Clarksville Transit System

Ridership Growth Study

09.20.2019

Prepared By:

AECOM

Transit Insight

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Overview

The mission of the Clarksville Transit System (CTS) is to plan, implement, maintain, and manage a public transportation system that allows for maximum mobility for the community, with emphasis on safety, quality, and efficiency. The purpose of this Ridership Growth Study was to review the current public transportation services provided by CTS and identify specific opportunities for ridership expansion. As is the case with many fast-growing communities, the emergence of new residential and commercial developments have the potential to produce "pockets" that receive little or no transit service.

This Ridership Growth Study identified several potential service expansions or modifications, as well as potential new routes, which would provide connections to areas within the community that may represent significant ridership. As funds become available or prioritized, CTS may implement these services to expand the reach of public transit in the Clarksville Urbanized Area as well as increase ridership productivity. The AECOM team reviewed existing conditions of the CTS service area and prepared this summary to provide guidance for future route expansion.

CTS currently provides fixed-route transit and paratransit service within the urbanized area of Clarksville, TN. CTS operates 11 routes with 24 fixed-route vehicles, as well as complementary ADA paratransit services, called the Lift, using 13 demand response vehicles. CTS provides an average of 2,340 transit rides per day.

Due to its close proximity to Nashville, a large portion of Clarksville residents work outside of the Clarksville area. To meet this need, the Regional Transportation Authority of Middle Tennessee (RTA) provides weekday express bus service to and from Downtown Nashville during the morning and afternoon peak periods. In the morning, (i.e., 5:48, 5:56, 6:20, and 6:50 am), this service (Route 94X) picks up riders at the newly constructed Park and Ride lot located on I-24 at Exit 11 in Clarksville and transports them to Music City Central where they can disembark and transfer to other routes. In the afternoon, the 94X returns to the Clarksville Park and Ride lot at 4:37, 5:20, 5:53, and 6:06 pm. Currently, CTS does not serve this area of Clarksville, so there is no opportunity for transit connections between CTS and RTA.

The main objective of this Ridership Growth Study was to identify areas within the CTS service boundaries that may have potential ridership opportunities, but are not currently served by fixed-route CTS service. The long-term goal of this study is to provide CTS the knowledge and budgeting capability to introduce service to these areas, thus improving service for the community and increasing ridership. As part of this analysis, several

Ridership Growth Opportunity Zones were identified through:

- A review of growth and development patterns over the past few years
- A review of demographics and other changes in population since the CTS Comprehensive Operational Analysis (COA) was completed in 2016
- A survey of non-riders, employers, employees, and Ft. Campbell on-base residents, as to their transit awareness, reasons for riding or not riding CTS, popular destinations, and other travel information
- A map-based analysis using a Geographic Information System (GIS) to identify any potential transit ridership zones currently not serviced by CTS

Study Area

The Clarksville Transit System focuses on the existing and anticipated mobility needs of targeted populations and the general public throughout the CTS service area. The service area is defined by the Clarksville Urbanized Area (UA) boundary and contains the cities of

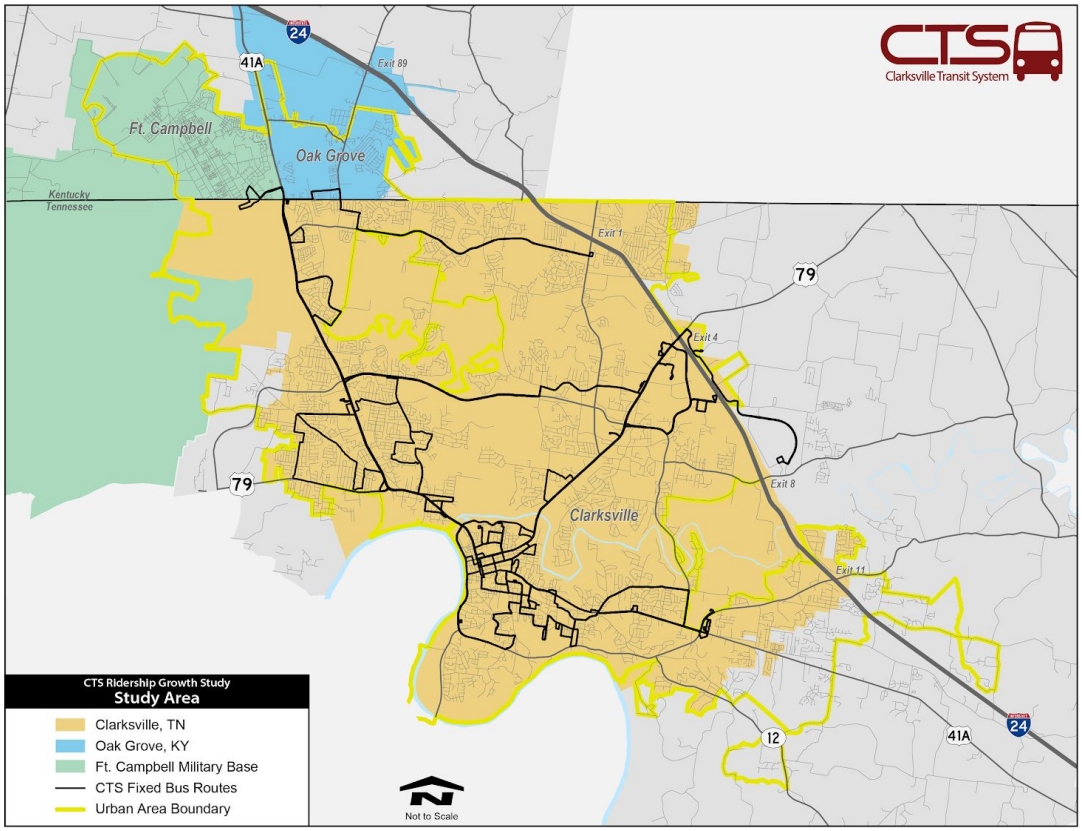


Figure 1 - Study Area

Clarksville, TN, and Oak Grove, KY. The UA also includes Fort Campbell - a US military base that spans the Tennessee-Kentucky border. The Clarksville Urbanized Area Metropolitan Planning Organization (CUAMPO) planning boundary extends beyond the Urbanized Area (UA) to include the entirety of Montgomery County, and a portion of unincorporated southwest Christian County, Kentucky, and surrounding Oak Grove. Both the UA and the CUAMPO Planning Area are included in the Clarksville, TN-KY Metro Area Core Statistical Area (CBSA) - which consists of the entirety of Montgomery, Trigg, and Christian counties. While CTS may operate outside the Clarksville city limits in the UA, only the City of Clarksville contributes to the operating and capital costs of CTS.

For the purpose of this report, the Urbanized Area boundary will serve as the study area as shown in Figure 1. The study area encompasses close to 110 square miles. Major highways that run through the study area include: I-24, US-79, and US-41A.

Current Ridership and Services

CTS provides fixed-route service Monday through Saturday, from 4:40 am – 9:00 pm on weekdays, and 6:00 am – 9:00 pm on Saturdays. Specific hours depend on the route. The service operates primarily as a radial transit system with fixed-route buses pulsing at the Downtown Transit Center (located at 200 Legion Street) at approximately the same time. Buses depart downtown to key outlying destinations then return to the Downtown Transit Center at approximately the same time, enabling passengers to transfer from one route to another to reach their final destination. Additionally, there are major transfer points along each route where routes intersect.

Ridership on CTS is healthy at an average of 2,340 rides per day. Of the 11bus routes, two of these, Route 900 and Route 901, serve as on-campus circulators, called the Peay Pickup, for Austin Peay State University. In addition, Route 1000 is a connector service to the businesses and manufacturing off of Industrial Park Drive to the east . These three routes do not travel to the Downtown Transit Center, but do offer connections to other CTS fixed routes in the area.

A listing of CTS fixed routes is provided on the following page as well as the current CTS System map, shown in Figure 2. The map illustrates that CTS provides both north-south movement along major roadways in addition to east-west movement, or cross-town services. Headways, or the frequency of bus service, on CTS routes generally range from 30 minutes to 1 hour - with most routes pulsing on the hour or half-hour.

List of CTS Fixed Routes:

- Route 1 – Fort Campbell
- Route 2 – Tiny Town Road
- Route 3 – Cunningham Loop
- Route 4 – Peachers Mill Road
- Route 5 – Hilldale
- Route 6 – Madison Street
- Route 7 – Governor's Square Mall
- Route 8 – 101 Express/Hospital
- Route 900 – Peay Pickup - North Loop
- Route 901 – Peay Pickup - South Loop
- Route 1000 – Industrial Park

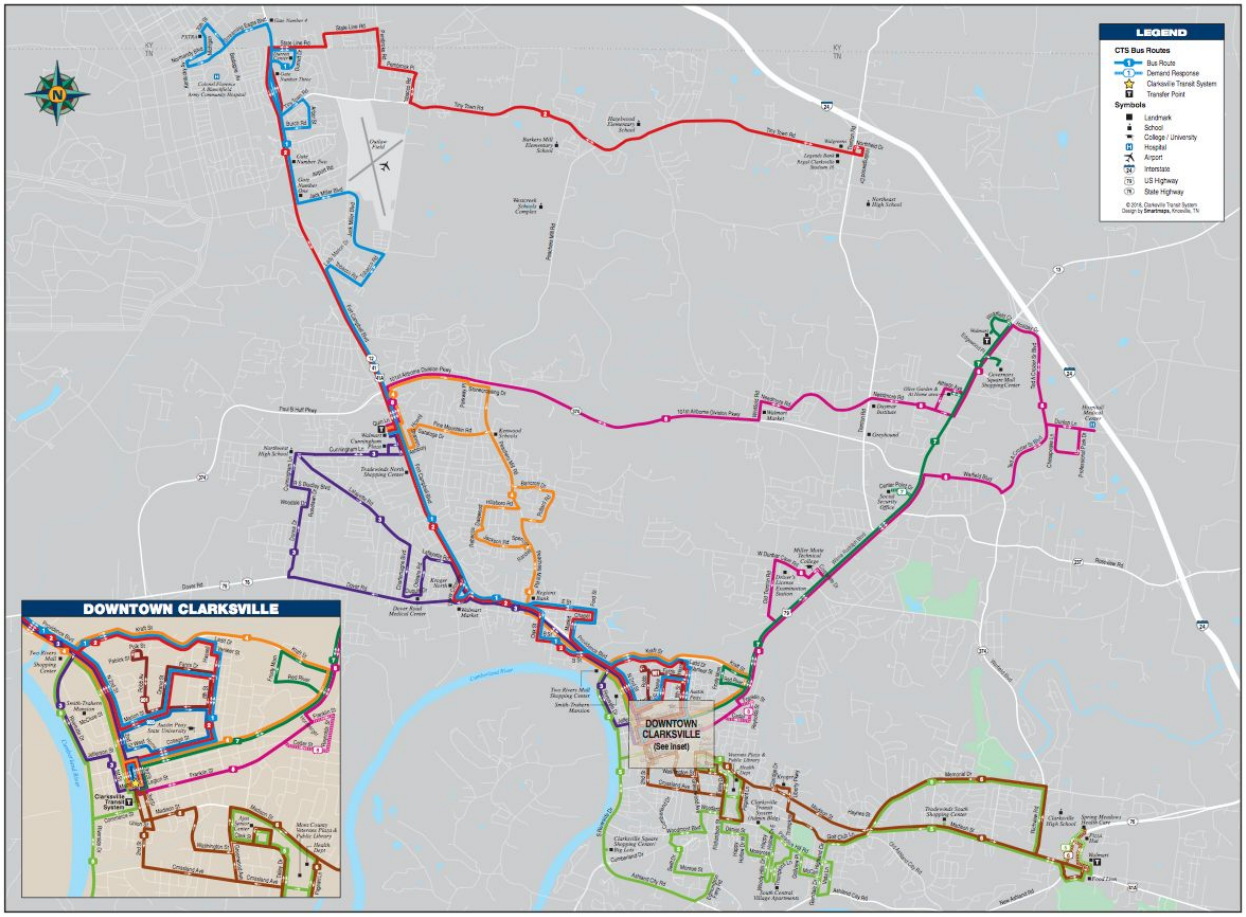


Figure 2 - Clarksville Transit System Route Map

The 2016 COA provided an in-depth review of CTS routes, including performance metrics. The table below contains an update to selected metrics for the 12 month period between June 2018 to May 2019.

Table 1 - CTS Performance Metrics

Route	Farebox Recovery (FR)		Pax/Hour		Pax/Mile		Net Cost/Pax	
	2015	**2019**	2015	**2019**	2015	**2019**	2015	**2019**
Route 1 – Fort Campbell	10.6 %	**9%**	11.40	**10.24**	0.65	**0.63**	$7.49	**$7.26**
Route 2 – Tiny Town Road	10.1%	**10%**	10.61	**10.18**	0.52	**0.52**	$8.05	**$7.30**
Route 3 – Cunningham Loop	10.7%	**10%**	12.66	**11.40**	0.73	**0.67**	$6.74	**$6.51**
Route 4 – Peachers Mill Road	7.4 %	**7%**	8.63	**7.73**	0.50	**0.46**	$9.89	**$9.61**
Route 5 – Hilldale	7.3 %	**6%**	9.22	**8.05**	0.60	**0.53**	$9.26	**$9.23**
Route 6 – Madison Street	8.8 %	**8%**	15.60	**13.39**	1.01	**0.89**	$5.47	**$5.55**
Route 7 – Gov. Square Mall	6.8 %	**6%**	11.54	**9.38**	0.74	**0.61**	$7.40	**$7.92**
Route 8 – 101 Express/Gateway Medical Ctr.	5.2 %	**5%**	6.28	**5.18**	0.31	**0.28**	$13.60	**$14.34**
Route 1000 – Industrial Park	N/A	**2%**	N/A	**0.02**	N/A	**0.06**	N/A	**$44.89**
System Average	8%	**7%**	10.7	**8.40**	0.60	**0.52**	$8.49	**$12.51**

As seen in Table 1, ridership on these services remains solid; however, based on the current net cost per passenger, CTS may wish to consider Route 1000 for potential remediation or modification. This could include targeted marketing to employers along the route, route revisions, or service elimination. Should this route be eliminated, there may be opportunities to divert some of these operating funds into new services proposed in the *Service Opportunities and Recommendations* section of this report.

Existing travel nodes and activity centers

Activity centers and popular destinations within the City of Clarksville remain largely unchanged since the 2016 COA study was completed; however, there are areas of higher growth and new development as illustrated in the Transit Score maps and figures in the *Project Analysis* section. A listing of the current Activity Centers is shown in Table 2.

Table 2 - Activity Centers and Popular Destinations

ID	Name	Address	Served by CTS
1	Transit Center	200 Legion St.	**Yes**
2	Austin Peay State University	601 College St.	**Yes**
3	Tradewinds North Shopping Center	1596 Ft. Campbell Blvd.	**Yes**
4	Wal-Mart (Ft. Campbell Blvd.)	1680 Ft. Campbell Blvd.	**Yes**
5	Fort Campbell - Gate #1	N/A	**Yes**
6	Fort Campbell - Gate #2	N/A	**Yes**
7	Fort Campbell - Gate #3	N/A	**Yes**
8	Fort Campbell - Gate #4	N/A	**Yes**
9	Fort Campbell - Gate #6	N/A	**No**
10	Blanchfield Army Community Hospital	650 Joel Dr.	**No**
11	PXTRA	2840 Bastogna Ave.	**Yes**
12	Outlaw Field	Outlaw Field Rd.	**Yes**
13	Regal Clarksville Stadium 16	1810 Tiny Town Rd.	**Yes**
14	Two Rivers Mall Shopping Center	668 N. Riverside Dr.	**Yes**
15	Dover Road Medical Center	201 Dover Rd.	**Yes**
16	Cunningham Plaza	1636 Ft. Campbell Blvd.	**Yes**
17	Heritage Park	1241 Peachers Mill Rd.	**Yes**
18	Clarksville Square Shopping Center	1031 S. Riverside Dr.	**Yes**
19	Ajax Senior Center	951 Clark St.	**Yes**
20	Veterans Plaza	350 Pageant Ln.	**Yes**
21	Tradewinds South Shopping Center	1937 Madison St.	**Yes**

22	Spring Meadows Health Care	220 HWY 76	**Yes**
23	Wal-Mart (Madison St.)	2315 Madison St.	**Yes**
24	Driver's License Examination Station	220 W Dunbar Cave Rd.	**Yes**
25	Miller-Motte Technical College	1820 Business Park Dr.	**Yes**
26	Daymar College	2691 Trenton Rd.	**Yes**
27	Social Security Office	119 Center Pointe Dr.	**Yes**
28	Governors Square Mall	2801 Wilma Rudolph Blvd.	**Yes**
29	Wal-Mart (Wilma Rudolf Blvd.)	3050 Wilma Rudolph Blvd.	**Yes**
30	Gateway Medical Center	651 Dunlop Ln.	**Yes**
31	Dunbar Cave State Park	401 Old Dunbar Cave Rd.	**No**
32	Clarksville Marina	250 Marina Way	**No**
33	Corporate Business Park	N/A	**No**
34	Publix (New) - Sango	920 MLK Jr Pkwy / Hwy 76	**No**
35	TDOT/RTA Park and Ride (New)	Exit 11 Park and Ride on Hwy 76	**No**
36	Greyhound Bus Station	2249 Lowes Dr. West	**No**
37	Oak Grove Racing and Gaming (Under development)	Corner of Ft. Campbell Blvd. and Thompsonville Ln.	**No**
38	Hankook	2950 International Blvd.	**Yes**
39	LG Electronics North America	101 Life's Good Way	**No**

New development is occurring throughout Clarksville and, where feasible, CTS should consider providing service to some of these new communities. From the list above, this study recommends providing service to the new Park & Ride lot, Publix, the recent development on MLK Jr Blvd. / SR-76, the Greyhound bus station, and the proposed Oak Grove Racing and Gaming facility. More details about these recommendations are provided in the *Service Opportunities and Recommendations* portion of this report.

Web Survey Results

Survey Overview

Four surveys were conducted to solicit both rider and non-rider opinions about CTS and potential new service areas. A web-based survey was developed and distributed through the City of Clarksville, CTS, and CUAMPO websites as well as the housing authority on Ft. Campbell. The primary survey instrument was called the Community Survey and was open to the general public. Announcements were pushed out to email lists, APSU, and links were placed on CTS and city websites to notify individuals within the broader Clarksville community. The Community Survey was open from May 3rd, 2019 through June 4th, 2019. During this time, 390 responses were received. A Spanish version was also provided, however, no responses were submitted.

The second and third surveys involved both employers and employees within the region. With the assistance of CUAMPO and the Clarksville Area Chamber of Commerce, a short explanation of the survey and links to an Employer Survey, as well as an Employee Survey were distributed via email to Chamber members with more than three employees. Additionally, emails were sent to the Human Resource Directors of Clarksville Manufacturers Association members.

The Employer Survey was targeted at gathering information about employee travel needs from the perspective of the employer. It also served as an opportunity to make employers aware of CTS as a possible transportation option for their employees. Employers were requested to notify their employees and provide them an opportunity to complete the Employee Survey.

The goal of the Employee Survey was to solicit specific feedback from employees about their personal travel needs. This survey was identical to the Community Survey; however, it also included a question requesting the name of their employer. This allowed responses to be separated by employer to identify any specific needs or trends within the community. These surveys were distributed and collected the week of May 20th. During that time, responses were received from 6 employers and 17 employees. Of the 17 employee responses, seven were from the Tennessee College of Applied Technology, which is currently outside of the CTS service area. It appears that none of the businesses that responded to the Employer Survey also had employees that completed the survey. Of the 17 employee responses, 8 did not indicate their employer at all. Because the intent of the Employee Survey was to look for business and location specific transportation challenges, this task was not completed. Consequently, the results were merged with the other survey

responses received from the overall Community Survey. This yielded a total of 407 survey responses.

