Appendix A: Features and Use of the MTA *Service Analyzer*

Development of the MTA Service Analyzer

The "MTA Service Analyzer" is a tool that can help MTA identify transit needs, and evaluate proposed transit alternatives. It is an add-on program to the TransCAD geographic information system. The program shows how well public transportation serves travelers to and from various parts of Nashville/Davidson County. It generates thematic maps, tabular data, and summary statistics that can readily highlight opportunities for service improvements. It also provides quantitative information on service hours—thus system costs—and ridership changes in response to alternative service scenarios.

The MTA Service Analyzer contains a detailed representation of MTA routes as well as the underlying road network. The road network includes *all* roads in Davidson County (with added roads for the route of the MTA 96 bus to Murfreesboro). This complete network is far more detailed than the representational network used by the Nashville MPO in its transportation models. The comprehensiveness allows for a fair representation of walking paths to any bus stop, and it allows MTA planners to test new or modified bus routes along any road in the county.

The original idea for the MTA Service Analyzer was to use origin/destination (OD) data from the 2006 MTA passenger survey to determine: 1) how the MTA is serving existing trips and 2) how route and schedule changes might improve transit service for current passengers. However, it became apparent early on that the OD data were too sparse on certain routes to adequately represent current customers. The model *does* examine the 2006 OD data, but the data limitations prompted us to include in the model other information about trip patterns.

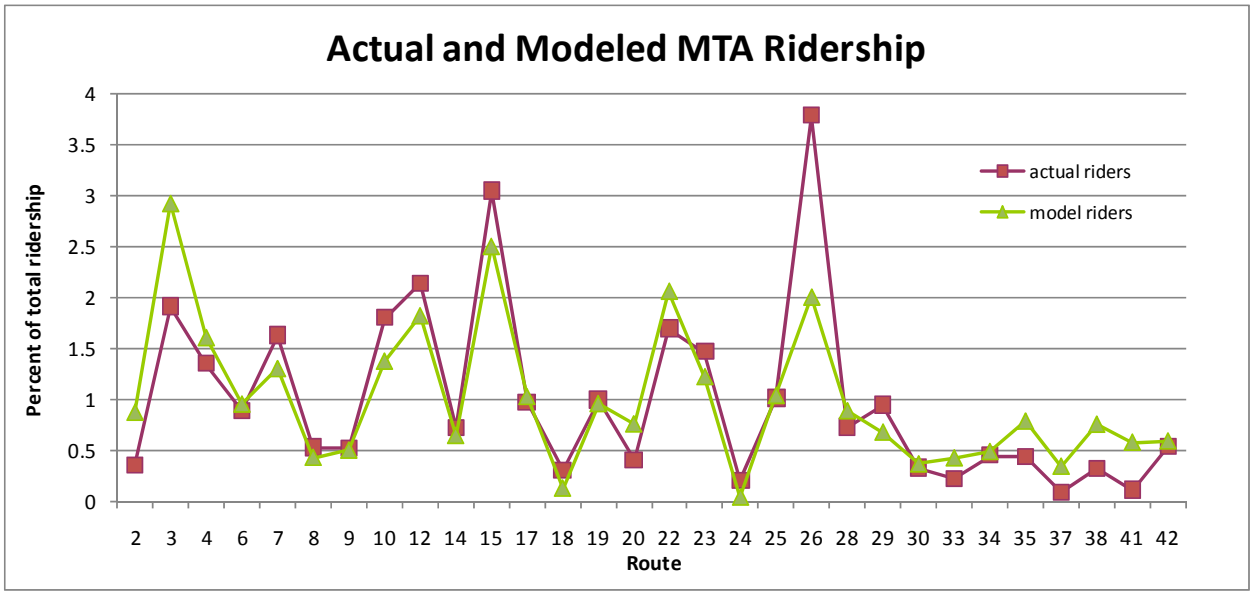
The first of these was the Journey to Work data from the 2000 census. This data, based on long-form census surveys to one in six households, shows commute trips between each of the metropolitan area's 162 census tracts.

The second source was the Nashville MPO, which provided trip tables for commute and other trip purposes between each of the 1,097 transportation analysis zones (TAZs) in the area covered by the MTA Service Analyzer. The MPO synthesized these trip matrices based on demographic and economic land use data, and with further calibration to match area highway volumes and other travel parameters. The MPO trip matrices are thus the best data available on the full set of trips within the region. The small size of the TAZs has the further advantage

We received the TAZ data in January 2009. It took some time to get the model working with the new TAZ data, but ultimately the model was able to use this data to represent the current MTA service reasonably well. Figure A-1 compares ridership as estimated by the model with actual ridership on each route in the system. These numbers are quite close for most routes, although routes 26 and 3 have large deviations.

