

# MetroRapid Bus Rapid Transit Project Before-and-After Study (2018)

Austin, Texas



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## **MetroRapid Bus Rapid Transit Project; Austin, Texas**

The MetroRapid Bus Rapid Transit (BRT) project established BRT facilities and upgraded bus services in two corridors: the North Lamar/South Congress Corridor now served by the 21-mile-long MetroRapid Route 801 and the Burnet/South Lamar Corridor now served by the 16.5-mile-long MetroRapid Route 803. The two routes run together for three miles through downtown Austin and the University of Texas campus. Within those three miles are transit priority lanes 1.25-mile-long street couplet in downtown Austin. Figure 1 shows the two BRT routes and the locations of the new BRT stations that they serve.

The MetroRapid project was developed and built by Capital Metro, the principal transit provider for metropolitan Austin. Capital Metro now operates the two new MetroRapid routes.

The project was initially identified as an element of the 2004 All Systems Go system plan that established a vision for future BRT services. In 2008, Capital Metro completed a simplified alternatives analysis that identified the North Lamar/South Congress and Burnet/South Lamar corridors as the priorities for initial BRT implementation. In 2009, Capital Metro completed its Service Plan 2020 that set the foundation for dedicated transit priority lanes within Downtown Austin.

The MetroRapid project entered Project Development (PD) in 2009. The Federal Transit Administration and Capital Metro executed a Project Construction Grant Agreement (PCGA) to fund the project in 2012. The project opened for service in 2014 – Route 801 in January and Route 803 in August.

### **Physical scope**

The MetroRapid project comprises 34.5 miles of new BRT treatments on existing arterial streets. (The 34.5-mile project length equals the total of the two route lengths minus the three miles of common running.) The BRT buses operate in mixed traffic except on the 1.25 miles of transit-priority lanes on the Guadalupe/Lavaca street couplet in downtown Austin. These transit-priority lanes were implemented concurrently with, but funded separately from, the BRT project. Consequently, the scope of the MetroRapid project itself included no transit guideway elements.

The project introduced 77 BRT stations: 20 paired and 3 single stations for Route 801; and 16 paired and 2 single stations for Route 803. Paired stations are located on the opposite sides of the MetroRapid-served street, typically on the far side of signalized intersections. The stations are curbside and are of a standard BRT-only design with special branding, color schedule, and logo to distinguish them from other bus stops and shelters. The scope of each station included construction of concrete pads and lane bulb-outs in existing street right-of-way, canopies, ramps, railings, benches and/or lean bars, real-time passenger information displays, trash receptacles, signage, and markings. While the project scope did not include any new park-ride facilities, several new MetroRapid stations are located at existing park-ride lots.

The project included renovations to an existing administrative building and maintenance facility at the North Operations Center, a storage yard for the BRT vehicles, and security improvements.

Special site-work for the project included the relocation of, and/or adjustments to, underground utilities at new BRT stations and the provision of temporary access easements to adjacent land uses during construction of stations.

