

Mountain Line

On-Demand Feasibility Study

Adopted November 20, 2019



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Executive Summary

The purpose of the Mountain Line On-Demand Feasibility Study (On-Demand Study) is to analyze the cost, considerations, and benefits of implementing an on-demand program within the Mountain Line boundary. On-demand transportation is defined as a flexible, real-time hailed transportation option which utilizes emerging technologies and private sector partnerships. As new mobility service providers disrupting transportation services with cutting edge technology emerge, there is a growing trend for public transit agencies to partner with these private companies to enhance public transit. Such partnerships tend to focus on on-demand services that can be hailed in real-time such as subsidizing Transportation Network Companies (TNC), like Uber and Lyft, trips to connect to a transit stop or implementing an in-house microtransit program through a software partnership that allows agency vehicles to be summoned on-demand.

GOALS OF STUDY:

- To provide a cost-effective solution in areas along low performing routes
- To provide a level of service where there is currently no fixed-route transit, both spatially and temporally
- To provide a first mile-last mile connection to fixed-route

Chapter 1: Introduction – Provides information on the purpose of this study, types of on-demand strategies researched, the benefits of implementing on-demand program, and applicability of these strategies. On-demand transportation can complement a fixed-route transit system by helping fill transportation gaps, such as a first mile-last mile connection, serve suburban or rural areas where fixed-route transit is not warranted, or provide late-night or weekend service when fixed-route transit ridership is low. In areas that are dense and have linear streets, fixed-route is still the most cost-efficient way to move people from one place to another. On-demand transportation should not replace high ridership routes.

Chapter 2: On-Demand Strategies – Provides information on the two main on-demand strategies: microtransit and partnership with TNCs. Microtransit is IT-enabled, multi-passenger transportation service that serves passengers using dynamically generated routes to maximize ridership and productivity. There are a variety of private companies that partner with transit agencies to provide this service through a spectrum of operation models, from software only to a turn-key solution. TNCs, such as Uber and Lyft match passengers with vehicles via a mobile app and website.

Chapter 3: Performance Analysis - This section includes three different analyses which feed into the program design of an on-demand strategy. The first part analyzes Mountain Line's fixed-route system and identifies low performing routes and sections of routes to understand if an on-demand system would be more cost-effective than providing fixed-route in these areas. This analysis demonstrated that for the Thorpe Loop area, an on-demand program can be more cost efficient than fixed-route and provide a higher level of service.

The second part of this chapter includes a geographic analysis which identifies areas within Mountain Line's boundary where there currently is no transit service and assesses travel patterns and number of trips to and from these areas. The geographic analysis shows that University Heights, Country Club Estates, Industrial Drive, and Doney Park are the areas where on-demand transportation are recommended for further analysis.

Lastly, a temporal analysis which identifies the time gap in which of no transit service is provided by Mountain Line from about 10:30 pm – 5:45 am. Further analysis shows that the period from 11 pm – 3 am on Friday and Saturday has the highest concentration of vehicle trips outside of Mountain Line’s current service hours. These results indicate that this time period would be the priority to fill a temporal gap when there is no transit service. If funding allows, the program could expand to other days of the week.

Chapter 4: Program Design – The section incorporates the data results from Chapter 3 and designs an on-demand program which addresses a specific goal identified in Chapter 1.

Goal 1: Provide a cost-effective solution in areas along low performing routes. Thorpe Loop is the one area in the Mountain Line system where there are more benefits than challenges to streamlining a low performing route with an on-demand solution. It is recommended that this program will use the microtransit strategy with one dedicated vehicle during Route 5 service hours and will rely on utilizing Mountain Lift paratransit vehicles that are in service to supplement the service.

Goal 2: Provide a level of service where there is none, either spatially or temporally. This chapter has two different on-demand programs to meet this goal; a Late-Night program and a program in Doney Park.

The Late-Night zone will cover Flagstaff city limits and run from 11 pm – 2:30am Fridays and Saturdays. Since Mountain Line currently does not run service during this time, a TNC partnership can be the first phase to understand demand and travel patterns. To receive the Late-Night TNC subsidy, this study recommends it by required that a passenger must use fixed-route for one part of their journey. For example, using the bus to get to work but then using a TNC to get home when the fixed-route is no longer running.

Doney Park is an area that is outside of Flagstaff city limits that could be considered for an on-demand program. However, through additional analysis, Doney Park is not recommended at this time. Funding for this program poses a challenge since it is outside of Flagstaff city limits. Due to the large service area and high ridership numbers, Mountain Line would need 3 - 4 dedicated vehicles in the area for microtransit. This equates to over \$700,000 in operating costs and Mountain Line would need to buy additional vehicles.

Goal 3: Provide first mile-last mile connection to fixed-route. Based on results from geographic gaps in Chapter 3, University Heights and Country Club/Industrial are two areas where a first mile-last mile on-demand program could be implemented.

The hills and narrow roads in the University Heights neighborhood are challenging for a 40-foot bus to safely navigate. Connecting people from University Heights to Routes 4, 14, and 10 is a viable option for a first mile-last mile solution since there are three different fixed-route options. It is recommended that this program utilizes the microtransit strategy since it is about \$70,000 less than a TNC partnership.

The second on-demand zone includes the Country Club neighborhood and Industrial Drive area north of I-40 and south of Route 66 and the railroad tracks. The on-demand solution could be delivered through either the TNC or microtransit strategy since the overall program costs are similar for both programs. Microtransit has advantages and is the recommended strategy since it is operated in-house, there is more ownership of the program, and there are Mountain Lift vehicles that pickup and drop-off in the area.

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Chapter 5: Implementation - Provides recommendations and phasing of the on-demand programs analyzed in this On-Demand Study. The phasing recommendations are based on the need, readiness, and feasibility of the program. This chapter also provides a five-year budget, policy considerations, federal requirements, and marketing suggestions.

The first priority is to have a demonstration in the Thorpe Loop area. Then it would be Late-Night, followed by University Heights and then Country Club/Industrial. Doney Park is not recommended at this time. Funding for this program poses a big challenge since it is outside of Flagstaff city limits. In addition, TNC availability in Doney Park is another issue that would need to be addressed before the program is implemented.

The following is a five-year budget to implement the on-demand programs. Funding these programs is a challenge since there are limited new revenue opportunities. Public-private partnerships is a potential revenue source to fund these programs. Otherwise, according to peer city research, majority of agencies used local funds to pay for on-demand programs. The local funds include savings from eliminated fixed-route service and local sales tax.

Five-year budget for on-demand programs

	Year 1	Year 2	Year 3	Year 4	Year 5
Program implementation	Thorpe Loop	Thorpe Loop, Late-Night	Thorpe Loop, Late-Night, University Heights	Thorpe Loop, Late-Night, University Heights, Country Club/Industrial	Thorpe Loop, Late-Night, University Heights, Country Club/Industrial
Annual Operations	\$169,670	\$300,476	\$598,743	\$979,278	\$979,278
One-time software start-up costs	\$35,000	N/A	N/A	N/A	N/A
Annual Technology fees	\$9,000	\$9,000	\$27,000	\$54,000	\$54,000
Fleet Costs *if Mountain Lift is at capacity	\$160,000	N/A	\$320,000	\$480,000	N/A
Total Cost	\$373,670	\$309,476	\$945,743	\$1,513,278	\$1,033,278

The On-Demand Study also includes a variety of policy considerations, including fare structure, payment options, Title VI implications, wait times, and pick up policies. There is also information on federal requirements including drug and alcohol testing requirements, Americans with Disabilities Act (ADA), and National Transit Database (NTD) requirements.

Marketing is also a crucial part of implementing an on-demand program. Based on peer research, one of the top lessons learned from other on-demand programs is to have a robust marketing plan. This includes tabling events to teach people how to use the app, flyers in the mail, social media, lunch and learns, and advertisement on websites. The On-Demand Study provides messaging ideas and targeted marketing information.

Chapter 1: Introduction

As new mobility service providers disrupting transportation services with cutting edge technology emerge, there is a growing trend for public transit agencies to partner with these private companies to enhance public transit. Such partnerships tend to focus on on-demand services that can be hailed in real-time such as subsidizing Transportation Network Companies (TNC), like Uber and Lyft trips to connect to a transit stop or implementing an in-house microtransit program through a software partnership that allows agency vehicles to be summoned on-demand. On-demand transportation is defined as a flexible, real-time hailed transportation option which utilizes emerging technologies and private sector partnerships.

The purpose of the Mountain Line On-Demand Feasibility Study (On-Demand Study) is to analyze the cost, considerations and benefits of implementing an on-demand service within the Mountain Line boundary.

GOALS OF STUDY:

- To provide a cost-effective solution in areas along low performing routes
- To provide a level of service where there is currently no fixed-route transit, both spatially and temporally
- To provide a first mile-last mile connection to fixed-route

BENEFITS

On-demand transportation has a variety of benefits for the customer, including reduced wait times and increased mobility options. It can also help reach community coverage goals, such as providing some level of service in an area that does not have any. Figure 1 shows the benefits from the customer perspective, transit agency perspective, and shared benefits.

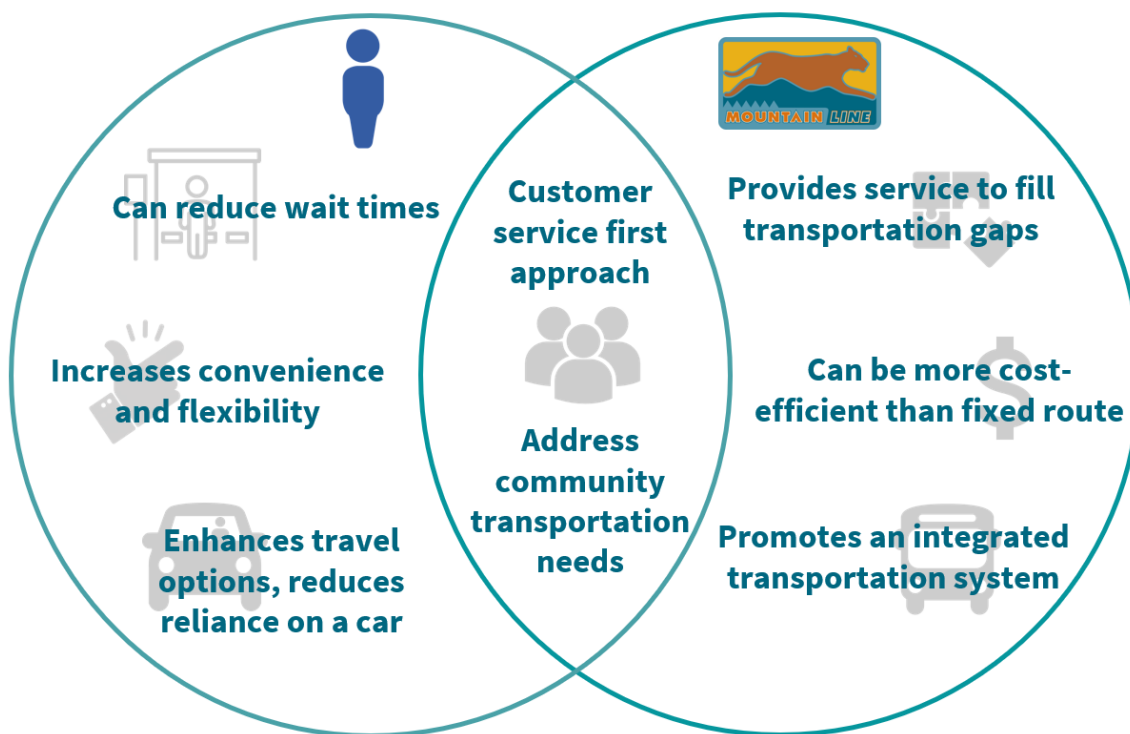


Figure 1: Benefits of On-Demand Transportation.

APPLICABILITY

On-demand transportation can complement a fixed-route transit system by helping fill transportation gaps, such as a first mile-last mile connection, serve suburban or rural areas where fixed-route transit is not warranted, or provide late-night or weekend service when fixed-route transit ridership is low. In areas that are dense and have linear streets, fixed-route is still the most cost-efficient way to move people from one place to another. On-demand transportation should not replace high ridership routes.

Best uses include:

- Connections to bus stops and transit hubs
- Provide service during off-peak hours
- Service in low-density areas or suburban neighborhoods
- Replace low performing fixed-routes

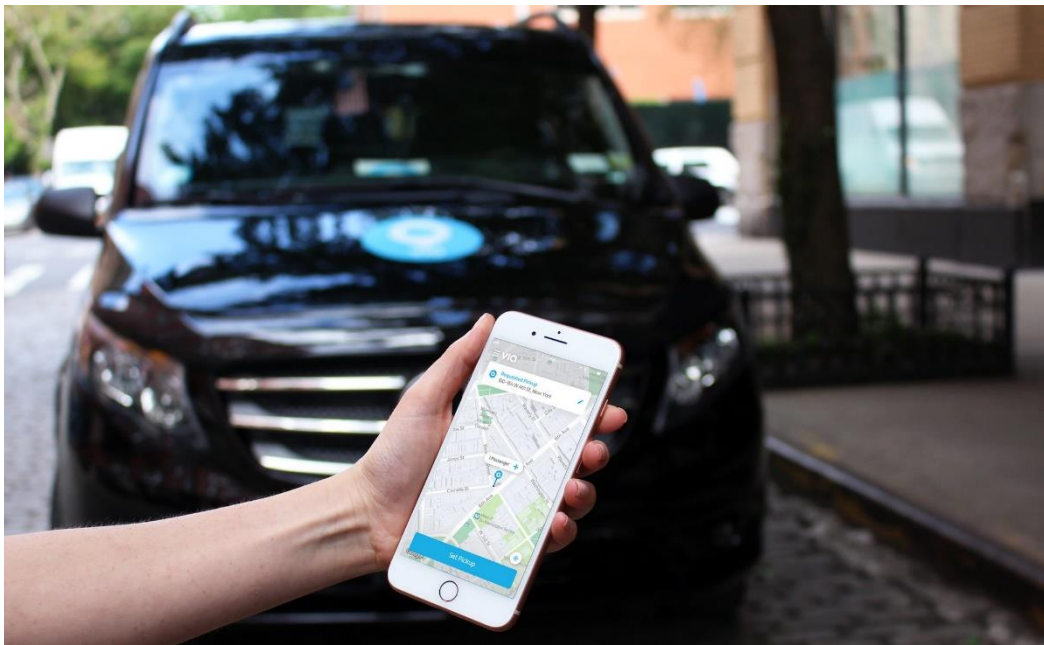


Figure 2: Jersey City on-demand service with Via. Source: 6sqft.com

Chater 2: On-Demand Strategies

There are two main on-demand strategies to choose from: microtransit and partnership with transportation network companies (TNCs). The following provides information on the types of operation models and applicability of each strategy.

MICROTRANSIT

The Federal Transit Administration (FTA) defines microtransit as IT-enabled, multi-passenger transportation service that serves passengers using dynamically generated routes to maximize ridership and productivity. The rides are real-time hailed through a smart phone app. This transportation option is intended to increase passenger convenience by keeping wait times between 5 – 20 minutes and reduces walking distances since it is a curb to curb program.

OPERATION MODELS

There are a variety of private companies that partner with transit agencies to provide this service through a spectrum of operation models, from software only to a turn-key solution. Hybrid operation models also exist wherein the private company can provide software and vehicles, or software and operations.

SOFTWARE

Most of the companies offering microtransit services provide the software only operation model. This includes both a passenger app and a driver app. The software for the driver app will dynamically route drivers in real-time to pick up riders in the most efficient manner. The software matches riders together with similar origins and destinations, creating shared rides. The driver has a tablet that gives directions to pick up passengers. The software only model also includes a smartphone app and website for passengers to request rides; some companies also provide a call-in option for people who do not have a smart phone or would rather talk to a person to order a ride. However, based on the peer cities, if the app-based option is advertised and promoted, people tend to use the app since it results in a faster pick up. Through the app, the passengers can see where the vehicle is in real-time and the estimated wait time.

Through the software only model, the drivers, vehicles, and operations management are all provided by the transit agency. This provides the agency more control of the overall program, driver training, customer service expectations, and vehicle maintenance. Agencies can also use underutilized paratransit vehicles for microtransit service. In this scenario, drivers do not need a Commercial Drivers License (CDL) to operate a paratransit van, making it easier to hire drivers and expedited training.

TURN-KEY

The turn-key solution is an operation model where the private company deploys and operates the microtransit service on the agency's behalf. The model includes the technology needs as well as the drivers, vehicles, and operations management. This option can be more expensive than the software only model, and the agency has less control of the overall operations and program details. This solution works best for transit agencies that do not have capacity to either repurpose existing vehicles or purchase additional vehicles. In addition, if an agency is facing driver shortages or is at management or dispatching capacity, this solution can relieve some of the added workload of establishing a new program. With the turn-key model, there needs to be in-house oversight of the program and

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management of the private company to ensure not only the success of the program, but that it complements the transit agency's brand and reputation in the community.

EXAMPLES

The following table shows examples of private companies that provide microtransit software; this is not an exhaustive list and was updated October 2018. There is additional information in Appendix A.