The last survey was developed and distributed based on the results from the Transit Score analysis. As shown on the map in Figure 3, there is a high transit propensity score focused near the Ft. Campbell residential housing areas. In addition, there is a Walmart Supercenter and a soon to be constructed racing and gaming facility in Oak Grove, both of which are currently not served by CTS.

Based on this analysis, the study project team agreed that a survey of residents in that community may provide additional information about travel patterns and transit preferences. In cooperation with the Ft. Campbell Public Works and Property Management departments, a similar community survey was designed and distributed on base. This effort was accordingly folded into the project at a later date and therefore distributed between August 8th, 2019 to August 14th, 2019. During this time we received a total of 87 surveys from on-base residents.

Summaries of the responses for all surveys are provided in the pages that follow.

Community Survey Results

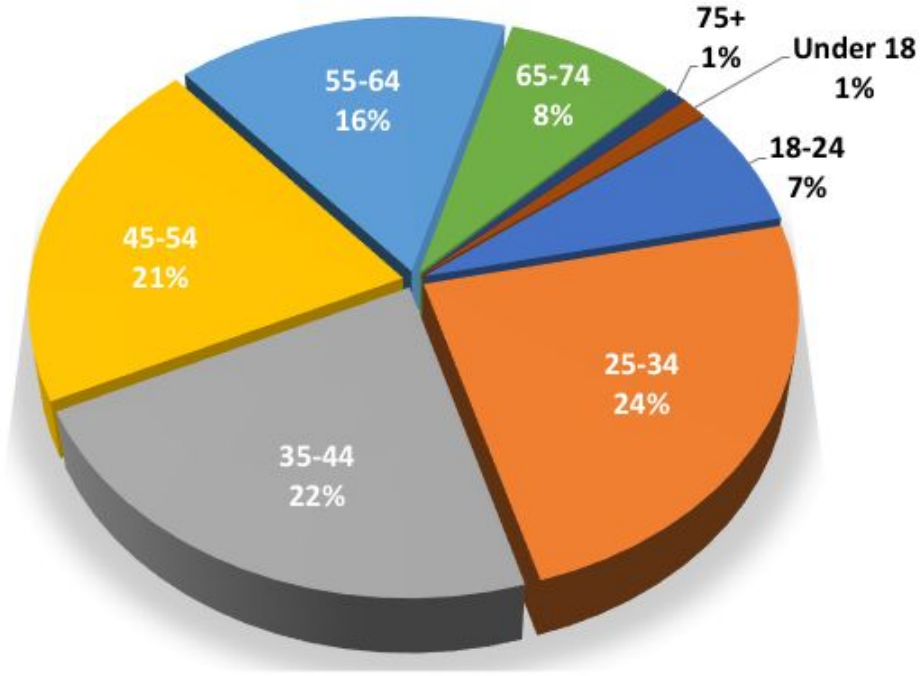
The Community Survey was designed as a short, 15 question, self-reporting survey. The majority of questions were not required questions and therefore could be skipped by the participants without aborting the survey; however, response rates for all of the questions were very strong, with the biggest drop-off in responses on the write-in style questions, which is common. Overall, the survey provided a comprehensive database of responses. In addition to the multiple-choice and select-many style questions, several questions allowed for “other” or “fill-in” responses to gather as much information from participants as possible.

The survey results helped inform the demographic and geographic service analysis; however, as a web-based, self-selected survey, these results are not intended to be a representative sample of Clarksville residents and is not statistically significant. Rather, these results provide a snapshot of some resident’s opinions about using transit as well as their familiarity with CTS.

Age

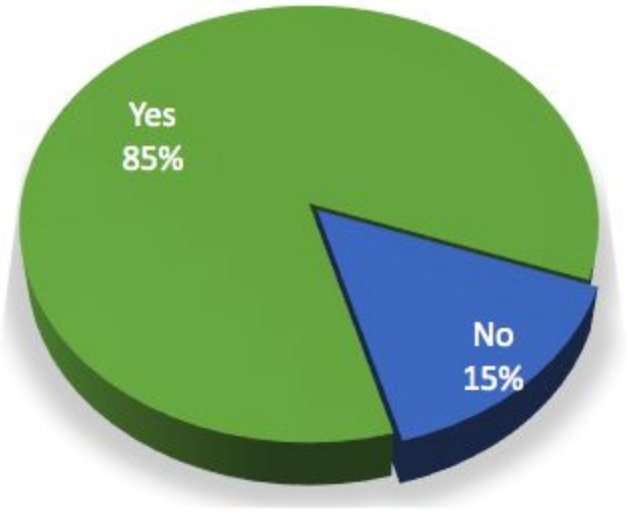
The age distribution was very even across the board, with the top three ranges between 20 and 25%. Overall, the majority of respondents fell between the 25 - 65 range, at 83%. An effort was made to target APSU students before the school year ended, and while there was not a specific question to identify APSU students, it is likely that many responses in the 18-24 age range, as well as some in the 25-34 age range were students. The relatively even distribution of age responses provides some confidence that the survey does cover a good cross-section of potential riders.

What is your age range?



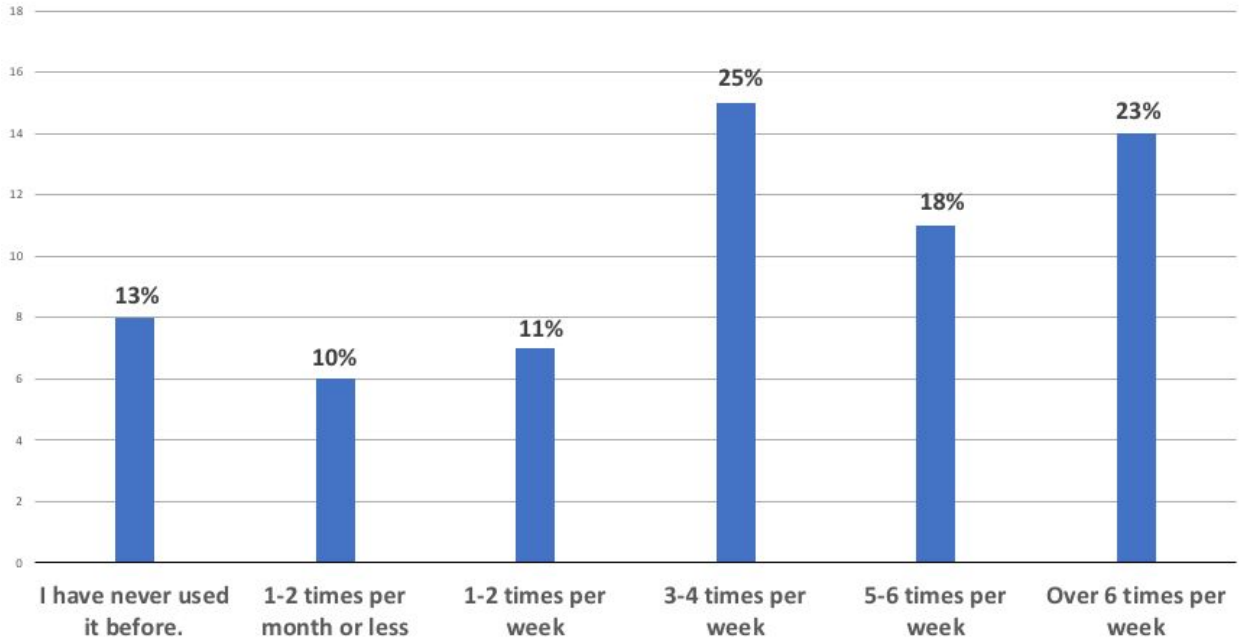
Driver's License

Do you have a valid driver's license?



The great majority of respondents have a valid driver's license at 85%. Of those who indicated they do not have a valid driver's license, 66% ride CTS more than 3-4 times per week and 77% ride it more than 1-2 times per week. It is interesting to note that 13% of respondents who did not have a valid driver's license have never used CTS before.

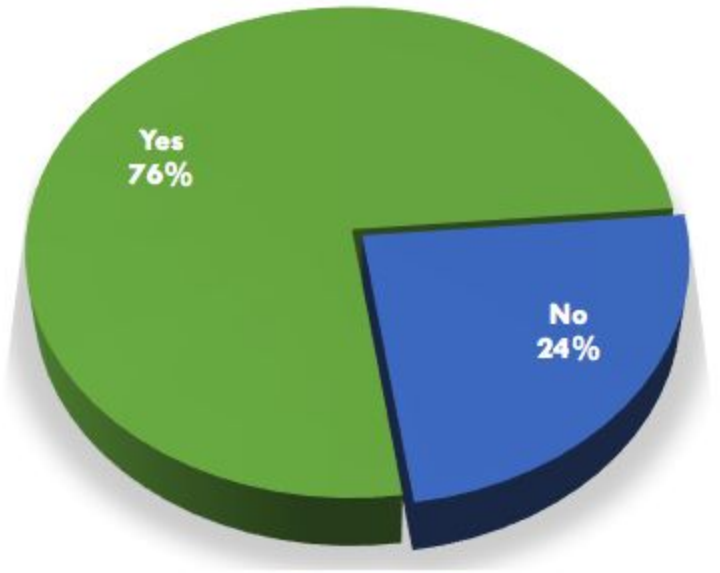
Detail of those with no valid driver's license for the question, How often do you ride Clarksville Transit?



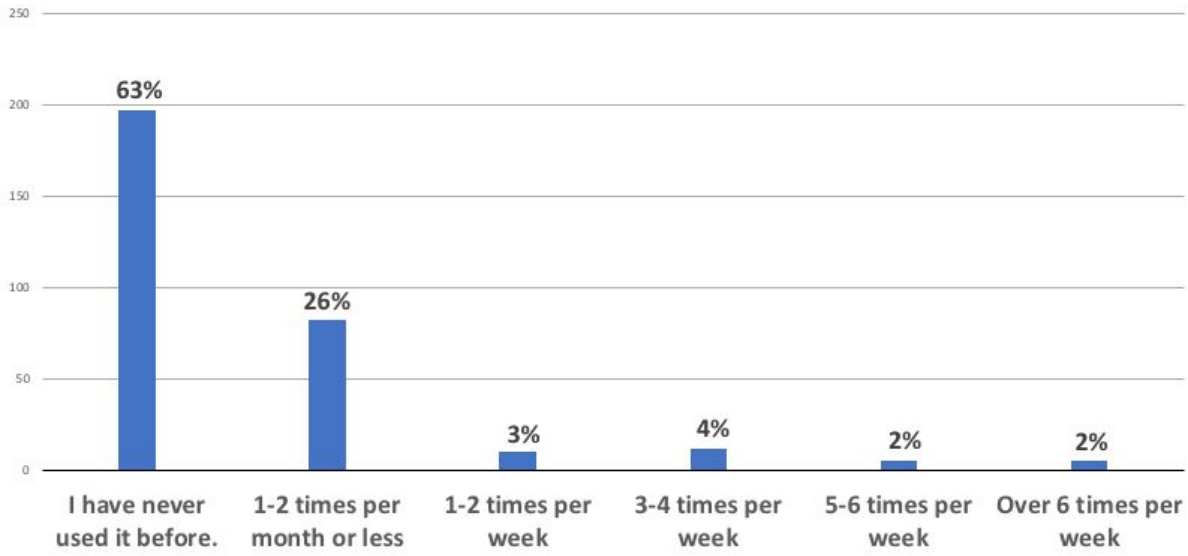
Reliable Transportation

Do you currently have a reliable form of transportation?

Just over three quarters of respondents have a reliable form of transportation. Of those respondents, over 63% have never ridden CTS before. At the same time, 26% indicated that they ride 1-2 times per month or less, which might indicate familiarity with the service, but rare actual usage.



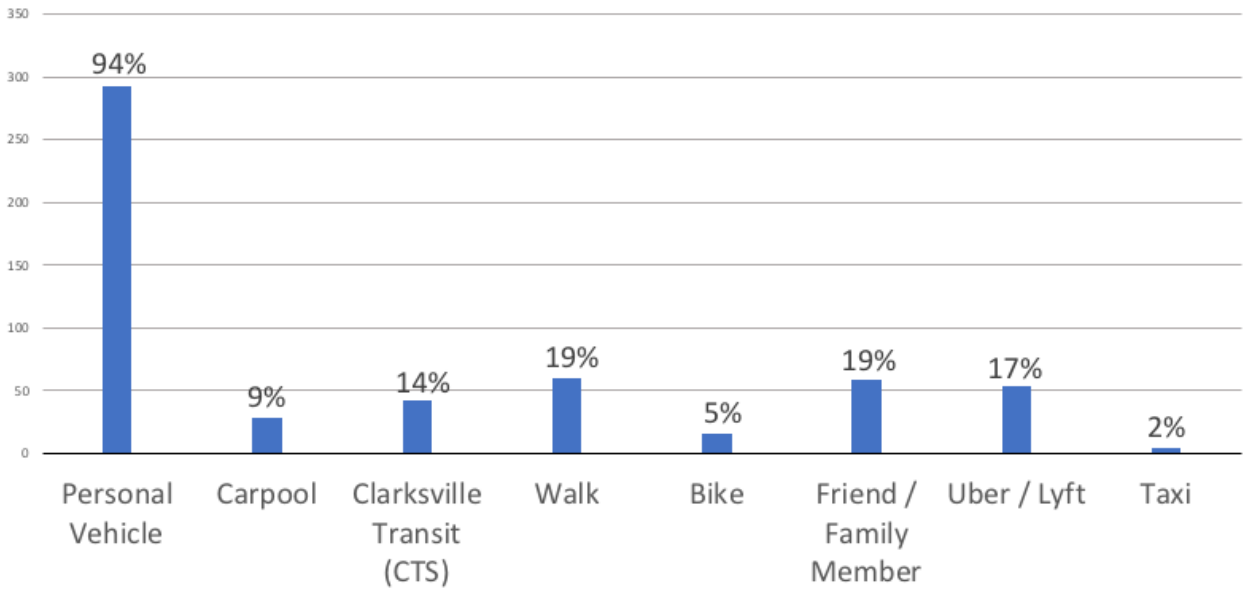
Detail of those who have reliable transportation for the question, How often do you ride Clarksville Transit?



Current Transportation Mode

Multiple selections were allowed for this question, therefore the total number of responses is greater than 100%. The results shown below indicate the percentage of each individual mode as compared to the overall number of respondents who answered this question. Not surprisingly, 94% of the respondents indicated they had a Personal Vehicle. In addition, 19% of the respondents indicated they walked and 5% indicated they bike. This gives an overall picture of what transportation the respondents utilize. The Personal Vehicle stands out as the primary mode, followed by Friend/Family Member and Walking at 19% each.

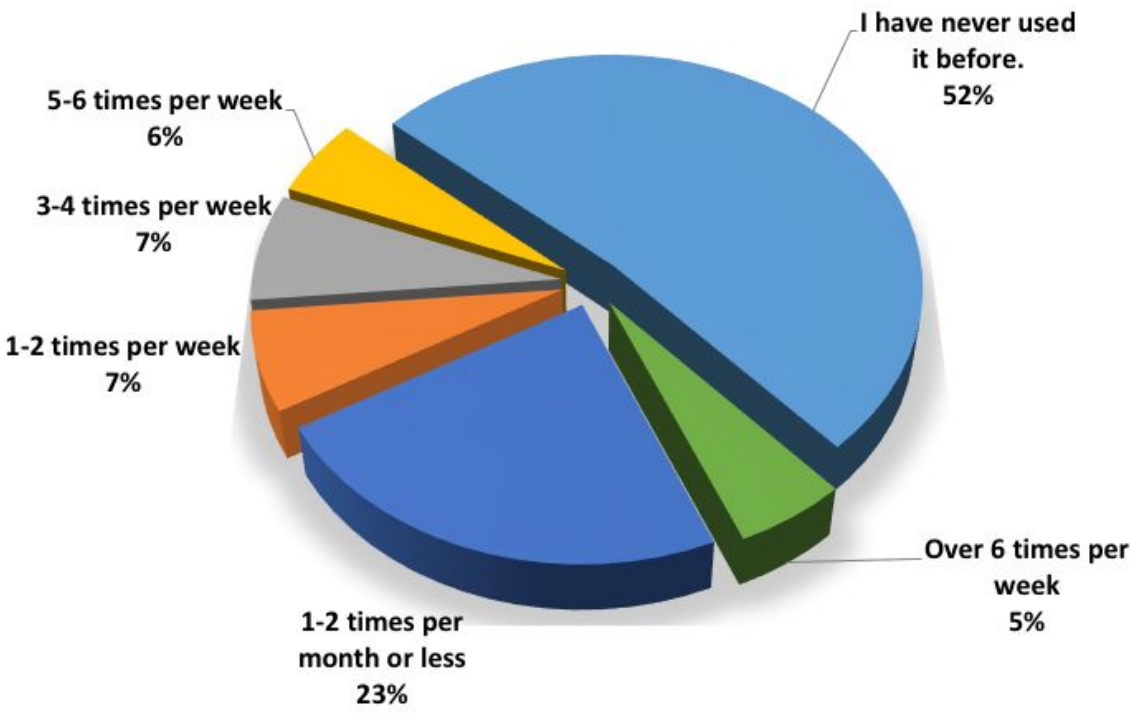
Please identify the mode(s) you currently use for transportation in Clarksville



Frequency of Transit Ridership

The highest overall response to this question was 52% for those who have never used transit, followed by using transit 1-2 times per month or less, at 23%. This would indicate that 75% of survey respondents are not regular users of CTS. However, this does indicate that 25% of those surveyed ride the service weekly, with 18% indicating they ride it at least 3-4 times per week or more.

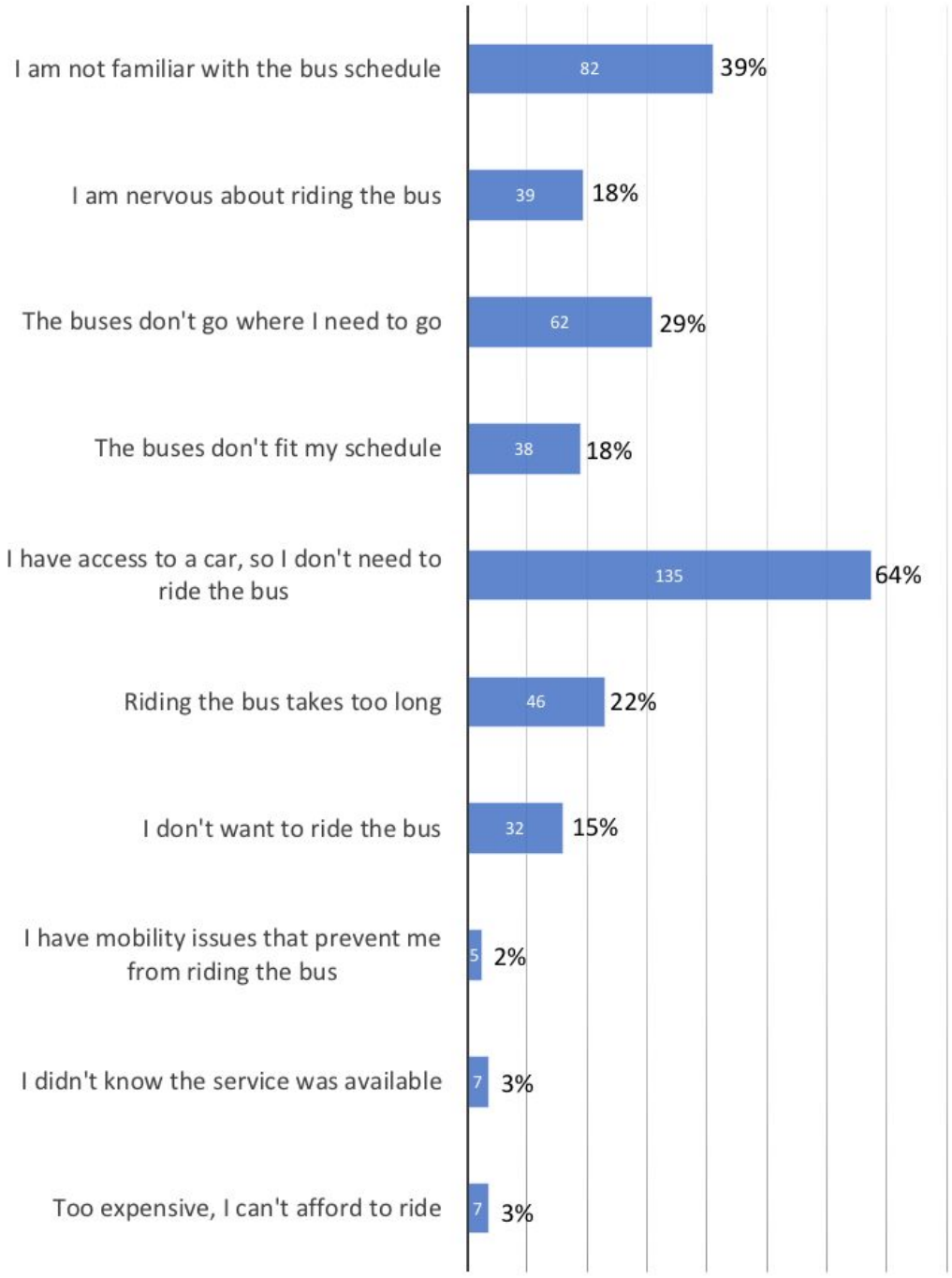
How often do you ride Clarksville Transit?



