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George Mason University and City of Fairfax

Transit Study

PREPARED FOR

GEORGE MASON UNIVERSITY

CITY OF FAIRFAX VIRGINIA 1805

PREPARED BY vhb

IN ASSOCIATION WITH

George Mason University
Center for Social Science Research

DISCLAIMER

This study was a joint effort between George Mason University and the City of Fairfax to understand how the CUE bus system and Mason Shuttles are utilized by riders, and review areas where the services overlap to identify potential efficiencies that could be gained. The study also examined the existing funding arrangement for transit services between George Mason University and the City of Fairfax. The outcome was the development of guidance based on a review of existing revenue sources, service utilized, and discussions between both parties. While this guidance provides both entities the flexibility to adjust factors to accommodate changing service usage and funding levels, there was not complete agreement about specific details at the conclusion of this study. Financial contributions by George Mason University to support the CUE bus system will be determined based on additional negotiation between George Mason University and the City of Fairfax.

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Executive Summary

Background

The City of Fairfax began providing transit service in the early 1980s as a response to growing concerns about parking and congestion on the George Mason University campus and growth in public transportation needs for the City. The City-University-Energysaver (CUE) provides service to the City of Fairfax with termini at George Mason University and the Vienna/Fairfax-GMU Metrorail station. This service provides city residents and visitors along with university students, faculty, and staff a means of cost-effective transportation.

As George Mason University has grown, so too has demand for additional and more-focused transportation services. In 2003 Mason Shuttles began as a service for international students, and has grown to five different shuttle routes operating at greater frequency today. In addition to CUE and Mason Shuttles, Metrobus and Fairfax Connector provide regional bus connections to the City and George Mason University Fairfax Campus.

George Mason University provides a contribution to offset the costs of operating the CUE bus service. In addition, the University subsidizes the full cost of operating the Mason Shuttles. Recent changes in ridership and an examination of current funding levels raised questions about service overlaps, funding amounts, and the existing operating model.

This study developed recommendations for improvements to the transit services for both George Mason University and the City of Fairfax. This study examined usage patterns for CUE Bus and specific Mason Shuttle routes to identify potential route changes that could result in system efficiencies, cost savings, and ridership increases. In addition, perceptions of both services were gathered to identify service improvements to address the demands of both existing riders and those not currently using either service. The existing unmet need for transit service was quantified, and potential service options and funding strategies for Mason Shuttles and/or the City of Fairfax CUE were developed.

Significant data about both services was required to answer these questions. Mason Shuttles and CUE provided information about service characteristics, funding, and ridership for the past five years to identify patterns and trends. In order to better understand how riders used both systems, more detailed ridership data was required. The George Mason University Center for Social Science Research assisted in the collection of detailed on-board ridership counts, rider surveys, and community surveys. These surveys provided information about the travel patterns of CUE and Mason Shuttle ridership, ridership perspectives of the service, and identified opportunities for service improvement.

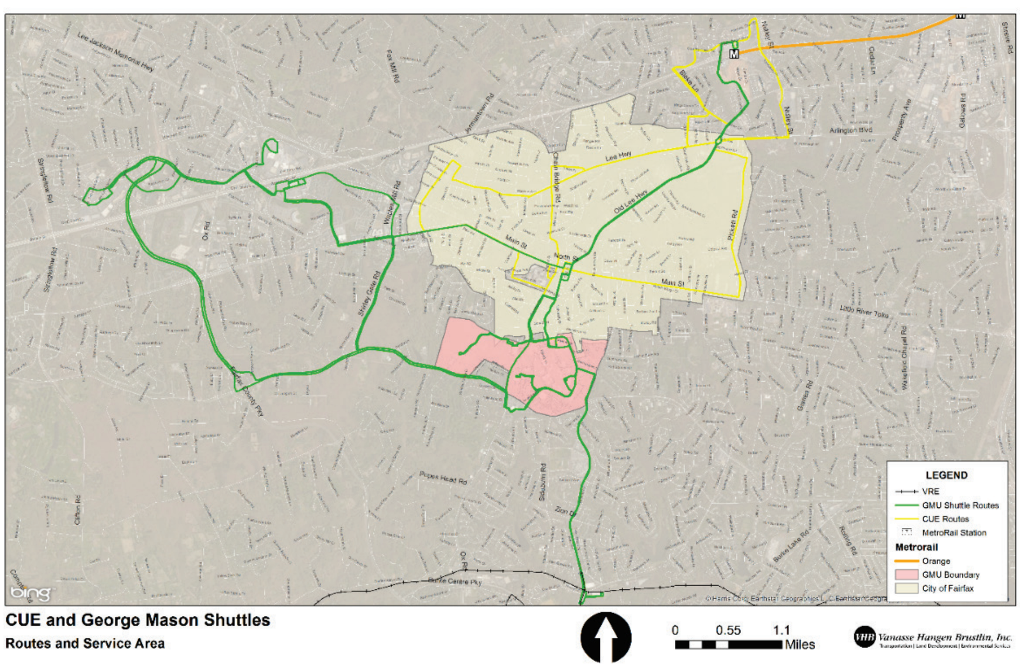
The study is broken into the following sections to present the collected data, describe the analysis completed, and present recommendations rooted in that analysis:

- Existing Conditions
    - Service Characteristics
    - Demographics
    - Historic Trends)
- Ridership and On-board Survey
- Household Survey
- Route Performance and Analysis
    - Cost Analysis
    - Mason Contribution to CUE
    - Ridership Analysis
- Demand Analysis
    - University Growth
    - City of Fairfax Demographic Shifts
    - Travel Demand
    - Capacity Analysis
- Recommendations

Existing Services

The map below shows the City of Fairfax and surrounding service area for the CUE and selected Mason Shuttle routes. CUE Gold 1, Gold 2, Green 1, Green 2, and selected Mason Shuttle routes were included because they operated within the City of Fairfax and immediate surrounding area. Mason Shuttle routes not included as part of the study were the Fairfax to Prince William, Field House, West Campus, and I-95 Commuter shuttles.

Figure E-1: Study Routes



Data for each route were compiled into a route profile which includes:

- Major Generators Served
- Transfer Locations
- Service Span
- Service Frequency
- Number of Trips
- Route Length
- Run Time
- Ridership
- Revenue Vehicle Miles
- Revenue Vehicle Hours

In addition to the route profiles, the study documents other transit services that operate within the study area, study area demographics linked to higher transit use, and historic CUE and Mason Shuttle performance trends.

Ridership

Ridership counts were collected from the last week in March 2014 through the first week in May 2014. Study team staff rode each route and manually counted the number of passengers boarding and alighting at each bus stop. From these data, the bus load—the number of passengers onboard the bus—was calculated for each trip leg between every stop on the route. These three types of data—boardings, alightings, and passenger loads—each provide a more in-depth understanding of different aspects of the system.

Studying boardings and alightings reveal which bus stops have the highest demand. Additionally, identifying the maximum load point—the location on the route with the greatest number of riders—is used to determine route segments that could benefit from additional service and higher service frequency. Evaluating route loads shows the most popular and crowded portions of each route. This information is important for planning service frequency and scheduling appropriately sized vehicles. These data also identify the stops and route segments with the lowest demonstrated demand. Stops and route segments that are not frequently used should be considered for adjustments that will effectively serve more riders. **Error! Reference source not found.** illustrates the on-off count data for one direction of Mason Shuttle's Mason to Metro route.

Table E-1: Mason to Metro Boardings/Alightings

Weekday Outbound to Vienna/Fairfax-GMU

Stop	ON	OFF	LOAD
Mason Inn	46	0	46
Mason Pond Drive at Patriot Circle	2	0	48
Sandy Creek Shuttle Stop	313	2	359
Masonvale Patriot Circle at Staffordshire Lane	2	3	358
Rappahannock River Lane	193	14	537
Commerce Building	5	7	535
Fairfax Circle	0	3	532
Vienna Metro	0	532	0
	561	**561**	

On-board Survey

The study team conducted an on-board survey to gain an understanding of the travel patterns of current riders of both CUE and Mason Shuttles. The survey was conducted on board buses, collecting information from riders as they travel. The survey results provide information about the trips made, travel behavior, and perceptions of the service. The information gathered through the on-board surveys provided data used to develop improvement recommendations, enabling CUE and Mason Shuttles to enhance the transit system by aligning service to the needs of riders.

The on-board survey was conducted on all study routes during both weekdays and weekends from April 9th to April 28th, 2014. The trip assignments were randomized and staffed by a member of the study team from the Mason Center for Social Science Research (CSSR). The survey instrument is included as part of the study. The study team collected 439 on CUE and 491 surveys on Mason Shuttle routes.

An analysis of the data collected from the survey respondents found that over 60 percent of the CUE bus riders were City of Fairfax residents. Of the respondents who identified as non-City residents, 78 percent had a destination within the City of Fairfax. Those riders who reported a destination outside the City were either traveling to the Mason Fairfax Campus or a location just outside the City's jurisdictional boundaries. The majority of Mason Shuttle riders reported not living in the City of Fairfax.

A large number of CUE riders (77 percent) reported not having access to a vehicle for their trip. Over half the CUE riders surveyed reported not having a valid driver's license. The percentage of licensed drivers was higher for Mason Shuttle riders, but fewer had access to a vehicle. CUE bus riders tended to ride more days out of the week when compared to Mason Shuttle riders. The majority of both rider groups rode the bus every week.

Riders of both systems reported learning about transit information from the internet, word of mouth, and printed bus schedules. Mason Shuttle riders also learned from Mason-specific communications. A smaller group of both riders learned from the real-time information service, NextBus.

The majority of riders walked from their origin to the CUE or Mason Shuttle system. The majority of Mason Shuttle riders accessed their destination by transferring to Metrorail. Just under 50 percent of CUE riders accessed their destination via Metrorail. The majority of riders were traveling between Home and Work/University. Most riders originated from within the City of Fairfax or the Fairfax campus. The location of destinations was much more scattered across the region. Riders were also asked how they would complete their current trip is the service they were riding wasn't available. Over a third of Mason Shuttle riders indicated that they would have used CUE if Mason Shuttles wasn't available.

When asked to provide perceptions of the existing services, riders indicated that the proximity of transit to their trip ends, availability throughout the day, and running on-time were more impactful in their decision to use transit. Mason riders were more likely to be sensitive to the cost of transit fares when compared to non-Mason riders. The cost of parking and/or fuel did not factor into their decision to use transit. The availability of parking was also not a factor.

Household Survey

Household surveys were conducted to collect information from riders and non-riders related to perceptions of both services. This information will inform recommendations that could attract new riders or encourage existing riders to ride more frequently.

The household surveys were conducted by the Mason CSSR. Surveys were collected using two methods. Initially, all respondents were contacted via email or a postcard to fill out a survey online. Everyone with a valid Mason email address received the survey, and a random sample of City of Fairfax addresses was used. Targeted phone calls were used with the City residents to support the postcard and ensure a higher return. The Mason Community Survey collected 2,263 responses and the City survey returned 995 responses. The City survey results were factored to account for the higher response rate among older residents.

More City residents drove a personal vehicle as their primary mode of travel than Mason respondents. Driving was still the most popular travel mode for Mason respondents, but they were split between other modes to a greater degree than City respondents.

Both Mason and City respondents were aware of both bus services to a high degree. However, there was an overall lower awareness of CUE and Mason Shuttles providing real-time passenger information through NextBus. Both groups cited the service area in relation to their origin or destination, travel time, and frequency as reasons for not using transit. When asked what improvements would get respondents to ride transit more, the most common responses were more frequent service, shorter travel times, and improved real-time passenger information. This finding was surprising since there was an indication that people are not aware that both services provide NextBus. Riders were also asked which destinations they would like to see served. Many of the requested locations fell within a quarter mile of an existing route, indicating an unawareness about the existing service area. Locations that were frequently identified by respondents but not currently served by CUE were Fair Oaks Mall and Fairfax Hospital. Locations that were commonly identified by the Mason community included Tysons Corner, Springfield, Centreville, and Burke. Many of these locations are accessible by other transit services, but would require a transfer or additional fare.

Route Performance Assessment

A goal of this study was to identify ways to improve transit system performance, resulting in potential cost savings, increased ridership, and greater rider satisfaction. Through a detailed examination of CUE and Mason Shuttle routes, it is possible to identify both the best and poorest-performing routes. This information was used to inform improvements to both systems. The ability to quantify how each route performs, enables segment by segment route optimization. It is important to recognize that within every system, there are successful and unsuccessful routes, both financially and in terms of ridership. Many systems make policy decisions to provide service to areas that may not produce high ridership, but provide a valuable transportation service. With measured analysis, Mason and CUE can determine the appropriate balance between the needs of riders, operational concerns, and funding constraints to maximize the efficiency and effectiveness of both systems.

A number of different analysis methods were used to provide a more balanced approach, understanding that some routes will perform better than others depending on the metric being examined. The following assessments were conducted for each route:

- A cost centers analysis examines information on operation, ridership, revenue, and cost data at the route level. This provides an examination of each route against the others. It requires development of a cost model to assign costs to each route, and because Mason Shuttles does not collect a fare, this approach is limited. Routes were ranked in terms of best to worst against each other (ordinal) and in terms of how they contribute to the overall system (portfolio).
- A service efficiency approach looks at the amount of service provided in relation to the resources expended.
- A service effectiveness approach measures how much of a given service is consumed.

The route assessment shows that both systems are performing well in most measures. When comparing the routes against each other for the CUE system, the Gold routes perform better than the Green routes, but the difference in performance is small and all the routes exceed the system's performance standards set by their Transit Development Plan. While the system has displayed declining ridership in recent years, these same trends have been witnessed across the region and nation. The farebox recovery for CUE is over 40 percent, which is above industry standards. The Mason to Metro route is the strongest performing route for Mason Shuttles. The Gunston Go-Bus has undergone service adjustments in recent years that show an overall improvement in performance. The Burke VRE Shuttle was still new at the time of this study, but is expected to improve based on other route's past performance and efforts to market it to the Mason Community.

Passenger loading for the routes was also examined to determine segments or routes that have capacity constraints. The load factor analysis will rely on three sets of data. The first are hourly ridership boardings collected from the farebox of CUE buses for a week in April 2014. This information will be compared to the seating capacity and number of buses operating during each hour of service. The second set of data comes from passenger boardings collected on every trip of a Mason Shuttle bus reported by Reston Limousine. The counts provided cover the entire month of April 2014, providing a relatively large sample. These two sets of data report passenger boardings and do not include passenger alightings. These counts do not account for the passengers that get off the bus between the two route ends, but rather are just a summation of everyone who boarded the bus. To supplement this, the passenger counts collected during the on-board survey were used. The observed passenger loads were examined to see if they exceeded the reported vehicle capacities.

The existing CUE routes showed some periods where capacity reached or exceeded the seated capacity. These periods of time were focused on the Gold 1 and 2 routes and around the peak periods of travel. While the loads observed did exceed the seated capacity in some instances, they did not exceed the vehicle's capacity, which allows for standees. Passenger loads should be studied closely moving forward to determine whether additional frequency is warranted during peak periods.

The Mason to Metro and Mason to Metro Express displayed similar peaks in ridership that began to approach the seated capacity of the vehicles. This could warrant additional service in the future as Mason Shuttle ridership has continued to grow. Efforts to take advantage of the overlap in service between Mason Shuttles and CUE should be explored further by communicating to riders both services' abilities to access common destinations. The other Mason routes studied did not display issues with crowding.

The impact of large events on the Mason campus to transit service was also explored. There was no discernable increase in ridership associated with large events at the Patriot Center. Utilizing passenger volume data from Reston Limousine and CUE for the month of April 2014, a comparison of event and non-event day total ridership was done. The following events were held at the Patriot Center during the month of April 2014:

- Ringling Brothers and Barnum and Bailey Circus (April 9, 10, 11, 12, 13, 17, 18, 19, 20)
- Ludacris Concert (April 25)

The events included weekday and weekends, with show times occurring during the afternoon and evening. The difference in average CUE ridership on event and non-event days was less than 1 percent. The same was true of Mason Shuttle routes that travel between the Metrorail and campus.

Mason Contribution to CUE

George Mason University has been contributing funding for the CUE bus system through a long-standing partnership with the City of Fairfax. The amount provided has varied over the years, as has the method for determining the amount. The funding contributed is intended to cover a portion of Mason's share of operating and capital costs.

The study examined how other universities and municipalities determine payment for transit service. This showed that there are many different funding and operating arrangements. The payment amount may cover the cost to operate a specific route(s), be based solely on the ridership carried, or cover an agreed upon share of the total cost. Each school and the surrounding municipalities determine the arrangement that fits their needs appropriately. There is no one-size-fits-all, or "right" way to operate and fund a transit service for an institution of higher learning.

An assessment of the Mason contribution in FY2013 was completed as part of this study. Mason contributed $720,000 in FY2013 (and FYs 14 and 15). The contribution in FY2016 is $750,000. Both Mason and the City of Fairfax benefit from the cost sharing arrangement. The City and CUE are able to cover a portion of the cost to operate the bus while Mason's faculty, students, and staff receive the benefit of riding CUE fare free. The impact to CUE if Mason were to reduce or discontinue their contribution would likely be a reduction in service levels. Additionally, Mason would not be able to provide a similar level of service to areas only currently served by CUE that would be cost effective. Both parties realize benefits through this arrangement, and it is in everyone's best interest to work towards coming to an agreement on guidelines that inform the annual contribution. The guidelines do not need to determine an exact dollar amount, but should provide a starting point for negotiation. The agreement should also be set for a period of time, three years, and only revisited on an annual basis if significant changes occur in service levels or any other factor that would significantly impact cost.

Recommendations

Based on the analysis conducted the five following needs were identified:

- **Improved/expanded communication with riders** - The survey results show that awareness of schedules, real-time passenger information, and destinations served were weaknesses for both agencies. Awareness of the many methods of communication for each service could be strengthened.

- **Better marketing of Real-time Passenger Information** - Awareness of the NextBus application rated lower in the survey than any other transit amenity offered by CUE and Mason. Survey responses prioritized service frequency and on-time performance as key factors when choosing transit. Providing real-time passenger information can inform arrival and wait times, improving perceptions of frequency, on-time performance, and even travel time.

- **Identification and marketing of route options for popular destinations** - The survey asked respondents to list locations they would like to see served by CUE or Mason Shuttles. Many of the locations requested are actually within a quarter mile of an existing CUE or Mason Shuttle route. Many of those outside the Mason Shuttle or CUE service area are accessible via other agency routes. Highlighting those options can raise awareness and ridership.

- **Modify or eliminate poorly performing routes** - Some of the Mason routes studied were performing under the system average. Decisions about the purpose and need of the route should be examined to determine whether the route should be modified or eliminated to address performance.

- **Develop Goals, Objectives, and Performance Standards** - The CUE has goals, objectives, and performance standards that were developed as part of the most recent transit development plan. The periodic review and update of these measures allow an agency to continuously monitor its success against changing conditions. Mason Shuttles does not currently have any formalized goals, objectives, or performance standards. Creating these would provide Mason Shuttles with the ability to measure performance and provide a clear standard for determining whether a route should be retained, modified, or potentially eliminated.

Develop Goals, Objectives, and Performance Standards

CUE currently has a set of goals, objectives, and performance standards that were put in place through their most recent Transit Development Plan (TDP). There is no need to update these standards at this time since the current TDP should be slated for update soon. When that occurs the goals, objectives, and performance standards should be updated to reflect current conditions and needs. It is recommended that CUE establish an annual performance review of their routes using the standards currently in place to monitor route performance and identify issues before they become major problems.

Mason Shuttles currently has goals and objectives that were developed as part of the recent Transportation Master Plan. Performance standards were not identified at that time. As a major part of Mason's transportation system, Mason Shuttles should develop performance standards that help Mason realize the goals and objectives of the Master Plan.

The following goals and objectives were identified as part of the Master Plan and should place Mason Shuttles on the path to being the primary provider for Mason students, faculty, and staff:

- **Connectivity**: provide service to desired destination
- **Convenience and Availability**: provide useful stops and a reasonable schedule
- **Information**: provide tools to empower informed transportation decisions
- **Perception**: make service "feel" safe, reliable, and convenient

The following measures were identified to support the Master Plan goals for Mason Shuttles. Included with each measure is a standard that Mason Shuttles should strive to exceed.

- **Connectivity**
    - *Service Coverage* - This measures the percentage of the area covered by transit service. Since Mason's service area isn't defined by a jurisdictional boundary, they should measure how well they serve the desired destinations of the population riding Mason Shuttles. This can be problematic because the survey responses noted desired destinations all over the region. The most suitable method for determining how well this goal is being served would be to periodically (every 2-3 years) conduct surveys of the riders to determined desired destinations. This information should be reviewed and those locations receiving the largest number of requests should be overlaid with the available transit services, including CUE, Fairfax Connector, and WMATA to determine coverage. The goal should be to cover approximately 75 percent of those destinations deemed "reasonable". The term reasonable is subjective, but consideration should be given to the feasibility of serving those destinations requested. A request for service to Front Royal, Virginia is likely not reasonable.

- **Convenience and Availability**
    - *Frequency* - Due to the different design and nature of each of the Mason Shuttle routes it is difficult to apply a system-wide standard to each route. Decisions should be made about the importance of frequency in the success of a route. Mason Shuttles should base service frequency on meeting demand. Routes like the Metro to Mason route have an expectation for frequent service, while a route like the Burke VRE Shuttle is timed to align with train schedules. Service frequency improvements should be considered on routes where the load factor is between 0.76 and 1.00 passengers per seat during the peak travel times. Load factors approaching 0.50 or fewer passengers per seat should be examined for possible headway increases during the peak travel times. No Mason Shuttle route should have a headway greater than 30 minutes during the peak or greater than one hour during the off peak.

    - *Service Span* - Similar to frequency, service span goals are going to be different for each route. The service span for Mason Shuttle routes should be based on demand. Routes should be examined for service span increases if the passenger load on the first or last trip is between 0.76 and 1.00 passengers per seat. Routes with passenger loads lower than 0.50 passengers per seat on either end of the service span should be examined for service span reductions.

- **Information**
    - *Knowledge of Mason Shuttles* - Through periodic survey efforts, Mason Shuttles can determine how successful their informational campaigns are working. The survey effort for this study indicated that the majority (> 90%) of the Mason Community are aware of the Mason Shuttles. Mason Shuttles should strive to continue this level of awareness and work towards increasing the figure, while also improving route awareness.

- **Perception**
    - *On-time performance* - Measuring how often a route operates ahead or behind schedule will inform how reliable the service is. Ensuring that riders can reliably access transit is paramount to ensuring positive experiences and retaining riders. Routes that have problems staying on schedule should be examined to determine the underlying cause and for possible schedule changes. Routes should be considered early if they arrive 1 minute ahead of schedule, or late is they arrive over 5 minutes behind schedule. Mason Shuttles should strive to maintain an on-time performance standard of 85 percent or greater of all shuttle trips.

    - *Safety* - Safety did not appear to be an issue for Mason Shuttles based on survey results, but ensuring it doesn't become a problem is important to retaining a successful service. As part of future recurring survey efforts, Mason Shuttles should assess perceptions of safety for Mason Shuttle riders.

Improved/Expanded Communications

The ability to connect and share information about a transit service with their customers quickly and easily is vital to ensuring continued success of the service and satisfaction of the ridership. This is especially important during periods when the service has unexpected changes to the schedule or routing. The growth and popularity of smart phones and social media applications provide a variety of platforms to disseminate information to customers. These can be added to the existing arsenal of traditional website communications, email communications, newsletter communications, and printed schedules, maps, or notices.

- Both CUE and Mason Shuttles should review their websites to ensure that current information about schedules, routes, and fares are accessible to both PC users and mobile device users. This information should be easy to find and highlighted. Service disruptions or other temporary changes should be displayed prominently.
- Mason Shuttles and CUE should consider setting up email subscription services for service notifications. These could be based on home address or zip code, ensuring that the communications are targeted and related to the user. An example could be sharing information about free parking and the shuttle schedule at the Burke VRE to those faculty, students, and staff who live near the Burke VRE.

Mason currently provides service information via Twitter, and the City of Fairfax has a social media presence on Facebook, Twitter, and YouTube. Each media can provide a transit service with different benefits. The following recommendations related to communications are proposed:

- CUE should create its own social media accounts. They presently piggyback on the City's accounts. Their own accounts will allow CUE to communicate more directly with its riders, and allow those who "follow" CUE to receive targeted information they are looking to receive.
- Mason Shuttles should expand its social media footprint into Facebook and YouTube. The ability to share video content through both provides Mason Shuttles the ability to develop and quickly share informational videos about using public transportation or other pertinent topics.

- Both agencies should develop social media policies that address who can access and post content, the types of material that will be posted, how critical feedback will be handled, and security concerns.

The cost associated with expanding social media communications is primarily associated with staff time. Based on other similar systems it would be expected that these activities would occupy anywhere from 20 to 80 hours a month.

Raise Awareness of Real-time Passenger Information

Based on results from the community survey, respondents indicated that amenities like real-time passenger information (RTPI) would get them to ride more frequently. However, the potential ridership was least familiar with the RTPI through Nextbus for Mason Shuttles and CUE. Ensuring more people are aware of the RTPI would help riders know when the next bus is arriving, allowing them to plan their trips better. For example, there was an anecdotal belief that people view the CUE Gold 1 and 2 as dramatically slower than the Metro to Mason routes. The difference in travel time between the two was within a few minutes. Increasing rider awareness and use of RTPI would allow users to see when the next bus to campus is arriving regardless of affiliation, and provide information to dispel the myth of the CUE buses being dramatically slower than Mason Shuttles.

Raising awareness can be accomplished through better marketing of the NextBus application through each agency's website, on the buses, through social media, and at bus stops. Placing digital signs at key stops in conspicuous locations will also raise awareness. To alleviate bias for Mason Shuttles, the bus layover at the Vienna Metro should be moved. Currently the Green routes are located closest to the Mason Shuttle stop and the Gold routes are located on the other side of the circle. Swapping the layover locations would place the Gold routes, which are the more similar to the Mason to Metro route, closer to the Mason Shuttle stop. This would allow waiting riders to hop on the first bus available, improving the sense of frequency.

Marketing Travel Options to Popular Destinations

Many of the destinations requested by survey respondents were already accessible by existing transit services. Many were accessible via CUE or Mason Shuttles. CUE and Mason Shuttles should develop updated materials to raise awareness of how to access popular destinations via transit. This could be accomplished by acquiring trip planner applications or ensuring that up-to-date information is shared with Google Maps or other web-based mapping services. Other methods to market accessible destinations would be targeted social media communications and revised printed materials.

Another approach to accessing new destinations would be to subsidize Mason use of Metrobus or Fairfax Connector buses. These agencies currently provide service to community-identified destinations like Tysons Corner. The fact that Mason riders cannot ride these routes fare free could be a barrier to their use, based on survey responses indicating a negative response to transit fares. Providing preloaded SmartTrip cards to resident students or all students could be one way to introduce them to the service. Once they discover the value, they would likely continue using the routes by applying their own funds.

CUE and Mason Shuttle Operating Structures

A number of different operating and management structures were reviewed as part of the study. These ranged from university-operated, municipally operated, independent transit authorities, and the current university-municipal hybrid structure. Within these structures are self-operated and contracts models. For the current arrangement between Mason and the City of Fairfax, the existing hybrid model is functioning well and provides both parties with the ability to meet their needs. Mason's sharing of CUE's costs allows Mason to take advantage of the CUE service area, which would be difficult to provide as a stand-alone service. The funding from Mason helps the City provide a higher level of service. Operating CUE as a city department allows for the sharing of staff costs for a relatively small transit service. While the ability to focus solely on transit and raise a dedicated funding stream would be ideal, the costs associated with transitioning CUE to an independent transit authority may be too great for the amount of service provided. Mason can't rely on CUE alone for the provision of transit services to meet the University's needs. Mason's demands for service between the campus and Metro would overwhelm CUE and thus require supplementing the service with Mason Shuttles. Mason has needs to provide connections to the Prince William campus and other locations outside the City of Fairfax. These don't make sense for CUE to provide because the City would be funding services likely not used by City residents. Therefore, Mason needs to provide these services through the current arrangement with a contractor. Mason doesn't need to take on the added responsibilities and costs associated with providing the service internally.

Mason Funding of CUE

Through the review of Mason's contribution for CUE service a recommendation was made to develop general guidelines for the contribution based on agreed-upon inputs. The contribution should be determined for three year periods to eliminate the need for annual negotiations, except in the case of significant changes in service provided, ridership, or items that impact costs (fuel, new vehicles, etc.).

Mason's contribution should consider the following inputs:

- Annual CUE operating cost
- Annual CUE capital cost (amortized bus cost)
- Local fares, including fares received + amount not received, but offered by City to subsidize certain classes of riders
- State support for CUE (amount actually received by the City from the state for CUE operations)
- Any additional support CUE receives
- Mason ridership as a percentage of total ridership. This number should be calculated based on an average of the most recent three years of Mason ridership on CUE in order to smooth out any annual fluctuations in ridership.

Route Recommendations

Through the analysis, no major route changes or new services for Mason Shuttles or CUE were identified. The only route change proposed as part of this study was for Mason Shuttles. A review of the ridership for the Late Night Gunston-Go Bus service showed very low ridership compared to the other trips. Late night service has been reduced over the past few years, likely in response to low ridership. It is recommended that the two late night trips be eliminated on the Gunston-Go Bus.

Other service improvements include exploring partnerships with Fairfax Connector and WMATA. Access to Tysons Corner, Centreville, and Burke were highlighted from the survey. Fairfax Connector is in the middle of a TDP update and should be contacted about increased connections to Mason.

Lastly, the City of Fairfax and Mason recently completed a planning charrette that recommended the following:

- Opening access to the public on late night Mason Shuttle routes
- Adding stops in Old Town Fairfax on Mason Shuttle routes

These recommendations were identified at the end of this planning study, so they were not fully examined. Opening access to City residents on Mason Shuttles would require an understanding of any liability issues related to non-Mason riders on the buses. Other items that would need to be explored further would be demand for late night service and the capacity for Mason Shuttles to accommodate this demand. Based on the ridership analysis, the last runs from the Metro returning to campus could operate near capacity. This would require additional service to accommodate the demand. The other question to be answered would be whether additional funding arrangements would need to be included. This could include a discount to Mason associated with services rendered to the City or a direct payment from the City to Mason.

Summary of Improvements

The following table provides a summary of the proposed improvements:

Table E-2: Recommendations for Improvements to Mason Shuttles and CUE

Recommendation	Entity	Estimated Cost	Time Frame
Eliminate Gunston-Go Bus Late Night Service	Mason Shuttles	(savings)	1 Year
Improve communications materials	CUE & Mason Shuttles	\$5,000 - \$10,000	1-2 Years
Develop popular destinations materials	CUE & Mason Shuttles	\$2,000 - \$5,000	1-2 Years
Expand RTPI Program	CUE & Mason Shuttles	\$40,000 capital \$500 - \$1,000 O&M	2-3 Years
Create SmartTrip Pass Program	Mason Shuttles	\$27,000 - \$700,000	5 Years
Work with Fairfax Connector to expand connections to campus	Mason Shuttles	unknown	5 Years

Conclusion

This study was able to acquire a significant amount of data on the financial performance and rider impressions of CUE and Mason Shuttle service. It was able to use that data to inform recommendations for both the City and Mason Shuttles on how best to proceed to ensure that their service is sustainable, effective, and equitable for all stakeholders. These recommendations form the framework for continued success in the partnership of CUE and Mason Shuttles.

1

Existing Conditions

1.1 Background

The City of Fairfax began providing transit service in the early 1980s. The service began as a response to growing concerns about parking and congestion on the George Mason University campus, and a growth in public transportation needs for the City. The City-University-Energysaver (CUE) provides service to the City of Fairfax with termini at George Mason University and the Vienna/Fairfax-GMU Metrorail station. This service provides city residents and visitors along with university students, faculty, and staff a means of cost-effective transportation.

As George Mason University has grown, so too has the demand for additional and more-focused transportation services. In 2003 Mason Shuttles began as a service for international students, and today the service provides five different shuttle routes at greater frequency.

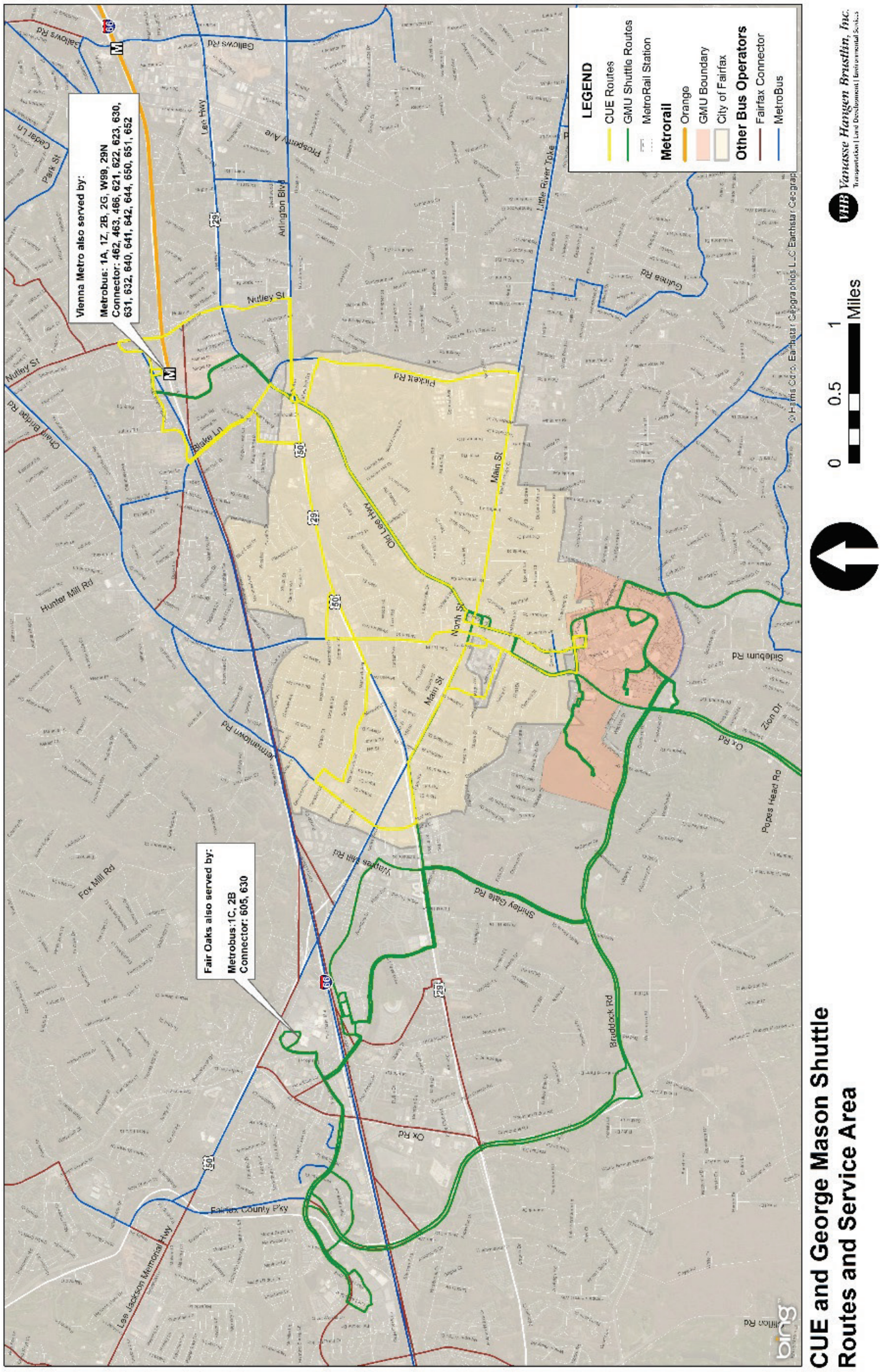
In addition to CUE and Mason Shuttles, Metrobus and Fairfax Connector also connect the region to the George Mason University Fairfax Campus.

George Mason University provides a contribution to the costs of operating the CUE bus service. In addition, the University subsidizes the full cost of operating the Mason Shuttles. This study will develop recommendations for improvements to the transit services for both George Mason University and the City of Fairfax. This study examines usage patterns for both the CUE Bus and specific Mason Shuttle routes to identify potential route change opportunities for cost savings, ridership increases, and service improvements. The existing unmet need for transit service will be quantified, and potential service options and funding strategies for Mason Shuttles and/or the City of Fairfax CUE will be developed.

1.2 Service Area

The CUE provides service primarily within the boundaries of the City of Fairfax. The routes travel into Fairfax County to serve the George Mason University campus and the Vienna/Fairfax-GMU Metrorail station. Mason Shuttles cover a much larger geographic area by providing service to the Vienna/Fairfax-GMU Metrorail station, the Burke VRE Station, George Mason University Prince William Campus, and local retail centers. There are also several Metrobus and one Fairfax Connector route that also provide service to portions of the campus or City. This study focuses on the overlapping areas currently served by CUE and Mason Shuttles.

Figure 1-1: Transit Routes and Service Area



1.3 Service Characteristics

Mason Shuttles and CUE operate transit service throughout the majority of the day. Mason Shuttle routes connect the Fairfax Campus to other campuses, major transportation hubs, or areas of satellite parking at least 12 hours a day during the week, with select routes operating more on Fridays and Saturdays. Mason Shuttle routes that provide connections to nearby retail operate for fewer hours. CUE service operates all four routes up to 17.5 hours a day during the week with reduced service provided on Saturdays and Sundays. Tables 1 and 2 show the service span for each route in the system as of April 1, 2014 as well as the number of trips operated in each direction. Outbound (OB) trips for Mason Shuttle routes travel away from the Fairfax Campus and Inbound (IB) travel towards the campus. Outbound trips for CUE routes travel away from the Vienna Metro and Inbound travel back towards the Metro. This level of detail provides information about the amount of service and capacity for each route.

Service frequency between the Mason Shuttle routes varies similarly to service span. Those routes providing connections between other campuses or major transportation service, such as Metrorail, operate more frequently than the other shuttles. Service frequency is also increased during peak travel times. CUE service provides a consistent level of service on all weekday routes. This service frequency is reduced in the evening and on Saturdays and Sundays. Tables 3 and 4 show the average service frequency for each route as it changes throughout the day.

Table 1-1: Service Span - Mason Shuttles

	Weekday				Saturday				Sunday			
Route	**Service Span**	**Total Hours**	**OB Buses**	**IB Buses**	**Service Span**	**Total Hours**	**OB Buses**	**IB Buses**	**Service Span**	**Total Hours**	**OB Buses**	**IB Buses**
Metro Express	7:20am-10:50pm	15.5	30	31	No Service				No Service			
Metro to Mason	6am-12am (6am-4am Fri)	18 (22 Fri)	47 (43 Fri)	50 (44 Fri)	8am-4am	16	39	40	8am-11:30pm	15.5	31	31
Gunston Mason	7:30am-11:10pm	15.7	12	13	3pm-11:10pm	8.2	5	6	3pm-11:10pm	8.2	5	6
Gunston George	3pm-10:30pm	7.5	5	5	3pm-10:30pm	7.5	5	5	3pm-10:30pm	7.5	5	5
Gunston Late	10:30p-12a (Fri Only)	1.5	2	2	10:30p-12a	1.5	2	2	No Service			
Field House Exp	2pm-11pm (Mon/Wed) 10am-11pm (Tue/Thu)	9 (Mon/Wed) 13 (Tue/Thu)	36 (Mon/Wed) 52 (Tue/Thu)	36 (Mon/Wed) 52 (Tue/Thu)	No Service				No Service			
Fairfax to Prince William	6:30am-11pm	16.5	29 (Mon-Thu) 16 (Fri)	29 (Mon-Thu) 17 (Fri)	8am-8pm	12	6	6	8am-8pm	12	6	6

	Weekday				Saturday				Sunday			
Route	Service Span	Total Hours	OB Buses	IB Buses	Service Span	Total Hours	OB Buses	IB Buses	Service Span	Total Hours	OB Buses	IB Buses
Burke VRE	7:10am-10:45am 3:15pm-7:50pm	12.3	16	16	No Service				No Service			

Table 1-2: Service Span - CUE

	Weekday				Saturday				Sunday			
Route	Service Span	Total Hours	OB Buses	IB Buses	Service Span	Total Hours	OB Buses	IB Buses	Service Span	Total Hours	OB Buses	IB Buses
Gold 1	5:40am-11:10pm	17.5	28	30	8:25am-8:52pm	12.5	12	12	10am-6:28pm	8.5	8	8
Gold 2	5:25am-9:57pm	16.5	27	29	8am-8:27pm	12.5	12	12	9:33am-6:01pm	8.5	8	8
Green 1	5:30am-11pm	17.5	26	28	8:25am-8:35pm	12.2	11	11	10am-5:55pm	7.9	7	7
Green 2	5:15am-8:43pm	15.5	24	26	8:02am-8:12pm	12.2	11	11	9:37am-5:32pm	7.9	7	7

Table 1-3: Service Frequency in minutes - Mason Shuttles

	AM Peak (5:30am-9:30am)			Mid-day (9:30am-3pm)			PM Peak (3pm-7pm)		
Route	**Weekday**	**Saturday**	**Sunday**	**Weekday**	**Saturday**	**Sunday**	**Weekday**	**Saturday**	**Sunday**
Metro Express	60 (Mon-Thu) 30 (Fri)			30			60 (Mon-Thu) 30 (Fri)		
Metro to Mason	15	30	30	30	30	30	15	30	30
Gunston Mason	60			60			30	30	30
Gunston George							30	30	30
Gunston Late									
Field House Exp				15			15		
Fairfax to Prince William	30	120	120	30	120	120	30	120	120
Burke VRE	30			30			30		

	Evening (7pm-11pm)			Night (11pm-Close)		
Route	**Weekday**	**Saturday**	**Sunday**	**Weekday**	**Saturday**	**Sunday**
Metro Express	30					
Metro to Mason	30	30	30	30	30	30
Gunston Mason	30	30	30			
Gunston George	30	30	30			
Gunston Late				30 (Fri)	30	
Field House Exp	15					
Fairfax to Prince William	60					
Burke VRE						

Table 1-4: Service Frequency in minutes - CUE

	AM Peak (5:30am-9:30am)			Mid-day (9:30am-3pm)			PM Peak (3pm-7pm)		
Route	**Weekday**	**Saturday**	**Sunday**	**Weekday**	**Saturday**	**Sunday**	**Weekday**	**Saturday**	**Sunday**
Gold 1	30			30	60	60	30	60	60
Gold 2	30			30	60	60	30	60	60
Green 1	30			30	60	60	30	60	60
Green 2	30			30	60	60	30	60	60

	Evening (7pm-11pm)			Night (11pm-Close)		
Route	**Weekday**	**Saturday**	**Sunday**	**Weekday**	**Saturday**	**Sunday**
Gold 1	60					
Gold 2	60					
Green 1	60					
Green 2	60					

The following section provides an overview of the routes included as part of this transit study. The routes selected for this study serve areas within the City of Fairfax as well as nearby Fairfax County. The routes not included as part of this study include the Field House Express, which connects the main Fairfax Campus with the west Fairfax Campus, and the shuttle connecting the Prince William and Fairfax Campuses. Each section describes the route, including a route profile and a route map. The route profile includes useful statistics that describe operational characteristics. These data will be used in the analysis section as part of the performance review for each route.

Mason Shuttles

Mason to Metro

The Mason to Metro route connects the Fairfax Campus of George Mason University with the Vienna/Fairfax-GMU Metrorail station. The combination of the shuttle and the Orange Metrorail line provide frequent service between the Fairfax and Arlington campuses of George Mason University.

<table>
<tr><th colspan="12">Route - Metro to Mason</th></tr>
<tr><th colspan="12">Major Generators Served</th></tr>
<tr><td colspan="12">Mason Inn, Sandy Creek, Masonvale, Rappahannock River Lane, Commerce Building, Circle Towers, Vienna/Fairfax-GMU Station</td></tr>
<tr><th colspan="12">Transit/Transfer Centers Served</th></tr>
<tr><th colspan="6">Location</th><th colspan="6">Routes Served</th></tr>
<tr><td colspan="6">Sandy Creek</td><td colspan="6">Fairfax/Prince William, Gunston's Go-Bus, Burke VRE</td></tr>
<tr><td colspan="6">Rappahannock River Lane</td><td colspan="6">Metro Express, Fairfax/Prince William, Gold1, Gold2, Green1, Green2</td></tr>
<tr><td colspan="6">Vienna/Fairfax-GMU Station</td><td colspan="6">Metro Express, 1A, 1Z, 2B, 2G, W99, Gold1, Gold2, Green1, Green2, 462, 463, 466, 621, 622, 623, 630, 631, 632, 640, 641, 642, 644, 650, 651, 652</td></tr>
<tr><th colspan="12">Service Span</th></tr>
<tr><th colspan="4">Weekday</th><th colspan="4">Saturday</th><th colspan="4">Sunday</th></tr>
<tr><td>Time Frame</td><td>Total Hours</td><td>OB Trips</td><td>IB Trips</td><td>Time Frame</td><td>Total Hours</td><td>OB Trips</td><td>IB Trips</td><td>Time Frame</td><td>Total Hours</td><td>OB Trips</td><td>IB Trips</td></tr>
<tr><td>6am-12am (6am-4am Fri)</td><td>18 (22 Fri)</td><td>47 (43 Fri)</td><td>50 (44 Fri)</td><td>8am-4am</td><td>16</td><td>39</td><td>40</td><td>8am-11:30pm</td><td>15.5</td><td>31</td><td>31</td></tr>
<tr><th colspan="12">Service Frequency</th></tr>
<tr><th colspan="4">AM Peak</th><th colspan="4">Mid-day</th><th colspan="4">PM Peak</th></tr>
<tr><td>Weekday</td><td>Saturday</td><td colspan="2">Sunday</td><td>Weekday</td><td>Saturday</td><td colspan="2">Sunday</td><td>Weekday</td><td>Saturday</td><td colspan="2">Sunday</td></tr>
<tr><td>15</td><td>30</td><td colspan="2">30</td><td>30</td><td>30</td><td colspan="2">30</td><td>15</td><td>30</td><td colspan="2">30</td></tr>
<tr><th colspan="4">Evening</th><th colspan="4">Night</th><td colspan="4" rowspan="3"></td></tr>
<tr><td>Weekday</td><td>Saturday</td><td colspan="2">Sunday</td><td>Weekday</td><td>Saturday</td><td colspan="2">Sunday</td></tr>
<tr><td>30</td><td>30</td><td colspan="2">30</td><td>30</td><td>30</td><td colspan="2">30</td></tr>
<tr><th colspan="12">Number of Trips</th></tr>
<tr><td colspan="12">97 (Monday-Thursday)</td></tr>
<tr><th colspan="12">Route Length</th></tr>
<tr><td colspan="12">6.53</td></tr>
<tr><th colspan="12">Run Time</th></tr>
<tr><th colspan="4">Am Peak</th><th colspan="4">Midday</th><th colspan="4">PM Peak</th></tr>
<tr><td colspan="4">30</td><td colspan="4">30</td><td colspan="4">30</td></tr>
<tr><th colspan="12">Ridership</th></tr>
<tr><th colspan="4">Annual Ridership (Jan 2013-Dec 2013)</th><th colspan="4">Monthly Ridership (April 2014)</th><th colspan="4">Average Weekday Ridership (April 2014)</th></tr>
<tr><td colspan="4">257,406</td><td colspan="4">29,222</td><td colspan="4">1,098</td></tr>
<tr><th colspan="12">Revenue Vehicle Miles</th></tr>
<tr><td colspan="12">525.73 Miles</td></tr>
<tr><th colspan="12">Revenue Vehicle Hours</th></tr>
</table>

40 Hours 15 Minutes

Figure 1-2: Mason to Metro Route and Stops

Metro Express

The Metro Express route began operating in the Fall of 2012 to provide a more direct alternative to the Mason to Metro route. The route length is shorter, with only one campus stop at Rappahannock River Lane before following the same routing as the Metro to Mason to the Vienna/Fairfax-GMU Metrorail station. The route stops at the Commerce Building and Circle Towers between the two termini.

Route - Metro Express

Major Generators Served

Rappahannock River Lane, Commerce Building, Circle Towers, Vienna/Fairfax-GMU Station

Transit/Transfer Centers Served

Location	Routes Served
Rappahannock River Lane	Mason to Metro, Fairfax/Prince William, Gold1, Gold2, Green1, Green2
Vienna/Fairfax-GMU Station	Mason to Metro, 1A, 1Z, 2B, 2G, W99, Gold1, Gold2, Green1, Green2, 462, 463, 466, 621, 622, 623, 630, 631, 632, 640, 641, 642, 644, 650, 651, 652

Service Span

Weekday				Saturday				Sunday			
Time Frame	Total Hours	OB Trips	IB Trips	Time Frame	Total Hours	OB Trips	IB Trips	Time Frame	Total Hours	OB Trips	IB Trips
7:20am-10:50pm	15.5	30	31	No Service				No Service			

Service Frequency

AM Peak	Mid-day	PM Peak
Weekday	Weekday	Weekday
60 (Mon-Thu) 30 (Fri)	30	60 (Mon-Thu) 30 (Fri)
Evening	**Night**	
Weekday	Weekday	
30		

Number of Trips

61

Route Length

Run Time

Am Peak	Midday	PM Peak
30	30	30

Ridership

Annual Ridership (Jan 2013-Dec 2013)	Monthly Ridership (April 2014)	Average Weekday Ridership (April 2014)
52,410[1]	11,122	582

Daily Revenue Vehicle Miles

107.68 Miles

Daily Revenue Vehicle Hours

8 Hours 15 Minutes

[1] The Metro Express does not operate during the months of June, July, and August.

Figure 1-3: Metro Express Routes and Stops

Gunston Go-Bus

The Gunston Go-Bus routes provide connections between the Fairfax campus and nearby shopping and entertainment destinations. The primary corridors used are Braddock Rd, Shirley Gate Rd, Fair Lakes Parkway, and Fairfax County Parkway. The Mason route operates from 7:30 am until 11 pm Monday through Friday, and from 3:00 pm to 11:00 pm on Saturday and Sunday. The George route operates in the afternoon and evening from 3 pm to 10:30 pm. The route operates in the opposite direction from the Mason route. There is also a Late Night route that provides service at 10:30 and 11 pm.

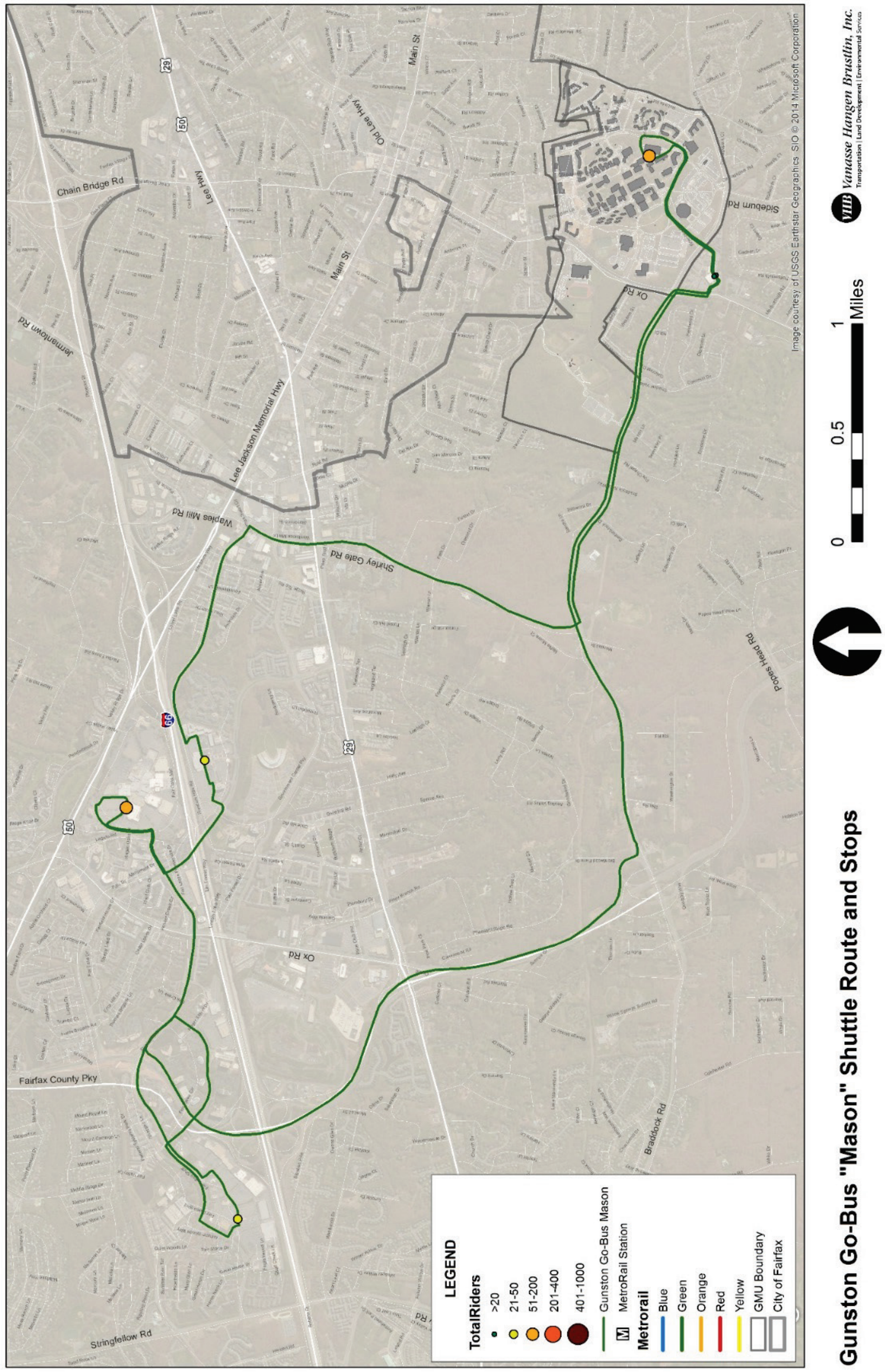
<table>
<tr><td colspan="12">Route - Gunston Go-Bus</td></tr>
<tr><td colspan="12">Major Generators Served</td></tr>
<tr><td colspan="12">Sandy Creek, University Mall, Fair Lakes Center, Fair Oaks Mall, Fairfax Corner, Old Town Fairfax</td></tr>
<tr><td colspan="12">Transit/Transfer Centers Served</td></tr>
<tr><td colspan="6">Location</td><td colspan="6">Routes Served</td></tr>
<tr><td colspan="6">Sandy Creek</td><td colspan="6">Mason to Metro, Fairfax/Prince William, Burke VRE</td></tr>
<tr><td colspan="6">Fair Oaks Mall</td><td colspan="6">1C, 2B, 605, 630</td></tr>
<tr><td colspan="12">Service Span</td></tr>
<tr><td colspan="4">Weekday</td><td colspan="4">Saturday</td><td colspan="4">Sunday</td></tr>
<tr><td>Time Frame</td><td>Total Hours</td><td>OB Trips</td><td>IB Trips</td><td>Time Frame</td><td>Total Hours</td><td>OB Trips</td><td>IB Trips</td><td>Time Frame</td><td>Total Hours</td><td>OB Trips</td><td>IB Trips</td></tr>
<tr><td>7:30am-12:00am</td><td>16.5</td><td>19</td><td>20</td><td>3:00pm-12:00am</td><td>9</td><td>12</td><td>13</td><td>3:00pm-11:10pm</td><td>9</td><td>12</td><td>13</td></tr>
<tr><td colspan="12">Service Frequency</td></tr>
<tr><td colspan="4">AM Peak</td><td colspan="4">Mid-day</td><td colspan="4">PM Peak</td></tr>
<tr><td>Weekday</td><td>Saturday</td><td colspan="2">Sunday</td><td>Weekday</td><td>Saturday</td><td colspan="2">Sunday</td><td>Weekday</td><td>Saturday</td><td colspan="2">Sunday</td></tr>
<tr><td>60</td><td></td><td colspan="2"></td><td>60</td><td></td><td colspan="2"></td><td>15</td><td>15</td><td colspan="2">15</td></tr>
<tr><td colspan="4">Evening</td><td colspan="4">Night</td><td colspan="4" rowspan="3"></td></tr>
<tr><td>Weekday</td><td>Saturday</td><td colspan="2">Sunday</td><td>Weekday</td><td>Saturday</td><td colspan="2">Sunday</td></tr>
<tr><td>15</td><td>15</td><td colspan="2">15</td><td>30</td><td>30</td><td colspan="2"></td></tr>
<tr><td colspan="12">Number of Trips</td></tr>
<tr><td colspan="12">35 (Monday-Thursday)</td></tr>
<tr><td colspan="12">Route Length</td></tr>
<tr><td colspan="12">18.18 - George/Mason, 12.8 - Late</td></tr>
<tr><td colspan="12">Run Time</td></tr>
<tr><td colspan="4">Am Peak</td><td colspan="4">Midday</td><td colspan="4">PM Peak</td></tr>
<tr><td colspan="4">30</td><td colspan="4">30</td><td colspan="4">30</td></tr>
<tr><td colspan="12">Variations</td></tr>
<tr><td colspan="12">Inbound</td></tr>
<tr><td colspan="6">Mason</td><td colspan="6">13</td></tr>
<tr><td colspan="6">George</td><td colspan="6">5</td></tr>
<tr><td colspan="6">Late</td><td colspan="6">2</td></tr>
<tr><td colspan="12">Outbound</td></tr>
<tr><td colspan="6">Mason</td><td colspan="6">12</td></tr>
<tr><td colspan="6">George</td><td colspan="6">5</td></tr>
<tr><td colspan="6">Late</td><td colspan="6">2</td></tr>
<tr><td colspan="12">Ridership</td></tr>
<tr><td colspan="4">Annual Ridership (Jan 2013-Dec 2013)</td><td colspan="4">Monthly Ridership (April 2014)</td><td colspan="4">Average Weekday Ridership (April 2014)</td></tr>
</table>

44,626[2]	6,229	229
Revenue Vehicle Miles		
366.08 Miles		
Revenue Vehicle Hours		
24 Hours		

[2] Gunston Go-Bus operates January 2013 to May 2013 and August 2013 to December 2013.

Figure 1-4: Gunston Go-Bus “George” Route and Stop

Figure 1-5-: Gunston Go-Bus "Mason" Route and Stops



Burke VRE

Mason Shuttles began operating a shuttle between the Burke Centre VRE station and Sandy Creek in September 2013. The route provides a connection to commuters utilizing the Virginia Railway Express. Mason also advertises this route as a free parking shuttle bus connection, as parking in the VRE garage at Burke Centre is free, in contrast to permit parking on the Fairfax Campus.

<table>
<tr><td colspan="12">Route - Burke VRE</td></tr>
<tr><td colspan="12">Major Generators Served</td></tr>
<tr><td colspan="12">Sandy Creek, Burke Centre VRE</td></tr>
<tr><td colspan="12">Transit/Transfer Centers Served</td></tr>
<tr><td colspan="6">Location</td><td colspan="6">Routes Served</td></tr>
<tr><td colspan="6">Sandy Creek</td><td colspan="6">Mason to Metro, Fairfax/Prince William, Burke VRE</td></tr>
<tr><td colspan="6">Burke Centre VRE</td><td colspan="6">Virginia Railway Express - Manassas Line, 17B, 17L, 495</td></tr>
<tr><td colspan="12">Service Span</td></tr>
<tr><td colspan="4">Weekday</td><td colspan="4">Saturday</td><td colspan="4">Sunday</td></tr>
<tr><td>Time Frame</td><td>Total Hours</td><td>OB Trips</td><td>IB Trips</td><td>Time Frame</td><td>Total Hours</td><td>OB Trips</td><td>IB Trips</td><td>Time Frame</td><td>Total Hours</td><td>OB Trips</td><td>IB Trips</td></tr>
<tr><td>7:10am-10:45am 3:15pm-7:50pm</td><td>8.0</td><td>16</td><td>16</td><td colspan="4">No Service</td><td colspan="4">No Service</td></tr>
<tr><td colspan="12">Service Frequency</td></tr>
<tr><td colspan="4">AM Peak</td><td colspan="4">Mid-day</td><td colspan="4">PM Peak</td></tr>
<tr><td colspan="4">Weekday</td><td colspan="4">Weekday</td><td colspan="4">Weekday</td></tr>
<tr><td colspan="4">30</td><td colspan="4">30</td><td colspan="4">30</td></tr>
<tr><td colspan="4">Evening</td><td colspan="4">Night</td><td colspan="4" rowspan="3"></td></tr>
<tr><td colspan="4">Weekday</td><td colspan="4">Weekday</td></tr>
<tr><td colspan="4">N/A</td><td colspan="4">N/A</td></tr>
<tr><td colspan="12">Number of Trips</td></tr>
<tr><td colspan="12">32</td></tr>
<tr><td colspan="12">Route Length</td></tr>
<tr><td colspan="12">6.64</td></tr>
<tr><td colspan="12">Run Time</td></tr>
<tr><td colspan="4">Am Peak</td><td colspan="4">Midday</td><td colspan="4">PM Peak</td></tr>
<tr><td colspan="4">30</td><td colspan="4">30</td><td colspan="4">30</td></tr>
<tr><td colspan="12">Ridership</td></tr>
<tr><td colspan="4">Annual Ridership (Jan 2013-Dec 2013)</td><td colspan="4">Monthly Ridership (April 2014)</td><td colspan="4">Average Weekday Ridership (April 2014)</td></tr>
<tr><td colspan="4">570[3]</td><td colspan="4">512</td><td colspan="4">23</td></tr>
<tr><td colspan="12">Revenue Vehicle Miles</td></tr>
<tr><td colspan="12">212.48 Miles</td></tr>
<tr><td colspan="12">Revenue Vehicle Hours</td></tr>
<tr><td colspan="12">8 Hours 42 Minutes</td></tr>
</table>

[3] The Burke VRE began service in September 2013, so ridership was not reported from January to August.

Figure 1-6: Burke Center VRE Route and Stops

CUE Bus

Gold 1/2

The Gold routes connect portions of the western area of Fairfax to downtown Fairfax, George Mason University, and Metrorail. The Gold 1 operates in a clockwise direction and the Gold 2 travels in a counter-clockwise direction. The routes vary slightly as they travel around the Fairfax County Judicial Center and the area around Fairfax Circle.

Route - Gold 1/2

Major Generators Served

Vienna/Fairfax-GMU Station, Fairfax Circle, Fairfax High School, Courthouse Plaza, Downtown Fairfax, George Mason University - Fairfax Campus, INOVA Access, Fairfax County Judicial Center, Kamp Washington, Jermantown Square, Fairfax Court, Boulevard Shopping Center, Fairfax Shopping Center

Transit/Transfer Centers Served

Location	Routes Served
Rappahannock River Lane	Metro Express, Fairfax/Prince William, Gold1, Gold2, Green1, Green2
Vienna/Fairfax-GMU Station	Metro Express, 1A, 1Z, 2B, 2G, W99, Gold1, Gold2, Green1, Green2, 462, 463, 466, 621, 622, 623, 630, 631, 632, 640, 641, 642, 644, 650, 651, 652

Service Span

Weekday				Saturday				Sunday			
Time Frame	Total Hours	OB Trips	IB Trips	Time Frame	Total Hours	OB Trips	IB Trips	Time Frame	Total Hours	OB Trips	IB Trips
5:25am-11:10pm	17.75	28(1) 27(2)	30(1) 29(2)	8am-8:52pm	12.87	12	12	9:33am-6:28pm	8.92	8	8

Service Frequency

AM Peak			Mid-day			PM Peak		
Weekday	Saturday	Sunday	Weekday	Saturday	Sunday	Weekday	Saturday	Sunday
30			30	60	60	30	60	60

Evening			Night		
Weekday	Saturday	Sunday	Weekday	Saturday	Sunday
60					

Number of Trips

114

Route Length

Gold 1 - 13.15mi, Gold 2 - 13.42 mi

Run Time

Am Peak	Midday	PM Peak
59	59	59

Ridership

Annual Ridership (Jan 2013-Dec 2013)	Monthly Ridership (April 2014)	Average Weekday Ridership (April 2014)
Gold 1 - 228,51 Gold 2 - 227,774	Gold 1 - 20,258 Gold 2 - 19,320	Gold 1 - 834 Gold 2 - 798

Revenue Vehicle Miles

Gold 1 - 409 Miles

	Gold 2 - 397 Miles
Revenue Vehicle Hours	
	Gold 1 - 31 Hours Gold 2 - 30 Hours

Figure 1-7: CUE Gold 1 Ridership

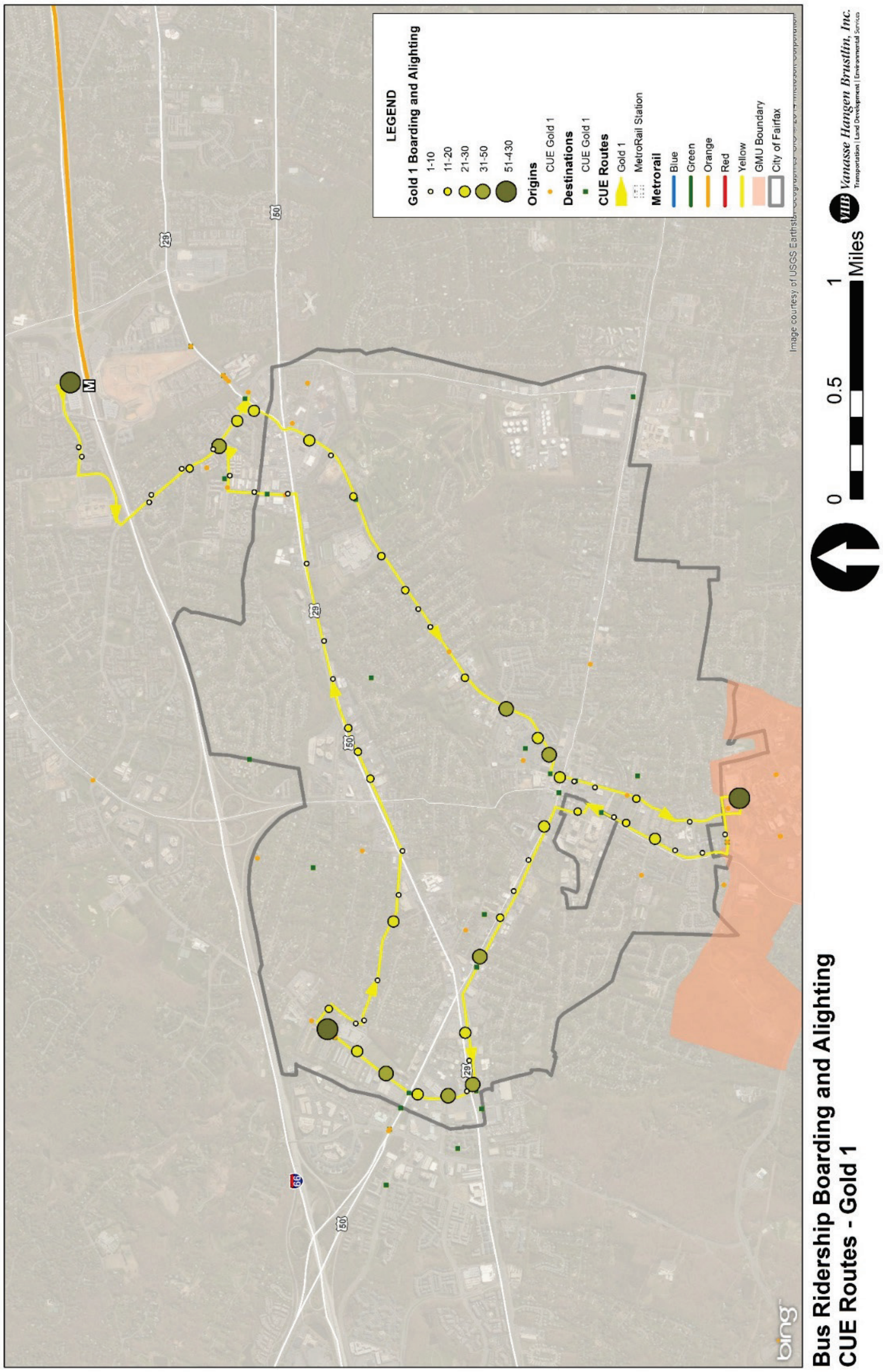
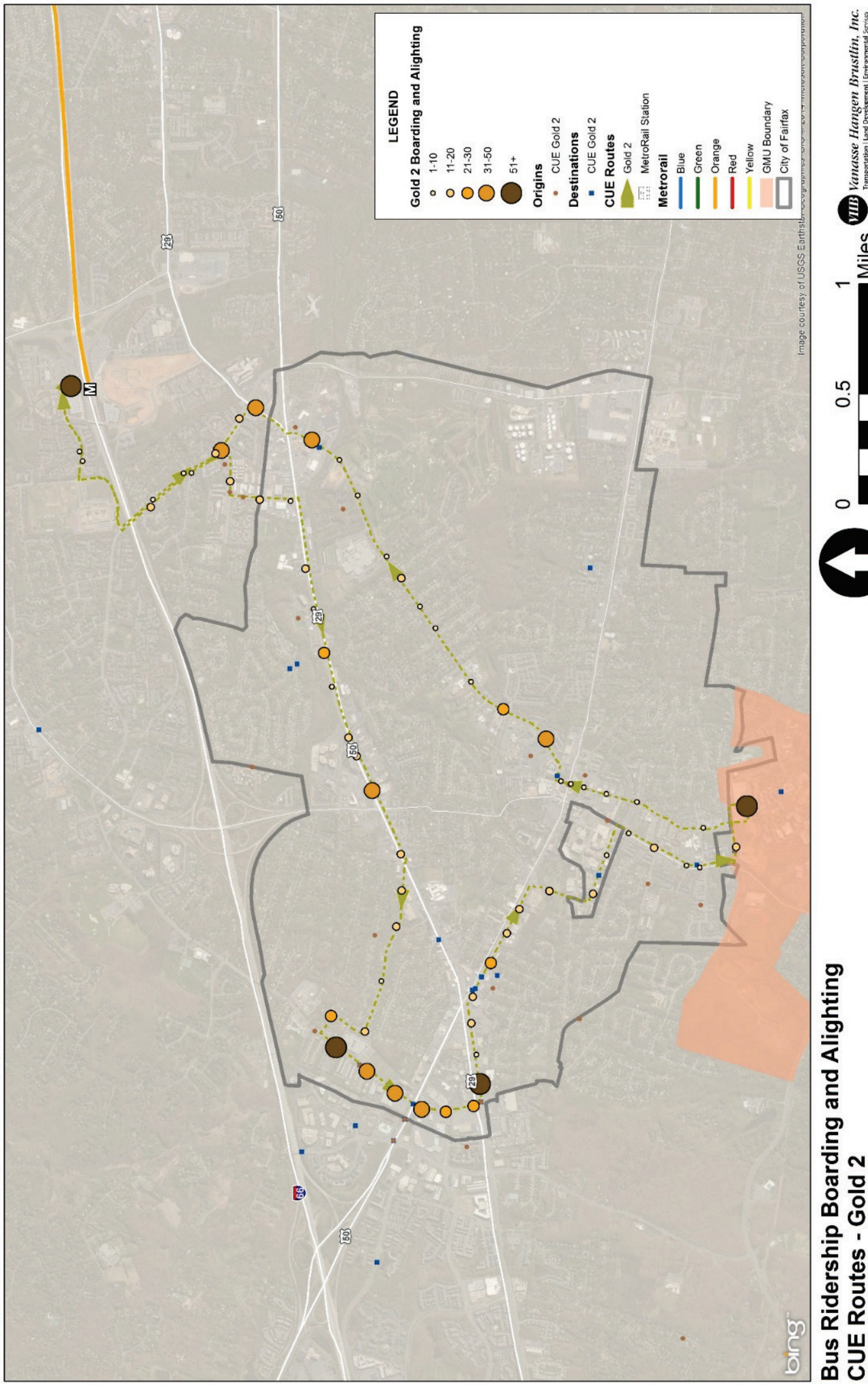


Figure 1-8: CUE Gold 2 Ridership



Green 1/2

The Green routes connect the eastern end of Fairfax to downtown Fairfax, George Mason University, and the Metrorail. The Green 1 travels clockwise and the Green 2 travels counter-clockwise.

Route - Green 1/2

Major Generators Served

Vienna/Fairfax-GMU Station, Fairfax Circle, Fair City Mall, Turnpike Shopping Center, Pickett Shopping Center, Woodson High School, Fairfax Square Center, Main Street Center, Downtown Fairfax, George Mason University - Fairfax Campus, INNOVA Access, Fairfax County Judicial Center, Fairfax Shopping Center

Transit/Transfer Centers Served

Location	Routes Served
Rappahannock River Lane	Metro Express, Fairfax/Prince William, Gold1, Gold2, Green1, Green2
Vienna/Fairfax-GMU Station	Metro Express, 1A, 1Z, 2B, 2G, W99, Gold1, Gold2, Green1, Green2, 462, 463, 466, 621, 622, 623, 630, 631, 632, 640, 641, 642, 644, 650, 651, 652

Service Span

Weekday				Saturday				Sunday			
Time Frame	Total Hours	OB Trips	IB Trips	Time Frame	Total Hours	OB Trips	IB Trips	Time Frame	Total Hours	OB Trips	IB Trips
5:15am-11pm	17.75	26(1) 24(2)	28(1) 26(2)	8:02am-8:35pm	12.55	11	11	9:37am-5:55pm	8.30	7	7

Service Frequency

AM Peak			Mid-day			PM Peak		
Weekday	Saturday	Sunday	Weekday	Saturday	Sunday	Weekday	Saturday	Sunday
30			30	60	60	30	60	60

Evening			Night		
Weekday	Saturday	Sunday	Weekday	Saturday	Sunday
60					

Number of Trips

104

Route Length

Green 1 - 11.18 miles, Green 2 - 11.37 miles

Run Time

Am Peak	Midday	PM Peak
59	59	59

Ridership

Annual Ridership (Jan 2013-Dec 2013)	Monthly Ridership (April 2014)	Average Weekday Ridership (April 2014)
Green 1 - 205,095 Green 2 - 185,066	Green 1 - 17,704 Green 2 - 16,300	Green 1 - 729 Green 2 - 658

Revenue Vehicle Miles

Green 1 - 398 Miles
Green 2 - 368 Miles

Revenue Vehicle Hours

Green 1 - 31 Hours
Green 2 - 29 Hours

Figure 1-9: CUE Green 1 Ridership

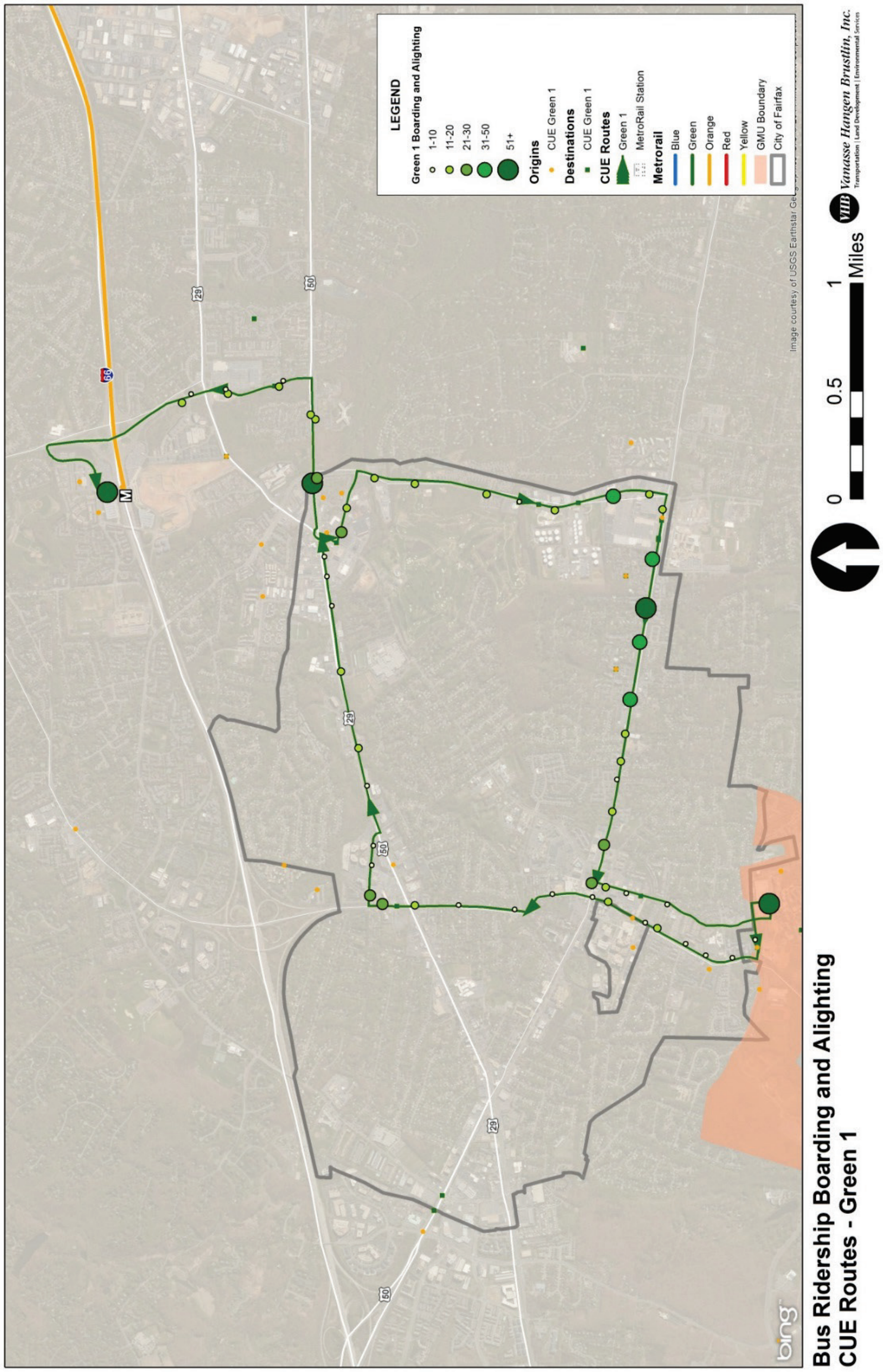
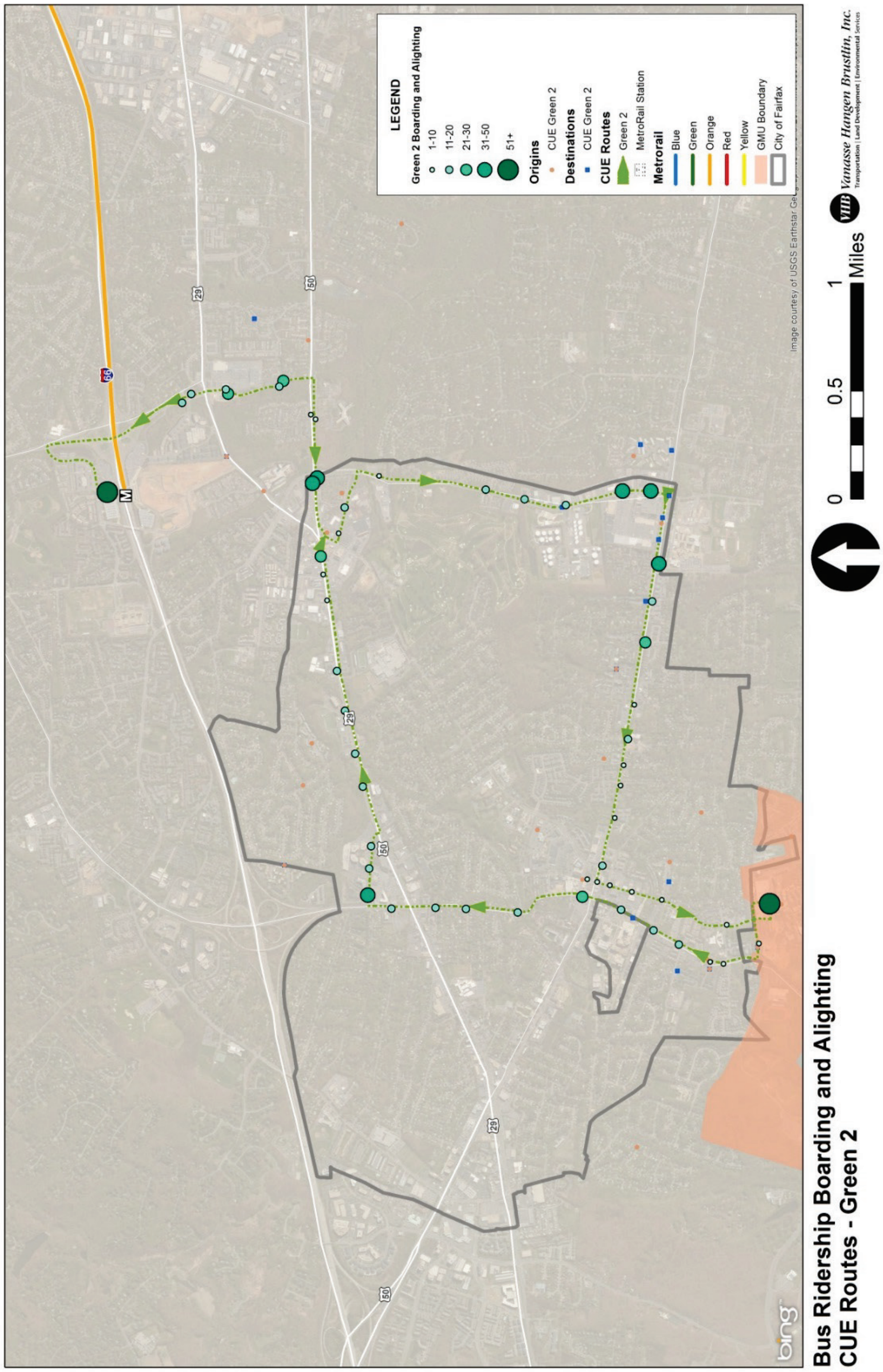


Figure 1-10: CUE Green 2 Ridership



Other Transit Services

In addition to the CUE and Mason Shuttle routes that serve the George Mason University Fairfax Campus, there are five other bus routes that stop on or near the campus. WMATA's Metrobus routes 15M, 17A, 17G, and 29K all stop on the north side of the Fairfax campus along University Drive. The 15M route connects George Mason University to Tysons Corner with stops in the City of Fairfax, Oakton, and the Town of Vienna along the way. The route runs Monday through Friday with service only provided during the AM and PM peaks. The 17A and 17G provide service between the Fairfax campus and the Pentagon Metrorail station with stops in the Kings Park neighborhood. These routes operate Monday through Friday during AM and PM peak commute times. Fairfax Connector operates route 306 during off-peak hours Monday through Friday when the 17A and G aren't operating. The 29K provides service between the Fairfax campus and the King Street/Old Town Metrorail station with stops along Little River Turnpike facilitating connections to Northern Virginia Community College - Annandale Campus as well as Landmark Mall. Service operates Monday through Saturday, with service hours reduced on Saturdays.

The Vienna/Fairfax-GMU Metrorail station provides connections to many other bus routes in the Fairfax Connector and Metrobus systems. These routes serve areas such as Centreville, Chantilly, Oakton, Vienna, and Tysons Corner. The recent opening of the Metrorail Silver Line through Tysons Corner and Reston provide another access point to the Metrorail system, but also bus to bus transfer potential for other areas in Fairfax and Loudoun Counties. The Metrobus 15M serves both the Vienna and Tysons Corner stations of the Orange and Silver Metrorail lines.

1.4 Demographics

Comparing the population and household distribution in relation to the existing Mason Shuttle and CUE route networks provide a foundation for evaluating how effectively transit is meeting the area's transportation needs. Where households and persons displaying transit-dependent characteristics are located in relation to existing service is particularly interesting. Identifying these areas will show where there is potential demand for transit service. While a demographic analysis can't determine the exact need for transit service, it does provide evidence for locations that could support new or expanded service.

Demographic information was queried from the 2012 American Community Survey and linked to geographic information using GIS to determine and display locations with high concentrations of likely transit-dependent populations. Overlaying this information with the bus network shows how effectively the existing services are meeting the area's transportation needs.

Population Density

The census blocks surrounding George Mason University have varying levels of population density. Areas within the city of Fairfax, surrounding the Metrorail stations, southeast, and northwest to Fair Lakes/Fair Oaks are more densely populated, while large areas to the east and southwest of campus have fewer people per square mile.

Household Density

The trends in population density were refined into more specific areas when household density was examined. Census blocks with large volumes of households per square mile were focused near the Metrorail stations, in Fair Lakes/Fair Oaks, and to a lesser degree within the Old Town Fairfax area. Independent of other factors, the higher the household density in a given area, the more likely a bus stop located in that area will have greater ridership. If that high household density is combined with other indicators of transit dependence, those areas will be more likely to be supportive of expanded transit service.

Figure 1-11: Population Density near CUE/Mason Routes

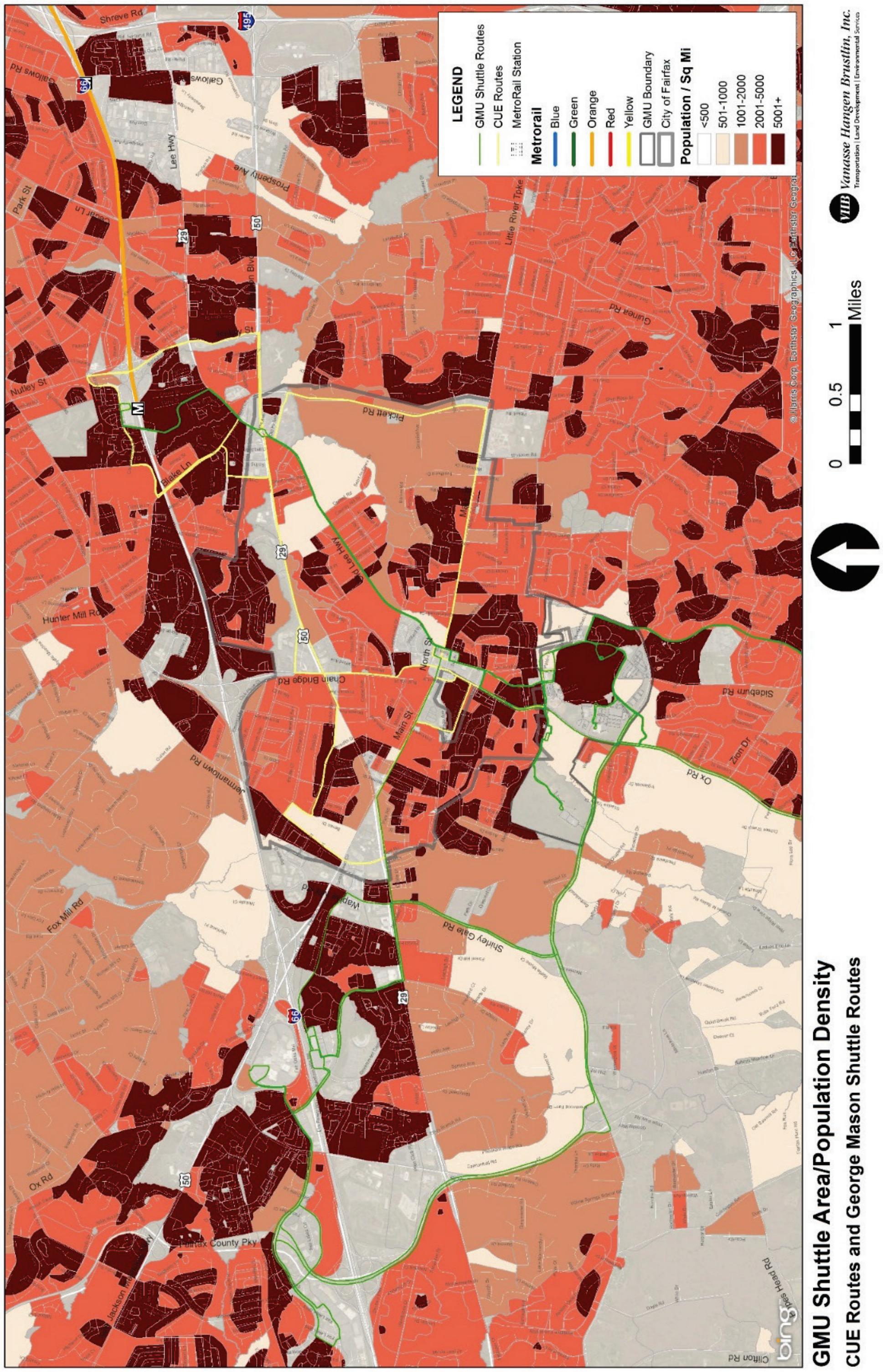
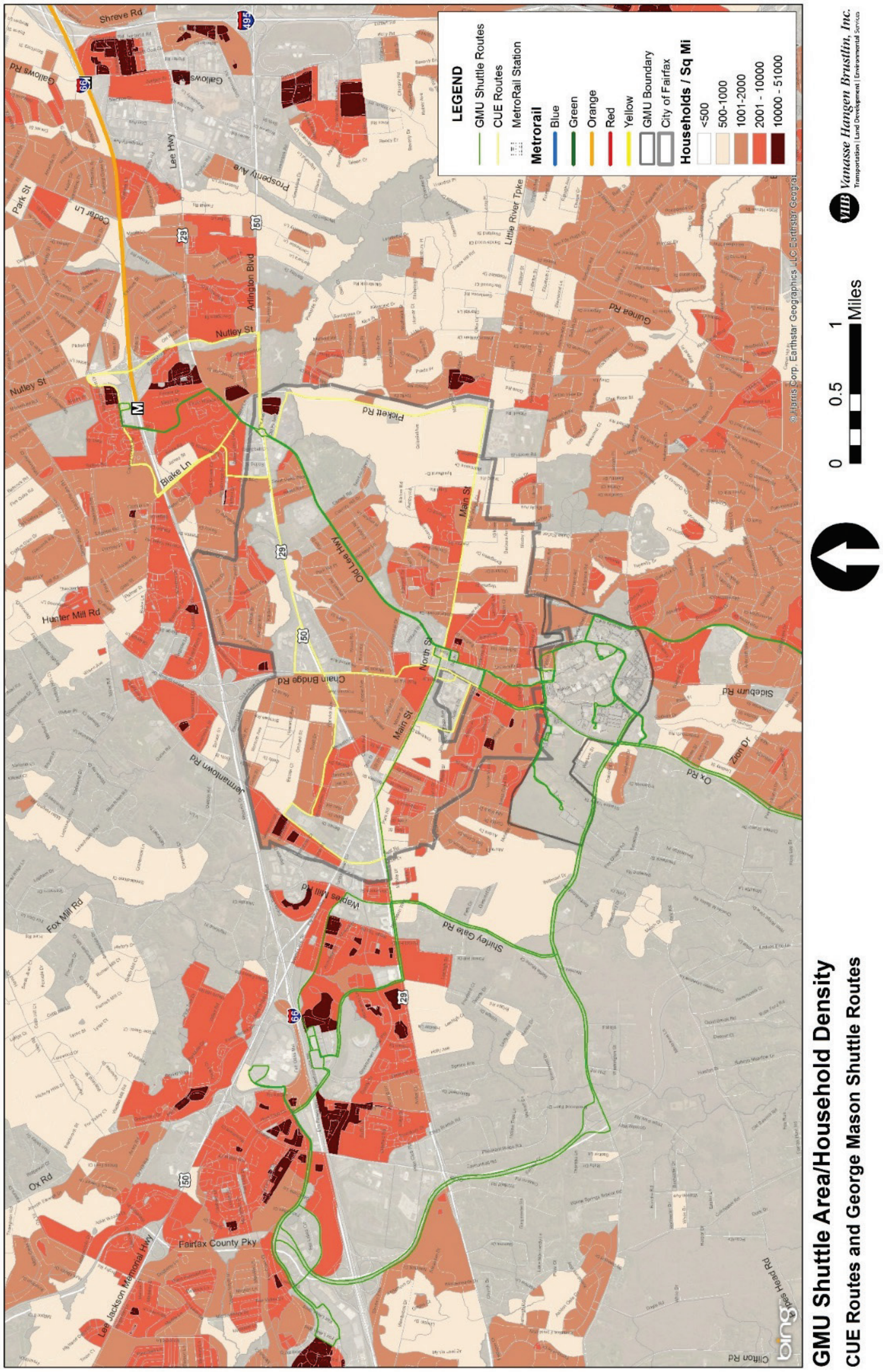


Figure 1-12: Household Density near CUE/Mason Shuttle Routes



Indicators of Transit Dependence

Indicators of transit dependence are not determinants of transit use, but they are prevalent characteristics of transit users who are left with few other options for travel. These characteristics are:

- Living below the poverty line
- Being 65 or older
- Living in a household with no or only one vehicle.

Many of the people who fall into one or more of these categories will not use transit, while people who don't fall into these categories do. Transit use is often a combination of a person's circumstances and choices. However, these indicators identify persons who personal circumstances align with an above average use of transit.

Poverty

The area surrounding George Mason University is relatively affluent, but the census blocks on campus and within two or three miles to the immediate east and west have more than 500 persons below the poverty line.

Age

The density graphic highlights the concentration of residents 65 years old and over within the survey area. While the study area doesn't have a high concentration of residents that are 65 years or older, blocks west and east of the bus survey area house many older residents.

Household with No Vehicle

The number of households without a vehicle seem to be concentrated within the George Mason campus and in the central parts of the City of Fairfax. There are also a significant number of households with no vehicle to the east of Fairfax.

Household with One Vehicle

The areas with a higher number of households with access to one vehicle seem to correlate to areas of higher population density. Notable outliers include areas east and southeast of the Vienna metro, and southwest of the George Mason University Campus.

Public Transportation Use

Populations currently reporting using public transportation are primarily concentrated around the Vienna Metro station. Encouraging greater transit use in the areas with greater population density, such as the Fair Lakes/Fair Oaks area, may be achieved by offering more direct routes to Metrorail for those populations.

Figure 1-13: Persons Living Below Poverty Line

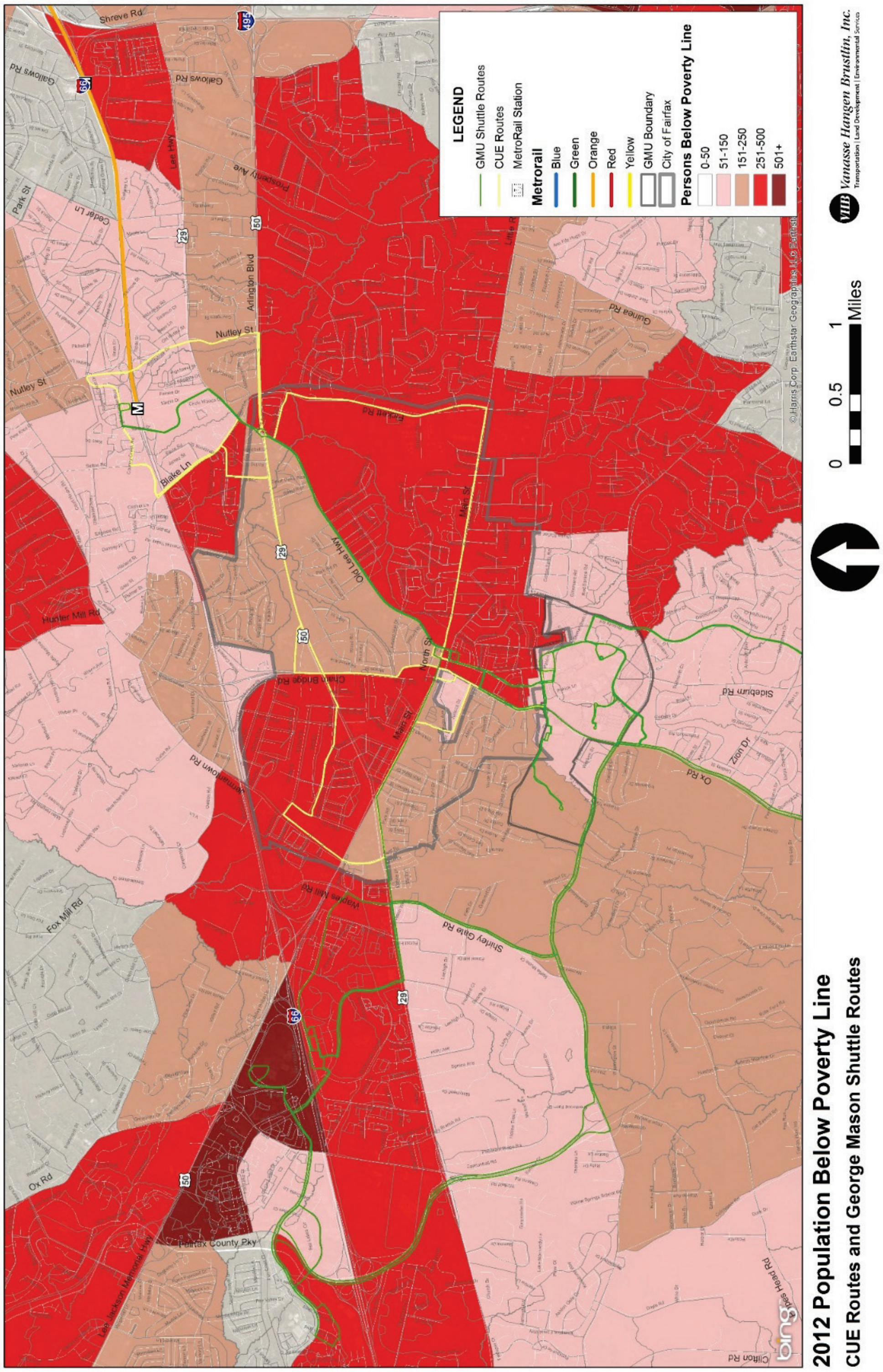


Figure 1-14: Population 65+ Years Old by Census Tract

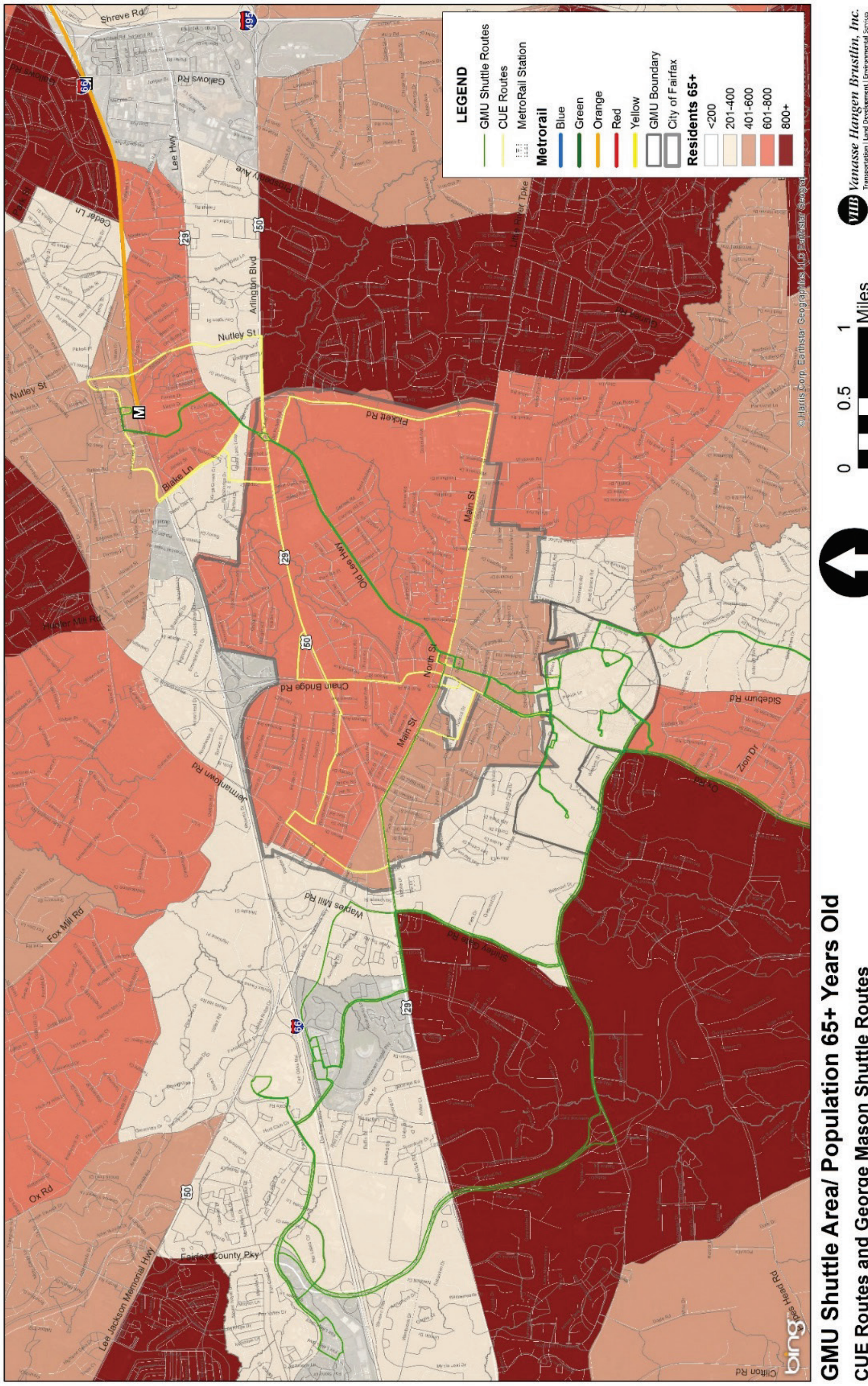


Figure 1-15: Households without Access to a Vehicle

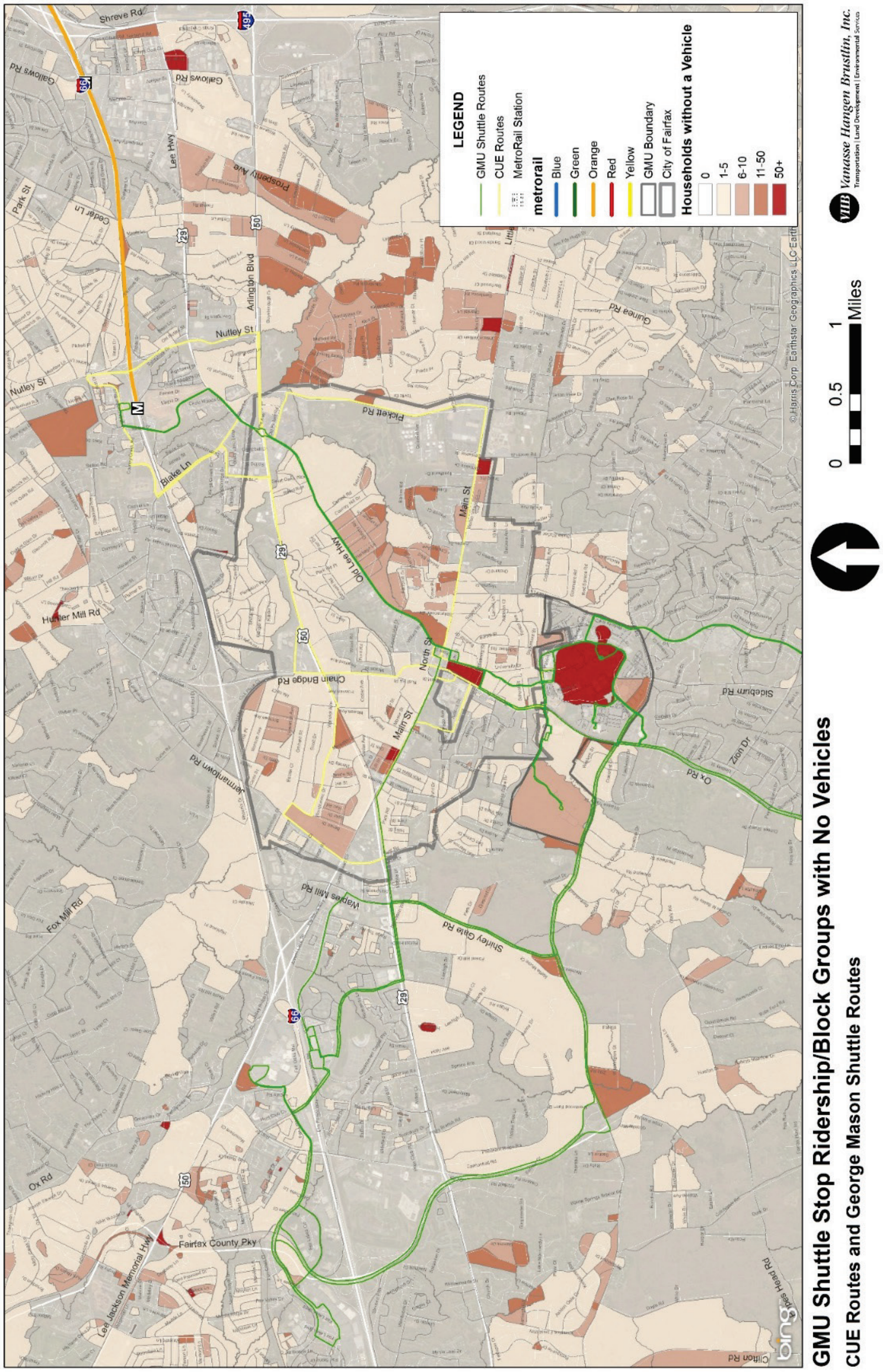
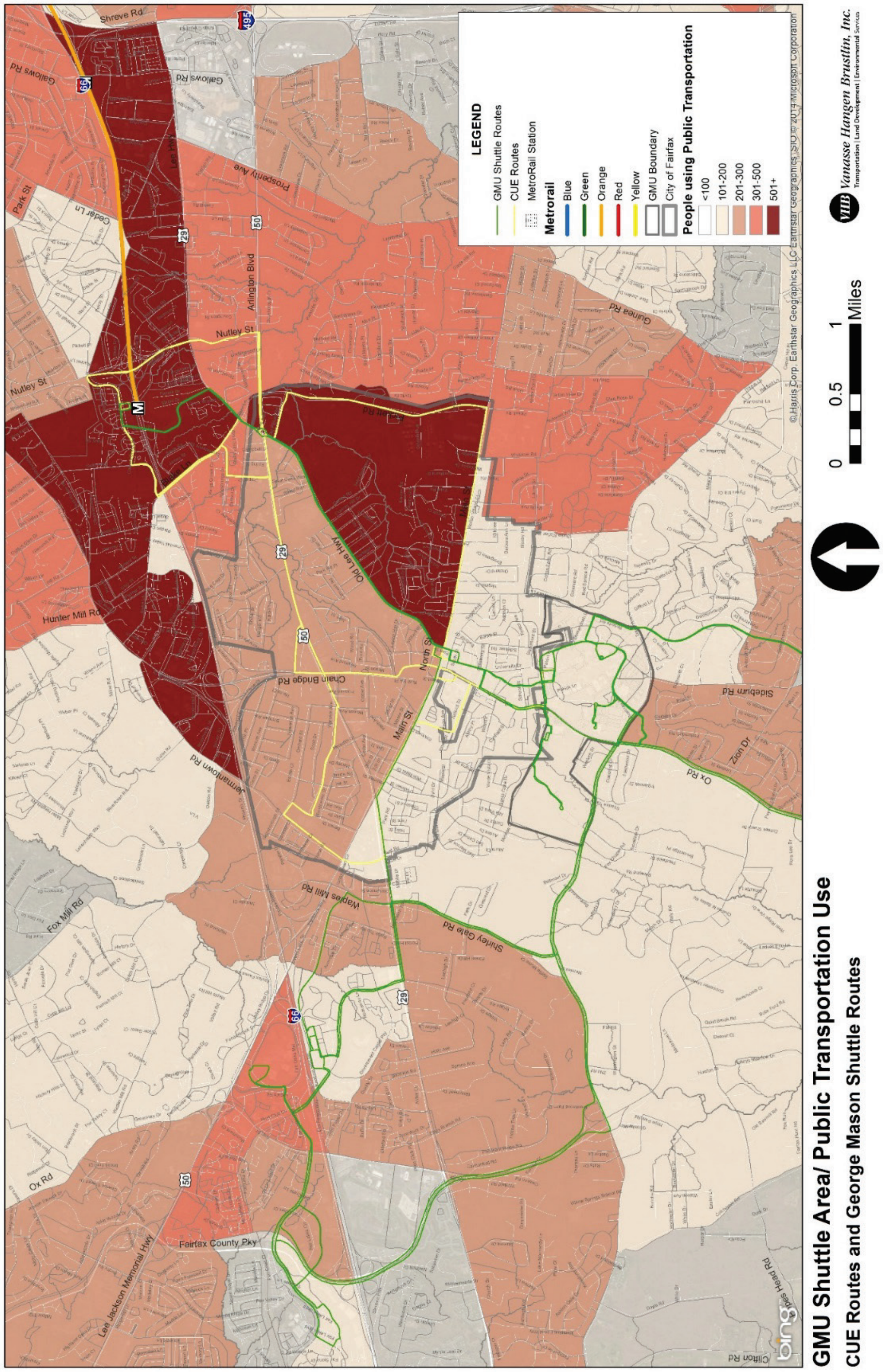


Figure 1-16: Households with Access to 1 Vehicle

Figure 1-17: Public Transportation Use by Census Tract



George Mason University

George Mason University is comprised of four campuses: Fairfax, Arlington, Prince William, and Loudoun. The Fairfax and Prince William campuses are the largest at 677 and 135 acres respectively[4]. George Mason University has a total student enrollment of 33,917 (fall of 2013). This enrollment was an almost three percent growth from 2012. Table 5 shows the change in student body enrollment over the past five years. The total student body has grown over the past five years, fueled by increased undergraduate enrollment despite slight declines in Law and Graduate student enrollment.

Table 1-5: George Mason University Enrollment Figures (2009-2013)

	2009	2010	Percent Change ('09-'10)	2011	Percent Change ('10-'11)	2012	Percent Change ('11-'12)	2013	Percent Change ('12-'13)
Undergraduate	19,702	20,157	2.31%	20,782	3.10%	20,653	-0.62%	21,990	6.47%
Law	696	731	5.03%	721	-1.37%	647	-10.26%	528	-18.39%
Graduate	11,669	11,674	0.04%	11,817	1.22%	11,661	-1.32%	11,399	-2.25%
Total	**32,067**	**32,562**	**1.54%**	**33,320**	**2.33%**	**32,961**	**-1.08%**	**33,917**	**2.90%**

Table 1-6: George Mason University Fall 2013 Enrollment by Age

	Number	Percent
Undergraduate		
Under 25	16,949	77.1%
25 to 29	2,677	12.2%
30 and Over	2,364	10.8%
Professional		
Under 25	199	37.7%
25 to 29	230	43.6%
30 and Over	99	18.8%
Graduate		
Under 25	2,146	18.8%
25 to 29	3,481	30.6%
30 and Over	5,767	50.6%
Total		
Under 25	**19,294**	**56.9%**
25 to 29	**6,388**	**18.8%**
30 and Over	**8,230**	**24.3%**

Sixty-three percent (21,421) of the student body is enrolled full-time, leaving 12,496 part-time students. The Fairfax Campus has a student population of 26,203. The resident student population for the fall of 2013 was 6,023. There are currently no restrictions on resident students bringing vehicles to school. The majority of students come from the Commonwealth of Virginia (81 percent). A breakdown of the student body by age can be found in Table 6 below. Not surprisingly, more than 75% of the undergraduate population is under 24 years old. When examined as part of the total student body, students 24 and under comprise over half of the student population.

[4] George Mason University 2013-2014 Facts and Figures

According to a report recently released by US PIRG, the number of vehicle-miles traveled by people age 16 to 34 decreased almost 25 percent between 2001 and 2009[5]. Given these trends, the younger population of the University community will likely desire, and may demand, greater access to transportation alternatives. Providing a transit service that meets their needs is one way to take advantage of this trend.

The total number of University faculty for the fall of 2013 was 3,853. This number includes 1,431 full-time, 1,125 part-time, and 1,297 graduate assistants. There were 2,526 reported administrative faculty and classified staff[6]. These individuals are not an insignificant percentage of the total Mason population, and learning what could entice them to utilize transit for elements of their travel needs could have a major impact on parking and traffic congestion both on Mason's campuses and the communities in which they reside.

Future Growth

An enrollment projection was produced as part of the George Mason University Transportation Master Plan in 2010. This projection assumed a conservative growth in enrollment of 1.88 percent per year. The enrollment projection for 2013 was 26,263 students. This closely matched the actual fall 2013 enrollment at the Fairfax campus of 26,203. By 2020 it was estimated that the student population would reach nearly 30,000 on the Fairfax campus. Accommodating an additional 4,000 students on campus while also addressing facility space needs, parking, and traffic growth will likely require growth in transit services, in addition to other programs to address travel demand.

The City of Fairfax is forecast to have modest growth over the next five years, adding approximately 500 households and 1,000 jobs. This is roughly 5 percent growth over the five-year period from 2015 to 2020[7].

1.5 Historic Trends

A review of performance and operation for CUE and Mason Shuttles over the past five fiscal years (FY2009 to FY2013) provides an understanding of the general direction of each system. Examining this historic data offers a broader context for understanding the current condition of each system. This report examined both CUE and Mason Shuttles for trends in levels of service, ridership, operating costs, and other indicators or system health. The trends identified through this review will be important considerations in planning for the future. The most recent five years of data were chosen for analysis because this time period was still relevant, the data was of a good quality, and both CUE and Mason Shuttle data were available. The data constraints prohibited true seasonal analysis of CUE relative to the drop in Mason Shuttle service, but annual trends in ridership should account for any academic year variance in ridership. It is not anticipated that CUE will change service in step with the academic calendar.

[5] *Transportation and the New Generation: Why Young People are Driving Less and What it Means for Transportation Policy*, U.S. PIRG, April 2012.
[6] Source: George Mason Factbook (2013-14)
[7] Metropolitan Council of Governments Cooperative Forecast 8.2.

Cue Bus

The historic system-level data CUE reports to the National Transit Database (NTD) provided several performance and operational variables to examine. Overall, CUE appears to have kept service relatively static but experienced a decline in ridership. The decline in ridership requires further analysis.

Operating Statistics

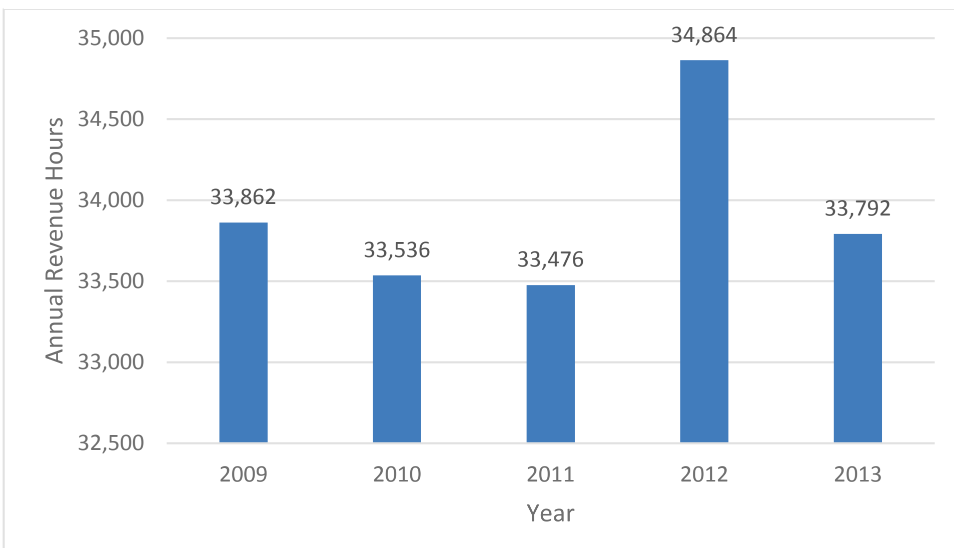
The historic operating statistics of CUE were measured in Revenue and Platform hours and miles. Revenue hours and miles measure the time and distance the system provides service to customers. Platform hours and miles measure the total time and distance that operators are in a bus, including both revenue and deadhead (when the bus is not in service for customers) operation.

Revenue Hours

Over the past five years, annual revenue hours have remained relatively unchanged. From the years 2009 to 2011 revenue hours declined approximately 1 percent before increasing in 2012. There was a 4 percent increase in revenue hours from 2011 to 2012. Revenue hours declined 3 percent to a level just slightly lower than the 2009 level. These fluctuations are likely due to minor system changes. Even with the severity of the recent recession and the dramatic impacts it had on budgets, the revenue hours seem to have been impacted very little.

Platform hours for CUE were only available for 2013. Platform hours for 2013 were 34,572. Revenue hours for 2013 represent approximately 98 percent of the platform hours. This high percentage of revenue hours indicates CUE used its vehicles efficiently by limiting the amount of time vehicles are on the road but out of service.

Figure 1-18: CUE Annual Revenue Hours (2009-2013)

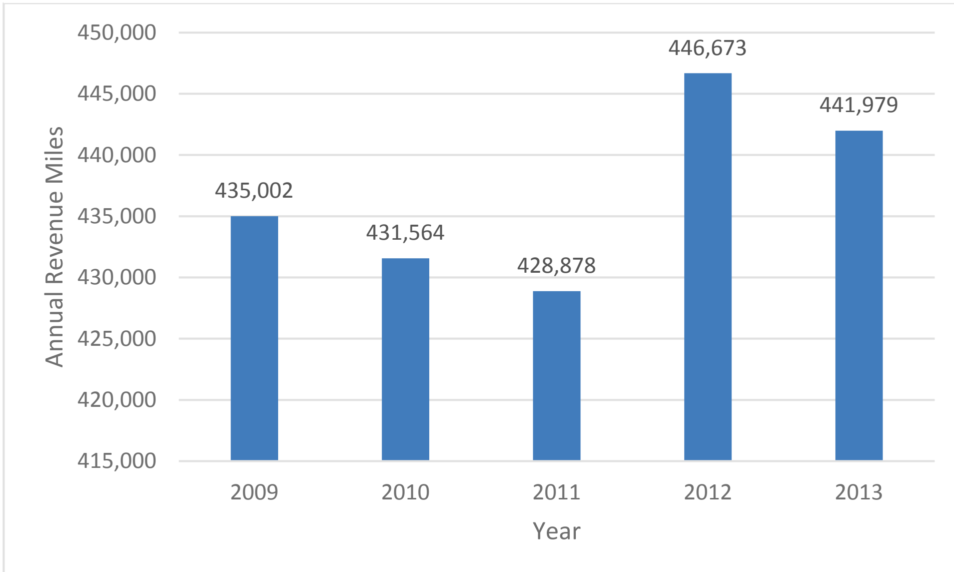


Revenue Miles

Revenue miles increased slightly since 2009, while revenue hours have declined slightly. The changes from year to year, as for Revenue hours, are likely associated with minor changes in service. The overall change in miles from 2009 to 2013 was a 2 percent increase.

Platform miles were only available for 2013. The platform miles were 457,960, with 15,981 deadhead miles. Revenue miles comprise approximately 97 percent of total miles. Similar to revenue hours and platform hours, this indicates an efficient use of resources.

Figure 1-19: CUE Annual Revenue Miles (2009-2013)



Trips Statistics

Trip statistics focus on the amount of CUE service consumed over the five-year period. The two most relevant measures of service consumption reported to the NTD are unlinked trips and passenger miles. Unlinked trips measure ridership and account for each time a rider boards a bus. For example, a trip that requires one transfer counts as two unlinked trips. This should not be confused with the number of passengers. Passenger miles represent the total distance riders travel throughout the system.

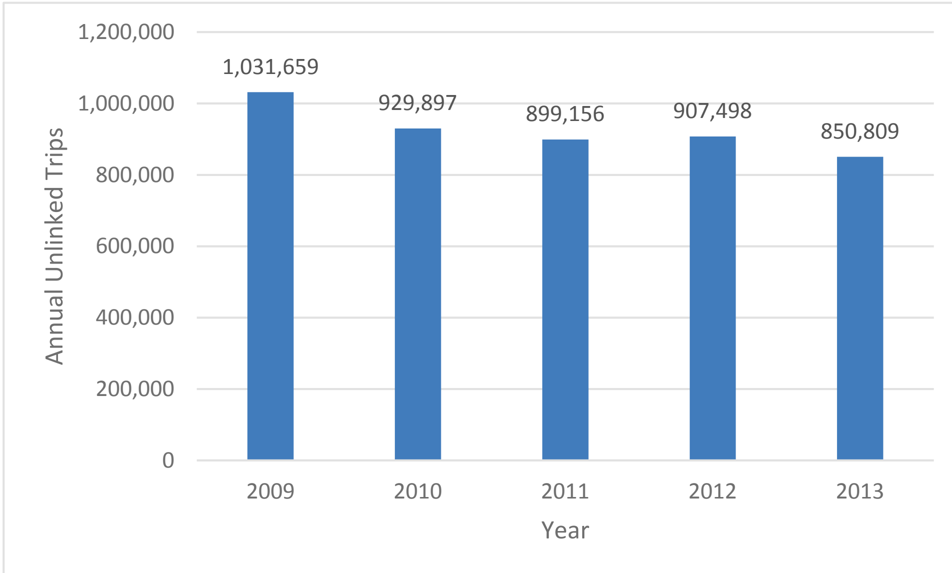
Unlinked Trips

Despite the relatively steady amount of service provided over the past five years, the number of annual unlinked trips has steadily declined. From 2009 to 2011 unlinked trips decreased by approximately 13 percent. There was a small rebound in 2012, followed by another drop in 2013. Overall, annual unlinked trips have decreased by roughly 18 percent from 2009 to 2013.

This analysis only examined the previous five years of data, but it is important to note that CUE ridership peaked in fiscal year 2007 at 1,126,966 riders before beginning a year-over-year decline. The ridership figures observed during the FY 2004 and 2005 years are closed to the recently observed ridership figures, pointing to the possibility that ridership may be stabilizing after a peak in 2006 and 2007[8]. This trend has been observed in other transit agencies in the region as well as across the nation. The American Public Transportation Association figures from FY2004 to FY2013 show a peak in bus ridership around 2006 with a decrease that has started to stabilize in recent years[9].

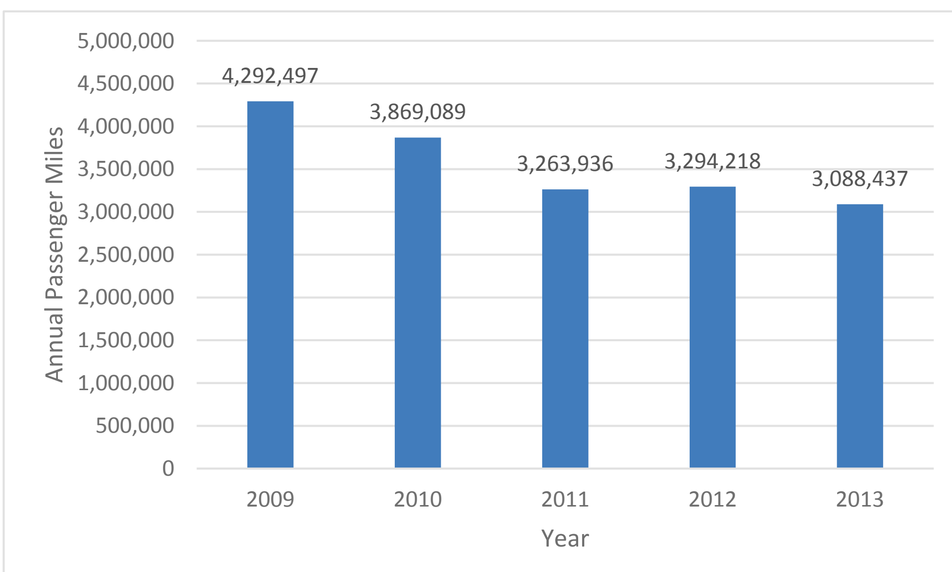
[8] Source: Figures pulled from CUE and Metrobus fares 1980 through present spreadsheet provided by CUE.
[9] Source: APTA ridership figures were downloaded from www.apta.com and pulled from APTA-Ridership-by-Mode-and-Quarter-1990-Present spreadsheet.

Figure 1-20: CUE Annual Unlinked Passenger Trips (2009-2013)



Passenger Miles
Like unlinked trips, annual passenger miles have declined roughly 28 percent between 2009 and 2013. Not surprisingly; the fewer unlinked trips are made, the fewer miles are accrued. While the two are linked, passenger mileage is also an indication of how far people are traveling within the system. The biggest drop was between 2010 and 2011 (16 percent). There was also a modest bump in passenger miles in 2012 which corresponded with an increase in revenue miles. This is a greater decrease than unlinked trips over the same period, and would indicate people are not riding as far as they once did.

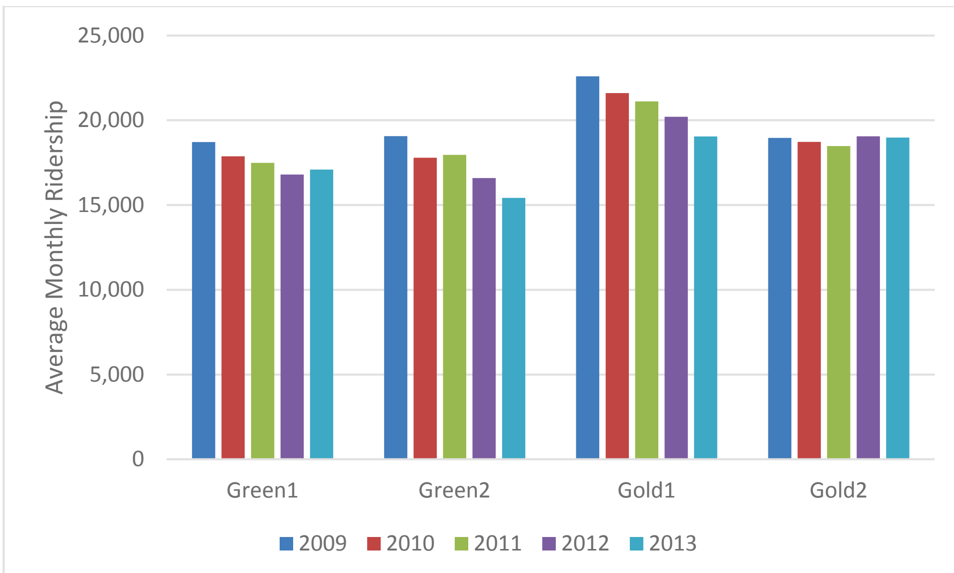
Figure 1-21: CUE Annual Passenger Miles (2009-2013)



Ridership by Route

Figure 5 shows that while the general trend has been decreasing ridership between 2009 and 2013, there is a fair amount of variation between the four CUE routes. .While Gold 1 and Green 2 have seen declines over the five years, Gold 1 has been steadier in its decline, while Green 2 has seen greater decrease over the last two years. Green 1 and Gold 2 have actually seen recent small increases in 2012 and 2013. Green 1 showed declines from 2009 to 2012 with a bump in 2013. Gold 2 showed relatively steady ridership between 2009 and 2011 with a bump in 2012 that held steady in 2013. This analysis shows that while the overall trend for ridership has been negative for the system, it isn't necessarily the case for each route. By looking at the routes separately, different trends emerge.