Table 1: Microtransit service providers

	TransLoc	Routematch	Ecolane	Via	Transdev
Type of service provided	Software only	Software only	Software only	Software or turn-key	Software or turn-key
Cost for 6-month pilot	6-month pilot: \$25,000 (subsidized)	6 months pilot with 6 vehicles: \$45,000 - \$50,000	N/A	6-month pilot is \$23,500, 12-month for \$44,000	N/A
Software start-up costs	Included in pilot	Included in pilot	\$33,000 first year, 20% less the next year	\$40,000 set up fee	\$15,000 - \$35,000
Reoccurring software costs	1-5 vehicles \$500 per month, 6-10 \$450 per month	\$1,000 per vehicle per month	\$800 per vehicle per month	\$700 per vehicle per month	Depends on partnership agreement
Turn-key cost per hour	N/A	N/A	N/A	\$45-49 per hour	Call center \$1.80 per call. \$28-\$33 per hour
Order rides through app and phone option	Both	Both	Both	Both	Both
ADA vehicle option	Software only	Software only	Software only	Yes	Yes
Provide data	Yes	Yes	Yes	Yes	Yes
Payment through app	No?	Yes	Yes	Yes	Yes
Integrate fare with Mountain Line	No?	Yes	Yes	Yes	Yes

TRANSPORTATION NETWORK COMPANY (TNC)

Transportation Network Companies (TNC) such as Uber and Lyft have provided app-based ride-sourcing services in U.S. cities since 2012. These companies match passengers with vehicles via a mobile app and website. These services are also known as ride-hailing and ridesharing.

TRANSIT PARTNERSHIPS

When TNCs began expanding in U.S. cities, it was uncertain if this new service would complement transit or detract from ridership growth. Several transit agencies partnered with TNCs directly to try and understand the relationship between transit and this new technology. The primary motivation for transit agencies to partner with TNCs include demonstrating innovation, increasing mobility for existing and new transit customers, and improving cost efficiency. TNC companies are motivated by attracting new customers and demonstrating efforts to solve local mobility challenges. Many of the partnerships with TNCs have been in the form of agencies subsidizing TNC trips within a certain area or time of day to fill in transportation gaps. Taxi's have also been utilized to provide a cash-only and call-in option.

COMPARING STRATEGIES

Both a TNC partnership and a microtransit program are best used in areas and/or times of day when there is low fixed-route ridership, such as late-night service or serving a suburban neighborhood. However, there are two major differences between the on-demand solutions. The first difference is program oversight and management. Transit agencies have less control with a TNC partnership in terms of vehicle type, drivers, and data sharing. However, these programs run more like a turn-key since there is less staff needed and utilizes existing vehicles. A challenge with a TNC partnership is the availability of data. TNCs have been hesitant to provide trip data, including origin and destination data, due to concerns over privacy and public record requests. The second difference is the cost of service. Microtransit operations are often budgeted using cost per hour, like traditional fixed-route services. TNC partnerships are subsidizing trips and therefore budgeted using cost per trip. Depending on the estimated ridership, a service might be more cost efficient through one of the on-demand strategies, but not the other.

PEER CITY RESEARCH

Peer city research was conducted to understand the types of on-demand programs that are being implemented around the country. Researching how these programs are being implemented, lessons learned, and successes associated with the services is pertinent to the development of this On-Demand Study. Additional information about the research can be found in Appendix F.

Fourteen different on-demand programs were researched; six of those were TNC partnerships and eight were microtransit programs. From the research conducted, 47% are first mile-last mile programs, 40% of the programs serve areas with no or limited transit service, and 13% are programs to fill late-night or weekend service gaps.

There are four main lessons learned from the peer city research. The first is marketing. It is important to create a robust plan, educate customers, and use both traditional outreach methods and social media to promote the program. Second is demand. Many of the programs had more demand than predicted, which causes difficulties with wait times and budget. It is important to be flexible and track the program daily, especially during the beginning of implementation. The third lesson learned is to have a pilot or demonstration. It is important to test and make adjustment often. Lastly is planning. Be clear on the goals to help design the program. The agencies researched include:

City of Phoenix | San Joaquin Regional Transit District | Capital Metro | Pinellas Suncoast Transit Authority | Norwalk Transit District | York Regional Transit | City of Arlington | Gwinnett County Transit | Harvard University | Tri-Valley Wheels | City of Monrovia | Valley Regional Transit | Dayton RTA | Marin Transit | Ann Arbor Area Transit Authority

Chapter 3: Performance Analysis

This section includes three different analyses which feed into the program design of an on-demand strategy. The first part analyzes Mountain Line's fixed-route system and identifies low performing routes and sections of routes to understand if an on-demand system would be more cost-effective than providing fixed-route in these areas. The second part is a geographic analysis which identifies areas within Mountain Line's boundary where there currently is no transit service and assesses travel patterns and number of trips to and from these areas. This analysis is to understand first mile-last mile connections in Flagstaff. Lastly, a temporal analysis is conducted which identifies time gaps of no transit service within Mountain Line's system.

LOW PERFORMING ROUTES

Figure 3 shows Mountain Line's average weekday boardings from October 2018. Route 5, overlaid in yellow, has the lowest ridership in the system. In addition, the Thorpe area, known as Thorpe Loop has additional concerns for the system since it increases the ride time by 8 minutes or more for the passengers who are traveling downtown. Another section with low ridership is on Route 3, along Soliere/Country Club. This area is surrounded by bus stops

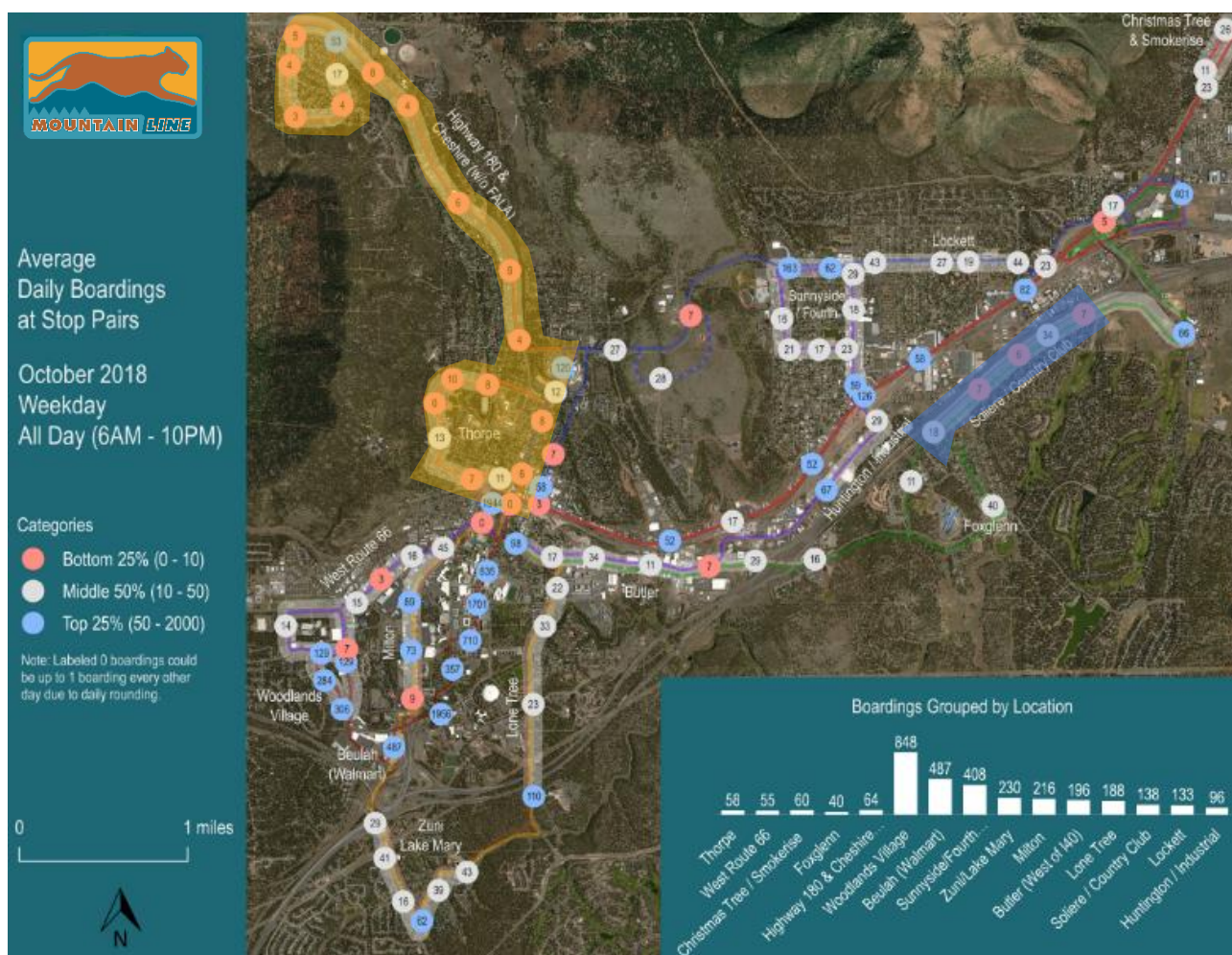


Figure 3: Average Daily Boardings October 2018

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in the top and middle of the ridership categories, making it challenging to reasonably cut the route at the same time. Country Club's low density and circuitous roads makes it difficult for a fixed-route bus to travel through the neighborhood. Therefore, it is possible to consider an on-demand program meeting new service area goals that would drop passengers at these low performing bus stops and increase their productivity. See Chapter 4 for more information.

Table 2 represents the three areas in the Mountain Line system which are low performing. The cost estimates for the microtransit and TNC partnerships are for wait times of 15 minutes or less. The estimated cost for microtransit uses a cost per hour of \$50.71, which incorporates FY20 budgeted wages for an operator and operations and maintenance of a paratransit vehicle. To determine the number of vehicles needed for microtransit, estimated ridership and size of the area is needed. More information on estimated ridership and area size is in Chapter 4: Program Design and Appendix B and E. The cost estimates for TNC partnership subtracts \$1.25, cost of a one-way Mountain Lift ticket, from the estimated Lyft trip in the area (<https://www.lyft.com/rider/cities/flagstaff-az>) and multiplies that number by estimated ridership in the area. More information on estimated ridership can be found in Appendix B. The fixed-route costs are for 15-minute frequency to show comparative costs and utilizes cost per hour of \$63.51.

Thorpe Loop is the only area that can be reasonably cut from the rest of the route and have an on-demand service serve that area cost-effectively. The Soliere/Country Club will be further analyzed as a first mile-last mile solution since the route cannot be reasonably streamlined.

Table 2: Low performing areas in Mountain Line's system

	Route 5	Thorpe Loop	Soliere/Country Club
Fixed-route existing frequency	\$440,700	\$58,300	\$94,700
Fixed-route cost (15 mins)	\$997,600	\$181,100	\$253,500
Microtransit	\$1,149,336	\$169,670	\$300,989
TNC Partnership	\$1,505,244	\$130,031	\$150,282
Other Considerations	Route 5 has high enough ridership that it would take 6 microtransit vehicles to serve this area, increasing costs.	Route 5 would be 35 min runtime, save passengers 8 minutes going downtown.	Better for a first mile-last mile program since route cannot be reasonably cut.

GEOGRAPHIC GAPS

WITHIN FLAGSTAFF

Transit is a valued part of Flagstaff's mobility culture, as demonstrated by the dedicated transit tax that was first approved in 2000 for ten years, increased in 2008, and renewed in 2016 with a sunset in 2030. This transit tax has an integral role in providing fixed-route services in Flagstaff. However, there are several areas in Flagstaff which are not conducive to fixed-route due to the street configuration, lack of connectivity within the area, and/or low densities. Microtransit and TNCs can potentially serve these areas better than fixed-route because they can be more responsive and can cover a larger area, increasing the potential rider pool.

As shown in Figure 4, there are several areas within Flagstaff city limits which are outside of a .25-mile walk shed from existing bus stops. This map is developed using the road network providing a realistic

view into where people can walk to stops to access the Mountain Line system. Blue areas are those that are served while grey are not. Areas of Flagstaff that do not currently have transit service are analyzed in Table 3.

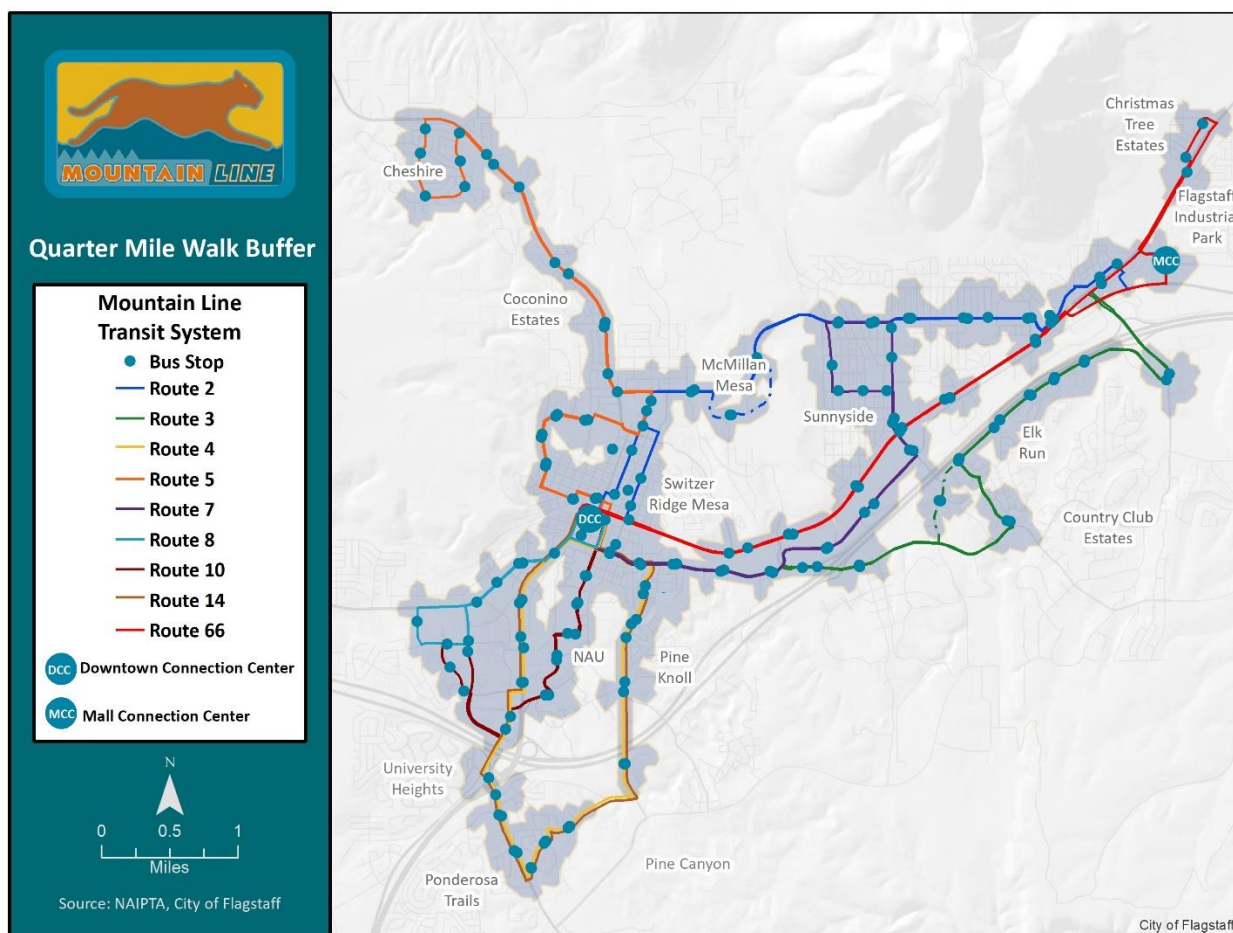


Figure 4: Quarter Mile Walking Shed Buffer from Bus Stop

University Heights and Ponderosa Trails

University Heights and Ponderosa Trails are both residential suburban neighborhoods south of I-40 in the Flagstaff city limits. Both of these neighborhoods have low walkability to stops since many of the roads are circuitous and do not connect to the main road. Route 4 and 14 could be rerouted to serve University Heights, but the narrow streets and hills make it difficult for a 40-foot bus to navigate the roads and the extra time would mean more buses would be needed to maintain existing levels of service on the remainder of the routes. Mountain Line's 5-Year Transit plan identifies serving Pulliam Airport. If Mountain Line starts to serve the airport, a route could go through Ponderosa Trails and serve that neighborhood through fixed-route. Therefore, University Heights is recommended for more on-demand research and Ponderosa Trails is not.

Woody Mountain

Woody Mountain has a mixture of low-income housing along Route 66, including Hidden Hollow Manufactured Homes and Kit Carson RV Park. There are also housing communities along Woody Mountain Road, including Presidio in the Pine and Timber Sky Development, which are not dedicated

affordable housing. This area is also home to one of W.L. Gore and Associates Inc. offices, a large employer in Flagstaff. Serving this area with fixed-route is an area identified in Mountain Line's 5-Year Transit Plan as Route 8 can extend to serve this area. Therefore, this area is not recommended for further on-demand research.

Pine Canyon

Pine Canyon is a low-density suburban neighborhood adjacent to a golf course. This neighborhood houses many vacation rentals and second homes making it likely a low ridership area. This neighborhood also has circuitous roads which do not connect, causing difficulties for fixed-route and walking to and from bus stops. Route 4 and 14 could be rerouted to serve this area, however this would add 17 minutes of run time, decreasing the rider experience for existing riders. Since this area has many vacation rentals and second homes, it is not recommended for further on-demand research. The Mountain Line's 5-Year Transit Plan shows potential service along the new John Wesley Powell road. As planning for and the roadway develops, the appropriate service type can be re-evaluated.

Country Club Estates

Country Club Estates is a large suburban, residential neighborhood. There is a golf course throughout the neighborhood, with narrow, circuitous roads. Currently, Route 3 serves several apartment complexes along Soliere Avenue. Due to the size and road configuration in Country Club, walking to the bus stops on Soliere Avenue is not a convenient option for people living in the neighborhood. Since the bus stops along Soliere Avenue have low ridership, it is recommended Country Club be analyzed further for a first mile-last mile on-demand program to bring more people to these existing bus stops.

