2016 motion

Nashville MTA/RTA TRANSIT PLAN

FINAL REPORT APPENDICES - DECEMBER 2016

APPENDIX 7

TECHNICAL MEMOS

Nashville MTA

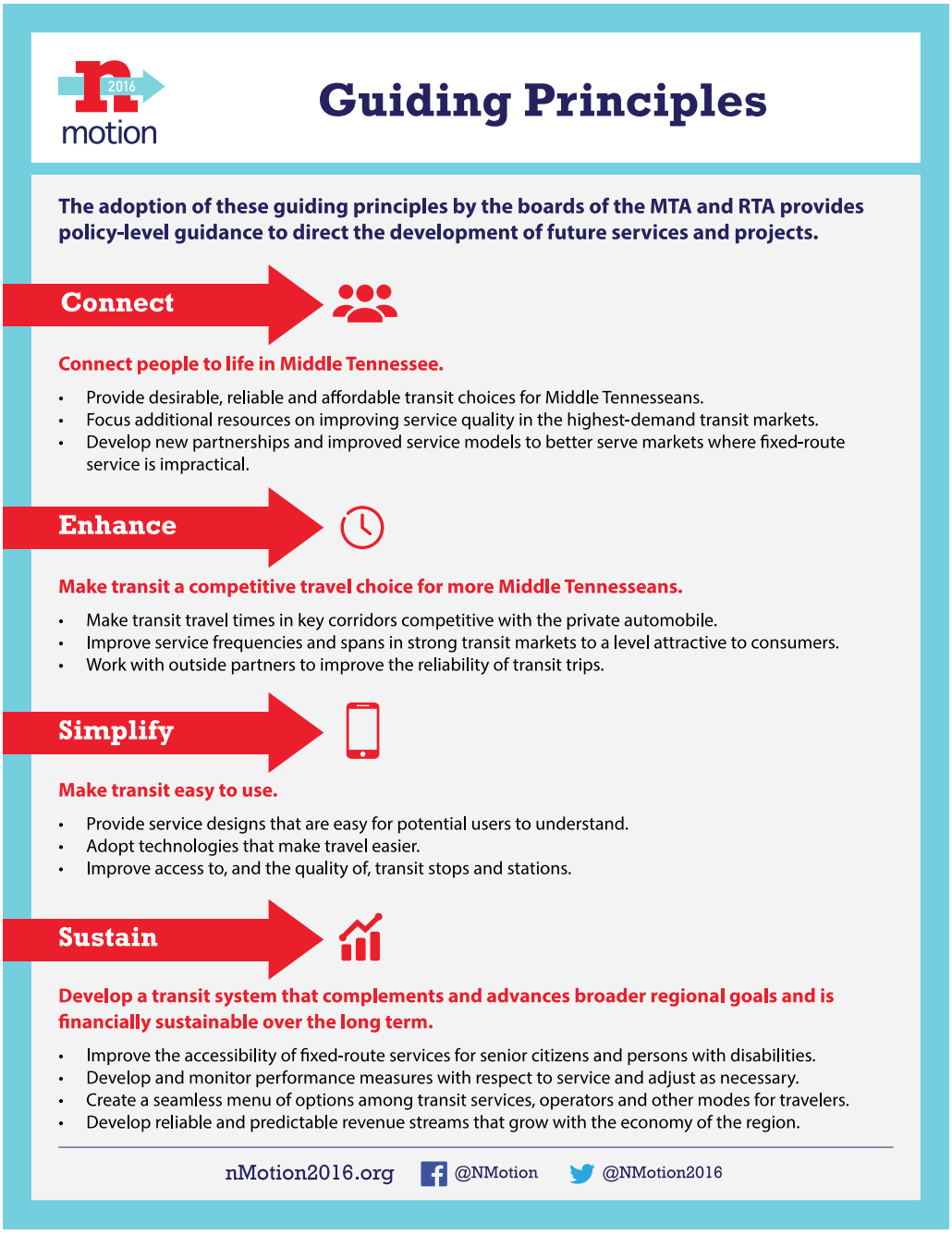
RTA

NELSON NYGAARD

PROGRAM IMPACTS

The nMotion program will provide a large number of benefits for Middle Tennessee. This document presents selected benefits and other impacts of the nMotion 2016 recommendations. These impacts are presented in terms of evaluation criteria that are based on the project's guiding principles, which were established during the nMotion planning process and guided the development of recommendations. The project themes, goals, and objectives are shown in Figure 1 below.

FIGURE 1 | GUIDING PRINCIPLES



For each of the themes, goals, and objectives shown below, specific evaluation criteria were developed to quantify the impacts of the nMotion recommendations. The evaluation metrics that were measured for each theme are listed below:

CONNECT

- Projected ridership
- Service to Metro area residents
- Metro area jobs served by transit
- Amount of service to Metro area low income residents
- Amount of service to Metro area minority residents
- Service to outer county residents
- Regional jobs served by transit
- Amount of service to outer county low income residents
- Amount of service to outer county minority residents

ENHANCE

- Amount and percentage of fast/significantly faster service
- Percent of service that provides frequent all day service
- Route miles of service with dedicated and/or managed rights-of-way

SIMPLIFY

- Route miles of High Capacity Transit services
- Route miles of service with pedestrian improvements

SUSTAIN

- Route miles of service that could stimulate TOD/economic development

The methodology and findings for each of these evaluation metrics are presented in this document. Several criteria utilize metrics based on service type, such as Frequent Service or Local Service. A complete list of routes by service type is presented at the end of this document in Table 8.

CONNECT

PROJECTED RIDERSHIP

The project team determined the projected ridership for all transit services in 2040 under the nMotion plan. For each existing and new route, the team determined a baseline level of ridership and then estimated future year ridership for each route to determine based on several factors, such as improved level of service and projected increases in population and employment density. Factors used to estimate projected ridership for the recommended service plan include:

- Changes in population and employment density along each route
- Changes in service type
- Increases in service levels
- Increases due to service simplification
- Increases due to improvements in pedestrian conditions

- Increases due to the introduction of new services

MTA and RTA currently carry approximately 34,000 passengers per weekday. With all improvements in place, ridership is projected to increase by 550% to nearly 190,000 passengers per weekday. A step-by-step description of the methodology used to develop the estimates and the final results for each route are presented in the Ridership Estimation Methodology technical memorandum. A summary table of projected ridership figures is presented in Table 1.

TABLE 1 | EXISTING AND PROJECTED RIDERSHIP

	EXISTING SERVICES		RECOMMENDED SERVICE (2040)	
	RIDERSHIP	PERCENT	RIDERSHIP	PERCENT
Frequent Service	8,683	26%	99,811	53%
Other Local Service*	21,737	64%	31,125	16%
Commuter Rail	1,057	3%	6,588	3%
Freeway BRT	0	0%	45,071	24%
Express Bus	2,272	7%	2,800	1%
Regional Rapid Bus	0	0%	3,434	2%
Total Ridership	**33,749**	**100%**	**188,829**	**100%**

* "Other Local Service" is all MTA local service that is not considered Frequent Service, or all routes that operate less frequently than every 15 minutes.

