



Average Weekday Ridership for the Guadalupe-Lamar Light Rail Minimum Operable Segment

by Andrew Mayer

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Purpose

This study develops average weekday ridership estimates for four light rail alignment scenarios in Austin, Texas. They include the Central Austin Community Development Corporation's proposal for a light rail starter line, or Minimum Operable Segment, that would serve Guadalupe Street and Lamar Boulevard from 4th Street to Airport Boulevard.

Summary

A spreadsheet-based model developed by the Transportation Research Board's FTA-Sponsored Transit Cooperative Research Program (TCRP)¹, was populated with station-specific block-resolution data from the 2010 Census and 2011 Longitudinal Employment-Household Demographics (LEHD). ESRI's ArcGIS 10.4 was the primary analysis tool for population data, and the Census Bureau's OnTheMap² tool was used for finding employment data. Station points were selected based on optimized jobs counts in each transit shed. The model calculated ridership based off the number of people and jobs in the station catchment areas, the daily parking rate in the Central Business District, and how much of the project was grade-separated. Using merged half-mile radius buffers produced an estimate for average weekday ridership for the **2016 Central Austin CDC Guadalupe-N Lamar Minimum Operable Segment**.

This process was repeated for the **2015 MobilityATX/Civic Analytics Proposal**, the **2000 Guadalupe-N Lamar to McNeil FTA project**, and **Guadalupe-Riverside Alternative Minimum Operable Segment**. Running the analysis on the 2000 Federal Transit Administration's (FTA) project provided an apples-to-apples comparison with the FTA's ridership estimate of 37,400 made back in 1999, as well as test the calibration and sensitivity of the model developed by the Transit Cooperative Research Program.

Data used by this model meet the definition of current-year data, as the term applies in FTA studies, and represent not a future year estimation, but one that is more conservative and looks back at known historical jobs and population data. The model draws on static data and does not incorporate linked trip demand into its ridership model. The **2016 Central Austin CDC Guadalupe-N Lamar Minimum Operable Segment** light rail alignment would expect to pick up passengers from buses currently providing transfers at the North Lamar Transit Center, the 32-mile commuter rail Red Line at Crestview Station, and bus transfers at Republic Square. Today, Republic Square is Capital Metro's most active bus hub.

As of May 2016, the Red Line carries an average of 2,660 daily riders. It has been reported at or near crush load several times a week during peak hour travel, but is planned to double in capacity when improvements now underway are complete. The introduction of light rail along Guadalupe and North Lamar would increase demand for the Red Line for commuters to the university and state offices, free up seats on the Red Line for utilization in the core as suburban riders alight at Crestview Station, as well as attract new inbound transfers from East Austin.

¹ Transit Cooperative Research Program (TCRP) Report 167: Making Effective Fixed-Guideway Transit Investments: Indicators of Success <http://www.trb.org/main/blurbs/170972.aspx>

² U.S.Census Bureau, Center for Economic Studies <http://onthemap.ces.census.gov/>

Alignments and Average Weekday Ridership Estimates

2016 Central Austin CDC Guadalupe-N Lamar Minimum Operable Segment

Route: Guadalupe at 4th Street, North on Guadalupe/Lavaca to North Lamar to Airport Blvd.

Length: 5.3 miles

10 Stations

Northern Terminus: Crestview Station at North Lamar and Airport Blvd

Southern Terminus: Republic Square at Guadalupe and 4th Streets

2010 Population: 44,631

Jobs, 2011, ½ mile: 184227

Average Weekday Ridership: 34,000 +/- 9,000

2000 Guadalupe-N Lamar to McNeil FTA project³

Route: Congress at 4th Street, North to 11th, North on Guadalupe/Lavaca to North Lamar to Crestview, Crestview North to McNeil on current Red Line track

Length: 14.6 miles

17 Stations

Northern Terminus: McNeil

Southern Terminus: Congress and 4th Streets

2010 Population: 61,340

Jobs, 2011, ½ mile: 205,729

Average Weekday Ridership: 45,000 +/- 9,000

³ Station points were determined as a part of a follow-on study by Capital Metro in 2001 titled The Rapid Transit Project but were not defined for the proposal in 2000.

2015 MobilityATX/Civic Analytics Proposal

Route: William Cannon at South Pleasant Valley to Todd Ln to Burleson to South Pleasant Valley to East Riverside Drive to South 1st Street, to Guadalupe/Lavaca to North Lamar to north of Rundberg Lane.