Industrial Drive

Industrial Drive is home to a variety of human service organizations, including Flagstaff Shelter Services, Hozhoni Foundation, and The Guidance Center. This area is between Route 66 and the railroad tracks to the north and I-40 to the south, causing barriers to access existing transit. This is a major destination for many of Mountain Line's most vulnerable passengers, who must walk almost one mile to access Route 66 bus stops. To serve this area through fixed-route, a new route would need to be created. Therefore, this area is recommended for further on-demand research to understand the best way to serve this area through an on-demand program.

Flagstaff Pulliam Airport

Flagstaff Pulliam Airport is a popular destination in Flagstaff. It provides flights to Denver, Dallas, and Phoenix seven days a week. Parking is free at the airport, but the limited capacity provides challenges for future growth. There is currently no public transportation that goes to the airport. Serving the airport is identified in Mountain Line's 5-Year Transit Plan as an area to add fixed-route service. Therefore, it is not recommended to analyze this area further through an on-demand program.

Table 3 below represents the areas in Flagstaff without transit service. It evaluates if these areas can be served by an existing fixed-route and estimates the added cost and run time to reroute existing service to service these areas. It also provides a recommendation if these areas should be researched further for on-demand service.

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Table 3: Serving Flagstaff areas with transit

	University Heights/ Ponderosa Trails	Woody Mountain	Pine Canyon	Country Club Estates	Industrial Drive	Flagstaff Pulliam Airport
Add onto existing route	Reconfigure Route 4 and 14	Extend Route 8	Reconfigure Route 4 and 14	No	No	No
Length of route	2.52 mi	2.64 mi	4.31 mi	7.52 mi	6.25 mi	11.08 mi
Run time	11 mins	10 mins	17.3 mins	30 mins	25 mins	44 mins
Fixed-route cost per year	\$114,150	\$114,400	\$161,700	\$781,400	\$260,100	\$478,700
Recommended for more on-demand research	Yes. Narrow streets, difficult to serve with fixed-route	No. Easy to add onto existing network, identified in 5-Year Transit Plan to serve this area.	No. Circuitous roads, low density. Area has many second homes and vacation rentals	Yes. Large area, low density, circuitous roads, difficult to serve with fixed-route	Yes. Low density, area does not need service all day	No. Large area, ridership estimates warrant fixed-route, identified in 5-Year Transit Plan

OUTSIDE FLAGSTAFF

There are several neighborhoods outside of Flagstaff city limits but are within Mountain Line's service boundary, which coincide with Flagstaff Metropolitan Planning Organization (FMPO). These neighborhoods are between 3 – 10 miles from the closest fixed-route bus stop. Funding transit in these neighborhoods are difficult since Mountain Line's transit tax is for transit service in Flagstaff. On-demand service to these areas is evaluated in the table below, as it may be a good option to achieve coverage and provide access to the existing fixed-route system.

Kachina Village/ Mountainaie

Kachina Village and Mountainaie are low-density to rural residential areas about 12 miles south of Downtown Flagstaff. Both of these neighborhoods have circuitous roads, hills, and limited connection points which are not conducive to transit. It would require at least 2 microtransit vehicles to serve this area to keep wait times at 15-minutes or better. The estimated ridership is low, 15-25 people per day, resulting in a high cost per passenger. TNC partnership would be difficult due to the availability of TNCs in this area and high program costs since the average trip cost is \$12.75. Therefore, this area is not recommended to be served by an on-demand program.

Doney Park

Doney Park is a low-density to rural residential area northeast of Flagstaff city limits. Each house is on a large plot of land and many of the roads do not connect, causing challenges for transit routes. The density in this area does not support transit, and the distance between each house would make bus stop placement difficult as well. This area is the closest proximity to a bus stop (3 – 5 miles) and has estimated ridership of 120 riders per day from Doney Park to the Flagstaff Mall. Therefore, this area is recommended for further on-demand research.

Bellemont

Bellemont is an unincorporated community in Coconino County. It is located along Interstate 40 about 11 miles west-northwest of Flagstaff. Bellemont has small plot sizes and houses a variety of duplexes and single-family homes. For transit access, many of the roads do not connect to each other, limiting walkability in the neighborhood. From downtown Flagstaff to Bellemont on the I-40, there are few attractions along the corridor. It would require at least 2 microtransit vehicles to serve this area to keep wait times at 15-minutes or better. The estimated ridership is low, 15-25 people per day, resulting in a high cost per passenger. TNC partnership would be difficult due to the availability of TNCs in this area and high program costs since the average trip cost is \$19.75. Therefore, this area is not recommended to be served by an on-demand program. However, Coconino County is developing a Bellemont Area Plan, which encourages future dense development in this area. Monitoring the development in this area is recommended for future consideration.

Timberline-Fernwood

Timberline-Fernwood is a low-density to rural residential area, northeast on 89A, outside of Flagstaff city limits. This area has a small populated, has large plots of land, and many of the roads do not connect. If there is an on-demand program in Doney Park, this area could be incorporated into their program. However, this should only be added after there has been proven success in the Doney park area.

Table 4 below represents the areas outside of Flagstaff city limits. It shows the run time and cost associated if fixed-route would serve these areas. It also provides a recommendation if these areas would warrant on-demand service. Cost per trip is using fixed-route cost per hour of \$64, hourly frequency, and estimated ridership to serve these areas. Estimated ridership can be found in Appendix B.

Table 4: Serving FMPO areas with fixed-route transit

	Kachina Village/ Mountanaire	Doney Park	Bellemont	Timberline- Fernwood
Add onto existing route	No	No	No	No
Length	24.56 mi	20.38 mi	25.80 mi	25.12 mi
Run time	98 minutes	81 minutes	103 minutes	100 minutes
Fixed-route cost per year	\$798,700	\$839,500	\$663,800	\$815,000
Cost per trip	\$124.06	\$41.35	\$130.40	\$123.12
Recommended for on-demand	No. Travel time would warrant 2 vehicles. High cost w/ low population.	Yes. High number of trips to the mall, easy connection.	No. Travel time would warrant 2 vehicles. High cost w/ low population.	If there is Doney Park service, could add this area to it.

TEMPORAL ANALYSIS

Each route on Mountain Line starts and stops at varying times. When Mountain Line is not running, Flagstaff has taxis, Uber, and Lyft to provide a level of transportation for those who do not have a vehicle or wish not to drive. This gap in service makes taking public transit a one-way option for late night workers and people who go to a late-night movie or go downtown for entertainment. Table 5 displays

MOUNTAIN LINE ON-DEMAND FEASIBILITY STUDY

the stop and start times, demonstrating the general gap in service from about 10 pm – 6 am on the weekdays and about 8 pm -7 am on weekends.

Table 5: Mountain Line transit start and stop times

	Weekday		Weekend	
	Stop time	Start time	Stop time	Start time
Route 2	10:37 pm	5:38 am	8:37 pm	6:48 am
Route 3	10:39 pm	6:15 am	8:39 pm	6:45 am
Route 4	10:12 pm	6:05 am	8:12 pm	7:05 am
Route 5	9:46 pm	6:32 am	7:46 pm	7:32 am
Route 7	9:51 pm	5:40 am	7:51 pm	6:45 am
Route 8	9:30 pm	6:15 am	7:30 pm	7:15 am
Route 10	10:45 pm	6:25 am	8:20 pm	7:25 am
Route 14	10:04 pm	6:14 am	8:04 pm	7:14 am
Route 66	10:38 am	5:49 am	8:38 pm	6:49 am

STREETLIGHT DATA ANALYSIS

StreetLight Data is a company that utilizing cell phone data to aggregate travel patterns for analysis. The following analysis is conducted using 11 pm fixed-route stopping times since the Mountain Line 5-Year Transit Plan recommends smoothing spans on fixed-route to 11 pm on weekdays and add service hours on weekends. It would cost approximately \$107,000 annually for fixed-route to expand hours to 11 pm, compared to \$225,750 to provide those trips via TNC or taxi during 8 pm – 11 pm.

Using StreetLight Data, 11 pm – 6am on Fridays and Saturdays have the greatest number of vehicle trips when fixed-route is not running; the greatest concentration of vehicle trips is between 11 pm – 3 am. For scale, vehicle trips during morning commute hours are shown in Table 6 as well.

Table 6: Number of car trips outside of Mountain Line hours

	Monday – Thursday	Friday and Saturday	Saturday	Sunday
6 am – 10 am	55,961	43,760	15,762	13,762
11 pm – 6 am	7,425	24,301	12,052	9,957
11 pm – 3 am	4,407	16,979	9,383	7,456

As seen in Figure 5, the top five origins and destinations on Friday and Saturday from 11 pm to 3 am are downtown Flagstaff, Northern Arizona University (NAU), Southside, Beulah Area, and Flagstaff Mall.

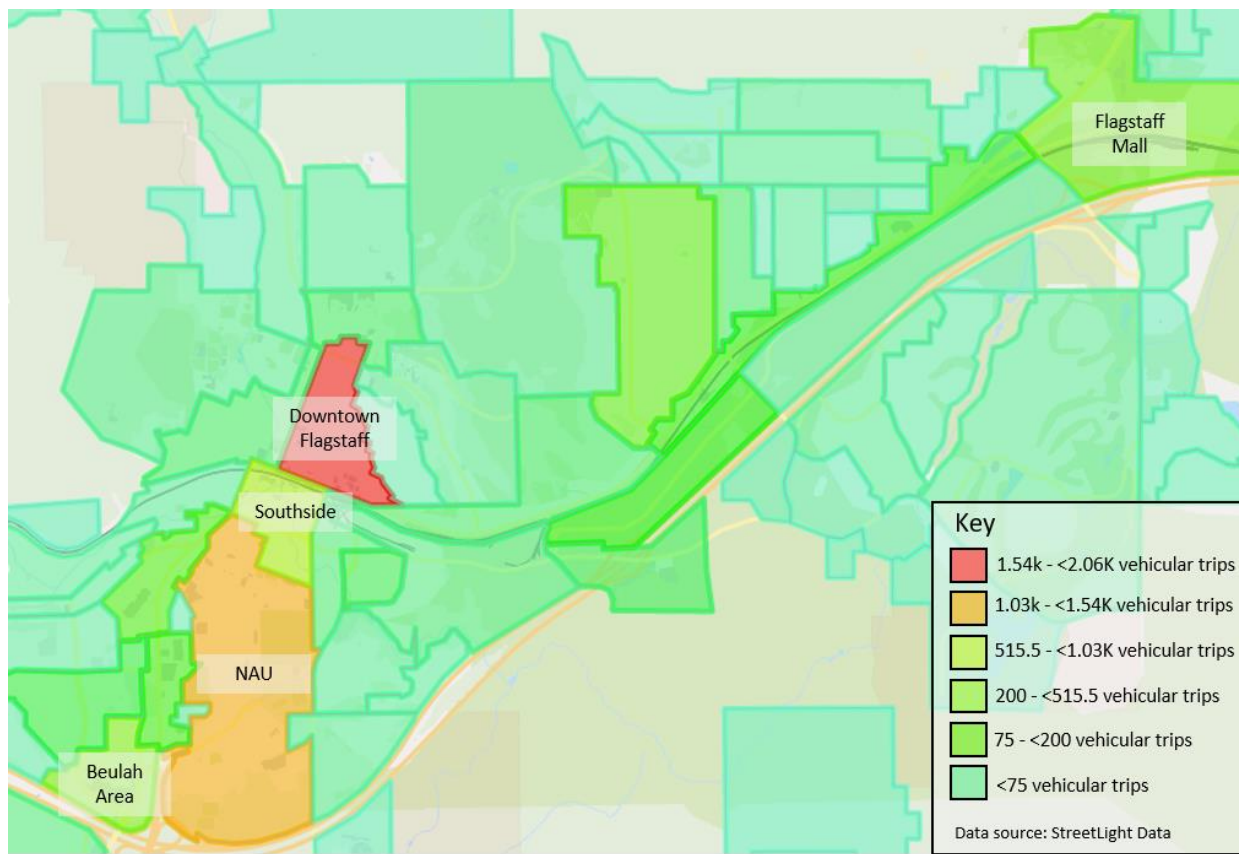


Figure 5: Top origins and destinations from 11 pm to 3 am

CONCLUSION

The low performing routes analysis demonstrated that for the Thorpe Loop area, an on-demand program can be more cost efficient than fixed-route and provide a higher level of service. Replacing fixed-route with on-demand service would also allow Route 5 to streamline, reducing operation costs for the Mountain Line system and travel time for passengers. The results from this analysis indicate Thorpe Loop would be a good pilot for on-demand program design to achieve the goal of cost-effectiveness.

The geographic analysis shows that University Heights, Ponderosa Trails, Pine Canyon, Country Club Estates, Industrial Drive, and Doney Park are the areas where on-demand transportation could serve. Pine Canyon will not move to program design since this neighborhood is not a priority to provide transportation since it is an affluent neighborhood with many second homes and vacation rentals. Ponderosa Trails will also not be included in program design since this area can be served by a fixed-route connecting to the airport. Therefore, results indicate University Heights, Country Club Estates, Industrial Drive, and Doney Park are good areas to pilot on-demand program to achieve the goals of geographic coverage where there currently is no transit service and first mile-last mile connections.

The temporal analysis shows that the period from 11 pm – 3 am on Friday and Saturday has the highest concentration of vehicle trips outside of Mountain Line’s current service hours. These results indicate that this time period would be the priority when filling a temporal gap of no transit service. If funding allows, the program could expand to other days of the week.

Chapter 4: Program Design

The following on-demand programs have been designed by incorporating the data results from Chapter 3: Performance Analysis. Each program has a specific goal which is identified in Chapter 1. When designing an on-demand zone, there is a balance between potential ridership and zone size. In order to maintain 15-minute wait times, it is estimated that one vehicle can have 4.7 boardings in one hour within a 5 – 7 square mile zone. If the zone is larger than 7 square miles or ridership exceeds 4.7 boardings, then an additional vehicle is needed, which increases program costs.

Historical Mountain Lift trip schedules were also analyzed to understand the paratransit demand in the area. Under the microtransit strategy, paratransit vehicles could be used for on-demand service when no paratransit trips are scheduled, as long as it does not hinder paratransit on-time performance.

Partnering with TNCs was analyzed in the study. However, partnering with taxi companies can also be included. Taxi's also play an integral role in providing a cash-only and call in option for customers. Therefore, it is recommended that a TNC partnership also includes a taxi company. This recommendation also satisfies the Federal Transit Administration's (FTA) taxi cab exception. More information is found in Chapter 5, Federal Requirements.

GOAL 1: PROVIDE A COST-EFFECTIVE SOLUTION IN AREAS ALONG LOW PERFORMING ROUTES

Incorporating results from low performing routes in Chapter 3: Performance Analysis, Thorpe Loop is the one area on the Mountain Line system where there are more benefits than challenges to streamlining a low performing route with an on-demand solution. An on-demand program can be more cost efficient than providing fixed-route with comparable wait times. It would also reduce travel times for passengers going to and from Cheshire neighborhood, increasing the attractiveness of the route. More information regarding program design can be found in Appendix E.

PROGRAM DESCRIPTION

This program consists of replacing Thorpe Loop on Route 5, which includes stops 2-7 outbound and 25-30 inbound with an on-demand program. The geofenced area, as shown in Figure 6, includes Thorpe Loop stops, Flagstaff Medical Center stop, and the Downtown Connection Center.

It is recommended that this program uses the microtransit strategy with one dedicated vehicle during Route 5 service hours and relies on utilizing Mountain Lift paratransit vehicles that are in service to supplement the service. It is not recommended to have a TNC partnership to solely serve the Thorpe Loop area since existing Mountain Lift vehicles already serve this area frequently. A Mountain Lift vehicle can perform on-demand trips when demand is low in the paratransit program, resulting in better coordination and flexibility between both programs.



Figure 6: Thorpe Loop on-demand zone

MOUNTAIN LINE ON-DEMAND FEASIBILITY STUDY

MOUNTAIN LIFT ANALYSIS

There are approximately 15 Mountain Lift clients that live in Clark Homes or in the general vicinity. There is an average of 12 clients who regularly travel to J.C. Montoya Adult Center. In November 2016, there was an average of more than 150 pickups from Thorpe Loop area, which equals about 5 trips per day.

STAFFING AND FLEET

Table 7: Thorpe Loop microtransit staffing and fleet needs

Staffing requirements	
Operators	3 to fill annual service needs, though only 1 in service at a time
Ops Supervisors	0
Mechanic	0
Fleet requirements	1 dedicated vehicle. Mountain Lift vehicles for surplus trips

RIDERSHIP AND COST

Estimated ridership is based on actual October 2017 boardings and alightings at the stops along Thorpe Loop. Estimated fares are determined by multiplying estimated ridership by \$2.50, the price of an adult day pass. Operating costs are estimated using revenue hours multiplied by FY20 budgeted wages for operators, the direct and indirect operations and maintenance of a vehicle, and indirects including administration, utilities, and legal. The total cost is for operations only. For microtransit, there are one-time technology start-up costs ranging from \$15,000 - \$45,000 and annual technology fees ranging from \$6,000 - \$9,000 per vehicle.

Table 8: Annual cost for Thorpe Loop microtransit service

Estimated Ridership	34,485
Revenue Hours	5,046
Estimated Fares	\$86,213
Fixed-Route Cost	\$181,100
Cost per Trip	\$7.42
Total Cost (including fares)	\$169,670

ADDITIONAL CONSIDERATIONS:

The following provides program considerations and challenges with implementing the Thorpe Loop program. See Appendix C for a risk assessment of the program.