NUMBER OF DAVIDSON COUNTY RESIDENTS SERVED BY TRANSIT

A major objective of nMotion was to improve service to Davidson County residents who live in transit supportive areas, with transit supportive areas defined as areas with eight or more residents per acre and/or more than four jobs per acre. This criterion evaluates both current (2010) population distribution along existing MTA transit service and future (2040) population distribution along proposed MTA transit service in transit supportive areas.

Methodology

Davidson County's existing population distribution was obtained from the 2010 U.S. Census, which divides the data into Census blocks (generally one city block). Future population distribution was compiled from the Nashville Area Metropolitan Planning Organization's (MPO) 2040 population and employment traffic analysis zone model, which divides the data into traffic analysis zone grids (TAZ grids, generally 40 acres).

To assess the number of residents living in areas with significant transit demand that are served by existing transit services or will be served by proposed transit services, the study team summed all of the residents from blocks and TAZ grids whose centroids were within ½ mile of existing and proposed MTA routes that have a combined population and employment density that can support transit service at a frequency of 60 minutes or longer. The total number of residents living in areas with significant transit demand served by each alignment for 2010 and for 2040 was reported by frequency type (see Table 2). These measures indicate the total number of residents served by existing and proposed frequent (15-minute midday frequency), local, commuter/express, and other local routes as well as the total number of residents without MTA services within a half mile.

Findings

At present, 279,000, or just under half, of Davidson County's residents live in transit supportive areas. By 2040, that number is expected to increase to 411,000 and 54% of all residents. With the nMotion improvements, most residents will be served by more convenient services and fewer will be unserved (see Table 2):

- The number of residents who will be served by Frequent Service will increase from 91,000 to 236,000, an increase of 160%.

- The number of residents who will be served by Other Local Service will decrease from 104,000 to 74,000. With nMotion improvements, there will be a significant increase in the amount of Frequent Service provided in Davidson County. As such, many residents who were previously served only by route considered Other Local Service will be served by Frequent Service (in addition to some local routes), resulting in the decrease in residents served only by Other Local Service.
- The number of residents who will be served only by other types of service will increase from 139,000 to 167,000, or by 20%. (This percentage is relatively low due to the large increase in the number served by Frequent Service.)
- The number of county residents without any service will decrease from 35,000 to 25,000, or by 58%

TABLE 2 | EXISTING AND PROJECTED POPULATION SERVED BY TRANSIT IN AREAS WITH SIGNIFICANT TRANSIT DEMAND

	2010	2040	PERCENT INCREASE
Population Living in Transit Supportive Areas	278,500	411,130	+47.6%
Served by Frequent Service	90,800	235,880	+159.7%
Served by Local Service	104,160	141,922	+36.3%
Served by Commuter/Express Service	34,610	25,110	-27.4%
Unserved	48,930	20,560	-58.0%

Note: The figures presented above indicate the best frequency available. Residents presented as served by Frequent Service could also be served by local and commuter/express service. Residents served by local service could also be served by commuter/express service.

NUMBER OF DAVIDSON COUNTY JOBS SERVED BY TRANSIT

A second major objective was to improve access to jobs, with a focus on service to jobs in transit-supportive areas.

Methodology

The methodology was similar to that used to determine the number of residents served. Davidson County's existing job distribution was obtained from 2010 Census Longitudinal Employer-Household Dynamics (LEHD) data, which divides the data into Census blocks (generally one city block). Future job distribution and density was obtained from the Nashville Area MPO's 2040 population and employment model, which divides the data into traffic analysis zone grids (TAZ grids, generally a cluster of city blocks).

To assess the number of jobs located in areas with significant transit demand that are served by existing transit services or will be served by proposed transit services, the study team summed all of the residents from blocks and TAZ grids whose centroids were within ½ mile of existing and proposed MTA routes that have a combined population and employment density that can support transit service at a frequency of 60 minutes or longer. The total number of jobs located in areas with significant transit demand served by each alignment for 2010 and for 2040 was reported by frequency type (see Table 2). These measures indicate the total number of jobs served by existing and proposed frequent (15-minute midday frequency), local, commuter/express, and other local routes as well as the total number of jobs without MTA services within a half mile.

Findings

At present, 386,000, or 88%, of Davidson County's jobs are located in transit supportive areas. By 2040, that number is expected to increase to 744,000, and 95% of all jobs. With the nMotion improvements, many more jobs will be served by more convenient services, and a lower percentage will be unserved (see Table 2):

- The number of jobs that will be served by Frequent Service will increase from 196,000 to 554,275, or by 182%
- The number of jobs that will be served by other types of service will increase from 160,000 to 190,000, or by 19%. (The percentage of jobs served by other types of service is relatively low due to the large increase in the number served by Frequent Service).

- The number of jobs that are not served will increase from 30,000 to 39,000, or by 31%.[1] However, the percentage of unserved jobs will decrease from 8% to 5%.

TABLE 3 | EXISTING AND PROJECTED JOBS SERVED BY TRANSIT IN AREAS WITH SIGNIFICANT TRANSIT DEMAND

	2010	2040	PERCENT INCREASE
Total Davidson County Jobs	386,428	783,656	+102.8%
Served by Frequent Service	196,408	554,275	+182.2%
Served by Local Service	153,818	167,667	+9.0%
Served by Commuter/Express Service	6,179	22,531	+264.6%
Unserved	30,023	39,183	+30.5%

Note: The figures presented above indicate the best frequency available. Residents presented as served by Frequent Service could also be served by local and commuter/express service. Residents served by local service could also be served by commuter/express service.

AMOUNT OF SERVICE TO DAVIDSON COUNTY LOW INCOME RESIDENTS

A very important role of transit is to provide options and better opportunities for low income residents, and increases in service to low income residents[2] was considered to be particularly important.

Methodology

Increases in service to low income residents were measured in terms of weekday vehicle hours of service to census blocks where the percentage of residents living at or below the poverty level exceeds the county average (14% in 2010; projected to be 13% in 2040).

Findings

Today, all transit routes serve at least one census block with above average numbers of low income households. This will also be the case with the recommended system in 2040. Furthermore, with more service on nearly all routes, the increases in service to these census blocks will be very high. The total number of service hours provided to census blocks with an above average percentage of low income residents will increase from 1,700 per weekday to over 3,900, or by 132%.

AMOUNT OF SERVICE TO METRO AREA MINORITY RESIDENTS

Higher than average proportions of minority residents are disadvantaged, and in a similar manner as for low income residents, transit provides options and opportunities that otherwise may not be available. The provision of effective transit service to minority populations is also particularly important to the Federal Transit Administration and is a requirement under Title VI of the Civil Rights Act of 1964.

