Bus Rapid Transit (BRT)

Implementation Plan along Transit Corridors

HNTB in association with FTE

Prepared for: MPO Miami-Dade Metropolitan Planning Organization

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Purpose of Study

The ‘Bus Rapid Transit Implementation Plan’ identifies implementable, cost-feasible, and practical recommendations for a new level of premium transit service along four major corridors in Miami-Dade County: NW 27th Avenue, W Flagler Street, Kendall Drive, and Douglas Road. These recommendations are based on a comprehensive review of existing BRT systems considering the local social, physical, and political environments. Included in this report are low and high cost estimates for each corridor based on level of investments, as well as potential funding sources.

Definition of Bus Rapid Transit (BRT)

The FTA defines BRT as an enhanced bus system that operates on bus lanes or other transitways in order to combine the flexibility of buses with the efficiency of rail. By doing so, BRT operates at faster speeds, provides greater service reliability and increased customer convenience. It also utilizes a combination of advanced technologies, infrastructure, and operational investments that provide significantly better service than traditional bus service. The Institute for Transportation and Development Policy defines BRT as a high-quality bus-based transit system that delivers fast, comfortable, and cost-effective urban mobility through the provision of segregated right of way infrastructure, rapid and frequent operations, and excellence in marketing and customer service. BRT combines all of these qualities into a permanently integrated transit system with a quality image and uniquely identifiable brand.

BRT's flexibility derives from the fact that BRT vehicles (e.g., buses, specialized BRT vehicles) can travel anywhere there is pavement and the fact that BRT's basic service unit, a single vehicle, is relatively small compared to train-based rapid transit modes. A given BRT corridor may encompass route segments where vehicles operate in mixed traffic, exclusive bus lanes, or on a dedicated, fully grade-separated transitway with major stations. BRT is an integrated system that is designated to improve the speed, reliability, and identity of bus transit.

Essential BRT Components

Many of the components at the heart of BRT have been in use for decades. However, there is uncertainty among elected officials and even some transit professionals about what BRT is and how it differs from conventional bus services and systems. Transit planners have strived for ways to enhance the speed and reliability of transit service in an attempt to encourage more usage with exclusive bus lanes, limited-stop/express services, and dedicated busways. Most systems in the United States have some or all of the basic elements of a functioning BRT system. Commonly used BRT elements include:

- Dedicated right of way / alignment
- Enhanced stations
- "Smart", articulated vehicles
- Frequent service, long service hours
- Off-board fare collection
- Transit signal priority and queue jumps at intersections
- Real-time arrival signage
- Passing lanes at stations
- Unique system-wide branding
- Careful integration with the bicycle and pedestrian networks

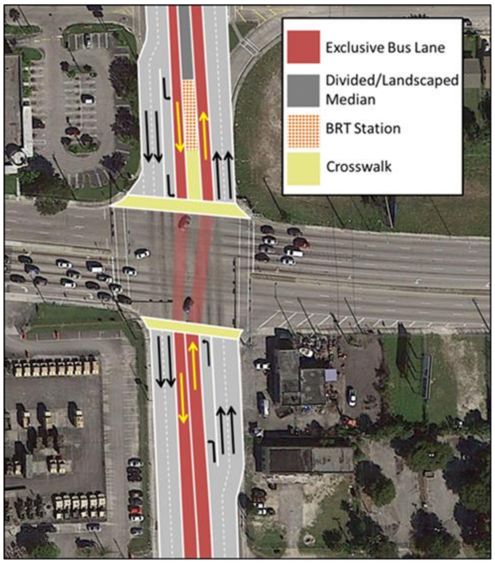
The cumulative impact of packaging multiple BRT elements together is the key to a fully successful and integrated rapid transit system.

