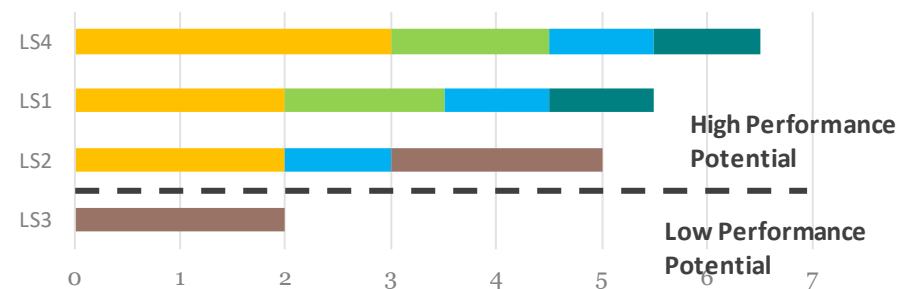
within a reasonable walk. Limited-Stop Alternatives 1 and 4 received a score addition of one point.

Final Results

Out of a possible 8.5 points, Limited-Stop Alternatives 4, 1, and 2 scored five points or higher and are considered to have high performance potential. Limited-Stop Alternatives 4 and 1 score in four of the five categories, and Limited-Stop Alternative 2 scored in three. These three alternatives have potential to be successful limited-stop services, all connecting at least two job centers along dense corridors. Although these corridors are served by local bus, limited-stop services could unlock new transit markets for those wishing to travel more quickly and have access to more frequent service to destinations along these routes.

Limited-Stop Alternative 3, however, only scores in one category. It lacks the density and pedestrian accessibility along the route that would result in high ridership and efficient operating conditions. It is considered to have low performance potential for limited-stop service.

Figure 40 | Limited-Stop Final Results





EVALUATION FINDINGS

Although commuter bus services all currently run to Downtown Phoenix, there are many other major job centers in the region. By assessing the different elements of demand that make commuter bus successful, varying alternatives to different job centers were explored. Three different types of commuter service—traditional express bus, traditional express bus with shuttle connections, and limited-stop arterial service—were found to have potential in the region. The key findings from the evaluation are as follows:

- After comparing all existing commuter bus services to the minimum service standards, there were a number of opportunities to combine, alter, and discontinue service. Overall, the initial service changes to Downtown Phoenix routes cost less to operate on a daily basis and offer high-ridership areas more frequent and efficient service.
 - Phoenix North Central and Downtown Tempe have the highest potential in the region to support new express services, due to their high numbers of jobs and density, high-quality pedestrian environment, and large travel flows from certain areas. Of the eight alternatives with the highest potential for success, five are to Phoenix North Central, and three are to Downtown Tempe.
 - Many different job centers in the region have medium potential to support express services, including Deer Valley, Broadway Innovation Corridor and Northwest Tempe, Price Corridor, and additional services to Phoenix North Central and Downtown Tempe. These alternatives have a mix of conditions that create their potential to become new services, but none to the degree of the high potential alternatives.
 - Several alternatives were not recommended for further consideration at this time for commuter service. These included both routes to Southwest Tempe, two to Phoenix North Central, one to Downtown Tempe, four to Deer Valley, and two to Price Corridor. Many of these job centers have difficult operating conditions for commuter bus, and most of these routes lack the high numbers of commuters which give the other alternatives a high chance of success.
- There are three limited-stop services with potential for successful service: Limited-Stop Alternative 1 which runs from Downtown Tempe to Downtown Scottsdale, Limited-Stop Alternative 2 which runs from Downtown Scottsdale to Scottsdale Airpark, and Limited-Stop Alternative 4, which runs from Downtown Scottsdale to Downtown Phoenix via Camelback/Biltmore and Phoenix North Central.
 - Limited-Stop Alternative 3 running along Bell Road into Scottsdale Airpark does not have high potential for success as a limited-stop service.



RECOMMENDED SERVICE

CREATION OF THE RECOMMENDATIONS

Recommendations for Changes to Existing Services

The Downtown Phoenix recommendations are based on a combination of the initial service changes mentioned in the alternatives analysis and stakeholder input. A few of the final recommendations have been modified to better reflect current ridership, existing plans and studies, and the political realities of transit service provision.

New Express Bus & Limited-Stop Recommendations

The evaluation of the alternatives in the previous chapter resulted in each alternative being ranked as having high, medium, or low performance potential (see Figure 35 and Figure 40). All alternatives that had either high or medium performance potential are included as part of the recommendations. All recommended services to new job centers have an identical alignment to the alternatives, except for one service to Phoenix North Central, which was modified as a result of stakeholder input.

INTENDED USE

Rather than a recommended network, the recommended services are intended to be used as a menu of options for the region. The evaluation process in the previous chapter of the report identified alternatives with high performance potential and medium performance potential. All recommended services are considered viable options for commuter service, and the demarcation is only intended to indicate the routes that have particularly high ridership potential. However, due to a variety of factors such as funding procurement, operational environments, and park-and-ride capacities, among others, the region could choose to implement a

medium performance potential route over a high potential route. It could also be more important to prioritize a medium potential route for other reasons, for instance if it serves a particular demographic or area.

The alignments of the recommended services as well as the exact stop and park-and-ride locations also are not meant to indicate final service recommendations. Rather, these alignments are suggestions as to how to connect general areas of high demand.

All recommended services are viable in the short-term and are based on 2018 levels of demand. However, due to several factors, these recommendations are intended for medium-term implementation in the next 5-10 years. This timeframe accommodates the development of the next Regional Transportation Plan (RTP), which would serve as a means of funding these services. In addition, due to the COVID-19 pandemic, major shifts in travel behavior and the economy have made the next several years unpredictable. The impacts of both funding and the pandemic will be explored later.

Trip and Frequency Assumptions

Each recommended route has a recommended number of AM peak, midday, and PM peak trips, or frequency. These recommendations are based on the market size and expected ridership ranges. Each peak period was considered to be three and a half hours long. The distribution of trips throughout the peak periods can be determined based on demand. Although most travel is expected in the morning and evening peaks, large markets can often support midday trips.

Midday trips serve several purposes:

- They allow for greater access for the few riders taking non-work-related trips or workers with different shift times.
- They make the service more attractive to peak-oriented travelers who may need to travel home unexpectedly, or who sometimes work half-days, etc.



While midday trips on commuter services generally have lower ridership than peak trips, the existence of midday service can boost ridership in the peak for the reasons listed above.

Fleet Requirement Assumptions

The major capital investment for any of the recommended services is the purchase of new vehicles. Depending on the length and number of trips served by the route, a different number of vehicles is needed to run the service. For all the recommendations serving new job centers, fleet requirement estimates are included that represent the number of vehicles needed to run the number of peak trips within a 3.5-hour time frame. Because the number of midday trips is always lower than peak trips, the fleet requirement is sufficient for midday trips as well.

In practice, when a network of routes is in service, it is often most efficient to interline the services, which could result in lower overall fleet needs than if the services ran in isolation. It is also necessary for a transit agency to carry spare vehicles. These factors are not taken into account when calculating the fleet requirements for the recommendations to new job centers. The existing commuter services to Downtown Phoenix already operate using interlining and have spare vehicles, so individual fleet assumptions for these recommendations were not included.

EXPRESS BUS RECOMMENDATIONS

Express bus service generally serves one to four park-and-rides in a residential area and runs most of its length on a highway before serving a major job center. The job center is generally dense enough that if the bus stops every quarter to one half mile, most riders can walk to their job in a short amount of time. Express bus services are recommended for Downtown Phoenix, Phoenix North Central, Downtown Tempe, and Broadway Innovation Corridor/Northwest Tempe.

Downtown Phoenix

All current commuter bus service runs to Downtown Phoenix. The evaluation of these services was entirely based on current alignments and service levels. However, the recommendations remove references to current route names to provide the option of re-thinking some of these services without the confines of existing funding.

Based on the results of the North Glendale Park-and-Ride Study, the Northwest Valley Express Options Study, and other stakeholder input, some modifications were made to the services in the Northwest Valley. The Grand Avenue Limited was also discontinued due to low ridership and difficult operating conditions, instead serving the Glendale City Lot with Route Downtown Phoenix 2. For more information on why running bus service on Grand Avenue is difficult, refer to the Grand Avenue Transit Feasibility Study.

An extension of the South Mountain West RAPID to the new Baseline Road and 202 Loop Park-and-Ride is put forward as a possible recommendation in the Laveen South Mountain Transportation Study. However, it is not included as a recommendation in this study. The total market size for this service is 300 commuters into Downtown Phoenix, well below the 2,500-commuter minimum market size considered feasible for commuter bus.