Methodology

The amount of service provided to minority neighborhoods was determined in the same manner as for low income neighborhoods, with increases measured in terms of weekday vehicle hours of service to census blocks where the percentage of minority residents exceeded the county average (38%)

[1] Note also that the figures presented reflect the jobs served by identified fixed-route services. The recommendations also include expenditures for yet to be determined new services to fill gaps and serve new areas, which would reduce the percentage of unserved jobs.

[2] Low income residents are defined as individuals living in a household with a household income that is below the official poverty threshold for a household of that size and composition according to the 2010 Census.

Findings

As with service to low income areas, all existing transit routes serve at least one census blocks with above average numbers of minority residents, and this will also be the case with the recommended system. The total number of service hours provided to census blocks with an above average percentage of minority residents will increase from 1,700 revenue vehicle hours per weekday to over 3,900, or by 132%.

NUMBER OF RESIDENTS SERVED BY RTA AND OUTER COUNTY SERVICES

As the outer counties grow more quickly than Davidson County, the demand for transit will increase dramatically. This demand will be for both local and regional services. As is the case today, local services will primarily serve walk-up passengers, while regional services will serve riders over a large geographical area, a large proportion who will access transit via driving and park and ride lots.

Methodology

As described above, the number of residents who would be served would vary by service type:

- For Regional Rapid Bus and local services, in the same manner as for Davidson County, it was assumed that all residents within ½ mile of service would be served.
- For RTA regional services – commuter rail, Freeway BRT, and express bus – where the largest access modes will be park and ride, estimates were based on the number of residents who live outside of Route 155/Briley Parkway that are or would be with within 5 miles of a station/park and ride lot. Davidson County residents who live beyond Briley Parkway were included in the estimates as those people would be served by RTA services to a greater extent than MTA service.

For both categories of service, GIS-based analysis was used to determine the number of residents served by existing routes and those that would be served by the 2040 network. Data sources were 2010 U.S. census block data to estimate the number of residents that are currently served, and Nashville MPO TAZ-based projections for 2040.

Findings

In 2010, 666,000 of Middle Tennessee's residents were served by RTA and outer county local services (see Table 4). With the nMotion 2016 improvements, this number will increase to 1.8 million, or by 177%. The percentage of residents served with increase from 43% to 66%. Virtually all of those who would remain unserved are would be those living in non-transit supportive areas.

TABLE 4 | RESIDENTS SERVED BY RTA AND OUTER COUNTY SERVICES

	2010	2040	PERCENT INCREASE
Served	665,996	1,818,496	+177.2%
Unserved	882,627	937,771	+6.2%
Total	1,548,623	2,756,267	+77.9%

NUMBER OF JOBS SERVED BY RTA AND OUTER COUNTY SERVICES

Although Nashville will remain the job center of Middle Tennessee, the pace of job growth will be faster in outer counties than in Davidson County. Outer county transit connections will be needed connect residents to these jobs, including reverse commute trips from Davidson County to outer areas.

Methodology

Whereas it was assumed that outer county residents would access regional services by car from up to five miles away, this would not be the case with trips to jobs, as "last mile" connections would be limited to shorter distance options such as walking, biking, local shuttles, and TNC connections. For this reason, the number of jobs that were considered

as served were limited to those within ½ mile of Rapid Bus and local routes, and within ½ mile of regional service stations (commuter rail, Freeway BRT, and express bus stops). As with service to Davidson County jobs, GIS-based analysis was used to determine the number of jobs served by existing routes and those that would be served by the 2040 network. Data sources were U.S. Census Longitudinal Employer-Household Dynamics (LEHD) block data for 2010 and Nashville MPO TAZ grid-based projections for 2040.

Findings

In 2010, 224,000,000 Middle Tennessee jobs were served by RTA and outer county local services (see Table 5). With the nMotion 2016 improvements, this number will increase by 260% to 808,000. The percentage of jobs served will increase from 27% to 55%. Nearly all of those who would remain unserved are would be those located in non-transit supportive areas.

TABLE 5 | JOBS SERVED BY RTA AND OUTER COUNTY SERVICES

	2010	2040	PERCENT INCREASE
Served	224,446	808,348	+260.1%
Unserved	596,466	650,467	+9.1%
Total	820,912	1,458,815	+77.7%

AMOUNT OF SERVICE TO OUTER COUNTY LOW INCOME RESIDENTS

In a similar manner as in Davidson County, outer area improvements are also intended to provide options and better opportunities for disadvantaged residents.

Methodology

Increases in service to low income residents were measured in terms of weekday vehicle hours of service to census blocks where the percentage of residents living at or below the poverty level exceeds the nine county outer county average (9.5% in 2010; projected to be 8.5% in 2040). As with the number of total residents served, distinctions were made for local and regional service, with low residents considered served if they do or would live within ½ mille of local services or within 5 miles of a regional station or stop.

Findings

At present, relatively little service is provided to census blocks with large percentages of low income residents – only 90 vehicle hours of service per weekday. The nMotion program would increase this by 1,173% to 1,146 vehicle hours of service.

AMOUNT OF SERVICE TO OUTER COUNTY MINORITY RESIDENTS

Outer area improvements are also intended to provide greater options and opportunities to minority residents.

Methodology

Service to minority residents was determined in a similar manner as for low income residents. With increases in service to minority residents measured in terms of weekday vehicle hours of service to census blocks where the percentage of minority residents exceeds the nine county outer county average (21% in 2010; projected to be 17% in 2040). As with the number of total residents served, distinctions were made for local and regional service, with low residents considered served if they do or would live within ½ mille of local services or within 5 miles of a regional station or stop.

Findings

There is a direct correspondence between census blocks with higher than average percentages of residents living in poverty and those with higher than average percentages of minority residents, and the results are the same – the number of service hours provided to these areas would increase by 1,173% from 90 vehicle hours per day to 1,146.

ENHANCE

Enhancing existing transit service can make transit a more attractive and competitive travel choice for more Middle Tennesseans. Features such as increased frequency and longer spans of service are key components of the recommended plan. The program also includes strategies that can make transit travel times competitive with the private automobile in key corridors, such as dedicated rights-of-way for transit vehicles.

FASTER SERVICE

A common theme of the nMotion 2015 outreach is that residents and workers want faster service. For the purposes of this study, fast services were considered to be light rail, BRT, Rapid Bus, commuter rail, Freeway BRT, express bus, and Regional Rapid Bus service.

Methodology

Increases in fast services consisted of a comparison of the number of revenue vehicle/train hours of fast service that is currently provided with the amount of service that is proposed. Existing services that were considered as "fast" are limited to BRT-lite, Music City Star, and express bus services. Future service that were considered as fast include light rail, BRT, Rapid Bus, commuter rail, Freeway BRT, express bus, and Regional Rapid Bus.