Length: 14.0 miles

26 Stations

Northern Terminus: North of Lamar and Rundberg

Southern Terminus: South Pleasant Valley and William Cannon

2010 Centroid Population: 103,700

Jobs, 2011, ½ mile: 214,034

Average Weekday Ridership: 60,000; +/- 8,000

Guadalupe-Riverside Alternative Minimum Operable Segment

Route: Guadalupe Street and Riverside Drive from 24th St to Grove Boulevard

Length: 5.5 miles

12 Stations

Northern Terminus: 24th and Guadalupe St

Southern Terminus: East Riverside Drive and Grove Blvd

2010 Population: 53,825

Jobs, 2011, ½ mile: 134,871

Average Weekday Ridership: 25,000 +/- 5,000

Station Points

2016 Central Austin CDC Guadalupe-N Lamar Minimum Operable Segment

Station Name	Latitude	Longitude
Republic Square/4 th St	30.267273	-97.746887
Wooldridge Square/8 th St	30.270874	-97.745605
Capitol/12 th St	30.274902	-97.74408
Museum/17 th St	30.280701	-97.742004
University of Texas/24 th St	30.28772	-97.741577
North University/29 th St	30.294663	-97.742482
Hyde Park/38 ½ St	30.303493	-97.737643
Triangle-State/47 th St	30.314892	-97.732362
Old Koenig Ln	30.327804	-97.725192
Crestview	30.33728	-97.719116

2000 Guadalupe-N Lamar to McNeil FTA project⁴

Station Name	Latitude	Longitude
Republic Square/4 th St	30.267273	-97.746887
Wooldridge Square/8 th St	30.270874	-97.745605
Capitol/12 th St	30.274902	-97.74408
Museum/17 th St	30.280701	-97.742004
University of Texas/24 th St	30.28772	-97.741577
North University/29 th St	30.294663	-97.742482
Hyde Park/38 ½ St	30.303493	-97.737643
Triangle-State/47 th St	30.314892	-97.732362
Old Koenig Ln	30.327804	-97.725192
Crestview	30.33728	-97.719116
Anderson Ln	30.352295	-97.722595
Research Blvd	30.371887	-97.723877
Braker Ln	30.390076	-97.717224
Gracy Farms Ln	30.403687	-97.710388
Parmer Ln	30.421082	-97.705505
Howard Ln	30.438721	-97.700012
McNeil Rd	30.453125	-97.720703

⁴ Station points were determined as a part of a follow-on study by Capital Metro in 2001 titled The Rapid Transit Project but were not defined for the proposal in 2000.

2015 MobilityATX/Civic Analytics Proposal

Station Name	Latitude	Longitude
William Cannon Dr	30.180298	-97.746826
Dove Springs Elementary	30.188721	-97.745483
Teri Rd	30.195313	-97.74469
St Elmo's Dr	30.206909	-97.740417
Ben White Blvd E	30.214294	-97.735779
Parker Ln	30.219299	-97.732605
Oltorf E	30.227478	-97.7276
S Pleasant Valley Dr	30.234131	-97.722778
Burton Rd	30.240295	-97.72699
Lakeshore Blvd	30.245117	-97.730713
Travis Heights/Alameda Dr	30.250916	-97.740479
Lakefront	30.258728	-97.748413
Republic Square/4 th St	30.267273	-97.746887
Wooldridge Square/8 th St	30.270874	-97.745605
Capitol/12 th St	30.274902	-97.74408
Museum/17 th St	30.280701	-97.742004
University of Texas/24 th St	30.28772	-97.741577
North University/29 th St	30.294663	-97.742482
Hyde Park/38 ½ St	30.303493	-97.737643
Triangle-State/47 th St	30.314892	-97.732362
Old Koenig Ln	30.327804	-97.725192
Crestview	30.33728	-97.719116
North Lamar Transit Center	30.348328	-97.712524
Fairfield Dr	30.354675	-97.703979
Rundberg Ln	30.364929	-97.695984

Guadalupe-Riverside Alternative Minimum Operable Segment

Station Name	Latitude	Longitude
Grove Blvd	30.226987	-97.707818
Crossing Place	30.231963	-97.717649
S Pleasant Valley Dr	30.234131	-97.722778
Burton Rd	30.240295	-97.72699
Lakeshore Blvd	30.245117	-97.730713
Travis Heights/Alameda Dr	30.250916	-97.740479
Lakefront	30.258728	-97.748413
Republic Square/4 th St	30.267273	-97.746887
Wooldridge Square/8 th St	30.270874	-97.745605
Capitol/12 th St	30.274902	-97.74408
Museum/17 th St	30.280701	-97.742004
University of Texas/24 th St	30.28772	-97.741577

Methodology

Parking Rates

For this analysis, <http://www.bestparking.com/austin-parking/> provided data on daily parking rates in the Central Business District. The settings used were daily, on a weekday, arriving at 8:00 AM and departing at 5:00 PM. Rates vary downtown, but they averaged \$20.