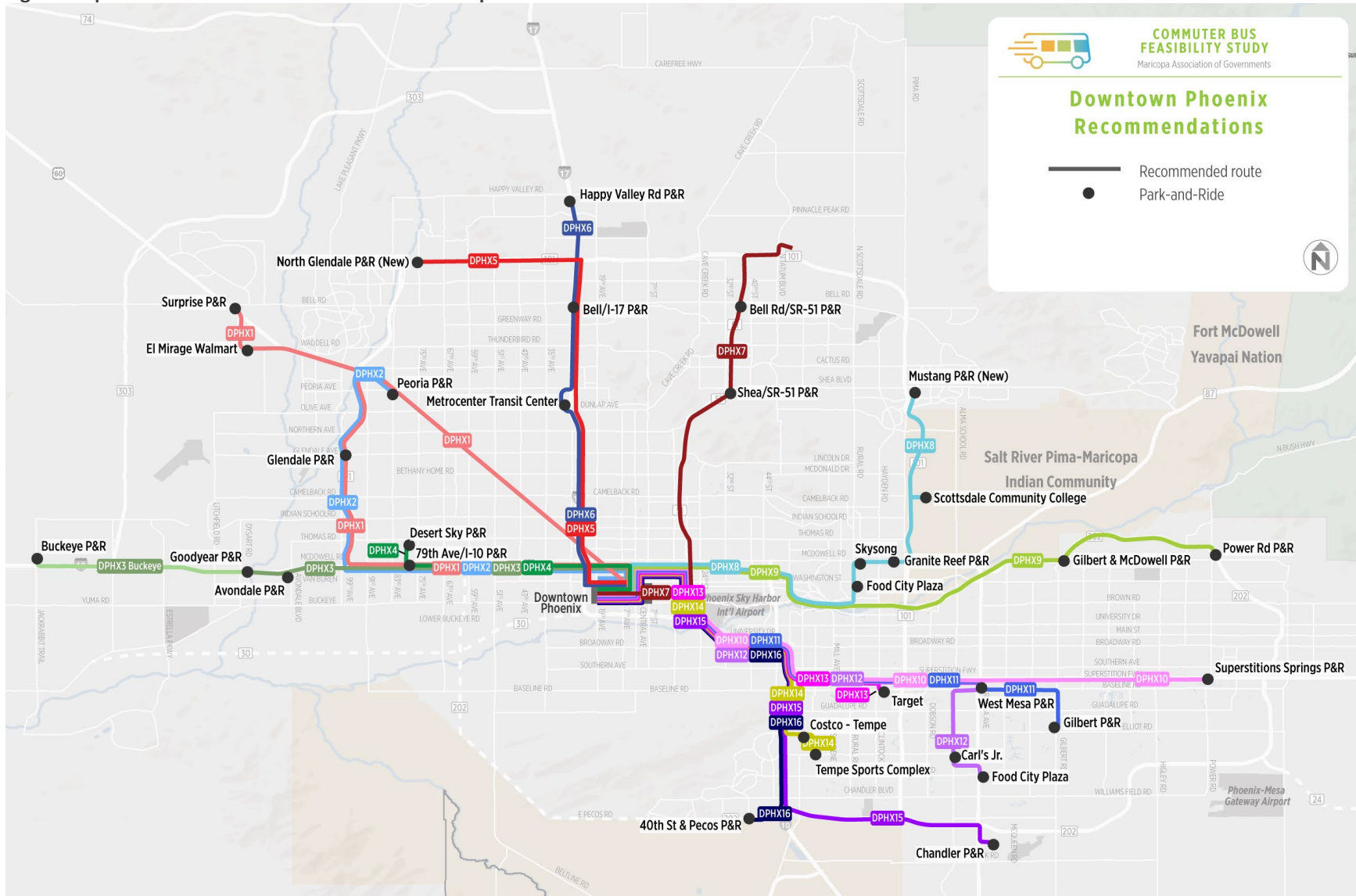
Figure 41 and Figure 42 display the recommended services for Downtown Phoenix. All services match the four minimum trips in both the AM and PM peak as described in the Valley Metro Service Standards. Downtown Phoenix 15 (based on Route 542) has a recommended additional morning and evening trip based on the recommendations of the Chandler Transportation Master Plan 2019 Update. Unlike existing services, the routes currently with the highest ridership are recommended to have at least one midday round trip. Routes Downtown Phoenix 6 and 7 are recommended to have hourly service in the midday. The recommendations are based either on the existing service or the initial service changes described earlier in the report.



Figure 41 | Downtown Phoenix Recommendations Characteristics

Route	AM Trips	Midday Trips	PM Trips	Adaptation from Route	Change from Existing Service/Initial Service Change
Downtown Phoenix1	4 Inbound	None	4 Outbound	Adapted from Rt 571 Express (Existing)	None
Downtown Phoenix2	4 Inbound	1 Round Trip	4 Outbound	Adapted from Rt 573 Express (Existing)	Serve Peoria Park-and-Ride instead of Arrowhead Mall and Foothills Aquatic Center Park-and-Ride, addition of one midday trip
Downtown Phoenix3	8 Inbound	1 Round Trip	8 Outbound	Adapted from Rt 562/563 Express (Initial Service Change)	Addition of one midday trip
Downtown Phoenix4	12 Inbound	1 Round Trip	12 Outbound	Adapted from Rt I10W RAPID (Existing)	Addition of one midday trip
Downtown Phoenix5	4 Inbound	1 Round Trip	4 Outbound	Adapted from Rt 575 Express (Existing)	Serve North Glendale Park-and-Ride instead of Arrowhead Mall and Foothills Aquatic Center Park-and-Ride
Downtown Phoenix6	21 Inbound	7 Round Trip	21 Outbound	Adapted from Rt I17 RAPID (Existing)	Addition of seven midday trips
Downtown Phoenix7	15 Inbound	7 Round Trip	15 Outbound	Adapted from Rt SR51 RAPID (Existing)	Addition of seven midday trips
Downtown Phoenix8	4 Inbound	1 Round Trip	4 Outbound	Adapted from Rt 514 Express (Initial Service Changes)	Addition of one midday trip
Downtown Phoenix9	5 Inbound	None	5 Outbound	Adapted from Rt 535 Express (Existing)	None
Downtown Phoenix10	6 Inbound	None	6 Outbound	Adapted from Rt 533 Express (Existing)	None
Downtown Phoenix11	6 Inbound	None	6 Outbound	Adapted from Rt 531 Express (Initial Service Changes)	None
Downtown Phoenix12	5 Inbound	None	5 Outbound	Adapted from Rt 541 Express (Initial Service Changes)	None
Downtown Phoenix13	4 Inbound	None	4 Outbound	Adapted from Rt 520/521 Express (Initial Service Changes)	None
Downtown Phoenix14	4 Inbound	None	4 Outbound	Adapted from Rt 522 Express (Initial Service Changes)	None
Downtown Phoenix15	9 Inbound	1 Round Trip	9 Outbound	Adapted from Rt 542 Express (Existing)	Additional AM/PM peak trips and one midday round trip
Downtown Phoenix16	15 Inbound	1 Round Trip	15 Outbound	Adapted from Rt I10E RAPID (Existing)	Addition of one midday trip

Figure 42 | Downtown Phoenix Recommendations Map





Phoenix North Central

Phoenix North Central is located just two miles north of Downtown Phoenix. It shares a similar density and pedestrian environment to Downtown Phoenix, making it a good candidate for traditional bus service. However, there is almost no commuter bus ridership to this area currently, although transferring to light rail is possible. Phoenix North Central also has more jobs and larger commute flows than Downtown

Phoenix from some areas. Thirteen services to Phoenix North Central are recommended: five have high performance potential and eight have medium performance potential (see Figure 43 and Figure 44). Most Phoenix North Central recommended routes are based on the alignments of the recommendations to Downtown Phoenix. In the same manner as the Downtown Phoenix recommendations, the Phoenix North Central recommendations have been renamed to not reflect any currently operating services. Phoenix NC 4 diverts from the alternatives by serving the proposed North Glendale Park-and-Ride based on the results of the North Glendale Park-and-Ride Study.

Figure 43 | Phoenix North Central Recommendations Characteristics

Route	AM Trips	Midday Trips	PM Trips	Fleet Requirement	Note
High Performance Potential					
Phoenix NC 2	8 Inbound	1 Round Trip	8 Outbound	5	Adapted from Rt 563 Express
Phoenix NC 4	15 Inbound	7 Round Trips	15 Outbound	12	Adapted from Rt I17 RAPID, serve North Glendale Park-and-Ride instead of Arrowhead Mall and Foothills Aquatic Center Park-and-Ride
Phoenix NC 5	15 Inbound	7 Round Trips	15 Outbound	7	Adapted from Rt SR51 RAPID
Phoenix NC 9	6 Inbound	1 Round Trip	6 Outbound	4	Adapted from Rt 531 Express
Phoenix NC 12	8 Inbound	1 Round Trip	8 Outbound	6	Adapted from Rt 542 Express
Medium Performance Potential					
Phoenix NC 1	5 Inbound	1 Round Trip	5 Outbound	3	-
Phoenix NC 3	12 Inbound	1 Round Trip	12 Outbound	6	Adapted from Rt I10W RAPID
Phoenix NC 6	4 Inbound	1 Round Trip	4 Outbound	3	Adapted from Rt 514 Express
Phoenix NC 7	5 Inbound	None	5 Outbound	3	Adapted from Rt 535 Express
Phoenix NC 8	6 Inbound	None	6 Outbound	4	Adapted from Rt 533 Express
Phoenix NC 10	4 Inbound	None	4 Outbound	2	Adapted from Rt 521 Express
Phoenix NC 11	4 Inbound	None	4 Outbound	2	Adapted from Rt 522 Express
Phoenix NC 13	15 Inbound	1 Round Trip	15 Outbound	7	Adapted from Rt I10E RAPID

Figure 44 | Phoenix North Central Recommendations Map





Downtown Tempe

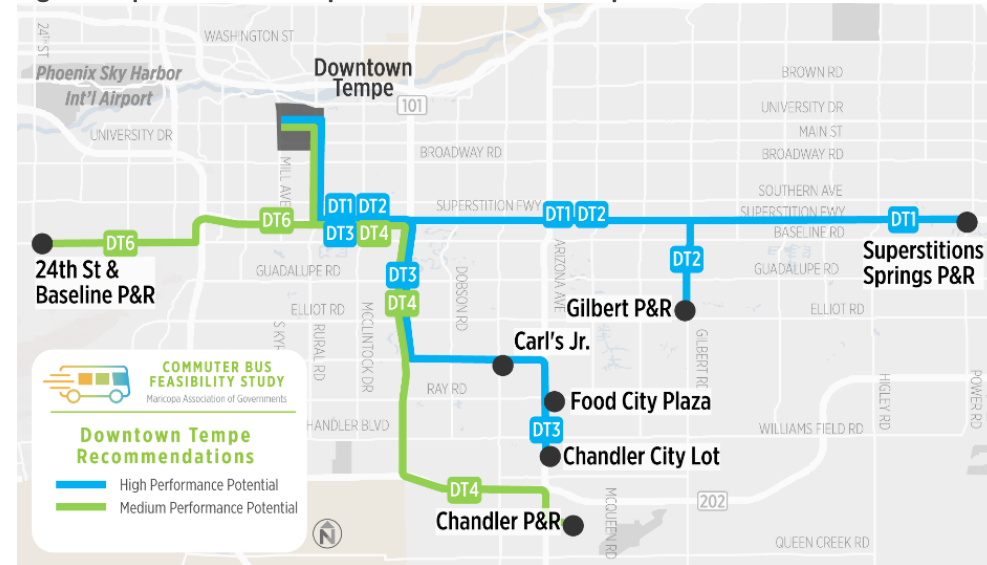
Downtown Tempe, home to the ASU Main Campus, is a dense, walkable job center well-suited for commuter service. Of the five services recommended, three have high performance potential and two have medium performance potential (see Figure 45 and Figure 46). All five services are in the East Valley. Downtown Tempe 3, in particular, has a large market size and is recommended for all-day service to accommodate student travel that does not match traditional peak travel. All other

Figure 45 | Downtown Tempe Recommendations Characteristics

Route	AM Trips	Midday Trips	PM Trips	Fleet Requirement
High Performance Potential				
DT Tempe 1	4 Inbound	1 Round Trip	4 Inbound	2
DT Tempe 2	4 Inbound	1 Round Trip	4 Inbound	2
DT Tempe 3	6 Round Trips	7 Round Trips	6 Round Trips	4
Medium Performance Potential				
DT Tempe 4	5 Inbound	None	5 Outbound	2
DT Tempe 6	4 Inbound	None </td <td>4 Outbound</td> <td>2</td>	4 Outbound	2

recommended routes are traditional peak-period services, with Downtown Tempe 1 and Downtown Tempe 2 having large enough markets to support 1 round trip in the midday. Downtown Tempe 4 reflects the new express service recommended in the Chandler Transportation Master Plan 2019 Update. Although its score in the analysis of alternatives did not qualify for high performance potential, this is an example of a route that has medium performance potential, but could be higher priority to the region to implement than a high performance potential route due to its recommendation in another plan.