Findings

Currently, MTA and RTA provide 708 vehicle revenue hours per weekday of these types of services, which comprises 40% of all weekday service. The recommended program will increase the amount of weekday service provided to 3,523 hours, or by 398%. Furthermore, the proportion of service that would be considered as fast would increase from 40% to 68%

TABLE 6 | AMOUNT OF FAST SERVICE (WEEKDAY REVENUE VEHICLE/TRAIN HOURS)

	EXISTING	2040	PERCENT INCREASE
Fast Service	708	3,523	+397.1%
Other Service	1,080	1,649	+52.7%
Total Service	1,797	5,172	+187.8%

FREQUENT ALL DAY SERVICE

Many stakeholders listed infrequent service as a major reason that service is not convenient. At present, most MTA and RTA services operate relatively infrequently, and a major emphasis will be to provide more frequent service to improve convenience.

Methodology

Increases in frequent services were determined by comparing the number of revenue vehicle hours of frequent service that is currently provided with the amount of service that is proposed. Frequent services were considered to be those that would operate at least every 15 minutes during peak periods.

Findings

At present, only nine routes provide service every 15 minutes or better, and these routes provide 358 hours of service per weekday. With the development of a Frequent Transit Network, 20 routes would provide frequent service, and these routes would provide 2,124 hours of service, which would be an increase of 493%. In addition, the percentage of total service, in terms of vehicle hours, that would be frequent would increase from 20% to 41%.

TABLE 7 | EXISTING AND RECOMMENDED SERVICE HOURS FOR FREQUENT ALL DAY TRANSIT SERVICE

	EXISTING	2040	PERCENT INCREASE
Frequent Service	358	2,124	+493.2%
Other Service	1,439	3,048	+111.8%
Total Service	1,797	5,172	+187.8%

TRANSIT SERVICE WITH DEDICATED AND/OR MANAGED RIGHTS-OF-WAY

An important way to make service fast is to operate it in dedicated or managed lanes (for example, HOV lanes). At present, only the Music City Star operates in a dedicated right-of-way. With the recommended program, the array of services that would operate in dedicated or managed rights-of-way would increase to Northwest commuter rail, Freeway BRT, and BRT.

Methodology

Increases in the number of services operating in dedicated or managed lanes were determined by comparing the current number of route miles of service in dedicated or managed lanes with that in the recommended program.

Findings

With the recommended program, light rail, BRT, commuter rail, and freeway BRT would operate in a total of 241 route miles of dedicated or managed lane service. This would be an increase of 793%.

SIMPLIFY

For people to use transit, they must be able to understand it, and simpler services are easier to understand than complex services. By providing simple and comprehensible services, MTA can make transit more attractive, increasing the number of regular riders and encouraging new riders to try transit.

PREMIUM TRANSIT SERVICES

Premium transit services are designed to be easy to use and understand, with simple and direct service design, recognizable branding, and other features that make it intuitive and accessible.

Methodology

Increases in the amount of premium services were based on increases the number of routes miles of services. Existing services that were considered to be premium services include Music City Star commuter rail, BRT-lite, and express bus service. Future services that were considered to be premium services include commuter rail, light rail, BRT, Rapid Bus, Regional Rapid Bus, Freeway BRT, and express bus services.

Findings

At present, MTA and RTA operate 504 route miles of premium services. With the recommended plan, there would be 713 route miles, for an increase of 41%.

PEDESTRIAN IMPROVEMENTS

A key strategy for making transit easier to use will be to improve access to transit services. Providing comfortable and safe pedestrian access to transit stops is a crucial way to support transit service and encourage ridership. A better pedestrian environment around stops and stations can also increase the catchment area for transit: if it is safe and comfortable to walk to transit, more people will be willing to walk farther to reach transit service.

As part of the nMotion Transit Strategic Plan, investments to improve the pedestrian environment will be made along all light rail, BRT, and rapid bus lines. As a result, a total of 177 route miles will see pedestrian improvements. High-quality pedestrian access to these transit stations will increase the catchment area for these high-frequency, high-capacity services, making service more attractive and encouraging ridership.

SUSTAIN

nMotion is intended to develop a transit system that complements and advances broader regional goals, and is financially sustainable over the long-term. This includes potential opportunities for transit to stimulate economic development, and in particular, Transit-Oriented Development, or TOD.

OPPORTUNITY TO STIMULATE TOD/ECONOMIC DEVELOPMENT

Transit can be a tool for stimulating economic development. In particular, light rail and BRT present significant opportunities: frequent, high-quality transit service can generate transit-oriented retail and housing development. A system of high-quality services can support the Nashville region's efforts focus future growth in key areas and along major corridors, as well as make the region as a whole a more attractive place to live and do business.

The recommended plan proposes 47 route miles of light rail and nearly seven route miles of full BRT, for a combined total of 54 route miles of high-capacity transit that could stimulate economic development along and around major corridors. In addition, increases in service on the Music City Star and the development of Northwest Corridor commuter rail would stimulate development around 14 commuter rail stations.

TABLE 8 | LIST OF ROUTES IN 2040 NMOTION PROGRAM BY SERVICE TYPE

ROUTE	SERVICE TYPE	FAST SERVICE?	PREMIUM SERVICE?	DEDICATED ROW?
FREQUENT SERVICE				
3 West End	Arterial BRT	Yes	Yes	Yes
4 East Nashville	Rapid Bus	Yes	Yes	
7 Hillsboro	Arterial BRT	Yes	Yes	Yes
9 MetroCenter	Rapid Bus	Yes	Yes	
12 Nolensville	Light Rail	Yes	Yes	Yes
17 12th Avenue South	Rapid Bus	Yes	Yes	
18 Elm Hill/Airport	Rapid Bus	Yes	Yes	
22 Bordeaux	Rapid Bus	Yes	Yes	
23 Dickerson Road	BRT	Yes	Yes	Yes
25 Edgehill	Rapid Bus	Yes	Yes	
29 Jefferson/TSU	Rapid Bus	Yes	Yes	
31 Hospitals	Rapid Bus	Yes	Yes	
34 Opry Mills	Rapid Bus	Yes	Yes	
44 North Nashville	Rapid Bus	Yes	Yes	
50 Charlotte	Light Rail	Yes	Yes	Yes
55 Murfreesboro Pike/Airport	Light Rail	Yes	Yes	Yes
56 Gallatin Pike	Light Rail	Yes	Yes	Yes
OTHER LOCAL SERVICE				
1 100 Oaks	Local 30 Peak			
2 Belmont	Local 30 All Day			
5 West End/Bellevue	Frequent Peak			
6 Lebanon Pike	Frequent Peak			
8 8th Avenue South	Frequent Peak			
11 Trinity	Frequent Peak			
13 Harding	Local 30 All Day			
14 Whites Creek	Frequent Peak			
16 Woodmont	Local 30 All Day			
19 Herman	Frequent Peak			
20 Scott	Local 30 Peak			
21 University Connector	Local 30 All Day			
28 Meridian	Local 30 Peak			
30 McFerrin	Local 30 Peak			
40 Bell	Local 30 Peak			
42 St. Cecilia/Cumberland	Local 30 All Day			
43 Hickory Hills	Local 30 Peak			
45 Airport/Opry Mills	Local 30 All Day			
60 Music City Blue Circuit	Circulator			
61 Music City Green Circuit	Circulator			
72 Edmondson Pike Connector	Local 30 Peak			
75 Thompson	Local 30 All Day			
76 Madison Connector	Local 30 Peak			
93 Music City Star West End Shuttle	Commuter/Express (Shuttle)			