Busway Alignment Options

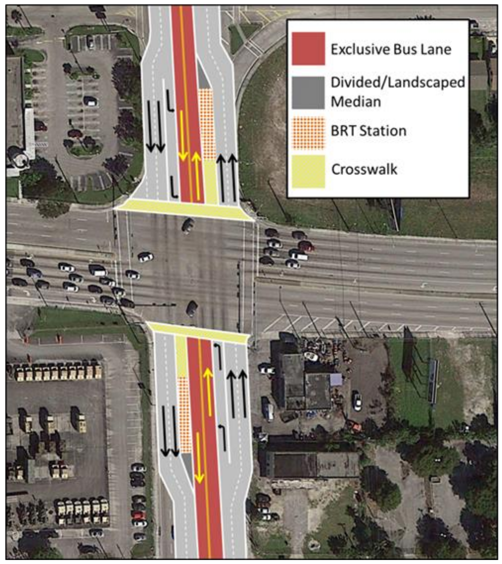
Many busway alignment designs were considered as a part of this study, which included transit station locations and other roadway infrastructure improvements. These options were presented to the Study Advisory Committee for their input in order to craft proposed recommendations for each corridor. Ultimately, only two general types of busways were considered as a part of this study: median/left lane alignment and curbside alignment. The median alignment was combined with the left lane alignment because they share many characteristics, such as station placement, left-turning vehicle considerations, and impacts to traffic flow during construction/implementation.

The median alignment featured different designs based on station design and location within the busway. The graphics below show the three alignment options that were ultimately considered for the proposed BRT corridors. After considering the pros and cons for each, curbside BRT alignment was selected for all corridors. Because the curbside alignment was the preferred option, the repurposed transit lane must accommodate right-turning vehicles, whether accessing driveways or at the intersections if there is no exclusive right turn lane.

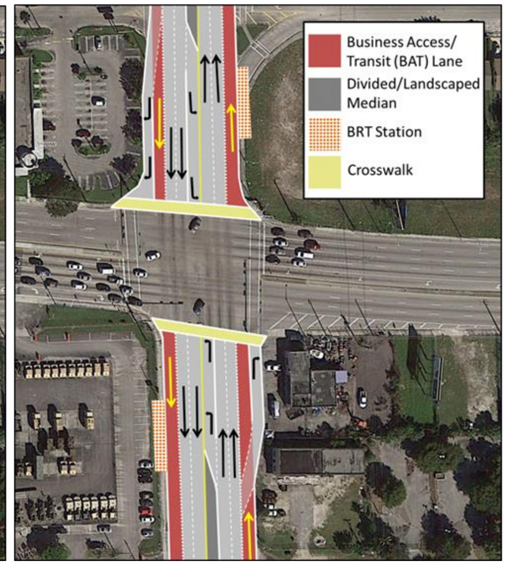
Median Alignment Option #1



Median Alignment Option #2



Curbside Alignment Option



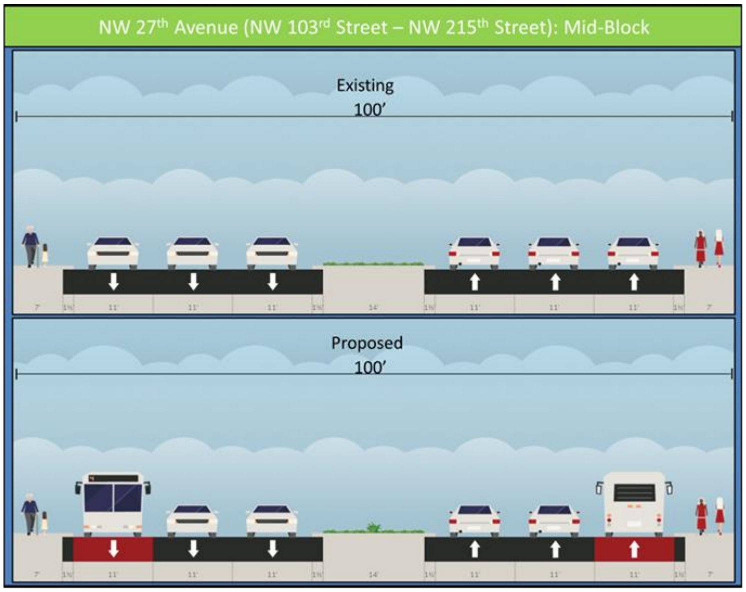
Median-running BRT	
PROs	**CONs**
Faster running speeds due to fewer vehicular conflicts	Major conflicts with left and median access
Local bus service will not impact BRT operations	Requires special signal phasing at intersections
Facilitates variation in platform height	Requires more right of way - minimum of two bus lanes and space for platform
Facilitates closed fare collection areas	Most designs require vehicles with doors on the left side
Does not impact right turning vehicles	Alignment across intersection often skewed
Does not impact bicycles	Passengers required to access platform located in the middle of the street
Breaks up wide streets and makes pedestrian crossings easier and safer	Florida Administrative Codes limits bus shelters to a height of 10 feet and prohibits placing them in the medians