Figure 1-22: CUE Annual Average Monthly Ridership by Route (2009-2013)



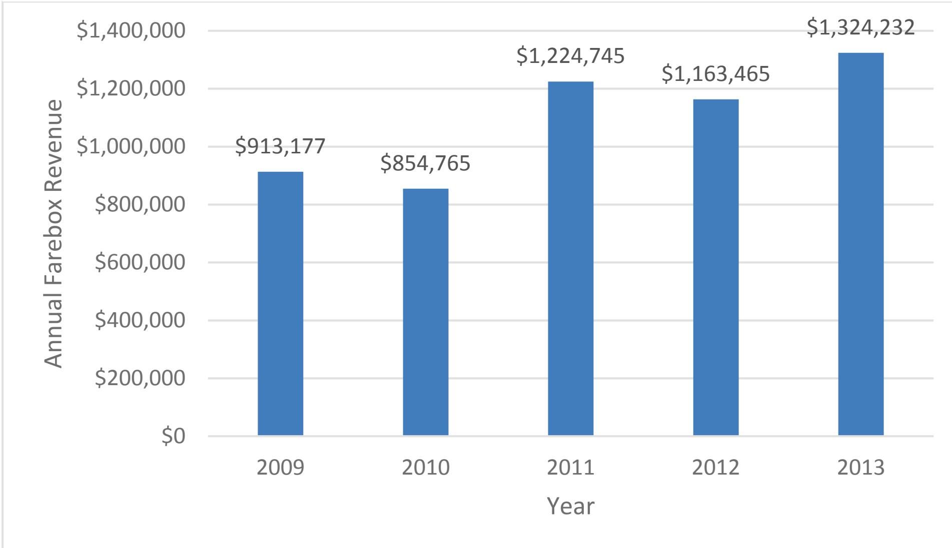
Farebox

Revenue generated from the farebox of a transit system is an important source of funding to offset operating costs. No transit system generates enough farebox revenue to completely cover operating costs. While it is important to observe the trend in farebox revenue collected over time, it is also important to understand the farebox recovery ratio. The farebox recovery ratio measures the amount of the operating cost recouped by farebox revenue.

Revenue

Accounting for inflation, 2013 generated the most farebox revenue of the studied years. When compared to the trend in annual unlinked trips, farebox revenue has shown a general positive trend. There were drops in 2010 and 2012, but otherwise revenue has increased with the largest increase occurring in 2011. The increases in farebox revenue are likely associated with fare increases that have occurred during these periods. Prior to April 1, 2010 the full cash fare was $1.35, while the current full cash fare is $1.75. The largest increase over the five year period occurred between 2010 and 2011.

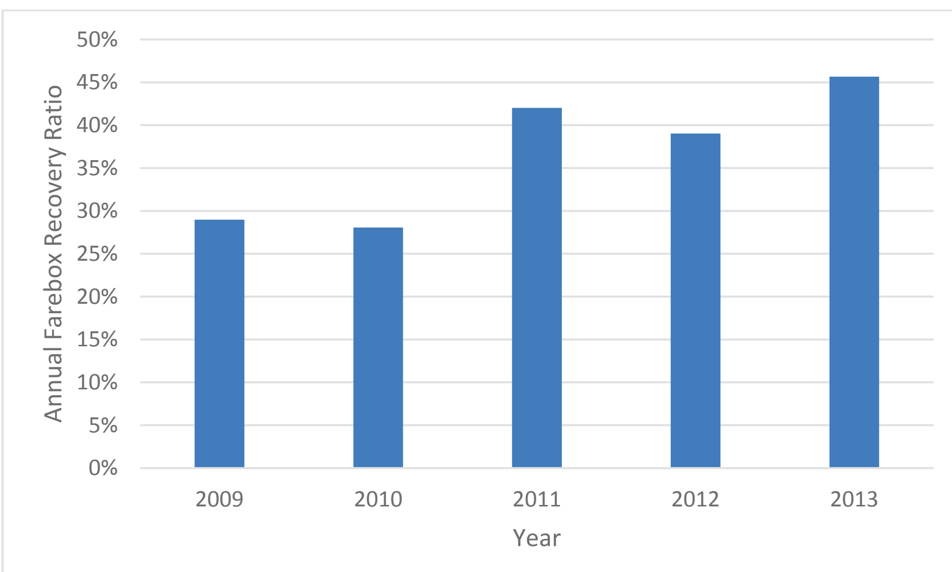
Figure 1-23: CUE Annual Farebox Revenue in 2013 Dollars (2009-2013)



Farebox Recovery Ratio

The trend for farebox recovery ratio mirrors the trend for farebox revenue very closely. There is a small drop in 2010 and 2012, but the general trend has been positive. The biggest jump in the ratio occurred in 2011 when it went from 28 percent to 42 percent. The farebox recovery ratio for 2013 reached 46 percent. The combination of decreasing costs and fare increases have improved the recovery ratio. The fare increases may have impacted ridership as well, but have not yet caused a decline in revenue past 2009 levels.

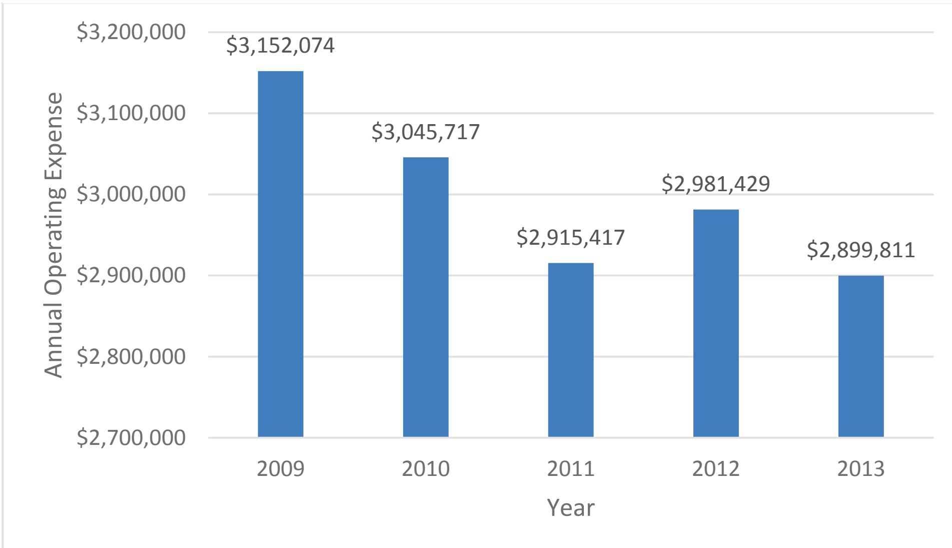
Figure 1-24: CUE Annual Farebox Recovery Ratio (2009-2013)



Annual Operating Expense

Annual operating expenses have remained relatively stable when accounting for inflation. The cost to operate CUE decreased from 2009 to 2011. There was a small bump in 2012, likely associated with the increase in service miles and hours. However, the cost in 2013 was the lowest for the five year period. The decline in operating expenses stands in contrast to the increase in revenue, and helps explain the increase in farebox recovery.

Figure 1-25: CUE Annual Operating Expense in 2013 Dollars (2009-2013)



Mason Shuttles

Historic data for Mason Shuttles was provided by both the University and Reston Limousine, the contractor providing the shuttle service. Overall, ridership, service, and costs have been increasing over the same five year period. The following charts display the trends discussed above for CUE, except farebox revenue and recovery ratio as the Mason Shuttles do not charge a fare.

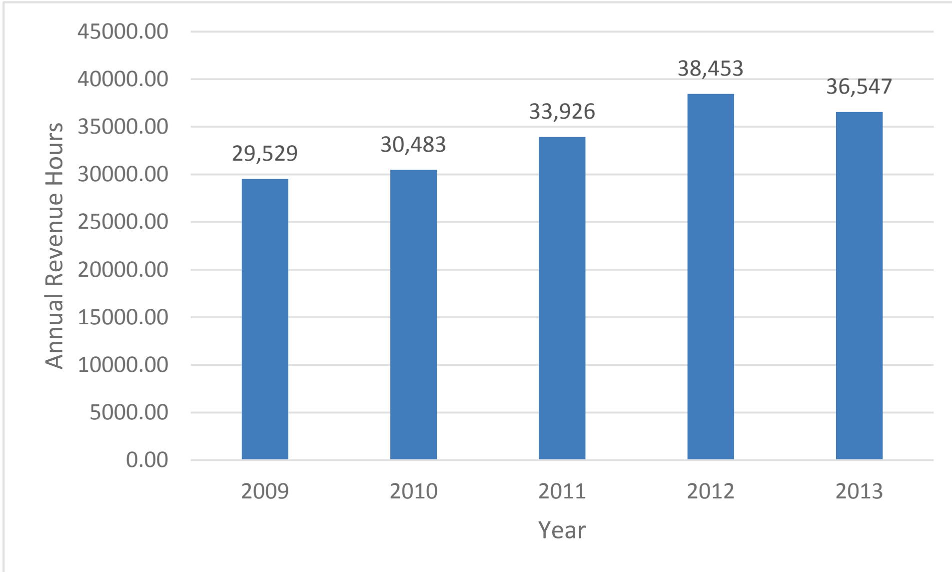
Operating Statistics

Revenue Hours

Overall revenue hours have increased. Annual revenue hours for Mason Shuttles steadily increased until 2012. There was a small decrease that occurred in 2013 associated with contraction of two routes (West Campus Shuttle and Campus Circulator). The biggest jump in hours occurred in 2012.

Platform hours for 2013 were 38,880. Revenue hours accounted for 94 percent of the platform hours, indicating an extremely efficient use of resources. This was aided by the storage of vehicles on the Mason campus, reducing the time and miles associated with reaching the start of a route.

Figure 1-26: Mason Shuttle Annual Revenue Hours (2009-2013)

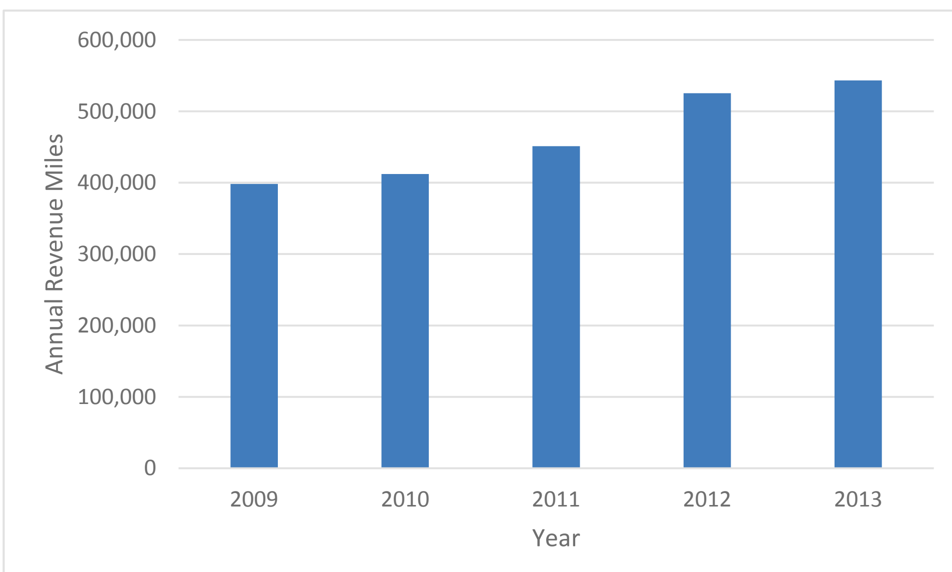


Revenue Miles

Like revenue hours, annual revenue miles grew for the five year period. Mileage was relatively flat between 2009 and 2010 with increases in 2011 and 2012. The biggest increase occurred in 2012. This is likely associated with growth in the Prince William Campus shuttle. Despite minor reductions in shorter routes, mileage increased slightly in 2013.

Platform hours for Mason Shuttles weren't reported, but it is assumed that the percent of deadhead miles would be low, based on the recorded difference between revenue hours and platform hours.

Figure 1-27: Mason Shuttle Annual Revenue Miles (2009-2013)

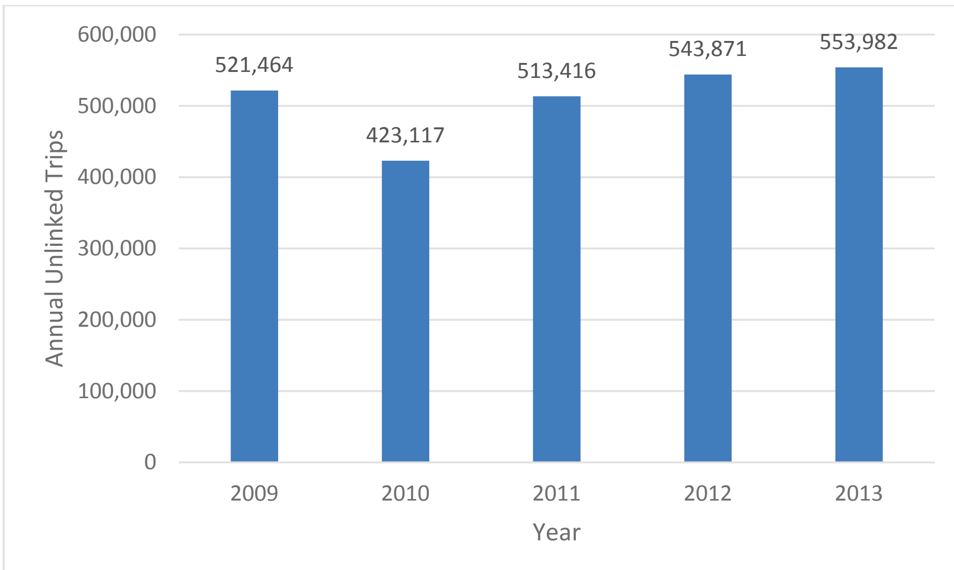


Trip Statistics

Unlinked Trips

Unlinked passenger trips increased slightly over the five year period. There was a drop in unlinked trips from 2009 to 2010 despite the increase in service provided. The Campus Circulator route saw a decrease in service and a dramatic drop in trips offset by the growth in trips on the other routes. Ridership picked back up the following year. Unlinked trips did not show as dramatic a jump in 2012 when compared to the change in service. There was only a 6 percent increase, while revenue miles increased by 16 percent, meaning fewer passengers were carried per mile of service. Overall, unlinked trips have shown a steady positive trend since 2011.

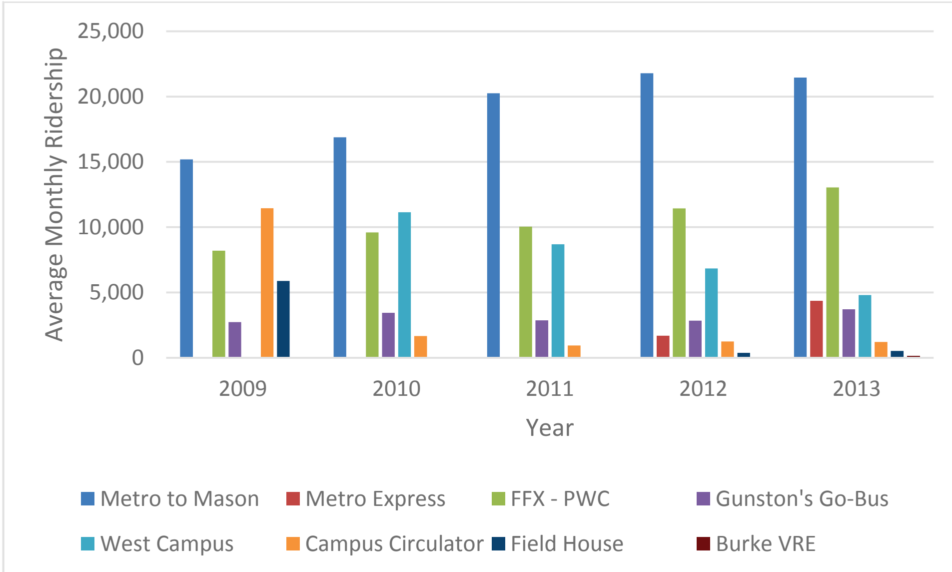
Figure 1-28: Mason Shuttle Annual Unlinked Passenger Trips (2009-2013)



Ridership by Route

A review of the five-year historic average monthly ridership by route provides a better picture of what is causing the variability in the overall ridership. Some routes have been operating for the entire five-year period observed, while other routes were eliminated or created over the course of the same period. Another consideration is that some routes are operated year-round while others are only operated during the spring and fall semesters. Most of the routes still operating today have shown year-over-year growth. The Campus Circulator and West Campus shuttle were discontinued. While both the Mason to Metro and Metro Express routes compete with CUE routes, both experience high ridership.

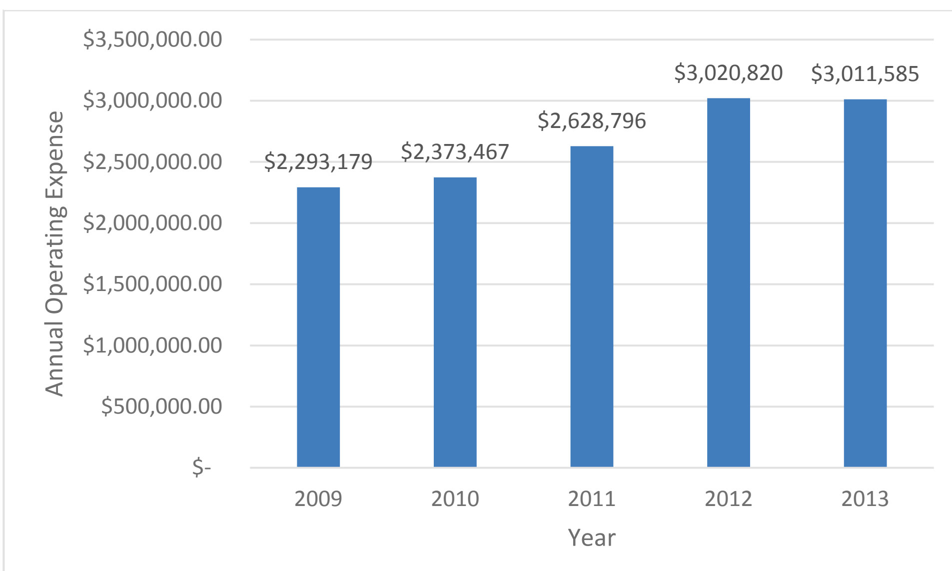
Figure 1-29: Mason Shuttle Annual Average Monthly Ridership by Route (2009-2013)



Annual Operating Expense

Accounting for inflation, the total operating expense for Mason Shuttles has mirrored the amount of service provided, increasing over the past five years with a plateau occurring in 2012-13. Based on the amount of change that occurred during this five-year period, with routes being added and eliminated, costs have remained fairly constant at around $3 million. The biggest jump in operating cost (15%) occurred between 2011 and 2012. This is closely linked to the 16 percent increase in revenue vehicle miles tied to route length increases on many of the routes and the start of the Metro Express service.

Figure 1-30: Mason Shuttle Annual Operating Expense in 2013 Dollars (2009-2013)



Conclusion

The historic NTD data for CUE highlights some areas for further study, in particular the decreasing ridership that occurred over the five-year period from 2009 to 2013 despite modest service changes. Fares changed quite a bit during this period, both in response to reduced City revenue associated with the recession and budget tightening, and in concert with a Metrobus fare increase. Even with the decline in ridership, CUE experienced an increase in fare revenue and farebox recovery associated with the fare increase. Mason shuttles have seen significant change in service offered during the same period; some routes have been eliminated while new ones have been started. Overall, the service has continued to grow in terms of service provided, ridership, and cost. The three have not necessarily trended together, with cost and service increasing disproportionately to ridership. The decreases in CUE ridership don't mirror the increases in ridership for Mason Shuttles, which may be accounted for with increased student population and improved route design. Based on the data it is difficult to determine how the CUE and Mason shuttle ridership disparities are linked by similar causal factors.

2

Ridership

2.1 Introduction

Riders are the foundation of every transit system. They rely on transit to get them to their destinations, allowing them to earn a living, obtain further education, or access healthcare. Meeting the needs of these riders is the primary responsibility and obligation for Mason Shuttles and CUE. A detailed analysis of the ridership will assist Mason Shuttles and CUE in effectively meeting the needs of their riders and potential ways to improve the service.

Ridership is one of the primary measures of effectiveness used by transit agencies to determine success for both the system and at the individual route-level. As ridership grows, the economic efficiency of the route improves. Therefore, evaluating ridership for both the system and each route is an element in understanding how well they are performing. Routes that carry more riders are considered successful and should be considered for improvements. Routes that are struggling should be examined to determine the cause of their poor ridership. These routes may need to be reconsidered. Ultimately, the goal of ridership analysis is to improve the performance of the existing system. Improving system performance is a benefit to both Mason Shuttles and CUE as well as their riders and the community.

Both Mason Shuttles and CUE currently track their ridership. Mason Shuttles receive ridership counts from Reston Limousine, and CUE collects ridership data from the electronic farebox onboard each bus. This information helped identify trends both over longer periods of time and throughout the year. More detailed ridership counts were collected on each route at the stop level to provide a better understanding of the activity that occurs along each route. Stop-level ridership provides a picture for how the route is used. This helps us answer questions such as; are people boarding at one end and getting off at multiple locations along the route, or are they riding primarily from end-to-end? This can inform how the route should be operated. More detailed ridership information can be used to identify passenger loading along the route, which can determine vehicle and operational needs. If only one segment of a route is overburdened, a possible solution could be to short-turn certain trips to improve service frequency to the high ridership portion of the route. Stop-level ridership identifies high- and low-activity stops. High-activity stops are candidates for improvements, such as adding shelters or real-time passenger information. Low-activity stops should be further analyzed to determine their need. Consolidating stops can result in travel time improvements in addition to reducing costs associated with maintenance.

Stop-level ridership can provide information about how a route and transit system are utilized, but will not provide information about how riders access the transit system, where they are coming from or going to, and their impressions of the system. An on-board survey of riders is required to gain this level of detail. The information collected as part of an on-board survey will help determine better the needs of the riders. Combining this information with the ridership detail provide valuable information to inform decisions on how to improve and change each system.

2.2 Ridership

Ridership counts were conducted for each route in the CUE system, and the following routes in the Mason Shuttles system:

- Mason to Metro
- Metro to Mason
- Mason Express
- Gunston Go (George, Mason, and Late)
- Burke VRE

The counts were collected from the last week in March 2014 through the first week in May 2014 by the George Mason University Center for Social Science Research (CSSR). CSSR staffed each route and manually collected the number of boarding and alighting passengers for each stop along the route. These data were inputted into a tablet computer loaded with a program that listed the stops specific to the route being surveyed. This information was used to calculate the passenger load for the bus: the number of passengers on the bus. Together, the boardings, alightings, and passenger loads provide a more in-depth understanding of the system.

Ridership counts for each route were collected for two weekdays and a Saturday, if weekend service was applicable. The two weekdays were intended to correspond to the same day of the week, with one associated with a major event on the Mason campus and one a non-event day. This was intended to provide insights into whether the transit systems see more utilization during major events, such as concerts at the Patriot Center. Some of the routes were not surveyed for their full service span. The Mason to Metro and Metro Express routes operate for greater than 15 hours. The majority of the service span was surveyed and a factor was applied based on a comparison to other available ridership data to account for a full day. Factors were developed utilizing full-day ridership counts provided by Reston Limousine. These counts were also used as a check for accuracy of the total boardings against the collected counts. When differences of greater than 10 percent were noted in daily totals, counts were sent back to CSSR for verification. If the difference remained, these counts were also factored utilizing the counts provided by Reston Limousine.

Mason Shuttles

Mason to Metro

The Mason to Metro route showed daily ridership of over 1,000 riders. The outbound trips picked up the most riders at the Sandy Creek stop. Based on the observed passenger loads most people utilize the route for its intended purpose of accessing Metro. The highest loads were observed between Rappahannock River Lane and Vienna/Fairfax-GMU. The Vienna/Fairfax-GMU stop observed the highest alightings in the outbound direction. Not surprisingly the Vienna Metro stop observed the highest number of boardings in the inbound direction. However the stop at Chesapeake River Way, near Rappahannock River Lane, displayed the highest number of alightings. The Chesapeake River

Way and Sandy Creek stops did not show a similar proportion of alightings when compared to the outbound boardings for the Rappahannock River Lane and Sandy Creek stops. This would indicate while most people ride from the Metrorail Station to the George Mason campus, people don't necessarily board and alight at the same stop on campus. This could be the result of the rider's schedule and their location on campus at the time of the shuttle.

Weekday Outbound to Vienna/Fairfax-GMU

Stop	ON	OFF	LOAD
Mason Inn	46	0	46
Mason Pond Drive at Patriot Circle	2	0	48
Sandy Creek Shuttle Stop	313	2	359
Masonvale Patriot Circle at Staffordshire Lane	2	3	358
Rappahannock River Lane	193	14	537
Commerce Building	5	7	535
Fairfax Circle	0	3	532
Vienna Metro	0	532	0
	561	**561**	

Weekday Inbound to Mason Inn

Stop	ON	OFF	LOAD
Vienna Metro	518	0	518
Fairfax Circle	2	0	521
Commerce Building	8	12	516
Chesapeake River Way	3	276	244
Masonvale Patriot Circle at Staffordshire Lane	4	46	203
Sandy Creek Shuttle Stop	1	178	26
Mason Pond Drive at Patriot Circle	0	3	23
Mason Inn	0	21	2
	537	**535**	

The Saturday ridership counts do not show a different pattern from the weekday ridership counts. This would indicate that while the travel is likely for different purposes on the weekend versus the weekday, the predominant stop usage remains the same. People board at the Sandy Creek and Rappahannock River Lane stops leaving the campus and get off at the Vienna station, and do the opposite on the return trip.

Saturday Outbound to Vienna/Fairfax-GMU

Stop	ON	OFF	LOAD
Mason Inn	19	0	19
Mason Pond Drive at Patriot Circle	0	0	19
Sandy Creek Shuttle Stop	226	0	245
Masonvale Patriot Circle at Staffordshire Lane	6	0	251
Rappahannock River Lane	199	6	444
Mason Townhomes	6	0	450
Commerce Building	4	0	454
Fairfax Circle	4	28	430
Vienna Metro	0	430	0
	464	**464**	

Saturday Inbound to Mason Inn

Stop	ON	OFF	LOAD
Vienna Metro	397	0	397
Fairfax Circle	32	0	429
Commerce Building	2	6	425
Mason Townhouses	2	5	422
Chesapeake River Way	0	267	155
Masonvale Patriot Circle at Staffordshire Lane	0	13	142
Sandy Creek Shuttle Stop	0	95	47
Mason Pond Drive at Patriot Circle	0	17	30
Mason Inn	0	28	2
	433	**431**	

Metro Express

The Metro Express route showed a daily ridership of approximately 600 riders. Outbound trips carried 250, while inbound trips carried just over 300 daily riders. Due to the limited number of stops and the focus of the route, to quickly carry riders between the Vienna Metrorail station and the Fairfax campus, it wasn't surprising to find the highest stops by boarding and alighting were the Rappahannock River Lane and Vienna Metro stops. The highest passenger loads were observed just after leaving campus in the outbound direction and just prior to arriving on campus in the inbound.

Weekday Outbound to Vienna/Fairfax-GMU

Stop	ON	OFF	LOAD
Rappahannock River Lane	237	0	237
Commerce Building	4	4	237
Fairfax Circle	9	59	187
Vienna Metro	0	187	0
	250	**250**	

Weekday Inbound to Rappahannock River Lane

Stop	ON	OFF	LOAD
Vienna Metro	240	0	240
Fairfax Circle	83	3	320
Commerce Building	10	3	327
Rappahannock (GMU)	0	327	0
	333	**333**	

Gunston's Go-Bus

Gunston's Go-Bus is comprised of three routes: Mason, George, and the Late. The Mason route operates the longest service span of the three route variations. The route carries roughly 150 daily riders. The majority of riders board and alight at the Sandy Creek stop. The second highest number of boardings is at Fair Oaks Mall. The second highest number of alightings is at Fair Lakes Center. The University Mall stop displayed the lowest ridership figures. This low ridership is likely the result of a number of factors, such as construction and its proximity to the Fairfax Campus, which makes it reachable by other means of transportation.

Weekday - Mason

Stop	ON	OFF	LOAD
Sandy Creek Shuttle Stop	77	0	77
University Mall	0	4	73
Fair Lakes Center	14	34	53
Fair Oaks Mall	32	26	59
Fairfax Corner	26	12	73
University Mall	1	1	73
Sandy Creek Shuttle Stop	0	73	0
	150	**150**	

The George operates in the opposite direction of the Mason route during the afternoons and evening. The highest boarding and alighting was observed at the Sandy Creek Stop. The second highest boarding was observed at Fair Lakes Center. The imbalance in this stop for the Mason and George routes is likely the result of the routing. Fair Lakes Center is the second stop on the Mason route and the third stop from the end on the George route. Using the Mason route to get to Fair Lakes and the George route to return to campus shortens the in-vehicle time for the rider in the each direction of travel respectively. Fair Oaks Mall is the second highest destination on the George route.

Weekday - George

Stop	ON	OFF	LOAD
Sandy Creek Shuttle Stop	48	0	48
University Mall	0	2	46
Fairfax Corner	2	16	32
Fair Oaks Mall	13	21	24
Fair Lakes Center	14	8	30
University Mall	0	1	29
Sandy Creek Shuttle Stop	0	29	0
	77	**77**	

The Late route operates two trips on Friday and Saturday nights. One trip departs at 10:30 pm and the other at 11 pm. The route does not travel the same routing as the George or Mason routes. It instead provides a connection between Fairfax Corner and the Rave Fairfax Corner 14 movie theatre, Old Town Fairfax, and University Mall to campus. Based on the observed counts and the reported counts from Reston Limousine the route does not show much use.

Weekday - Late

Stop	ON	OFF	LOAD
Sandy Creek Shuttle Stop (GMU)	3	0	3
University Mall	1	2	2
Fairfax Corner	0	1	1
Old Town Fairfax	0	0	1
University Mall	0	0	1
Sandy Creek Shuttle Stop (GMU)	0	1	0
	4	**4**	

Saturday ridership for the Mason and George routes is greater than for the same periods of time during weekdays. This isn't surprising considering the route connects the Fairfax campus with local shopping and entertainment. Weekends provide students with greater "free" time to take advantage of these opportunities. The George route carried more riders than the Mason route, with Fair Oaks Mall being the most popular destination. Riders of the two routes also followed the same patterns for weekday service, using the route with a particular destination sooner in the stop order and taking the opposite route to return to campus. The Late route showed even lower ridership than the weekday service. This would seem to indicate that students are driving, or using a form of transportation other than bus, to access late night entertainment.

Saturday - Mason

Stop	ON	OFF	LOAD
Sandy Creek Shuttle Stop (GMU)	42	0	42
University Mall	3	6	39
Fairfax Corner	12	22	29
Fair Oaks Mall	21	15	35
Fair Lakes Center	12	9	38
University Mall	0	0	38
Sandy Creek Shuttle Stop (GMU)	0	38	0
	90	**90**	

Saturday - George

Stop	ON	OFF	LOAD
Sandy Creek Shuttle Stop (GMU)	51	0	51
University Mall	2	2	51
Fairfax Corner	2	15	38
Fair Oaks Mall	27	31	34
Fair Lakes Center	32	9	57
University Mall	1	0	58
Sandy Creek Shuttle Stop (GMU)	0	58	0
	115	**115**	

Saturday – Late

Stop	ON	OFF	LOAD
Sandy Creek Shuttle Stop (GMU)	0	0	0
University Mall	0	0	0
Fairfax Corner	2	0	2
Old Town Fairfax	0	0	2
University Mall	0	0	2
Sandy Creek Shuttle Stop (GMU)	0	2	0
	2	**2**	

Burke VRE

The Burke Centre VRE route connects the Fairfax campus with the VRE's Manassas line. The route is relatively new. The observed daily ridership was almost 30 riders. The highest boardings were observed at the VRE station and the highest alightings were observed at the Sandy Creek stop. The slight difference in boardings and alightings for the Sandy Creek stop could be explained by people catching a ride with someone back to the station, or slight errors in the count.

Weekday - Burke Centre VRE

Stop	ON	OFF	LOAD
Sandy Creek Shuttle Stop (GMU)	12	0	12
Burke VRE Station	17	12	17
Sandy Creek Shuttle Stop (GMU)	0	17	0
	29	**29**	

CUE Bus

Gold 1

The Gold 1 operates clockwise between Vienna/Fairfax-GMU and the George Mason University Fairfax campus while serving the western portion of the city. In the inbound direction the Mason stop has the highest number of boardings with the Metrorail station showing the highest alightings. The reverse was true in the outbound direction. The load in the inbound direction remains mostly flat approaching Jermantown Road, where it begins to increase until just prior to Fairfax Circle. The load then decrease slightly until reaching Metro. The load in the outbound direction doesn't display as much variability. There is a small peak approaching Fairfax High School and then a steady drop-off moving through downtown Fairfax and onto the Mason campus.

Weekday - Inbound to Vienna/Fairfax GMU

Stop	ON	OFF	LOAD
Rappahannock Lane at Patriot Circle	121	0	121
University Drive & Chain Bridge Rd.	3	1	122
Chain Bridge Rd. at School St.	0	3	119
Chain Bridge Rd. at INOVA	5	5	120
Chain Bridge Rd. at West Dr.	8	14	114
Chain Bridge Rd. at Armstrong St.	8	5	117
Chain Bridge Rd. at Justice Drive	8	5	120
West St. at Fairfax Courthouse	1	2	119
Main St. at Fairfax Building	16	6	129
Main St. at Railroad Ave.	1	1	129
Main St. at Keith Ave.	3	7	125
Main St. at Oak St.	11	7	129
Main St. at Hallman St.	18	28	119
Lee Highway at Chipotle	14	7	127
Lee Highway at Hilltop Shopping Center	5	1	131
Lee Highway at Jermantown Rd.	12	22	121
Jermantown Rd. at Jermantown Sq.	7	3	124
Jermantown Rd. at James Swarts	20	13	131

Jermantown Rd. at Main St.	11	12	130
Jermantown Rd. at Comfort Inn	21	13	139
Jermantown Rd. at Fair Haven Ct.	17	8	148
Jermantown Rd. at Cavalier Ct.	50	16	182
Orchard St. at Bevan Dr.	3	9	175
Bevan Dr. at Lanier School	5	1	179
Warick Ave. at Bevan Dr.	1	0	181
Warick Ave. at Hill St.	5	3	183
Warick Ave. at Meredith Dr.	16	8	190
Warick Ave. at H/Mart Shop	8	2	196
Fairfax Blvd. at McLean Ave.	7	1	201
Fairfax Blvd. at Denny's Rest	11	9	203
Fairfax Blvd. at University Dr.	9	2	209
Fairfax Blvd. at Eaton Pl.	14	2	221
Fairfax Blvd. at 10201 Block	1	2	220
Fairfax Blvd. at Plantation Pkwy.	8	2	226
Fairfax Blvd. at Stafford Drive	3	1	227
Fairfax Blvd. at Rebel Run	4	6	226
Draper Dr. at Fairfax Blvd.	3	5	224
Draper Dr. at Beach St.	0	1	223
Kingsbridge Dr. at Kings Crown Ct.	4	6	221
Blake Lane at Lindenbrook St.	6	3	224
Blake Lane at Bel Glade	0	1	222
Blake Lane at Five Oaks Rd.	1	3	220
County Creek at Village Springs Lane	0	1	219
Vienna Fairfax-GMU Metro Station	0	219	0
	468	**468**	

Weekday - Outbound to Rappahannock

Stop	ON	OFF	LOAD
Vienna-Fairfax-GMU Metro Station	209	0	209
County Creek at Village Springs Lane	0	2	207
Blake Lane at Five Oaks Rd.	2	5	205
Blake Lane at Bel Glade	0	11	193
Blake Lane at Knightsbridge Dr.	6	28	171
Blake Lane at Blake Lane Loop	15	6	180
Lee Highway at Arthur Teachers	27	3	203
Old Lee Highway at Fairfax Circle Shopping	14	14	203
Old Lee Highway at Ridge Ave.	6	0	209
Old Lee Highway at Great Oak Drive	2	11	200
Old Lee Highway at Fairfax High School	14	2	212
Old Lee Highway at Brookswood Dr.	1	13	200
Old Lee Highway at Embassy Ln.	2	0	203
Old Lee Highway at Heritage Ln.	1	6	198
Old Lee Highway at St. Leo's Church	5	8	194
Old Lee Highway at Layton Hall Dr.	17	32	180
Old Lee Highway at Willard Way	12	15	176

Old Lee Highway at Library	15	35	156
University Dr. at Main St.	8	17	146
University Dr. at Sager Ave.	2	1	147
University Dr. at Fire Station No.3	0	5	143
George Mason Blvd. at Armstrong St.	5	9	138
George Mason Blvd. at School St.	0	2	137
Rappahannock Lane at Patriot Circle	3	140	0
	366	**366**	

Saturday ridership for the Gold 1 has the same high ridership stops for boardings and alightings as well as the peak load occurring in the same approximate point. Overall ridership is about 42 percent lower than weekday ridership and the pattern of boardings and alightings observed during the weekday aren't the same. The inbound direction has a more gradual increase to the stop with the peak load, and doesn't display the high boardings observed on Jermantown Road during the weekday. The outbound trips display a sharper growth in the load once the bus hits Old Lee Hwy, before dropping through Downtown. This would appear to indicate a different ridership pattern, that while still centered on the Metro and Mason, isn't as heavily commuter-based as the weekday pattern.

Saturday - Inbound to Vienna/Fairfax-GMU

Stop	ON	OFF	LOAD
Rappahannock Ln. at Patriot Circle (GMU)	55	0	55
University Drive & Chain Bridge Rd.	3	2	56
Chain Bridge Rd. at School St.	2	2	57
Chain Bridge Rd. at INOVA	1	2	56
Chain Bridge Rd. at West Dr.	2	0	58
Chain Bridge Rd. at Armstrong St.	3	0	61
Chain Bridge Rd. at Justice Drive	3	2	63
West St. at Fairfax Courthouse	4	2	65
Main St. at Fairfax Building	0	4	61
Main St. at Railroad Ave.	1	2	60
Main St. at Keith Ave.	0	0	60
Main St. at Oak St.	1	3	58
Main St. at Hallman St.	8	4	62
Lee Highway at Chipotle	6	5	62
Lee Highway at Hilltop Shopping Center	10	5	67
Lee Highway at Jermantown Rd.	10	5	72
Jermantown Rd. at Jermantown Sq.	7	7	72
Jermantown Rd. at James Swarts	9	13	68
Jermantown Rd. at Main St.	10	13	65
Jermantown Rd. at Comfort Inn	7	11	60
Jermantown Rd. at Fair Haven Ct.	9	3	66
Jermantown Rd. at Cavalier Ct.	12	7	71
Orchard St. at Bevan Dr.	2	1	73
Bevan Dr. at Lanier School	3	13	63
Warick Ave. at Bevan Dr.	1	0	64
Warick Ave. at Hill St.	3	0	67

Warick Ave. at Meredith Dr.	4	0	72
Warick Ave. at H/Mart Shop	4	6	70
Fairfax Blvd. at McLean Ave.	4	2	73
Fairfax Blvd. at Denny's Rest	9	7	74
Fairfax Blvd. at University Dr.	0	2	72
Fairfax Blvd. at Eaton Pl.	2	7	68
Fairfax Blvd. at 10201 Block	0	1	67
Fairfax Blvd. at Plantation Pkwy.	3	3	67
Fairfax Blvd. at Strafford Drive	1	0	68
Fairfax Blvd. at Rebel Run	2	1	69
Draper Dr. at Fairfax Blvd.	6	3	72
Draper Dr. at Beach St.	0	2	70
Kingsbridge Dr. at Kings Crown Ct.	1	3	68
Blake Lane at Lindenbrook St.	1	3	66
Blake Lane at Bel Glade	1	0	67
Blake Lane at Five Oaks Rd.	0	0	67
County Creek at Village Springs Lane.	0	0	67
Vienna-Fairfax-GMU Metro Station	0	67	0
	213	**213**	

Saturday - Outbound to Rappahannock River Lane

Stop	**ON**	**OFF**	**LOAD**
Vienna-Fairfax-GMU Metro Station	58	0	58
County Creek at Village Springs Lane.	0	0	58
Blake Lane at Five Oaks Rd.	3	2	59
Blake Lane at Bel Glade	1	0	60
Blake Lane at Knightsbridge Dr.	0	2	59
Blake Lane at Blake Lane Loop	0	0	59
Lee Highway at Arthur Teachers	5	8	56
Old Lee Highway at Fairfax Circle Shopping	3	5	55
Old Lee Highway at Ridge Ave.	13	2	66
Old Lee Highway at Great Oak Drive	18	2	83
Old Lee Highway at Fairfax High School	6	0	89
Old Lee Highway at Brookswood Dr.	4	0	93
Old Lee Highway at Embassy Ln.	4	3	94
Old Lee Highway at Heritage Ln.	8	2	100
Old Lee Highway at St. Leo's Church	1	5	97
Old Lee Highway at Layton Hall Dr.	3	5	95
Old Lee Highway at Willard Way	2	6	91
Old Lee Highway at Library	8	11	89
University Dr. at Main St.	5	18	76
University Dr. at Sager Ave.	0	2	74
University Dr. at Fire Station No.3	3	2	76
George Mason Blvd. at Armstrong St.	0	0	76
George Mason Blvd. at School St.	0	5	71
Rappahannock Ln. at Patriot Circle	0	71	0
	145	**145**	

Gold 2

The Gold 2 travels in a counter-clockwise direction from Vienna/Fairfax-GMU to the Mason campus following a similar routing to the Gold 1. This provides a bi-directional loop around the western side of the City. As expected, the ridership shows a pattern that mirrors the activity of the Gold 1. Locations with high boardings and/or alightings in one direction show a similar, but opposite, rider count in the other direction. Loading in the inbound direction peaks approaching Fairfax Circle before falling off at the Metro. The loading in the outbound direction peaks just after departing the Metro, gradually dropping on the approach to Jermantown Road, and then holding relatively steady until reaching Mason.

Weekday - Inbound to Vienna/Fairfax-GMU

Stop	ON	OFF	LOAD
Rappahannock Ln. at Patriot Circle (GMU)	108	0	108
George Mason Blvd. at School St.	2	2	108
University Dr. at Armstrong St.	3	5	106
University Dr. at Fire Station No. 3	4	2	108
University Dr. at Sager Ave	2	2	108
University Dr. at Main St.	7	3	112
University Dr. at North St.	7	2	117
Old Lee Highway at Willard Way	26	11	132
Old Lee Highway at Layton Hall Dr	15	13	135
Old Lee Highway at Daniel Run School	3	5	133
Old Lee Highway at Heritage Ln	4	1	136
Old Lee Highway at Embassy Ln	2	4	134
Old Lee Highway at Queen Anne Dr	10	1	143
Old Lee Highway and Cornell Road	1	8	136
Old Lee Highway at Great Oak Dr	7	3	141
Old Lee Highway at Ridge Ave	2	7	136
Old Lee Highway at Old Pickett Rd	22	15	143
Fairfax Blvd at Fairfax Circle Plaza	8	29	121
Blake Ln at Blake Ln Loop	6	11	117
Blake Lane at Lindenbrook Street	9	6	120
Blake Ln at Bel Glade	2	5	117
Blake Ln at Five Oaks Rd	2	8	112
County Creek at Village Springs Lane.	1	4	109
Vienna/Fairfax-GMU Metro Station	0	109	0
	255	**255**	

Weekday - Outbound to Rappahannock River Lane

Stop	ON	OFF	LOAD
Vienna-Fairfax-GMU Metro Station	191	0	191
County Creek at Village Springs Lane.	3	2	192
Blake Lane at Five Oaks Rd.	8	5	195
Blake Lane at Bel Glade	4	3	196
Blake Lane at Knightsbridge Dr.	20	12	204
Kingsbridge Dr at Kings Crown Ct	8	10	202

Draper Dr at Beech Dr	8	7	203
Draper Drive at Fairfax Blvd	2	4	201
Fairfax Blvd at Rebel Run	2	9	194
Fairfax Blvd at Stafford Dr	1	5	191
Fairfax Blvd at Plantation Pkwy	10	11	190
Fairfax Blvd at 10201 Block	1	3	187
Fairfax Blvd at Eaton Pl	5	8	184
Fairfax Blvd at University Dr	2	9	178
Fairfax Blvd at Chain Bridge Rd	16	16	178
Fairfax Blvd at McLean Ave	4	10	172
Warwick Ave at Burrows Ave	7	11	168
Warwick Ave at Meredith Dr	6	9	165
Warwick Ave at Hill St	6	2	168
Warwick Ave at Bevan Dr	6	6	169
Orchard St at Bevan Dr	9	12	165
Jermantown Rd at Gainsborough Ct	29	26	168
Jermantown Rd at Fair Haven Ct	19	17	170
Jermantown Rd at Kutner Park	18	20	168
Jermantown Rd at Main St	17	18	167
Jermantown Rd at James Swarts	12	14	165
Jermantown Rd at Lee Highway	11	11	165
Lee Highway and Rust Road	32	19	178
Lee Highway at Guitar Center	5	3	179
Lee Highway at Holly Street	8	10	177
Main St at Chesnut St	6	8	175
Main St at Hallman St	14	9	180
Main St at Oak St	6	6	181
Main St at Keith Ave	4	8	177
Judicial Dr at Main St	12	6	183
Judicial Dr at Page Ave	6	10	178
Judicial Dr at Court House	2	3	177
Chain Bridge Rd at Armstrong St	1	1	177
Chain Bridge Rd at West Dr	12	7	182
Chain Bridge Rd at Canfield Street	4	5	182
Chain Bridge Rd at School St	7	2	186
University Drive at Occoquan	1	13	175
Rappahannock Ln. at Patriot Circle (GMU)	0	175	0
	543	**543**	

Saturday ridership for the Gold 2 was about 35 percent lower than the weekday ridership. The patterns in the inbound direction are very similar to the weekday patterns, peaking just prior to Fairfax Circle. The outbound direction shows a slightly different pattern with the peak load occurring later in the route near Jermantown Road on Saturdays.

Saturday - Inbound to Vienna/Fairfax-GMU

Stop	ON	OFF	LOAD
Rappahannock Ln. at Patriot Circle (GMU)	40	0	40
George Mason Blvd. at School St.	0	0	40
University Dr. at Armstrong St.	0	2	38
University Dr. at Fire Station No. 3	0	0	38
University Dr. at Sager Ave	2	1	38
University Dr. at Main St.	3	1	40
University Dr. at North St.	3	4	39
Old Lee Highway at Willard Way	11	2	48
Old Lee Highway at Layton Hall Dr	8	4	52
Old Lee Highway at Daniel Run School	11	3	59
Old Lee Highway at Heritage Ln	5	2	62
Old Lee Highway at Embassy Ln	0	0	62
Old Lee Highway at Queen Anne Dr	0	1	61
Old Lee Highway and Cornell Road	2	0	62
Old Lee Highway at Great Oak Dr	0	10	52
Old Lee Highway at Ridge Ave	3	1	54
Old Lee Highway at Old Pickett Rd	0	1	53
Fairfax Blvd at Fairfax Circle Plaza	2	9	46
Blake Ln at Blake Ln Loop	8	8	45
Blake Lane at Lindenbrook Street	0	7	38
Blake Ln at Bel Glade	2	2	38
Blake Ln at Five Oaks Rd	0	1	37
County Creek at Village Springs Lane.	0	0	37
Vienna/Fairfax-GMU Metro Station	0	37	0
	96	**96**	

Saturday - Outbound to Rappahannock River Lane

Stop	ON	OFF	LOAD
Vienna-Fairfax-GMU Metro Station	50	0	50
County Creek at Village Springs Lane.	0	0	50
Blake Lane at Five Oaks Rd.	1	0	51
Blake Lane at Bel Glade	0	0	51
Blake Lane at Knightsbridge Dr.	0	0	51
Kingsbridge Dr at Kings Crown Ct	6	4	53
Draper Dr at Beech Dr	6	1	58
Draper Drive at Fairfax Blvd	6	0	64
Fairfax Blvd at Rebel Run	1	3	62
Fairfax Blvd at Stafford Dr	2	11	53
Fairfax Blvd at Plantation Pkwy	2	3	52
Fairfax Blvd at 10201 Block	0	0	52
Fairfax Blvd at Eaton Pl	1	3	51
Fairfax Blvd at University Dr	0	0	51
Fairfax Blvd at Chain Bridge Rd	0	1	49
Fairfax Blvd at McLean Ave	1	1	49

Warwick Ave at Burrows Ave	2	0	51
Warwick Ave at Meredith Dr	4	3	52
Warwick Ave at Hill St	10	0	62
Warwick Ave at Bevan Dr	1	1	62
Orchard St at Bevan Dr	3	12	53
Jermantown Rd at Gainsborough Ct	1	1	53
Jermantown Rd at Fair Haven Ct	10	1	61
Jermantown Rd at Kutner Park	2	8	55
Jermantown Rd at Main St	21	4	72
Jermantown Rd at James Swarts	12	5	79
Jermantown Rd at Lee Highway	3	8	74
Lee Highway and Rust Road	12	9	76
Lee Highway at Guitar Center	5	4	77
Lee Highway at Holly Street	4	9	72
Main St at Chesnut St	5	3	74
Main St at Hallman St	7	7	74
Main St at Oak St	2	4	72
Main St at Keith Ave	3	0	75
Judicial Dr at Main St	2	0	77
Judicial Dr at Page Ave	0	3	75
Judicial Dr at Court House	3	3	75
Chain Bridge Rd at Armstrong St	1	3	73
Chain Bridge Rd at West Dr	1	8	66
Chain Bridge Rd at Canfield Street	1	7	61
Chain Bridge Rd at School St	0	5	55
University Drive at Occoquan	0	0	55
Rappahannock Ln. at Patriot Circle (GMU)	0	55	0
	191	**191**	

Green 1

The Green 1 travels clockwise from the Mason campus to Vienna/Fairfax-GMU, covering the east side of the City. The two ends of the route have the highest boardings and alightings. A great deal of boarding/alighting activity occurs in both directions between the two ends, highlighting the amount of local travel that occurs on this route. The loads peak in the inbound direction just prior to reaching Nutley Street. In the outbound direction the loads peak at Roberts Road before making the approaching to the Mason campus through Downtown.

Weekday - Inbound to Vienna/Fairfax-GMU

Stop	ON	OFF	LOAD
Rappahannock Ln. at Patriot Circle (GMU)	90	1	89
University Drive & Chain Bridge Rd.	2	2	89
Chain Bridge Rd. at School St.	3	1	91
Chain Bridge Rd. at INOVA	6	1	96
Chain Bridge Rd. at West Dr.	4	3	97
Chain Bridge Rd. at Armstrong St.	7	5	99
Chain Bridge Rd. at Justice Drive	4	3	100

Chain Bridge Rd. at County Court	15	1	114
Chain Bridge Rd. at Main St.	1	2	113
Chain Bridge Rd. at Whitehead St.	6	2	116
Chain Bridge Rd. at Kenmore Dr.	1	0	117
Chain Bridge Rd. at Stratford Dr.	3	0	121
Chain Bridge Rd. at Fairfax Blvd.	7	10	118
Chain Bridge Rd. at Marriott Hotel	14	15	117
Eaton Pl. at Best Western Hotel	15	10	122
Eaton Pl. at 10306 Blvd.	3	0	125
Eaton Pl. at Fairfax Blvd.	2	1	127
Fairfax Blvd. at 10201 Block	3	4	126
Fairfax Blvd. at Plantation Pkwy.	8	4	129
Fairfax Blvd. at Strafford Drive	5	3	131
Fairfax Blvd. at Rebel Run	6	6	130
Fairfax Blvd. at Draper Drive	2	3	129
Fairfax Blvd. at Spring St.	4	6	127
Fairfax Blvd. at Campbell Drive	5	5	126
Fairfax Blvd. at Pickett Rd.	12	10	129
Arlington Blvd at Stonehurst Drive	9	5	133
Nutley St. at Barrick Drive	3	7	129
Nutley St. at Pan Am Shopping	3	5	127
Nutley St. at Lee Highway	3	5	125
Vienna-Fairfax-GMU Metro Station	0	125	0
	249	**249**	

Weekday - Outbound to Rappahannock River Lane

Stop	ON	OFF	LOAD
Vienna-Fairfax-GMU Metro Station	164	0	164
Nutley St. at Hermosa Drive	11	0	175
Nutley St. at Pan Am Shopping	11	5	181
Nutley St. and Barrick St.	6	5	183
Arlington Blvd. at Stonehurst Dr.	11	0	193
Fairfax Blvd. and Pickett Rd.	45	23	215
Old Pickett Rd. at Home Depot	15	9	221
Old Pickett Rd. at JL Tree Service.	2	14	209
Pickett Road at Thaiss Park	4	7	206
Picket Rd. at Silver King Court	11	7	210
Picket Rd. at Barrister Keep	4	12	202
Picket Rd. at Post Office	2	5	200
Picket Rd. at Colonial Ave.	15	2	212
Picket Rd. at Mathy Dr.	15	23	204
Picket Rd. at Turnpike Shopping Center	11	5	210
Main St. at Pickett Rd.	11	7	214
Main St. at Whiteacre Rd.	26	23	216
Main St. at Lyndhurst	26	26	216
Main St. at Maple Ave.	26	21	221
Main St. at Stonewall Ave.	9	23	206

Main St. at Tedrich Blvd.	15	5	216
Main St. at Virginia St.	13	0	229
Main St. at Robert's Road	4	2	231
Main St. at Locust Rd.	4	7	228
Main St. Market Place	2	23	207
University Dr. at Main St.	6	19	195
University Dr. at Sager Ave.	4	12	187
University Dr. at Fire Station No.3	6	2	191
George Mason Blvd. at Armstrong St.	2	0	194
George Mason Blvd. at School St.	0	0	194
Rappahannock Ln. at Patriot Circle (GMU)	0	194	0
	480	**480**	

Saturday ridership is about 40 percent of the weekday ridership for the Green 1. Fewer people board at the termini of the route while general activity between the ends is very similar to the weekdays. There is less activity that occurs in the middle of the route along Main Street and around Eaton Place in both directions, and the alightings at the end of each direction are reduced from the weekday ridership.

Saturday - Inbound to Vienna/Fairfax-GMU

Stop	**ON**	**OFF**	**LOAD**
Rappahannock Ln. at Patriot Circle (GMU)	29	0	29
University Drive & Chain Bridge Rd.	0	0	29
Chain Bridge Rd. at School St.	0	5	25
Chain Bridge Rd. at INOVA	5	0	30
Chain Bridge Rd. at West Dr.	3	3	29
Chain Bridge Rd. at Armstrong St.	4	2	30
Chain Bridge Rd. at Justice Drive	4	1	33
Chain Bridge Rd. at County Court	13	3	42
Chain Bridge Rd. at Main St.	5	0	47
Chain Bridge Rd. at Whitehead St.	8	1	54
Chain Bridge Rd. at Kenmore Dr.	1	0	55
Chain Bridge Rd. at Stratford Dr.	0	1	54
Chain Bridge Rd. at Fairfax Blvd.	1	1	54
Chain Bridge Rd. at Marriott Hotel	0	2	52
Eaton Pl. at Best Western Hotel	6	0	58
Eaton Pl. at 10306 Blvd.	1	0	59
Eaton Pl. at Fairfax Blvd.	0	0	59
Fairfax Blvd. at 10201 Block	3	0	62
Fairfax Blvd. at Plantation Pkwy.	3	0	64
Fairfax Blvd. at Strafford Drive	3	0	67
Fairfax Blvd. at Rebel Run	0	0	67
Fairfax Blvd. at Draper Drive	0	2	65
Fairfax Blvd. at Spring St.	5	7	63
Fairfax Blvd. at Campbell Drive	0	14	49
Fairfax Blvd. at Pickett Rd.	8	5	52
Arlington Blvd at Stonehurst Drive	1	0	53

Nutley St. at Barrick Drive	3	3	52
Nutley St. at Pan Am Shopping	3	7	48
Nutley St. at Lee Highway	3	0	50
Vienna-Fairfax-GMU Metro Station	0	50	0
	109	**109**	

Saturday - Outbound to Rappahannock River Lane

Stop	**ON**	**OFF**	**LOAD**
Vienna-Fairfax-GMU Metro Station	48	0	48
Nutley St. at Hermosa Drive	0	1	46
Nutley St. at Pan Am Shopping	7	0	53
Nutley St. and Barrick St.	5	1	57
Arlington Blvd. at Stonehurst Dr.	0	0	57
Fairfax Blvd. and Pickett Rd.	35	7	85
Old Pickett Rd. at Home Depot	16	3	98
Old Pickett Rd. at JL Tree Service.	5	1	102
Pickett Road at Thaiss Park	1	0	103
Picket Rd. at Silver King Court	3	4	102
Picket Rd. at Barrister Keep	8	0	111
Picket Rd. at Post Office	0	1	109
Picket Rd. at Colonial Ave.	5	3	111
Picket Rd. at Mathy Dr.	3	15	100
Picket Rd. at Turnpike Shopping Center	5	23	82
Main St. at Pickett Rd.	7	5	83
Main St. at Whiteacre Rd.	5	11	77
Main St. at Lyndhurst	7	12	72
Main St. at Maple Ave.	7	5	74
Main St. at Stonewall Ave.	9	3	80
Main St. at Tedrich Blvd.	1	1	80
Main St. at Virginia St.	1	9	72
Main St. at Robert's Road	0	3	69
Main St. at Locust Rd.	2	3	69
Main St. Market Place	6	9	65
University Dr. at Main St.	2	4	63
University Dr. at Sager Ave.	0	5	58
University Dr. at Fire Station No.3	0	1	57
George Mason Blvd. at Armstrong St.	0	3	54
George Mason Blvd. at School St.	0	0	54
Rappahannock Ln. at Patriot Circle (GMU)	0	54	0
	189	**189**	

Green 2

The Green 2 travels counter-clockwise between the Vienna Metrorail Station and Mason campus providing the other half of the loop for the eastern side of the City. Like the other CUE routes the Green 2 displayed the highest number of boardings and alightings at the Metro and Mason ends of the route. Ridership in the inbound direction increases approaching the Foxcroft Apartments and then gradually drops before reaching Metro. The outbound direction mirrors the Green 1 with the load growing approaching Stafford Drive, remaining flat until Eaton Place, and then gradually dropping approaching the campus.

Weekday - Inbound to Vienna/Fairfax-GMU

Stop	ON	OFF	LOAD
Rappahannock Ln. at Patriot Circle (GMU)	106	0	106
George Mason Blvd. at School St.	2	1	107
University Dr. at Armstrong St.	5	1	111
University Dr. at Fire Station No. 3	4	0	115
University Dr. at Sager Ave	1	1	115
University Dr. at Main St.	6	3	117
University Dr. at North St.	7	2	122
Main St. at East St.	11	2	131
Main St. at Locust St.	4	0	134
Main St. at Roberts Rd.	10	0	144
Main St. at Virginia St.	7	2	149
Main St. at Tedrich Blvd.	6	5	150
Main St. at Stonewall Ave.	1	0	151
Main St. at Maple Ave.	11	14	149
Main St. at Trapp Rd.	13	2	159
Main St. at Whitacre Rd.	20	15	165
Pickett Rd. at Picket Shopping Center	24	26	162
Pickett Rd. at Mathy Dr.	24	8	178
Pickett Rd. at Colonial Ave.	6	6	178
Pickett Rd. at Post Office	11	6	183
Pickett Rd at Shelly Krasnow Ln.	6	6	183
Pickett Rd. at Silver King Court	0	0	183
Pickett Rd. at Thaiss Park	2	1	185
Old Pickett Road at Foxcroft Apts	6	6	185
Old Pickett Rd. at Old Lee Highway	0	10	175
Fairfax Blvd. at Pickett Rd.	13	24	164
Arlington Blvd at Stonehurst Drive	1	1	164
Nutley St. at Barrick Drive	6	15	155
Nutley St. at Pan Am Shopping	8	6	157
Nutley St. at Lee Highway	8	9	157
Vienna-Fairfax-GMU Metro Station	0	157	0
	329	**329**	

Weekday - Outbound to Rappahannock River Lane

Stop	ON	OFF	LOAD
Vienna-Fairfax-GMU Metro Station	134	0	134
Nutley St. at Hermosa Drive	9	3	140
Nutley St. at Pan Am Shopping	19	4	156
Nutley St. and Barrick St.	9	5	160
Arlington Blvd. at Stonehurst Dr.	1	5	155

Fairfax Blvd. and Pickett Rd.	21	14	162
Fairfax Blvd. at Campbell Dr.	13	9	165
Fairfax Blvd. at Spring St.	5	0	170
Fairfax Blvd. at Draper Dr.	5	5	169
Fairfax Blvd. at Rebel Run	11	7	174
Fairfax Blvd. at Stafford Dr.	9	5	178
Fairfax Blvd. at Plantation Pkwy.	5	15	167
Fairfax Blvd. at 10201 Block	3	10	161
Eaton Pl. at Office Park	15	4	172
Eaton Pl. at 10306 Block	8	9	171
Eaton Pl. at Chain Bridge Rd.	9	27	153
Chain Bridge Rd. at Orchard St.	3	13	143
Chain Bridge Rd. at Fairfax Blvd.	10	10	143
Chain Bridge Rd. at Providence Way	2	14	132
Chain Bridge Rd. at Kenmore Dr.	5	6	130
Chain Bridge Rd. at Main St.	6	17	119
Chain Bridge Rd. at County Court House	5	12	112
Chain Bridge Rd. at Armstrong St.	3	10	105
Chain Bridge Rd. at West Dr.	11	9	108
Chain Bridge Rd. at Canfield St.	3	5	106
Chain Bridge Rd. at School St.	1	1	106
University Dr. at Occoquan	3	3	106
Rappahannock Ln. at Patriot Circle (GMU)	0	106	0
	329	**329**	

The Saturday ridership on the Green 2 in the inbound direction does not follow the patterns observed during the weekday. Slightly fewer riders come from the campus, changing the stop with the highest boardings to the stop near Foxcroft Apartments. This is also where the load peaks. Most riders appear to ride through to the Metro in the inbound direction. In the outbound direction the Saturday ridership more closely mirrors the weekday ridership but with lower rider volumes.

Saturday - Inbound to Vienna/Fairfax-GMU

Stop	**ON**	**OFF**	**LOAD**
Rappahannock Ln. at Patriot Circle (GMU)	16	0	16
George Mason Blvd. at School St.	0	0	16
University Dr. at Armstrong St.	0	0	16
University Dr. at Fire Station No. 3	0	1	15
University Dr. at Sager Ave	6	0	21
University Dr. at Main St.	13	4	30
University Dr. at North St.	0	0	30
Main St. at East St.	7	0	37
Main St. at Locust St.	0	0	37
Main St. at Roberts Rd.	6	4	39
Main St. at Virginia St.	1	5	35
Main St. at Tedrich Blvd.	3	0	38
Main St. at Stonewall Ave.	1	0	39
Main St. at Maple Ave.	9	9	39

Main St. at Trapp Rd.	1	3	38
Main St. at Whitacre Rd.	10	7	41
Pickett Rd. at Picket Shopping Center	13	7	48
Pickett Rd. at Mathy Dr.	4	4	48
Pickett Rd. at Colonial Ave.	4	1	51
Pickett Rd. at Post Office	0	1	50
Pickett Rd at Shelly Krasnow Ln.	7	8	49
Pickett Rd. at Silver King Court	3	1	50
Pickett Rd. at Thaiss Park	12	0	62
Old Pickett Road at Foxcroft Apts	19	3	79
Old Pickett Rd. at Old Lee Highway	9	3	85
Fairfax Blvd. at Pickett Rd.	12	16	80
Arlington Blvd at Stonehurst Drive	0	3	77
Nutley St. at Barrick Drive	4	9	72
Nutley St. at Pan Am Shopping	4	4	73
Nutley St. at Lee Highway	0	7	66
Vienna-Fairfax-GMU Metro Station	0	66	0
	167	**167**	

Saturday - Outbound to Rappahannock River Lane

Stop	ON	OFF	LOAD
Vienna-Fairfax-GMU Metro Station	53	0	53
Nutley St. at Hermosa Drive	1	0	54
Nutley St. at Pan Am Shopping	7	7	54
Nutley St. and Barrick St.	4	0	58
Arlington Blvd. at Stonehurst Dr.	0	0	58
Fairfax Blvd. and Pickett Rd.	13	8	63
Fairfax Blvd. at Campbell Dr.	5	5	63
Fairfax Blvd. at Spring St.	3	0	66
Fairfax Blvd. at Draper Dr.	0	0	66
Fairfax Blvd. at Rebel Run	0	2	64
Fairfax Blvd. at Stafford Dr.	7	3	68
Fairfax Blvd. at Plantation Pkwy.	0	0	68
Fairfax Blvd. at 10201 Block	8	15	60
Eaton Pl. at Office Park	0	10	50
Eaton Pl. at 10306 Block	7	5	52
Eaton Pl. at Chain Bridge Rd.	0	2	50
Chain Bridge Rd. at Orchard St.	5	3	52
Chain Bridge Rd. at Fairfax Blvd.	3	3	52
Chain Bridge Rd. at Providence Way	4	7	49
Chain Bridge Rd. at Kenmore Dr.	5	0	54
Chain Bridge Rd. at Main St.	8	2	61
Chain Bridge Rd. at County Court House	0	2	59
Chain Bridge Rd. at Armstrong St.	5	5	59
Chain Bridge Rd. at West Dr.	0	5	54
Chain Bridge Rd. at Canfield St.	0	2	52
Chain Bridge Rd. at School St.	0	5	47

University Dr. at Occoquan	0	2	46
Rappahannock Ln. at Patriot Circle (GMU)	0	46	0
	139	**139**	

2.3 On-Board Survey

On-board surveys provide valuable insights about the people actually riding the buses. Collecting information about the types of trips being made, views of the existing service, and demographic data allow a transit agency to reinforce ridership gains made in recent years and attract new riders. Results collected through an on-board survey can assist in identifying improvements that would better align the system to the needs of existing riders or attract new riders

Methodology

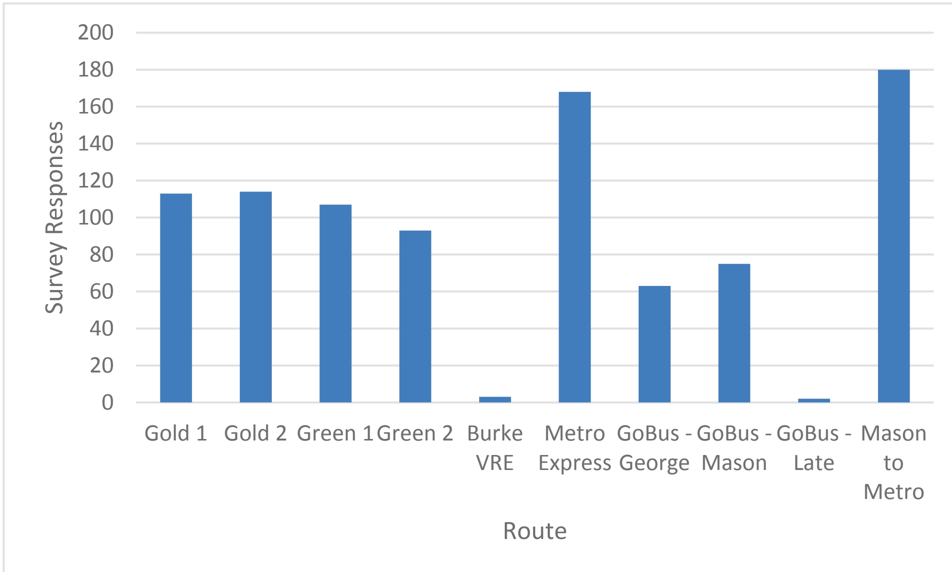
The Mason Shuttles and CUE on-board survey was conducted in April 2014, on all of the study routes. The routes were surveyed during both weekdays and weekends between April 9, 2014 and April 28, 2014. During this period, trips were randomly selected for survey.

Each randomly selected trip was staffed with a member from Mason's Center for Social Science Research (CSSR) equipped with a tablet computer loaded with the survey to enter respondents' answers directly into an electronic format. This method contributed to the collection of high-quality data because a trained surveyor entered the data and was available to clarify questions for respondents. The length of time required to complete the survey and the limited travel time of trips constrain the number of responses that can be collected during a period of time. The surveyors also encountered a significant number of people unwilling to participate in the survey, which also contributed to a limited sample size. The survey questionnaire is provided in the Appendix.

Survey Results

The on-board survey collected a total of 930 responses. There were 439 (47 percent) collected on CUE routes and 491 (53 percent) collected on Mason Shuttle routes. Figure 1 below shows the number of responses collected on each route during the course of the survey effort. The CUE routes were all equally sampled while the Mason to Metro routes were sampled more than the other Mason Shuttle routes. This should be the case since these routes carry more riders that the other routes studied.

Figure 2-1: On-board Survey Responses by Route



The on-board survey was designed to capture two primary categories of information: trip characteristics and rider perceptions. Secondarily, some rider characteristics were also collected to provide general insights into who is using the service and potentially why. Questions related to trip characteristics indicate how riders are currently using the systems. Questions related to rider perceptions provide information about how current riders view the service and what attributes they find more important to their choice. Questions asked about the characteristics of riders and their households provide an understanding of who is using the service, where they reside, and information about access to an automobile.

Personal Characteristics

The rider information collected through the on-board survey helps paint a picture of the type of people making use of the service. This information provides insights on where people riding the CUE or Mason Shuttles reside, and whether they have access to an automobile and can drive. Information was also collected about their affiliation, if any, with the University. This information can be used to determine if the rider is a captive transit rider and whether they can choose to use either system.

Over 60 percent of the riders surveyed on CUE routes reside in the City of Fairfax. Of those residing in the City, 30 percent were Mason students and 3 percent were Mason employees. The remaining 30 percent were not affiliated with the University. Of all the riders surveyed on CUE, 45 percent reported an affiliation with Mason. This figure is slightly higher than the observed Mason ridership on CUE (36 percent). During the month of April 2014, Mason-affiliated riders were roughly 38 percent of the CUE ridership observed. This difference shouldn't impact results greatly, and based on a review of the results by rider group there appears to be little difference in their views and responses.

A more detailed examination of CUE riders was done to determine where they reside. As part of the survey riders were asked about their true origin and destination. Many respondents were uncomfortable or unable to give an exact address or intersection that can be geolocated. However, roughly 36 percent of valid origin/destinations locations among CUE riders were located in the City of Fairfax. This is approximately half of the responses to the question about City residency. This result could be related to a number of reasons, such as a greater proportion of non-City residents provided valid locations. Based on the survey results it would appear that roughly three in five riders live in the City. Based on the geocoded results, only two in five riders reside within the City.

Nearly 60 percent of Mason Shuttle riders responded they do not live in the City of Fairfax. This isn't surprising since the geographic area where Mason students are coming from is well beyond the City of Fairfax boundaries. Of the group that responded they do live in the City, the largest percentage of those surveyed were students (40 percent). Students made up the majority of the sample for Mason Shuttles. As discussed above, the fall 2013 enrollment comprised over 30,000 students, roughly 4,000 faculty, and 2,500 staff. Students are over 80 percent of the Mason community, and would be expected to make up the majority of any survey sample. The student population may be slightly over-represented at 87 percent of the sample, but again the percentages are relatively close and a certain number of students indicated that they were also faculty and staff for Mason, blurring the lines. Surveyors were reminded to keep the sample random and not focus on one particular group of riders. However, it was reported by surveyors that students were more willing to participate in the survey. Despite this challenge, the sample does not grossly over-represent one group. Five percent of the Mason Shuttle respondents reported no affiliation with the University. There is no information contained in the survey to indicate how they were able to board a Mason Shuttle vehicle when they are only open to those with a valid Mason ID. Possibilities include people using old IDs or IDs of others, or survey error may account for these data. A problem with use of Mason Shuttles by non-Mason riders hasn't been reported by staff.

Figure 2-2: Breakdown of CUE Ridership by Residency

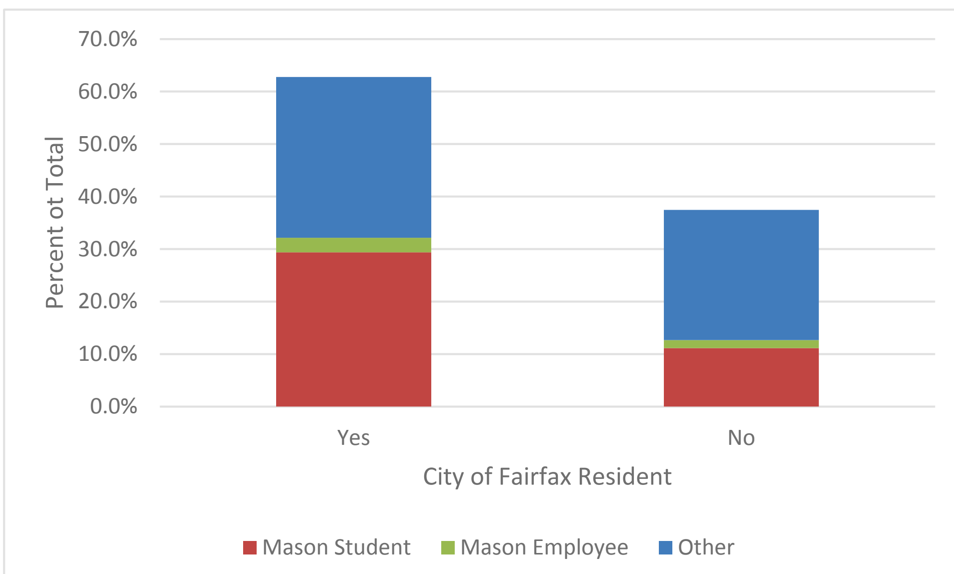


Figure 2-3: Mason vs. Non-Mason Ridership for CUE[10]

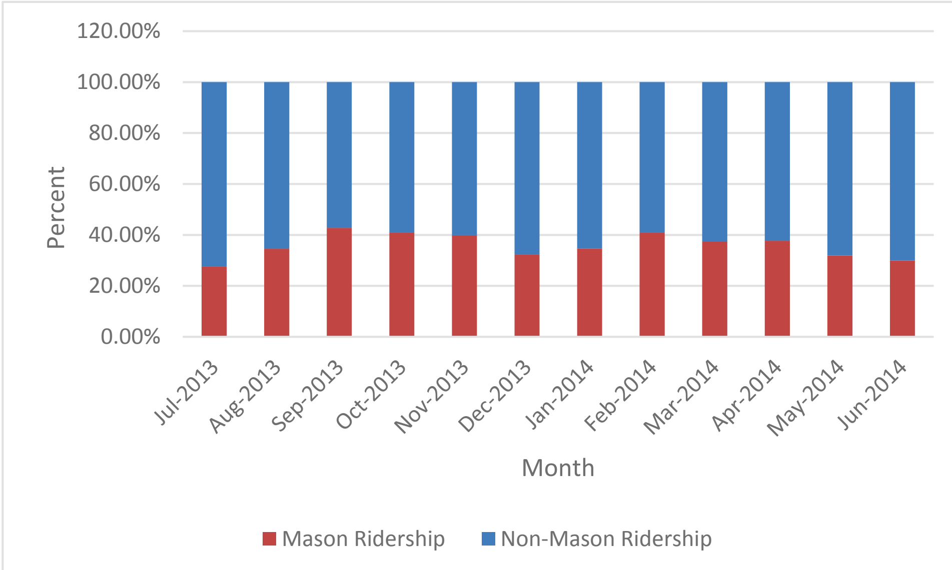
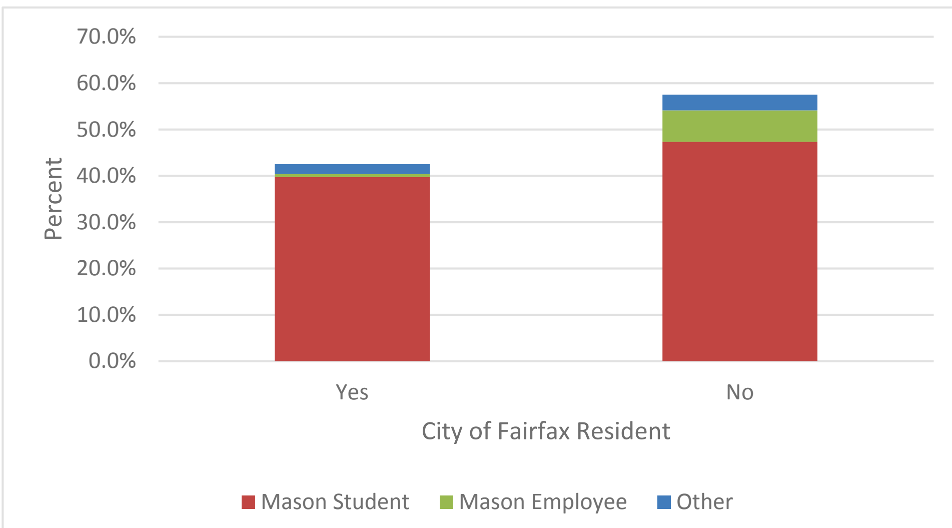


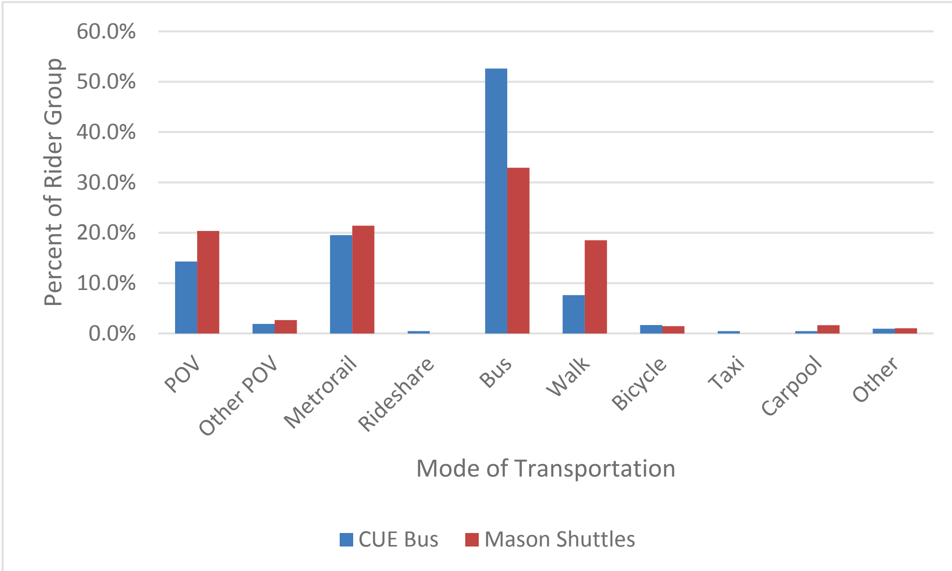
Figure 2-4: Breakdown of Mason Shuttle Ridership by Residency



Riders were asked which mode of transportation they use most frequently. The majority of CUE riders responded that they use the bus as their primary mode of travel. Mason Shuttle riders were more multimodal in their response, indicating high usage between driving, taking transit (Metro and bus), and walking. Biking is not a heavily used mode, and TDM programs like rideshare and informal carpools do not appear to be utilized greatly by the group surveyed. Respondents who responded “other” listed responses that included multiple modes (Metro and bus) as well as the Virginia Railway Express (VRE). It is important to note that the responses are linked to the mode that the respondent felt was the mode they used most.

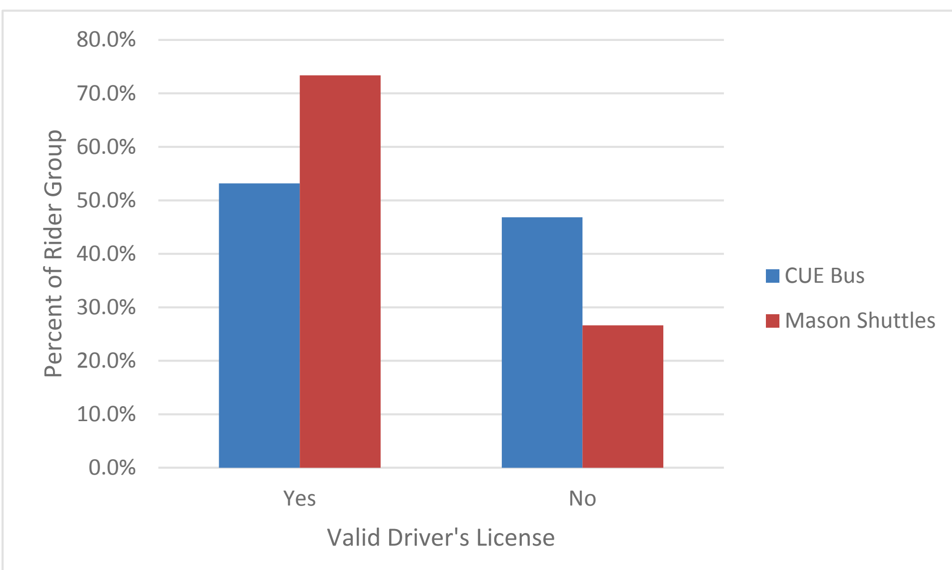
[10] Source: CUE Farebox data, provided July 14, 2014

Figure 2-5: Mode of Transportation used Most Often - by Rider Group



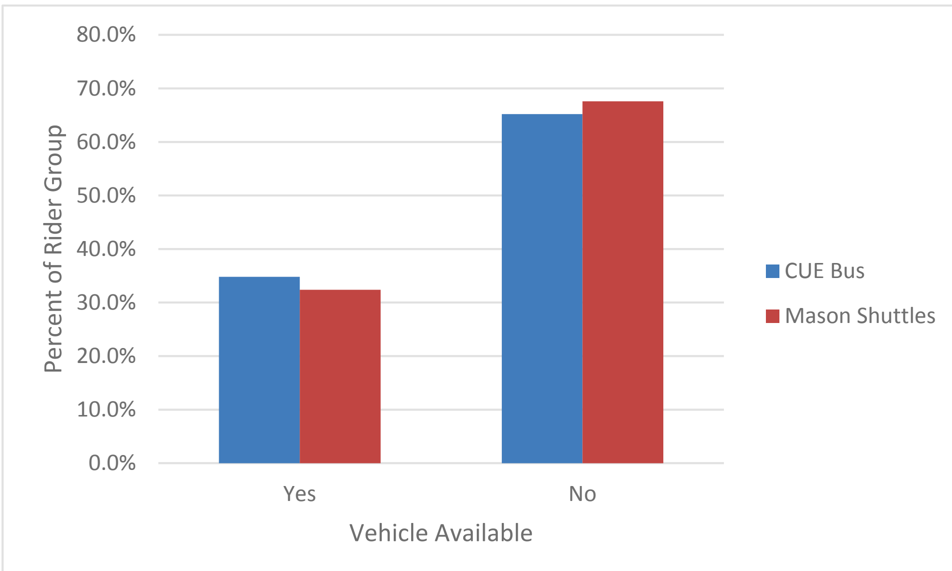
In addition to the primary mode of travel, questions were asked about whether the person held a valid driver's license and had access to a vehicle. Overall, 64 percent of riders held a valid driver's license. The proportion of CUE riders without a license (47 percent) was higher than the proportion of Mason riders (27 percent). This would appear to indicate that CUE riders are more dependent on public transportation for their travel than Mason riders. No further questions were asked as a follow up to determine the reason for the respondent not having a license. It is likely that riders on CUE buses are riding because they don't have a license and therefore can't drive.

Figure 2-6: License Status of Riders



Another factor that increases a person's reliance on public transportation is the availability of a vehicle. The survey asked respondents whether a vehicle was available for the trip they were making. A no response doesn't necessarily mean the individual doesn't have a vehicle, but does mean that at certain times the vehicle isn't available and the person does need to rely on transit. Most riders (74 percent), regardless of license status did not have a vehicle available for the trip. When license status was considered, 65 percent of CUE riders and 68 percent of Mason Shuttle riders who held a driver's license did not have a vehicle available. This would indicate that many riders who could drive, do not have access to a vehicle to drive, at least part of the time. There were not significant differences in the responses for the different systems. Roughly a third of those who could drive chose transit over driving.

Figure 2-7: Vehicle Availability for Riders with a Valid Driver's License



Riders were asked how frequently they ride. Those riders who don't ride frequently likely only use transit for specific trips, like traveling to a special event. Determining why they don't ride more often can provide valuable information on where improvements should be focused to grow ridership.

Most riders use both the CUE and Mason Shuttles weekly (70 percent). CUE riders were slightly more like to ride weekly than Mason Shuttle riders. This is a positive result, indicating that those who are currently riding both services do so frequently. Of those who ride weekly, the majority ride three days a week or more. A third of CUE riders ride five days a week, as do more than a fifth of Mason Shuttle riders. Students were likely to ride between three and five days a week, which aligns with a college class schedule. Mason Employees and non-Mason riders were more likely to ride more days a week.

CUE riders have been using CUE for longer periods of time than Mason Shuttle riders. This isn't an unexpected result because the nature of a university setting includes students graduating and new students arriving every semester, resulting in greater rider turnover. A more detailed look at the results show that Mason employees and those not-affiliated with Mason have been riding CUE longer. Fairfax residents are likely to being riding longer than non-residents, and over a third of the respondents, regardless of affiliation, have been riding CUE for at least six months or more. The results for Mason Shuttle riders were very similar, with faculty and staff riders having used the service longer than students.

Figure 2-8: Length of Time Riding CUE

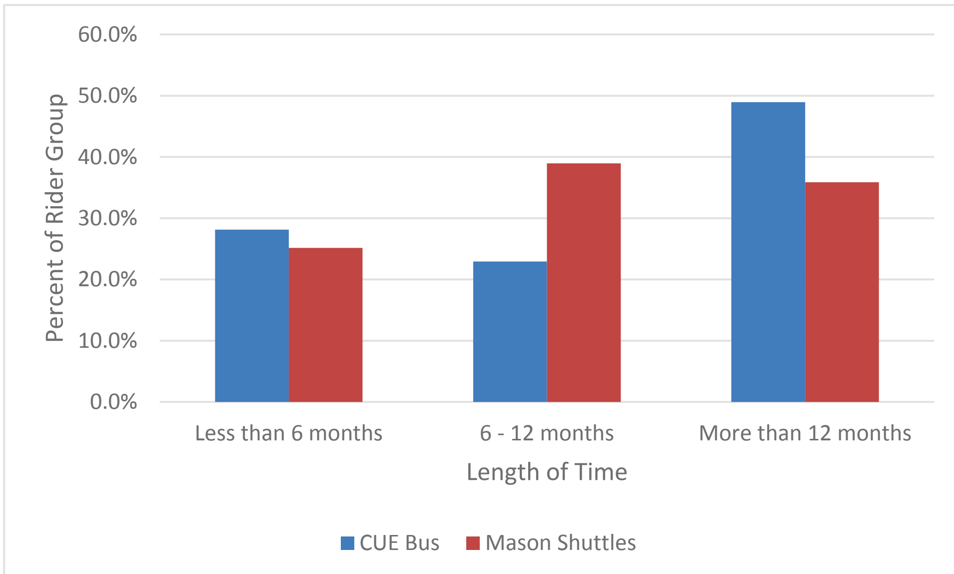


Figure 2-9: Frequency of Use

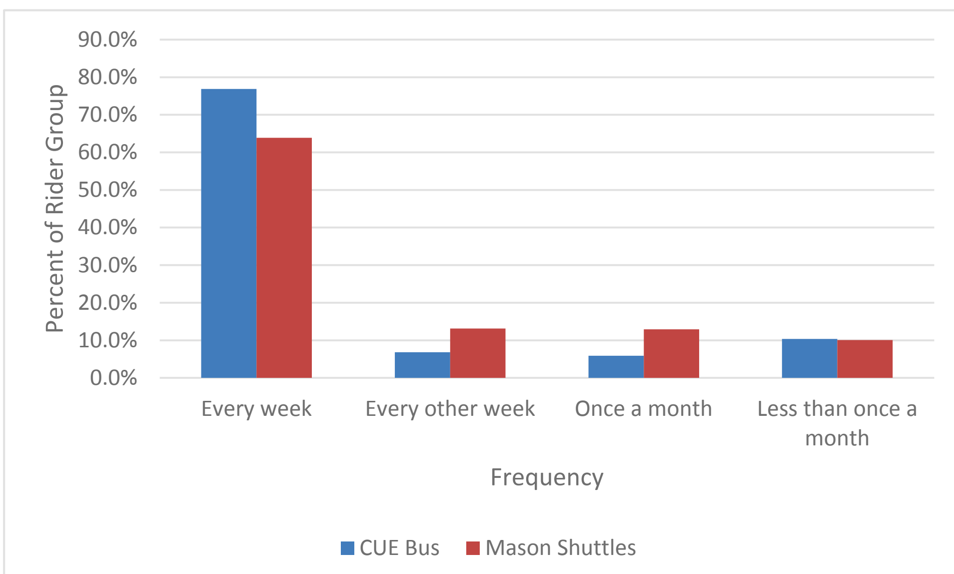
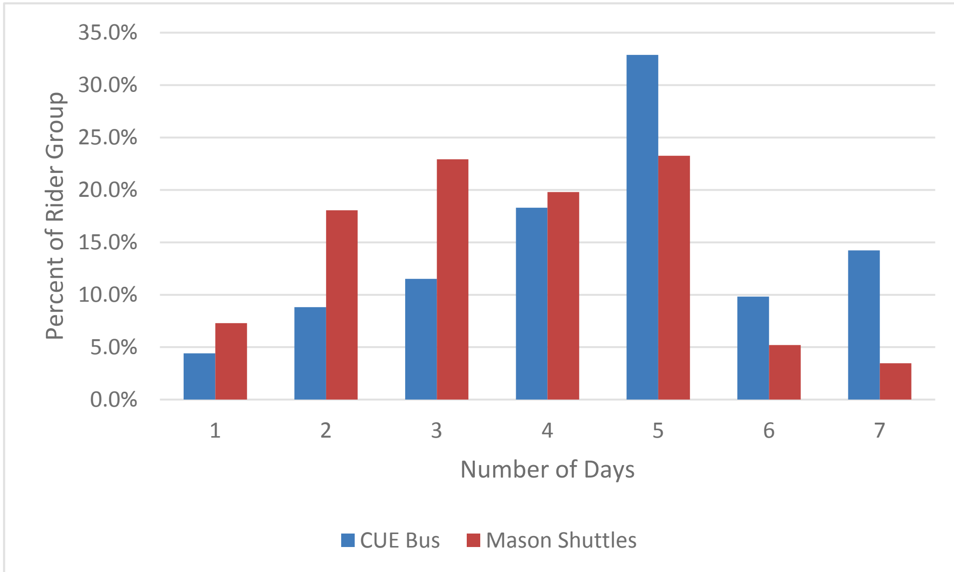
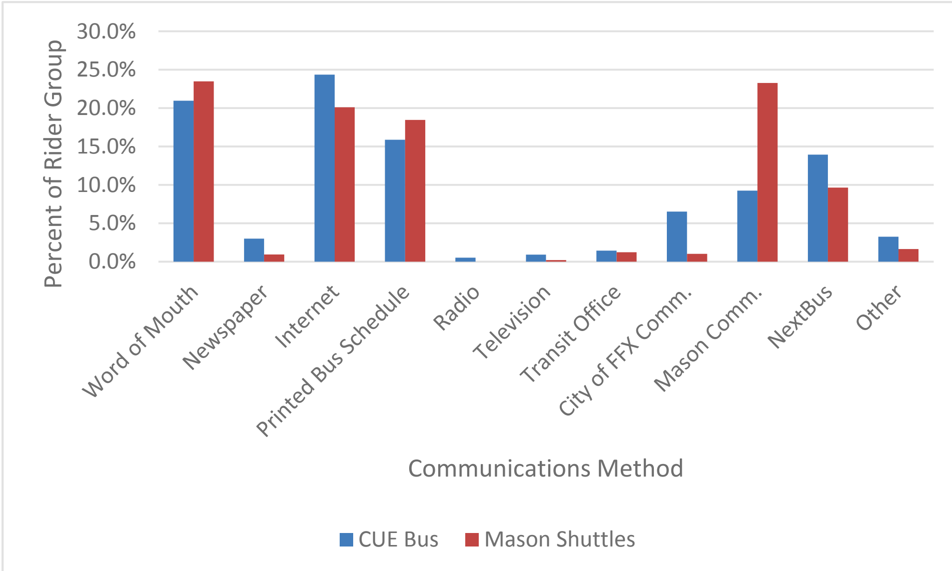


Figure 2-10: Typical Weekly Use (Ridership Survey)



It is important for agencies to determine the best way to communicate information that is pertinent to using the system to their riders. Agencies will often utilize many different methods to convey system information. Understanding how riders currently learn about the system as well as their desired communications media can help focus marketing and communications efforts. Riders were asked about the ways they learn about bus information. CUE riders obtain most of their bus information through the internet and word of mouth (45 percent combined). Mason Shuttle riders rely more on word of mouth (23.5 percent) and Mason communications (23.3 percent) and the internet as a close third (20.1 percent). Other notable methods included printed schedules, 16 percent for CUE and 19 percent for Mason Shuttle riders. NextBus was used by approximately 14 percent of CUE riders, but fewer than 10 percent of Mason Shuttle riders. Given the student ridership of the Mason shuttle system, and general student inclination towards real-time transit information, it's odd that more Mason riders don't use NextBus.

Figure 2-11: Methods for Learning about Transit Information



Trip Characteristics

The following tables were related to questions about the rider's trip. They provide insights into how people access transit, what purposes they use transit, and where they are coming and going. Understanding this information and identifying trends about usage can aid in improving service. If all trips are work trips centered on commuter travel time, then improving peak service may result in improved ridership. Transit trips typically include work-based, school-based, or recreational-/entertainment-based trips. Shopping is not often reported as a trip purpose for transit riders.

The majority of riders (70 percent) surveyed access transit by walking to the bus stop. Another 20 percent transfer from Metrorail, and the remaining 10 percent are split between the other responses. Very few of those surveyed access the bus by biking, again reinforcing the point that biking isn't a highly used mode for those surveyed.

Upon reaching the end of their trip, most riders surveyed transfer to Metrorail to reach their destination. Based on the ridership counts collected and the design of both systems this isn't surprising. A quarter of those surveyed walked to their destination. Another six percent of Mason Shuttle riders and 20 percent of CUE riders surveyed transferred to another bus route. Very few riders use any other modes to reach their destination.

Figure 2-12: Travel Mode from Origin to CUE or Mason Shuttles

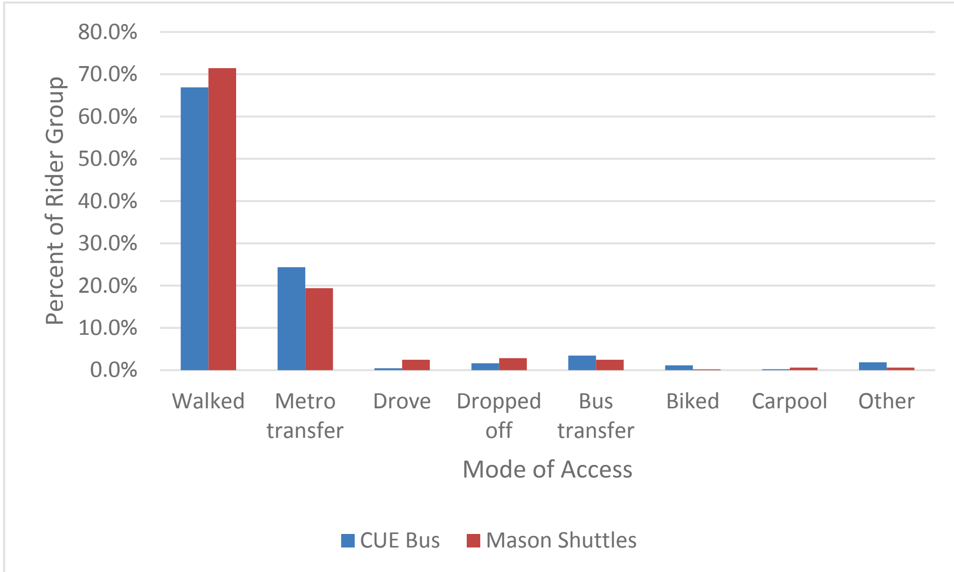
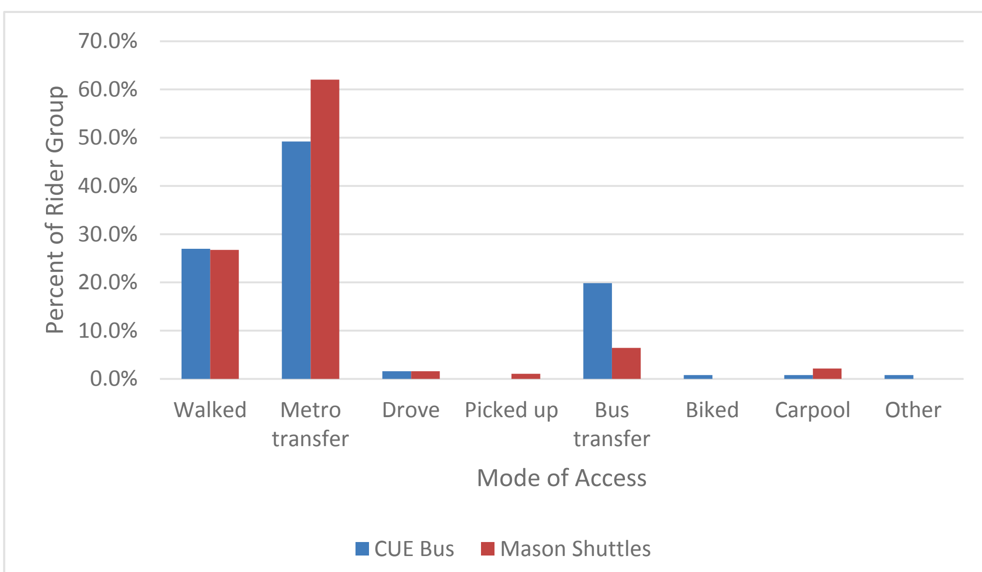


Figure 2-13: Travel Mode from CUE or Mason Shuttles to Destination



Most CUE riders surveyed were coming from their home when they accessed the bus. Mason Shuttle riders surveyed primarily came from home or the University. Shopping accounted for fewer than 5 percent of all trip origins. The responses for shopping were slightly higher for Mason Shuttle riders than CUE riders. The majority of these riders were surveyed on a Gunston Go-Bus which carries riders to area shopping destinations.

Most CUE riders were traveling to work, home, or a college/university. Most Mason Shuttles riders were accessing the University, with the second highest destination being their home. Shopping trips accounted for a little over 10 percent of all trip ends. Again, most Mason Shuttle riders accessing shopping did so by riding the Gunston Go-Bus. The “other” category accounted for 10 percent of trip ends. Most of the responses associated with the “other” category were linked to entertainment and visiting friends/family.

Figure 2-14: Classification of Trip Origins

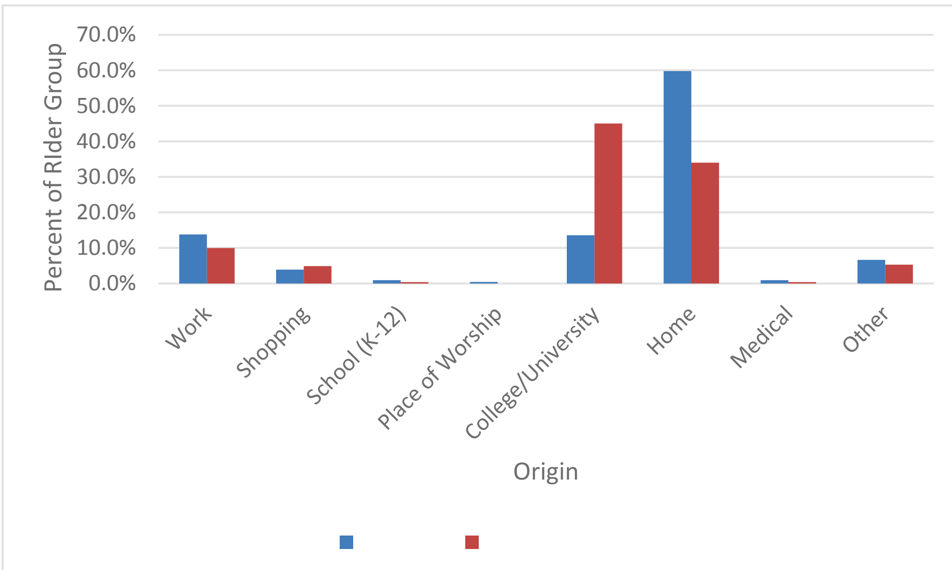
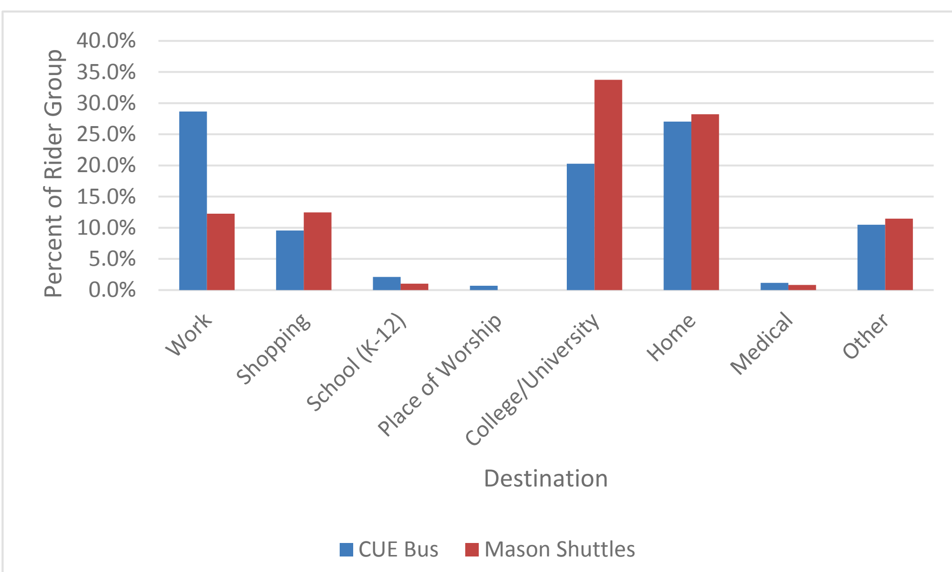


Figure 2-15: Classification of Trip Destination



Riders were asked about their "true" origin and destination. Transit riders rarely board and alight the bus near their exact origin and destination. In a region as large as Northern Virginia, travelers often travel distances that cross jurisdictional and agency boundaries requiring transfers. Mapping the origins and destinations can provide insights into better ways to serve riders. The address information provided in the survey was geocoded using a geographic information system (GIS). The following maps show the origins and destinations of the riders by bus operator. The origins reported by CUE riders tends to be located within the City's boundaries as well as along major corridors, many of which have Metrorail service. Because many of the CUE riders surveyed don't have a driver's license or access to a vehicle, it would make sense that their origin is found along corridors with existing transit. The Mason Shuttle riders are more spread out around the region and include areas of Loudoun, western Fairfax, and Prince William counties. Destinations for CUE and Mason Shuttle riders are more focused. CUE riders reported destinations around the City of Fairfax as well as major destinations along the I-66/Orange Line corridor and the Dulles Toll Road corridor. Mason Shuttle destinations are concentrated around the Mason campuses (Fairfax and Arlington), Fair Oaks/Fair Lakes area, and Washington, D.C.

Figure 2-16: Ridership Origins by Bus Operator

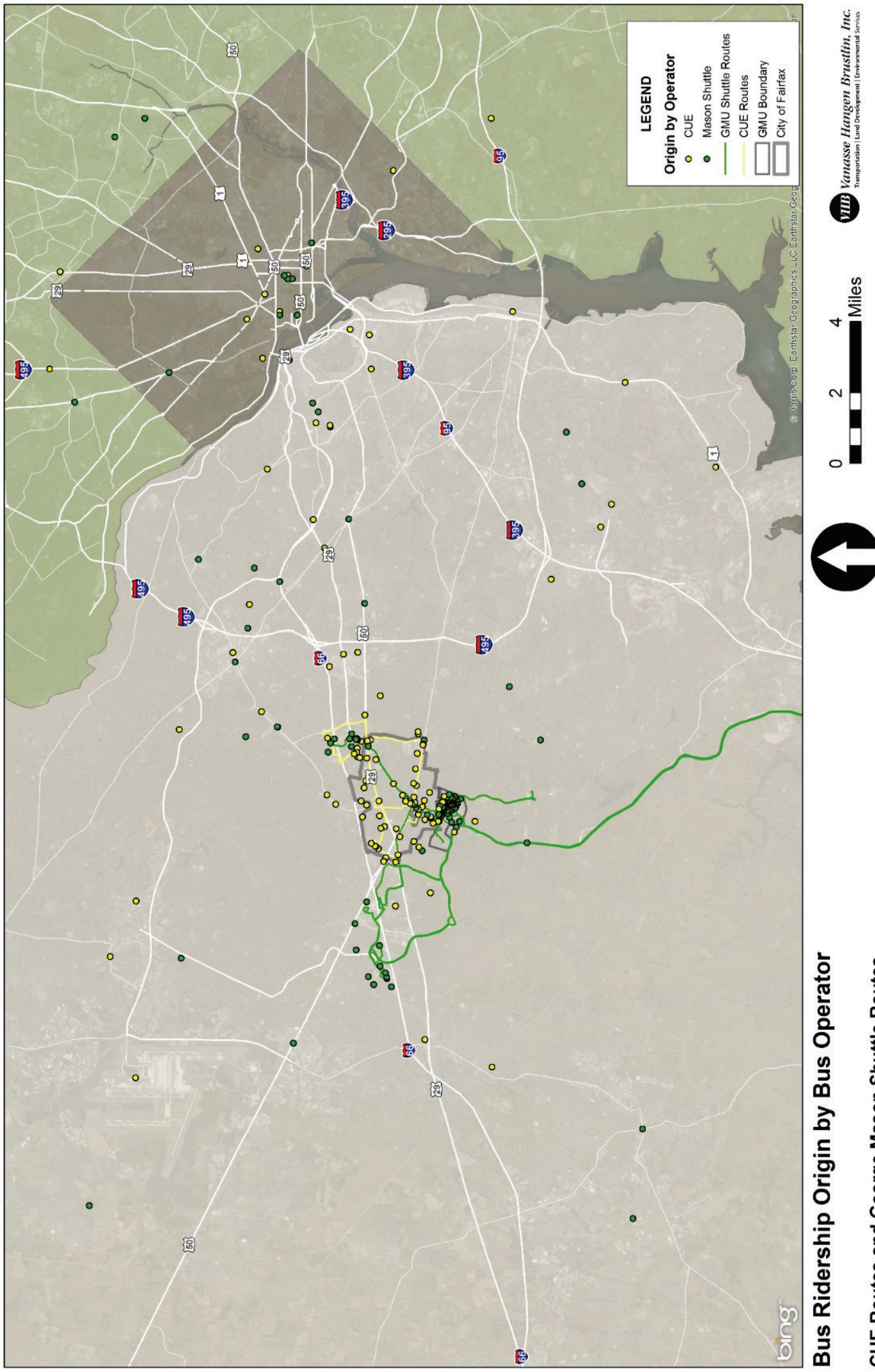


Figure 2-17: Ridership Origins by TAZ

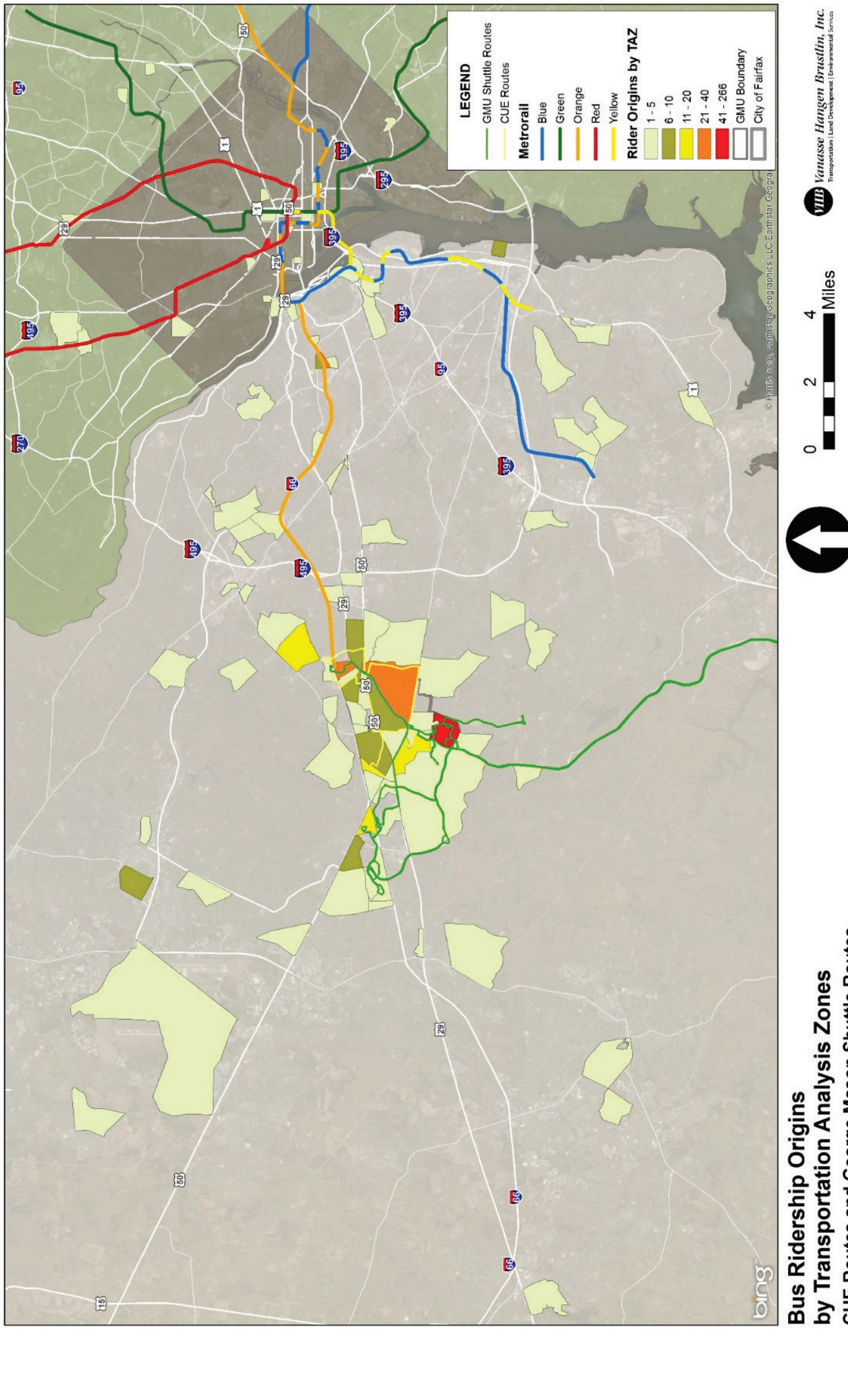


Figure 2-18: Ridership Destinations by Operator

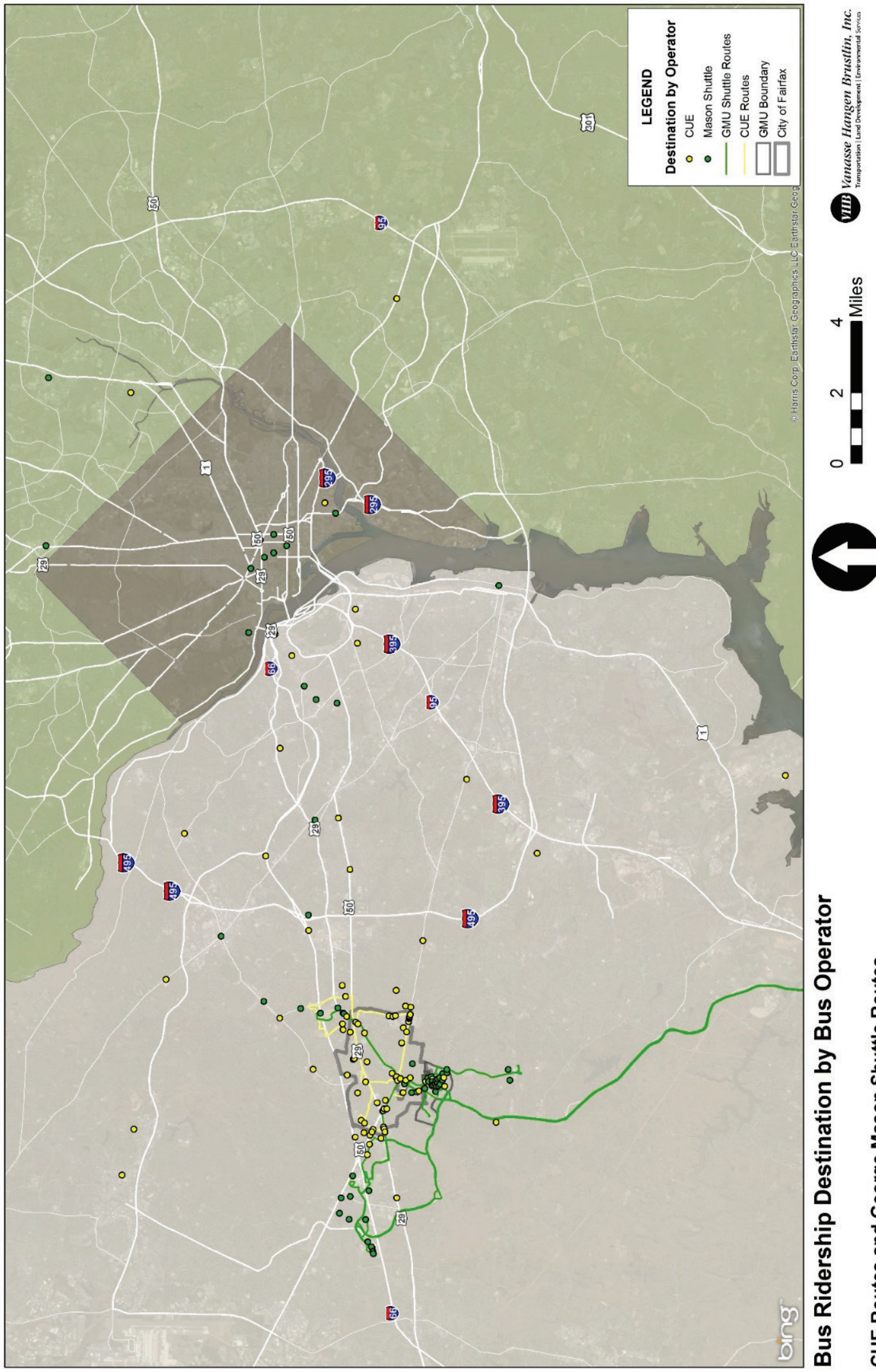
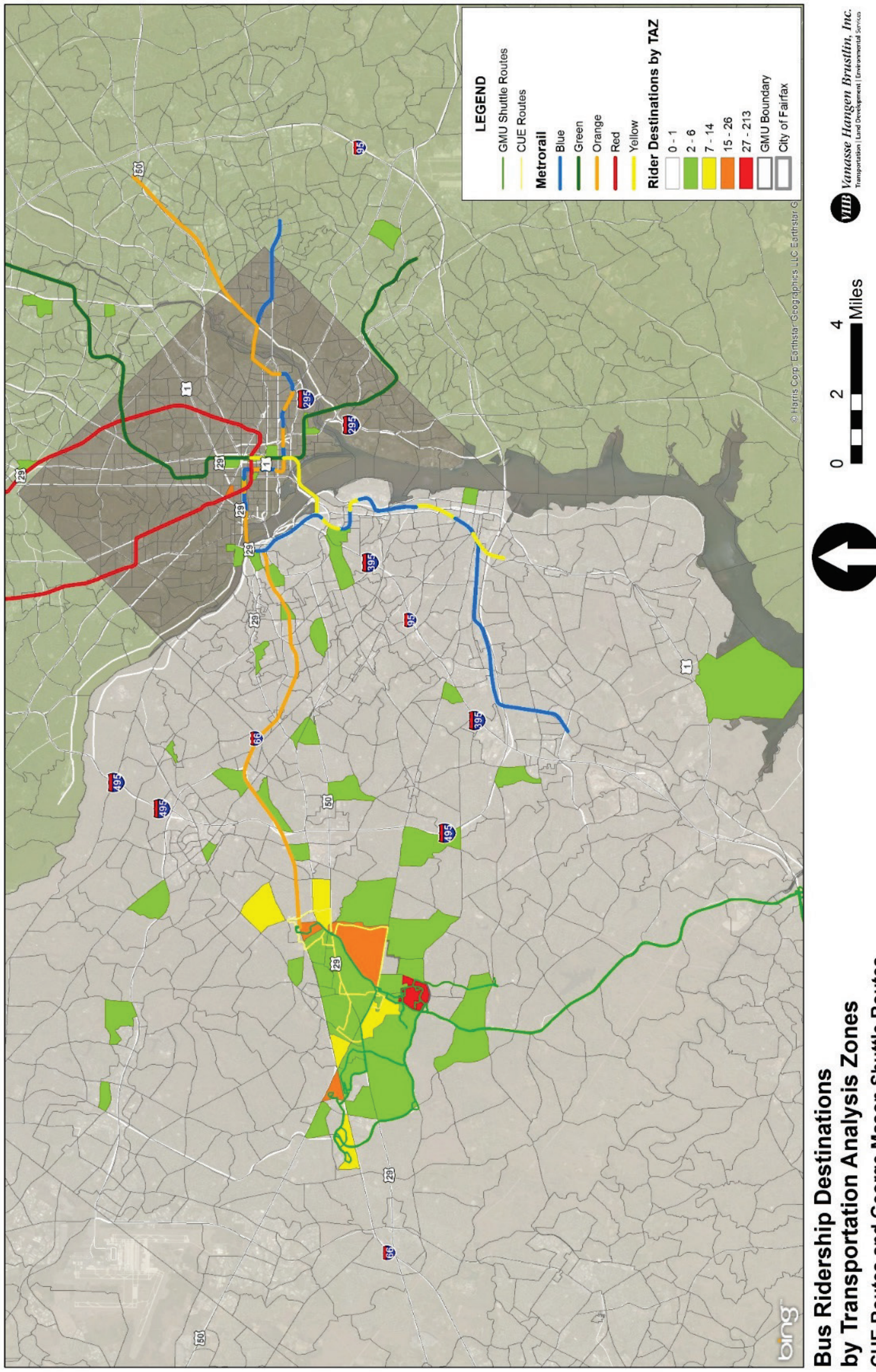
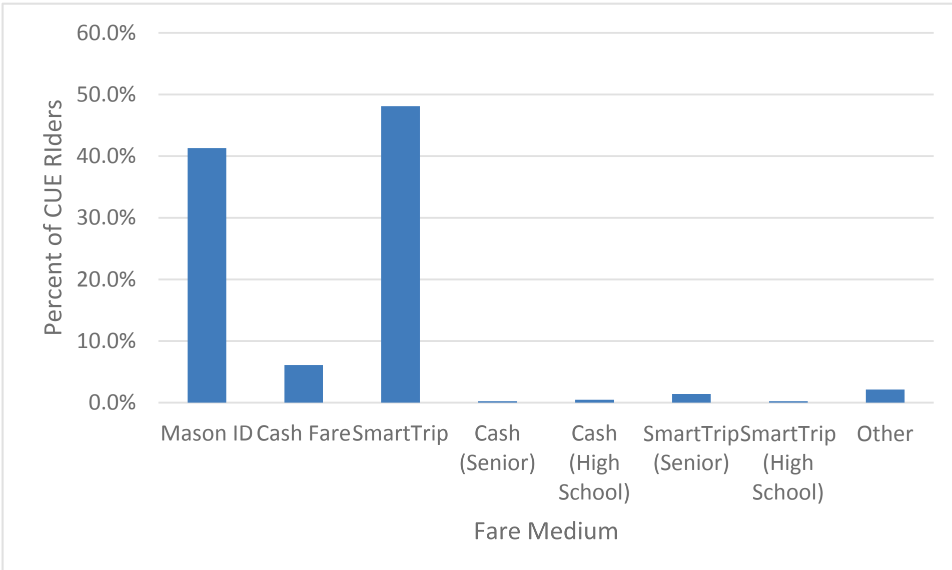


Figure 2-19: Ridership Destinations by TAZ



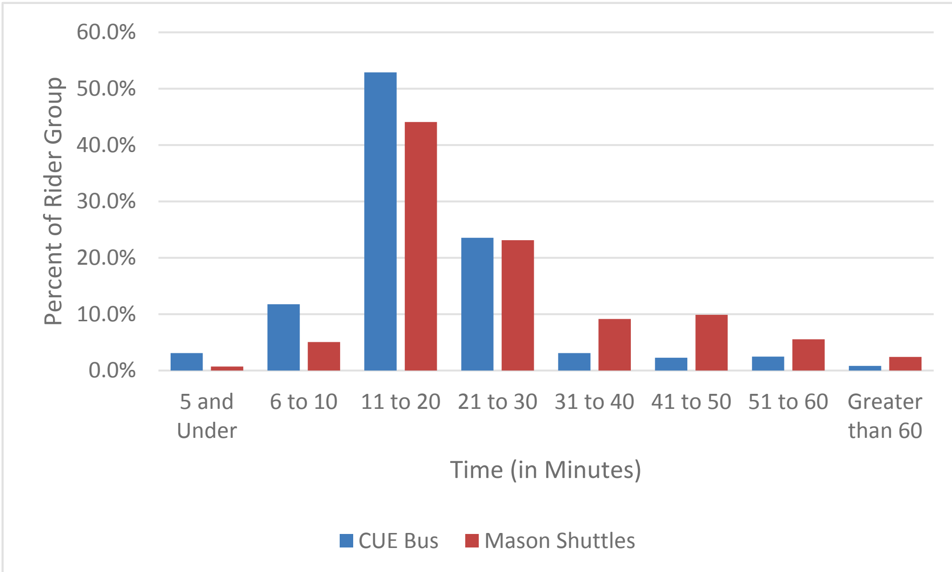
Those riders surveyed on the CUE bus were asked how they paid for their trip. The majority (50 percent) of riders paid using a SmarTrip card. Approximately 40 percent of riders were associated with Mason and used their ID to ride fare-free. Seven percent of riders paid with cash and roughly 3 percent utilized a discount as either a high school student or senior citizen. Riders falling into the "other" category paid with Metro Access or Metro coins.

Figure 2-20: Fare Payment for CUE



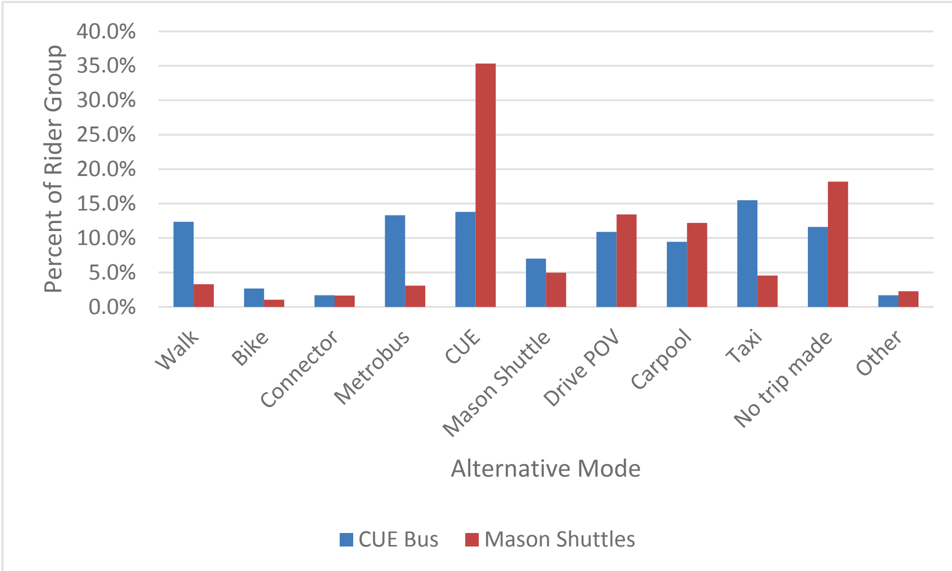
In response to a widely held perception about longer trip times associated with using CUE buses for trips that could also be made using Mason Shuttles, a question was added to the survey asking the rider how long they thought their trip would take. The results ranged from 5 minutes all the way to 99 minutes. The most common response was 20 minutes. This was the case for both CUE and Mason Shuttles. Over 60 percent of respondents stated their trip would last 20 minutes or fewer, and 86 percent stated 30 minutes or fewer. The question appears to indicate that the riders of both systems appear to have similar perceptions of their trip lengths, with more Mason shuttle riders reporting their trips will take longer. The geography for riders is great, and may include transfers to Metrorail, and it appears that many riders reported their full travel time, not the time it took to complete their trip on Mason Shuttles.