Development of the MTA Service Analyzer occurred simultaneously with work on the Strategic Master Plan. We thus did not have the benefit of the completed MTA Service Analyzer until near the end of the process. We were nonetheless able to learn from the model throughout the project. The next section describes insights coming from the MTA Service Analyzer.

Figure A-1: MTA Service Analyzer Ridership Forecast Using TAZ Data Versus Actual Ridership



Insights from the MTA Service Analyzer

By December of 2008, the MTA Service Analyzer was available for some analysis using census tract level data. Figure A-2 below provides graphical output from the model that indicates the relative share of income adjusted total jobs in a census tract and also the percent of those jobs that can be accessed by public transportation. In Figure A-2, the green portion of each pie shows the proportion of work trips to the zone where public transportation is a reasonable alternative. The blue indicates the proportion of work trips where public transportation is not a reasonable alternative. The red indicates the proportion of work trips that would be made by walking. The effect of the income adjustment is to weigh the trips more heavily if they are from a tract with lower income. This helps to highlight the trips with the highest propensity to use transit.

Examining Figure A-2, the corridor between downtown Nashville and the Vanderbilt Medical Center area shows up as a corridor with a large number of jobs. Improving transit to the Vanderbilt area—perhaps by increasing service between downtown and Vanderbilt would be suggested by this graphic. The idea of extending the proposed Route 26 BRT service beyond Music City Central to Vanderbilt would be supported by this analysis.

Figure A-3 shows the top 50 work flows in the area poorly served by public transportation. This map also shows flows weighted by income, so that lower income residential census tract work trips are weighted heavier than higher income trips. This analysis reveals that many of these work flows are coming from outside Nashville/Davidson County—pointing to the need for an expanded transit capability for the greater region. Another large unserved work flow is to the Opry Mills area from neighborhoods to the east of downtown. The MTA has not been successful in its attempts at providing cross-town service or service to Opry Mills, thus we did not recommend trying to meet this need at this time. However, as development continues in the future, the MTA may want to reconsider service to this area. The MTA Service Analyzer could be used to examine the potential for public transportation to serve this cross-town need.

Figure A-4 shows the way that the MTA Service Analyzer assigned trips to the different MTA routes, including the new Route 72 that was to be implemented in March of 2009. The MTA Service Analyzer predicted that Route 72 would have a similar ridership to Route 28 (about 19,500 riders per month based on 2007 data). However, work trips for the Correctional Development Center at the eastern end of Route 72 were not represented in the Journey to Work census data. Once Nashville MTA becomes familiar with the model, it will be important to make corrections in the underlying data to allow for special trip generators such as the Correctional Development Center.

Figure A-2: Transit Availability for Work Trips by Census Tract (Using Journey to Work Data)