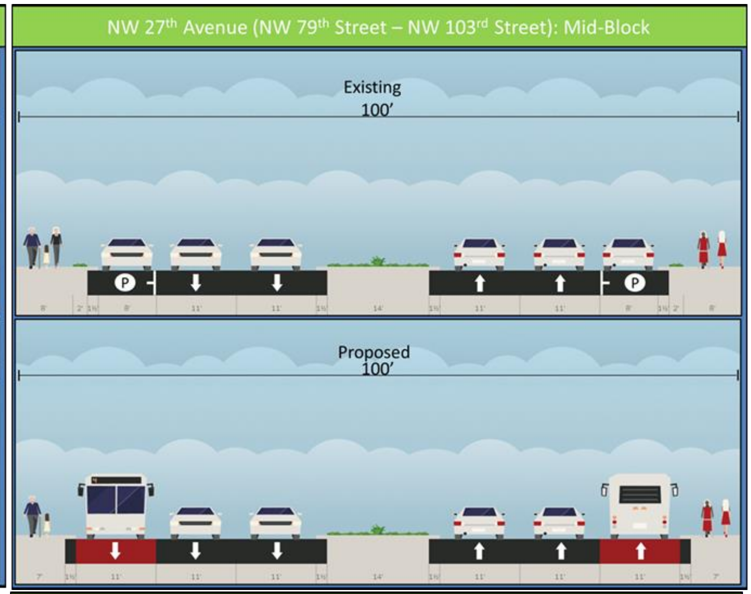
Curbside-running BRT	
PROs	**CONs**
Allows full mid-block business access	More difficult to provide closed fare collection
Does not impact left turns at intersections	Higher platform height impacts the sidewalk area for pedestrians
All bus operations occur in the same lane - easier for riders	Limited running speeds because of right turning vehicles
Requires less right-of-way	Requires special consideration for bicycles
Allows for standard door locations	Special passing consideration required if local bus uses same running way as BRT
Alignment does not cause lane shifts or deflections	Can be difficult enforcing the bus-exclusivity of the lane
Passengers remain on the curb	

NW 27th Avenue Concepts

The portion of NW 27th Avenue between SR 112 and NW 215th Street was chosen as one of the four proposed BRT corridors for this study. Designing a curbside busway throughout this corridor required careful planning mainly due to the variation in right of way. There are three distinct segments within the proposed BRT corridor: SR 112 to NW 79th Street, NW 79th Street to NW 103rd Street, and NW 103rd Street to NW 215th Street. Additional right of way will be required for most of the proposed stations along the corridor in order to accommodate the transit stations along the curb. The graphics below detail the existing and proposed typical sections for NW 27th Avenue at mid-block locations.

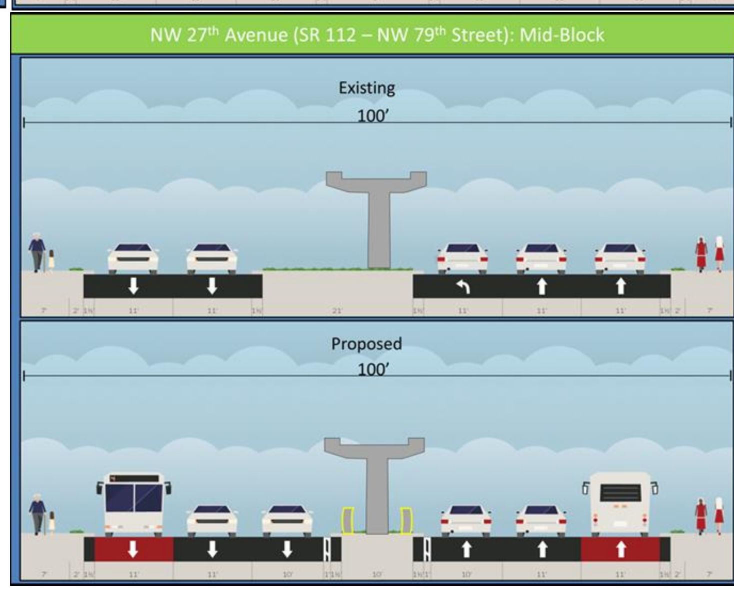
The northern-most segment will simply repurpose the curbside lane to a transit only lane. The middle segment will repurpose the existing on-street parking and will also require restriping/reconstructing the median to fit the proposed transit only lanes. The southern-most segment will require reconstructing the existing median under the Metrorail as well as acquiring additional right of way at select locations to accommodate a transit only lane and two general purpose lanes in each direction.