ROUTE	SERVICE TYPE	FAST SERVICE?	PREMIUM SERVICE?	DEDICATED ROW?
REGIONAL SERVICES				
24X Bellevue Express	Commuter/Express		Yes	
27 Old Hickory	Commuter/Express		Yes	
39X Airport Express	Commuter/Express		Yes	
41 Golden Valley	Commuter/Express		Yes	
80 Gallatin Pike	Regional Rapid Bus	Yes	Yes	
81 Nolensville Pike	Regional Rapid Bus	Yes	Yes	
83X Murfreesboro-Cool Springs	Commuter/Express		Yes	
84X Murfreesboro Express	Freeway BRT	Yes	Yes	Yes
86X Smyrna/La Vergne Express	Commuter/Express		Yes	
87X Gallatin Express	Freeway BRT	Yes	Yes	Yes
88X Dickson Express	Commuter/Express		Yes	
89X Springfield/Joelton Express	Commuter/Express		Yes	
90X Cool Springs Express	Commuter/Express		Yes	
91X Franklin Express	Freeway BRT	Yes	Yes	Yes
92X Hendersonville Express	Commuter/Express		Yes	
95X Spring Hill Express	Commuter/Express		Yes	
96X Nashville/Murfreesboro Relax and Ride	Regional Rapid Bus	Yes	Yes	
97X Columbia-Nashville Express	Commuter/Express		Yes	
Music City Star	Commuter Rail	Yes	Yes	Yes
Northwest Commuter Rail (Clarksville-Nashville)	Commuter Rail	Yes	Yes	Yes

RIDERSHIP ESTIMATION METHODOLOGY AND RESULTS

This document describes the methodologies used to develop ridership forecasts for both local and commuter services under the nMotion plan and the results. Since local services and commuter services each serve unique markets and operate different types of service, two different methodologies were used to estimate the potential impacts of service changes on ridership. However, similar factors can impact potential ridership on both kinds of services, including population and employment density, amount of service provided, and upgrades to premium services. The step-by-step process for calculating ridership forecasts based on these factors is described below, followed by a route-by-route summary of existing and projected ridership.

Detailed calculation tables for each route, as well as all input factors used in this methodology and their sources, are included in Table 6 and Table 7.

LOCAL SERVICES

Local services include local bus, Rapid Bus, BRT, and light rail. Nine steps were used to project future ridership on local services:

1. Determine baseline ridership
2. Determine projected changes in population and employment density along each route
3. Add future increases due to changes in population density
4. Add future increases due to changes in employment density
5. If there is an upgrade in service type, apply service type factors
6. Add increases due to increases in service levels
7. Add increases due to service simplification
8. Add increases due to improvements in pedestrian conditions
9. Add increases due to yet to be identified expansion of local service

Step 1 Determine Baseline Ridership

The first step was to determine baseline ridership for both existing and new routes. This was calculated as follows:

- **Existing routes**: For existing local routes, existing ridership was used as base ridership.
- **New routes**: For new local services, base ridership was estimated using the following steps:
  1. First, the average existing population and employment density were calculated along each new route.
  2. Then, an existing route that serves similar average population and employment densities, and other similar characteristics, was identified, and ridership per route mile was calculated for that existing route.
  3. Finally, the ridership per route mile figure was applied to the length of the new route to estimate base ridership for the new route.

Step 2 Determine Changes in Population and Employment Density

More than any other factor, changes in population and employment densities will drive changes in ridership. This is because:

- Transit needs to serve sufficiently high volumes of travelers to be cost-effective, and the density of development determines the overall size of the travel market. The reach of transit is generally limited to within ¼ to ½ mile of the transit line or station, and thus the size of the travel market is directly related to the density of development in that area.
- Transit service frequencies, in turn, are closely related to market size. Bigger markets support more frequent service, while smaller markets can support only less frequent service.
- To attract travelers who have other options, such as automobiles, transit must be relatively frequent—at least every 30 minutes, and preferably every 10 to 15 minutes. Below that, transit can be expected to serve only those who do not drive or cannot drive.

To determine these impacts, the project team determined changes in population and employment density along routes. Both population and employment density were calculated within ½ mile of each route using GIS.

Step 3 Determine Ridership Impacts of Changes in Population Density

Using the population density figures calculated in Step 2 and using the same density factors that were used to determine transit propensity/underlying transit demand (see Table 1), relationships were developed to estimate ridership increases due to increases in density. These increases were applied to existing ridership.

TABLE 1 | RIDERSHIP IMPACTS OF CHANGES IN POPULATION DENSITIES FOR LOCAL BUS SERVICE

POPULATION/ ACRE	POPULATION/ ACRE (MIDPOINT)	TRANSIT SERVICE FREQUENCY	IMPLIED RIDERSHIP INCREASE
8–16	12.0	60 mins	--
16–31	23.5	30 mins	100%
31–47	39.0	15 mins	300%
47–92	69.5	10 mins	500%
>92	NA	5 mins	1100%

Source: Nelson\Nygaard compiled from various national sources

Step 4 Determine Ridership Impacts of Changes Employment Density

In the same manner as for population density, relationships were developed to estimate ridership increases due to increases in employment density (see Table 2). These increases were applied to baseline ridership. Finally, the ridership increases due to population and employment density from Steps 3 and 4 were added to baseline (Step 1) ridership to get future year base ridership.

TABLE 2 | RIDERSHIP IMPACTS OF CHANGES IN EMPLOYMENT DENSITIES FOR LOCAL BUS SERVICE

EMPLOYMENT/ ACRE	POPULATION/ ACRE (MIDPOINT)	TRANSIT SERVICE FREQUENCY	IMPLIED RIDERSHIP INCREASE
4–8	6.0	60 mins	--
8–16	12.0	30 mins	100%
16–24	20.0	15 mins	300%
24–48	26.0	10 mins	500%
>48	NA	5 mins	1100%

Source: Nelson\Nygaard compiled from various national sources.

Step 5 Determine Ridership Increases Due to Upgrades in Service Types

It has been clearly demonstrated that LRT, BRT, and Rapid Bus services will attract more riders than regular bus services. The increases are due to a number of factors, including faster and more frequent

service that operates for longer hours, better vehicles and facilities, and high visibility branding, among others. Since many of these elements have not yet been defined for the nMotion 2016 projects, factors or estimating ridership were based on observed impacts from other actual projects and projections from Alternatives Analyses projects. The average observed and projected impacts were as summarized in Table 3.