Reasons for Not Riding CTS

The following question allowed for multiple answers to be selected. The percentages below are based on each response compared to the total number of individuals who responded to this question. The two largest categories were, *Have access to a car, so I don't need to ride,* at 64%, followed by *I am not familiar with the bus schedule* at 39%. This last figure could be an indication that providing and/or marketing of travel training services, (such as one-on-one and group training sessions, as well as "How to Ride" sessions at public events), could increase ridership in that cohort.

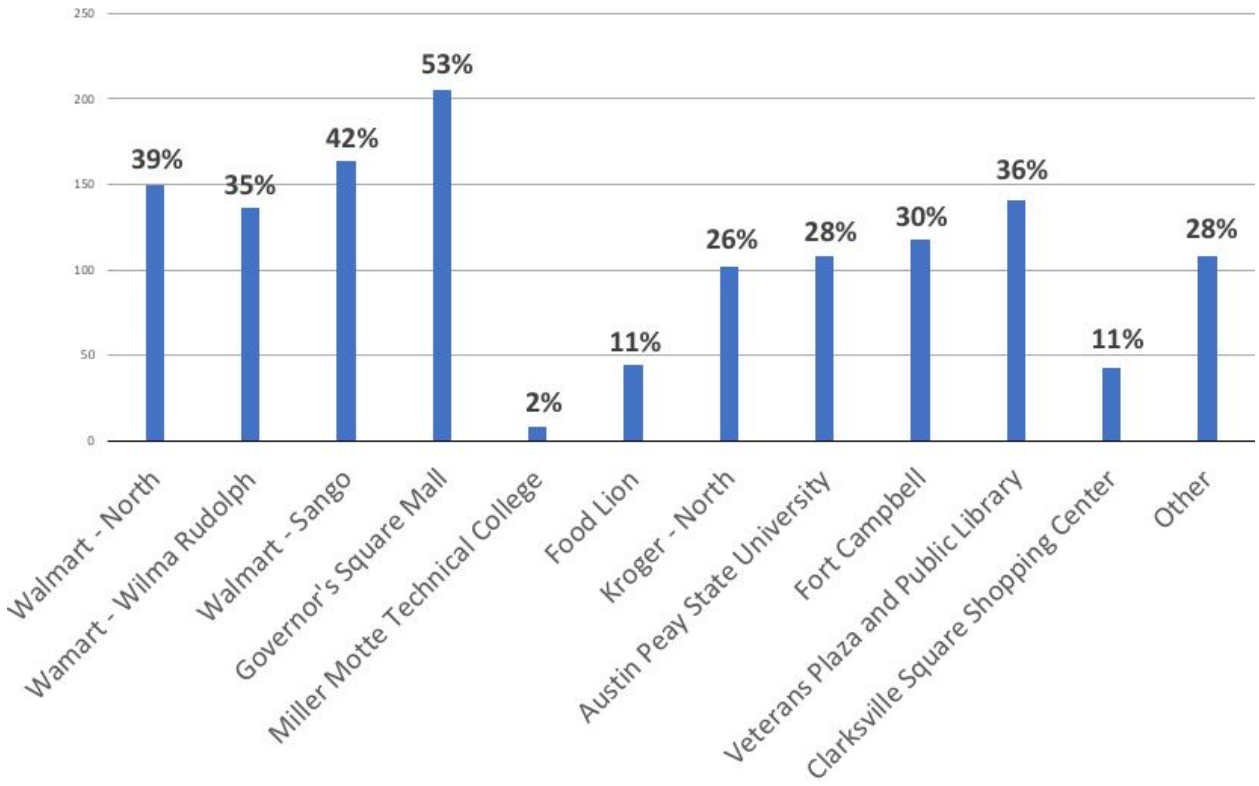
Please indicate the reason(s) why you do not use Clarksville Transit (check all that apply).



Frequent Destinations

This question provided a list of popular destinations within the Clarksville community. Respondents were asked to mark all that applied. Overall, it appears that the Governor's Square Mall, Walmart-Sango, and Walmart-North were the top 3 destinations. It is interesting to note that the Veterans Plaza/Public Library and Walmart-Wilma Rudolph were ranked just below them. All of the most popular destinations are currently served by CTS.

Select from the list of supplied destinations, those that you frequent regularly



Top 3 Destinations other than Work or Home

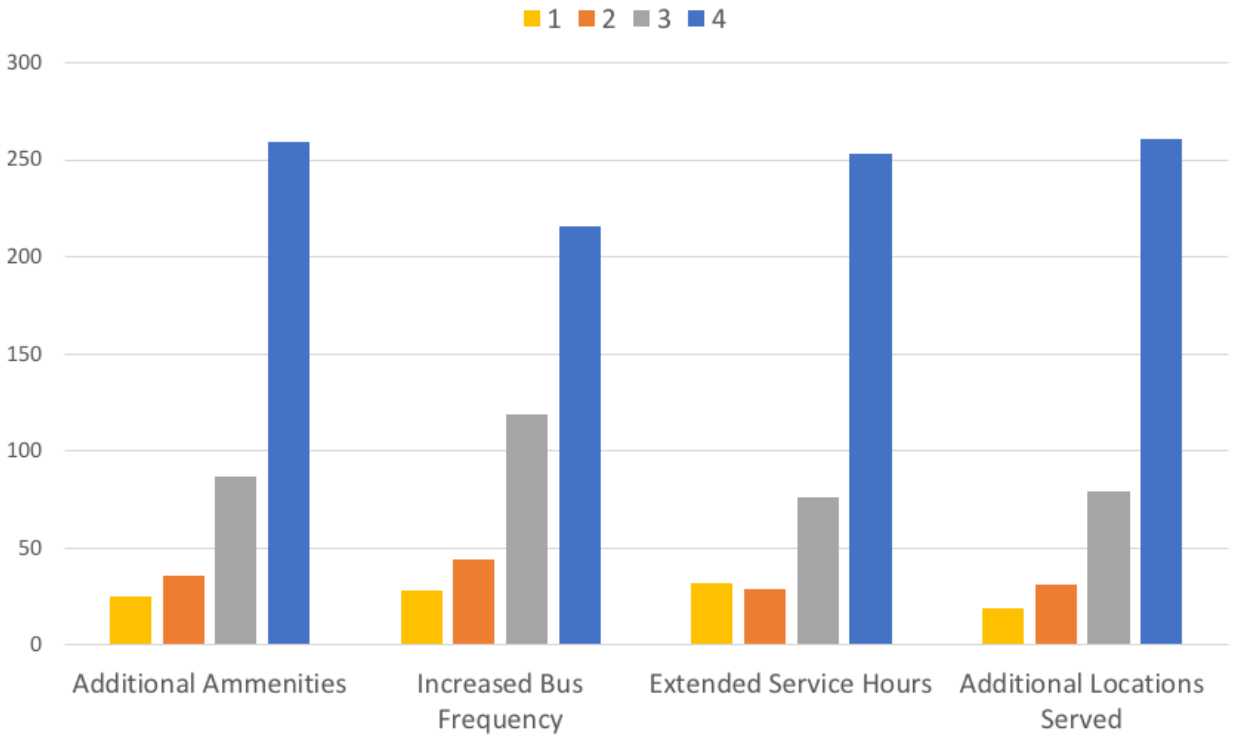
Respondents were asked to write-in the top 3 destinations that they most regularly frequent. This question was supplemental to the previous *Destinations* question in order to identify any patterns or areas of demand not previously suggested. Overall, there was substantial overlap with responses in the previous question, and included answers primarily focused on Walmarts, Grocery Stores, and Governor's Square Mall. No new areas were identified.

Future Needs

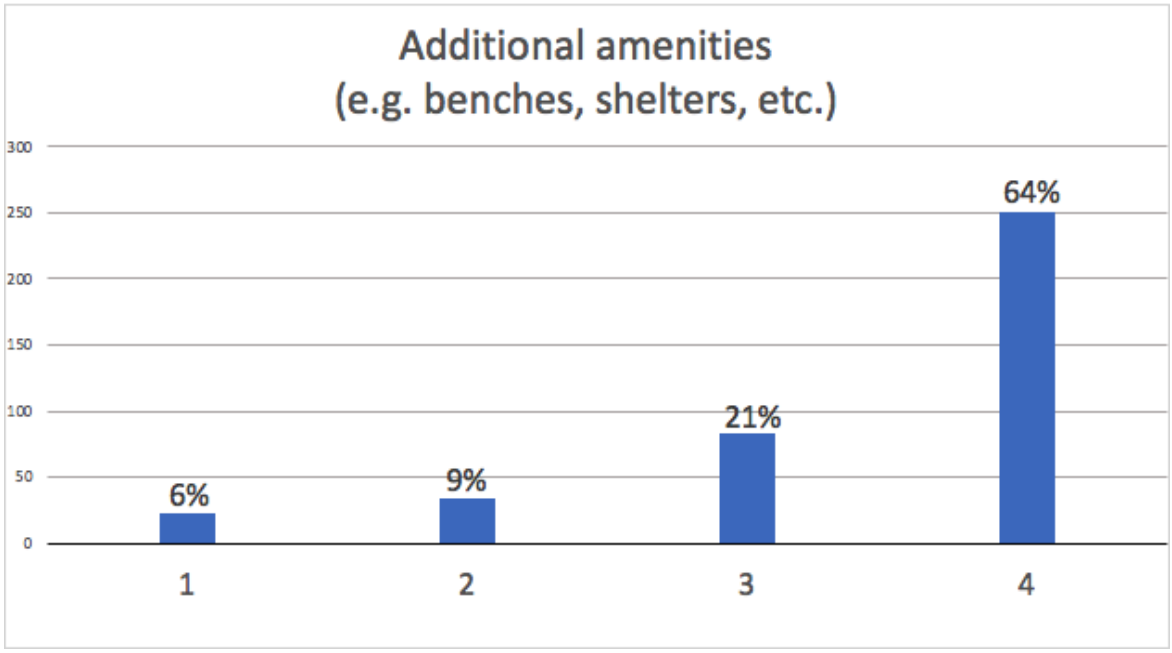
Participants were asked to rank the level of importance for various potential changes to the transit system in the future. We received full participation to all four of these questions, with 407 total responses. The table below shows the number of responses and how the individual needs compare against one another. The tables that follow include the percent of responses for each individual question. For all of the questions, a minimum of 50% of respondents indicated that the suggested changes were Highly Important. This shows that the majority of respondents value expanding the capabilities of CTS through providing additional amenities, increasing bus frequency, extending service hours and serving more locations.

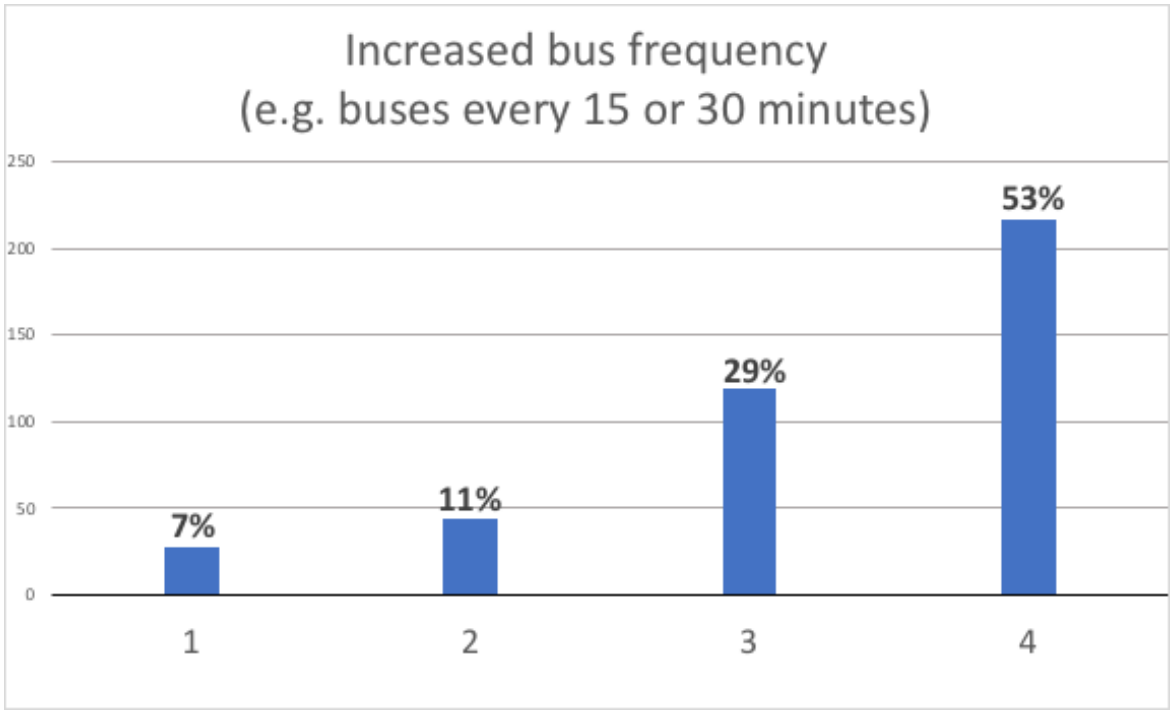
Ranking of Future Needs

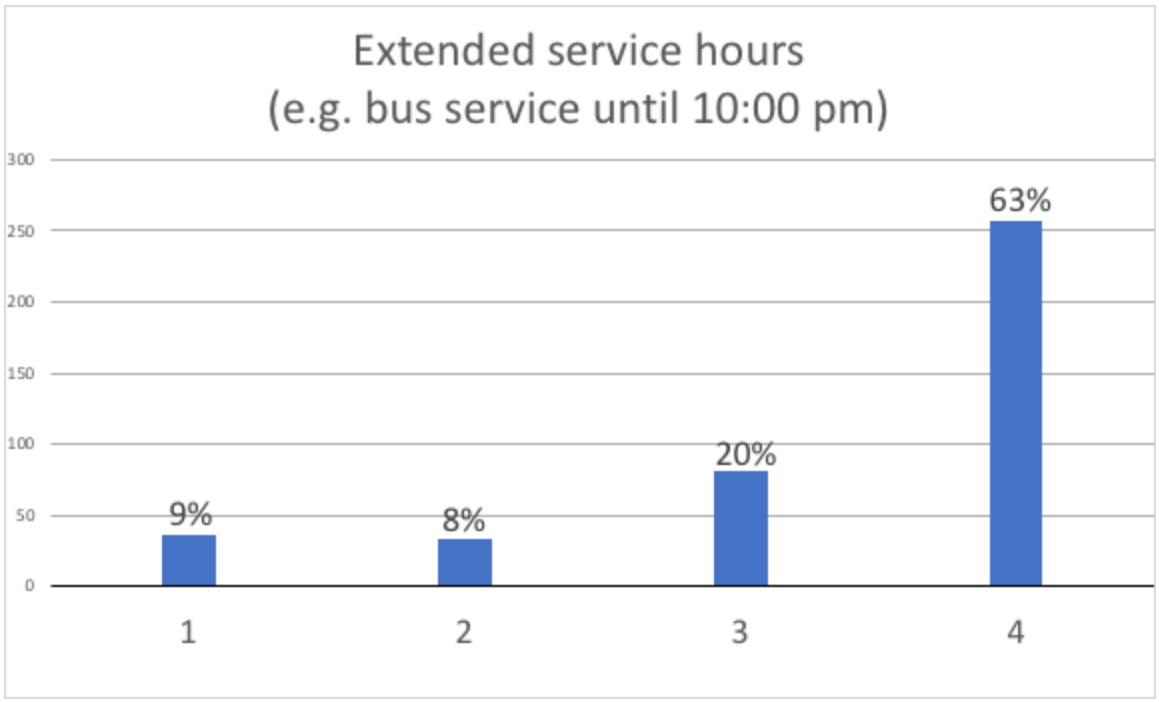
(1 Indicates Low Priority, and 4 Indicates High Priority)



Please indicate your level of importance of the following potential changes to Clarksville Transit. (1 = Not Important, 4 = Highly Important)



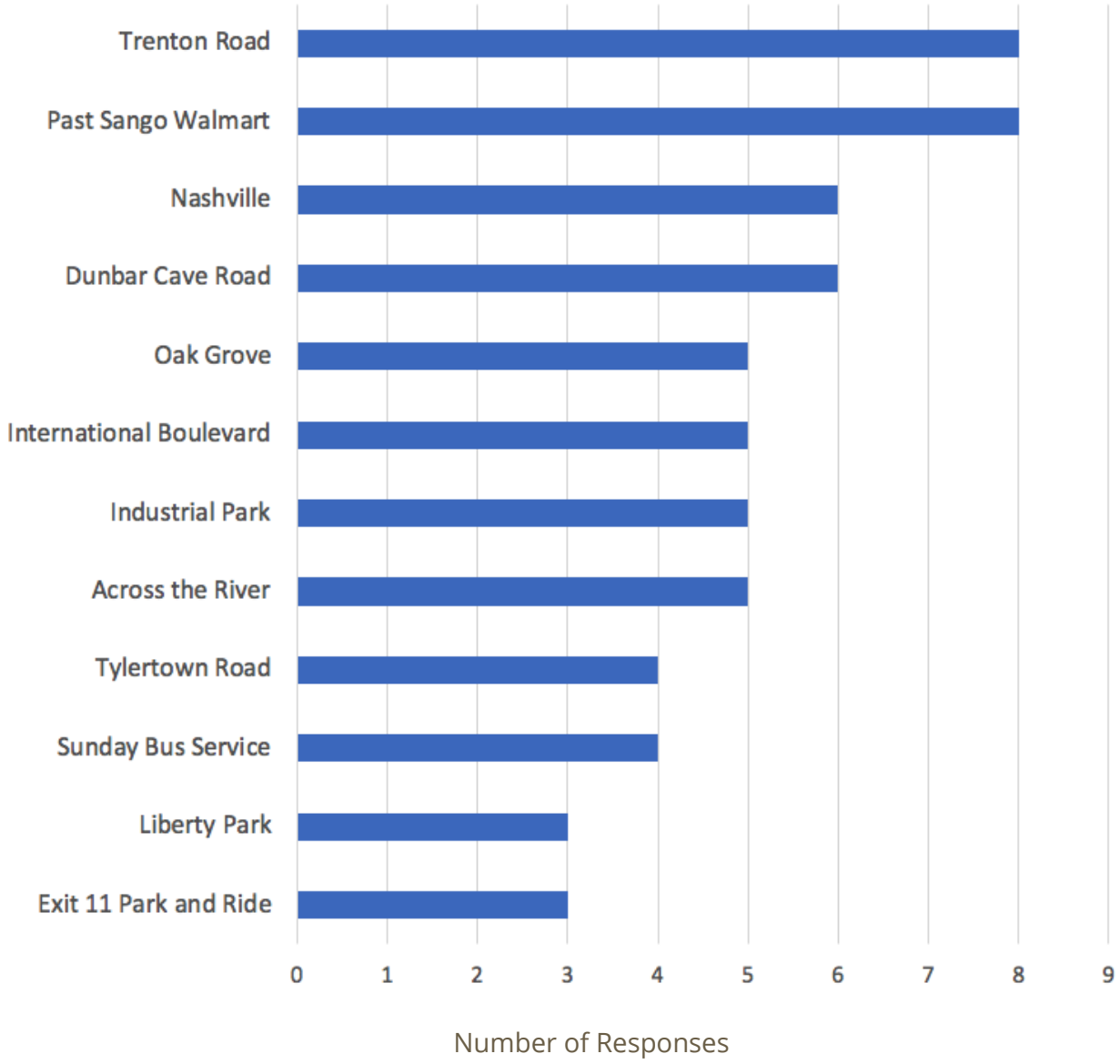



Extended service hours
(e.g. bus service until 10:00 pm)
300
250
200
150
100
50
0
9%
8%
20%
63%
1
2
3
4


Additional locations served
300
250
200
150
100
50
0
5%
8%
20%
67%
1
2
3
4

Write-in Additional Locations

The survey included a write-in option for respondents to identify areas, communities or businesses where they would like to see additional service. A total of 143 responses to this question were received and - as expected - the responses covered a broad range of areas; however, overall there were some themes identified. It is interesting to note that "*Trenton Road*", and "*Past the Sango Walmart*" were the highest write-in options with each receiving 8 responses. Additionally, *Oak Grove* and the *Exit 11 Park and Ride* were also supported. These comments coincide with the transit ridership propensity analysis and tie in with recommended service modification discussed in the *Service Opportunities and Recommendations* section.

