TECHNICAL REPORT

Tolled Managed Highways with Rapid/ Enhanced Bus Routes and Ridesharing Study

General Planning Consultant (GPC) Services
Work Order # GPC IV-26

Submitted by:

Gannett Fleming

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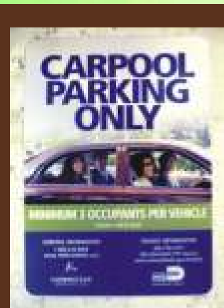
June, 2013



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Miami-Dade County, Florida

Prepared for:

MIAMI-DADE County Metropolitan Planning Organization

Prepared by:

Gannett Fleming, Inc.

June 2013

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TECHNICAL REPORT

1 Introduction

Miami-Dade County continues to face severe congestion on most of its highways during peak periods and even beyond. Coupled with constrained budget and limited public funding sources, in part because of the weak economy, the traditional response to increasing travel demand – capacity improvements on the roadways within the region – is less feasible.

The solution to growing travel demand has become increasingly sophisticated and localities around the country are turning to active traffic demand management (ATDM). Traffic management has generally taken the approach of facilitating movement with progressed signal timing, traffic-activated signals, and even ramp metering. The Florida Department of Transportation (FDOT) distributes traffic advisories through dynamic message signs (DMS) and *511* information services. They deploy *Road Rangers* and other emergency response to quickly clear disabled vehicles from the highways. Florida's Turnpike Enterprise (FTE) employs a "Quick Clearance" policy using a rotating stable of contract tow services to quickly remove disabled vehicles from the Turnpike. All of these actions respond to the traffic that has already made the decision to take to the highway network.

ATDM takes a proactive approach to managing and controlling traffic demand so as to balance travel demand with transportation system capacity. Active traffic demand management therefore, can be summed up in the following:

- Proactive management of transportation demand and roadway capacity;
- Integrating the concept of balancing transportation supply and demand; and
- Addressing traffic congestion before a breakdown occurs.

This study was conducted to examine the potential for an interconnected network of tolled managed highway facilities that would support enhanced bus service and promote ridesharing. The underlying hypothesis is that managed lanes would offer a means for bypassing congestion and could also support alternative modes of travel. Toll revenues could support transit operations as well as the cost of construction, operation, and maintenance of managed lane facilities, and therefore offer an even greater range of viable travel alternatives for a broad travel market.

2 Literature Search on ATDM

This section of the document summarizes the state-of-the-practice for ATDM approaches now being employed by cities and states across the country. It addresses ATDM from the perspective of major managed lane, toll roads, and express bus networks that both accommodate travel demand but as importantly, attempt to influence traveler decisions.

2.1 ATDM Defined

Active Traffic Management (acronym is ATM) is generally regarded as a pro-active approach for dynamically monitoring, managing, controlling, and influencing traffic demand and traffic flow as well as available capacity of transportation facilities, based on prevailing demand and traffic conditions, using one or a combination of real-time and predictive operational strategies. Through the use of available tools, infrastructure and communications devices, traffic flow is managed and travel behavior is influenced in real-time. When implemented together and alongside traditional traffic demand management strategies, these operational strategies help to maximize the effectiveness and efficiency of the transportation facility and overall transportation system while resulting in improved safety, trip reliability, and throughput. A truly Active Management philosophy dictates that the full range of available operational strategies be considered; including the various ways these strategies can be integrated among existing infrastructure for the various transportation modes, to actively manage the transportation system so as to achieve system performance goals. This includes traditional traffic management and ITS technologies as well as new technologies and non-traditional traffic management technologies used in other parts of the world.

2.2 Managed Lanes

2.2.1 Managed Lanes Defined

Managed lanes are a type of highway facility that makes use of a combination of strategies to regulate the flow of traffic to a volume that can efficiently move along a highway. These facilities make use of a toll that varies in response to traffic demand, limits or prohibits certain vehicle classes, while encouraging others through discounts and exemptions of other classes, and controls access through the use of only limited number of entrances and exits. Managed lanes in operation today are all "freeways-within-freeways," offering one or more managed lanes within an existing highway. Operations are continuously monitored and incidents are responded to with greater urgency than is normally found on other facilities.

2.2.2 Benefits of Managed Lanes

Managed lanes offer benefits over conventional lanes for both individual travelers and the areas through which they pass. Managed lanes maximize the effective use of a travel lane by limiting, through a variably-priced toll, the volume of traffic to levels that can efficiently travel at or near the posted speed limit. While higher volumes of traffic could make use of a lane, travel speeds would decline and congestion and the potential for crashes would increase. Consequently, managed lanes offer a more reliable trip since traffic volumes will travel at or near the speed limit at all times of the day. Most managed lane facilities were constructed in addition to existing general purpose lanes and therefore represent additional traffic-carrying capacity for a highway. And because managed lanes require users to pay a toll, they offer a new source of revenue for transportation improvements. They are frequently planned, designed, and implemented more rapidly than traditional highway facilities because of the revenue generated by the projects.

Managed lanes can promote a variety of transportation strategies for a region. For example, pricing policy can offer discounts for carpools, vanpools, and low-emission vehicles, and encourage travel in the shoulders of the peak periods rather than during the peaks.

2.2.3 Existing Applications of Managed Lanes

Managed lanes are in operation on twelve highways located in ten cities in eight states. Many locales in which managed lane projects are located are considering extensions of existing facilities or the implementation of additional facilities. At least four managed lane projects are under construction and by one count, nearly two dozen other projects are in some stage of development. ***Figure 1*** shows the locations of these projects.

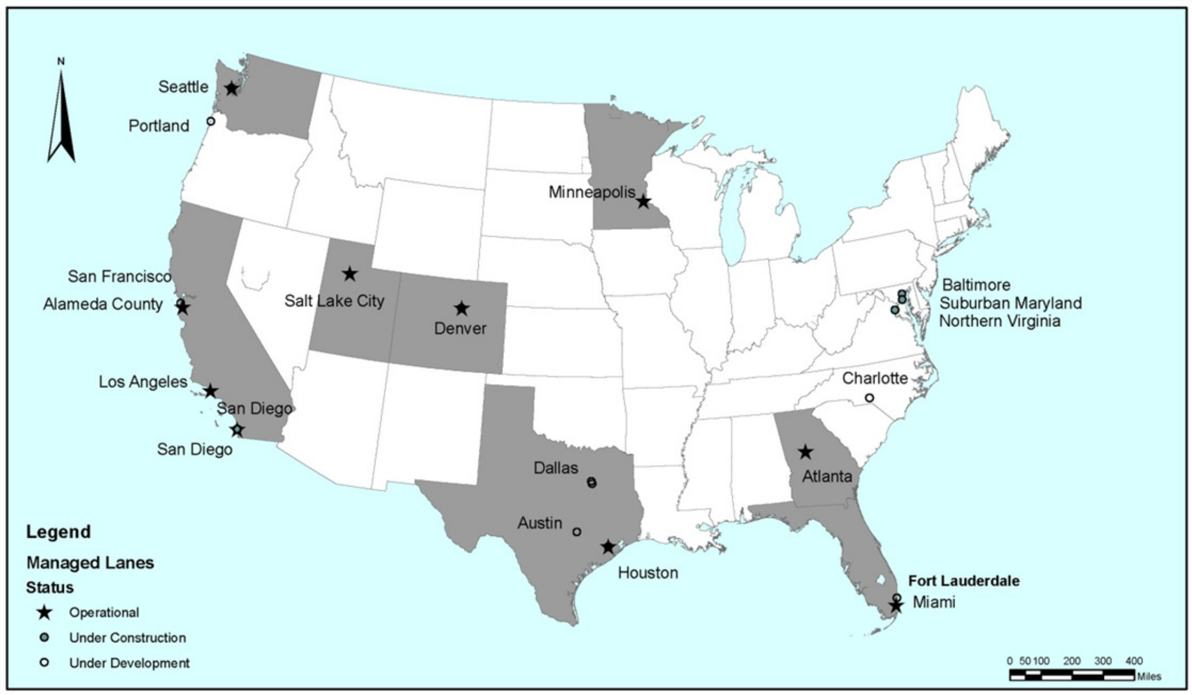

Figure 1 - Managed Lane Projects in the U.S.

The first managed lane was opened to traffic in 1995. SR-91 in Orange County, California has operated continuously since then and has been the model for subsequent managed lane projects. Since that time, additional managed lane projects have been constructed to allow toll-paying traffic to take advantage of less congested travel lanes; generally, through the conversion of existing HOV or bus lanes. All of the managed lanes in operation today apply a variably-priced toll.

Managed lanes have to date been configured as one or more variably-priced toll lanes within a limited access highway. No toll-within-toll facility, in which variably priced express lanes would operate within an existing toll road, has yet been constructed.

Generally, the toll changes in direct response to traffic demand though in some cases, a fixed schedule is employed that is based on historic traffic volumes, but not revised on a real-time basis. The toll schedule is typically altered in accordance with state policy and law. Toll rates are fixed with the range of a maximum and minimum rate, set in accordance with state law and policy and even fiscal policies.

Congestion pricing, in which the toll is adjusted in response to traffic (either in real-time or on a scheduled basis, the schedule based upon recent historical experience) has almost always been effective in managing traffic. While incidents do occur, the agencies applying a variably-priced toll have quickly learned to set the price so as to avoid reaching congested conditions from which recovery would often become a problem.

Existing managed lanes are configured to facilitate longer distance travel. While interstate entrances/exits are typically one to two miles apart access points to managed lanes are much less frequent. Several projects offer access only at the termini with no intermediate access.

2.2.4 Managed Lanes Costs and Revenues

Managed lanes are typically priced to manage traffic, limiting volumes only to those levels that can efficiently move through a corridor. Typically, toll revenues are insufficient to pay for the construction, operation, and maintenance of the managed lane facility. Generally, existing managed lane projects were not structured financially to do so and therefore a detailed financial analysis is not available. Available information on annual revenues and capital and operating & maintenance costs suggest that only a few managed lane projects are self-sustaining even when setting aside the initial capital investment for the construction. The off-peak or minimum tolls are nominal, intended to cover little more than the cost of toll collection and so as to maintain around-the-clock tolling; the minimum toll clearly is not intended to manage traffic nor to help generate revenues to finance the new infrastructure.

2.2.5 Transit and Managed Lanes

Transit has benefited from the implementation of managed lanes. The Houston managed lanes facilities were originally constructed as bus-only roadways with excess capacity "sold" to other vehicles. Most other managed lanes were constructed to serve general automobile traffic and also serve as a fixed guideway for express bus service. Tolling policies have been used to encourage transit use; Denver set a minimum toll of $3.25 during peak periods so as not to compete with the express bus fare. Other systems offer transit service at a very low price, between $2.00 and $5.50 making them very competitive with the toll and a real financial advantage when considering automobile operating costs.

Transit has benefited therefore, from managed lane tolling in the following ways:

- Transit buses share a fixed guideway with general toll-paying traffic but at no cost to the transit operator;
- Toll revenues are often used for capital facilities built adjacent to the managed lane facilities (e.g., Park-and-ride lots, new bus terminals and expanded boarding platforms, direct access ramps between park-and-ride lots, major destinations, and the managed lane facility, real-time passenger information systems, high quality transit vehicles (new buses), new bus routes including express services, traffic signal priority systems (TSP) for transit vehicles); and
- Toll revenues can be used to subsidize operating and maintenance costs for transit operations. I-15 in San Diego is the only current example of this while conversely SR-91 in Los Angeles specifically precludes such cross-subsidization. Several of the recent Urban Partnership Agreement (UPA) projects specifically dedicated funding to transit as shown in ***Table 1***.