Figure 46 | Downtown Tempe Recommendations Map





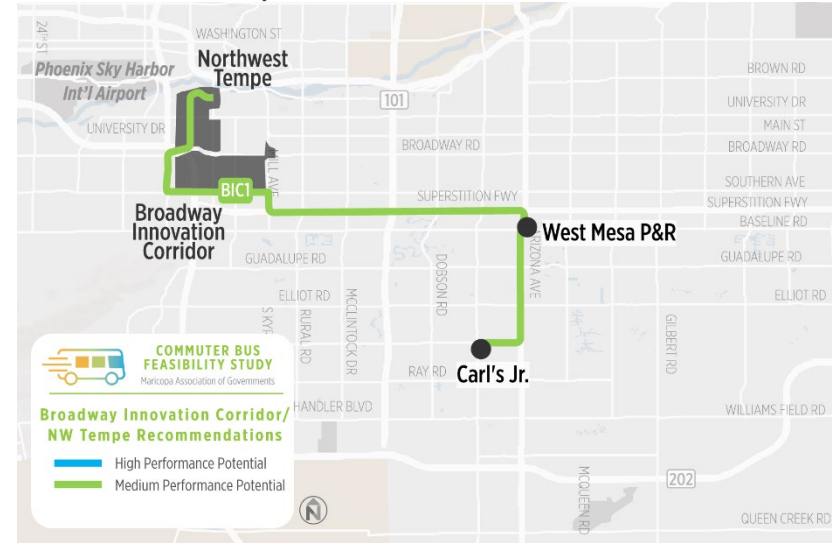
Broadway Innovation Corridor/Northwest Tempe

Broadway Innovation Corridor and Northwest Tempe are two medium-sized job centers with moderate pedestrian access that border each other along Broadway Road in Tempe. The combination of demand from Chandler and Mesa form another potential commuter route contained within the East Valley. It is suggested this route has both four AM and four PM trips and one midday round trip (see Figure 47 and Figure 48).

Figure 47 | Broadway Innovation Corridor/Northwest Tempe Recommendations Characteristics

Route	AM Trips	Midday Trips	PM Trips	Fleet Requirement
Medium Performance Potential				
Broadway IC 1	4 Inbound	1 Round Trip	4 Outbound	3

Figure 48 | Broadway Innovation Corridor/Northwest Tempe Recommendation Map





EXPRESS BUS WITH FIRST MILE/LAST MILE CONNECTION RECOMMENDATIONS

The following recommended services look very similar to express bus services outside of the job center: serving one to three park-and-rides and running mostly on highways. However, express bus routes serve dense, walkable job centers, while both Deer Valley and Price Corridor are large, dispersed job centers. Most riders in Deer Valley or Price Corridor would not be able to walk to their destination without the bus circulating the entire large job center, which could add an unreasonable amount of in-vehicle time to the trip. For this reason, these services are only viable with connections to a first mile/last mile option, which can radiate out from central points to assure all employees can reach their jobs. First mile/last mile options will be explored in the next section.

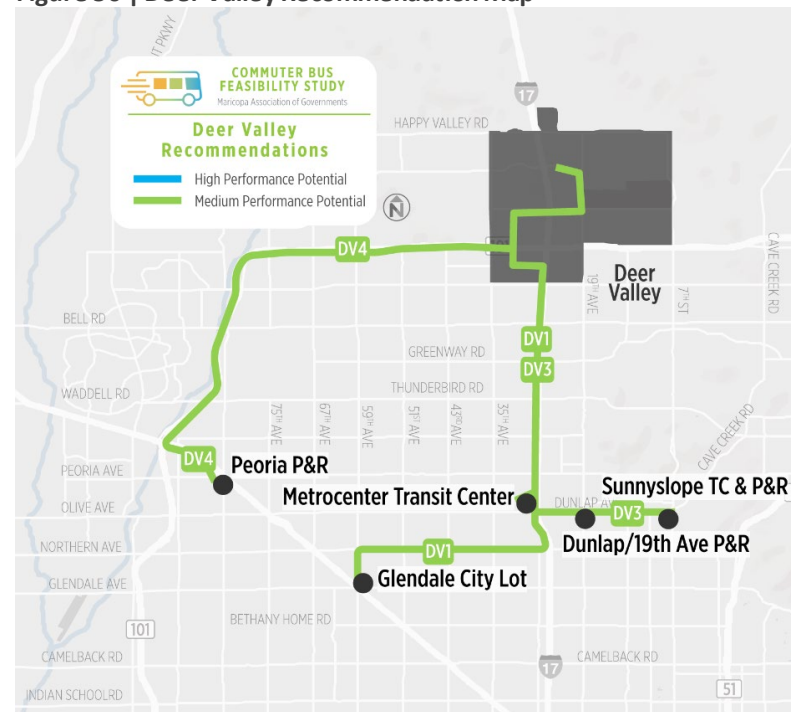
Deer Valley

Deer Valley is a large job center in Northern Phoenix, home to many large employers. Three services, all of medium performance potential, are recommended to Deer Valley, from areas of Phoenix, Glendale, and Peoria (see Figure 50). While Deer Valley 1 has a very large market size, the added cost and time penalties of the needed first/last mile solutions will likely make them less competitive and more difficult to implement. However, if all three services were implemented, the costs of funding first mile/last mile solutions could be more cost effective. Figure 49 displays recommended service levels.

Figure 49 | Deer Valley Recommendations Characteristics

Route	AM Trips	Midday Trips	PM Trips	Fleet Requirement
Medium Performance Potential				
Deer Valley 1	6 Inbound	1 Round Trip	6 Outbound	5
Deer Valley 3	4 Inbound	1 Round Trip	4 Outbound	3
Deer Valley 4	4 Inbound	1 Round Trip	4 Outbound	3

Figure 50 | Deer Valley Recommendation Map





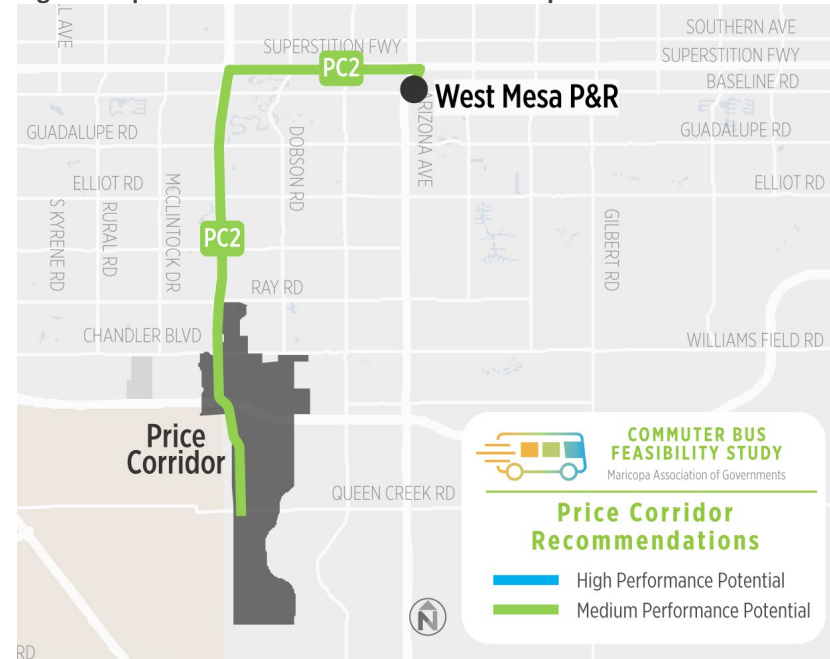
Price Corridor

Price Corridor is a large employment center in Chandler, also with many large employers. One service with medium performance potential serving West Mesa is recommended (see Figure 52). This service would be recommended with the minimum service standard of four AM and four PM trips (Figure 51). As with Deer Valley, this service will not be as time competitive as traditional bus services and will be more difficult to implement from a cost perspective. Unlike Deer Valley, because only one service to Price Corridor is recommended, any first mile/last mile solution would only serve this one route, making it less cost effective.

Figure 51 | Price Corridor Recommendation Characteristics

Route	AM Trips	Midday Trips	PM Trips	Fleet Requirement
Medium Performance Potential				
Price Corridor 2	4 Inbound	None	4 Outbound	1

Figure 52 | Price Corridor Recommendation Map



FIRST MILE/LAST MILE OPTIONS

Three new express bus routes are recommended for Deer Valley and one new route for Price Corridor. Deer Valley and Price Corridor are home to many employment opportunities but are lower density and have low pedestrian access when compared to the other job centers. Due to large parking lots and little pedestrian infrastructure, there are few jobs within walking distance of potential stop locations in these two areas.

To get riders from commuter buses to their workplace, the region can employ a series of first mile/last mile strategies.

Figure 53 | Deer Valley Employment Centers and Potential Shuttles



Fixed-Route Shuttles

Fixed-route shuttles can be used to connect bus stops or mobility hubs to the entrances of job buildings. These shuttles operate along a set path and schedule, ideally timed with the arrivals and departures of commuter buses. Figure 53 and Figure 54 show potential shuttle routes, connecting the largest employers in Deer Valley and Price Corridor to a few express bus stops, respectively.

Fixed-route shuttles can be operated by one or many of the following entities:

- **Valley Metro** - The transit agency can work with employers to identify travel needs and plan a shuttle service. The shuttles can be timed with the express bus schedule, bring riders to multiple employers, and be operated using Valley Metro vans or cutaway vehicles.
- **Individual Employers/Property Management Companies** - Employers or property owners or management companies can individually operate shuttles directly between bus stops and their job centers. This option works best for the largest employers, since there would be more employees to transport at one time in a van.
- **Transportation Management Associations (TMAs)** - TMAs are organizations consisting of and funded by multiple employers and institutions, designed to collectively provide transportation services for their employees and discourage single-occupant vehicle trips. TMAs can operate fixed-route shuttles that take employees from bus stops to the entrances of employers who are a part of the TMA.

Mobility Hubs

Instead of traditional bus stops, commuter buses in Deer Valley and Price Corridor can stop at centrally located mobility hubs, which are locations that connect different modes of transportation together, as well as other



amenities. They can be created at new publicly owned sites, in private property agreements, or through the conversion of park-and-ride facilities. A mobility hub may include bike share, scooter share, car share, and shuttle connections that allow riders to reach their destinations via several different mode choices. Mobility hubs may increase the reach of fixed-route transit by providing options that are faster than walking.