Figure 2-21: Perception of Travel Time



Riders were asked how they would have made the trip if the bus they were on wasn't available. CUE riders have potentially fewer alternatives than Mason Shuttle riders because many can't use Mason Shuttles. Most Mason Shuttle riders responded they would use CUE. This indicates that many of the riders surveyed see CUE as an alternative to their current choice. CUE riders responded with a range of responses including: using a different bus, walking, or driving. Of note were the low number of people who would bike or use Fairfax Connector as an alternative. These findings reinforce the disinclination towards biking, as well as the lack of Fairfax Connector routes that operate through the City of Fairfax. This limits the ability to use the service as an alternative. About 12 percent of riders responded they would have driven, meaning they chose to utilize transit. It is important to note that about 15 percent would not have made the trip at all. The number reporting abandoning the trip absent bus service was higher for Mason Shuttles than CUE, likely associated with the fact that more CUE riders utilize the bus to access work and can't afford to not make the trip. These CUE riders have limited alternatives for travel and rely more heavily on transit for their travel needs.

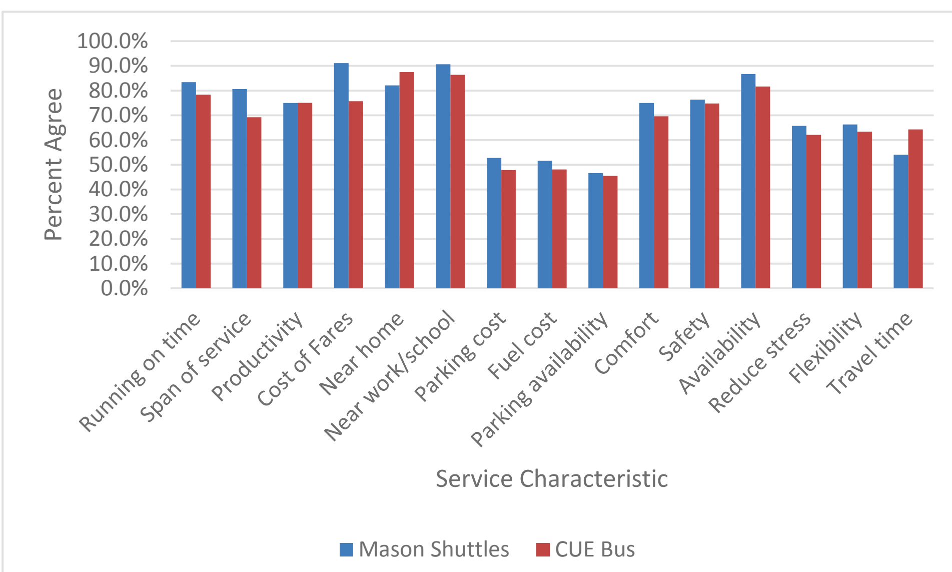
Figure 2-22: Mode of Transportation Used if Current Bus Unavailable



Service Perceptions

The last set of questions asked the rider how different reasons factored into their decision to use transit. The question did not ask them to rate each reason against the other, but the following table show the percentage of riders who responded that the factor was either "very important" or "important" for their decision to use transit. This gives some indication about how each reason rates against the others. According to the responses, the cost of parking, cost of fuel, and availability of parking do not really impact the choice to use transit. Factors that did rate higher were the proximity of transit to trip ends, the availability of transit throughout the day, and running on time. Mason Shuttle riders were more sensitive to the cost of fares, showing that a large reason for riding may the free aspect of the service. Travel time did not rate very highly relative to other factors. This runs contrary to the belief that students are choosing Mason Shuttles because it runs faster than CUE. It may be that they are choosing Mason Shuttles because it runs more frequently, because the travel times aren't dramatically different between the two services.

Figure 2-23: Factors effecting choice to use Transit



3

Household Survey

3.1 Introduction

Understanding why people choose to ride, or not ride, transit is an important piece of the puzzle for improving service. Every transit agency, even the most successful, can grow their ridership. Whether getting existing riders to ride more frequently, or getting non-riders to consider transit, understanding the needs of the rider population is paramount. The previous chapter examined the existing ridership and included a survey of rider's travel patterns and views of the services for both Mason Shuttles and CUE. In an effort to understand the reasons people may not be choosing transit, an additional survey was done within the Mason and City of Fairfax communities. The survey collected responses from people not currently riding Mason Shuttles or CUE, to help understand why they choose to not use transit. .A secondary goal of the survey was to gather additional views from people who currently utilize transit to understand factors that may get them to ride more frequently. Many of these riders are choice riders, meaning they have access to other modes of transportation to complete their travel, but could potentially choose to use transit. Choice riders are an excellent market to target for ridership growth. While they don't currently use transit, they might if the circumstances were right.

Many of the people who live in the City of Fairfax and/or are affiliated with George Mason University fall into the category of potential choice riders, and despite efforts to improve transit service, will likely remain potential choice riders. Choice riders are difficult to attract because they demand a high level of service. Many of them travel by private automobile and expect a level of service that can compete with the private automobile in terms of time, cost, and flexibility. Successfully competing against the automobile can be challenging for transit agencies.

The household surveys were conducted and collected by George Mason University's Center for Social Science Research (CSSR). Survey information was collected using two methods. The first was an online survey tool that collected people's responses. Everyone with an active George Mason University email was contacted with a link to the survey. City of Fairfax residents were contacted through a mailing that provided the link to the online survey and a survey identification number. Addresses were randomly selected through a service to provide a demographically representative sample. If the online survey was accessed by a City resident they then received a paper copy of the survey to fill out and return. If no response was received through this method, targeted phone calls were conducted.

Both surveys sought information about existing travel patterns, impressions and knowledge of Mason Shuttles and/or CUE, and characteristics that might result in greater transit usage. The results were collected as two separate surveys. The survey responses were collected via email from those with a Mason email, and via postal mail for City residents. In addition, some residents heard about the survey and sought to provide responses without receiving the mailing. Those responses were added in with the other responses. There is potential for overlap in sampling between the surveys as persons affiliated with the University may have also been randomly selected if they lived in the City of Fairfax.

3.2 Mason Survey

The Mason Survey was sent as a web link to everyone with a George Mason University email address. This included students, faculty, staff, and other University affiliates. Recipients who clicked on the link were taken to the survey and asked to participate by completing the questions. The survey was entirely self-administered. The survey collected 2,263 responses.

Respondents answered questions on:

- how often they use particular modes of transportation
- the size and driving eligibility of their household
- their awareness of CUE and GMU Shuttle service features
- their CUE/GMU Shuttle ridership habits
- which factors contribute to riding or not riding CUE/GMU Shuttles

The full list of questions and tabular response information grouped by University affiliation status is present in the Appendix.

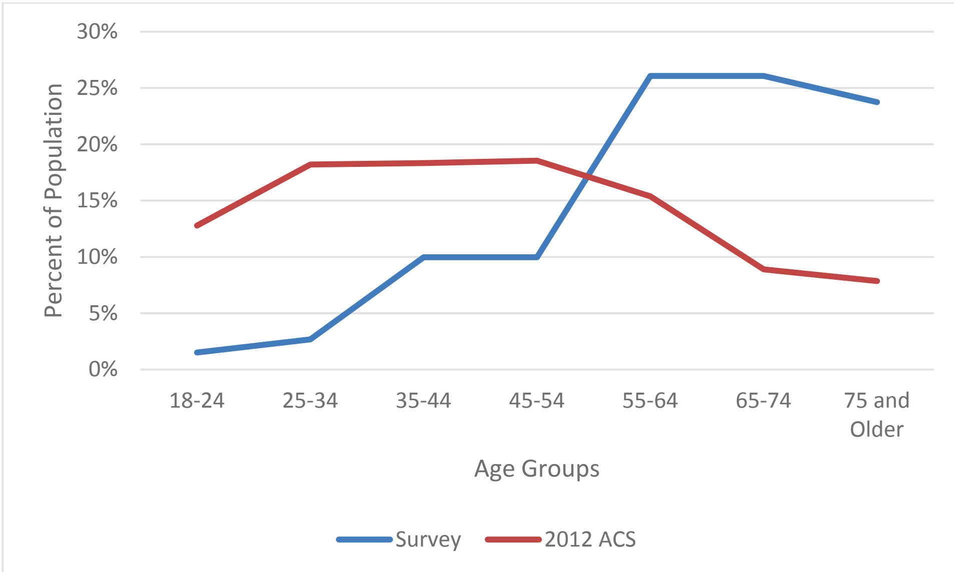
On George Mason's website, they report they have 33,917 students and 2,556 academic faculty and 2,526 administrative staff. Respondents of the survey self-identified as 84 staff, 54 faculty, 1,637 students, and 198 other. Faculty and staff make up 13% of the total University-affiliated population. Within the web-based survey, which wasn't intended to mimic the University population, Faculty/staff made up 7.8% of the University-affiliated population. While this slightly over represents the student population, this was considered adequate for our study, and no weighting factor for students, faculty, staff and other distribution was computed.

3.3 City of Fairfax Survey

The City of Fairfax Survey was sent to a randomly-selected population within the City of Fairfax boundaries. Postcards with a link to the web survey and a unique participant identification number were mailed to purchased addresses. The postcard was mailed to 5,000 residents during the week of April 13, 2014. After one month, a paper version of the survey was mailed to those addresses who had not completed the survey online. Reminder phone calls were made to those who had a listed phone number and had not completed the survey during the week of May 29, 2014. The survey returned 995 total responses.

The survey collected responses from 871 (88 percent) people who responded they were residents of the City of Fairfax. Sixty-seven (8 percent) responded that they were affiliated with George Mason University. Another twenty of the full survey sample responded they were affiliated with Mason (87 of 995). The survey was answered by slightly more men than women. Figure 33 show the age distribution of survey respondents against Census data for the study area.

Figure 3-1: Age Distribution of Survey Respondents Compared to Census



Because the responses were heavily skewed towards older age demographics relative to the population of the City of Fairfax, and to ensure that the responses were age-representative of the City's population, a weighting factor was applied based on age.

Respondents answered questions on household size, vehicle availability, travel habits, transit usage, and which factors may influence their transportation habits. Key findings are listed below.

3.4 Key Findings

Travel Patterns

Mason-affiliated individuals were far more likely to not utilize personal vehicle modes of transportation, instead using Metrorail, bus, and walking at greater rates than those in the City of Fairfax Community. Neither population uses bicycling or taxis as a frequent mode of transportation.

Within the University-affiliated population, those self-identifying as staff were most likely to use non-personally-focused transportation options (Figure 36).

Figure 3-2: Frequency of Use by Travel Mode (Mason)

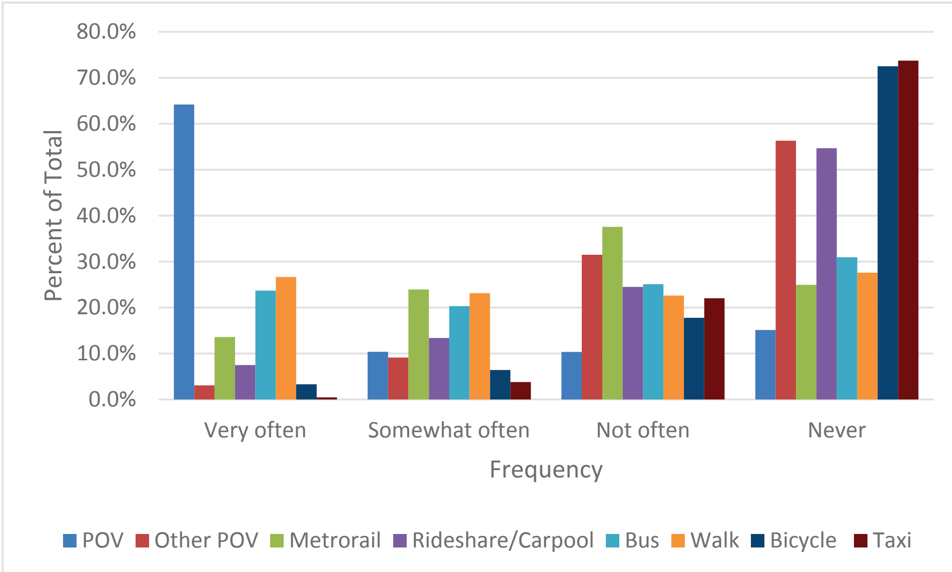


Figure 3-3: Frequency of Use by Travel Mode (Community)

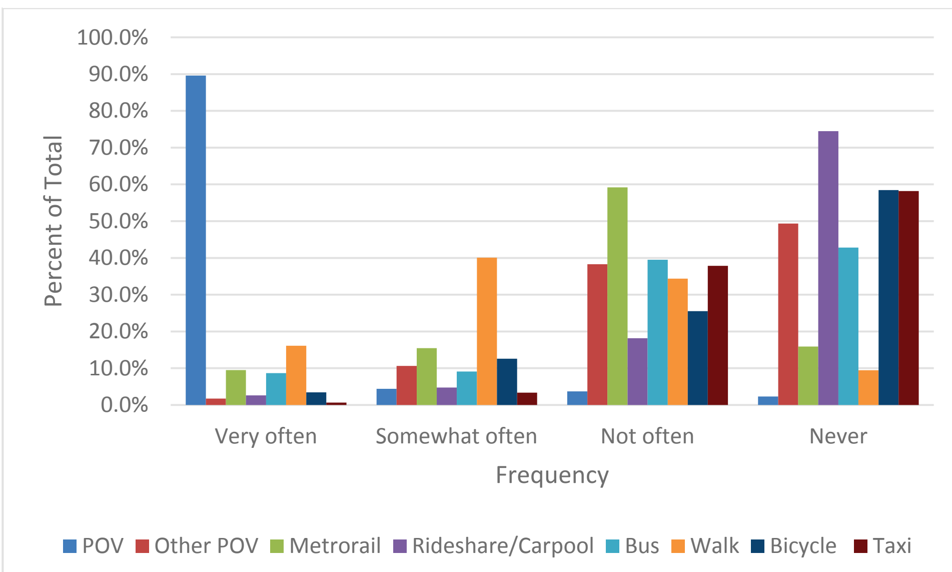


Figure 3-4: Most Frequent Mode Used (Mason)

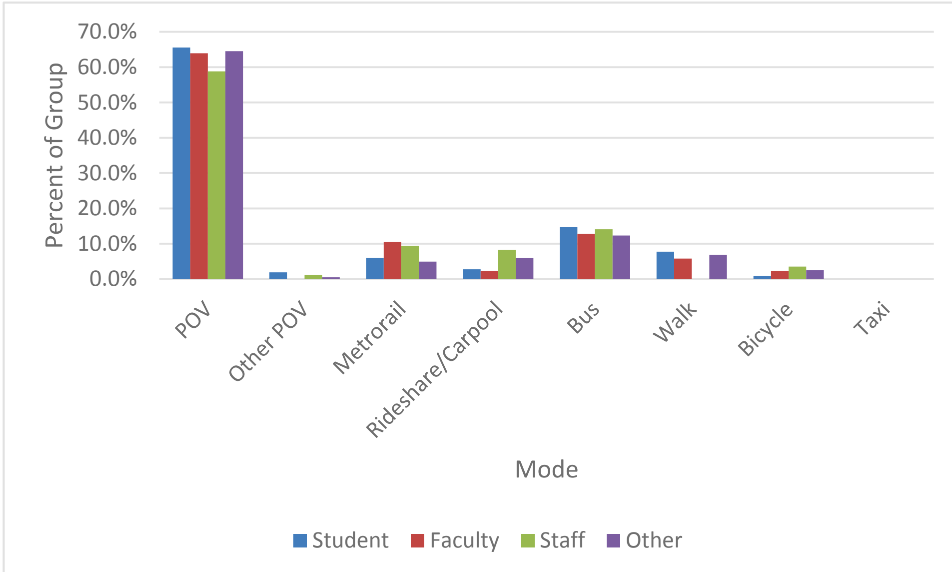
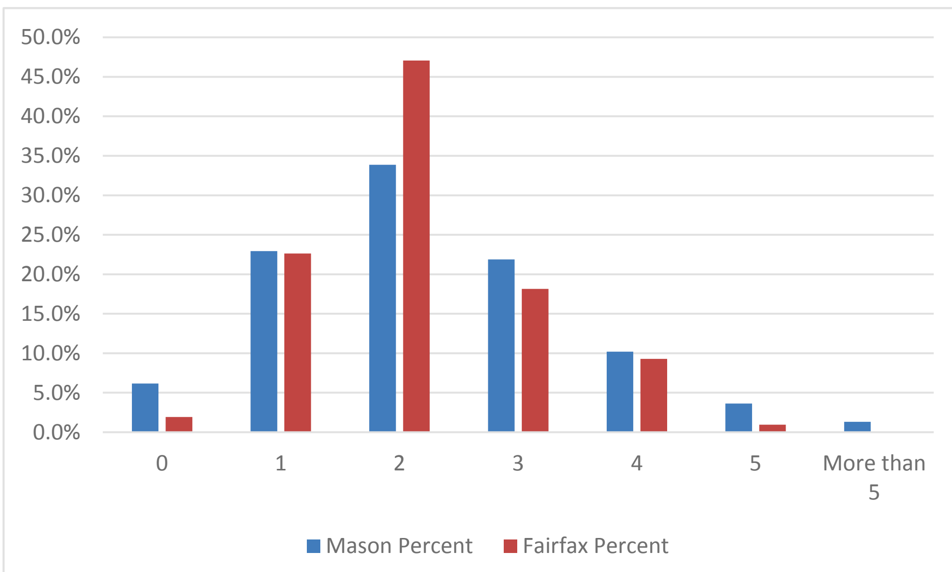


Figure 3-5: Number of Vehicles Available (Mason v. Fairfax)



Vehicle Availability

Given that the University-affiliated population is more likely to use alternate modes of transportation, that same population have a greater percentage of households without a vehicle available (6.2%), than the city of Fairfax community (1.9%) (Figure 37). The Fairfax surveyed population also had more households with multiple vehicles available. This would indicate more transit-captive ridership within the Mason sample, and more opportunities for increasing transit-choice ridership within the Fairfax sample.

System Awareness and System Use

Both the George Mason and Fairfax Communities reported high knowledge of CUE as a service. Fewer students at George Mason reported knowing about CUE Service (86.2%) compared to the community (98%). People across both data sets were most familiar with CUE stops and routes, and least familiar with CUE bus fares and real-time passenger information. Importantly, more than 35% of the Mason-affiliated population reported being unfamiliar with the CUE bus fares associated with Mason students, faculty, and staff. More than 50% of both the Fairfax and Mason communities were unfamiliar with the real-time passenger information (see Appendix). Both of these areas are opportunities for education that may increase ridership on CUE/Mason Shuttle.

Neither the community nor the Mason-affiliated population had more than 50% of its respondents report using CUE in the past 12 months. However, the University faculty reported more than 55% having ridden in the past 12 months, the highest-affirmative-responding group. (Figure 38). Mason-affiliated individuals reported using CUE less frequently than their Fairfax cohort – of those reporting use, 50% report using it 1-3 days per week, and 50% use it 4 or more days per week. This is compared to 18% of Fairfax community CUE riders using CUE 1-3 days per week and 82% using CUE 4 or more days per week. (Figure 40) This seems to indicate that the Fairfax Community is riding CUE more regularly as a means to get to work, and that Mason CUE riders are using it more occasionally to supplement other travel modes.

Figure 3-6: Mason-affiliated Using CUE Bus in last 12 months

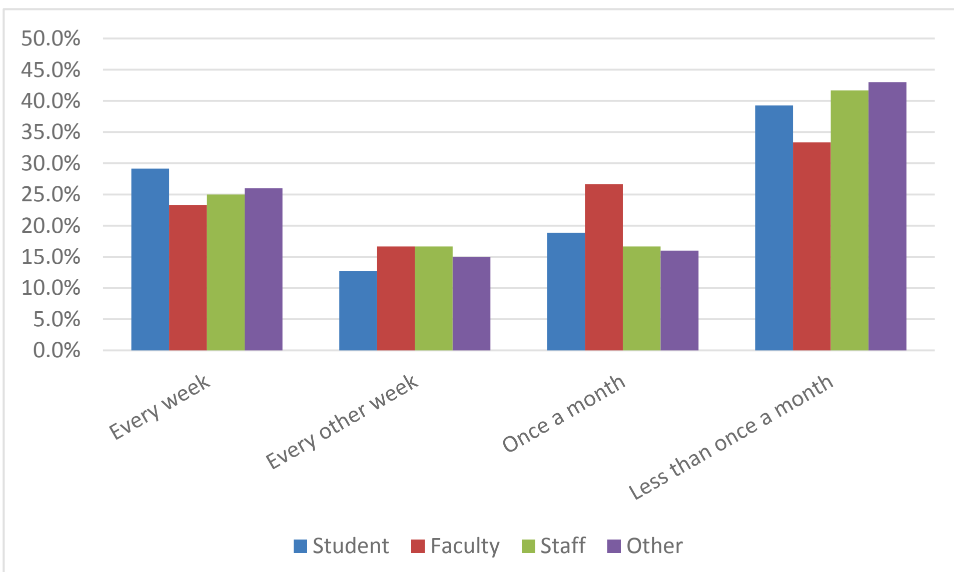


Figure 3-7: Community Using CUE Bus in the Last 12 Months

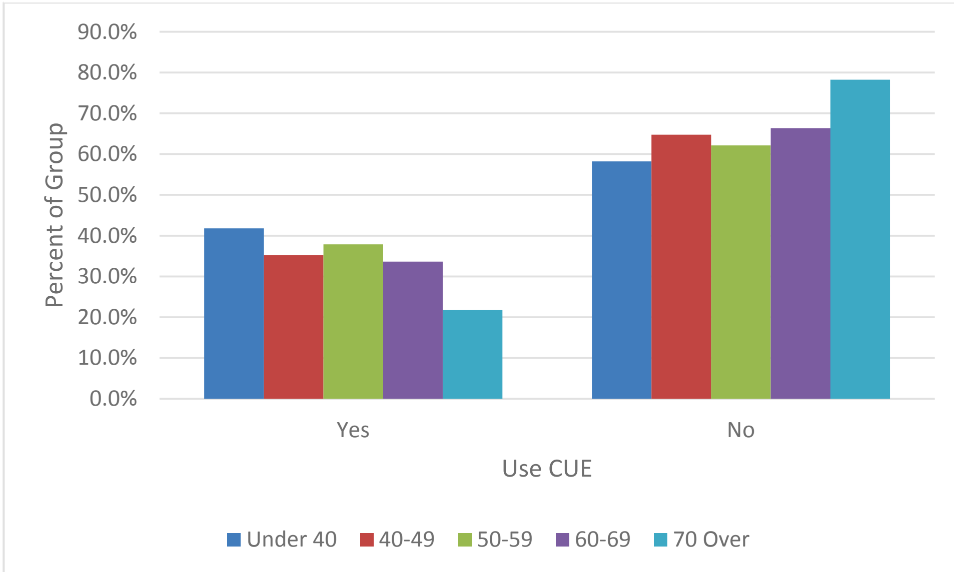
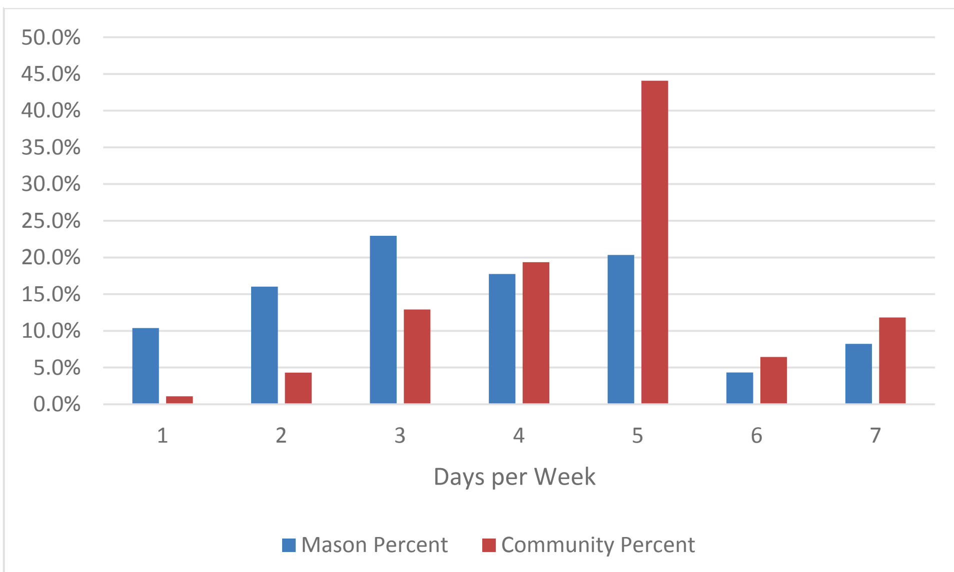
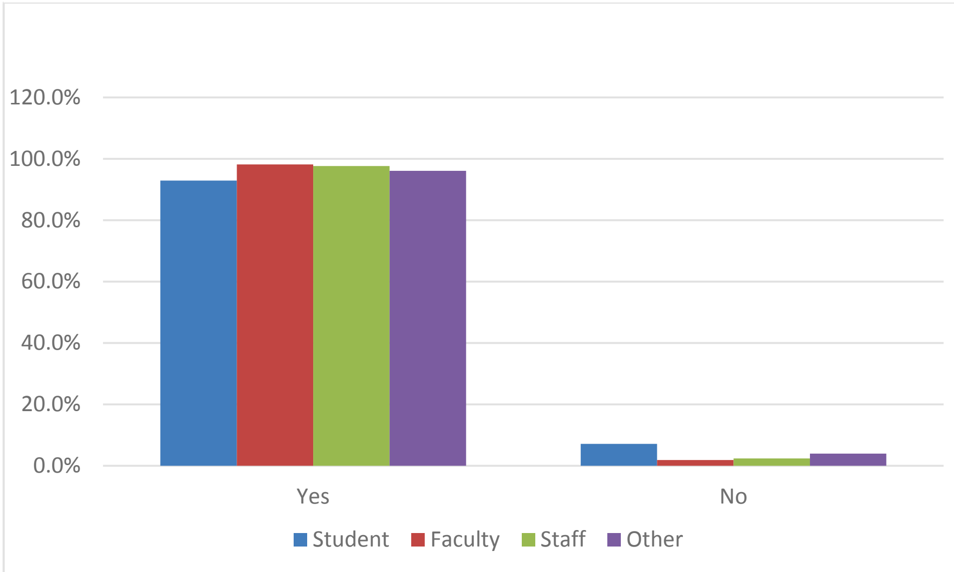


Figure 3-8: Days per Week Riding CUE



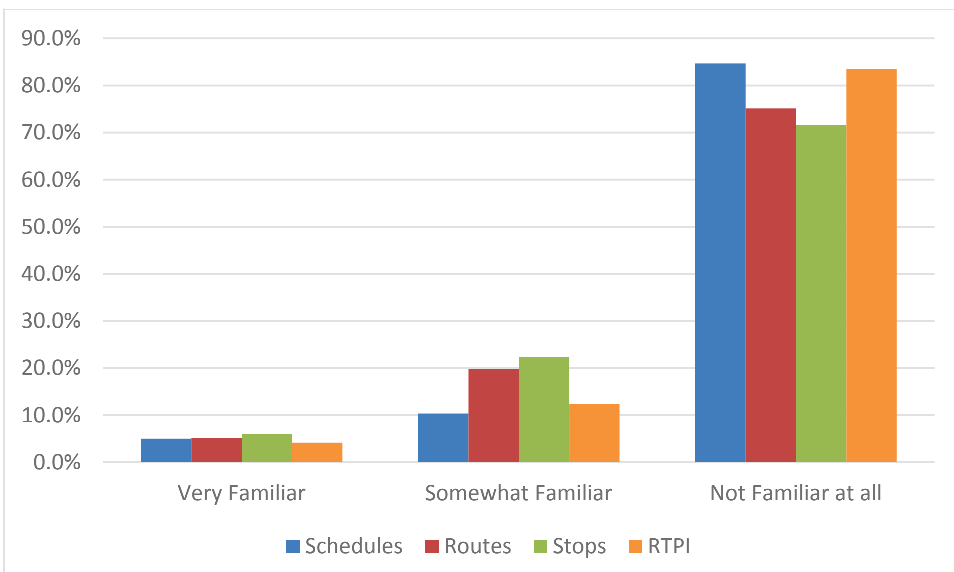
Both Mason and Fairfax communities reported more than 90% awareness of the Mason Shuttles. Of the Mason-affiliated population, students had the lowest awareness of the Mason shuttles. This is despite students making up the vast majority of shuttle ridership. This shows the potential for Mason shuttle ridership increases within the student population if greater efforts are spent on educating the ridership base.

Figure 3-9: Mason Awareness of Mason Shuttles



Similarly to how they rated their CUE awareness, Faculty at Mason reported above-average awareness of the Mason shuttle schedules, routes, stops, real-time passenger information, and frequency or use. Conversely, while the Fairfax Community was largely aware of the Mason shuttle system, they are largely unfamiliar with the Mason shuttle system attributes. (Figure 42)

Figure 3-10: Community Awareness of Mason Shuttle Attributes



This lack of awareness of elements of the system, combined with the system being focused solely on the Mason community means that community use of the system is very low – only 11.3% of the Fairfax community reported using the Mason shuttle system in the previous 12 months, and this number was largely made up of individuals below the age of 40 (see Appendix).

Despite high reported awareness of the Mason shuttles, less than two-thirds (65.7%) of the Mason-affiliated community reported having ridden a Mason shuttle within the past 12 months. Faculty, Staff, and other affiliates rode at slightly higher rates than students – 72.9% compared to 65.1%. This seems to follow naturally from their reported greater knowledge of system attributes. To try to improve student participation within the shuttle and CUE systems, respondents were asked about their general satisfaction with the services and what factors could increase their ridership.

Satisfaction

Both Mason and Fairfax communities reported being overwhelmingly satisfied with most aspects of CUE and Mason shuttle service. For CUE service, respondents were most commonly-dissatisfied with wait-times; and Mason respondents also expressed moderate dissatisfaction with service area. For the Mason Shuttle system, wait-times again engendered the most dissatisfaction (30.9%), followed by availability of seats (21.8%). Respondents reported being more than 80% satisfied with service area, days and hours, on-time performance, and travel time, and more than 90% satisfied with cleanliness and safety.

Figure 3-11: Community Satisfaction with CUE Service

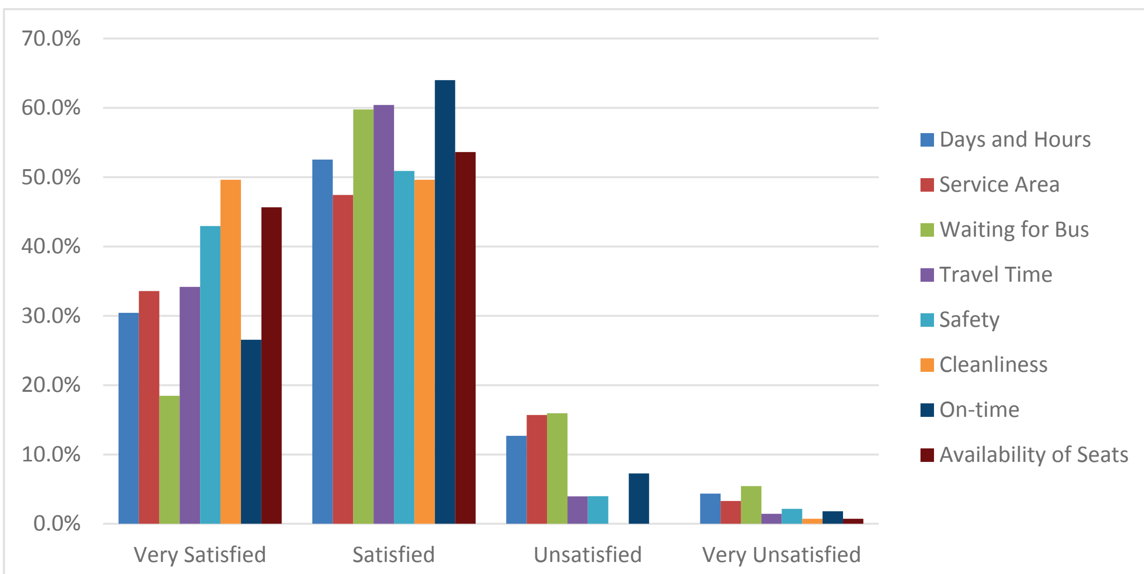
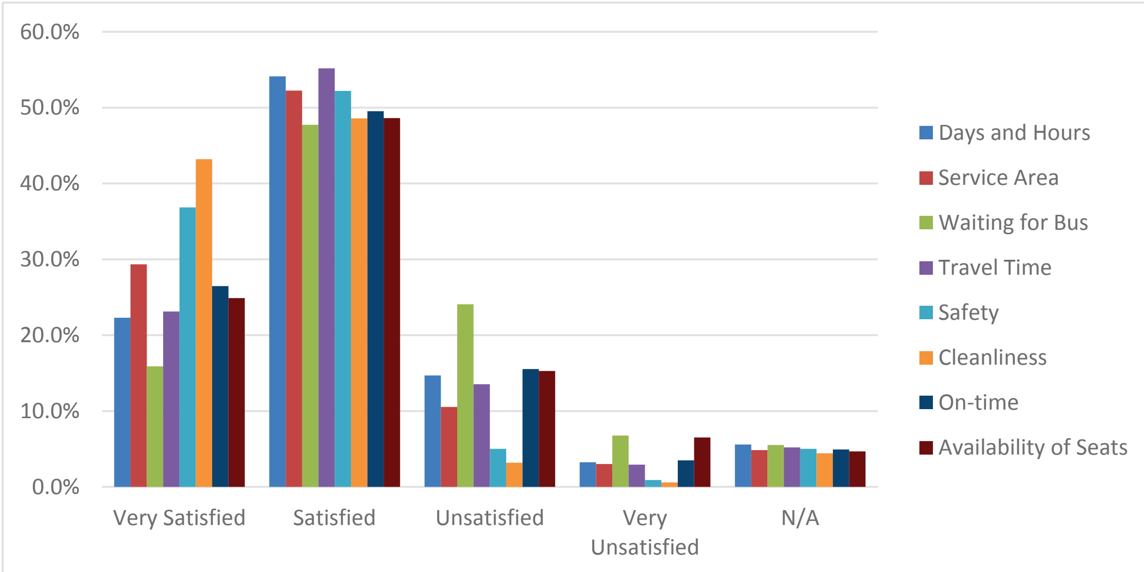


Figure 3-12: Mason Satisfaction with CUE Service



Factors that influence Ridership

Survey respondents were asked why they don't utilize CUE or Mason Shuttle systems, and secondarily what factors would make them ride the bus more frequently. Several trends were observed. The most common reason respondents don't ride CUE more often is that they prefer other modes of transportation. That seems to be an external factor outside of the scope of this study, so we focused more on other factors not rating as highly. Also ranking highly with both communities surveyed were the *Routes not meeting their needs* and the *Travel time being too long*. *Cost*, *Atmosphere,* and *Safety concerns* were least-likely to be listed as reasons for not riding CUE. Within the community survey, those aged 40-59 were more likely to report the routes not meeting their needs compared to those under 40 or over 60. While only 27.7% of the community survey felt travel times were too long and this influenced their ridership decision, 44.5% of the Mason-affiliates reported that long travel times influenced their ridership calculus. This sentiment was relatively uniformly shared across the student, faculty, staff, and other categories, suggesting this group has a different perception of expected travel time that may be driven by the performance of the Mason shuttles. Targeting the 40-59 year-old demographics' route needs and the route time perceptions of the Mason community are worthwhile goals.

Figure 3-13: Reasons the Community doesn't ride CUE

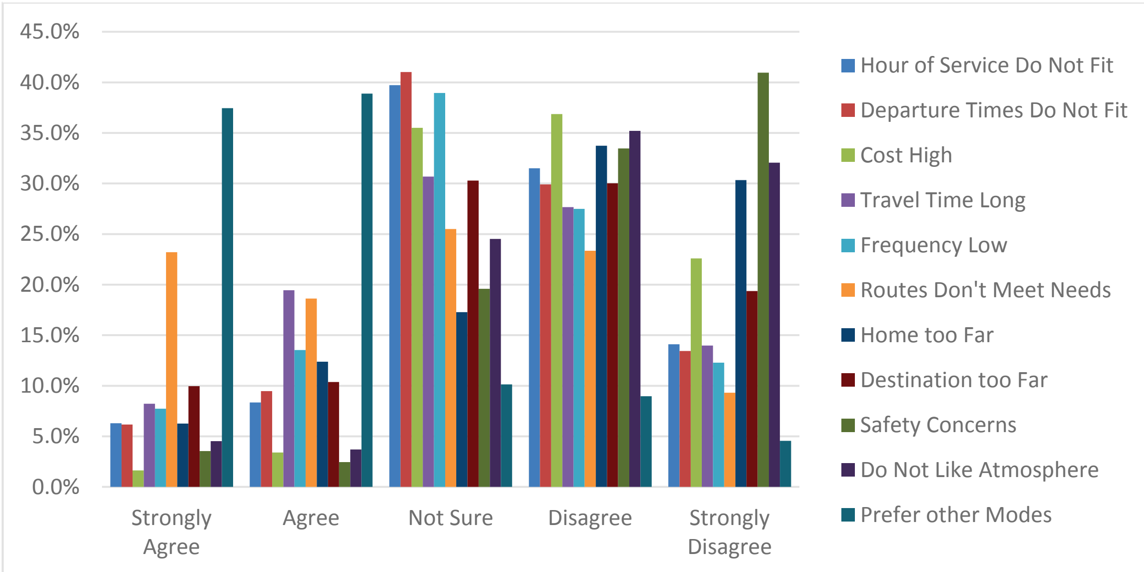
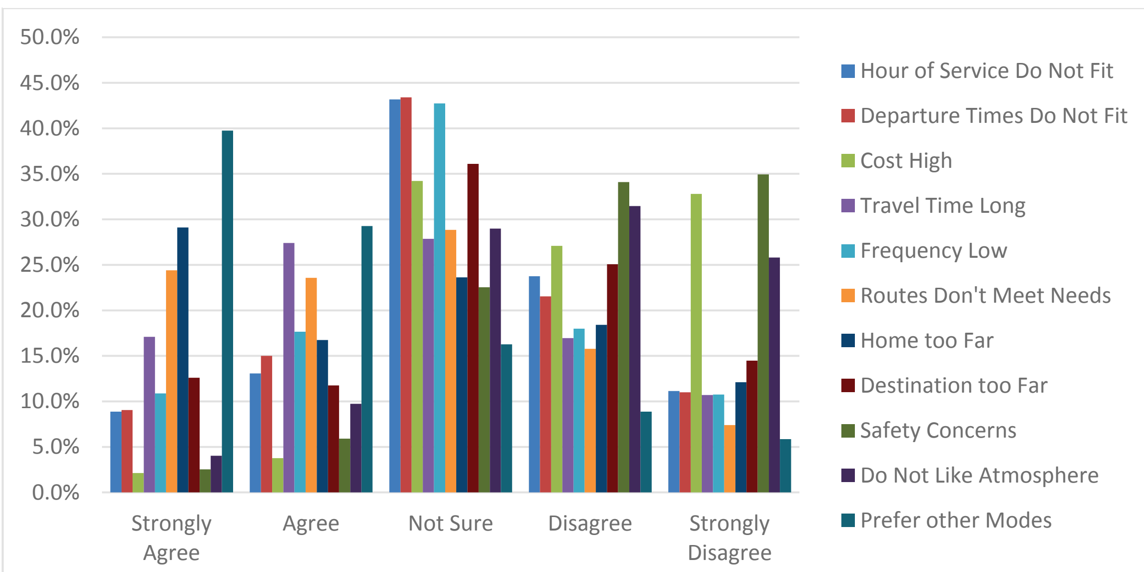
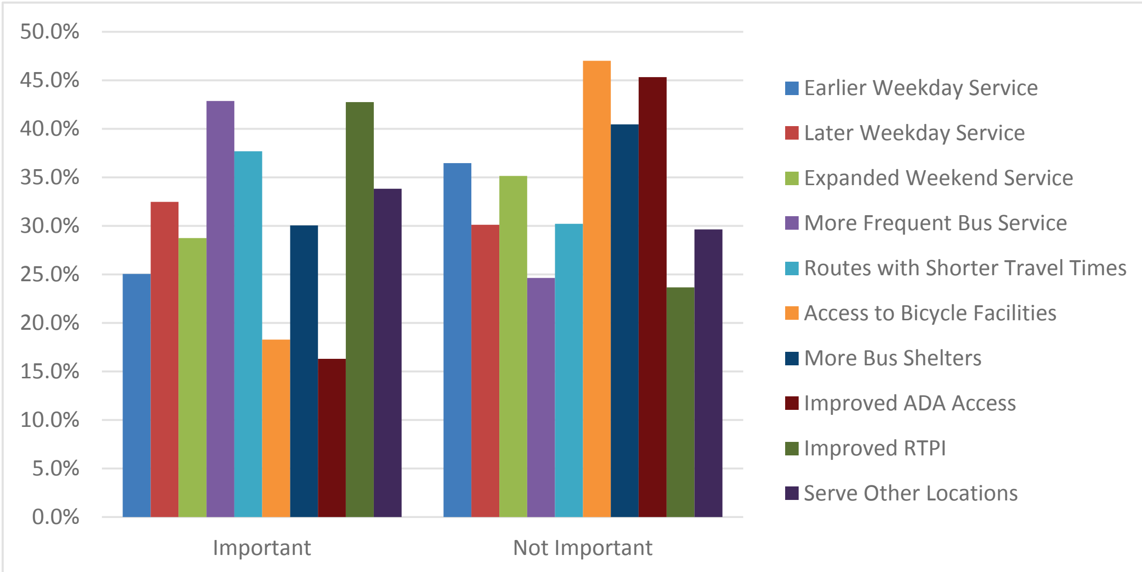


Figure 3:14: Reasons the Mason Community doesn't ride CUE



While the Routes not meeting the needs of the surveyed populations rated highly, asking the question in terms of prioritizing factors for increasing ridership yielded slightly different results. Serving other locations still ranked highly, but not as high as more frequent bus service with shorter travel times and real-time passenger information. ADA compliance, bicycle and shelter facilities tended to be least important in influencing ridership. The Mason population, while already having higher bus participation, seems to also be easier to influence regarding their mode-choice. This is evident by how highly they rated important/unimportant factors influencing ridership.

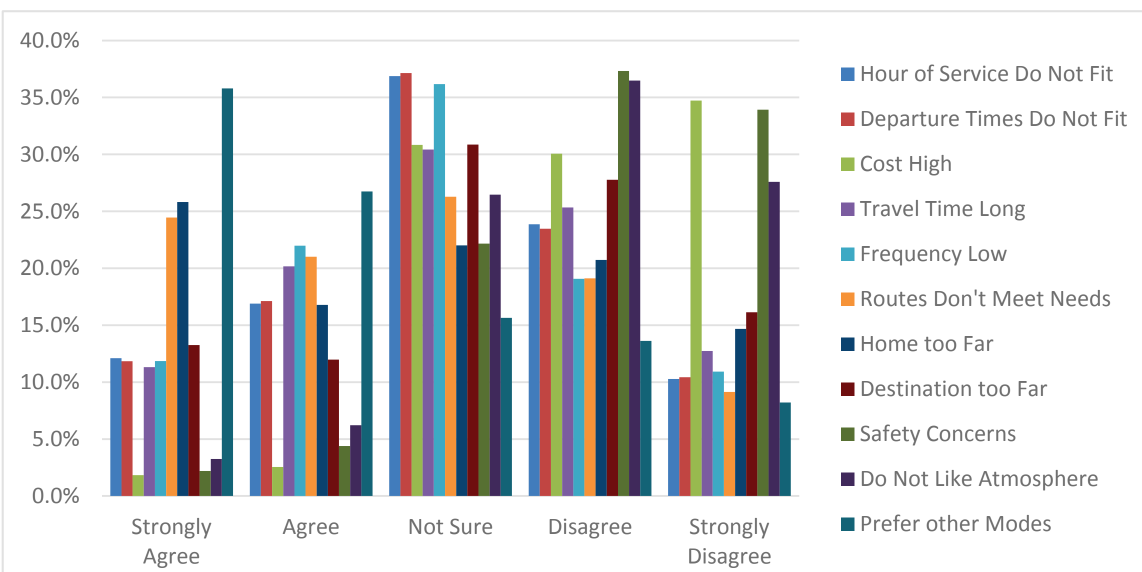
Figure 3-15: Factors to increase Community CUE ridership



When the Mason-affiliated population was asked why they don't ride the Mason shuttles, their response again indicated that they prefer other modes over the bus, and that the service area, frequency of buses, and distance from their home to the bus influenced the decision to not ride.

Staff were most likely to agree that the stops are too far from their home (50.9%), while more than 45% of all students, faculty, staff, and other respondents agreed that the routes don't match their needs.

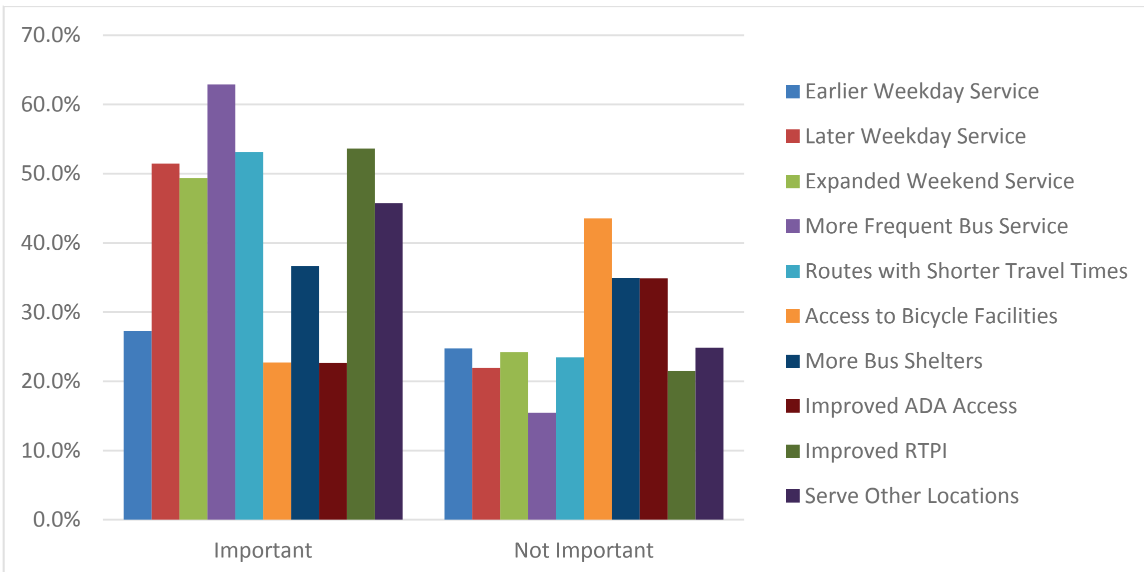
Figure 3-16: Reason Mason Community Doesn't Ride Mason Shuttles



When asked which factors being changed might increase the likelihood of them riding the Mason shuttles, respondents pointed to more frequent bus service, shorter travel times, improved real-time information, and expanded service hours (later on weekdays and weekends).

Interestingly, serving other locations didn't rank as highly despite issues with proximity to travel origin and other route-issues being rated highly in the inhibiting factors section. A caveat about the proposed change questions and inhibiting factors is that respondents could choose none or all of the factors as being important or not-important. There wasn't a question asked about rating factors relative to others, just whether those factors had degrees of importance.

Figure 3-17: Factors that would influence ridership of Mason Shuttle

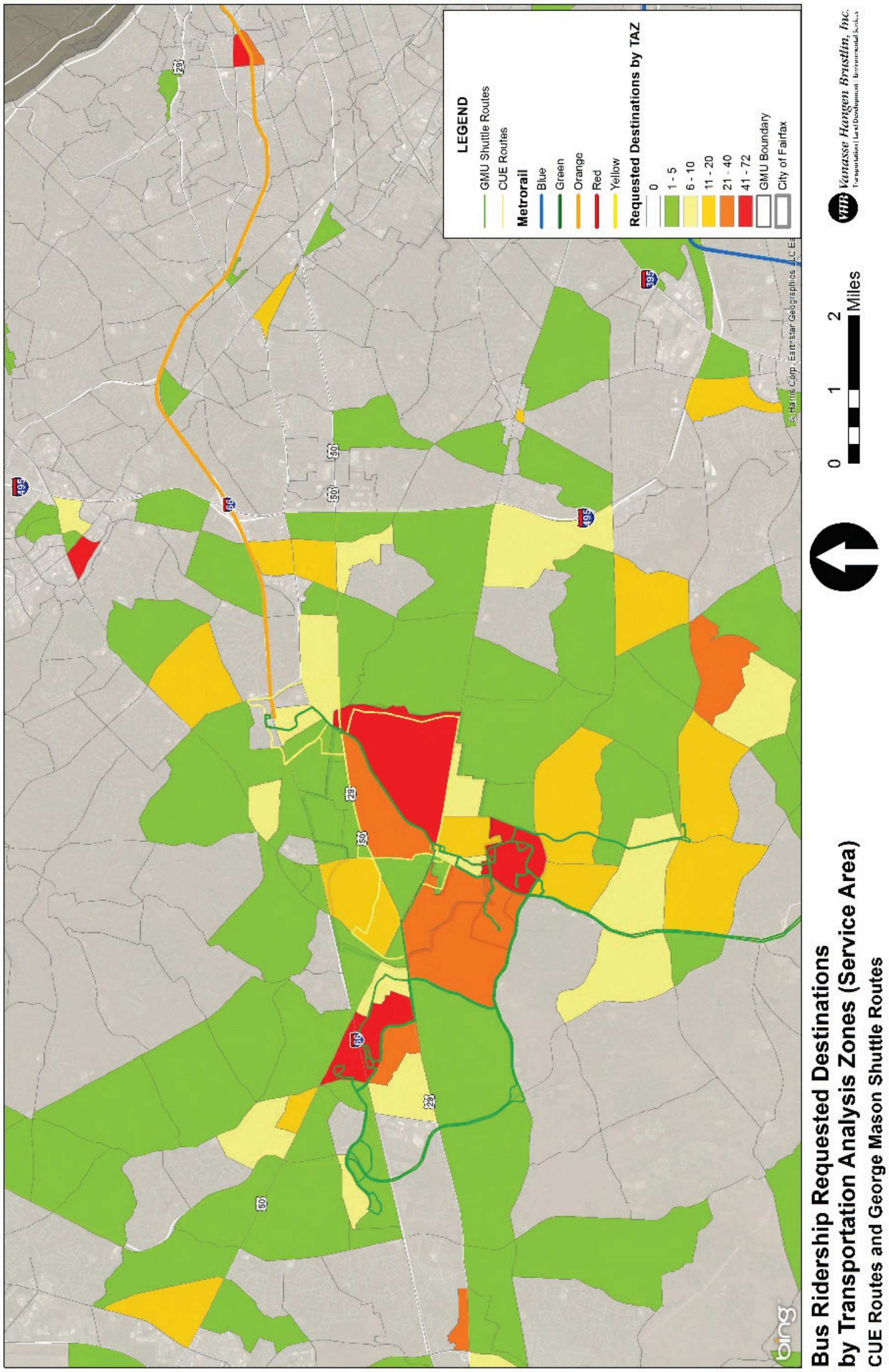


In looking at serving other locations, those that were most frequently cited for CUE were: Fair Oaks Mall, the Fairfax Villa neighborhood, and Fairfax hospital. Those most frequently cited for Mason shuttles were: Tysons Corner, Springfield, Centreville, the Arlington campus, Fairfax Square Apartments, and Burke Center.

Requested destinations were mapped and grouped by regional transportation analysis zones (TAZ). Most of those TAZs are already served by existing Mason, CUE or Metrorail service. Those falling outside of those zones were Tysons Corner, and the area southeast of Campus towards Burke.

Based on the initial findings of the survey effort, some potential improvements begin to emerge. Considering new routes have the potential to increase ridership, but an education campaign may have the same benefit. Increasing awareness of CUE routes and schedules through real-time passenger information may yield a more informed and satisfied rider base. It may also have the added benefit of decreasing the misperception that travel times are too long, thereby increasing ridership satisfaction and ultimately increasing unlinked passenger trips. These concepts will be reviewed as this study moves forward; those that prove positive will be moved forward as recommendations.

Figure 3-18: Requested Destinations by TAZ



4

Route Performance and Analysis

4.1 Introduction

A goal of this study was to identify ways to improve transit system performance, resulting in potential cost savings, increased ridership, and greater rider satisfaction. Through a detailed examination of CUE and Mason Shuttle routes, it is possible to identify both the best and poorest-performing routes. This information will be used to inform improvements to both systems. The ability to quantify how each route performs, enables segment by segment route optimization. It is important to recognize that within every system, there are successful and unsuccessful routes, both financially and in terms of ridership. Many systems make policy decisions to provide service to areas that may not produce high ridership, but provide a valuable transportation service. With measured analysis, Mason and CUE can determine the appropriate balance between the needs of riders, operational concerns, and funding constraints to maximize the efficiency and effectiveness of both systems.

4.2 Cost Analysis

A cost centers analysis examines information on operations, ridership, revenue, and cost data at each individual route level. This approach allows for a comparison of each route within a system against each other. Each route is considered its own operating entity, with recent operating and financial data providing a snapshot of financial performance. This type of analysis is more revealing for the CUE system because it collects fares while Mason Shuttles does not charge a fare, meaning none of the costs are recuperated. A better-performing Mason Shuttle route from a ridership perspective doesn't result in a lower deficit when compared to an underperforming route.

Calculating statistics like deficit or other industry-standard measures like farebox recovery, are challenging to produce at a route-level because of a lack of uniform source data. Frequently, these data are provided by the agency or pulled from other reports like the National Transit Database (NTD). Data for CUE was pulled from the NTD for revenue and cost information. CUE Ridership was derived from counts collected using their farebox system. All data for Mason Shuttles was provided by Reston Limousine. Data presented below is for Fiscal Year 2013 to allow for consistent comparisons between available data. Since data pulled from the NTD is combined for the entire system and an agency generally doesn't track costs at a route-level, a cost allocation model is used to derive the desired cost values for each route. The cost model is the preferred method for calculating route-level costs because it applies more than one variable to produce operating cost. A multi-factor approach provides greater accuracy compared to a single factor approach, such as using cost per hours of service. The cost model approach requires a certain level of detail that wasn't available for Mason Shuttles because the service is contracted through a third party. The data provided by Reston Limousine only provides a cost to operate the route, and doesn't break those costs into categories for labor, maintenance, fuel, overhead, etc. Therefore, route-level costs were derived based on the percentage of revenue hours associated with each route. This method ties the amount of service provided to the cost to provide the service, which is one factor considered in a multi-factor cost allocation model.

More detailed cost information was available for CUE through their F-30 form submitted to NTD for FY2013. The reported costs from the form are assigned to either revenue hours, revenue miles, or overhead (Tables 1 and 2). The total costs for overhead were assigned to revenue hours and revenue miles in proportion to their assigned costs.

Table 4-1: Cost Categorization for Cost Model

Category	Vehicle Operations	Vehicle Maintenance	Non-Vehicle Maintenance	General Administration
Operators' salaries and wages	Hours	--	--	--
Other salaries and wages	Hours	Miles	Overhead	Overhead
Fringe Benefits	Hours	Miles	Overhead	Overhead
Services	Hours	Miles	Overhead	Overhead
Fuel and lubricants	Hours	Miles	--	--
Tires and tubes	Hours	Miles	--	--
Other materials and supplies	Hours	Miles	Overhead	Overhead
Utilities	Hours	--	--	Overhead
Casualty and Liability Costs	--	Miles	Overhead	Overhead
Miscellaneous Expenses	Hours	Miles	Overhead	Overhead

Table 4-2: Assigned Costs

	Assigned Costs		
	Revenue Hours	**Revenue Miles**	**Overhead**
Operators' salaries and wages	$1,086,100		
Other salaries and wages	$164,140	$154,159	
Fringe Benefits	$630,454	$77,737	$101,514
Services		$79,659	$59,890
Fuel and lubricants	$325,818	$6,318	
Tires and tubes	$36,551	$1,005	
Other materials and supplies	$15,222	$121,536	$1,034
Utilities			$743
Casualty and Liability Costs			$20,768
Miscellaneous Expenses			$17,163
Subtotal	**$2,258,285**	**$440,414**	**$201,112**
Allocated Overhead	**$168,292**	**$32,820**	
Total	**$2,426,577**	**$473,234**	
Annual Operating Statistic	**33,792**	**441,979**	
Unit Cost	**$71.81**	**$1.07**	

Unit costs were then calculated for revenue hours and revenue miles. Assigning the unit costs to the cost model resulted in the following formula for producing route-level operating costs.

$$Operating\ Cost\ = (\$71.81\ \times Revenue\ Hours) + (\$1.07\ \times Revenue\ Miles)$$

Route-level fare information for CUE routes was estimated by multiplying ridership by a system-wide average fare of $1.56.

Ordinal Ranking

The ordinal ranking diagnostic procedure ranks all the routes from best to worst on the following measures for CUE:

- Passengers per Revenue Hour;
- Passenger Revenue Recovery;
- Subsidy per Revenue Hour; and
- Subsidy per Passenger.

Since Mason Shuttles doesn't collect a fare, the passenger revenue recovery measure is not relevant. Treating the cost for each Mason Shuttle route as a subsidy allows for analysis of subsidy per rider and hours of service allowing for a relevant comparison between Mason Shuttle routes.

Passengers per Revenue Hour

Passengers per revenue hour is often used as a measure of service effectiveness. This variable answers the question, "how much of a transportation service is being consumed in relation to the amount available?" The more passengers riding a given route in relation to the amount of service provided, the more effective the service.

Despite the relative similarity in service provided for the four CUE routes, there are some differences in service effectiveness between them. The two Gold routes perform better than the Green routes, carrying roughly 26 passengers per hour compared with 23.

Table 4-3: CUE Passenger Productivity

	Passengers/Revenue Hour	
Route	**Value**	**Rank**
Gold 1	26.17	2
Gold 2	26.28	1
Green 1	23.83	3
Green 2	23.10	4

The FY 2011-2016 Transit Development Plan (TDP) for CUE recommended a ridership productivity standard of 25 passengers per revenue hour on weekdays, 20 passengers per revenue hour on Saturdays, and 15 passengers per revenue hour on Sundays. The passengers per revenue hour values discussed above are for all days of the week, meaning that Saturdays and Sundays are impacting the value reported. A quick review of weekday ridership from April 2014 shows that all CUE routes are performing above the standard set by the TDP.

A review of route productivity for Mason Shuttles shows the Mason to Metro route greatly outperformed the others studied. Of the four routes with data available for FY 2013, the Mason to Metro Express was the least productive. However, this was the first year the route was in service, and the Metro Express shuttle doubled in ridership from FY 2013 to FY 2014. There was no data available for the Burke VRE route because it didn't begin service until the fall 2013 semester. From September 2013 to April 2014 the route productivity for the Burke VRE shuttle was 1.49 passengers per revenue hour. Because route productivity is often low during the initial year of service, it is expected that productivity would increase during the second year.

Table 4-4: Mason Shuttles Passenger Productivity

Route	Passengers/Revenue Hour	
	Value	Rank
Mason to Metro	23.56	1
Mason to Metro Express	8.13	4
Gunston Go-Bus George	10.70	3
Gunston Go-Bus Mason	10.70	2

Mason Shuttles does not have a service standard for route productivity. Many public agencies utilize a standard of 50 percent of the system average. This metric would result in a service standard for productivity of 7.42 passengers per revenue hour. Every route except the Burke VRE shuttle exceeds this standard. When a route doesn't meet the agency standard it doesn't indicate a route should necessarily be eliminated, but highlights routes that should be focused on for improvements. The Burke VRE shuttle is a relatively new route. New services often require a period of "start-up" time to generate ridership.

Passenger Revenue Recovery

A route's revenue recovery is an indication of how effective that route is at covering its operating costs. Passenger fares are the primary source of revenue for public transportation. A higher revenue recovery value results is a decreased reliance on other sources of funding (local, state, and federal) to cover the shortfall.

The systemwide revenue recovery ratio for the CUE system is 45.23 percent. The Gold routes performed better than this average when compared to the Green routes. The Gold 2 route had the highest revenue recovery at 47.78 percent and the Green 2 had the lowest at 42 percent.

Table 4-5: CUE Passenger Revenue Recovery

Route	Passenger Revenue Recovery	
	Value	Rank
Gold 1	47.59%	2
Gold 2	47.78%	1
Green 1	43.32%	3
Green 2	42.00%	4

CUE set a cost effectiveness standard of 15 percent farebox recovery in the TDP. The current system and route-level farebox recovery ratios well exceed the standard that was put in place before the recent fare increases. This standard will likely require an update in the next transit development plan.

Mason Shuttles does not collect a fare from those riding. Therefore, no passenger revenue recovery analysis can be performed.

Subsidy per Revenue Hour

Another method for assessing cost effectiveness is by measuring the subsidy per revenue hour. The subsidy is the difference between operating costs and passenger revenue, or the amount of assistance from other sources that is required to pay for the route. The subsidy is often covered through a combination of federal, state, and local sources.

Since the Gold routes performed better than the Green routes in revenue recovery, they required less subsidy per hour of service provided. The Gold 2 recorded the lowest subsidy per revenue hour at $44.80 and the Green 2 had the highest at $49.77. The system average subsidy per hour was $ 47.00.

Table 4-6: CUE Subsidy per Revenue Hour

	Subsidy per Revenue Hour	
Route	**Value**	**Rank**
Gold 1	$44.97	2
Gold 2	$44.80	1
Green 1	$48.63	3
Green 2	$49.77	4

CUE does not currently have a standard for subsidy per revenue hour. They do have a standard for local subsidy per passenger trip, which will be discussed in the next factor. Some systems set a standard for subsidy per revenue hour at 150 percent of the system value ($47.00). If CUE were to follow this standard, their subsidy per revenue hour would be $70.50, and all the CUE routes perform with lower subsidy values. If the system average subsidy is used as the standard, Green 1 and Green 2 would be slightly above.

Since Mason Shuttles does not collect a fare from riders, the operating cost for each route will be considered the subsidy. The Mason to Metro route had the highest subsidy at $92.69 per revenue hour and the Mason to Metro Express had the lowest at $60.12 per revenue hour. The average for the study routes was $83.42. The subsidy per revenue hour for the Burke VRE shuttle using data from September 2013 to April 2014 was $60.64, which would make it the second least-subsidized route.

Table 4-7: Mason Shuttles Subsidy per Revenue Hour

	Subsidy per Revenue Hour	
Route	**Value**	**Rank**
Mason to Metro	$92.69	4
Mason to Metro Express	$60.12	1
Gunston Go-Bus George	$77.84	2
Gunston Go-Bus Mason	$77.84	3

Mason Shuttles does not have a standard for subsidy per revenue hour. Using the 150 percent of the study route average ($125.13) would result in none of the routes exceeding the standard. If the study route average was used, the Mason to Metro route would exceed the standard. This is a result of the amount of service provided by this route, which is higher than any of the other routes being studied.

Subsidy per Passenger

Subsidy per passenger is another measure of passenger revenue effectiveness. The resulting figure represents how much additional funding, in addition to the fare paid, is required per rider to operate the route and system. The higher the subsidy per passenger, the more federal, state, and local assistance is required to cover the operating cost.

The total average subsidy per passenger for CUE is $1.89 per rider. This figure includes all local, state, Federal, and Mason funding. This figure would change if these additional funding sources were not available. If Mason did not provide a contribution to cover their portion of the system costs, but instead their riders just paid a standard fare, the average subsidy per rider would increase to $3.38 per rider. This assumes that all the existing Mason riders would continue to use CUE. The value would increase further if Mason did not provide a contribution, and all Mason riders stopped riding CUE.

The Gold 2 route had the lowest subsidy per rider ($1.70) and the Green 2 had the highest ($2.15). The ordinal rankings mirror those in subsidy per revenue hour

Table 4-8: CUE Subsidy per Passenger

	Subsidy per Passenger	
Route	**Value**	**Rank**
Gold 1	$1.72	2
Gold 2	$1.70	1
Green 1	$2.04	3
Green 2	$2.15	4

The CUE TDP provides for a local subsidy per passenger standard of $1.40 per passenger trip. This figure includes local support from the City's general fund as well as the contribution from Mason. If the state and federal support CUE received in FY 2013 was discounted, the local subsidy per rider would be $0.94. That figure is well below the CUE TDP standard, and is likely the result of the recent fare increases that have improved revenues collected.

The subsidy per passenger for the Mason Shuttle routes was $4.64 per rider. The Mason to Metro route had the lowest subsidy per passenger ($3.93) and the Mason to Metro Express route had the highest ($7.39). The Mason to Metro Express subsidy per passenger was only slightly higher than the Gunston Go-Bus subsidy per passenger. The Burke VRE shuttle subsidy per passenger for the period from September 2013 to April 2014 was $40.71. This is considerably higher than the other observed values. The fact that the route was new and served a select group of commuters likely contributed to this value. Mason is currently advertising that people can park for free at the Burke VRE station and take the shuttle to campus which should contribute to improved route performance in the future.

Table 4-9: Mason Shuttles Subsidy per Passenger

	Subsidy per Revenue Hour	
Route	**Value**	**Rank**
Mason to Metro	$3.93	1
Mason to Metro Express	$7.39	4
Gunston Go-Bus George	$7.27	3
Gunston Go-Bus Mason	$7.27	2

Composite Score

Composite scores were calculated by summing the individual rankings of the routes for each measure to create an overall ranking that considers all the measures. Due to the consistency in the CUE route rankings for each of the four measures, the Gold 2 was the best performing route and the Green 2 the worst performing. The small differences between the routes should be noted, as all the routes exceed the CUE TDP established standards.

Table 4-10: CUE Route Rankings

Route	Ranking					
	Passengers per Revenue Hour	Passenger Revenue Recovery	Subsidy per Revenue Hour	Subsidy per Passenger	Composite Score	Composite Ranking
Gold 1	2	2	2	2	8	2
Gold 2	1	1	1	1	4	1
Green 1	3	3	3	3	12	3
Green 2	4	4	4	4	16	4

There was more variability in the scoring for the Mason Shuttle routes, however the composite scoring was much tighter than the scoring for CUE. The Mason to Metro route was the highest performing route based on the measures considered, while the Mason to Metro Express was the lowest performing route. The Mason to Metro route will likely outperform the Express route due to the design of the route. The Express route does not provide a significant time savings over the Mason to Metro route and has fewer stops, thereby limiting the pool of eligible riders. These factors likely contribute to the Mason to Metro route carrying more passengers. It should be noted that the Mason to Metro Express route has shown considerable growth in ridership since its first year in operation.

Table 4-11: Mason Shuttles Route Rankings

Route	Ranking					
	Passengers per Revenue Hour	Passenger Revenue Recovery	Subsidy per Revenue Hour	Subsidy per Passenger	Composite Score	Composite Ranking
Mason to Metro	1	n/a	4	1	6	1
Mason to Metro Express	4	n/a	1	4	9	4
Gunston Go-Bus George	3	n/a	2	3	8	3
Gunston Go-Bus Mason	2	n/a	3	2	7	2

Portfolio Analysis

While the ordinal approach assesses individual routes using key performance measures and compares them to other routes within that system; the portfolio approach provides insight into performance by assessing route performance relative to the whole of the system. Through this approach it is possible to see how individual routes contribute to overall system performance.

Three perspectives were examined:

- ridership contribution;
- deficit contribution; and
- combination passenger revenue recovery/deficit.

Ridership Contribution

When developing a system improvement program, it is important to consider the distribution of passengers across the system's routes. Typically, there are a small number of routes that carry a large portion of the system's ridership. Improvements on these routes, resulting in small route-specific ridership increases, can have large impacts on the system ridership. This isn't the case with CUE. The design of the CUE system has four routes that provide very similar levels of service, resulting in similar levels of ridership. The Gold routes carry just over half of the system's ridership. The Green 2 route carries the smallest percentage of system ridership, at just over one-fifth.

Table 4-12: CUE Ridership Contribution (FY 2013)

Route	Riders	Percent Contribution
Gold 1	228,511	27.0%
Gold 2	227,774	26.9%
Green 1	205,095	24.2%
Green 2	185,066	21.9%

Conversely, with the Mason Shuttles, the Mason to Metro route carries the bulk of the ridership for the routes studied. Combined with the Metro Express route, the service to the Vienna/Fairfax-GMU station would account for almost 90 percent of the ridership.

Table 4-13: Mason Shuttles Ridership Contribution (FY 2013)

Route	Riders	Percent Contribution
Mason to Metro	265,212	79.1%
Mason to Metro Express	28,914	8.6%
Gunston Go-Bus George	20,263	6.0%
Gunston Go-Bus Mason	21,091	6.3%

Revenue Hours Contribution

Similar to ridership, many systems have a large percentage of service scheduled on a small number of routes. Optimizing service for these routes can result in significant improvements to the financial condition of the system.

The revenue hour contribution for CUE routes is more evenly distributed than the ridership contribution. All the routes contribute approximately one-quarter of the revenue hours of the system. Based on this analysis, changes to one route would only have minimal impact to the overall system performance.

Table 4-14: CUE Revenue Hour Contribution (FY 2013)

Route	Revenue Hours	Percent Contribution
Gold 1	8,785.92	26%
Gold 2	8,448.00	25%
Green 1	8,448.00	25%
Green 2	8,110.08	24%

The Mason to Metro route contributes the majority of the revenue hours for the routes studied at nearly 61 percent. Together the two Metro routes contribute 80 percent, which is slightly less than their combined ridership contribution. The Gunston routes contribute 20 percent of the service hours.

Table 4-15: Mason Shuttles Revenue Hour Contribution (FY 2013)

Route	Revenue Hours	Percent Contribution
Mason to Metro	12,018.53	60.5%
Mason to Metro Express	3,795.33	19.1%
Gunston Go-Bus George	1,978.13	10.0%
Gunston Go-Bus Mason	2,058.87	10.4%

Combination Passenger Revenue Recovery/Deficit

Another method to categorize a route's financial performance is through examination of both the farebox recovery and deficit amounts for each route. Since Mason Shuttles do not collect fare revenue it will not be examined using this method. The performance of each bus route is compared to the average passenger recovery (45.23%) and average deficit. Using these two ratings, the routes can be categorized into four categories described in Table 16.

Table 4-16: Passenger Revenue Recovery and Deficit Quadrants

	Route Performance Compared to Average	
Service Increase Priority	**Passenger Revenue Recovery**	**Contribution to Deficit**
1	Better (Higher)	Better (Lower)
2	Better (Higher)	Worse (Higher)
3	Worse (Lower)	Better (Lower)
4	Worse (Lower)	Worse (Higher)

On average, each CUE bus route should account for about one-quarter of the system deficit, or $397,033 because of the symmetry in service characteristics observed across the four routes. The value reported in Table 17 for the deficit is below 1.0 if the route contributes less than the average and over 1.0 if it contributes more.

Table 4-17: CUE Farebox Recovery and Contribution to Deficit (FY 2013)

Route	Farebox Recovery (%)		Contribution to Deficit		Category
	Value	**Rating**	**Value**	**Rating**	
Gold 1	47.59%	Better	1.00	-	1
Gold 2	47.78%	Better	0.95	Better	1
Green 1	43.32%	Worse	1.03	Worse	4
Green 2	42.00%	Worse	1.02	Worse	4
Average	**45.23%**		**1.00**		

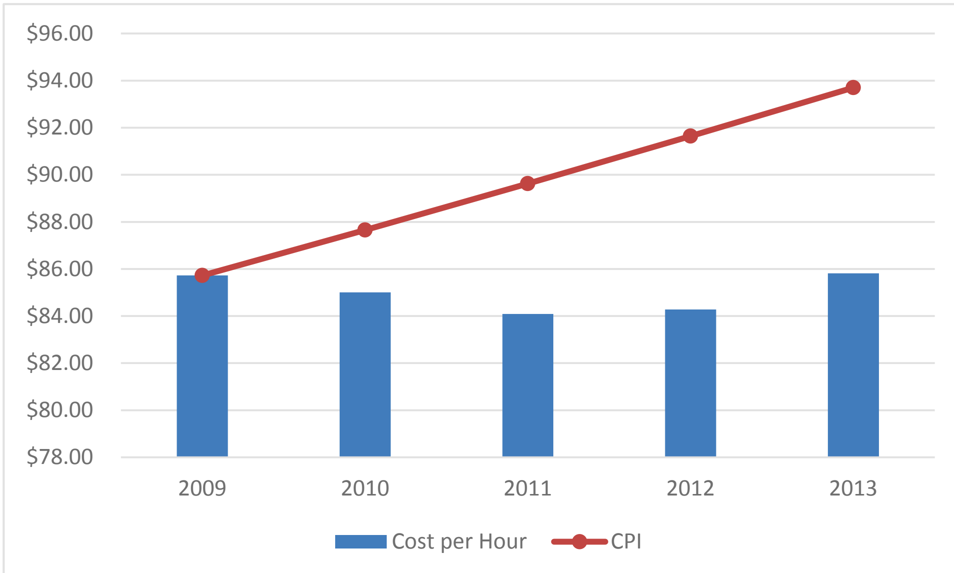
The two Gold routes fall into this category 1 with superior ratings in both categories, while the two Green routes fall into category 4 with poor revenue recovery and deficit contribution. Routes that fall into category "4" score below the standard for Farebox Recovery and Deficit Contribution, and should be targeted for improvements that are able to more closely balance the supply and demand characteristics. It should be noted that the differences between "Better" and "Worse" for the CUE routes is very small. This is likely due to the small number of routes operated and the relative similarity of each route's service characteristics and performance. All of the routes perform better than system standards in the TDP that were described in the previous section. All of the CUE routes displayed better than a 40 percent revenue recovery ratio. This is a high number by industry standards, and outperforms many regional transit agencies, which only recover around 20 percent of their costs through fare revenue. The Green routes are still candidates for improvements that would result in better performance.

Service Efficiency

Service efficiency examines the amount of public transportation service provided for a community in relation to the resources expended. Service efficiency answers the question, "How much does it cost to produce a unit of transportation service?" One measure of service efficiency is operating expense per revenue hour. The lower the cost of the revenue hour of service, the more efficient the system.

The cost per revenue hour has remained relatively unchanged for CUE over the past five years. The costs dropped slightly in 2010, '11, and '12, but came back up to around $86.00 per hour in 2013. Overall the cost has not increased relative to the consumer price index during the same period which increased 2.25 percent per year.

Figure 4-1: Operating Expense per Revenue Hour for CUE



The cost per hour for both the Mason to Metro (including Express) and Gunston Go-Bus (George and Mason) have been increasing since 2010. Other than a small decrease between 2009 and 2010, the cost per revenue hour has been increasing annually by about 4-5 percent. This rate of increase outpaces that of the consumer price index. It is difficult to determine the cause of the increase in the cost per revenue hour for Mason Shuttle routes due to the lack of detailed cost information provided. It could be associated with changes in fuel prices, increased overhead, or costs associated with the other Mason Shuttle routes not being studied through this effort.

Figure 4-2: Operating Expense per Revenue Hour (Mason to Metro)

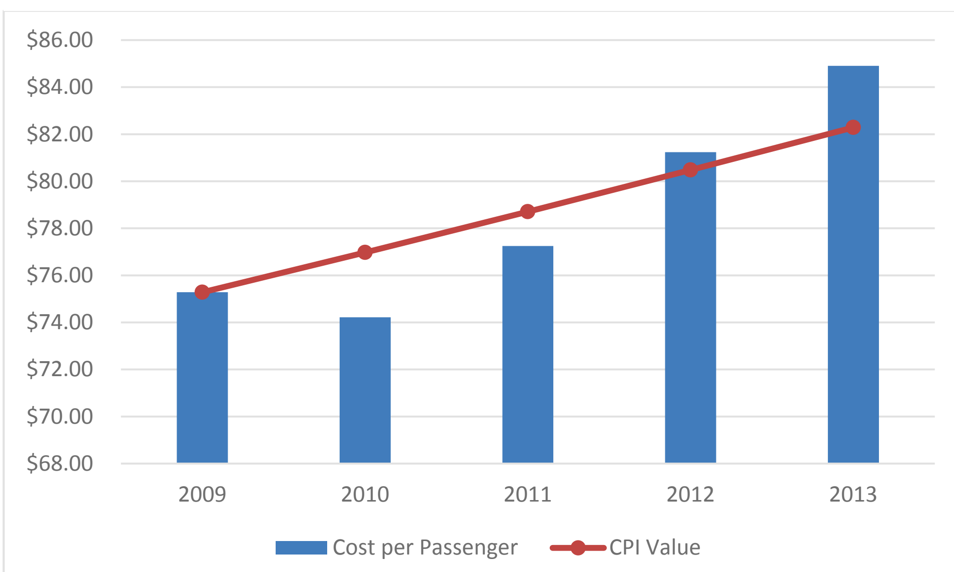


Figure 4-3: Operating Expense per Revenue Hour (Gunston Go-Bus)

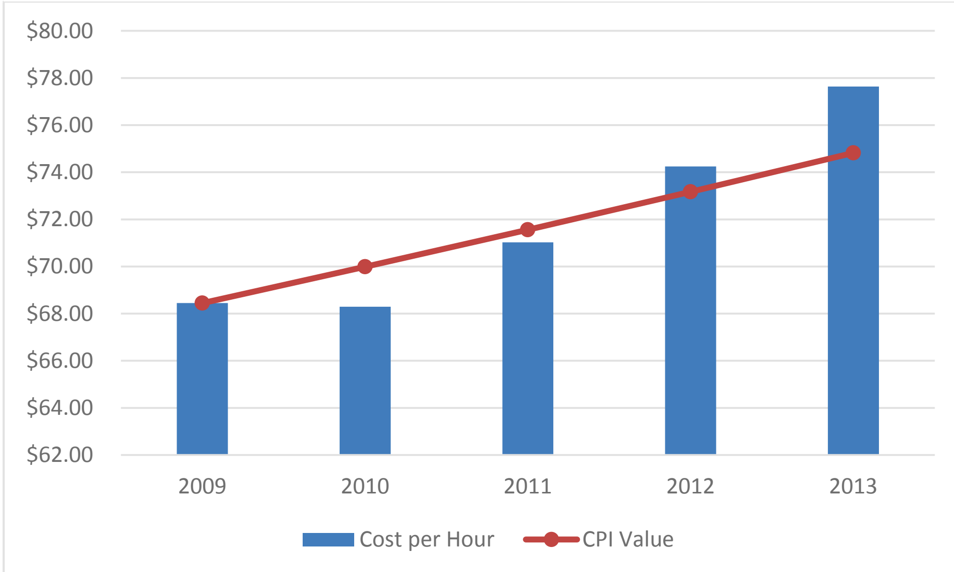
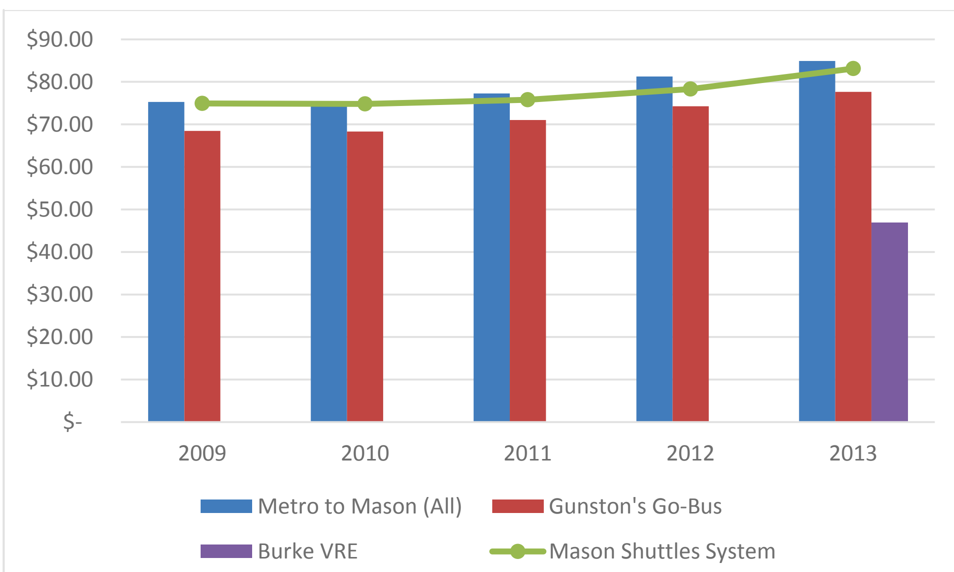


Figure 4 compares the three study routes against the system-wide cost per revenue hour. The cost per hour for Gunston Go-Bus and the Burke VRE routes are below the system average. Starting in 2011 the cost per hour for the Metro to Mason route began rising above the system average. This is likely associated with adding the Mason to Metro Express in 2012, compared to the relative static service characteristics of the other Mason routes in the system. The higher cost compared to the system average is minimal, and should just be monitored moving forward.

Figure 4-4: Operating Expense per Revenue Hour (Mason Shuttles)



Service Effectiveness

Service effectiveness is a measure of the consumption of transportation service in relation to the amount of service available. The measure of passengers per revenue hour is used to assess the amount of service consumed. The more passengers carried per service hour provided, the higher the level of service effectiveness.

The passengers per revenue hour has been steadily declining for CUE over the past five years. This isn't surprising because the service supplied has remained static while the ridership has decreased. One possible explanation could be the fare increases that have occurred in recent years. The increases have been in response to decreased funding, which could be linked to lower ridership totals. The riders who are in the greatest need for public transportation are often the ones who have the hardest time adjusting to fare increases. Low-income riders are more likely to adjust their travel based on fare changes.

Figure 4-5: Passengers per Revenue Hour (CUE)

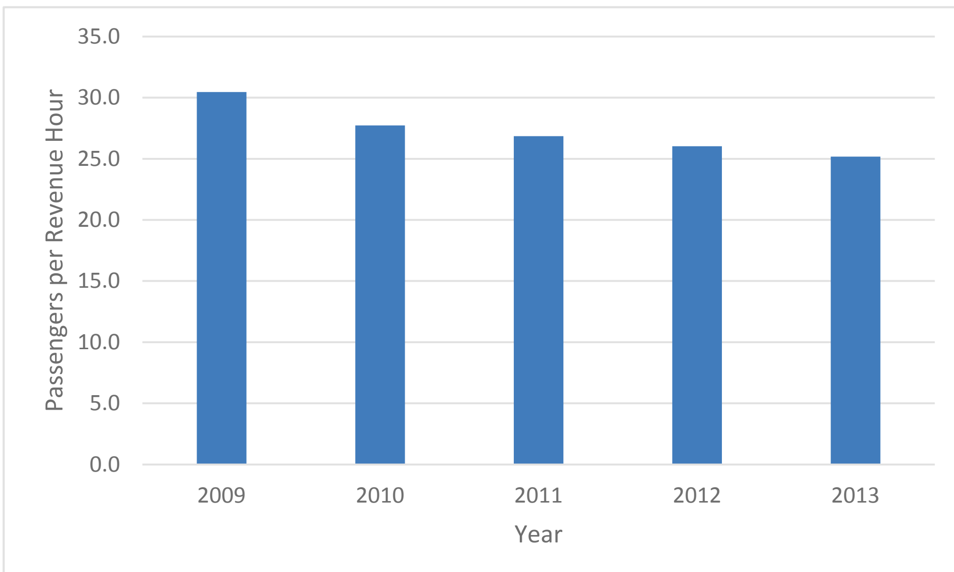
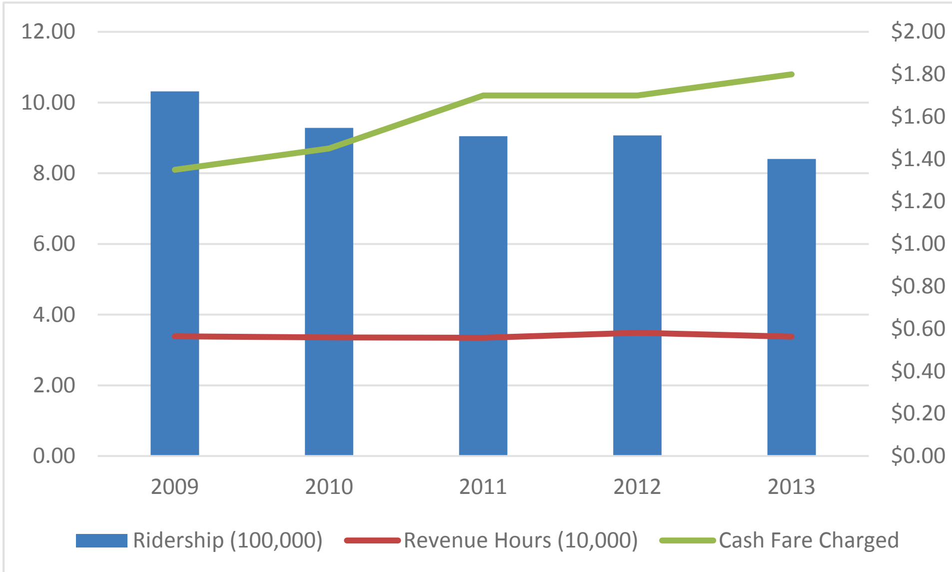


Figure 6 plots the ridership for CUE against service hours, and cash fare charged. While ridership has been declining, most notably in 2010, the fare charged has been increasing, while service hours have held relatively steady. While causation can't be confirmed, the fare charged changes do correspond to changes in ridership.

Figure 4-6: Comparison of Service, Passenger, and Fare Trends (CUE)



Passengers per revenue hour for the Mason to Metro routes and Gunston Go-Bus routes display different patterns over the last five years. Mason to Metro routes have shown consistent growth in the number of riders carried per hour of service from 2009-2012. The decline in 2013 is likely associated with the addition of the Express service. The new route added service to the system, but didn't result in a corresponding increase in ridership, likely because it was new. As noted earlier, the ridership on the route picked up in 2014. The Gunston Go-Bus route showed steady declines in passengers carried per hour. The amount of service provided has changed over the past five years. A second bus was added in 2010, which doubled the service supplied. There was not a commensurate increase in ridership. Service was relatively unchanged between 2011 and 2012, with no appreciable change in ridership. In the fall of 2013, the Gunston Go-Bus Mason route added morning service. This increase in service also brought new riders and increased the service effectiveness.

Figure 4-7: Passengers per Revenue Hour (Mason to Metro)

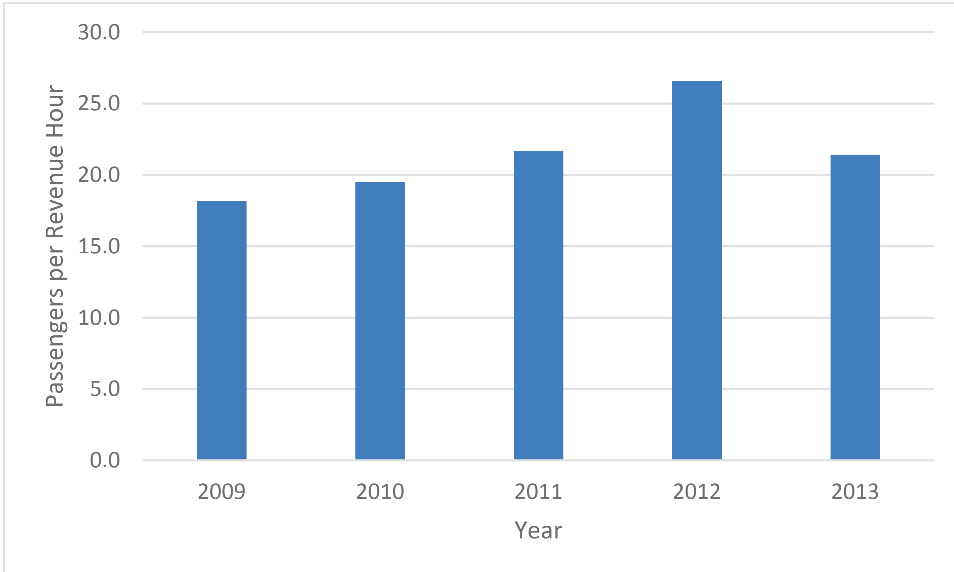


Figure 4-8: Passengers per Revenue Hour (Gunston Go-Bus)

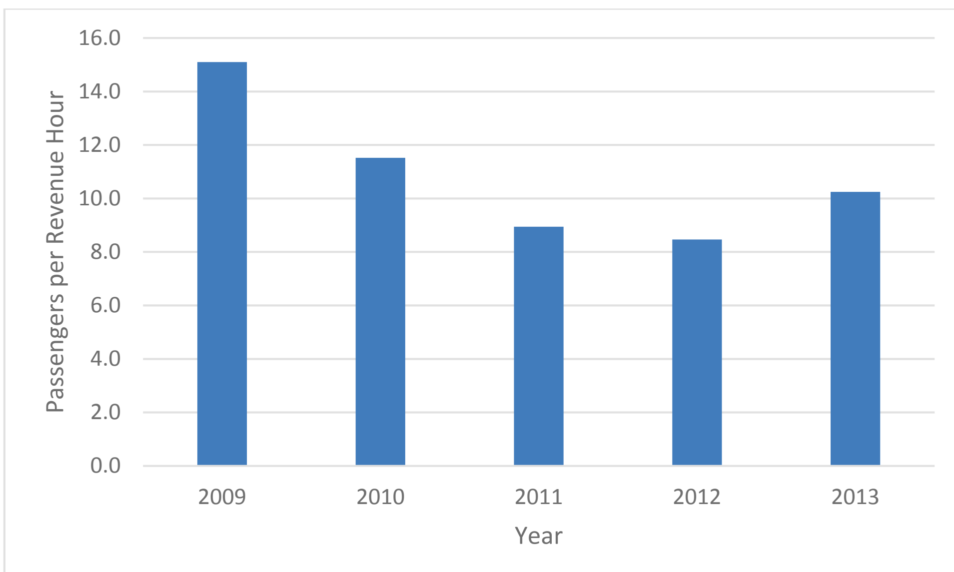


Figure 80 shows the percent change in Mason to Metro ridership against the percent change in service supplied. Ridership was outpacing the increase in service up to 2012 when more service was added, not resulting in a corresponding increase in ridership. This trend continued in 2013. The changes in service for the Gunston Go-Bus did not initially result in a comparable increase in ridership, but recent “tweaks” appear to be resulting in better ridership growth, especially for the Gunston Go-Bus Mason route.

Figure 4-9: Comparison of Service and Passenger Trends (Mason to Metro)

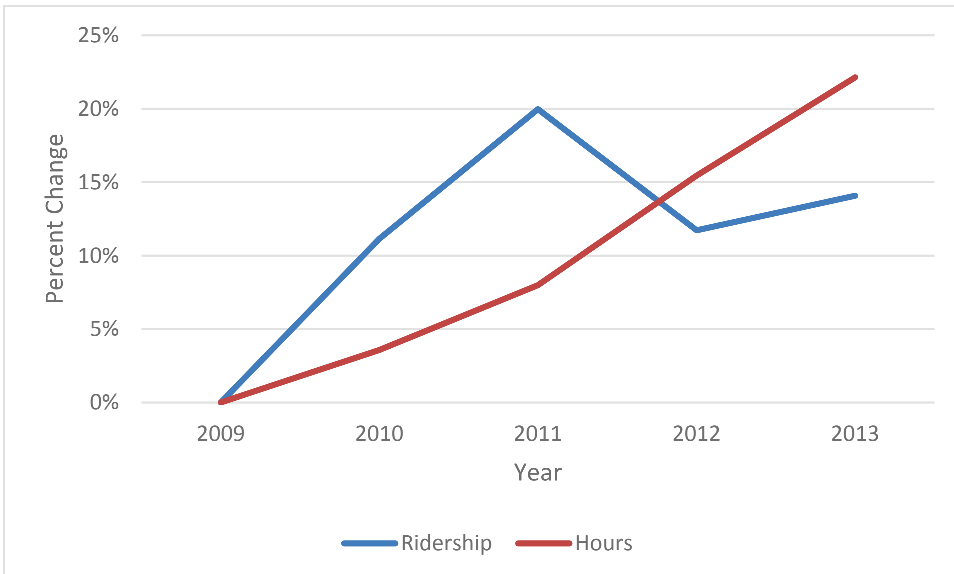
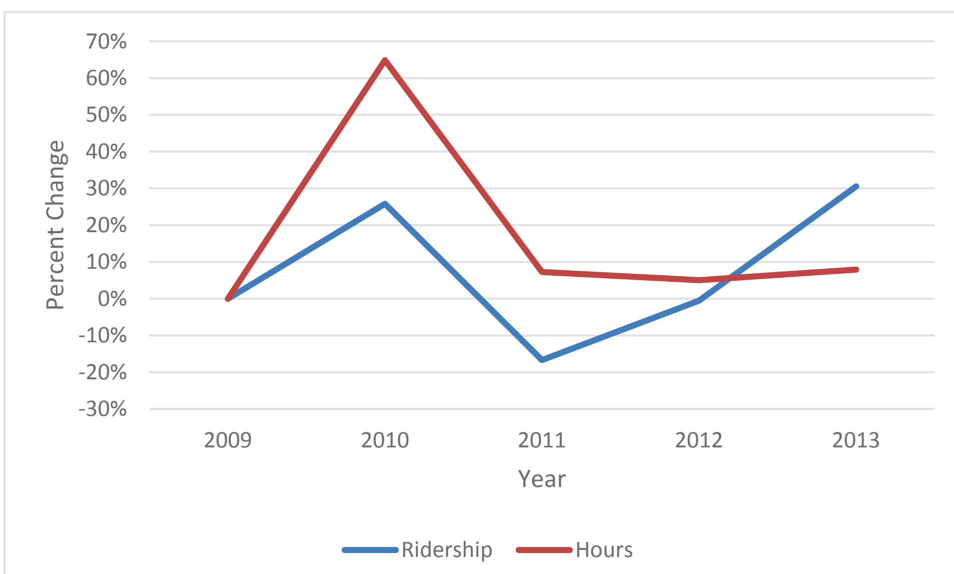


Figure 4-10: Comparison of Service and Passenger Trends (Gunston Go-Bus)



Cost Effectiveness

Cost effectiveness addresses the consumption of transportation services in relation to the resources expended. Total operating expense per passenger measures how much it costs to transport a transit rider. The lower the expense per passenger served, the more cost effective the service.

The cost per passenger for CUE service has increased over the past five years, in many years exceeding the CPI increase of 2.25 percent. This is likely the result of decreasing ridership in relation to the cost to operate the service. The cost has remained relatively flat, but ridership has dropped since 2009.

Figure 4-11: Operating Expense per Passenger (CUE)

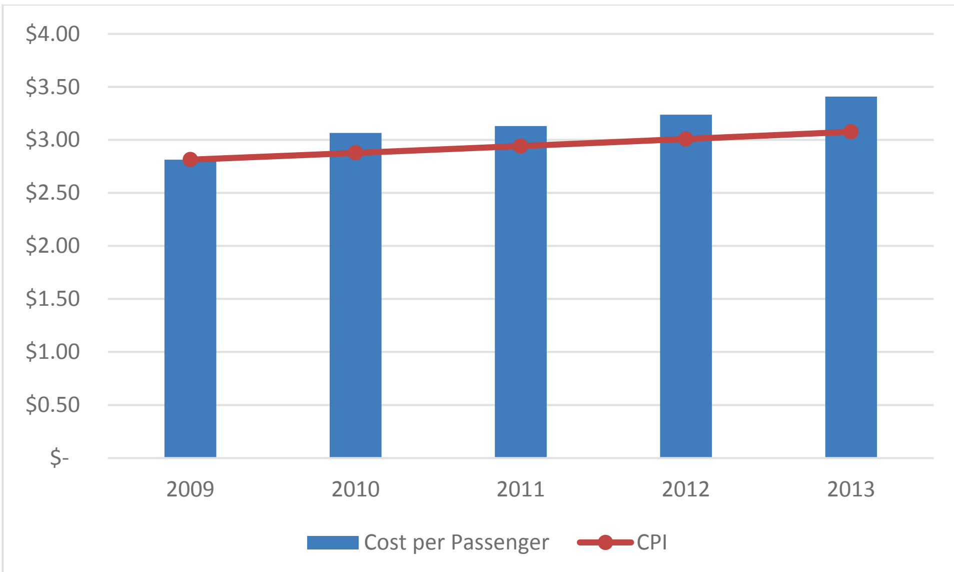
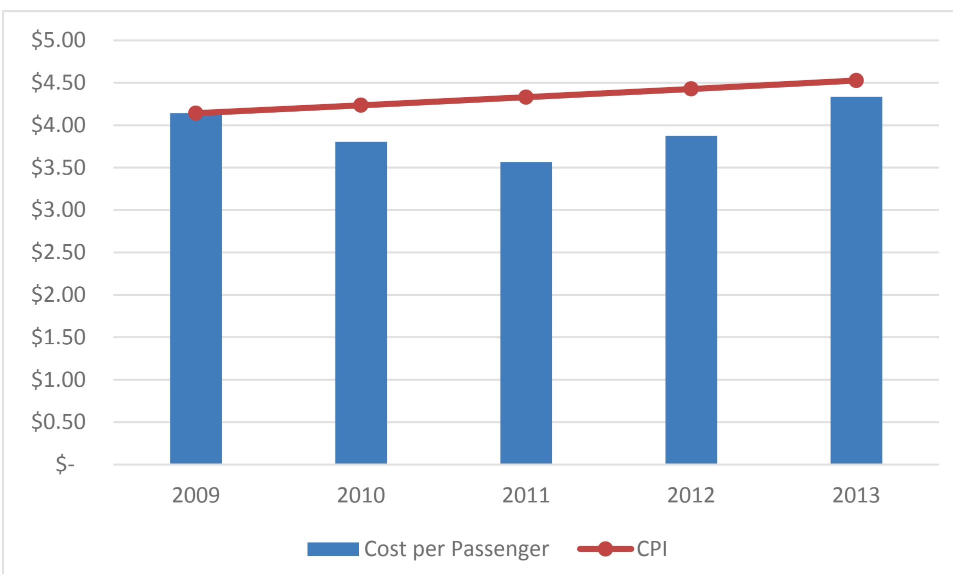


Figure 4-12: Operating Expense per Passenger (Mason to Metro)



The cost per passenger for the Mason to Metro services decreased between 2009 and 2011, before increasing in both 2012 and 2013. The decreases were associated with the cost effectiveness of the

Mason to Metro route growing ridership while keeping cost increases to a minimum between 2009 and 2011. The addition of the Mason to Metro Express route in 2012 increased costs without adding a corresponding increase in riders. The cost per rider increases should slow as the service continues to grow ridership. The cost per rider for the Gunston Go-Bus was increasing considerably until 2012, and actually dropped in 2013. The additions to the Gunston Go-Bus Mason route seem to have resulted in enough of a ridership increase to offset the additional costs.

Figure 4-13: Operating Expense per Passenger (Gunston Go-Bus)

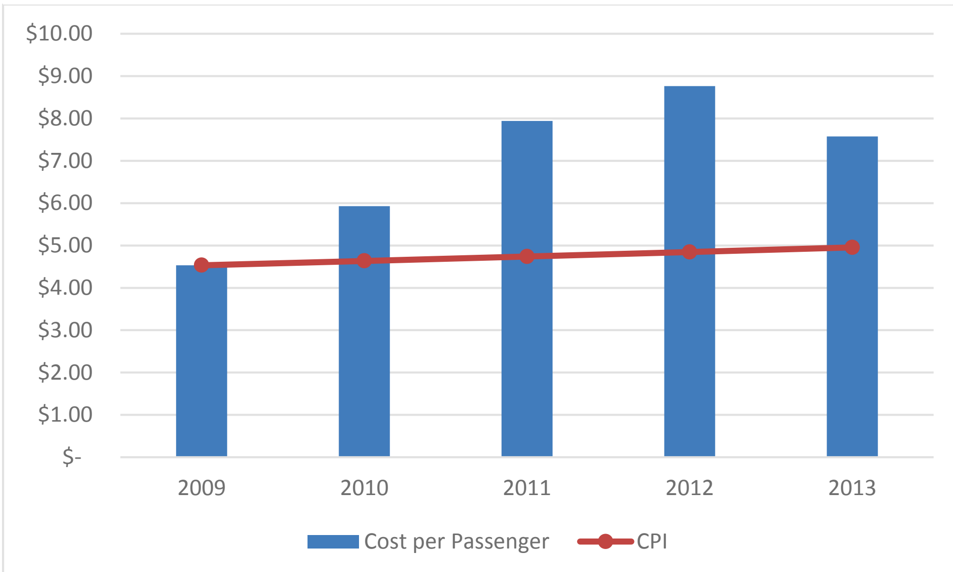
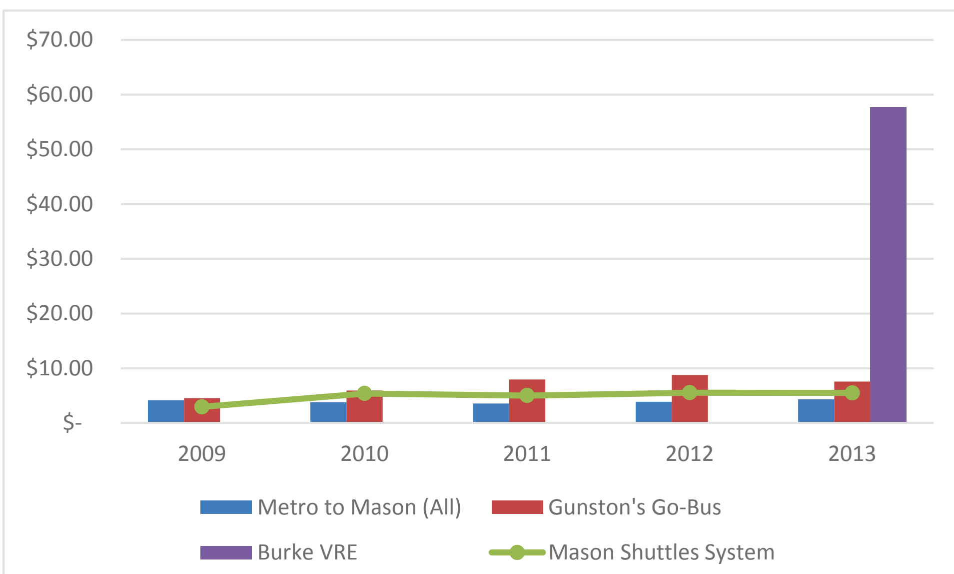


Figure 4-14: Comparison of Operating Expense per Passenger against Mason Shuttle System



As a system, Mason Shuttles has kept a relatively flat cost per passenger; around $5.00 per rider. This has been possible through having high ridership routes, like the Mason to Metro route offsetting lower ridership routes like the Burke VRE shuttle. Overall, the Mason to Metro and Gunston Go-Bus routes are performing right around the system average for cost per passenger. The Burke VRE shuttle, in its first year of operation did not; but should improve based on other observed trends and greater marketing.

Conclusion

Based on the analysis, both systems are performing well in most measures. The CUE Gold routes have performed slightly better than the CUE Green routes, with the Green 2 being the lowest performing of the four. The Mason to Metro route has been the strongest performing route when considered without the Express route. The addition of the Express route in 2012 added considerable service, but struggled initially in adding the same level of ridership. The Gunston Go-Bus routes appear to be performing better in recent years after making several adjustments. The Burke VRE shuttle did not perform well in terms of service effectiveness, but this is likely associated with the specific commuter market being served and lack of knowledge about a new route. Efforts to market the route should improve performance.

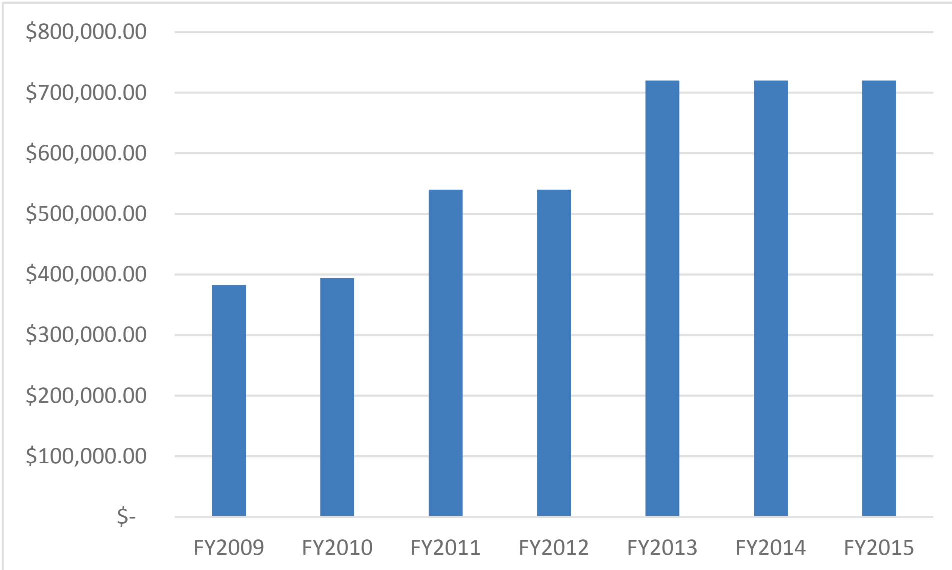
The different analysis techniques included in this section provide a snapshot of financial productivity and performance. The procedures are diagnostics in that they provide one input to subsequent service planning steps. Other information, derived from the ride checks, surveys, and other analysis will also influence service proposals. Other considerations may also influence decisions related to service proposals.

4.3 Mason Contribution to CUE

George Mason University has been contributing funding for the CUE bus system through a long-standing partnership with the City of Fairfax. Mason contributes funding assistance to cover a portion of the operating and capital costs for CUE; and students, faculty, and staff receive the benefit of riding fare-free per the annual agreement. The amount contributed has varied over the years, and has not always increased from year to year (Figure 15). Table 1 shows the Mason contribution relative to CUE operating costs. The numbers show that in recent years Mason's contribution has been a greater percentage of the CUE operating budget. This declined in fiscal year 2015 as the City began accounting for the costs other City departments provide to CUE by a assigning a portion of city management costs to the operating cost of CUE. These services include things like human resources support for CUE staff, legal and risk management services provided by the City, and information technology support. The management fee added an estimated $500,000 to the operating costs currently budgeted for CUE service.

A review of the agreements between Mason and the City show that the funding amount used to be tied to a formula linking ridership and a predetermined fare of $0.25. This formula was used to determine overages that would be paid in addition to a base payment agreed to by both parties in the contract. Changes in the base payment were linked to growth in the campus population and inflation. The agreements were in effect for a period of three to five years with the ability to renew based on agreement between the two parties. Recently, the base payment has been determined through negotiations between the two parties and the use of a formal formula has been discontinued, although as illustrated by Table 4-18 below, the amount paid continues to be closely related to Mason's share of operating and capital costs of CUE.

Figure 4-15: George Mason University's Contribution to CUE



[11]

Table 4-18: Mason Contribution and CUE Operating Costs[12]

	Total CUE Operating Cost	Mason Contribution	Mason Percent of CUE Operating Cost	Total CUE Ridership	Mason Ridership on CUE	Mason Percent of CUE Ridership
FY2009	$ 2,829,830	$ 382,500	14%	1,027,335	314,903	31%
FY2010	$ 2,765,730	$ 393,975	14%	932,178	320,369	34%
FY2011	$ 2,732,325	$ 540,000	20%	902,107	323,602	36%
FY2012	$ 2,732,159	$ 540,000	20%	909,100	328,446	36%
FY2013	$ 2,958,853	$ 720,000	24%	851,819	314,984	37%
FY2014	$ 2,976,460	$ 720,000	24%	826,246	298,766	36%
FY2015	$ 3,538,438	$ 720,000	20%	771,188	288,045	37%

[11] The City of Fairfax's figures for Mason's contribution in FY2010 was reported as $298,320 in published budget reports. Due to the timing of payments received over multiple fiscal years, the payment appears lower than the actual contracted amount. Therefore, a 3 percent growth rate was applied to the FY2009 contribution per the direction of the City and Mason.
[12] Source: *CUE and Metrobus fares 1980 through present* spreadsheet provided by the City of Fairfax.

Other Examples of University/Municipal Funding

The determination of a payment for transit services between a municipality and an institution of higher education is done a variety of ways throughout the country; and there is no industry standard for arriving at a “magic number”. Some institutions pay for the amount of service operated specifically for their needs, others will pay a fee to cover the ridership associated with the institution, and others will negotiate an agreed upon fee that isn’t tied to the amount of service provided or the ridership.

For instance,

- The City of Harrisonburg, Virginia provides transit services for the City as well as James Madison University (JMU). JMU contributes funding allowing their faculty, staff, and students to ride fare free. The Harrisonburg Department of Public Transportation (HDPT) and the University meet every year to determine the amount of the contribution. There is no formula that drives the negotiation, but the amount provided is able to cover the dollar figure for the fare of those associated with JMU.

- Virginia Commonwealth University (VCU) recently transitioned to a privately-operated transit service from one contracted through the local public transit agency. Prior to implementing RamRide, VCU contracted with GRTC Transit System, the transit provider for the Richmond region. Under their annual agreement, VCU would pay GRTC a fee based on the miles of service operated. The cost per mile figure was set annually.

- Liberty University in Lynchburg, Virginia provides transportation to the campus through a combination of University-operated shuttles and contracted services with Greater Lynchburg Transit Company (GLTC). In addition, Liberty students can get a free monthly pass from the University’s card services, allowing fare free rides on any GLTC route. The contracted services operated by GLTC are paid based on a rate per hour of service provided to Liberty.

- The University of North Carolina’s (UNC) transit services are provided solely by the Town of Chapel Hill. The Town submits a bill to the University based on a formula to cover the costs of the entire transit service apportioned to the University. The formula only covers operating costs, not capital, and does not cover routes specifically operated for UNC, for which the University pays the full cost of operation.

- Cornell’s transit services are provided by a not-for-profit agency comprised of representatives of the University, Tomkins County, and the City of Ithaca. All three parties used to operate their own services, which resulted in duplication. The parties decided to combine as a single agency called TCAT where they all had an equal say in the operations. Each member contributes one-third of the costs. Cornell does pay for any additional services that are contracted specifically for the University. Students, faculty, and staff are still required to purchase bus passes to ride TCAT. However, faculty and staff bus passes are covered as part of their employee benefits. Students received a free bus pass their first year as an incentive to not bring a car. After their first year, students pay a reduced fee for the annual bus pass.

The review of a handful of school transit services highlights the fact that there as many different funding and operating arrangements as there are schools. Each school and the surrounding municipalities determine the arrangement that fits their needs appropriately. There is no one-size-fits-all, or “right” way to operate and fund a transit service for an institution of higher learning.

Analysis of Mason Contribution

Mason contributed $720,000 to the City of Fairfax in fiscal years 2013, 2014, and 2015, and $750,000 in FY 16. The CUE operating cost for FY2013 was $2,958,853[13]. The CUE transportation fund also shows operating costs for CUE that are associated with the amortization of capital assets at $40,000 annually. This results in a total operating cost figure for CUE in FY2013 of $2,998,853. To determine the amount of CUE’s operating cost Mason should be paying, it is necessary to remove fares paid by non-Mason riders and any additional funds the City might receive for transit operations. It is important to note that these other funding sources, such as operating assistance from the state, fluctuate from year to year. Also, the reported fare revenue for CUE should not be used as the local revenue amount for this assessment because CUE further subsidizes certain groups of riders (seniors and high school students). To eliminate this additional subsidy it is necessary to apply the CUE cash fare to the non-Mason ridership count. The full rate local revenue for non-Mason riders for FY2013 would have been $949,464 (527,480 riders at $1.80 fare). Subtracting the state support and full rate local revenue from the total CUE operating cost results in a City Cost to Operate CUE of $1,449,389[14]. Mason contributed roughly 36 percent of the total CUE ridership in FY2013, resulting in the Mason portion of the CUE operating costs being approximately $521,800[15].

In addition to contributing operating costs, Mason also agrees to cover a portion of CUE’s capital costs. The City purchases replacement vehicles periodically based on the life cycle of the existing fleet. The City pays for the vehicles at the time of purchase. Some portion of this cost has in the past been covered by other funding sources, such as the state, but the availability and amount of capital assistance varies. These additional sources should be considered.

Currently, CUE’s fleet is comprised of six diesel buses and six hybrid-diesel buses. The purchase price for one of CUE’s hybrid-diesel buses was $548,888 in August 2009[16] and the cost of a new diesel bus in July 2015 was approximately $450,000. The cost to replace the entire fleet of six diesel buses and six hybrid-diesel buses would be approximately $6,600,000[17]. The useful life for a heavy duty bus is 12 years, resulting in an annual cost of $550,000.

Whether the City receives funding to support capital purchases should be a consideration when determining Mason’s share. Because Mason does not provide the City with their share of the capital purchase at the time of delivery, but does so over time, consideration should be given to amortizing the cost borne by the City.

In sum, the Mason contribution is substantial enough that a significant fare increase would be required to cover the shortfall if Mason stopped providing a direct subsidy. Increasing fares would likely result in a ridership decrease. In the survey results Mason riders, especially students, reported

[13] Source: *CUE and Metrobus fares 1980 through present* spreadsheet
[14] $2,998,853 - $600,000 - $949,464
[15] $1,449,389 x 36%
[16] Source: City of Fairfax Asset Inventory Database
[17] Assumes that a new diesel bus is $450,000 and a new hybrid-diesel bus is $650,000.

high sensitivity to fare increases. Requiring them to pay a fare would likely shift more riders to the Mason Shuttle system. The Mason to Metro services are already operating at or near capacity on many trips during the peak travel times. Shifting Mason riders off CUE to the Mason to Metro routes would likely result in overcrowding and a need to add service. Combining the annual operating and capital costs for the CUE Gold 1 and 2 results in a cost per rider of $3.91 versus $4.27 for the Mason to Metro and Mason to Metro Express routes. This comparison accounts for vehicle depreciation costs that are likely included in the Reston Limousine fee charged to Mason. Increasing service on the Mason to Metro routes would cost Mason more money than it currently pays per rider to CUE. There would also be a loss of transportation to areas of the City of Fairfax not currently covered by Mason Shuttles. A quarter of the Mason-affiliated riders surveyed on CUE traveled to or from locations that are not accessible using current Mason Shuttles routes. More Mason-affiliated riders were recorded on the CUE Green routes (44%) than on Gold routes (37%) according to CUE ridership figures and survey results. Loss of CUE access would result in a need for additional Mason service that would likely not be very successful from a cost per rider perspective. By using CUE, costs are shared by the City and the additional ridership associated with City riders. The current contribution seems to be an effective compromise for equitable service allocation and funding. Changing the current agreement would not only impact finances, but also disrupt operations

If CUE service for Mason were discontinued, riders that could not utilize another transit option would likely be forced to drive to campus. This would place more vehicles on already congested roads surrounding the Fairfax campus, and require a larger demand for parking on campus. The *Mason Transportation Master Plan* developed a 2020 forecast for parking demand. The *Plan* also presented a scenario whereby parking demand could be decreased through the use of travel demand management policies that shift people to other modes, such as transit. The *Plan* also places a high priority on programs and policies that “reinforce non-automobile travel”. The proposed reduction in driving associated with transit use helps the University meet its goal for carbon neutrality and financial sustainability. The plan states, “each student or faculty/staff trip converted from a single-occupant vehicle to transit reduces competition for roadway capacity, eliminates the need for a parking space, and removes conflicts with non-motorized travel modes, improving efficiency”. There are costs associated with providing additional road capacity and parking on campus that Mason would have to incur if the current service arrangement with CUE were altered. As presented above, the payment of a fare doesn’t typically cover the full operational costs associated with providing transit service. Even a system like CUE, with a relatively higher farebox recovery for the region, still requires a subsidy to cover the costs. Mason’s contribution assists in covering this deficit and lowering the overall subsidy per rider.

That being said, Mason and the City should periodically monitor the ridership and capital costs associated with the CUE service to make sure the contribution remains efficacious for both parties. The agreement and the guidelines should be revisited often enough to allow for the City to plan for new vehicles and service if needed, but also account for the time it takes to work such agreements through the City and University administration. Consideration for developing a set of guidelines that derives the contribution would result in a contribution that can be justified by actual numbers, and serves as baseline for further negotiation. Developing guidelines that accounts for the cost components each currently agrees are important (operating and capital) can be easily accomplished. This would remove any ambiguity in the number agreed-upon each fiscal year. The exercise performed above demonstrated one method for determining the Mason contribution. Based on the current operations of CUE and the University, every three years seems optimal to determine what adjustments to the contribution are necessary based on changes in costs and/or ridership. Clauses should be added that would trigger the agreement being revisited sooner if there are major cost or ridership changes. What defines a major change should be agreed upon by both parties but could include a 10 percent change in Mason ridership or CUE's operating costs.

An average of the previous three years of ridership would be recommended to account for year to year fluctuations in any guidelines used. The capital cost portion of the guidelines should be based on Mason's portion of the ridership and the City's portion of the match from the state for capital purchases. Capital costs should be increased by an annualized fleet replacement cost. Additionally, applying an amortization of capital costs would offset the burden the City endures by having to front the fleet replacement cost before receiving payments from the state. A modest growth rate could be applied to the initial figure to account for inflation.

4.4 Ridership Analysis

The existing conditions report contained information about passenger boardings and alightings at the stop-level collected through on-board surveys. This information highlighted heavily used stops. It also provided information about route activity based on passenger loads; indicating those sections of the route that are most heavily utilized. To supplement the initial ridership study, additional analyses were done. These include:

- Origin and destination analysis;
- Load factor analysis;
- Transfer analysis;
- Analysis of the impacts of large events; and
- Analysis of desired locations.

Origin and Destination Analysis

One measure of route efficacy is to examine the origin-destination pairs associated with the rider survey. Stop pairings were examined for both trip purpose and individual stop. Trip purpose refers to the function of the origin and destination associated with the surveyed trip, for example, Home to Shopping or Work to a Medical appointment. Individual stop volume refers to the number of surveyed riders traveling from one specific stop to another specific stop, the Vienna Metro to Pan Am Shopping Center, for example. These stop pairings were compiled into matrices and then examined for notable results. The example table below shows the trip purposes associated with riders surveyed on the Gold 1 & 2 Routes. More populous stop pairings are highlighted in red and orange.

Origin-Destination Trip Purposes by Route

CUE Gold 1 and Gold 2

The CUE Gold 1 and Gold 2 primarily connect riders coming from their Home to Work or from Home to College or University. Primary destinations were College (47 of 222), Home (53 of 222) and Work (70 of 222)There may be some sample issues as far more individuals were going to work or school than coming home from work or school. One "Other" destination that showed up multiple times for this route was the Courthouse/Jail complex.

Table 4-19: Gold 1 & 2 Rider Trip Purposes

		Destination								
	Type	College or University	Home	Medical	Other	Place of Worship	School (K-12)	Shopping	Work	**Grand Total**
Origin	College or University	4	13		2			1	3	**23**
	Home	41	12	1	17	1	5	9	62	**148**
	Medical				1					**1**
	Other		3		3			1		**7**
	Place of worship								1	**1**
	School (K-12)						1	2	1	**4**
	Shopping	2	3		1			1		**7**
	Work		22	1	3			2	3	**31**
	Grand Total	**47**	**53**	**2**	**27**	**1**	**6**	**16**	**70**	**222**

CUE Green 1 and Green 2

The primary origin for riders of the Green 1 or Green 2 is Home (106 of 197). The second-most primary origin was College (33 of 197) followed by Work (24 of 197). Those coming from Home were most likely to be going to Work (36 of 106) or College (31 of 106). The most likely destination was also Home, but with fewer destinations compared to originations (63 of 197). Other popular destinations were Work (50 of 197) and College (39 of 197). Seventy-five percent of all trips going to Work or College came from Home (31 of 39 or 36 of 50). While the most popular destination was Home, origins for that destination were fairly evenly split between college, other, and work.

Table 4-20: Green 1 & 2 Rider Trip Purposes

		Destination								
	Type	College or University	Home	Medical	Other	Place of Worship	School (K-12)	Shopping	Work	**Grand Total**
Origin	College or University	3	16		1		1	7	5	**33**
	Home	31	15	2	11	1	1	9	36	**106**
	Medical		1							**1**
	Other	1	12		5			1	2	**21**
	Place of worship	1								**1**
	School (K-12)		1							**1**
	Shopping	3	3		1			3		**10**
	Work		15		1			1	7	**24**
	Grand Total	**39**	**63**	**2**	**19**	**1**	**2**	**21**	**50**	**197**

Mason to Metro/Metro to Mason/Metro Express

The two primary origin-destination pairs for the Metro-Mason route were College/University to Home and Home to College/University, suggesting this is a primarily a route for students commuting to and from campus via the Vienna Metro. College made up 39 percent of the origins, and Home was another 41 percent. Similarly, those going to College made up 30 percent of destinations, and those going home made up 36 percent of destinations. The only other notable origin-destination pair was those going from Home to Work (27 percent of home origins). Of those going from Home to Work, 34 of 39 self-identified as working at Mason (23), or being a student at Mason (11).

Table 4-21: Mason to Metro Rider Trip Purposes

		Destination							
	Type	College or University	Home	Medical	Other	School (K-12)	Shopping	Work	**Grand Total**
Origin	College or University	19	74		28		6	9	**136**
	Home	66	19	1	14	3	1	39	**143**
	Medical	1					1	1	**3**
	Other	7	6		6		4	1	**24**
	Shopping	1	3						**4**
	Work	10	22		1			3	**36**
	Grand Total	**104**	**124**	**1**	**49**	**3**	**12**	**53**	**346**

Gunston Go-Bus "Mason" and "George"

The most popular trip purpose for the Gunston routes was from College to Shopping. With stops at the shopping centers at Fair Oaks, Fair Lakes, and Fairfax Corner, this should not be surprising. The bulk of trips originate at college (83 of 138) with Home and Shopping making up the remaining origins. Primary destinations are College (58 of 138), and Shopping (49 of 138). Three items of note were Home-College, College-Work and Home-Work ridership: 7 percent of riders were coming from Home to College, eight percent of riders came from Work to College or Home and 6 percent of riders came from College to Home or Work. While we tend to think of this route as being a recreational route for the students, these data show that more than a handful are using the route for educational or commuting purposes.

Table 4-22: Gunston Go-Bus Rider Trip Purpose

		Destination							
	Type	College or University	Home	Medical	Other	School (K-12)	Shopping	Work	**Grand Total**
Origin	College or University	27	5	2	7	1	36	5	**83**
	Home	10	2				5	3	**20**
	Other	1					2		**3**
	School (K-12)						1		**1**
	Shopping	11	2	1		1	5		**20**
	Work	9	2						**11**
	Grand Total	**58**	**11**	**3**	**7**	**2**	**49**	**8**	**138**

Burke VRE Shuttle

The Burke VRE Shuttle system sample size is very small at three riders. Those three riders were all traveling from a combination of Work or College origins to Home destinations. It's presumed that with the route only serving the George Mason campus and VRE Station that those respondents coming from Work were referring to work at GMU campus.

Notable Origin-Destination Stops Pairs by Route

Green 1

The Vienna Metro stop accounts for almost half of boardings – 43 of 107, next was Rappahannock River Ln with 15. The Vienna Metro accounts for fewer alightings than boardings – 24, with

Rappahannock River Ln (16), Main Street/Pickett Road (8) and Fairfax Blvd/Pickett Road (9) filling in. If riders get on at the Metro, they tend to get off at Main Street/Pickett, Pickett/Mathy, and Pickett/Turnpike/Rappahannock Ln. Similarly, if you boarded at Main/Pickett, you were most likely to get off at Rappahannock River Ln. While boardings are primarily concentrated at the Metro, alightings are fairly very evenly dispersed throughout the stop area. Twenty-five named stops had boardings, and people got off at 27 named stops.

Green 2
The Vienna Metro accounts for about one-third of boardings/alightings (balanced both ways – 28 of 93). Other than Vienna, people get on at Fairfax Blvd/Pickett Road (14) and at Rappahannock River Ln (13). Other than Metro, people tend to get off at Rappahannock River Ln (12), George Mason Blvd/School Street (6) and Fairfax/Pickett (6). People that got on at Fairfax/Pickett were largely going to Rappahannock River Ln (6 of 14) or the Metro (5 of 14). Oddly, six reported both boarding and alighting at the Vienna Metro. People got on at 25 named stops, and got off at 31 named stops. There were fewer Vienna Metro – GMU campus pairing on this route than on the Green 1.

Gold 1
Vienna Metro accounts for 37 of 113 riders boarding and 31 of 113 alighting this route. The 37 people that boarded the metro got off at 27 different stops, dispersed throughout the route. Besides the Metro, the most-used stops for boarding were Rappahannock River Lane (16) then Lee Highway/Arthur Treachers (7). The Lee Highway/Arthur Teachers stop had seven individuals board and get off at seven different stops throughout the system. Highest non-Metro alightings were at Rappahannock River Ln (8) and George Mason Blvd/School Street (6) and Jermantown Road/Cavalier Court (6).

Gold 2
More than one-third of riders on Gold 2 originate at the Metro (40 of 114). However, less than a quarter disembark at the Metro (26 of 114). These riders likely use another CUE route to return to the Metro station. The primary origin stop for riders getting off at the Metro was Rappahannock River Ln (5), however only two of the five riders began their trip at Rappahannock River Lane and finished at the Vienna Metro. Other than Metro, the peak boarding locations were – Rappahannock River Lane (10), Jermantown Road/Gainsborough Court (7) and Jermantown Road/Lee Highway (6). Combined, the Jermantown corridor from Fair Haven Court to Main Street accounted for 22 of 114 boardings. Primary destinations for the Jermantown Road ridership were at George Mason Boulevard/School Street (5 of 22) and at Rappahannock River Lane (8 of 22), with the majority of both of these rider groups coming from Home to College. This suggests this corridor may have Mason Shuttle expansion opportunities. Non-Metro peak alighting locations were Rappahannock River Lane (13) and George Mason Drive/School Street (13). The 13 people getting off at School Street came from eight different stops throughout the route.