Table 1 - Transit Features of Managed Lane Projects

Facility	Transit Features
Miami, Florida (*95 Express*)	• Three new bus routes, served by 12 buses • 500 additional parking spaces at the Golden Glades interchange park-and-ride lot • Transit signal priority along arterials
Minneapolis, MN (I-394)	• New bus service • Constructed or expanded 6 park-and-ride lots, • Permitted buses on contra-flow lanes, • Installed ITS technology including transit ITS features.
Minneapolis, MN (I-35W)	• In-line bus stations • Purchase of additional buses
Orange County, CA (SR-91)	• None
San Diego, CA (I-15)	• Park-and-ride lots with multiple express routes • Ridematch services • Nine direct access points to and from the general purpose lanes ramps for • Four direct access ramps from transit stations
Houston, TX (I-10) Houston, TX (US 290)	• Park-and-ride lots • Freeway ramp metering • Transit centers • Direct access ramps
Seattle, WA S(R-167)	• Park-and-ride lots
Denver, CO (I-25)	• Park-and-ride lots
Alameda County, CA (I-680)	• Transit centers • Transit-oriented development • Revenue-sharing with transit
Salt Lake City, UT (I-15)	• Park-and-ride lots
Atlanta, GA (I-85)	• Purchased 36 additional buses for five new routes, • Constructed three new park-and-ride lots and expanded one other.

2.2.6 Managed Lanes and Ridesharing

Managed lanes have also been used in conjunction with a variety of rideshare programs. In addition to capital projects like park-and-ride lots, and direct access ramps, various rideshare services have worked in conjunction with the managed lanes operations to promote ridesharing including vanpooling. ***Table 2*** summarizes the programs employed in association with existing managed lane facilities.

The Dulles Toll Road goes beyond rideshare tolling; the toll road flanks the airport access road, a free highway to Dulles International Airport. Motorists can take the toll road for free with an occupancy of two or more, pay the toll, or if traveling to the airport, travel free regardless of occupancy. Commuter Connections maintains a database of people looking to carpool or rideshare and the corridor contains six park-and-ride lots to help support ridesharing.

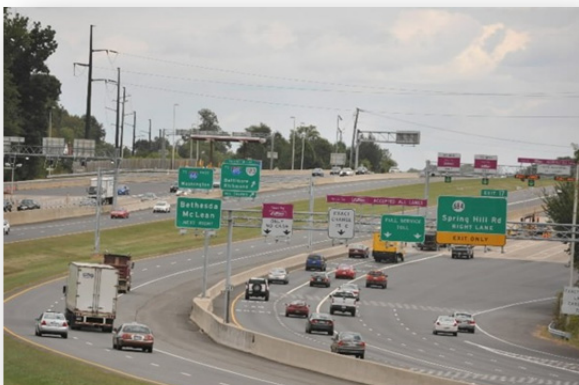

Table 2 - Managed Lane Park-and-ride and Rideshare Features

Managed Lane Facility	Number of Park-n-Ride Facilities	Rideshare Program
SR-91 Los Angeles	11 on system, none in corridor	OCTA Share the Ride Program: - vanpool program - park-n-ride lots - Southern California ridematching service (a partnership of five counties)
I-15 Express Lanes San Diego	21 in the I-15 corridor	SANDAG - Ridematcher Service - Park-n-ride lots - Guaranteed ride home
I-394 MnPass Minneapolis	4 in I-35W corridor 5 in I-394 corridor	- Guaranteed ride home - MetroTransit is rideshare agency - Ride match program - Vanpool matching program
I-35W MnPass Minneapolis	Construction of nearly 2,900 new parking spaces at six new or expanded park and ride facilities south of downtown Minneapolis.	MetroTransit rideshare agency - Guaranteed ride home - ride match program - Vanpool matching program - Partnerships with major employers to promote flex-time and telecommuting
I-25 Express Lanes Denver	4 park-and-ride lots in corridor	Commuter Choice Program - Front Range Vanpool Program/Denver Regional Council of Governments - Ride Arrangers - Ride match service - Ride match for getting children to school - Telework program
I-15 Express Lanes Salt Lake City	8 UDOT lots one other lot	None

Managed Lane Facility	Number of Park-n-Ride Facilities	Rideshare Program
I-10 (Katy) West & US 290 QuickRide Houston	7 in corridor (3 on I-10, 4 on US 290)	MetroStar - Vanpool - Ridematching - Emergency/guaranteed ride home
SR 167 Seattle	19 major park-and-ride lots	King County Metro Rideshare Operations - Ride match service - Commuter vanpool program - Van share program
I-680 Alameda County, CA	2 operated by CALTRANS	511 RideMatch service - carpool matching - Vanpools - Commuter rewards program (incentives for capooling - cash subsidies)
95 Express Miami	Golden Glades Broward Boulevard	South Florida Commuter Services - vanpool program (South Florida Vanpool Service) - ride matching - cash incentives - emergency ride home - telework program
I-85 Express Lanes, Atlanta, GA	Hamilton Mill and Cedar Road - 1,900 spaces I-985 and SR-20 lots will be expanded by 400 spaces	RideSmart - carpool matching and incentives - Vanpool matching and PVSI and other vendors - Guaranteed ride home - SchoolPool

2.3 Toll Facilities Defined

Toll roads have been in existence in the United States for more than two centuries. The basic principle employed is to charge the user the cost of the facility: toll facilities generally operate under autonomous authorities and are required to cover the cost of capital, operations, and maintenance from toll revenues. Although state departments of transportation operate many toll facilities, they continue to set toll rates consistent with costs.

2.3.1 Fixed Rate Tolls

Toll rates are generally based upon the distance traveled and the number of vehicle axles. Tolls may be collected on ramps or on the mainline but toll collection points are generally established to create a uniform toll rate for all users. Tolls are uniform by class of vehicle, typically the number of axles though occasionally the weight of the vehicle. While cash toll payments using manned toll collection booths is still common, nearly every fixed toll operation offers an electronic toll collection system using a transponder, similar to Florida's *SunPass*.

Most of the toll facilities serve large geographic areas. Portions of these systems close to urbanized areas may employ certain rideshare measures. The Maine Turnpike for example, operates several park-and-ride lots and also an express bus operation.

2.3.2 Transit on Fixed Rate Toll Facilities

Of the eleven toll facilities examined in this literature search only the Maine Turnpike actively supported transit operations. The Maine Turnpike Authority operates the Zoom Turnpike Express. The express bus service links Biddeford and Saco with downtown Portland, a distance of about 17 miles.

- Buses depart from the commuter park and ride lots in Biddeford and Saco and carry passengers to Portland each morning between 6:00 a.m. and 9:30 a.m. They make the return trip in the evening between 2:45 p.m. and 6:40 p.m. Buses operate in both directions during both peak periods.

Regular, one-way fares are $5.00 and 10-ride tickets cost $39. Monthly commuter passes are $100 and quarterly passes $260. Zoom riders may transfer to any connecting ShuttleBus, Metro, or South Portland Bus at no additional charge.

The partnership between a toll agency and a private bus operator cited above, is unique among the toll agencies and is the sole example of a toll agency promoting a transportation mode that generates no revenue for the agency.

2.3.3 Variably-Priced Toll Facilities

Toll roads that vary prices apply variations either based on the time-of-day in which the travel occurs or based upon the occupancy of the vehicles. The former approach tends to shift some traffic from the mostly heavily traveled time periods to earlier and later periods. The latter approach encourages ridesharing, reducing the total traffic on the road. Twenty-nine facilities, operated by 11 toll agencies were identified as using a variably-priced toll arrangement. ***Figure 2*** identifies the locations of the variably-priced facilities as well as the fixed priced facilities included in this study

Figure 2 - Fixed and Variably-Priced Toll Facilities

Variable pricing can be applied to all classes of vehicles or a select few. The Illinois Toll Road for example, offers a 67 to 78 percent discount over the daytime toll rate for trucks between the hours of 10 p.m. and 6 a.m. The Intercounty Connector in Maryland offers a reduction in the variably-priced toll of $0.25 to $0.35/mile in the peak with a $0.20 to $0.30/mile toll for two-axle vehicles in the off-peak. The overnight rate is further reduced to $0.10 to $0.30/mile. Leeway, in Lee County, Florida charges a toll for island-bound vehicles only; the toll is reduced by 25 percent in the off-peak hours. Similarly, the Pocahontas Parkway outside of Richmond, Virginia offers a discount to two-axle vehicles during the off-peak periods while multi-axle vehicles pay the same rate throughout the day.

The New Jersey Turnpike charges tolls based on eight different vehicle classes, from passenger vehicle through three-axle buses. Cash, EZ-Pass off-peak, and EZ-Pass weekend rates are offered for most classes. The Turnpike also offers discounts for low-emission vehicles. ***Table 3*** lists the 29 facilities operated by 11 different agencies operating variable rate toll facilities.

2.3.4 Time-of-Day Tolling

Time-of-day tolling generally employs a peak and off-peak toll. (Examples of this tolling are noted on **Table 3**, below). On the recently opened Intercounty Connector in Maryland, the toll is higher Monday through Friday, 6 to 9 a.m. and 4 to 7 p.m. than at other times. The SR 520 Bridge in Washington varies the toll throughout the day with a no toll from midnight to 5 a.m. and a maximum toll of $3.50 with a *Good To Go!* transponder between 7 and 9 a.m. Registered vanpools, transit, and emergency response vehicles travel toll-free. Carpools and motorcycles are not among the toll-free categories. Time-of-day toll facilities may also employ a ridesharing component; SR 520 exempts tolls for registered vanpools and transit. Buses pay the same toll at all times on the New Jersey Turnpike.

2.3.5 Rideshare Tolling

Tolling plans that promote ridesharing are less common. This approach offers multi-passenger vehicles a discount on the toll: the Bay Area Toll Authority offers a 50 percent discount to vehicles carrying three or more persons and a toll exemption for sanctioned vanpools carrying between ten and fifteen passengers, including the driver.

The Port Authority of New York and New Jersey (PANYNY) operates the six bridges and tunnels crossing the Hudson River connecting New York with New Jersey. The toll structure offers a $3.50 toll for those in the carpool plan (three or more persons per vehicle) versus the $7.50 off-peak period toll and $9.50 peak period toll. Participants must register as a carpool and must use the EZPass transponder to pay the toll.

Cars must pass through a staffed toll lane so that the toll collector can verify the presence of the requisite number of occupants in the vehicle.