- **Challenges with transfers:** There are challenges with transferring from Route 5 to an on-demand program because travel times would increase for riders who are wanting to go to destinations in the Thorpe Loop. If wait times average 15 minutes, then a rider's trip would increase from eight minutes to twenty-three minutes of travel time.
- **Technology concerns:** There are two schools, a senior center, and senior and low-income housing along Thorpe Loop. Since this population might not have access to a smart phone, there could be increased challenges with a primarily app-based program. Therefore, it is pertinent to have a call-in option and travel training to get seniors and youth comfortable with the technology.
- **Public concerns:** This on-demand solution requires Route 5 to reduce service in a senior and low-income area. This could cause some public backlash about the on-demand

program and Mountain Line organization. To mitigate this challenge, it will be necessary to communicate to the affected area and the public in general that this area is not losing service, rather replacing it with a premium service with lower wait times. It will be important to involve stakeholders, such as J.C. Montoya Senior Center, Clark Home residents, and school staff early in the process to address any issues.

GOAL 2: PROVIDE A LEVEL OF SERVICE WHERE THERE IS NONE, EITHER SPATIALLY OR TEMPORALLY

Incorporating results from geographic gap and temporal analysis in Chapter 3: Performance Analysis, the late-night gap will be filled through an on-demand program between 11 pm – 2:30 am, Fridays and Saturdays. This can be a first phase in providing late-night service since the greatest number of trips are during these days compared to Monday – Thursday.

Doney Park is an area outside of Flagstaff city limits that could be considered for an on-demand program. This area is recommended since an on-demand program is also about \$200,000 less than adding a fixed-route. In addition, Doney Park to the Flagstaff Mall is one of the highest origin and destination sets among the areas in the FMPO. There is an average of 4,000 trips per day between these two areas, equating to an estimated 120 trips with an on-demand program. The methodology behind the estimated ridership and fixed-route costs can be found in Appendix B and E.

PROGRAM DESCRIPTION

LATE-NIGHT

The Late-Night zone will cover Flagstaff city limits and run from 11 pm – 2:30am Fridays and Saturdays. To fill the temporal gap on Saturday from 8 pm – 11 pm, it is recommended the fixed-route system expands service on Saturdays to 11 pm. It would cost approximately \$107,000 annually for fixed-route to expand hours to 11 pm, compared to \$225,750 to provide those trips via TNC or taxi during 8 pm – 11 pm. After 11 pm, number of trips drop off, so it would be more cost effective to have a TNC partnership and taxi provider to provide a call-in and cash option. It is suggested that any private mobility provider can be a part of the Late-Night program by entering into a contract with Mountain Line. Since Mountain Line currently does not run service during this time, a TNC partnership can be the first phase to understand demand and travel patterns. A late-night option through microtransit or fixed-route is not recommended at this time since it would create third shift challenges for mechanics, operations supervisors, and customer service.

To receive the Late-Night TNC subsidy, this plan recommends it be required that a passenger must use fixed-route for one part of their journey. For example, using the bus to get to work but then using a TNC to get home when the fixed-route is no longer running, so as to control cost by limiting access to the program to those using fixed-route while in operation. This option would require increased technology for fare payment, such as mobile ticketing. It is anticipated that Mountain Line will have mobile ticketing by spring of 2020. This partnership would also require Mountain Line to have access to the TNC's API (application programming interface), so payment can be integrated into the app. This requirement should be included in any contract with a TNC company. It would also be helpful for the TNC companies to add Mountain Line's fixed-route arrival times in the app. This has been done in other cities in the country, like Denver, Colorado.

DONEY PARK

The Doney Park zone is 17 sq. miles and includes a grocery store and a few other amenities. The zone also includes the Mall Connection Center (MCC), which is about 5 – 7 miles from Doney Park, though has few origins and destinations in-between. The MCC serves three different routes which connect to Downtown Flagstaff. It is recommended this on-demand zone is served through a TNC partnership since it is \$59,798 less than a microtransit strategy. In addition, this area currently does not have transit service, so a TNC partnership can be the first phase to understand demand and utilization of the program. If the TNC partnership surpasses 45,000 annual trips, microtransit would be the more cost-efficient option. If the program surpasses 65,000 annual trips, fixed-route would be more cost-efficient. However, there are still land-use, road configuration, and density challenges for fixed-route to be successful in this area.

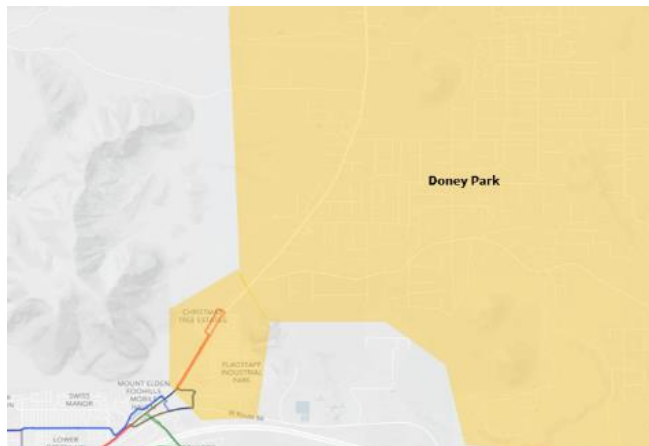


Figure 7: Doney Park on-demand zone

STAFFING AND FLEET

Table 9: Late-Night and Doney Park staffing and fleet for TNC partnership

Staffing requirements	Late-Night	Doney Park
Operators	0	0
Ops Supervisors	0	0
Mechanic	0	0
Fleet requirements	TNC partnership	TNC partnership

RIDERSHIP AND COST

For Late-Night service, estimated ridership is based on travel from StreetLight Data on Fridays and Saturdays from 11 pm – 3 am. For Late-Night service, cost per trip is calculated by the average cost of the Lyft trip in Flagstaff minus \$1.25 the customer would pay. Estimated ridership for Doney Park is based on gathering percentages of travel from StreetLight Data based on actual travel to and from origins and destinations in the FMPO. Vehicular trips were then multiplied by 3%, which is the transit mode share from the FMPO Trip Diary. Cost per trip is calculated by the average cost of a Lyft trip in Doney Park to the Mall Connection Center minus \$1.25 the customer would pay.

Table 10: Cost for Late-Night and Doney Park TNC Partnership

	Late-Night	Doney Park
Estimated Ridership	12,168	43,560
Annual Hours	364	5,046
Fixed-Route Cost	\$483,912	\$839,500
Cost per trip	\$10.75	\$13.75
Total Cost (including fares)	\$130,806	\$598,950

ADDITIONAL CONSIDERATIONS

The following provides considerations and challenges with implementing the Late-Night and Doney Park programs. See Appendix C for a risk assessment of the programs.

- **TNC availability:** Currently, TNC availability during late night hours and in Doney Park can be an issue in Flagstaff. Since Doney Park is a lower density neighborhood, wait times could be longer than in city limits since there are not as many vehicles in the area. Through a TNC partnership, more demand is created, which could result in more drivers in the area. In addition, Uber and Lyft have historically provided incentives for drivers to go to high demand areas with driver shortages. A pilot program would be instrumental to understand the relationship between demand and driver availability. Otherwise, a microtransit program would be the other solution and have dedicated vehicles in the zone. Microtransit program for Late-Night would cost \$659,887 and for Doney Park would cost \$658,748.
- **TNC fare structure:** The program costs are based on passengers paying \$1.25 per ride, the same as a one-trip on the fixed-route, and Mountain Line would subsidize the rest of the trip. Based on peer city research, the rate that passengers pay tend to be higher than fixed-route fares since it is a more premium service. Some agencies have paid up to \$5 for the trip, and then the customer pays the rest. When customers order the ride, they would see the discount applied and know how much they are paying for the ride. For the Late-Night option, having Mountain Line pay up to \$5 would change the budget to \$236,038 per year. This budget estimate does not have the condition that a trip has to end or start with fixed-route.
- **Surge Pricing:** Surge pricing is a tool that Uber and Lyft use to maximize the relative supply and demand in an area. This tends to happen during late night hours, when there is a high demand for TNCs. This can dramatically increase the price of a trip, sometimes 3.5 times the usual price. Some transit agencies have tried to reduce surge pricing in the contract between the TNC but have been unsuccessful. However, Uber has provided incentives for more drivers to work during those surge times to try and add supply, thus decreasing the increased prices.
- **Funding for Doney Park:** Since Doney Park is outside of Flagstaff City Limits, the dedicated transit tax cannot be used to fund this program. To implement this program, Coconino County or a different entity would need to fund this program.

GOAL 3: PROVIDE FIRST MILE-LAST MILE CONNECTION TO FIXED-ROUTE

Based on results from geographic gaps in Chapter 3: Performance Analysis, there are two areas where a first mile-last mile on-demand program would benefit the Mountain Lift system: University Heights and Country Club/Industrial areas. More information regarding program design can be found in Appendix E.

PROGRAM DESCRIPTION

UNIVERSITY HEIGHTS

The hills and narrow roads in University Heights neighborhood are challenging for a 40-foot bus to safely navigate. Connecting people from University Heights to Routes 4, 14, and 10 is a viable option for a first mile-last mile solution since there are three different route options and, during peak service, there

is a bus arriving every five minutes. According to StreetLight Data, the main destinations for people with an origin in University Heights are NAU's campus, Woodlands Village, or Milton Road, which these routes directly serve.

The closest Mountain Line stops are about 1 – 2 miles from parts of University Heights. The on-demand zone, shown in Figure 8, includes University Heights, Route 10 (stops 8 and 13), Route 4 (stop 5), and Route 14 (stops 13 and 14) near Beulah Boulevard and Woodlands Village Boulevard.

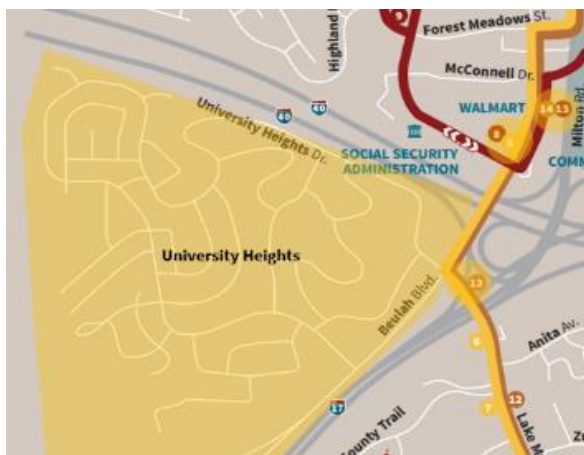


Figure 8: University Heights on-demand zone

It is recommended that this program utilizes the microtransit strategy with one dedicated vehicle all day and an additional dedicated vehicle during peak hours (6 am – 9 am and 4 pm – 7 pm). Mountain Lift vans can help supplement the demand, but since this area does not have many paratransit trips, this is not a reliable vehicle source. The TNC strategy could be an option, however according to the estimated ridership, a TNC partnership has higher overall program costs of \$376,862 compared to \$298,267 for microtransit. TNCs could be a back up option if the microtransit vehicles are in-use. This would require an agreement with a TNC company and the microtransit software company to allow trips to dispatch to the TNC company.

COUNTRY CLUB/INDUSTRIAL DRIVE

The second on-demand zone, shown in Figure 9, includes the Country Club neighborhood and Industrial Drive area north of I-40 and south of Route 66 and the railroad tracks.

Route 3 runs in the northern part of the Country Club neighborhood. Figure 3 in Demand Analysis shows that this section of fixed-route is in the bottom 25% of bus stop performance. A first mile-last mile program would benefit this section by bringing more riders to these low performing stops. Expanding fixed-route service in this neighborhood is very difficult due to the circuitous roads, making on-demand a better service option.

The Industrial Drive area is home to human service agencies and Flagstaff Shelter Services—major destinations for Mountain Line's most vulnerable riders—generating the need for some sort of public transportation option.

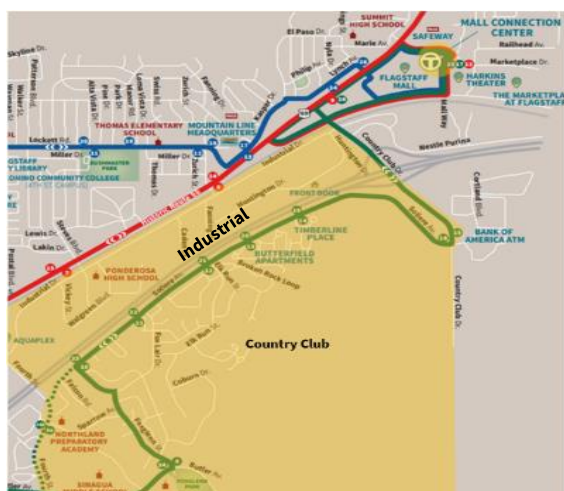


Figure 9: Country Club/Industrial on-demand zone

However, due to the low density and lack of connectivity in the area, it does not warrant a new fixed-route. An on-demand program can help fill that transportation gap and connect people to the fixed-route. The on-demand zone utilizes Route 3 stops 9-15 outbound and 18-24 inbound, and the Mall Connection Center. Route 66 bus stops are not included in the geofenced zone since the vehicles would have to cross the train tracks, potentially increasing travel times.

The on-demand solution could be delivered through either the TNC or microtransit strategy since the

overall program costs are similar for both programs. Microtransit has advantages and is the recommended strategy since it is operated in-house, there is more ownership of the program, and there are Mountain Lift vehicles that pickup and drop-off in the area. Flagstaff Shelter Services' busiest times for transportation are 8 am in the mornings and 4 pm in the afternoons when people are coming to and from the shelter. Therefore, a dedicated vehicle will be needed during these peak times. It is recommended to have one dedicated vehicle all day and an additional dedicated vehicle during peak hours (6 am – 9 am and 4 pm – 7 pm).

MOUNTAIN LIFT ANALYSIS

There are approximately 45 Mountain Lift clients that live in University Heights or the surrounding area. Utilizing data from November 2016, University Heights has about 70 pickups (2.3 per day). Ponderosa Trails, a neighboring area, has about 180 Mountain Lift pickups (6 per day). In Country Club, there are about 60 pickups per month (2 per day). In Industrial area, there are about 200 pickups (6.8 per day).

STAFFING AND FLEET

Table 11: University Heights and Country Club/Industrial staffing and fleet

Staffing requirements	University Heights	Country Club/Industrial
Operators	4 to fill annual service needs, though only 1 in service at a time	5 to fill annual service needs, though only 1 in service at a time
Ops Supervisors	0	0
Mechanic	0	0
Fleet requirements	2 vehicles: 1 dedicated, 1 during 6 am – 9 am, 4 pm – 7 pm	2 vehicles: 1 dedicated, 1 during 6 am – 9 am, 4 pm – 7 pm

RIDERSHIP AND COST

Estimated ridership is based on gathering percentages of travel from StreetLight Data Location-Based Services (LBS) for an Average Weekday in 2017 based on actual travel to and from origins and destinations in the FMPO. Then, the vehicular trips are multiplied by 3%, which is the transit mode share from the FMPO Trip Diary (3%). Estimated fares are determined by multiplying estimated ridership by \$2.50, the price of an adult day pass. Operating costs are estimated using revenue hours multiplied by FY20 budgeted wages for operators, the direct and indirect operations and maintenance of a vehicle, and indirects including administration, utilities, and legal. More information regarding ridership and program design can be found in Appendix B and E. For microtransit there are one-time technology startup costs ranging from \$15,000 - \$45,000 and annual technology fees ranging from \$6,000 - \$9,000 per vehicle. Fixed-route details are found on Table 3 in Chapter 3.

Table 12: Cost for University Heights and Country Club/Industrial microtransit program

	University Heights	Country Club/Industrial
Estimated Ridership	27,225	38,496
Revenue Hours	7,224	9,402
Estimated Fares	\$86,213	\$96,240
Fixed-Route Cost	\$271,100	\$1,041,500
Cost per Trip	\$13.46	\$12.39
Total Cost (including fares)	\$298,267	\$380,535

ADDITIONAL CONSIDERATIONS

The following provides considerations and challenges with implementing the University Heights and Country Club/Industrial programs. See Appendix C for a risk assessment.

- **Challenges with transfers:** Route 3 runs every 30 minutes during peak hours. This can cause challenges with timing transfers from microtransit to fixed-route. This challenge can be mitigated by making sure microtransit and fixed-routes are integrated into the same app to enable comprehensive trip planning. When trip planning, it shows real-time arrival of the microtransit compared to the fixed-route system, which can help mitigate missed connections. The Mall Connection Center stop is better for first mile-last mile connection since it serves three different routes with seven buses arriving in an hour.
- **Microtransit on University Heights Drive only:** To maintain 15-minute wait times, a suggestion is for microtransit vehicles to pickup and drop-off passengers on University Heights Drive. This option would only be for able-bodied passengers.
- **Fare Integration:** Fare integration with the fixed-route system will be critical for both first mile-last mile solutions to be successful. An example of fare integration would be providing the passenger with an all-day fixed-route pass if they use microtransit. It is suggested the first mile-last mile programs have a higher fare, which includes a day pass. More information can be found in Chapter 5, Policy Considerations.

CONCLUSION

This section provides a summary of all the on-demand programs analyzed in this chapter. These programs are prioritized in the next chapter, Chapter 5: Implementation.