TABLE 3 | RIDERSHIP CHANGES DUE TO UPGRADES IN SERVICE TYPES

EXISTING SERVICE TYPE	UPGRADED SERVICE TYPE			
	RAPID BUS	BRT	LRT	STREETCAR
Local Bus	+45%	+65%	+80%	+85%
Rapid Bus	--	+20%	+65%	+75%
BRT	--	--	+35%	--

Source: NN analysis of impacts of actual impacts and review of projected impacts from AAs.

These factors include the impacts of all of the elements described above. However, because they were developed based on data from many different real and theoretical projects, they represent a variety of different service levels; while the nMotion estimates needed to account for service level differences between Scenarios 1, 2, and 3. To make this possible, and for the sake of simplification, it was assumed that the percentage increases presented in Table 3 would represent Scenario 2 service levels, and that subsequent adjustments for Scenario 1 and 3 would reflect differences in service spans and frequencies as described below.

Step 6 Determine Ridership Increases Due to Service Level Improvements

TCRP Report 95, "Traveler Response to Transportation System Changes,"[1] found that "Increased bus frequency normally attracts increased patronage, and vice versa but with wide variation in results," but that "elasticities calculated for the more recently reported frequency changes group either around an elasticity of +0.3 or around +1.0, the threshold of elastic response. Nevertheless, both historical and more recent elasticities of bus service changes exhibit a service elasticity average that is on the order of +0.5."

To simplify the process, these estimates used an elasticity of +0.5, which was applied to the difference between the total number of proposed weekday trips and the current/base number of trips:

- For Rapid Bus, BRT, and LRT, as described above, the factors include the impacts of increased service levels, spans, and travel times. It was assumed that the factors produced an estimate for Scenario 2. For Scenarios 1 and 3, the elasticity was applied to the difference between the scenario's proposed number of weekday trips and the Scenario 2 number of weekday trips.
- For other routes, the elasticity was applied to the difference between the proposed number of trips and the current number of trips.

Step 7 Determine Changes due to Simpler Service

Experience from other areas indicates that service reconfiguration directed at simplifying service can attract more regular riders, more casual or spontaneous riders, and enhance the overall transit experience. Although it is often difficult to separate the impacts of individual types of changes, experience from three other cities indicates that these types of changes can increase ridership by 10 to 20% (see Table 4). Considering the relative complexity of existing MTA service, a simpler route structure and clockface headways would be expected to increase ridership by at least 10%. For these estimates, a "Service Simplification" factor of +10% was applied to the ridership figure from previous steps.

[1] Transit Cooperative Research Program, 2004.

TABLE 4 | SERVICE RATIONALIZATION RESULTS IN OTHER AREAS

COMMUNITY	ACTIONS	RESULTS
Seattle/Renton, WA	Establish Hub & Spoke structure; route consolidation on key corridors; improved cross-town, community, and reverse-commute services. Intense community outreach and analysis involved in designing changes.	Ridership: +12%
Orange County, CA	Increase service on key routes; Headways made more consistent; unproductive routes eliminated; new community & feeder routes. Overall service-hours reduced	Ridership: +10% Operating Costs: -5%
Riverside, CA	Increased frequency on key direct routes, implemented clockface headways	Ridership: +20% Service Hours: +4%

Source: TCRP Report 95, Chapter 10 – Bus Routing and Coverage

Step 8 Determine Changes due to Pedestrian Improvements

Based on an internet search and consultation with our internal pedestrian experts, no research has been conducted on the impacts of pedestrian improvements on transit ridership. In Nashville, poor pedestrian access to transit is a significant deterrent to the use of transit, especially on major routes. In the absence of any quantitative information on the impacts of pedestrian infrastructure improvements, a ridership increase of 20% was assumed on the routes for which we are assuming accompanying pedestrian improvements (light rail, BRT, and Rapid Bus).

Step 9 Determine Increases Due to Yet to be Identified Expansion of Local Service

The recommendations of the nMotion plan identify major new services and assume that other existing local services will be maintained and improved. The above steps include the ridership impacts of these changes. In addition, the recommendations also include still to be determined expansions of existing services. Ridership increases as a result of these service expansions were calculated as follows:

MTA

1. Determine the cost of the new services. To calculate this, an "allowance" was determined, which is an add-on to the cost of the identified local services. For MTA services, this allowance was set at 25%. The cost of expanding services was calculated by multiplying the cost of identified local services by 25%.
2. Determine the number of annual service hours that these additional amounts would provide. This was calculated by dividing the total operating cost estimate by $100, which is MTA's average operating cost per revenue vehicle hour.
3. Convert the annual total determined in Step 1 to average weekday service hours. This was done by multiplying the number of service hours determined in Step 2 by 0.81 (the percent of expenses spent on weekdays versus weekends) and then dividing by 255 (the average number of weekdays in a year).
4. Finally, it was assumed that new local services will average 15 passengers per hour. The number of average weekday service hours was then multiplied by 15 to determine the average weekday ridership for these expanded services.

RTA: Increases in Clarksville Transit, Franklin Transit, and Murfreesboro Rover Existing Local Services

1. Determine the cost of the new services. To calculate this, an "allowance" was determined as it was for MTA services. For RTA services, this allowance was set at 33%. The cost of expanding services was calculated by multiplying the cost of identified local services by 33%.
2. Determine the number of annual service hours that these additional amounts would provide. This was calculated by dividing the costs by $100, which is RTA's average operating cost per revenue vehicle hour.
3. Convert the annual total determined in Step A to average weekday service hours. Existing services only operate on weekdays, so the 0.81 factor was not used for RTA services. Instead, the annual number of service hours was simply divided by 255.
4. As with MTA services, it was assumed that new local services will average 15 passengers per hour. Thus, the number of average weekday service hours was multiplied by 15 to determine the average weekday ridership for these expanded services.

RTA: New Local Services Where None Now Exist

1. Determine average per capita annual ridership at Clarksville Transit, Franklin Transit, and Murfreesboro Rover (using NTD for annual ridership, and city population as denominator).
2. Divide annual per capital ridership by 255 to get average per capita weekday ridership.
3. For each city with new local service, city population was multiplied by average per capital weekday ridership figure from Step 2.

COMMUTER SERVICES

Ridership was also estimated for commuter services, which include commuter rail, Freeway BRT, Express Bus on Shoulder, and Commuter/Express service. these services operate differently and serve different markets than local services, and so a different methodology was used to estimate potential ridership for commuter services, including routes that would operate both peak direction only and routes that would operate bi-directional service.

PEAK DIRECTION SERVICES

Peak direction services are designed primarily to serve work trips to and from the Nashville core. These routes may provide some reverse direction service, but that service is largely incidental, and primarily designed to cycle buses.

Five steps were used to project future ridership:

1. Determine baseline ridership
2. Calculate ridership changes attributable to changes in population
3. Calculate ridership changes due changes in the location of jobs
4. Calculate ridership changes attributable to changes in service levels
5. If applicable, calculate ridership increases attributable to shorter travel times

Step 1 Determine Baseline Ridership

Baseline ridership was determined as follows:

- **Existing routes**: For existing peak period peak direction commuter routes, existing ridership was used as baseline ridership.