Table 3 - Variable Rate Toll Agencies, Facilities, and Support for Transit and Ridesharing

Agency	Facility	Length (miles)	Rideshare Toll	Hybrid/ILEV	Commuter/Express Buses
Washington DOT	SR 520 Bridge	1.4	Free for registered vanpools	-	Free
New Jersey Turnpike Authority	New Jersey Turnpike	148	-	-	Discount
	Garden State Parkway	173			-
Toll Road Investors Partnership II, (TRIP II)	Dulles Greenway	14	-	-	-
Bay Area Toll Authority	Antioch Bridge	2	50% of SOV toll	-	X
	Benicia-Martinez Bridge	1			
	Carquinez Bridge	1			
	Dumbarton Bridge	2			
	Richmond-San Rafael Bridge	6			
	Oakland Bay Bridge	6			
	San Mateo-Hayward Bridge	2			
Port of Authority of New York and New Jersey	George Washington Bridge	1	36% of peak period toll	53% of off-peak toll	Free
	Lincoln Tunnel	2			
	Holland Tunnel	2			
	Bayonne Bridge	1			
	Goethals Bridge	1			
	Outerbridge Crossing	2			

2.4 Express Bus Networks

Many jurisdictions are operating bus services that carry passengers from distances of twenty or more miles from the central business district. These services typically collect passengers at a handful of park-and-ride lots and other collection points and then operate closed-door to a downtown or other activity center; routes are generally oriented in a radial manner from a central business district. Once at the destination end, they tend to make several stops. The trip is reversed in the evening peak period.

While some operate just a few routes (Maine Turnpike has only one route) others, like the New York Metropolitan Transportation Authority operate nearly 100 separate lines. Fares are typically quite low. One-way fares as low as $1.50 and as high as $5.50 buy a trip that amounts to approximately $0.75 to $0.28 per mile. Multi-ride discounts make the trip very inexpensive and very competitive with driving alone in an automobile.

2.4.1 Facilities Supporting Express Bus Service

This study examined express bus operations in twelve urbanized areas. These facilities offer a good cross section of the services operating across the United States and represent large and mid-sized cities, transit agency and state DOT operators, and extensive networks approaching 100 routes down to single route operations.

Express buses tend to serve radial trips to the central business district but in several instances, cover outlying areas before continuing downtown. Buses operate on all types of roadways including free and tolled roads and interstates, limited access roadways, and arterials. ***Table 4*** summarizes certain characteristics for these representative express bus systems.

2.4.2 Existing Express Bus Service on Managed Lanes

Express bus service is available on 11 out of 12 managed lane facilities across the country. The number of routes varies from a low of one or two to a high of ten in Salt Lake City.

While only limited data are available, the pattern of performance is reasonably consistent across the various systems. Buses typically operate at speeds in the mid-twenties; several in the forties.

Most service is between suburban communities and the downtown or central business district. In Salt Lake City, several connect surrounding suburbs with industrial districts.

Ridership, while not readily available, is typically in the range of several hundred to approximately 2,500 for a single route. The Total ridership for ten routes in Houston, Texas is nearly 13,000 per day.

2.4.3 Revenue-Sharing between Toll Agencies and Transit

Tolls can offer an additional source of revenue for transit service, which is not self-supporting. The I-680 project in Alameda County, CA dedicates 18 percent of toll revenues to the transit system for the region. In New York, the Metropolitan Transportation Authority dedicates more than 60 percent of the annual toll revenues to the City's transit service. These arrangements stand out among the various toll and transit systems across the country as being unique.

Table 4 - Primary Characteristics of Representative Express Bus Networks

Location	Operator	Route Configuration	Primary Roadways
Atlanta, GA	MARTA	Entirely radial	HOV lanes, toll roads, arterials, limit access roads
Dallas, TX	DART	Entirely radial	Interstates, toll roads, limited access roads, arterials
Denver, CO	RTD	Primarily radial	Interstates, US primary routes, managed lanes, arterials
Hartford, CT	Connecticut DOT	Entirely radial	Interstates, US primary routes, arterials
Los Angeles, CA	LA DOT	Primarily radial	Interstate, US primary, arterials
Portland, ME	Maine Turnpike Authority & Shuttlebus	Point-to-point to downtown Portland	Toll road
New York City, NY	Metropolitan Transportation Authority	CBD-oriented network	All
Palm Beach County, FL	Palm Tran	Point-to-point to downtown West Palm Beach	Interstate
Riverside, CA	Riverside Transit	Network	Interstate
Sacramento, CA	Placer	Radial	Interstate
Tampa, FL	HART	Network	Interstate, arterial
Santa Clara County, CA	VTA	Primarily radial	Interstate, primary, arterial

2.5 Literature Search Summary

2.5.1 Existing Network

95 Express, the first managed lane facility in Miami-Dade County, has proven successful in creating a congestion-free route. It has encouraged ridesharing, created a congestion-free fixed guideway for express bus service, and caused some shift in travel patterns to less congested time periods. Plans with the region's transportation agencies contemplate the implementation of more managed lane facilities with express bus service, which would create additional opportunities for ATDM applications.

In tandem with *95 Express*, the region is already interlaced with toll facilities: FTE operates the Homestead Extension to Florida's Turnpike, Miami-Dade Expressway operates five toll roads, Miami-Dade County operates two toll causeways, and the Village of Bay Harbor Islands operates a third.

South Florida Commuter Services (SFCS) actively markets alternative travel modes (i.e. carpooling, vanpooling, transit, and bicycling) and the region operates several park-and-ride lots including the Golden Glades lot at the confluence of the Turnpike, Palmetto Expressway, and I-95.

Using the information gathered from other parts of the country, the Miami-Dade Metropolitan Planning Organization can advance ATDM and improve travel in the county for its residents, workers, and visitors.

2.5.2 Applications to Miami-Dade County

Based on review of the latest trends in transportation networks the following are worth noting:

- All lane time-of-day tolling is being applied on congested toll roadways to manage travel demand and generate revenues for funding multimodal infrastructure.
- Rideshare and premium transit services are being financed in entirety or in part by toll revenues on both fixed and variable toll facilities.

3 Data Gathering and Analysis

Information on the existing and planned transit system as well as the existing and planned highway and tollway system was obtained and analyzed for Miami-Dade County. A series of maps were prepared to summarize all collected data. The maps served as the basis for developing the Tolled Managed Highway Network Plan.

4 Tolled Managed Highway Network Plan

This study considered two distinct scenarios for developing a countywide managed highway network combined with a premium transit grid network:

Scenario A – Emerging Express Lane Network: Representing a regional network of segregated median express lanes on existing expressway facilities.

Scenario B - Express Roadway/Lane Hybrid Network: Based on a network of all-lane tolling with contiguous HOV lanes on most toll facilities and two Biscayne Bay crossings (MacArthur Causeway and Julia Tuttle Causeway) combined with segregated median express lanes on non-tolled expressway facilities.

4.1 Scenario A

4.2 Scenario A Highway Network

The proposed highway network for Scenario A was developed based primarily on ongoing projects and plans for managed (express) lanes on the existing Miami-Dade County expressway network. The facilities selected are those most likely to have managed lanes in the near future as well as those with the greatest potential to support express bus service. (See ***Figure 3***). The facilities selected in the network include the following:

- Existing I-95 Express Lanes
- Three existing non-tolled expressways (I-95, I-75, and SR-826)
- Four existing MDX tollways (SR-878, SR-874, SR 836, and SR-112)
- One existing Florida Turnpike Enterprise Tollway (HEFT/SR-821)

- Existing Julia Tuttle Causeway/I-195

Expressway facilities not included in Scenario A include the following:

- Existing SR-836 Extension
- Existing SR-924
- Existing Turnpike/SR-91 Spur
- Planned New MDX Tollways (SR-924 extensions, SR-836 extension, US 1 Express, Connect 4)

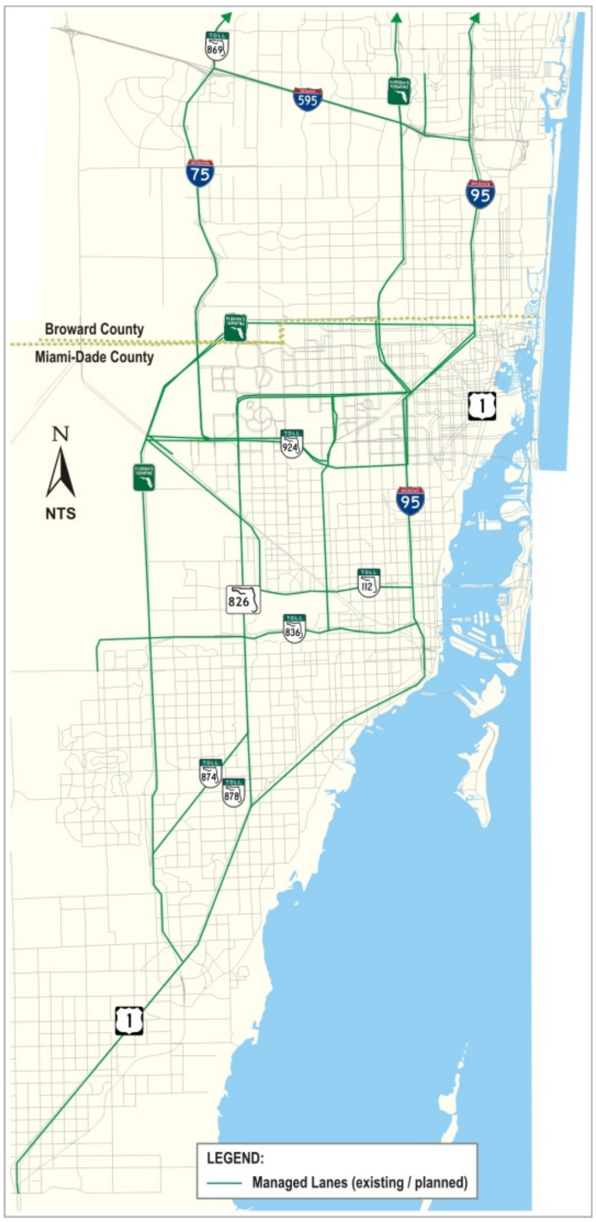

Figure 3 - Existing and Planned Managed Lane Facilities in Miami-Dade County

The managed lane facility type for Scenario A includes median express lanes on all facilities resulting in a toll-within-a-toll section for all toll roadways. A majority of the facilities would have four managed lanes (two in each direction), with certain facilities or portions of facilities consisting of two managed lanes (one lane per direction). ***Figure 4*** shows the typical cross section for this type of facility.

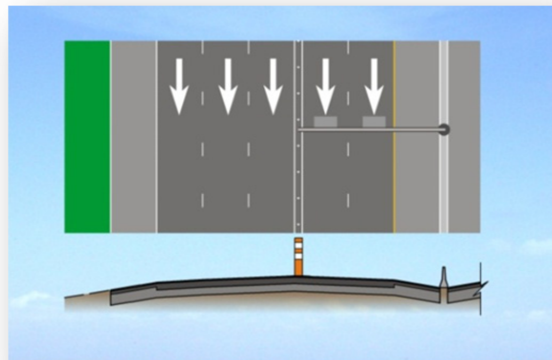

Figure 4 – Scenario A Typical Managed Lane Configuration

Access to/from the managed lanes to/from the general use lanes was established based on planned access locations and logical connection points between facilities. The direct access ramp locations (between facilities and to/from park-and-ride/terminals) were established based on existing ramp facilities and planned ramp facilities.

Figure 5 illustrates the proposed express lane network for Scenario A.

4.2.1 Scenario A Toll Rates

The proposed general traffic toll rates for Scenario A were developed based primarily on the most recent peak season average toll rates along I-95 Express. For all expressways the rates were adjusted to reflect the length of the tolled segment. For the tolled expressways the variable tolls were added to the existing fixed base toll.