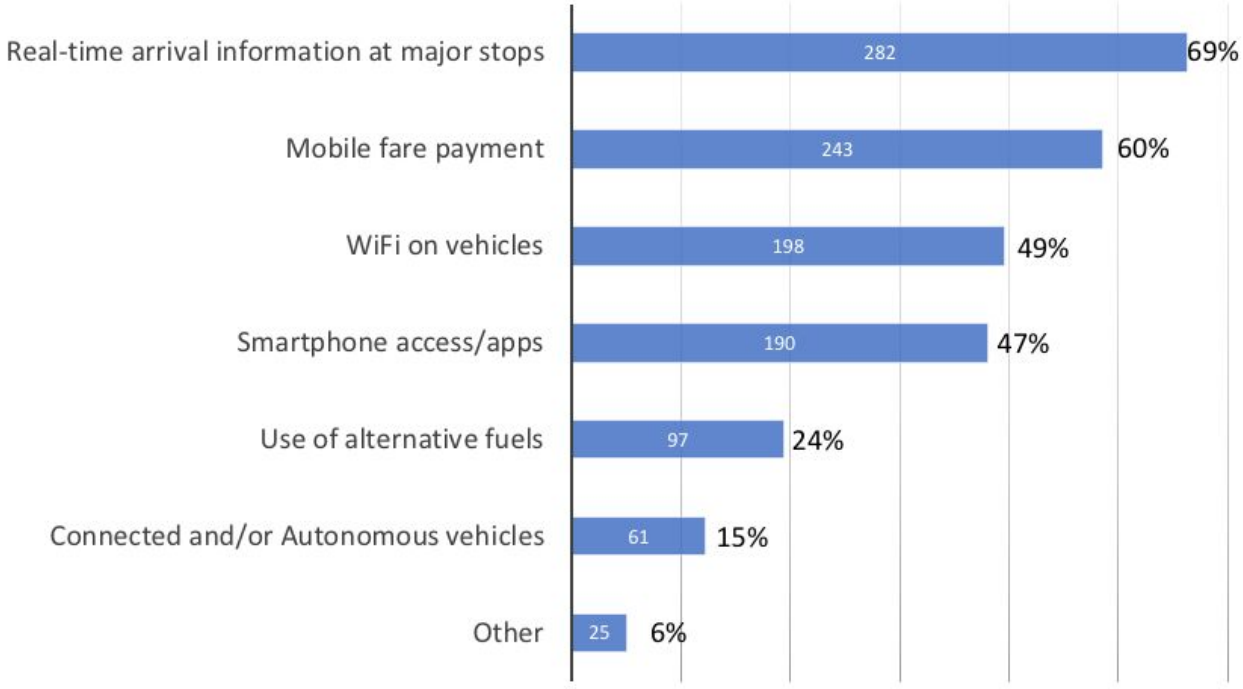


It is also interesting to note that several write-in locations, such as "*Nashville*" and "*Industrial Park*" indicate that respondents were not aware that service does exist to these areas. Service to Nashville is provided by the Regional Transportation Authority via the Exit 11 Park and Ride, and Route 1000 provides service on Industrial Park Road. Several respondents also indicated the need for service on International Boulevard. While service does exist on the southern portion of International Boulevard, there may be an opportunity to look at revising Route 1000 to provide additional service to the employment zone on the northern portion as well.

Future Technology

When asked about the future technology needs of CTS, the largest majority of responses illustrated a preference for *Realtime arrival information* and *Mobile fare payment options*. Real-time arrival information received the highest number of responses at 69%. This would support an investment by CTS in making real-time data available on all routes, similar to what is provided for the Peay Pickup, and could have a positive impact on growing ridership.

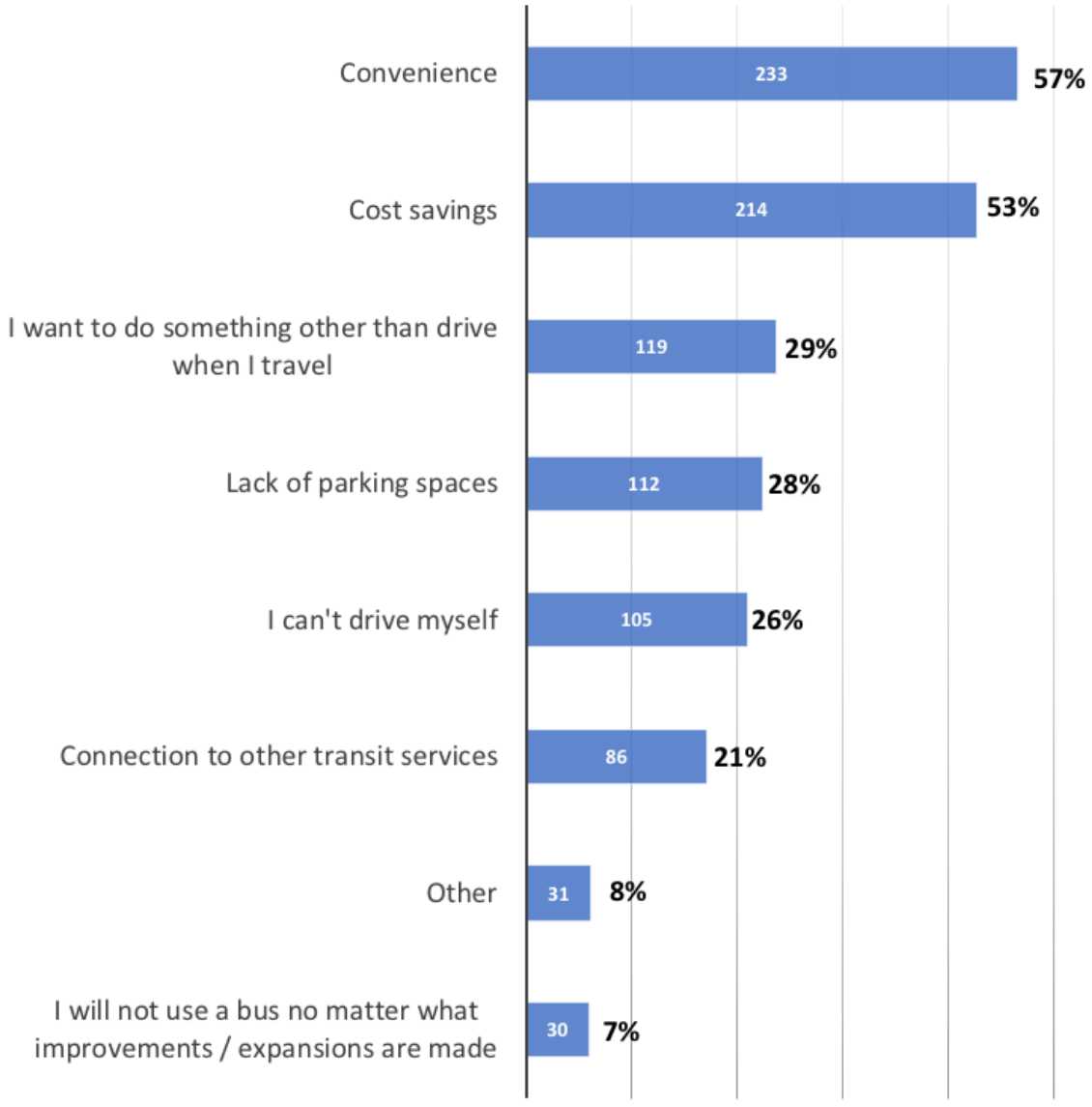
When thinking about the future of public transportation in Clarksville, what type(s) of technology is/are important to you? (Select all that apply)



Reasons for Riding in the Future

The majority of respondents indicated *Convenience* (57%) and *Cost savings* (53%) as the primary motivators for using CTS. These responses are generally in line with opinions about transportation nationally. It is interesting to note that the next highest answers were *I want to do something other than drive when I travel* at 29% and *Lack of parking spaces at 28%*. Should the City face parking challenges in the future, the appeal for riding the bus might increase somewhat.

What is/are the primary reason(s) you would use a bus in the future?



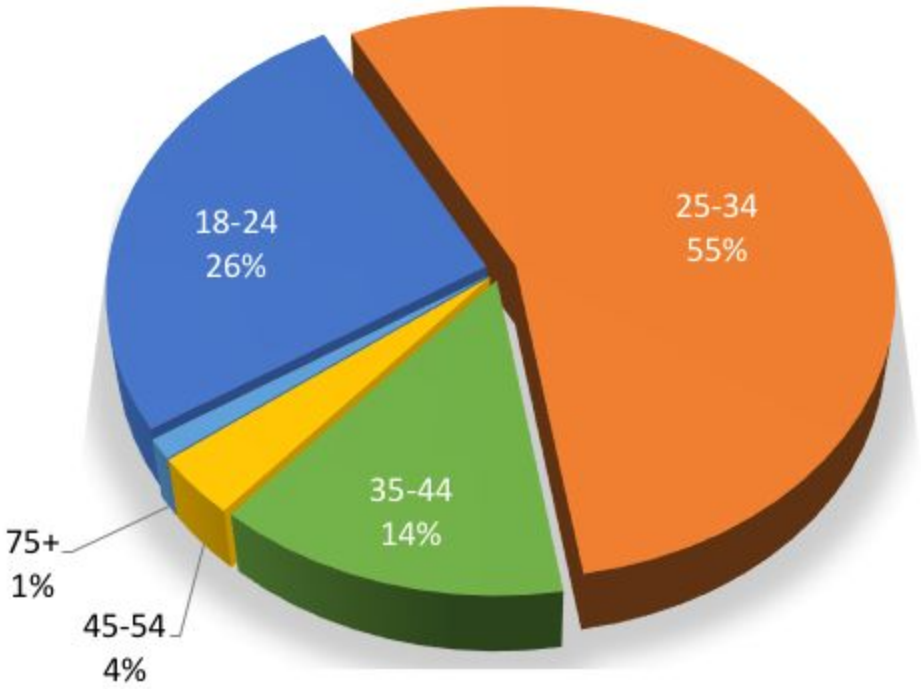
Ft. Campbell Survey Results

As discussed previously, a similar but separate survey was distributed to Ft. Campbell residents through the housing division on the base. These surveys were specifically targeted at residents in the northernmost portion of the base, near Gate 6. The transit propensity maps showed a high level of potential transit ridership from this on-base community due to lower income, low car ownership, and a high density of residents.

Ft. Campbell - Age

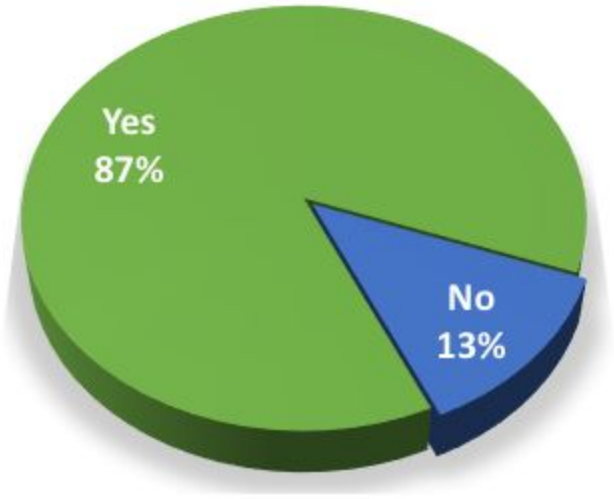
The age distribution skewed younger as can be expected with military personnel, with a total of 81% of respondents under the age of 35. The largest response category was 25-34 at 55%, followed by 18-24 at 26%, with 35-44 coming in at 14%.

What is your age range?



Ft. Campbell - Driver's License

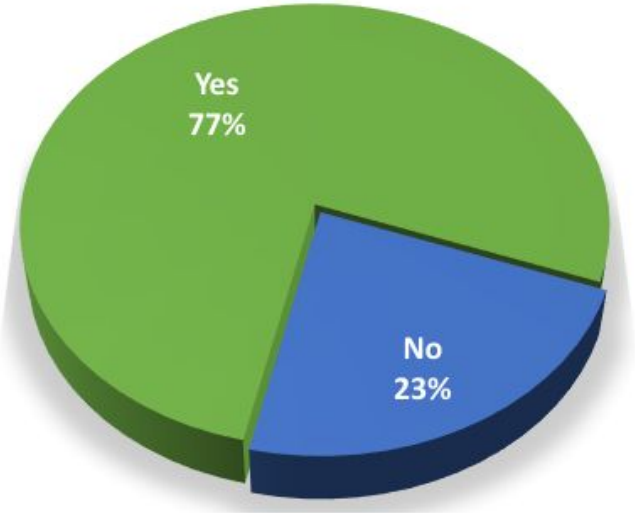
Do you have a valid driver's license?



Similar to the Community Survey results, the great majority of respondents have a valid driver's license at 87%.

Ft. Campbell - Reliable Transportation

Do you currently have a reliable form of transportation?

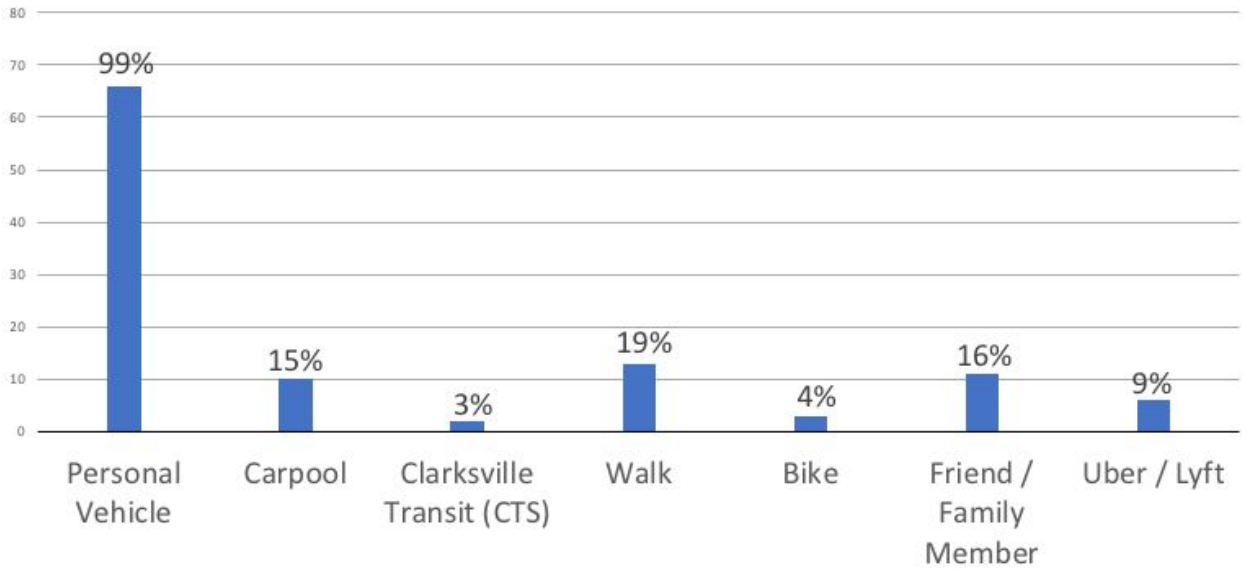


Over three quarters of respondents have a reliable form of transportation.

Ft. Campbell - Current Transportation Mode

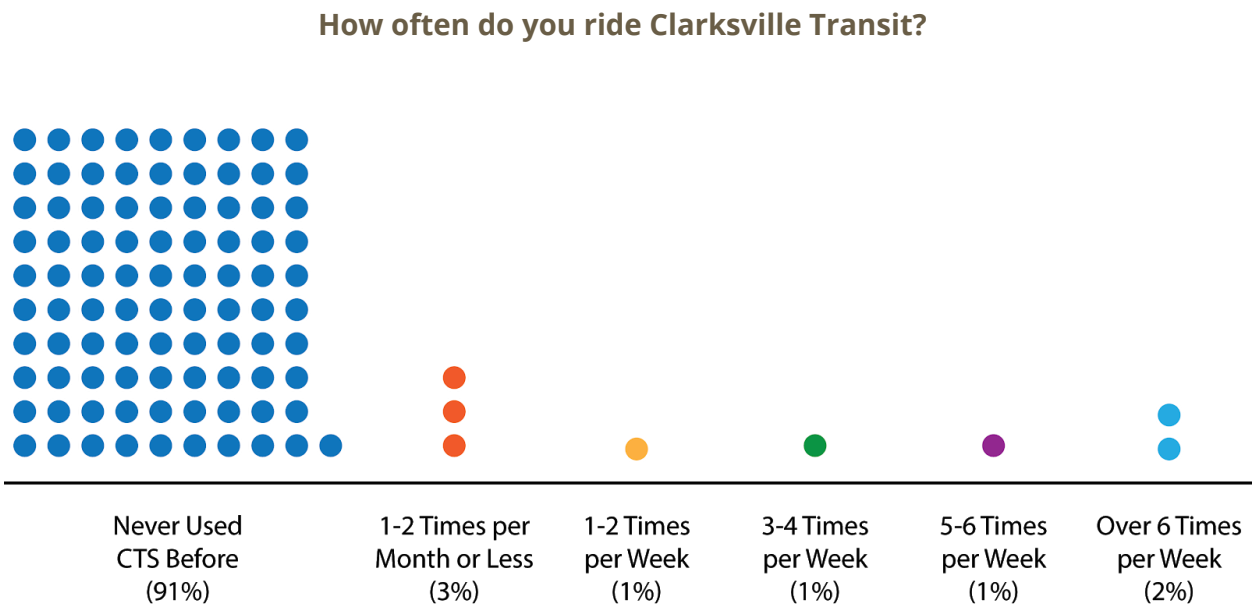
Multiple selections were allowed for this question, therefore the total number of responses is greater than 100%. The results shown below indicate the percentage of each individual mode as compared to the overall number of respondents who answered this question. Similar to the results from the Community Survey, the highest number of respondents, 99%, indicated they used a Personal Vehicle for transportation. In addition, 20% of the respondents indicated they walked and 16% indicated they ride with a Friend or Family Member. This provides an overall picture of what types of transportation the respondents utilize.