OnTheMap

- 1) In OnTheMap, make a selection using points to represent each station on the line. Add a half-mile ring buffer around the points and click "Confirm and Add Advanced Selection."
- 2) LEHD data are derived from Texas Workforce Commission and correspond to the location reported by an employer for an unemployment insurance premium paid. The University of Texas has reported the location of all of its jobs in a point that is more than a half-mile from Guadalupe Street. UT jobs are not reportable for any station on or near Guadalupe Street running a half mile buffer, so it is necessary to adjust for an issue with the LEHD data where the jobs point for the UT Campus. To accomplish this, in the advanced selection, draw a polygon around the University of Texas-Austin campus. The boundaries are Guadalupe Street to the west, Dean Keaton Street to the north, IH-35 to the east, and Martin Luther King Jr. Boulevard to the south. Do not buffer the polygon. Hit "Confirm Advanced Selection" to continue.
- 3) On the "Selection Area" pop-up, click on "Perform Analysis: Both Areas."
- 4) On Analysis Settings, select "Work" for the area, "Area Profile" for analysis type 2011 for the year, and "All Jobs" for the Job Type. Click "Go" once all have been selected.
- 5) In the results tab, the first item will be "Total All Jobs" and a count. Copy and paste that number into the ridership spreadsheet.

ArcGIS

- 1) In ArcCatalog, create a point layer file named "Light Rail Stations." The fields for the layer should be "Name" in text for the station names, "CAL" in text for the Civic Analytics Line, "GL_MOS" in text for the Guadalupe Lamar Minimum Operable Segment, and so on for additional alignments.
- 2) Add a file of 2010 Census Blocks with demographic data for the Austin area. In this case, the file "capcog-2010-blocks-race"⁵ was used. The important attribute is population data; in this case the field was "total_pop." The 2010 Census Block file was found on CAPCOG's GIS portal.
- 3) Add the "Light Rail Stations" layer to the map. If necessary, project the layer to match the projection of the 2010 Census Blocks. If neither has a coordinate system defined, project both of them to use "NAD_1983_2011_StatePlane_Texas_Central_FIPS_4203_Ft_US."⁶
- 4) Open the Editing toolbar and start an editing session. When prompted to choose the layer to edit, select "Light Rail Stations." If a window with warning pops up, click "continue."
- 5) In the editing toolbar, go to the right and click "Create Features." This will bring up a tab on the right with the "Light Rail Stations" file included.
- 6) Click on "Light Rail Stations," then select the "Point" button on the editing toolbar. This will allow you to create station points in ArcMap.
- 7) Place the points on the map. The station points should be in the same location as the points used in OnTheMap.
- 8) In the Table of Contents, open the attribute table for "Light Rail Stations." Fill in the "Station Name" field and any fields indicating what alignment the station is part of.
- 9) Save the edits and close out the editing session.
- 10) Open the Geoprocessing Tab and select Buffer. Input features should be "Light Rail Stations." Name an output feature. In the distance, input "2640" as the linear unit and make sure "feet" is the unit of measurement. In the Dissolve Field, select "ALL." Click OK at the bottom of the menu.
- 11) There should be a half-mile buffer around the station points that appears as one polygon.
- 12) Under the Selection Tab, choose Select By Location. Make sure "Select Features From" is the selection method, the 2010 Census Blocks file is the target layer, and the source layer is the buffer of the station points. "Have their centroid in the source layer feature" is the spatial selection method. The size of the census blocks makes centroid selection a simple yet relatively precise method for dealing with polygons on the edge of the buffer.
- 13) There should now be a large number of census blocks that have been selected. In the table of contents, right click on the 2010 Census Blocks layer. Scroll down to "Selection" and choose "Create Layer From Selected Features."
- 14) Rename and symbolize the 2010 Census Blocks selection, then open the attribute table. Right click on the total population field and choose "Statistics." The Sum statistic will be used for the population estimate.

⁵ Capital Area Council of Governments

http://data.capcog.org/Information_Clearinghouse/data/Census2010/census-2010-popblocks-race.zip

⁶ ArcGIS map spatial reference NAD_1983_2011_StatePlane_Texas_Central_FIPS_4203_Ft_US

15) Sometimes, there will be census blocks that are within a half-mile of the station but are inaccessible due to barriers, like a river. To correct this, select the census blocks that are inaccessible. Open the attribute table, right click on the total population field and choose "Statistics." Take the sum from this selection and subtract from the larger census blocks selection.

16) Copy and paste the revised sum of population into the Population field in the spreadsheet.

Inputting into the Spreadsheet

Input the population, employment numbers and the average daily parking rate in the CBD. For the Guadalupe-Lamar MOS, 100% of the project is at grade, but this number may vary for different alignments. If desired, the number of stations and total project cost can be inputted to determine what is the capital cost per rider.