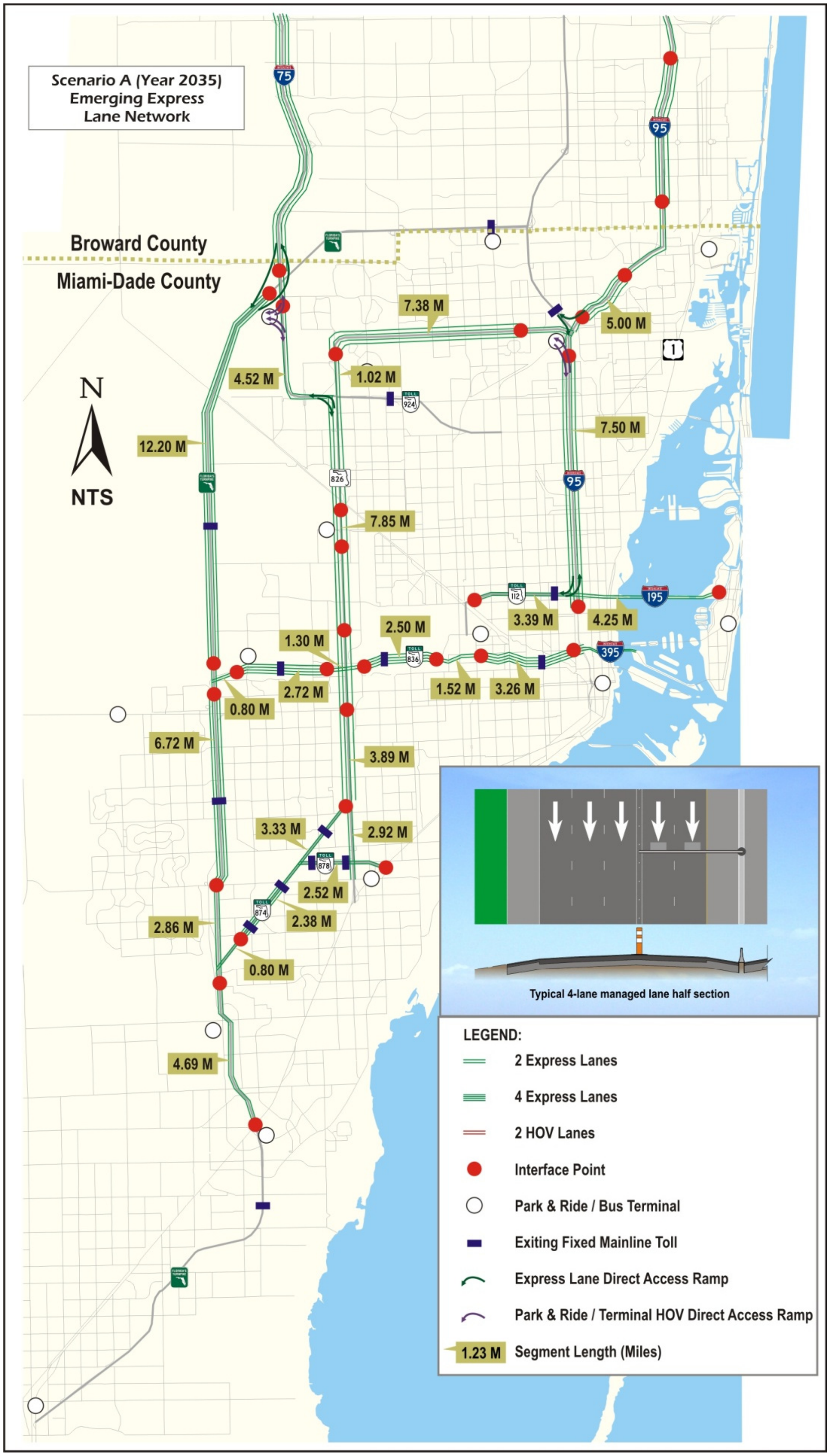

Figure 5 - Scenario A Express Lane Network

Figure 6 illustrates the proposed peak and off-peak period toll rates developed for Scenario A.

Based on limitations of the SERPM model all non-transit high occupancy vehicles (HOVs) would pay a full toll the same as single occupant vehicles on all facilities. Only transit buses would travel toll-free. If this concept were to be implemented it is recommended that HOV vehicles be considered for a discounted toll as a means of providing a financial incentive to rideshare.

4.2.2 Scenario A Express Bus Network

The proposed express bus network for Scenario A was developed based on providing high-speed one-seat ride connections between fifteen existing or planned transit hubs. The fifteen express bus hubs include the following locations:

1. Proposed NW 215th Street/NW 27th Avenue Park-and-Ride and Bus Terminal
2. Existing Aventura Mall Bus Terminal
3. Proposed I-75/Miami Gardens Drive Park-and-Ride Facility
4. Future Miami Lakes Bus Terminal
5. Existing Golden Glades Interchange Intermodal Terminal
6. Existing MetroRail Palmetto Station Intermodal Terminal
7. Proposed SW 147th Avenue/SW 8th Street Park-and-Ride and Bus Terminal
8. Proposed NW 12th Street/NW 107th Avenue Park-and-Ride Facility
9. Existing Miami Intermodal Center (MIC) at Miami International Airport (MIA)
10. Proposed Downtown Miami Intermodal Center at Government Center
11. Future South Miami Beach Intermodal Terminal at City Hall
12. Existing Metrorail Dadeland North Station Intermodal Terminal
13. Existing SW 152nd Street/SW 117th Avenue Park-and-Ride Facility
14. Future SW 200th Street/HEFT Park-and-Ride Facility
15. Proposed SW 344th Street/Busway Intermodal Terminal

From these 15 major hubs a series of 18 express bus routes were developed taking into consideration logical connection points and managed lane access point locations. ***Figure 7*** illustrates the proposed express bus routes and terminals for Scenario A.

For modeling purposes the express bus routes would operate only during peak periods (two three-hour periods) with 10 minute headways and a base full fare of $2.35.

4.3 Scenario B

The proposed highway network for Scenario B was developed based primarily on providing an alternative to the toll-within-a-toll configuration associated with tolled roadways that create several constraints/challenges.

- The infrastructure costs associated with adding segregated median lanes and direct access ramps can be quite significant.
- Segregated median lanes have few access locations intentionally by design so they are geared to a limited number of specific longer distance travel markets. The limited number of access points limits bus (and rideshare) access to/from the segregated lanes.
- Does not result in excess toll revenues that could be applied in a meaningful way to transit or ridesharing.
- Results in a limited amount of mode shift to ridesharing or transit.
- General use lanes that become congested over time and thus have reduced vehicle throughput.