Please identify the mode(s) you currently use for transportation in Clarksville



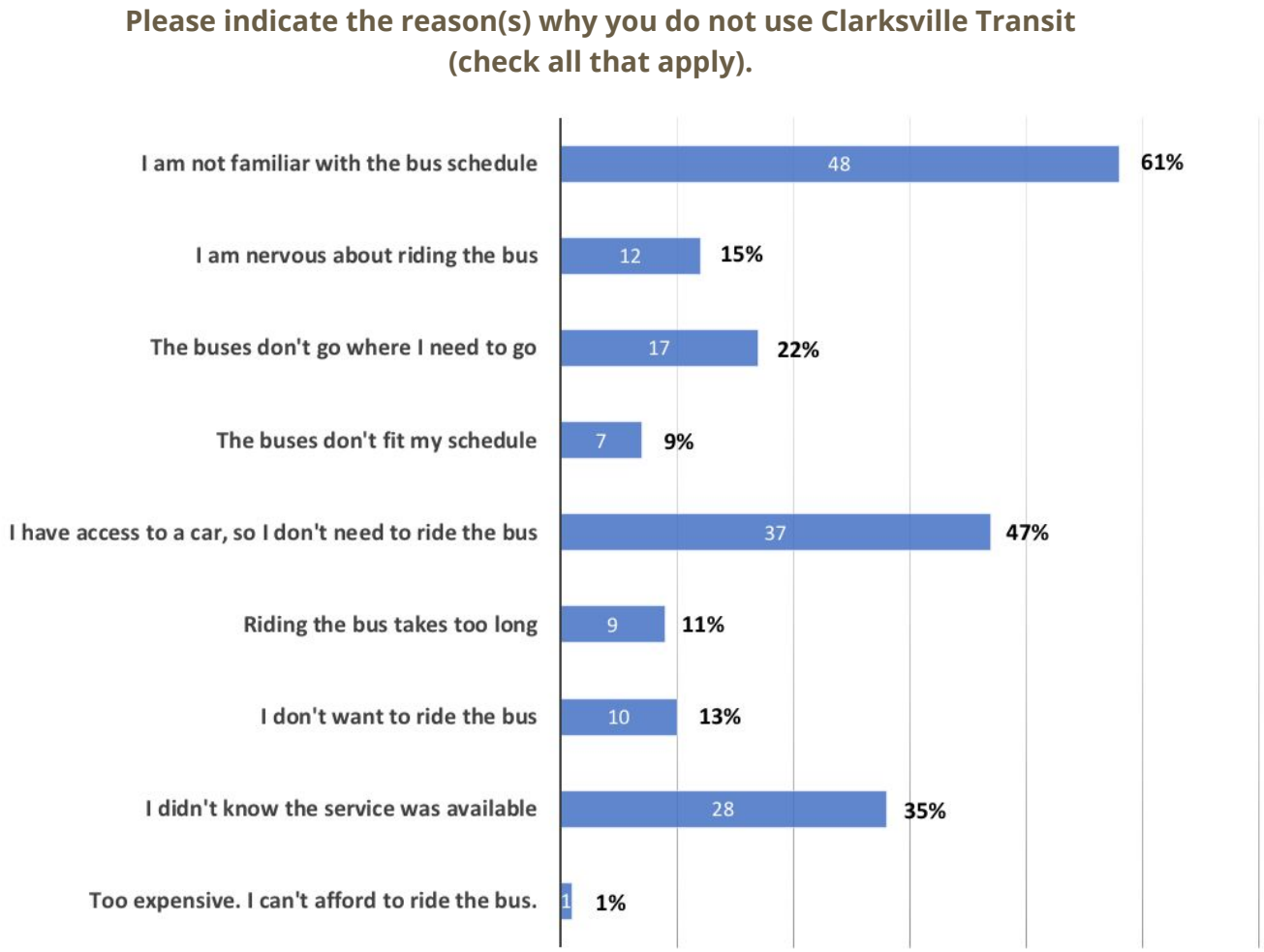
Ft. Campbell - Frequency of Transit Ridership

The results for the on-base residents were considerably higher than those from the Community Survey, with the Ft. Campbell responses showing 91% had never used CTS before, compared to 51% for the overall Community Survey. This ties in with the responses to the next question showing that 61% of respondents were not familiar with the bus schedule and may be a function of transplants moving to the Clarksville region not being familiar with city services. A full 35% indicated that they did not know the service was available. The responses to these questions indicate an opportunity for CTS to engage further with this on-base housing community to determine what actions may increase ridership. As proposed in the *Service Opportunities and Recommendations* section, a route modifcation that serves this portion of the base as well as the Oak Grove Walmart and the new race and gaming center has the potential to garner new ridership in this community.



Ft. Campbell - Reasons for Not Riding CTS

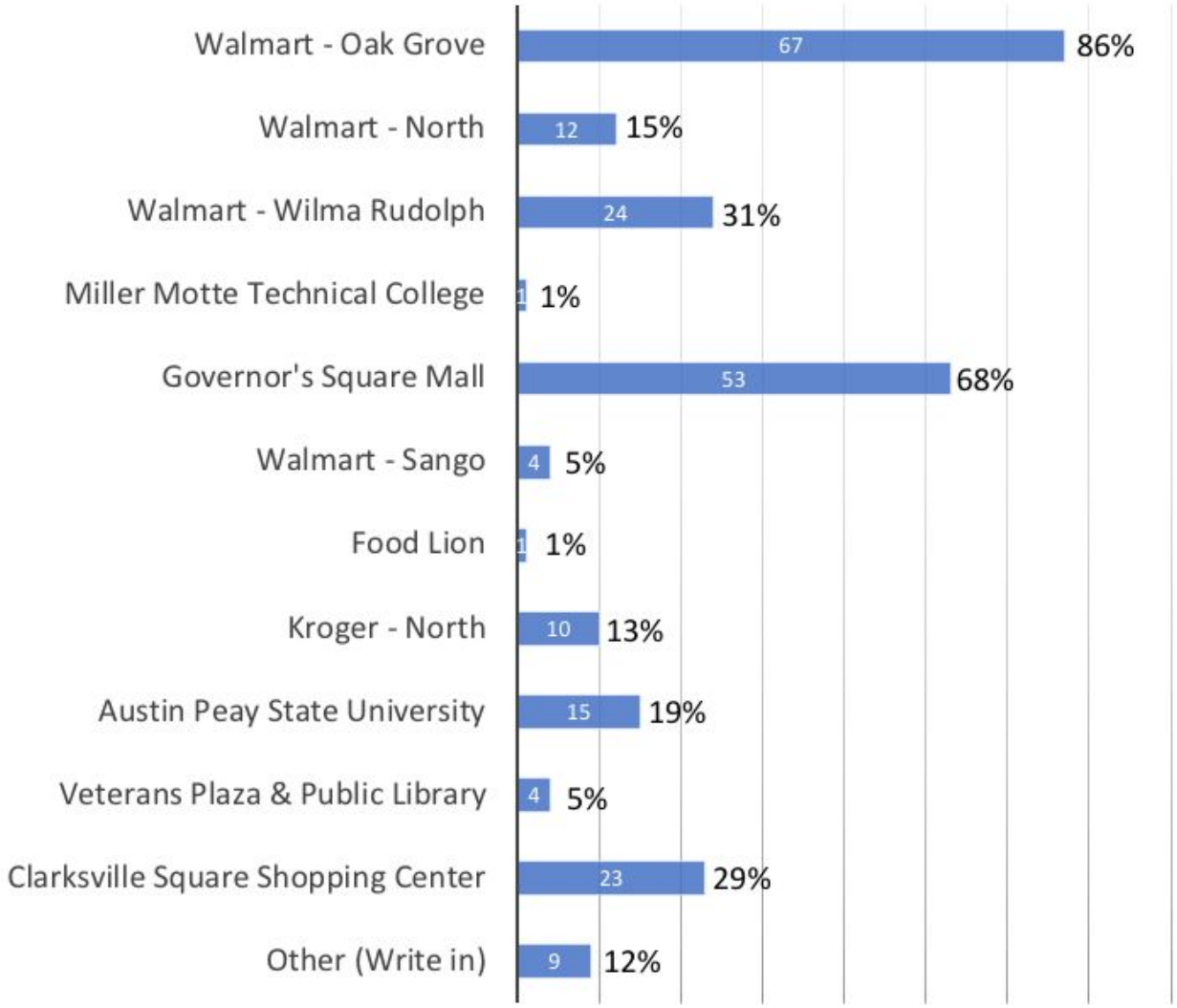
The following question allowed for multiple answers to be selected. The percentages below are based on each response compared to the total number of individuals who responded to this question. The two largest categories were, *I am not familiar with the bus schedule*, at 61%, and *Have access to a car, so I don't need to ride,* at 47%, followed by *I didn't know the service was available* at 35%.



Ft. Campbell - Frequent Destinations

This question provided a list of popular destinations within the Clarksville community. Respondents were asked to mark all that applied. Overall, residents on the base chose Walmart - Oak Grove as their most frequent destination at 86%, followed by Governor's Square Mall at 68%, and Walmart - Wilma Rudolph at 31%. This illustrates a potential opportunity for CTS to provide service to this Walmart and the dense housing area of the base. This would provide a direct connection for Ft. Campbell residents to this popular destination as well as provide more shopping opportunities for Clarksville residents.

Select from the list of supplied destinations, those that you frequent regularly

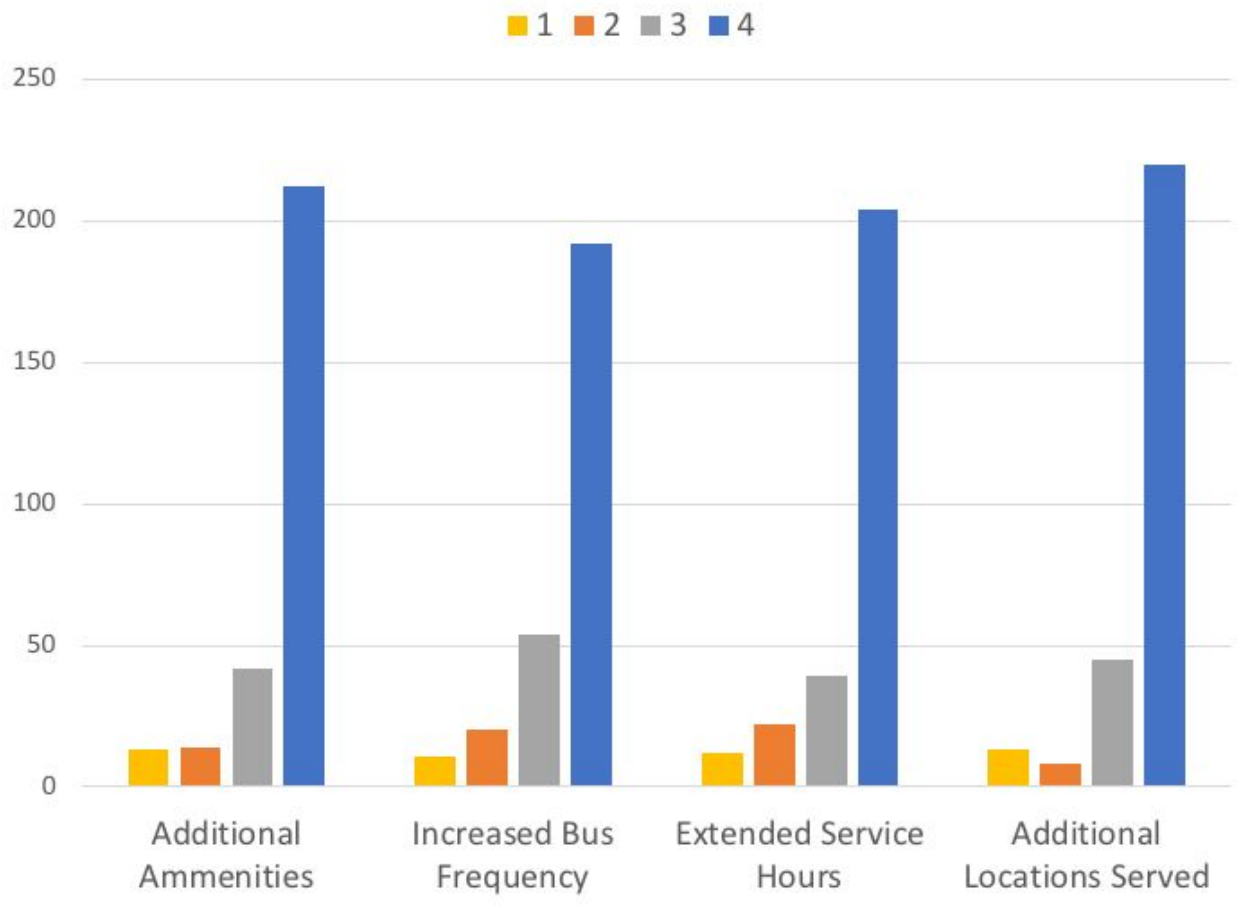


Ft. Campbell - Future Needs

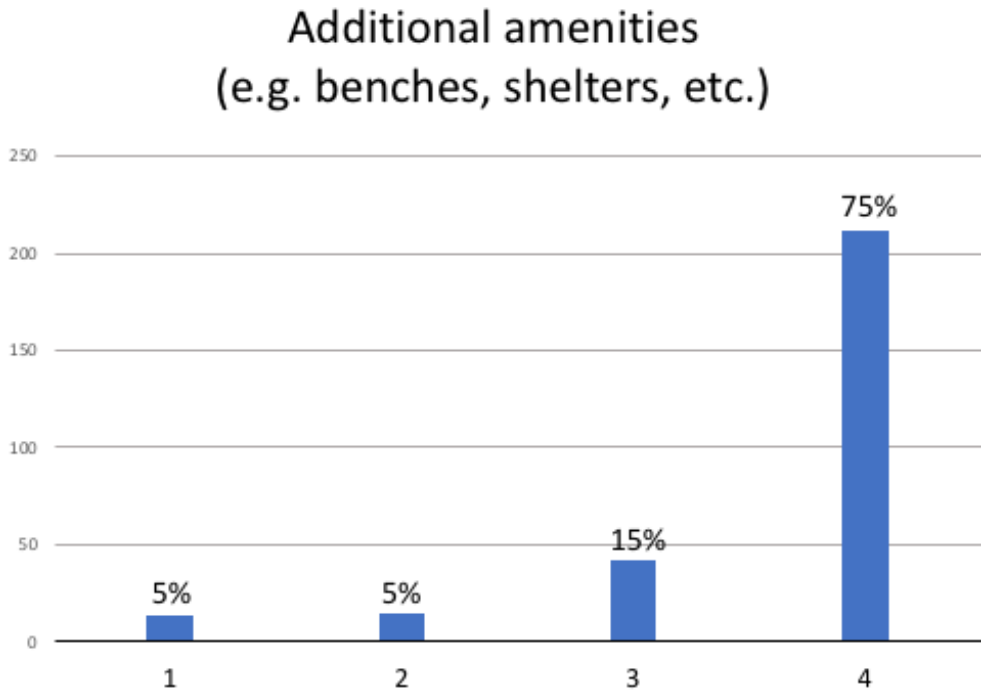
Residents were asked to rank the level of importance for various potential changes to the transit system in the future. The table below shows the number of responses and how the individual needs compare against one another. The tables that follow include the percent of responses for each individual questions. For all of the questions, nearly 70% or above of respondents indicated that the suggested changes were Highly Important. This does indicate that increasing investment in CTS amenities and services might increase ridership from and within the Ft. Campbell community.

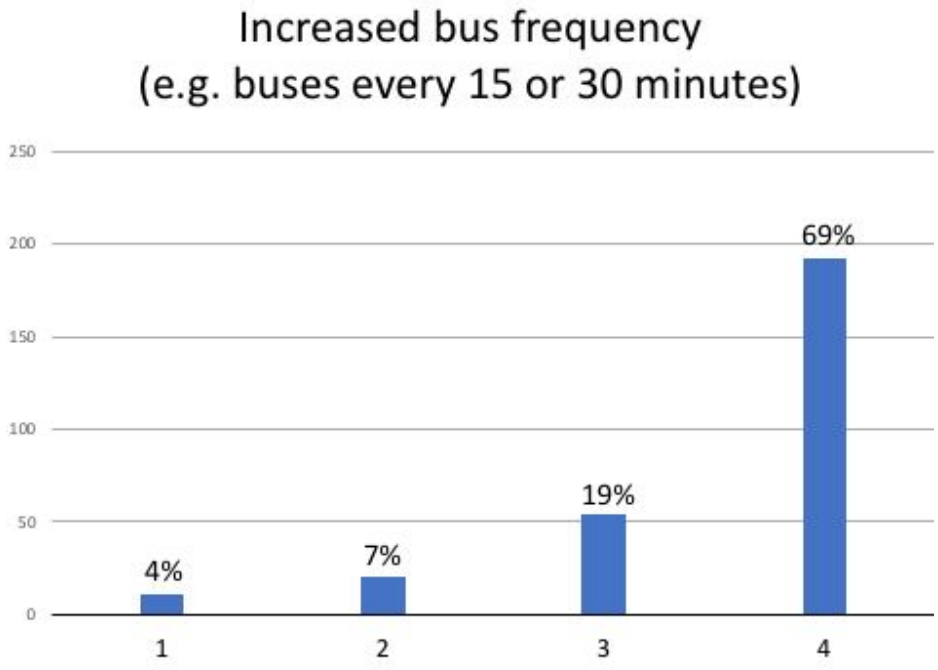
Ranking of Future Needs

(1 Indicates Low Priority, and 4 Indicates High Priority)

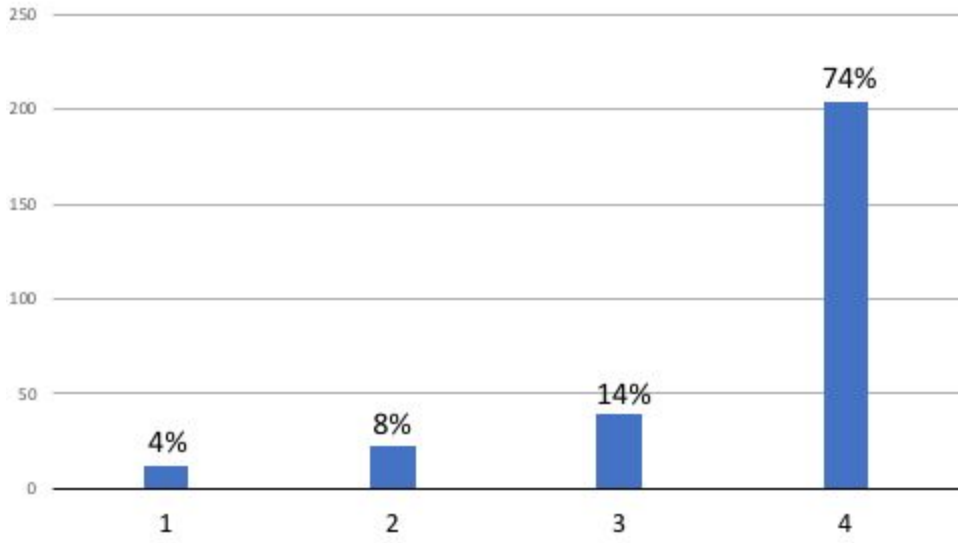


Please indicate your level of importance of the following potential changes to Clarksville Transit. (1 = Not Important, 4 = Highly Important)