- **New routes**: For new peak period peak direction commuter routes, an existing route that serves a similar market size was identified (the method for determining market size is described in Step 2). The ridership for that route was then adjusted up or down based on the difference in market size between the existing route and the new routes.

Step 2 Calculate Ridership Changes due to Population Growth

Commuter services, which rely heavily on park-and-ride access, typically have much larger catchment areas than local service. With long stop spacing, the catchment areas are also related to the stops rather than the alignment. To account for this, rather than determine the population served along the alignment, we instead calculated the total population within five miles of each station/stop for the base and future years. Then, the percent increase was applied to the base ridership.

In addition:

- Population around inner stations was not included, as in nearly all cases, these riders would be better served by local services. For Middle Tennessee services, stations/stop on Briley Parkway/State Route 155 were included.
- Also, unlike with local services, increases in jobs around stops were not included, since the peak period, peak direction nature of the service means that these would not be served.

Step 3 Calculate Ridership Changes Due to Changes in Job Locations

A high proportion of trips on peak period peak direction commuter routes are work trips. While jobs are growing very rapidly throughout Middle Tennessee, they are growing at different rates in different areas. To account for changes in the Nashville core's relative importance as a job market, we took the following steps to calculate ridership based on changes in job locations:

1. First, we determined the current number of jobs in Davidson County and the other counties that will be served by the commuter route, and calculated the percentage of the total current jobs that are in Davidson County.
2. Then, we determined the future number of jobs in Davidson County and the other counties that will be served by the commuter route, and calculated the percentage of the total future jobs that will be in Davidson County.
3. Finally, the percentage of future jobs in Davidson County was divided by the percentage of current jobs in Davidson County.
4. This factor was then applied to the ridership figure from Step 2.

Step 4 Determine Ridership Increases due to Service Level Improvements

As discussed previously, increased levels of service can have a significant impact on ridership. In the same manner as for local service, a travel time elasticity of +0.5 was applied to the percentage difference between the total number of proposed weekday trips and the current number of trips to determine the potential impact of increased service levels on commuter service ridership.

Step 5 Determine Ridership Changes Attributable to Faster Service

There is only limited data available on the ridership impacts of changes in travel times on commuter services. However, the data that does exist implies a travel time elasticity of -0.56 to -0.95 (see Table 5). Given severe congestion in regional corridors, it was assumed that ridership increases would be on the high side. For routes with travel time differences – Freeway BRT and Express Bus on Shoulder –a travel time elasticity of -0.90 was applied to the percentage reduction in travel times. For Freeway BRT, it was assumed that travel times will be reduced by 30%, and for express bus on shoulder service, it was assumed that travel times would be reduced by 15%.

TABLE 5 | TRAVEL TIME ELASTICITIES

MODE	ELASTICITY	SOURCE
Commuter Rail	-.59	Compiled by Mayworm, Lago, McEnroe 1980
Commuter Rail	-.56	Hepburn (1977)
Commuter Rail (over 25 miles)	-.86	Hepburn (1977)
Lowell-Nashua Base Case	-.69	KKO and Associates, 2002
Lowell-Nashua Alternative 1	-.79	KKO and Associates, 2002
Lowell-Nashua Alternative 2	-.88	KKO and Associates, 2002
Lowell-Nashua Alternative 3	-.95	KKO and Associates, 2002

BI-DIRECTIONAL SERVICES

Bi-directional routes are those that serve trips in both directions, rather than primarily to and from the Nashville core. Examples are the Murfreesboro Relax and Ride route, and the proposed Route 90X Cool Springs route. Ridership on bi-directional services was estimated in the same manner as for peak direction services, and reverse direction ridership was added based on the proportion of jobs served in outer counties relative to the jobs served in Davidson County.

In total, six factors were used to project future ridership, the first five of which are the same as for peak direction services:

1. Determine baseline ridership
2. Calculate ridership changes attributable to changes in population
3. Calculate ridership changes due changes in the location of jobs
4. Calculate ridership changes attributable to changes in service levels
5. If applicable, calculate ridership increases attributable to shorter travel times
6. Estimate reverse direction ridership based on number of jobs served

Steps 1 - 5

Steps 1 through 5 were repeated as previously described under Commuter Services.

Step 6 Estimate Reverse Direction Ridership

Reverse direction ridership was estimated based on the number of outer area jobs served relative to the number of inner area jobs served. This was calculated as follows:

1. Estimate the number of future year number of jobs within two miles of inner area stations (those within two miles of stations/stops along or inside of Briley Parkway/State Route 155. (The two-mile radius is somewhat arbitrary, but reflects a smaller catchment area for trips at the outer end of the trip versus the inner end of the trip.)
2. Estimate the number of future year jobs within two miles of outer area stations.
3. Divide the number of outer area jobs by the number of inner area jobs to develop a reverse direction factor. This factor was used to estimate reverse direction ridership and was added to the Step 5 ridership [Total Ridership = Step 5 Ridership + (Step 5 Ridership * Reverse Direction Factor)].

RIDERSHIP ESTIMATES

Current and projected future year ridership are shown in Table 6 and Table 7 on the following pages.