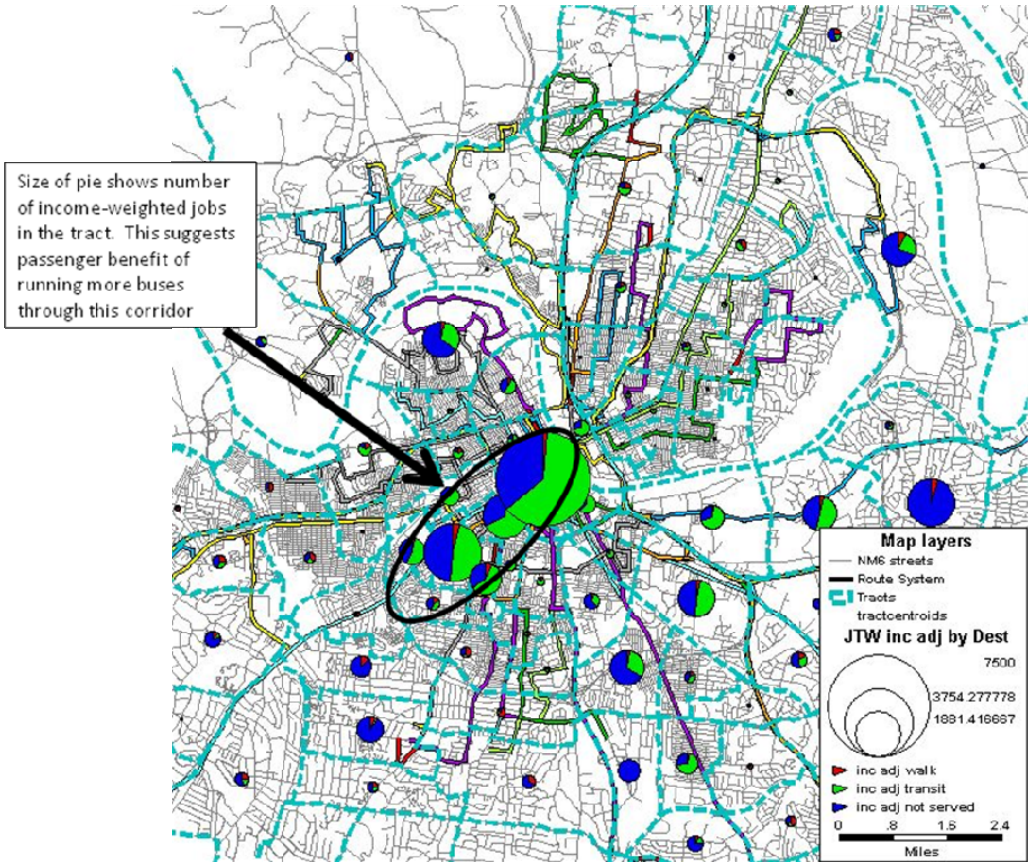


Figure A-3: Top Fifty Work Flows Poorly Served by Public Transportation

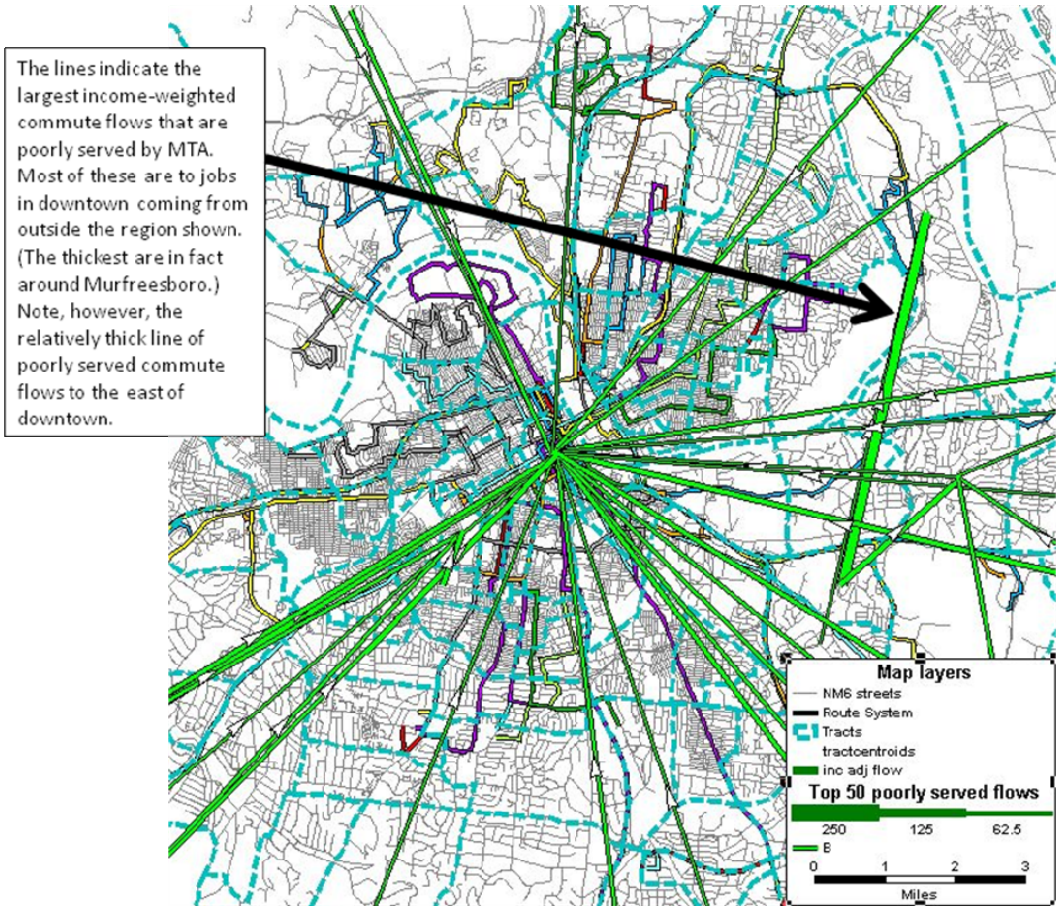
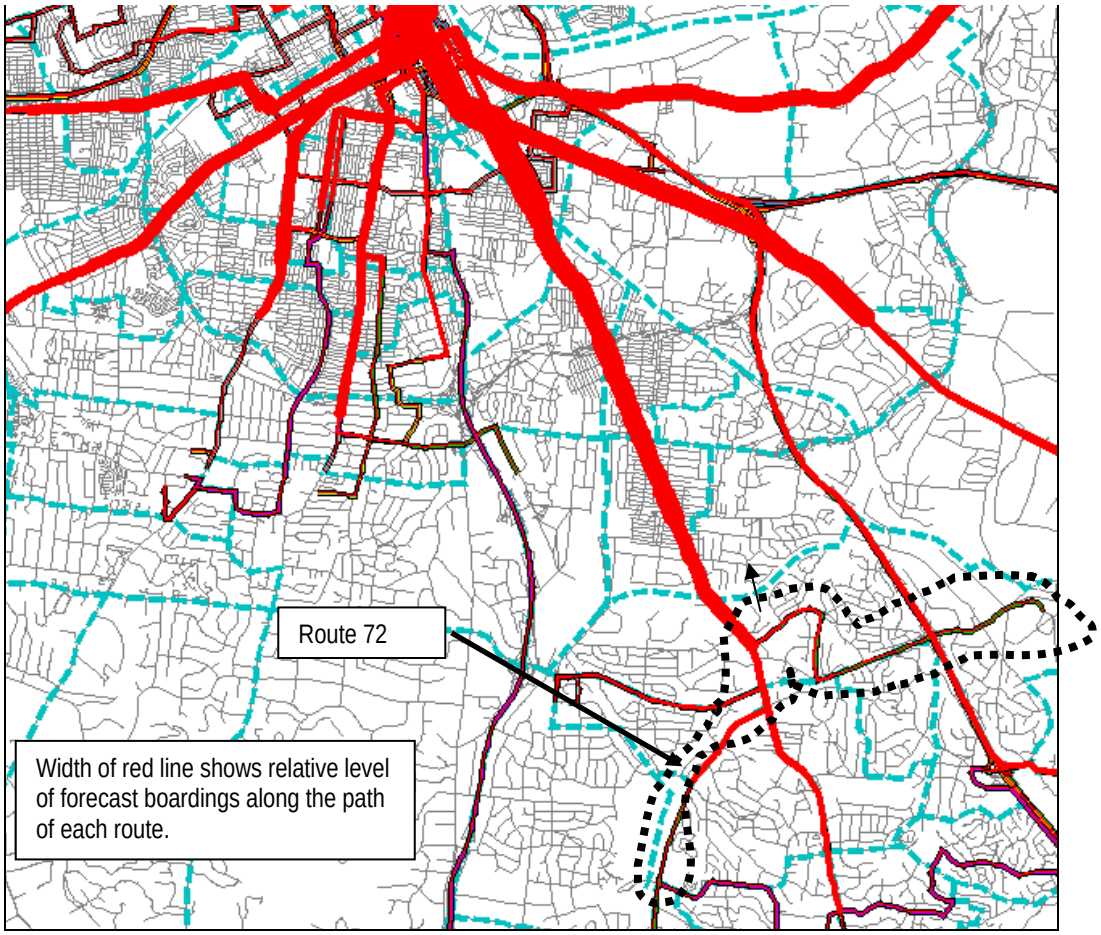


Figure A-4: Transit Ridership on MTA Routes Showing New Route 72



In March of 2009, once the TAZ data had been included in the MTA Service Analyzer, it was used to analyze the mini-hub concepts, which were developed as a way to help with some of the need for connections away from downtown Nashville. While the MTA Service Analyzer did not find that the set of all of the proposed mini-hubs was advantageous, some looked better than others. The data provided include change in ridership by route as well as change in total service time by route. Thus the data allow computation of the cost of the change (by multiplying additional service hours times the MTA cost per hour) and thus the cost per new rider due to the change. The MTA Service Analyzer will allow refinement and improvement of the mini-hub concepts.