Gunston Go-Bus George and Mason
The primary origin and destination stop for the Gunston Route is the Sandy Creek stop on the Mason campus. Sandy Creek accounted for 74 of 138 trip origins and 76 of 138 trip destinations. The other primary origin stop was Fair Oaks Mall (35 of 138). The other primary destination for riders was Fairfax Corner (23 of 138). Interestingly, the rider data indicated that students are frequently coming from Fair Oaks Mall back to campus. Thirty-one individuals rode the bus from the Fair Oaks Mall to Sandy Creek, the highest stop pairing of the route; however, only eight riders went from Sandy Creek to Fair Oaks Mall. This may be a function of sample size, but notable nonetheless.

The lowest performing stops on the Gunston routes were either Fairfax Corner or University Mall. University Mall was accessed more by the Mason route (6 of 7) riders while Fairfax Corner was accessed more by the George route (4 of 7) riders. University Mall is notable as being a low-passenger stop, even though both the George and Mason routes stop twice here, once at the beginning and once at the end of their routes. This may be due to construction taking place at University Mall during the time of the ridership survey and its proximity to campus.

Mason to Metro/Metro to Mason/Metro Express Routes

George Mason's Campus, and the Vienna Metro are the primary stops for most of the CUE routes. Having a route that directly connects those two elements allows us to view the intermediate stops in greater detail. The bulk of riders on campus board at Rappahannock River Lane (108), as opposed to the Sandy Creek Shuttle Stop (53). Likewise, riders coming from the Metro are more likely to stop at Rappahannock River Lane (75) than Sandy Creek (26). The other origin destination pair of note was between Rappahannock River Lane and Fairfield Circle (Lee Highway/Circle Woods Drive) – 21 riders traveled from Rappahannock River Lane to Fairfield, and 15 riders traveled from Fairfield to Rappahannock River Lane. The remaining stops saw little ridership outside of occasional riders to and from the Vienna Metro. The lowest ridership stops were at the Commerce Building and Masonvale Patriot Circle.

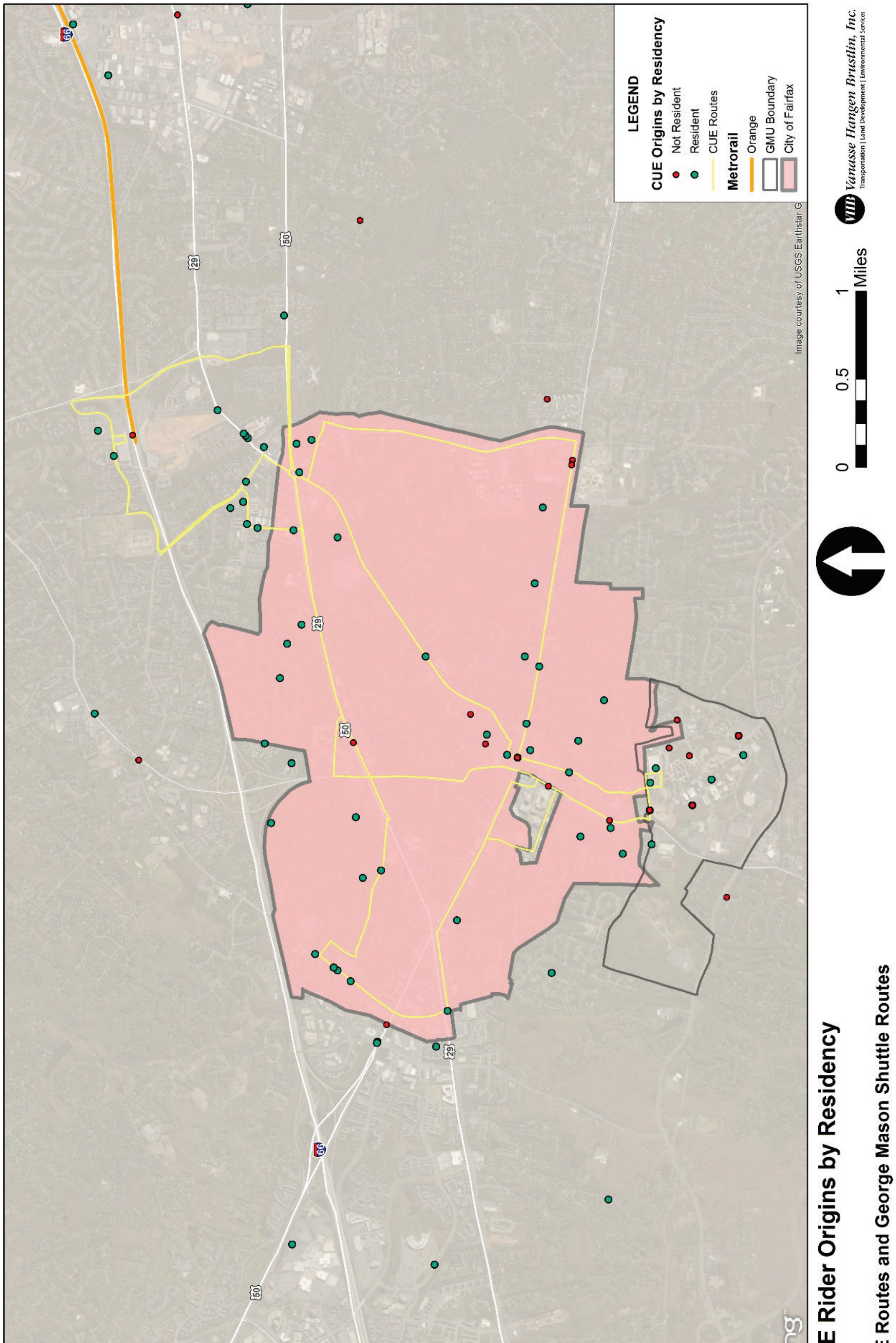
Non-City of Fairfax Resident CUE Rider Analysis

The methods by which riders get to CUE vary, and some of this is driven by the rider's place of residency. For Fairfax residents, they are more likely to walk to a CUE stop (78%) or transfer from Metro to CUE (17%) compared to other modes. However, non-Fairfax residents using CUE are more likely to transfer from Metrorail (39%) or walk themselves (46%). While this is fewer riders walking to the CUE bus than city residents, it's still a large portion of the CUE riding population. This is partly due to the geography of the CUE routes and ridership relative to the City of Fairfax. The below graphic shows the distribution of CUE ridership origins relative to the city of Fairfax. Large portions are located near George Mason University, and the Vienna Metro, both areas slightly outside of the boundaries of the city of Fairfax.

Table 4-23: CUE Rider Means of Getting to Bus by Residency

CUE Riders	Dropped off by someone	Drove by myself and parked	Other (Please Describe):	Rode bicycle	Transferred from another bus route:	Transferred from Metrorail	Walked	Grand Total
Non-Fairfax Res	5	2	6	1	7	58	68	147
Fairfax Res	2		2	3	7	41	192	247
Grand Total	**7**	**2**	**8**	**4**	**14**	**99**	**260**	**394**

Figure 4-16: CUE Rider Origins by Residency



Load Factor Analysis

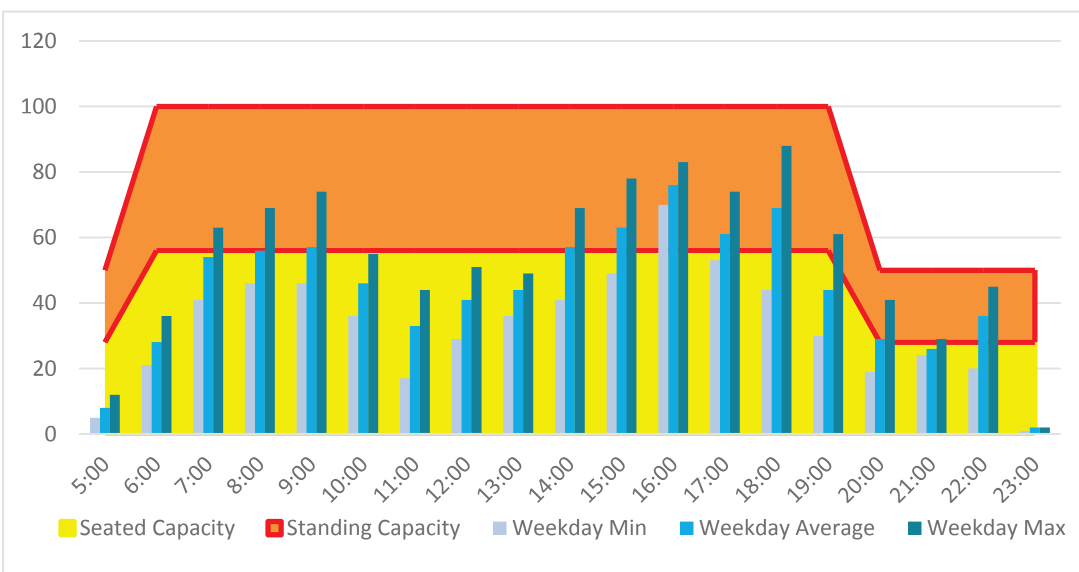
Before recommendations are made that could impact ridership, it is important to understand the capacity of the existing services and fleet to accommodate growth. A load factor analysis focuses on seating capacity in relation to observed passenger volumes. The load factor analysis will rely on three sets of data. The first is hourly ridership boardings collected from the farebox of CUE buses for a week in April 2014. This information will be compared to the seating capacity and number of buses operating during each hour of service. The second set of data comes from passenger boardings collected on every trip of a Mason Shuttle bus by Reston Limousine. The counts provided cover the entire month of April 2014, providing a relatively large sample. These two sets of data report passenger boardings and do not include passenger alightings, meaning they are likely higher than the actual observed passenger loads on either system's bus. These counts do not account for the passengers that get off the bus between the two route ends, but rather just a summation of everyone who boarded the bus. To supplement this, the passenger counts collected on-board will be used. The observed passenger loads will be examined to see if they exceed the reported vehicle capacities.

CUE Bus

Knowledge of vehicle capacities is necessary to conduct a load analysis. The CUE system operates two differently sized buses. They have six 30 foot buses with a seated capacity of 28 passengers and a maximum capacity of 50 passengers when including standees. They also have six 35 foot buses that seat 32 passengers and hold up to 60 maximum. Since the two differently sized buses get assigned to both routes, the smaller capacity will be used for the load analysis as a more conservative figure.

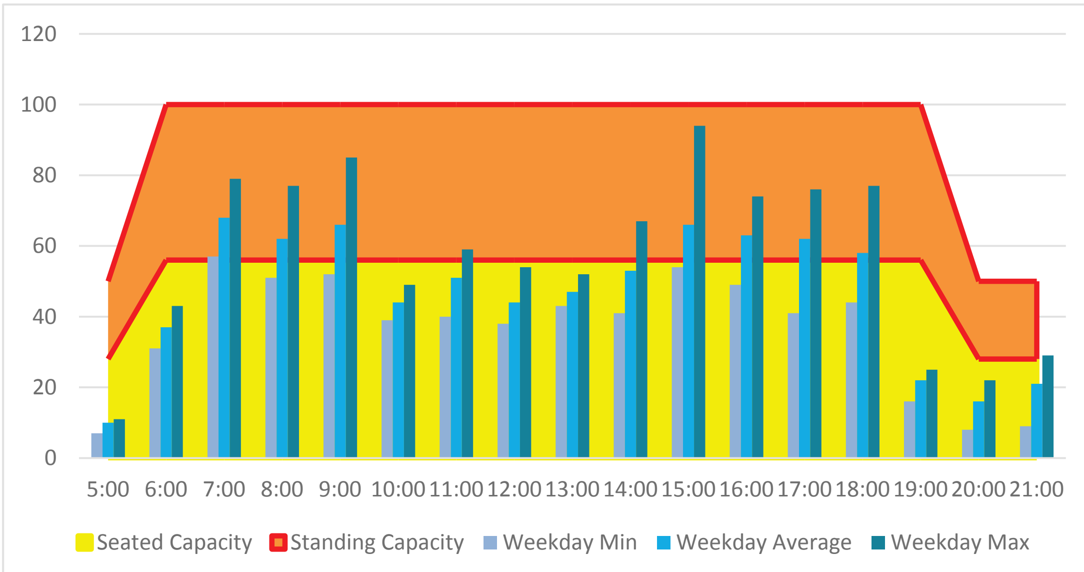
The Gold 1 route showed weekday peaks during the morning and evening commute times, with the evening peak being larger. Maximum observed boardings during the peaks typically exceeded seated capacity, and the average boardings during the heart of the evening peak exceeded the seated capacity. The maximum capacity was never exceeded. A similar analysis of the on-board passenger counts revealed only one trip between 8:30 a.m. and 9:10 a.m. with a passenger load that exceeded the seated capacity.

Figure 4-17: Gold 1 Capacity



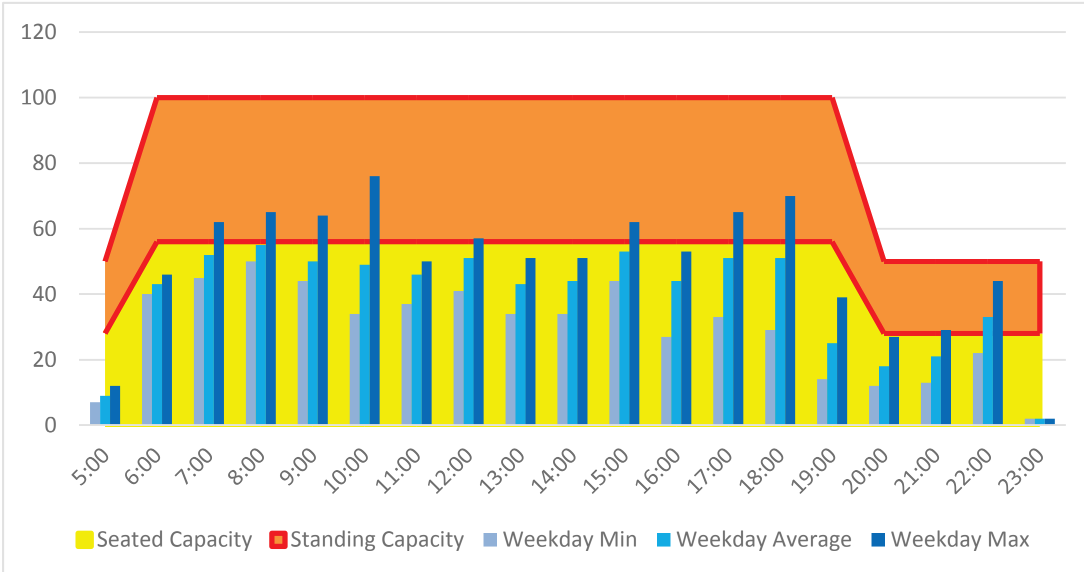
The Gold 2 showed ridership peaks during similar times when compared to the Gold 1, but the peaks were more pronounced. The route showed average boardings in the morning and evening peak exceeding the seated capacity, with some of the maximum boardings during off peak times exceeding the seated capacity. The afternoon peak displayed a trip where the boardings approached the maximum capacity. The on-board count data showed no trips where the seated capacity was exceeded. This would seem to indicate that there is a lot of activity throughout the course of the route since the farebox data shows a high number of boardings with no equally high passenger loads in the on-board data.

Figure 4-18: Gold 2 Capacity



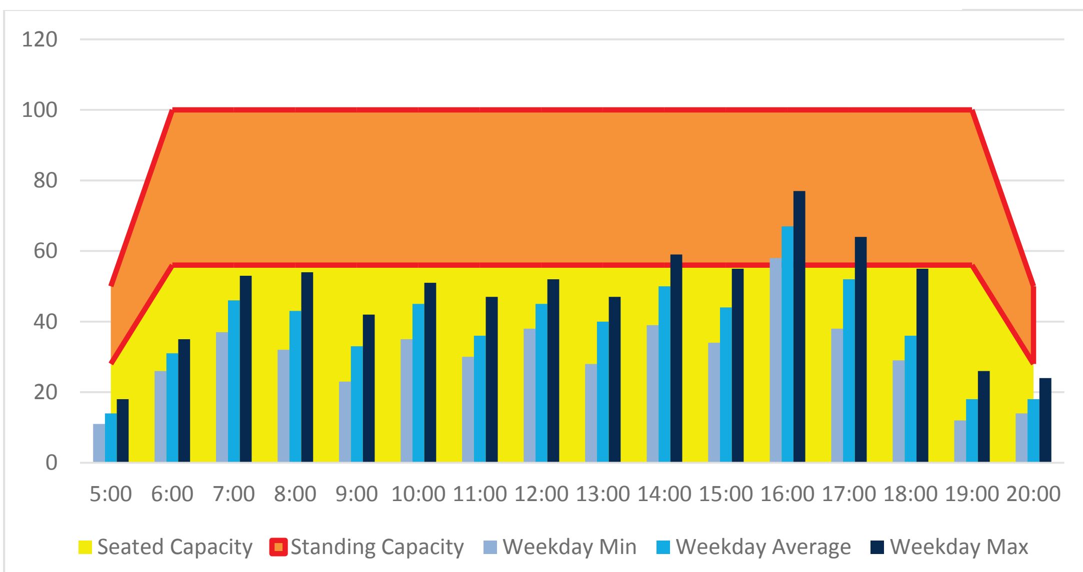
The Green 1 showed only one period of time where the average boardings exceeded the seated capacity - at 10 p.m. Maximum boardings during the morning and evening peak were consistently above the seated capacity, but below similar levels observed on the Gold routes. Ridership on the Green 1 was much more consistent across the day, with less pronounced peaks. This would appear to indicate the route is used for more than just commuter trips. Only one trip around 9:30 a.m. from the on-board ridership showed a load at 28 passengers for a couple of stops.

Figure 4-19: Green 1 Capacity



The Green 2 showed relatively few periods where seated capacity was exceeded. This was only observed during the evening peak, and most were the maximum observed boardings, not the average. Similar to the Green 1, the boardings for the Green 2 were more consistent throughout the day. None of the on-board counts showed a capacity problem.

Figure 4-20: Green 2 Capacity



An examination of loads for the Saturday and Sunday trips showed no capacity issues for any of the CUE routes.

Mason Shuttles

Mason Shuttles operate primarily two different vehicle sizes on the study routes. The Mason to Metro and Gunston Go-Bus use a 32 passenger body-on-chassis vehicle, and the Mason to Metro Express and Burke VRE shuttle use a 24 passenger body-on-chassis vehicle. According to Reston Limousine they do not allow standing passengers, except for the last trip of the day for a particular route. Using these capacity figures and the data sources available, the following observations were made.

The Mason to Metro and Metro to Mason route are essentially mirror opposites of one another when analyzing boardings by time of day. The Metro to Mason route has a peak in boardings during the morning from 8 a.m. to 10 a.m., with a consistent level of activity thereafter occurring until about 11 p.m. There were some maximum values that exceeded the seated capacity of the vehicle. Only one trip in the on-board ridership dataset displayed a load factor of 33 riders. This was on a Saturday at 5 p.m. There were a handful of trips that displayed load factors greater than 75 percent of the vehicle capacity. Two of the three trips were observed during the weekday between 8 a.m. and 10 a.m. The other trip was observed on a Saturday around 7 p.m.

The Mason to Metro route showed consistently higher boardings in the later afternoon and evening hours, with lower observed boardings in the morning. This pattern shows that most users of these routes travel to campus in the morning and back to the Metro in the evening. Similar to the Metro to Mason route, some of the maximum boardings exceeded the seating capacity however, none of the on-board data showed a load above the maximum capacity. The on-board trips showed loads exceeding 75 percent of the vehicle capacity occurring between 3 p.m. and 5 p.m. during the weekday.

Figure 4-21: Metro to Mason Capacity

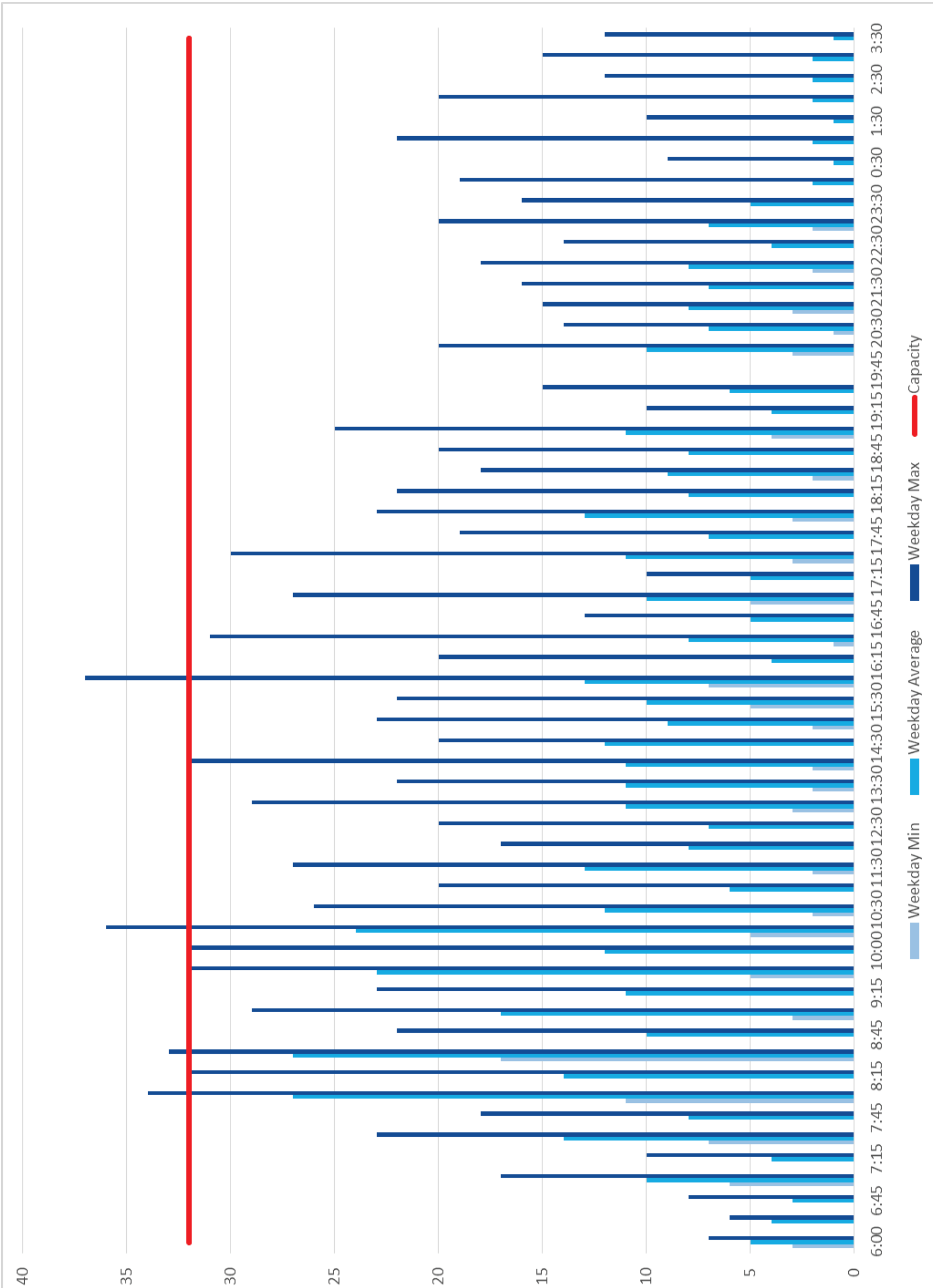
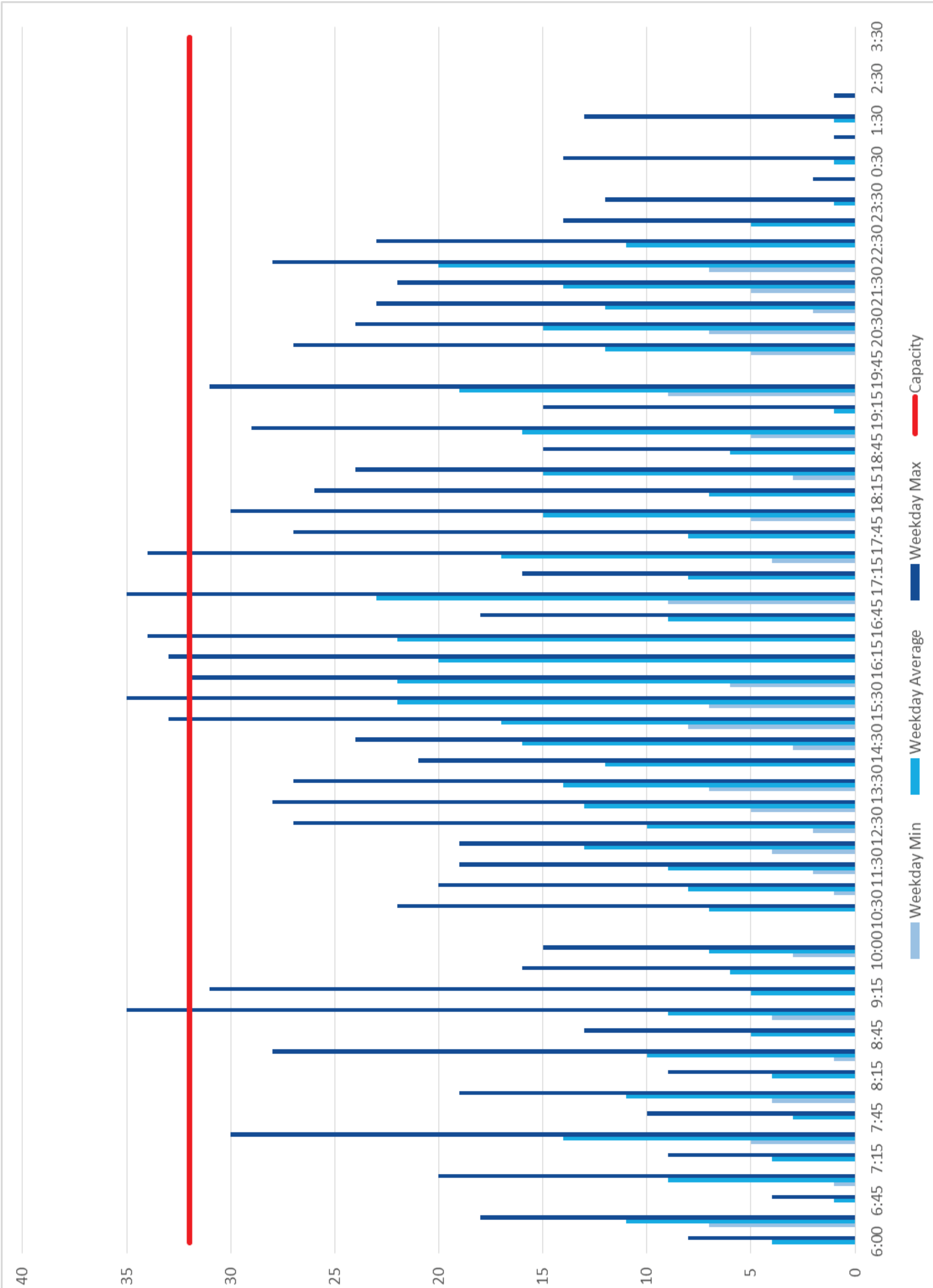


Figure 4-22: Mason to Metro Capacity



The Mason to Metro Express routes showed a similar but slightly less pronounced pattern to the non-express routes, with the trips traveling towards campus displaying higher boardings in the morning and the trips traveling to Metro displaying higher boardings in the evening. None of the average boardings in either direction exceeded the vehicle capacity. Some of the maximum boardings exceeded the vehicle capacity, but this wasn't supported through the on-board ridership counts. Some of the inbound trips to campus showed loads greater than 75 percent of the vehicle capacity.

Figure 4-23: Metro to Mason Express Capacity

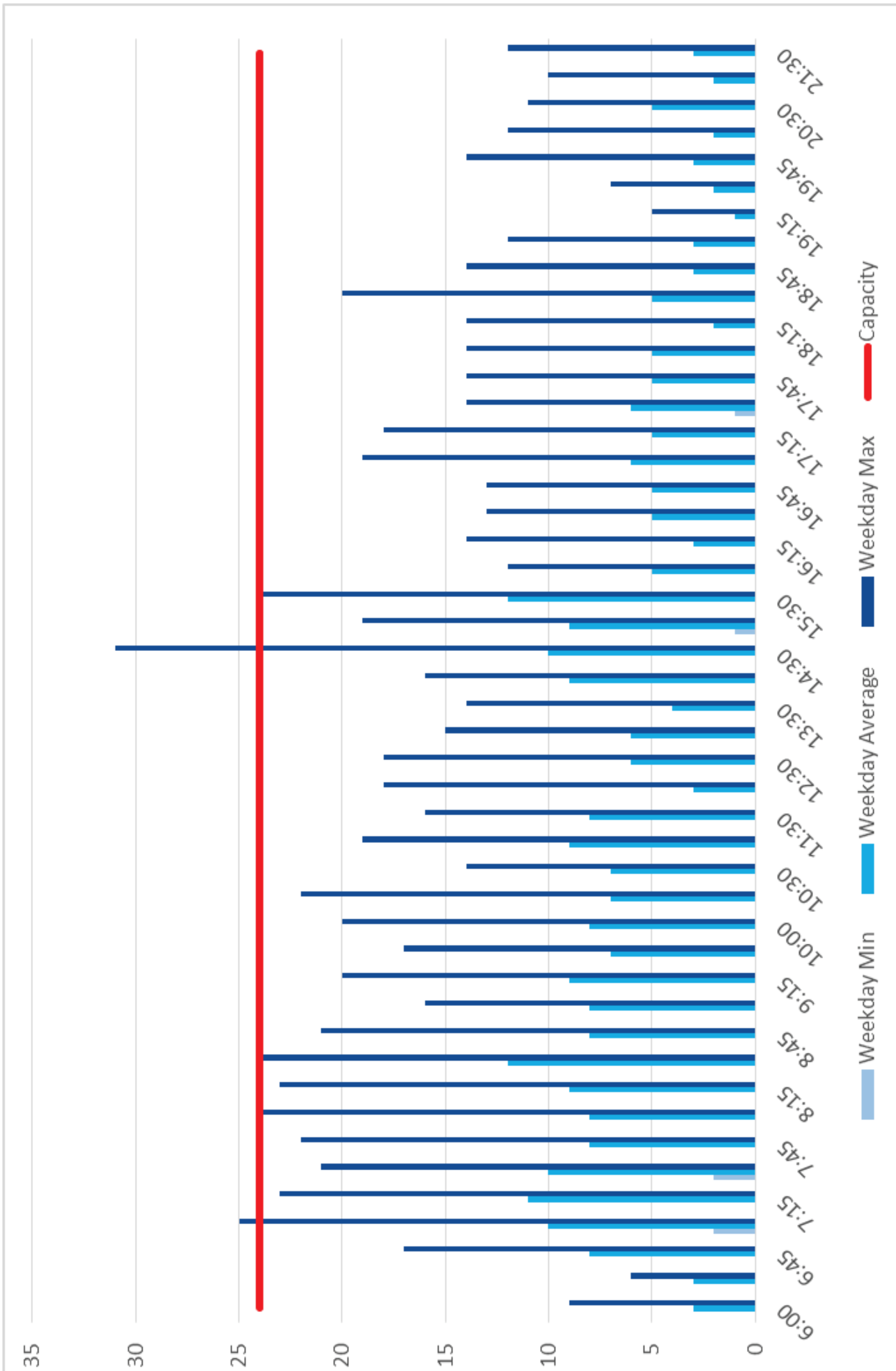
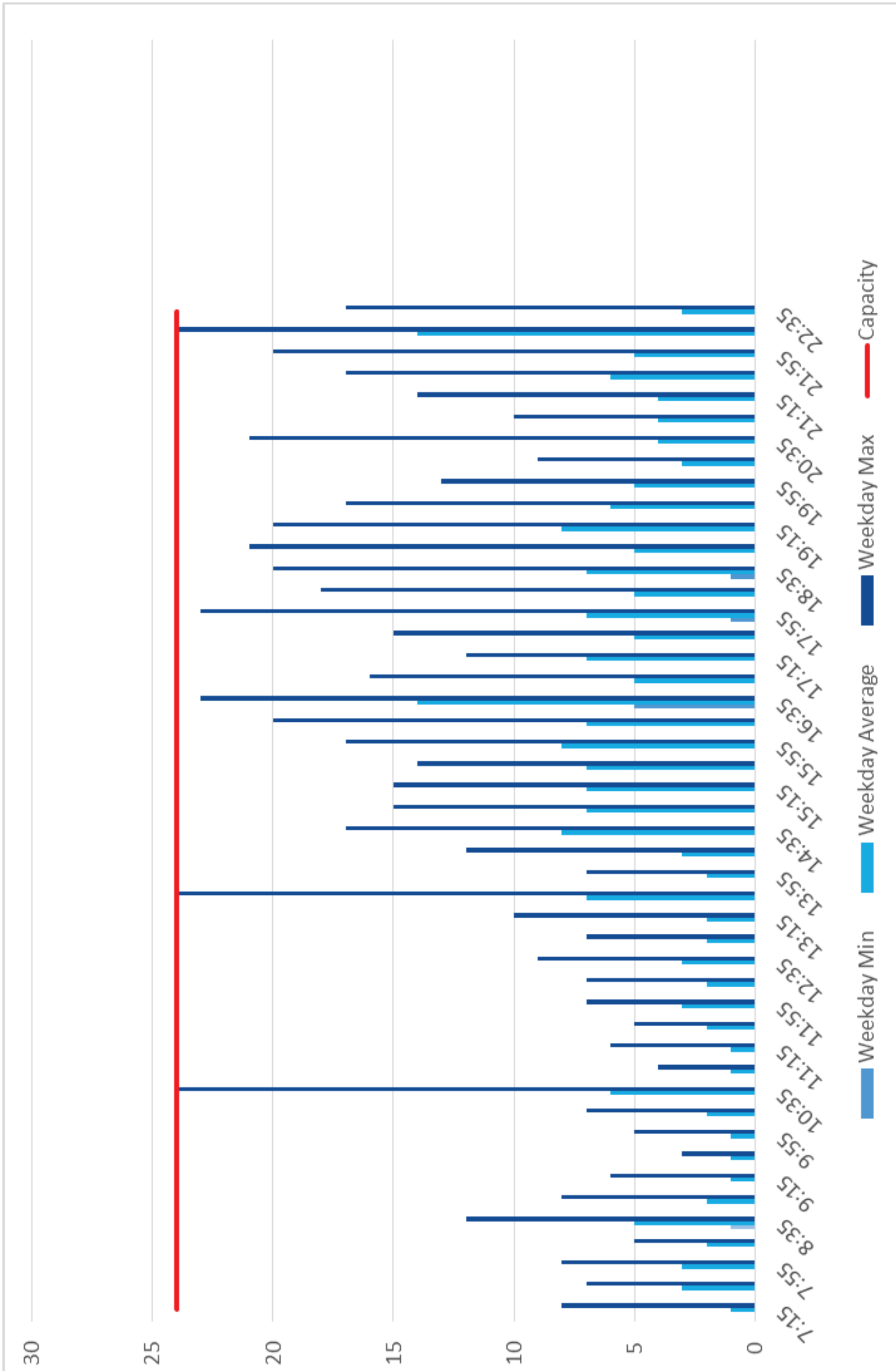


Figure 4-24: Mason to Metro Express Capacity



The Gunston Go-Bus routes do not appear to have any capacity constraints. The George route did show average boardings on Saturdays between 20 and 30 on most trips. The Mason route did not show any trips exceeding the vehicle capacity for average or maximum boardings. Saturday boardings were typically higher than weekday boardings. None of the on-board trips showed loads exceeding the vehicle capacities. The 3 p.m. trip on Saturday for the George did exceed 75 percent of the vehicle capacity approaching Fairfax Corner.

Figure 4-25: Gunston Go-Bus George Capacity (Weekday)

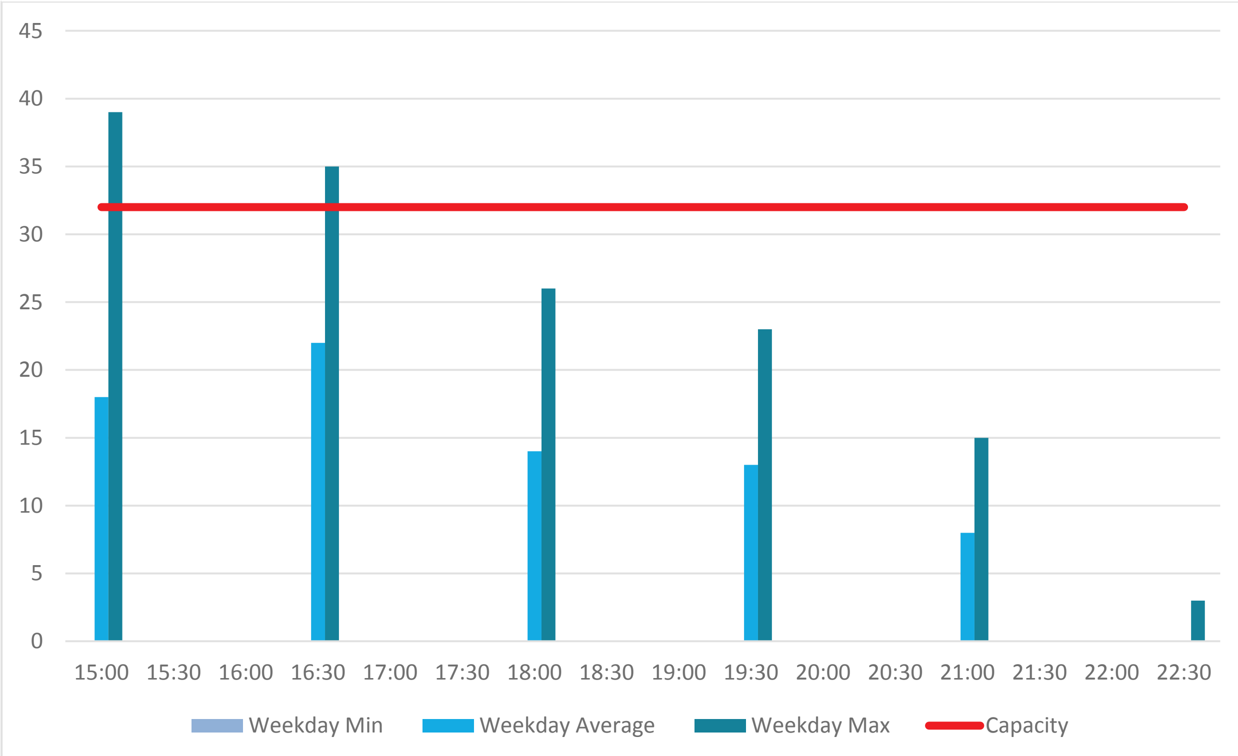


Figure 4-26: Gunston Go-Bus George Capacity (Saturday)

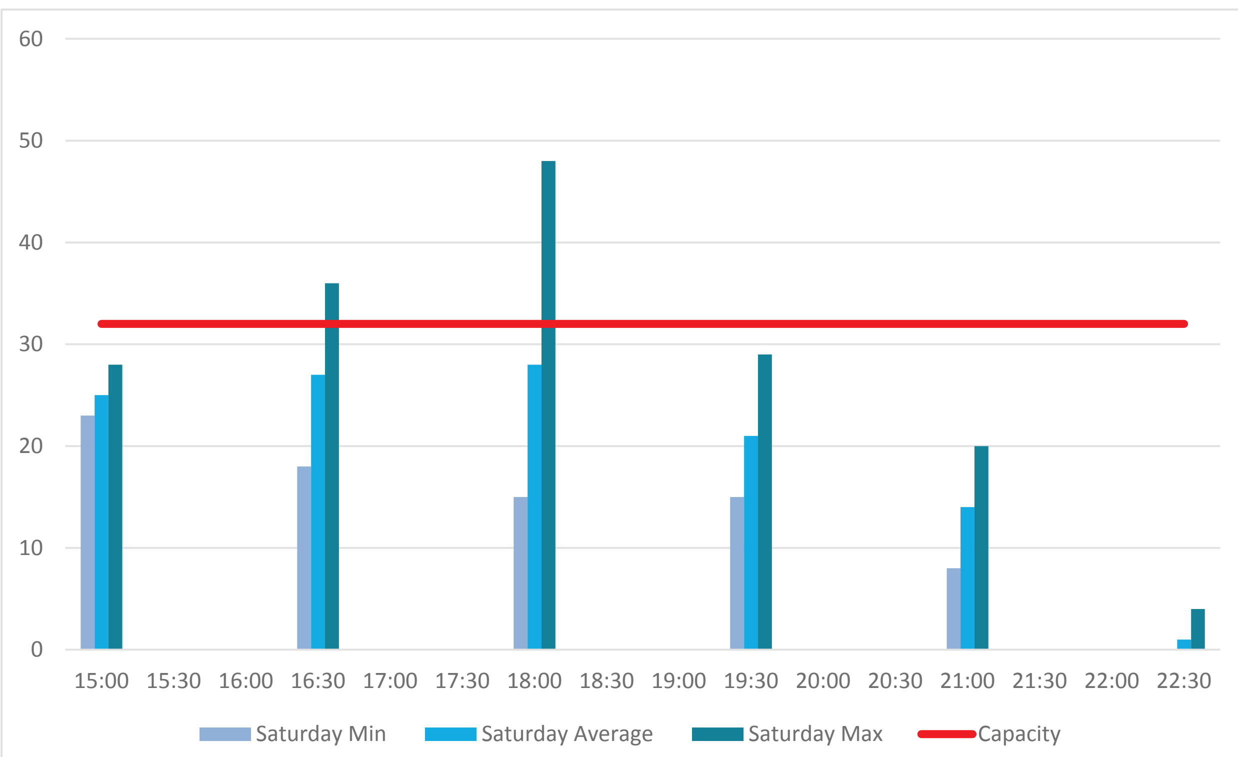


Figure 4-27: Gunston Go-Bus Mason Capacity (Weekday)

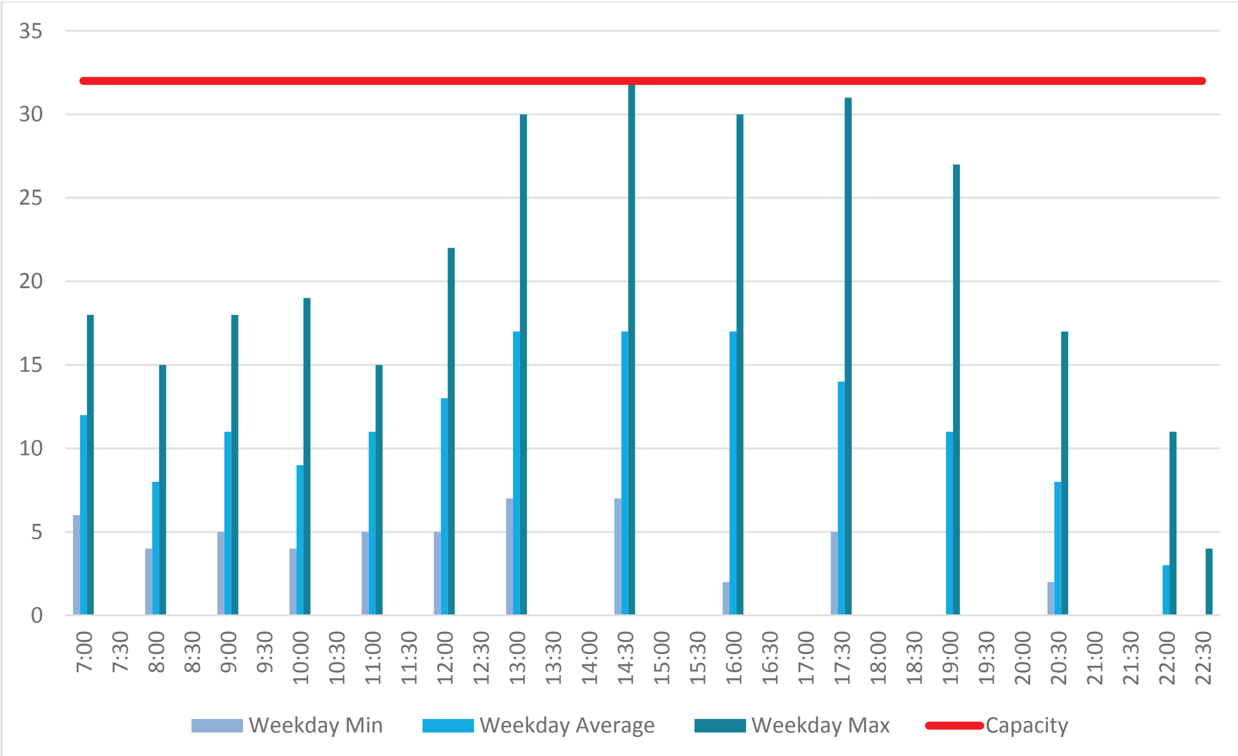
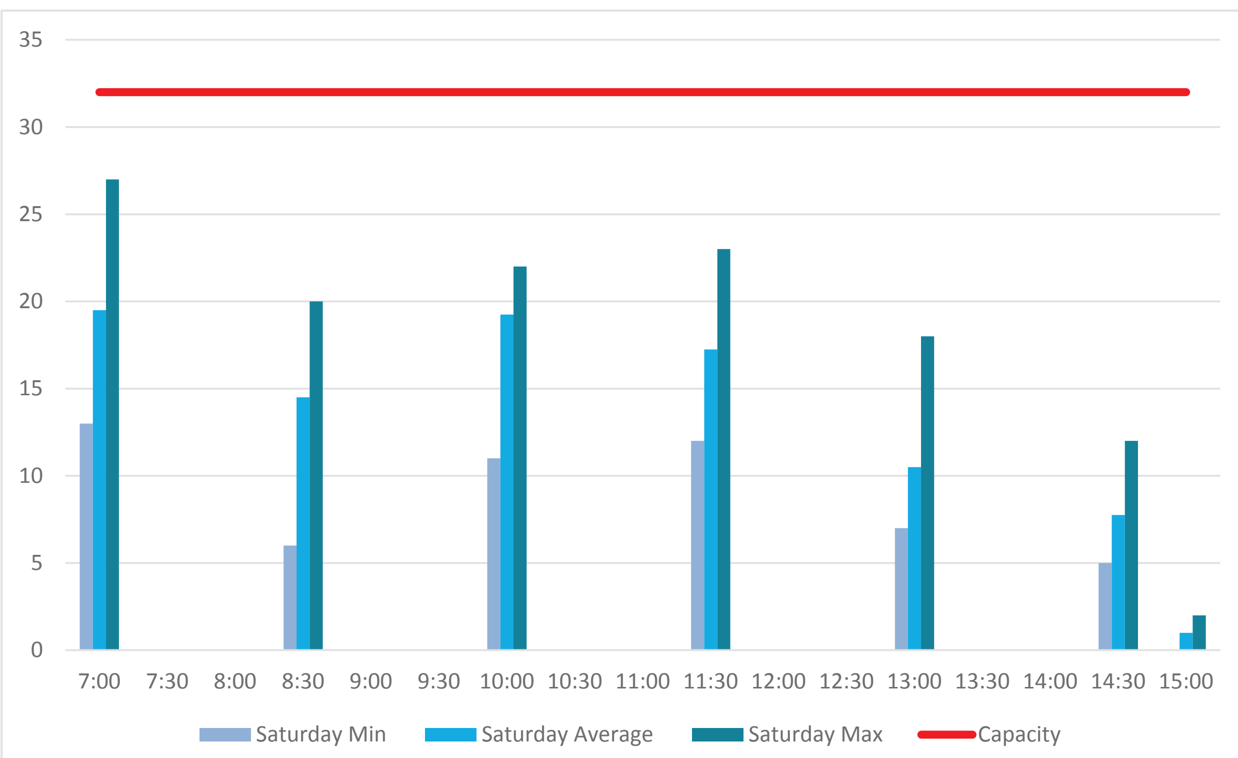
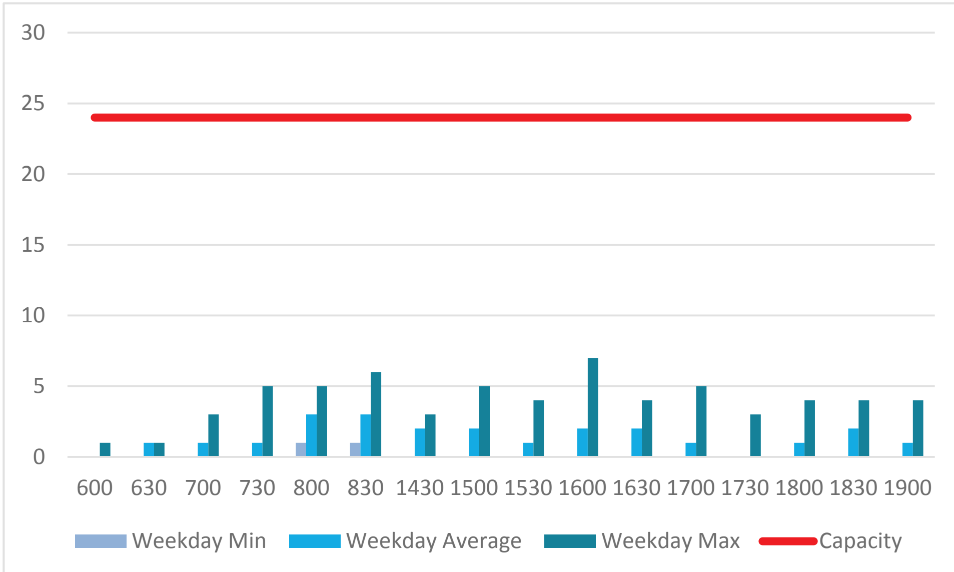


Figure 4-28: Gunston Go-Bus Mason Capacity (Saturday)



The Burke VRE shuttle does not currently display any capacity issues based on the Reston Limousine data or the on-board data. Peaks in ridership were noted during the morning peak between 8 a.m. and 9 a.m., with no true peak noticed during the evening hours. The route only operates while the VRE is in service, so there is no mid-day service.

Figure 4-29: Burke VRE Capacity



Transfer Analysis

The ability to understand how riders travel within a transit system is important when determining the impacts of route changes. Changing a route that riders rely on for a connection can result in increased travel times or even the inability to complete a trip. While the origins and destinations analysis provided some level of detail to understanding of common route pairs, a transfer analysis provides insights into how people are using the transit system to access those destinations. . Information was collected through the on-board survey which included the route a rider transferred from or to. This information is only available for those riders who provided a response. Of the 930 collected responses, 396 provided information about their transfer activity. The table below indicates the number of riders who transferred from a particular route and the route they transferred to. The greatest number of riders transferred to the Orange line at the Vienna/Fairfax-GMU station. The majority of these riders were coming from the Mason to Metro and Express route. Approximately one-quarter of riders transferred from Metrorail to a Mason Shuttle and another quarter transferred to a CUE route. A handful of riders transferred to or from a Metrobus or Fairfax Connector route.

Table 4-24: On-board Survey Transfer Matrix

To

From	Gold 1	Gold 2	Green 1	Green 2	Met Exp	M to M	Go Bus	Orng	1A	1C	2B	3A	12	15M	17	29	305	466	505	605	621	630	631	640	641	S2
Gold 1								21	2	1								1		1						
Gold 2								10																		
Green 1								11				1						1	1							
Green 2								18		2																
Met Exp								53								1	1									
M to M								63													1					1
Go Bus																										
Orng	27	32	30	15	42	50																				
1A																										
1C																										
2B	1		1																							
3A																										
12							1																			
15M					1																					
17			1																							
29			1																							
305																										
466																										
505																										
605																										
621																										
630				1																						
631			1																							
640	1																									
641	1																									
S2																										

In addition to information collected through the on-board survey, CUE collects transfer information through the farebox and SmartTrip cards. This information was provided as a report which included data on from which other system riders boarding a CUE bus originated. This report from CUE from July 1, 2012 to June 30, 2013 reported 851,819 total passenger trips. Of those trips, 189,845 (22 percent) were transfers. The largest number of transfers (55 percent) were from Metrorail. The second highest number of transfers came from Metrobus or other CUE routes. Approximately 2 percent of riders transferred from a Fairfax Connector bus. The remaining transfers came from other area transit services including DASH, ART, and PRTC.

Table 4-25: CUE Transfers (July 1, 2012 - June 30, 2013)

	Count	Percent of Total Riders	Percent of Transfer Riders
Total Riders	851,819		
Total Transfers	189,845	22.3%	
Metrobus	34,520	4.05%	18.18%
Metrorail	104,246	12.24%	54.91%
DASH	30	0.00%	0.02%
ART	25	0.00%	0.01%
CUE	34,811	4.09%	18.34%
Fairfax	15,668	1.84%	8.25%
Ride On	41	0.00%	0.02%
The Bus	21	0.00%	0.01%
PRTC	467	0.05%	0.25%
Other	16	0.00%	0.01%

Large Event impacts on Ridership

The City of Fairfax and Mason posed the question of whether transit ridership was impacted by large events occurring on Mason's campus. George Mason University is home to the Patriot Center, a 10,000 seat arena. The Patriot Center hosts a variety of events, including University sporting events, concerts, shows, and other large events. In order to determine the impact of large events on transit, ridership counts were to be collected on each route for the same day of the week on an event day and a non-event day. Due to issues encountered by the survey team, sufficient data was not collected to provide an analysis of the impact of events on transit. Utilizing passenger volume data from Reston Limousine and CUE for the month of April 2014, a comparison of event and non-event day total ridership was done. The following events were held at the Patriot Center during the month of April 2014:

- Ringling Brothers and Barnum and Bailey Circus (April 9, 10, 11, 12, 13, 17, 18, 19, 20)
- Ludacris Concert (April 25)

The events included weekday and weekends, with show times occurring during the afternoon and evening. The difference in average CUE ridership on event and non-event days was less than 1 percent. The same was true of Mason Shuttle routes that travel between the Metrorail and campus. Based on this analysis no impact on system ridership was observed when large events were held at the Patriot Center. This is likely a function of the location of the Patriot Center, which is located in a predominantly suburban setting with ample free parking.

Figure 4-30: Event Ridership (CUE)

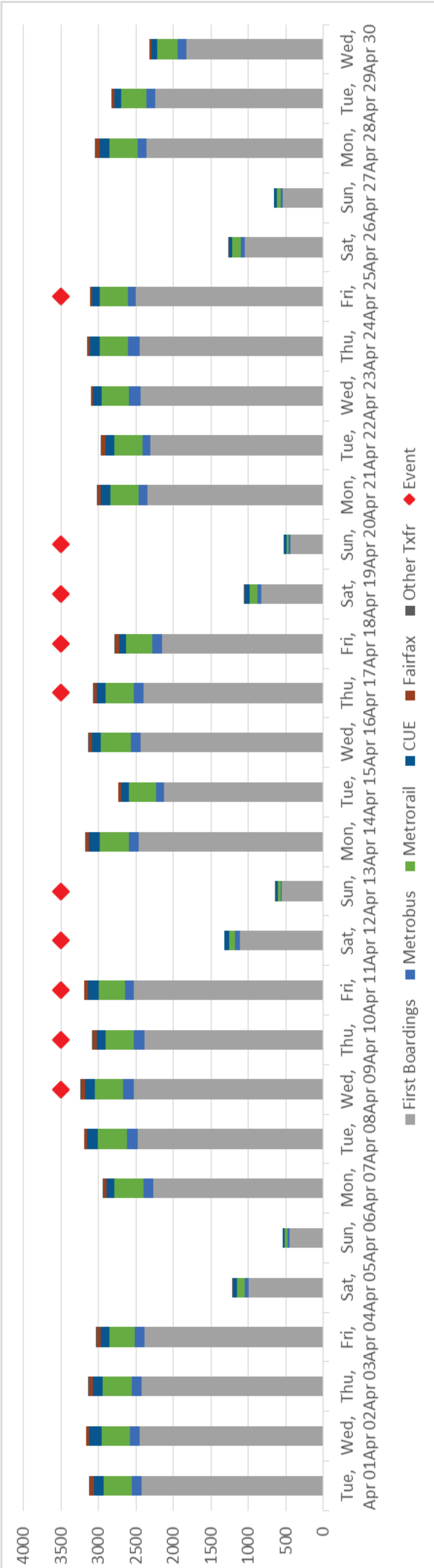
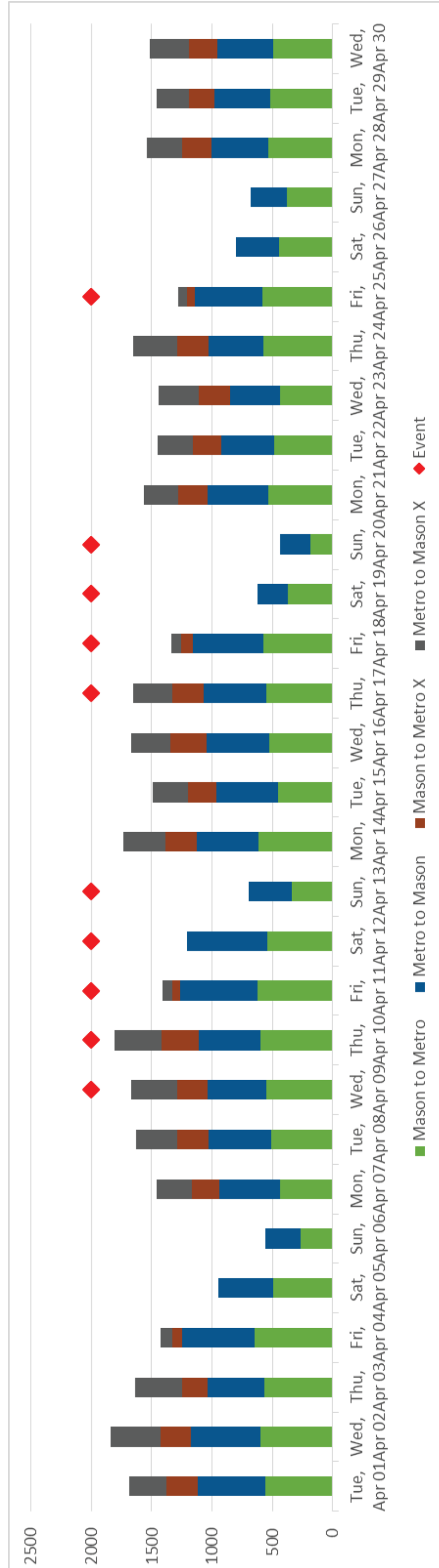


Figure 4-31: Event Ridership (Mason Shuttles)



Analysis of Locations Not-Presently Served

One of the questions asked in the online and paper surveys of both the Fairfax and GMU Communities was, “Which locations would you like to see served?” The vast majority of these locations are within a quarter mile walking distance of an existing Mason Shuttle or CUE Bus route. The Fairfax and Mason surveys included a total of 1,420 requested destinations; of those, 1,308 had destinations that were able to be geocoded. A frequent sentiment among those who filled out the survey but didn’t list tangible destinations, was a desire for more campus-circulator-style routes on the George Mason campus.

The geocoded requested destination list was first examined to see if there was already coverage available to riders. CUE primarily operates within the City of Fairfax, which has 6.35 square miles of area. When CUE routes were buffered by a quarter mile defined walking distance, the resulting buffer covered 4.85 square miles, or 76 percent of the City. A sizable portion of the remaining 24 percent of City area is industrial, park, and golf course property west of Pickett Road between Old Lee Highway and Main Street, an area with few roads and little population.

For all destinations requested, 181 requests were located within the city of Fairfax, 497 of the requests were outside of the city, but within a three mile buffer of the city, 168 destinations were between three and five miles. There were 256 between five and ten miles outside the city, and 206 requested destinations were more than 10 miles away.

Within the list of requested destinations, 213 requests were within a quarter mile of an existing CUE Stop, and 215 were within a quarter mile of a CUE Route. This means that more than 99 percent of requested destinations within the quarter mile CUE buffer are also within quarter mile of a CUE stop. Of the requests, 246 requests were within quarter mile of a Mason stop, and 420 requests were within quarter mile of a Mason shuttle route. The greater spacing between Mason Shuttle stops results in only 58 percent of the requested destinations within the Mason Shuttle route buffer being within quarter mile of a Mason Shuttle stop. Requests within a quarter mile of a bus stop are important, not because they need to be discounted as irrelevant locations, but because they symbolize potential ridership that may need further education to take advantage of the existing service.

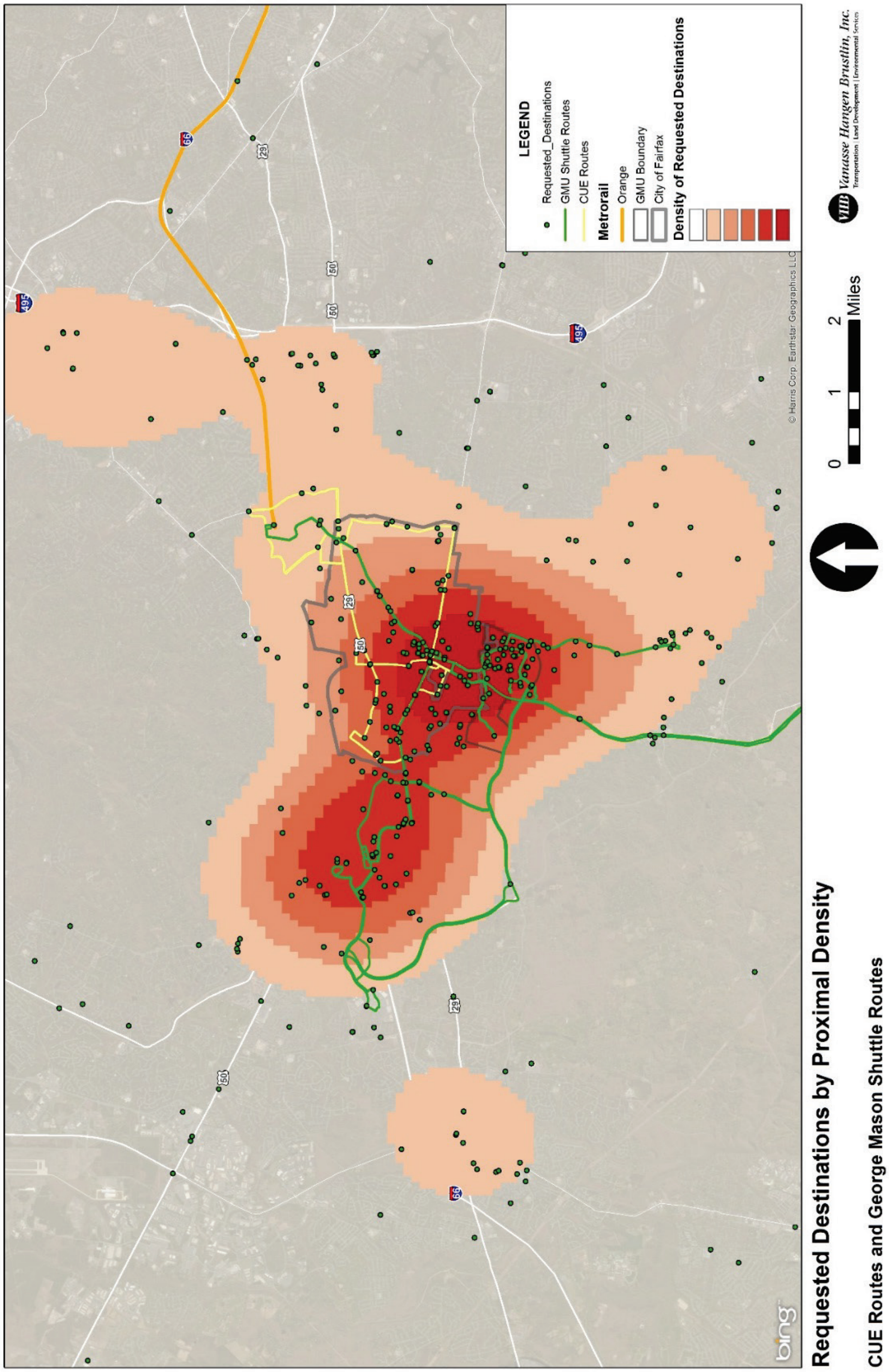
Within the existing service area, there were several areas of requested destinations not presently served. First is the Fairfax Villa neighborhood. This neighborhood is bounded by Shirley Gate Road to the west, Braddock Road to the south, Route 123 to the East, and Route 50/Main Street to the north. It is largely single-family low density housing, with Fairfax Villa Elementary School as its central feature. There were 35 requests for service to this neighborhood. The number of surveys requesting this service relative to the population of the neighborhood seems to indicate a sampling bias, but is still worth examination. Also within the City of Fairfax were seven requests for service in the area immediately surrounding Roberts Road and Forest Avenue.

Requested destinations outside of the City of Fairfax, but still within the reasonably-serviceable area are:

- Tysons Corner – 58 requests
- Merrifield/Dunn Loring Metro – 32 requests
- Fair Oaks/Penderview – 20 requests
- Oakton, particularly along Jermantown Road – 13 requests
- Further west to Centreville – 44 requests.

- Further south to Burke/Fairfax Station – 72 requests

Figure 4-32: Requested Destinations by Proximal Density



These requests seem to be geographically split by whether the nature of the destination is home or another attractor such as a job or shopping. Fairfax Villa, Burke, Centreville, Roberts/Forest, and to a lesser-extent Oakton are all residential attractors. Fair Oaks, Merrifield, and Tysons Corner are all commercial attractors. There is a demonstrable demand for these locations to be served for the residents of Fairfax, and the George Mason Community, but indirect or bus to bus transfer service may be unappealing. An example is the current 15M Metrobus route, which connects the Mason campus with Tysons Corner via Route 123. However, despite all the existing service connecting the Mason campus to the Vienna/Fairfax-GMU station, the 15M diverts up Courthouse Road to serve the Metrorail station, making a trip between Mason and Tysons that much longer. Another consideration is the fact that Mason students do not receive a fare-free ride on Metrobus routes like they do on CUE buses.

5

Demand Analysis

5.1 Introduction

Prior to developing recommendations for service improvements based on the analysis of the existing conditions, it is important to understand how demand for each service might grow looking ahead. Just because a particular route isn't performing well today in terms of ridership, doesn't mean that as Mason or the City of Fairfax grows it would continue to perform poorly. It is important to understand changes that may occur in the next five years, which could impact transit ridership.

Demand is the number of trips made when service is available at a given cost. Cost is defined as both monetary price (fare) and time required to make a trip. Research has shown that increases in fare and travel time can have a negative impact on ridership. Understanding this relationship is important to determining not just those impacts, but in determining fare policy and designing routes. Characteristics such as the road a route travels, the number of stops, location of stops, and fare collection methods can all impact the time it takes to make a trip. Some of these aspects are easier to control than others.

Determining the future demand or need for transit service can be a challenge. It is difficult to predict the host of factors that can impact transit demand. Demand for service can be linked to growth in population or households. Household travel surveys can also be used to determine trip rates that can be applied to populations who are more likely to rely on public transportation, such as those residing in households with no vehicle available. Another potential source for data that can be applied to demand estimates is the regional travel demand model. The model accounts for growth in persons, traffic, and land use based on planned changes. Using a choice model provides a more accurate estimate for which mode people will choose based on determined preferences. While other data will be examined as part of the demand analysis to discover potential trends that could refine the demand estimate, the demand model will provide the baseline information for the estimate.

5.2 University Growth

University growth would be expected to impact growth in demand for transit services. As more people attend Mason, which has limited parking resources, it would be expected that more people would ride Mason Shuttles and CUE. A review of historic growth to determine whether a relationship between student growth and ridership growth exists was conducted. This information along with projected university growth would provide one estimate for future demand.

The George Mason University student body grew by almost 6 percent from 2009 to 2013. The largest growth has been in the undergraduate student body. The number of students living on campus has grown by one-fifth. Faculty numbers increased by more than ten percent during the same period. These figures account for full-time, part-time, and administrative faculty. Staff positions grew by over one-fifth from 2009 to 2013, likely in response to the growth in facilities on campus and the needs associated with maintaining those facilities. Overall, growth in each population fluctuated over the five year period analyzed.

Table 5-1: Historic Campus Growth (2009-2013)[18]

	2009	2010	Percent Change ('09-'10)	2011	Percent Change ('10-'11)	2012	Percent Change ('11-'12)	2013	Percent Change ('12-'13)	Percent Change ('09-'13)
Students[19]	32,067	32,562	1.54%	33,320	2.33%	32,961	-1.08%	33,917	2.90%	5.77%
Living on Campus	4,996	5,341	6.91%	5,477	2.55%	5,748	4.95%	6,023	4.78%	20.56%
Faculty	2,969	3,059	3.03%	3,227	5.49%	3,234	0.22%	3,344	3.40%	12.63%
Staff	1,431	1,534	7.20%	1,629	6.19%	1,674	2.76%	1,738	3.82%	21.45%
Total	**41,463**	**42,496**	**2.49%**	**43,653**	**2.72%**	**43,617**	**-0.08%**	**45,022**	**3.22%**	6.94%

It would be logical to assume that demand for Mason Shuttles would be closely tied to growth in the university population. In an effort to determine whether certain populations have a greater impact on route-level and system-level ridership, a correlation analysis was conducted. This analysis has a limited number of data points to compare since data was only provided from 2009 to 2013, resulting in figures that may not be statistically valid. For the purposes of determining an estimate of demand however, they will provide a sufficient order of magnitude for planning purposes.

Table 5-2: Correlation of Mason Population to Mason Shuttle Ridership

	Students	*On-Campus*	*Faculty*	*Staff*	*Total Mason Pop.*	*Mason to Metro Riders*	*Gunston Riders*	*Metro& Gunston Riders*	*Mason Shuttle Riders*
Students	1								
On-Campus	0.907424	1							
Faculty	0.966607	0.955258	1						
Staff	0.936313	0.980778	0.988746	1					
Total Mason Pop.	0.996631	0.932822	0.983962	0.961501	1				
Mason to Metro Riders	0.9226	0.981899	0.974214	0.97693	0.946362	1			
Gunston Riders	0.570983	0.584114	0.440624	0.475958	0.544492	0.480998	1		
Metro & Gunston Riders	0.931533	0.989145	0.968083	0.974053	0.951574	0.99646	0.553	1	
Mason Shuttle Riders	0.460982	0.483111	0.557285	0.49765	0.484976	0.629907	-0.17652	0.581698	1

When comparing population to ridership, the Mason to Metro and combination of Mason to Metro and Gunston's Go-Bus ridership correlated highly to the on-campus population. The challenge with

[18] Source: George Mason University Annual Factbooks 2009-2013, George Mason University Institutional Research & Reporting.
[19] Includes figures for students living on campus.

using the on-campus population figure for producing an estimate of demand is the lack of on-campus population figures for future years. The University's 2002 Master Plan document calls for a total build-out of 9,200 beds in 2020. The document does not propose how many should be constructed each year up to 2020. Currently, Mason has approximately 6,300 beds on the Fairfax campus. Due to the lack of data available, an equation tying on-campus growth to ridership demand was not pursued further. The next highest correlation came between faculty and staff populations and the Metro to Mason and combination ridership. Forecasts for these figures are lacking. They are also a result of student population size and campus facilities, and it doesn't seem appropriate to not include student figures in a demand estimate when they comprise the largest group of riders. The total university population figure showed a reasonably high correlation to the combination of Metro to Mason and Gunston Go-Bus ridership. Running a regression analysis using ridership demand as the dependent variable and population as the independent variable results in an R-squared value of 0.91 and a standard error of 19,220 based on five observations. The following demand equation was produced:

$$Demand = -1727325 + 53.18008x$$

Using annual growth rates pulled from the 2011 *Transportation Master Plan*, estimates for student enrollment up to 2020 could be produced from the most recent year's figures. Estimates for faculty and staff were also developed up to 2020 to produce a Mason population figure to derive transit demand for the Mason to Metro and Gunston Go-Bus. The estimates for faculty assumed a student to faculty ratio of one to 10.1 based on a review of the most recent student to faculty ratios. Staff growth was estimated by applying an annual growth rate of 3 percent derived from recent data. The demand estimate for the two routes combined reaches over 600,000 riders by 2020. Using recent ridership data, a percentage that each individual route comprised of the total figure was developed to produce an estimate for each route up to 2020.

Table 5-3: Mason Population Forecast

	2013	2014	2015	2016	2017	2018	2019	2020
Students[20]	33,917	34,550	35,200	35,860	36,530	37,220	37,920	38,630
Faculty[21]	3,344	3,420	3,490	3,550	3,620	3,690	3,750	3,820
Staff[22]	1,738	1,790	1,840	1,900	1,960	2,020	2,080	2,140
Total	**38,999**	39,760	40,530	41,310	42,110	42,930	43,750	44,590

Table 5-4: Mason Ridership Demand Forecast

	2013	2014	2015	2016	2017	2018	2019	2020
Combination Ridership	354,442	387,100	428,100	469,500	512,100	555,700	599,300	644,000
Mason to Metro[23]	309,816	340,600	376,700	413,200	450,600	489,000	527,400	566,700
Gunston's Go-Bus[24]	44,626	46,500	51,400	56,300	61,500	66,700	71,900	77,300

[20] Assumes annual growth rate of 1.88% from 2013
[21] Assumes student/faculty ratio of 1:10.1
[22] Assumes annual growth rate of 3% from 2013
[23] Assumes Mason to Metro ridership is 88% of combination ridership
[24] Assumes Gunston's Go-Bus ridership is 12% of combination ridership

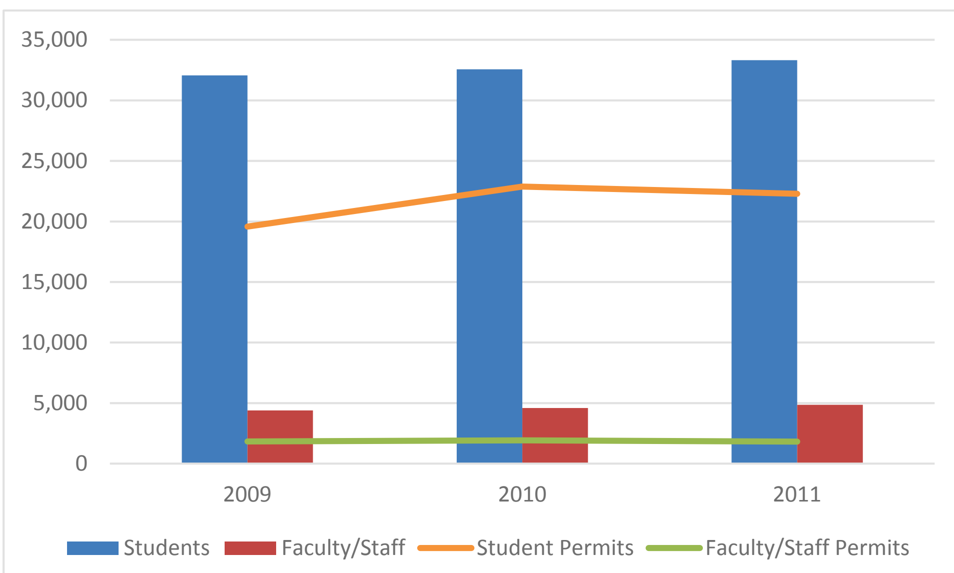
University Parking

Parking supply and demand can be closely related to transit use. Mason has reached a point in its growth due to space constraints that it must build parking structures to accommodate the parking demand for the campus. Structured parking is costly, and as more students come to campus and additional buildings are constructed to accommodate them, the space available for structures becomes even tighter. Mason will need to determine what an acceptable level of parking is for their population. They currently provide the shuttles and other travel demand management (TDM) programs to reduce the number of vehicles coming to campus. A review of the available parking permit sales data indicate that not everyone purchases a permit. Approximately two-thirds of students purchase a parking pass and roughly two-fifths of faculty and staff. Anecdotally, permit purchases have been declining, possibly pointing to fewer people driving to campus. It is not possible to conclusively say that this trend will result in a corresponding increase in shuttle ridership because people will try and find free parking nearby, carpool, or switch to modes such as biking. It would be expected that some percentage of people not choosing to park on campus would choose transit. As more data becomes available on parking and transit usage, Mason should consider studying it further to determine the relationship.

Table 5-5: Mason Parking Permits Purchased (2009-2011)

	2009	2010	Percent Change ('09-'10)	2011	Percent Change ('10-'11)
Student	19,581	22,883	16.86%	22,291	-2.59%
Faculty/Staff	1,834	1,925	4.96%	1,823	-5.30%
Total	21,415	24,808	15.84%	24,114	-2.80%

Figure 5-1: Comparison of Mason Population and Parking Permit Sales



5.3 City of Fairfax Demographic Shifts

Discussed earlier in the report, certain demographic characteristics can play a role in people's decision to use public transportation. Certain characteristics have been linked to greater transit usage because they are often associated with a lack of other transportation alternatives. Persons livings in households with no vehicle available, persons living below the poverty line, and person age 65 and older are all tied to greater transit dependence for various reasons. A correlation analysis was run using figures from the American Community Survey for each characteristic and CUE ridership. The analysis was only done for the years 2009 to 2012 because of available Census data. Based on this analysis, poverty status showed the greatest correlation to ridership, albeit a negative relationship. Population showed a lower, but positive relationship to ridership. There is no forecast for the population in poverty, so the ability to forecast future demand off this relationship would not be feasible.

Table 5-6: City of Fairfax Demographic Correlation Analysis

	CUE Ridership	*City Population*	*Households w/No Vehicle*	Persons Below the Poverty Line	Persons Age 65+
CUE Ridership	1				
City Population	0.806538	1			
Households w/ No Vehicle	-0.74489	-0.57726	1		
Persons Below the Poverty Line	-0.93652	-0.54892	0.732747	1	
Persons Age 65+	-0.4291	0.178284	0.468606	0.717006	1

5.4 Other Factors Impacting CUE Ridership

In addition to demographic characteristics, two other factors have been raised as having a potential impact on CUE ridership: fare increases and growth in Mason Shuttles. It is well documented that fare increases result in losses in ridership. The *Simpson - Curtain* rule states that for each 3 percent increase in fare, there is a corresponding decrease in ridership of 1 percent. Based on a correlation analysis of these factors against ridership, there was a fairly high negative correlation between fare and ridership for CUE. This would support industry research. Increases in the service provided between the Vienna/Fairfax - GMU Metro station and the Mason campus, the only route to directly compete with CUE, didn't show as strong a relationship to the CUE ridership. Based on these findings a demand relationship using fare amount was developed.

$$Demand = 1144015 + -156178 \times Fare$$

The regression analysis resulted in an r-squared of 0.92 with a standard error of 21,279 using 5 observations. Again, this is a small number of observations, but does provide a rough approximation of the impacts associated with changes in fare for CUE.

5.5 Travel Demand Model

There are many factors that can impact demand for transit, making it a very complex and challenging thing to determine. The above discussions focused on an individual factor's impact on transit demand. Producing a multivariate regression analysis would provide a greater level of complexity to the demand formula. The regional travel demand model uses inputs for future population, housing, employment, and future transportation improvements to determine origin and destination patterns. This means that the model accounts for things like new roads, traffic congestion, and land use changes that can all impact travel choices for the region.

Transit demand growth is based on the Metropolitan Washington Council of Governments (MWCOG) Transportation Planning Board's (TPB) Version 2.3 travel demand forecast model. The percent growth in transit was calculated from the output of the mode choice model for subareas determined for the City of Fairfax and George Mason University (Figure 2). Applying the percent change in transit ridership from 2010 to 2040 as a factor to the current ridership for CUE and Mason Shuttles provides an estimated demand for service. The 2040 forecast horizon from the model goes beyond the year for all the forecasts from Mason for student enrollment which was 2020. It should also be noted that the model doesn't account for Mason Shuttles ridership because it isn't reported to MWCOG.

Based on this analysis there is a 63 percent increase in bus ridership for the City of Fairfax and GMU. Applying this growth factor to the most recent daily ridership available for each of the CUE routes results in a daily weekday ridership or approximately 5,000 riders when Mason is in session. The annual ridership would grow to almost 1.4 million riders. Applying the same factor to the Metro to Mason routes would result in an annual ridership around 500,000 riders. This is below the estimate produced above that accounted for growth of the University population. The more conservative estimate produced using the model is likely a result of the model not accounting for all the ridership currently being carried via Mason Shuttles. This result is a limitation of the model and points to a demand equation that is more closely linked to University growth and changes for producing an estimate.

A more detailed look at the demand figures for the subareas created for the City of Fairfax and GMU was completed to determine if certain areas of the City would be more impacted by land use changes and growth. Figure 3 shows the absolute change in bus trips originating in each of the subareas. The area around the Metro and the northwest corner of the City show the highest number of trips originating from those areas. The greatest change in trip production occurred in subarea V, followed by subareas I, IV, and VI. The change in riders coming into the City was spread across more subareas (Figure 4). While the absolute growth in trip attractions was not as large as the magnitude of trip productions, the percent of growth for some of the areas was of a similar scale. Subareas I, III, V, VI, and GMU all saw a growth in trip attractions of greater than 100 percent of the trips from 2010 to 2040. Based on these results it would appear that additional service will likely be warranted on all the routes, but perhaps more so on the Gold routes, to accommodate the growth in demand.

Figure 5-2: City of Fairfax Modeling Subareas

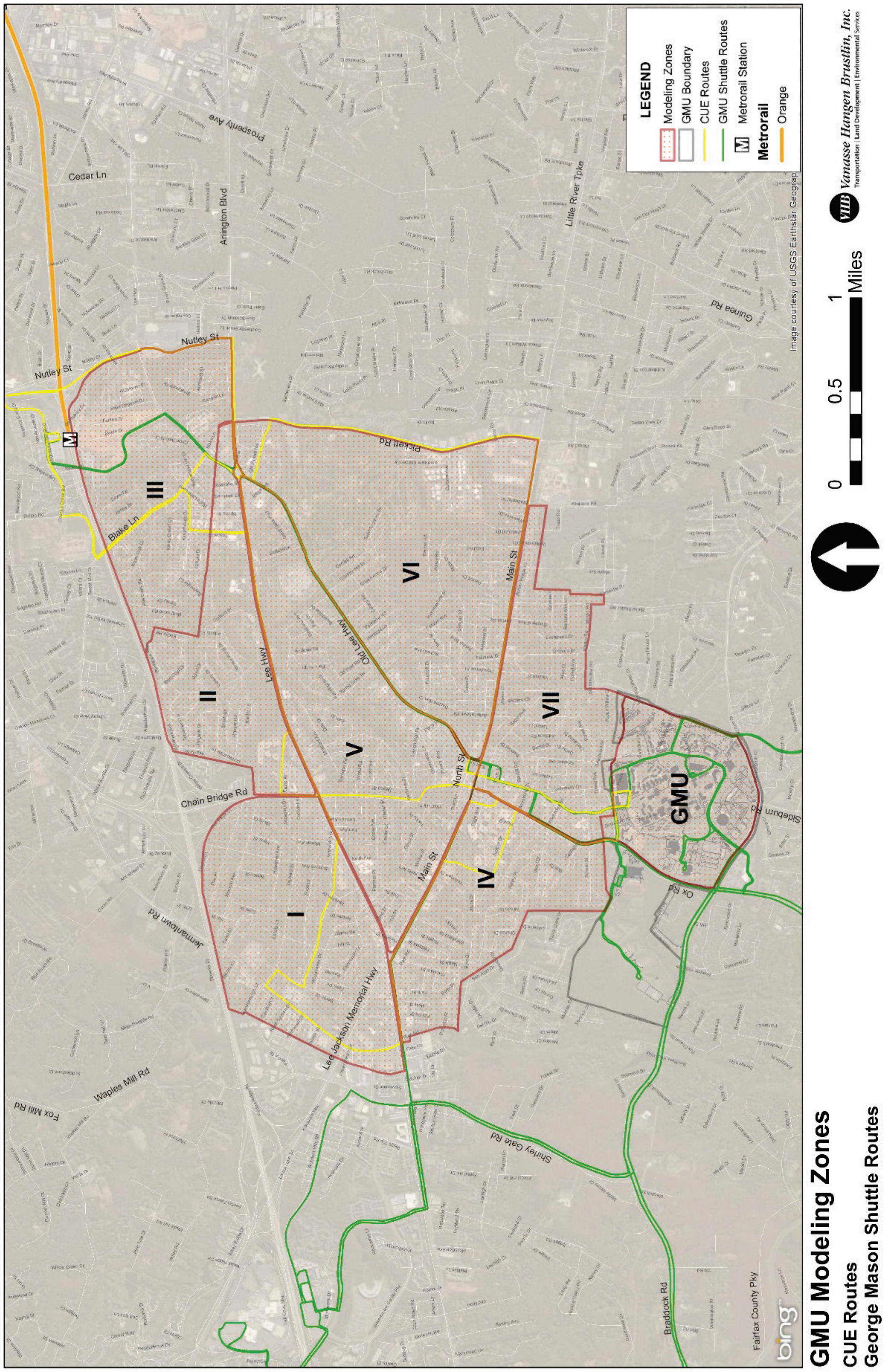


Figure 5-3: City of Fairfax Change in Trip Productions (2010 - 2040)

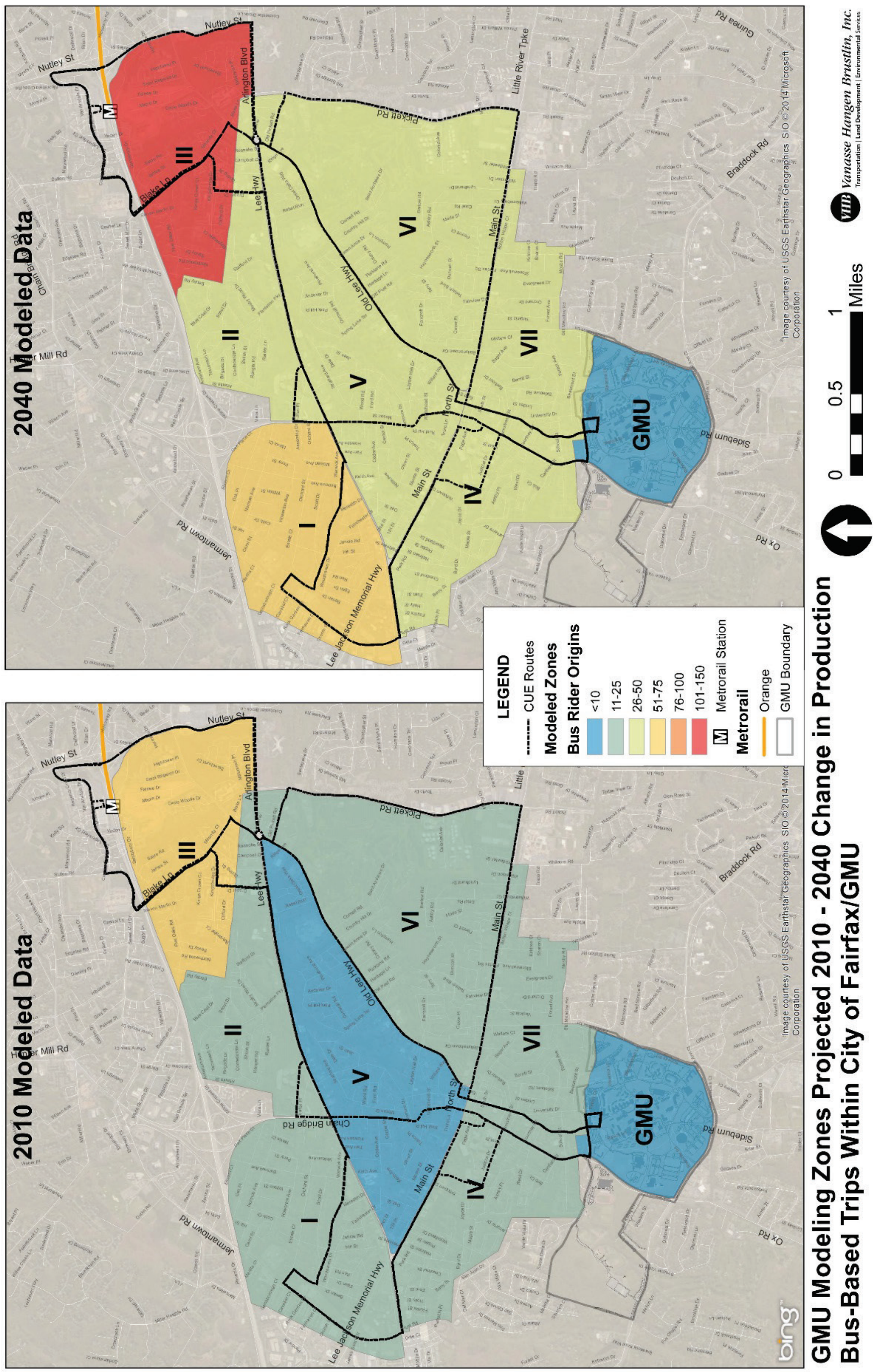
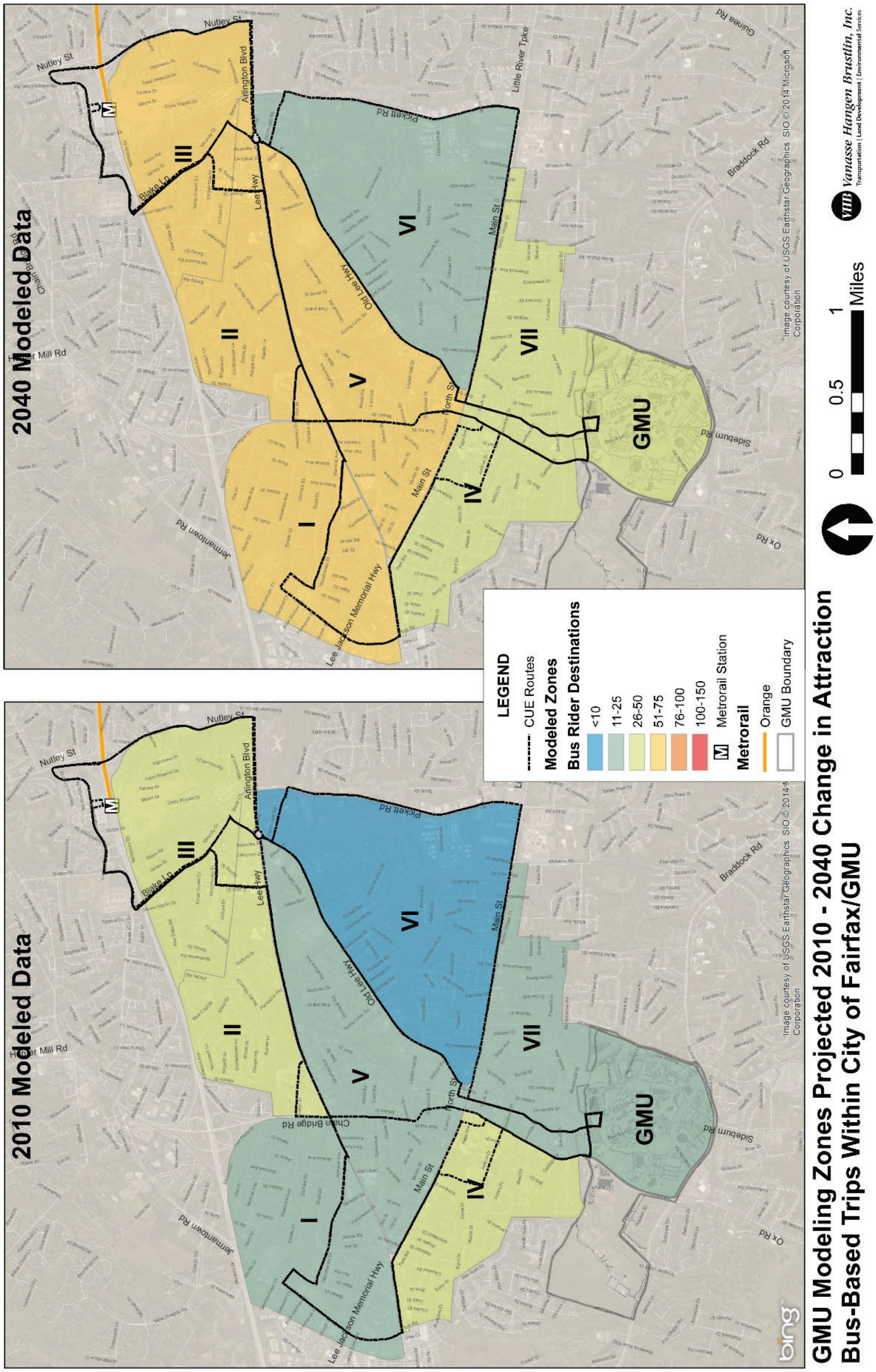


Figure 5-4: City of Fairfax Change in Trip Attractions (2010 - 2040)



5.6 Capacity Analysis

Using the forecasts for transit demand produced above, along with the capacity analysis conducted as part of the performance review, provided some insights into whether the existing system can accommodate future growth. The growth factors produced for both CUE and the Mason to Metro routes were applied to the minimum, average, and maximum ridership values for each trip and plotted against the existing capacity. The figures for each route show that all of them would likely need a larger vehicle or additional trips added to the route to accommodate the ridership demand.

CUE

Assuming the same size vehicles currently operated, the Gold routes would likely require two additional trips to each of the routes. The average ridership per trip between the hours of 7 AM and 7 PM was around 90 riders. Three trips with a 28 passenger bus per hour would only be able to accommodate 84. The Green routes would at the very least require another trip each. They currently carry fewer riders per trip and a third trip per hour would accommodate the average hourly ridership of around 70 riders.

Figure 5-5: Gold 1 Capacity (2040)

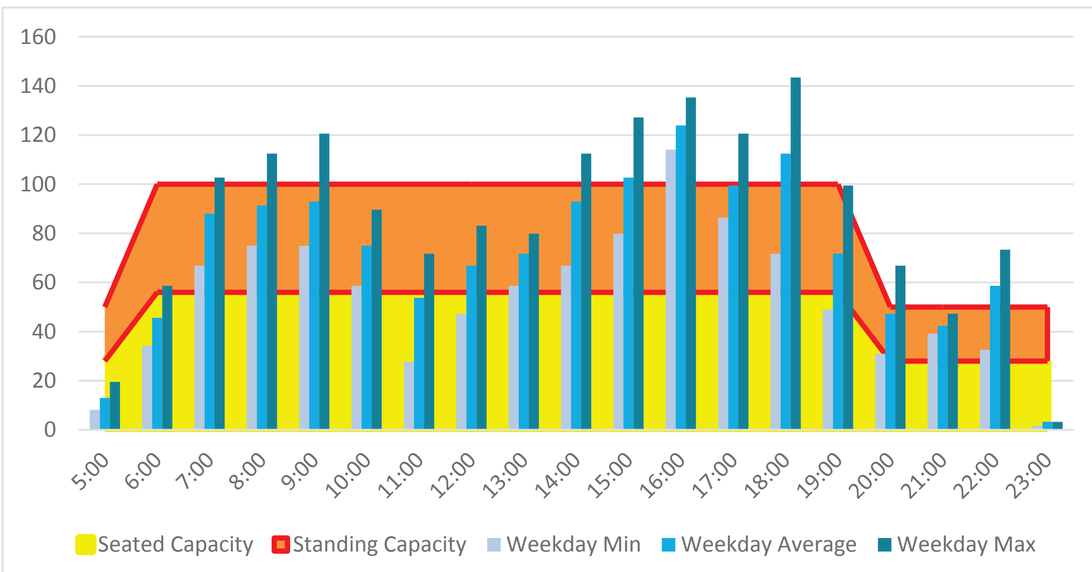


Figure 5-6: Gold 2 Capacity (2040)

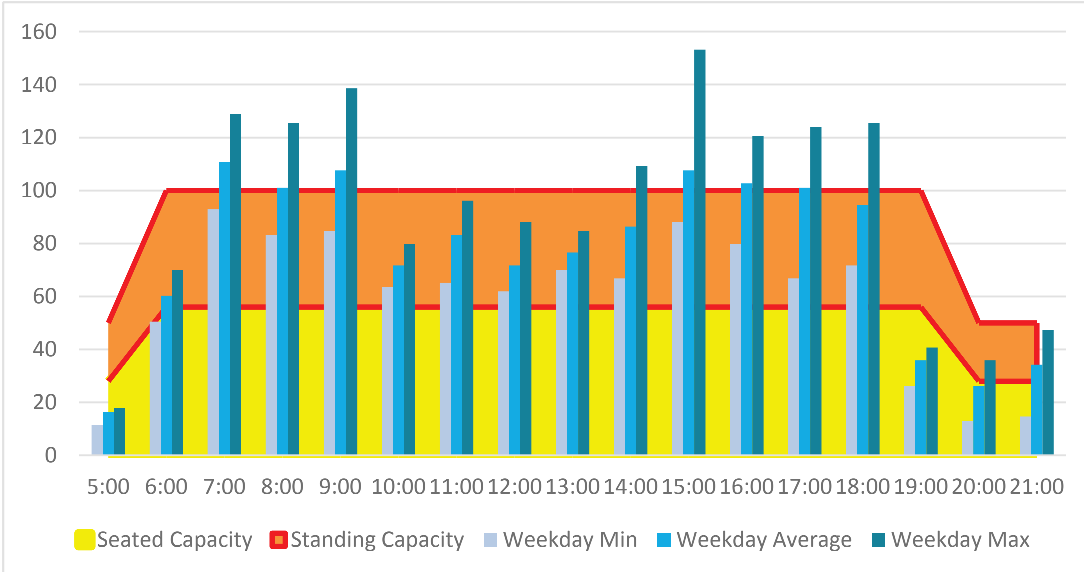


Figure 5-7: Green 1 Capacity (2040)

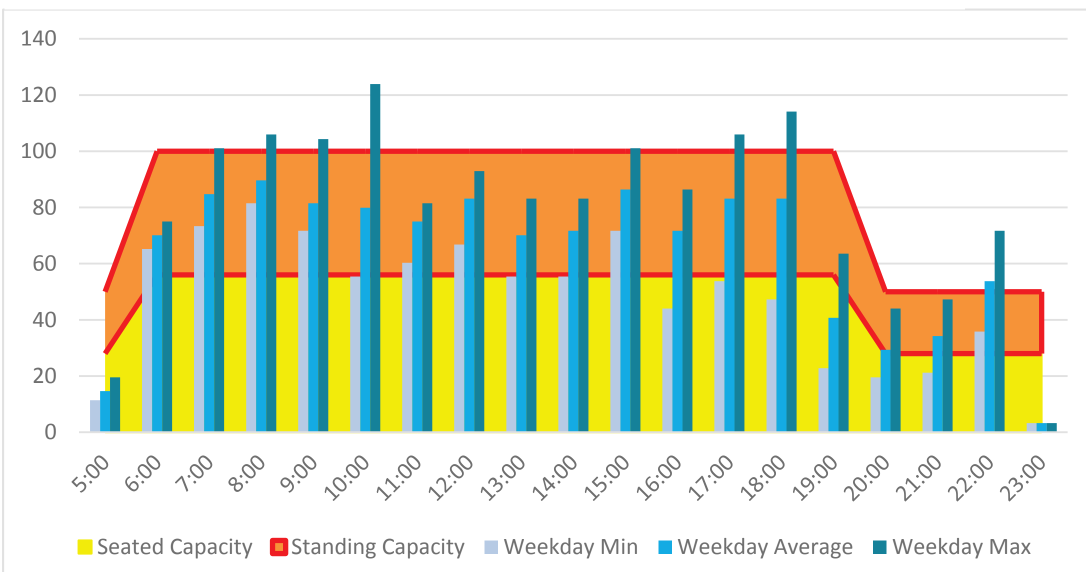
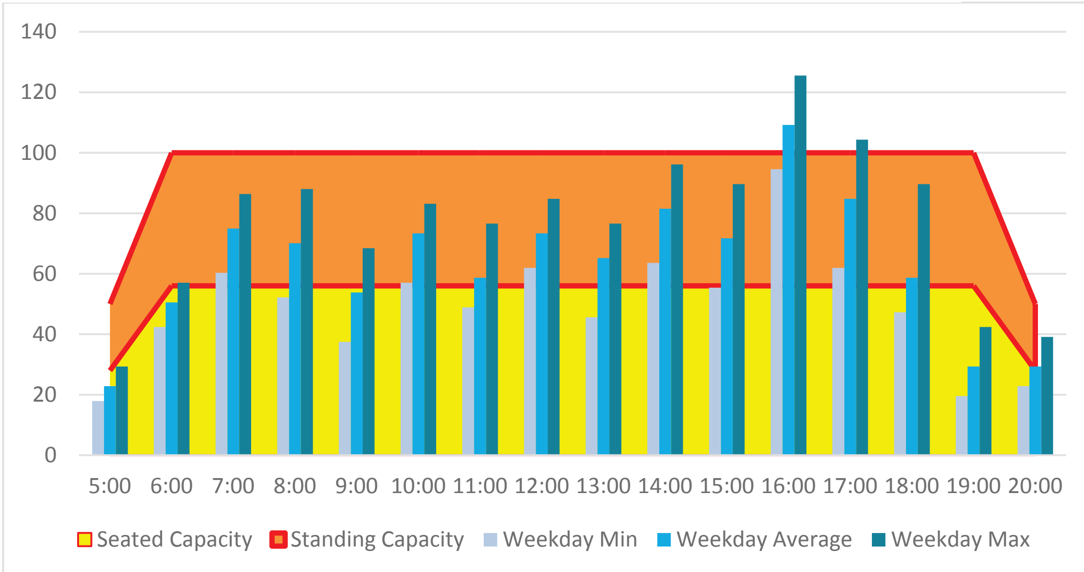


Figure 5-8: Green 2 Capacity (2040)



Mason to Metro (Mason Shuttles)

A similar review of the future capacity of the Mason to Metro routes using the growth calculated from the regression equation discussed above shows that the average ridership per trip only exceeds vehicle capacity during the peak travel times in the peak direction. More of the maximum observed ridership per trip figures exceed the capacity however, and likely would warrant additional service being added to the route. Considering the current seating capacities for the Mason to Metro (32) and Mason to Metro Express (24), there would like need to be one additional trip added to each route. The additional trips should be focused around a typical workday time period for the Mason to Metro routes, while the Mason to Metro Express routes would only warrant additional trips during the peak travel time and direction.

5.7 Conclusion

Based on the forecasts for future demand, both systems will grow significantly. While the CUE system has seen recent decreases in ridership, it is not forecasted that they would continue to decrease based on forecasts for population and housing growth. Mason Shuttle's growth will be closely linked to growth in the university population and changes in TDM policies and parking supply. If Mason were to slow growth, it would be expected that growth in ridership would slow as well. The demand forecasts conducted were based on the existing transit systems, and those changes proposed in existing planning documents and included in the regional travel demand model. This means that the forecasts don't account for potential recommendations that may come from this planning study. These forecasts will be used to guide recommendations for service changes that will follow, providing insight into the amount of service that should be provided to accommodate growth in both the University and the City.

Figure 5-9: Mason to Metro Capacity (2020)

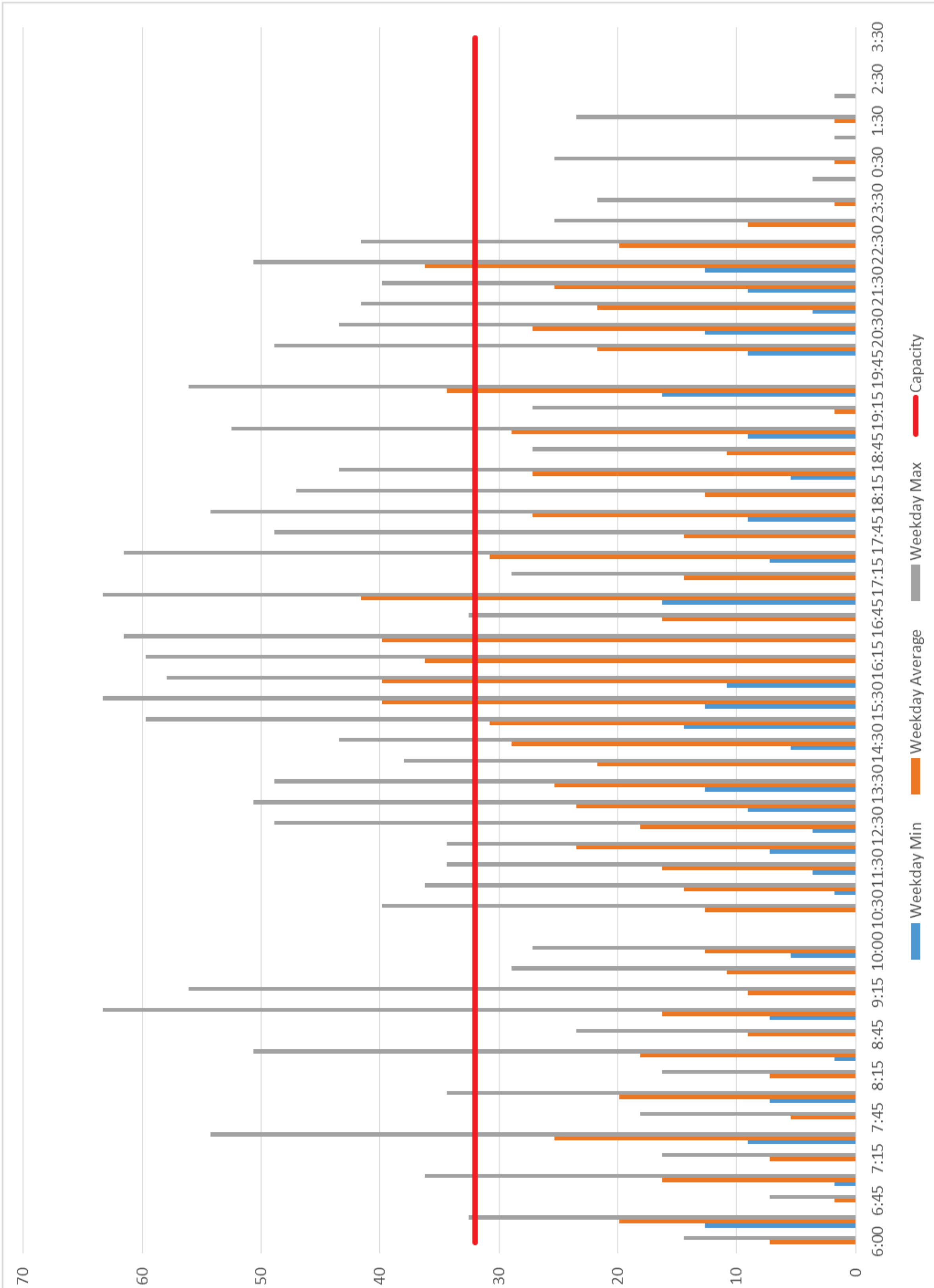


Figure 5-10: Metro to Mason Capacity (2020)

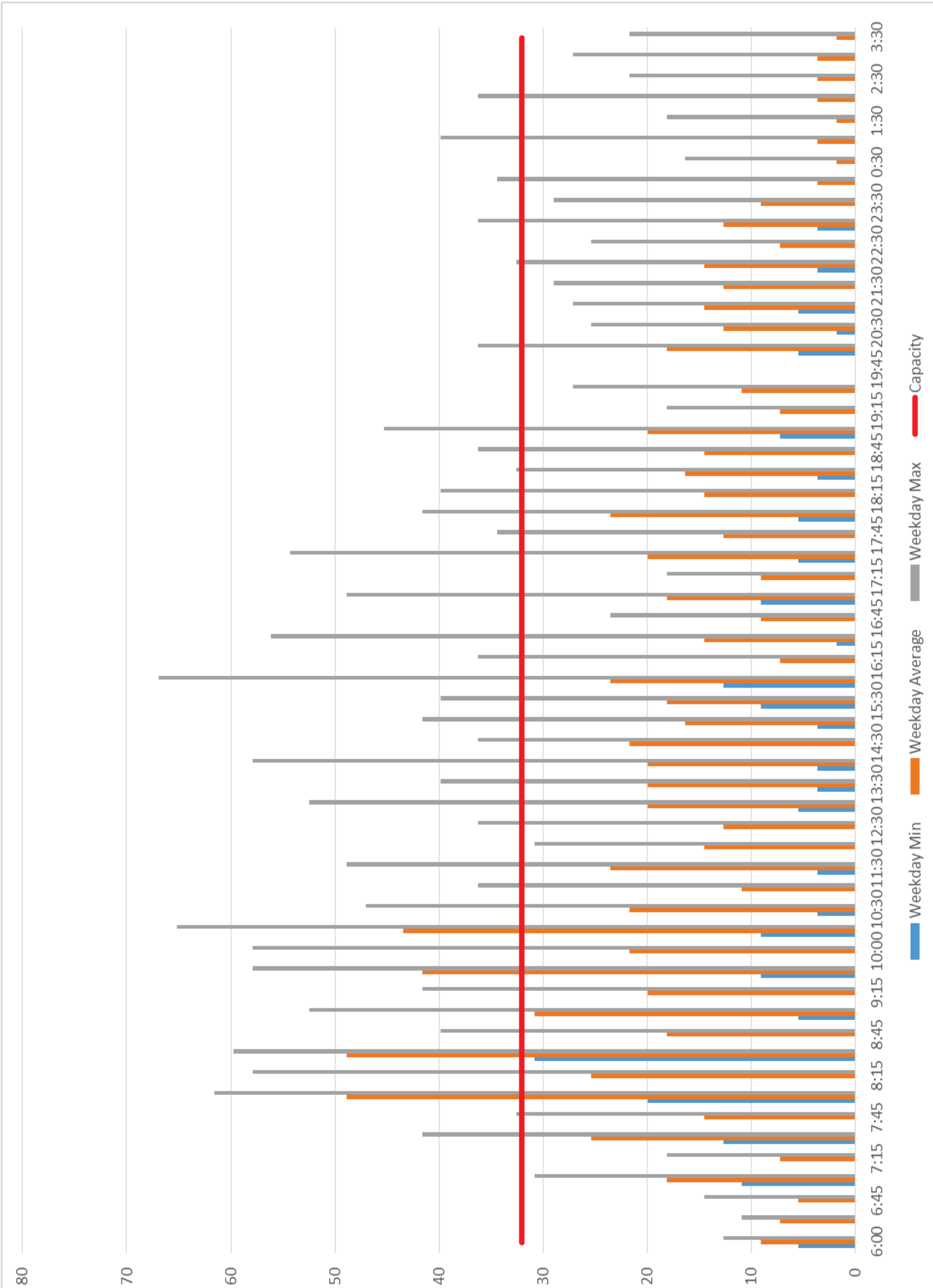


Figure 5-11: Mason to Metro Express Capacity (2020)

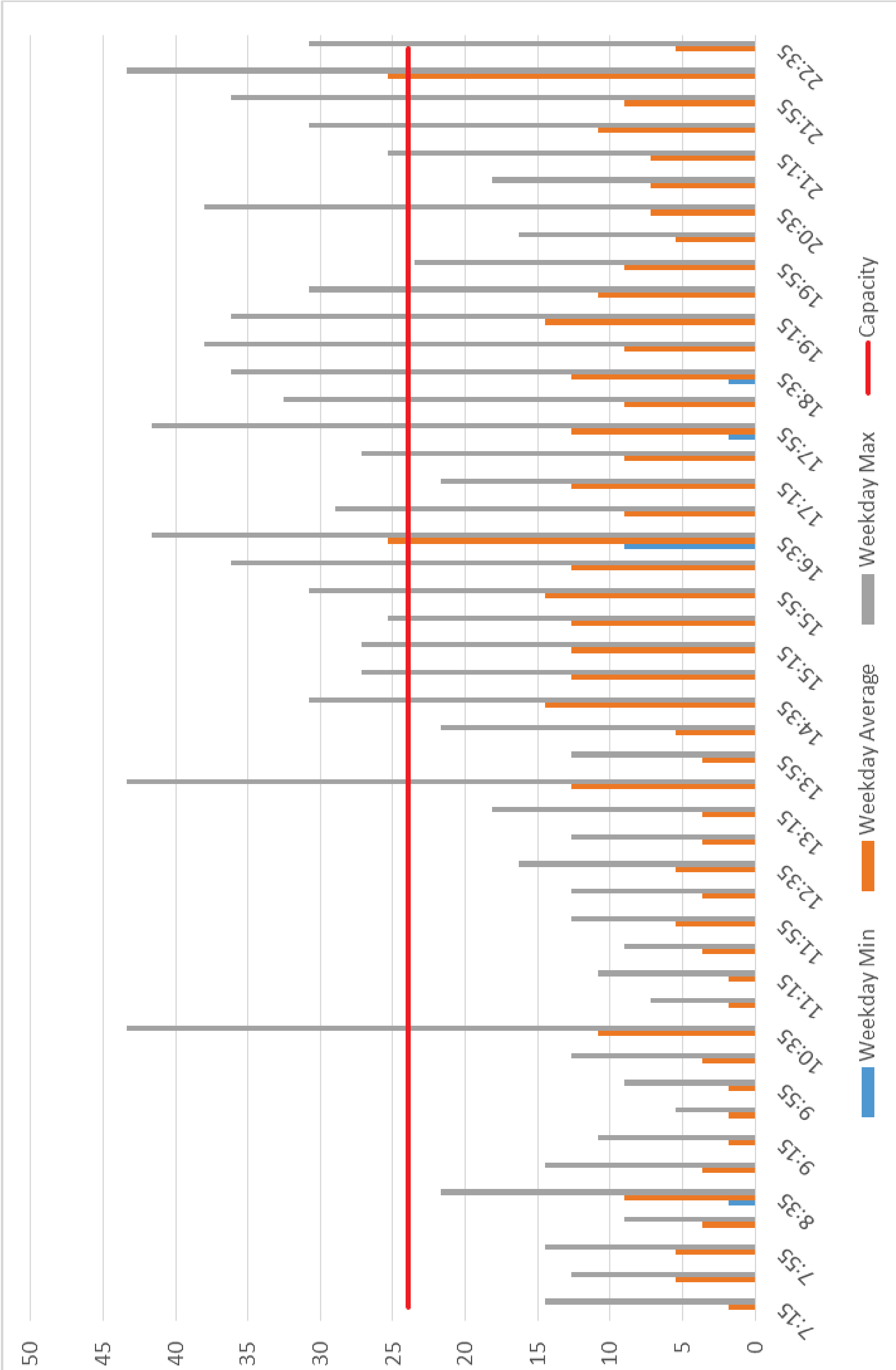
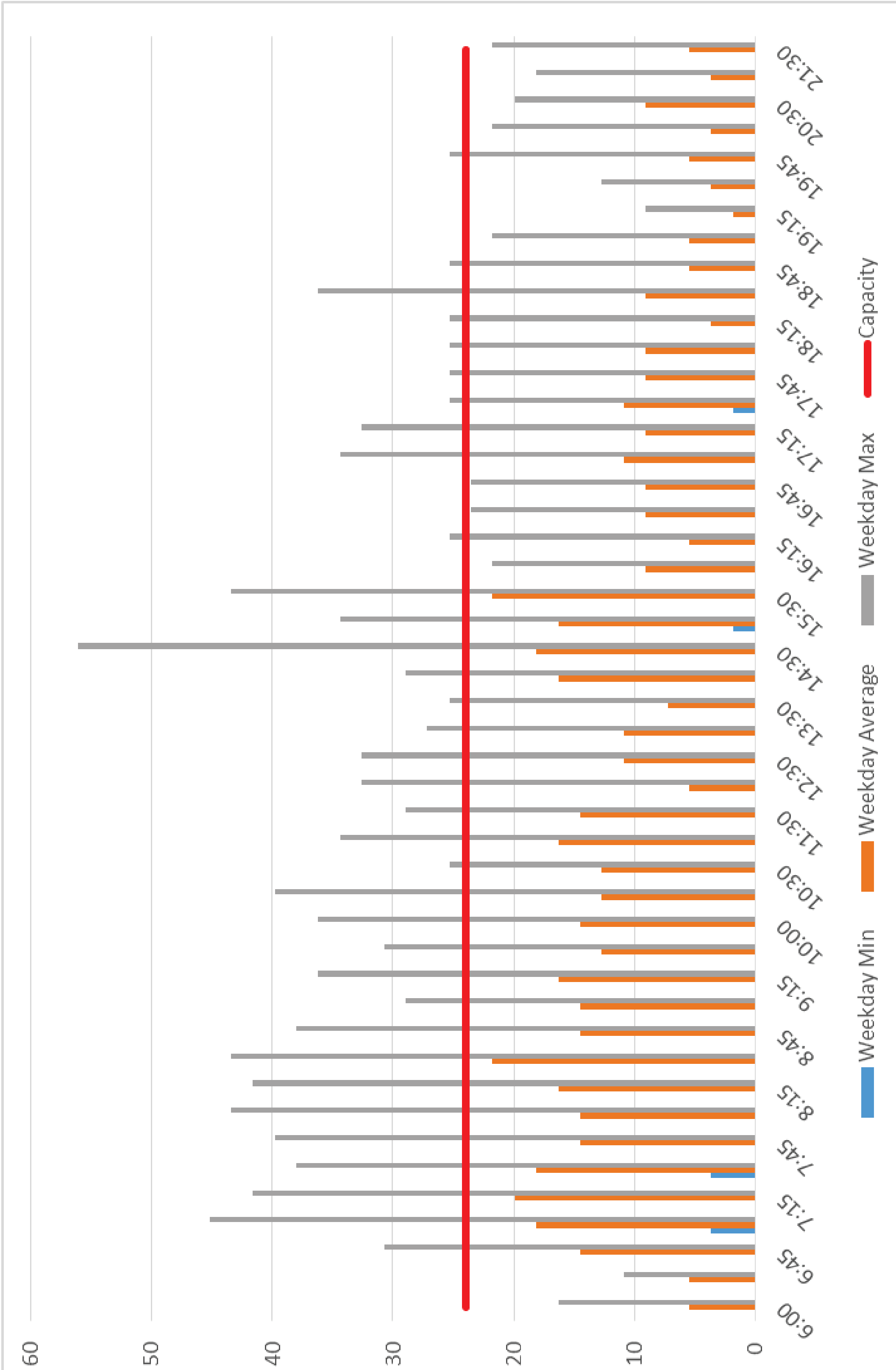


Figure 5-12: Metro to Mason Express Capacity (2020)



6

Recommendations

6.1 Introduction

This study has presented the steps involved in the assembly of study data, manipulation of that data, and the analysis of the data and the subsequent results. The analysis highlighted areas of need for Mason Shuttles and the CUE. This section will summarize those needs and present system changes that address those needs. General costs associated with the recommendation, a time frame for implementation, and an estimate of how improvements could impact demand for service will also be presented.

Included as part of the Recommendations section is an overview of various transit operating structures. A summary of the operating structure, the pros and cons, and an example will be included. A suggestion for how Mason and the City of Fairfax should move forward will be included in this summary. Also included as part of this final section will be a review of the existing sources of funding available to Mason and CUE, and a discussion of other potential sources.

6.2 Summary of Needs

Based on the review of transit data and the survey results the following needs were identified:

- **Improved/expanded communications** - The survey results show that awareness of schedules, real-time passenger information, and destinations served were weaknesses for both agencies. Awareness of the many methods of communication for each service could be strengthened**.**
- **Better marketing of Real-time Passenger Information** - Awareness of the NextBus application rated lower in the survey than any other transit amenity offered by CUE and Mason. Survey responses prioritized service frequency and on-time performance as key factors when choosing transit. Providing real-time passenger information can inform arrival and wait times, improving perceptions of frequency, on-time performance, and even travel time.
- **Identification and marketing of route options for popular destinations** - The survey asked respondents to list locations they would like to see served by CUE or Mason Shuttles. Many of the locations requested are actually within a quarter mile of an existing CUE or Mason Shuttle route. Many of those outside the Mason Shuttle or CUE service area are accessible via other agency routes. Highlighting those options can raise awareness and ridership.

- **Modify or eliminate poorly performing routes** - Some of the Mason routes studied perform under the system average. Decisions about the purpose and need of the route should be examined to determine whether the route should be modified or eliminated to address performance.
- **Develop Goals, Objectives, and Performance Standards** - The CUE has goals, objectives, and performance standards that were developed as part of the most recent transit development plan. The periodic review and update of these measures allow an agency to continuously monitor its success against changing conditions. Mason Shuttles does not currently have any formalized goals, objectives, or performance standards. Creating these would provide Mason Shuttles with the ability to measure performance and provide a clear standard for determining whether a route should be retained, modified, or potentially eliminated.

6.3 Service Improvements

This section outlines potential improvements that would address the needs identified above. Most of the improvements identified are viewed as near-term solutions that can be enacted over the next one to five years. Identifying funds to support these improvements will be key to enacting these solutions.

Develop Goals, Objectives, and Performance Standards

CUE currently has a set of goals, objectives, and performance standards in place. These were developed as part of the *2011-2016 Transit Development Plan*. These performance standards were used to assess various aspects of the routes as part of this study. There is no need to update these at this time, but they should be reviewed as part of the next TDP update. CUE should measure route performance against their standards as part of an annual performance monitoring program. This review is used to highlight system and route performance on a periodic basis and allow CUE to address underperforming areas early before they become major problems.

Mason Shuttles currently has goals and objectives that were developed as part of the recent Transportation Master Plan, but doesn't have any performance standards in place. The recent Master Plan identified larger principles for the entire transportation system. Mason Shuttles, as a major provider of transportation service to the Mason community, should strive to help the University meet these.

Mason Shuttles staff discussed that the service was initially created to supplement the service being provided by CUE to access the Fairfax campus. Recent increases in student enrollment and residential students have changed the campus complexion. In addition, Mason has worked hard to improve and expand programs related to the student experience. University growth has resulted in new facilities being constructed and the elimination of many surface parking areas. These changes resulted in more parking structures being constructed, driving up the cost of accommodating vehicles on campus. Additionally, the growth in the residential student population has transitioned Mason from a commuter school to a residential community with different support needs. These changes along with a push from the University to reduce the number of vehicles coming to campus have resulted in a significant growth in shuttle services. The Shuttles not only provide access to the Fairfax campus, but also connect students to other campuses, as well as local destinations. The role of Mason Shuttles has grown from supporting access to playing a major role in student and university life.

The goal of Mason Shuttles has transitioned from supplementing existing transit services to being the primary provider of transit services to the Mason Community. The following goals and objectives were identified as part of the Master Plan and should place Mason Shuttles on the path to being the primary provider for Mason students, faculty, and staff:

- **Connectivity**: provide service to desired destination
- **Convenience and Availability**: provide useful stops and a reasonable schedule
- **Information**: provide tools to empower informed transportation decisions
- **Perception**: make service "feel" safe, reliable, and convenient

To assist in measuring how well Mason Shuttles is meeting the outlined goals and objectives, the following performance measures were identified. These measures were selected because of how they relate to the goals presented above. Many of the measures rely on rider surveys. The ability to easily connect with the Mason community through email or web-based survey tools make it easier for internal staff to conduct and collect information about the service. These should be conducted every two to three years. Additionally, monitoring route-level ridership data monthly and annually will provide a reasonable measure of system performance between these survey periods. Dramatic changes in ridership, positive or negative, should be examined further to determine the cause and whether service changes are warranted. Additionally, routes that operate consistently at capacity should be considered candidates for additional service.

- **Connectivity**
    - *Service Coverage* - This measures the percentage of the area covered by transit service. Since Mason's service area isn't defined by a jurisdictional boundary, they should measure how well they serve the desired destinations of the population riding Mason Shuttles. This can be problematic because the survey responses noted desired destinations all over the region. The most suitable method for determining how well this goal is being served would be to periodically (every 2-3 years) conduct surveys of the riders to determined desired destinations. This information should be reviewed and those locations receiving the largest number of requests should be overlaid with the available transit services, including CUE, Fairfax Connector, and WMATA to determine coverage. The goal should be to cover approximately 75 percent of those destinations deemed "reasonable". The term reasonable is subjective, but consideration should be given to the feasibility of serving those destinations requested. A request for service to Front Royal, Virginia is likely not reasonable.

- **Convenience and Availability**
    - *Frequency* - Due to the different design and nature of each of the Mason Shuttle routes it is difficult to apply a system-wide standard to each route. Decisions should be made about the importance of frequency in the success of a route. Mason Shuttles should base service frequency on meeting demand. Routes like the Metro to Mason route have an expectation for frequent service, while routes like the Burke VRE Shuttle is timed to align with train schedules. Service frequency improvements should be considered on routes where the load factor is between 0.76 and 1.00 passengers per seat during the peak travel times. Load factors approaching 0.50 or fewer passengers per seat should be examined for possible headway increases during the peak travel times. No Mason

Shuttle route should have a headway greater than 30 minutes during the peak or greater than one hour during the off peak.

- *Service Span* - Similar to frequency, service span is going to be different for each route. The service span for Mason Shuttle routes should be based on demand. Routes should be examined for service span increases if the passenger load on the first or last trip is between 0.76 and 1.00 passengers per seat. Routes with passenger loads less than 0.50 passengers per seat on either end of the service span should be examined for service span reductions.

- **Information**
  - *Knowledge of Mason Shuttles* - Through periodic survey efforts, Mason Shuttles can determine how successful their informational campaigns are working. The recent survey effort for this study indicated that the majority (> 90%) of the Mason Community are aware of the Mason Shuttles. Mason Shuttles should strive to continue this level of awareness and work towards increasing the figure, while also improving route awareness.

- **Perception**
  - *On-time performance* - Measuring how often a route operates ahead or behind schedule will inform how reliable the service is. Ensuring that riders can reliably access transit is paramount to ensuring positive experiences and retaining riders. Routes that have problems staying on schedule should be examined to determine the underlying cause and for possible schedule changes. Routes should be considered early if they arrive 1 minute ahead of schedule, or late is they arrive over 5 minutes behind schedule. Mason Shuttles should strive to maintain an on-time performance standard of 85 percent or greater of all shuttle trips.

  - *Safety* - Safety did not appear to be an issue for Mason Shuttles based on survey results, but ensuring it doesn't become a problem is important to retaining a successful service. As part of future survey efforts, Mason Shuttles should assess perceptions of safety for Mason Shuttle riders.

6.4 General Recommendations

The following section addresses many of the common needs identified for Mason Shuttles and CUE. Many of these are in response to the surveys conducted of both riders and non-riders.

Improved/Expanded Communications

The ability to connect and share information about a transit service with their customers quickly and easily is of vital importance, especially when the service encounters unexpected impacts to service reliability or routing changes. The growth and popularity of smart phones and social media applications provide a variety of platforms to disseminate information to customers. These can be added to the existing arsenal of traditional website communications, email communications, newsletter communications, and printed schedules, maps, or notices.