On-Demand Services

Rather than a shuttle system with defined routes, first mile/last mile services can also be provided in a more flexible manner, using on-demand microtransit or ride-hailing services. Microtransit is a service where customers can request a trip through a smart phone application or phone call and get matched with other riders for a shared trip in a van, routed to optimize wait and trip times for each rider. Transit agencies and TMAs can contract for software and operate microtransit with their own vehicles and drivers, or they can contract the entire turnkey operation of microtransit to a service provider like Via.

Transit agencies, individual employers, and TMAs can also partner with ride-hailing companies, such as Lyft or Uber, to provide first mile/last mile services. Customers can hail individual or shared rides once they get off a commuter bus at a mobility hub or bus stop, and the ride will take them to their employers. These rides on on-demand services can be subsidized fully or partially by employers.

Figure 54 | Price Corridor Employment Center and Potential Shuttles



PARK-AND-RIDES

A major consideration for the implementation of commuter routes are the capacities at each park-and-ride being served by a new route. For the park-and-rides in the study area with available data, utilization ranges broadly from under 10 percent to over 75 percent (see Figure 56). If all recommended services were implemented, many park-and-rides would have two or more routes serving them, with the West Mesa Park-and-Ride served by as many as five routes (see Figure 57).

Routes harness demand from a general area, rather than from the exact site of a specific park-and-ride. Because most riders access a park-and-ride by driving, a park-and-ride within a one- or two-mile radius is as accessible by car as any other park-and-ride displayed in the alignments of the recommended services. If a route is implemented, it will need to be considered within the context of any other routes serving the park-and-ride, and if various combinations of future services causes a strain on the capacity. If the recommended lot does not have the capacity to serve a new route, a nearby existing park-and-ride or a new park-and-ride could be chosen for service instead.

Park-and-rides can be costly infrastructural investments. As part of the North Glendale Park-and-Ride Study, it was identified that building a new park-and-ride can cost up to \$23,000 per space. A much less costly option is to use an already built parking facility through a partnership with a site such as a large retailer or church; partnerships such as these are already practiced in the region. There are also many proposed park-and-rides throughout the region in the next several decades that could aid in service expansions and reduce the strain on existing park-and-rides (see Figure 57). Several existing park-and-rides also have proposed expansions.

Mustang in Scottsdale, identified as a potential new park-and-ride, has a high supply of parking (see Figure 55). This parking currently serves a large retail center. As online shopping becomes more ubiquitous, demand for parking at retail sites may continue to decrease. These underutilized parking lots could potentially serve as potential sites for park-and-rides.

Park-and-rides can also incorporate mobility hub features to increase multimodal access to surrounding areas and provide opportunities for riders to access commuter services without driving.

Figure 55 | Existing Mustang Parking

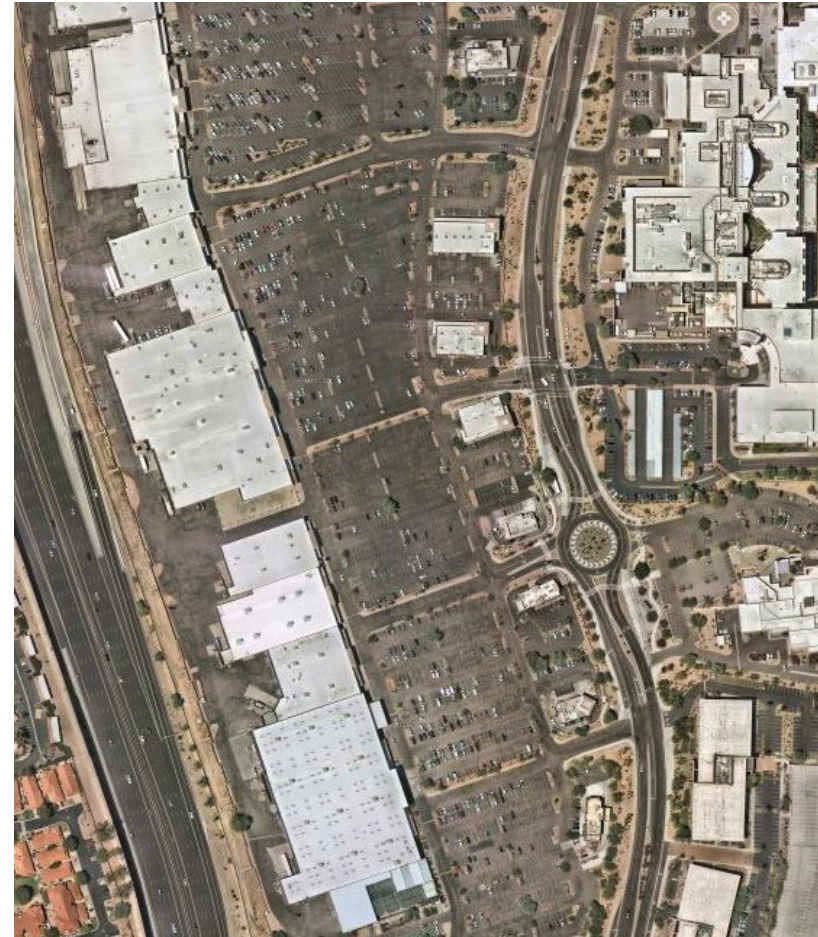


Figure 56 | Average Weekday Park-and-Ride Utilization

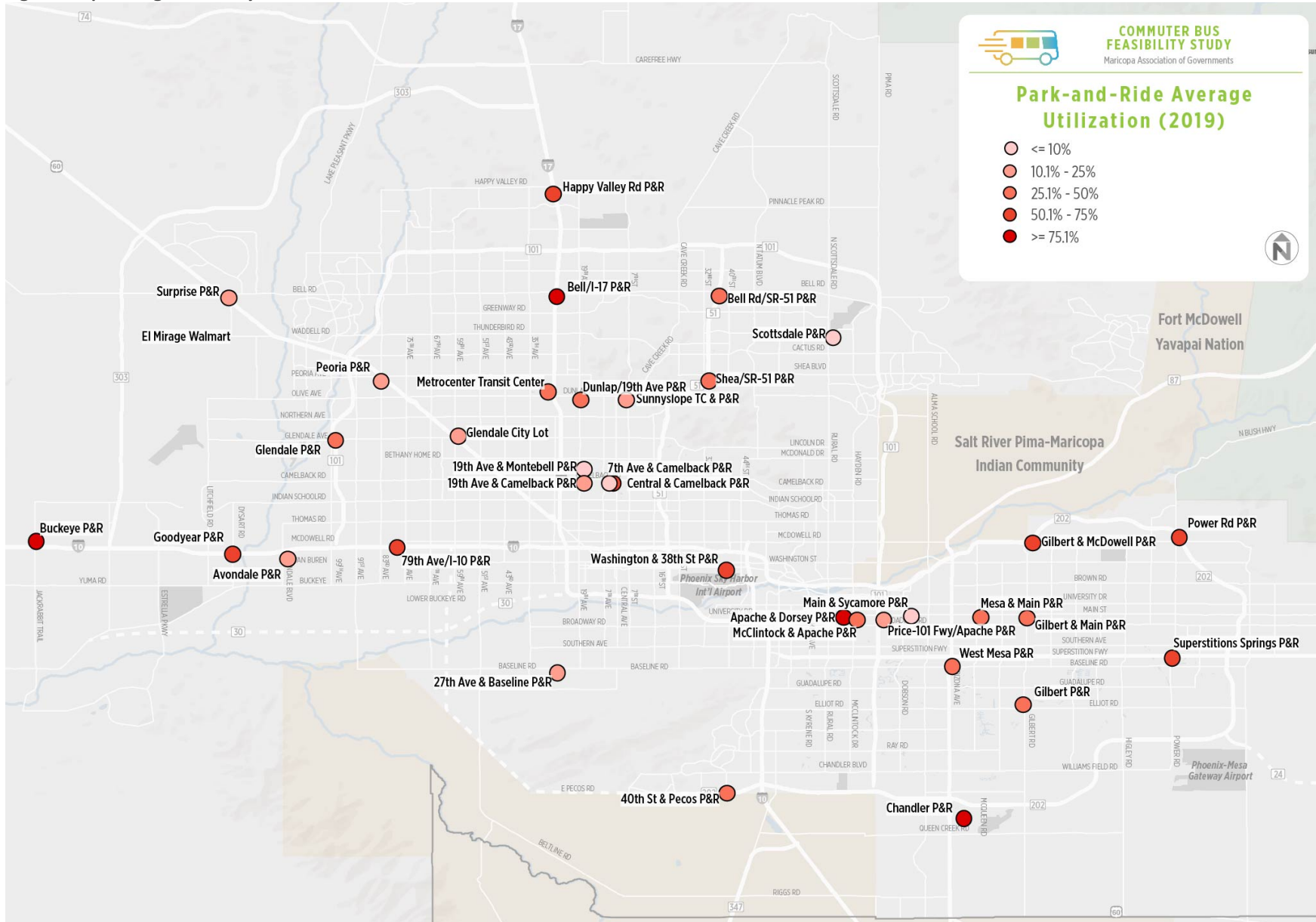
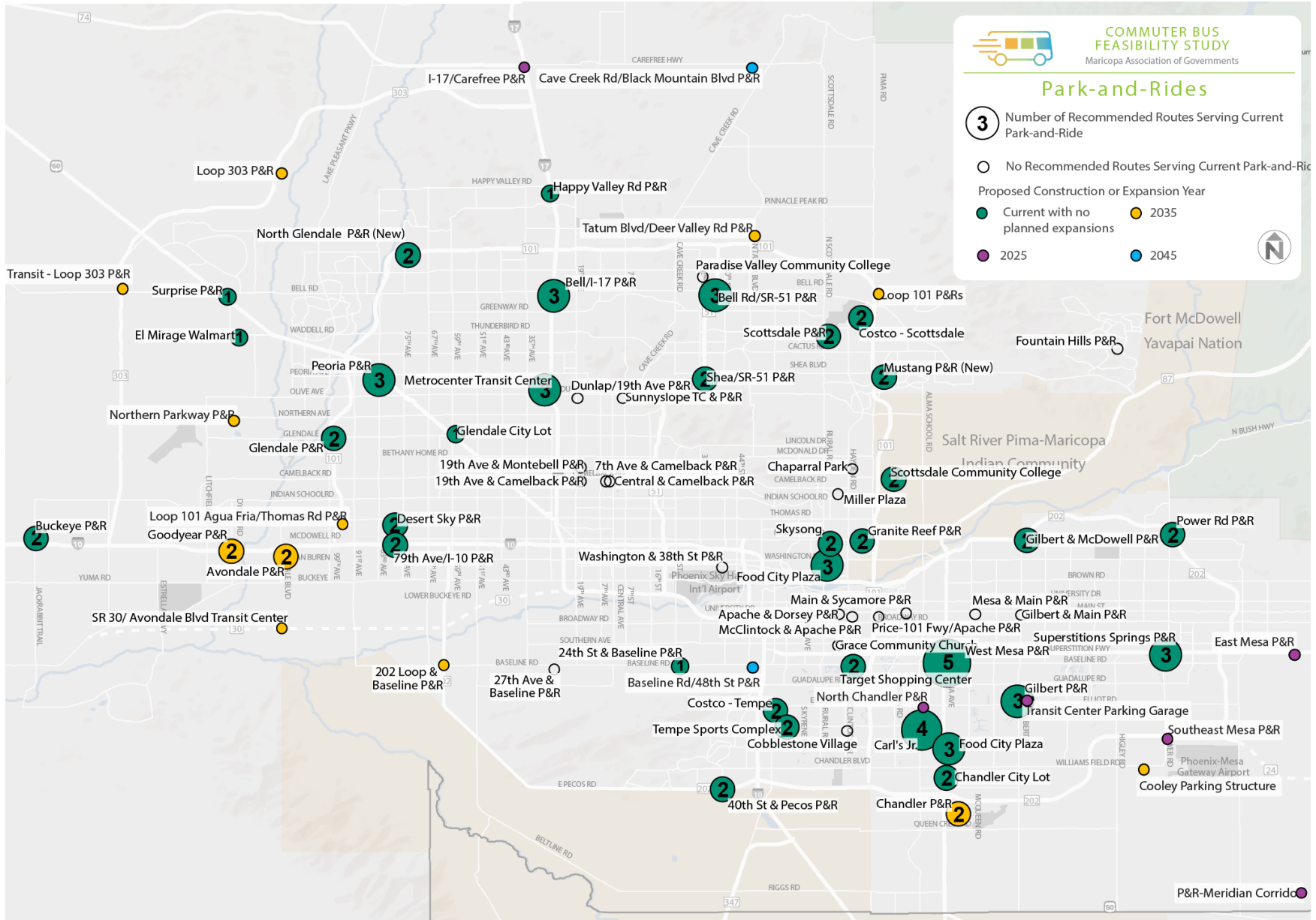