Table 13: Summary of On-demand programs

	Thorpe Loop	University Heights	Country Club/Industrial	Late-Night	Doney Park
On-Demand Program	Microtransit	Microtransit	Microtransit	TNC partnership	TNC partnership
Size of zone	0.7 sq. mi	0.74 sq. mi	3.11 sq. mi	66.08 sq. mi	9.7 sq. mi
Service days/hours	7 days a week, Route 5 service hours	7 days a week, Route 10 service hours	7 days a week, Route 3 service hours	Friday and Saturdays, 11 pm – 2:30 am	7 days a week, Route 66 service hours
Staffing Requirements	3 operators	4 operators	5 operators	Program oversight	Program oversight
Dedicated Vehicles	1 vehicle	2 vehicles: 1 dedicated, 1 during 6 am – 9 am, 4 pm – 7 pm	3 vehicles: 1 dedicated, 2 during 6 am – 9 am, 4 pm – 7 pm	N/A	N/A
Trips per Hour	6.83*	3.77	4.09	33.43	8.63
Cost per Trip	\$7.42	\$13.46	\$12.39	\$10.75	\$13.75
Annual Operating costs	\$169,670	\$298,267	\$380,535	\$130,806	\$598,950
* Utilizing paratransit vehicles in the field for excess pickups					

IMPACTS ON MOUNTAIN LIFT

The microtransit programs identified in this On-Demand Study plan to use underutilized paratransit vehicles. Mountain Line currently has eight paratransit vehicles, but five are used in maximum service. These on-demand programs also rely on Mountain Lift paratransit vehicles that are in service to help fill the surplus demand of the dedicated vehicles. Paratransit vehicles are sometimes standing down for over an hour in the field, waiting for their next pickup. To better utilize the driver and vehicle, drivers would switch over to become on-demand service during these extended breaks. Currently the technology does not exist to have shared rides between paratransit clients and on-demand clients. In the future, when the technology exists, the microtransit and on-demand programs would ideally work side by side, sharing rides with on-demand and paratransit passengers to increase capacity. If this shared ride system is implemented, it is important to abide by ADA requirements and the excessive trip length requirement. This requirement states that paratransit trip should be in comparison to the time required to make a similar trip using the fixed-route system. Another consideration is the added pickup time for paratransit clients. For example, paratransit vehicles currently go into apartment complexes to pick up people and sometimes the driver will help a passenger to their door. This can add travel time for customers who already on the vehicle and can delay people waiting to be picked up.

Another consideration to manage demand for the microtransit programs is trip brokering with a TNC. If there is no available paratransit vehicle and the dedicated vehicle is busy, a trip goes to a TNC to help fill the demand. This would require an agreement with a TNC company and the microtransit software company to allow trips to dispatch to the TNC company. This would keep operating costs lower than adding an additional vehicle to meet demand. It is also more dynamic, since the TNC vehicles are already in the field and can react more quickly than Mountain Line dispatching an additional vehicle, assuming there is staff available. The payment process for the TNC trip would need to be established prior to implementing a brokerage model.

ANTICIPATED GROWTH

Since the on-demand programs are more flexible than Mountain Lift and include same day booking, online payment, and real-time arrival estimates; it is anticipated that some paratransit clients will start using the microtransit service instead of Mountain Lift. Mountain Line staff will need to have a way to track when a vehicle is in paratransit use compared to microtransit use to understand the cost associated with each program. To understand if there are cost savings, staff would track trips made by paratransit clients and then use cost per microtransit trip verse cost per paratransit trip.

In FY2018, the Mountain Lift cost per trip was \$36.70. By increasing the capacity on the vehicles, especially when there is down time between pickups, the cost per trip will decrease since the vehicles are more efficiently used. Another consideration to decrease cost is for the programs is to integrate in the future. This integration would have additional efficiencies such as shared software costs and management.

Chapter 5: Implementation

This chapter provides recommendations and phasing of the on-demand programs analyzed in this On-Demand Study. The phasing recommendations are based on the need, readiness, and feasibility of the program. This chapter also provides a five-year budget, policy considerations, federal requirements, and marketing suggestions.

RECOMMENDATIONS

The results of this On-Demand Study suggest the first on-demand program to be considered is the Thorpe Loop program, a microtransit program replacing a section of Route 5. The program provides a variety of benefits to the Mountain Line system and its customers. In addition, this area has the highest activity of paratransit pickups analyzed in this On-Demand Study, so it would be a good testing ground to understand if paratransit vehicles can be utilized for a microtransit program. To test this out, a demonstration program is recommended prior to officially streamlining Route 5. The demo would be for a small group of people, for example Clark Homes residents, to understand the type of demand from this development and if existing paratransit vehicles in the field can provide trips during down time. If this is successful, a larger scale demo, marketed throughout the city could be for six months to a year.

The second program to be considered is Late-Night program. Late-night service has been a request on Mountain Line's Never Rider Community Survey and Mountain Line's Onboard Survey for several years. It is recommended to smooth spans to 11 pm on fixed-route per the Mountain Line 5-Year Transit Plan on Monday - Saturday. If funding does not allow, the Late-Night program can start at 10 pm to fill the one-hour gap. This would add \$70,000 to the Late-Night budget. Filling in the late-night gap with a TNC partnership is an appropriate first phase into understanding ridership demand and origin and destination information. To implement this program, mobile ticketing on the fixed-route and an agreement between a TNC company allowing for fare integration in the app will need to be established.

The next on-demand program to implement would be University Heights. This area has the most frequent fixed-route connections, making it the most feasible first mile-last mile connection. If this area is successful, then Country Club/Industrial Drive could be considered. However, both options require having a complete trip planning app with fixed-route coordination in place prior to implementation to ensure customers are making their connections on time.

Lastly, Doney Park is not recommended at this time. Funding for this program poses a challenge since it is outside of Flagstaff city limits. In addition, TNC availability in Doney Park is another issue that would need to be addressed before the program is implemented. Due to the large service area and high ridership numbers, Mountain Line would need 3 - 4 dedicated vehicles in the area for microtransit. This equates to over \$700,000 in operating costs and Mountain Line would need to buy additional vehicles.

IMPLEMENTATION PHASES

Table 14: Implementation Phases on on-Demand programs

Phase 1	Phase 2	Phase 3
Thorpe Loop	Late-Night	University Heights
		Country Club/Industrial

MOUNTAIN LINE ON-DEMAND FEASIBILITY STUDY

IMPLEMENTATION TIMELINE

A demo is recommended to test and confirm the contents in this Study. If the demo is successful, this timeline applies. Otherwise, modify request for proposal timeline and move dates accordingly.

Table 15: Implementation timeline of on-demand programs

Activities	2020												2021												2022				
	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	
Draft/Publish RFI for Thorpe Loop demo																													
Develop and conduct marketing campaign																													
Train drivers																													
Implement Thorpe Loop demo without changing Route 5																													
Debrief demo																													
Request for Proposals process																													
Implement Thorpe Loop																													
Streamline Route 5																													
Initiate conversations with TNCs for Late-Night service																													
Sign contracts with TNCs/Taxis																													
Conduct marketing campaign																													
Implement Late-Night program																													
Train drivers on First mile-last mile program																													
Develop and conduct marketing campaign																													
Implement program																													

MEASURES OF SUCCESS

When implementing a pilot program, it is important to identify performance measures beforehand and track them during to understand if the pilot program is successful and should continue. Below are several performance measures in categories of high, medium, and low, ranging from the most critical factors that should be tracked closely to factors that are less important in the decision making of whether to continue the program or not. These performance measures are intended for a pilot of 6 months to a year.

For a smaller demo program in the Thorpe Loop area, lasting 2 weeks to a month; key performance measures to track will be ridership, wait times, number of calls and complaints, number of shared rides, and number of trips transferring to fixed-route. The demo is intended to understand the demand of the program and number of vehicles needed to meet the demand. It will provide a testing ground to understand if paratransit vehicles in the field have the capacity to pick up on-demand customer during their down-time. After the demo, a survey to customers would also be beneficial to understand if customers preferred this service over fixed-route, understand if the service was easy to use, and challenges associated.

Table 16: High performance measures to track

Performance Measure	Data Needs	Program Associated
Riders paying about 18% of trip costs (similar to fixed-route)	Ridership and fare box return	All
Ridership of pilot program is increasing	Ridership	All
Wait times are 15 minutes or less	Average wait time	All
Majority of trips are shared rides	Number of shared rides	All
On-demand service is less expensive than adding a bus on Route 5	Program cost for Thorpe Loop program and cost for additional bus	Thorpe Loop

Table 17: Medium performance measures to track

Performance Measure	Data Needs	Program Associated
Ridership increases at first mile-last mile bus stops	Baseline ridership at bus stops, ridership at bus stops during program	University Heights and Country Club/Industrial
Majority of trips transfer to fixed-route	Number of on-demand trips, number of transfers (make sure systems are integrated)	All
Majority of trips utilize the app for booking and payment	Number of on-demand calls, and cash payment	All
Higher ridership on Route 5 after streamlining	Baseline ridership on Route 5, ridership during program	Thorpe Loop

Table 18: Low performance measures to track

Performance Measure	Data Needs	Program Associated
Number of Mountain Lift clients using the service increases	Number of profiles created, number of trips taken, Mountain Lift ridership	All

FIVE-YEAR BUDGET

Table 19: Five-year budget for on-demand programs

	Year 1	Year 2	Year 3	Year 4	Year 5
Program implementation	Thorpe Loop	Thorpe Loop, Late-Night	Thorpe Loop, Late-Night, University Heights	Thorpe Loop, Late-Night, University Heights, Country Club/Industrial	Thorpe Loop, Late-Night, University Heights, Country Club/Industrial
Annual Operations	\$169,670	\$300,476	\$598,743	\$979,278	\$979,278
One-time start-up software costs	\$35,000	N/A	N/A	N/A	N/A
Annual Technology fees	\$9,000	\$9,000	\$27,000	\$54,000	\$54,000
Fleet Costs *If Mountain Lift is at capacity	\$160,000	N/A	\$320,000	\$480,000	N/A
Total Cost	\$373,670	\$309,476	\$945,743	\$1,513,278	\$1,033,278

FUNDING

According to peer city research, majority of the programs use local funds to operate on-demand services. The local funds include savings from eliminated fixed-route service, local sales tax, and fare recovery from the program.

The City of Arlington uses FTA formula 5307 funding for operations, but since this is the only public transportation option in the city, those funds are available. Valley Regional Transit uses 5307 funding and the City of Boise pays for local match. Marin Transit uses 5310 funds for operations, but these funds are limited for trips serving seniors and people with disabilities. Each of these agencies followed federal regulations, such as having accessible vehicles and reporting.

Gwinnett County operates its microtransit program with Congestion Mitigation and Air Quality Improvement Program (CMAQ). Flagstaff is not currently eligible for CMAQ funds as the city is in attainment with air quality standards.

FUNDING SOURCES FROM PEER PROGRAMS

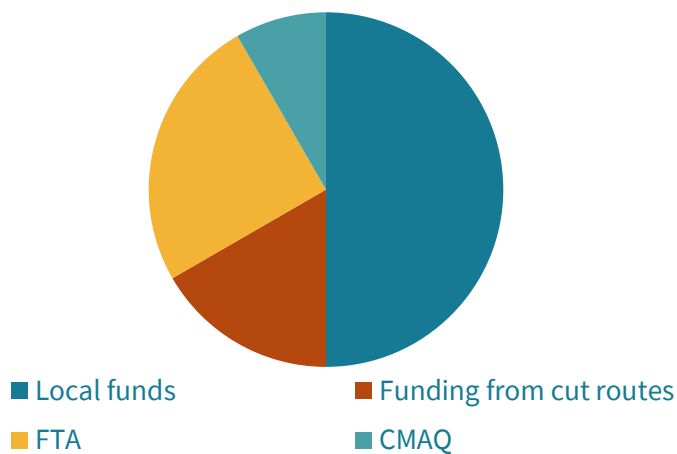


Figure 10: Funding sources from peer programs

REVENUE OPPORTUNITIES

The FTA has a Mobility On-Demand (MOD) Sandbox grant which was released in FY2016 and FY2019. In FY2019 the grant had three focus areas: payment integration, autonomous vehicles, and seamless transportation integration. This grant is for one-time funds to help start and operate a one-year pilot program. The FTA currently does not have long-term operating funds for on-demand programs.

Another revenue source would be from public-private partnerships. For example, partnering with the Downtown Business Alliance (DBA) to pay for late night trips or the J.C. Montoya Senior Center to help pay for trips within Thorpe Loop. The first step would be to start conversations with the organization and determine budget capacity. A service agreement would be required to determine funding amount and duration.

POLICY CONSIDERATIONS

FARE STRUCTRE

For the Thorpe Loop program, it is recommended fare would be the same structure as the fixed-route system. Since the Thorpe Loop is replacing existing fixed-route service, fares should not increase. A day pass would be valid on the fixed-route as well. (Adults are \$1.25 for one-way and \$2.50 for day pass.)

For the first mile-last mile programs (University Heights and Country Club), a higher fare can be considered since this an added service. It is suggested that customers would pay a higher price for the first mile-last mile on-demand trip but receive a free fixed-route day pass. Based on peer cities, a recommendation of \$5 for a day pass should be considered. Since this is a different program, Mountain Line's existing fare products, such as monthly pass and ecoPASS, would not be included in this program. A comprehensive fare product including unlimited on-demand and fixed-route trips can be considered at a higher price point to capture the on-demand trips.

For Late-Night service, the customer would pay \$1.25 towards a TNC or taxi trip and Mountain Line would subsidize the rest of the trip. This is not part of a day pass but is in-line with Mountain Line's one-way fare when the bus is otherwise unavailable. To receive this subsidy, the customer would have to take a fixed-route one half of their journey. Mobile ticketing on the fixed-route system and a partnership agreement with a TNC will make this integration feasible. Since this is a different program, Mountain Line's monthly pass and ecoPASS would not be included in this program.

Fare integration between the on-demand program and fixed-route system is important so the customer can have a seamless journey between both systems and to promote the use of people connecting to fixed-route system. Mobile ticketing on the fixed-route system will make this integration much easier.

PAYMENT

The on-demand programs are technology based and customers are encouraged to use the smartphone app to pay for their trip. Fare integration between the on-demand program and fixed-route system is important so the customer can have a seamless journey between both systems and to promote the use of people connecting to the fixed-route system.

There is more information on how to meet the needs of passengers with no smartphone and/or unbanked customers under Civil Rights Compliance.

CIVIL RIGHTS COMPLIANCE

TITLE VI

When implementing the microtransit services, Mountain Line's Title VI outreach process will need to be conducted in all the microtransit zones since service is either increasing frequency (University Heights and Country Club) or service is being reduced (Route 5 in Thorpe Loop). Title VI will include a comment period of at least 30 days prior to implementation of service. Even though service in Thorpe Loop area is being replaced with a microtransit service, it could still be perceived as a reduction in service. The public process can serve as rider engagement and education on the benefits of microtransit compared to fixed route. The public process will not be required for demonstrations that have the intent of ending and be evaluated after the service. However, public process will be triggered after the demo and before the regular service is launched.

CUSTOMERS WITH NO INTERNET OR SMARTPHONE ACCESS

For the microtransit programs, customers with no Internet or smartphone access would call into Mountain Line's dispatch to schedule a ride, acting as a call center. The call center allows customers to call in for booking a vehicle at the same standard as someone with a smart phone. According to peer research, advertising the app and conducting trainings on the app will reduce the number of people calling in, therefore reducing the need for additional staff.

For the Late-Night program, customers can call the taxi companies that are part of the program if they do not have a smart phone. There is also a company called GoGo Grandparent which provides a simple to use, 24/7 call-in option to hail Ubers and Lyft.

LIMITED ENGLISH PROFICIENCY (LEP)

To comply with Mountain Line's LEP plan and to increase access to the on-demand programs; the app used for the on-demand programs and informational materials will at minimum be available in Spanish.

UNBANKED CUSTOMERS

Unbanked customers are people who are not served by a bank or similar financial institution and relies on the use of cash rather than checks or credit cards. For microtransit, the paratransit vehicles currently do not have fare boxes installed, but would need to install to allow for use by cash-only customers. The fare boxes that are used on Mountain Line's fixed-route boxes cost \$2,850 each. These fareboxes are large and would be a challenge to fit on the paratransit vehicle. Smaller farebox solutions would need to be researched to find a solution to accept cash payment on-board. The Late-Night program, customers without a bank account can use a taxi company that is part of the program.

SERVICE AREA PROVISIONS

PICK UP POLICY

The microtransit service should only be a curb to curb service. Policy should prevent vehicles going into drive ways or driving into apartment complexes. The customer should be alerted when the vehicle is 5 minutes away and will be encouraged to wait outside for the vehicle. The vehicle should wait for 2 minutes, and if the customer is not ready to board, the vehicle will leave to its next destination.

WAIT TIMES

To ensure the attractiveness of the program, a goal is to keep wait times to 15 minutes or less. The on-demand app will display real-time arrival information and customers can also track the vehicle as well. If wait times continue to exceed 15 minutes, an added vehicle will be needed in the area to help alleviate

demand. Another consideration to manage demand for the microtransit programs is trip brokering with a TNC. If there is no available paratransit vehicle and the dedicated vehicle is busy, a trip goes to a TNC to help fill the demand. TNC integration with the app will be needed for this to be feasible.

It can also be considered to have customers walk up to 2 blocks of their pick-up location to ensure efficient service. This can help group riders together and can also reduce drive time. This will only be for able bodied individuals. Individuals need to be able to put preferences in the app if they are unable to walk this distance.

FEDERAL REQUIREMENTS

Mountain Line receives Federal Transit Administration (FTA) grant funds for transit operations and capital projects. Therefore, it is Mountain Line's responsibility to comply with statutory and regulatory requirements associated with the management of federally assisted grants. Mountain Line complies with all mandated procedures such as legal, financial, and technical capacity to carry out programs, procurement requirements, and all applicable civil rights statutes.

DRUG AND ALCOHOL TESTING REQUIREMENTS

Under federal transit law, public transportation operations that receive financial assistance under the FTA's programs must conduct controlled substance and alcohol testing of public transportation employees, contractors, and subcontractors as well. This law can cause challenges when partnering with TNC companies since all the drivers would be considered safety-sensitive positions and would have to follow the federal drug and alcohol requirements. However, there is one exception to this regulation, which is called the taxi cab exception. In general, when there are two or more TNC or taxi companies to choose from, the testing regulations do not apply. The rationale for this is the practical difficulty of trying to administer a drug and alcohol testing program in connection with multiple companies. For any TNC or taxi partnerships, in order to abide by drug and alcohol requirements, two or more companies would need to be included in the program.