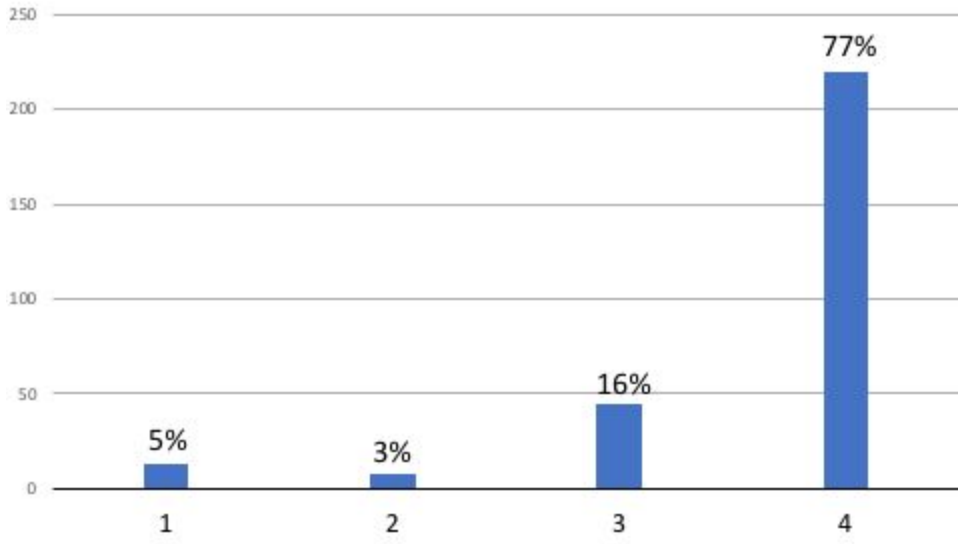




Extended service hours
(e.g. bus service until 10:00 pm)



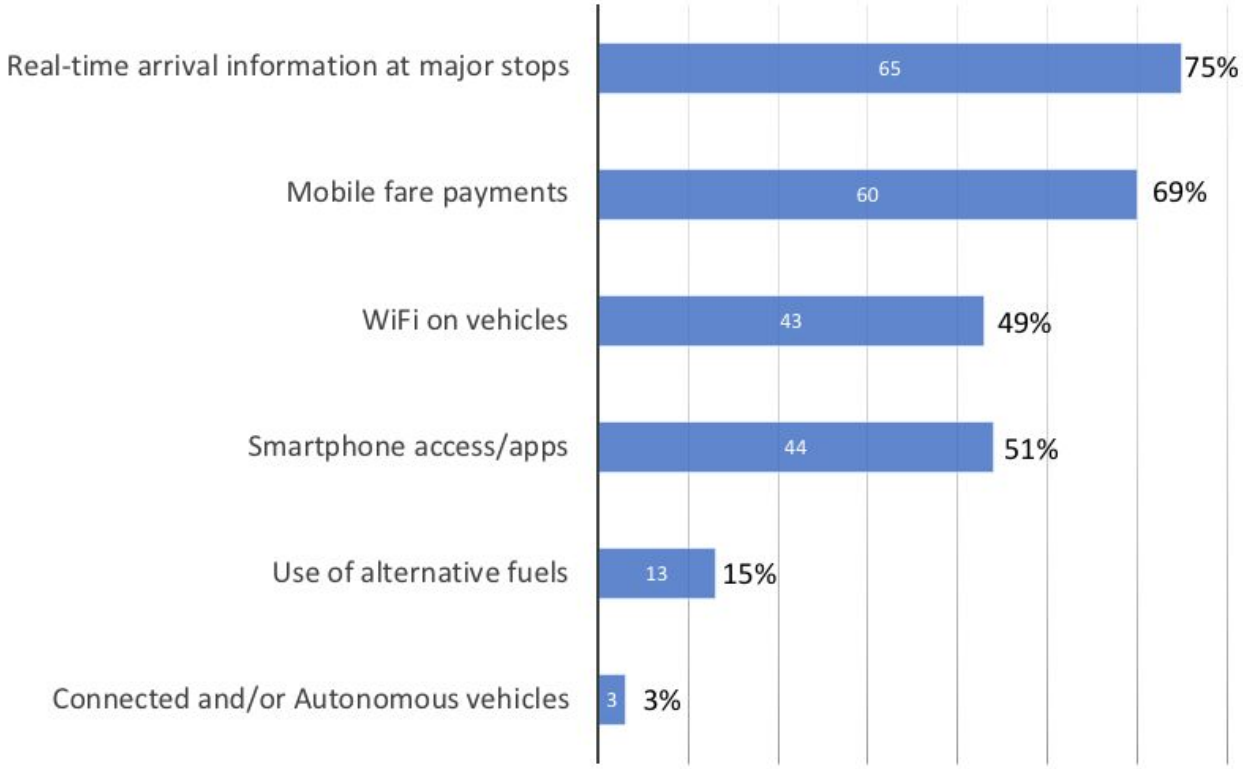
Additional locations served



Ft. Campbell - Future Technology

These results mirror the responses received for this question on the Community Survey in terms of priority. The largest majority of responses illustrated a preference for *Realtime arrival information* at 75%, followed by *Mobile fare payment options (69%), and WiFi on vehicles at 49%.* This seems to indicate support for CTS to invest in real-time technology for the bus system.

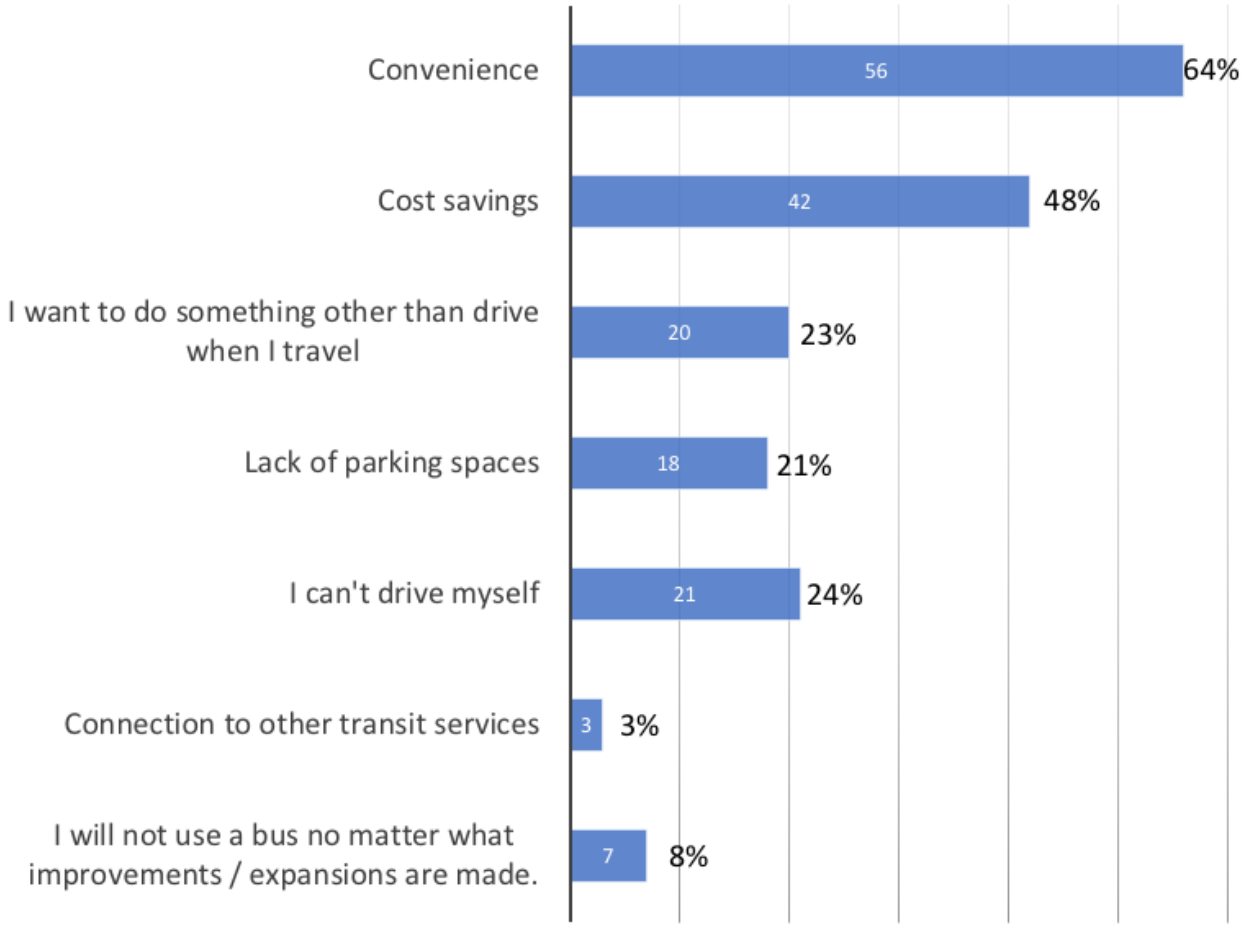
When thinking about the future of public transportation in Clarksville, what type(s) of technology is/are important to you? (Select all that apply)



Ft. Campbell - Reasons for Riding in the Future

As with the Community Survey, the majority of respondents indicated *Convenience* (64%) and *Cost savings* (48%) as the main factors for using CTS, which does align with national opinions about transit. The next highest answer was "*I can't drive myself*" at 24%, followed by *I want to do something other than drive when I travel* at 23%. This could indicate some demand for those without vehicles on-base. Additionally, should service be provided directly to and from Ft. Campbell to the Oak Grove Walmart, this could meet the respondents convenience qualification.

What is/are the primary reason(s) you would use a bus in the future?



Employer Survey Results

As discussed previously, a separate survey was distributed to employers within the Clarksville community to gather information about their employees transportation needs. In total, six employers responded; however, one of the businesses left the majority of questions blank, reducing the usefulness of their feedback. Accordingly, the summary below focuses on the five remaining respondents.

One of the respondents is in the fast food industry with multiple locations throughout Clarksville, and over 100 employees. Two of the businesses are industrial in nature, with one located on the International Boulevard corridor, housing 300 plus employees, and another located on Industrial Park Road with over 100 employees. One of the businesses is located downtown with few employees and more administrative job functions, and the final respondent is in the financial industry with multiple locations and approximately 25 employees.

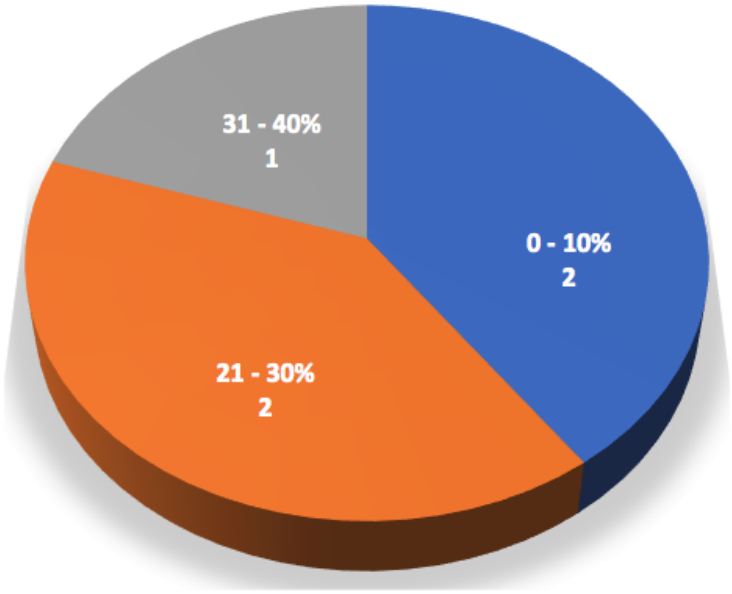
Although the overall survey response from businesses is small, it does provide a broad cross-section of the types of employers within the community.

Employer Survey Summary

- All five companies indicated that only 25% or fewer of their employees live outside of the City of Clarksville. This indicates that CTS could be a viable transportation option for several of the employers.
- All five of the employers indicated that their business operates Monday through Friday, with three respondents indicating they also operated on Saturday. Only one of the five companies indicated they are open on Sunday. Shift hours generally ranged from 6:00 am to midnight, with one business operating around the clock. While the early morning and mid-afternoon shifts could currently be served by CTS, the later evening services and Sunday service would be challenging and potentially costly for CTS to provide. However, there may be instances that CTS could work with individual employers to identify and respond to service during the day, and look for employer sponsored or shared-ride opportunities for those employees whose work hours fall beyond CTS scheduled times.
- Four out of the five businesses indicated that based on conversations with employees, there is a need for more transit in Clarksville. The fifth respondent indicated their may be a need.
- Two of the five companies confirmed that employees are currently using CTS to get to and from work.

- Most significantly, three out of the five respondents estimated that a sizable number of employees have issues with transportation, ranging from 21-30%, up to 40%. This indicates a strong opportunity for CTS to look for services that could meet these transportation demands.

If you answered "Yes" or "Maybe", what estimated percentage of your current employees have issues with reliable transportation?



- Lastly, two of the five businesses indicated that they would consider talking with CTS about developing a transportation program, sponsored by the employer, to assist with getting employees to work. CTS will be able to follow-up directly with these companies to further this possible solution.

Survey Limitations

Due to the nature of all self-selected web-based survey tools, this data can provide only a snapshot of opinions and attitudes towards CTS and transportation needs in general. These survey results can provide insight and serve as a sounding board for considering route and/or service changes; however, these data are not meant to reflect a statistically significant sample of the Clarksville population.

Project Analysis

In order to make informed recommendations about potential new areas for transit service, it is essential to review and understand the most recent population, demographic, and census data. Where possible, it is best to include local data such as building and/or housing permits, as well as employment data when available. Working with the City of Clarksville, CUAMPO, and CTS, the study assembled a data set that serves as the foundation for analysis. Details of the analysis and development process are provided on the following pages. In addition to the map and desk-analysis, fieldwork was conducted throughout the course of the project to confirm and support the data. This included on-site reviews of existing and new development, identifying potential routes and confirming bus compatibility with roadways and parking facilities, as well as investigating high transit score communities.

Demographics

Understanding the demographic composition of the Clarksville Urbanized Area is one of the keys to determining transit demand and potential ridership. There are several demographic indicators that, when combined, have proven to support transit service and generate riders. These include population density, employer/worker density, location of zero-vehicle households (i.e., families that do not own vehicles), and minority population areas. Other factors include the location of high-demand destinations such as colleges/universities, shopping centers, large employers and large residential communities.

The combination of this data allows transit planners to make important decisions on where and how often transit should operate within a service area. The next few sections discuss the key demographic measures that were used to determine the potential for additional or revised service.

Population Growth

According to the latest US Census estimates, the Clarksville MSA population was roughly 292,000 in 2018.[1] As seen in Table 3, the population has steadily grown at a healthy annual rate of 1.4 percent over the 5-year period between 2014 and 2018. This growth has mostly occurred within the Clarksville city limits (1.8% growth); while the City of Oak Grove, Kentucky – which is also included in the Clarksville MSA - has experienced a small reduction in population at a rate of 0.45 percent annually.

Table 3 - Population Estimates (2014-2018)

City	2014 Population Estimate	2018 Population Estimate	Average Annual Growth Rate
Clarksville, TN	145,842	156,794	1.83 %
Oak Grove, KY	7,509	7,376	-0.45 %
Clarksville MSA	276,473	292,264	1.40 %

Source: American Fact Finder, 2018 Population Estimates

[1] *American Fact Finder, Annual Population Estimates: April 1, 2010 to July 1, 2018*

Transit Score Analysis

The Transit Score is a metric used to estimate the demand for transit based on a combination of factors that identify areas of high transit ridership potential. These factors are summarized geographically at the block group level, which is the highest resolution for which these data are available. These key factors are:

- Population Density
- Minority Density
- Zero Vehicle Density
- Sum of Residential Building Permits (Clarksville only)
- Disabled Density
- Sum of Workers in 2015
- Poverty Density

Each of these provide insight into the geographic-coverage effectiveness of a local transit system and when analyzed independently, identify transit needs for a particular demographic. The Transit Score methodology combines these factors into a more manageable single value and then ranks that value on a scale of 0 (low) to 100 (high) relative to the highest ranking block group. Table 4 provides an example of how transit scores are calculated.

Table 4 - Example Transit Score Calculation

Transit Score Factors	Transit Score (Example Study Area = 3 Block Groups)		
	Block Group 1	Block Group 2	Block Group 3
Population Density	10	33	19
Minority Density	40	85	25
Zero Vehicle Density	90	100	80
Poverty Density	45	22	70
Disabled Density	65	55	43
Raw Transit Score	250	391	237
Final Transit Score	(250/391) 64	(391/391) 100	(237/391) 61

Figure 3 shows the Transit Scores for the selected block groups within the project study area. Based on the results, the block groups with the highest transit score are located in areas south of Madison Street near downtown Clarksville and in Oak Grove, Kentucky - just west of Ft. Campbell Boulevard on the base. These high transit scores are a result of a large concentration of population, minorities, zero vehicle households, low income households, and disabled persons within a block group area.

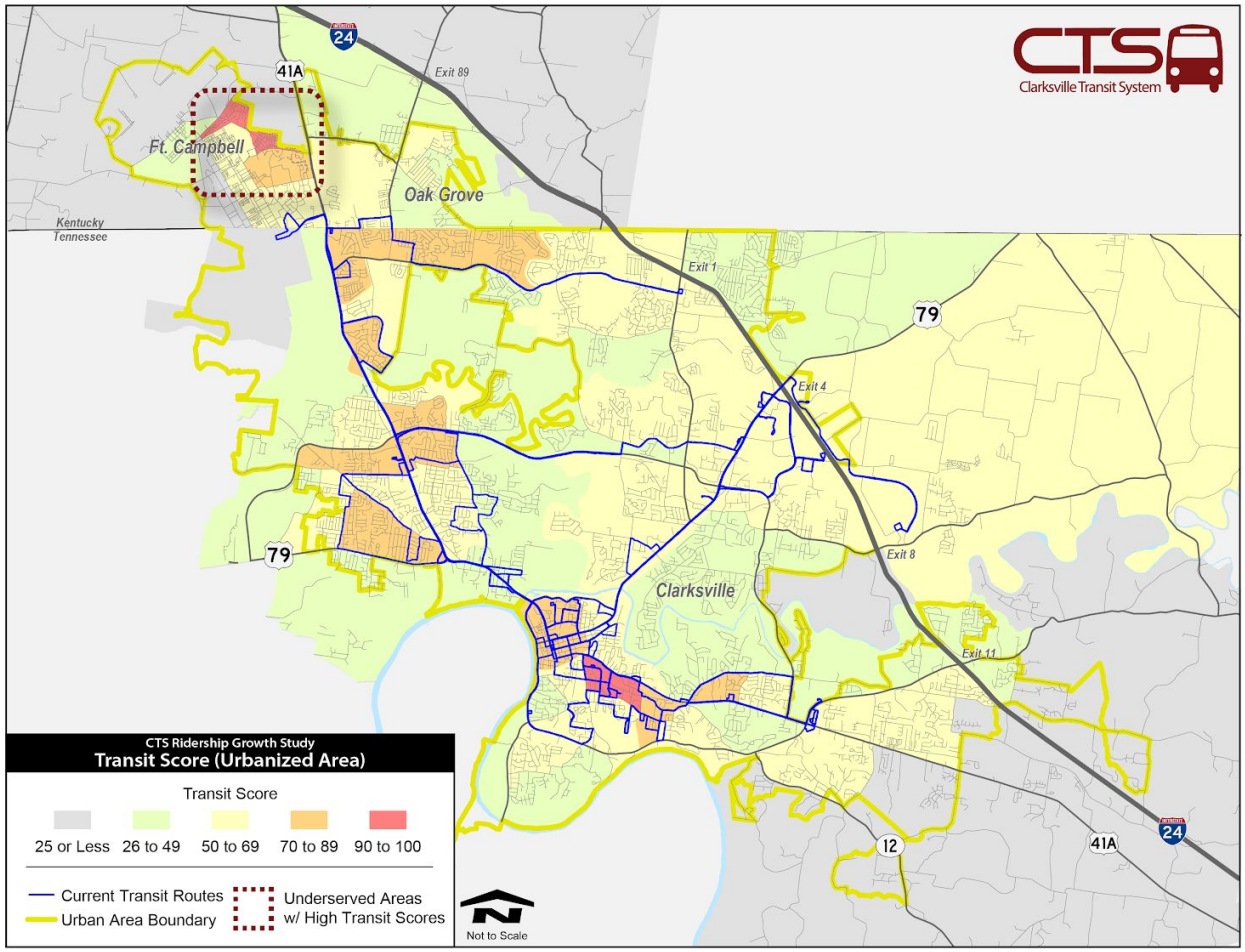


Figure 3 - Transit Scores (Urbanized Area)

It should be noted that some of the block groups in the Oak Grove area, when compared to the rest of the study area, dominate the high transit scores. This is primarily due to the dense residential developments located along Morgan Road, which can only be accessed through guarded entry gates off of Ft. Campbell Boulevard. For efficient transit service, denser development is always desirable; but if one particular area of the region overpowers the population density category, it can skew transit scores and produce artificially lower transit scores relative to the dominant area.