Figure 57 | Park-and-Rides Served by Recommended Routes



LIMITED-STOP RECOMMENDATIONS

Unlike traditional expressbus, limited-stop services operate on major arterials and are much more like local services. The recommended services have significant market sizes based on high population and employment densities along the corridors and all connect at least two job centers (see Figure 59). While most riders are expected to walk to these services, stop spacing is recommended to be significantly farther than the local services that currently run on these corridors, which decreases travel time. Limited-Stop 2 serves the Costco Park-and-Ride and Scottsdale Park-and-Ride both in the Airpark, which provides an opportunity for riders to drive to the service as well.

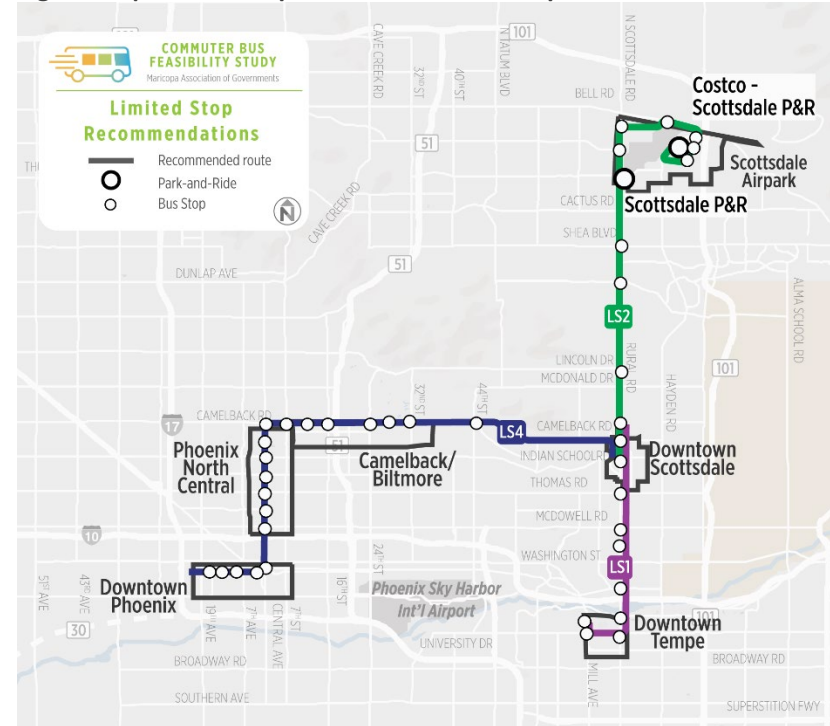
Limited-Stop 1 and Limited-Stop 4 serve very high demand areas and are recommended to be frequent all-day services (see Figure 58). Limited-Stop 2 has a smaller market size and mainly serves to connect Downtown Scottsdale and Scottsdale Airpark during peak periods with several widely spaced stops in between.

Although not assessed in this study, these services could benefit from any form of transit priority treatment, including bus-only lanes, queue jump lanes, and transit signal priority.

Figure 58 | Limited-Stop Recommendations Characteristics

Route	AM Frequency	Midday/Night Frequency	PM Frequency	Fleet Requirement
Limited-Stop 1	10 Mins	15 Mins	10 Mins	9
Limited-Stop 2	30 Mins	--	30 Mins	5
Limited-Stop 4	10 Mins	15 Mins	10 Mins	17

Figure 59 | Limited-Stop Recommendations Map



INTEGRATION WITH LIGHT RAIL AND OTHER TRANSIT

Many of the current and recommended commuter services overlap or connect with current or proposed transit services, including light rail. Light rail is a frequent, high-quality form of transit that serves as the spine of the Valley Metro system. However, transfer rates between commuter services and light rail are currently very low. Even if light rail frequency was increased significantly at peak, it is still unlikely that many riders would transfer from a commuter service to light rail to reach their destination due to the added travel time and the inconvenience of transferring. Most riders of commuter services, as explored in the market analysis, are higher-income and usually have access to a vehicle, unlike transit riders in general in the Valley. Therefore, they use commuter services out of convenience, and the inconvenience of transferring to light rail may be enough to lose current riders and make it difficult to attract new ones.

Phoenix North Central

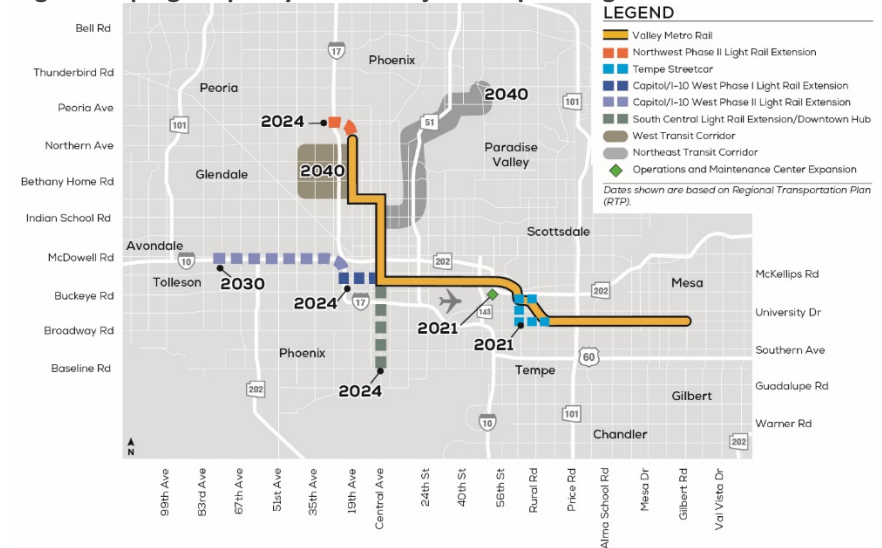
It is possible for anyone with access to a current commuter route to transfer to light rail to reach all jobs in Phoenix North Central. The travel time from the outer-most stop of all current commuter routes to the Central Avenue and Van Buren Street light rail stop is 30 - 80 minutes, with most falling around 50 minutes. With transfer time, it takes an additional 26 minutes to reach the northern end of Phoenix North Central, making for an average commute of nearly 90 minutes. Even if light rail were to be increased to a frequency of every 5 minutes, commuter bus routes that run directly to North Central save approximately 18 minutes on average due to a more direct path of travel and the lack of transfer. It is unlikely that increasing light rail frequency would be enough to entice many riders.

South Central Light Rail Extension

The South Mountain East and South Mountain West Rapid Routes are recommended to be discontinued due to low ridership. Because the areas

served by these two routes are close to Downtown Phoenix and Phoenix North Central, they can be better served by local services. The South Central Light Rail Extension will better serve these trips, especially with increased bus service along Baseline Road. This service is planned to open in 2024 (see Figure 60).

Figure 60 | High Capacity Transit Projects Map through 2040



Source: Valley Metro

I-10 Light Rail Extension

Phase II of the I-10 light rail expansion is slated to finish in the year 2030. Opportunities to integrate commuter services from the West Valley with light rail have been explored in other studies. Depending on the funding and implementation of commuter services in the West Valley, this can be

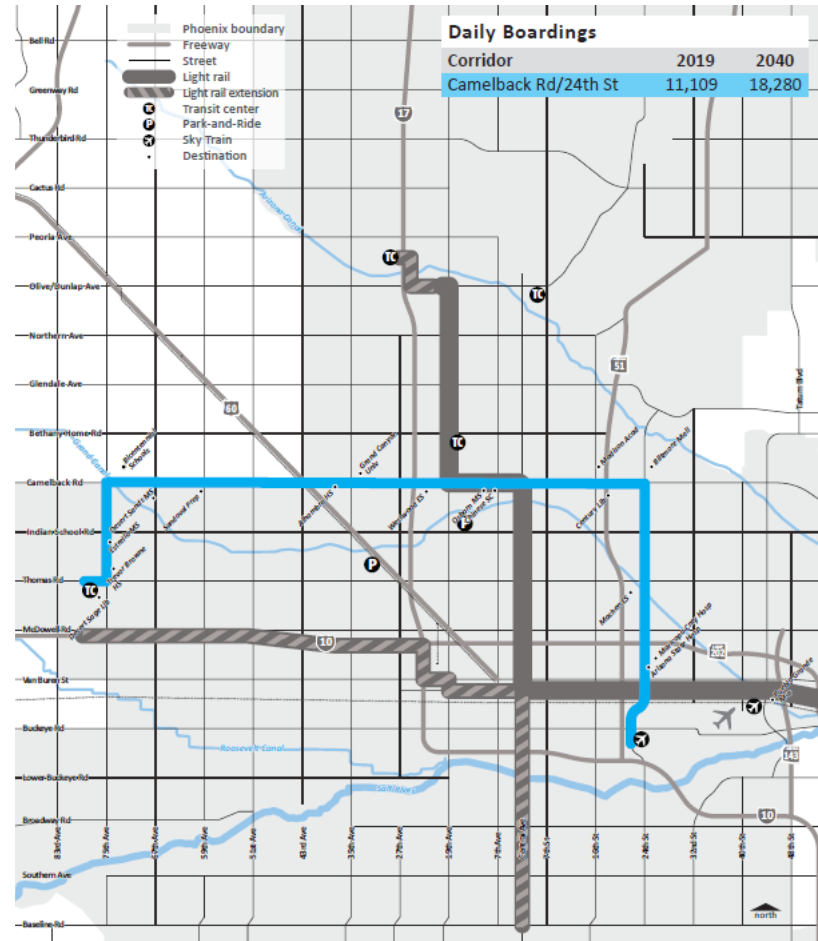
explored as an option for the services recommended in this study. However, it is likely that all of the same dynamics explored above will be present, resulting in very few riders transferring from a commuter route to light rail. It is more likely that commuter services would be phased out, and all current riders would be expected to park and board at the outer-most light rail stop.