Both agencies currently provide general information about their services through websites. The websites provide information about schedules, routes, and in the case of CUE, fares. Ensuring that the websites are functional for personal computers as well as tablets and smart phones is important to reaching as many users as possible. Information about schedules, fares, and real-time information should be highlighted and easy to find. If there are major system disruptions or temporary changes they should be the first thing a user sees when visiting the website.

Another great way to reach existing and potential riders, especially for Mason, is through email communications. These can be set up as subscription services, much like emergency notifications for traffic or weather, but focused on transit. Subscription services should be focused on sharing information about system disruptions, changes to service, or other pertinent information related to using the system. Mason also has the potential to target messages to specific user groups based on geography. The ability to group emails based on home address or zip code would provide the ability to target marketing for a particular route. The ability to park for free at the Burke VRE station and take the Burke VRE Shuttle could be sent through an email to only those students whose address is within a specific distance from the Burke VRE station. This ability would allow Mason to focus information related to certain services only to those who would be likely to use the service, eliminating emails to those not impacted. This would keep Mason Shuttle emails from becoming something people ignore because it never relates to their needs.

Social media is an ever changing communications medium that can provide near real-time connections with users who have selected to “follow” Mason Shuttles or CUE. The use of social media by transit agencies has grown in recent years. Transit agencies use social media to provide real-time updates, share other general information, conduct customer engagement, and connect with current or potential employees. Things to keep in mind when using social media include the staff time involved with maintaining the presence, the ability for others to publicly criticize the agency with little control from the agency’s side, concerns about cyber security, and concerns about accessibility for people with a disability. Facebook, Twitter, and YouTube were the applications most commonly utilized by transit agencies according to the Transit Cooperative Research Program (TCRP) Synthesis Report 99.

Agencies tend to use different applications for different purposes. Twitter is utilized more for real-time alerts and announcements of agency news. Facebook is used more for general announcements and engagement. YouTube is often used to share agency stories or news in a different format. Social media is viewed as a great way to communicate with existing riders, but not very effective in reaching potential riders or non-customers, and as such isn’t viewed as a method for increasing ridership.

Currently, the City of Fairfax has a Facebook page, Twitter account, and YouTube page. They will post information related to CUE, but CUE does not have its own account. Mason Shuttles has a Twitter account that they manage. Both services utilize NextBus which also provides the ability to communicate messages. Mason should continue to use Twitter for providing communications and should consider possibly adding Facebook, YouTube, or other popular social media outlets. The ability to post video content to a Facebook or YouTube account would provide Mason Shuttles with the ability to post instructional videos about riding or other topics. CUE should create its own social media accounts. These will allow CUE to communicate more directly with riders, and allow those “following” to receive targeted information about CUE. Before these are done, both agencies should develop a social media policy that outlines who can access and post content, the types of material that can be posted, how critical feedback will be handled, and address any potential security concerns.

The messages shared via the different media should be tailored to the strengths of each. Web-based or social networking media are best suited for sharing time-specific information that can be updated and disseminated quickly. Paper communications require greater lead time to prepare prior to posting and sharing the information. Agency websites should be a clearinghouse for all things related to transit information. They should be structured to provide easy and clear access to the most pertinent information. They should also provide information that is accessible to those with a visual disability. Printed information is still valuable for providing route or schedule information to those unfamiliar with a system. These should be located where people are likely to encounter the system for the first time.

The costs associated with expanding the communications program will primarily be in staff time. Many of the media outlined are internet-based with no major costs associated, since each agency has a website. The time associated with managing communications will range between 2 to 20 hours a month, based on other similarly sized agencies. The time involved is closely associated with the amount of content being shared in a particular month. If opportunities to partner with public relations or communications departments within the University or City are available, these should be explored. Costs associated with operating and maintaining websites and other electronic media can vary widely based on the amount of time involved and complexity of the site. A reasonable cost estimate would be in the $500-$2,500[25] range. These improvements can be enacted relatively quickly, over the next year.

Market Real-time Passenger Information

While people who took the survey indicated they learn about transit a number of ways (word of mouth, internet, printed schedules, and University/City communications), there appears to a lack of knowledge about certain aspects of each transit system. Knowledge that each system provides real-time passenger information (RTPI) was low. Each service currently uses NextBus to provide RTPI for their customers, but not many customers knew about it. This is problematic because most survey respondents highlighted RTPI and service frequency as key factors that would increase usage of transit. For example, there was an anecdotal belief that people view the CUE Gold 1 and 2 as dramatically slower than the Metro to Mason routes. The difference in travel time between the two is within a few minutes. Increasing rider awareness and use of RTPI would allow users to see when the next bus to campus is arriving regardless of affiliation, and provide information to dispel the myth of the CUE buses being dramatically slower than Mason Shuttles.

Improving rider awareness of RTPI could be accomplished through a couple different methods. The first would be better marketing of the NextBus application through each agency's website, on buses, through social media, and at bus stops. The second method involves the use of digital NextBus displays at major stops. These would be placed in conspicuous or high ridership locations to inform riders when the next bus is arriving. Locations served by both CUE and Mason shuttles should provide information about both services. A third way discussed to alleviate the bias for Mason Shuttles could be through moving the location of bus layovers at the Vienna Metrorail station. Currently the Green routes are located closest to the Mason Shuttle bus stop, while the Gold 1 and 2, located on the other side of the circle, and are the routes that more closely mirror the Mason to Metro service. Placing the stops closer together would allow people coming from Metro to see the next available bus without having to travel around the bus loop.

[25] Assumes average benefitted employee hourly rate of $125 multiplied by the estimated time commitment.

Costs for marketing the RTPI are related to staff time and printed materials that get posted on the buses. The major cost of this recommendation is the purchase and installation of RTPI screens. The recommendation would be to place these at the Vienna Metro, Rappahannock stop, and the Sandy Creek transit center. The approximate cost for each unit is around $10,000. Total costs would be around $36,000 for the three units, including installation. These should be purchased and installed over the next two to three years. Annual operating and maintenance costs will be around $500-$1,000.

Marketing of Travel Options to Popular Destinations

A review of the requested locations to be served by transit revealed that the majority of the destinations fell within the existing CUE and/or Mason Shuttle service area. Of the locations not currently served by Mason Shuttles or CUE, many are currently served by either Fairfax Connector or Metrobus. Some requests were for areas near the edge of the region in lower density areas that don't make financial sense to serve. Marketing that references these highly requested destinations, or the services that can connect people to them is advised. This can be combined with other marketing efforts to ensure consistency of the message and that the appropriate media is used. Larger transit agencies often provide a trip planner application on their website, but these can be expensive to setup and maintain, often costing the agency between $50,000 and $250,000. Therefore, it would be advisable to create static materials or targeted messages that show the expanse of destinations accessible by transit through a lower cost medium. The development of a map targeted to the Mason community would allow for those who are not local to Northern Virginia to identify the best way to get to popular destinations. The ability to develop interactive maps that can provide more detail has become easier and less costly through applications like ESRI's ArcGIS Online. A map could be created to highlight popular regional destinations. Upon clicking on the destination, information about the transit options available could be provided, including schedules and fares. Providing this information on the website, and at major stops, would reach the majority of riders and improve aware of the system. The information could be included in digital message boards providing real-time passenger information, making them more useful and informative than just stating when the next bus arrives.

Another potential solution is updating existing route maps to include popular destinations from the survey. Schedules and route maps are periodically updated as changes are enacted. When these updates occur, maps should be updated not just for route changes, but also the highlighted destinations to address customer preferences.

Targeted email/social media messages could be utilized to periodically highlight the destinations accessible through Mason Shuttles and/or CUE. These messages could be timed with major events occurring on campus or in the City, and inform customers through a social media post that they can access the event by using a particular route. These could also be sent out at certain times of the year. A social media post, email, or stop announcement could highlight popular shopping destinations and the routes that travel there during winter holidays.

The costs associated with creating new materials for the website and for communications purposes are again linked to staff time. The communications costs would be part of the staff costs mentioned above. To develop maps for the website or digital message boards would likely require 40-80 hours staff time initially, with a 20-40 annual staff time cost associated with periodic updates to the materials. The updated information should be completed over the next year to two years.

One potential barrier to Mason students not utilizing existing services to access some of the requested destinations is that they require using either a Fairfax Connector or a Metrobus route, which requires paying a fare. Paying a fare was highlighted as a major factor for the Mason community in informing their decision to use transit. One possible solution could be subsidizing a portion or the full amount of Mason students who ride Connector or Metrobus. This could be accomplished by purchasing SmartTrip fare cards preloaded with a fare. Marketing this option and requiring students to sign up for the program would likely cut down on overall costs as opposed to providing every student with a fare card. The cards could come initially loaded with a set amount that once used requires the student to then refill as a way to introduce the benefit of the service.

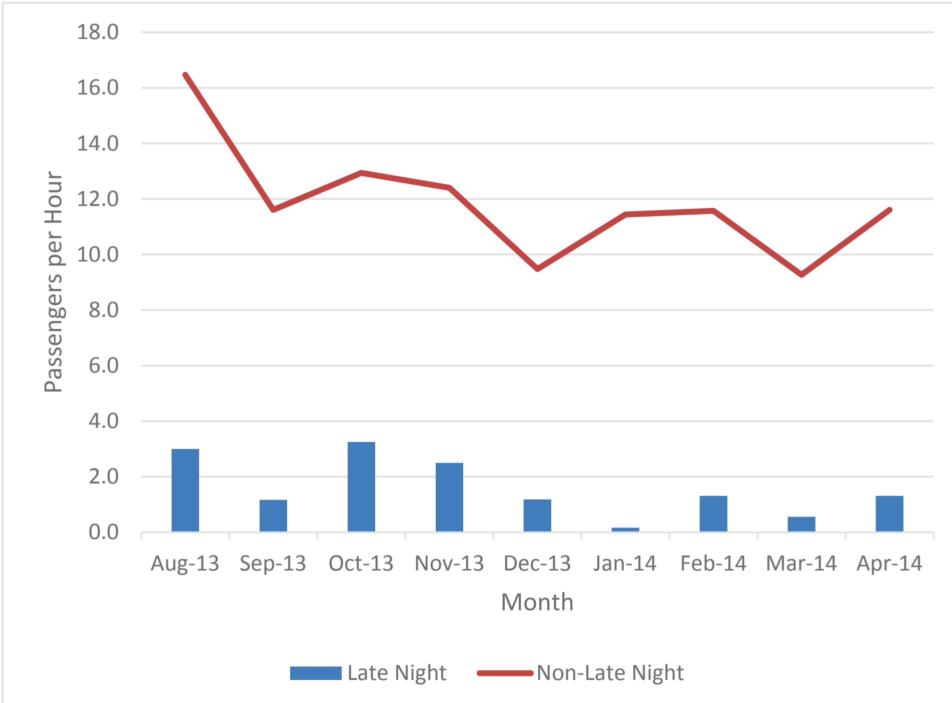
The costs associated with providing SmartTrip fares for use of Fairfax Connector or Metrobus could cost between $120,500 and $678,300 depending on the number of passes handed out, assuming an initial $20 fare[26]. The fare program is something that would likely require more study to determine a more exact number of passes required and fare amounts along with policies on administration. The initial recommendation would be to provide incoming freshman and transfer students a SmartTrip card when they arrive with a $50 preloaded fare. The cost would be around $150,000 and this could be put in place over the next two to five years.

Route Recommendations

Through the analysis, no major route changes or new services for Mason Shuttles or CUE were identified. The only route change proposed as part of this study is for Mason Shuttles. A review of the ridership for the Late Night Gunston-Go Bus service showed very low ridership compared to the other trips. Late night service has been reduced over the past couple years, likely in response to low ridership. It is recommended that the two late night trips be eliminated on the Gunston-Go Bus.

[26] The lower figure assumes a $20 SmartTrip card for every resident student (6,023) and the upper figure assumed a $20 card for every student (33,917).

Figure 6-1: Comparison of Late Night Gunston-Go Bus Ridership



Fairfax Connector is in the middle of an update to their transit development plan. They have not reached a point of developing route recommendations to test, but Mason should consider working with Fairfax Connector to identify needs and work on potential transit solutions. Mason currently provides the Burke VRE Shuttle that captures riders who live south of the campus. Mason should share information about Mason students, faculty, and staff who live south of the campus with Connector. The growth in ridership of the Burke Shuttle shows a demand for service connecting the Burke area with the campus. A route that would circulate through Burke and possibly Springfield before connecting to the Fairfax Campus appears to be viable.

A second option for improved service would be a stronger link between Tysons Corner and the George Mason campus. Metrobus currently runs the 15M via Chain Bridge Road during the morning and evening peak between Tysons and Mason. The route also connects to the Vienna Metro, making the trip between Mason and Tysons longer than a direct service, making it less attractive for travel between the two ends. Connector has developed other routes to supplement peak period Metrobus service, such as the 306. This could be another situation where Connector supplements Metrobus in the off-peak. The addition of the Silver Line and continued development occurring in Tysons makes it a major destination for shopping as well as jobs. A service that provides a link for Mason would be ideal, allowing students access to another retail destination as well as major job center.

The City of Fairfax and Mason recently completed a planning charrette entitled *#Vision Fairfax Mason* focused on connections, sustainability, and livability. The plan focused on transportation, economic development, land use, historic preservation, and housing. Recommendations related to transportation that were pertinent to CUE and Mason Shuttles included:

- Opening access to the public on late night Mason Shuttle routes
- Adding stops in Old Town Fairfax on Mason Shuttle routes

These recommendations were not studied as part of this effort, but their impacts should be considered moving forward. Mason Shuttles provides later service than CUE to the Vienna Metro on Friday and Saturday nights. Opening Mason Shuttles to the public would allow the public along the route to use Metro service later than they are currently able. Considerations that need to be studied are the existing capacity on the Mason to Metro routes during the late night service times and the potential demand for this service. Some of the late night trips can become crowded based on survey observations and anecdotal evidence. It will be important to not displace Mason riders who are paying for the service. Another consideration would be whether there is any cost sharing or fare charges to non-Mason riders.

Summary of Recommendations

The following table highlights the recommendations, any associated costs, who they relate to, and the time frame for implementation. Many of the recommendations presented can be implemented over a relatively short time frame with minor costs. Both systems are currently performing well and don't require major changes in service. Very little literature exists to quantify the impacts of the proposed recommendations on ridership. Some literature indicates a 1%-2% increase in ridership associated with better marketing and communications, however no definitive impact associated with real-time passenger information was found. All of the recommendations proposed are focused on improved access to information that can inform a traveler's decision making. These improvements should have a positive impact on ridership.

Table 6-1: Recommendations for Improvements to CUE/Mason Shuttle Service

Recommendation	Entity	Estimated Cost	Time Frame
Eliminate Gunston-Go Bus Late Night Service	Mason Shuttles	(savings)	1 Year
Improve communications materials	CUE & Mason Shuttles	\$5000 - \$10,000	1-2 Years
Develop popular destinations materials	CUE & Mason Shuttles	\$2,000 - \$5,000	1-2 Years
Expand RTPI Program	CUE & Mason Shuttles	\$40,000 capital \$500 - \$1,000 O&M	2-3 Years
Create SmartTrip Pass Program	Mason Shuttles	\$27,000 - \$700,000	5 Years
Work with Fairfax Connector to expand connections to campus	Mason Shuttles	unknown	5 Years

6.5 Operating Structures

There are many different management structures that could be considered for the current CUE and Mason Shuttle services. In its simplest form there are three primary structures.

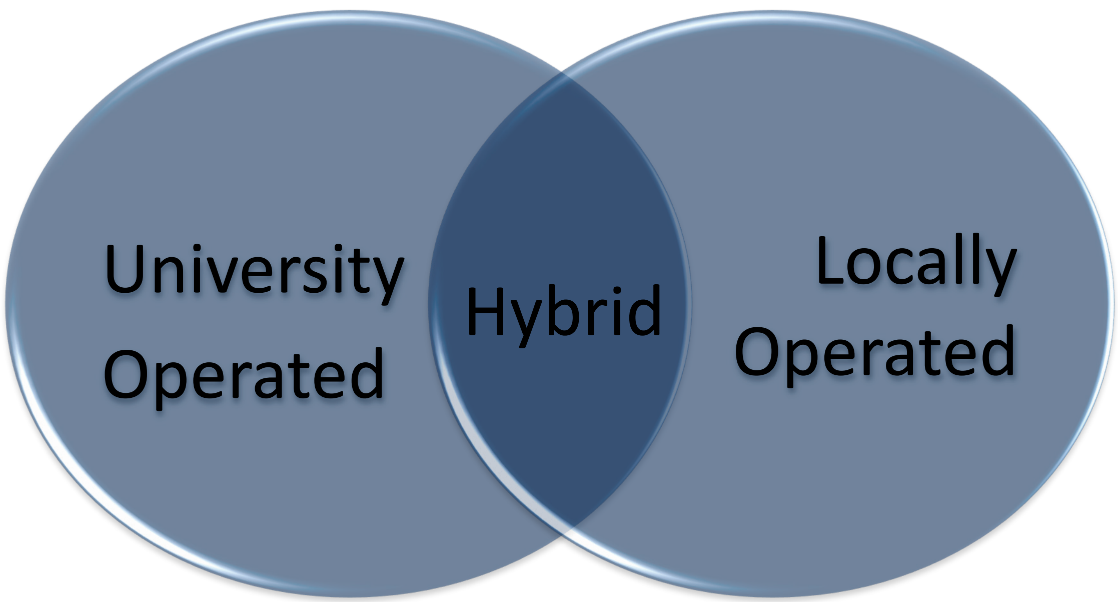
- A solely university-operated system where the school provides all the service. This model could be applied to provide service only to Mason or could expand to cover the City of

Fairfax. There are some systems where the university ridership is the largest component because of the size of the municipality, and therefore results in the university being the primary provider of service. This is not the case for the CUE.

- At the other extreme, no is service provided by the university and all service is provided by the locality. This is the case in a number of places like Harrisonburg and Blacksburg.

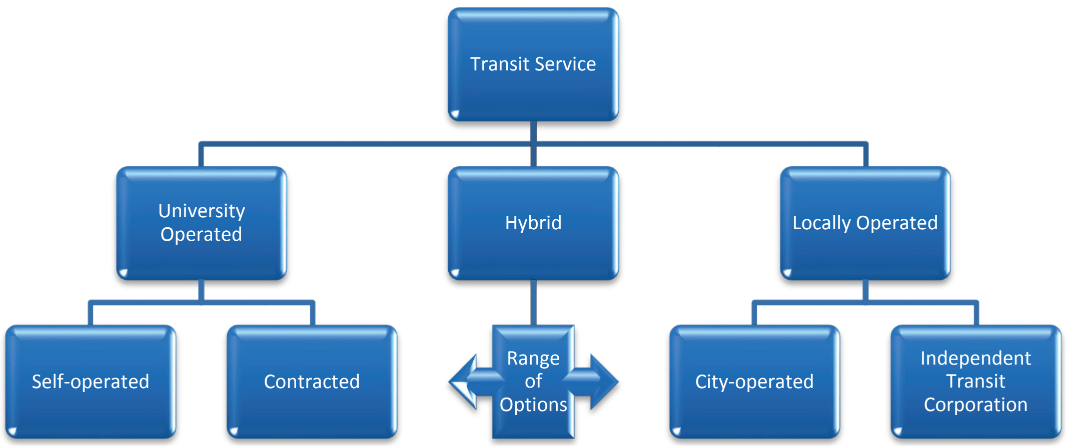
- A combination system or hybrid model can cover many different configurations, but involves some combination of university-operated and locally-provided service. The current operation for Mason and the City of Fairfax is a hybrid structure. Other hybrid structures include Liberty University and Greater Lynchburg Transit Company, Virginia Commonwealth University and Greater Richmond Transit Company, and Cornell University, which is part of a not-for-profit transit authority with the City of Ithaca and Tompkins County.

Figure 6-2: University/Municipal Transit Management Continuum



Within each overall management structure there are different operating arrangements that can be considered to provide the actual transit service. Each operating arrangement provides its own benefits and costs. The figure below highlights the most common arrangements.

Figure 6-3: Transit Operating Structures



University Self-operated

The self-operated model for a university involves the university being the provider of transit services to the school and potentially others. This model involves the school being responsible for the management, hiring and training of drivers, planning of routes, monitoring of operations, maintenance of vehicles, and all the other aspects of running a transit service.

- Pros
  - Ultimate control of the service and its management and operation
  - The ability to tailor the service specifically to university needs
  - Do not need to deal with soliciting and negotiating with a private contractor
- Cons
  - Responsible for all the functions of operating a transit system and the costs associated
  - Possibility of duplicative services if located in a municipality with transit service
  - Introduction of a new aspect of liability associated with providing transportation service

University Contracted

The contracted model allows the university to determine which functions it would like to be responsible for, while handing off the other functions to another party. This gives the school the ability to determine exactly how involved it would like to be in the actual provision of transportation services.

- Pros
    - University retains control of the services without the responsibility for those aspects it chooses to contract
    - The university can be as involved or removed from the actual management and operational aspects of transit service as it would like
    - The ability to tailor the service specifically to university needs
    - Potential for cost savings
- Cons
    - The university is still responsible for a certain level of management and oversight of the contractor(s)
    - Possibility of duplicative services if located in a municipality with transit service

Municipally-operated

The solely municipally operated structure removes all responsibility for the provision of services, save perhaps funding, from the university partner. This model requires the municipality to bear all the management and operational functions of the service. The municipality may be able to share some of the staff costs across multiple departments such as human resources, finance, risk management, or legal services.

- Pros
    - Sharing of staff and facility resources across multiple departments within the municipality
    - Removes the responsibility for the provision of transportation services from the university
- Cons
    - Due to the sharing of staff across departments, staff focus is not solely on the provision of public transit
    - The University loses the ability to control service to meet specific needs

Hybrid

The hybrid operating structure can be created to take advantage of the best operational benefits of a variety of structures. The combination of service provided by the university and a municipality allow for a better sharing of the costs. Those trips that serve purposes popular with both university and local users can be covered by the local provider, while those trips that are only demanded by the university can be covered by the school. The actual provision of the service, directly-operated or contracted, can be chosen based on the individual needs of the groups involved.

- Pros
    - Allows for sharing of costs between municipality and the university for those services that are shared
    - Allows the university to still provide some services specific to university needs or to supplement the public service to meet demands
    - Provides larger rider base for municipal transit services

- Cons
    - Both parties must compromise on aspects of shared services

Independent Transit Corporation/Authority

The independent transit corporation/authority structure would be separate from the municipality, giving it greater autonomy in providing transit service. The municipality and other stakeholders, possibly universities, would get a say in transit decisions through membership on the board of directors. This board is responsible for determining major decisions related to service delivery. By being an independent body, the agency is allowed to focus solely on the provision of transit services and other transportation-related tasks, such as travel demand management. This structure requires separate staff dedicated to the authority, as well as facilities for administration, maintenance, and fleet storage. Depending on how the agency is established, it may be able to levy taxes or issue bonds to fund operations and capital projects. This ability gives more certainty to the funding of transit and can aid in future planning.

- Pros
    - Focus of the agency staff is solely on the provision of public transportation
    - Potential for separate and dedicated funding streams depending on the enabling legislation
    - Provides the ability for all stakeholders to have a say through representation on a board of directors
- Cons
    - Requires the creation of separate staff dedicated to transit for roles that could be shared in other situations
    - Process for creation has proved challenging in Virginia

Conclusions

This general review of various management and operating structures has outlined the benefits and costs of each model. In relation to the current arrangement between Mason and the City of Fairfax the existing hybrid model is functioning well and provides both parties with the ability to meet their needs. Mason's sharing of CUE's costs allows Mason to take advantage of the CUE service area, which would be difficult to provide as a stand-alone service. The funding from Mason helps the City provide a higher level of service. Operating CUE as a city department allows for the sharing of staff costs for what amounts to a relatively small transit service. While being able to focus solely on transit and raise a dedicated funding stream would be ideal, the costs associated with transitioning CUE to an independent transit authority may be too great for the amount of service provided. Mason can't rely on CUE alone for the provision of transit services to meet the University's needs. Mason's demands for service between the campus and Metro would overwhelm CUE and thus require supplementing the service with Mason Shuttles. Mason has needs to provide connections to the Prince William campus and other locations outside the City of Fairfax. These don't make sense for CUE to provide because the City would be funding services likely not used by City residents. Therefore, Mason needs to provide these services through the current arrangement with a contractor. Mason doesn't need to take on the added responsibilities and costs associated with providing the service internally.

6.6 Funding

Mason Contribution

As part of the review of Mason's contribution to CUE, a recommendation was made to utilize a set of guidelines to inform the contribution discussion. The guidelines should account for Mason's share of the operating and capital costs that the City incurs. This requires a clear understanding of all the funding sources that pay for CUE bus service.

Operating Costs

To calculate the Mason Share of CUE Operating Costs, a determination of the factor(s) that will be used to assess the amount of service consumed by Mason is needed. The simplest measure is to identify Mason's share of CUE's ridership, but both Mason and the City should agree on the measure and how it is applied. Calculating the cost to operate CUE should consider all costs attributed to the operation of CUE. Calculations of revenue should include funding streams such as state assistance and local revenue collected through fares or subsidized by the City. These figures should be agreed upon by both Mason and the City.

The City's cost to operate CUE is comprised of base operating costs, management costs, and capital costs. Base operating costs include the following cost areas prescribed by the National Transit Database:

- Operator's salaries and wages
- Other salaries and wages
- Fringe benefits
- Services (labor and work provided by outside organizations)
- Fuel and lubricants
- Tires and tubes
- Other materials and supplies
- Utilities
- Casualty and liability costs
- Miscellaneous expenses

In addition to base operating costs, the City includes a proportion of its management expenses and the amortization of capital costs. The management costs are associated with costs incurred by other City departments who provide services to CUE. It should be noted that during discussions related to funding, Mason stated they have similar costs that benefit CUE but are not passed onto the City. There was discussion about whether Mason should cover their share of the full management costs, a specified percentage of the management costs, or none at all. These discussions resulted in Mason determining that the management fee costs associated with personnel, information technology, mailroom/printing, telephone, and building maintenance should be included.

Some of the costs associated with CUE's operations are covered by outside funding streams. These include any contribution from the state and revenues collected through passenger fares. Accounting for the local revenues collected through passenger fares by CUE should be based on the number of non-Mason riders multiplied by the full cash fare. Applying the full cash fare and not the actual revenue collected accounts for any subsidies the City provides to riders such seniors and high school students.

Currently, the City and Mason have agreed to use the Mason Ridership Share as the determination of Mason's contribution of CUE operating costs. It is recommended that this share be calculated based on an average of the most recent three years of Mason ridership on CUE. The average will help smooth out any annual fluctuations in ridership. This factor should be monitored moving forward as ridership trends have been changing.

Amortized Capital Costs

Currently, buses are the only material capital costs attributed to CUE. Any formula should allow for the flexibility to include additional capital costs that may be added in the future. To determine CUE's capital costs the following factors should be considered, but may be adjusted in the future.

- CUE's annual amortized capital costs
- Mason's share of the service consumed (ridership)
- Additional outside funding sources, such as grants

Total Mason Contribution

The costs, funding sources, and factor described above in identifying Mason's contribution to the City should provide a starting point for negotiations between Mason and the City of Fairfax. Once an amount has been agreed upon, an agreement between the City and Mason can be drafted and signed. Both parties agree any agreement should have a term of three to five years Additional considerations about how the amount adjusts from year-to-year will likely be included as part of any negotiation. The contribution will be updated as needed based on a review of the agreed-upon factors. The factors and the assessment of costs and funding should be revisited periodically to ensure consensus. External funding sources have a tendency to fluctuate over time and they should be accounted for in any funding guideline. The agreement should also establish circumstances that would warrant revisiting the contribution prior to the conclusion of the three year term. The following may trigger an early review of the methodology or factors in use:

- a 5 percent increase/decrease in Mason ridership on CUE;
- a 5 percent increase/decrease in the amount of service provided by CUE; and/or
- major fluctuations in fuel or maintenance costs.
- significant changes in fleet composition or new propulsion systems
- significant changes in external funding sources

Upon the conclusion of the three year term, the guidelines should be revisited to adjust the factors based on the conditions observed over that time. Additional factors can be added, as necessary, to ensure the guidelines do a representative job of estimating costs. This change should reduce the need to revisit the agreement annually, as well as ensure both parties feel confident in the amount of contribution being paid.

Other Potential Sources of Funding

Due to the fact that there is no dedicated source of funding for transit service in the City of Fairfax or at Mason, there is a constant question of whether the funding currently available will remain available or stable. CUE currently receives funding from the following sources:

- Passenger fares

- Advertising
- Local funding
- State
- Mason

Mason Shuttles currently receives funding from:
- Student Fees
- Parking Revenues

The current funding arrangements are meeting the needs for service, but as costs increase certain sources may struggle to provide sufficient funding. CUE's funding from the state is based on available funding and can vary from year-to-year. The recent creation of funding legislation through the NVTA and the associated funds have provided an infusion of additional local funding. Passenger fare revenue is directly tied to ridership, and advertising provides such a little percentage of funding as to be unreliable for budgeting purposes. Additional funding sources for CUE could include a possible increase in local funding. The City could also consider raising more revenue for CUE through the creation of a specific transit tax.

Mason Shuttles' dependence on funding from parking revenue is at odds with the success of the transit service. As more students take transit, resulting in the need for more service at greater costs, fewer students purchase parking permits, resulting in lower parking revenues. Additionally, universities are starting to examine the number and amount of fees being charged to students as a greater focus is placed on tuition costs. One possible additional source of funding for Mason Shuttles would be the creation of a faculty and staff fee that could be charged to the individual departments. The following funding sources were identified as potential revenue sources to fund transportation improvements as part of the recent George Mason University Transportation Master Plan. The *Plan* states that each source will have a funding limit as well as administrative considerations that will need to be accounted for. The following general sources were identified:
- Student Fees and Payroll Fringe Assessment
- Capital Project Assessment
- Operating Assessments to Departments
- Administrative Budget
- User Fees
- State Sponsored Annual Transportation Improvement Fund
- Donor Opportunities
- Partnership Opportunities

Mason should be cautious of any attempt to charge the users of the service more, because the users may determine the cost incurred isn't worth using transit. This will require a careful balance and detailed understanding of the full costs and benefits of the transportation system, including parking and facilities, to develop a strong case for additional or increased user fees. Some of these funding sources are likely more suitable to funding transit operations than others. A donor may want to fund a multimodal transportation center, but not operating costs for Mason Shuttles. The viability of each will need to be explored as part of a larger transportation funding strategy for Mason.

A

Appendices

Appendix A: On-Board Rider Survey

I am conducting a survey on behalf of the City of Fairfax and George Mason University. We're surveying CUE Bus and Mason Shuttle riders about their opinions regarding bus service and their general travel habits.

Will you be on the bus for the next 5-7 minutes to take a survey?
Are you willing to participate in this survey today?
☐ Yes ☐ No [“Thank you, have a nice day”]
Are you 18 years of age or older?
☐ Yes ☐ No [“Thank you for your time, we can only complete surveys with those who are at least 18 years old.”]

[Type of Bus]
☐ CUE ☐ Mason Shuttles

[Input route]
[*Tablet will have full list of routes*]

1. At which bus stop did you board this bus? *(Choose from list)*
[*Tablet will have full list of stops per route, indicated by street intersections*]

2. How did you get to that bus stop? *(or location)*
☐ Walked
☐ Transferred from Metrorail
☐ Drove by myself and parked
☐ Dropped off by someone
☐ Transferred from another bus (Rte #?)_____________
☐ Rode bicycle
☐ Drove/rode with someone else and parked
☐ Other (please describe) ___________________________

3. Was that the start of this journey?
☐ Yes ☐ No [Repeat Question #2]

4. Where did you come from before starting this bus trip?
☐ Work
☐ Shopping
☐ School (K-12)
☐ Place of Worship
☐ College/University
☐ Home
☐ Medical
☐ Other (please describe) ___________________________

[*If intersection is not known*]

5. Where is that location?

__________________ (Please type the intersection or the street name. If respondent does not know the street name or intersection, please provide the name of the place, building or neighborhood.)

6. At which bus stop will you exit this bus? *(Choose from list)*

[*Tablet will have full list of stops per route*]

7. What type of location is the place that is your final destination?

☐ Work ☐ College/University
☐ Shopping ☐ Home
☐ School (K-12) ☐ Medical
☐ Place of Worship ☐ Other (please describe) ___________________________

8. Where is that location?

__________________ (Please type the intersection or the street name. If respondent does not know the street name or intersection, please provide the name of the place, building or neighborhood.)

9. Before you reach your final destination, will you use another mode of transportation?

☐ Yes ☐ No

[*If yes*]

9a. What is the next mode of transportation will you use? *(Choose one)*

☐ Walk ☐ Transfer to another bus (Rte#?)____________
☐ Use the Metrorail ☐ Ride bicycle
☐ Drive by myself and park ☐ Drive/ride with someone else and park
☐ Be picked up by someone ☐ Other (please describe) ___________________________

10. Will that bring you to the end of your journey?

☐ Yes ☐ No

(If No, questions 9a and 10 repeat)

10. Including yourself, how many people from your household are travelling with you today on the bus?

[ ]

11. Was a private vehicle, such as a car, available for you to make this trip today?

☐ Yes ☐ No

12. Do you currently hold a valid driver's license?

☐ Yes ☐ No

13. How did you pay for your trip today? (Choose one)

☐ Did not pay, used Mason ID card
☐ Cash fare
☐ SmarTrip fare
☐ Cash fare (**Senior** discount)
☐ Cash fare (**High School** discount)
☐ SmarTrip fare (**Senior** discount)
☐ SmarTrip fare (**High School** discount)

☐ Other ________________________

14. About how many months have you been riding CUE Bus / Mason Shuttles?
☐ Less than 6 months ☐ 6 – 12 months
☐ More than 12 months

15. Approximately how often have you used this bus system during the last 12 months?
☐ Every week ☐ Every other week
☐ Once a month ☐ Less than once a month

[ONLY *if answered 'Every Week' to the previous question*]
15a. Please indicate the number of DAYS per week that you typically use this bus system
[ ] Days (Example: 2)

16. Which mode of transportation do you use **MOST** often? (select only one).
☐ Personal motor vehicle ☐ Drive someone else's motor vehicle
☐ Metrorail ☐ Formal Rideshare Program
☐ Bus ☐ Walking
☐ Bicycle ☐ Taxi
☐ Informal Carpool ☐ Other (Please Describe) ________________________

17. About how many **minutes** will your journey on this bus be?
["A bus journey is defined as the time starting from when you got on this bus until the time you got off this bus. It does not include transfers."]
[ ] minutes

18. How would you have made this trip if this bus was not available today?
☐ Walked ☐ Rode bicycle
☐ Took another bus – Fairfax Connector ☐ Took another bus – Metrobus
☐ Took another bus – CUE ☐ Took another bus – Mason Shuttle
☐ Drove by myself and parked ☐ Drove/rode with someone and parked
☐ Taxi ☐ I would not have made this trip
☐ Other ________________________

19. Please check all the ways that you learn about bus transit information.
☐ Word of mouth ☐ Newspaper
☐ Internet ☐ Printed bus schedule
☐ Radio ☐ Television
☐ Visited or called a transit office ☐ City of Fairfax communication
☐ George Mason communication ☐ NextBus
☐ Other _____________________

21. The following is a list of reasons as to why people ride the bus Please let us know the extent to which you **agree or disagree** that these are reasons you decide to ride the bus

	Strongly Agree	Agree	Neither agree nor disagree	Disagree	Strongly Disagree

Running on time	☐	☐	☐	☐	☐
Hours of service	☐	☐	☐	☐	☐
Making productive use of time	☐	☐	☐	☐	☐
Cost of fares	☐	☐	☐	☐	☐
Availability of transit near home	☐	☐	☐	☐	☐
Availability of transit near work or school	☐	☐	☐	☐	☐
Cost of parking at work or school	☐	☐	☐	☐	☐
Price of gas	☐	☐	☐	☐	☐
Availability of parking at work or school	☐	☐	☐	☐	☐
Comfort	☐	☐	☐	☐	☐
Safety	☐	☐	☐	☐	☐
Availability of transportation during the day	☐	☐	☐	☐	☐
Reducing stress	☐	☐	☐	☐	☐
Flexibility	☐	☐	☐	☐	☐
Time it takes to complete my trip	☐	☐	☐	☐	☐

We're nearing the end of the survey. There are just a few demographic questions before we finish.

22. Are you currently a resident of the City of Fairfax?
☐ Yes ☐ No

23. Are you currently a student at George Mason University?
☐ Yes ☐ No

[*If 23 answered yes*]
23a. Please indicate your Mason status.
☐ Freshman ☐ Sophomore
☐ Junior ☐ Senior
☐ Graduate degree-seeking ☐ Non-degree/Certificate seeking

[*If 23 answered no*]
23b. Do you currently work at George Mason University?
☐ Yes ☐ No

[If 23b answered yes]

23c. Please indicate the nature of your employment at George Mason University (GMU).

☐ Work on a GMU campus, but am not employed by GMU

☐ Full-Time GMU faculty	☐ Part-Time GMU faculty
☐ Full-Time GMU staff	☐ Part-Time GMU staff
☐ Graduate assistant	☐ Other (Please describe)

____

[Only if they answer yes to 23, and are riding a Mason Shuttles route]

24. Do you ever use the CUE Bus system?

☐ Yes ☐ No

[If answered no]

24a. Why don't you use the CUE Bus?

____

Appendix B: Community Survey

The City of Fairfax and George Mason University (Mason) are conducting a study of both the CUE Bus and Mason Shuttles. The study seeks to examine the transportation needs of the City and Mason populations and identify areas for improvement to those transportation systems. As part of this study, we would like you to complete a brief survey, which will take between 10 to 15 minutes to complete. **Thank you for your time.** Your participation in the survey is completely voluntary. All information that you provide during this survey will be kept confidential and used only for research purposes.

1. Are you willing to participate in this survey today

   ◯ Yes ◯ No

2. 2Are you 18 years of age or older?

   ◯ Yes ◯ No ["Thank you for your time, we can only complete surveys with those who are at least 18 years old."]

3. How often do you use the following modes of transportation?

	Very Often	Somewhat Often	Not Often	Never
rsonal motor vehicle	◯	◯	◯	◯
ive someone else's otor vehicle	◯	◯	◯	◯
etrorail	◯	◯	◯	◯
deshare/Carpool	◯	◯	◯	◯
s (CUE, Mason Shuttles, other public buses)	◯	◯	◯	◯
alk	◯	◯	◯	◯
cycle	◯	◯	◯	◯
xi	◯	◯	◯	◯

4. Which mode of transportation do you use **MOST** often? (Please check only one).

   ___ Personal motor vehicle
   ___ Drive someone else's motor vehicle
   ___ Metrorail
   ___ Rideshare/Carpool
   ___ Bus
   ___ Walk
   ___ Bicycle
   ___ Taxi
   ___ Other (Please describe) ______________________

5. How many motor vehicles are available in your household?
   _____ (Example: 2)

6. How many people are in your household?
   _____ (Example: 4)

7. How many people in your household are of driving age?

____ (Example: 2)

8. How many people in your household have a valid driver's license?
____ (Example: 2)

9. Are you aware that the City of Fairfax provides public transportation via CUE Bus?
___Yes
___ No
[If no, skip to question 15]
9a) How familiar are you with the following items related to the CUE Bus system? We are interested in your knowledge of the following, even if you do not ride the CUE Bus.

	ery Familiar	Somewhat Familiar	ot Familiar at all
JE Bus schedules	◯	◯	◯
JE Bus routes	◯	◯	◯
JE Bus stops	◯	◯	◯
CUE Bus fares	◯	◯	◯
CUE Bus fares for Mason students, staff/faculty and affiliates	◯	◯	◯
Real-time bus arrival information	◯	◯	◯

9b) Have you used the CUE Bus system during the last 12 months?
___ Yes
___ No (skip to question 15)

9c) How often have you used the CUE Bus system during the last 12 months?
___ Every week
___ Every other week
___ Once a month
___ Less than once a month

9d) If you answered "**Every week**" to the previous question, please indicate the number of **DAYS** per week that you used the CUE Bus system.
____ (Example: 5)

10. Are you aware that George Mason University provides shuttle services to its students, staff/faculty and affiliates?
___Yes
___ No
[If no, skip to question 15]
10a) How familiar are you with the following items related to Mason Shuttles.
We are interested in your knowledge of the following, even if you do not ride Mason Shuttles.

	Very Familiar	Somewhat Familiar	Not Familiar at all
Mason Shuttles schedules	○	○	○
Mason Shuttles routes	○	○	○
Mason Shuttles stops	○	○	○
Real-time bus arrival information	○	○	○

10b) Which Mason Shuttles routes have you used during the previous 12 months?
__ Mason to Metro
__ Metro Express
__Gunston's Go-Bus – Mason Route
__Gunston's Go-Bus – George Route
__Gunston's Go-Bus – Late Night
__Mason to Prince William Campus
__Mason to Burke VRE
__Field House Express
__None (skip to question 15)

10c) How often have you used Mason Shuttles during the previous 12 months?
___ Every week
___ Every other week
___ Once a month
___ Less than once a month

10d) If you answered "**Every week**" to the previous question, please indicate the number of **DAYS** per week that you used Mason Shuttles.
____ (Example: 5)

11. If you have used CUE Bus in the previous 12 months, please indicate how satisfied you were with the following aspects of your bus riding experience.

	Very Satisfied	Satisfied	Unsatisfied	Very Unsatisfied	N/A
Days and hours of bus service	○	○	○	○	○
Ability to travel where you need to go	○	○	○	○	○
Time spent waiting for the bus	○	○	○	○	○
Time spent on the bus	○	○	○	○	○

Safety and comfort of bus stops	○	○	○	○	○
Cleanliness and comfort of bus interior	○	○	○	○	○
Bus arriving and departing on schedule	○	○	○	○	○
Availability of seats on the bus	○	○	○	○	○

12. If any of the following changes were made to CUE Bus, how important would each be in making it more likely that you would ride it more often?

	Very Important	Somewhat Important	Not Important	Do Not Know	NA
Earlier weekday service	○	○	○	○	○
Later weekday service	○	○	○	○	○
Expanded weekend service	○	○	○	○	○
More frequent bus service (less time waiting)	○	○	○	○	○
Routes with shorter travel times	○	○	○	○	○
Access to bicycle facilities at bus stops (i.e., bike racks, bikeshare)	○	○	○	○	○
More bus shelters	○	○	○	○	○
Improved access for passengers with disabilities	○	○	○	○	○
Improved real-time schedule information	○	○	○	○	○

Serve locations currently not served*	○	○	○	○	○

f you selected "Very Important" or "Somewhat Important", please specify the location you would like to see served. (Please provide the name of the intersection, the complete street address or landmark.)

____

13. If you have used Mason Shuttles in the previous 12 months, please indicate how satisfied you were with the following aspects of your experience.

	Very Satisfied	Satisfied	Unsatisfied	Very Unsatisfied	N/A
Days and hours of bus service	○	○	○	○	○
Ability to travel where you need to go	○	○	○	○	○
Time spent waiting for the bus	○	○	○	○	○
Time spent on the bus	○	○	○	○	○
Safety and comfort of bus stops	○	○	○	○	○
Cleanliness and comfort of bus interior	○	○	○	○	○
Bus arriving and departing on schedule	○	○	○	○	○
Availability of seats on the bus	○	○	○	○	○

14. If any of the following changes were made to Mason Shuttles, how important would each be in making it more likely that you would ride them more often?

	Very Important	omewhat Important	Not Important	on't Know	N/A
Earlier weekday service	○	○	○	○	○

Later weekday service	○	○	○	○	○
Expanded weekend service	○	○	○	○	○
More frequent bus service (less time waiting)	○	○	○	○	○
Routes with shorter travel times	○	○	○	○	○
Access to bicycle facilities at bus stops (e.g., bike racks)	○	○	○	○	○
More bus shelters	○	○	○	○	○
Improved access for passengers with disabilities	○	○	○	○	○
Improved real-time schedule information	○	○	○	○	○
Serve locations currently not served*	○	○	○	○	○

f you selected "Very Important" or "Somewhat Important", please specify the location you would like to see served. (Please provide the name of the intersection, the complete street address or landmark.)

____

15. The following statements relate to why you <u>DO NOT USE</u> CUE Bus, or <u>DO NOT USE</u> them more often.

	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
The hours of service do not fit my schedule	○	○	○	○	○
The departure times do not fit my schedule	○	○	○	○	○

	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
It costs too much to ride the bus	○	○	○	○	○
The travel time is too long	○	○	○	○	○
The bus does not run often enough	○	○	○	○	○
The bus routes do not match my needs	○	○	○	○	○
It is too far from my home to the bus stop	○	○	○	○	○
It is too far from the bus stop to my destination	○	○	○	○	○
I have safety concerns	○	○	○	○	○
I do not like the atmosphere or conditions on the bus	○	○	○	○	○
I prefer other modes of transportation	○	○	○	○	○

16. The following statements relate to why you <u>DO NOT USE</u> Mason Shuttles, or <u>DO NOT USE</u> them more often.

	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
The hours of service do not fit my schedule	○	○	○	○	○
The departure times do not fit my schedule	○	○	○	○	○
It costs too much to ride the bus	○	○	○	○	○
The travel time is too long	○	○	○	○	○
The bus does not run often enough	○	○	○	○	○

	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
The bus routes do not match my needs	○	○	○	○	○
It is too far from my home to the bus stop	○	○	○	○	○
It is too far from the bus stop to my destination	○	○	○	○	○
I have safety concerns	○	○	○	○	○
I do not like the atmosphere or conditions on the bus	○	○	○	○	○
I prefer other modes of transportation	○	○	○	○	○

*If you selected "Very Important" or "Somewhat Important", please specify the location you would like to see served. (Please provide the name of the intersection, the complete street address or landmark.)

____

We're nearing the end of the survey. There are just a few demographic questions before we finish.

17. Do you live in the City of Fairfax?
__Yes
__No

18. Are you currently a student, or do you work (faculty, staff or affiliate) at Mason?
___Yes
___No (Skip to question 15)

19. Please indicate your Mason status: (check all that apply)
___Freshman
___Sophomore
___Junior
___Senior
___Graduate degree-seeking student
___Non-degree/Certificate seeking student
___Work on a Mason campus, but not employed by Mason
___Full-Time Mason faculty
___Part-Time Mason faculty
___Full-Time Mason staff
___Part-Time Mason staff

___Graduate assistant
___Other (Please describe) __________________________

20. What is the highest level of education that you have completed?
___Less than a high school degree
___High School Diploma or GED
___Some college but no degree
___Associate's degree or technical degree
___Bachelor's degree
___Graduate degree or professional degree

21. What is your employment status? (Check all that apply)
___Employed full-time
___Employed part-time
___Full-time student
___Part-time student
___Not employed
___Rather not answer

22. Which of the following income categories best reflects your household income for the last 12 months? (Please check one)

___Less than $10,000
___$10,001 to $35,000
___$35,001 to $75,000
___$75,001 to $100,000
___$100,001 to $125,000
___$125,001 to $150,000
___$150,001 to $175,000
___$175,001 to $200,000
___More than $200,000
___Rather not answer

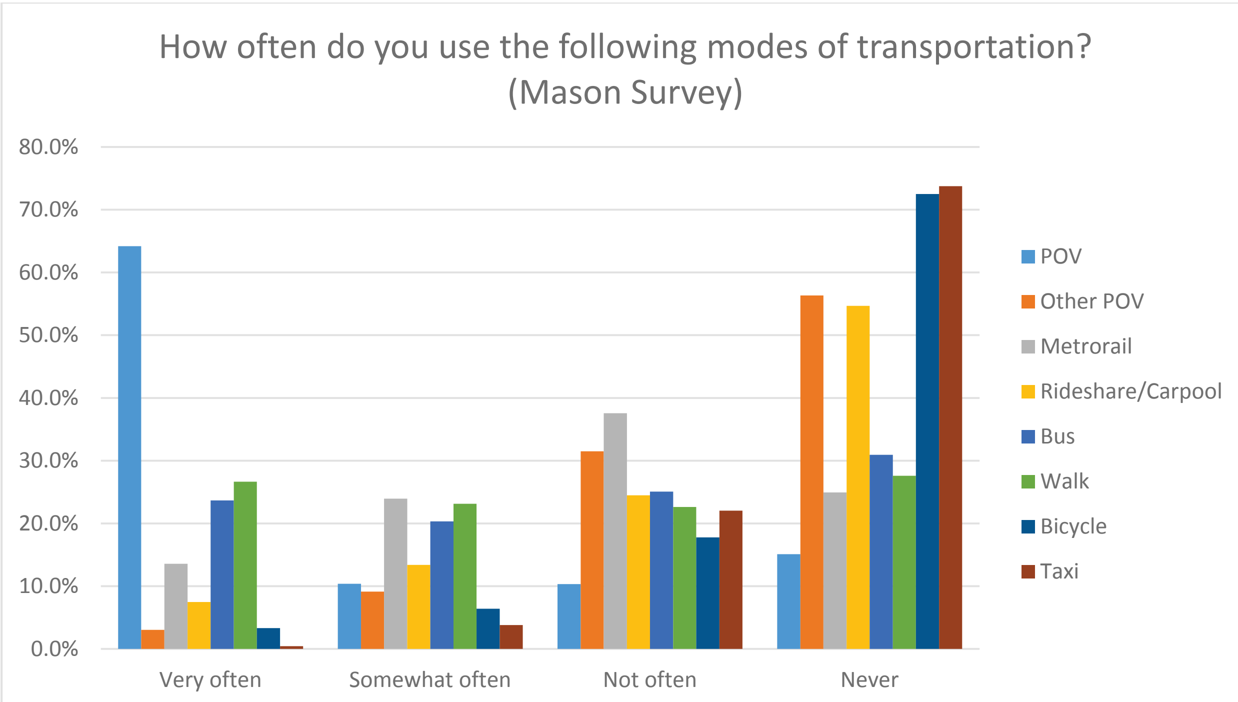
23. In what year were you born?
___(Example: 1995)

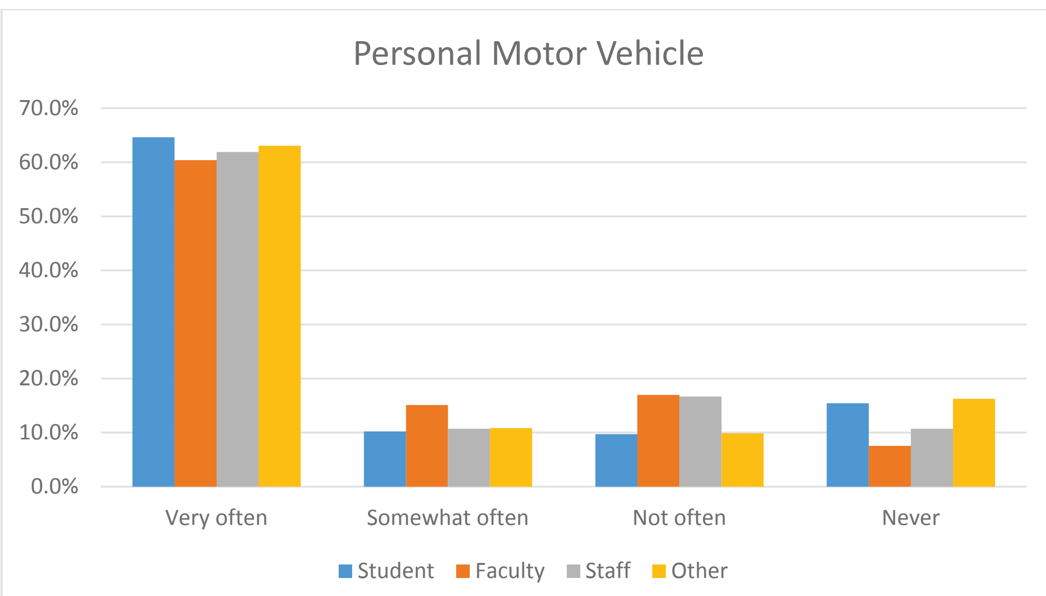
24. What gender do you identify as?
____

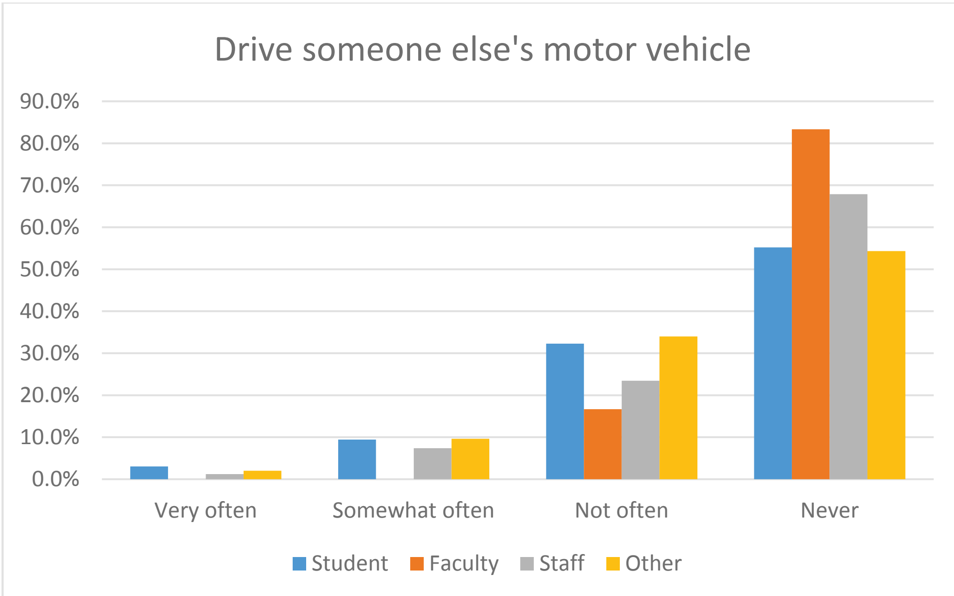
25. Which of the following best represents your racial or ethnic heritage? (Check all that apply)

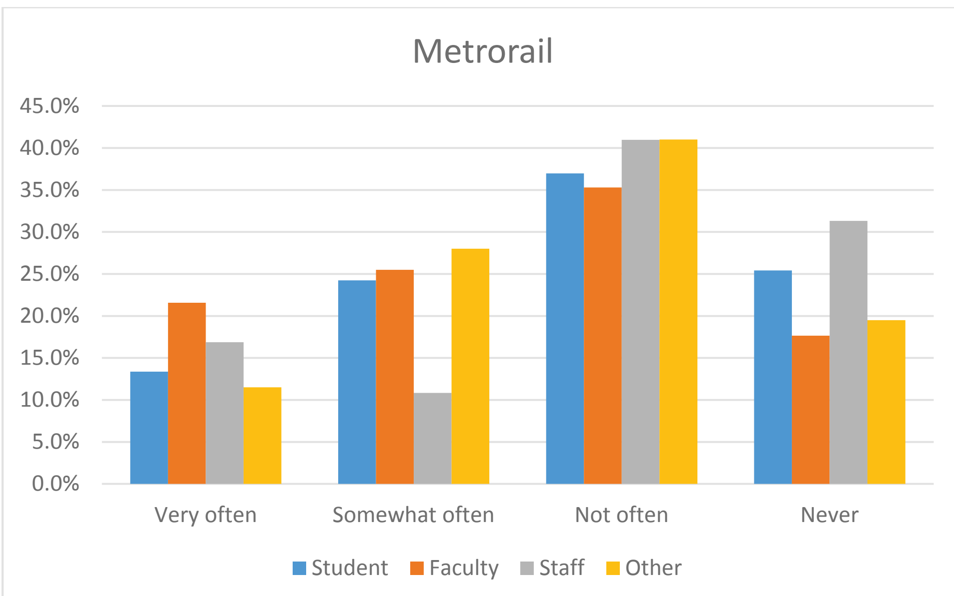
___American Indian or Alaska Native
___Asian
___Black or African American
___White
___ Hispanic or Latino
___Hawaiian & Other Pacific Islander
Other____________________
___Prefer not to answer

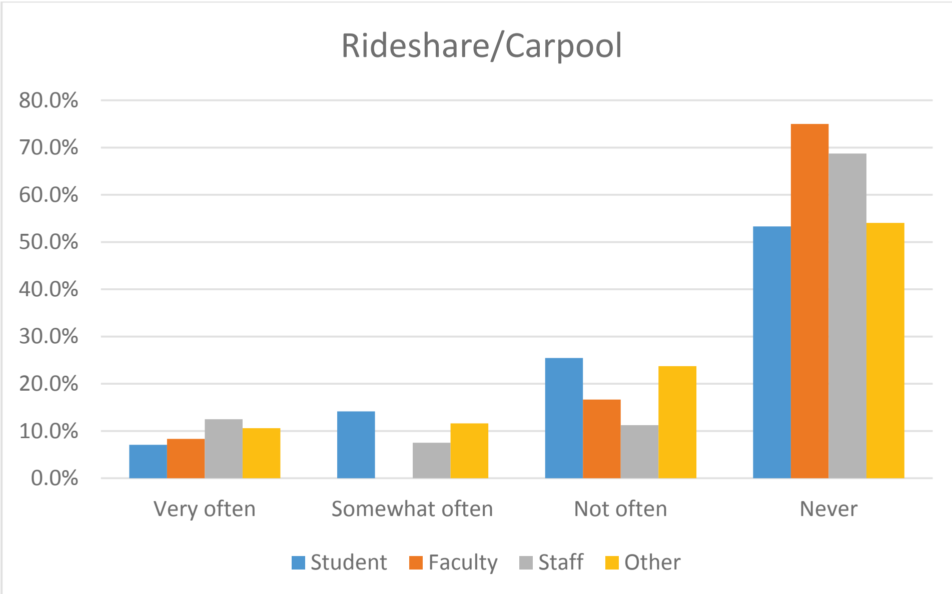
Appendix C Additional GMU Survey Graphics

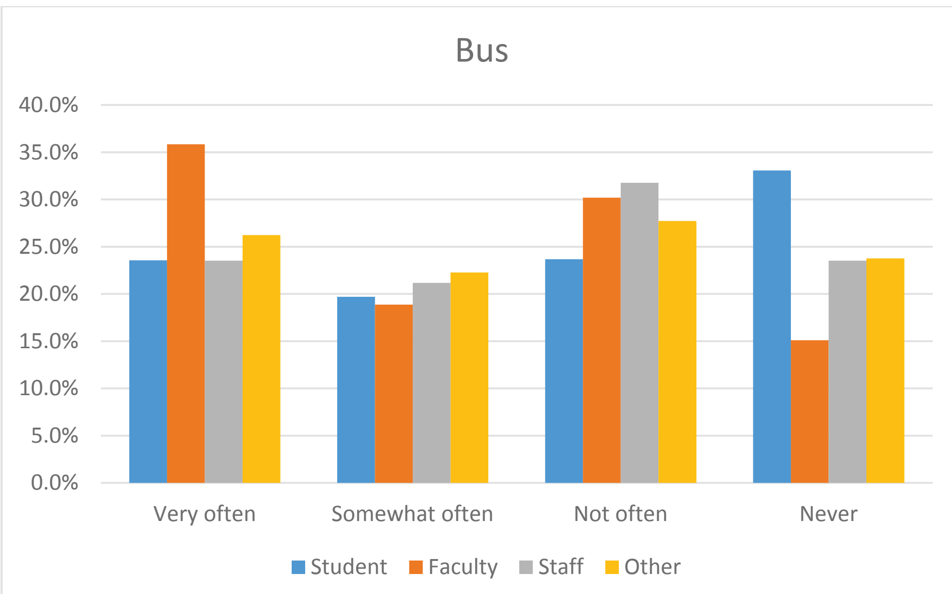


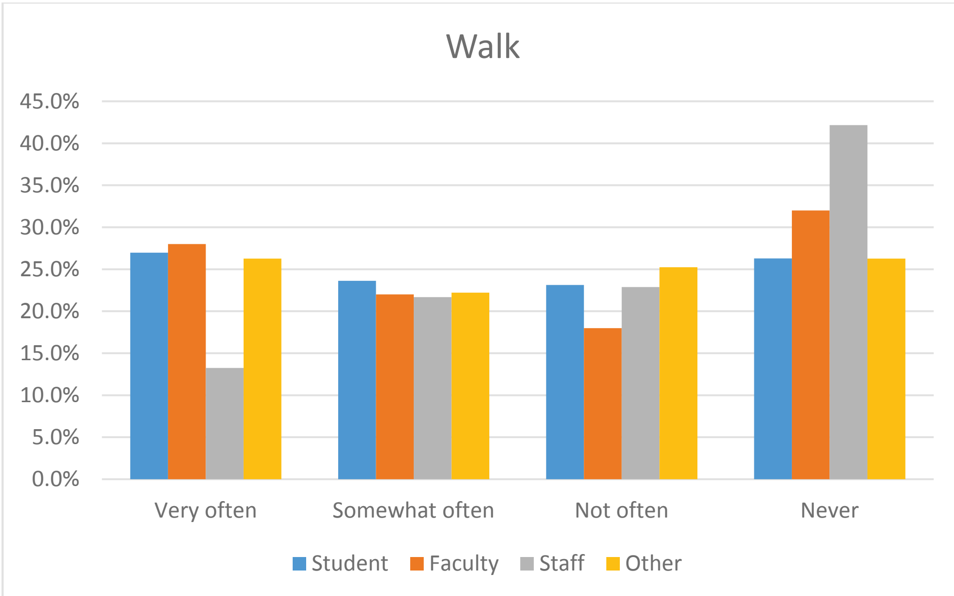


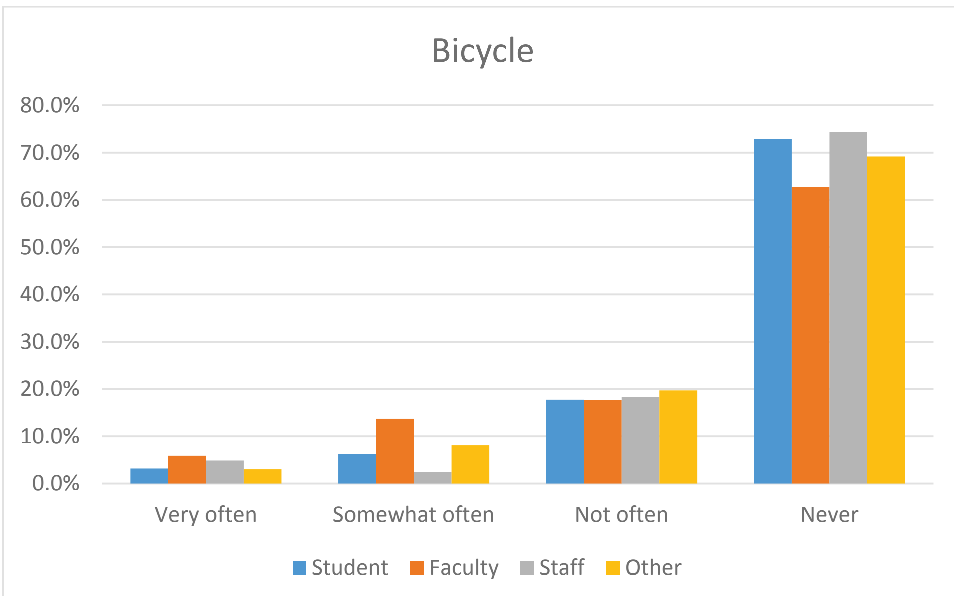

Drive someone else's motor vehicle
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very often
Somewhat often
Not often
Never
Student
Faculty
Staff
Other

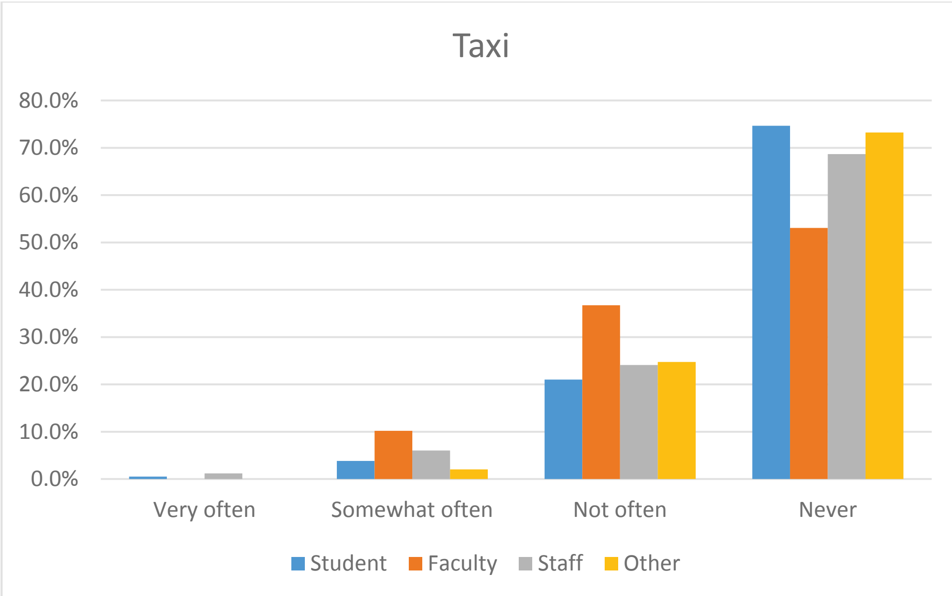

Metrorail
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very often
Somewhat often
Not often
Never
Student
Faculty
Staff
Other


Rideshare/Carpool
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very often
Somewhat often
Not often
Never
Student
Faculty
Staff
Other

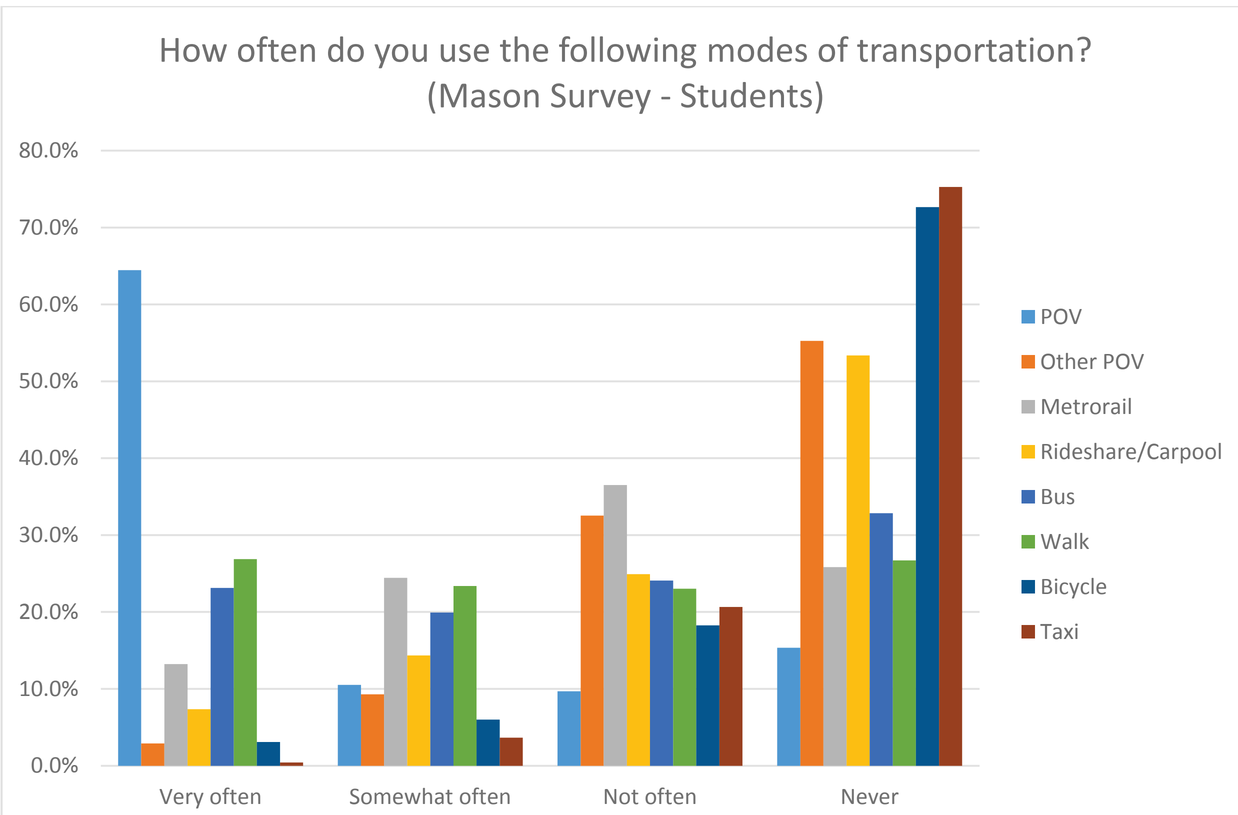

Bus
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very often
Somewhat often
Not often
Never
Student
Faculty
Staff
Other


Walk
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very often
Somewhat often
Not often
Never
Student
Faculty
Staff
Other

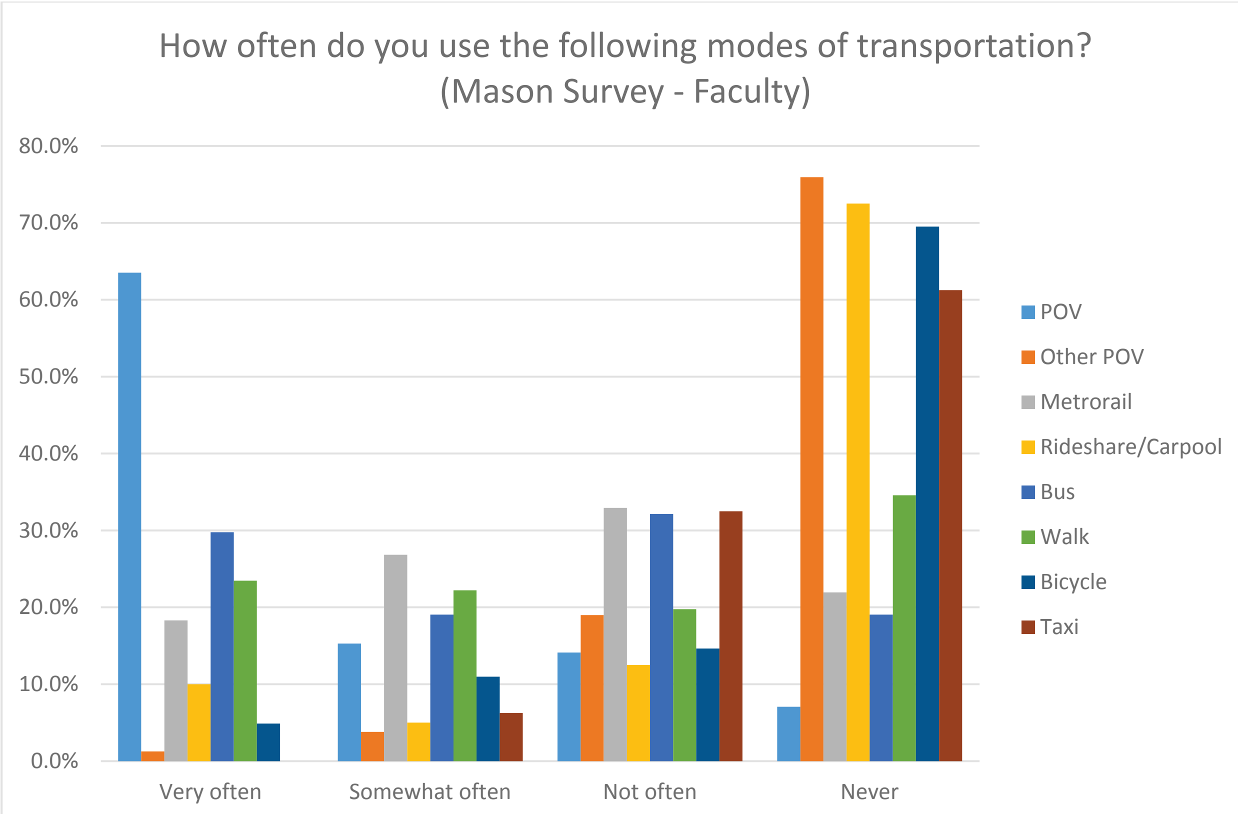

Bicycle
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very often
Somewhat often
Not often
Never
Student
Faculty
Staff
Other

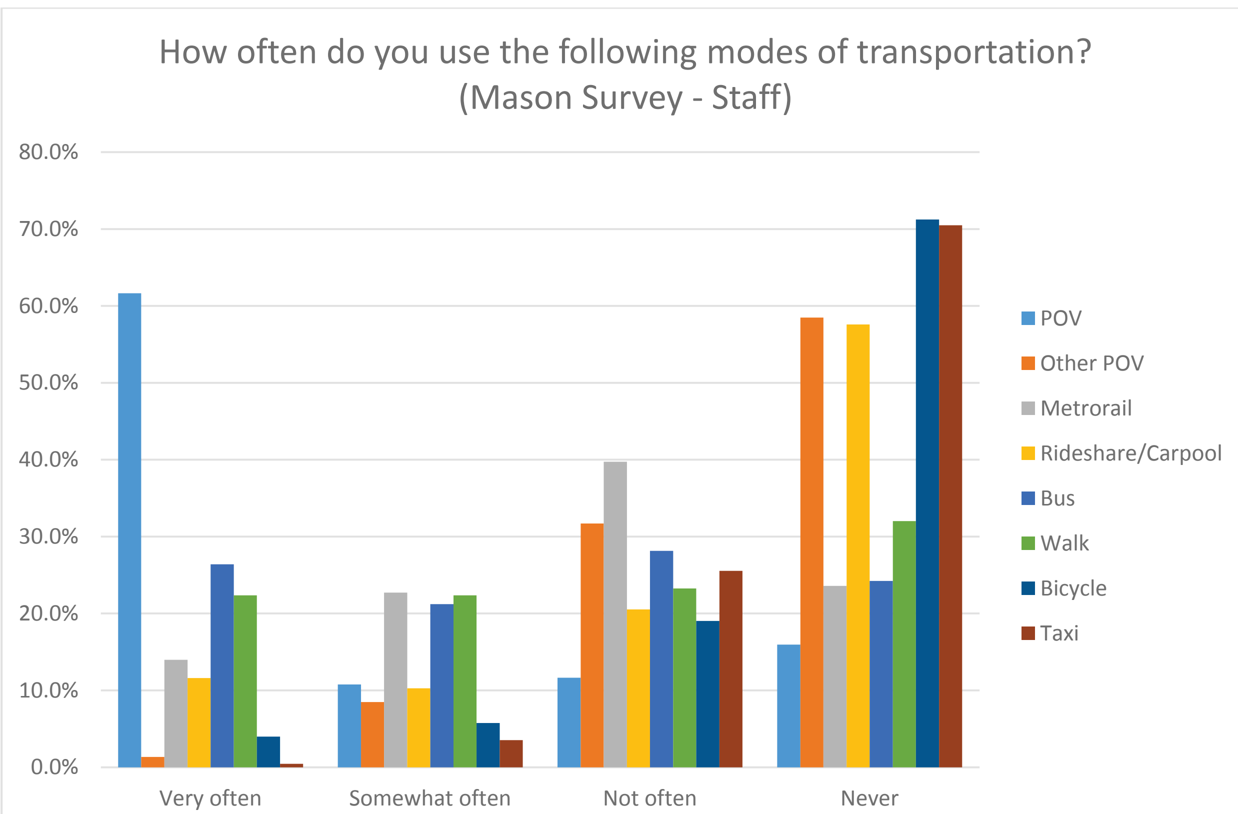


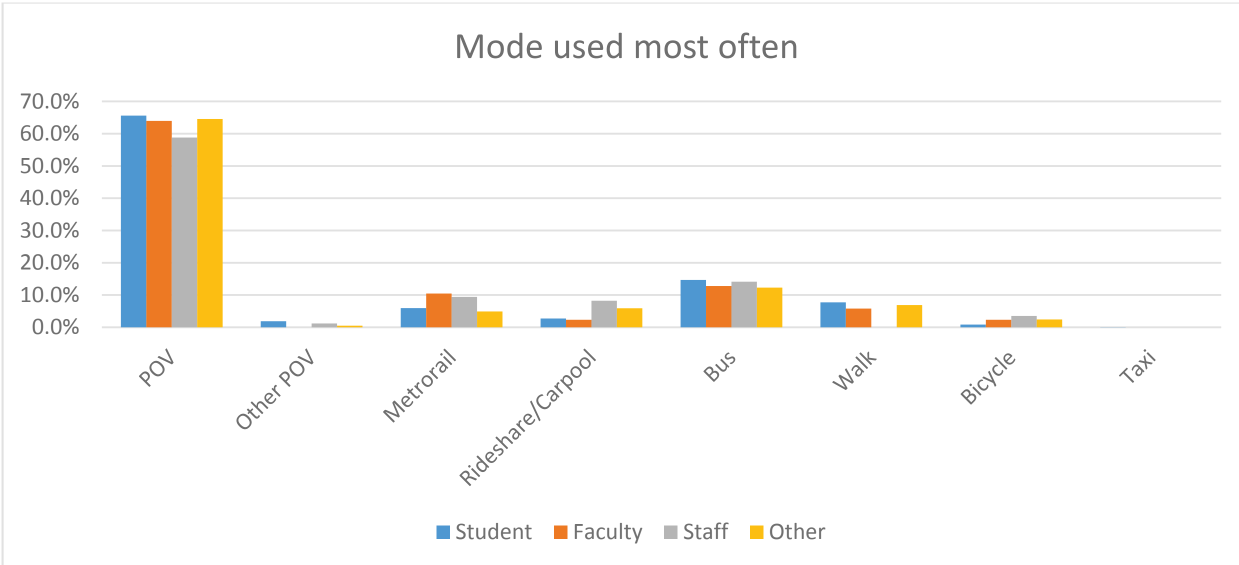
Taxi
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very often
Somewhat often
Not often
Never
Student
Faculty
Staff
Other

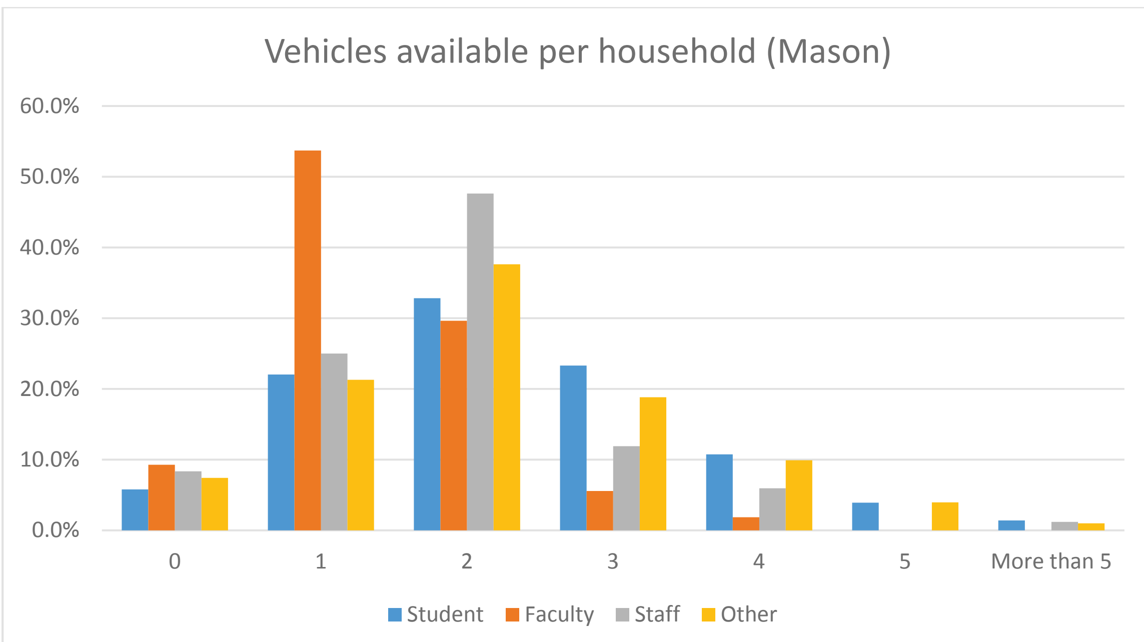


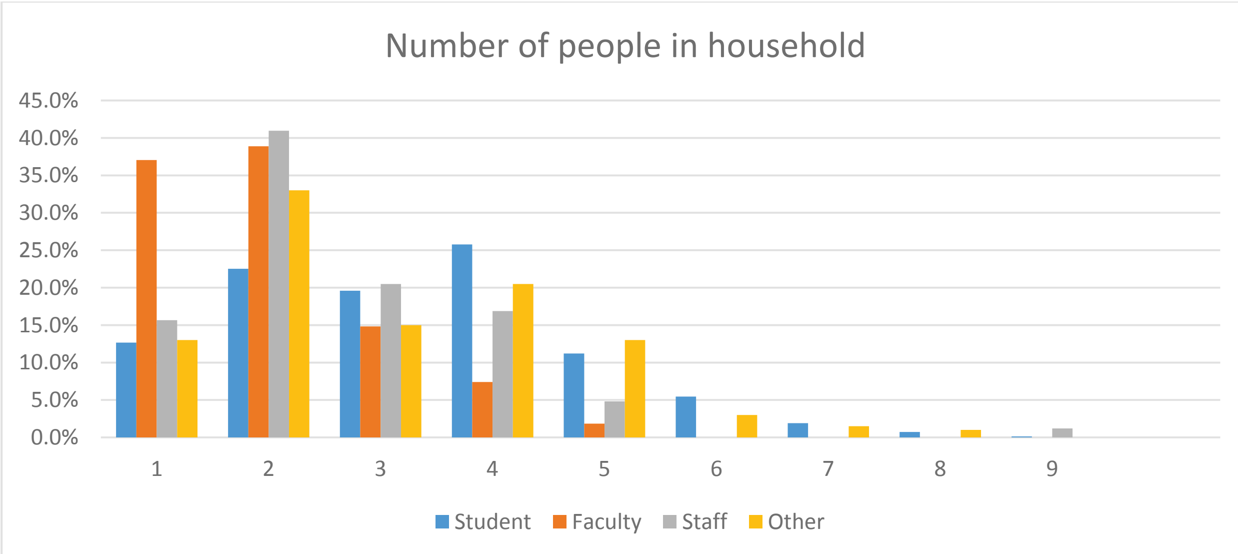
How often do you use the following modes of transportation? (Mason Survey - Students)
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very often
Somewhat often
Not often
Never
POV
Other POV
Metrorail
Rideshare/Carpool
Bus
Walk
Bicycle
Taxi

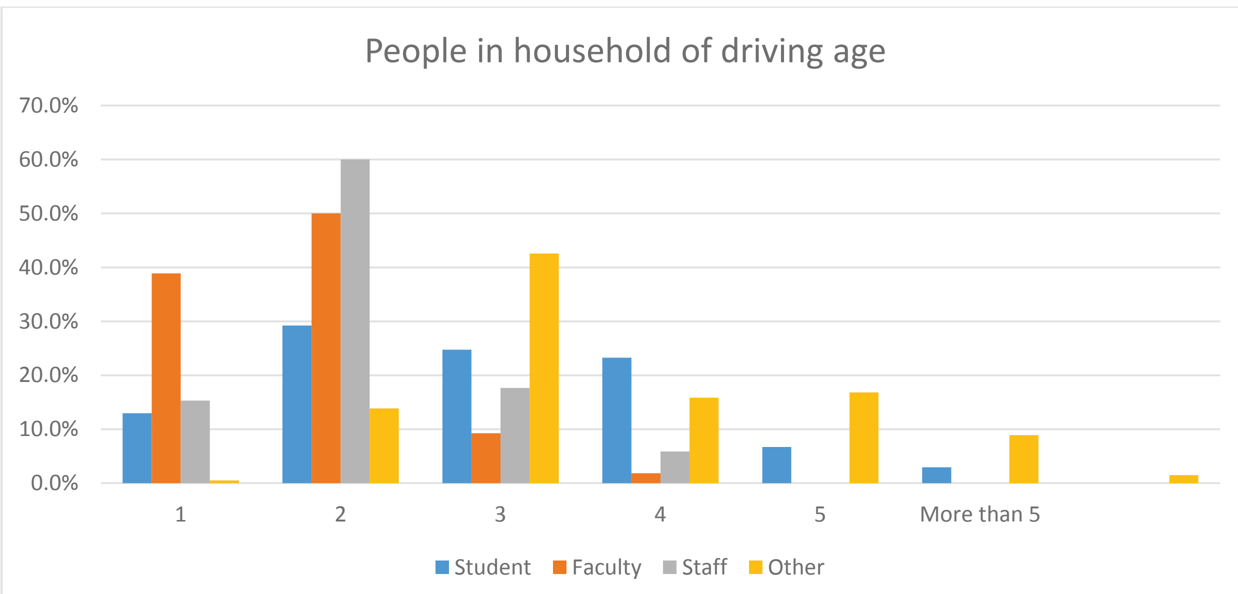

How often do you use the following modes of transportation?
(Mason Survey - Faculty)
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very often
Somewhat often
Not often
Never
POV
Other POV
Metrorail
Rideshare/Carpool
Bus
Walk
Bicycle
Taxi

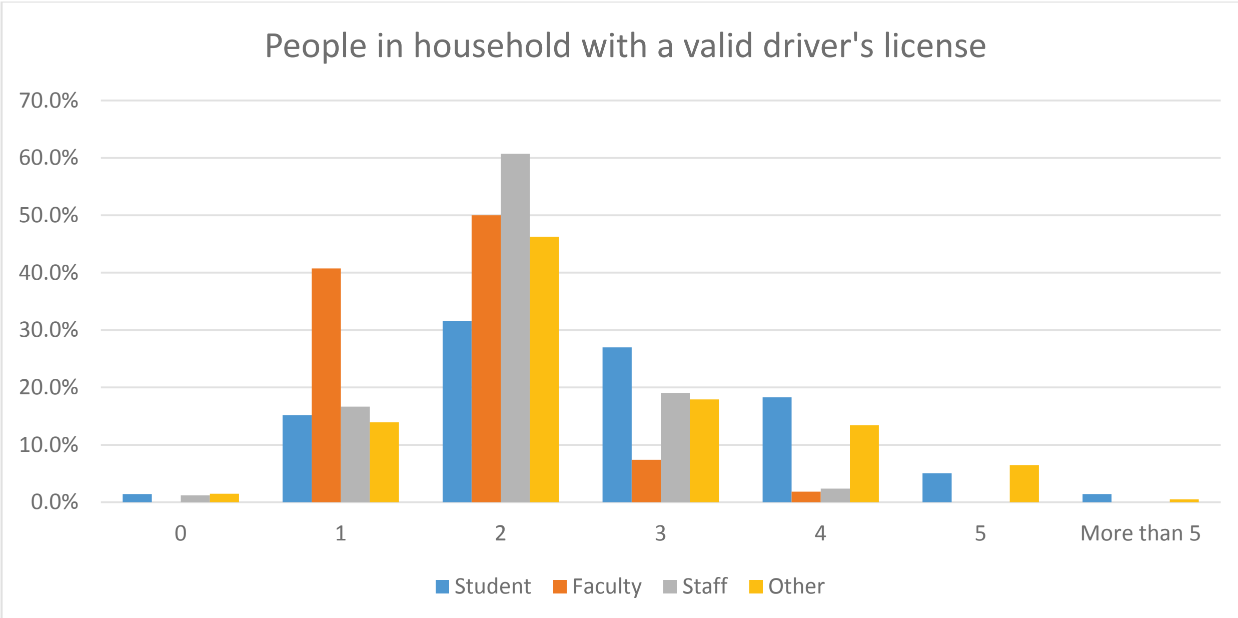

How often do you use the following modes of transportation?
(Mason Survey - Staff)
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very often
Somewhat often
Not often
Never
POV
Other POV
Metrorail
Rideshare/Carpool
Bus
Walk
Bicycle
Taxi

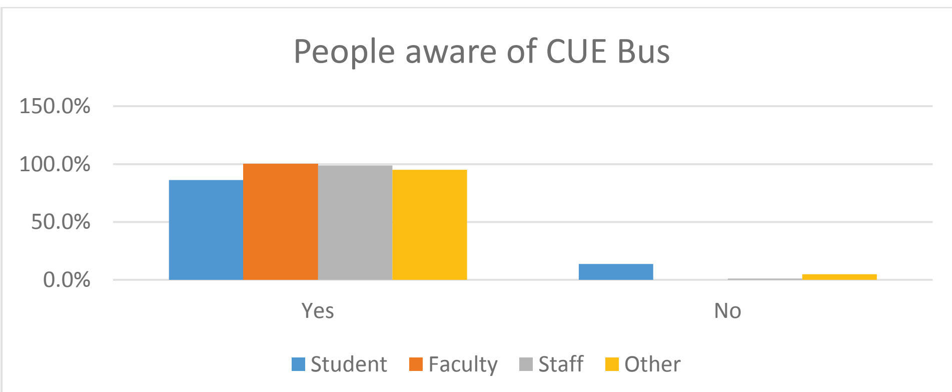

Mode used most often
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
POV
Other POV
Metrorail
Rideshare/Carpool
Bus
Walk
Bicycle
Taxi
Student
Faculty
Staff
Other

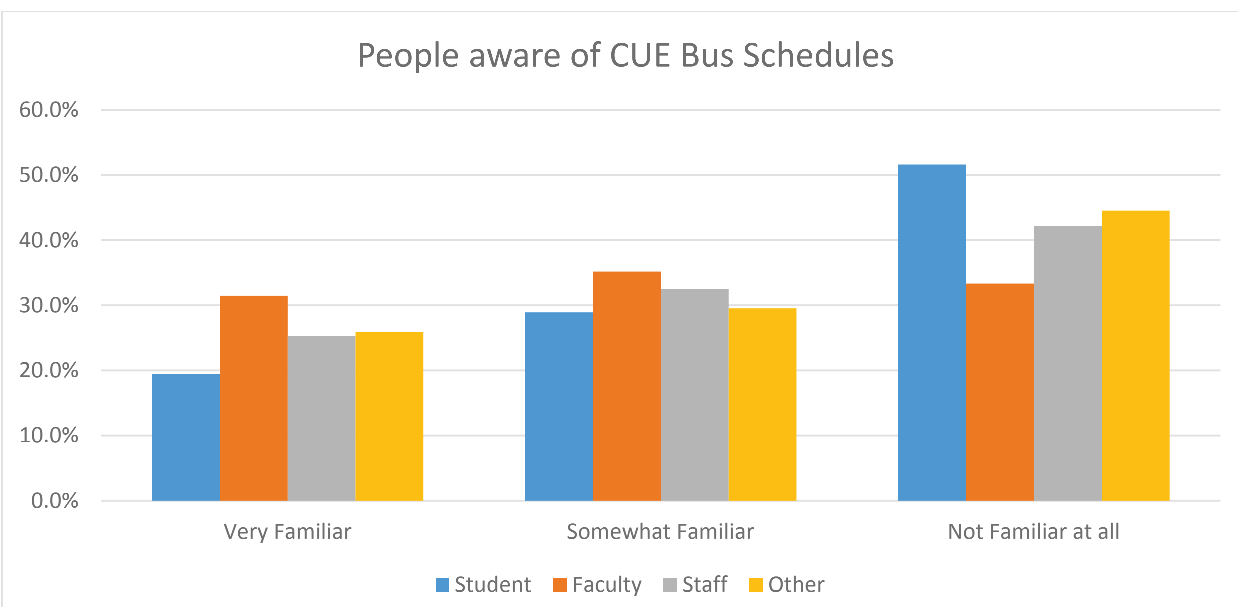

Vehicles available per household (Mason)
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0
1
2
3
4
5
More than 5
Student
Faculty
Staff
Other

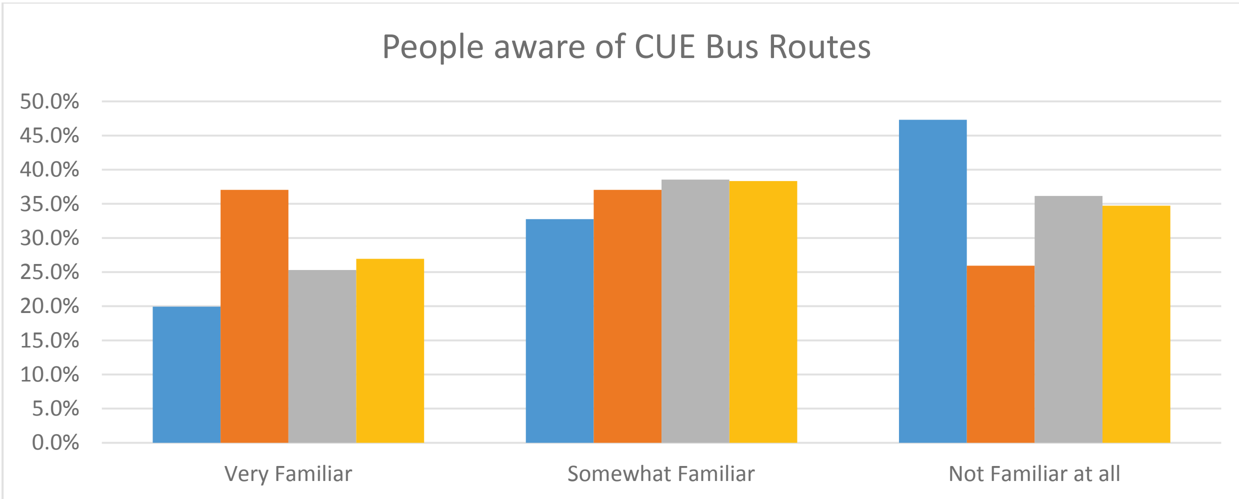

Number of people in household
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
1
2
3
4
5
6
7
8
9
Student
Faculty
Staff
Other

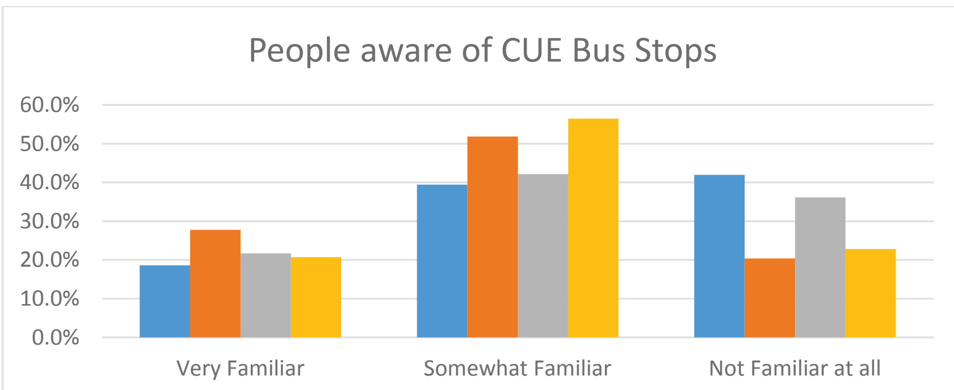

People in household of driving age
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
1
2
3
4
5
More than 5
Student
Faculty
Staff
Other

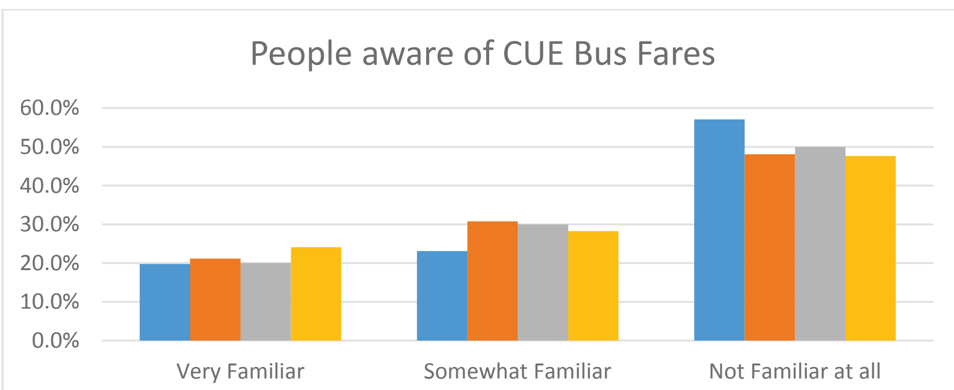

People in household with a valid driver's license
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0
1
2
3
4
5
More than 5
Student
Faculty
Staff
Other

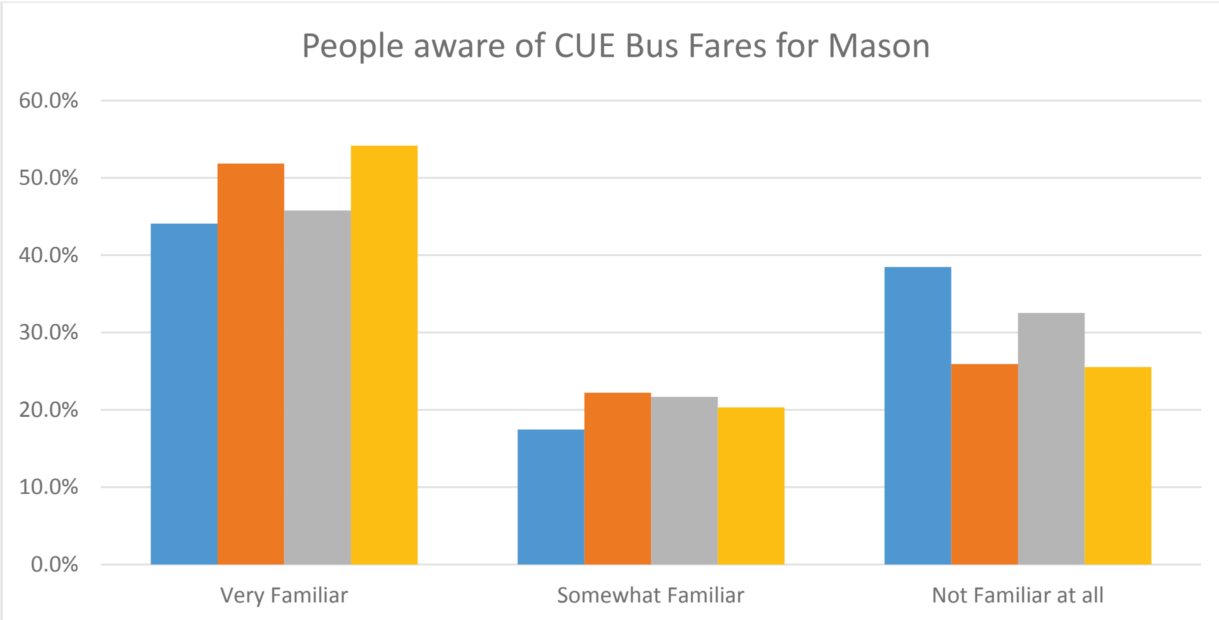

People aware of CUE Bus
150.0%
100.0%
50.0%
0.0%
Yes
No
Student
Faculty
Staff
Other

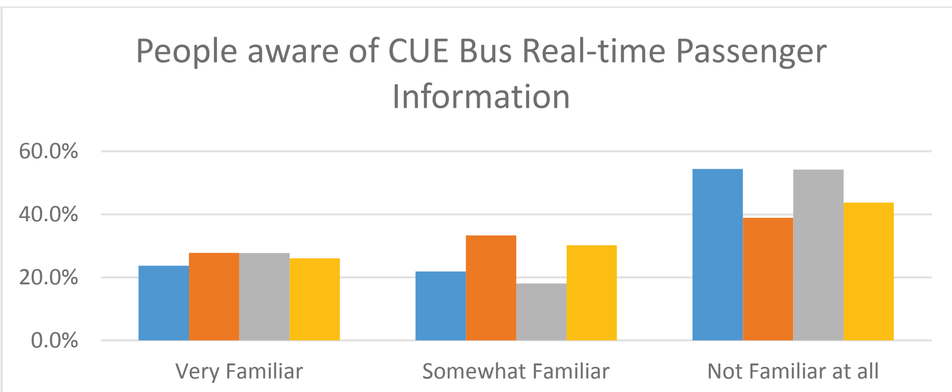

People aware of CUE Bus Schedules
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all
Student
Faculty
Staff
Other

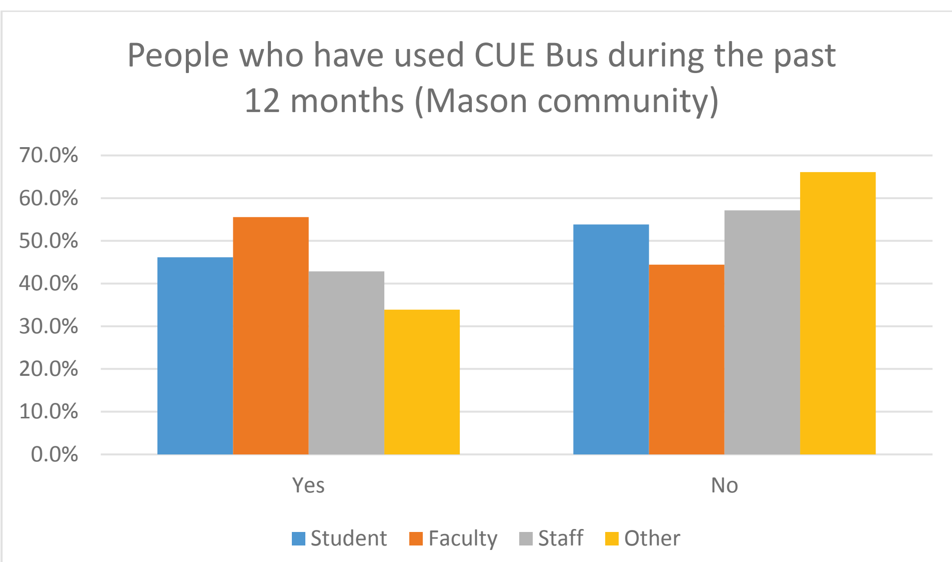

People aware of CUE Bus Routes
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all

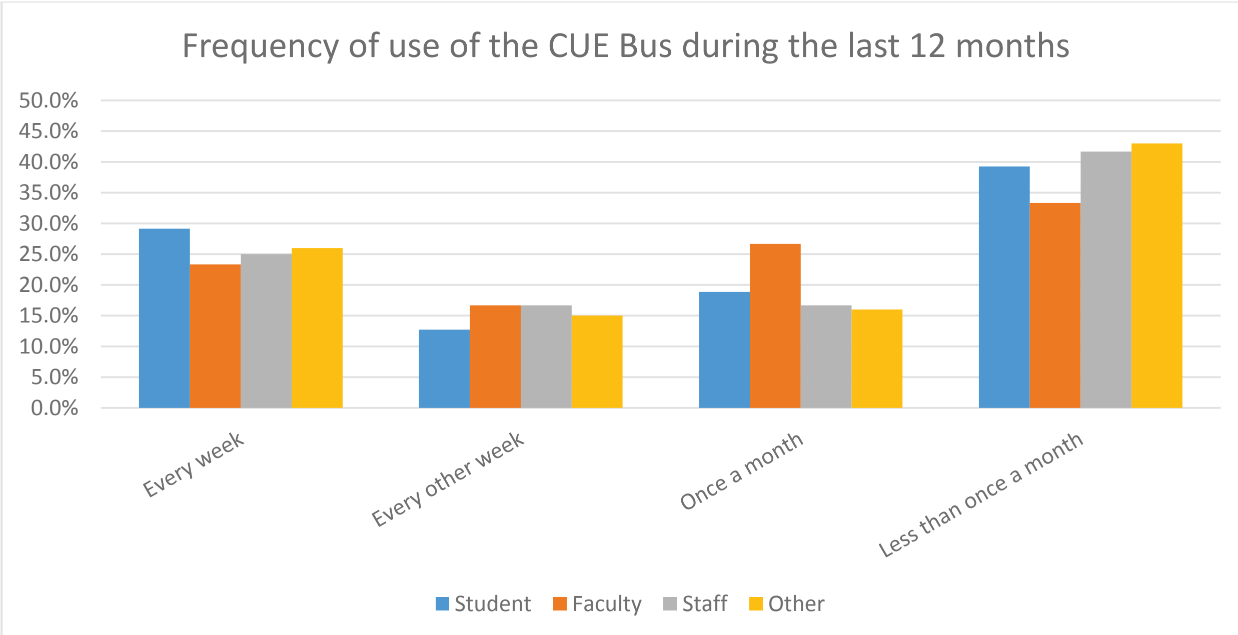

People aware of CUE Bus Stops
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all

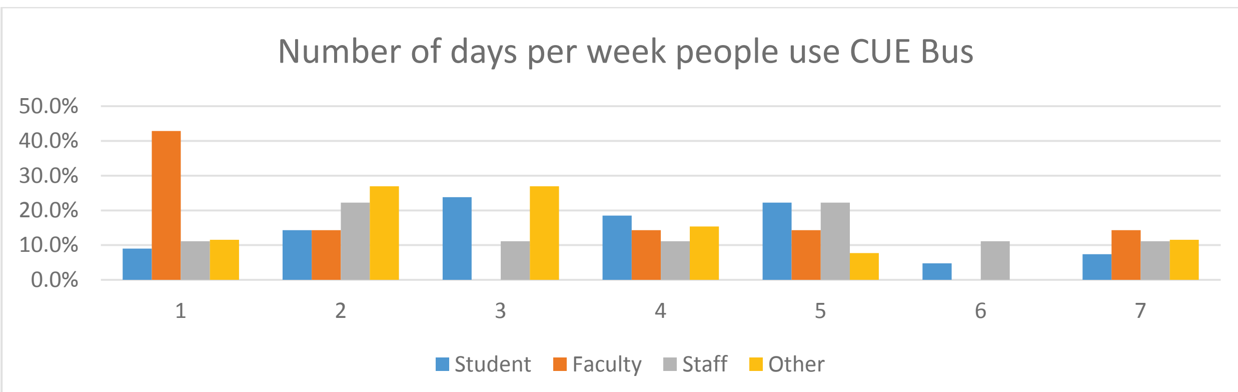

People aware of CUE Bus Fares
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all

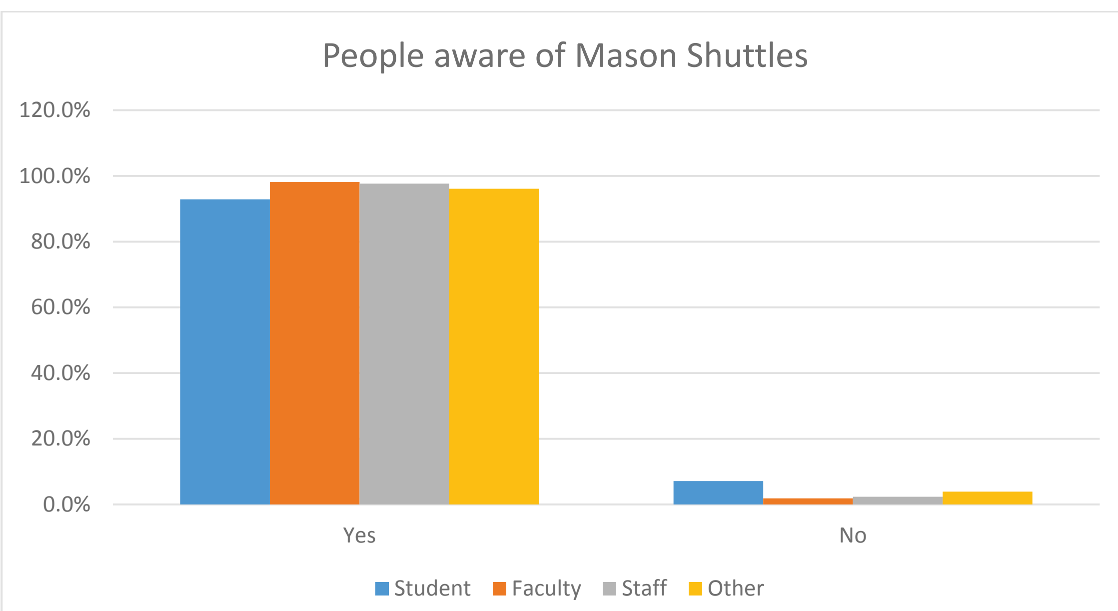

People aware of CUE Bus Fares for Mason
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all

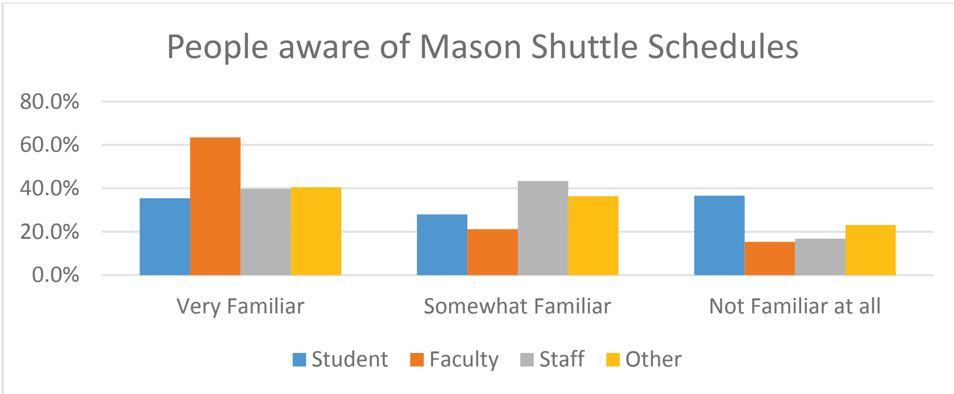

People aware of CUE Bus Real-time Passenger Information
60.0%
40.0%
20.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all

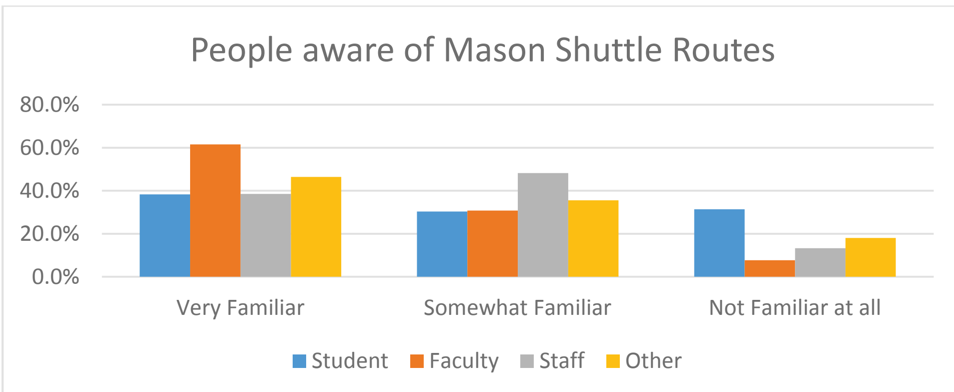

People who have used CUE Bus during the past 12 months (Mason community)
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Yes
No
Student
Faculty
Staff
Other

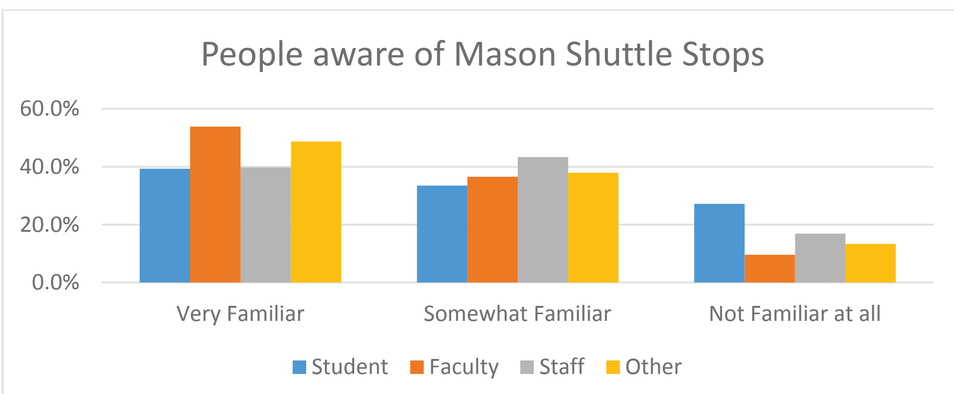

Frequency of use of the CUE Bus during the last 12 months
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Every week
Every other week
Once a month
Less than once a month
Student
Faculty
Staff
Other

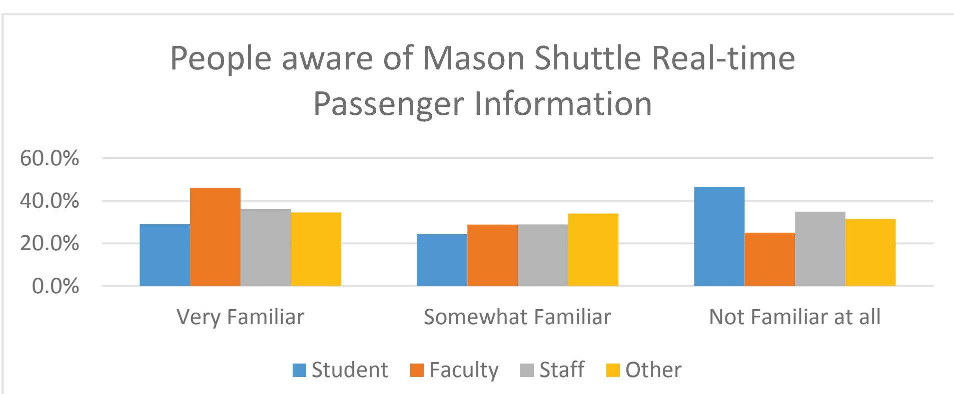

Number of days per week people use CUE Bus
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
1
2
3
4
5
6
7
Student
Faculty
Staff
Other

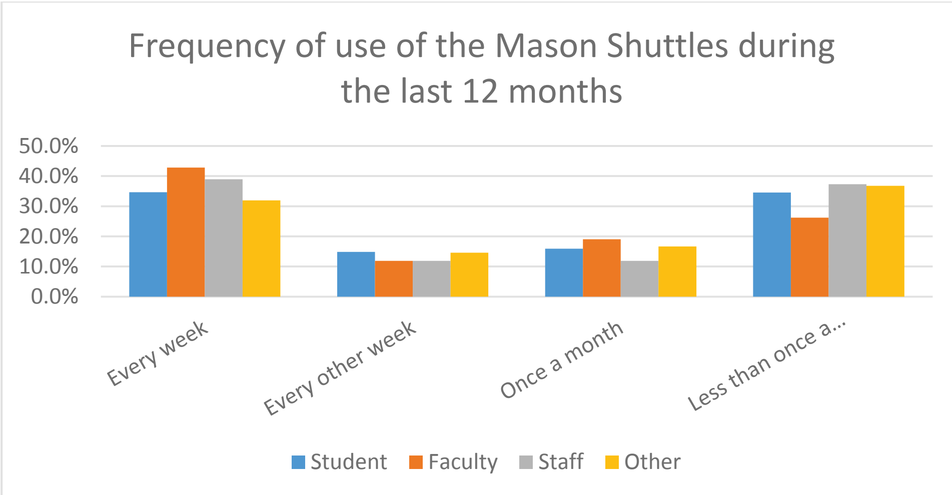

People aware of Mason Shuttles
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
Yes
No
Student
Faculty
Staff
Other

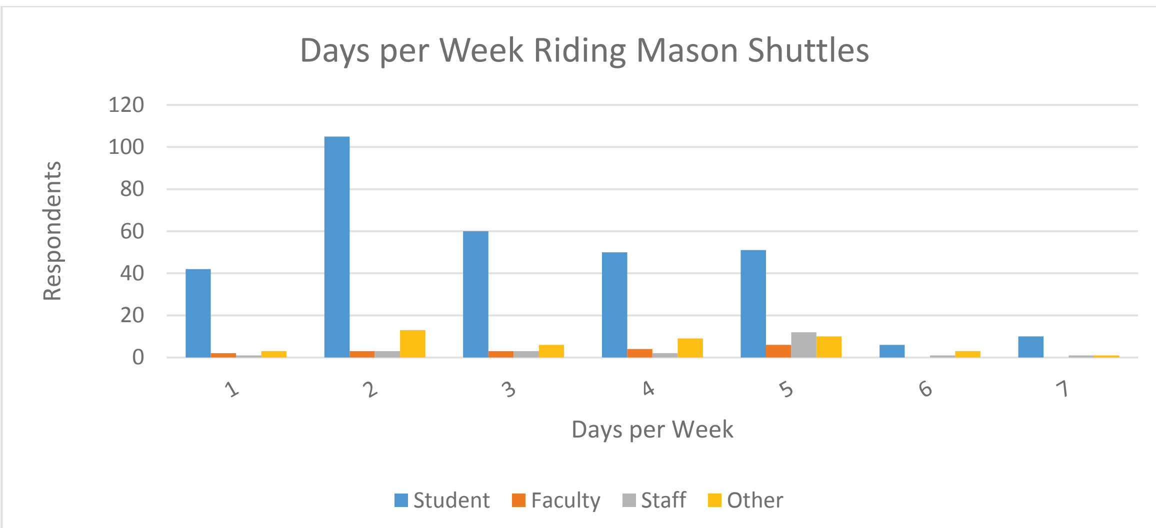

People aware of Mason Shuttle Schedules
80.0%
60.0%
40.0%
20.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all
Student
Faculty
Staff
Other

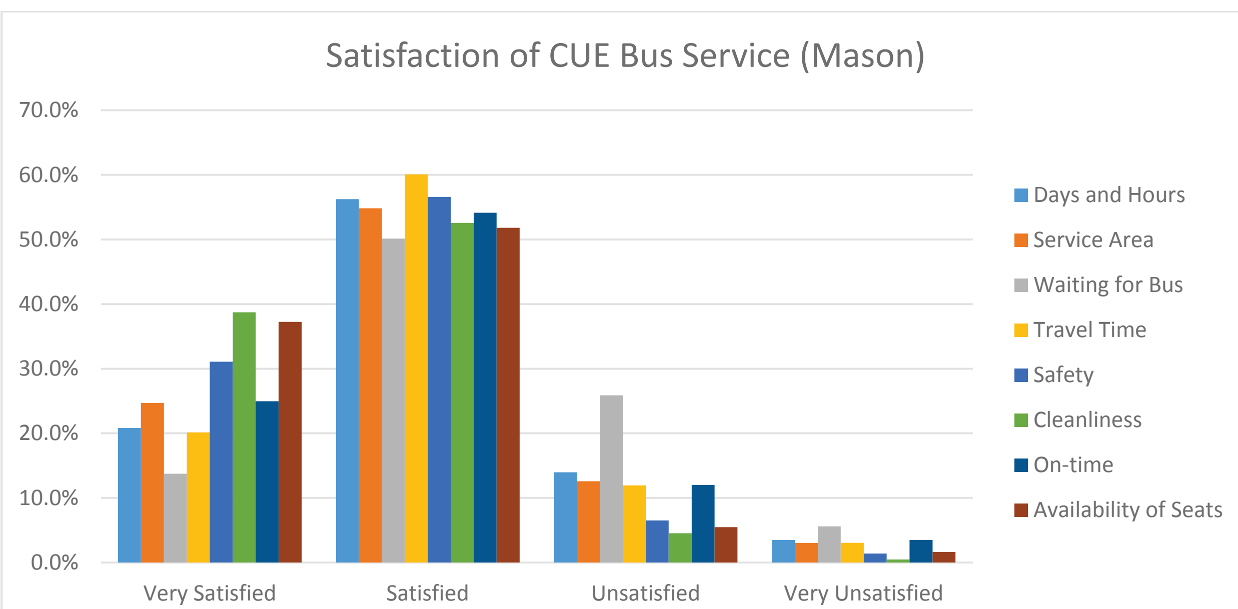

People aware of Mason Shuttle Routes
80.0%
60.0%
40.0%
20.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all
Student
Faculty
Staff
Other

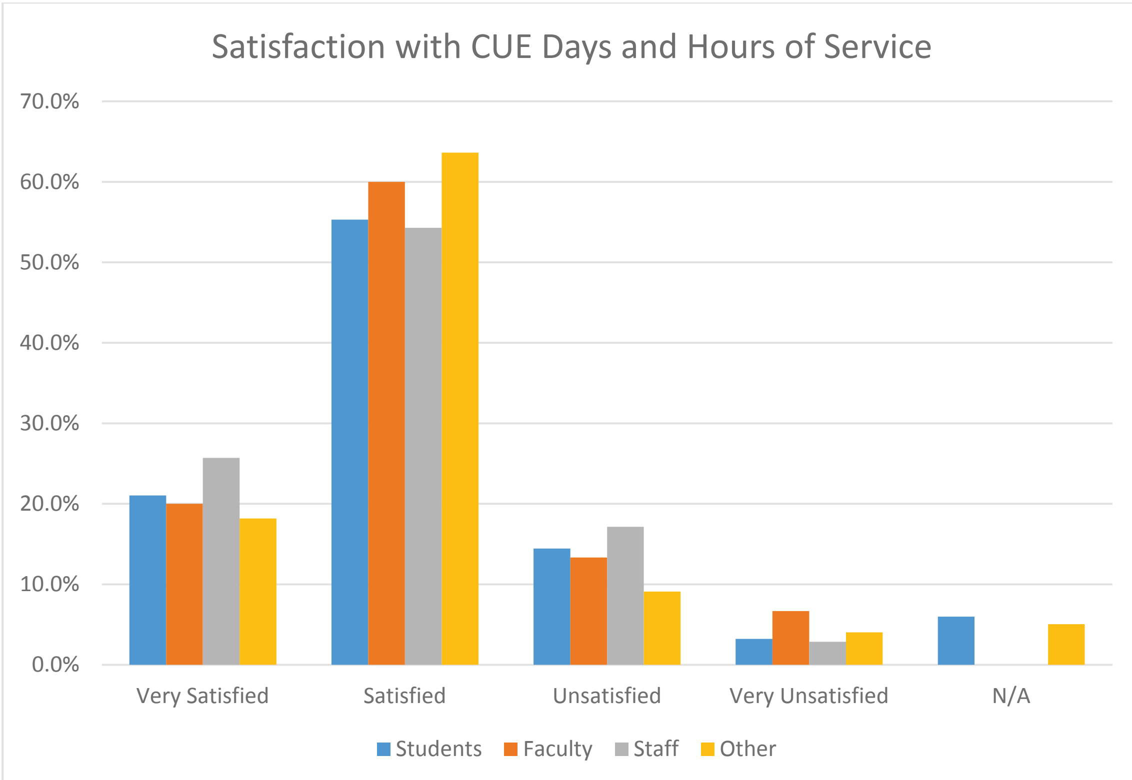

People aware of Mason Shuttle Stops
60.0%
40.0%
20.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all
Student
Faculty
Staff
Other

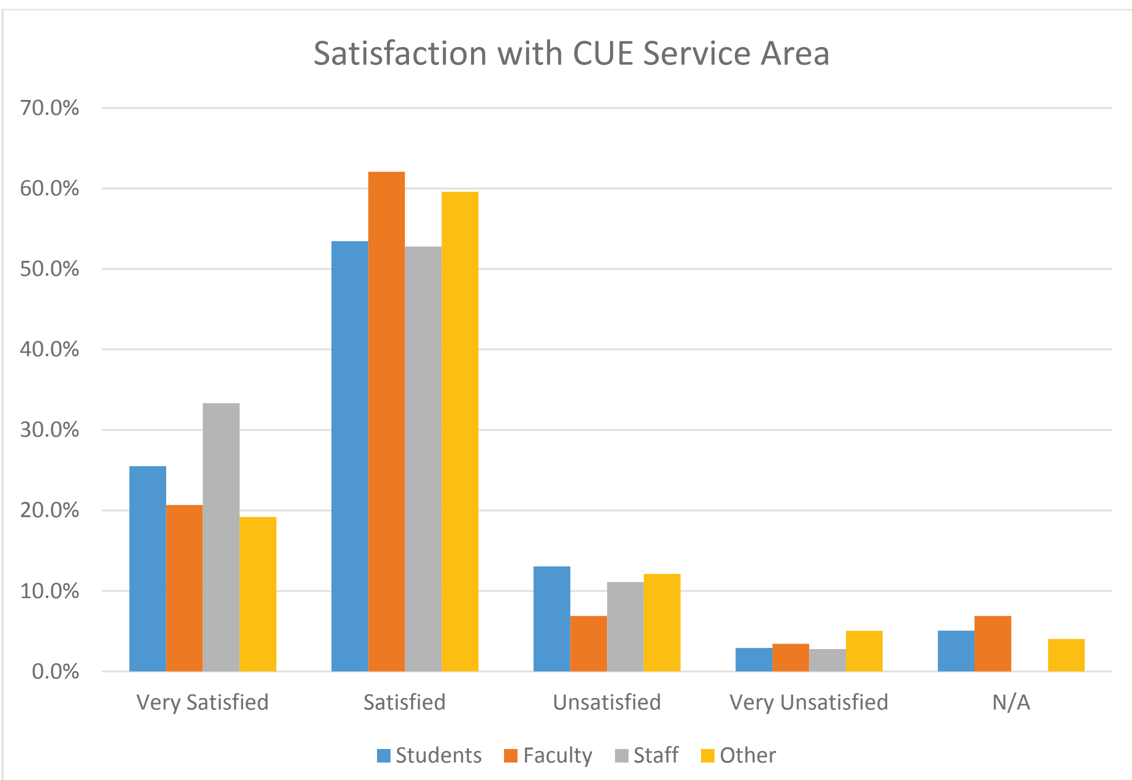

People aware of Mason Shuttle Real-time Passenger Information
60.0%
40.0%
20.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all
Student
Faculty
Staff
Other