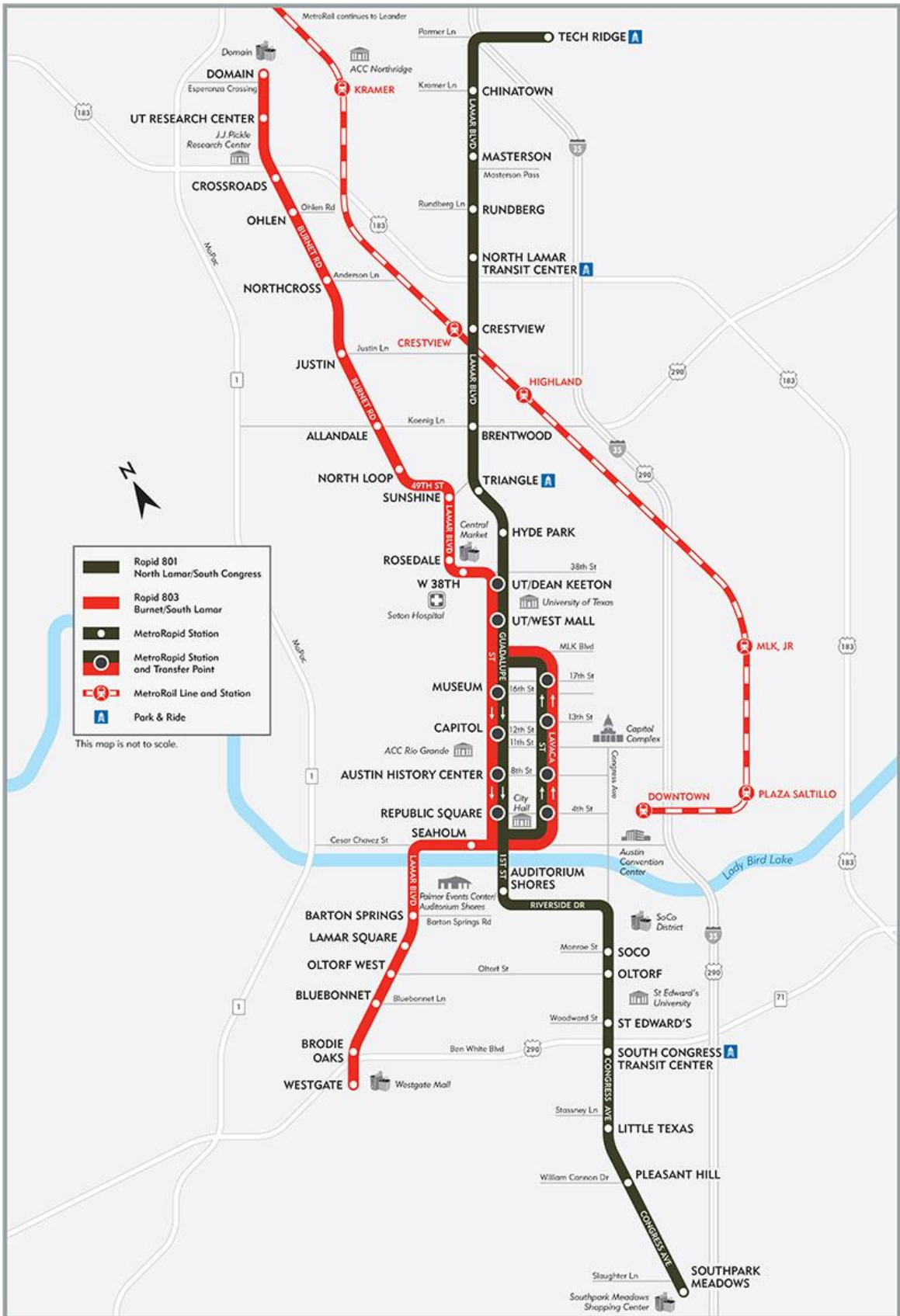


Figure 1, Map of the MetroRapid Corridors

Systems elements included traffic signals, communications, and fare collection. For traffic signals, the project made upgrades to the traffic control system including hardware and software to enable transit signal priority (TSP) at 133 of the 160 signalized intersections in both corridors outside of downtown. The TSP system extends green signals for BRT buses that are more than one minute behind schedule. No TSP treatment occurs within downtown where BRT buses run on the reserved-lane couplet. For communications, the project provided central automated dispatch for BRT vehicles, automated vehicle location (AVL), bus arrival prediction software, real-time schedule displays at all BRT stations, and additional computer work stations to monitor the system in real time. For fare collection, the project introduced a mobile ticketing application and on-board wi-fi on the BRT vehicles. All BRT vehicles are also equipped with ticket validators at the rear door and fare-boxes at the front door.

No right-of-way acquisition or improvement was needed for the project. Temporary construction easements were needed at approximately 10 percent of the stations.

The project included the purchase of 22 60-foot articulated buses and 18 40-foot buses. All vehicles have special outfitting as BRT vehicles and are equipped with automated vehicle locator systems and emitters for communication with central dispatch, traffic signals, and the real-time bus arrival system. All 40 BRT buses are net additions to the fleet; Capital Metro redeployed buses formerly serving the two corridors to other routes in the system.

The anticipated scope of the project at PD-entry and the PCGA matched the actual outcome closely. Three exceptions were:

- The northern terminus of the Route 803 leg of the project. At PD-entry and at the PCGA, the anticipated northern terminus was at St. David's North Austin Medical Center. The as-built terminus is approximately 1.5 miles south, located at The Domain – a high-density business, retail, and residential center. Ongoing negotiations with the property owner of The Domain meant that the scope at PD-entry and the PCGA had to identify the Medical Center as the northern terminus. Capital Metro and FTA agreed to modify the scope when negotiations were successfully concluded after the PCGA award.
- Construction easements. At PD-entry and at the PCGA, the scope assumed that 80 percent of the BRT stations would require construction easements. The actual outcome was that fewer than 10 percent of the stations needed these easements.
- Fare media. At PD-entry and at the PCGA, the scope included 10 new ticket vending machines at various locations. In the actual outcome, the scope dropped the vending machines and added a fare-purchase system for mobile devices as well as Wi-Fi on BRT vehicles.

These exceptions are relatively minor and generally reflect the kinds of modifications to the project that occur through project development.

### **Capital cost**

The actual cost of the project was \$38.9 million in year-of-expenditure dollars. This total does not include the \$100,000 cost of the transit-priority lanes in downtown Austin which were established at the same time as the BRT project but funded separately. The average cost of the BRT project was \$1.04 million per mile including BRT-vehicle costs and \$0.41 million

excluding the vehicle costs. Overall, 61 percent of the total project cost was for the BRT vehicles, 29 percent was for design and construction of stations, and 10 percent was for systems. The average cost of a BRT station was \$100,000.