Bus Rapid Transit (BRT)

Bus Rapid Transit (BRT) is another form of high-capacity transit not currently operating in the Valley. However, several past and current studies have assessed the feasibility of BRT along the corridors recommended for limited-stop services, namely Camelback Road (see Figure 61) and Scottsdale Road/Rural Road. The recommendations for limited-stop that overlap potential BRT corridors are meant to be complementary and synergistic rather than contradictory. Both BRT and limited-stop services perform best along high-density arterials that connect major activity centers like major employment locations. However, true BRT includes capital investments like bus-only lanes and transit signal priority. The recommended limited-stop services can be implemented with fewer capital investments and can be considered a less costly option with quicker implementation time, or an interim option before full BRT. It is not expected nor recommended, however, that both limited-stop services and BRT would operate in the same corridor simultaneously.

Other potential BRT corridors intersect with the arterials recommended for limited-stop service. Creating a network of high-frequency, high-quality transit options greatly benefits the whole region and makes potential ridership on these corridors stronger.

Figure 61 | Potential Phoenix BRT Corridor





FUNDING OPTIONS AND STRATEGIES

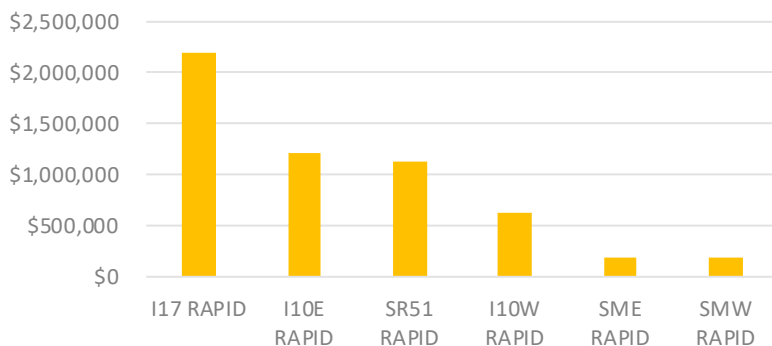
EXISTING FUNDING

Commuter services in the Valley are currently funded in a variety of ways, including local, regional, and federal funds. RAPID routes are funded by the City of Phoenix, while Express routes mostly rely on regional funds.

RAPID Routes

RAPID routes operate only within the boundaries of the City of Phoenix, and thus are funded entirely by the City. Phoenix voters approved the Transportation 2050 (T2050) initiative, which became effective on January 1, 2016. This ballot initiative raised a 0.7 percent sales tax for the city, which goes to fund RAPID routes, in addition to other transit investments such as local bus and light rail. This initiative also allocates funds to pay for new RAPID routes and extensions in the future.

Figure 62 | RAPID Routes Annual Cost



The total annual cost of operating RAPID routes is approximately \$5.5 million and is associated with the revenue miles for each trip. On average,

the service costs \$8.28 per mile to operate, translating to the total annual costs shown in Figure 62 by route. Annual costs for I-17 RAPID are the highest at approximately \$2.2 million since it is the most frequent RAPID route and has the greatest revenue miles. SME and SMW RAPID routes have the lowest annual operating cost, due to their low frequency and short route distance.

The City also collects fares on RAPID routes, which goes to offset the operational costs otherwise paid for by T2050 funds. Farebox recovery ratios in 2019 ranged from 7% on the SME RAPID to 28% on the I-10 West RAPID. Capital costs associated with buses are funded locally with a federal match.

Express Routes

Express routes cost approximately \$5.9 million to operate annually. The cost to run each route varies due to factors such as route distance, number of buses required in service, and the number of trips per day. Express routes are funded through a variety of sources, summarized below and shown in Figure 63:

- **Valley Metro Regional Public Transportation Authority (RPTA) Funds:** Regional transit funds make up most of the Express route funding. RPTA funds are allocated to various jurisdictions according to a pre-determined formula locally known as "jurisdictional equity."
- **Local Funds:** The Cities of Surprise and Chandler contribute local funding to supplement Express service to their cities.
- **Fares:** Fares make up 17 percent of gross costs for Express routes.
- **FTA Funds:** The FTA contributes funds to the operations of Express bus routes according to various funding formulas.



The distribution of funding sources differs by route and service area, as shown in Figure 64. West Valley routes, in general, get a greater amount of FTA funds per route than East Valley Routes. Routes 562 and 563 operate in the Avondale/Goodyear Urbanized Area (UZA). The Avondale-Goodyear UZA is designated as a Small UZA, meaning it had less than 200,000 population at the time of the 2010 Census. The UZA receives an apportionment of Federal Transit Administration §5307 funds and disburses these funds on a competitive basis. This means it can leverage a greater proportion of federal matching funds, 50 percent of operational costs after fares. However, this is likely to change. The UZA is likely to exceed the 200,000-population threshold by the 2020 Census, which would result in changes to UZA funding eligibility, particularly for transit operations.

The current UZA funding structure leaves more of the Phoenix-Mesa UZA federal funding credit dedicated to the West Valley jurisdictions for the other four routes in the West Valley (573, 571, 575, and Grand Avenue Limited). FTA funds make up about 20 percent of the total cost of these four routes. Additionally, the City of Surprise contributes some local funding for Route 571 Express.

The East Valley routes receive less federal funding credit per route, largely due to the greater number of routes among the jurisdictions in the East Valley. Federal funds make up approximately four percent of total costs. The City of Chandler also contributes some local funding for Route 542 Express.

Fares on Express routes offset operational costs. The farebox recovery ratio in 2019 for Express routes ranged from 7% on Route 520 to 25% on Route 535.

Figure 63 | Revenue Sources for Express Routes

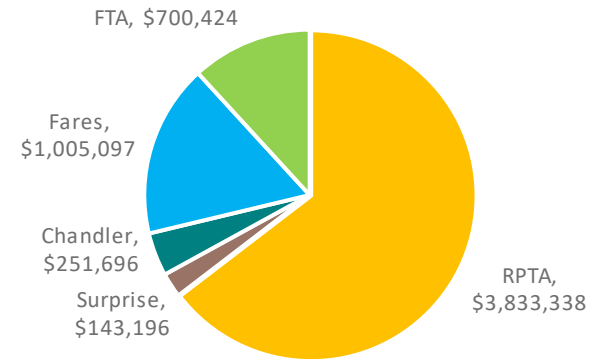
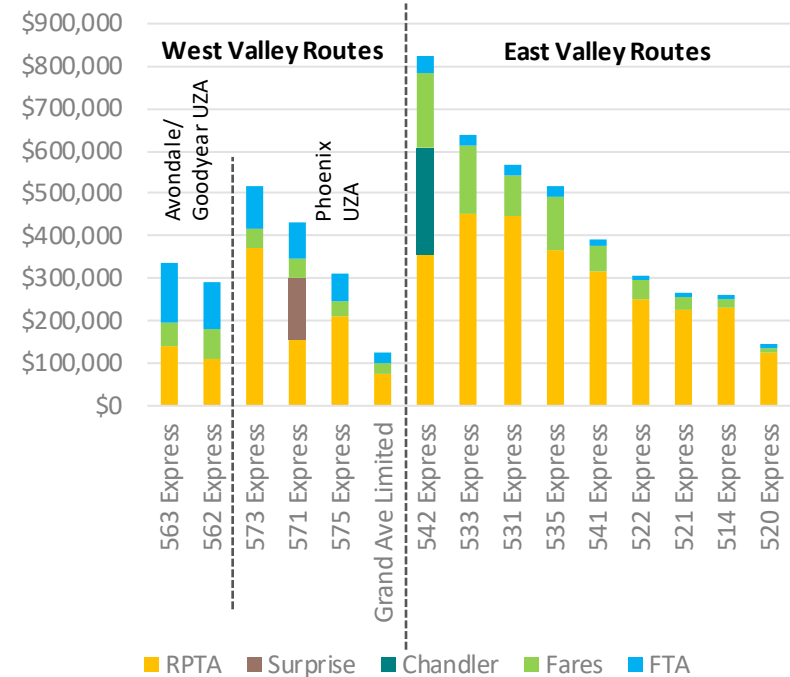


Figure 64 | Express Route Costs and Funding Sources by Route





FUTURE FUNDING STRATEGIES

As the Valley plans to revise and expand their commuter bus routes, agencies and municipalities should consider the following strategies to make funding more efficient:

- **Plan routes regionally:** Instead of dividing routes and funding pots between Express and RAPID routes, consider looking at them holistically in terms of funding with regional and local funds. This way, RAPID routes could serve areas outside of the City of Phoenix along the same route as park-and-rides within city limits.
- **Spend RPTA funds regionally:** RPTA funds are currently distributed among West Valley and East Valley routes using "jurisdictional equity." This leads to "handshake agreements," or complicated deals between cities on what credit to use to fund different sections of different routes. By looking at what the region needs, and distributing funds based on that need, funding can become more simplified and streamlined.
- **Maximize federal funding:** By planning routes regionally rather than by route or municipality, Valley Metro can ensure that there is a pot of local matching funds to ensure the region receives maximum federal match.
- **Operate high-performing routes to maximize farebox recovery:** The more riders per trip, the higher percentage of the trip that is paid for by fares. By using the Valley Metro Service Standards and other elements described in this document, all recommended routes have the potential for moderate to high ridership which can allow funding to go farther.



GROWTH INTO 2040

EXPRESS BUS RECOMMENDATIONS MARKET GROWTH

All studied job centers are projected to grow significantly by 2040, ranging from 23 percent in Phoenix North Central to 45 percent in the Price Corridor (see Figure 65). The market size for each commute route is expected to grow by a proportionate amount to the job center growth, since overall travel patterns are expected to remain similar based on job growth alone (see Figure 66). This results in the recommended routes with the highest current market sizes growing by the largest absolute number of riders. However, some current markets of more moderate sizes also grow significantly, especially routes to Downtown Tempe and Price Corridor, which have large job growth rates.