In other words, when transit score analysis is run without the inclusion of any Kentucky block groups, the region's transit scores increase overall. Block groups that were previously showing transit scores between 50 and 69 are now producing scores between 70 and 89. Furthermore, more block groups have scores in the highest tier between 90 and 100 - specifically within the Tiny Town and Green Acres regions near the TN-KY state line, western Peachers Mill near Ft. Campbell Boulevard, and the Greenwood and Sango regions. This analysis provides a more accurate reflection of the development patterns and densities of Clarksville as a whole. Figure 4 displays the calculated transit scores for the Tennessee portions of the Urbanized Area.

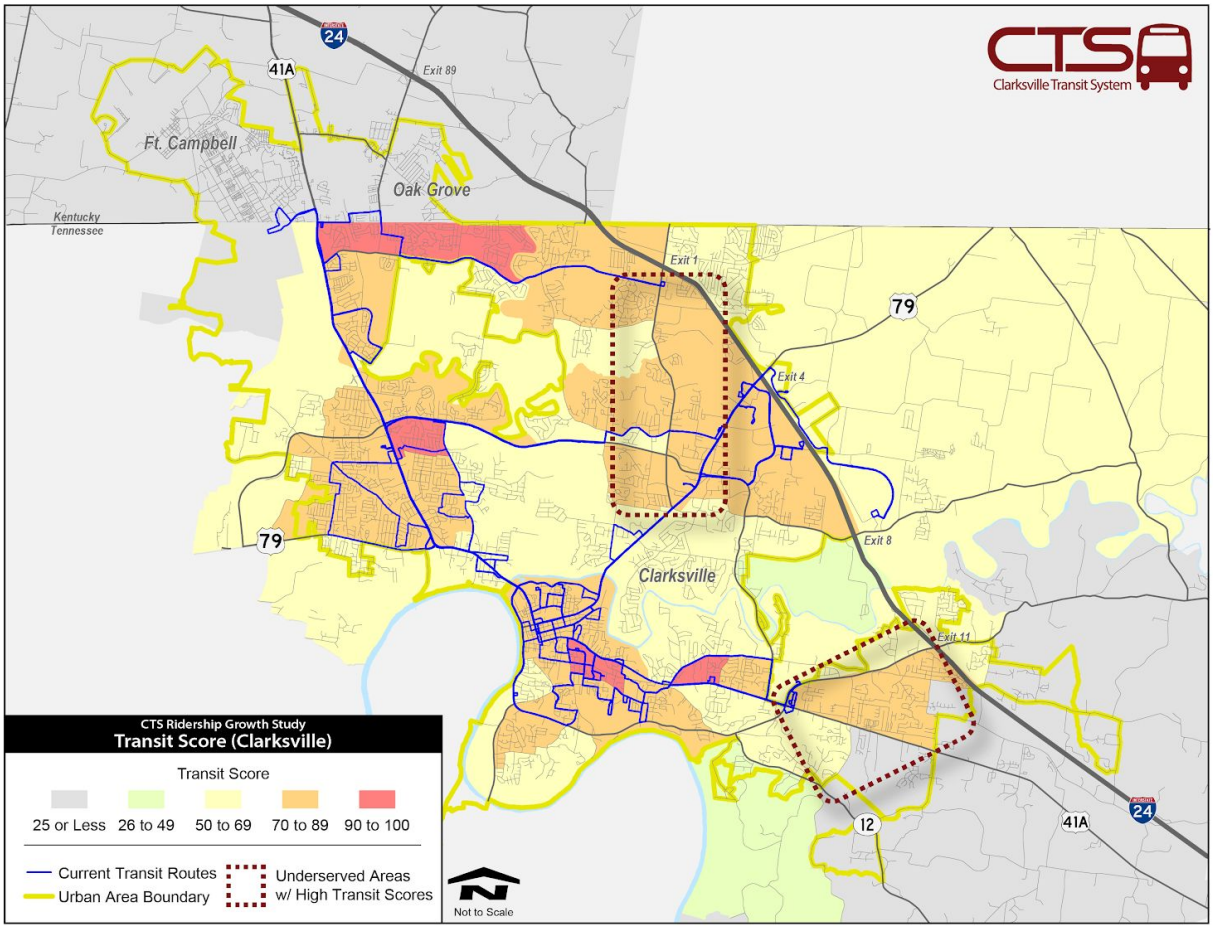


Figure 4 - Transit Scores (TN Only)

As is evidenced by the preceding maps, CTS does a good job providing service to the majority of highest scoring zones. There are, however, a few areas where service could be expanded to reach more potential riders (identified by the hashed-rectangular outlines on both maps). These are the high scoring zones off of Trenton Road, as well as the area between MLK Jr Parkway and US-41A, in the community called Sango. A substantial

amount of commercial and retail development is underway along MLK Jr parkway near the I-24 interchange and riders could also benefit from service to this area.

In addition, the highest scoring zone in Kentucky, which is on-base at Fort Campbell, is currently without bus service. CTS could gain riders and make transit more convenient for military personnel by extending service to this community.

Service Opportunities and Recommendations

Based on the responses from the various surveys, evaluations of transit scores, fieldwork, and discussions with CTS and CUAMPO staff, the following is a toolbox of route recommendations that could potentially attract new (or more frequent) riders in the Clarksville Urbanized Area:

- Combination Route 7 Revision (Trenton Road) and Route 8 Revision
- New route 70 (Trenton Road)
- New Route 60 (Madison Street / M.L.K. Jr. Pkwy)
- Route 1 Extension

Combination Route 7 and Route 8 Modifications

Route 7 - Ringgold

Currently, Route 7 and Route 8 share a portion of their service along Wilma Rudolph Boulevard. Route 7 is currently the 4th ranked route in terms of annual ridership, with over 84,000 rides, and is a bi-directional route serving Governor's Square Mall and the Walmart on Wilma Rudolph. It has very few turns and acts as a trunk line for the corridor. It operates every 30 minutes as well as Saturdays. A round trip currently takes about 50 minutes.

The Route 8 carries just over 50,000 rides and overlaps a significant portion of its route with Route 7. It also serves as a bi-directional major trunk line and a connector to the Medical Center and businesses along Ted A. Crozier Sr. Boulevard. From the hospital, it continues west along the 101st Airborne Division Parkway to the transfer point at Walmart-North on Fort Campbell Boulevard. Route 8 has the highest fixed route net cost per passenger and runs hourly, and Saturdays. Each vehicle takes two hours to complete a round trip.

The transit score for the southern and northern areas served by both Route 7 and Route 8 are high, however, the area north of the 101st Airborne Division Parkway also scores high and is currently not served by CTS. Trenton Road bisects these areas and serves as a direct North-South route. Several passenger generators and destinations lie along Trenton Road,

including several apartment and housing developments, Northeast High School and Elementary, as well as a connection for the Clarksville Greyhound Bus service.

One recommendation is to revise both Route 7 and Route 8 so that service can be provided to these high transit score communities. A proposed Route 7, as shown in Figure 5, would provide bi-directional service along Wilma Rudolph Boulevard as well as Trenton Road. Through this redesign, transfer opportunities would exist with Route 2 at the Hollingswood Drive turnaround, and Route 8 on Wilma Rudolph Boulevard at the existing stop near Baskin Robbins, or at the intersection of Forest Hills Drive.

These changes to Route 7 would remove service to areas north and east of the Needmore Road, but these areas would be serviced by modifications to Route 8, as shown in Figure 6. This new routing would provide riders an opportunity to travel from the northwest corner of Clarksville and Oak Grove, utilizing a transfer at Hollingswood Drive, to the eastern portion of the City without having to go downtown first. Additionally, this will provide access to new potential riders and destinations that are currently not served.

The revised Route 7 would expand the distance of the route from about 17 miles round trip to 20 miles; therefore, should CTS choose to move forward with these recommendations, a detailed timing and schedule analysis would need to be completed. Based on an estimated CTS bus speed of 17mph, the revised round trip would take about 70 minutes instead of the current 50 minutes. In an effort to keep the expanded service budget neutral, the headway of Route 7 would need to be reduced from 30 minutes to 45 minutes. However, since Route 8 shares a portion of its service with Route 7 along Wilma Rudolph Boulevard, the timing of Route 8 departures could be scheduled in coordination with Route 7 to provide more frequent service along the main trunk of Wilma Rudolph up to the 101st Airborne Division Parkway. Between the two routes, service along that shared portion could range between 15 and 30 minutes. A detailed review of all route schedules would be needed to coordinate transfers where possible.

In addition, should CTS choose to increase the frequency of service on Route 7, from 30 to 20 minutes, it would require the purchase of new fleet vehicles and hiring of staff. The approximate annual cost to operate an additional bus on this route would be $359,000.

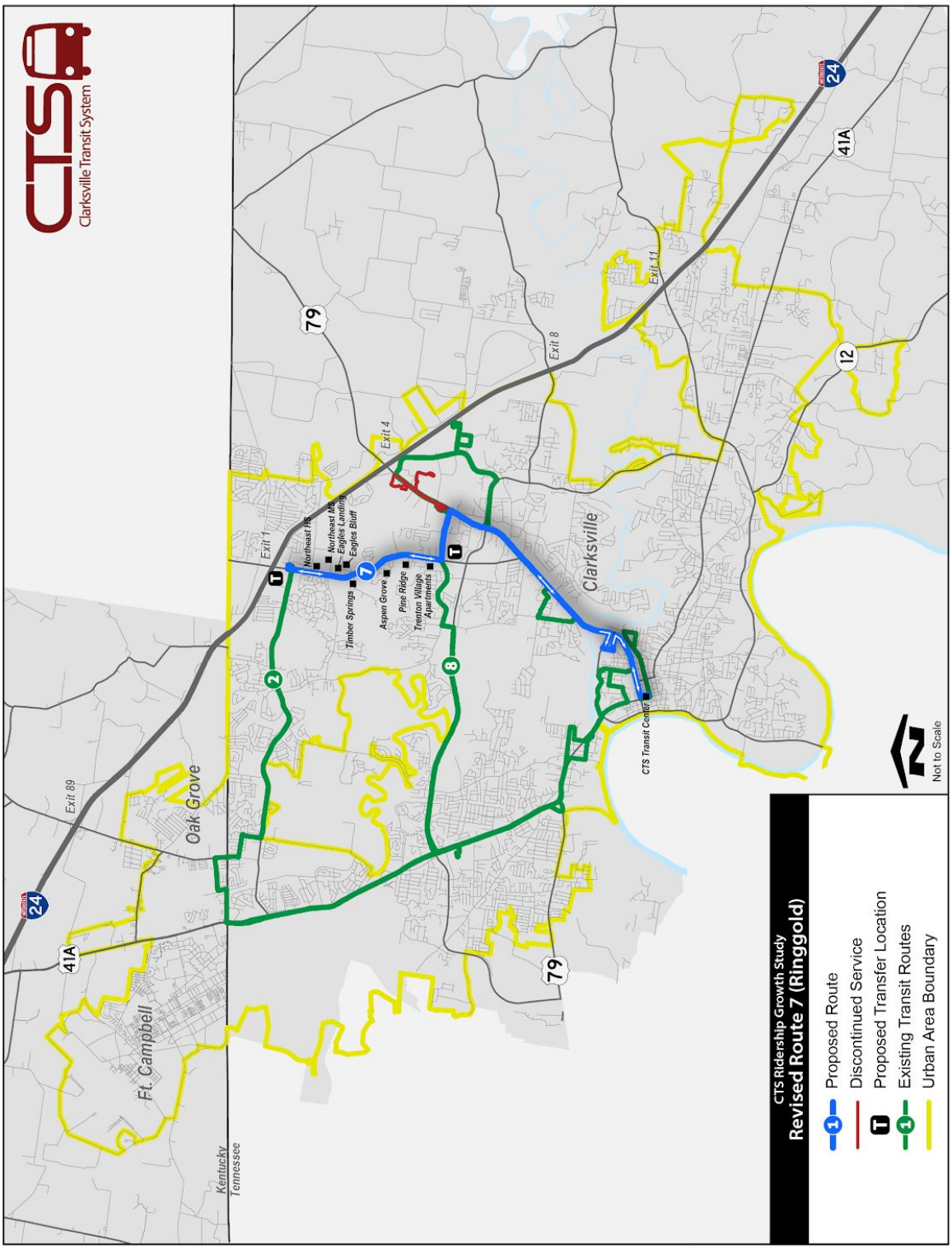


Figure 5 - Proposed Route 7 (Ringgold)

Route 8 - Hospital / Governor's Square

To decrease the impact of the proposed Route 7 changes, we also recommend modifications to Route 8 as shown in Figure 6. These revisions are primarily to provide a direct connection to Walmart and Governor's Square Mall, which will no longer be served by Route 7. These changes to Route 8 could boost ridership by adding two major destinations to the service. The service would operate bi-directionally along Wilma Rudolph Boulevard up to the 101st Airborne Parkway. From here, the route would travel in alternating bi-diretional loops. As an example, the first trip outbound would head east on the 101st Airborne Parkway, where it would then travel north to the hospital, and onward to the Walmart and Governor's Square Mall, before completing the loop via Needmore Road. The next outbound trip would follow the loop in the opposite direction, heading west on the 101st and traveling through the Needmore loop and north to the Mall, Walmart, and then completing the loop back through the hospital.

We also propose a timepoint and transfer opportunity where Route 7 and Route 8 overlap along Wilma Rudolph Boulevard as described in Route 7 modifications. This may not be a timed connection; however, it will allow passengers to transfer between these two routes, ultimately providing them access to travel north, south, east, or west from that location.

Route 8 currently ranks 7th overall in ridership and travels the longest distance of all routes. The proposed modification would eliminate a significant portion of the route that travels on the 101st Airborne Parkway and has a relatively low transit score as shown in Figure 4. This change would reduce the current round trip travel time from almost two hours to one hour and 25 minutes and would remove the transfer connection with Route 1, Route 2, and Route 4 at Walmart-North on Ft. Campbell Boulevard. Over the course of this analysis, it appears that the ridership and need for service along the proposed eliminated section is negligible; however, it is recommend that a detailed analysis of transfers, as well as ridership along the eliminated portion be conducted to ensure minimal impact to riders.

These proposed modifications shorten the distance and operating time to complete a round trip; therefore, these changes could be implemented with no additional cost impact to the CTS budget.

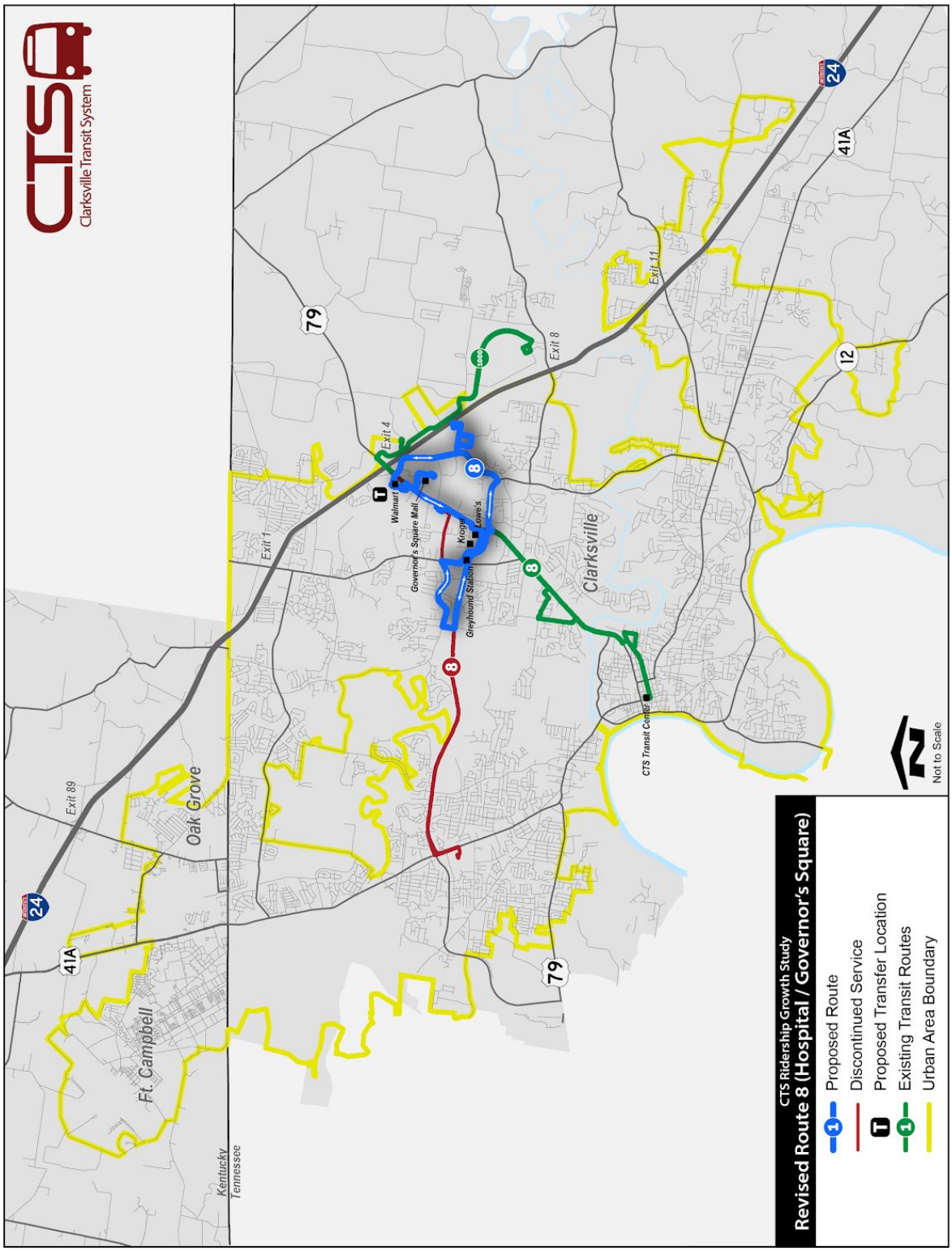


Figure 6 - Proposed Route 8 Revision (Hospital / Gov. Square Mall)

New Route 70 - Trenton Road

An alternate proposal to modifying both Route 7 and 8, is to keep those routes operating as is, and instead add a new route that provides connections to the unserved areas along Trenton Road. A proposed map of this route is shown in Figure 7. The advantages to adding this service instead of revising existing routes are more frequent service along the trunk of William Rudolph Boulevard, and minimal disruption to riders' current travel patterns. The disadvantages are primarily financial in nature requiring that CTS purchase additional vehicles and hire more operators.

The proposed New Route 70 would operate in a similar fashion to that as the modified Route 7, except traveling via Lowes and near the Greyhound connection prior to continuing along Trenton Road. The round trip distance of this route is 19 miles, requiring a round trip operating time of approximately 1 hour and 7 minutes. To operate this service with two buses on a 45 minute headway would cost approximately $614,500 annually.