TABLE 6 | AVERAGE WEEKDAY RIDERSHIP FORECASTS BY ROUTE – LOCAL SERVICES

ROUTE	EXISTING WEEKDAY RIDERSHIP	PLANNED SERVICE TYPE	POPULATION DENSITY FACTOR	EMPLOYMENT DENSITY FACTOR	PREMIUM SERVICE FACTOR	INCREASED SERVICE FACTOR	SERVICE SIMPLIFICATION FACTOR	IMPROVED PED ACCESS FACTOR	PROJECTED WEEKDAY RIDERSHIP
LOCAL SERVICES									
1 100 Oaks	101	Local 30 Peak	67%	21%	0%	110%	10%	0%	**417**
2 Belmont	181	Local 30 All Day	0%	16%	0%	114%	10%	0%	**469**
3 West End	1,188	Arterial BRT	0%	25%	0%	90%	10%	0%	**2,979**
4 East Nashville	1,251	Rapid Bus	-11%	25%	45%	16%	10%	20%	**2,719**
5 West End/Bellevue	1,174	Frequent Peak	9%	75%	0%	21%	10%	0%	**2,840**
6 Lebanon Pike	858	Frequent Peak	33%	140%	0%	59%	10%	0%	**3,956**
7 Hillsboro	1,447	Arterial BRT	0%	14%	0%	69%	10%	0%	**2,959**
8 8th Ave South	522	Frequent Peak	0%	25%	0%	106%	10%	0%	**1,411**
9 MetroCenter	575	Rapid Bus	100%	58%	45%	16%	10%	20%	**2,835**
11 Trinity	331*	Frequent Peak	33%	500%	0%	111%	10%	0%	**4,640**
12 Nolensville	2,018	Light Rail	11%	161%	80%	1%	10%	20%	**11,604**
13 Harding	290*	Local 30 All Day	0%	150%	0%	32%	10%	0%	**1,028**
14 Whites Creek	618	Frequent Peak	20%	67%	0%	59%	10%	0%	**1,951**
16 Woodmont	465*	Local 30 All Day	9%	50%	0%	32%	10%	0%	**1,049**
17 12th Ave South	769	Rapid Bus	-11%	57%	45%	16%	10%	20%	**2,143**
18 Elm Hill/Airport	337	Rapid Bus	100%	168%	45%	136%	10%	20%	**3,860**
19 Herman	1,067	Frequent Peak	0%	50%	0%	20%	10%	0%	**2,087**
20 Scott	287	Local 30 Peak	-11%	25%	0%	5%	10%	0%	**374**
21 University Connector	285	Local 30 All Day	-25%	11%	0%	28%	10%	0%	**339**
22 Bordeaux	1,573	Rapid Bus	11%	43%	45%	16%	10%	20%	**4,622**
23 Dickerson	1,691	BRT	20%	91%	65%	1%	10%	20%	**7,006**
25 Edgehill	519	Rapid Bus	0%	14%	45%	16%	10%	20%	**1,132**
27 Old Hickory	81	Commuter/Express	9%	56%	0%	163%	10%	0%	**363**
29 Jefferson/TSU	757	Rapid Bus	14%	28%	45%	16%	10%	20%	**2,052**
30 McFerrin	288	Local 30 Peak	0%	30%	0%	17%	10%	0%	**476**
31 Hospitals	998*	Rapid Bus	-44%	21%	45%	16%	10%	20%	**1,462**

ROUTE	EXISTING WEEKDAY RIDERSHIP	PLANNED SERVICE TYPE	POPULATION DENSITY FACTOR	EMPLOYMENT DENSITY FACTOR	PREMIUM SERVICE FACTOR	INCREASED SERVICE FACTOR	SERVICE SIMPLIFICATION FACTOR	IMPROVED PED ACCESS FACTOR	PROJECTED WEEKDAY RIDERSHIP
34 Opry Mills	342	Rapid Bus	50%	86%	45%	63%	10%	20%	**1,915**
40 Bell	152*	Local 30 Peak	-11%	33%	0%	110%	10%	0%	**407**
41 Golden Valley	99	Commuter/Express	9%	36%	0%	120%	10%	0%	**331**
42 St. Cecilia	496	Local 30 All Day	11%	50%	0%	32%	10%	0%	**1,133**
43 Hickory Hills	247	Local 30 Peak	33%	27%	0%	76%	10%	0%	**739**
44 North Nashville	1,195*	Rapid Bus	11%	65%	45%	16%	10%	20%	**4,023**
50 Charlotte	1,182	Light Rail	33%	35%	80%	1%	10%	20%	**4,214**
55 Murfreesboro Pike	2,244	Light Rail	11%	275%	80%	19%	10%	20%	**19,804**
55 Murfreesboro Pike/Airport	2,244	Light Rail	9%	213%	80%	19%	10%	20%	**16,523**
56 Gallatin Pike	2,895	Light Rail	0%	30%	80%	1%	10%	20%	**7,957**
60 Music City Circuit Blue	610	Circulator	33%	13%	0%	-18%	10%	0%	**826**
61 Music City Circuit Green	502	Circulator	33%	4%	0%	-28%	10%	0%	**570**
72 Edmonson Pike Connector	91	Local 30 Peak	0%	33%	0%	70%	10%	0%	**218**
75 Thompson	215*	Local 30 All Day	0%	75%	0%	32%	10%	0%	**534**
76 Madison Connector	356	Local 30 Peak	0%	200%	0%	27%	10%	0%	**1,468**
80 Gallatin Pike	273*	Regional Rapid Bus	0%	150%	0%	177%	0%	0%	**1,954**
81 Nolensville Pike	140*	Regional Rapid Bus	20%	133%	0%	105%	10%	0%	**762**
93 MCS West End Shuttle	340	Commuter/Express	-11%	0%	0%	163%	10%	0%	**824**
96 Murfreesboro R&R	176	Regional Rapid Bus	43%	28%	0%	129%	10%	0%	**718**
New MTA Local Services**	-	-	-	-	-	-	-	-	**2,673**
Expansion of Existing Outer County Services**	-	-	-	-	-	-	-	-	**11,808**
New Outer County Services**	-	-	-	-	-	-	-	-	**2,838**
TOTAL	**31,382**								**149,016**

* Existing baseline ridership for new routes was determined based on ridership of existing routes that are similar in service level and market area of new routes.
** See "Local Services," Step 9 for methodology for calculating projected ridership for new local services.

TABLE 7 | AVERAGE WEEKDAY RIDERSHIP FORECASTS BY ROUTE – REGIONAL SERVICES

ROUTE	EXISTING WEEKDAY RIDERSHIP	PLANNED SERVICE TYPE	POPULATION DENSITY FACTOR	COUNTY JOB SHARE FACTOR	INCREASED SERVICE FACTOR	FASTER SERVICE FACTOR	BIDIRECTIONAL SERVICE FACTOR	PROJECTED WEEKDAY RIDERSHIP
COMMUTER SERVICES								
24X Bellevue Express	239	Commuter/Express	16%	1.00	56%	84%	0	**801**
39X Airport Express	153*	Local 30 All Day	-13%	1.00	175%	263%	0	**1,330**
83X Murfreesboro-Cool Springs	105*	Commuter/Express	89%	0.86	300%	0%	0	**741**
84X Murfreesboro Express	171	Freeway BRT	45%	0.83	350%	525%	1.36	**16,120**
86X Smyrna/La Vergne Express	124	Commuter/Express	76%	0.93	233%	0%	0	**705**
87X Gallatin Express	90	Freeway BRT	38%	0.99	430%	645%	3.53	**22,198**
88X Dickson Express	77	Commuter/Express	31%	0.90	375%	563%	0	**3,094**
89X Springfield/Joelton Express	74	Commuter/Express	72%	0.99	375%	563%	0	**3,977**
90X Cool Springs Express	128*	Commuter/Express	98%	0.90	233%	0%	0.39	**1,116**
91X Franklin Express	99	Freeway BRT	46%	0.90	350%	525%	0.72	**6,753**
92X Hendersonville Express	103	Commuter/Express	29%	0.99	290%	0%	0	**517**
95X Spring Hill Express	85	Commuter/Express	128%	0.90	375%	0%	0	**870**
97X Columbia/Nashville Express	98*	Commuter Express	110%	0.90	30%	0%	0	**778**
Music City Star	1,057	Commuter Rail	47%	0.97	150%	0%	0.52	**5,848**
Northwest Commuter Rail	211*	Commuter Rail	31%	1.00	150%	0%	0.07	**740**
TOTAL	**2,367**							**65,586**

* Existing baseline ridership for new routes was determined based on ridership of existing routes that serve a similar market area as new routes.