At PD-entry, the predicted cost of the project was \$47.0 million, 21 percent higher than the actual outcome. This difference was caused primarily by a higher anticipated unit cost for each BRT vehicle (\$820,000 anticipated versus \$590,000 actual), along with a 5.0 percent unallocated contingency allowance that was not needed in the actual outcome. Small underestimates of the costs of stations, systems, and design services partially offset the larger overestimate of vehicle costs.

At the PCGA, the predicted cost was \$47.6 million, 22 percent higher than the actual outcome. By this point, the effect of depressed market conditions on the price of BRT vehicles had become clear and the revised anticipated cost of vehicles (\$610,000 each) largely eliminated the previous overestimate. Anticipated costs for stations and design services increased, however, contributing to the essentially unchanged overestimate of total costs. These higher cost estimates were later contained using in-house staff for some design work and avoiding the need for staging easements at all but eight of the 77 station area. The largest contributor to the overestimate at the PCGA, however, was the 11.0 percent unallocated contingency allowance that was entirely unneeded in the actual outcome. As a result, the project construction was completed at \$38.9 million, 18 percent less than the \$47.6 million predicted at the time of the PCGA.

### **Transit service**

MetroRapid Routes 801 and 803 provide weekday service on the project on 12- to 15-minute headways for two hours in the morning peak period and for five hours in the early afternoon and evening peak period. Service in the early morning, mid-day, and evening periods runs on 20-minute headways. On weekends, service runs on 20-minute headways from 9:30am to 6:30pm and on 30-minute headways during earlier and later hours.

Route 801 has an end-to-end runtime of 50 minutes, 10 percent shorter than the quickest available service in the corridor prior to the project. Route 803 has an end-to-end runtime of 46 minutes, 12 percent shorter than the quickest available service in its corridor prior to the project. These runtime reductions are the result of the (1) transit signal priority, (2) all-door, low-floor boarding, (3) mobile ticketing, and (4) limited stop features of the BRT project.

In the Route 801 corridor, the primary impacts of the BRT project were to (1) replace an existing limited stop service – Route 101 – with limited-stop service upgraded to BRT standards and new evening service hours, (2) reduce the frequency of the existing local service – Route 1 – by half, and (3) add a feeder route at each of the two new terminal stations to provide connections to Route 801 from a wider area.

In the Route 803 corridor, the primary impacts of the project were to (1) add the new BRT Route 803, (2) on Route 3, the principal local service in the corridor, marginally reduce the frequency weekday peak-period service and weekend early and late service, (3) eliminate limited-stop Route 174 that had served the northern part of the corridor generally to the east of Burnett, and

(4) adjust service frequencies on two crosstown routes that intersect with Route 803 in the southern part of the corridor.

In summary, the BRT project had impacts on transit service that were very different between the two corridors in two important ways:

- BRT MetroRapid Route 801 was essentially a modest upgrade of an existing limited-stop route; in contrast, MetroRapid Route 803 introduced a BRT-standard limited-stop service into a corridor where no limited-stop service had existed; and
- Service frequencies on the principal local route in the Route 801 corridor were significantly lower – half their former levels – after project opening; in contrast, service frequencies on the principal local route in the Route 803 corridor were only moderately lower after project opening.

The difference in frequency changes to local services is attributable to lessons learned by Capital Metro from the earlier opening of the MetroRapid 801 corridor. Rider reactions to those service changes indicated that many of the trips served by the local service were not well served by the BRT route; consequently, the significant reduction in the frequencies of the existing local route, along with the higher fare charged on route 801, had made transit service less appealing for many existing riders. Capital Metro consequently made less significant frequency reductions on the principal local route when Route 803 started service seven months later.

Fare policies have changed throughout project development and operations. Fares for local and limited-stop routes increased from \$0.50 to \$0.75 in 2009 and to \$1.00 in 2010. Fares for the two MetroRapid routes introduced by the BRT project in 2014 were \$1.50. In 2015, local/limited bus fares increased to \$1.25 and MetroRapid fares increased to \$1.75. In January 2017, Capital Metro eliminated this fare difference by resetting MetroRapid fares to the same \$1.25 as for local service.