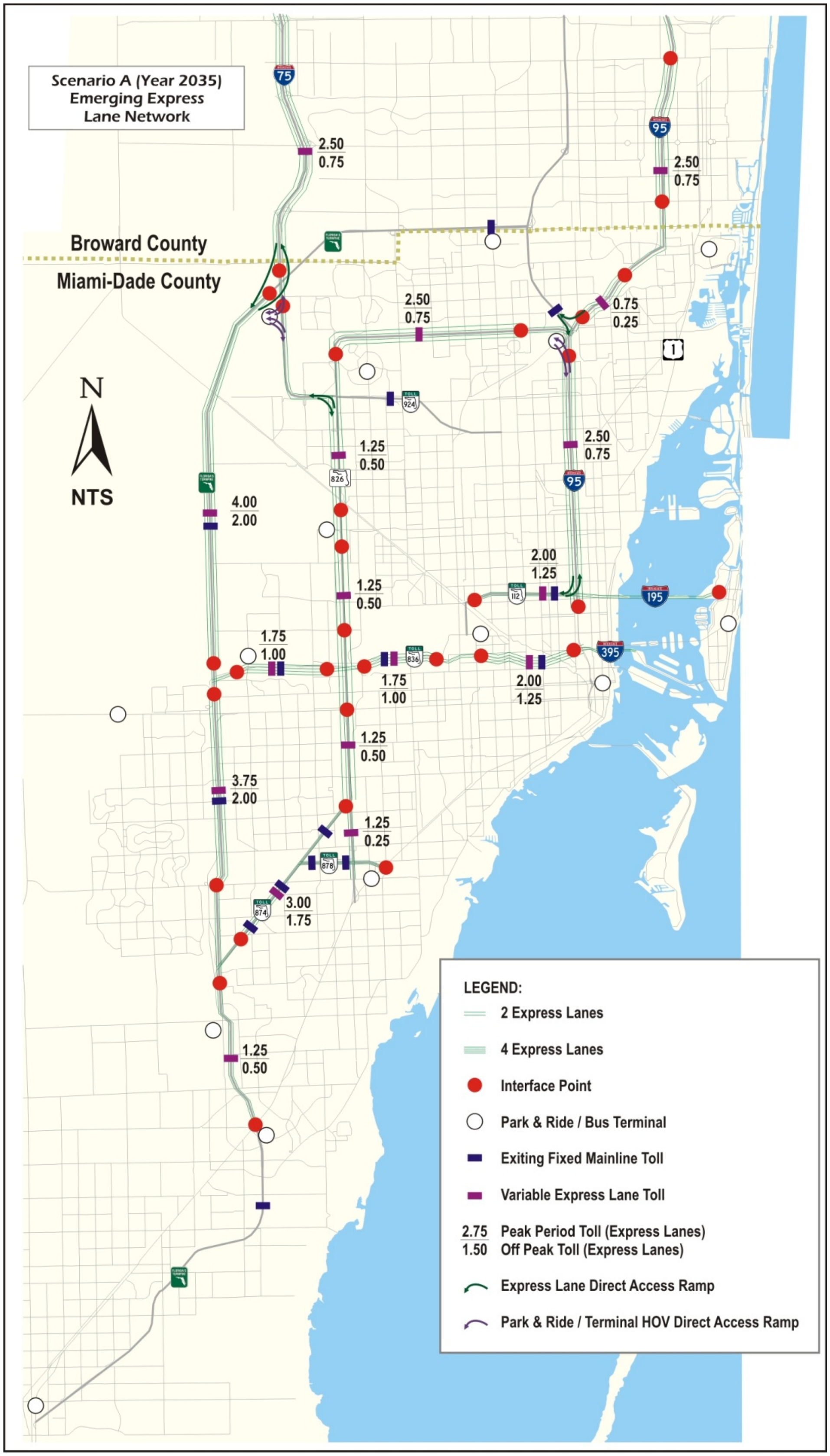

Figure 6 - Scenario A - Proposed Peak and Off-Peak Period Toll Rates

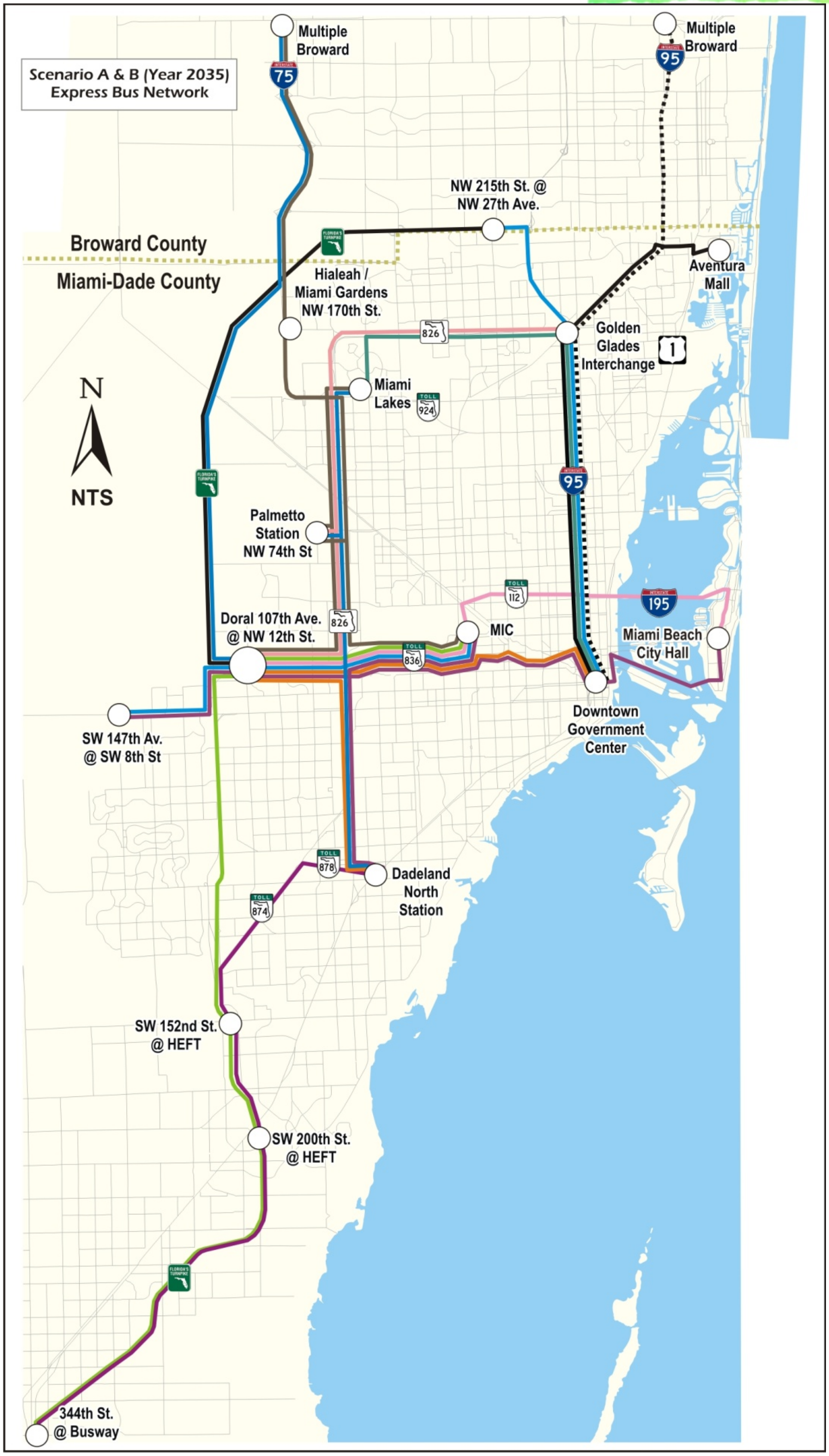

Figure 7 - Highway Express Bus System

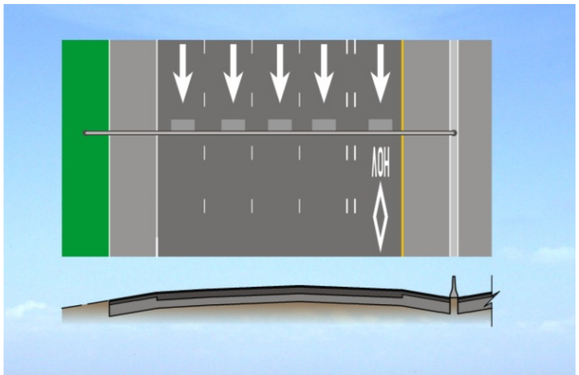

Figure 8 - Scenario B Typical HOV Lane Configuration

Therefore Scenario B proposes that the toll-within-a-toll configuration on toll roadways be replaced with inside buffer-separated expressway HOV lanes with all lane time-of-day tolling. ***Figure 8*** shows the typical cross section for this type of facility. For purposes of this study the tolls in the peak periods were assumed to be approximately double the current base toll and off peak tolls were assumed to remain as under current conditions. Buffer-separated expressway lanes, with time-of-day tolling, compare favorably against the barrier-separated configuration of Scenario A;

- they would require less transportation infrastructure with lower costs to implement,
- allow more markets to be served, allow more flexibility in express bus routing, produce greater amounts of toll revenue to be applied to transit and ridesharing,
- increase vehicle throughput and for a greater mix of vehicles, and
- produce greater amounts of mode shift.

4.3.1 Scenario B Highway Network

The proposed highway network for Scenario B was developed simply by maintaining the same network as Scenario A for the non-tolled expressways and replacing the median express lanes with buffer separated HOV lanes on existing toll expressways. Additional toll facilities with new time-of-day tolling were also included in this network and include the following:

- Existing SR-836 Extension
- Existing SR-924
- Existing I-395/MacArthur Causeway
- Existing I-195/Julia Tuttle Causeway
- The majority of the currently non-tolled facilities would have four managed lanes (two in each direction) while all tolled facilities would have two HOV lanes (one lane per direction).

Access between the managed lanes and the general use lanes, and between managed lanes and the direct access ramp locations (between facilities and to/from park-and-ride/terminals) for the managed lanes, are the same as Scenario A. Access to/from the buffer separated HOV lanes to/from the general use lanes for all eligible vehicles is essentially continuous.

Figure 9 illustrates the proposed express lane and HOV network for Scenario B.

4.3.2 Scenario B Toll Rates

The proposed general traffic toll rates for Scenario B are the same as Scenario A for all non-toll expressways. On all managed lane facilities tolls would be collected during both peak and off-peak time periods. For the toll expressways the peak period toll rate was established to be approximately two times the base toll rate which is somewhat consistent with the rates applied to the Non-toll expressways (peak to off-peak tolls range from two to three times). Off-peak toll rates on toll expressways were maintained to current conditions. The tolls on the toll expressways for Scenario B were applied at all existing mainline toll facility locations instead of on a managed lane segment location as they were for Scenario A. For new toll facilities (such as I-195 and I-395) toll rates were established for both peak and off-peak time periods.

Figure 10 illustrates the proposed peak and off-peak period toll rates for Scenario B.

For high occupancy vehicles (HOVs) on non-tolled and tolled expressways the tolls would apply similar to Scenario A. That is HOVs would pay the full toll rate on all facilities at all times. Although this is not a desirable condition in practice, limitations in the model necessitated this approach.