AMERICANS WITH DISABILITIES ACT (ADA)

The Americans with Disabilities Act (ADA) of 1990 are a set of specific requirements transit providers must follow to ensure their services, vehicles, and facilities are accessible to and usable by individuals with disabilities. The ADA applies to almost all providers of transportation service, whether private or public, and whether or not an entity receives Federal financial assistance.

When transit systems partner with a TNC or taxi company, ADA regulations still apply. For the service to be considered accessible, some vehicles, whether provided by the TNC or taxi entity, the transit agency, or another contractor, must be accessible to passengers who use wheelchairs, such that the service to passengers with disabilities is equivalent to that provided to passengers without disabilities.

In Flagstaff, there is limited access to accessible vehicles for TNCs and taxi companies. Mountain Lift could fill in the ADA trips, however this can be an issue for the Late-Night program since paratransit is not running during those hours. Valley Regional Transit in Idaho partnered with Non-Emergency Medical Transportation (NEMT) providers since no taxi companies had ADA vehicles. This could be an option in Flagstaff to help address ADA requirements during hours when paratransit is not operating but needs to be addressed prior to implementation.

NATIONAL TRANSIT DATABASE (NTD)

Recipients or beneficiaries of grants from the FTA are required to submit data to NTD. According to peer city research, microtransit programs are reporting unlinked passenger trips (UPT), vehicle revenue hours (VRH), and vehicle revenue miles (VRM) under demand response.

Contracts with TNC for on-demand, shared mobility service may be included in NTD reporting. To report TNC trips to NTD, the trip must be shared, meaning passengers are grouped together based on passenger origins and destinations. Currently, Uber and Lyft do not have a shared ride feature in Arizona since there is not enough volume of TNC trips in this state yet. For these services to be implemented, there needs to be a certain volume of ride requests to assume that there is efficiency for multiple riders to be matched. Therefore, trips cannot be counted until that option is available.

DATA SHARING

New transportation technologies such as bike share, scooter share, and TNCs are operated by private mobility companies and produce unprecedented amount of data generated by their customers. The data streams contain important information for the public sector to aid in planning, policy making, and vital regulation and oversight. Although these companies are operating in the public right-of-way, the data is not always obtainable by the public entities. When entering into a public-private partnership with a mobility company, a data sharing agreement in the contract is necessary in order to obtain the data needed for planning and program oversight. An example of Pinellas Suncoast Transit Authority (PSTA)'s contract with Uber can be found in Appendix D.

VEHICLES

The proposed microtransit programs would use Mountain Line's existing paratransit vehicles. These are standard cutaway buses that are ADA wheelchair accessible. Currently, Mountain Line has eight vehicles but only five are used during peak demand. If additional vehicles are needed, it is recommended to look at different vehicle types, such as mini-van style or Ford Transit van. Research from microtransit programs that use cutaways show



Figure 11: Mountain Lift Paratransit vehicle

that there can be a negative stigma associated with using paratransit vehicles. In addition, they are not as comfortable as a mini-van type solution or Transit van, which detracts from the attractiveness of the service. To note, the lifecycle costs are different between the vehicles. The Transit Van is around \$55,000 and have a shorter useful life compared to the cutaways which are \$160,000 but can last around seven years or longer.

MARKETING

Marketing is a crucial aspect when implementing an on-demand program since this is typically a new type of service in a community. Based on peer research, one of the top lessons learned from other on-demand programs is to have a robust marketing plan. This includes tabling events to teach people how to use the app, flyers in the mail, social media, lunch and learns, and advertisement on websites.

AUDIENCE

Table 20: Marketing audiences

Type of audience	Definition	Collateral materials
General Public	People in Flagstaff and surrounding neighborhoods in the FMPO	Social media ads on Mountain Line and other partners' pages, Mountain Line website, press release, notifications at DCC, Kaspar Office, and MCC, tutorial on how to use the program (video or flyer).
Targeted Group	Neighborhoods, community centers, and businesses within and surrounding the on-demand zone	Tabling events at community events (i.e., farmers markets), flyers mailed to houses, flyers distributed to businesses, lunch and learns at large employers (i.e., Flagstaff Medical Center).

MESSAGING

Messaging for an on-demand program should be creative, catchy, and simple. Since it is a new service and requires some explaining on how to use the program, the messaging should provide basic steps on how to use the service, which app to download, and show a map of the zone. Several agencies have created how-to videos which are posted on their website and social media.

Naming is also an important aspect of branding the program and making it attractive to users. For example, San Joaquin Regional Transportation District (RTD) has a microtransit program called Van Go!, inspired by the Dutch painter Vincent van Gogh. Each vehicle has a different van Gogh painting on the side of the vehicle. Others include Pick-Up by Cap Metro in Austin, Texas and Go Dublin! from Tri-Valley Wheels in Dublin, California.



Figure 12: San Joaquin RTD Van Go! Ad. Source: sanjoaquinrtd.com

Agencies throughout the U.S. have put forth innovative and creative marketing events to promote their on-demand programs. A few examples include:

- **“Appy Hour”:** Big Blue Bus in Santa Monica partnered with Lyft to provide MODE (Mobility On-Demand Every Day). This service is a curb-to-curb, on-demand program for senior and individuals with disabilities. To teach people how to use Lyft, the agency created an event called “appy hour.” A staff member went to senior housing, community spaces, and senior centers to explain step by step on how to use the app. This included downloading, entering credit card information, hailing a ride, etc. After these events, more seniors started to use the app instead of calling into Big Blue Bus’s call center.
- **Boots on the Ground:** When City of Arlington implemented their microtransit service with Via, they had staff members conduct a “boots on the ground” marketing approach. This included setting up tables at Walmart and other popular areas. Staff helped people download the app and explain how to use the service.

Appendix

Appendix A: Private Software Companies for microtransit

Appendix B: Estimated Ridership in Flagstaff Metropolitan Planning Organization (FMPO)

Appendix C: Risk Assessment of on-demand programs

Appendix D: Pinellas Suncoast Transit Authority (PSTA)'S contract with Uber

Appendix E: Program design spreadsheet

Appendix F: Peer city research spreadsheet

APPENDIX A: PRIVATE SOFTWARE COMPANIES FOR MICROTRANSIT

The following provides detailed information about private software companies for microtransit services. The companies researched include TransLoc, Via, Routematch, Ecolane, and Transdev. This is not an exhausted list of private software providers. The information was gathered in October 2018.

TRANSLOC

TransLoc is a technology provider with the mission to make public transit the first choice for all. TransLoc provides transit agencies with the tools to optimize their service, through real-time tracking and dispatch for fixed-route, transit model app for passengers, and On-Demand software solution for microtransit. In January 2018, TransLoc joined Ford Smart Mobility Business Group. Through this partnership, TransLoc has a focus on “ushering in the future of mobility with agency-owned flexible microtransit solutions.”

SOLUTION

TransLoc provides software for operating microtransit. This includes On-Demand Dispatching and real-time rider communications and tracking. Currently TransLoc has implemented 36 pilots through the United States. These pilots have been used to tackle transportation issues such as first mile-last mile connection, underperforming routes, and underserved areas.

TECHNOLOGY AND HARDWARE NEEDS

The technology needs from the transit agency are minimal. Each vehicle needs an iPad to run the driver app, which provides a map and directions of the route. It also includes passenger information, such as name, number of passengers, and picture (optional) so the driver knows who and how many people they are picking up.

FARE

The price of fare is very flexible and up to the agency. Most agencies have made the microtransit service free during the pilot period. Others, who have fareboxes installed in the vehicles, take cash only. TransLoc does not have payment integration with the app, limiting the flexibility of pay options.

EQUITY

TransLoc has both a call option and app-based option to request rides. A smart phone is not required to use this service, but the app-based option is faster, and the user can see wait times and estimated arrival. Vehicles are provided by the transit agency, so the vehicles can be ADA accessible. Many agencies have repurposed paratransit vehicles. The app does not have any features for people who are visually impaired, and the app is only in English.

DATA

TransLoc provides the transit agency with all the data and the agency can keep the data. Data includes origin and destination, ridership, and passengers per hour. TransLoc is flexible to work with the agency if other data points are desired. Ridership data can be used for NTD reporting.

COST

Currently, TransLoc is focusing on implementing pilots with transit agencies. Ford Mobility is subsidizing pilots, which include use case consulting, simulator tool (estimates which use cases are most successful), implementation (includes weekly calls, training, help with staging), and marketing support throughout the whole pilot. Ford Mobility is subsidizing the first 44 pilots at \$25,000 for a 6-

month pilot. After the pilot, the software costs are \$500 for 1-5 vehicles per month, \$450 for 1-6 vehicles per month. Without the subsidy, a pilot costs \$114,175.

PLANNING ASSISTANCE

TransLoc has a simulator tool which takes origin and destination data, census data, paratransit data, and other data sources to predict ridership and estimate if certain areas or use cases, would be more successful than others. They predict passengers per hour and ridership.

WHAT STANDS OUT?

TransLoc is focusing on starting pilots with transit agencies, and Ford Mobility is subsidizing majority of the cost. This software is new to TransLoc and the company is using pilot projects to “fool-proof” the software. There are currently 36 pilots on-line and the simulator tool has been 90% accurate in predictions verse outcomes. TransLoc has a strong focus on partnership and working with the transit agency step by step. Their microtransit app is not customizable and does not reflect the branding of the transit agency. They do not have dynamic routing capabilities. Meaning, once a vehicle’s route is created, if another customer requests a ride along the recently created route, the route will not change and deviate to pick them up, reducing the efficiency of the vehicle and extending wait times.

VIA

Via is a real-time hailed, dynamically routed shuttle service. Their mission of “we ride together”, represents the various technology options the company delivers to match riders together who are traveling with similar origins and destinations. Via provides a Transportation Network Company (TNC) option, Ride with Via, which is currently deployed in Chicago, New York, and Washington DC. Via also has a microtransit platform as both software only and turn-key option.

SOLUTION

Via boasts to have the “technology for the future of mobility.” Through Via’s microtransit platform, there is powerful rider aggregation algorithm, dynamic predictive routing, and custom apps. Via has a Transit as a Service (TaaS) model, providing a turn-key solution. They also have a software as a service (SaaS) solution to integrate the software with agency operations. Their solutions have been deployed to tackle first mile-last mile solutions and frequency vs. coverage tradeoff.

TECHNOLOGY AND HARDWARE NEEDS

The technology needs from the transit agency are minimal. Each vehicle needs a tablet or smartphone to run the driver app, which provides a map and directions of the route. It also includes passenger information, such as name, number of passengers, and picture (optional) so the driver knows who and how many people they are picking up.

FARE

The price of fare is very flexible and up to the agency. Most agencies have made the microtransit service free during the pilot period. Via is primarily a cashless service. There is payment integration with the app. There is also an option for people who do not have bank services. Customers can pay cash to buy pre-paid vouchers at, for example a grocery store. Then, customer enters voucher code in the app.

EQUITY

Via has both a call option and app-based option to request rides. A smart phone is not required to use this service, but the app-based option is faster, and the user can see wait times and estimated arrival. With the TaaS model, vehicles can be ADA accessible. Through the SaaS model, vehicles are provided

by the transit agency, so the vehicles can be ADA accessible. Many agencies have repurposed paratransit vehicles. There is both a cash and credit card option. The app has features for people who are visually and hearing impaired, such as multiple font sizes and voice over capabilities. The app can also come in multiple languages.

DATA

Via provides the transit agency with all the data and the agency can keep the data. Data includes origin and destination, ridership, and passengers per hour. Via is flexible to work with the agency if other data points are desired. Ridership data can be used for NTD reporting.

COST

Through the SaaS model, a 6-month pilot is \$23,500 and a 12-month pilot is for \$44,000. Via mentioned that pilot price is negotiable. Without a pilot, for example through an RFP process, there is \$40,000 set up fee, then it is \$700 per vehicle per month. The TaaS model is \$45-\$49 per service hour.

PLANNING ASSISTANCE

Via helps with planning through goal setting, data collation, simulation of service, service model design (help define the on-demand transit service parameters), launch support, marketing, and performance optimization throughout the pilot.

WHAT STANDS OUT?

Via is the only private company providing a turn-key option. There are less pilots and active programs compared to TransLoc, but Via has more customization features and has been established longer as a company. Via provides planning and implementation services and is also willing to work together with agencies. In addition, since Via has TNC deployment and a turn-key option, Via understands operations and customer satisfaction from a holistic point of view, not just from the software perspective. Therefore, the company is continuing to make improvements to the customer and driver experience and optimize the best performance and utilization of vehicles.

ROUTEMATCH

SOLUTION

Routematch provides software solutions for demand responsive vehicles, fixed-route, payment integration, and on-demand software. They develop human centric solutions that connect people to new opportunities. Routematch has a partnership with Lyft to maximize transportation options and help fill first mile-last mile gaps.

TECHNOLOGY AND HARDWARE NEEDS

The hardware needs from the transit agency are minimal. Each vehicle needs a tablet to run the driver app, which provides a map and directions of the route.

FARE

The price of fare is very flexible and up to the agency. Most agencies have made the microtransit service free during the pilot period. Routematch is focusing on payment integration and mobility as a service platform. Payment through the app can also be integrated with Lyft. Payment can be through the app, but can also be cash on-board.

EQUITY

Routematch has both a call option and app-based option to request rides. A smart phone is not required to use this service, but the app-based option is faster, and the user can see wait times and estimated

arrival. Vehicles are provided by the agency, so they can be ADA accessible. Many agencies have repurposed paratransit vehicles. There is both a cash and credit card option. The app has features for people who are visually and hearing impaired, such as multiple font sizes and voice over capabilities. The app can also come in multiple languages.

DATA

Routematch provides the transit agency with all the data and the agency can keep the data. Data includes origin and destination, ridership, and passengers per hour. Routematch is flexible to work with the agency if other data points are desired. Ridership data can be used for NTD reporting.

COST

Routematch has a “pay as you go” option to reduce the cost barrier. A cost estimate is \$1,000 per vehicle per month. A 6-month pilot with 6 vehicles is \$45,000 - \$50,000. Software and licensing is about \$125,000 after the pilot. Routematch can help with funding and is open to negotiating costs.

PLANNING ASSISTANCE

Routematch can help with planning, such as best case uses and number of vehicles. They also help with setting fare prices.

WHAT STANDS OUT?

Routematch has been creating dispatching software for fixed-route and demand responsive operations since 2000. Their payment integration and on-demand software are new platforms for the company. They do not have as many pilots or existing programs that are using the software compared to Via or TransLoc.

ECOLANE

SOLUTION

Ecolane specializes in demand response management software and Mobiltiy as a Service (MaaS). The company prides itself on reliable and innovative solution, backed by trusted customer relations. The demand responsive management software provides real-time, logic-based schedule optimization. The company has partnered with Amazon’s Alexa, so customers can book, change, and review upcoming trips by using the interactive voice response.

TECHNOLOGY AND HARDWARE NEEDS

The hardware needs from the transit agency are minimal. Each vehicle needs a tablet to run the driver app, which provides a map and directions of the route. The customer app is accessible on iOS and Android platforms. The customer app has trip details, real-time arrival, flexibility to manage trips.

FARE

Fares are flexible and up to the agency. There is payment through the app, also a cash option on-board if desired.

EQUITY

Ecolane has both a call option and app-based option to request rides. A smart phone is not required to use this service, but the app-based option is faster, and the user can see wait times and estimated arrival. Vehicles are provided by the agency, so they can be ADA accessible. Many agencies have repurposed paratransit vehicles. There is both a cash and credit card option. The app has features for people who are visually and hearing impaired, such as multiple font sizes and voice over capabilities. The app can also come in multiple languages.

DATA

Ecolane provides the transit agency with all the data and the agency can keep the data. Ridership data can be used for NTD reporting.

COST

The mobility on-demand software is \$29,000 for the first year and 20% less the next year. This includes the app, Alexa application, website, and call lines. There is also an implementation start-up fee, which differs between each agency. For the licensing, it is \$4,000 per year, and 20% less the next year.

PLANNING ASSISTANCE

Ecolane does not help with planning or have predictive modeling capability to estimate ridership and efficiency.

WHAT STANDS OUT?

Ecolane specializes in real-time dynamically routing. For example, if a vehicle is running late or breaks down, the software can automatically distribute the trips to different drivers. The feature is not on TransLoc's software. In addition, Ecolane is focusing on MaaS, integrating other modes and trips together with one payment.

TRANSDEV

SOLUTION

Transdev is a full-service provider, including turn-key solutions, demand responsive brokerage, on-demand software, and autonomous vehicle partnerships. The company promotes itself as "The Mobility Company", striving to be on the cutting edge of mobility services. For on-demand service, Transdev provides a hybrid model for turn-key services, meaning certain services can be contracted out through Transdev. They also provide payment integration through their app.

TECHNOLOGY AND HARDWARE NEEDS

The hardware needs from the transit agency are minimal. Transdev provides a tablet for each vehicle. The driver app provides a map, directions of route, and details of the passenger being picked up. The customer app is accessible on iOS and Android platforms. The app is customizable and can be branded based on the transit agency's program. The customer app has trip details, real-time arrival, flexibility to manage trips.

FARE

Fares are flexible, and the agency decides the rate. There is payment through the app, also a cash option on-board if desired.

EQUITY

Transdev has equity at the center of their microtransit services. Transdev can provide a calling center option to help with scheduling a trip. A smart phone is not required to use this service, but the app-based option is faster, and the user can see wait times and estimated arrival. Transdev can provide wheelchair accessible vehicles, or the transit agency can provide vehicles. The app has features for people who are visually and hearing impaired, such as multiple font sizes and voice over capabilities. The app can also come in multiple languages.

DATA

Transdev provides the transit agency with all the data and the agency can keep the data. Ridership data can be used for NTD reporting.

COST

Turn-key services is \$28 - \$33/hr. The call center is about \$1.80 per call. The app with branding is \$15,000 - \$35,000 per year, depending on if there will be payment integration with fixed-route system, or the level of customization.