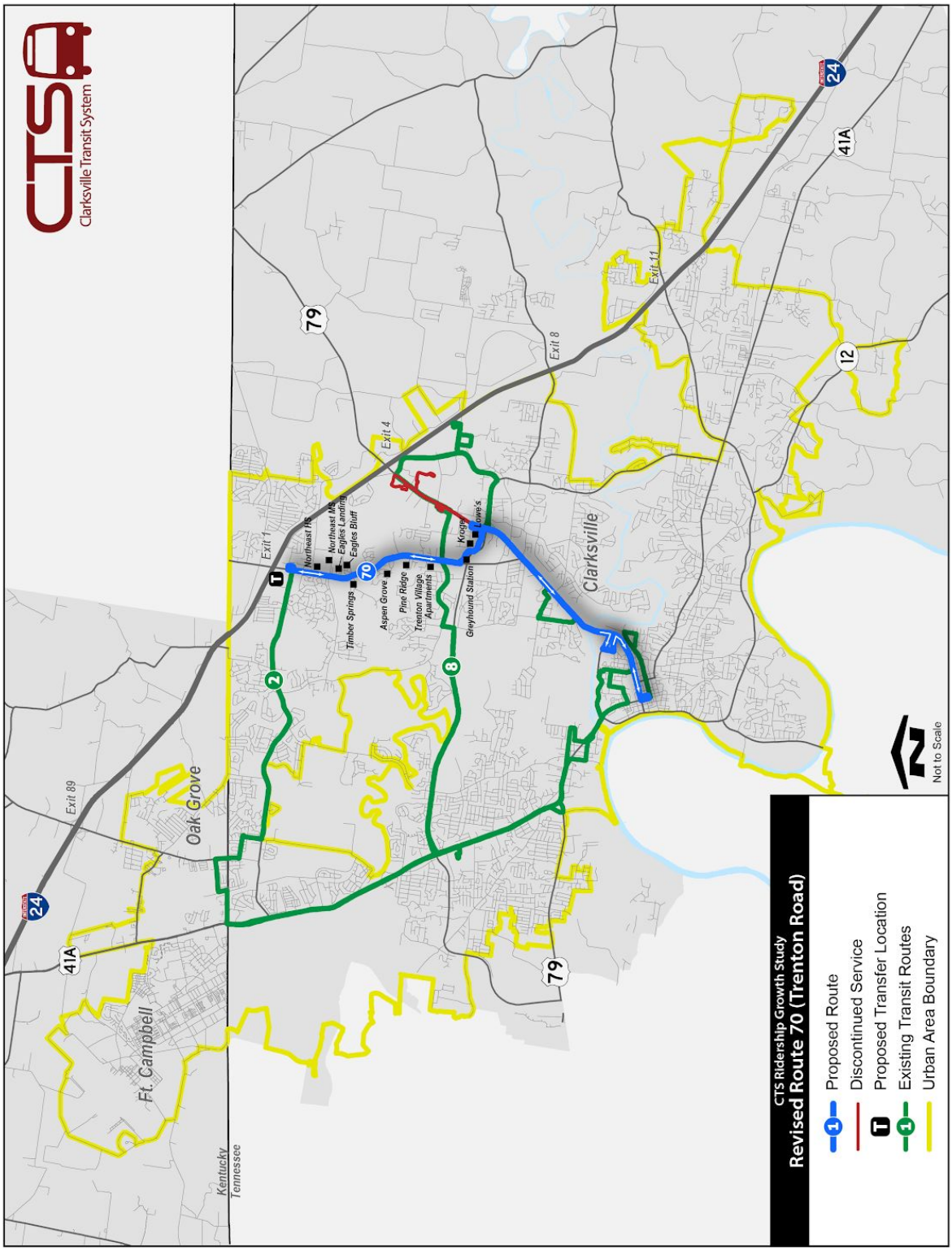


Figure 7 - Route Map of Route 70 (Trenton Road)

Route 6 - Madison / Route 60 - Publix, Park & Ride

Route 6 - Madison is the highest performing service in the Clarksville system. It ranks first for ridership as well as passengers per hour, and net cost per passenger. The Route 6 provides 30 minute service and operates on Saturdays. A round trip takes approximately 50 minutes.

As is indicated on the transit score map (Figure 4), Route 6 currently serves two of the highest scoring transit demand zones. However, as is also shown on Figure 4, there is a large swath of potential transit demand east of the current end of the line and significant development has occurred along MLK Jr Parkway near Exit 11.

Additionally, the Regional Transportation Authority provides commuter bus service to Nashville from a new Park and Ride lot just east of I-24. RTA currently provides four early morning inbound trips to Nashville starting at 5:48 am, and one evening trip at 5:20 pm There is one morning departure headed from Nashville to Clarksville at 5:52 am and four early afternoon trips beginning at 3:45 pm. In an effort to provide region wide transit connectivity, it is recommended that CTS provide some type of service to the Exit 11 Park and Ride lot; however, due to the early morning nature of long-distance commute trips, it would be challenging to envision riders traveling long distances by local bus, to connect to a longer trip by regional bus.

Therefore, rather than adjust all route schedules to start service early enough to make a CTS connection to the Park and Ride possible, we recommend creating a new route, Route 60 - Publix / Park and Ride. This route can connect with the regional RTA service as well as provide new connections to the growing community on Martin Luther King Jr Parkway near I-24.

The route proposal is shown in Figure 8, and would require the route to leave the transit center at 5:00 am While not all CTS riders would be able to make a connection to the RTA service, those who live along the highest ridership corridor, and within two high transit propensity areas would have access. Additionally, there may be opportunities for CTS to identify Park and Ride lots near the Transit Center in downtown Clarksville. Residents could potentially use these lots and ride to the CTS connecting service (Route 60), instead of driving all the way to the Exit 11 Park and Ride lot.

Due to the limited number of RTA commuter trips over a one hour period in the morning and slightly more than an hour in the afternoon, it would not be necessary to run Route 60 to the Exit 11 Park and Ride throughout the day. The new Publix on MLK Jr Parkway has been identified as a proposed turn-around location for the majority of service on the proposed Route 60. This would allow CTS to provide needed transit service to the growing community along MLK Jr Parkway as well as provide a connectivity option for regional

transit. As RTA ridership grows at the Clarksville Park and Ride, there may be opportunities for CTS to provide later morning and mid-day trips to this location.

The scheduling of this service could be designed in coordination with the existing Route 6 - Madison, to provide more frequent service along the highest ridership corridor - achieving a potential headway of 20 minutes along the shared segments as well as providing a more direct trip to the many retail services along Madison Street (i.e., Walmart-Sango). This route would extend beyond current CTS service areas on Madison Street to Old Farmers Road, where it could provide transit access for the apartment complexes, residential developments, and healthcare facilities in that community.

Route 60 is approximately 18 miles round trip to the Publix on MLK Jr Parkway, with a few of the trips running to the Exit 11 Park and Ride resulting in a 20 mile round trip. The estimated round trip running time is 64 minutes, therefore CTS could operate two buses on a 45 minute headway during similar hours of existing services (5:00 am - 8:00 pm weekdays; noon - 9:00 pm Saturdays) for approximately $614,500 annually.

One specific challenge of this routing, is the bus making a left turn to cross MLK Jr Parkway on the return trip to the transit center. MLK Jr Parkway is a high-speed roadway with significant peak-time commuter traffic. This was observed during the peak morning rush hour to determine the viability of a transit bus crossing this intersection. It does appear that the bus could cross this intersection due to generous sight lines, a school zone in the area just before the intersection, and the lack of development between the stop light at Madison and MLK Jr Parkway. However, prior to implementing this service, it would be worthwhile for CTS to coordinate with the appropriate roadway agency to determine if a traffic signal is warranted. During field visits, significant queuing of cars turning east off of Old Farmers Road onto MLK Jr Parkway was observed - which may indicate the need for a signalized intersection.

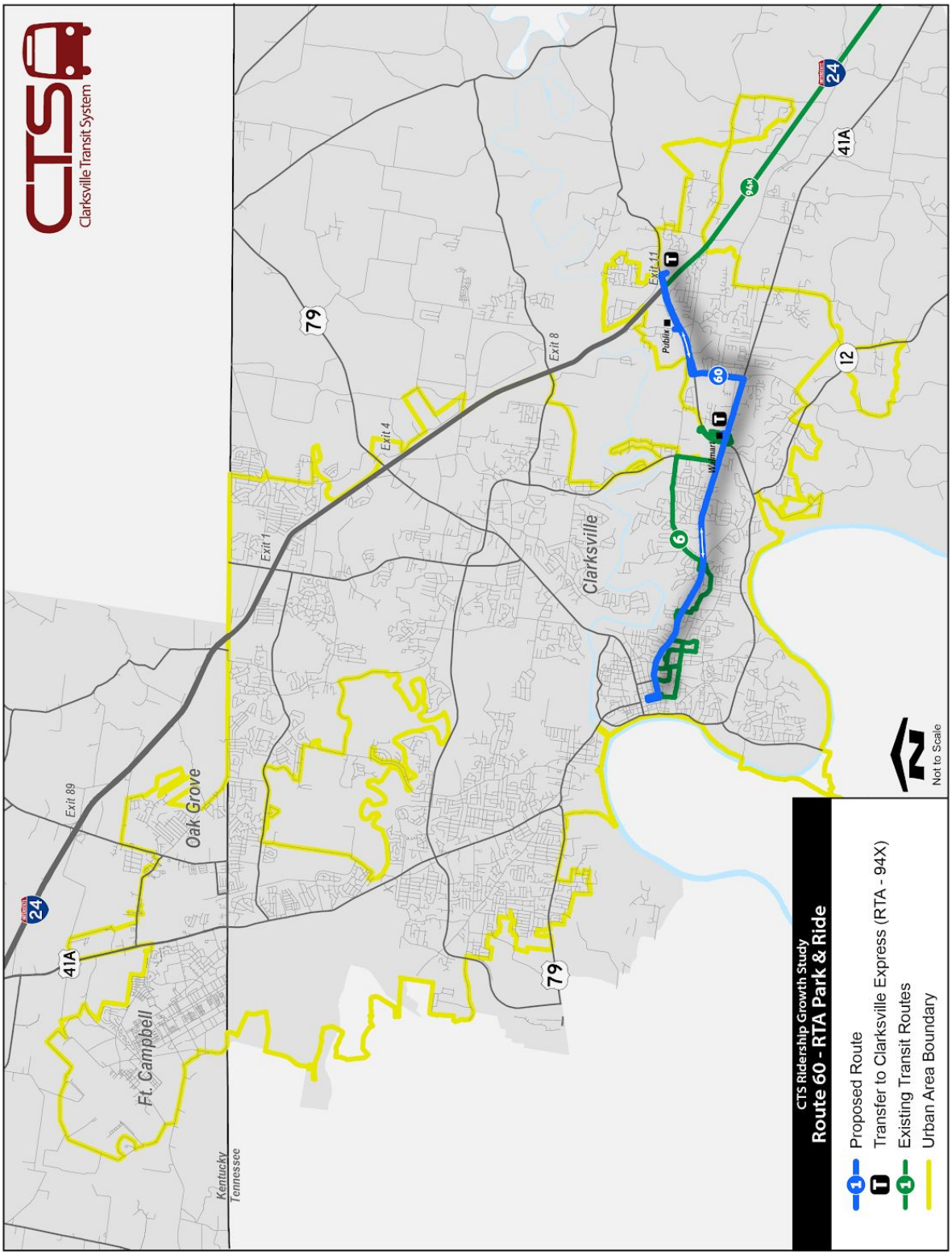


Figure 8 - Proposed Route 60 (Park & Ride)

Route 1 - Fort Campbell Extension

Route 1 - Fort Campbell has the second highest ridership at over 102,000 trips annually. It currently operates on an hourly headway with a total round trip distance of approximately 31 miles. The recommendation, as shown in Figure 9, is to continue the route northward through Ft. Campbell to Morgan Road, where the bus would exit the base through Gate 6, and turn North onto Ft. Campbell Boulevard to the Oak Grove Walmart. From here the bus would begin its inbound loop on Thompsonville Lane to Pembroke Oak Grove Road, turning west onto Tiny Town Road where it would resume its current routing. Proposed recommendations involve operating this service so that each outbound trip travels the loop in reverse. This will allow both base residents and community residents to travel the route to and from destinations along the loop portion, without an unnecessary and lengthy trip downtown.

Adding this loop to the existing route would extend the total round trip distance to 40 miles. The outbound travel time to the Oak Grove Walmart is estimated at 1 hour and 17 minutes, while the inbound portion from the Walmart to CTS Station is approximately 1 hour and 3 minutes, resulting in a total round trip time of 2 hours and 20 minutes. This timing allows for another bus to be added to this route and still maintain an hour headway; however, if the analysis finds that buses travel this corridor faster than the estimated 17 mph, it may be possible to improve the headway from 1 hour to 45 minutes. The estimated cost of providing additional service on this route is $426,750 annually.

This route expansion would serve the high scoring transit zones at the north end of the base as well as reach some additional high scoring zones in the Oak Grove community. Before changes to this route could be implemented, further conversations with Ft. Campbell would be needed.

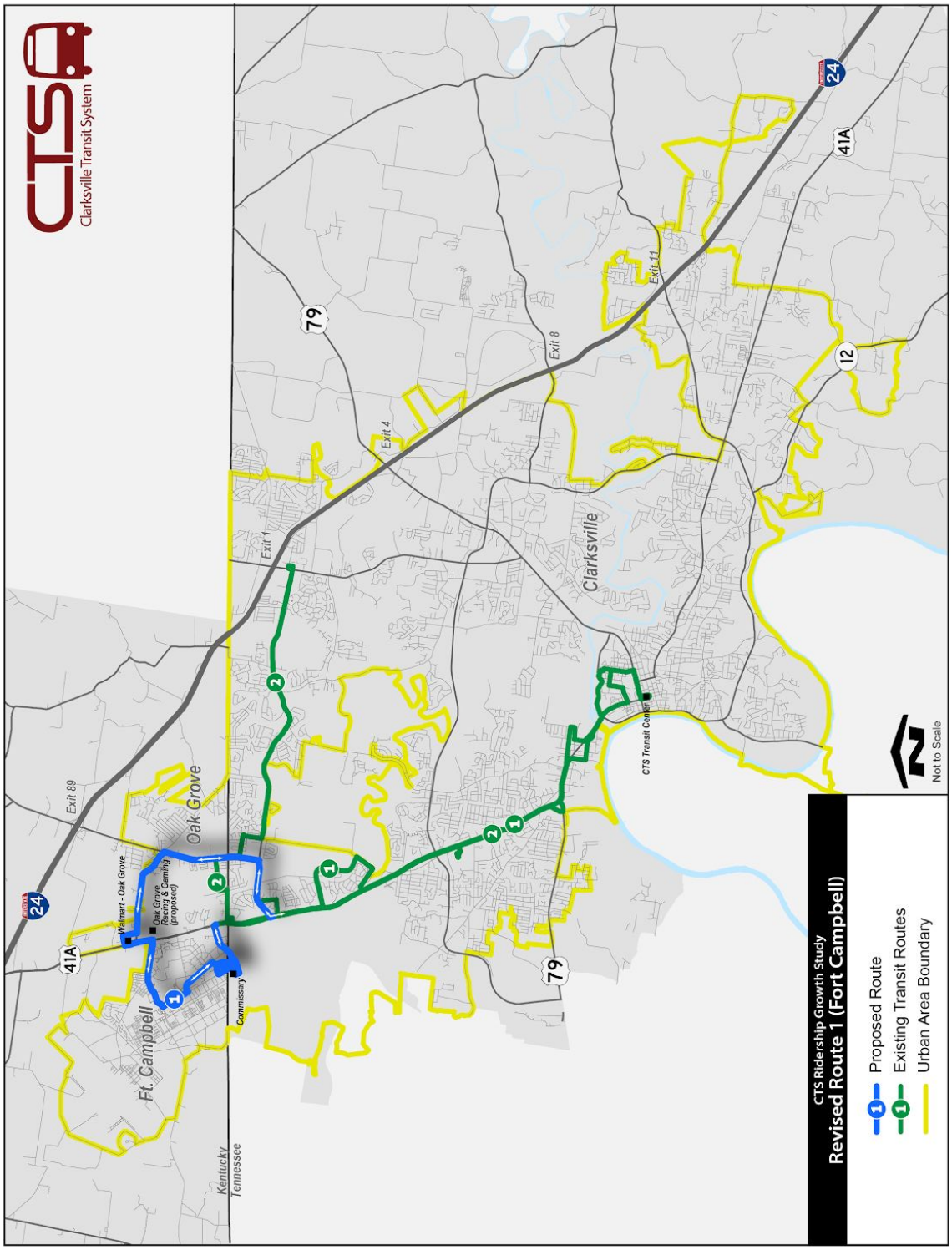


Figure 9 - Proposed Route 1 Revision (Ft. Campbell)

Challenges and Opportunities

Challenges

There are several challenges that CTS will need to consider before embarking on these new service options. The first and foremost challenge is funding. Expanding the geographic service area will require additional hours of service and therefore increased operating funds. Further, adding new services also requires the purchase of more vehicles and the associated costs of maintenance. This can be a difficult challenge to overcome; however, federal and state grants may be available to cover the capital cost of vehicles more readily than the additional operating cost. It is recommended that CTS work with local elected officials, CUAMPO, and other agency partners to identify potential financial resources that can assist CTS in meeting the rider and community needs identified in this report.

The majority of route proposals suggested through this report operate on public roads and therefore are fully within CTS's capability to implement without restriction. However, the proposed changes to Route 1 - Ft. Campbell, would modify the existing path of CTS vehicles in the base. Specifically, Route 1 currently enters and exits the base through Gate 4. As identified previously, the proposed redesign would require CTS vehicles to enter through one gate and exit through another, depending on the direction of the route. Due to base safety standards, a uniformed safety officer currently rides the bus while it is on base, exiting the bus once it departs. Should CTS modify the route to serve more of the base, and therefore exit through a different gate from which it entered, this may require a change in protocol for base safety personnel, as they will no longer be returned to where they boarded. The study team worked closely with Ft. Campbell personnel in looking at potential route changes and staff were generally supportive; however, any proposed changes would need to be vetted and confirmed with the appropriate base divisions prior to implementation.

Opportunities

Providing effective and efficient transit service in smaller urban communities is a difficult challenge. Generally, smaller communities such as Clarksville have a lower overall population density that is spread wide throughout the community. This makes reaching all of the potential riders difficult. Additionally, due to the sprawling nature of these communities, transit trip times and routes are accordingly lengthy and sometimes

circuitous. From a general review of existing transit service, CTS does a good job of balancing competing needs of both transit coverage and frequency.

Through conducting this analysis, however, some areas of opportunity were identified where transit ridership could be gained. These areas have been highlighted in the report and primarily include:

- The northern portion of Ft. Campbell and the Oak Grove area
- Areas along Trenton Road
- The new development along Exit 11
- Portions of the Sango community

Extending routes or adding new routes to service these areas would have a positive impact on the geographic coverage of CTS as well as potentially increasing ridership. As CTS is able to acquire additional funding or prioritize future projects, we recommend that CTS consider these opportunities as value enhancing investments for the Clarksville community.

Cost Estimate Notes

Providing transit service requires an agency to balance geographic and time-based constraints with customer needs, and system operating and vehicle maintenance costs. While this analysis seeks to identify areas of unmet transit need, as well as propose a menu of possible solutions, the cost and timing to provide these services should be considered informed estimates. Costs in this proposal are based on a conservative hourly rate of $75 with bus speeds estimated at 17 mph. In a review of the bus schedule, it appears that average bus speeds range between 17 and 22 mph, therefore, should CTS determine to implement any of these changes, a thorough timing of routes may yield a higher speed, resulting in reduced costs or improved headways.

In addition, prior to implementation of any of the proposed service changes, it is recommend that a full schedule review and route timing analysis be completed to accurately coordinate the new and/or revised routes into the fabric of the CTS transit network. The coordination of multiple vehicles, operating over several routes, is a puzzle that must be built with all pieces at the same time.