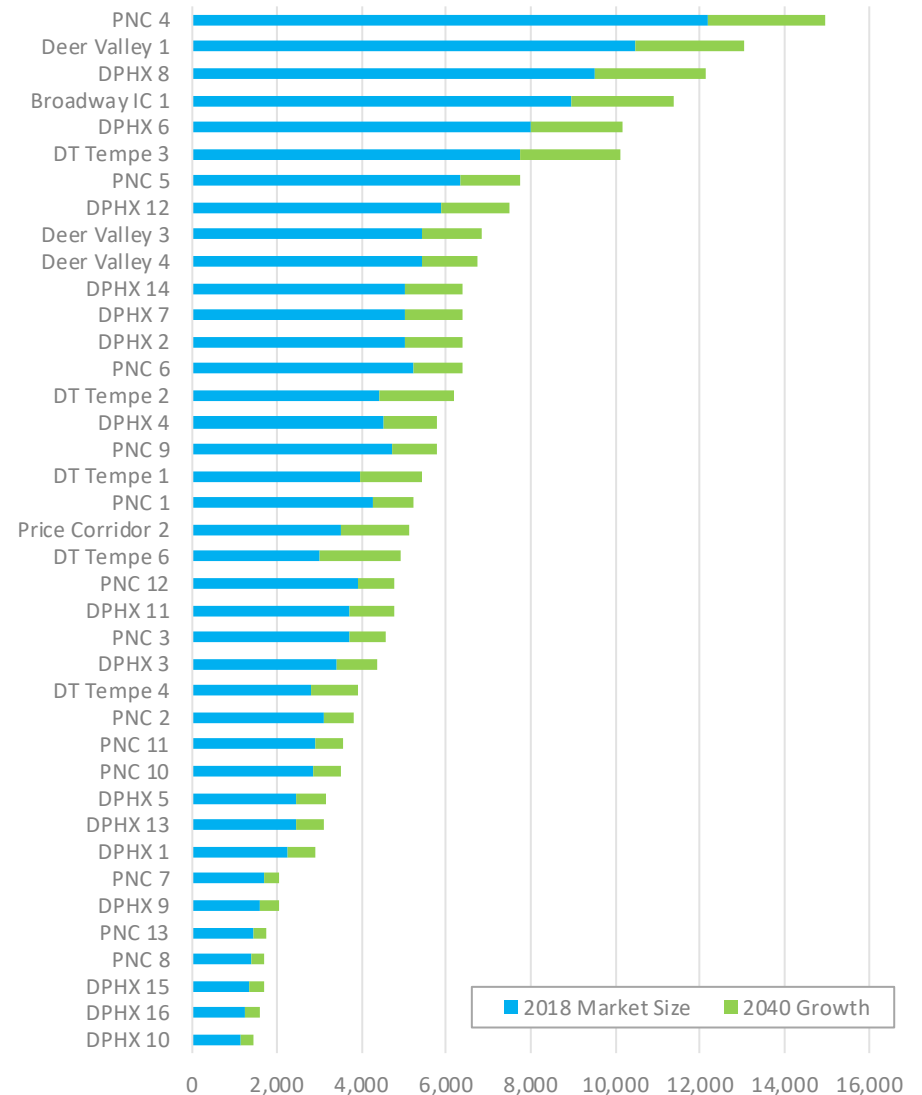
The resulting growth could likely create greater demand for trips during peak periods, and mid-day trips if the markets are large enough. Growth in the region will also result in increased congestion, which could make commuter bus more attractive, especially if bus travel times become more competitive through improvements to HOV travel speed.

Figure 66 | Job Center Growth

Job Center	Total Jobs (2040)	Growth (2018-2040)
Downtown Phoenix	69,110	27.4%
Phoenix North Central	76,890	22.5%
Downtown Tempe	33,590	35.0%
Deer Valley	73,350	25.4%
Price Corridor	52,270	44.5%
Broadway Innovation Corridor/Northwest Tempe	41,170	27.2%
Total	502,510	27.7%

Source: MAG Travel Demand Model

Figure 65 | Recommended Commuter Bus Market Size Growth (2018 - 2040)



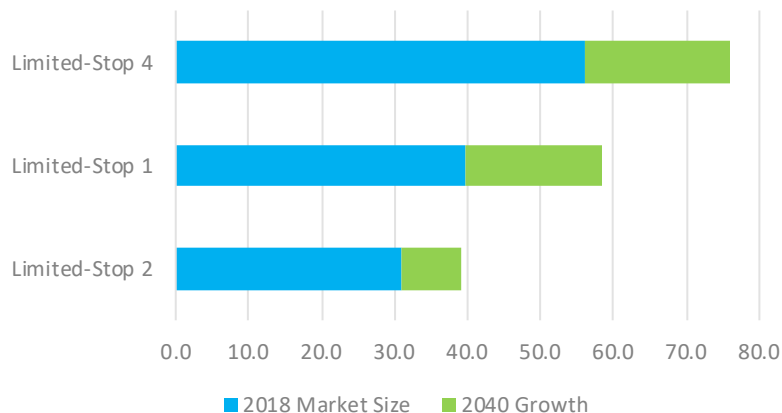


LIMITED-STOP RECOMMENDATIONS MARKET GROWTH

Limited-stop market size is assessed through combined population and employment density within a half-mile of each stop. Both Limited-Stop 4 and Limited-Stop 1 have very high current densities and are expected to be even denser in 2040 (35 percent and 47 percent denser, respectively). Limited-Stop 2 serves a less dense area but is also projected to be 27 percent denser in 2040.

Limited-Stop 4 and Limited-Stop 1 have projected densities in 2040 that are high enough to support very frequent service, as frequent as every 5 minutes. Continuing to densify some of the region's already dense corridors will aid in making the Valley a more transit-supportive environment.

Figure 67 | Limited-Stop Market Size Growth (by Combined Population and Employment Density, 2018-2040)

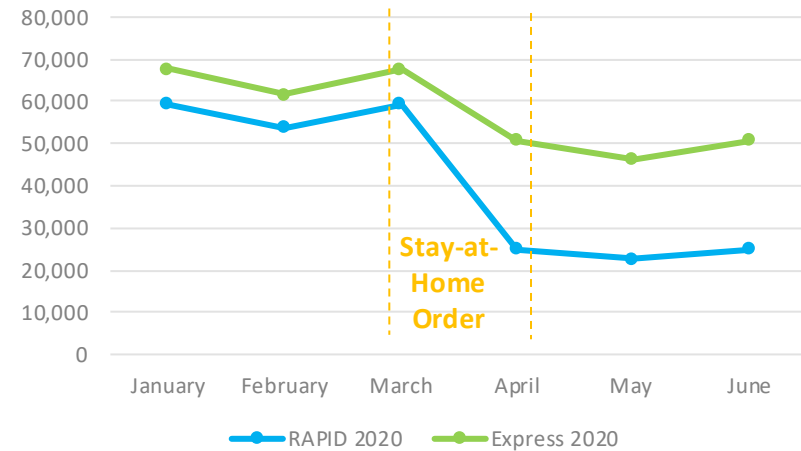


IMPACT OF COVID-19

The COVID-19 pandemic has impacted how people travel due to a variety of factors: increased working from home, stay-at-home orders, and temporarily closed job sites. Most transit services have seen large decreases in ridership. The decline of commuter bus ridership has been one of the most dramatic since commuter bus riders tend to be office workers who also own cars and thus can work from home or drive directly to work. Decreases in congestion have also made commuter bus less time competitive.

Many transit agencies have also decreased service due to budget cuts and decreased revenue. Valley Metro decreased its service on both Express and RAPID routes on April 6, 2020. As shown in Figure 68 through monthly revenue miles, Express service was reduced by about 25 percent and the more frequent RAPID service by over 50 percent.

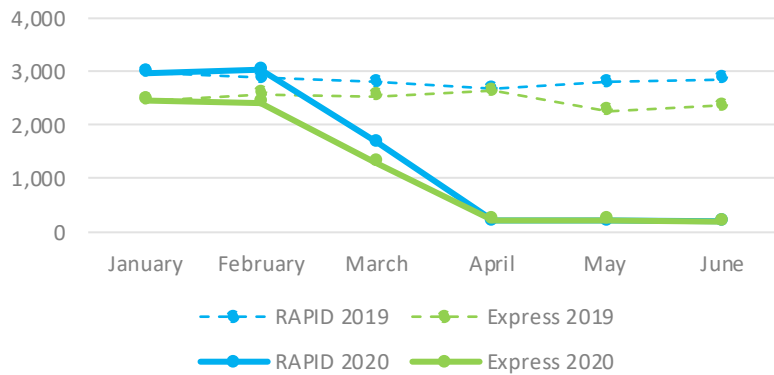
Figure 68 | Valley Metro Monthly Revenue Miles 2020





Ridership dropped by over 90 percent on both RAPID and Express routes, comparing April through June of 2020 to the same period in 2019 (Figure 69). Ridership has not yet shown signs of rebounding back to pre-COVID levels.

Figure 69 | Average Daily Boardings



Continuing to track ridership levels will be crucial to fully understand how to best provide transit during and after the pandemic. Valley Metro can adjust and rebalance service based on ridership data. Additionally, travel patterns may have changed permanently and may not be the same post-COVID, so tracking other behavior data such as the Maricopa County Trip Reduction Program Employee Survey can help the agency figure out what types of transit service can best serve commuters.

POSSIBLE SCENARIOS POST-COVID

After the COVID-19 pandemic, job centers and commute patterns may look different and require different transportation services than before the pandemic. During the market analysis phase of this project, analyzing the makeup of pre-COVID commuter bus ridership revealed that riders of these services are more likely to be white, from a household that has vehicles, and higher income compared to transit riders as a whole. Rather

than relying on transit out of economic necessity, these riders do so because of convenience or other benefits associated with transit. Nationally, peak-period transit travel has seen the biggest hit to ridership, while midday travel has decreased to a lesser extent.

Because the implementation time period for this project is medium term (five to ten years), it is likely that COVID-19 itself will no longer be a threat and affecting people's travel behaviors directly. However, long-term changes to the economy may occur. Potential changes include:

- Increase in people working from home most days of the week:** Those who work from home may continue to do so either permanently, or much more often than before the pandemic. Those who work from home most of the week would no longer need commuter transit services.
- Increase in people working from home one or two days a week:** Those who are able to work from home one or two days a week may choose to not use transit on the days they do go into the office, since many commuters use a monthly pass rather than pay for individual fares. When using the pass less often, it becomes less cost competitive. Working from home could also reduce the demand for peak-oriented travel. If it becomes more acceptable to commute only for certain meetings or work the morning or afternoon from home, for example, this reduces the demand for commuter bus because it does not run all day or frequently enough for flex schedules.
- Most people return to office:** Another potential scenario is that most people return to the office. While the culture and technical infrastructure may have changed to accommodate more working from home, companies and workers may seek the advantages that come from seeing co-workers in person, such as increased connections and a sense of belonging. Under this scenario commuters would likely return to their pre-COVID transit routes, though marketing may be needed to show that transit is a safe option.