PLANNING ASSISTANCE

Transdev does not provide planning assistance but would contact planning work to AECOM if needed.

WHAT STANDS OUT?

Transdev provides a flexible turn-key option. They also have a call center option to help with customer service. They partner with autonomous vehicle (AV) companies and are working towards an on-demand AV option. They have a trip brokerage option, to maximize transportation options for the customer.

APPENDIX B: ESTIMATED RIDERSHIP IN FMPO

Percentages of travel was first gathered from StreetLight Data Location-Based Services (LBS) for an Average Weekday in 2017 based on actual travel to and from origins and destinations in the FMPO. FMPO's Regional Travel Model was used to convert percentages to trips for an Average Weekday in Fall 2017 excluding internal trips in the destinations and trips from outside the FMPO. The Regional Travel Model trips are person trips in automobiles, scaled using the average vehicle occupancy for all automobiles from the 2012 FMPO Trip Diary (1.46 person per vehicle). Trips were rounded to the nearest 500 to better reflect the accuracy. Estimated Ridership is based on transit mode share from the FMPO Trip Diary (3%). A range of 3% – 5% is used since on-demand service provides a more convenient, flexible service compared to fixed-route service.

Origins	Destinations						
	Milton	NAU	Downtown	FMC	Sunnyside/4 th Street	Mall	Average
Thorpe total trips	2,500	1,000	3,000	500	1,500	500	1,500
Estimated Ridership	75-125	30-50	90-150	15-25	45-75	15-25	45-75
West Route 66 total trips	3,500	1,500	2,500	500	1,500	1,000	2,000
Estimated Ridership	105-175	45-75	75-125	15-25	45-75	30-50	60-100
Christmas Tree/Smokerise total trips	500	500	500	500	1,000	3,000	1,000
Estimated Ridership	15-25	15-25	15-25	15-25	30-50	90-150	30-50
Foxglenn total trips	500	500	500	0	1,500	1,500	500
Estimated Ridership	15-25	15-25	15-25	0	45-75	45-75	15-25
Highway 180 & Cheshire total trips	2,000	1,500	4,000	1,500	1,500	500	2,000
Estimated Ridership	60-100	45-75	120-200	45-75	45-75	15-25	60-100
Ponderosa Trails total trips	1,000	1,500	500	500	500	500	500
Estimated Ridership	30-50	45-75	15-25	15-25	15-25	15-25	15-25
University Heights total trips	2,000	2,000	1,500	500	500	500	1,000
Estimated Ridership	60-100	60-100	45-75	15-25	15-25	15-25	30-50
Country Club Area total trips	1,000	500	1,500	500	1,500	3,000	1,500
Estimated Ridership	30-50	15-25	45-75	15-25	45-75	90-150	45-75
Doney Park /Timberline total trips	500	1,000	1,000	500	1,500	4,000	1,500
Estimated Ridership	15-25	30-50	30-50	15-25	45-75	120-200	45-75
Kachina Village/Mountainaire total trips	500	500	500	500	500	500	500
Estimated Ridership	15-25	15-25	15-25	15-25	15-25	15-25	15-25
Bellemont total trips	500	500	500	500	500	500	500
Estimated Ridership	15-25	15-25	15-25	15-25	15-25	15-25	15-25

APPENDIX C: RISK ASSESSMENT OF ON-DEMAND PROGRAMS

The following provides a risk assessment based on a 1- 5 scale of the impact and probability of the risk. A risk assessment was conducted for Thorpe Loop, Late-Night, Doney Park, and University Heights.

Risk Assessment - Thorpe Loop				
	Risk	Impact x Probability = Score		
R1	General - Travel time increases when having to transfer	4	4	16
R2	General - Technology challenges with seniors and students - no smart phone, too confusing	2	2	4
R3	General - Public backlash - reducing fixed route service in a vulnerable area	4	4	16
R4	General - Wait times too long	1	1	1
R5	Microtransit - Demand too high, no capacity in existing fleet	4	3	12
R6	TNC Partnership - Too much demand, over budget	4	3	12
R7	Unpredictable service	4	4	16

Risk Assessment - Late Night				
	Risk	Impact x Probability = Score		
R1	General - Issues with 3rd shift (Manager? Front desk? Paratransit?)	3	2	6
R2	General - Having resources for a robust marketing plan	1	1	1
R3	Microtransit - Too much demand, wait times too long	3	3	9
R4	Microtransit - Not enough demand to warrant service	3	2	6
R5	TNC Partnership - Too much demand, over budget	4	3	12

Risk Assessment - Doney Park

	Risk	Impact x Probability = Score		
R1	General - Travel time increases when having to transfer	3	3	9
R2	General - Technology challenges - no smart phone, too confusing	2	1	2
R3	General - Wait times too long	2	3	6
R4	General - Difficulties coordinating with fixed-route at MCC	4	3	12
R5	Microtransit - Too much demand, wait times too long	3	3	9
R6	Microtransit - Not utilized enough to warrant a dedicated vehicle	2	5	10
R7	TNC Partnership - Too much demand, over budget	5	2	10
R8	General - Political issue, only serving one county district	3	3	9
R9	General - Dedicated funding source	5	5	25

Risk Assessment - University Heights

	Risk	Impact x Probability = Score		
R1	General - Travel time is too long when having to transfer	4	3	12
R2	General - Coordinating with fixed-route service when Route 10 is reduced service	4	2	8
R3	General - Technology challenges - too confusing	2	2	4
R4	Microtransit - Not utilized enough to warrant a dedicated vehicle	2	2	4
R5	Microtransit - Too much demand, wait times too long	4	3	12
R6	TNC Partnership - Too much demand, over budget	4	3	12
R7	Delaying paratransit service	5	3	15
R8	Expensive with low ridership	4	3	12

APPENDIX D: PINELLAS SUNCOAST TRANSIT AUTHORITY (PSTA)'S CONTRACT WITH UBER

Link to contract: <https://www.apta.com/wp-content/uploads/Contract-Uber-PSTA-Agreement.pdf>

Example below:

FNCT_ContractMaintenanceForm 01/08/2015 © 2016 Fleet-Net Corporation

Contract Maintenance

Active Contracts: ☒

Search Criteria

Contract #: C-16-TR-064

Transportation Services (ME)

Description: Transportation Services (ME) ☐ Inactive Contract Type: CONTRACT ☒

Comment: Grant Funded - To provide Transportation under the TD Mobility Enhancement grant program. One year grant. Customer - Chris Cochran

Total Contract Days: 334

Contract Days Remaining: 204

☒ Alert Warning Alert Days: 90

Alert Recurrence Days: 5

Alert Document: CTEp ☒

Alert Sent Date: 4/1/2017

Contract Administrator: PR Procurement Method: SS

Contract Start Date: 8/1/2016 Contract End Date: 6/30/2017

Actual Start Date: 8/1/2016 Actual End Date: 6/30/2017

Date Board Approved: 7/27/2016 Date Contract Signed: 8/2/2016

Closed By: Date Closed:

Primary Vendor #: 00012807 Uber Technologies, Inc.

Department #: Trans Trans - 40

Respond To Group: PD Retainage Percent: 0.00

Bid #:

Contract Amount: \$256,000.00

Purchased To Date: \$0.00

Amount Remaining: \$256,000.00

Paid To Date: \$0.00

Created: preitz 9/7/2016 12:25:15 PM FNCT_ContractMaintenanceForm

Updated: preitz 12/9/2016 12:10:23 PM FNCT_ContractMaintenanceForm

FNCT_ContractMaintenanceForm 01/08/2015 © 2016 Fleet-Net Corporation

Contract Maintenance

Active Contracts: ☒

Search Criteria

Contract #: C-16-TR-064

Transportation Services (ME)

Contract Amount: \$256,000.00

Reference #	Purchase Order #	Approved By	Comment	Amount	Updated
1		BOARD	No Purchase order, vendor paid by Pcard gl #70-5080118008	\$256,000.00	<input checked="" type="checkbox"/>
Created: preitz 9/7/2016 2:04:38 PM FNCT_ContractMaintenanceForm <input type="button" value="Update"/>					
2		BOARD	No Purchase Order, pay from Contract Module	(\$256,000.00)	<input checked="" type="checkbox"/>
Created: preitz 9/7/2016 2:04:36 PM FNCT_ContractMaintenanceForm <input type="button" value="Update"/>					
1		BOARD	No Purchase Order, pay from Contract Module	\$256,000.00	<input checked="" type="checkbox"/>
Created: preitz 9/7/2016 12:29:07 PM FNCT_ContractMaintenanceForm <input type="button" value="Update"/>					
*					<input type="button" value="Update"/>

MOUNTAIN LINE ON-DEMAND FEASIBILITY STUDY

APPENDIX F: PEER CITY RESEARCH SPREADSHEET

S:\Planning\On-Demand Project\Peer research\Peer Cities.Programs.Companies.xlsx

	City of Phoenix	San Joaquin Regional Transit District	Capital Metro	Pinellas Suncoast Transit Authority (PSTA)	Norwalk Transit District
	Phoenix, AZ	Stockton, CA	Austin, TX	Pinellas County, FL	Norwalk and southwest CT
Name of service		RTD Van Go!	Pick up by Cap Metro	Direct Connect	Wheels2U
Type of On-Demand service	Partnership with Lyft	Turn key style, Mobility-on-demand rideshare program with Ecolane	SaaS, on-demand Microtransit utilizing paratransit vehicles	Partnership with Uber, united taxi, and wheelchair transport.	SaaS, on-demand microtransit utilizing paratransit vehicles
Description	First/last mile solution. Take a Lyft to the nearest bus stop. New users use code PHXRIDES for \$5 off each of their first 5 rides to transit stops. Existing users, use TRANSIT PHX for 20% off. 6 month pilot in north and south Phoenix	On-demand ride-share service to help residents travel more easily within the Northern San Joaquin County. 1 year ago has partnership with Uber for rides, pay 50% of ride up to \$5. Had a 6 month pilot with TransLoc and now with Ecolane	Capital Metro launched a flexible, on-demand service that utilizes their dispatchers, paratransit vehicles, and operators. Opened system to paratransit and regular clients. Geofenced area with low density but growing area not ready for bus yet.	Take an uber or taxi to 24 locations to help with first or last mile. Partnership with Uber, united taxi, and wheelchair transport. Receives \$5 discount towards the trip.	Started early September. On-demand ride-share service allowing residents to request rides and be picked up in minibus vehicles and bring you to your destination. Regular fixed route ends at 7pm, leaving only 2 shuttle routes till midnight. This complements late night service.
Goals of program	First/last mile	San Joaquin has low density areas, wanted to provide some level of service to those areas	Provide some level of service to an area with very little service	Connect people with the core route network	Provide public transit during late night hours.
Audience served	General public	General public	General public	General public	General public, pick up/drop in 2 square mile
Days and hours	24/7	7 days a week, 8am - 5pm	7am - 7pm M-F, 10am - 5pm Sat	6:00am - 11:00pm, 7 days a week	Th-Sat 5pm - 12am, Sun 12pm - 9pm
Geofencing	Yes, north and south phoenix	Yes, specific area, planning to expand after pilot	Yes, low density area that is growing but does not warrant fixed route	24 direct connect stops	Yes, specific area with train station, entertainment, restaurants, TOD housing, large residential area
Transportation gap addressed	Spatial, first/last mile	Spatial	Spatial	Spatial, first/last mile	Temporal
Operation model	Partnership	Software as a Service	Software as a Service	Partnership	Software as a Service
Pilot (how long)	Yes, 1 year. Start October 2017	Yes, 1 year with Uber, 6 months with TransLoc	Yes, one year. Ended service June 2, 2018	Yes, started Feb 2016	Yes, 6 months
Partnership with private company	Lyft	Ecolane	Via	Uber, American taxi, wheelchair transport	TransLoc
Costs	Swap, City gave marketing space at bus shelters and Lyft gave discounts to riders. No City money was directly used	\$1 million for a year	\$10,000 per license per year. \$100,000 setting up software. About \$200,000 a year total.	Budget - FY17 \$100,000, FY19 - 156,000	\$25,000
Funding mechanisms	None	Bought vehicles with 5310 and 5311. Wanted to use 5311 for operating, but reporting was too complicated. Now uses LTF (local transit funds) not part of FTA	Pilot - Innovative Mobility fund. Continued service - local sales tax, fare recovery, and investments. No federal funds will be used	General funds, all local	Partnership between City of Norwalk, CT, and Norwalk Transit. Some funding from cut routes, City funds
Fare	New Lyft users - \$5 for 4 rides. Existing riders - 20% off of ride	\$5 one way trip, free transfers to buses	Free	Pays \$5 towards trip	Free during pilot. City of Norwalk is paying up to 25,000 trips
ADA/FTA compliance	Used promo code and no FTA funds being used	All vehicles ADA	Yes, paratransit vehicles, Cap Metro drivers	Uses local funds, has multiple providers	All vehicles are ADA
Fleet	Private vehicles	8 ADA vehicles in pilot phase, expand to 14 vehicles in January 2019 to be county wide	7 Paratransit vehicles, 4 vehicles at most	Uber and taxi fleet. Partnered with Wheelchair transport	2 Paratransit vehicles

MOUNTAIN LINE ON-DEMAND FEASIBILITY STUDY

	City of Phoenix	San Joaquin Regional Transit District	Capital Metro	Pinellas Suncoast Transit Authority (PSTA)	Norwalk Transit District
	Phoenix, AZ	Stockton, CA	Austin, TX	Pinellas County, FL	Norwalk and southwest CT
Name of service		RTD Van Go!	Pick up by Cap Metro	Direct Connect	Wheels2U
App and calling option	Limited ADA availability	Both options	Both options	Both options, 90% use Uber through app	App based, has a calling feature but app is advertised.
Successes	Helped provide some data for OnD and travel patterns. Had some utilization of existing Lyft users, very few new users	Both Ecolane and TransLoc have great customer service and helped with launch. Starting to focus on marketing, ridership when from 4 passengers per day to 10 in 2 weeks.	More than 20,000 trips in one year	After removing boundaries, ridership tripled from April to August. In September it grew but is leveling out	Up to 100 riders during the weekend. Will expand zone to include large residential area
Lessons learned	Spell out what you want from TNC and set expectations early on. Ex. Data sharing and what type of data.	Marketing - important to use traditional methods and social media. Outreach events to teach people how to use the app.	Important to educate customers on how to use the app. Keep checking the routing and make sure it is efficient. Cap Metro would inform Via, they would rework the algorithm. A pilot is great testing ground.	First PSTA used zones, but this hindered travel. Switched to use Direct Connect stops, allowing more freedom in travel	Need a robust advertisement program. Wish we would have more resources for advertisement
Challenges	Can not tell if user is using transit or just Lyft trip. City and Valley Metro does not have fare and tracking capabilities for fare integration.	Majority of people using service is elderly or people with disabilities, 90% use call in option. Marketing has been a challenge since the agency mostly uses social media. Going to start to use more traditional methods like flyers and outreach events. TransLoc is not as robust as Ecolane. Has capability to do whole county. TransLoc is better for a small area	Nothing extreme. Had to train 50+ community about the app.	Zones made travel difficult because you couldn't cross zones. Might have to backtrack your travel to get to the closest DC stop	So far, everything is running smoothly
Additional staffing	None	Part of contract, uses National Trust (owns Ecolane) for maintenance, dispatch, drivers, etc. RTD provides vehicles and facilities	Hire 2 temporary dispatch to answer calls. 51% of people called during the beginning of pilot, went down to 40%.	None	No additional staffing. Some drivers moved from part time to full time. Had to have supervisors stay 1 extra hour
Technical challenges	Lyft did not geofence in the beginning, difficult to figure out if trip was FLM solution.	90% use call in option, however app works very well. Due to marketing. TransLoc is better for small areas, does not work well for large, complex areas.	Have to keep working with Via to tweak algorithm to keep maximizing ridership.	Switched to start using a promocode, some people had to be trained on how to use promo code. \$5 starts when an origin or destination is within 800ft of a DC stop. Some people had a destination not within the 800 ft, so no price reduction. Nothing wrong with app, just need to communicate better and train people	None, very easy to train drivers and use app. Trained drivers in 15 mins
Future of the program	Data is helpful to decide if they want to do a microtransit or readjust fixed-route program	Expand to county wide	Program ended June 2018, not because the program did not work, there was a trial period with Via for one-year free service. Currently has an RFP out to continue service	Recently changed the fare structure to pay first \$5. Before was 50% of the ride, up to \$3. Expanded DC stops to 24.	After pilot going to move towards a first/last mile scenario. Use microtransit to feed into core routes. Funding will become more difficult, and competitive, so we will have to scale back on low performing routes.
Ridership	All zones - 5,557 a year. 15 per day.	No data received	20,000 one year ~55 per day. ~4.5 Passenger per hour	September 2018 - 3,975. September 2017 - 948. ~132 per day	100 per weekend. ~50 per day. ~7 passengers per hour. September to February = 3,216
Other performance measures	Average distance - 7.27 mi, duration 14 mins, average fare \$11.13 (1.79 discount)	No data received	Towards the end of the pilot, 70% of paratransit clients used this service. 40% were shared rides. Via made cost per passenger lower since average person per hour 3.65. Average \$51 per trip	Track average distance traveled (keep it low), average response time (keep it low), total unique riders (keep it low)	Collecting revenue per service hour: 2. Average wait time is 2-3 mins.