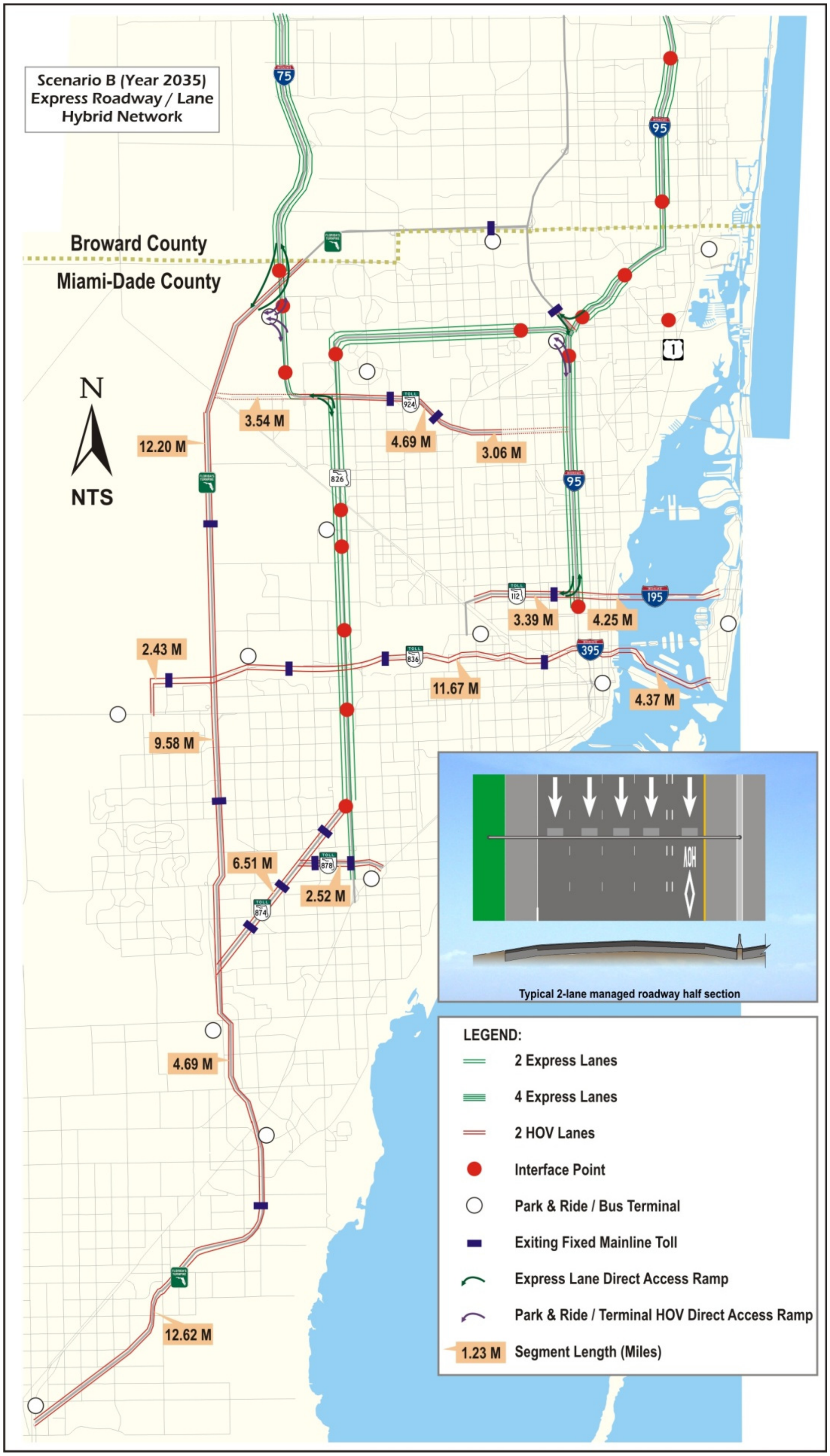

Figure 9 - Scenario B Express Lane Network

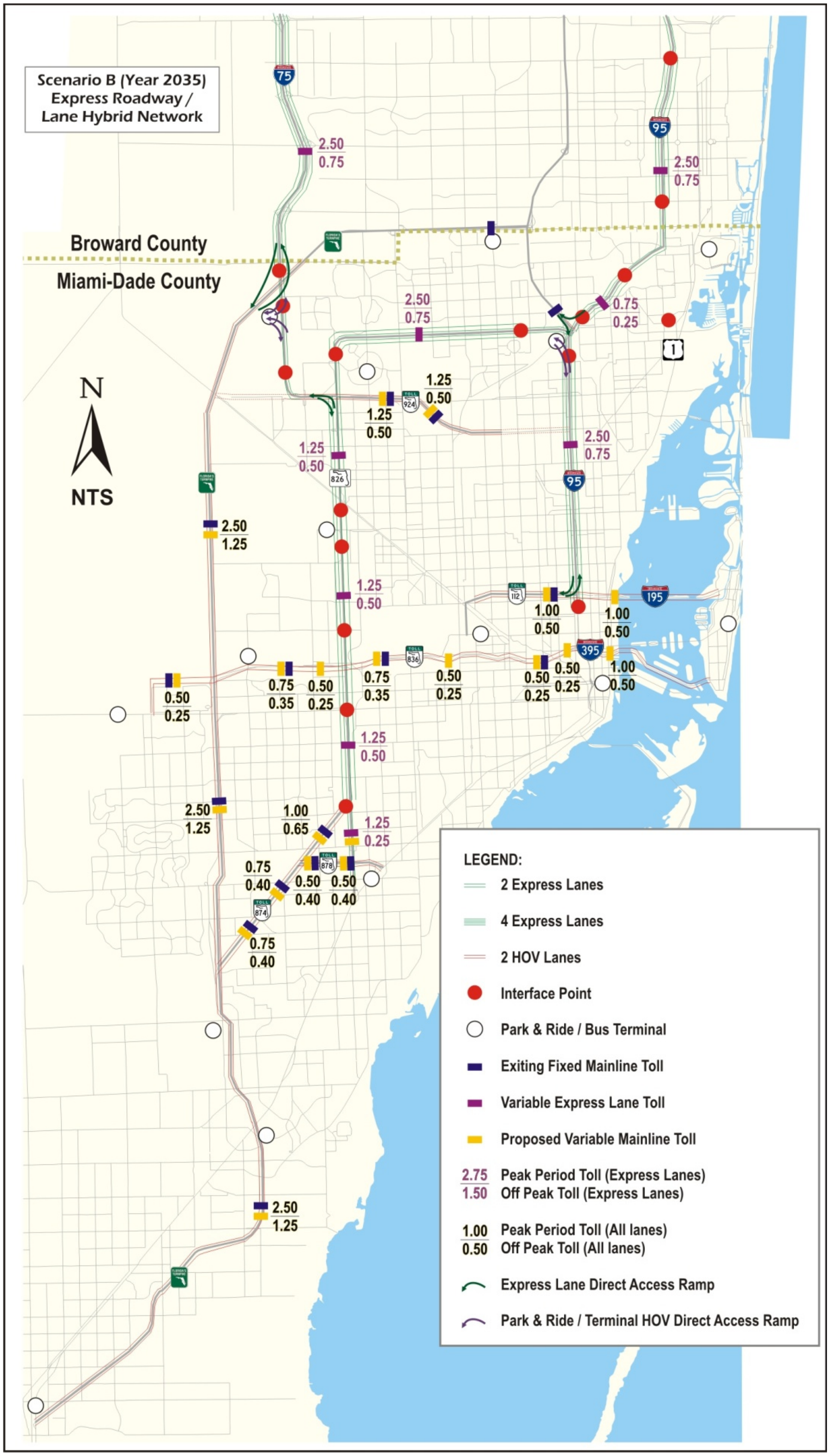

Figure 10 - Scenario B Proposed Peak and Off-Peak Period Toll Rates

4.3.3 Scenario B Express and Enhanced Bus Network

The proposed express bus network for Scenario B was kept the same as in Scenario A in order to simplify the comparison between the two scenarios. However Scenario B includes an additional network of adjacent arterial enhanced bus service (AEBS). The AEBS network was developed by selecting logical parallel and relatively continuous arterial roadways including those that currently have relatively high levels of transit ridership. The majority of the proposed AEBS routes would run parallel to the Scenario B highway network, however, AEBS routes were also developed for some planned expressway corridors as well as for SR A1A on the barrier islands. This was done to provide a more complete transit grid system, to include major transit routes and corridors, and to help determine the effectiveness of such a network.

A total of 26 AEBS routes along 12 corridors were developed for Scenario B taking into consideration the location of the express bus terminals and other logical connection points. Intermediate stops would be spaced at approximately half-mile spacing along all proposed AEBS routes. In certain corridors the AEBS service is currently in the early stages of implementation and in many cases the implementation involves the conversion of an existing limited-stop MDT MAX bus service. ***Figure 11*** illustrates the proposed AEBS network for Scenario B.

For modeling purposes the AEBS routes would operate during the entire day with 10 minute peak period headways, 20 minute off-peak headways, and a base full fare of $2.00 which is the current base standard bus fare. These proposed arterial rapid bus routes would include transit priority measures including transit signal priority, queue jumpers/bypass lanes, and curb extensions to improve travel times and reliability, along with enhanced transit stations and vehicles to improve customer comfort and convenience.

Figure 11 - Arterial Enhanced Bus System

5 Travel Demand Modeling

The Southeast Florida Regional Planning Model (SERPM) version 6.5.2 was utilized to quantify, evaluate and compare the current and projected future travel demand for the two managed lane and express/enhanced bus network Scenarios.

5.1 Model Development and Assumptions

In order to properly model the study scenarios a series of three model runs were performed. A series of enhancements/changes were made to the model, summarized below:

1) The SERPM version 6.5.2 utilizes speed curves for computing transit speeds. The speed curves represent factors that are applied to auto speeds to estimate transit speeds. During the initial model run it was observed that the transit speed for HEBS routes, that mostly operate on limited access facilities, was being underestimated. In order to overcome this issue, the transit speed on limited access facility was set equal to auto speeds. Making this change produced reasonable estimates for HEBS speeds. The model applies a 20% reduction to local bus travel to estimate travel times for AEBS routes. This default setting in the model was found to be appropriate to estimate AEBS speeds.
2) The LOS E capacity on managed lanes, used in highway assignment in SERPM 6.5.2 was set equal to 1650 vphpl.
3) The SERPM version 6.5.2 does not allow for different toll values to be modeled for the different time periods (AM, PM and Off-Peak). The scenarios tested as a part of this study had two different toll values for peak and off-peak periods. Two attributes were added to the highway network, one reflecting peak period toll and the other off-peak period toll. The model scripts for the highway network, trip distribution and highway assignment steps were modified to process the peak and off-peak toll values.
4) Scripts were developed to report volume (daily and by time period), volume to capacity ratio, and auto occupancy for managed lanes corridors.

5.1.1 Modeling Results

The modeling results were grouped into five different categories in order to assess overall performance and assess results of the various facilities within each scenario. The results were grouped into five categories:

- System wide performance,
- Managed/HOV lane performance,
- Auto occupancy,
- Transit network ridership and
- Net toll revenues.

5.1.2 System Wide Performance

System wide statistics were obtained for the two scenarios including VMT and VHT, Daily transit boardings, average trip lengths, and traffic volume on causeways. Following are some of the most noteworthy points related to the system wide measures for the two scenarios:

- Scenario A resulted in slight increases in VMT (1.9%) and VHT (2.8%) compared to the 2035 Cost Feasible Plan (CFP) while Scenario B resulted in a very slight increase in VMT (0.2%) and a slight decrease in VHT (0.6%) compared to the CFP.
- Scenario B resulted in almost 2% less VMT and 3% less VHT than scenario A.
- Scenario A resulted in an increase of 4.4% (21,000 daily boardings) total transit ridership compared to the CFP while scenario B resulted in an increase of 13.3% (63,000 daily boardings) total transit ridership compared to the CFP.
- Both scenarios in the peak travel periods resulted in increases in average trip lengths for home based work trips although scenario B had a smaller increase. For non work trips scenario A had a slight increase in average trip length while scenario B had a decrease in average trip length in the peak travel periods.
- Scenario B resulted in an overall decrease in causeway traffic (four Miami-Beach causeways: Kennedy, Julia Tuttle, Venetian, and MacArthur) by 10.6% while scenario A had a slight increase of 1.4 %.

- Scenario B diverted a significant amount of traffic (33% increase in daily traffic) to the Kennedy Causeway that would remain un-tolled.

5.1.3 Managed/HOV Lanes Performance

Managed and HOV lane statistics were obtained for the two scenarios including daily, peak period, and off-peak period traffic volumes and V/C ratios. Following are some of the most noteworthy points related to the managed and HOV lanes for the two scenarios:

- The AADT and off-peak period volumes were higher for scenario A for SR 874, SR 878, SR 836 and SR 112 as is somewhat expected compared to scenario B due to higher all lane tolls in the peak periods. For the HEFT scenario B AADT and off-peak volumes were higher likely as a result of the managed lane tolls assumed during the off-peak periods being slightly too high for the demand.
- Certain peak period V/C ratios particularly along the HEFT were low and this was likely attributed to peak period tolls being assumed to high for these segments. Most other V/C ratios were in a reasonable range.

5.1.4 Auto Occupancy

Auto occupancy values were obtained for the two scenarios for both the general use and preferential lanes. Following are some of the most noteworthy points related to auto occupancy:

- Both scenarios in general result in auto occupancy increases compared to the CFP.
- Scenario B auto occupancy was significantly higher along toll facilities where the HOV lanes (with continuous access and HOV-2 minimum requirement) were implemented instead of managed lanes (with limited access and an HOV-3 requirement).

5.1.5 Transit Network Ridership

Transit ridership values were obtained for the two scenarios for both the express bus service (HEBS) and arterial enhanced bus service (AEBS) routes. Following are some of the most noteworthy points related to transit ridership at the route level:

- Scenario A HEBS routes had a slightly higher overall ridership than scenario B EBS routes. This is likely attributed to the fact that scenario B would also have AEBS routes running parallel to the EBS routes and Scenario A would not.
- The HEBS routes that performed best under both scenarios were located along SR-826 east-west, the Turnpike and I-95, and SR-836.
- The AEBS routes that performed best under scenario B were located along NW 87th Avenue, A1A, Biscayne Boulevard, NW 7th Street and Flagler Street.
- Overall HEBS ridership for the 18 proposed routes (on 330 route miles) was not significant at approximately 10,000 to 12,000 riders per day in scenarios B and A respectively.
- Overall AEBS ridership for the 26 proposed routes (on 420 route miles) was acceptable at approximately 91,000 riders per day in scenario B.

5.1.6 Net Toll Revenues

Net toll revenues (toll revenues above current toll revenues) were calculated from the peak and off-peak volumes obtained at the various tolled highway segments for both scenarios. Following are some of the most noteworthy points related to the net toll revenues:

- Scenario A collects toll revenues in a limited number of managed lanes but net toll revenues are produced at all times. In Scenario B toll revenues are collected from all lanes but net toll revenues are produced only during peak periods.
- The peak period tolls in Scenario A are higher in the managed lanes than in the general use lanes in Scenario B.

It is most effective to collect tolls at all times in all lanes with a toll rate level that manages overall demand.

6 Facility Capital and Operating Costs

Capital and operating costs were developed for each of the two scenarios for both the highway and transit components.

6.1 Highway Network Costs

Highway facility costs were developed for capital as well as operations and maintenance.

6.1.1 Capital Costs

Highway facility capital costs were developed for each of the following five improvement types associated with scenarios A and B:

- Converting 2 lanes to a managed lanes
- Converting 2 lanes to HOV lanes
- Adding 2 new managed lanes
- Adding 2 new HOV lanes
- Converting 2 lanes and adding 2 managed lanes

Following are some of the most noteworthy points related to the highway capital costs:

- A four-lane managed lane facility typical of Scenario A costs approximately five times greater per mile than the two-lane HOV lane facility typical of Scenario B.
- Scenario B includes a larger highway network than Scenario A which results in increased capital costs.

6.1.2 Operations and Maintenance Costs

Highway facility operations and maintenance costs were developed for each of the improvement types. Following are the most noteworthy points related to highway capital costs:

- Scenario A typically costs approximately two times more per mile than Scenario B to operate and maintain.