- Lingering recession:** Even when the threat of COVID-19 is over, there may be a lingering recession for the few years after the pandemic. In a recession, unemployment is higher than usual, and there are fewer employees at job sites, reducing demand for commuter service overall.

The job centers analyzed in this study represent a variety of industries. Each industry and job site will be affected by the aftermath of the COVID-19 pandemic differently, so the potential changes described above will vary based on location and industry.

BEHAVIOR AND ATTITUDES

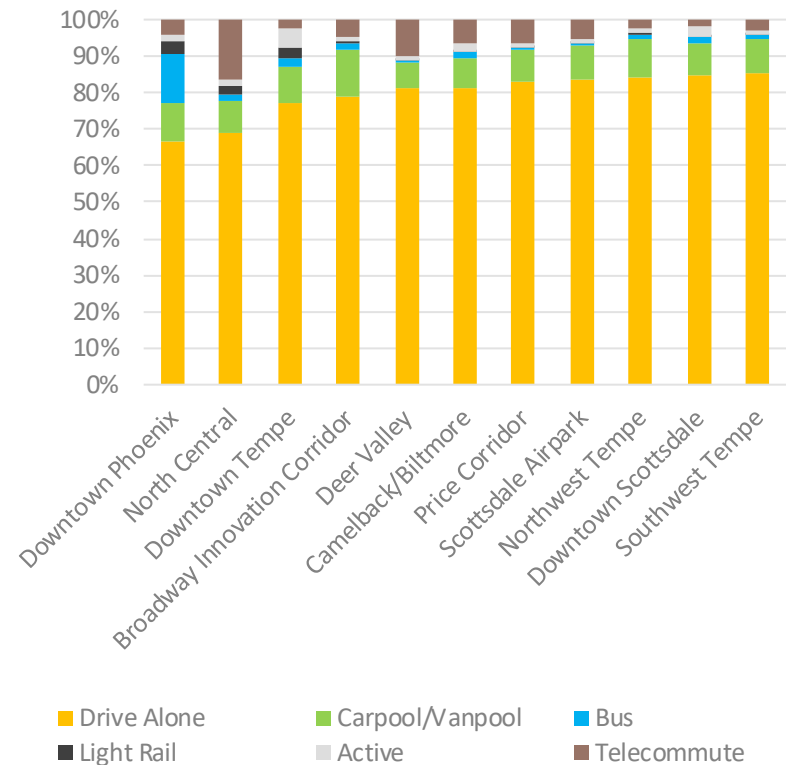
Looking at previous surveys and data collected in the region can help agencies understand the attitudes of commuters toward different transportation options and work schedules and better predict post-COVID behaviors. One such survey is Maricopa County's Trip Reduction Program Employee Survey, conducted annually for all employers in the region with 50 or more employees.

The 2019 iteration of the Trip Reduction Program Employee Survey found that employees overwhelmingly drive alone to their work sites, as shown in Figure 70. Only Downtown Phoenix had a sizeable proportion of employees who commuted by bus (14 percent), which is at least partially explained by the fact that current Express and RAPID buses only serve Downtown Phoenix. Based on the recommendations of this study, if commuter bus service were to be expanded to other job centers, the overall mode split of transit will likely increase.

Additionally, the job centers had a range of two to 17 percent of employees who telecommuted in 2019. North Central and Deer Valley, with the highest telecommute shares, could be the most likely to have higher telecommute shares post-COVID, due to the combination of having employers who supported the option before the pandemic and the increased infrastructure and cultural acceptance of telecommuting and flexible schedules during and post-COVID.

The survey also asked employees who commute by single occupancy vehicle what other option interested them the most. As shown in Figure 71, compressed work week and telecommuting were the most popular options in all but two of the job centers. This popularity indicates that workers would have engaged in this style of work had it been an option. While many employers did not offer a work from home or flexible work option before the pandemic, compressed work weeks and telecommuting could continue to be popular alternatives post-COVID. Both employers and employees will have gained more experience with them during COVID, and more employers may offer them as a permanent option.

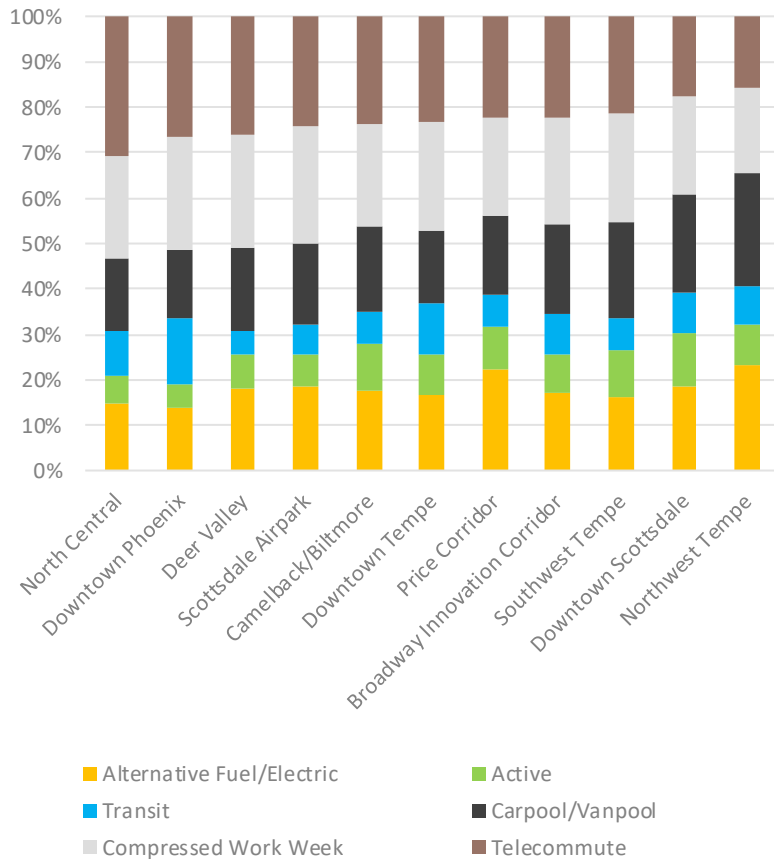
Figure 70 | Trip Reduction Survey Mode Split





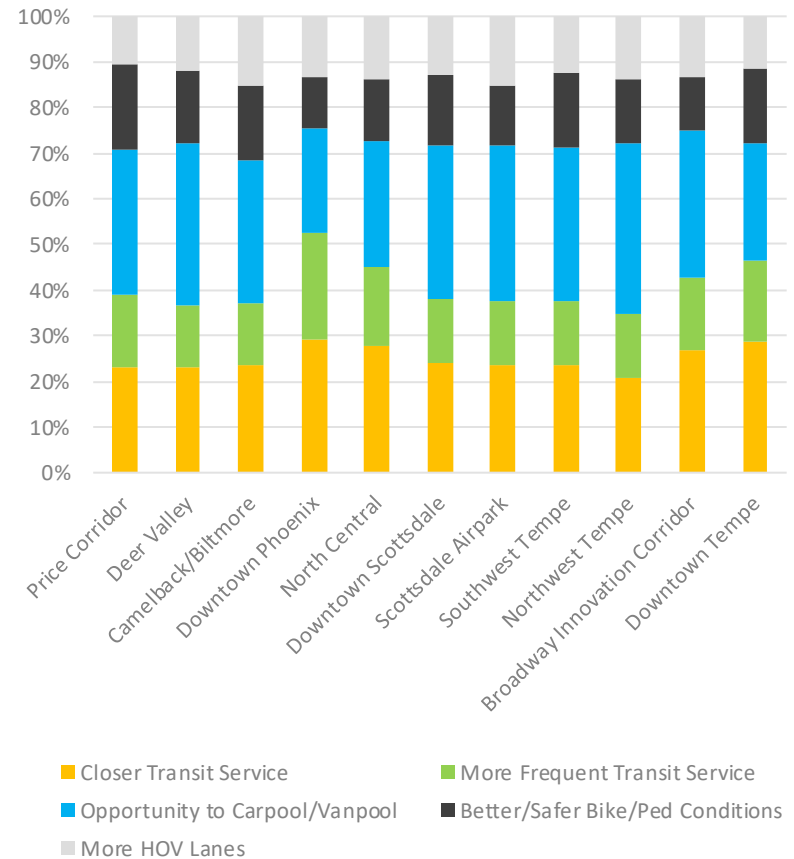
Lastly, the Trip Reduction Survey asked employees what transportation improvements they would like to see in order to reduce their single occupancy travel. As shown in Figure 72, improvements included: being closer to transit services; having more frequent transit service available; having the opportunity to carpool/vanpool; having better or safer pedestrian and bicycle connections; and the availability of additional HOV lanes. The recommendations in this study include greater frequency of

Figure 71 | Preferred Alternative to Single Occupancy Vehicle Commuting



express buses, as well as transit service that is closer to more job centers. HOV travel speeds could be improved through more enforcement or policy changes, so that they offer better time savings than existing HOV and general-purpose lanes. Improving transit frequency, speed, and reliability will be crucial for increasing its competitiveness with driving in the post-COVID era.

Figure 72 | Requested Transit Improvements





CONCLUSIONS

The recommendations in this report retain the integrity of the data-based approach used in the market and alternatives analyses, while also incorporating financial considerations and the practicality of various implementation timeframes. The report attempts to strike the balance between recommending the best performing and the most viable routes to inform the next iteration of the Regional Transportation Plan. The study team acknowledges it is difficult to forecast commuter bus needs beyond five to ten years due to changing market conditions and recommends that the market analysis be updated within that timeframe.

In addition, future studies should consider connections to light rail extensions, bus rapid transit, and the availability of new park-and-ride facilities, as these projects move closer to implementation. The performance of high occupancy vehicle (HOV) lanes throughout the region should continue to be monitored, perhaps prompting future conversations about enforcement and/or policy changes that would aid in the performance of commuter bus. Similarly, as congestion increases, direct high occupancy vehicle (DHOV) infrastructure should be assessed as a further means of time savings for commuter bus routes.

Another option that could leverage the efforts of cities and employers in creating mode-shift away from driving alone would be a regional transportation demand management (TDM) study. TDM strategies can boost ridership of high-quality transit services by providing additional incentives to not drive alone to work.