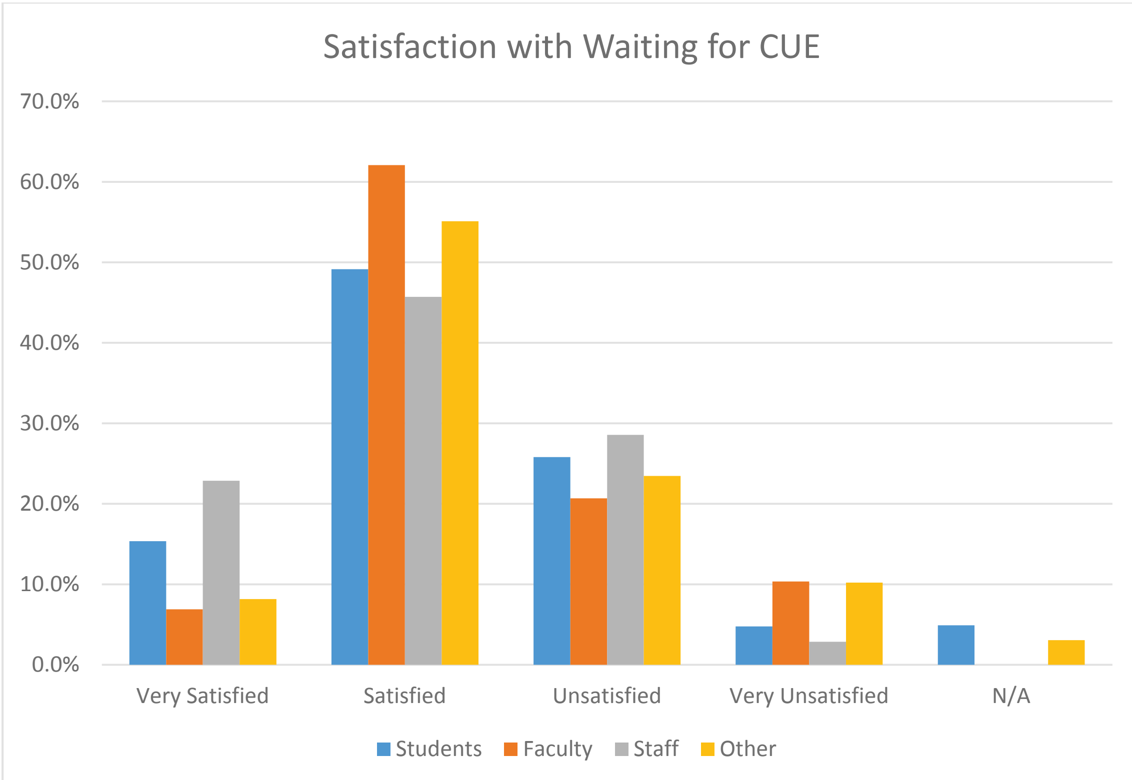

Frequency of use of the Mason Shuttles during the last 12 months
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Every week
Every other week
Once a month
Less than once a...
Student
Faculty
Staff
Other

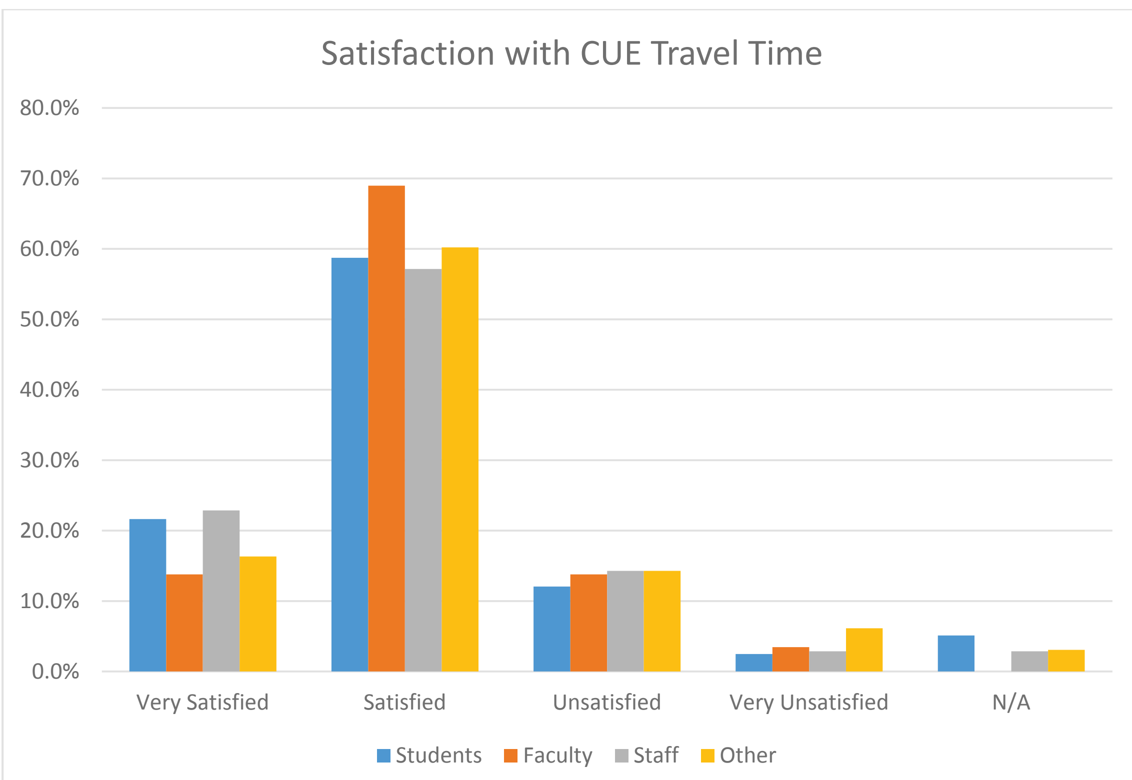

Days per Week Riding Mason Shuttles
Respondents
120
100
80
60
40
20
0
1
2
3
4
5
6
7
Days per Week
Student
Faculty
Staff
Other

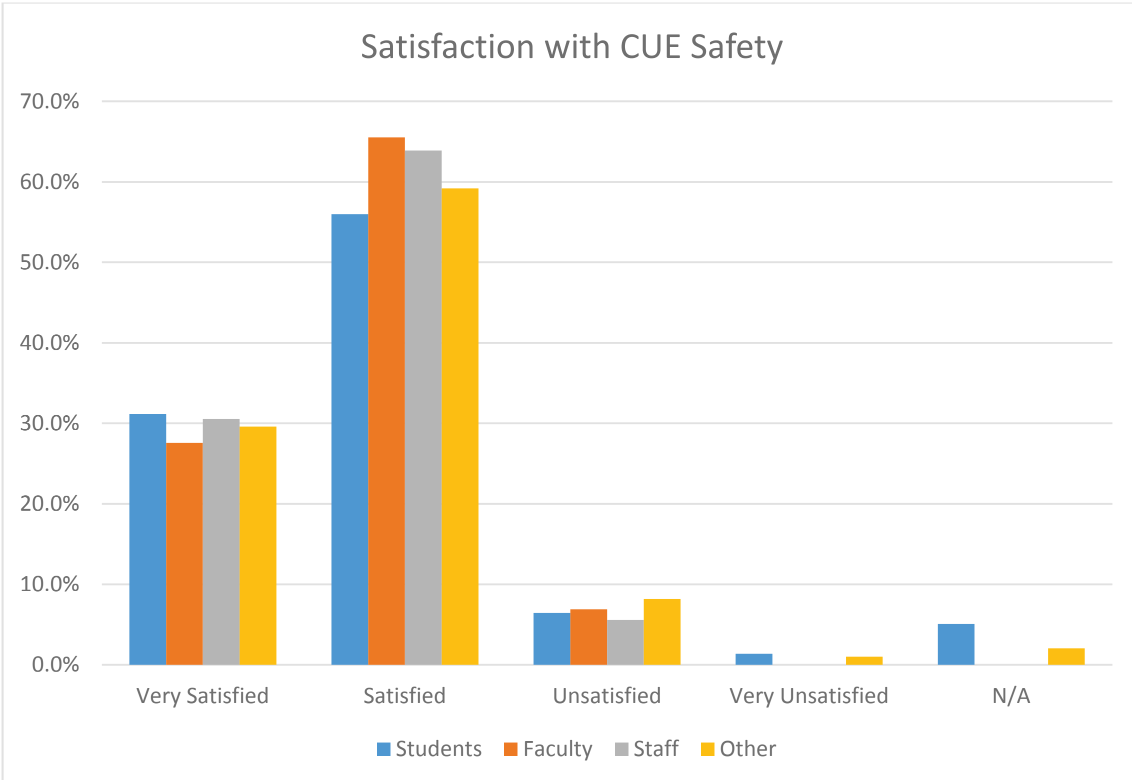

Satisfaction of CUE Bus Service (Mason)
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
Days and Hours
Service Area
Waiting for Bus
Travel Time
Safety
Cleanliness
On-time
Availability of Seats

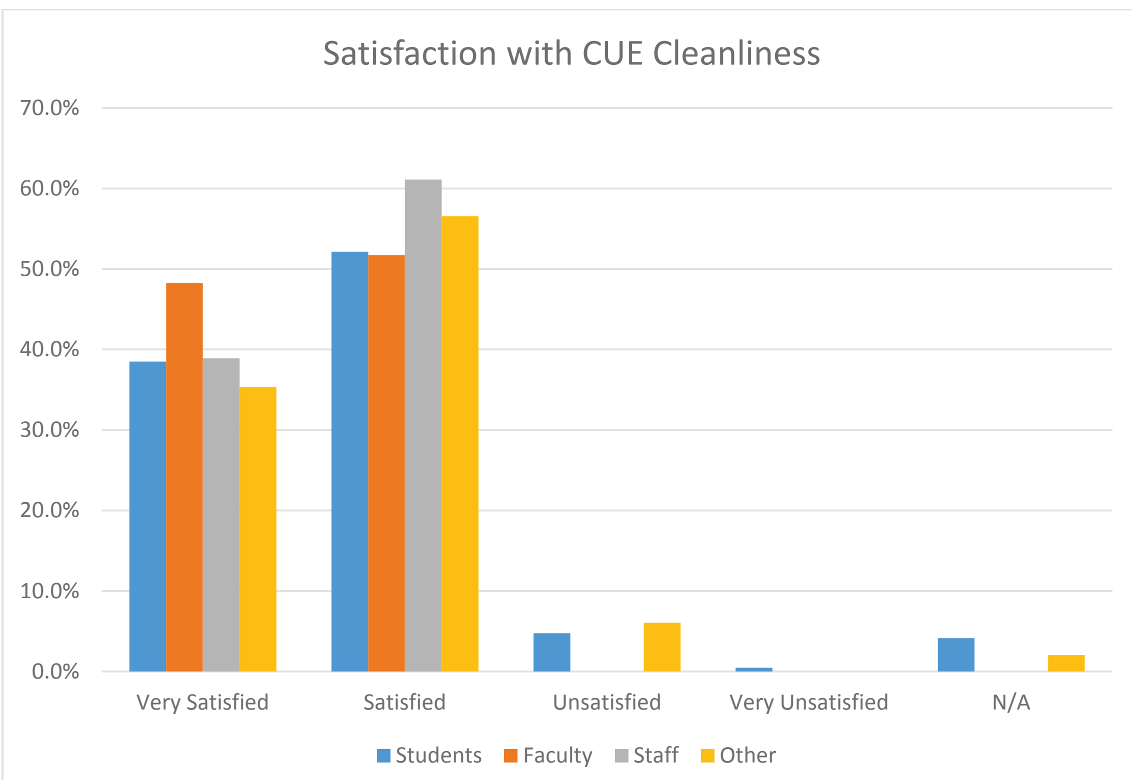

Satisfaction with CUE Days and Hours of Service
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Students
Faculty
Staff
Other

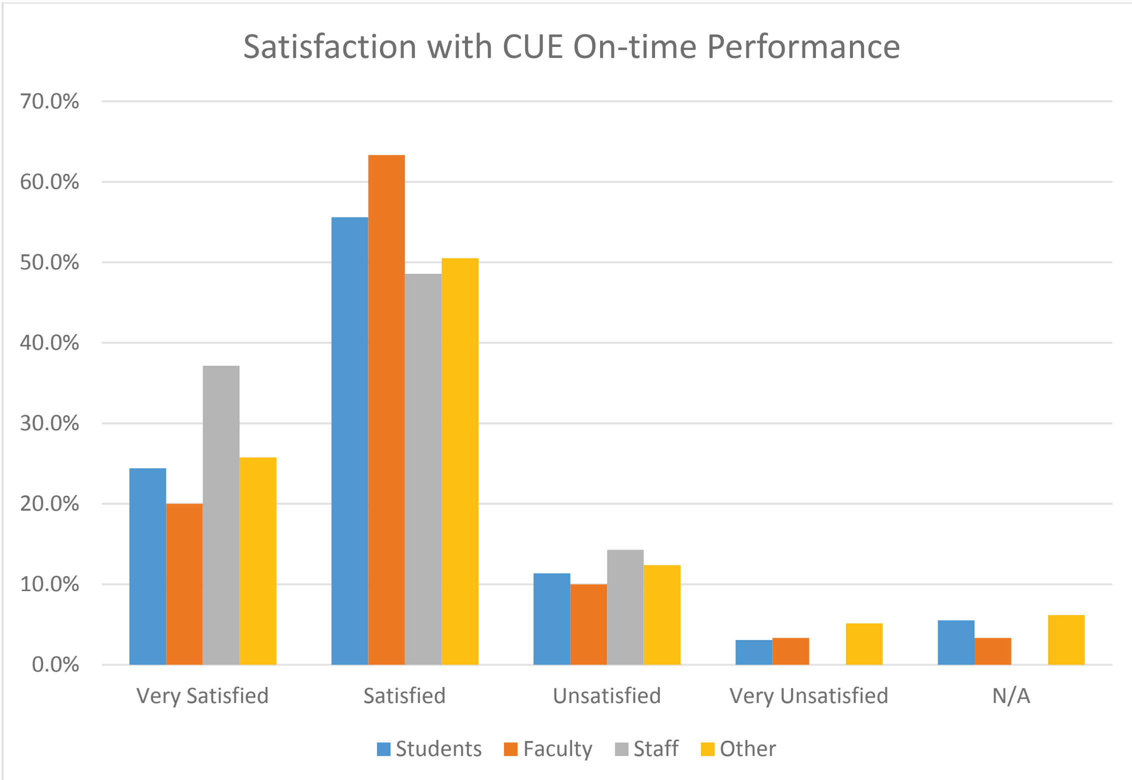

Satisfaction with CUE Service Area
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Students
Faculty
Staff
Other

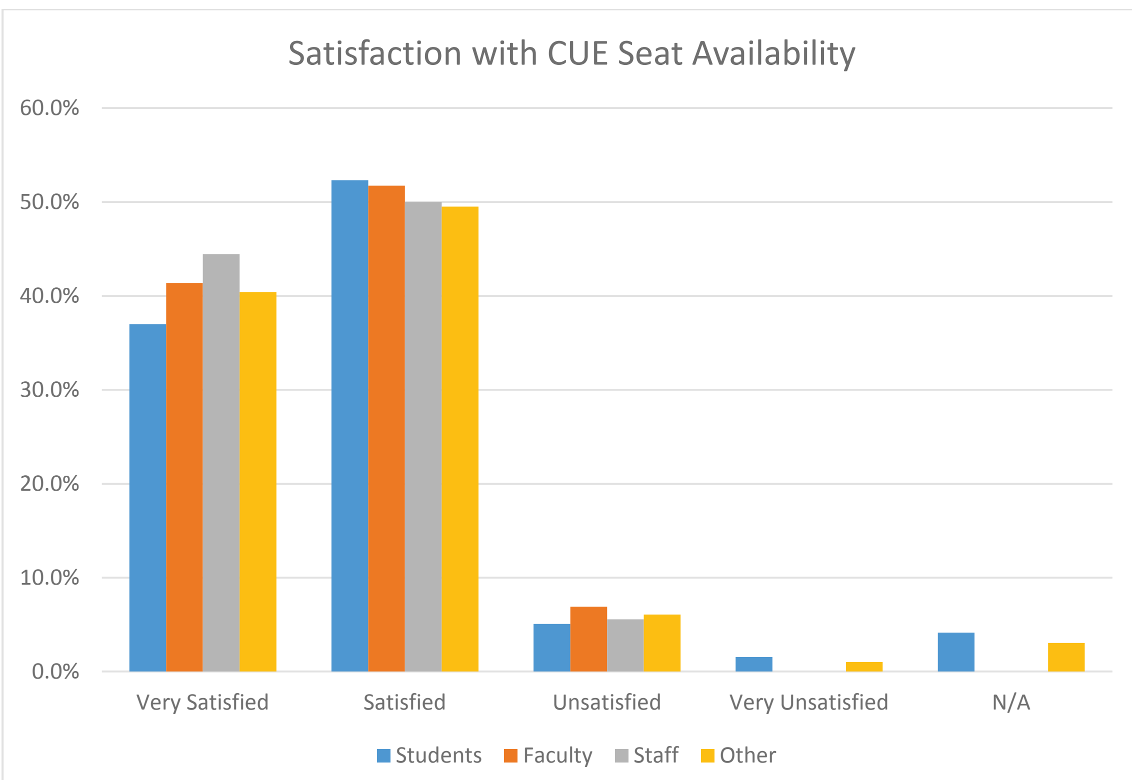

Satisfaction with Waiting for CUE
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Students
Faculty
Staff
Other

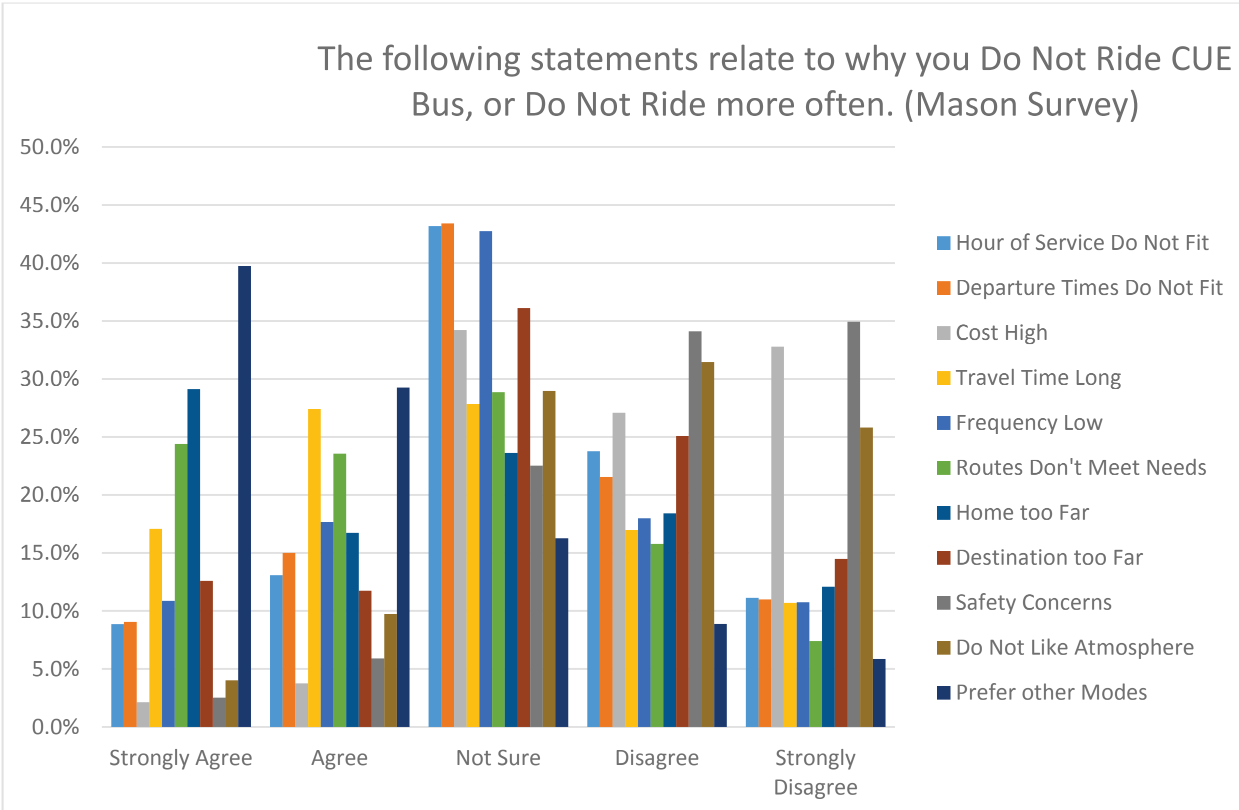

Satisfaction with CUE Travel Time
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Students
Faculty
Staff
Other

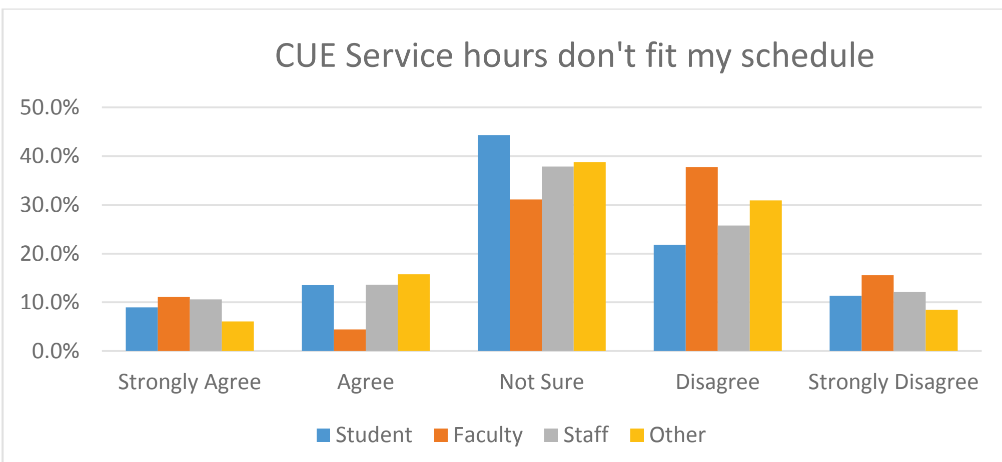

Satisfaction with CUE Safety
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Students
Faculty
Staff
Other

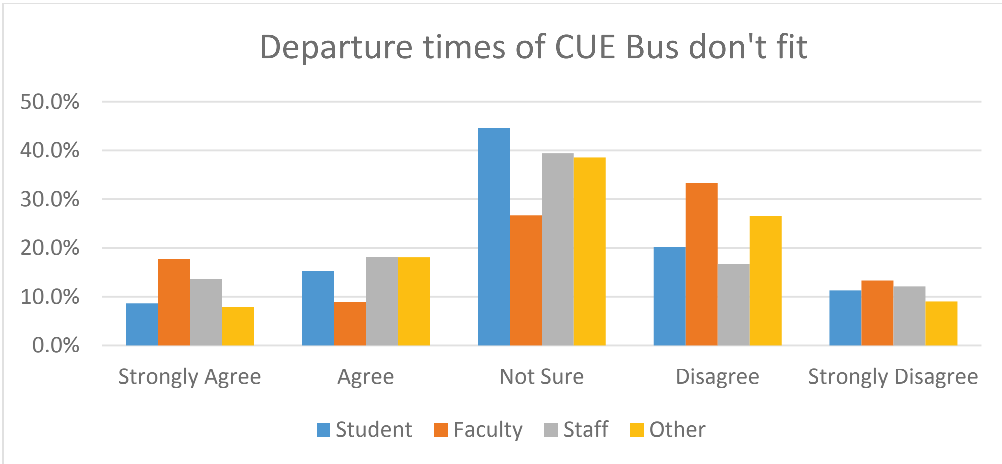

Satisfaction with CUE Cleanliness
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Students
Faculty
Staff
Other

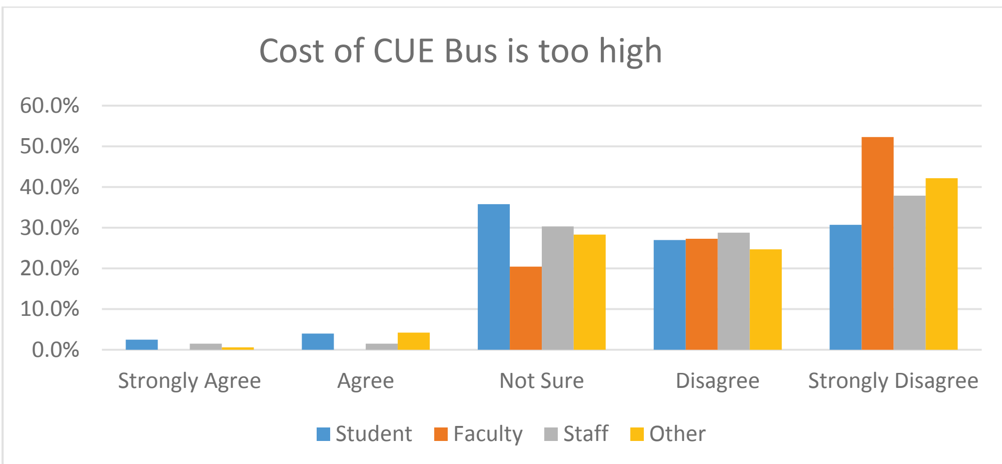

Satisfaction with CUE On-time Performance
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Students
Faculty
Staff
Other

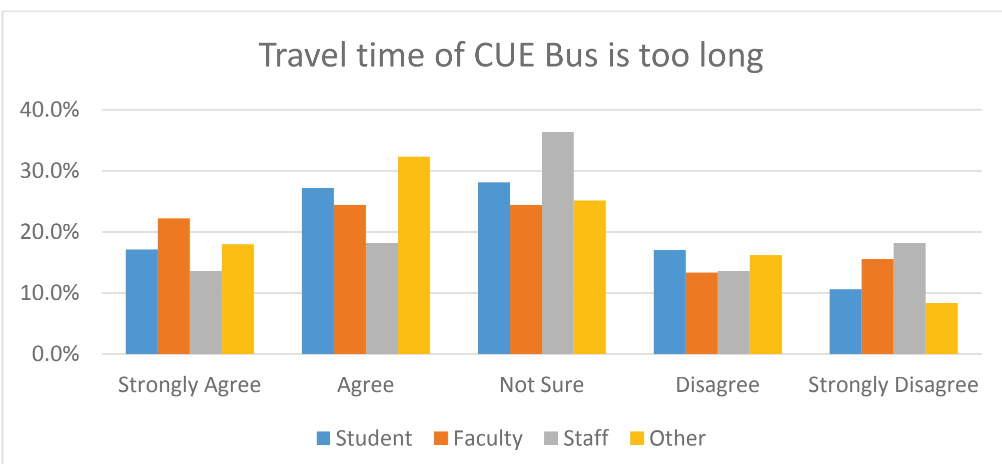

Satisfaction with CUE Seat Availability
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Students
Faculty
Staff
Other

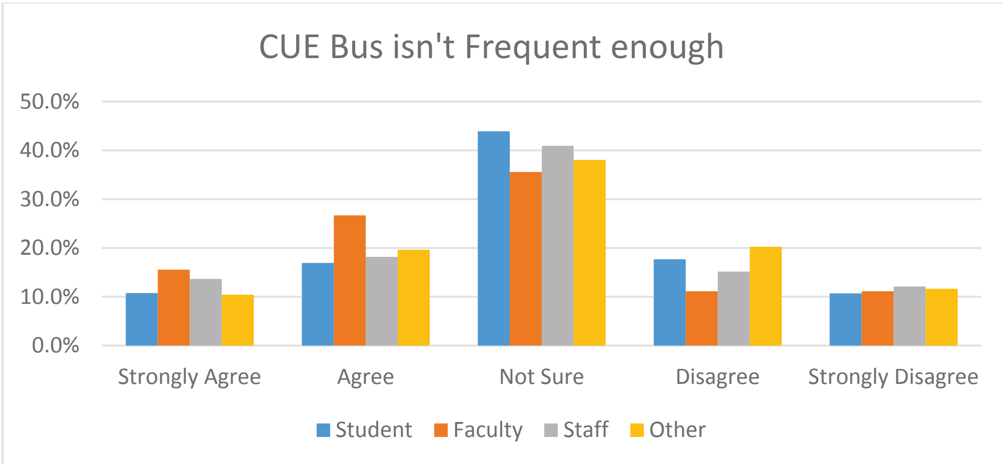

The following statements relate to why you Do Not Ride CUE Bus, or Do Not Ride more often. (Mason Survey)
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Hour of Service Do Not Fit
Departure Times Do Not Fit
Cost High
Travel Time Long
Frequency Low
Routes Don't Meet Needs
Home too Far
Destination too Far
Safety Concerns
Do Not Like Atmosphere
Prefer other Modes

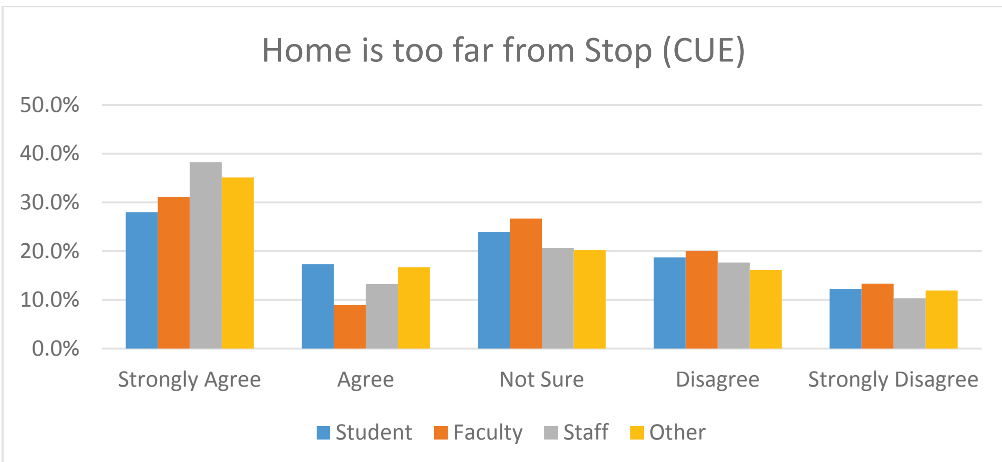

CUE Service hours don't fit my schedule
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

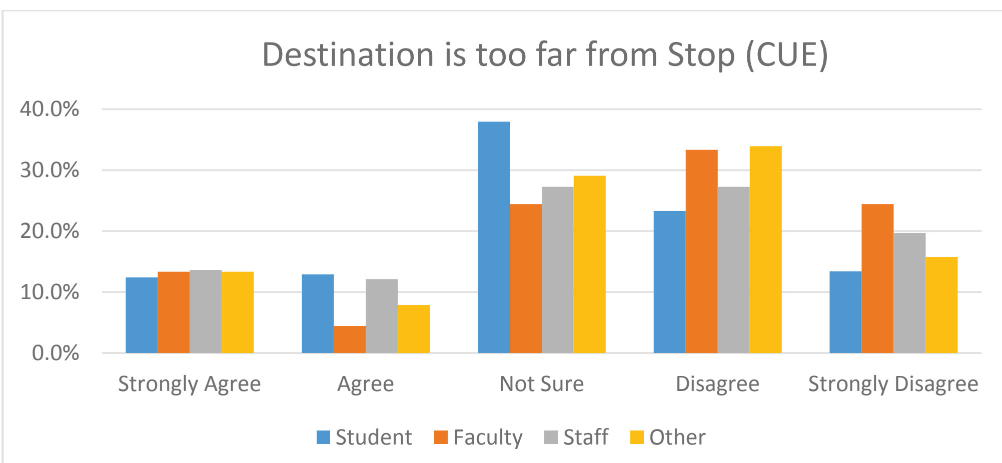

Departure times of CUE Bus don't fit
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

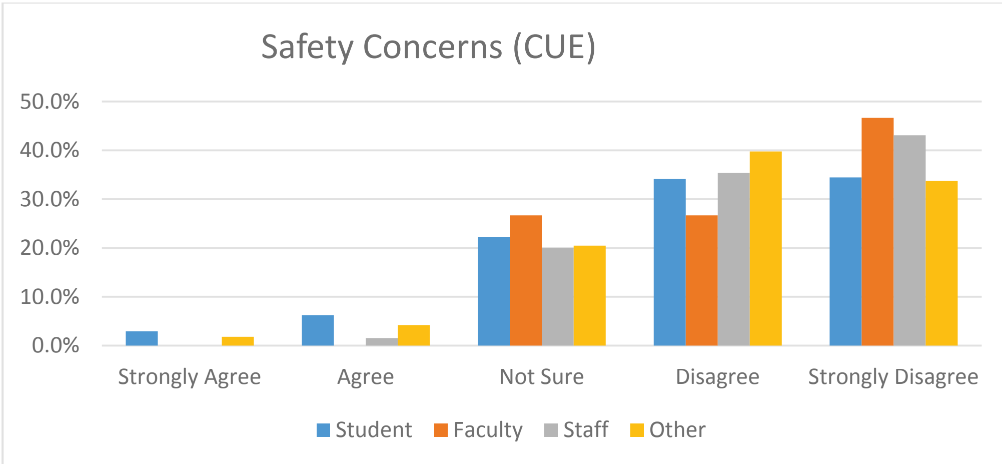

Cost of CUE Bus is too high
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

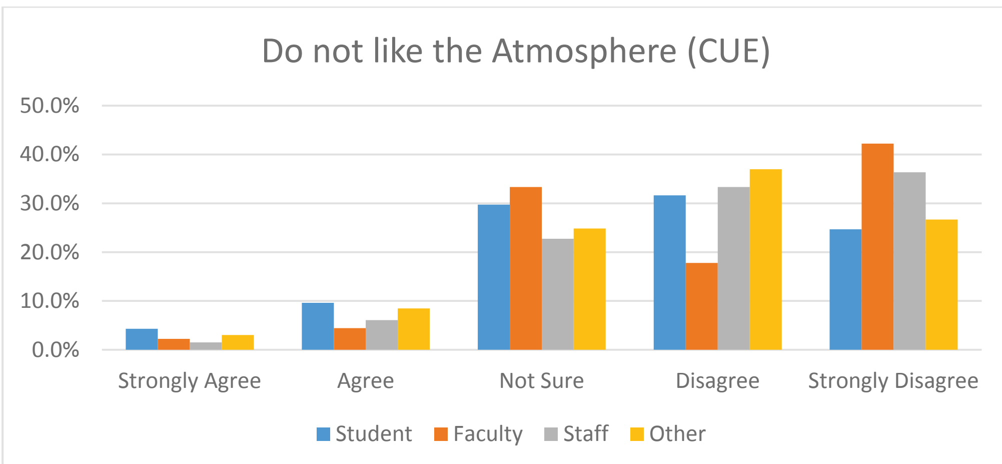

Travel time of CUE Bus is too long
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

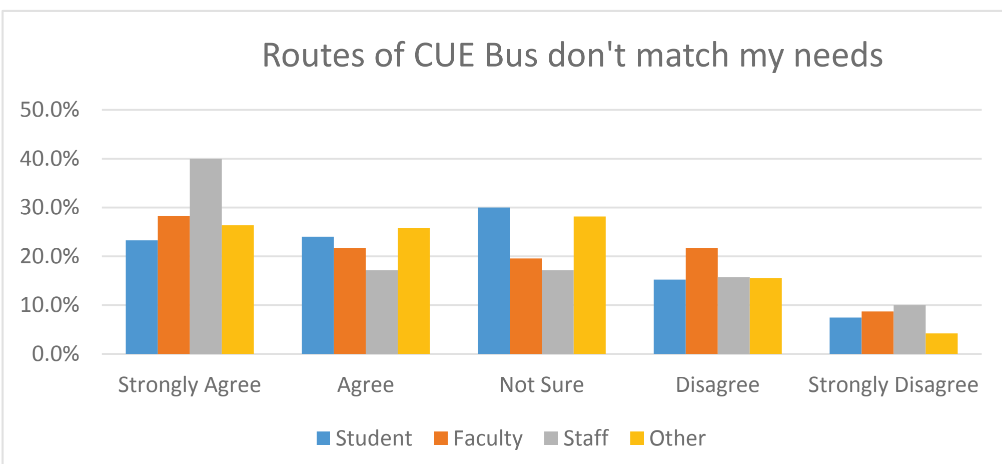

CUE Bus isn't Frequent enough
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

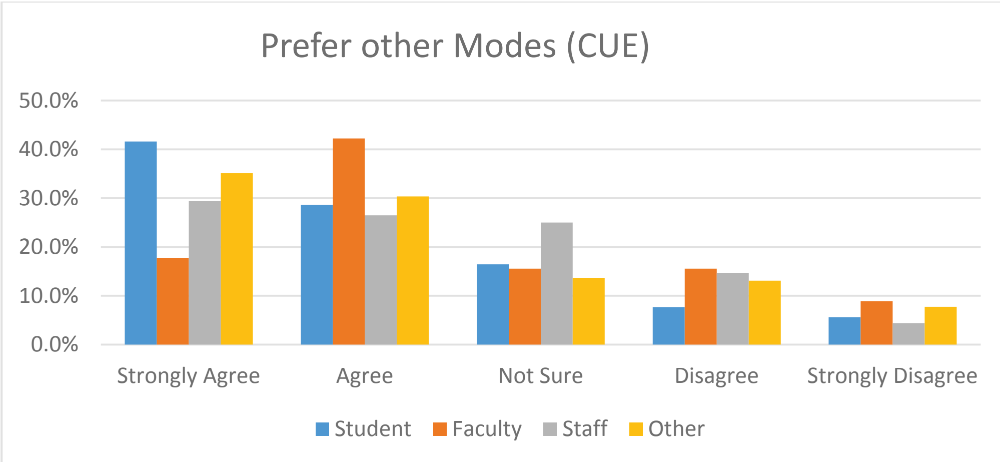

Home is too far from Stop (CUE)
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

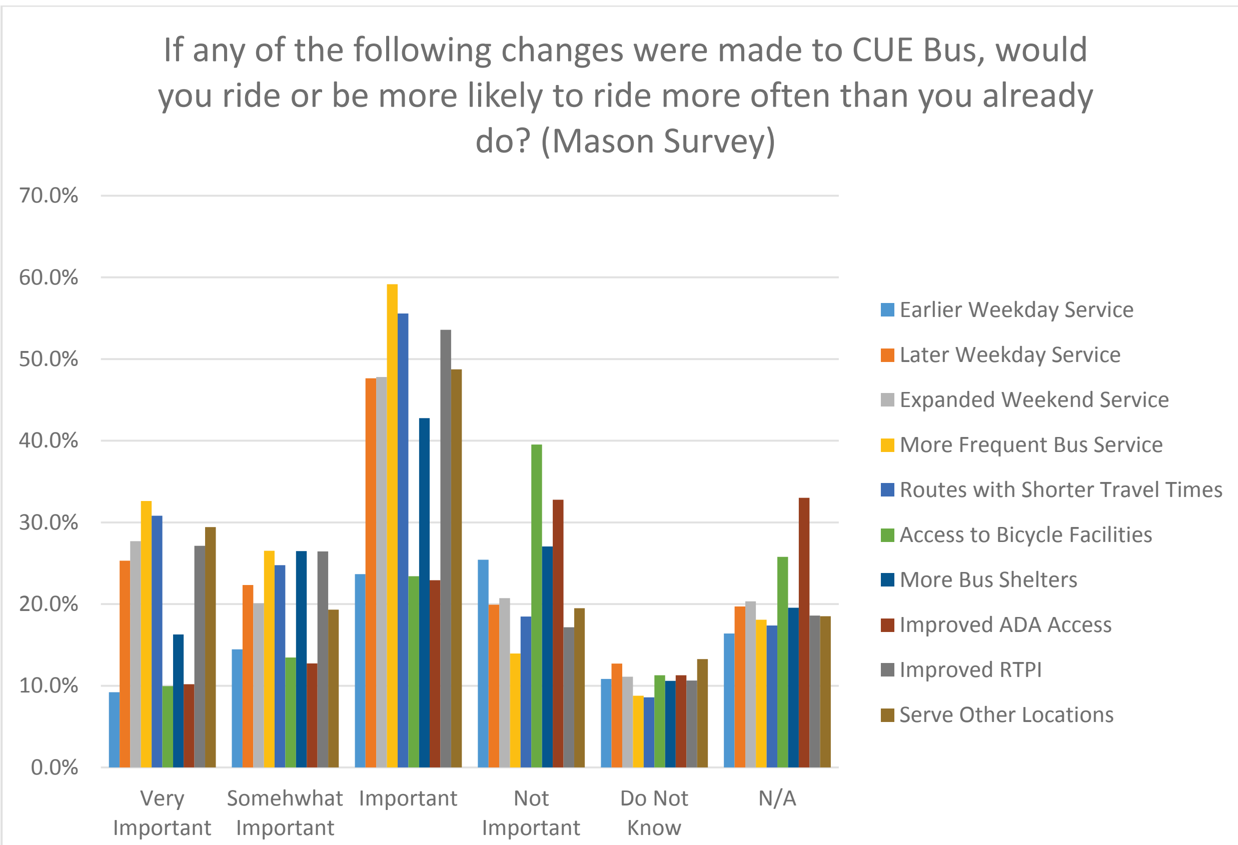

Destination is too far from Stop (CUE)
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

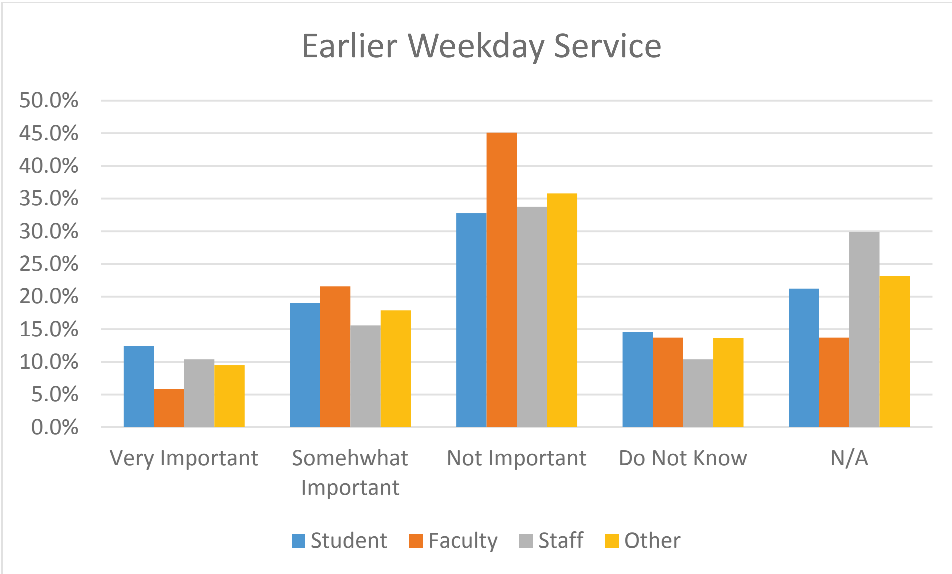

Safety Concerns (CUE)
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

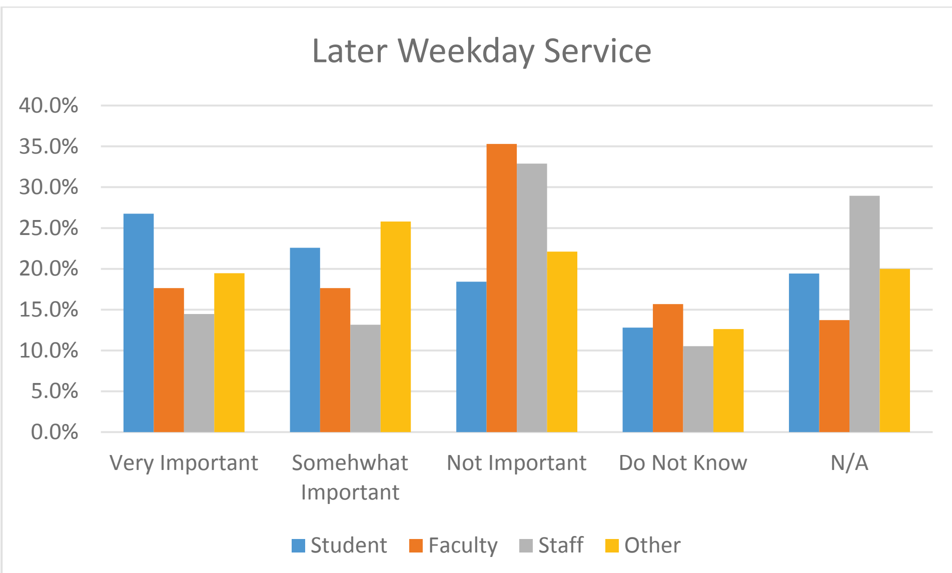

Do not like the Atmosphere (CUE)
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

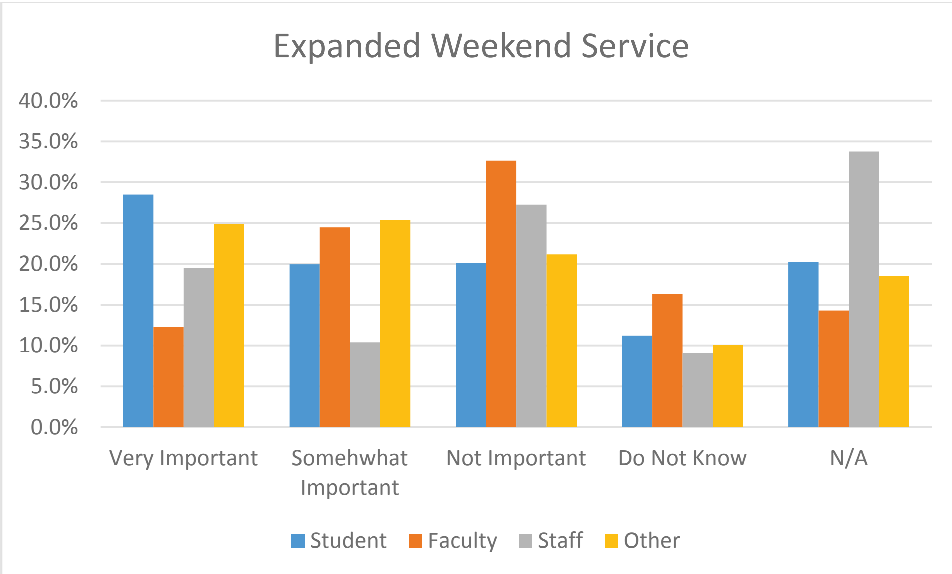

Routes of CUE Bus don't match my needs
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

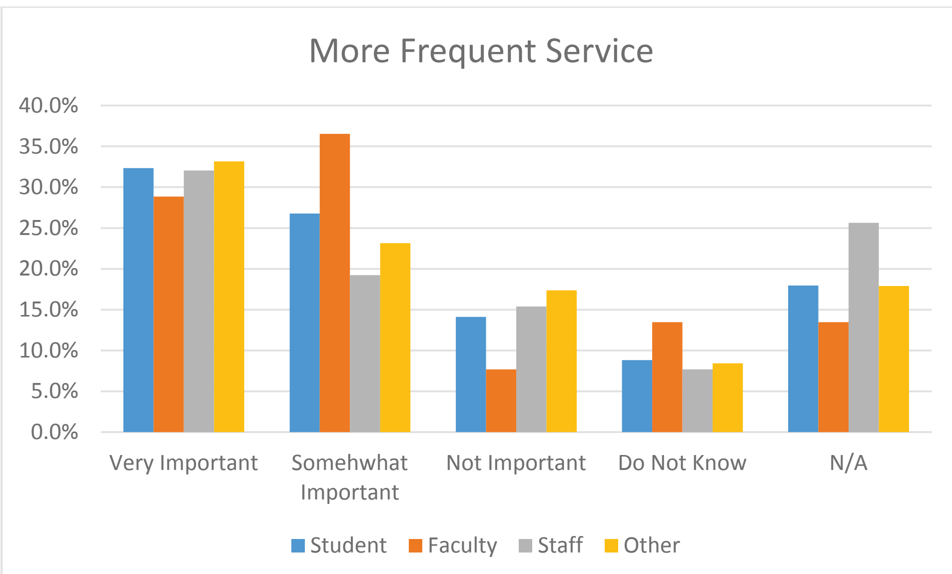

Prefer other Modes (CUE)
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

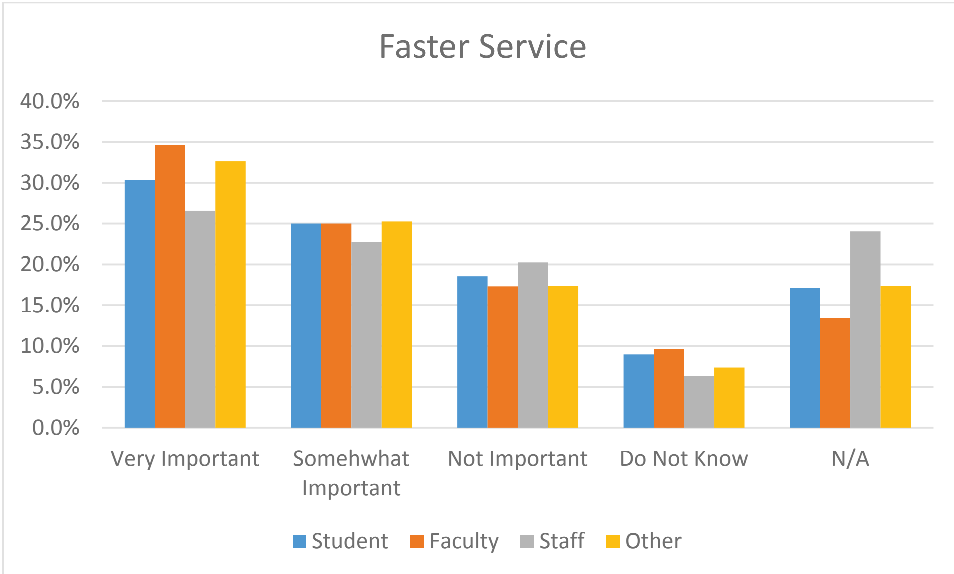

If any of the following changes were made to CUE Bus, would you ride or be more likely to ride more often than you already do? (Mason Survey)
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Important
Somehwhat Important
Important
Not Important
Do Not Know
N/A
Earlier Weekday Service
Later Weekday Service
Expanded Weekend Service
More Frequent Bus Service
Routes with Shorter Travel Times
Access to Bicycle Facilities
More Bus Shelters
Improved ADA Access
Improved RTPI
Serve Other Locations

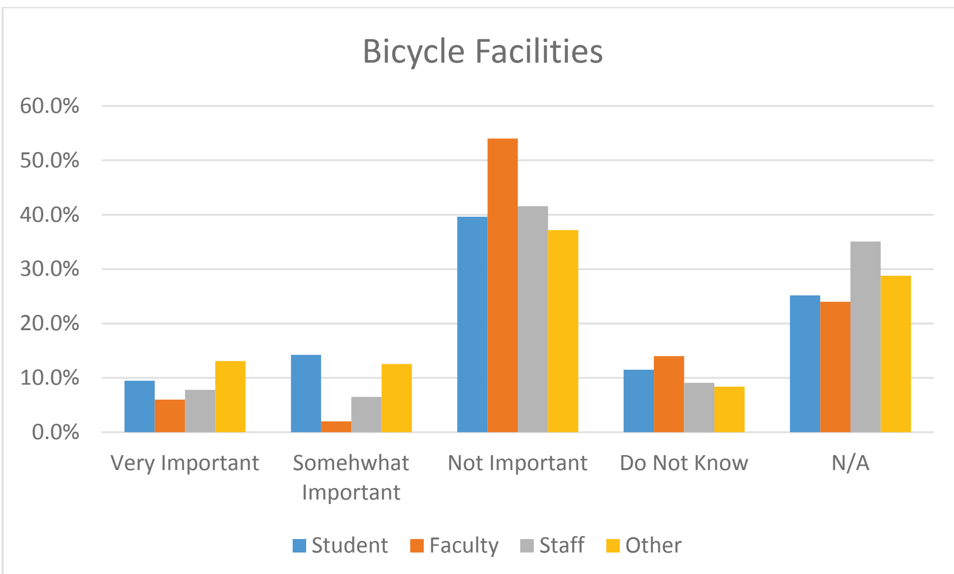

Earlier Weekday Service
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somehwhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other

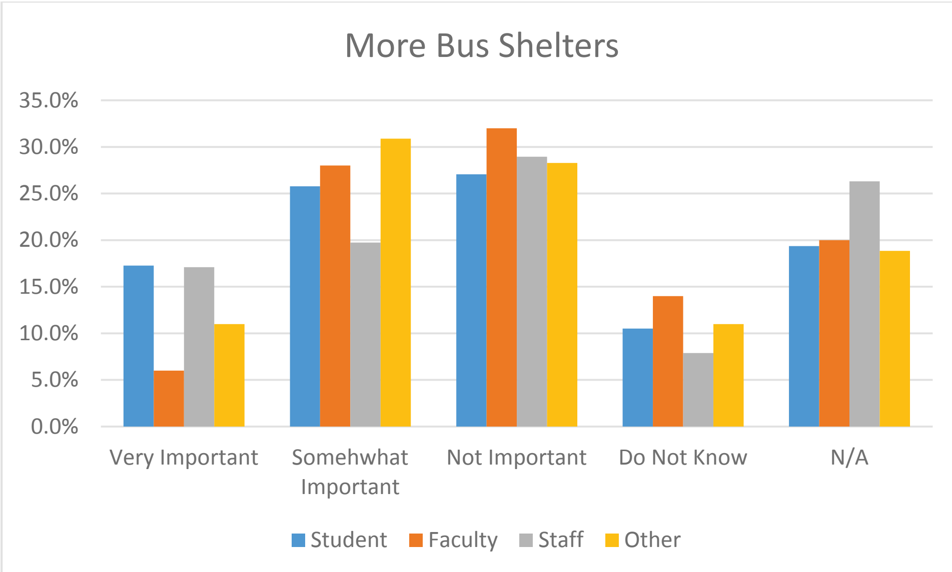

Later Weekday Service
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somehwhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other

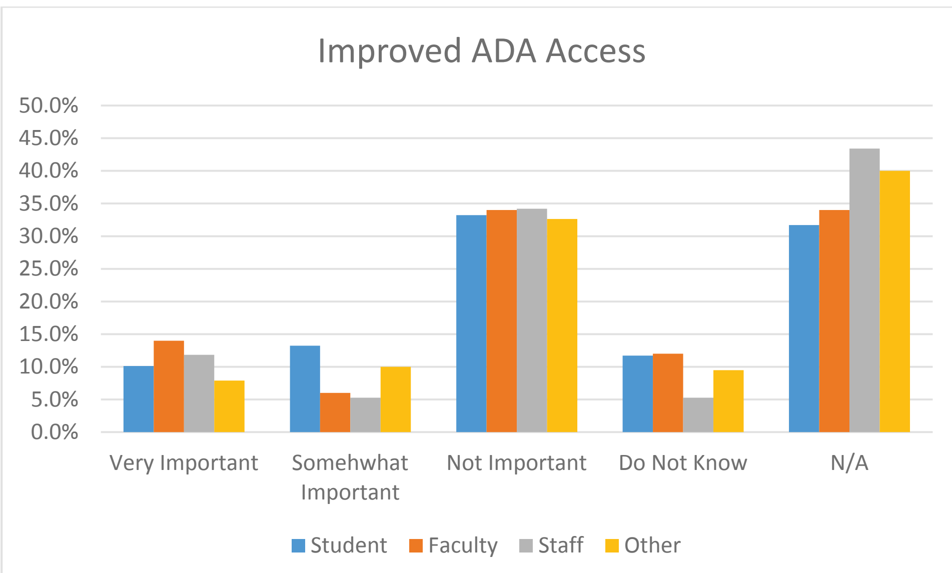

Expanded Weekend Service
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somehwhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other

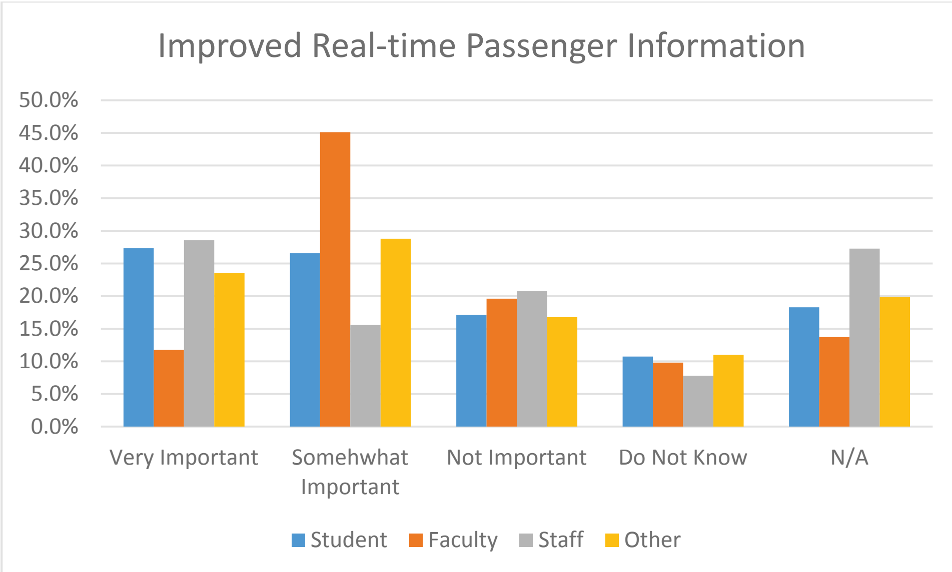

More Frequent Service
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somehwhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other

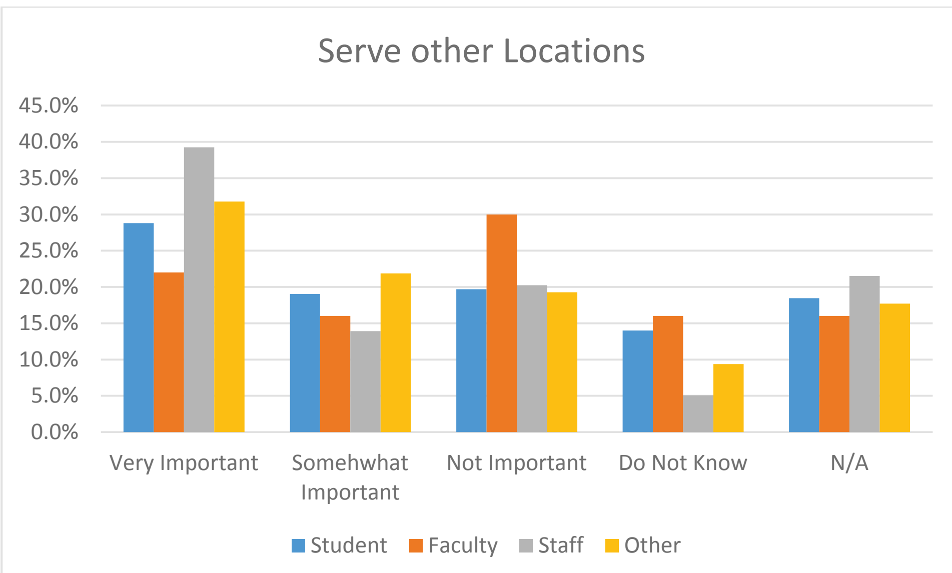

Faster Service
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somehwhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other

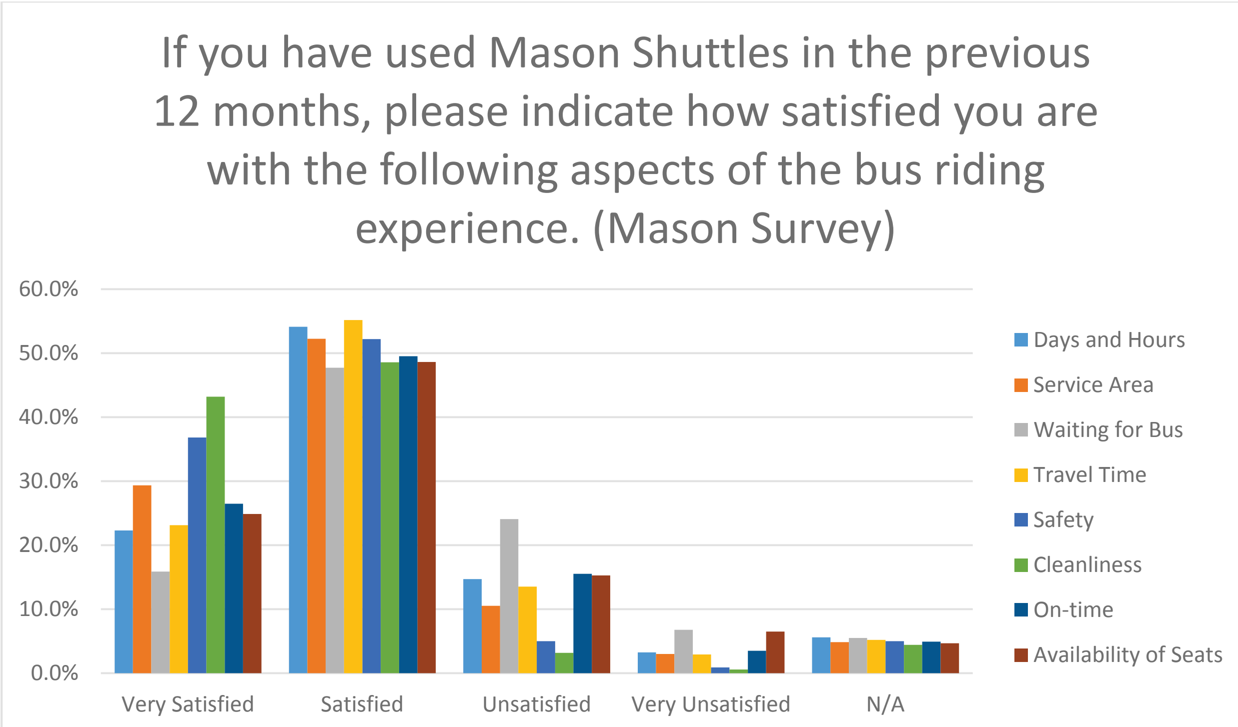

Bicycle Facilities
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Important
Somehwhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other


More Bus Shelters
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somehwhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other

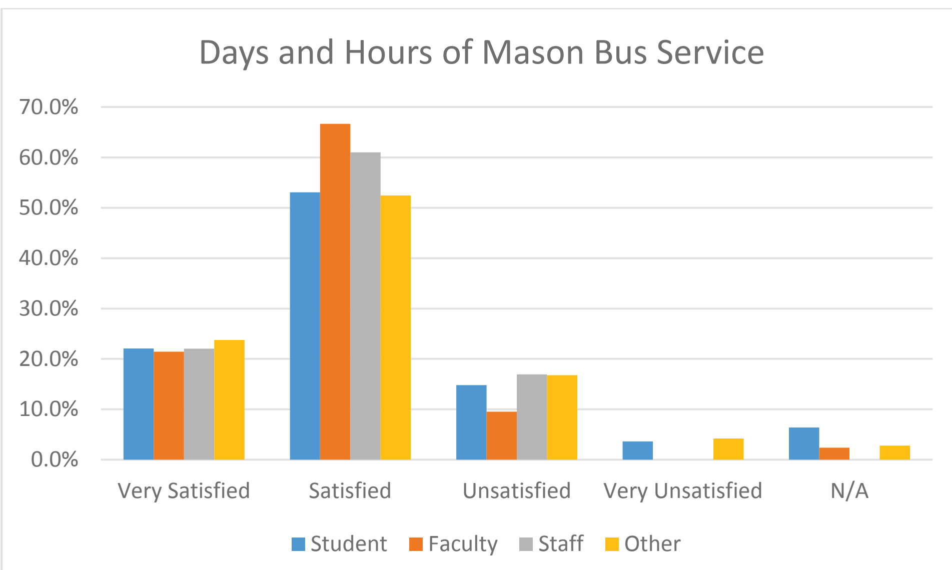

Improved ADA Access
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somehwhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other


Improved Real-time Passenger Information
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somehwhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other

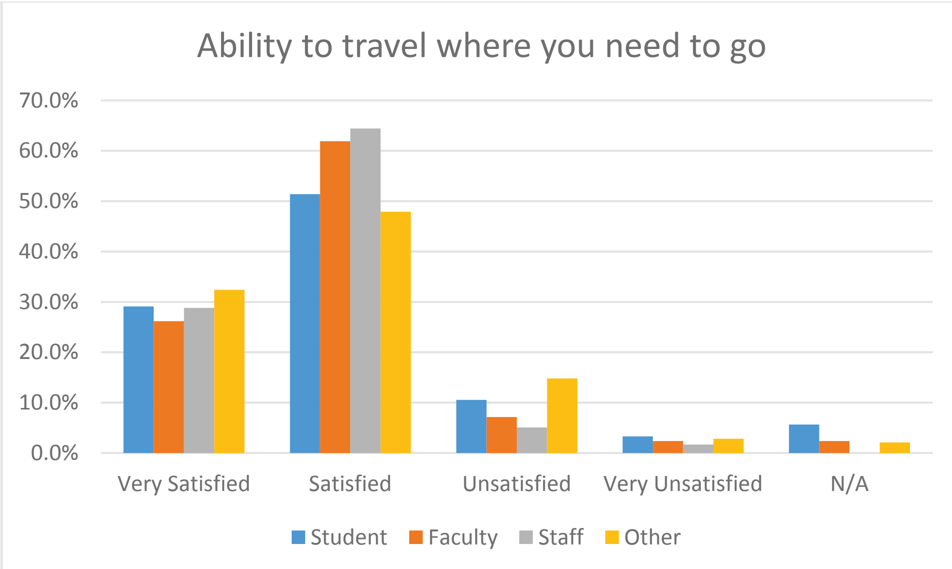

Serve other Locations
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somehwhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other

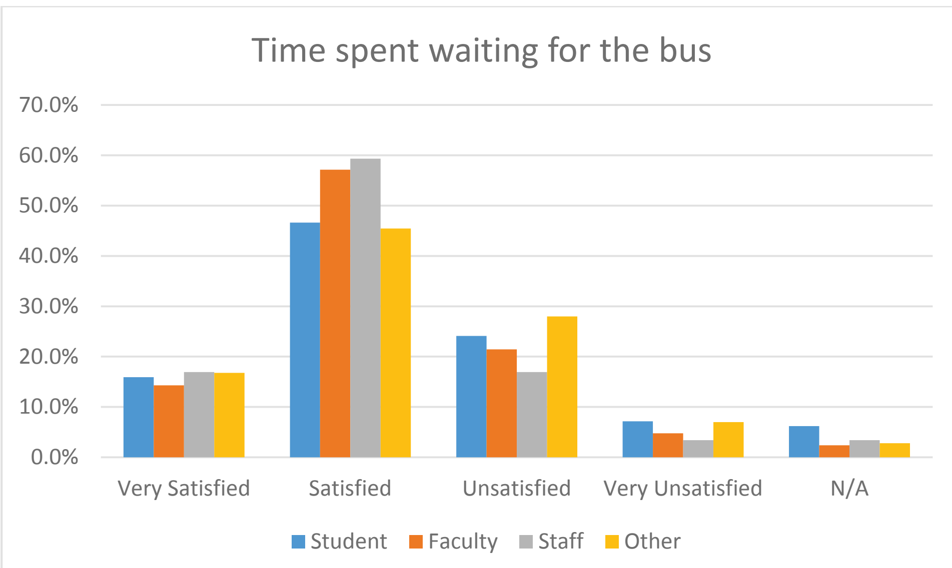


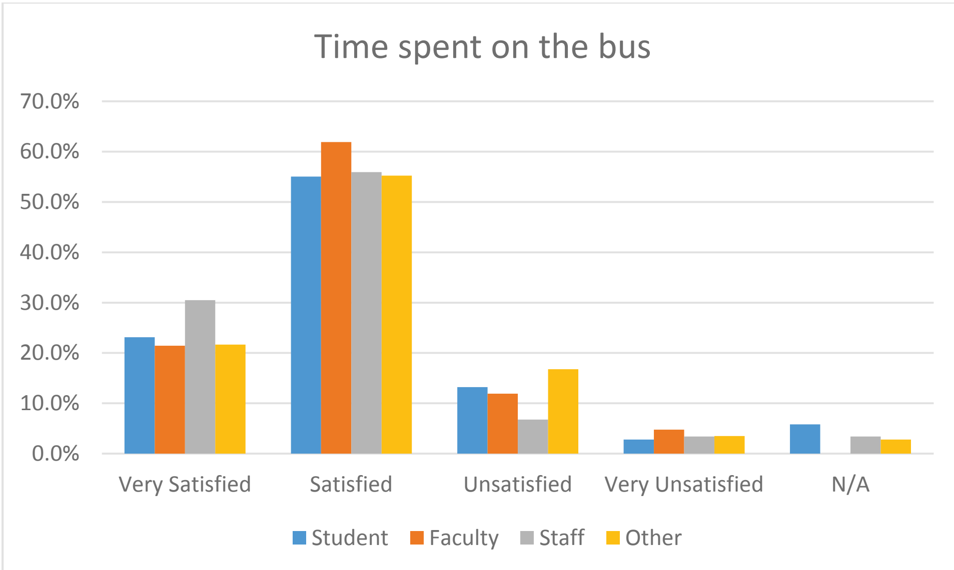
If you have used Mason Shuttles in the previous 12 months, please indicate how satisfied you are with the following aspects of the bus riding experience. (Mason Survey)
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Days and Hours
Service Area
Waiting for Bus
Travel Time
Safety
Cleanliness
On-time
Availability of Seats

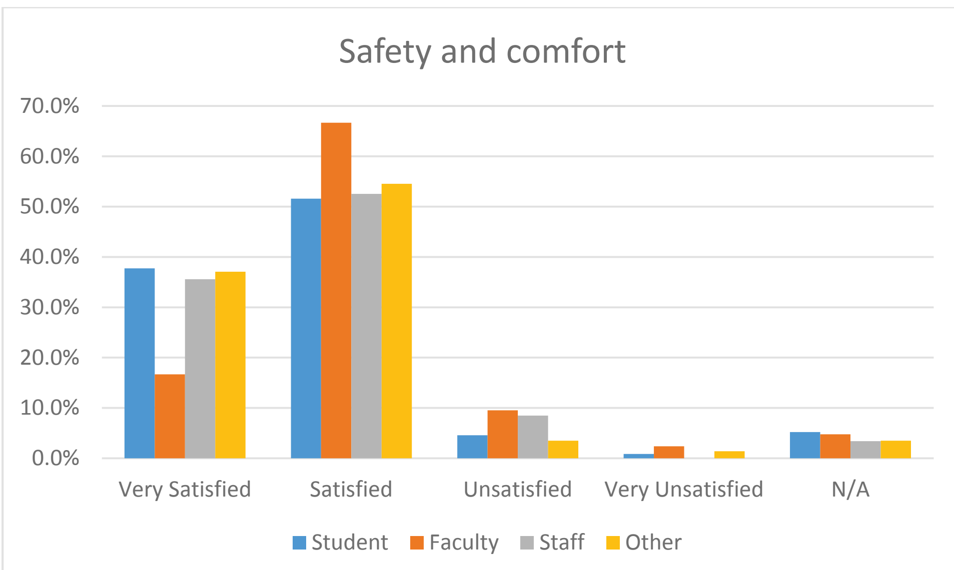


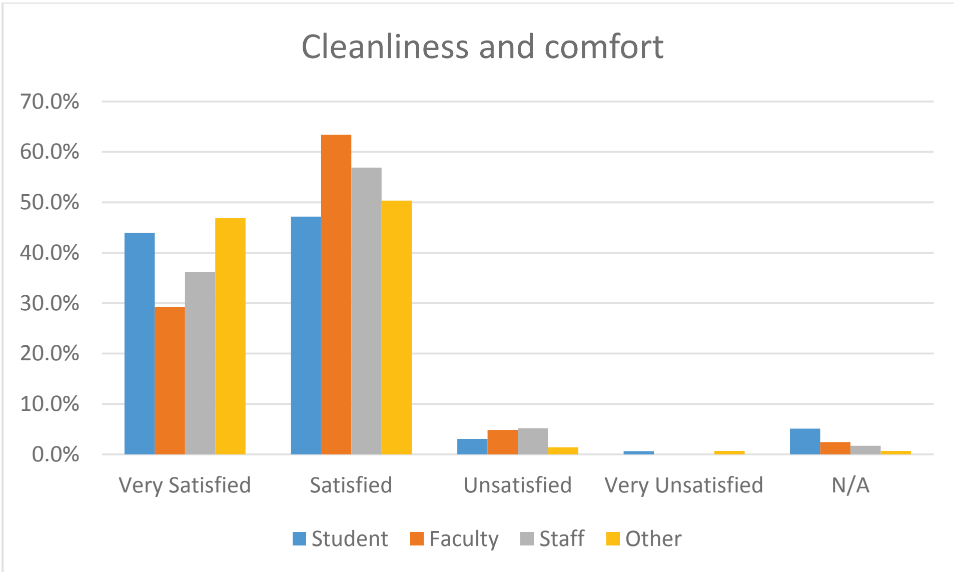
Days and Hours of Mason Bus Service
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Student
Faculty
Staff
Other

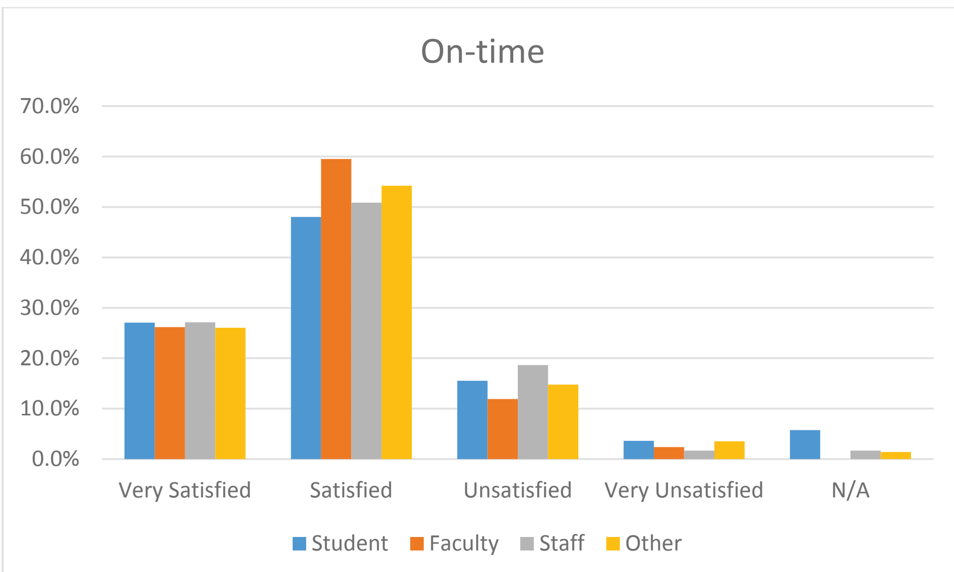

Ability to travel where you need to go
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Student
Faculty
Staff
Other

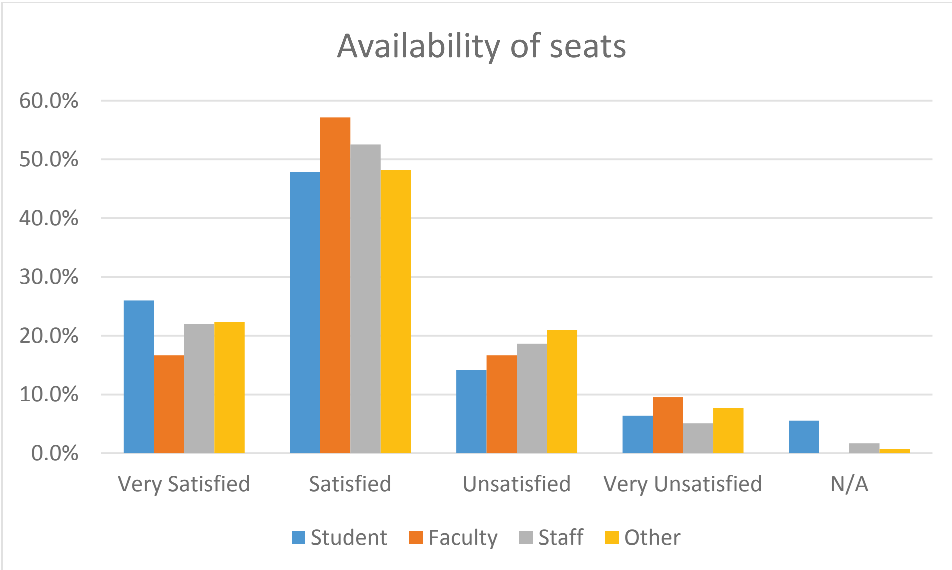

Time spent waiting for the bus
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Student
Faculty
Staff
Other

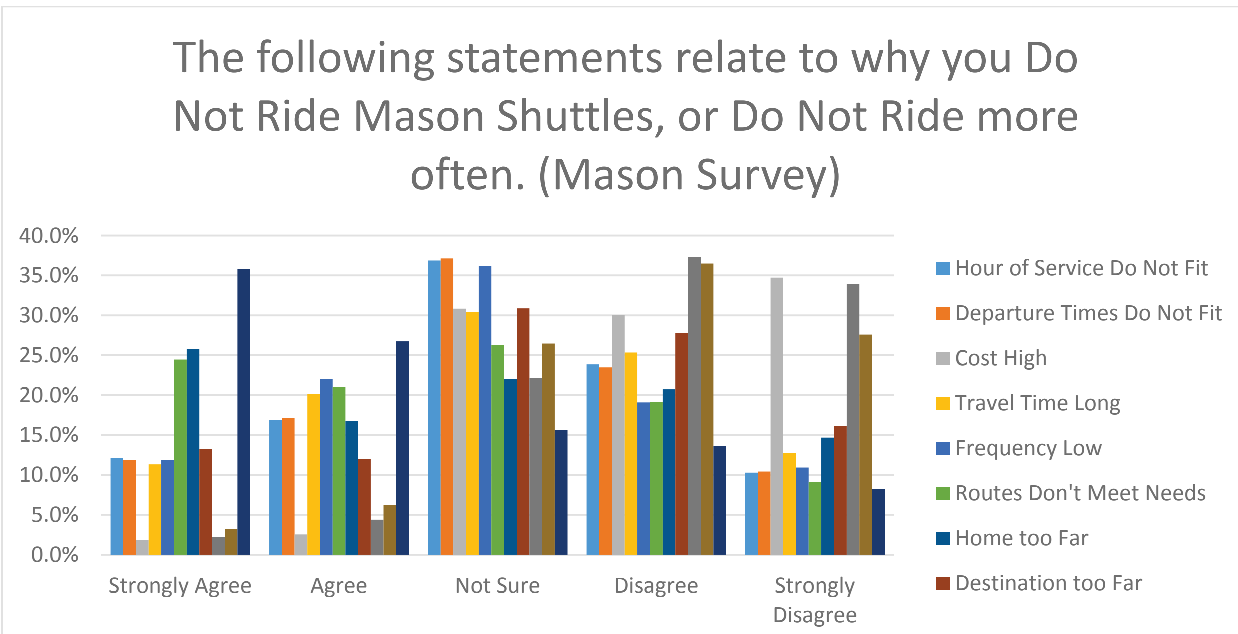

Time spent on the bus
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Student
Faculty
Staff
Other

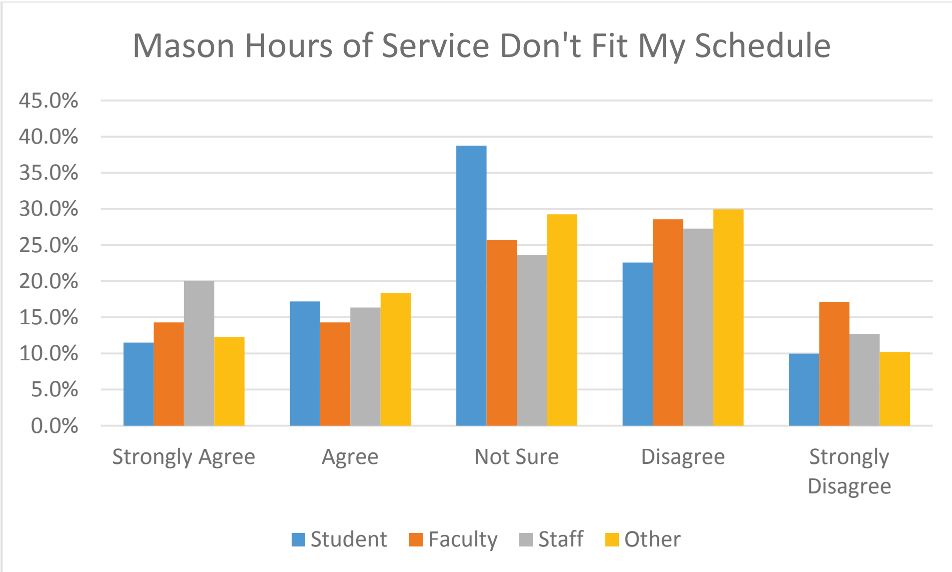

Safety and comfort
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Student
Faculty
Staff
Other

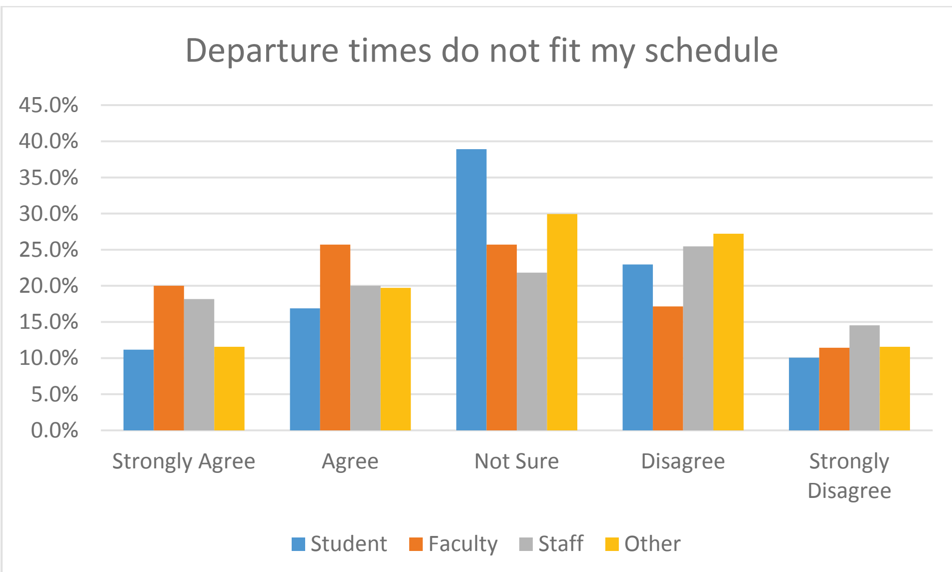

Cleanliness and comfort
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Student
Faculty
Staff
Other

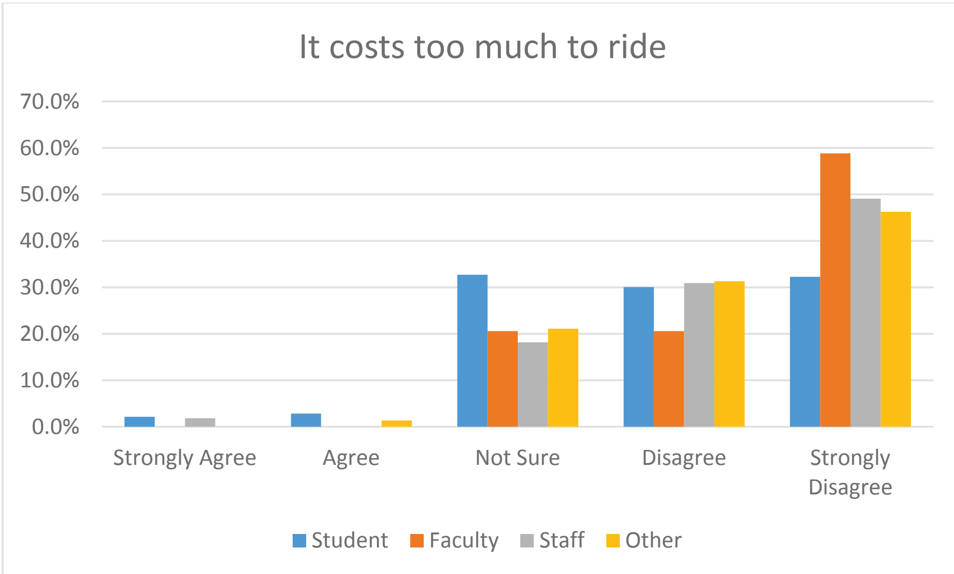

On-time
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Student
Faculty
Staff
Other

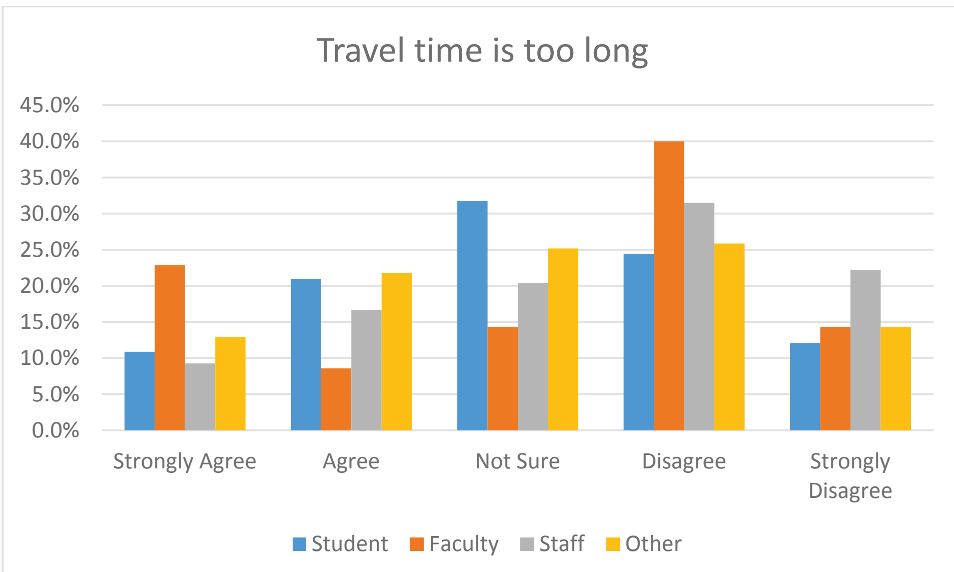

Availability of seats
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Student
Faculty
Staff
Other

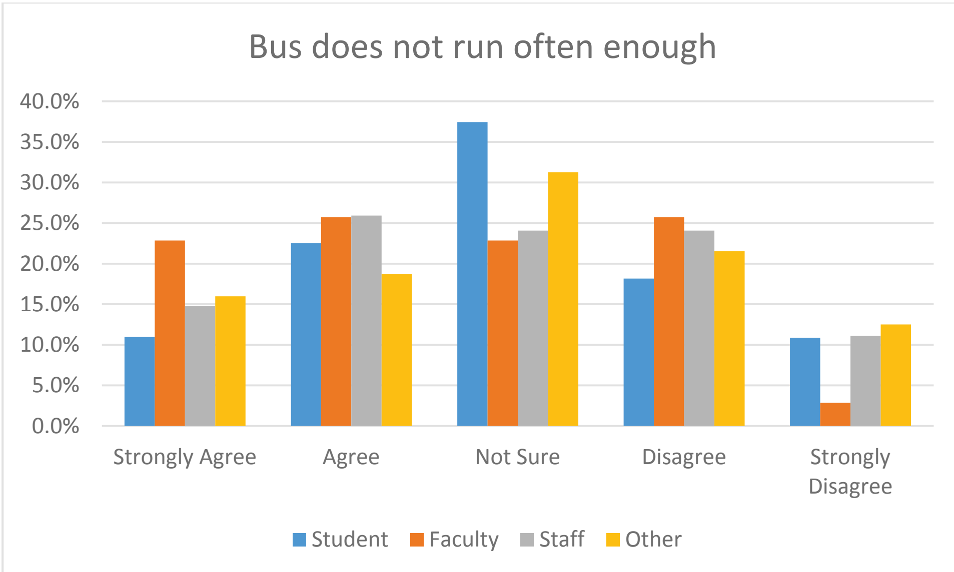

The following statements relate to why you Do Not Ride Mason Shuttles, or Do Not Ride more often. (Mason Survey)
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Hour of Service Do Not Fit
Departure Times Do Not Fit
Cost High
Travel Time Long
Frequency Low
Routes Don't Meet Needs
Home too Far
Destination too Far

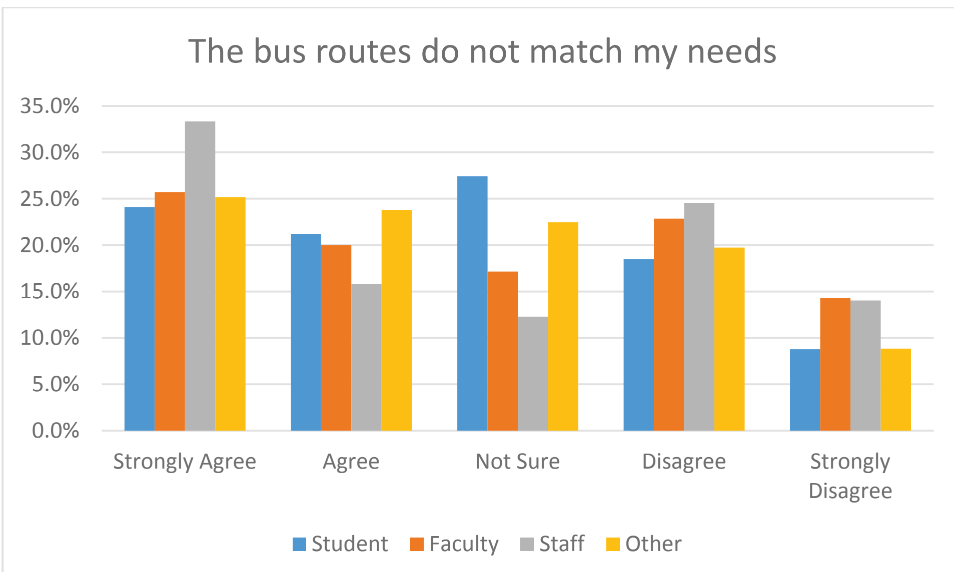

Mason Hours of Service Don't Fit My Schedule
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

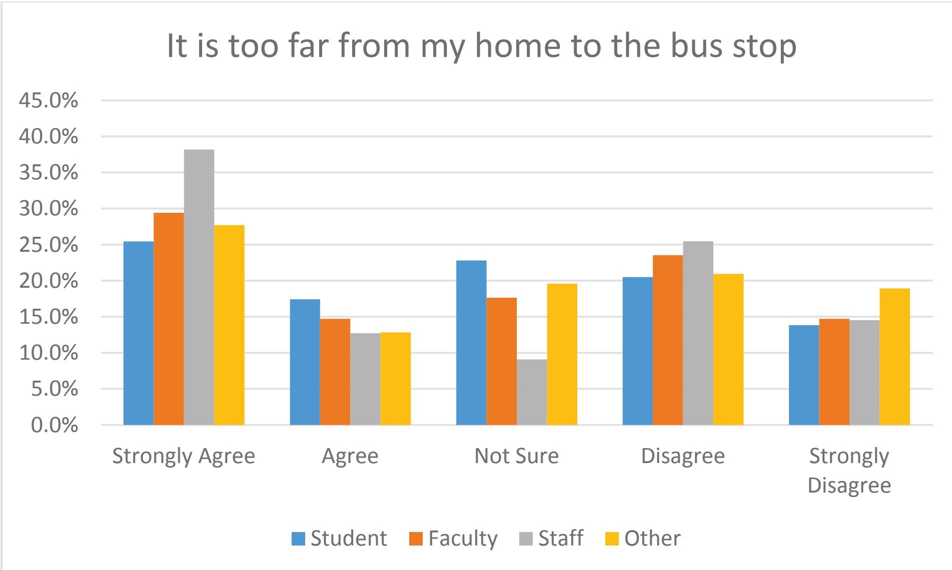

Departure times do not fit my schedule
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

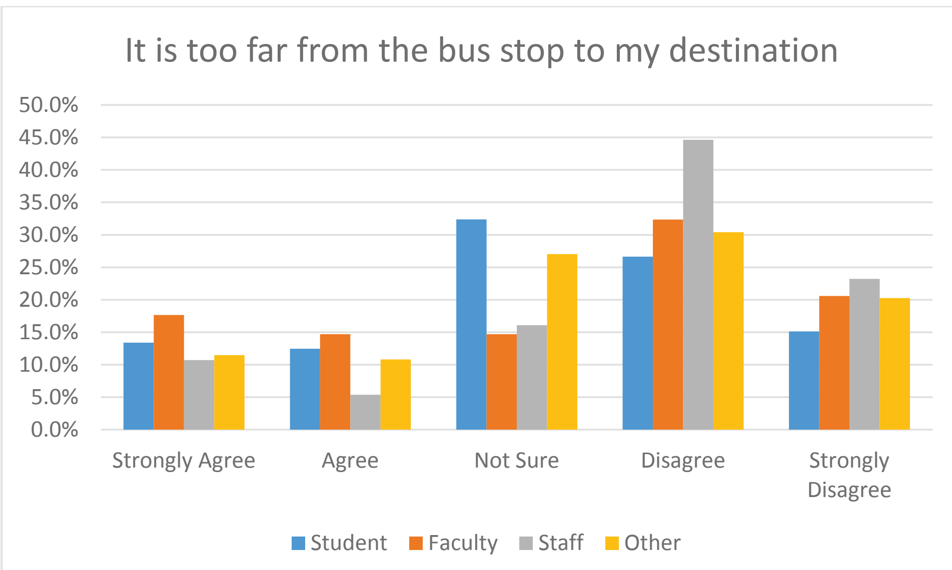

It costs too much to ride
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

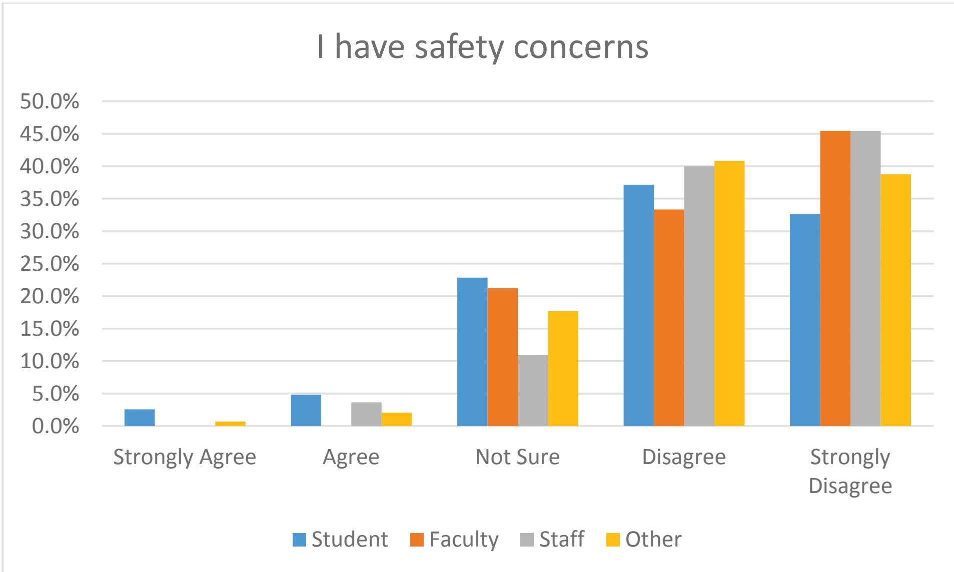

Travel time is too long
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

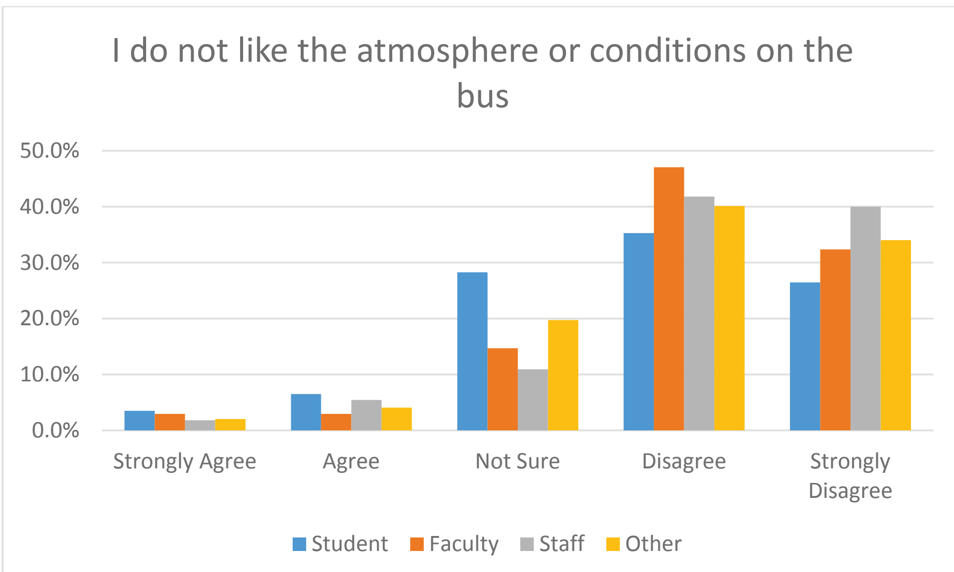

Bus does not run often enough
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

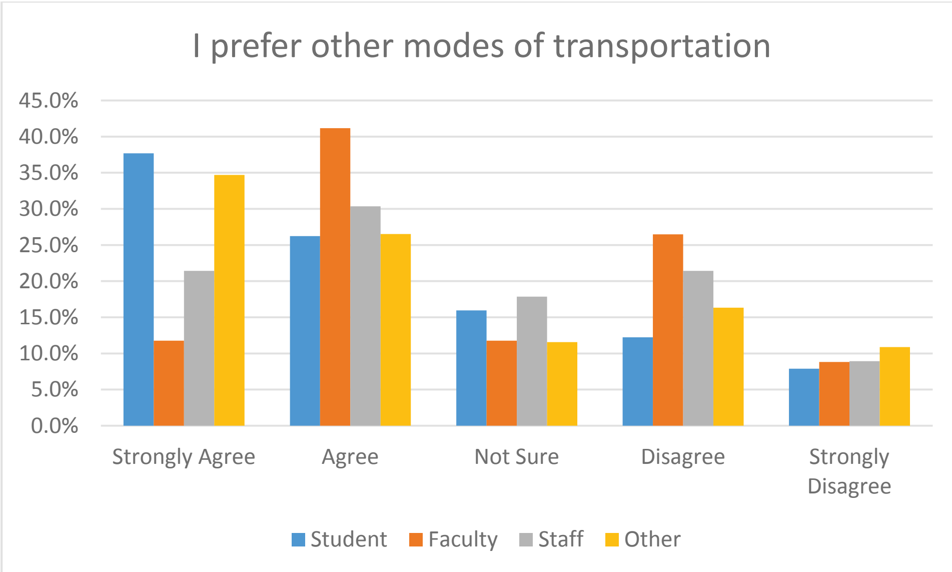

The bus routes do not match my needs
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

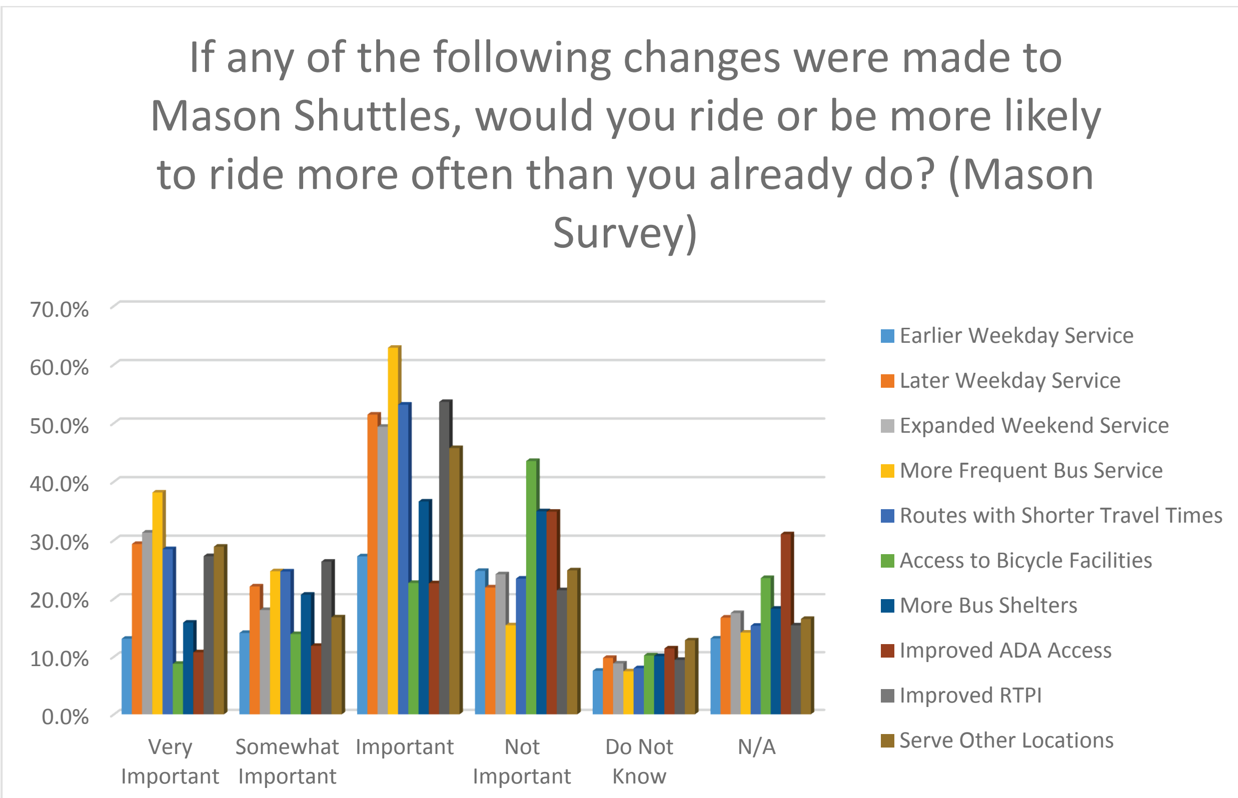

It is too far from my home to the bus stop
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

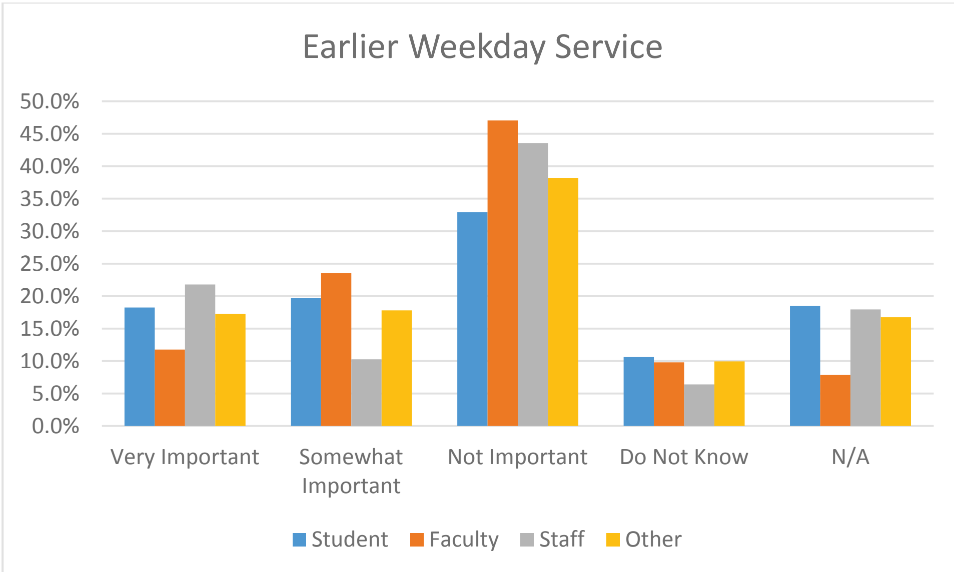

It is too far from the bus stop to my destination
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

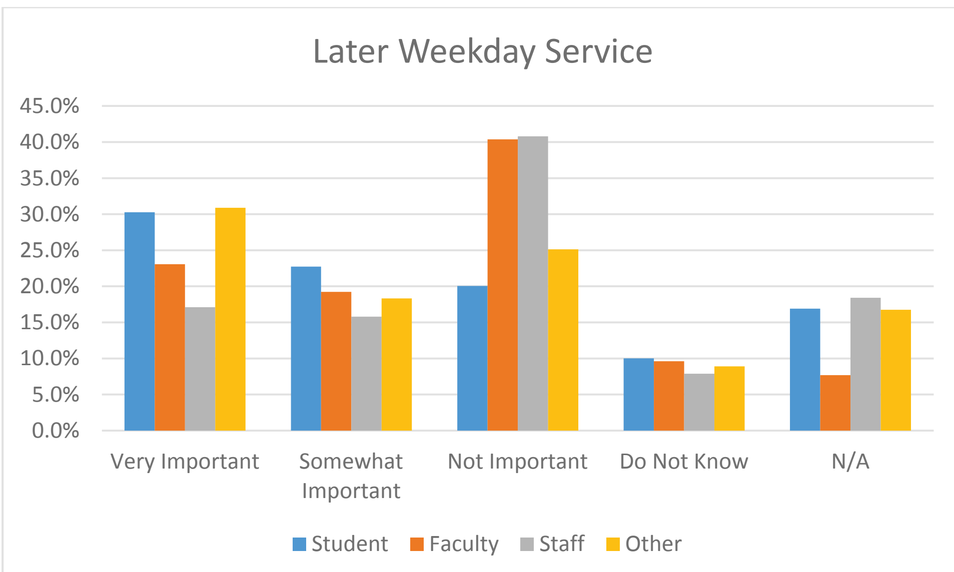

I have safety concerns
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

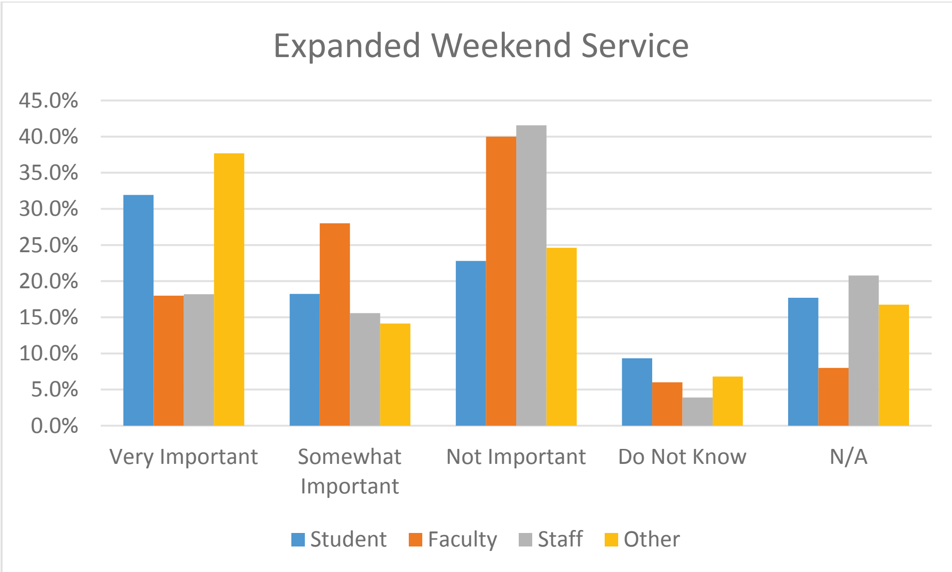

I do not like the atmosphere or conditions on the bus
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

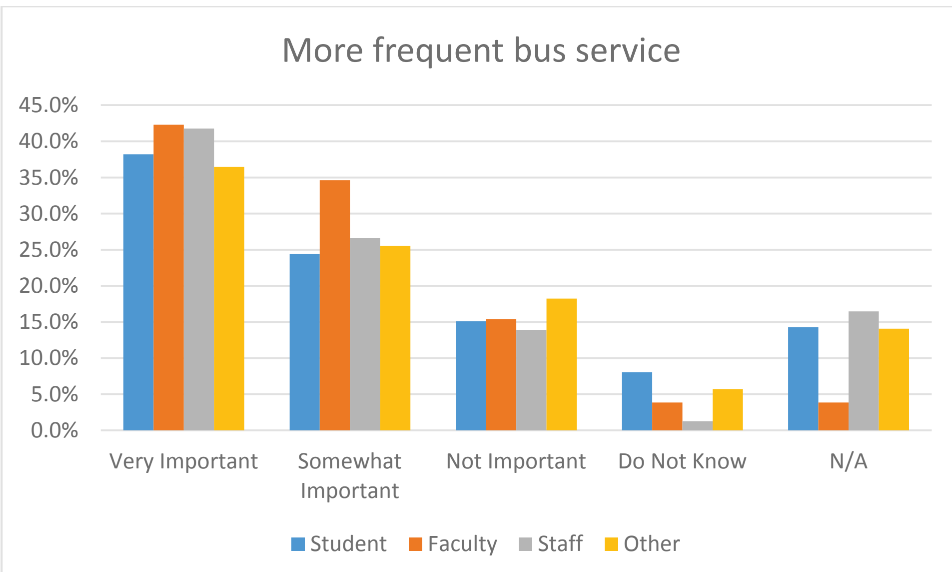

I prefer other modes of transportation
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Student
Faculty
Staff
Other

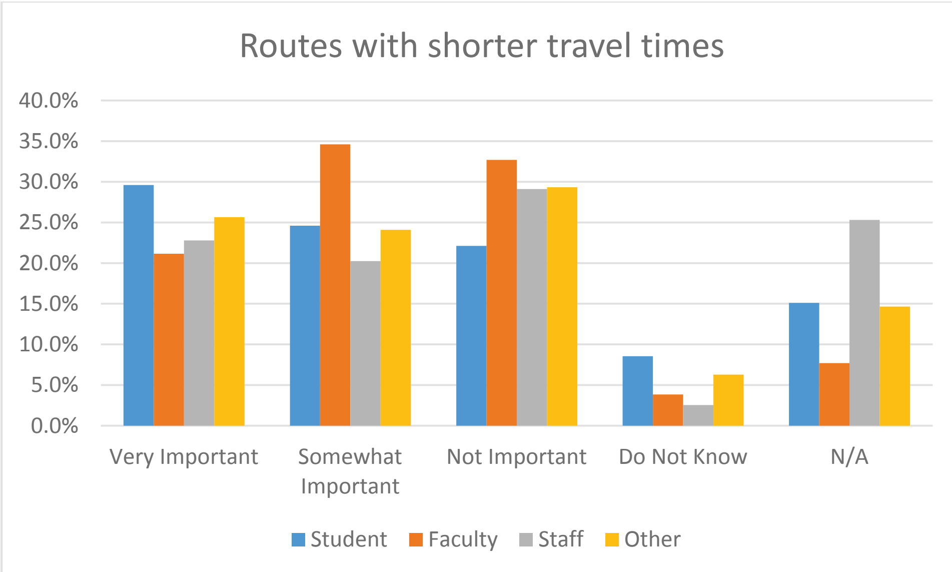

If any of the following changes were made to Mason Shuttles, would you ride or be more likely to ride more often than you already do? (Mason Survey)
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Important
Somewhat Important
Important
Not Important
Do Not Know
N/A
Earlier Weekday Service
Later Weekday Service
Expanded Weekend Service
More Frequent Bus Service
Routes with Shorter Travel Times
Access to Bicycle Facilities
More Bus Shelters
Improved ADA Access
Improved RTPI
Serve Other Locations

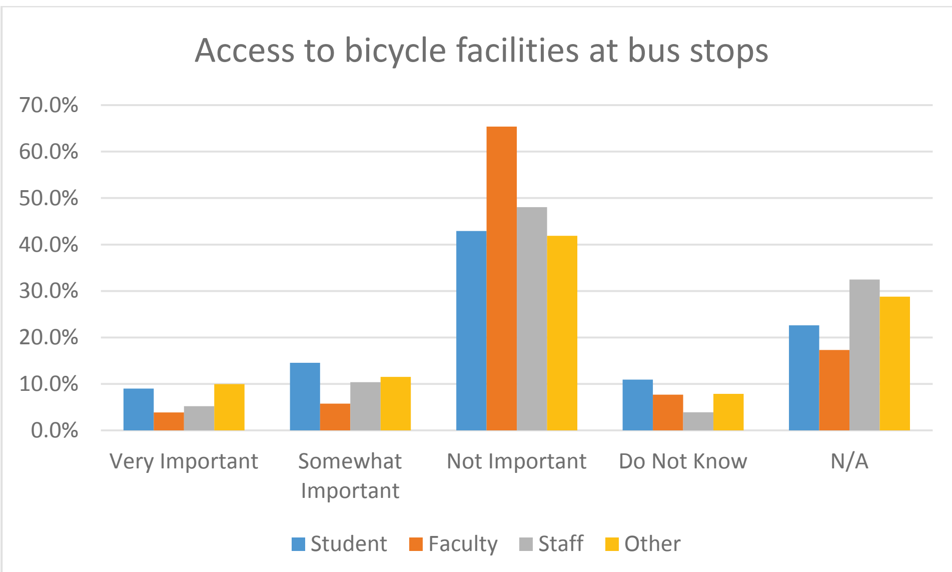

Earlier Weekday Service
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other

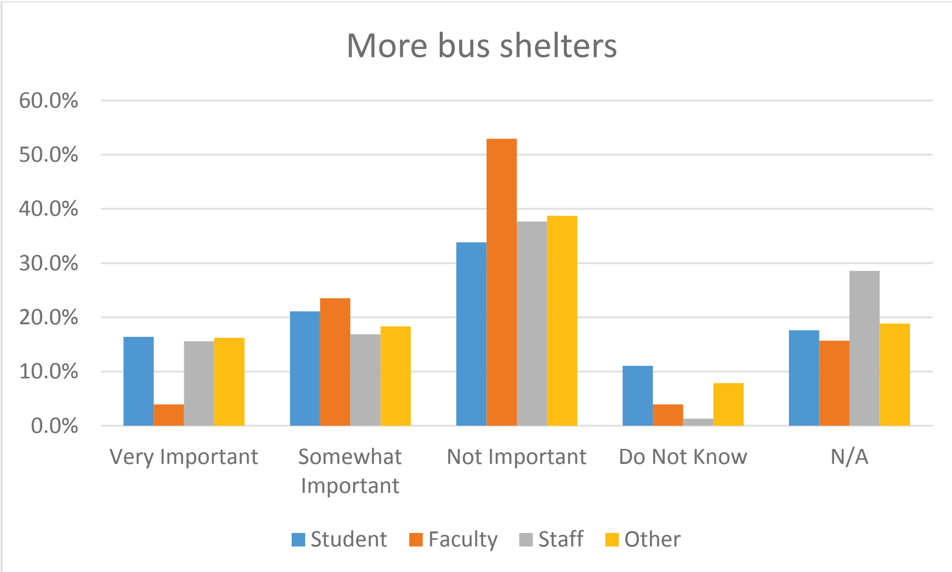

Later Weekday Service
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other

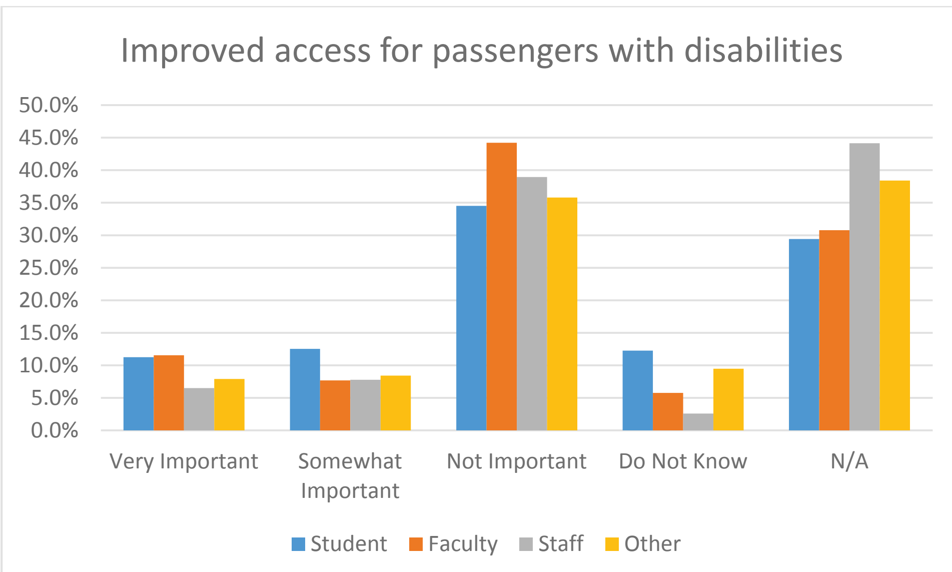

Expanded Weekend Service
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other

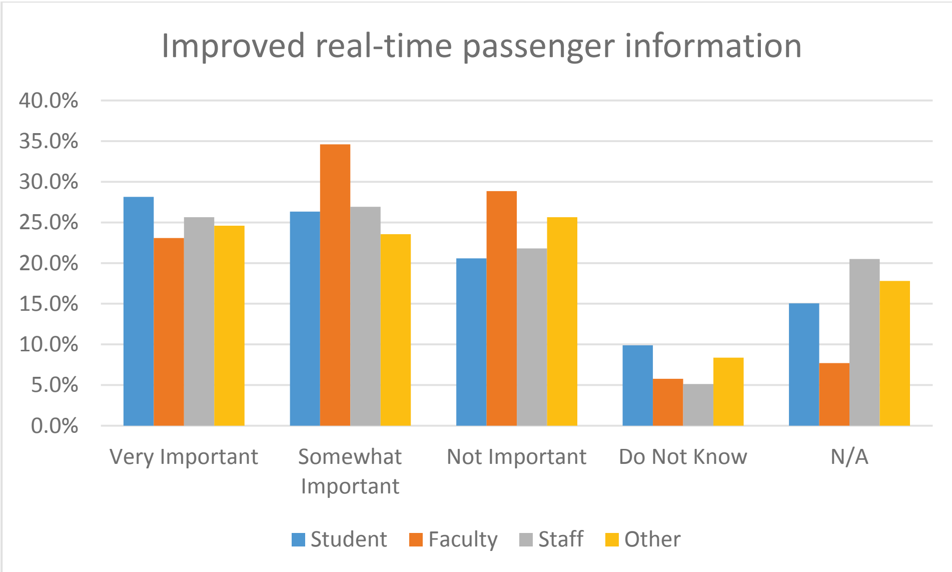

More frequent bus service
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other

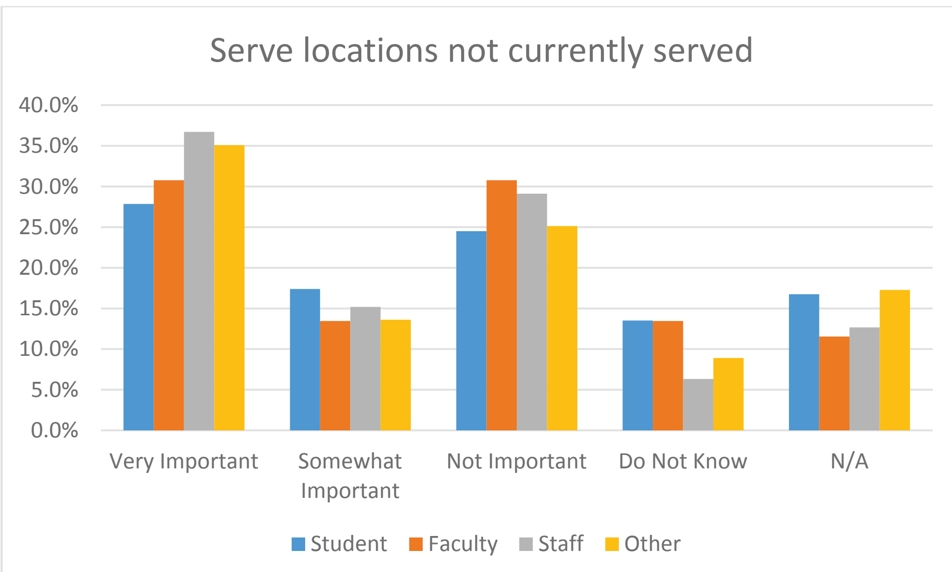

Routes with shorter travel times
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other

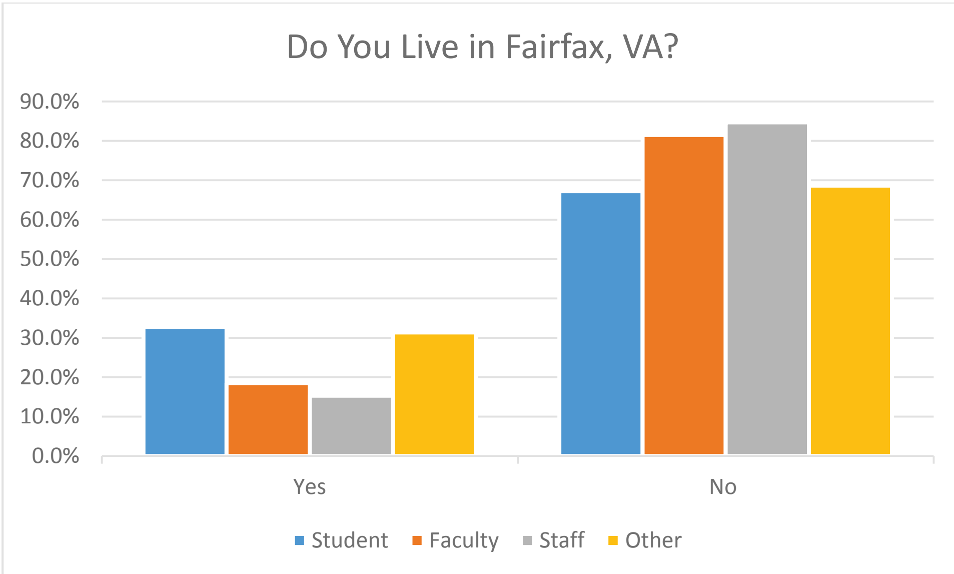

Access to bicycle facilities at bus stops
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other


More bus shelters
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other


Improved access for passengers with disabilities
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other

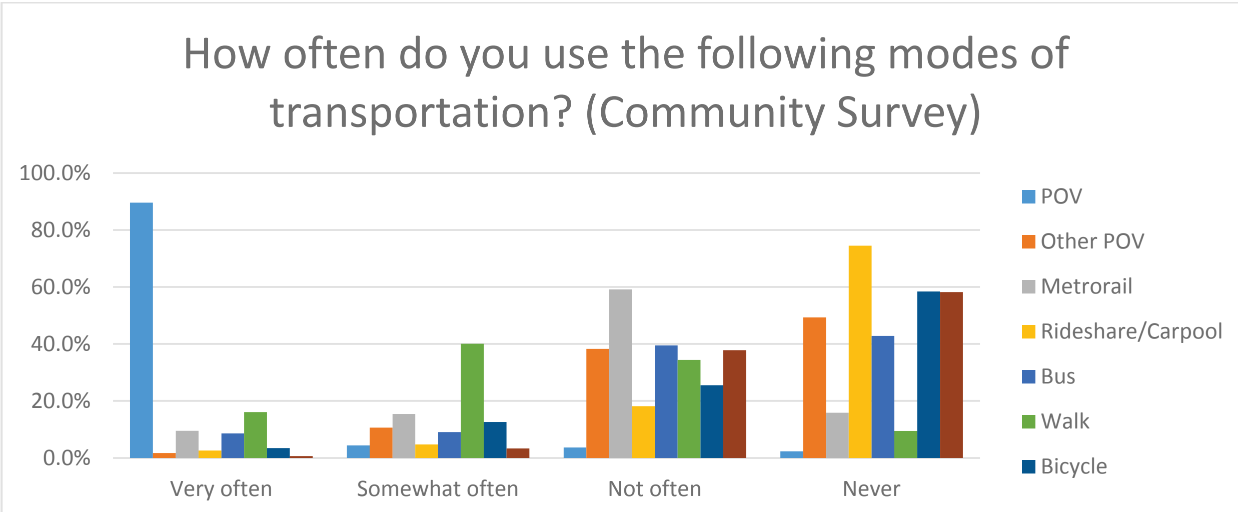

Improved real-time passenger information
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other

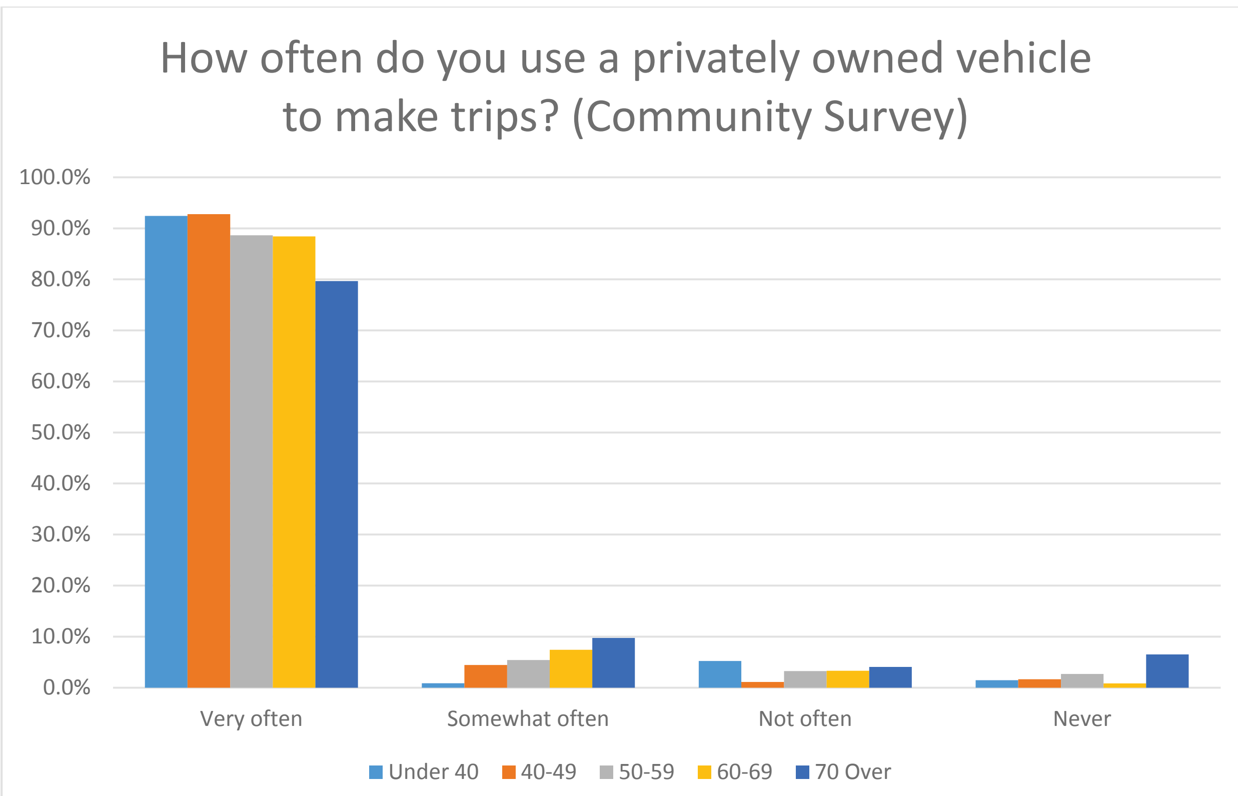

Serve locations not currently served
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Student
Faculty
Staff
Other