There are a total of 38 proposed transit stations throughout the corridor, featuring enhanced amenities to improve the comfort and experience for transit users.

Existing Routes 27 and 297 carried an average of 13,907 daily riders collectively, of which 8,327 daily riders boarded within the proposed BRT corridor. Based on experience from other US BRT systems, BRT ridership gains can range from 30 percent to 80 percent or more. An assumed growth projection of 50 percent would result in an average daily ridership of over 12,000 within the proposed BRT corridor.



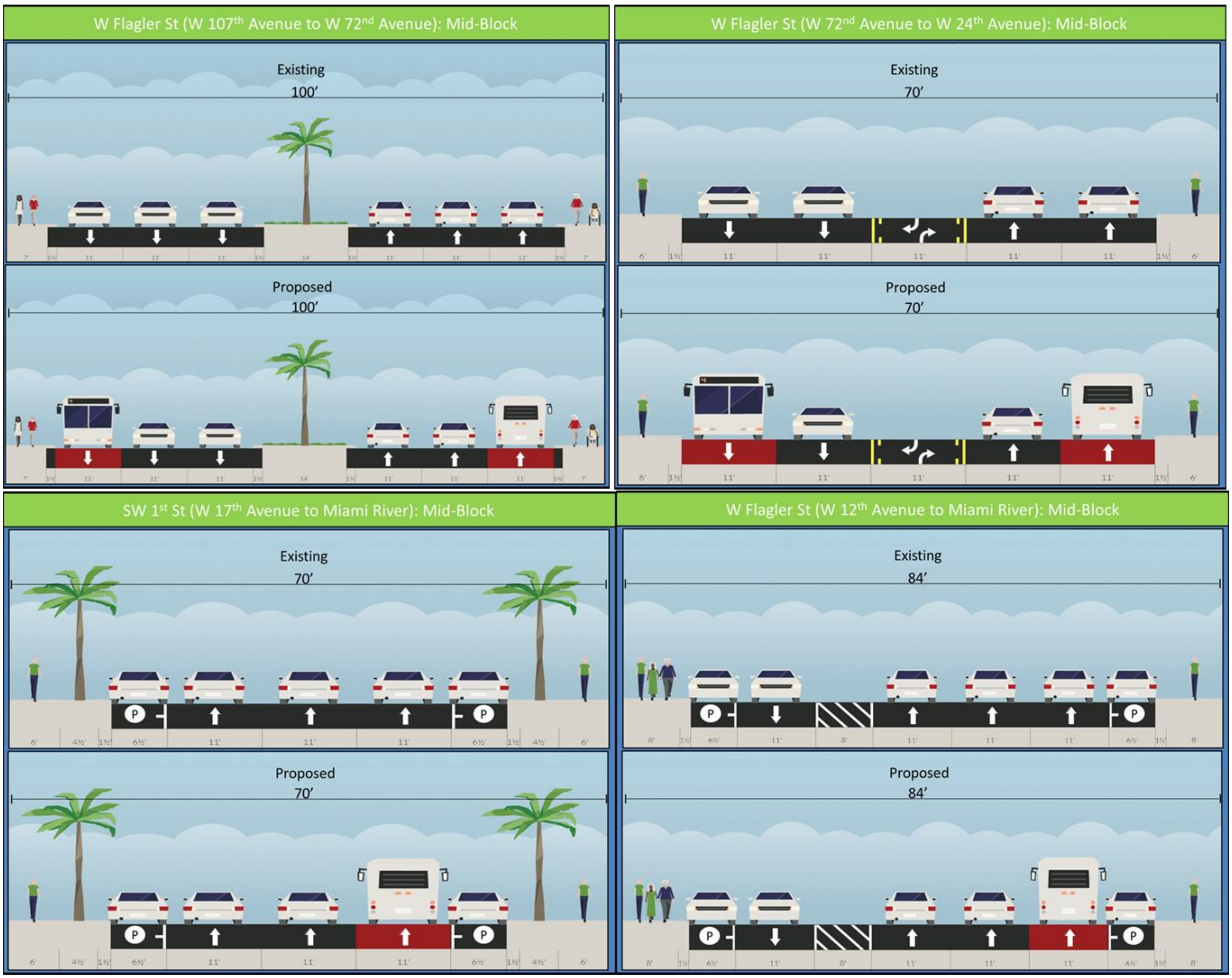
West Flagler Street Concepts

The portion of West Flagler Street between FIU (SW 8th Street/SW 109th Avenue) and downtown Miami was chosen as one of the four proposed BRT corridors for this study. This proposed BRT corridor also features three distinct segments: 107th Avenue to 72nd Avenue, 72nd Avenue to 24th Avenue, and 24th Avenue to the

Miami River. The graphics on the following page detail the existing and proposed typical sections for West Flagler Street.

In all three segments, the curbside lane will be repurposed for the transit only lane, reducing the number of general purpose lanes from three to two (in the western-most and eastern-most segments) and from two general purpose lanes to one (in the middle segment).