MOUNTAIN LINE ON-DEMAND FEASIBILITY STUDY

	York Regional Transit	City of Arlington	Gwinnett County Transit	Harvard Transportation & Parking	Tri-Valley Wheels	City of Monrovia
	York Region, Ontario, Canada	Arlington, TX	Gwinnett County, GA	Harvard Campus, MA	Dublin, CA	Monrovia, CA
Name of service	Mobility Plus Services	Arlington On-Demand	Microtransit Pilot	Evening Van Service	Go Dublin!	Go Monrovia
Type of On-Demand service	14 On-Demand services, providing fixed-route replacement (stop to stop), rural service (curb to bus stop)	Transit as a service powered by Via	Microtransit service in area with no transit service, partnership with TransLoc	Evening SaaS on-demand van service.	Rideshare promotion with Uber, Lyft, and DeSoto Cab Company. Residents must use rideshare options (i.e., Lyft line)	Partnership with Lyft, City subsidizes price
Description	Providing on-demand services for first-last mile solutions. Replacement of fixed-route, where on-demand now runs along bus stops where route used to run. In rural areas, has a nearest curb address to closest bus stop or hub location, on-demand service to commuter rail.	City of Arlington is the largest city in the US without a transit system, so the City issued an RFP in the summer of 2017 for transit services. Out of 4 participants, Via was most qualified. Offer on-demand rideshare option, M-F 6am - 9pm, Saturday 9am-9pm	Providing microtransit pilot that will run for free in Snellville, which currently does not have transit service. Door to door service within a specific zone	Previously used manual, paper system with call in option. In 2016, went from TransLoc software to Via. Transports faculty, staff, and students safely around campus as supplement to Harvard's fixed route shuttle bus system	Wheels pays for 50% of your fare, up to \$5.00 for any ride within city limits.	GoMonrovia is the City's enhanced mobility program that features \$0.50 rides with the car-sharing provider, Lyft, and \$1.00 30-minute rides with the bikeshare provider, LimeBike. These options are being provided in partnership with the City's existing dial-a-ride program. Wanted to bridge the gap with Gold Line station.
Goals of program	Provide best service to community, creating an extension of fixed-route system.	Provide some transit service in Arlington	Provide transit where there is currently none. In 2016, started looking at solutions to service this area.	Provide more convenient rider experience and fill in gaps of fixed route system	Wheels wanted to provide transit service in less-populated areas. Wanted to give residents an easy, affordable transportation solution	Provide fast, convenient, and affordable transportation options
Audience served	General public	General public	General public	Students, faculty, and staff. Need Harvard email to create log in	General public	General public
Days and hours	M-F have (1) Service between 9:30am and 2:30pm, (1) Rural service between 8:30am to 11:00pm, (1) Peak hour commuter rail connector, and (8) services running from 7:00pm to 11:00 pm; Sat there are (3) services from 7:00am to 7:00pm and (5) services from 7:00pm to 11:00 pm.	M-F 6am - 9pm, Saturday 9am-9pm	Monday through Friday from 6:00am - 8:30pm, Saturday from 7am - 7pm	Every night 7pm - 3am during academic year. 7pm - 12:30am after commencement - until classes begin	Everyday 24/7	Everyday 24/7
Geofencing	Yes, pick up people and drop off at nearest location	Yes, covers large portion of the city, plus centrepoint station	Yes, 17 square mile zone. No transit near by	Yes, campus service area. Door to door in some areas (mostly residential) and corner to corner in other areas	Trip must start and end in city limits	Yes, City limits and several unincorporated areas within LA county
Transportation gap addressed	Spatial	Spatial	Spatial	Spatial and temporal. More flexible (door to door) during late night hours	Temporal and Spatial	Spatial, First/Last mile
Operation model	Software as a Service	Transit as a service	Software as a service	Software as a service	Partnership with Lyft, Uber, and DeSoto Cab	Partnership with Lyft, City subsidizes price
Pilot (how long)	Providing service for several years	No, signed 4 year contract, with approval each year	Yes, started in September, 6 month pilot	No, previously used TransLoc	Started November 2016 for 1 year pilot.	No pilot, existing for 8 months
Partnership with private company	Routematch	Via	TransLoc	Via	Lyft, Uber, and DeSoto Cab	Lyft and Lime for bikeshare
Costs	\$25 per passenger hour	\$900,000 one year contract. Negotiating price for year 2, cost increased 1.8 million to increase number of vans and additional costs.	\$25,000 for TransLoc pilot, \$150,000 per month in operations	Could not disclose. Via negotiated price, first was too expensive	FY18 \$28,748	Subsidy - was \$6-7, now it is \$3-4 shared
Funding mechanisms	Different than US models. The City subsidizes the transportation. Budget is flexible, move money from fixed-route to demand services	1/3 general fund, 2/3 formula funding from FTA	Pilot - local funds. After pilot - ask for more CMAQ funds	University general fund	Transportation Develop Act funds from Wheels and Measure 8B funds from the Alameda County Transportation Commission	Local Return Dollars, dial-a-ride is also funded through this source.
Fare	Service integration. \$4 per trip (2 hour transfer window), included fixed route. Pay with smartcard or cash	\$3 one way	Free	Free	Agency pays 50% of fare, up to \$5.00	\$0.50 for shared rides, \$3 for non-shared
ADA/FTA compliance	Yes, vehicles are paratransit vehicles	Yes, vehicles have ADA access	Yes, vehicles are ADA	Yes, ADA vehicles	DeSoto has ADA vehicles, cash option, and phone option. Since there are multiple vendors, taxicab exception applies	Has dial-a-ride option, Lyft is partnering with MV to increase accessible vehicles. City program, not FTA
Fleet		15 in fleet, but Via drivers can use own vehicles during peak demand. Use 16-18 during peak.	7 total, 5 in service	Maximum is 4 vehicles	Private vehicles, ADA options through cap company	Private vehicles

MOUNTAIN LINE ON-DEMAND FEASIBILITY STUDY

	York Regional Transit	City of Arlington	Gwinnett County Transit	Harvard Transportation & Parking	Tri-Valley Wheels	City of Monrovia
	York Region, Ontario, Canada	Arlington, TX	Gwinnett County, GA	Harvard Campus, MA	Dublin, CA	Monrovia, CA
Name of service	Mobility Plus Services	Arlington On-Demand	Microtransit Pilot	Evening Van Service	Go Dublin!	Go Monrovia
App and calling option	Both options	Both options, calling option not used frequently	Both options, 90% use app	Both options, 95% app usage	Yes, through DeSoto cab	Both, people can call Dial-a-Ride number, they can order Lyft through concierge service
Successes	Ridership is continuing to grow, 15-16% each year	Ridership is continuing to grow (almost too much). Expanded area, and ridership continued to grow. About 620 rides per day. 18-35 age is most ridership, 55-65 is second. Overall very happy with service and via's customer service	Ridership is continuing to grow. 90% use phone app, very little on staffing	95% app usages, 200 a night ridership (with TransLoc was 150). Average miles decreased, 30% increase in passengers. More efficiency and better algorithms with Via. Via has their own service and TaaS, so they understand customer service and operations	Uses promo code, limited procurement needs. Ridership is continuing to grow. Fixed route cost \$26.13 per rider subsidy, Go Dublin is \$2.35. Ridership on BRT is growing after program. 28000 to 32759. \$5 get you anywhere where transit exists.	Great increases in ridership. 1,800 rides first week, 60,000 a month. Elderly population is starting to use service. Did reach out events to teach elderly how to download app and hail a ride. No issues with local taxi company, transit is very limited in area.
Lessons learned	Removed branding for individual programs. Everything from paratransit to fixed route is just YRT, helped reduced stigma with getting into a paratransit vehicle. Dedicate time for training and outreach.	Marketing - helpful to have "boots on the ground" set up tables at Walmart and other popular areas to help download app and use service. Via underestimated cost of service for bid, now in second year is increasing price and number of vehicles to keep wait times low	Include key destination points in zone, added Walmart to area after pilot began. Not a huge volume of calls (10-30 calls). Helps to have buy in from paratransit contractor. They helped spread the word, great partner	Via can have both geofencing and first last mile capability. TransLoc can only do one. TransLoc is not as flexible, lack of dynamically re-routing system, sometimes passengers would be on board for an hour (walking would take 20 mins). Negotiate price with Via. Reports are better and more reporting options with Via	Union in Dublin was not happy because routes had to be cut. Demand, make sure subsidy is not too much and program is not sustainable. If you are just using promo code, it follows FTA.	Demand was underestimated, not sure how to mitigate that. Determine a cost per subsidy that is sustainable, do not want to keep increasing price.
Challenges	Not having the technology has been difficult. New Routematch technology will launch in April.	Scalability - demand keep increasing, wait times are increasing. Some issues for elderly to adopt, extra marketing and training could be helpful.	Software lacks operational thinking. i.e. When one driver logs off and another one log in, rides que during between shifts. Also, app does not optimize in real time, i.e.. If a vehicle is delayed due to securing a wheelchair, rides stack up and routes do not change. Some agencies have used override option.	TransLoc has challenges making a day go from 7am - 3:30am, difficulty reporting. No problems with Via. There are 30 "tweak" options. Via is very comprehensive to explain consequences.	More riders may use service than expected and use funds quickly. Safety could be an issue since Uber drivers are not screened strictly. Challenges getting data from TNCs. Cost for wheelchairs are more expensive to customer (UberXL), need to figure out solution. Should agency subsidize more?	Demand is getting too high. Looking for grants to supplement program.
Additional staffing	None	Via provides 2 local staff to help with customer service. Via staffs one project manager located in NY. Otherwise, no additional staffing with City of Arlington	Needed additional drivers and supervisors. No dispatch or other staffing needed.	No additional staff since initial program started.	No additional staffing, very easy to manage program	No added City staff
Technical challenges	Enough time for training staff how to use program	Some adoption issues with customers. Otherwise, app is easy to use from customer and drivers	Contractor's phone is down a lot, issue not due to TransLoc.	Easy to implement. Many challenges with TransLoc's software (explained in Lesson Learned and Challenges)	Looking into concierge option to order Lyft rides for call-in option. Otherwise, easy to use for customers	Nothing so far, had a Lyft tutorial providing free dinner and help download app and hail a ride.
Future of the program	New technology in April, adding trip attributes (only drop-off at stops with benches). One app for trip planning, including private and public options	Increase number of vehicles.	If successful, program will expand to another area. Might start charging fares, however need to figure out installing fareboxes. Need to revisit rider policy - since it is free, what is the policy for no-shows.	No changes decided as of yet	Might expand program. Looking into more wheel chair accessibility options. There is a new partnership with Uber/MV, can we utilize that.	Might more towards \$0.50 in certain areas or only connect to transit? Going to conduct a study session to figure out solutions.
Ridership	Continuing to grow, 15-16% each year	620 per day. ~41 passenger per hour	250 riders per day. ~17 passengers per hour	200 a night. ~25 per hour	May 18 - 1659. ~53 trips per day	60,000 a month. ~ 2,000 trips per day
Other performance measures	Develop new performance measures as new technology launches. Strategy for cost per passenger, trip length, and divide it by urban and rural areas. Passengers per hour 1.3 - 1.8	N/A	N/A	Average miles of vehicles, passengers per vehicle.	Average wait is 10 - 15 minutes	N/A

MOUNTAIN LINE ON-DEMAND FEASIBILITY STUDY

	Valley Regional Transit	Dayton RTA	Marin Transit	Ann Arbor Area Transit Authority (AAATA)
	Ada County and Canyon County	Dayton, OH	Marin County	Ann Arbor, MI
Name of service	VRT Transit Connections	RTA Connect	Marin Transit Connect	FlexRide
Type of On-Demand service	Partnership with Lyft for first/last mile	Partnership with Lyft for first/last mile	Microtransit service for first/last mile and to service seniors and people with disabilities	Microtransit with local private company
Description	Riders get a \$2 Lyft ride to several bus stops. Can get the ride to or from a bus stop. But be within a 2 mile radius of the bus stop.	2 options - 1. customer can transfer to an RTA bus stop for free. 2. customers can use Lyft within a zone for a \$2 trip	Provides on-demand trips in service area. Area includes transit and BART connections, YMCA, senior housing, etc. Marin Transit is a 5311 agency	Door to door ride sharing service
Goals of program	Provide a first/last mile connection for 'best in class routes'. Focus on making transit better and more ridership along high frequency routes. Not focusing on coverage	First/last mile and spatial. Provide people in more rural areas with a transportation option	First last mile solution, wanted to serve multiple markets and provide a transportation option where fixed route is not conducive	FlexRide is a same-day and next-day on-demand service. Services area is less dense than a suburb and links up to bus routes and civic services. This service also provides a connection to a bus route. Service days are M-F 9-5.
Audience served	General public	General public	General Public	General public
Days and hours	6 a.m. to 9 p.m. Monday-Friday and from 7:30 a.m. to 6 p.m. on Saturday	24/7	Weekdays from 6:30am - 7pm	9am to 5pm M-F
Geofencing	Yes, specific zone with 14 bus stops, serving 4 routes	Yes, 5 different zones, all with bus stops to transfer to fixed route or just use service within zone for \$2 trip	Yes, 3 square mile area. Includes some transit and BART connections	Provide service in an area where there is no fixed route, and help connect people to bus routes
Transportation gap addressed	First/last mile	First/last mile and spatial	First last mile	Spatial (area in low density)
Operation model	Partnership with Lyft	Partnership with Lyft for first/last mile. Other taxi providers and paratransit	Partnership with Via Transportation	TaaS
Pilot (how long)	yes, 18 months. Contract with Lyft for 3 one year extensions	N/A	Yes, 1 year but will extend for 6 months	1 year pilot, will extend for another year
Partnership with private company	Lyft	Lyft	Via	Metro On-Demand (MODE) - Only Ann Arbor based
Costs	\$200,000	No data received	~\$55 - \$75 per hour, using paratransit costs. Contract paratransit service	Pay by service hour, ends up costing \$40 per service hour.
Funding mechanisms	5307 funding. City of Boise for local match	Funds from cut fixed routes	5310 funds	2014 Transportation Improvement Millage
Fare	\$2 for customer, transit agency pays the rest	Free if transferring to bus stop, \$2 within zone	Regular rides are \$4 per seat. 50% discounts for Marin Access services or passengers riding to or from a transit stop. Per rider charges also decrease as your party increases. For example, a regular priced trip for two riders is \$8, but the third is \$3 more, the fourth is \$2 more and all additional are only \$1 more.	\$1 each way. Discounts available students, seniors, and disabled
ADA/FTA compliance	ADA - partners with NEMT providers since no taxi companies had ADA vehicles. FTA - taxi exception rule since partner with 2 other transportation providers	If person calls RTA, first try to get on paratransit service, then push to Lyft or taxi provider	ADA accessible vehicles. Promoting to senior homes and human service agencies to fit the 50% of rides for seniors and people with disabilities	Yes, vehicles are ADA
Fleet	Lyft fleet, 2 NEMT providers	Paratransit, Lyft, and taxi providers fleet	Peak 3-4 vehicles, 2 during normal times	1 - 2 vehicles

MOUNTAIN LINE ON-DEMAND FEASIBILITY STUDY

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	Ada County and Canyon County	Dayton, OH	Marin County	Ann Arbor, MI
Name of service	VRT Transit Connections	RTA Connect	Marin Transit Connect	FlexRide
App and calling option	Both, mostly app usage. Customers can call VRT to schedule with NEMT	App is Lyft, calling option is RTA and first put on paratransit	Both, seniors tend to call in, otherwise app is very popular	Both. Reserve a ride a day before or at least 45 minutes in advance. Walk-ons acceptable at certain locations if space available
Successes	6 weeks in, but already 500 riders, trending upwards. Went through procurement process for contract with Lyft. Combined bus pass and Lyft rides for \$90	On-demand program ridership is growing, people get to their destinations quicker, have more transportation options, especially in rural areas. For people who call in, 80% are able to be on paratransit	Students with mobility devices and an adult day program have really benefited. Ridership is continuing to grow. Successful travel training with these agencies to promote independence	Program is slowly growing. Calls are handled by contractor, did not need additional staffing.
Lessons learned	Lyft only provides OnD within census tracks, can not know if ride to bus stop or just within the zone. Make sure everything is in contract, not sure in procurement meeting. Ex. Lyft line not in Boise, but Lyft said this would be part of program, so far it is not.	Outreach - reach out to locals, attended all city council meetings, rode routes and gave information out. Lots of customer outreach to prepare people. Policy - if ride service is late, and you miss your fixed route connection, they will take you to final destination	Time and effort for marketing a new program. In the beginning, be critical of algorithm, it took about 6 months to get it right. Might need a longer pilot than anticipated	Need to continually advertise people and teach people how to use the app. Scalability - able to provide fast, on-demand service but only able to pay for one van.
Challenges	Getting data, like OnD. Contract with federal clauses. Took 7 months with back and forth between agency and Lyft	Trapeze Software with paratransit vehicles are not able to do exactly what we want. Very difficult to schedule on-demand trips for people who call in. Union issues when program just started	Took 6 months for software to stabilize. Pre-book feature was difficult, in beginning it would deny rides	Goal is to have 2-4 passengers per hour, currently at 1-2. Only 10% of people request a ride through on-line or app. Need to advertise app and train people. Average wait to 15 minutes, since there is only one vehicle
Additional staffing	None	None, but call center when service was just launched had long wait times, not it is steady and under 60 seconds, have 15 call reps	None, just additional drivers but they contract that service out	None
Technical challenges	None with app. Part of procurement was Tapride from Double map to put technology on NEMTs. However, right now just calling company to schedule ride	Trapeze service has been challenging but it is not intended to do what we want to do	Took 6 months for software to stabilize. Pre-book feature was difficult, in beginning it would deny rides	Longer wait times, not as attractive as same day booking
Future of the program	Plan to expand program to it covers most of Boise. Will continue to track progress	Would like to move towards an on-demand program with our paratransit fleet, possibly different software. Goal is to be the regional coordinator for mobility	Eventually go to board for approval to continue service	Move towards the first/last mile connector and integrate real time bus arrival in app
Ridership	500 in first 6 weeks	No data received	1300 per month	No data received
Other performance measures	N/A	No data received	2 passengers per hour	No data received