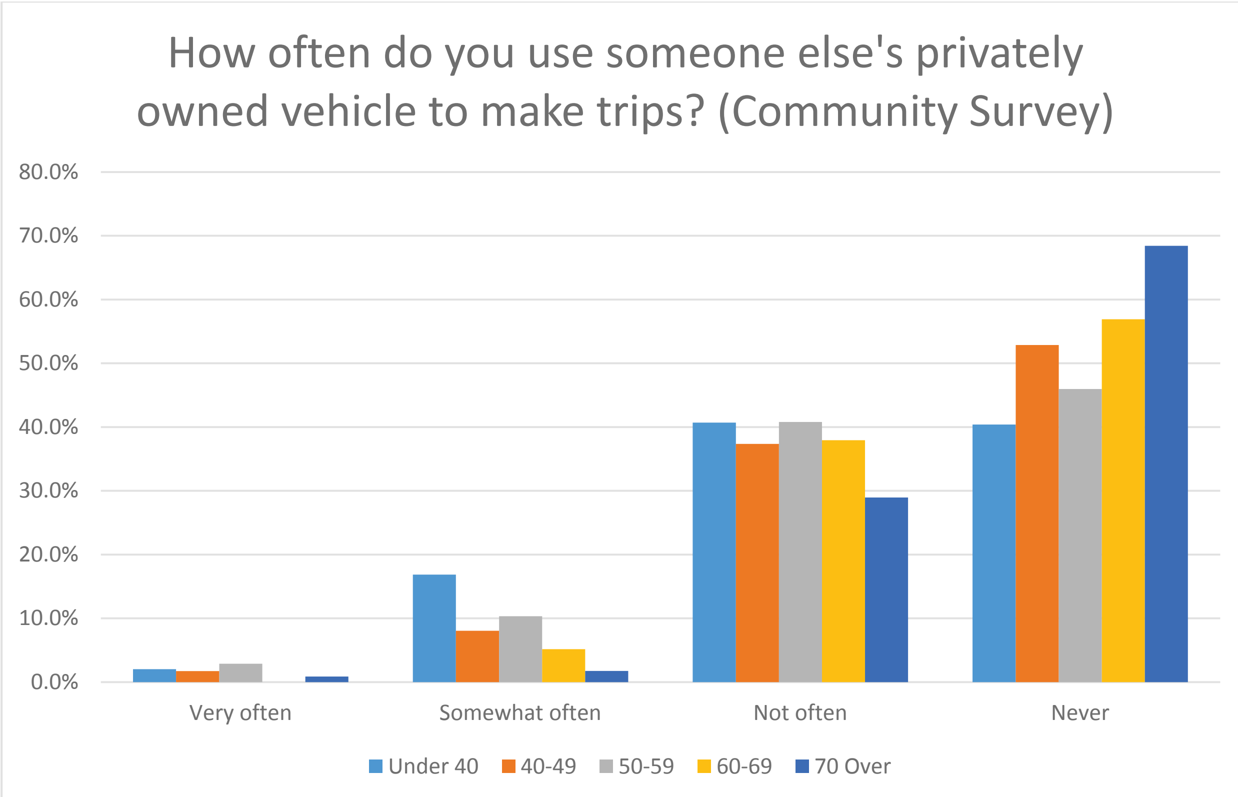

Do You Live in Fairfax, VA?
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Yes
No
Student
Faculty
Staff
Other

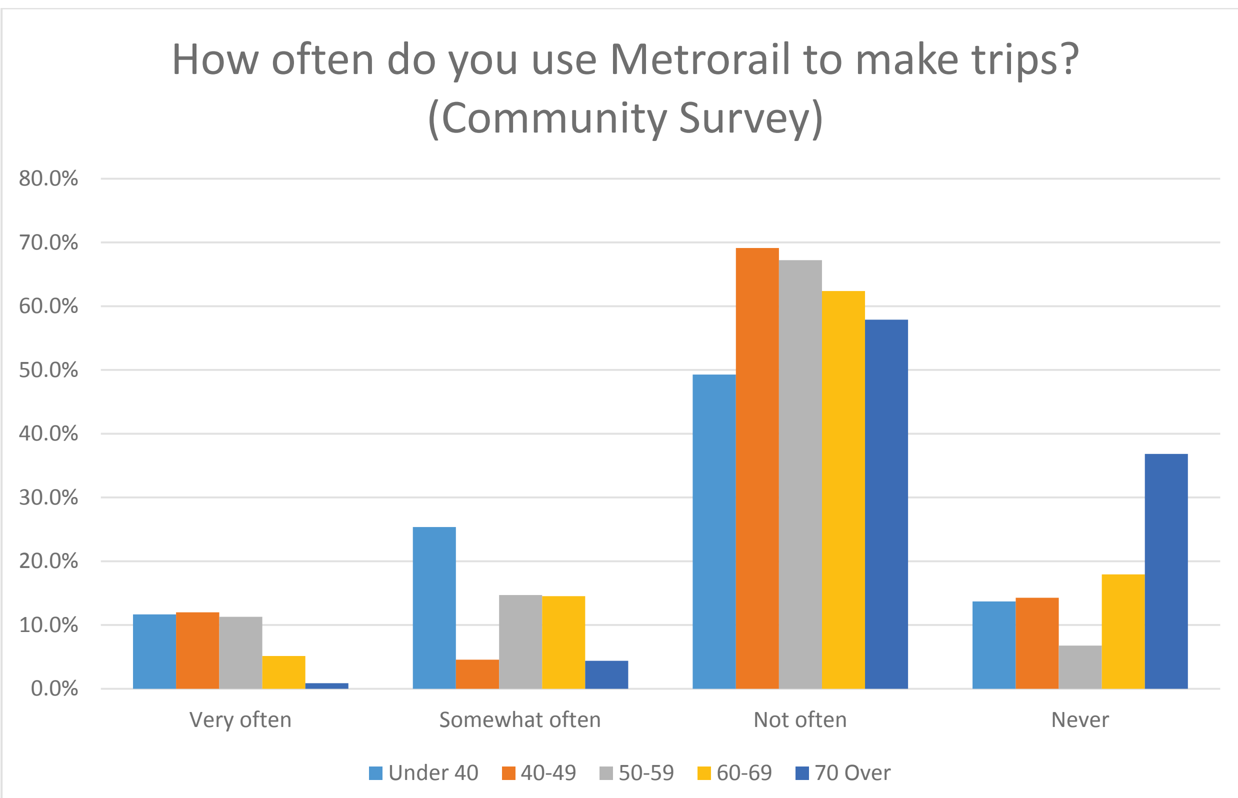
Appendix D: Additional Fairfax Community Survey Graphics

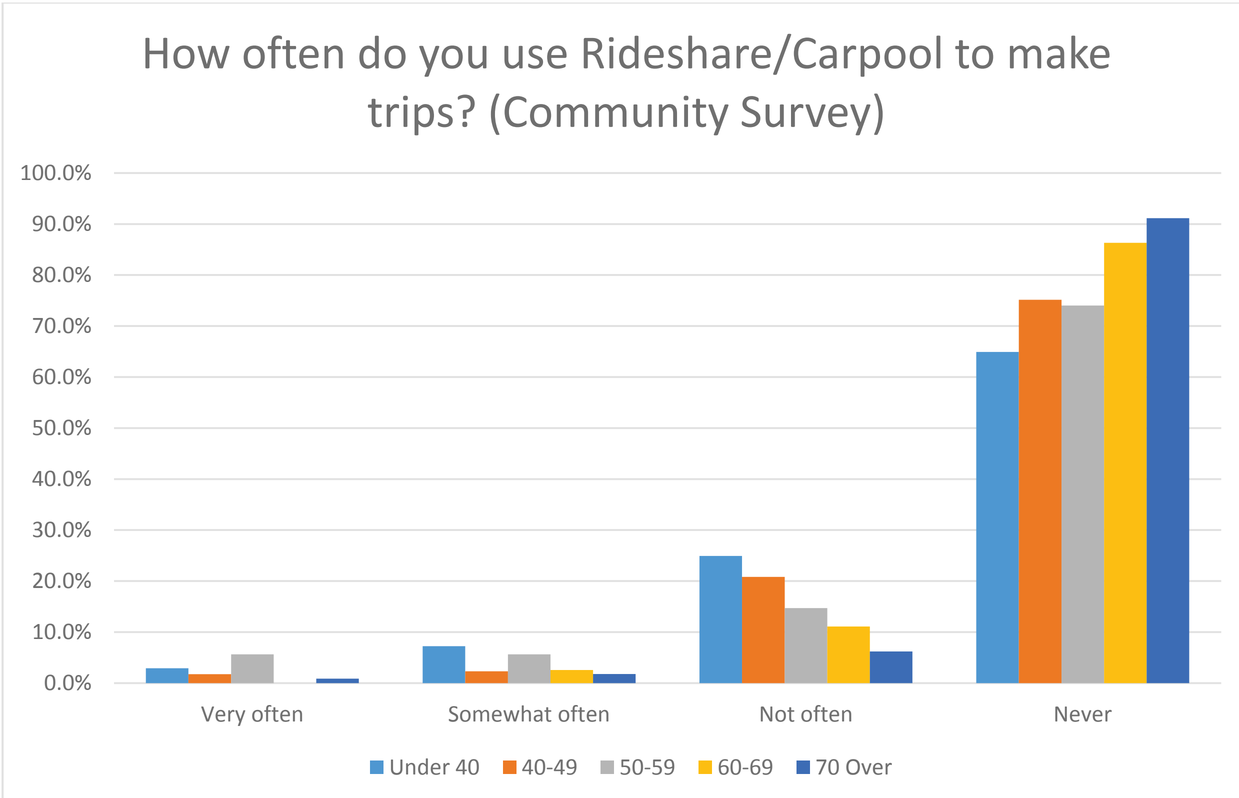
Appendix Graphics – Fairfax Community

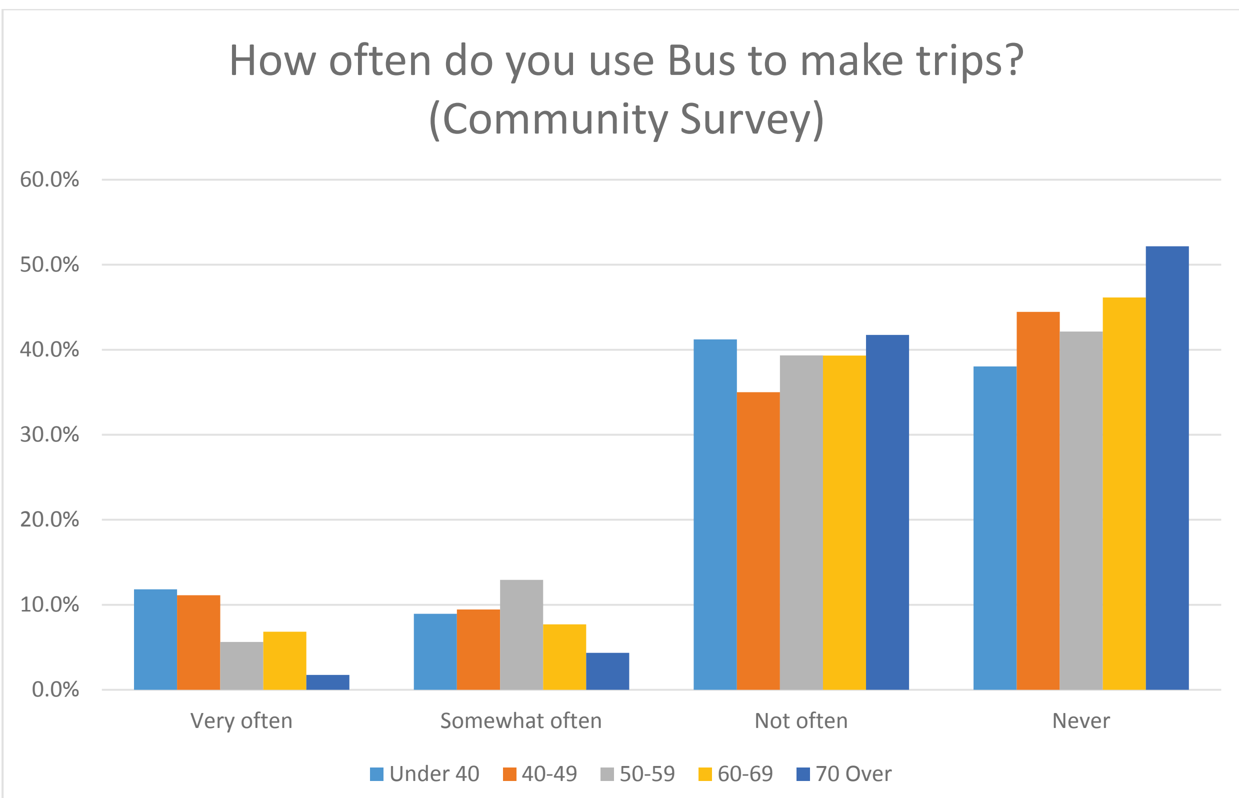


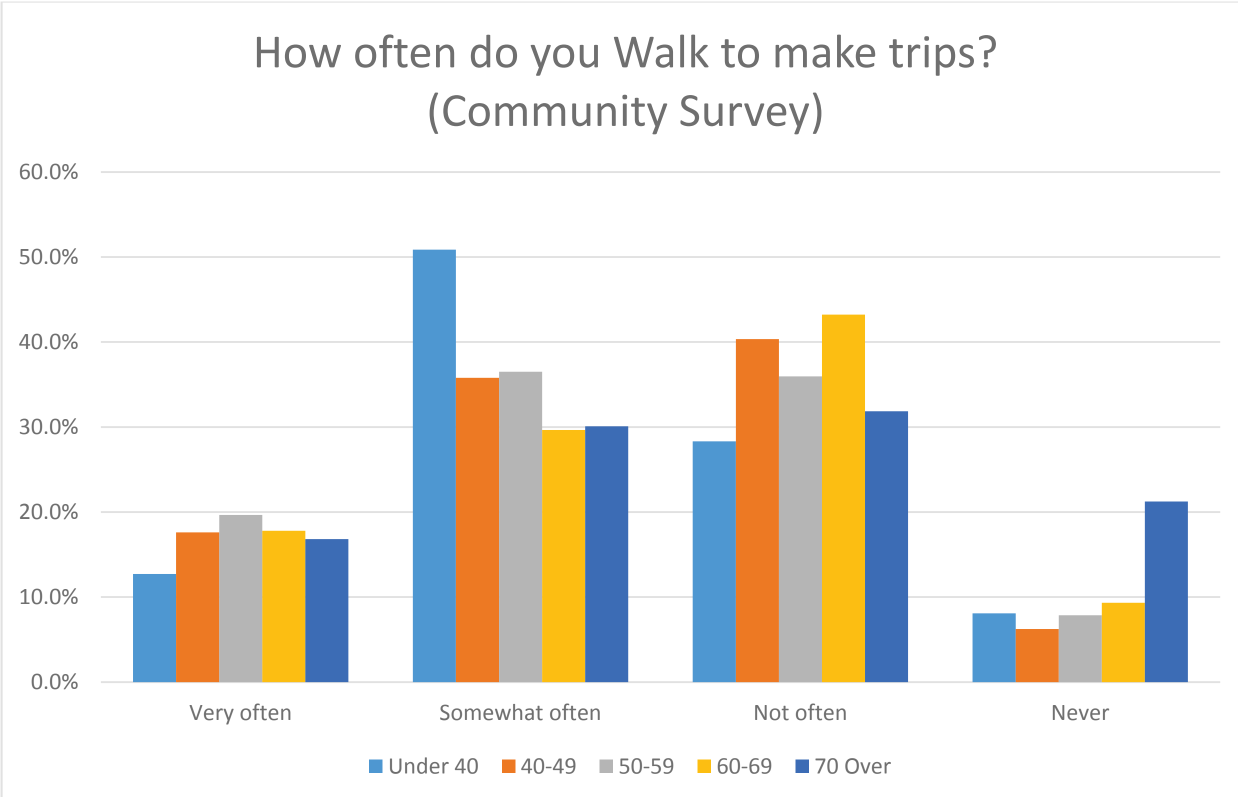


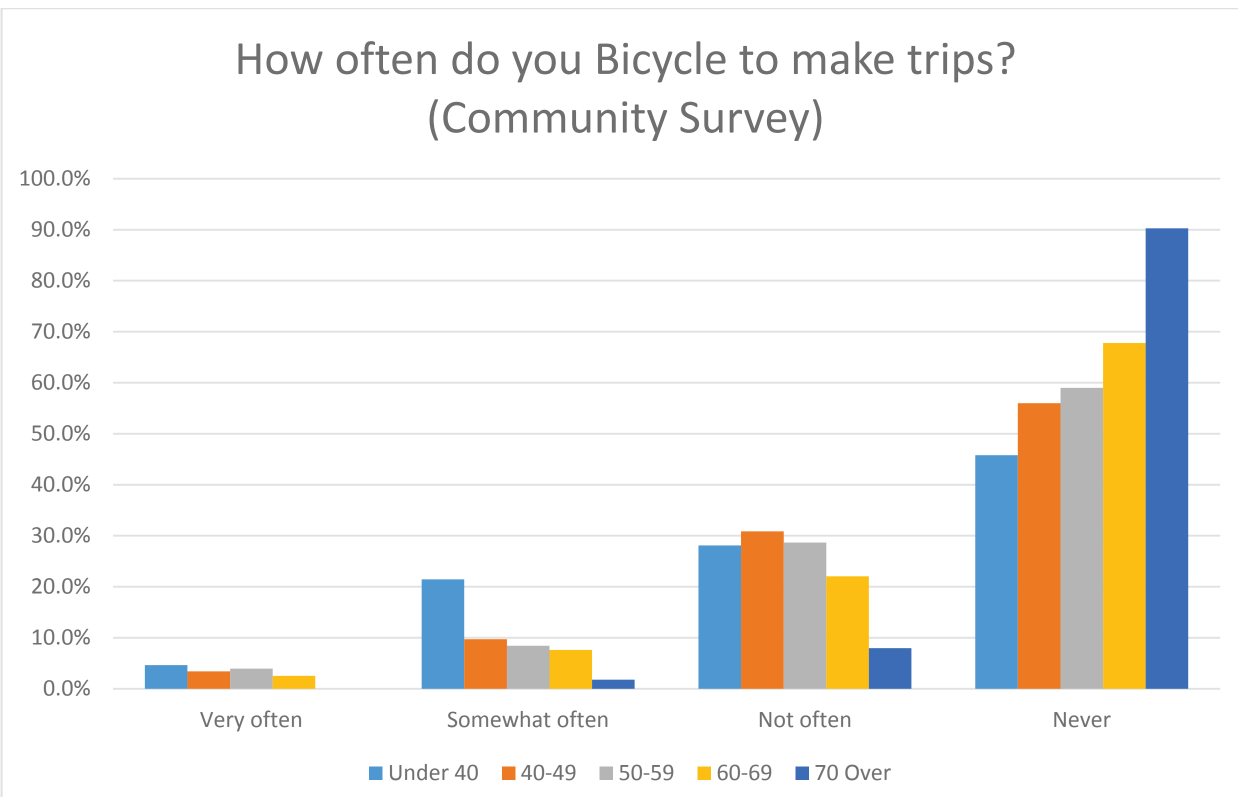

How often do you use someone else's privately owned vehicle to make trips? (Community Survey)
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very often
Somewhat often
Not often
Never
Under 40
40-49
50-59
60-69
70 Over

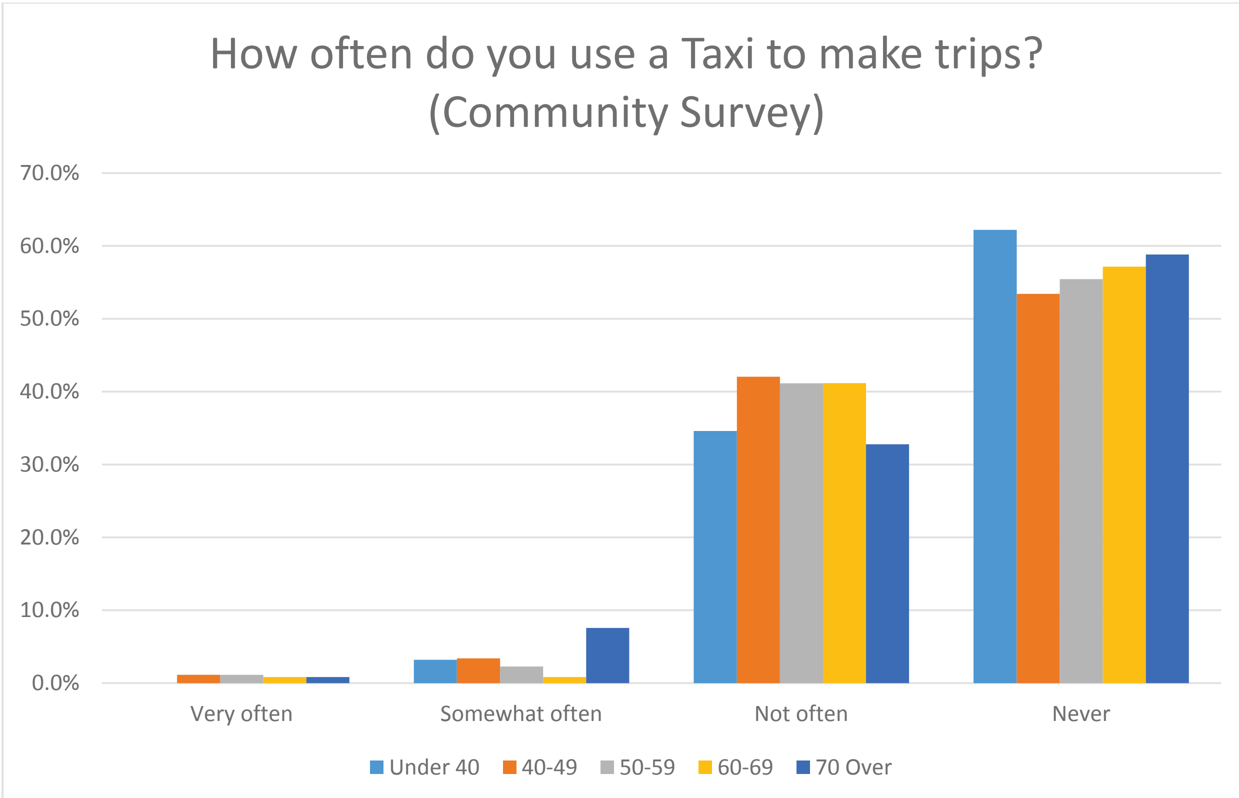

How often do you use Metrorail to make trips? (Community Survey)
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very often
Somewhat often
Not often
Never
Under 40
40-49
50-59
60-69
70 Over

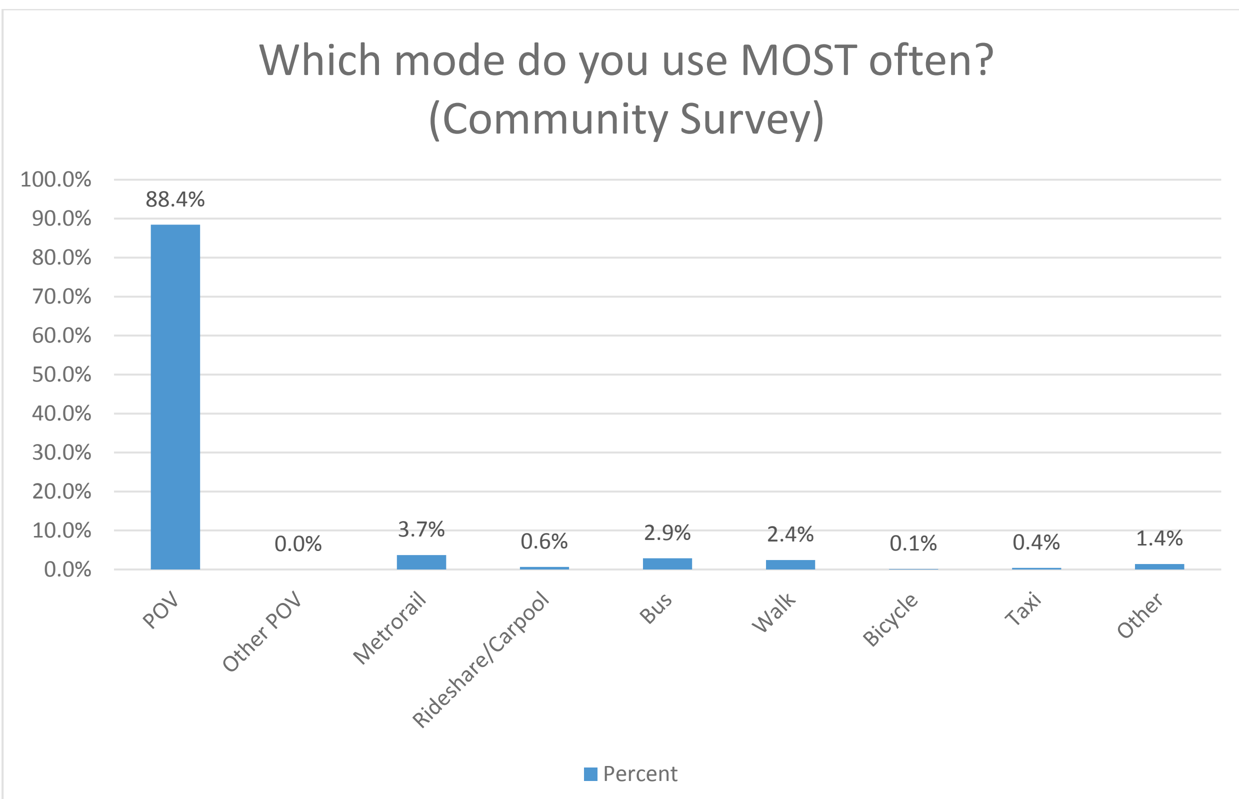

How often do you use Rideshare/Carpool to make trips? (Community Survey)
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very often
Somewhat often
Not often
Never
Under 40
40-49
50-59
60-69
70 Over

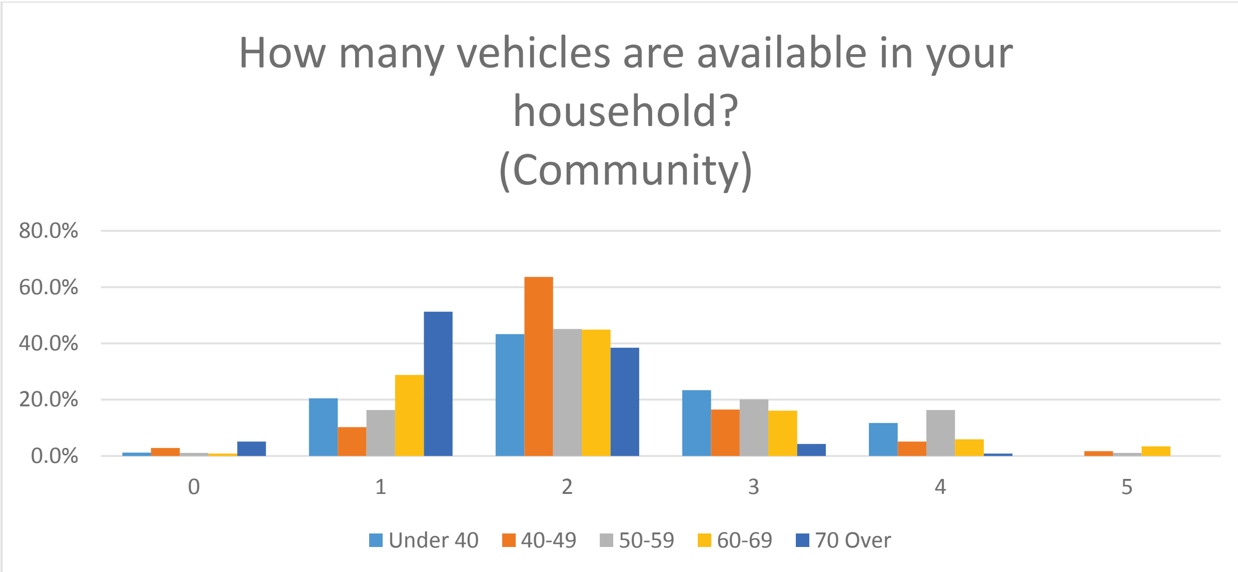

How often do you use Bus to make trips? (Community Survey)
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very often
Somewhat often
Not often
Never
Under 40
40-49
50-59
60-69
70 Over

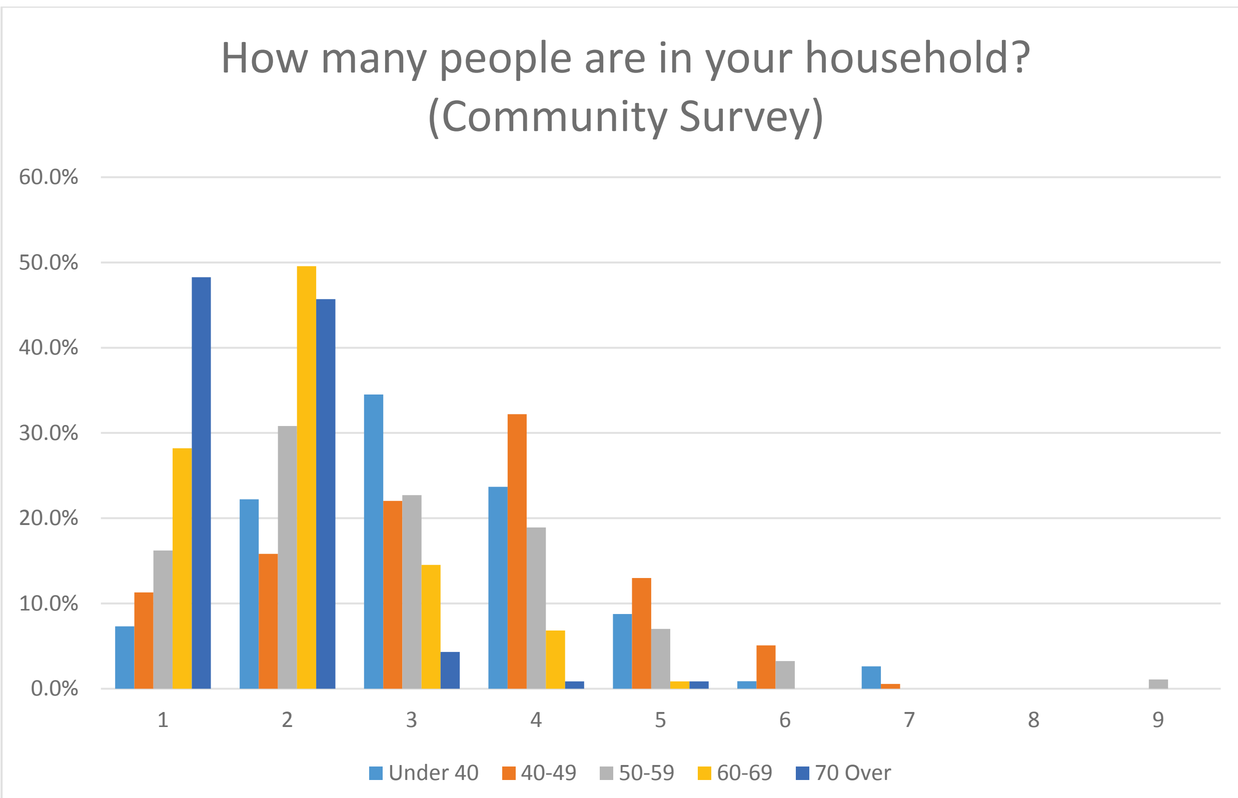

How often do you Walk to make trips?
(Community Survey)
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very often
Somewhat often
Not often
Never
Under 40
40-49
50-59
60-69
70 Over

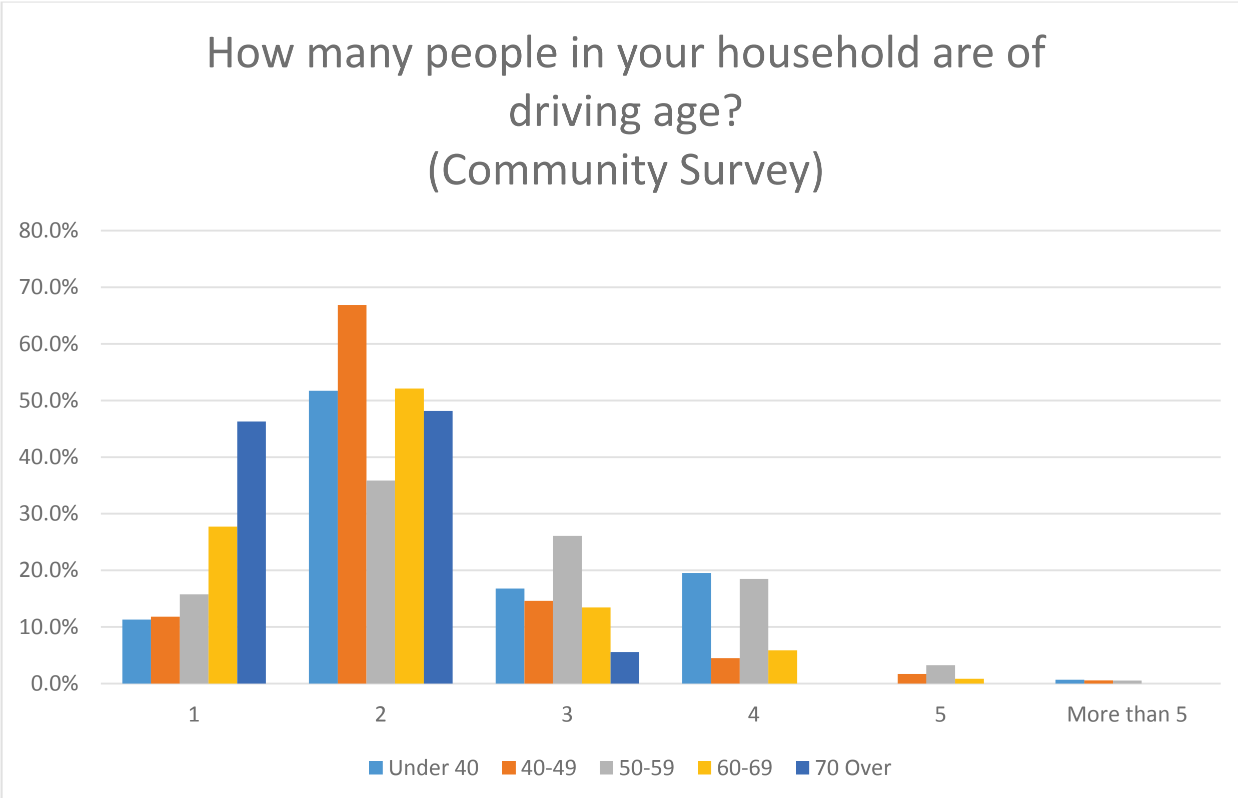

How often do you Bicycle to make trips?
(Community Survey)
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very often
Somewhat often
Not often
Never
Under 40
40-49
50-59
60-69
70 Over

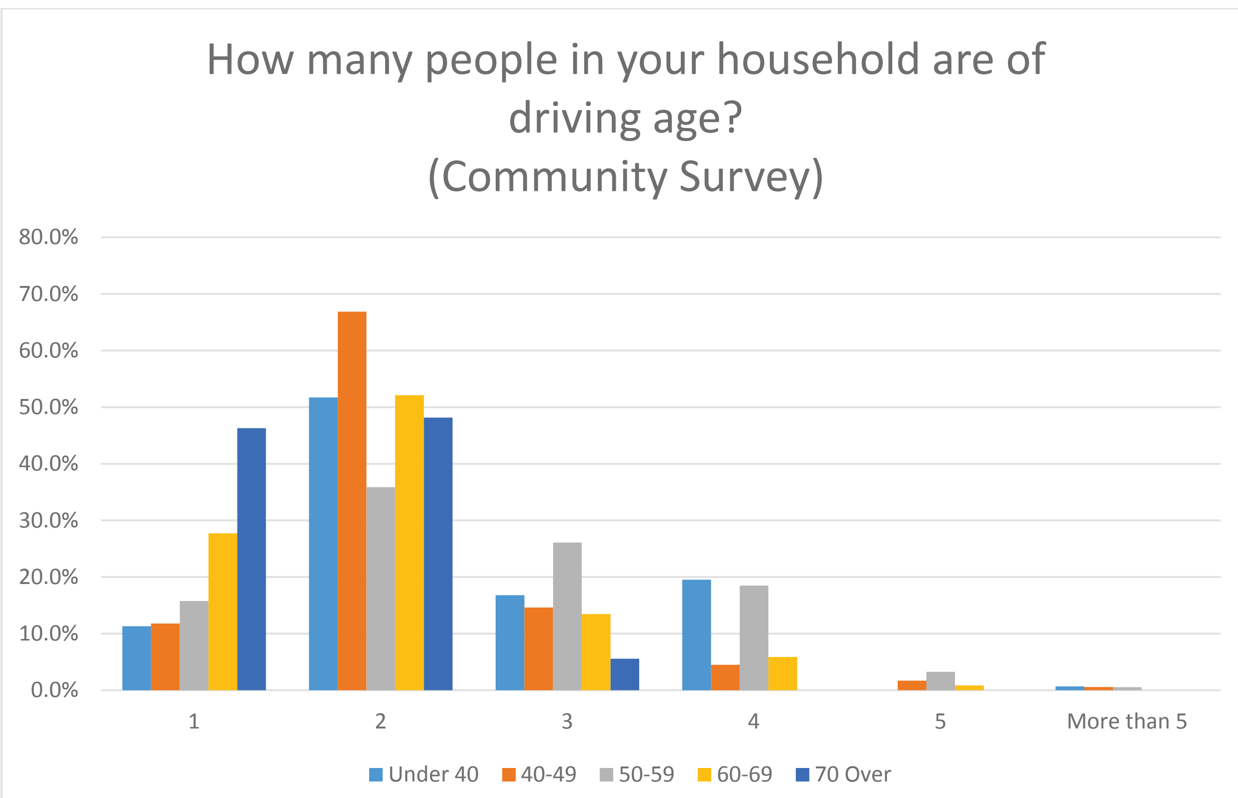

How often do you use a Taxi to make trips?
(Community Survey)
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very often
Somewhat often
Not often
Never
Under 40
40-49
50-59
60-69
70 Over

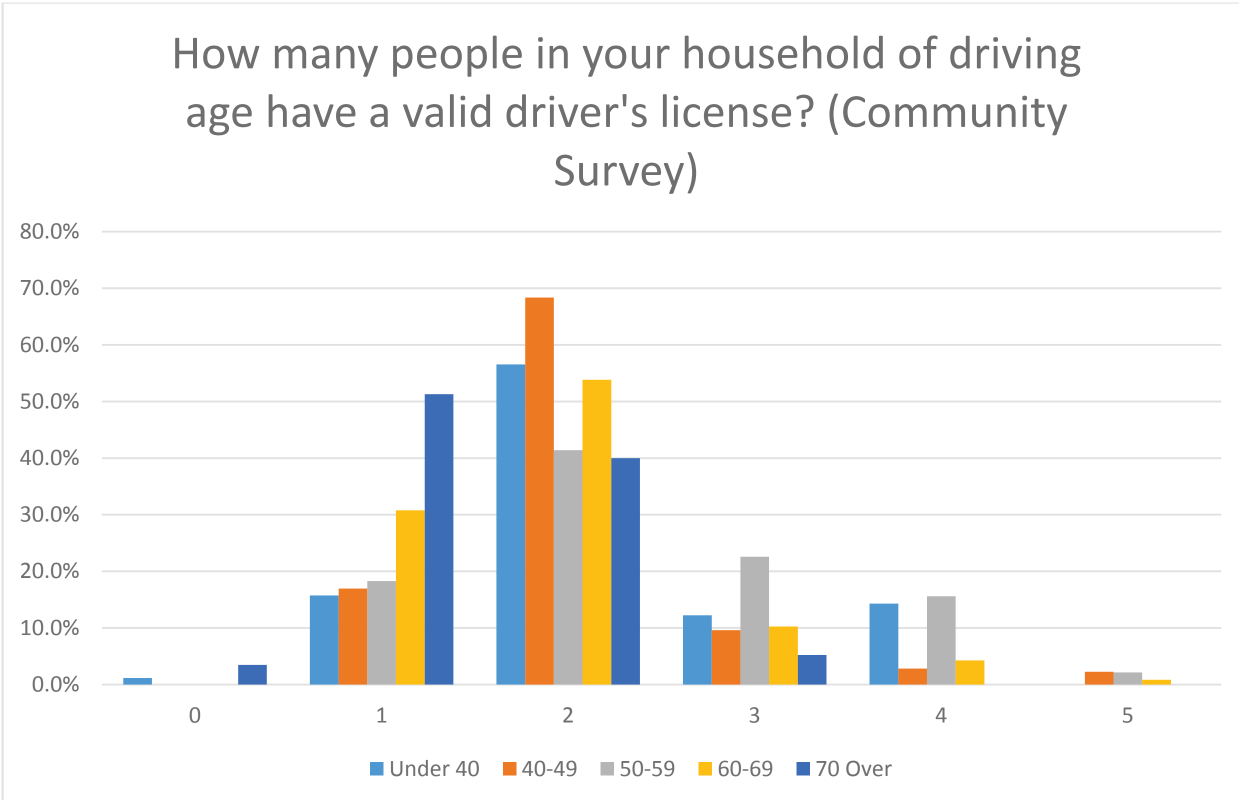

Which mode do you use MOST often?
(Community Survey)
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
88.4%
0.0%
3.7%
0.6%
2.9%
2.4%
0.1%
0.4%
1.4%
POV
Other POV
Metrorail
Rideshare/Carpool
Bus
Walk
Bicycle
Taxi
Other
Percent

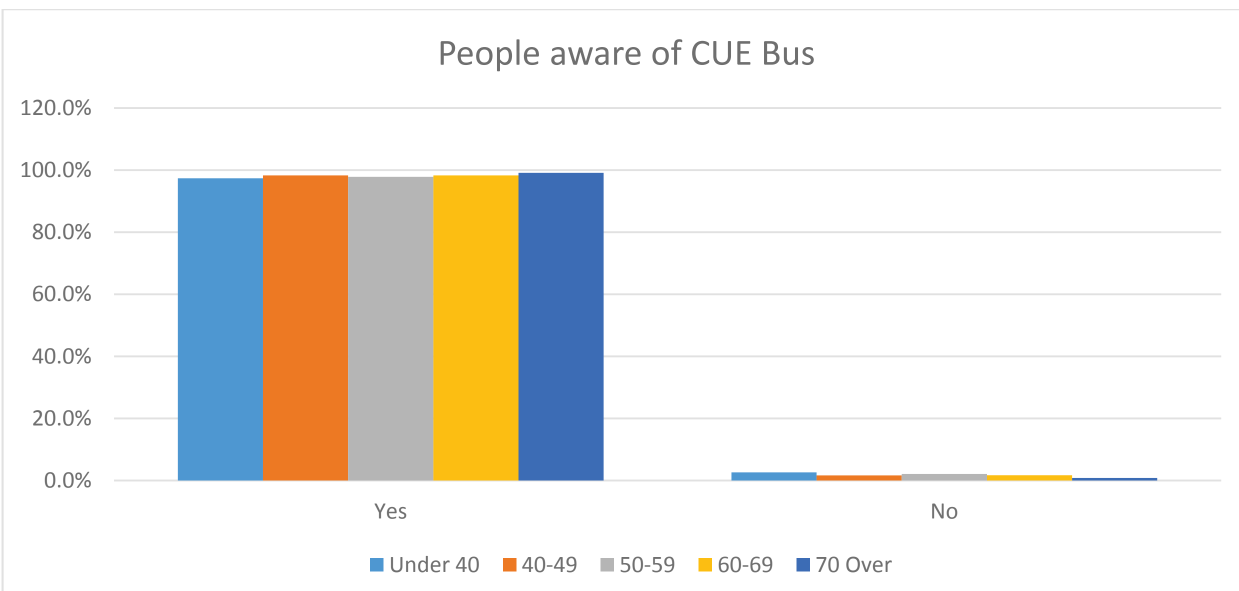

How many vehicles are available in your household?
(Community)
80.0%
60.0%
40.0%
20.0%
0.0%
0
1
2
3
4
5
Under 40
40-49
50-59
60-69
70 Over

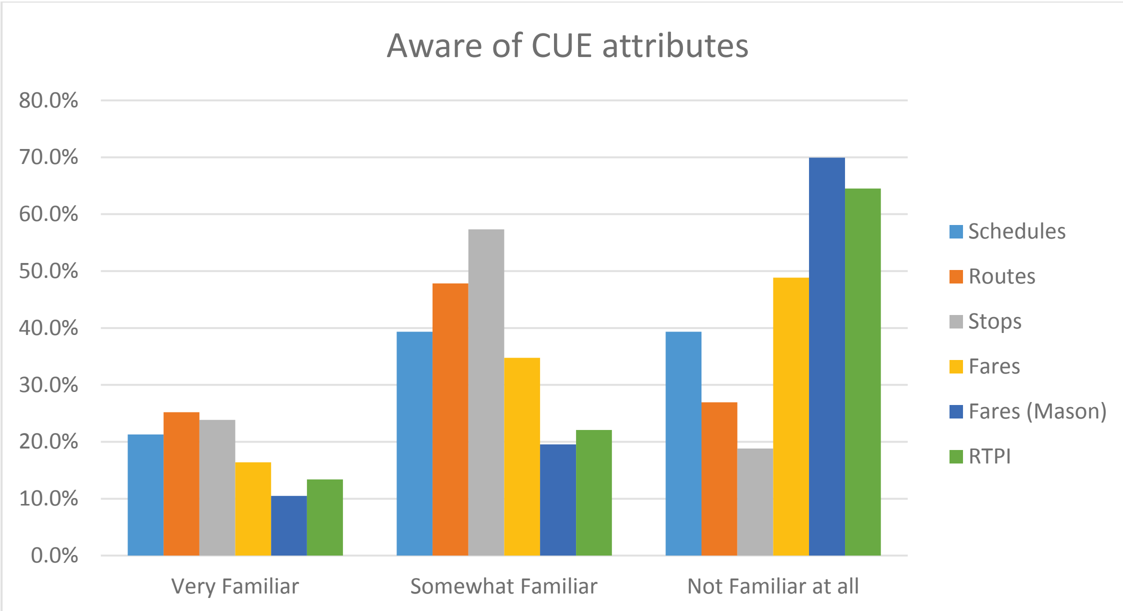

How many people are in your household?
(Community Survey)
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
1
2
3
4
5
6
7
8
9
Under 40
40-49
50-59
60-69
70 Over

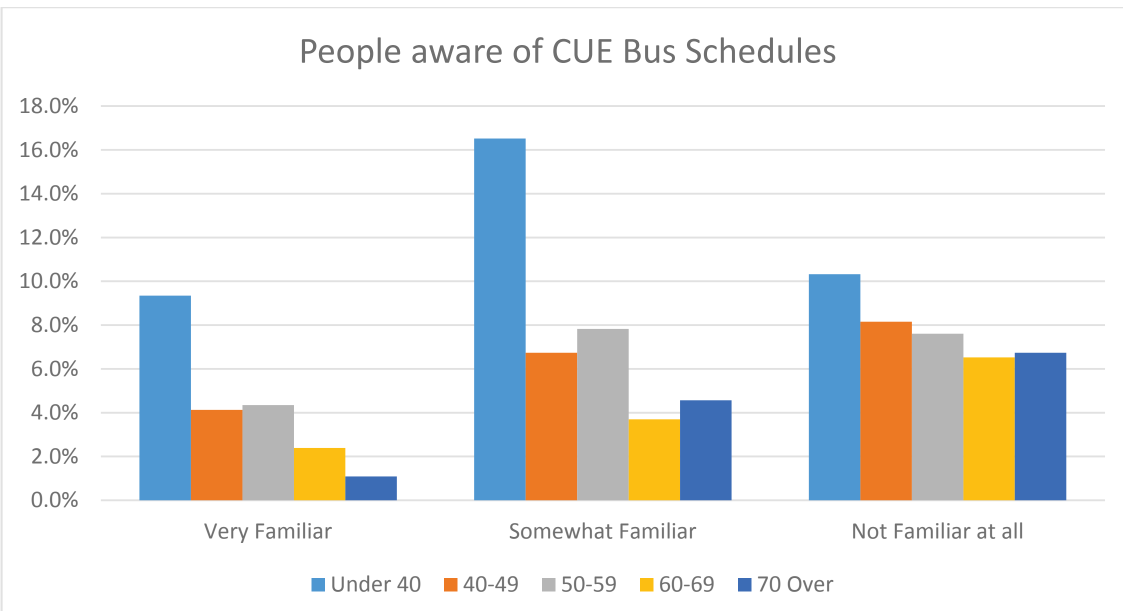

How many people in your household are of driving age?
(Community Survey)
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
1
2
3
4
5
More than 5
Under 40
40-49
50-59
60-69
70 Over

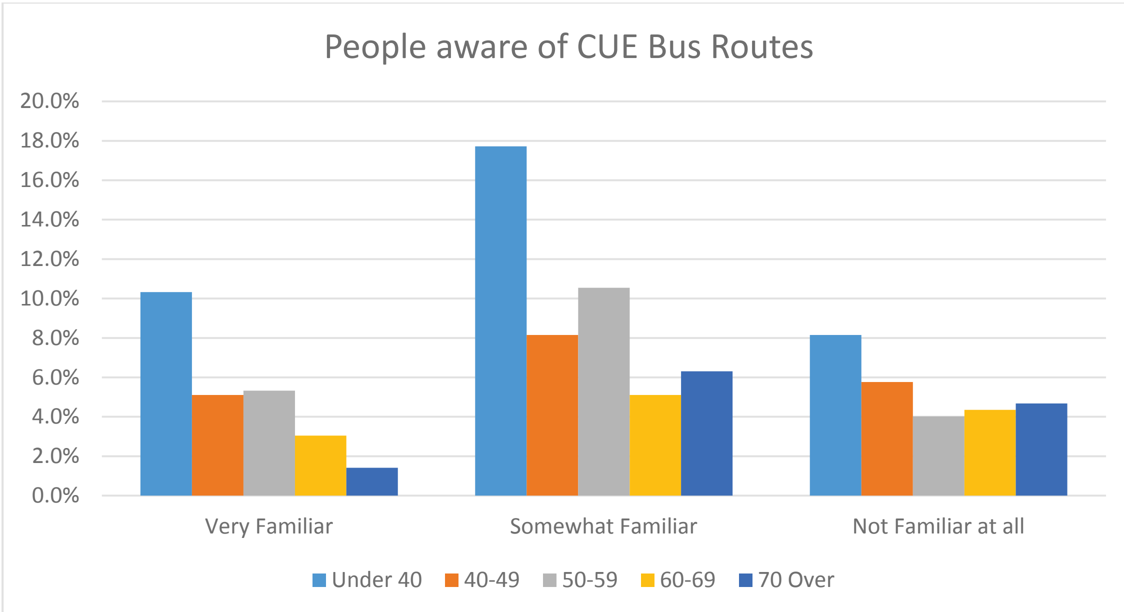

How many people in your household are of driving age?
(Community Survey)
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
1
2
3
4
5
More than 5
Under 40
40-49
50-59
60-69
70 Over

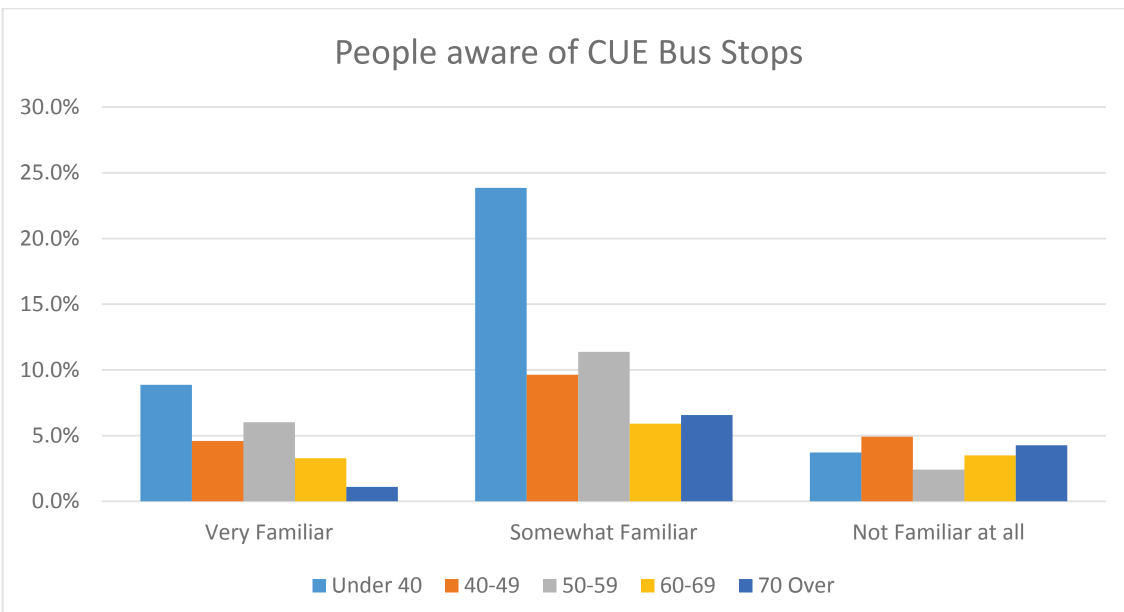

How many people in your household of driving age have a valid driver's license? (Community Survey)
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
0
1
2
3
4
5
Under 40
40-49
50-59
60-69
70 Over

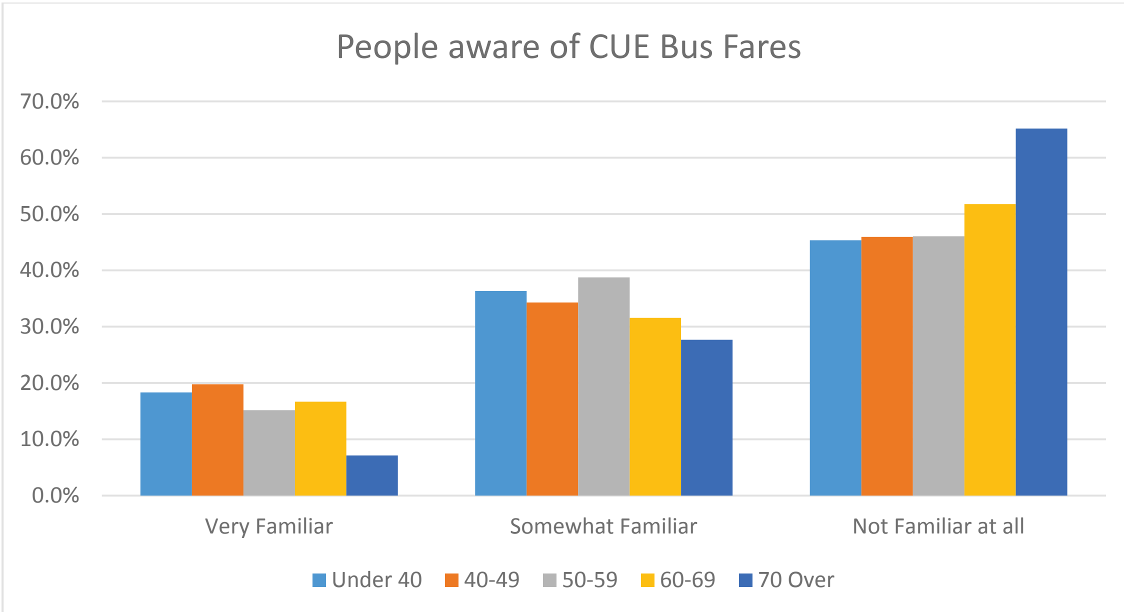

People aware of CUE Bus
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
Yes
No
Under 40
40-49
50-59
60-69
70 Over


Aware of CUE attributes
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all
Schedules
Routes
Stops
Fares
Fares (Mason)
RTPI

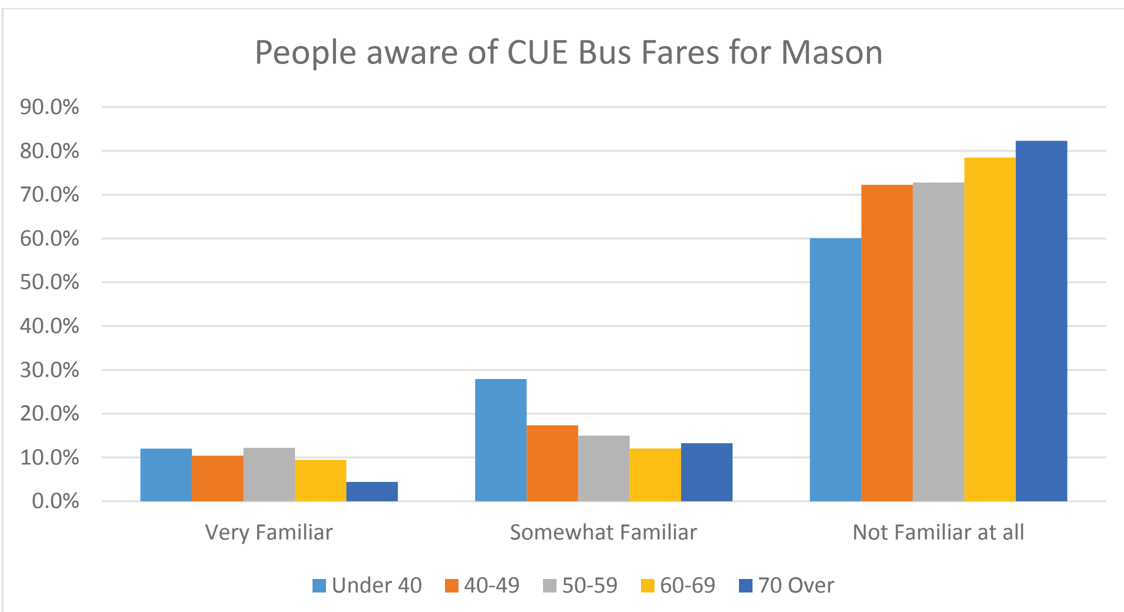

People aware of CUE Bus Schedules
18.0%
16.0%
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all
Under 40
40-49
50-59
60-69
70 Over


People aware of CUE Bus Routes
20.0%
18.0%
16.0%
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all
Under 40
40-49
50-59
60-69
70 Over

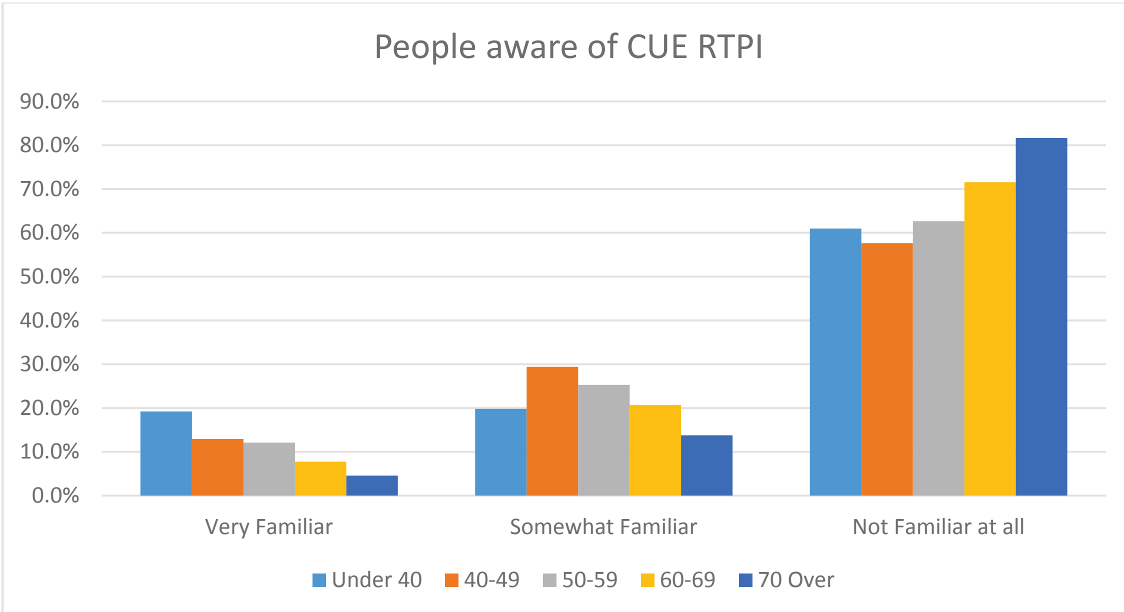

People aware of CUE Bus Stops
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all
Under 40
40-49
50-59
60-69
70 Over

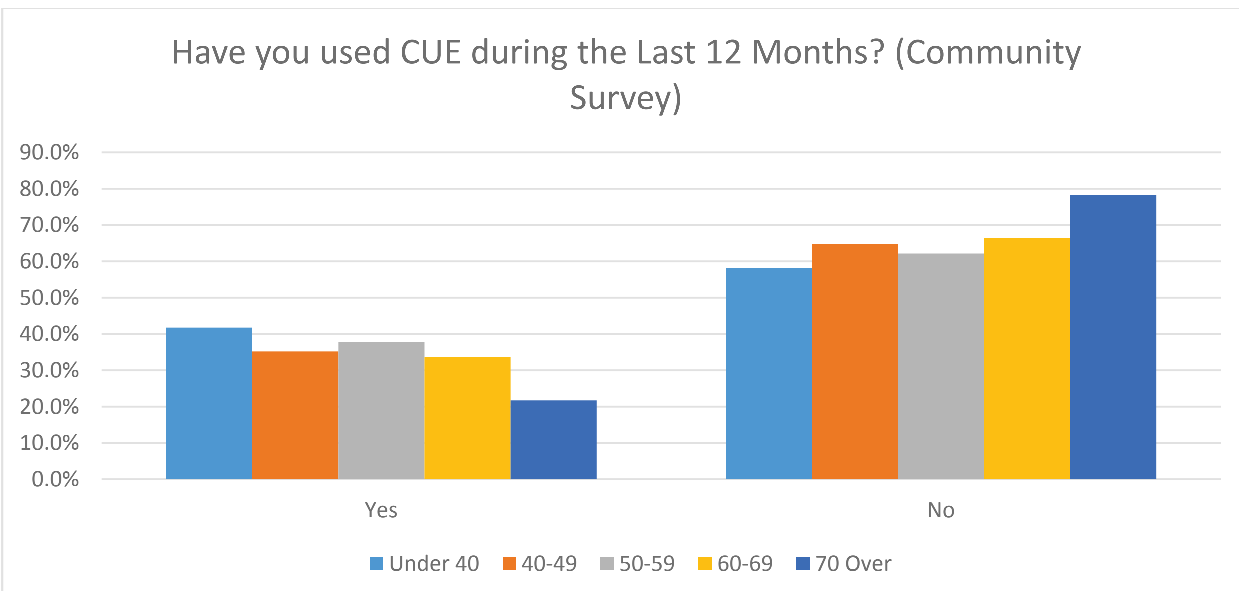


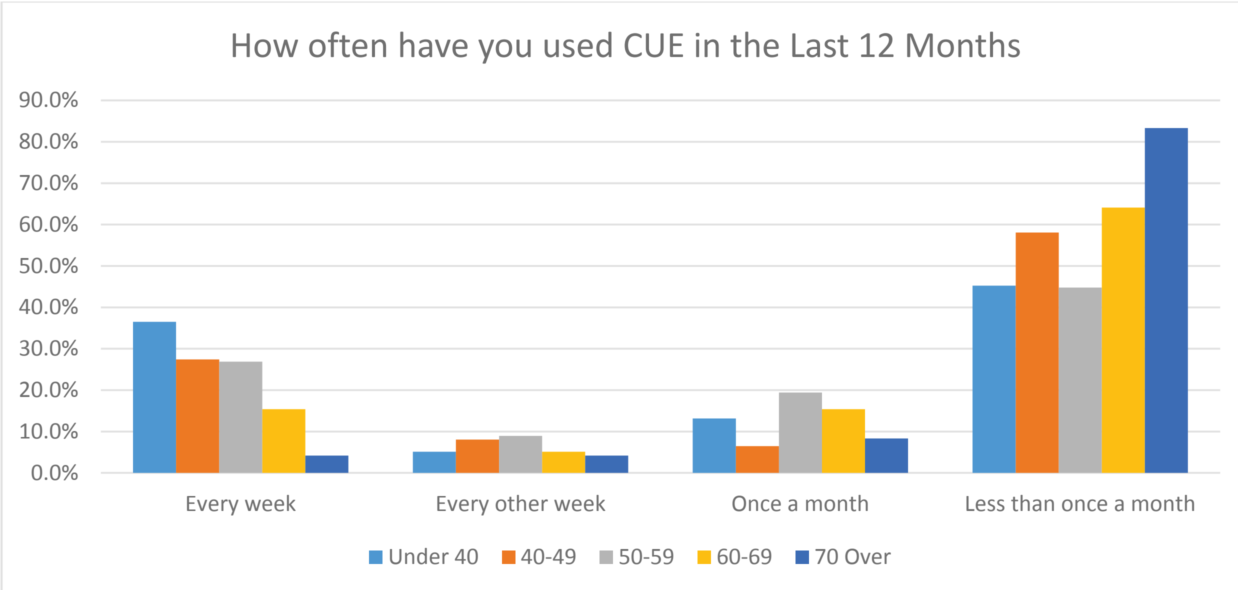
People aware of CUE Bus Fares
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all
Under 40
40-49
50-59
60-69
70 Over

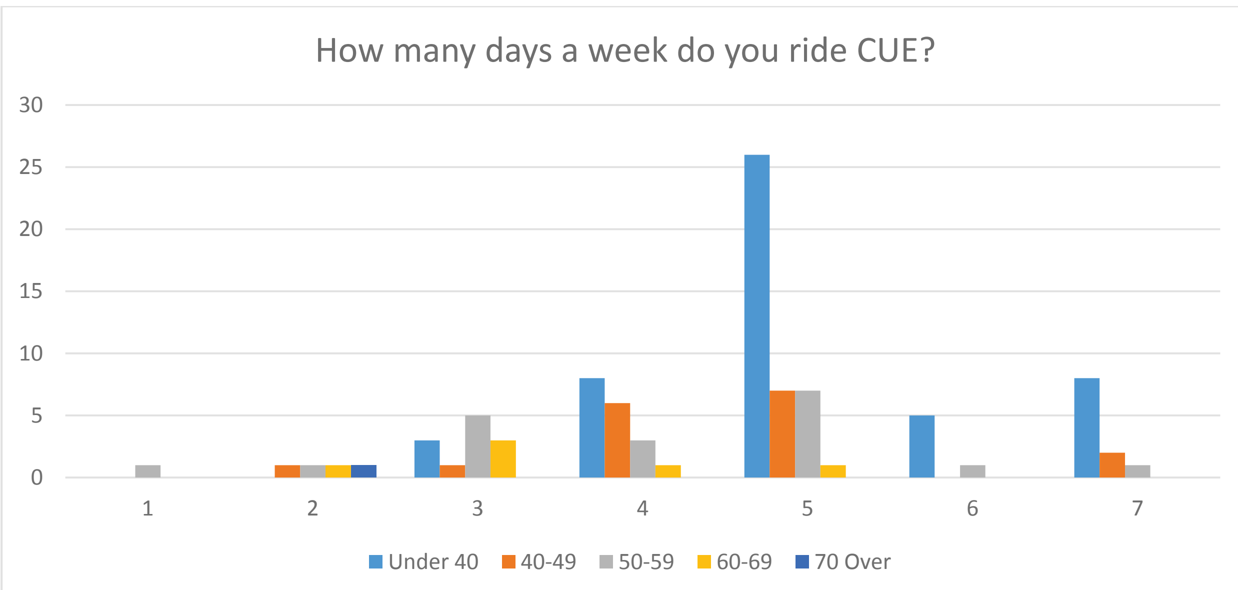


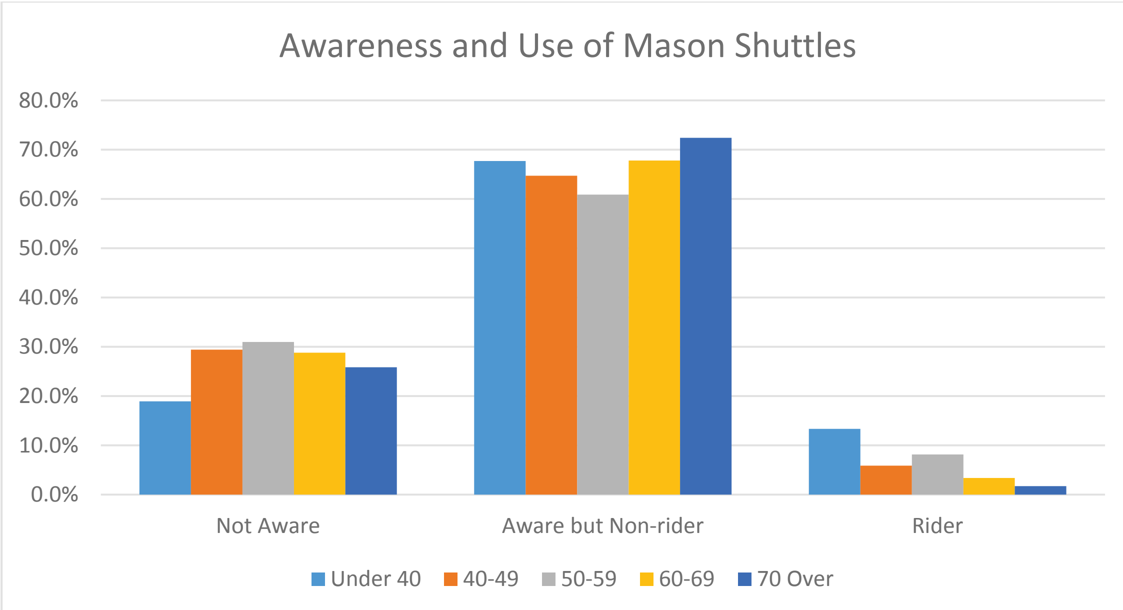
People aware of CUE Bus Fares for Mason
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all
Under 40
40-49
50-59
60-69
70 Over

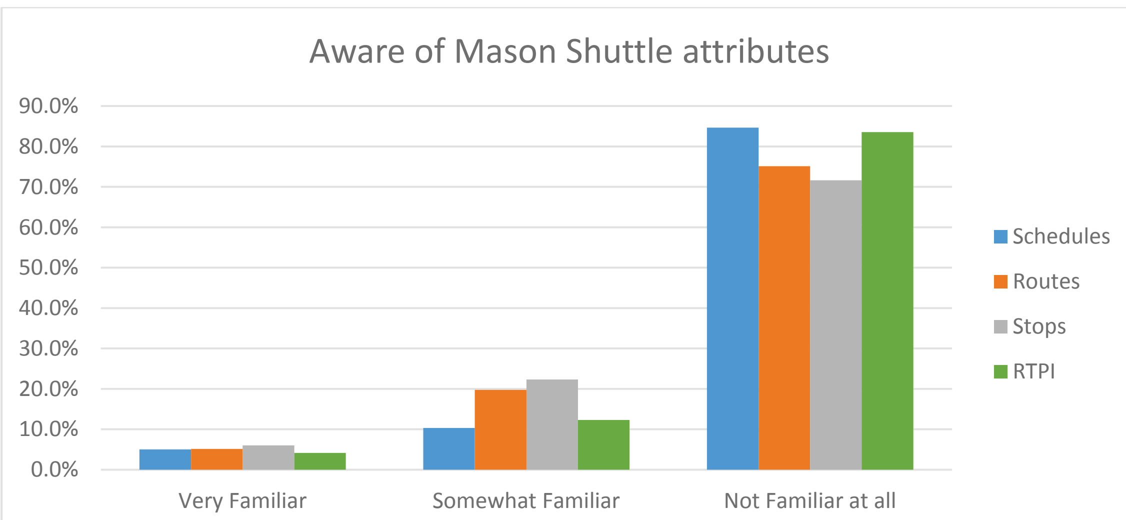

People aware of CUE RTPI
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all
Under 40
40-49
50-59
60-69
70 Over

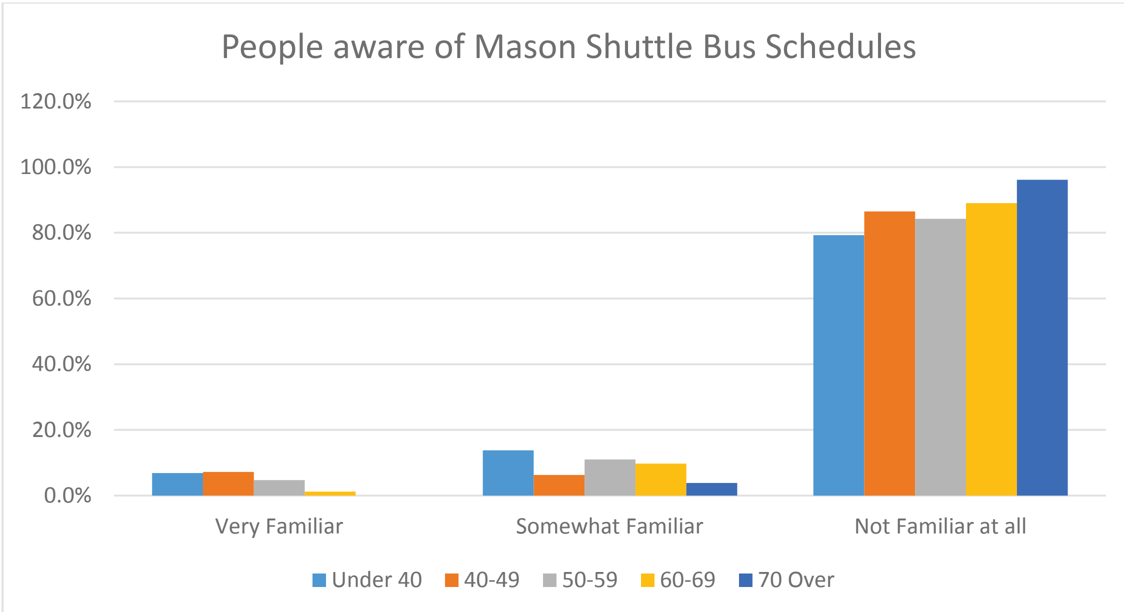

Have you used CUE during the Last 12 Months? (Community Survey)
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Yes
No
Under 40
40-49
50-59
60-69
70 Over

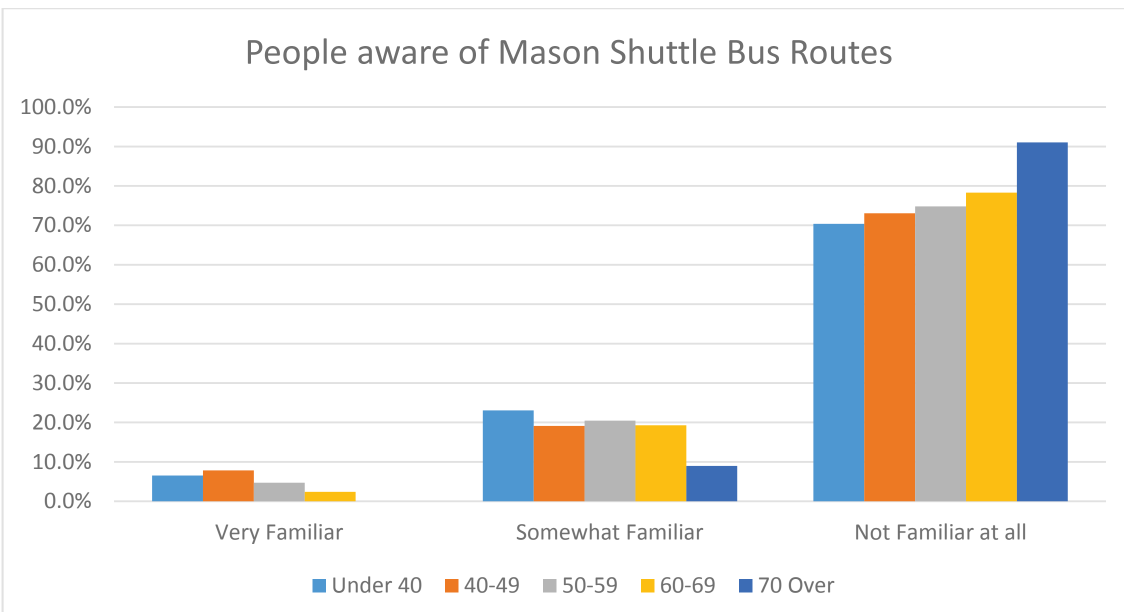

How often have you used CUE in the Last 12 Months
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Every week
Every other week
Once a month
Less than once a month
Under 40
40-49
50-59
60-69
70 Over

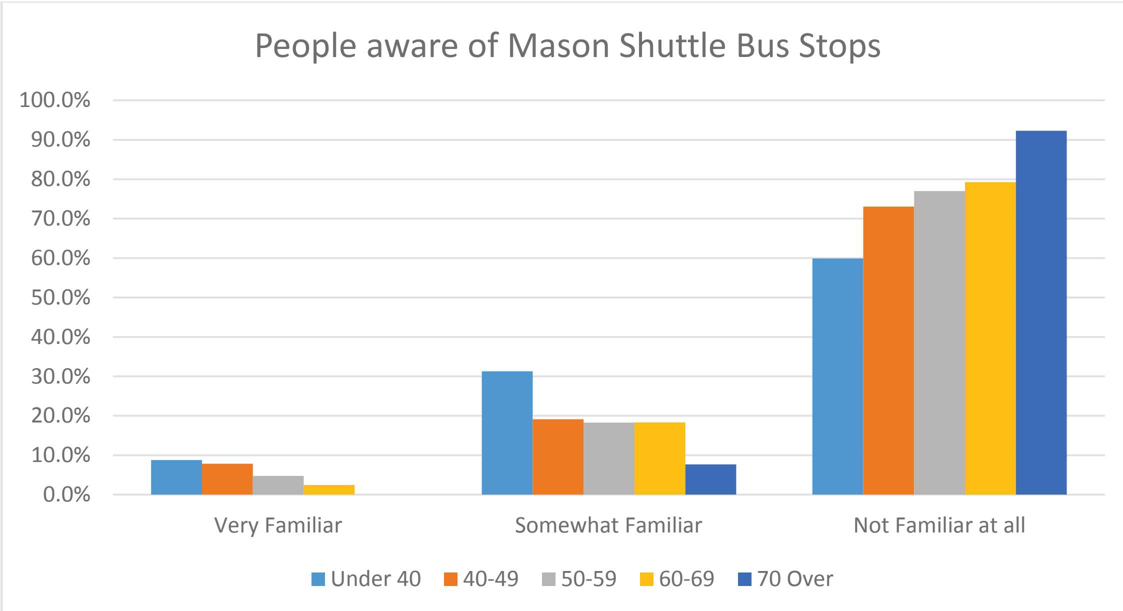

How many days a week do you ride CUE?
30
25
20
15
10
5
0
1
2
3
4
5
6
7
Under 40
40-49
50-59
60-69
70 Over

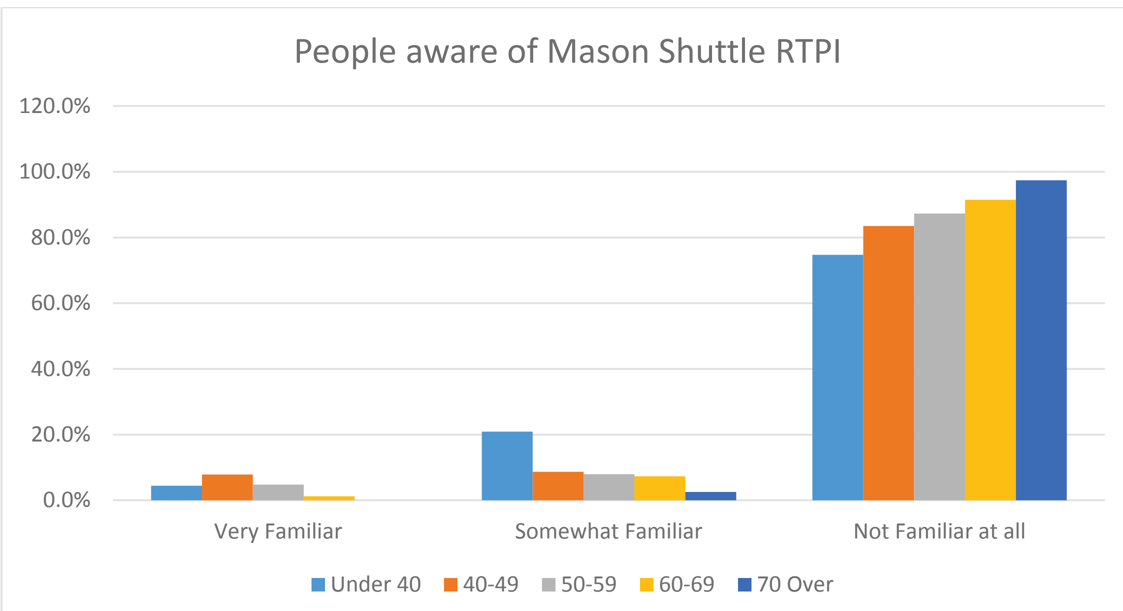

Awareness and Use of Mason Shuttles
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Not Aware
Aware but Non-rider
Rider
Under 40
40-49
50-59
60-69
70 Over

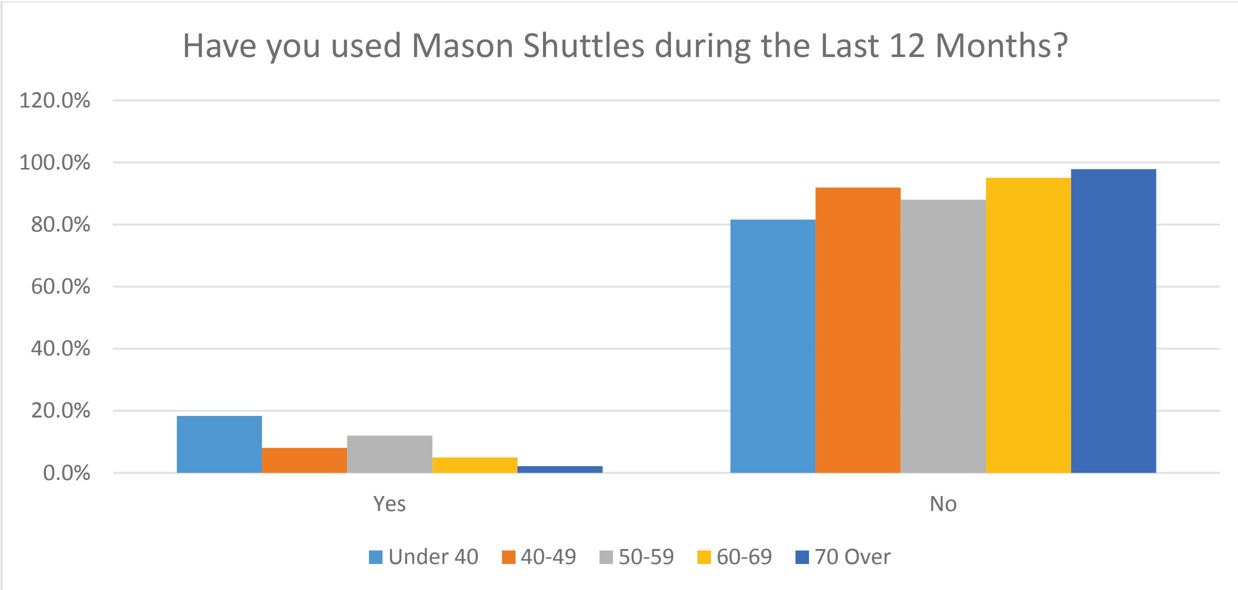

Aware of Mason Shuttle attributes
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all
Schedules
Routes
Stops
RTPI


People aware of Mason Shuttle Bus Schedules
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all
Under 40
40-49
50-59
60-69
70 Over

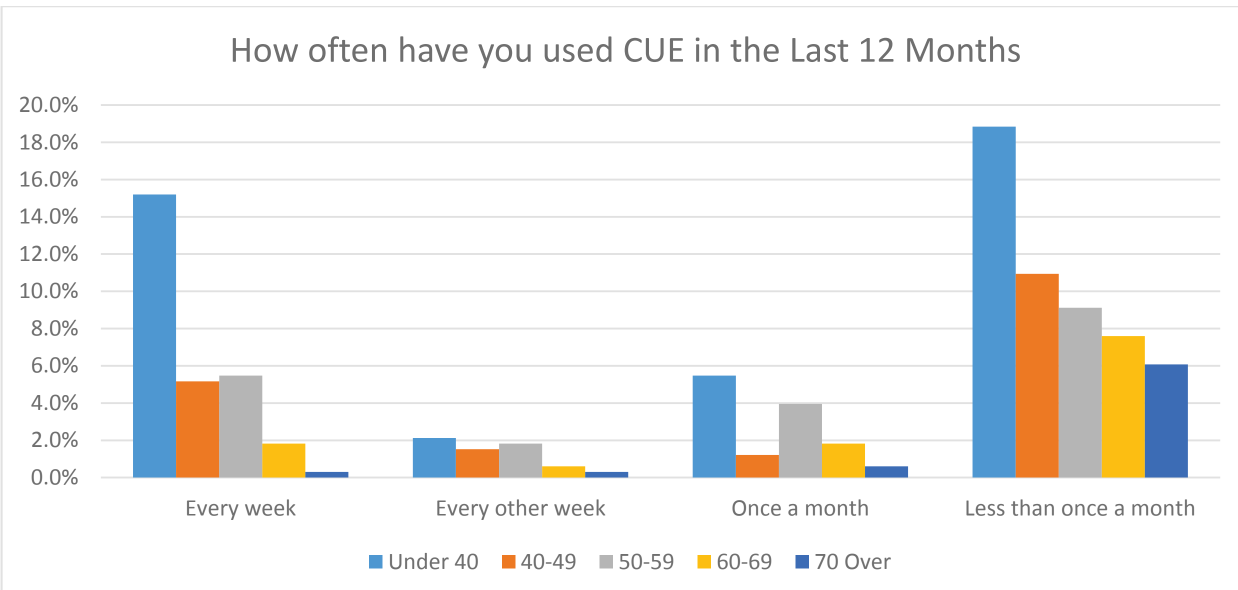

People aware of Mason Shuttle Bus Routes
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all
Under 40
40-49
50-59
60-69
70 Over


People aware of Mason Shuttle Bus Stops
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all
Under 40
40-49
50-59
60-69
70 Over

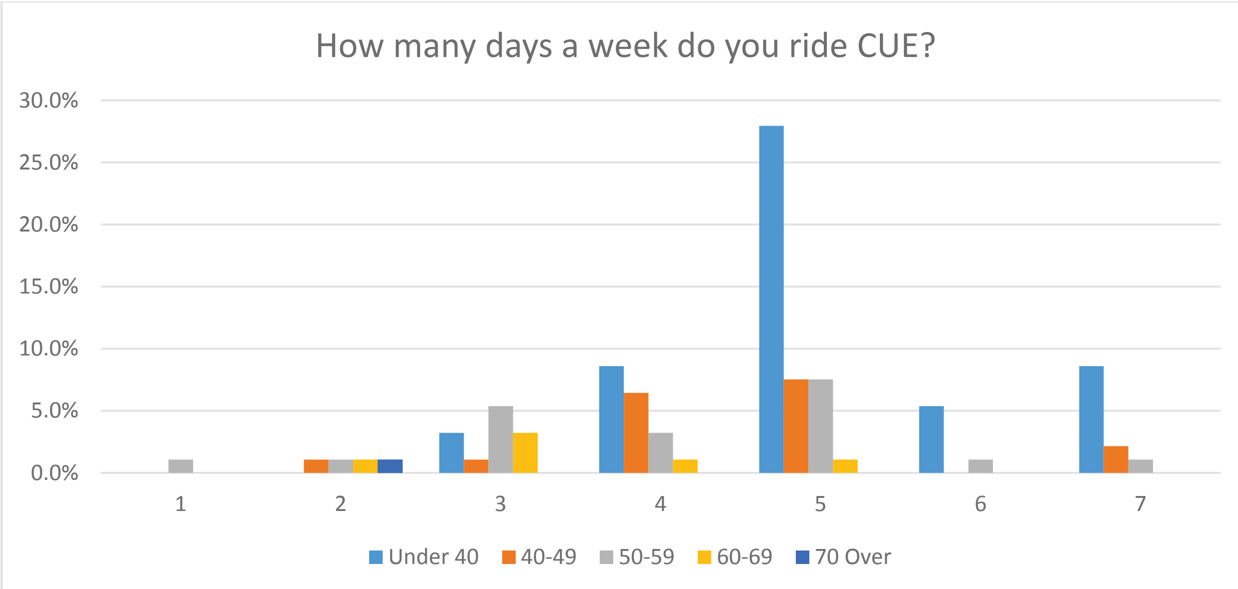

People aware of Mason Shuttle RTPI
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
Very Familiar
Somewhat Familiar
Not Familiar at all
Under 40
40-49
50-59
60-69
70 Over

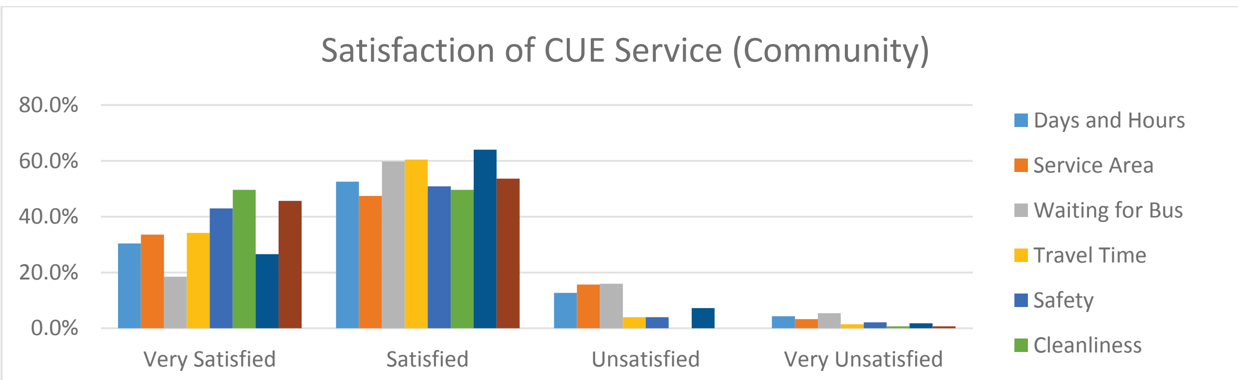


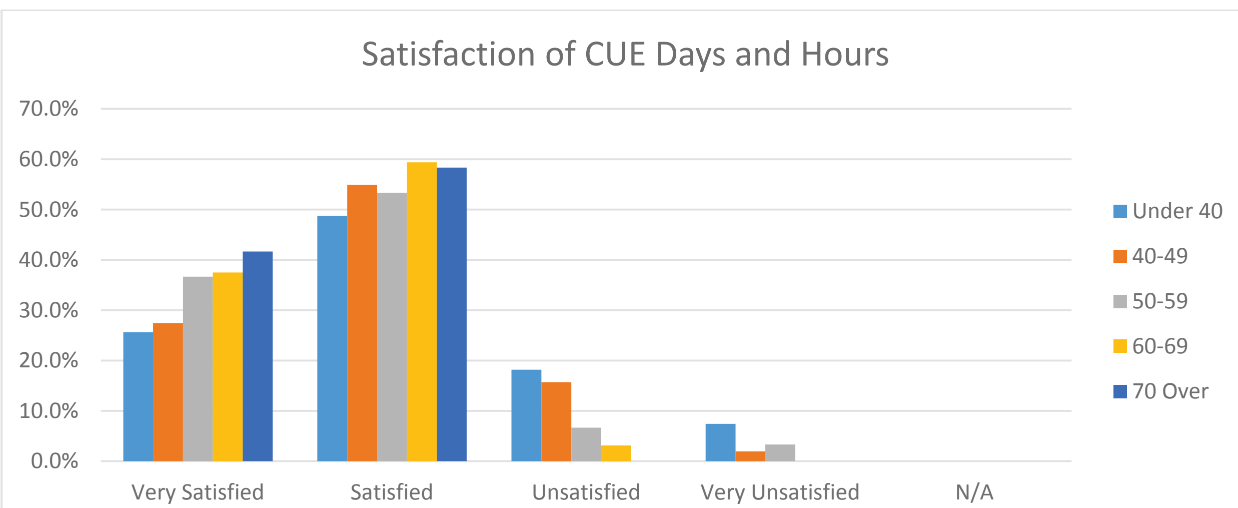
Have you used Mason Shuttles during the Last 12 Months?
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
Yes
No
Under 40
40-49
50-59
60-69
70 Over

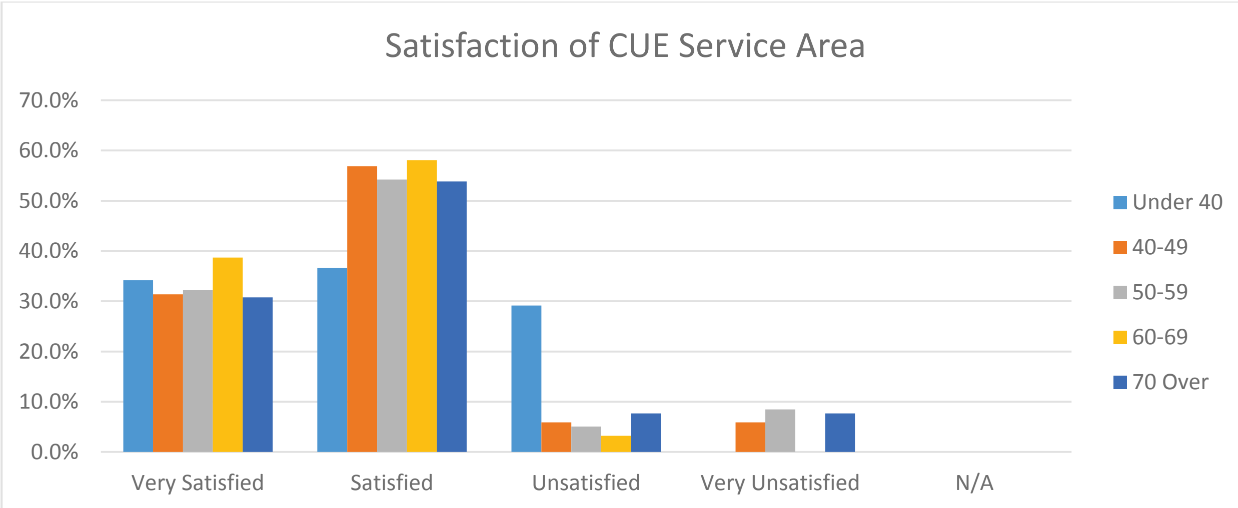


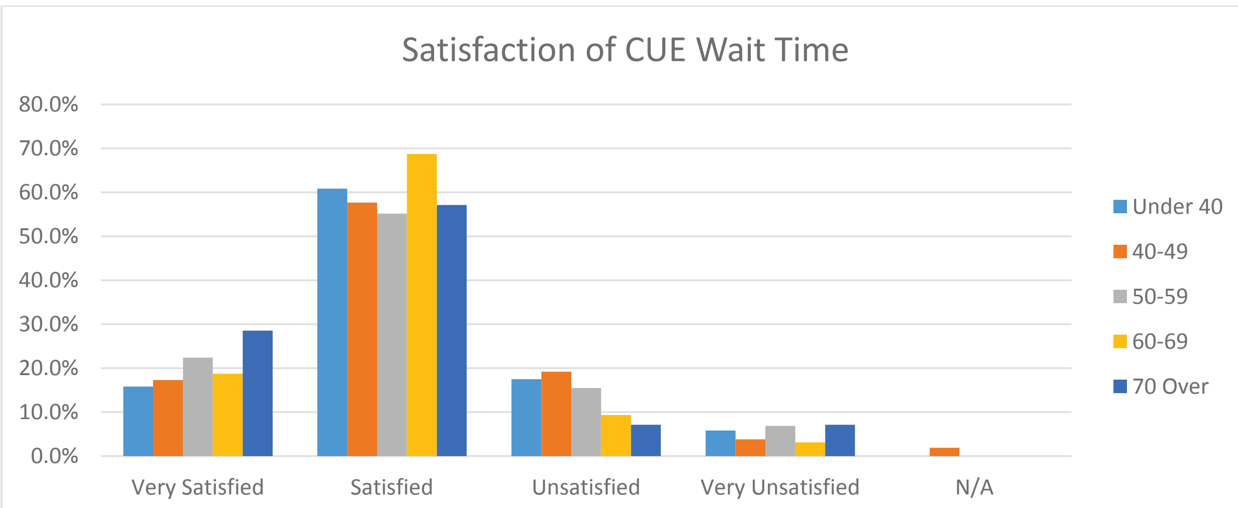
How often have you used CUE in the Last 12 Months
20.0%
18.0%
16.0%
14.0%
12.0%
10.0%
8.0%
6.0%
4.0%
2.0%
0.0%
Every week
Every other week
Once a month
Less than once a month
Under 40
40-49
50-59
60-69
70 Over

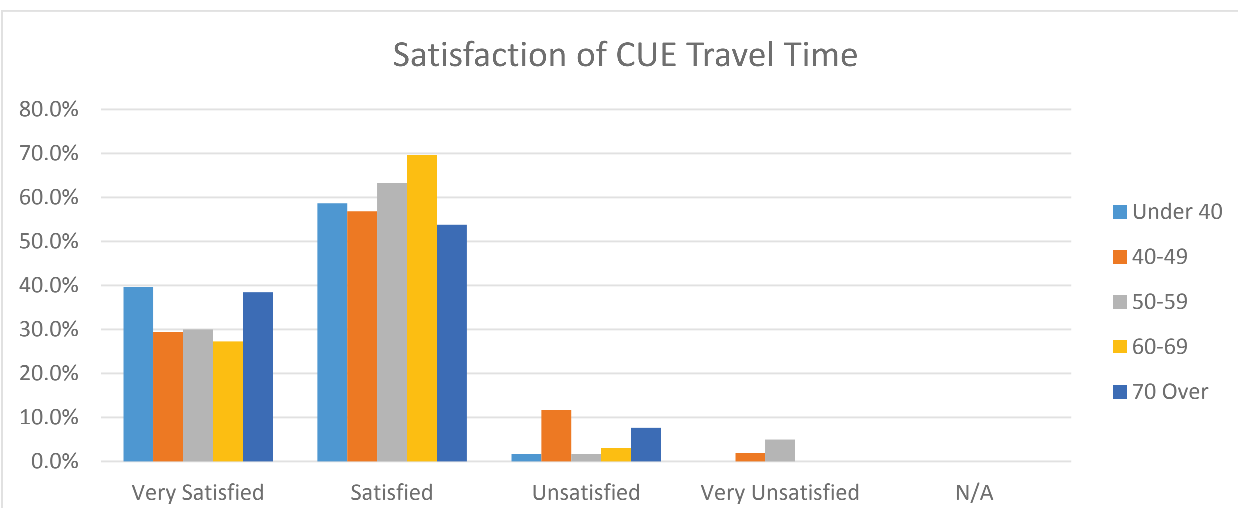

How many days a week do you ride CUE?
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
1
2
3
4
5
6
7
Under 40
40-49
50-59
60-69
70 Over

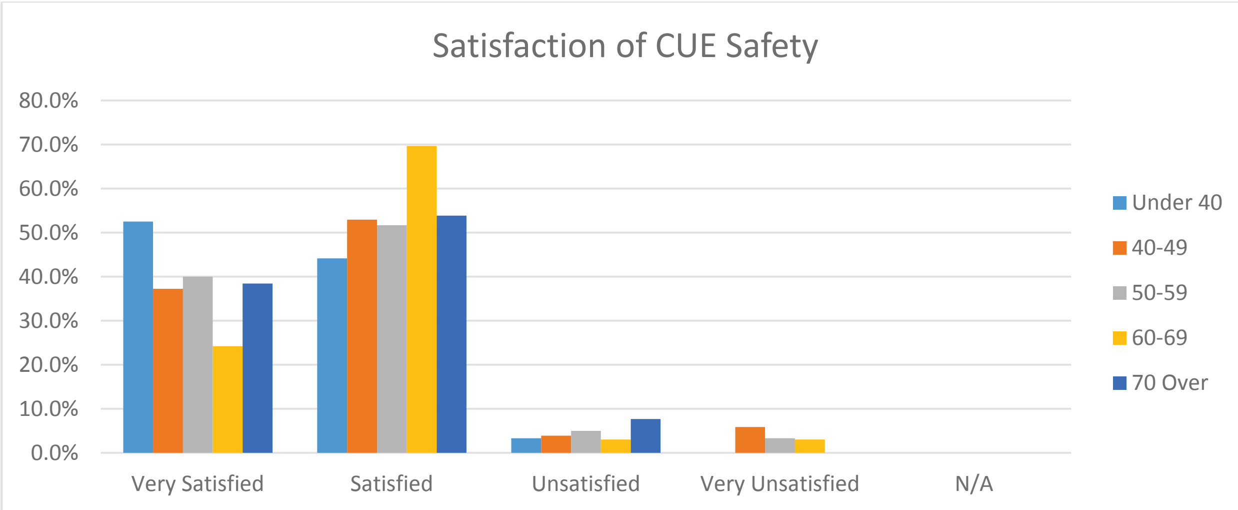

Satisfaction of CUE Service (Community)
80.0%
60.0%
40.0%
20.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
Days and Hours
Service Area
Waiting for Bus
Travel Time
Safety
Cleanliness

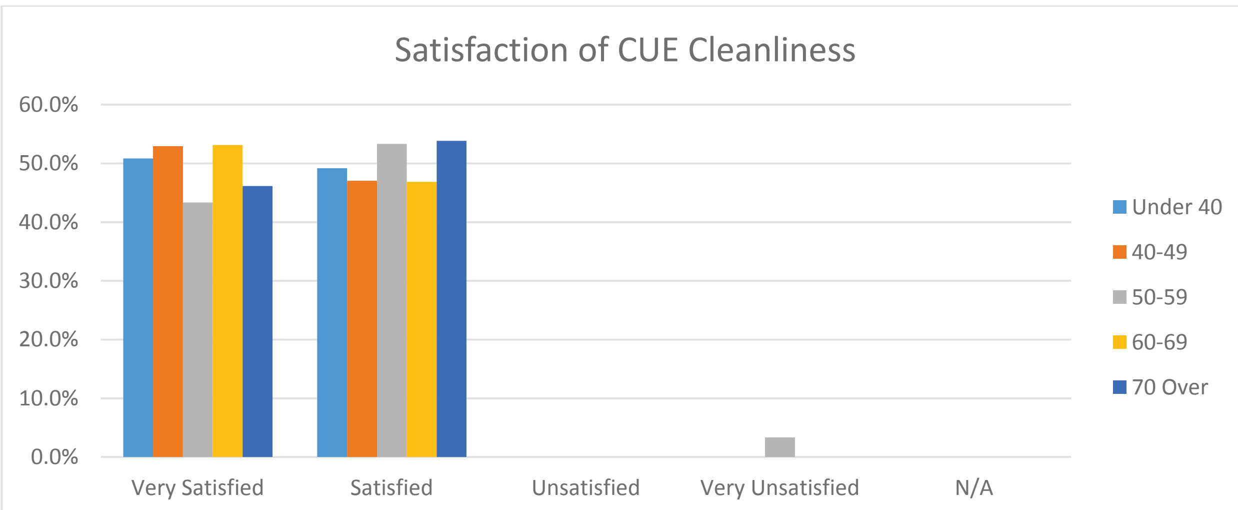

Satisfaction of CUE Days and Hours
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Under 40
40-49
50-59
60-69
70 Over

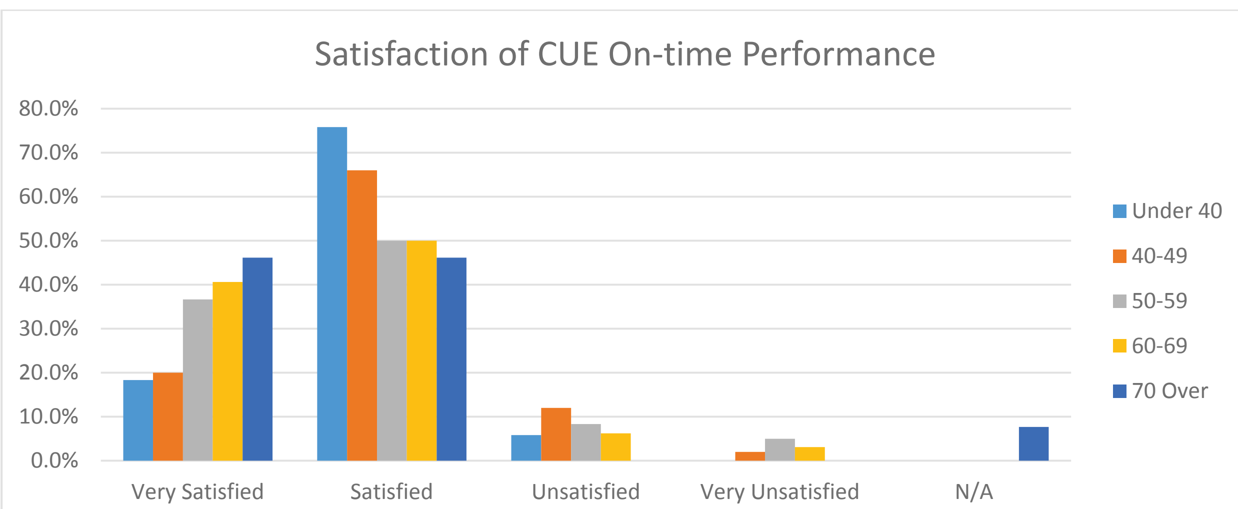

Satisfaction of CUE Service Area
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Under 40
40-49
50-59
60-69
70 Over

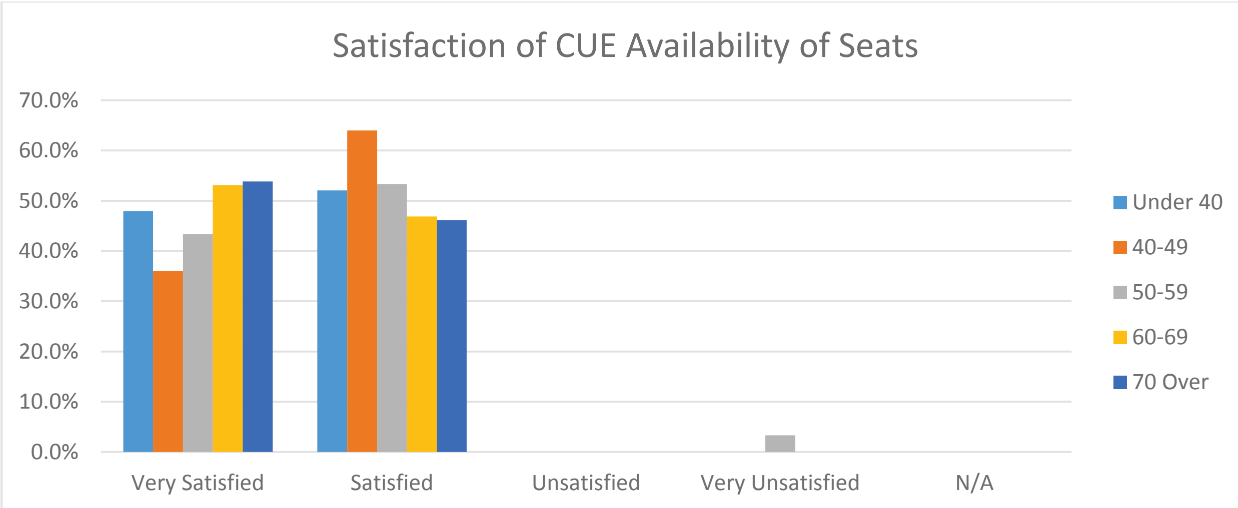

Satisfaction of CUE Wait Time
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Under 40
40-49
50-59
60-69
70 Over

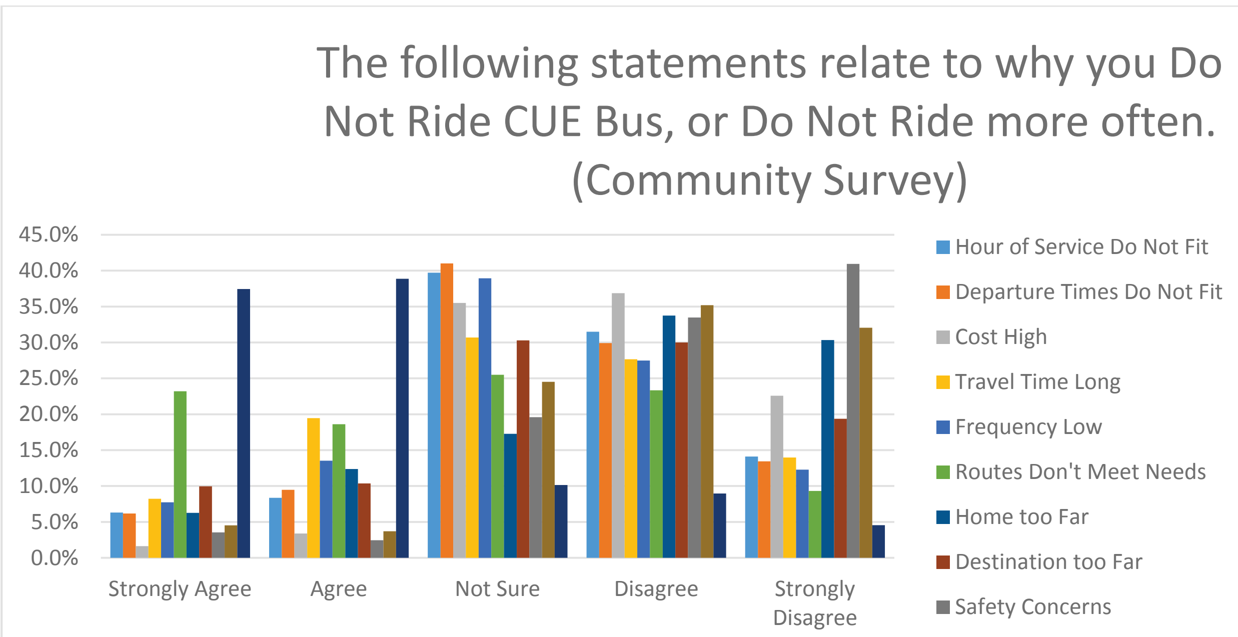

Satisfaction of CUE Travel Time
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Under 40
40-49
50-59
60-69
70 Over

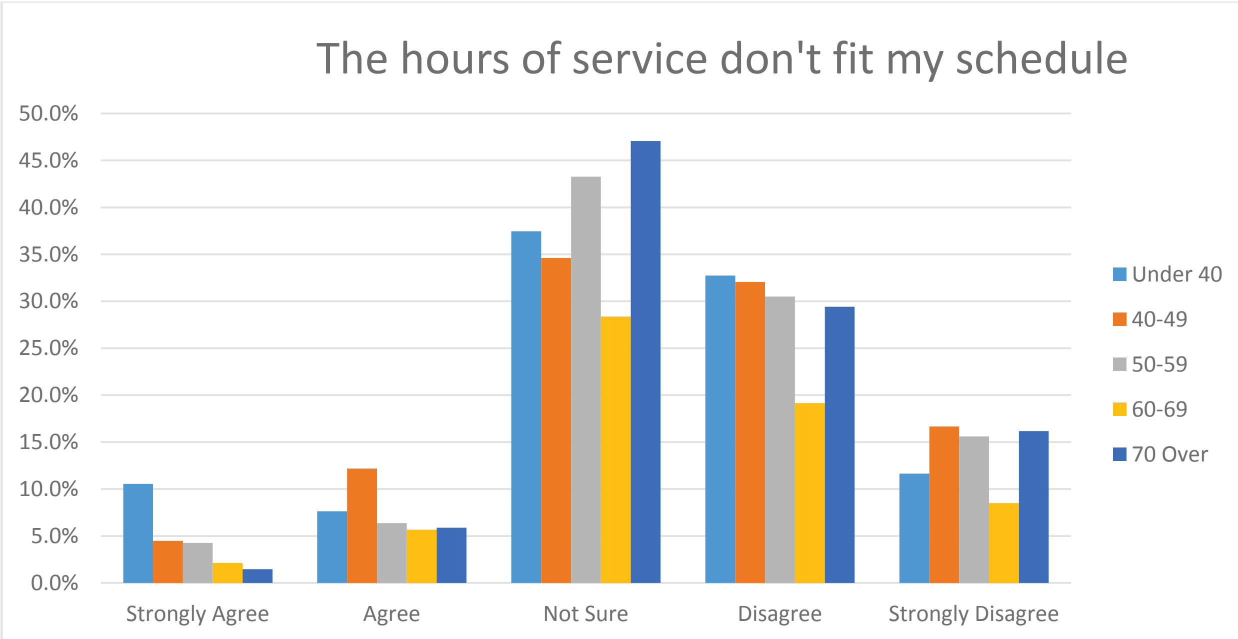

Satisfaction of CUE Safety
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Under 40
40-49
50-59
60-69
70 Over

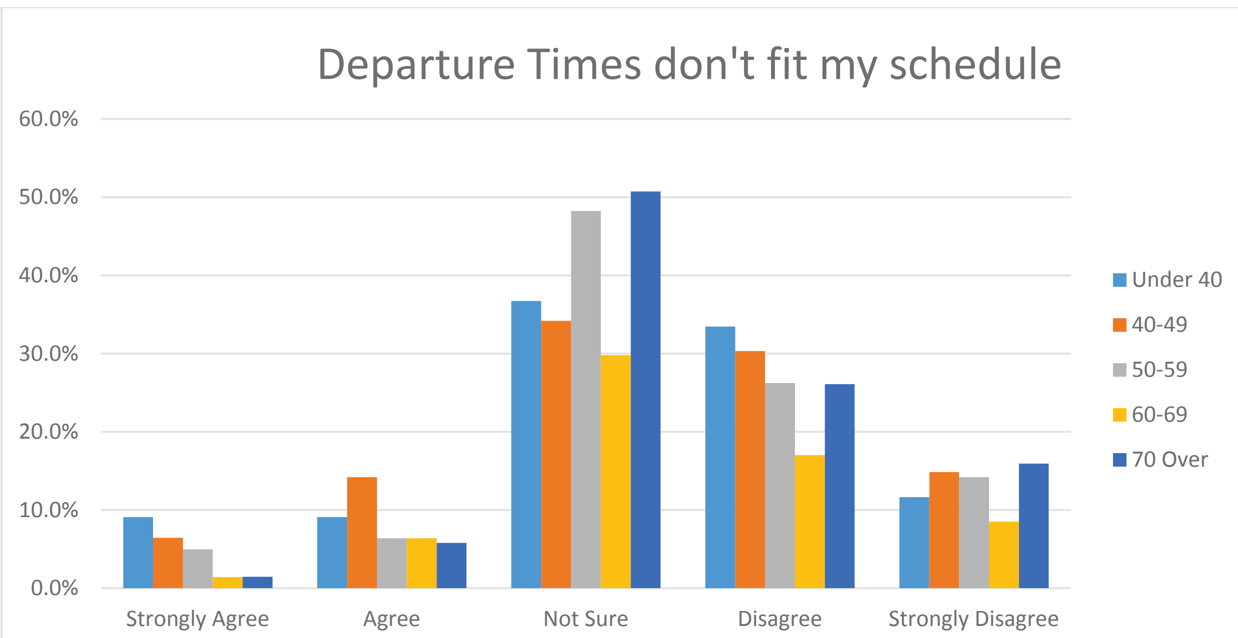

Satisfaction of CUE Cleanliness
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Under 40
40-49
50-59
60-69
70 Over

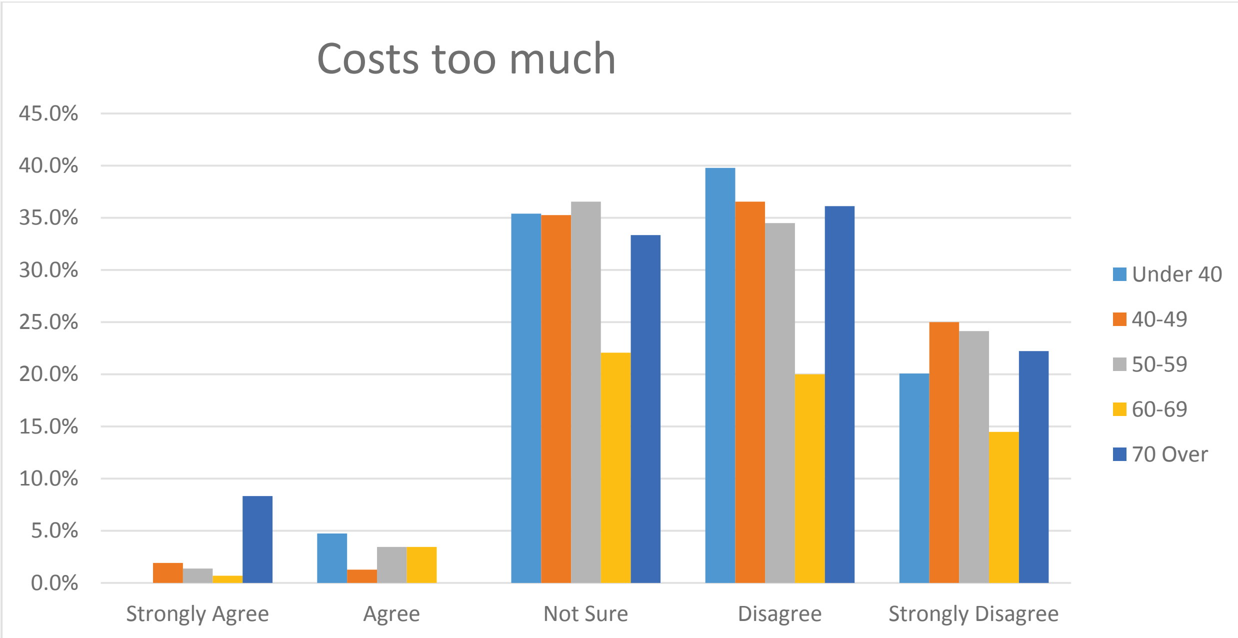

Satisfaction of CUE On-time Performance
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Under 40
40-49
50-59
60-69
70 Over

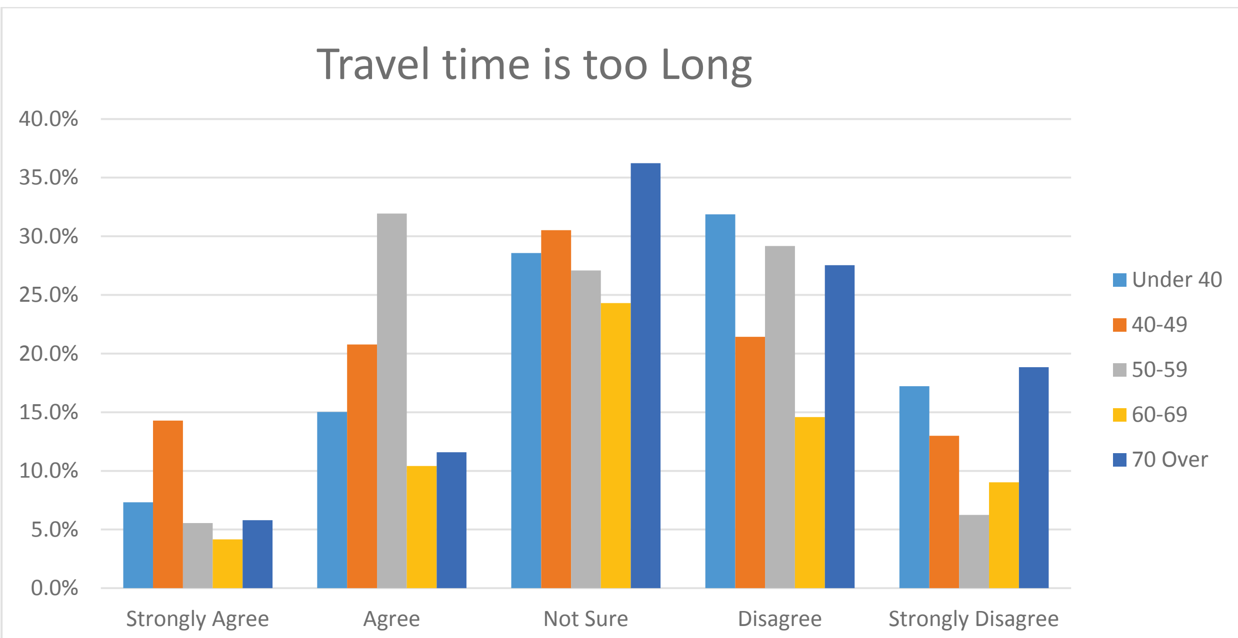

Satisfaction of CUE Availability of Seats
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Under 40
40-49
50-59
60-69
70 Over

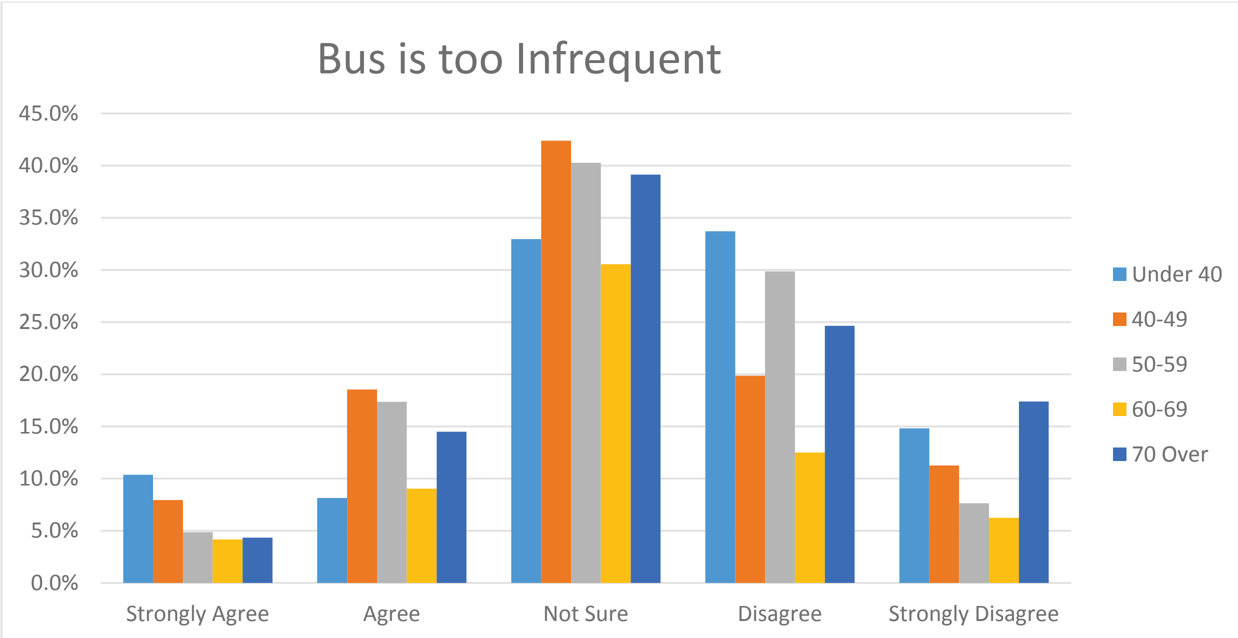

The following statements relate to why you Do Not Ride CUE Bus, or Do Not Ride more often. (Community Survey)
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Hour of Service Do Not Fit
Departure Times Do Not Fit
Cost High
Travel Time Long
Frequency Low
Routes Don't Meet Needs
Home too Far
Destination too Far
Safety Concerns

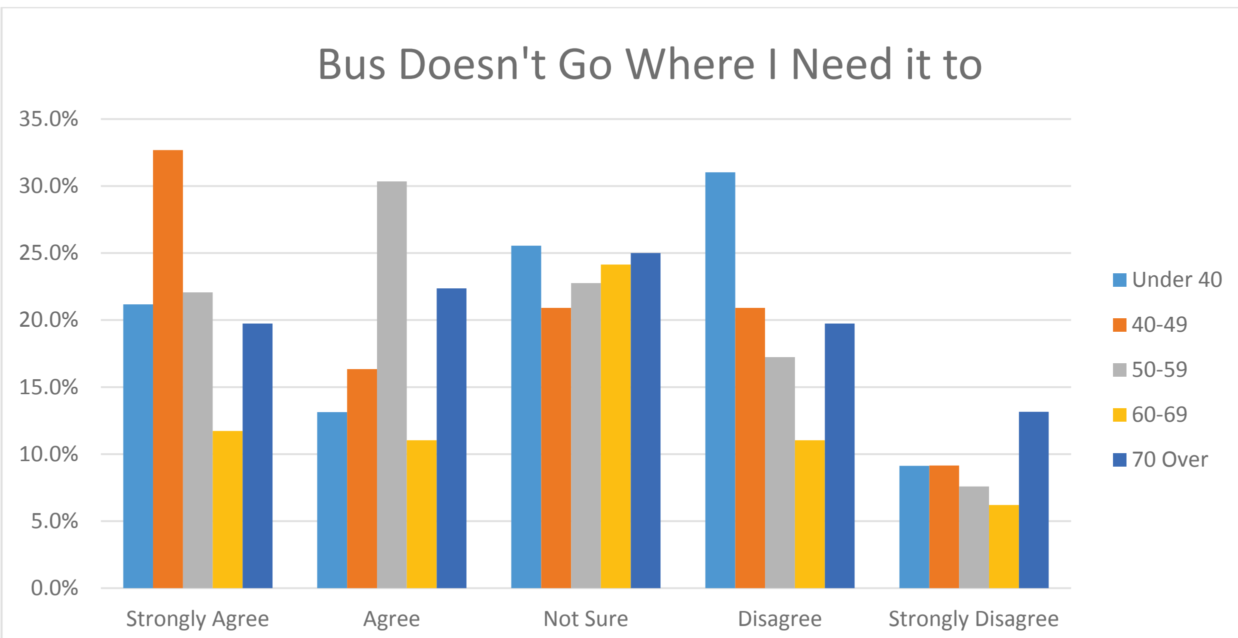

The hours of service don't fit my schedule
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