6.2 Transit Network Capital and Operations and Maintenance Costs

Transit network capital costs were developed for both the EBS and AEBS networks. Following is the most noteworthy point related to transit costs:

- Scenario B is approximately two times more costly than Scenario A in terms of transit capital costs primarily due to the additional number of buses required for the AEBS routes.
- Scenario B is approximately six times more costly than Scenario A in terms of transit operations and maintenance costs primarily due to the implementation of AEBS routes.

6.3 Overall Costs versus Toll Revenues

Based on the comparison of total costs to total revenues from tolls the following results are worth noting:

- Scenario B results in revenues that cover all highway costs with excess revenue being available to cover certain levels of transit.
- The highest demand corridors when properly priced are most likely to cover all costs including a robust transit and rideshare system.
- The two causeways with new toll facilities will produce revenues to cover all costs including the portion of a robust transit system associated with those roadways.

6.4 Scenario B Anticipated Benefits

The following summarize the anticipated benefits associated with Scenario B:

- There would be reduced congestion in all lanes at all times for all users including trucks. There would also be reduced congestion on the supporting arterial network.
- There will be a reduced need to widen and add general use lane capacity over time since overall vehicle demand is reduced particularly during peak travel periods.
- The cost of building the infrastructure that includes buffer separated HOV lanes is relatively

low especially when compared to segregated managed lanes.
- Will result in more revenues being available for use in the affected corridor.
- Pre-established toll rates are more predictable and user friendly.
- Increased incentives for HOV travel over SOV travel.
- Buffer-separated HOV lanes can serve more travel markets for all users.
- Result in greater modal shift to rideshare and transit.
- Increased person (and vehicle) throughput, reduced trip lengths, increased transit usage, and reduced overall VMT and VHT in the transportation network.

6.5 Scenario B Challenges to Implementation

Should the Miami Dade MPO choose to proceed to the next phases with implementing scenario B in some form there are several challenges that will have to be overcome. It should be noted that several cities and toll agencies throughout the country have implemented components of Scenario B in whole or in part; all lane tolling, HOV lanes on Tollways, toll discounts for rideshare, no tolls for transit and toll revenues applied to rideshare and/or transit. The following challenges have been identified for implementing scenario B:

- Existing Toll facility bond indentures that strictly limit how existing toll revenues are utilized. New toll bonds could be written to allow some or all of these activities.
- Public objection to "everyone paying a higher toll in the peak periods." Although this is true, the alternative of paying a toll to sit in congestion without good alternatives is worse.
- Potential diversion of SOVs to parallel streets. Although this is likely, the alternative with congested lanes will also produce diversion that would likely be worse due to significantly reduced vehicle throughput on general use lanes.
- Complexities of managing a network and the potential to produce "winners and losers."
- Engendering a regional, multi-modal approach to transportation within the context of facility-specific and modal agencies.

7 Study Recommendations

Based on the results of this study the following are the more significant recommendations:

- The two toll agencies (Turnpike Enterprise and Miami-Dade Expressway Authority) should perform a more detailed system-wide comparative analysis of all-lane time-of-day tolling with HOV lanes versus managed lanes on all future projects.
- FDOT and Miami-Dade County should perform a more detailed analysis of all-lane time-of-day tolling with HOV lanes on the southern causeways to/from Miami Beach (Kennedy Causeway, Julia Tuttle Causeway/I-195, Venetian Causeway, and MacArthur Causeway).
- FDOT should perform a detailed analysis of all-lane time-of-day tolling with HOV lanes along SR 826/Palmetto Expressway.
- All future transportation planning (such as the LRTP) should include the consideration of all-lane time-of-day tolling projects.

Appendix A – Modeled Results

Scenario A -
Cost and Revenue (Year 2015)

Facility			Peak Period GP	Peak Period ML	Peak Period Total	Off-Peak Period GP	Off-Peak Period HOV	Off-Peak Period Total	Scenario A Current Toll	Scenario A Peak Toll Rate	Scenario A Net Peak Toll Rate	Senario A Off-Peak Toll Rate	Scenario A Net Off Peak Toll Rate	Scenario A Annual Revenue - 2015		Annualized Facility Costs (from Scenario A - Facility Costs Table) - Capital and O&M	Annual Transit Costs	Total Costs (Facilities and Transit)	Facility Cost Recovery Ratio	Facility Cost Recovery Ratio	Total Cost Recovery Ratio (Includes Transit)	Total Cost Recovery Ratio (Includes Transit)	Length (miles)
HEFT	SW 344th St	SW 200th St	40,800	0	40,800	93,100	0	93,100	1.25	-	-	-	-	0		-	15,850,920	15,850,920	n/a	6%	0	2%	12.62
	SW 200th St	SR 874	61,600	700	62,300	186,500	21,900	208,400	-	1.25	1.25	0.50	0.50	1,607,592		3,650,330	5,890,714	9,541,045	44%		17%		4.69
	SR 874	SW 88th St	26,500	5,700	32,200	90,300	14,600	104,900	-	-	-	-	-	0		1,170,620	1,905,012	3,075,632	0%		0%		2.86
	SW 88th St	SR 836	37,400	200	37,600	104,400	200	104,600	1.25	3.75	2.50	2.00	0.75	88,367		7,691,790	4,476,112	12,167,903	1%		1%		6.72
	SR 836	I-75	15,200	0	15,200	71,600	0	71,600	1.25	4.00	2.75	2.00	0.75	0		13,964,262	21,681,727	35,645,989	0%		0%		12.2
SR 874	HEFT	SR 826	43,600	10,000	53,600	122,000	42,800	164,800	1.45	3.00	1.55	1.75	0.30	3,852,783		2,664,593	3,840,429	6,505,023	145%	104%	59%	43%	6.51
SR 878	SR 874	US 1	17,600	10,300	27,900	26,500	13,900	40,400	0.80	-	-	-	-	0		1,031,456	1,486,618	2,518,073	0%		0%		2.52
SR 826	US 1	SR 874	19,000	3,200	22,200	51,700	34,800	86,500	-	1.25	1.25	0.25	0.25	1,726,547		2,031,183	5,561,553	7,592,736	85%	118%	23%	41%	2.92
	SR 874	SR 836	49,000	14,900	63,900	150,500	75,100	225,600	-	1.25	1.25	0.50	0.50	7,636,912		4,452,539	7,409,055	11,861,594	172%		64%		3.89
	SR 836	Okeechobee Rd	67,600	9,500	77,100	190,800	67,300	258,100	-	1.25	1.25	0.50	0.50	6,189,059		5,734,504	15,736,545	21,471,049	108%		29%		5.01
	Okeechobee Rd	SR 924	50,500	26,800	77,300	143,100	72,200	215,300	-	1.25	1.25	0.50	0.50	9,462,022		3,491,066	9,580,132	13,071,198	271%		72%		3.05
	SR 924	Golden Glades	38,000	2,300	40,300	65,600	41,100	106,700	-	2.50	2.50	0.75	0.75	4,972,320		9,729,199	9,466,861	19,196,060	51%		26%		8.5
SR 924	HEFT	I-75/ SR 826	5,500	0	5,500	3,900	0	3,900	0.50	-	-	-	-	0		2,755,260	-	2,755,260	0%	0%	0%	0%	3.54
	I-75/ SR 826	I-95	37,300	0	37,300	68,800	0	68,800	0.50	-	-	-	-	0		6,031,995	-	6,031,995	0%		0%		7.75
I-75	Broward/Miami-Dade County Line	HEFT	69,800	1,400	71,200	107,100	46,400	153,500	-	-	-	-	-	0		521,666	-	521,666	0%	0%	0%	0%	0.49
	HEFT	I-75/ SR 924	52,900	17,600	70,500	103,000	33,900	136,900	-	-	-	-	-	0		4,812,105	4,389,630	9,201,735	0%		0%		4.52
SR 836	NW 137th Ave	HEFT	16,600	0	16,600	27,900	0	27,900	0.25	-	-	-	-	0		-	9,959,177	9,959,177	n/a	107%	0%	17%	2.43
	HEFT	SR 826	35,300	6,400	41,700	89,300	23,000	112,300	0.60	1.75	1.15	1.00	0.40	2,251,309		4,429,647	23,067,295	27,496,942	51%		8%		3.87
	SR 826	NW 42nd Ave	39,000	10,000	49,000	121,900	48,100	170,000	0.60	1.75	1.15	1.00	0.40	4,179,060		3,141,410	19,791,465	22,932,875	133%		18%		3.66
	NW 42nd Ave	I-95	34,900	5,000	39,900	95,800	45,300	141,100	0.50	2.00	1.50	1.25	0.75	5,638,468		3,731,434	5,308,279	9,039,713	151%		62%		3.26
SR 112	Okeechobee Rd	I-95	35,500	3,500	39,000	58,400	27,500	85,900	0.50	2.00	1.50	1.25	0.75	3,517,670		1,387,553	2,750,711	4,138,265	254%	254%	85%	85%	3.39
I-95	I-195	Golden Glades	94,200	15,500	109,700	172,500	52,800	225,300	-	2.50	2.50	0.75	0.75	10,651,572		-	21,575,046	21,575,046	n/a	348%	49%	37%	7.5
	Golden Glades	Dade County Line	73,200	2,900	76,100	139,000	33,900	172,900	-	0.75	0.75	0.25	0.25	1,447,852		3,478,054	7,549,733	11,027,786	42%		13%		5
I-395	I-95	MacArthur Causeway	38,600	0	38,600	72,200	0	72,200	-	-	-	-	-	0		-	3,873,496	3,873,496	n/a	n./a	0%	0%	4.37
I-195	I-95	Alton Rd	43,600	3,900	47,500	79,300	31,400	110,700	-	-	-	-	-	0		-	3,448,532	3,448,532	n/a		0%		4.25
														63,221,530		85,900,668	204,599,041	290,499,709	74%		22%		

Scenario B -
Cost and Revenue (Year 2015)