The transit service plan for the project accurately anticipated the alignments of the two new MetroRapid routes. The plan overestimated end-to-end runtime savings in both corridors, however, anticipating reductions of approximately 25 percent compared to the actual outcome of 10-12 percent. The difference is the result of unanticipated increases in traffic congestion in both corridors that slows BRT vehicles that operate in mixed traffic over 90 percent of the lengths of the routes. The plan underestimated the vehicle-hours of service that the new MetroRapid routes would provide, however. The plan called for 104,000 annual vehicle-hours of BRT operations providing weekday-only service spanning 14 hours of each weekday. This plan reflected current realities at the time when the Great Recession and its aftermath constrained transit operating budgets and limited the pace of economic development. Actual service requires 162,000 BRT vehicle-hours to provide MetroRapid service seven days per week over 19 hours on weekdays and 16-17 hours on weekends. Actual service levels reflect Capital Metro's response to a rapidly improving economy, increasing budget revenues, and rapid growth in local development, population, and employment.

The plan also anticipated better peak-period service headways on weekdays, however: every 10 minutes in the plan compared to 12-15 minutes in the actual outcome. This difference is again the consequence of increasing peak-period traffic congestion that has reduced the average speed of both general traffic and buses on streets in the corridor. As speed decreases, each bus serves fewer miles of the route – making it impossible to maintain headways with the number of BRT vehicles acquired for the two routes.

Capital Metro is currently acquiring additional BRT vehicles – eight for Route 801 and seven for Route 803 – so that it can improve MetroRapid headways in 2017 to the originally planned 10-minute intervals in the peak periods.

### **Operating and maintenance costs**

Actual costs for operation and maintenance (O&M) costs for the two MetroRapid routes and stations in fiscal year 2016 were \$15.0 million, 6.9 percent of Capital Metro’s total O&M budget of \$216.9 million.

Predicted annual MetroRapid O&M costs at both PD-entry and the PCGA were \$8.8 million, an underestimate of 41 percent driven primarily by the less ambitious service plan at those milestones that led to a 36 percent underestimate of the vehicle-hours of BRT service that would be required.

### **Ridership**

In 2016, two years after project opening, ridership on MetroRapid Route 801 was 5,800 boardings per average weekday. Ridership on the reduced-frequency local Route 1 was 5,700 for a total of 11,500 boardings on the principal services in the North Lamar/South Congress corridor. Feeder Routes 201 and 275 added a total of 1,700 weekday boardings in the corridor, some of which were transfers to/from Routes 801 and 1. The combined ridership on all four corridor routes was 2,400 fewer weekday boardings than the combined ridership of 15,600 weekday boardings on corridor routes before project opening. This ridership loss is attributable to three factors:

- The significantly reduced frequency – by half – of the Route 1 local service which meant that riders who found the new MetroRapid stop locations to be inconvenient for their trips faced longer wait times for Route 1 buses at local stops;
- The presence of limited-stop service on Route 101 before the introduction of MetroRapid which meant that MetroRapid was only a modest improvement over existing service; and
- The higher fare for MetroRapid service compared to the fare charged on all other services both before and after the introduction of the MetroRapid routes.

The result was that MetroRapid attracted only a modest number of new transit riders to the corridor while the reduced local service caused a somewhat larger number of existing riders to abandon transit in the North Lamar/South Congress corridor.

Ridership on MetroRapid Route 803 in 2016 was 3,500 boardings per average weekday and ridership on local Route 3 was 2,500 boardings per average weekday, for a total of 6,000 total boardings on the principal services in the Burnet/South Lamar Corridor. Crosstown Routes 331



and 338 had a total of 650 weekday boardings, some of which transferred to/from Routes 803 and 3. The combined ridership on Routes 803 and 3 was 3,900 daily boardings greater than the combined ridership on Routes 174 and 3 before project opening. This ridership gain is attributable to introduction of limited-stop service to the corridor with the new MetroRapid Route 803 and to the less significant reduction of service on local Route 3 after project opening.

After January 2017, when Capital Metro lowered fares on the MetroRapid routes to equal the fares charged on local routes, MetroRapid ridership increased significantly: Route 801 to 7,800 weekday trips from 5,800 weekday trips in 2016, and Route 803 to 4,200 weekday trips from 3,500 weekday trips in 2016. These gains include both existing riders who switched from local services to the MetroRapid routes and new (or returning) riders switching from other travel modes. The gains also reduced the net loss of riders in the Route 801 corridor to 900 weekday trips. This sensitivity to transit fares tends to confirm that the initial ridership loss in the Route 801 corridor was caused in part by the higher fare charged on the new MetroRapid routes. Capital Metro is also gradually adding BRT stations to fill gaps in station coverage in both corridors. Further ridership gains are likely as the agency deploys the additional BRT vehicles to improve peak-period headways to the planned 10-minute intervals and adds new MetroRapid stations in both corridors. Capital Metro does not plan adjustments to the Route 1 local service as the agency continues to focus on the performance and ridership of the new MetroRapid service.

Because the MetroRapid BRT project qualified as a Very Small Starts project in the FTA Capital Investment Grants program, no ridership forecasts were required for the project. Consequently, this study does not include an evaluation of forecast accuracy.