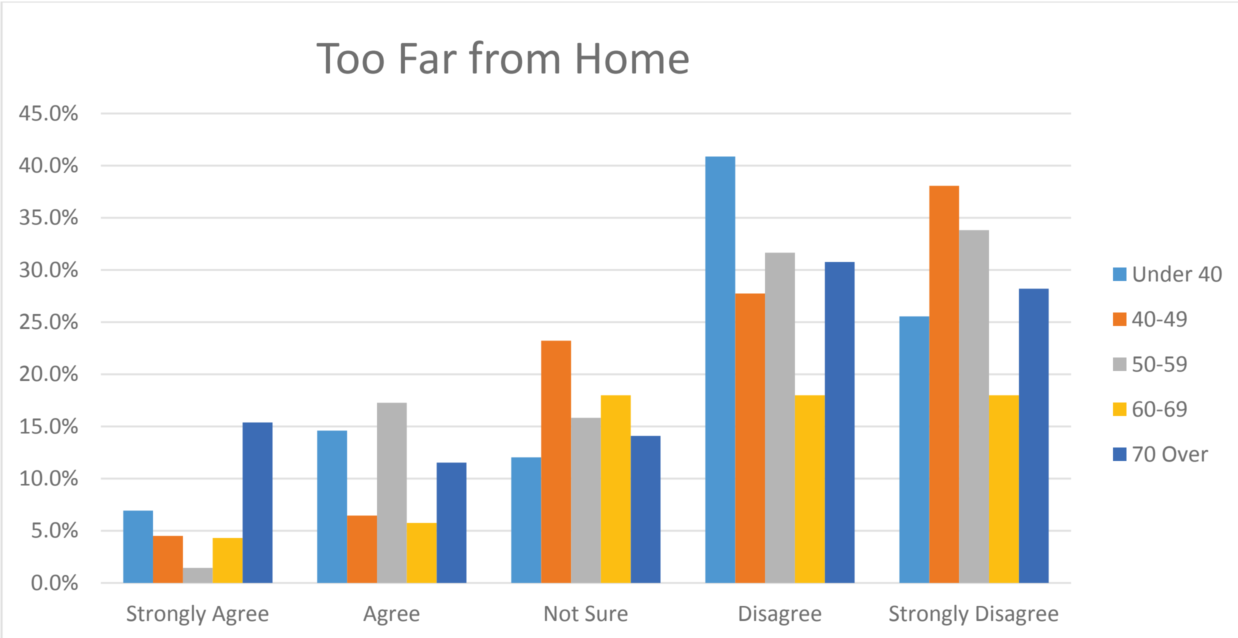

Departure Times don't fit my schedule
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

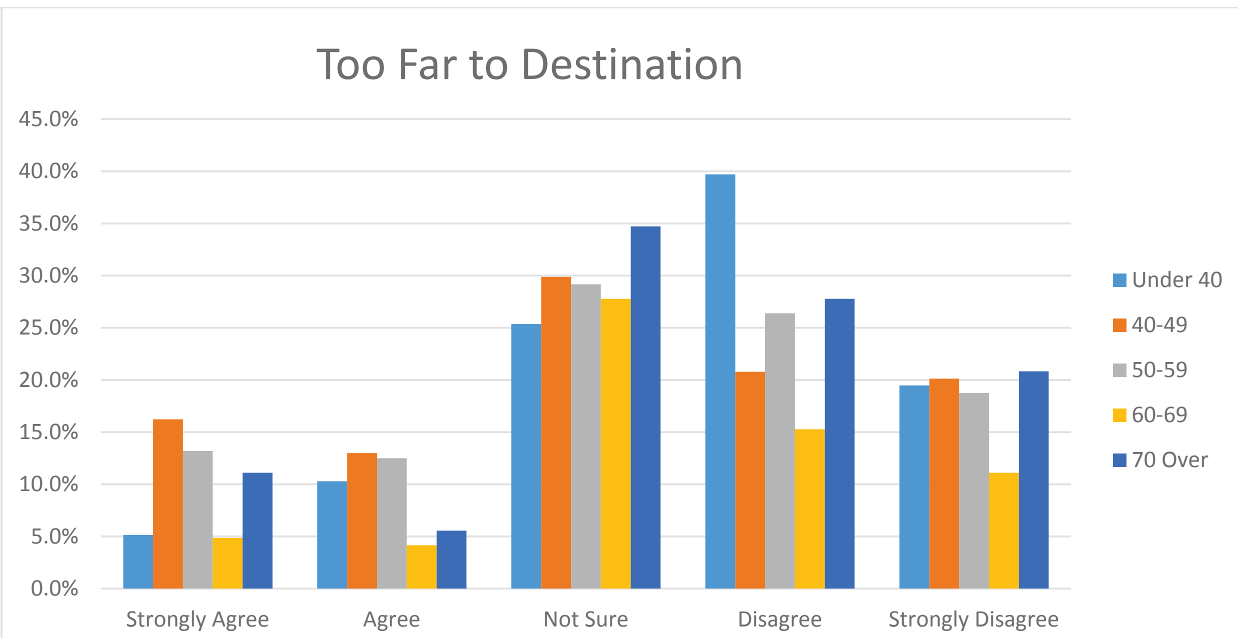

Costs too much
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

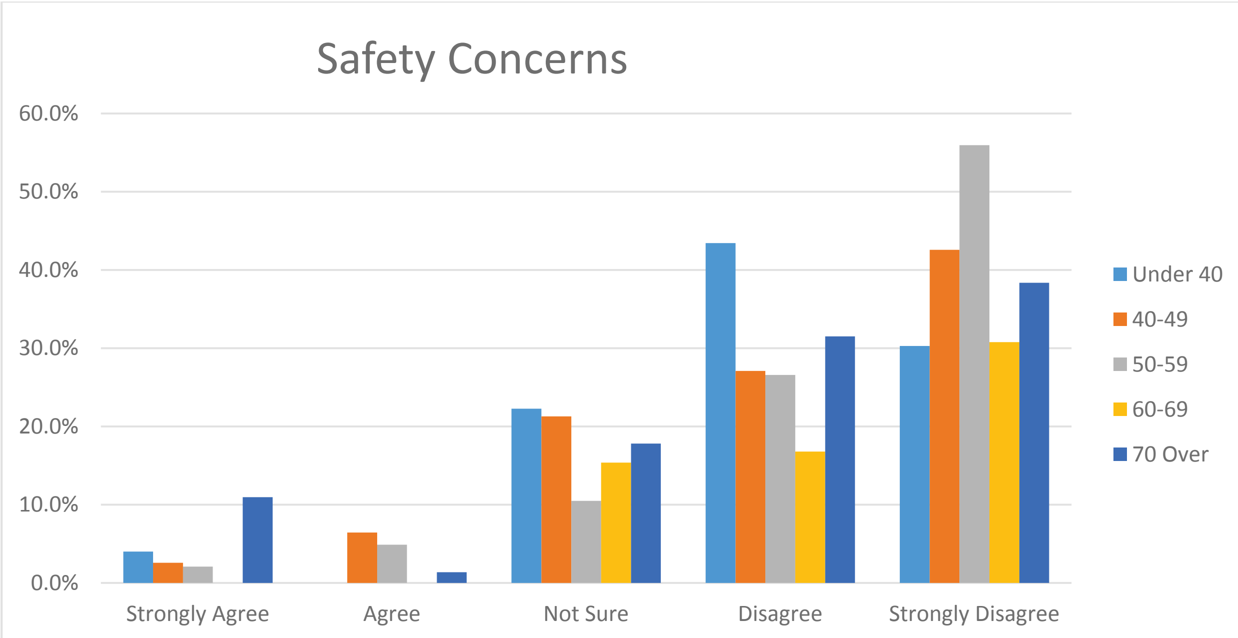

Travel time is too Long
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

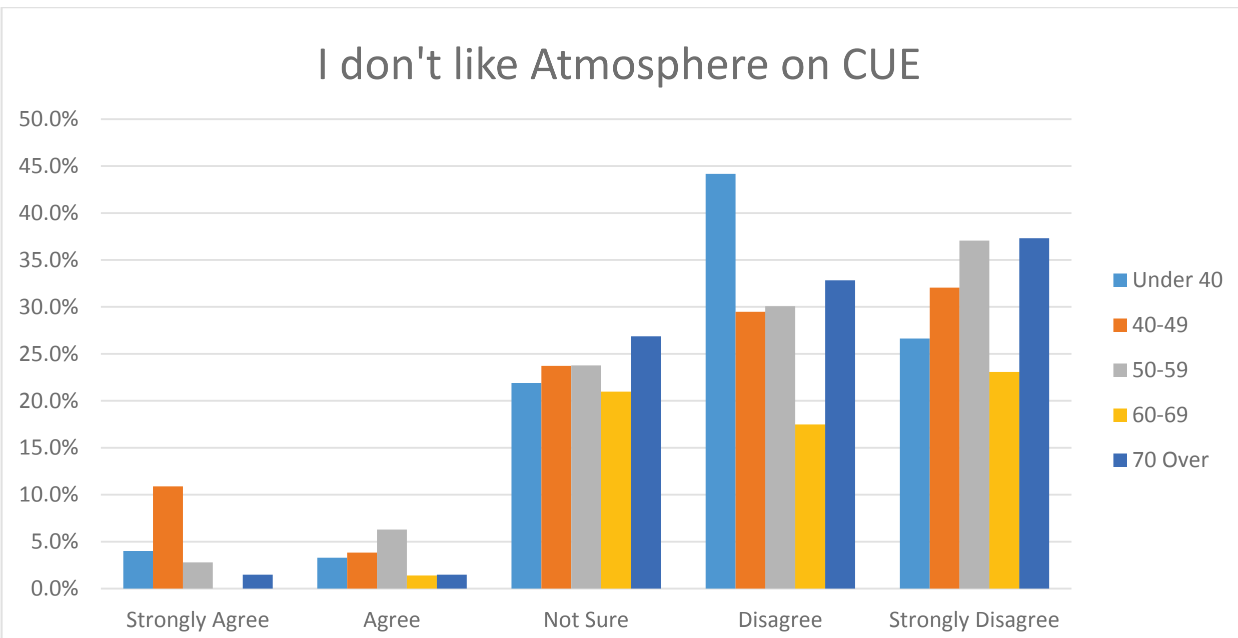

Bus is too Infrequent
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

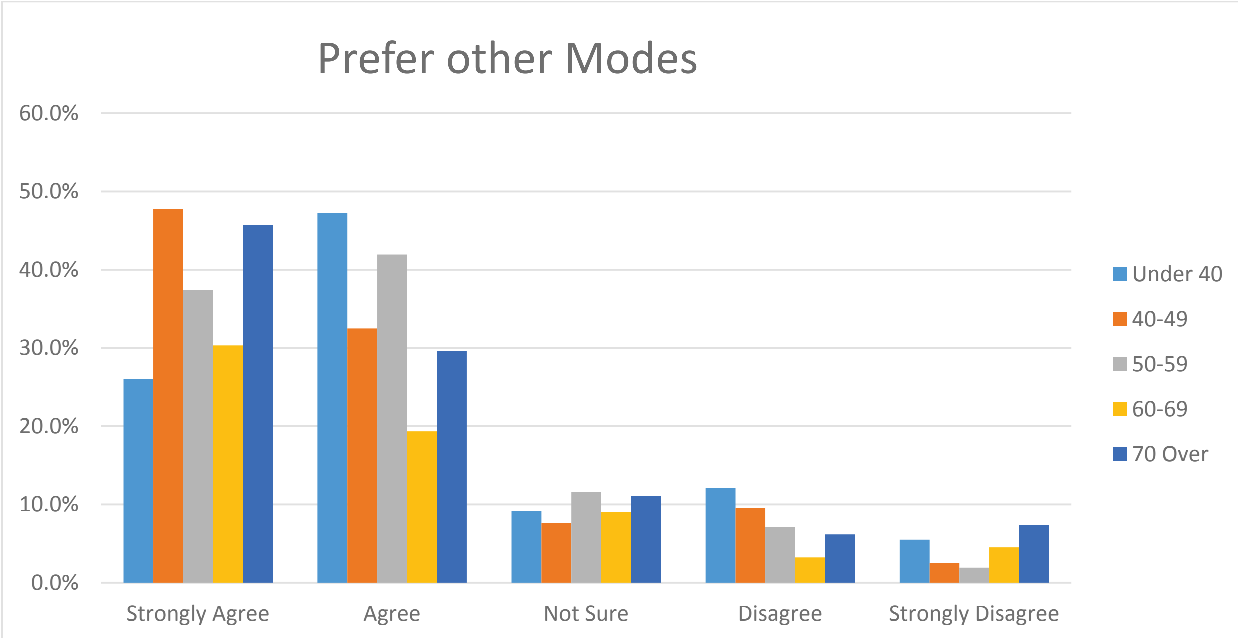

Bus Doesn't Go Where I Need it to
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

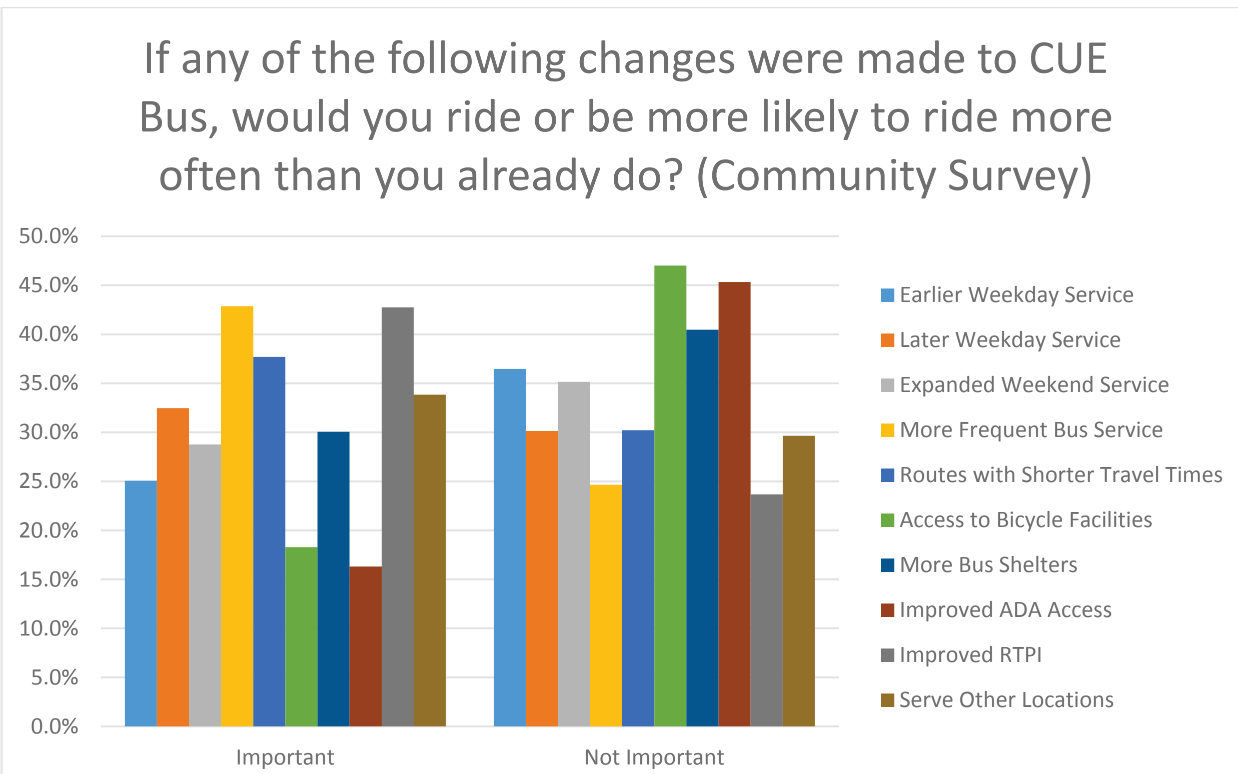

Too Far from Home
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

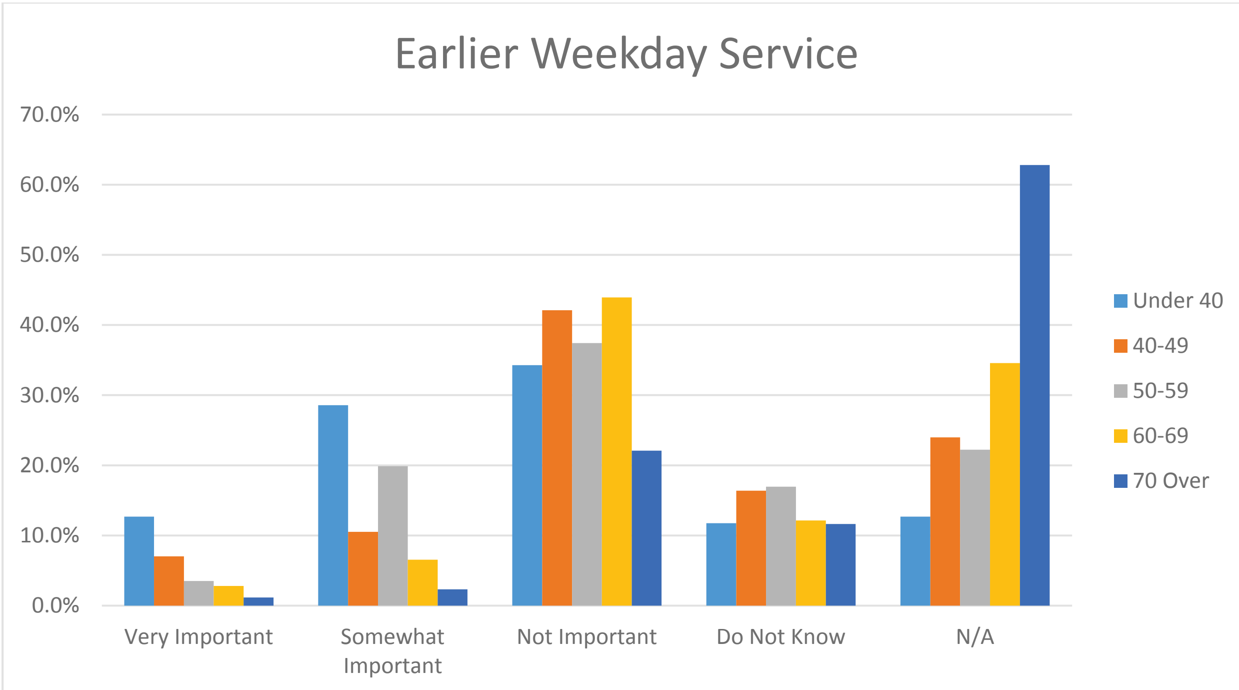

Too Far to Destination
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over


Safety Concerns
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

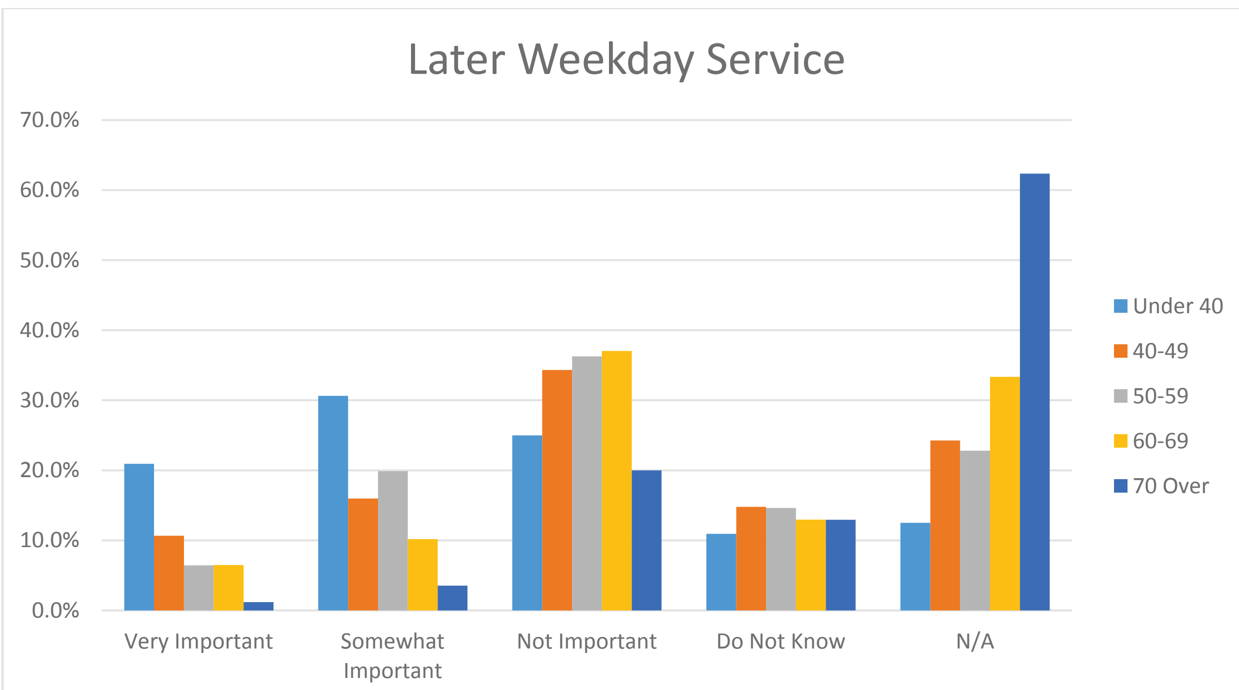

I don't like Atmosphere on CUE
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over


Prefer other Modes
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

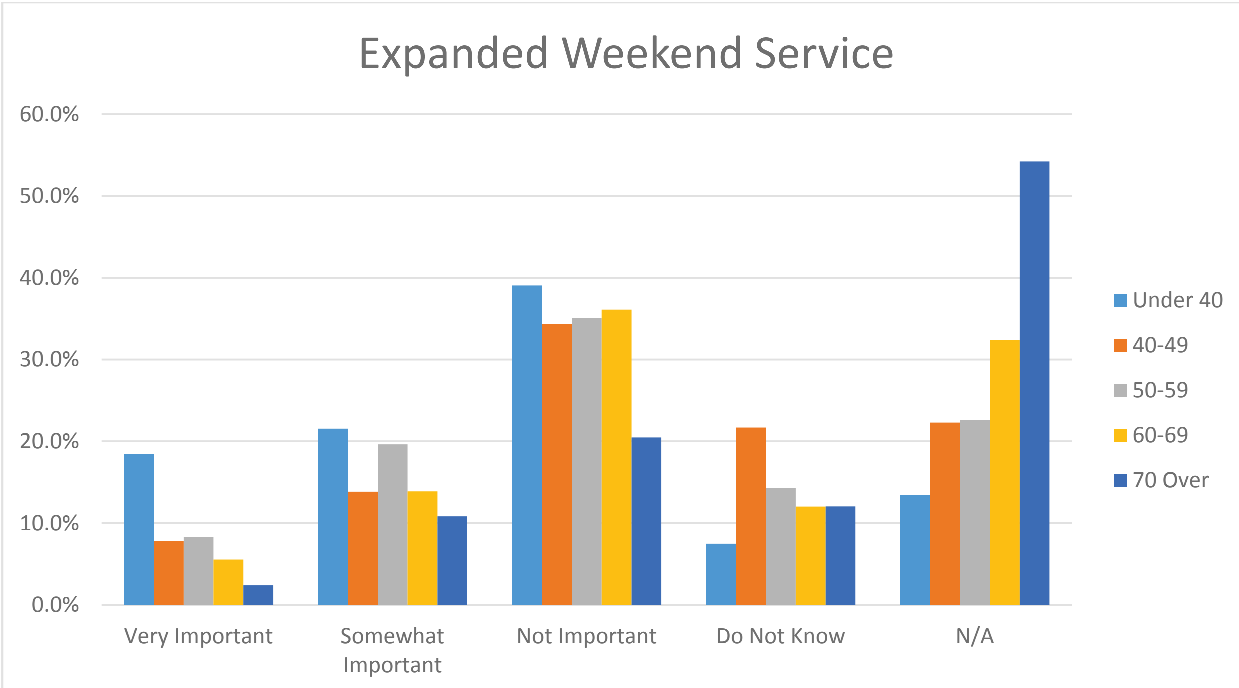

If any of the following changes were made to CUE Bus, would you ride or be more likely to ride more often than you already do? (Community Survey)
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Important
Not Important
Earlier Weekday Service
Later Weekday Service
Expanded Weekend Service
More Frequent Bus Service
Routes with Shorter Travel Times
Access to Bicycle Facilities
More Bus Shelters
Improved ADA Access
Improved RTPI
Serve Other Locations

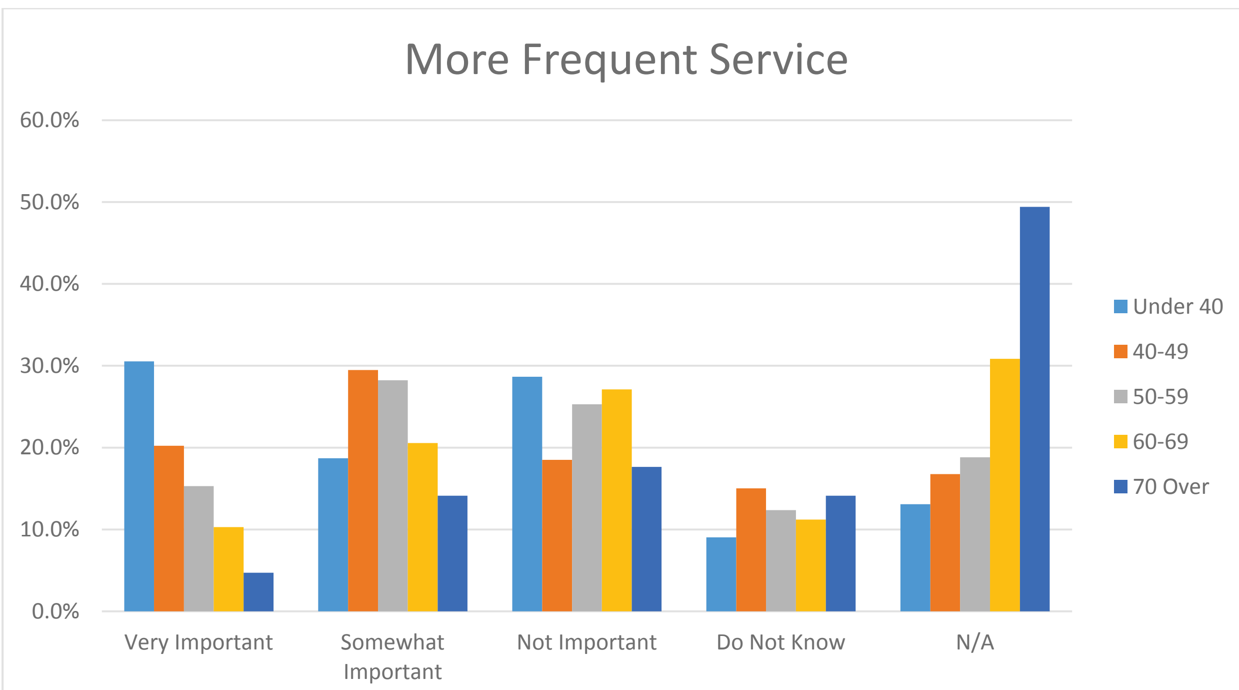


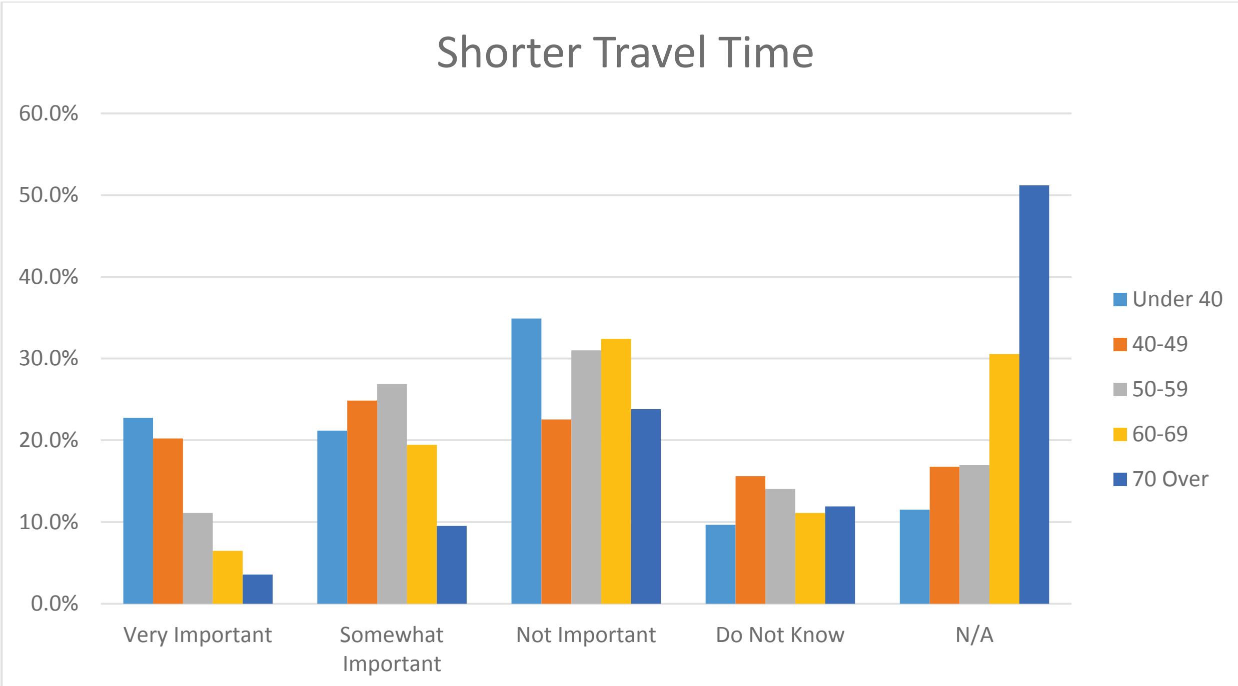
Earlier Weekday Service
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over

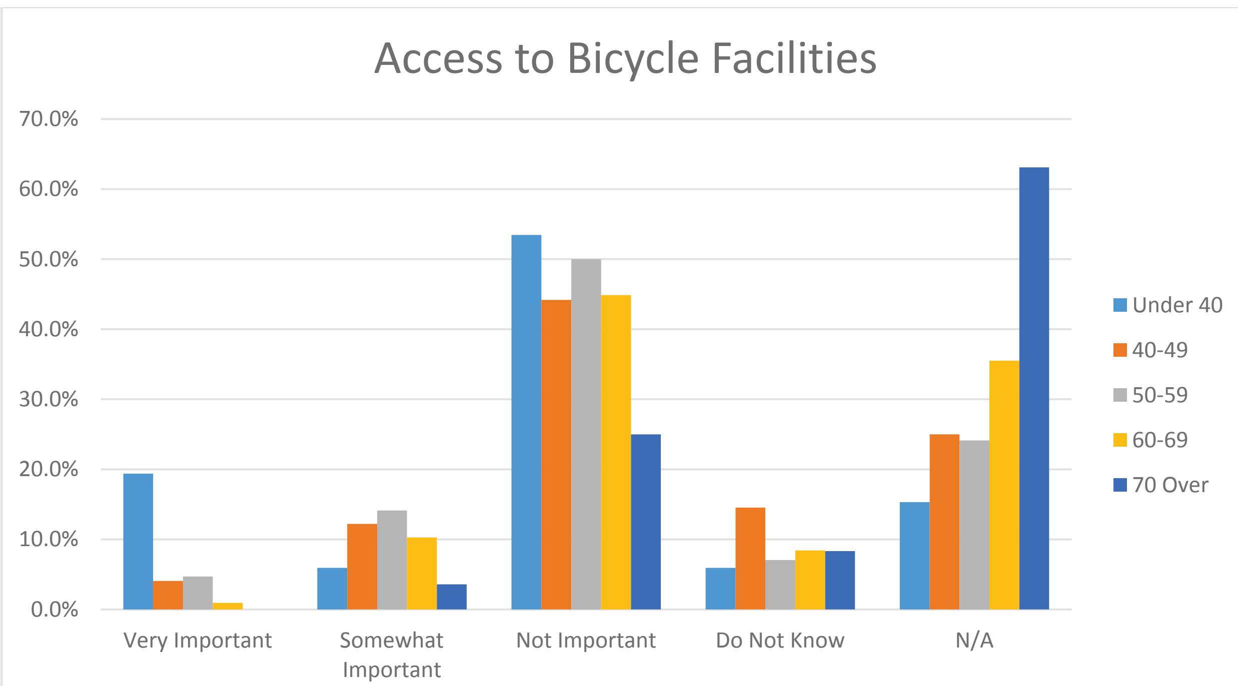


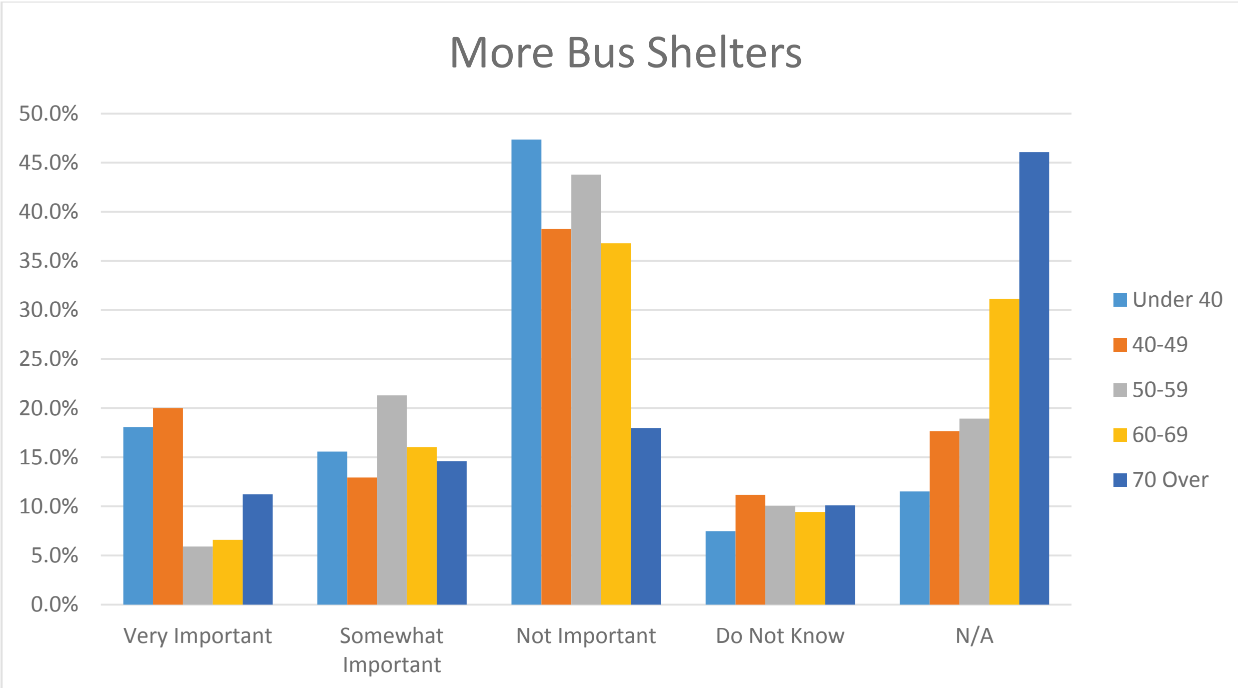
Later Weekday Service
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over

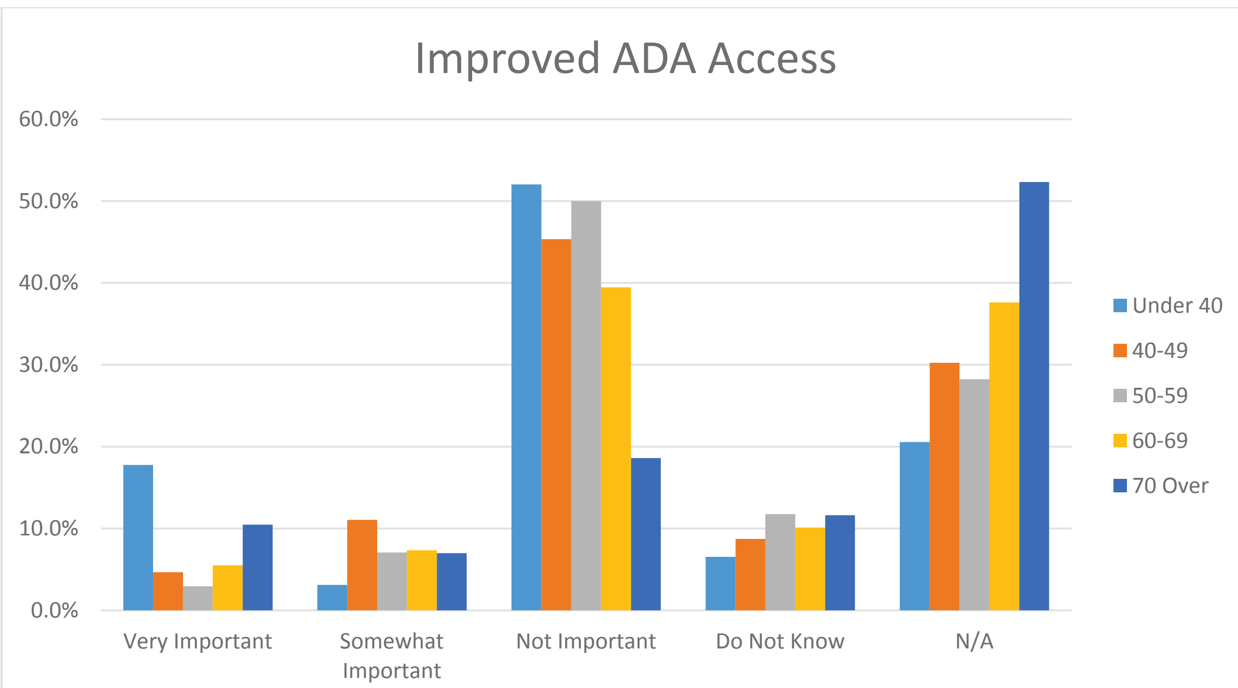

Expanded Weekend Service
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over

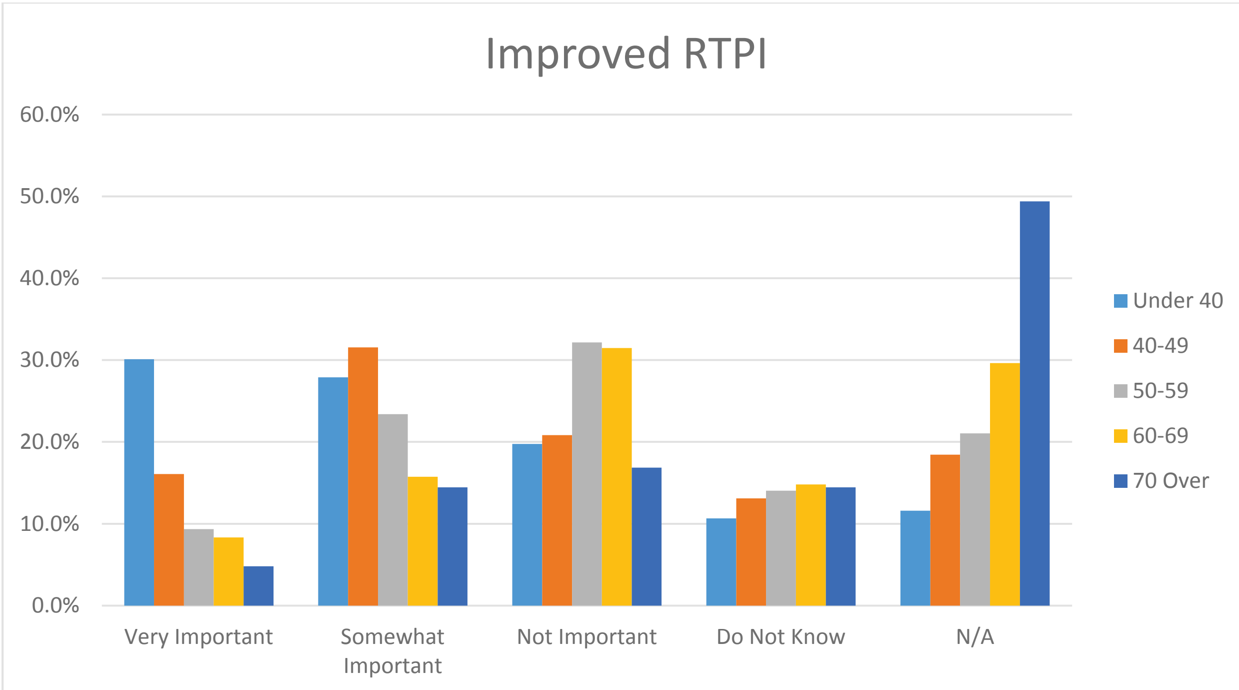

More Frequent Service
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over

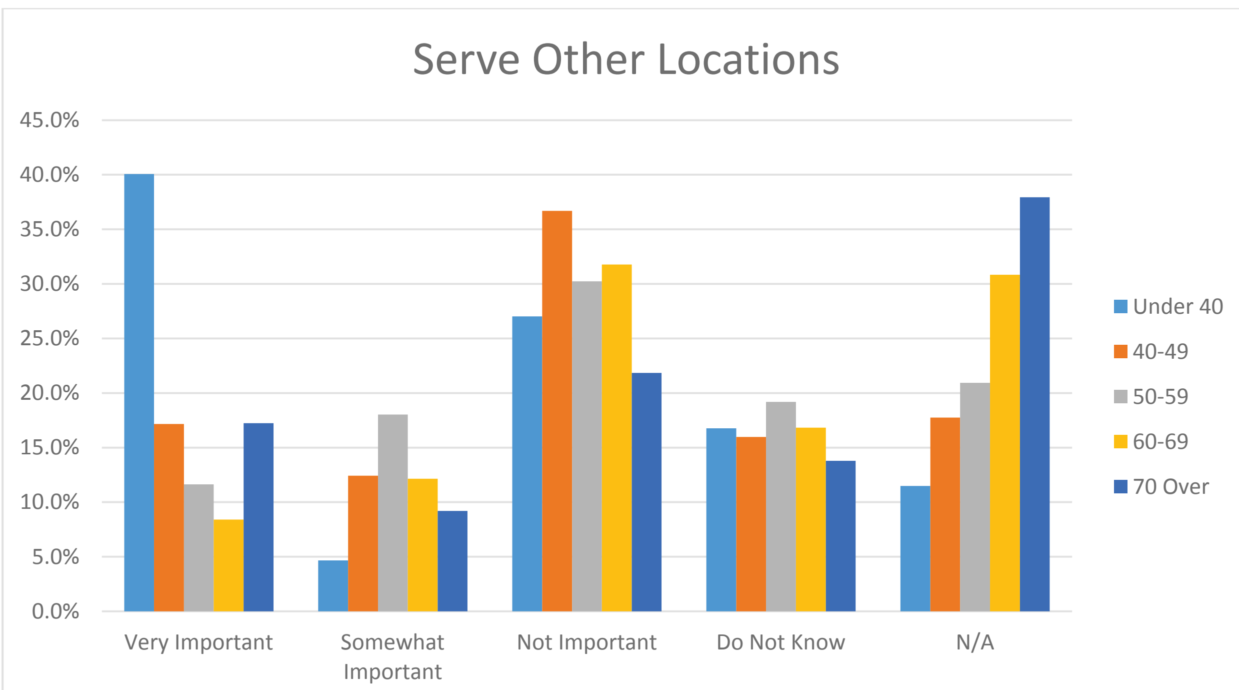

Shorter Travel Time
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over

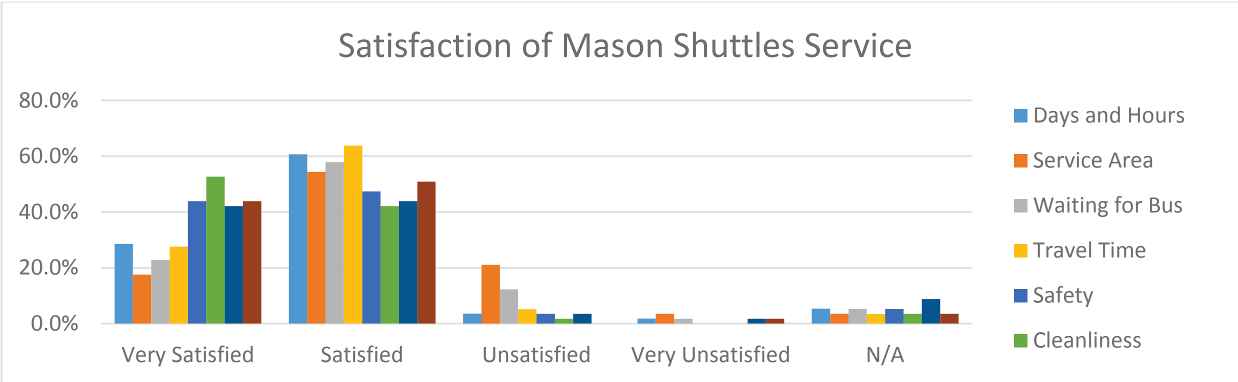

Access to Bicycle Facilities
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over

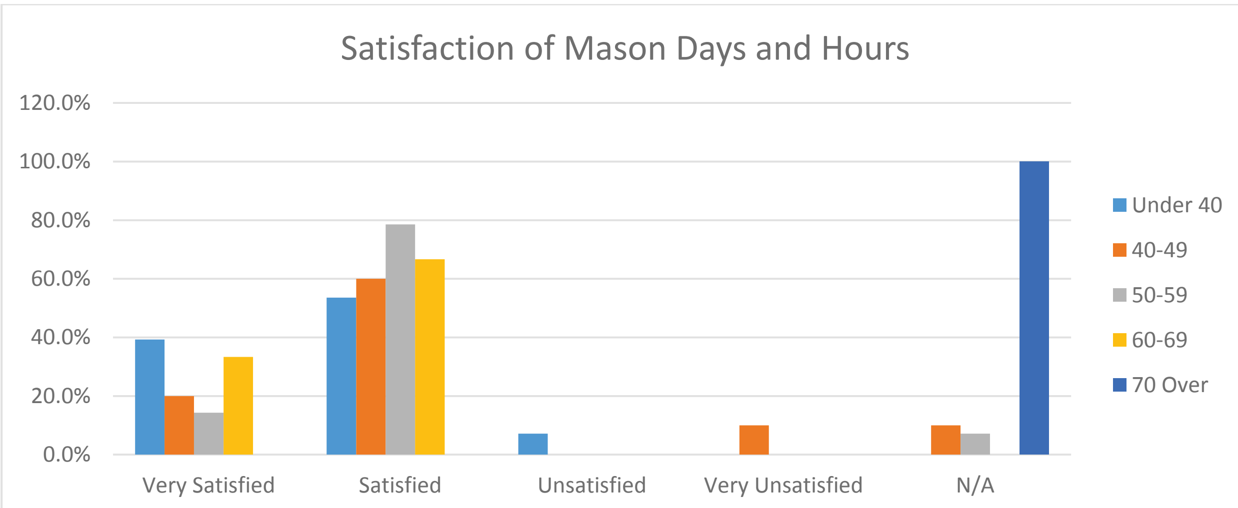

More Bus Shelters
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over

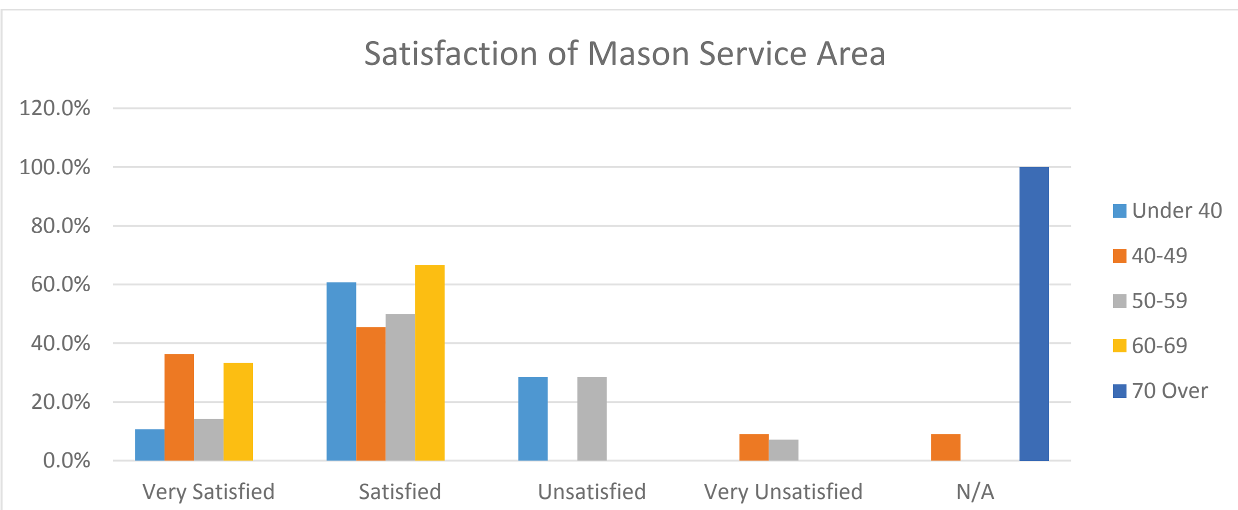

Improved ADA Access
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over

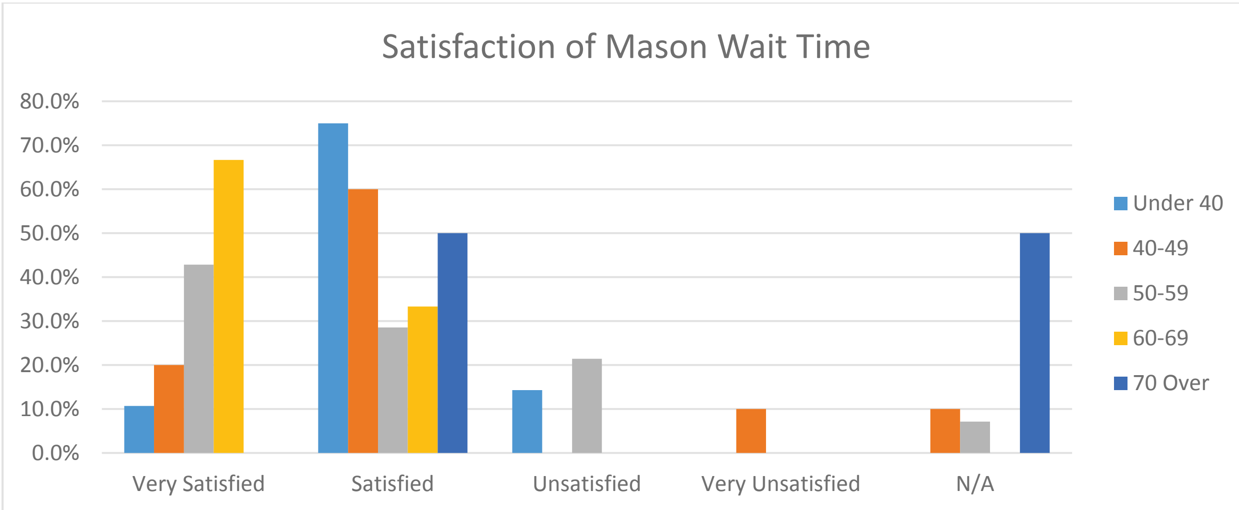

Improved RTPI
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over

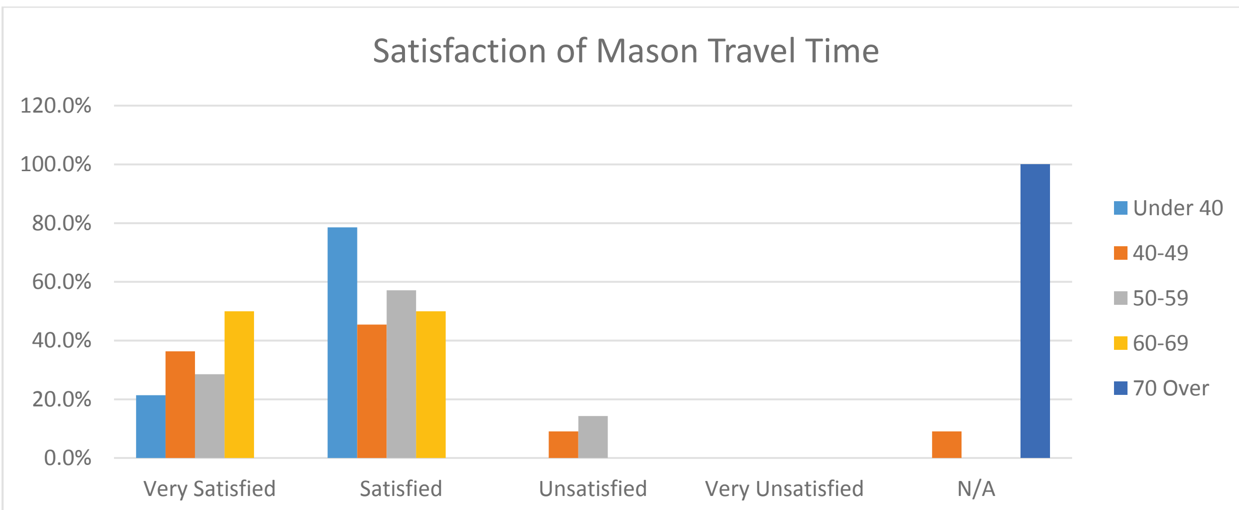

Serve Other Locations
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over

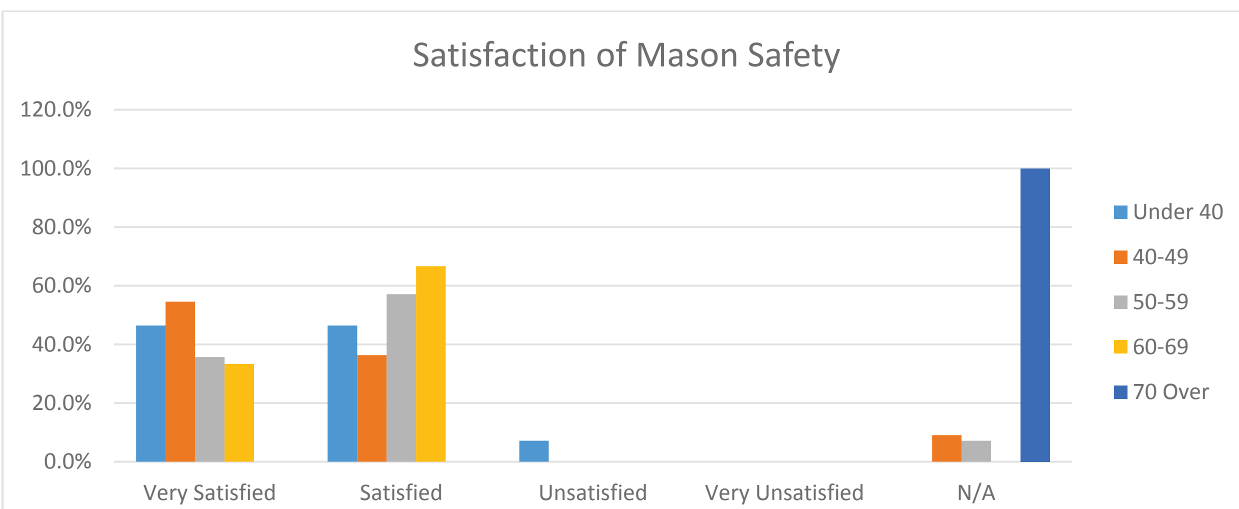

Satisfaction of Mason Shuttles Service
80.0%
60.0%
40.0%
20.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Days and Hours
Service Area
Waiting for Bus
Travel Time
Safety
Cleanliness

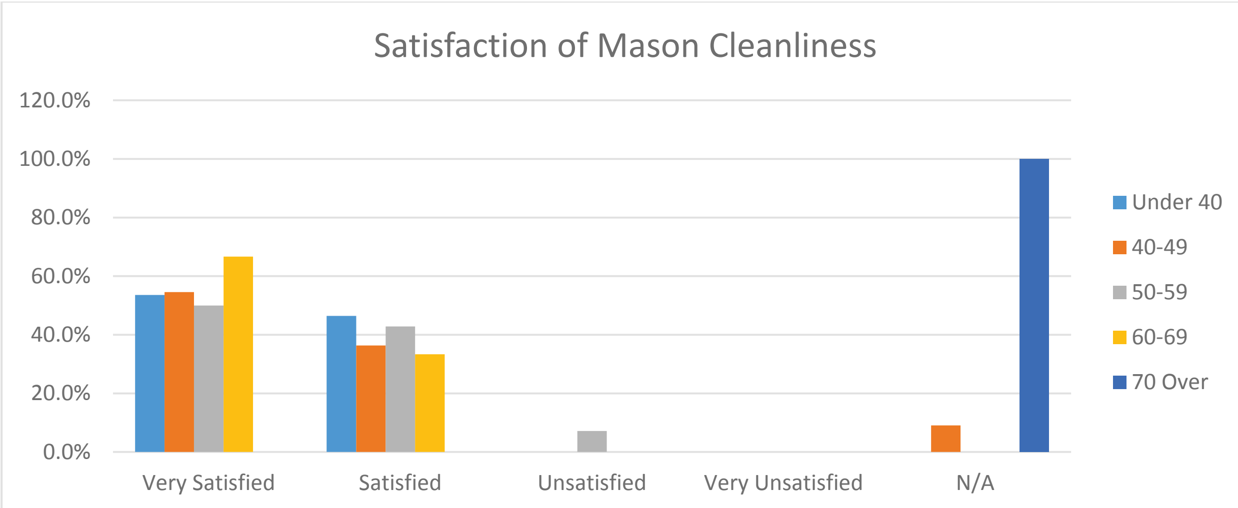

Satisfaction of Mason Days and Hours
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Under 40
40-49
50-59
60-69
70 Over

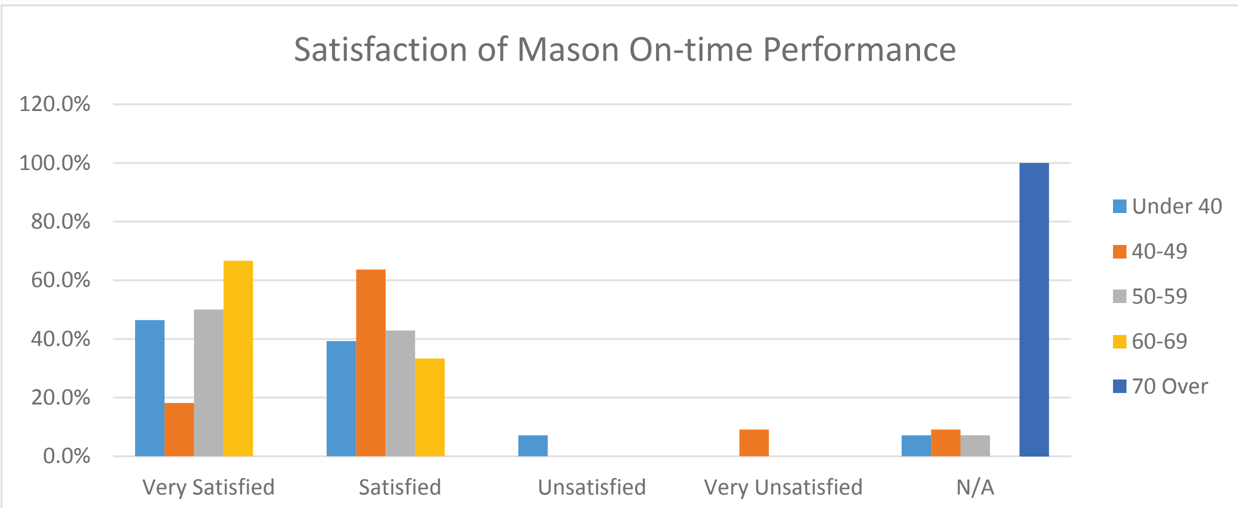

Satisfaction of Mason Service Area
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Under 40
40-49
50-59
60-69
70 Over

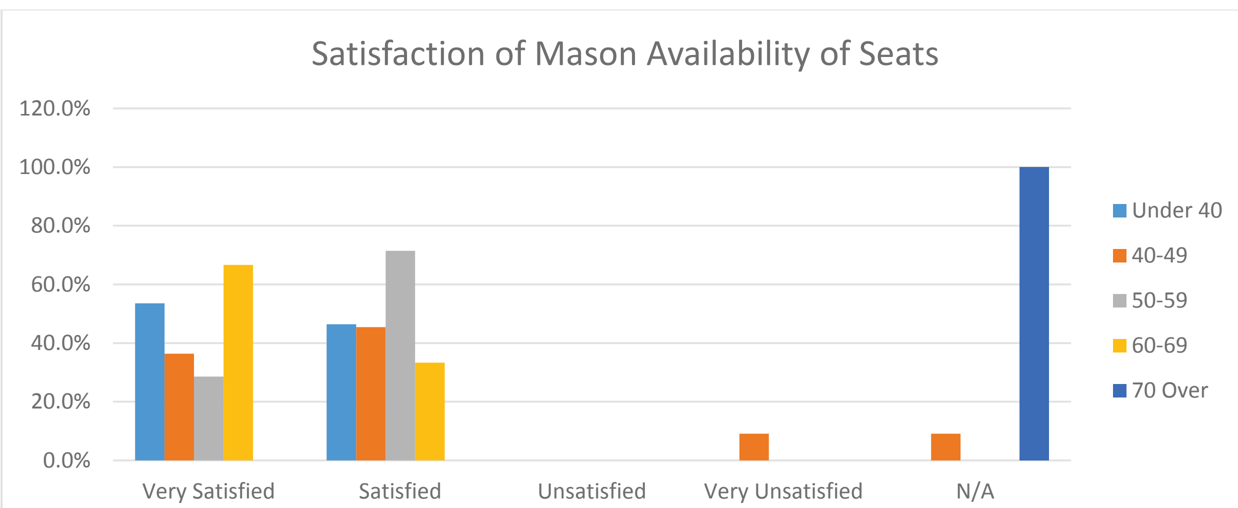

Satisfaction of Mason Wait Time
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Under 40
40-49
50-59
60-69
70 Over

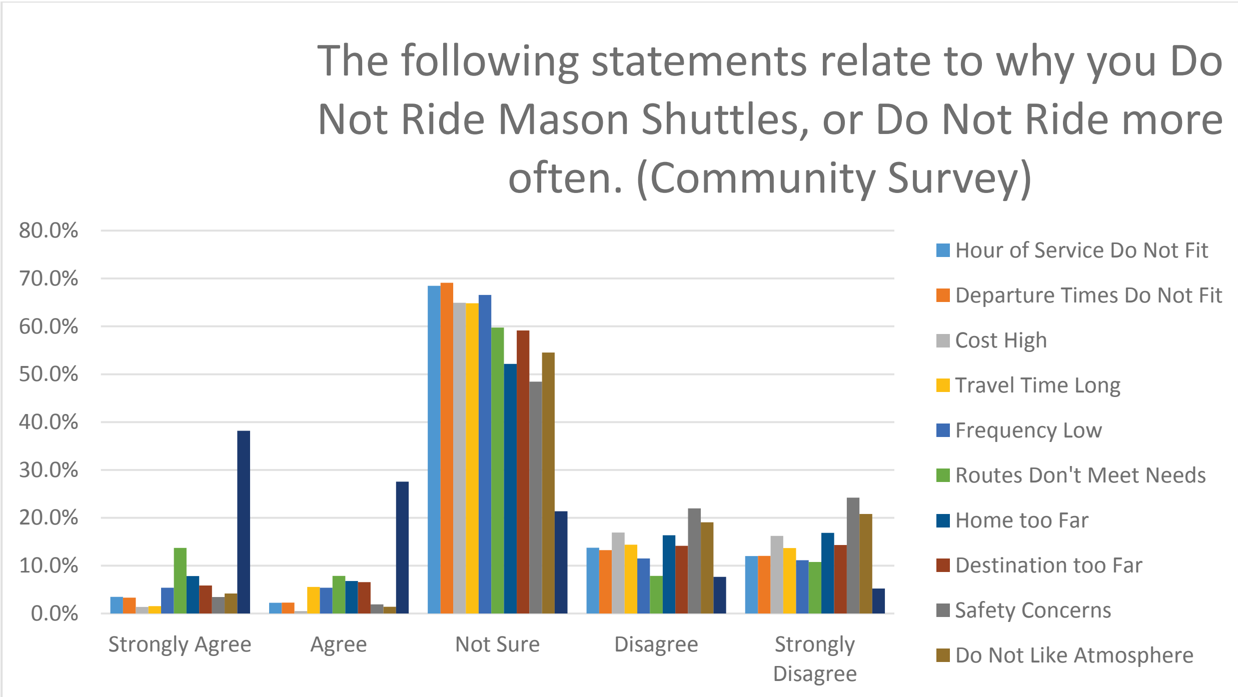

Satisfaction of Mason Travel Time
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Under 40
40-49
50-59
60-69
70 Over

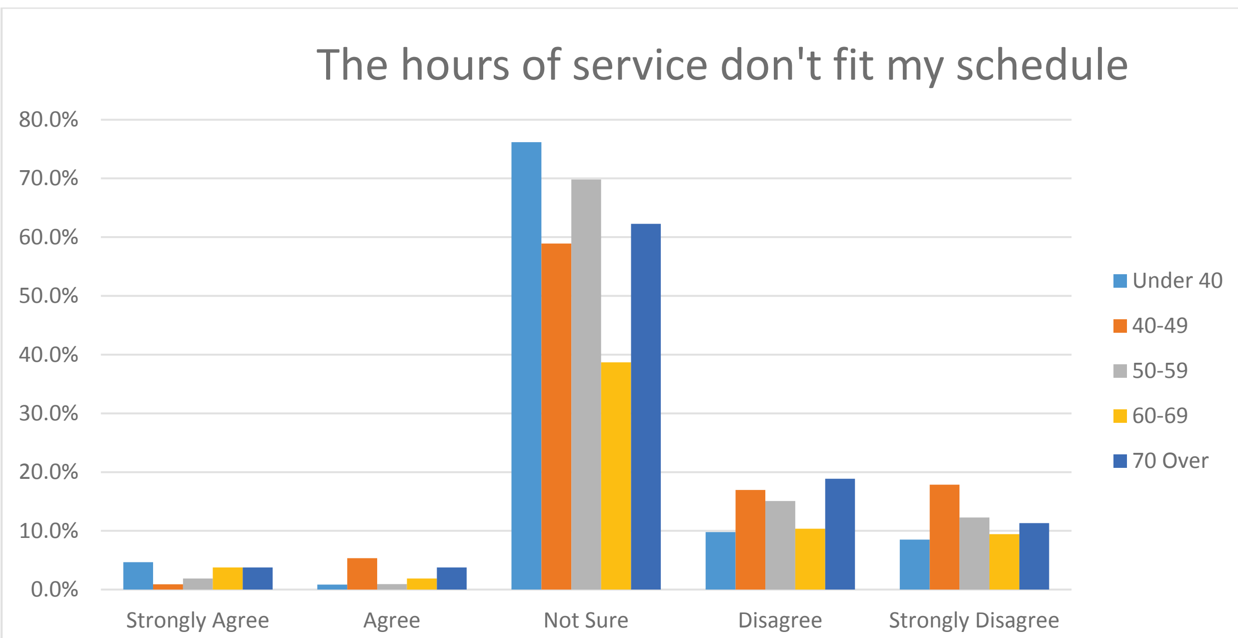

Satisfaction of Mason Safety
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Under 40
40-49
50-59
60-69
70 Over

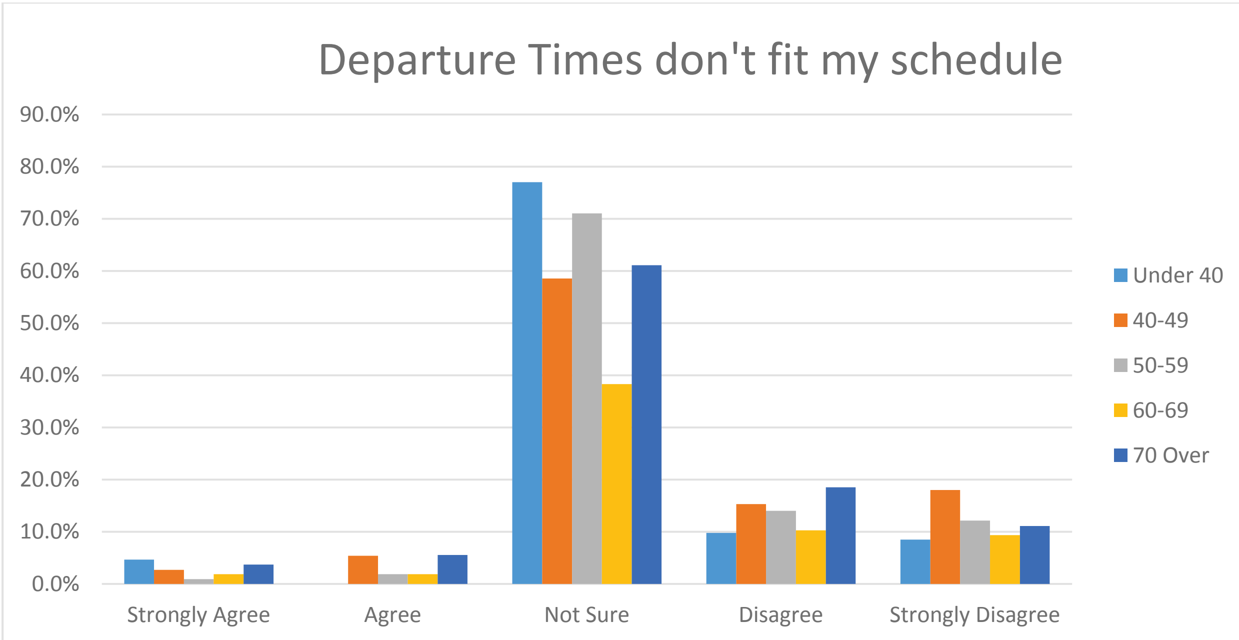

Satisfaction of Mason Cleanliness
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Under 40
40-49
50-59
60-69
70 Over

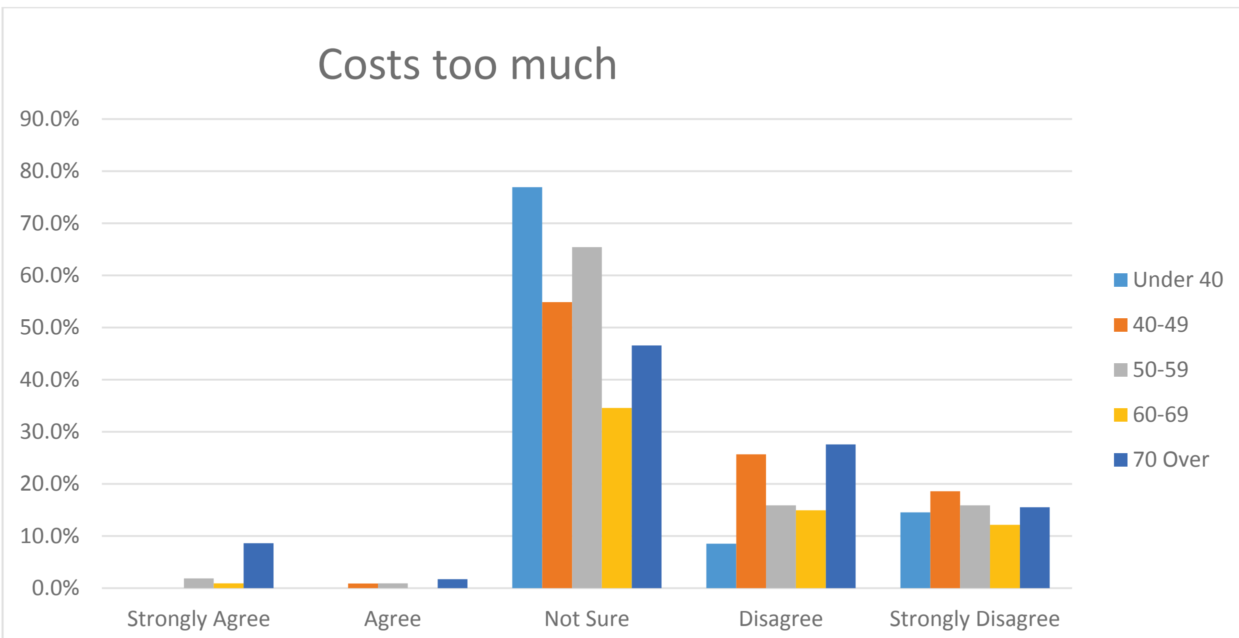

Satisfaction of Mason On-time Performance
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Under 40
40-49
50-59
60-69
70 Over

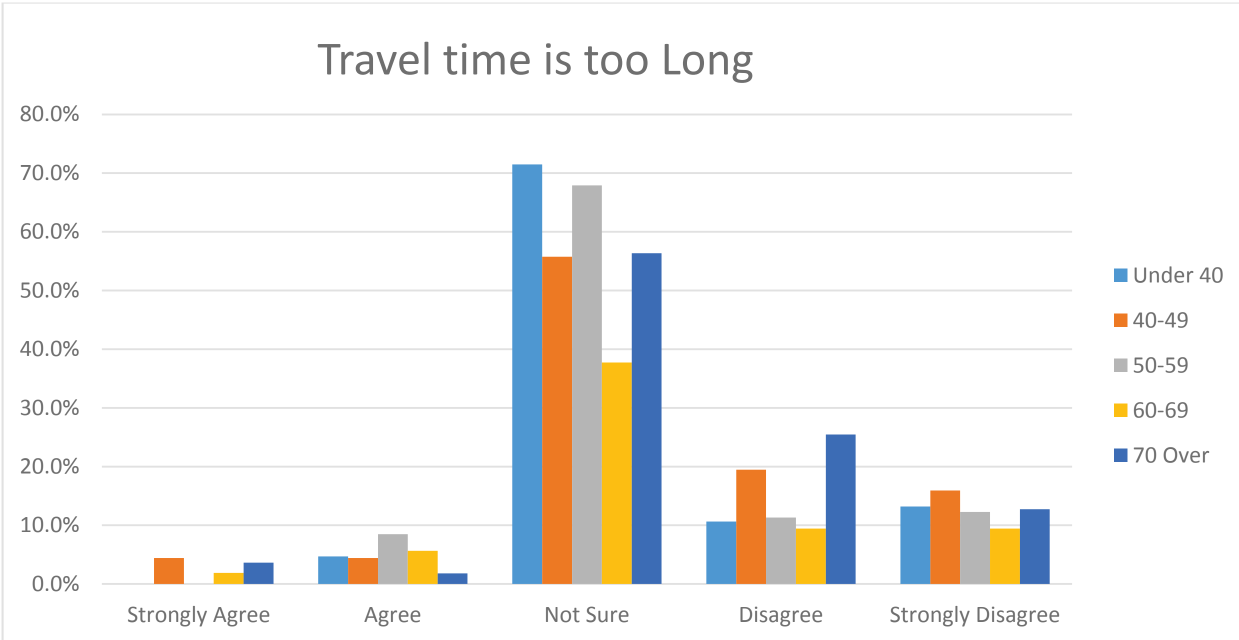

Satisfaction of Mason Availability of Seats
120.0%
100.0%
80.0%
60.0%
40.0%
20.0%
0.0%
Very Satisfied
Satisfied
Unsatisfied
Very Unsatisfied
N/A
Under 40
40-49
50-59
60-69
70 Over

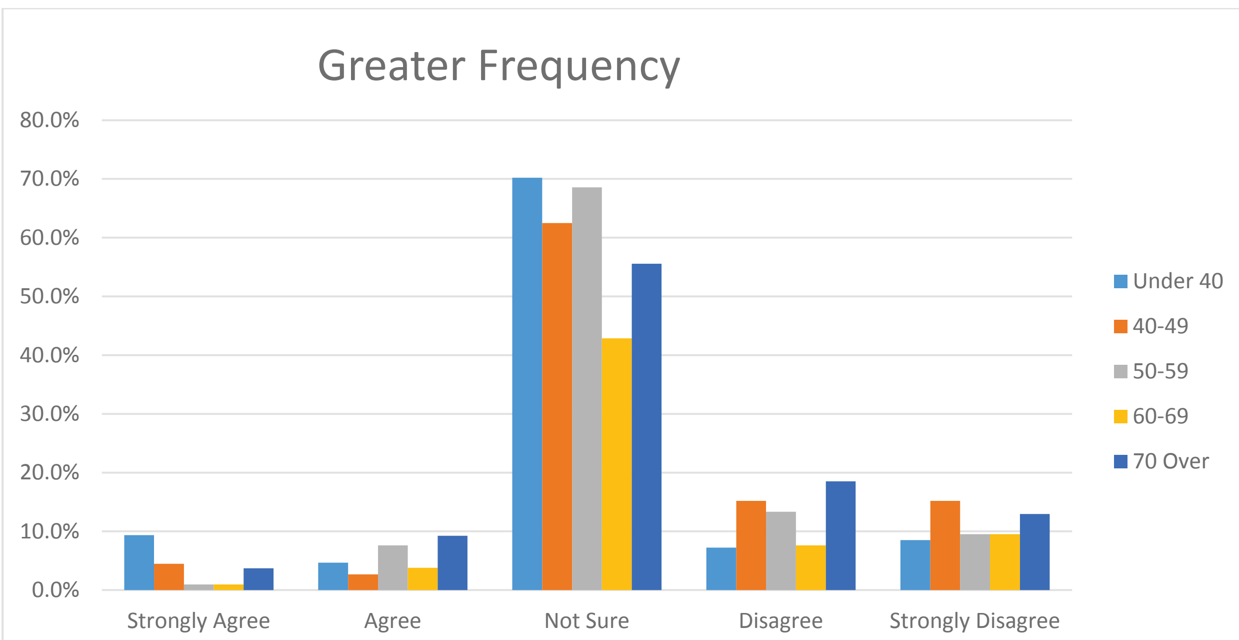

The following statements relate to why you Do Not Ride Mason Shuttles, or Do Not Ride more often. (Community Survey)
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Hour of Service Do Not Fit
Departure Times Do Not Fit
Cost High
Travel Time Long
Frequency Low
Routes Don't Meet Needs
Home too Far
Destination too Far
Safety Concerns
Do Not Like Atmosphere

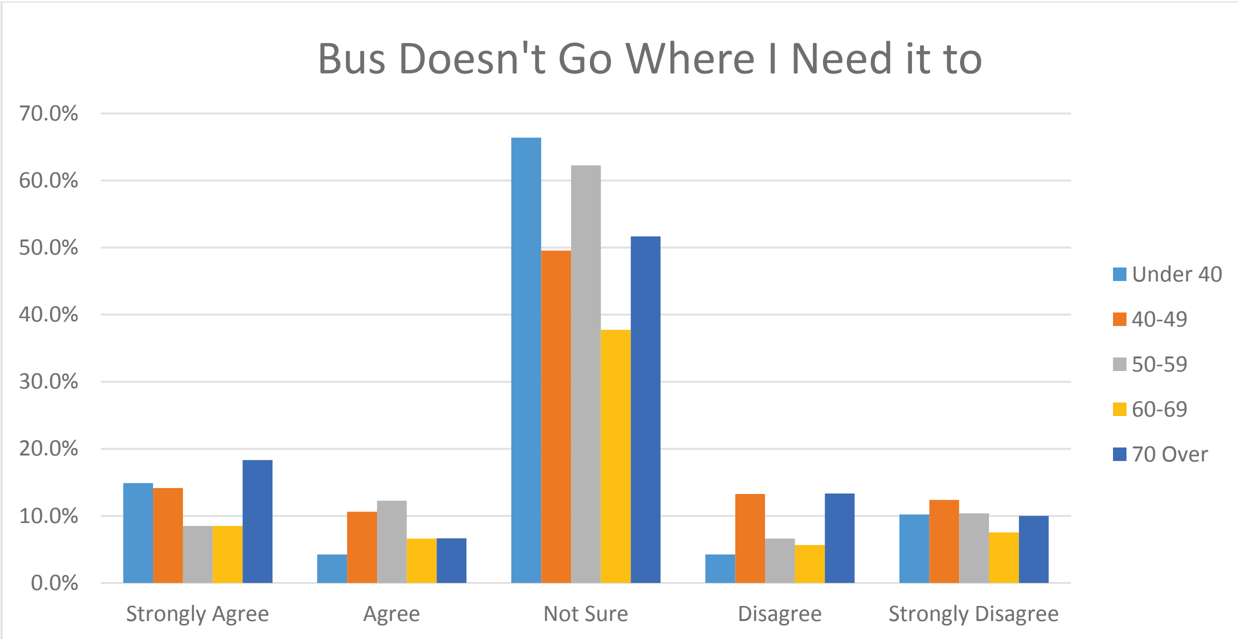

The hours of service don't fit my schedule
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

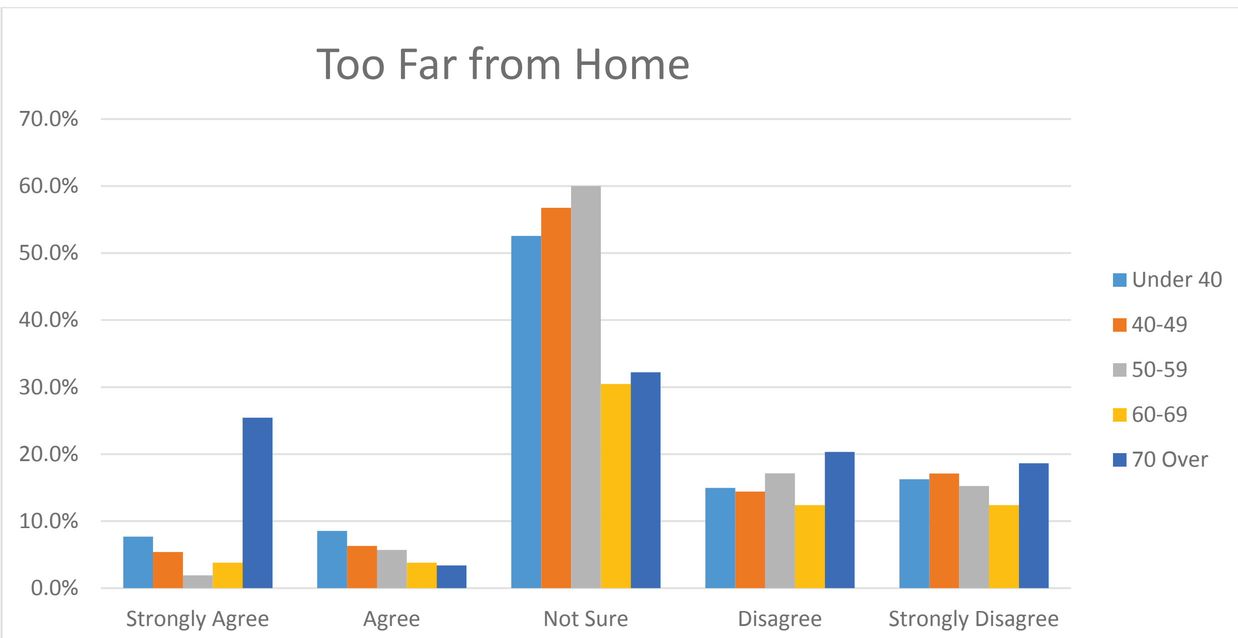

Departure Times don't fit my schedule
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

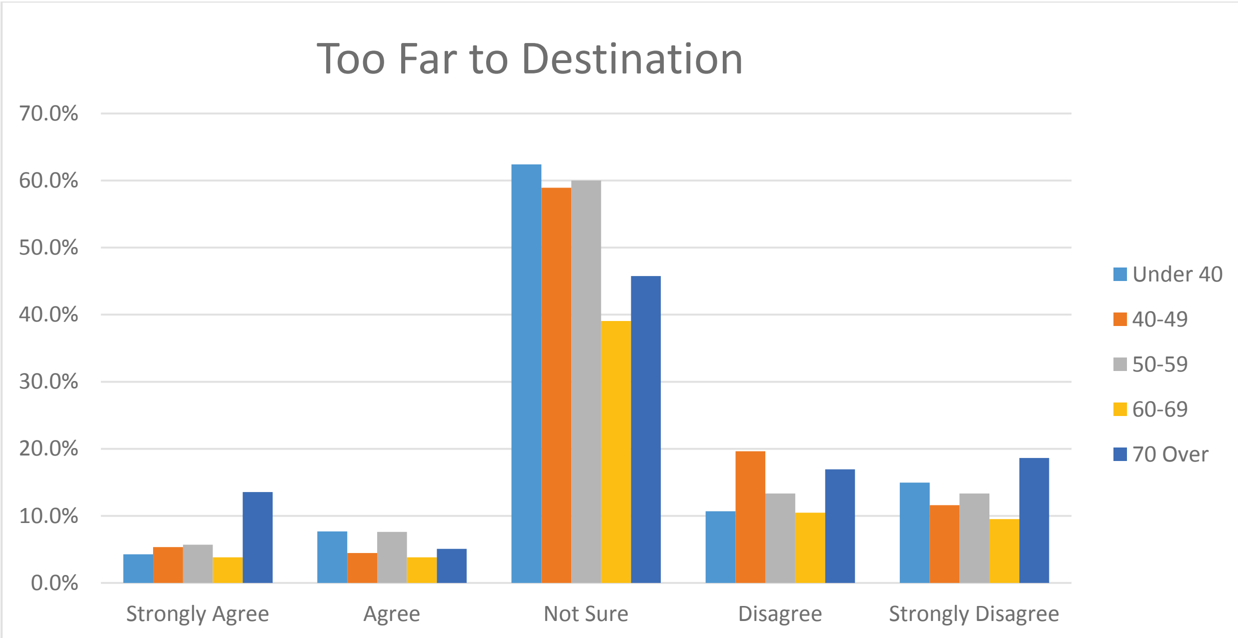

Costs too much
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

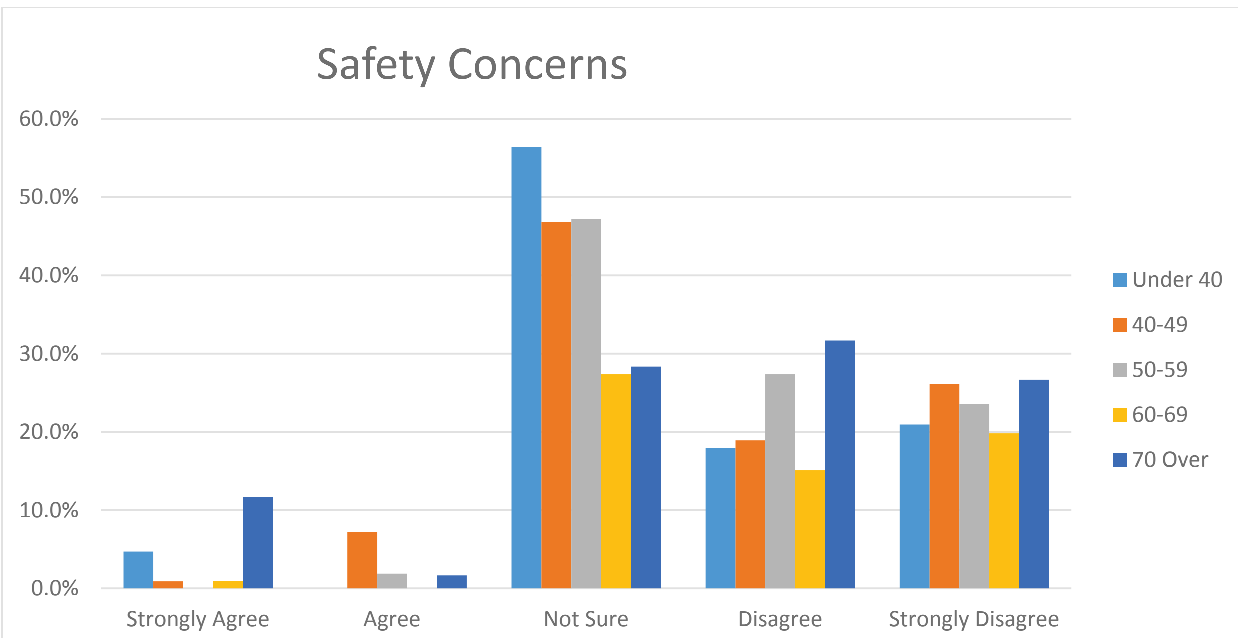

Travel time is too Long
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

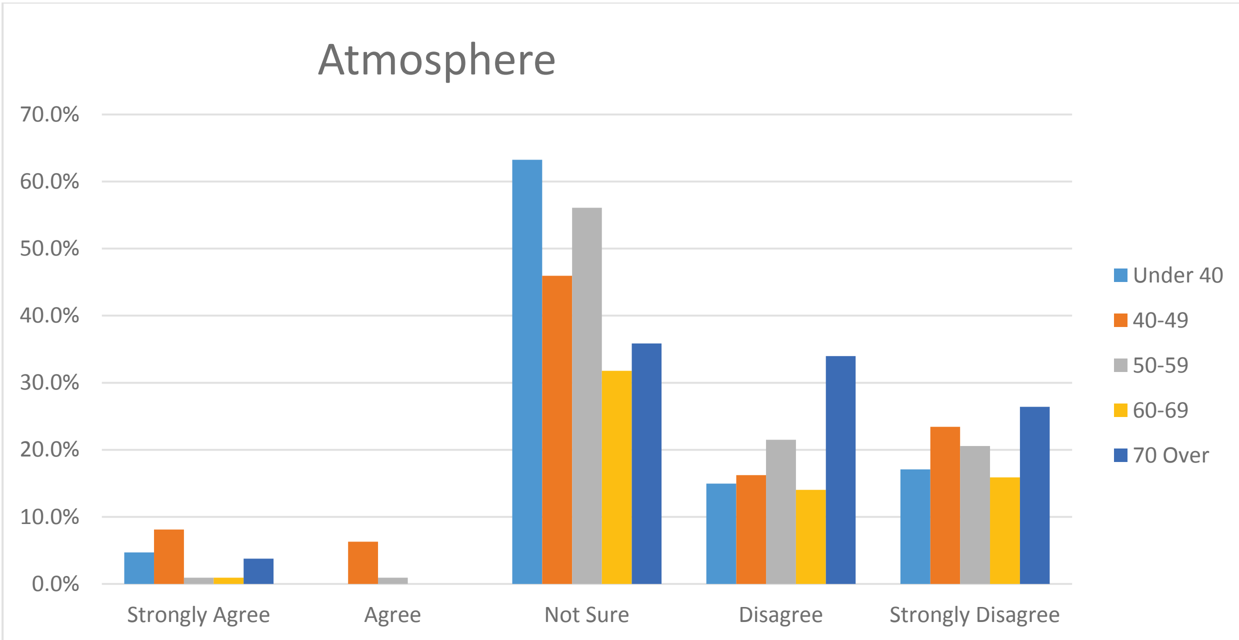

Greater Frequency
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

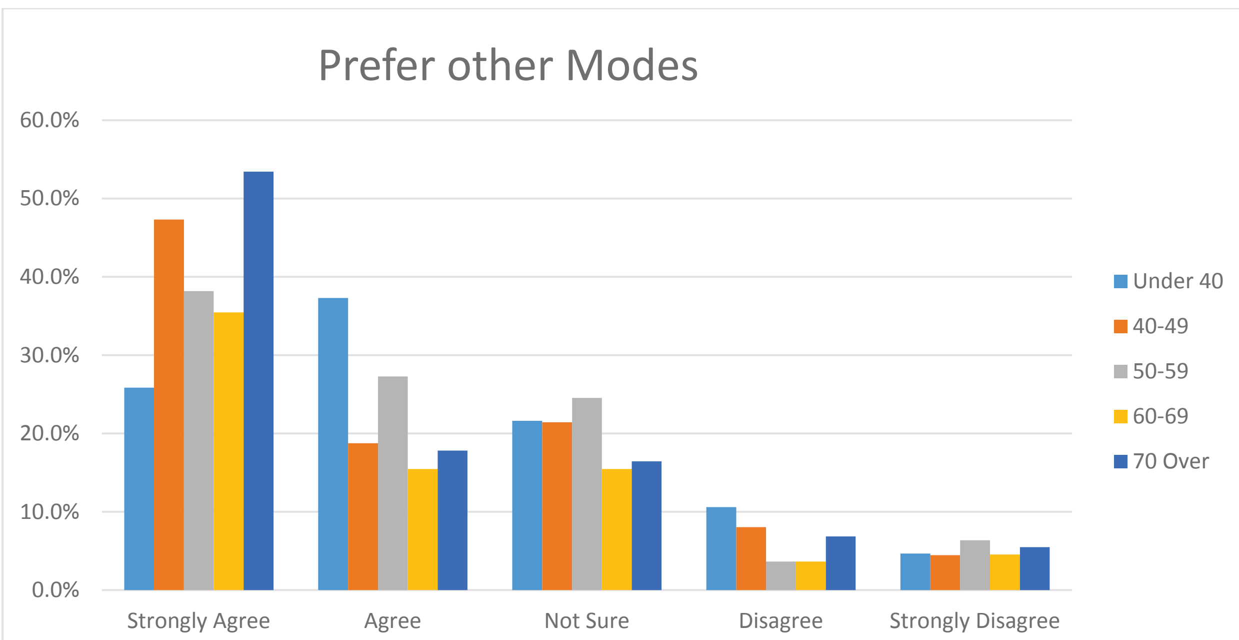

Bus Doesn't Go Where I Need it to
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

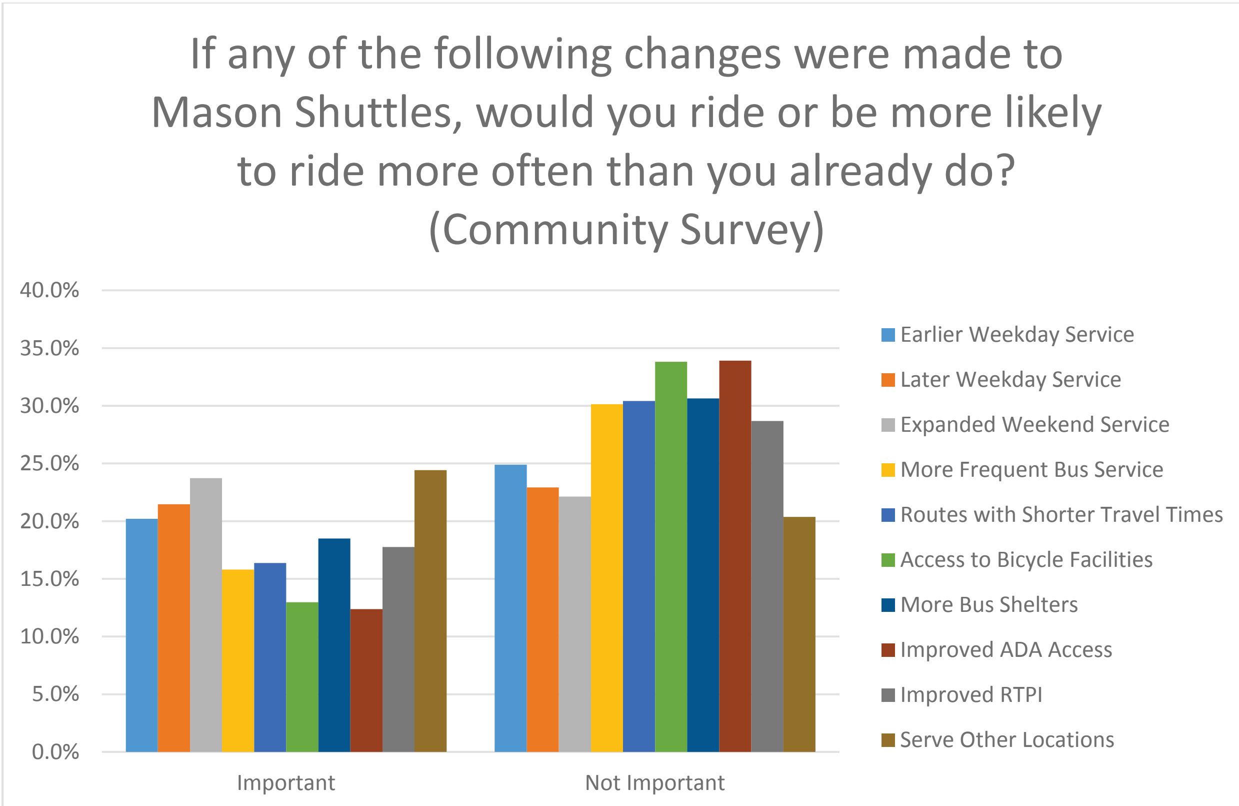

Too Far from Home
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

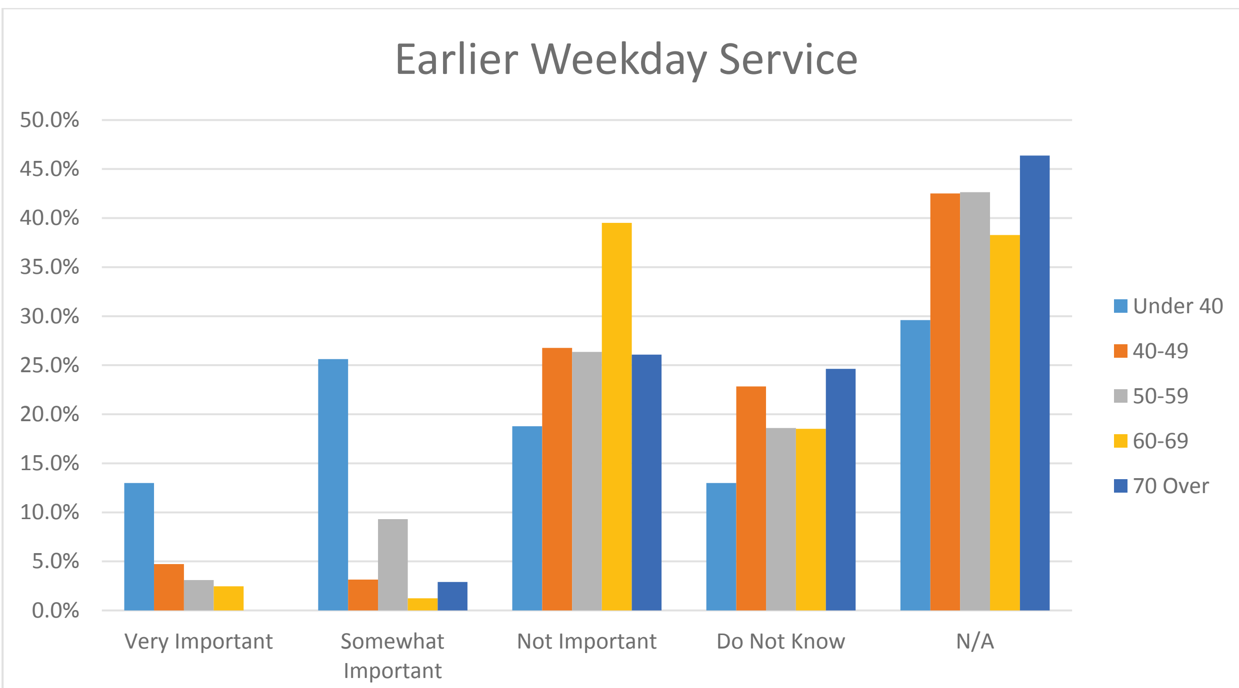

Too Far to Destination
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

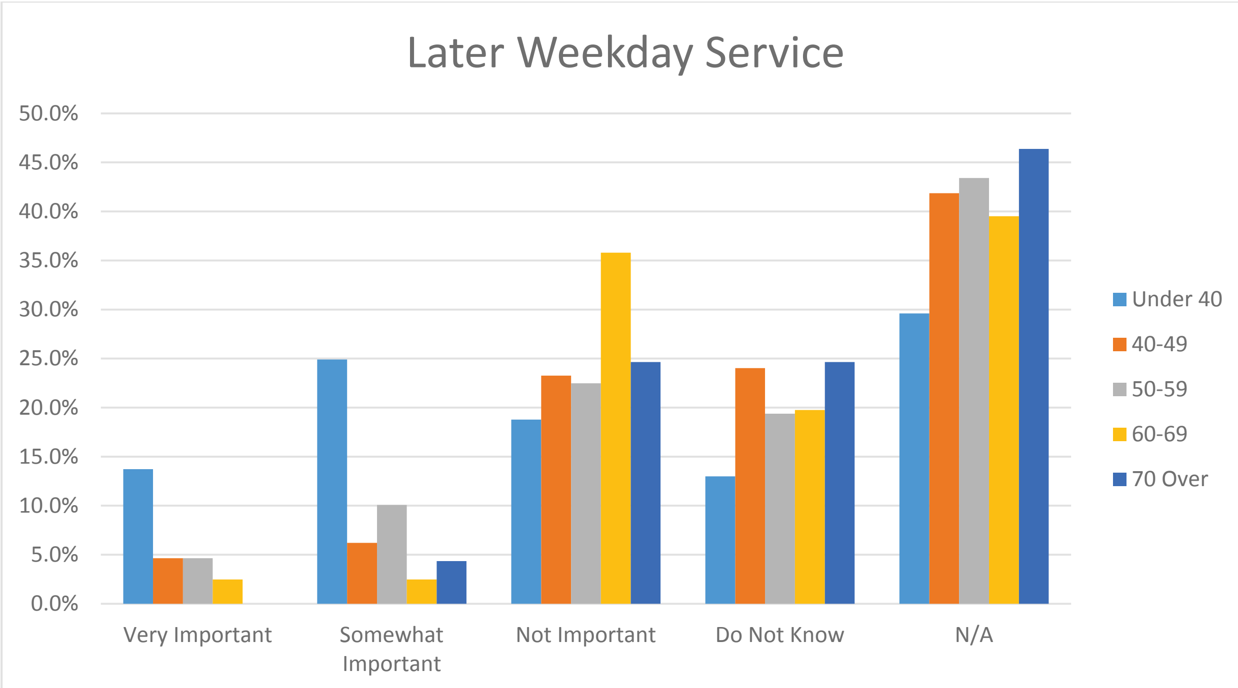

Safety Concerns
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

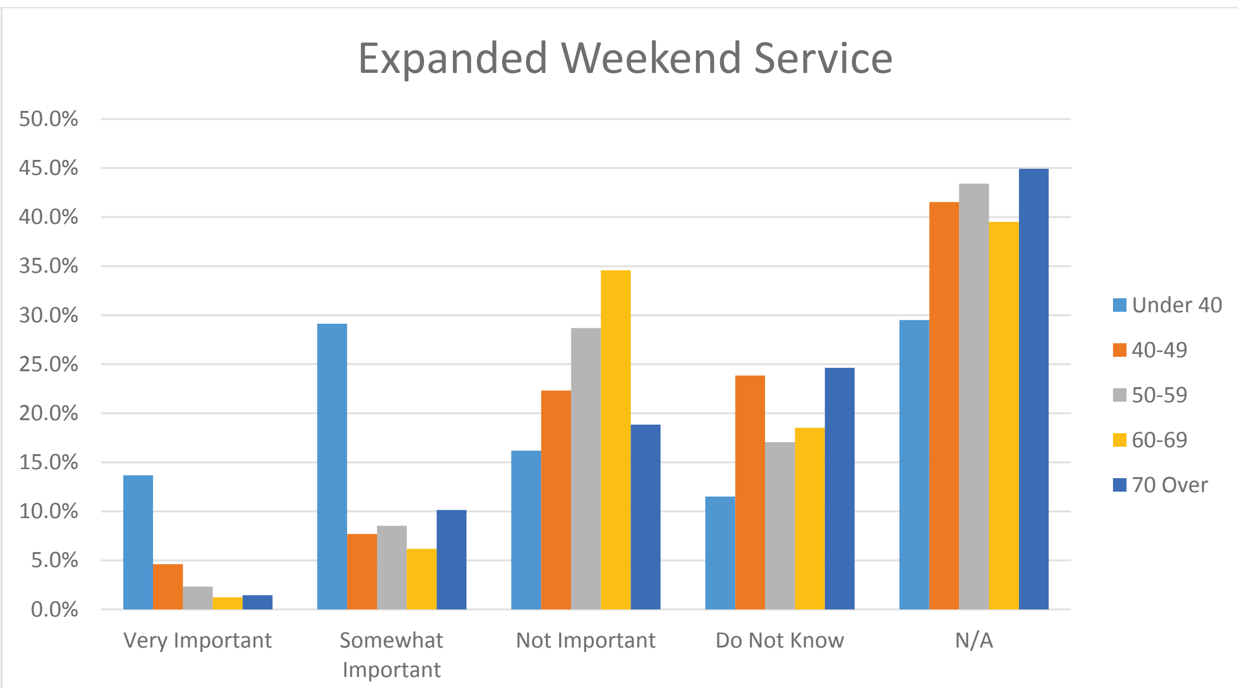

Atmosphere
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

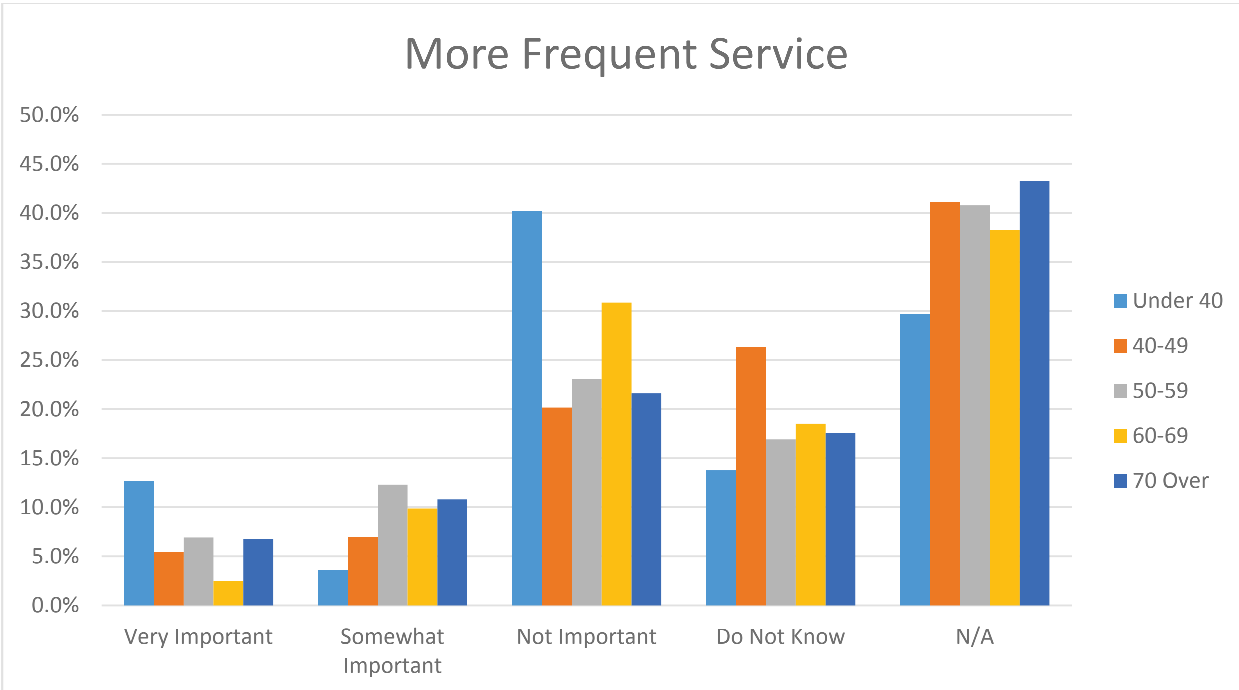

Prefer other Modes
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Strongly Agree
Agree
Not Sure
Disagree
Strongly Disagree
Under 40
40-49
50-59
60-69
70 Over

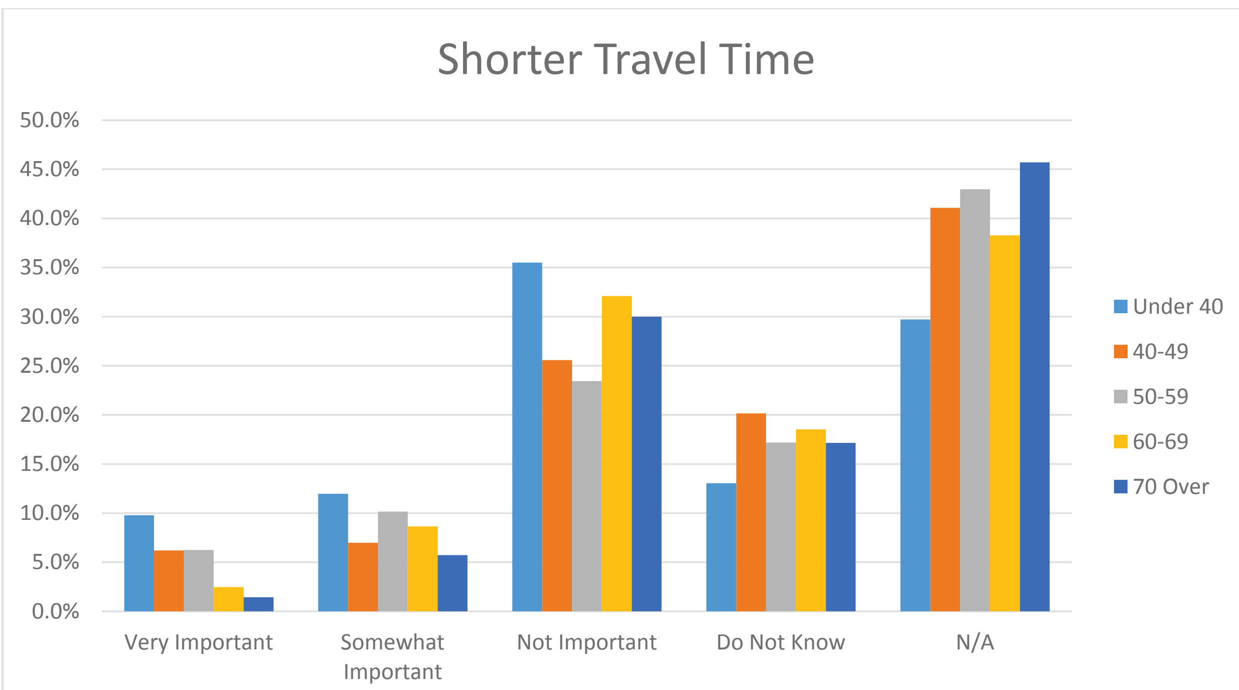

If any of the following changes were made to Mason Shuttles, would you ride or be more likely to ride more often than you already do? (Community Survey)
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Important
Not Important
Earlier Weekday Service
Later Weekday Service
Expanded Weekend Service
More Frequent Bus Service
Routes with Shorter Travel Times
Access to Bicycle Facilities
More Bus Shelters
Improved ADA Access
Improved RTPI
Serve Other Locations

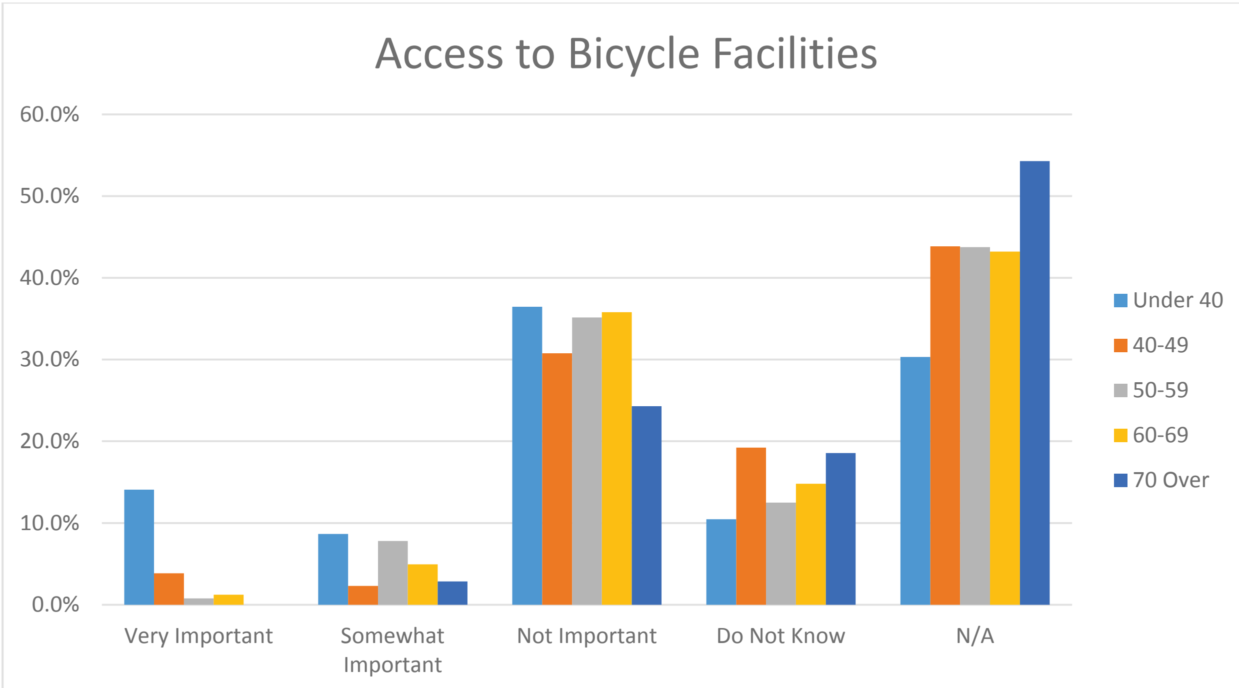

Earlier Weekday Service
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over

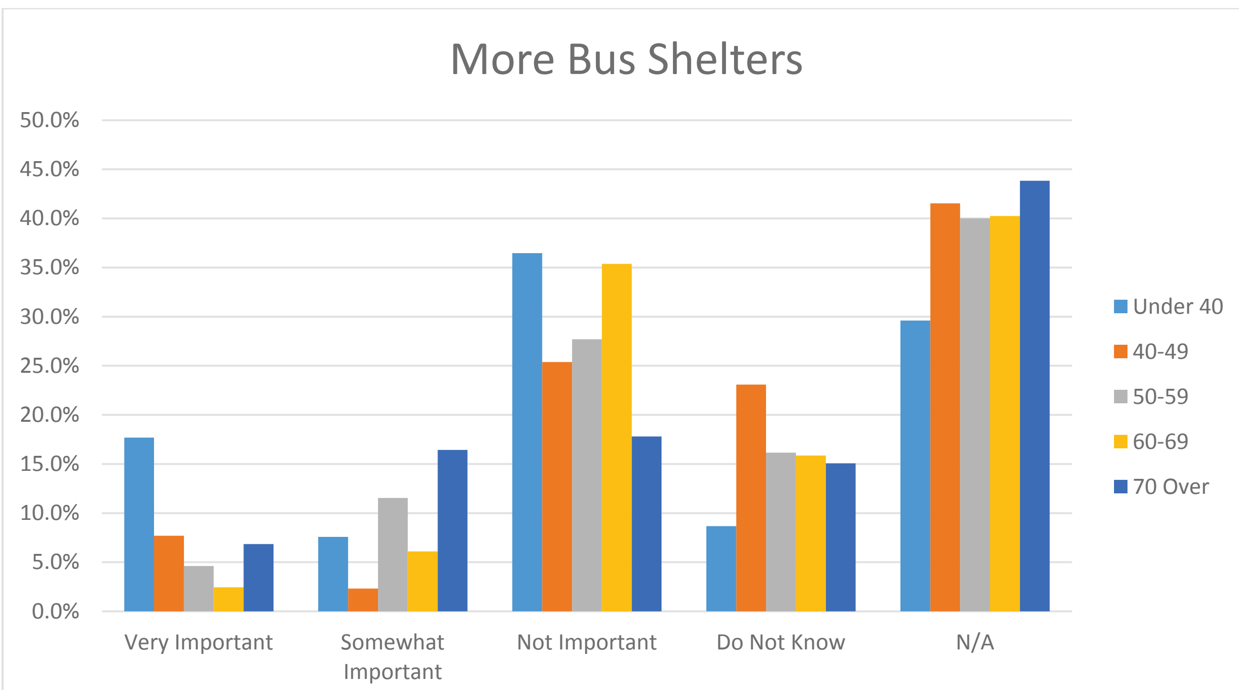

Later Weekday Service
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over

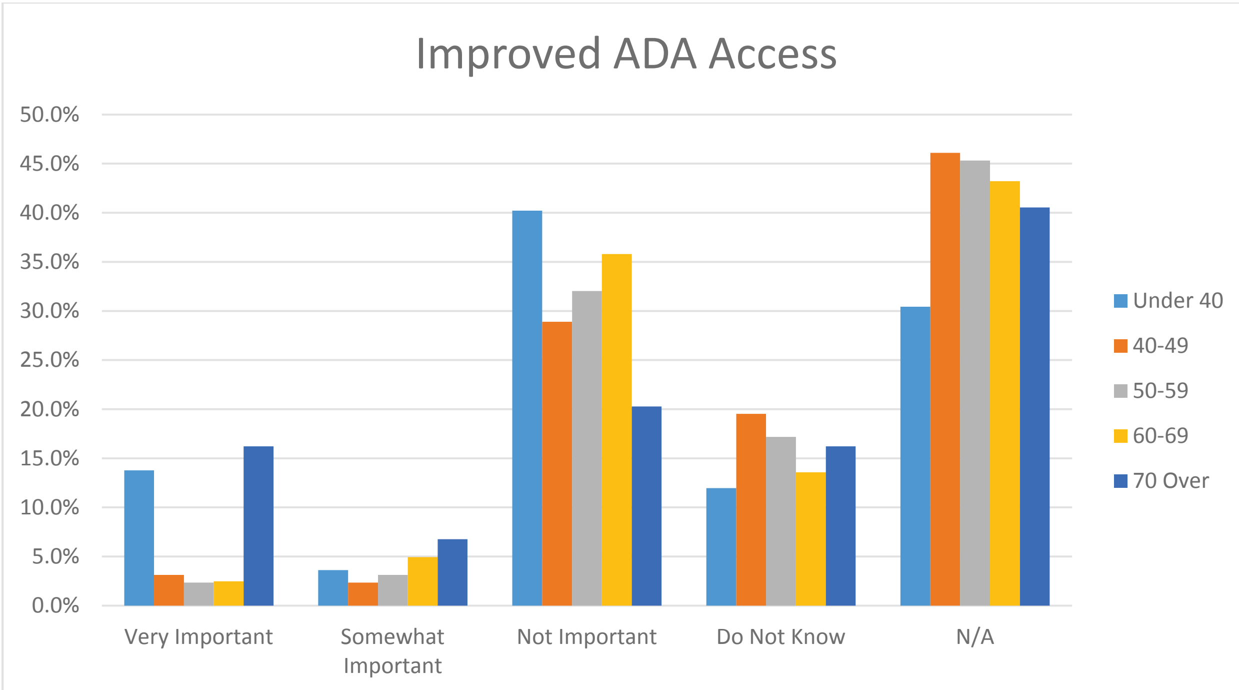

Expanded Weekend Service
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over

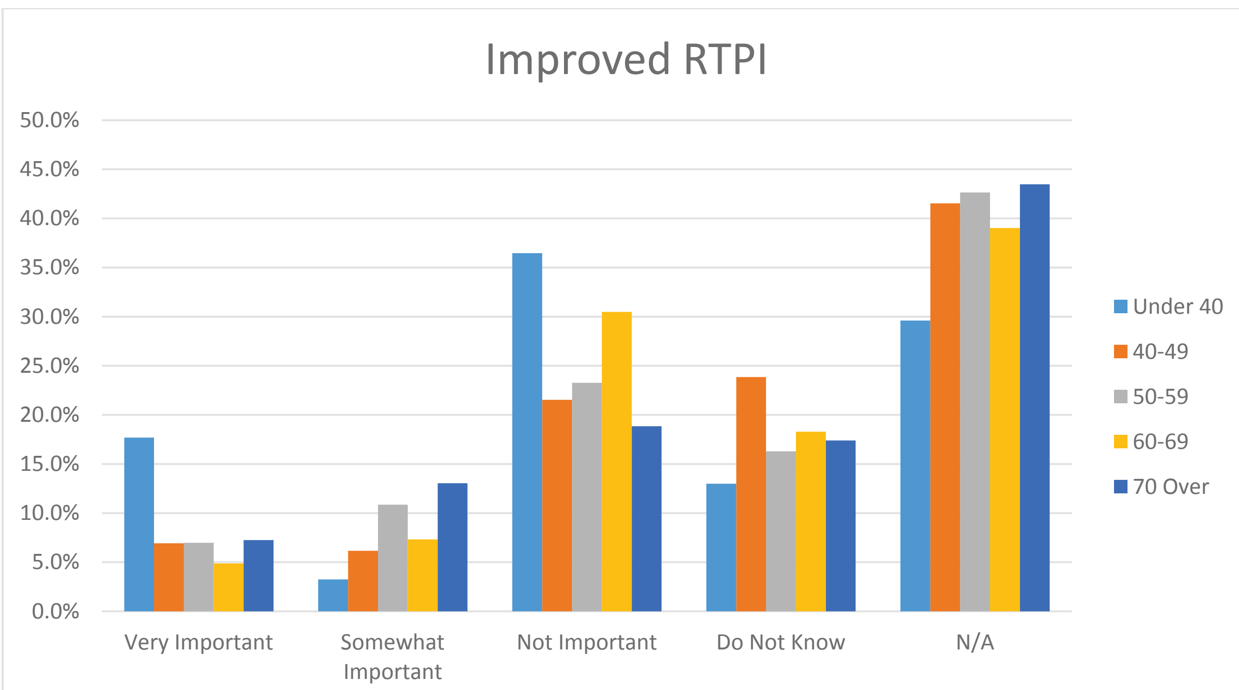

More Frequent Service
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over

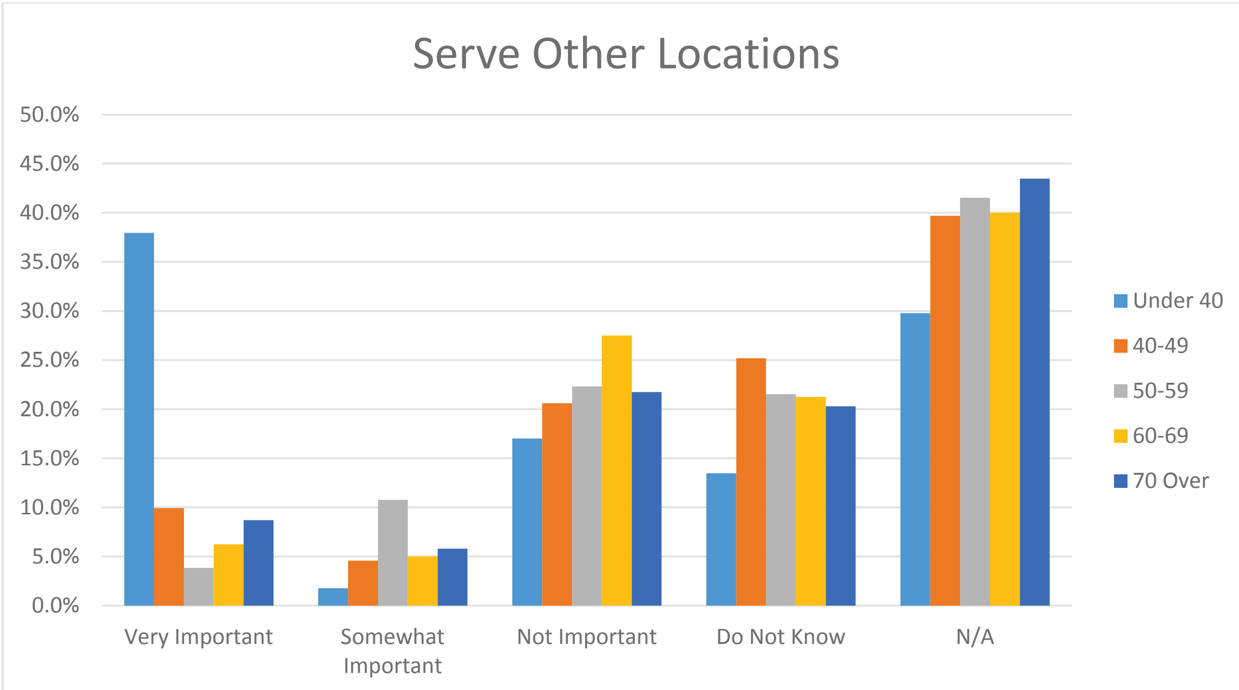

Shorter Travel Time
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over


Access to Bicycle Facilities
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over


More Bus Shelters
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over


Improved ADA Access
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over


Improved RTPI
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over


Serve Other Locations
50.0%
45.0%
40.0%
35.0%
30.0%
25.0%
20.0%
15.0%
10.0%
5.0%
0.0%
Very Important
Somewhat Important
Not Important
Do Not Know
N/A
Under 40
40-49
50-59
60-69
70 Over