A total of 28 transit stations are proposed throughout the corridor, most of which require additional right of way in order to accommodate them along the curb.
Existing Routes 11 and 51 currently average 15,634 daily riders collectively, of which 14,325 board within the proposed BRT corridor. Assuming a 50 percent increase in ridership due to higher levels of service with a uniquely branded system would yield nearly 22,000 average daily riders within the BRT corridor.

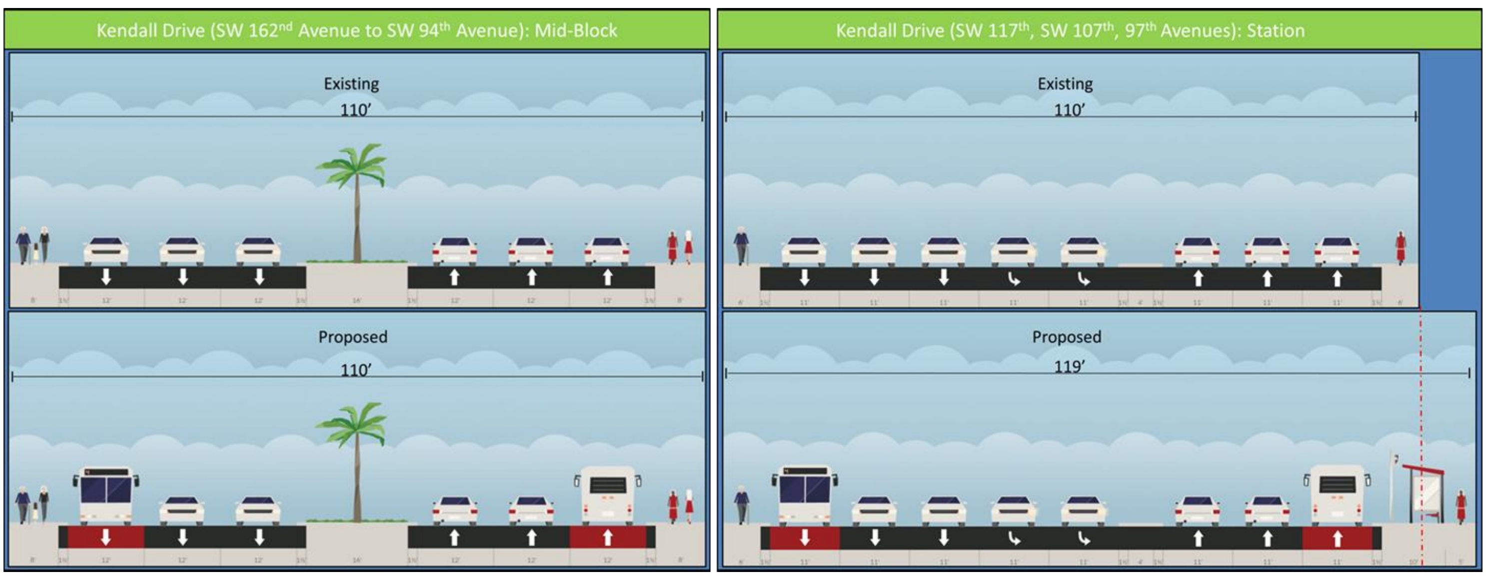


Kendall Drive Concepts

The portion of Kendall Drive between SW 162nd Avenue and the Dadeland South Metrorail Station was chosen as one of the four proposed BRT corridors for this study. The majority of the proposed BRT corridor has three general purpose lanes in each direction with dual left turns at major intersections. The segment of the corridor between SW 127th Avenue and the Turnpike has four general purpose lanes in each direction. Regardless of the number of lanes, the curbside is recommended to be repurposed for the transit only lane. The figures on the following page show the existing and proposed typical sections for the corridor.

There are a total of 32 proposed BRT transit stations, each requiring approximately nine feet of right of way to be acquired in order to accommodate the stations along the curb.

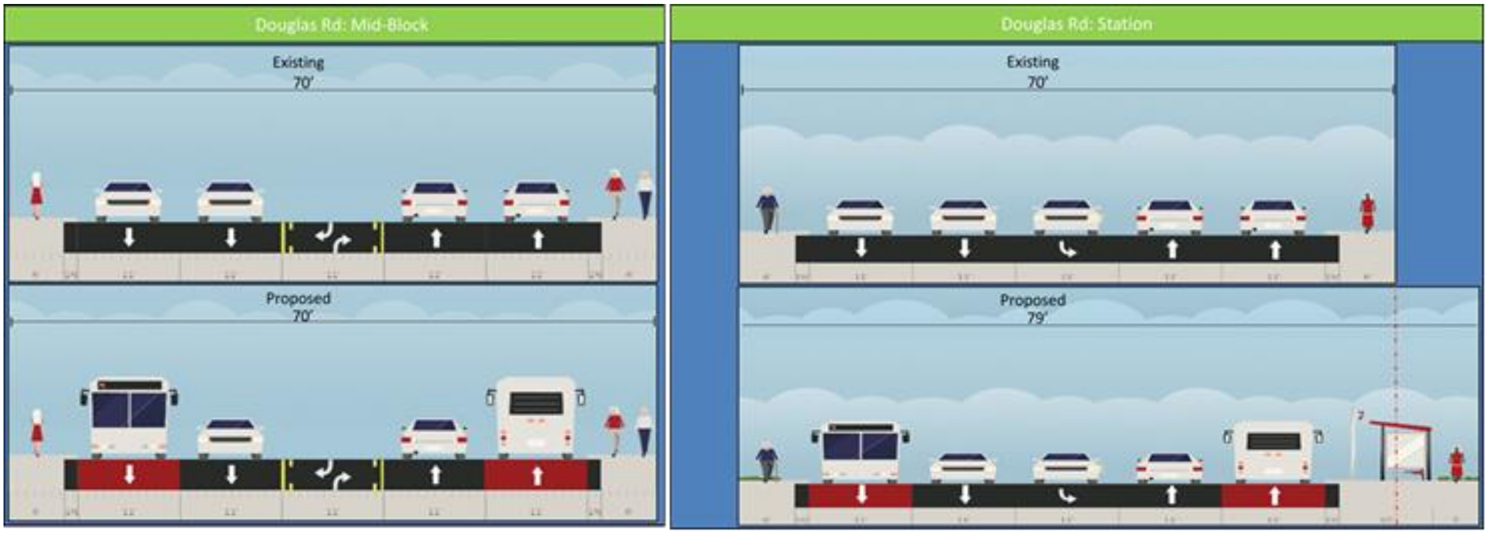
Existing Routes 88 and 288 currently average 4,180 daily riders throughout the corridor. Assuming a 50 percent increase in the number of riders, there would be over 6,000 average daily riders within the BRT corridor.



Douglas Road Concepts

The portion of Douglas Road between US 1 (the Coconut Grove Metrorail Station) and NW 25th Street (near the Miami Intermodal Center) was chosen as one of the four proposed BRT corridors for this study. The entire corridor has two general purpose lanes in each direction with a continuous left turn lane throughout. It is recommended that the curbside lane be repurposed for a transit only lane, leaving one general purpose lane in each direction. Right of way will need to be acquired at each station location in order to accommodate the station platform and the relocated sidewalk as seen depicted in the following graphic. There are a total of 14 proposed transit stations, each requiring approximately nine feet of additional right of way.

This is the only corridor in the study that does not currently have a MAX service. Existing Route 37 currently averages 1,941 daily riders throughout the proposed BRT corridor. Assuming a 50 percent increase in the number of riders due to the improved service, there would be nearly 3,000 average daily riders within the BRT corridor. This number could be higher considering this would be the first premium type service in the corridor.



Corridor Renderings

Cost Estimates

Cost estimates were developed based on the costs from similar, recently implemented BRT projects from across the country. The "low" estimate includes the typical or minimum level of BRT deployment while the "high" estimate includes all the elements from the enhanced BRT deployment. The cost per mile for the low end estimate ranges from $4.6 to $7.6 million per mile while the high end estimate ranges from $12.5 to $15.7 million per mile. Also included is the existing operation and maintenance cost for the MAX service, which is depicted to highlight the potential savings by replacing the MAX service with BRT along applicable corridors.

	NW 27th Avenue		W Flagler Street		Kendall Drive		Douglas Road	
	Low	High	Low	High	Low	High	Low	High
Roadway	$ 4,303,000	$ 37,526,000	$ 4,646,000	$ 43,803,000	$ 3,517,000	$ 30,867,000	$ 1,654,000	$ 14,517,000
Stations	$ 6,897,000	$ 13,607,000	$ 6,534,000	$ 14,074,000	$ 5,808,000	$ 13,008,000	$ 2,541,000	$ 5,211,000
Facilities	$ 3,200,000	$ 3,200,000	$ 5,000,000	$ 5,000,000	$ 19,100,000	$ 19,100,000	$ -	$ -
Corridor Branding	$ -	$ 18,256,000	$ -	$ 21,027,000	$ -	$ 14,670,000	$ -	$ 7,172,000
Property Acquisition	$ 420,000	$ 420,000	$ 374,000	$ 374,000	$ 423,000	$ 423,000	$ 255,000	$ 255,000
ITS	$ 4,020,000	$ 6,720,000	$ 5,640,000	$ 10,040,000	$ 2,680,000	$ 4,280,000	$ 1,760,000	$ 3,260,000
Vehicles	$ 34,000,000	$ 34,000,000	$ 30,000,000	$ 30,000,000	$ 20,000,000	$ 20,000,000	$ 10,000,000	$ 10,000,000
Contingencies	$ 7,294,000	$ 19,472,000	$ 7,551,000	$ 21,976,000	$ 8,432,000	$ 18,597,000	$ 2,318,000	$ 7,159,000
Design Services	$ 4,605,000	$ 19,827,000	$ 5,455,000	$ 23,486,000	$ 7,776,000	$ 20,481,000	$ 1,489,000	$ 7,540,000
Total Capital Costs	**$ 64,739,000**	**$ 153,028,000**	**$ 59,745,000**	**$ 169,780,000**	**$ 59,960,000**	**$ 141,426,000**	**$ 18,528,000**	**$ 55,114,000**
Cost per Mile	**$ 5,780,268**	**$ 13,663,214**	**$ 4,631,395**	**$ 13,161,240**	**$ 6,662,222**	**$ 15,714,000**	**$ 4,210,909**	**$ 12,525,909**
Annual Revenue Hours	49,612	52,576	45,328	48,035	29,083	31,545	15,109	16,012
Cost per Revenue Hour	$ 133.26	$ 133.26	$ 133.26	$ 133.26	$ 133.26	$ 133.26	$ 133.26	$ 133.26
Existing MAX O&M Cost	*$ 1,142,000*	*$ 1,142,000*	*$ 2,074,000*	*$ 2,074,000*	*$ 952,000*	*$ 952,000*	-	-
Total Annual O&M Costs	**$ 6,611,322**	**$ 7,006,224**	**$ 6,040,344**	**$ 6,401,141**	**$ 3,875,587**	**$ 4,203,735**	**$ 2,013,448**	**$ 2,133,714**

Implementation Schedule

The implementation schedule for project development and construction for these corridors is likely to range from five to nine years, depending on funding, political support, and physical constraints. Critical elements for each corridor during this phase will include the preliminary design, a detailed traffic impact study, completing an environmental document complying with the NEPA process, a final design, and right of way acquisition. Because each corridor has its own unique characteristics, opportunities, and constraints, this time frame will vary. This process can be expedited by combining tasks such as right of way acquisition with design.