Facility	From	To	Peak Period GP	Peak Period ML	Peak Period Total	Off-Peak Period GP	Off-Peak Period HOV	Off-Peak Period Total	Scenario B Peak Toll Rate	Scenario B Current Toll	Scenario B Net Peak Toll Rate	Scenario B Off-Peak Toll Rate	Scenario B Net Off Peak Toll Rate	Scenario B Annual Revenue - 2015	Annualized Facility Costs (from Scenario A - Facility Costs Table) - Capital and O&M	Annual Transit Costs	Total Costs (Facilities and Transit)	Facility Cost Recovery Ratio	Facility Cost Recovery Ratio	Total Cost Recovery Ratio (Includes Transit)	Total Cost Recovery Ratio (Includes Transit)	Length (miles)
HEFT	SW 344th St	SW 200th St	31,200	8,300	39,500	75,700	28,100	103,800	2.50	1.25	1.25	1.25	-	6,712,461	5,165,464	15,850,920	21,016,384	130%	63%	32%	15%	12.62
	SW 200th St	SR 874	49,300	8,100	57,400	179,600	36,700	216,300	-	-	-	-	-	0	1,859,757	9,724,535	11,584,293	0%		0%		4.69
	SR 874	SW 88th St	23,200	1,200	24,400	98,000	21,200	119,200	2.50	1.25	1.25	1.25	-	4,146,432	1,170,620	3,518,671	4,689,291	354%		88%		2.86
	SW 88th St	SR 836	25,100	1,700	26,800	90,200	34,800	125,000	-	-	-	-	-	0	2,750,548	8,267,646	11,018,194	0%		0%		6.72
	SR 836	I-75	9,700	1,900	11,600	59,200	28,600	87,800	2.50	1.25	1.25	1.25	-	1,971,254	9,495,528	28,565,165	38,060,694	21%		5%		12.2
SR 874	HEFT	SR 826	37,200	9,500	46,700	121,400	38,700	160,100	2.50	1.45	1.05	1.45	-	6,666,239	2,664,593	12,216,582	14,881,175	250%	157%	45%	35%	6.51
SR 878	SR 874	US 1	15,800	5,600	21,400	26,500	10,800	37,300	1.00	0.80	0.20	0.80	-	581,860	1,961,371	4,090,861	6,052,232	30%		10%		2.52
SR 826	US 1	SR 874	19,300	0	19,300	50,700	34,600	85,300	1.25	-	1.25	0.25	0.25	1,175,955	3,108,705	6,499,446	9,608,151	38%	124%	12%	30%	2.92
	SR 874	SR 836	44,000	15,600	59,600	149,600	75,300	224,900	1.25	-	1.25	0.50	0.50	7,769,462	4,452,539	11,318,850	15,771,389	174%		49%		3.89
	SR 836	Okeechobee Rd	62,300	11,900	74,200	188,600	63,800	252,400	1.25	-	1.25	0.50	0.50	6,358,995	5,734,504	20,984,952	26,719,457	111%		24%		5.01
	Okeechobee Rd	SR 924	46,500	36,400	82,900	139,700	74,300	214,000	1.25	-	1.25	0.50	0.50	11,236,151	3,491,066	12,775,270	16,266,336	322%		69%		3.05
	SR 924	Golden Glades	37,000	4,400	41,400	63,000	48,000	111,000	2.50	-	2.50	0.75	0.75	6,389,584	9,729,199	31,810,631	41,539,830	66%		15%		8.5
SR 924	HEFT	I-75/ SR 826	4,800	800	5,600	3,500	13,900	17,400	1.25	0.50	0.75	0.50	-	570,984	2,462,462	2,254,224	4,716,686	23%	36%	12%	28%	3.54
	I-75/ SR 826	I-95	17,900	4,400	22,300	34,700	28,700	63,400	1.25	0.50	0.75	0.50	-	2,273,740	5,390,983	-	5,390,983	42%		42%		7.75
I-75	Broward/Miami-Dade County Line	HEFT	70,000	600	70,600	116,800	41,100	157,900	-	-	-	-	-	0	521,666	-	521,666	0%	0%	0%	0%	0.49
	HEFT	I-75/ SR 924	48,200	21,000	69,200	97,700	39,600	137,300	-	-	-	-	-	0	4,812,105	5,814,087	10,626,192	0%		0%		4.52
SR 836	NW 137th Ave	HEFT	13,300	5,000	18,300	2,300	31,100	33,400	0.50	0.25	0.25	0.25	-	621,965	1,891,322	11,565,173	13,456,496	33%	139%	5%	11%	2.43
	HEFT	SR 826	26,400	7,200	33,600	75,200	33,000	108,200	1.25	0.60	0.65	0.60	-	2,969,117	1,584,021	28,585,934	30,169,955	187%		10%		3.87
	SR 826	NW 42nd Ave	23,900	11,700	35,600	119,600	41,500	161,100	1.25	0.60	0.65	0.60	-	3,145,850	1,498,066	28,564,395	30,062,462	210%		10%		3.66
	NW 42nd Ave	I-95	18,500	11,800	30,300	82,200	39,000	121,200	1.00	0.50	0.50	0.50	-	2,059,621	1,334,343	8,695,950	10,030,293	154%		21%		3.26
SR 112	Okeechobee Rd	I-95	18,500	12,300	30,800	44,800	27,700	72,500	1.00	0.50	0.50	0.50	-	2,093,608	1,387,553	5,928,493	7,316,046	151%	151%	29%	29%	3.39
I-95	I-195	Golden Glades	89,800	14,300	104,100	171,400	50,400	221,800	2.50	-	2.50	0.75	0.75	9,999,018	-	32,091,128	32,091,128	n/a	568%	31%	24%	7.5
	Golden Glades	Dade County Line	74,500	3,900	78,400	141,100	36,000	177,100	0.75	-	0.75	0.25	0.25	1,621,187	2,046,539	13,436,285	15,482,823	79%		10%		5
I-395	I-95	MacArthur Causeway	16,700	11,500	28,200	33,500	34,900	68,400	1.00	-	1.00	0.50	0.50	8,483,192	1,788,675	10,744,813	12,533,488	474%	545%	68%	95%	4.37
I-195	I-95	Alton Rd	21,800	12,000	33,800	54,100	36,300	90,400	1.00	-	1.00	0.50	0.50	10,739,938	1,739,558	5,857,971	7,597,529	617%		141%		4.25
														97,586,614	78,041,190	319,161,984	397,203,174	125%		25%		

Daily VMT and VHT

Attribute	2035 Cost Affordable	Scenario A	Scenario A Difference 2035	Scenario A % Difference 2035	Scenario B	Scenario B Difference 2035	Scenario B % Difference 2035	Scenario A to B Difference	Scenario A to B % Difference
Daily VMT	63,794,250	65,034,600	1,240,350	1.94%	63,925,250	131,000	0.21%	1,109,350	1.71%
Daily VHT	2,434,850	2,502,600	67,750	2.78%	2,419,450	-15,400	-0.63%	83,150	3.32%

Daily Transit Boardings

Transit Type	2035 Cost Affordable	Scenario A	Scenario A Difference 2035	Scenario A % Difference 2035	Scenario B	Scenario B Difference 2035	Scenario B % Difference 2035	Scenario A to B Difference	Scenario A to B % Difference
Metorrail	111,000	133,400	22,400	20.18%	133,600	22,600	20.36%	-200	-0.15%
Metromover	25,400	28,800	3,400	13.39%	28,900	3,500	13.78%	-100	-0.35%
Metrobus	339,200	334,400	-4,800	-1.42%	376,100	36,900	10.88%	-41,700	-12.47%
Total	475,600	496,600	21,000	4.42%	538,600	63,000	13.25%	-42,000	-8.46%

Trip Length in Miles

Trip Purpose	2035 Cost Affordable		Scenario A		Scenario B	
	Peak	Off Peak	Peak	Off Peak	Peak	Off Peak
Home based work	8.42	12.3	8.86	12.47	8.51	12.48
Non work	4.65	8.29	4.69	8.45	4.57	8.43

Volume on Causeway Bridges

Name	ADT								
	No Build	Scenario A	Scenario A Difference No Build	Scenario A % Difference No Build	Scenario B	Scenario B Difference No Build	Scenario B % Difference No Build	Scenario A to B Difference	Scenario A to B % Difference
Mc Arthur Causeway (I-395)	117,200	110,500	-6,700	-5.72%	96,600	-20,600	-17.58%	13,900	12.58%
Venetian Causeway	20,100	18,600	-1,500	-7.46%	14,500	-5,600	-27.86%	4,100	22.04%
Julia Tuttle Causeway (I-195)	157,800	158,500	700	0.44%	124,200	-33,600	-21.29%	34,300	21.64%
Kennedy Causeway (NE 79th St)	64,200	76,700	12,500	19.47%	85,900	21,700	33.80%	-9,200	-11.99%
Total	359,300	364,300	5,000	1.39%	321,200	-38,100	-10.60%	43,100	11.83%

Vehicle Miles and Hours

Transit System	Scenario A		Scenario B	
	Miles	Hours	Miles	Hours
HEBS	15,810	850	15,830	860
AEBS	NA	NA	58,030	4,370
Total	15,810	850	73,860	5,230

Notes:

1) The vehicle miles and hours were computed based on assumption that the buses will operate with peak period headway for 6 hours and off-peak period headway for 10 hours during the day

Facility	From	To	Segment Length (Miles)	No Build AADT			Scenario A AADT			Scenario B AADT			Scenario A Change in AADT			Scenario B Change in AADT			Scenario A to B Change in AADT		
				GP	ML	Total	GP	ML	Total	GP	HOV	Total	GP	ML	Total	GP	HOV	Total	GP	HOV	Total
HEFT	SW 344th St	SW 200th St	12.62	107,100	NA	107,100	133,900	NA	133,900	106,900	36,300	143,200	26,800		26,800	-200		36,100	27,000		-9,300
	SW 200th St	SR 874	4.69	240,300	NA	240,300	248,100	22,500	270,600	228,900	44,700	273,600	7,800		30,300	-11,400		33,300	19,200		-3,000
	SR 874	SW 88th St	2.86	161,300	NA	161,300	116,700	20,300	137,000	121,100	22,400	143,500	-44,600		-24,300	-40,200		-17,800	-4,400		-6,500
	SW 88th St	SR 836	6.72	179,700	NA	179,700	141,900	400	142,300	115,300	36,600	151,900	-37,800		-37,400	-64,400		-27,800	26,600		-9,600
	SR 836	I-75	12.2	104,700	NA	104,700	86,800	0	86,800	68,900	30,500	99,400	-17,900		-17,900	-35,800		-5,300	17,900		-12,600
SR 874	HEFT	SR 826	6.51	184,400	NA	184,400	165,600	52,900	218,500	158,700	48,200	206,900	-18,800		34,100	-25,700		22,500	6,900		11,600
SR 878	SR 874	US 1	2.52	51,200	NA	51,200	44,100	24,200	68,300	42,300	16,400	58,700	-7,100		17,100	-8,900		7,500	1,800		9,600
SR 826	US 1	SR 874	2.92	87,000	NA	87,000	70,700	38,000	108,700	70,000	34,600	104,600	-16,300		21,700	-17,000		17,600	700		4,100
	SR 874	SR 836	3.89	260,900	NA	260,900	199,500	90,000	289,500	193,600	90,900	284,500	-61,400		28,600	-67,300		23,600	5,900		5,000
	SR 836	Okeechobee Rd	5.01	240,100	68,300	308,400	258,400	76,900	335,300	250,900	75,700	326,600	18,300	8,600	26,900	10,800	7,400	18,200	7,500	1,200	8,700
	Okeechobee Rd	SR 924	3.05	198,200	68,300	266,500	193,600	99,000	292,600	186,200	110,700	296,900	-4,600	30,700	26,100	-12,000	42,400	30,400	7,400	-11,700	-4,300
	SR 924	Golden Glades	8.5	150,000	NA	150,000	103,600	43,400	147,000	100,100	52,400	152,500	-46,400		-3,000	-49,900		2,500	3,500		-5,500
SR 924	HEFT	I-75/ SR 826	3.54	15,000	NA	15,000	9,300	NA	9,300	8,300	14,700	23,000	-5,700		-5,700	-6,700		8,000	1,000		-13,700
	I-75/ SR 826	I-95	7.75	108,900	NA	108,900	106,100	NA	106,100	52,600	33,100	85,700	-2,800		-2,800	-56,300		-23,200	53,500		20,400
I-75	Broward/Miami-Dade County Line	HEFT	0.49	205,900	NA	205,900	176,900	47,800	224,700	186,800	41,700	228,500	-29,000		18,800	-19,100		22,600	-9,900		-3,800
	HEFT	I-75/ SR 924	4.52	178,000	NA	178,000	155,900	51,500	207,400	145,800	60,700	206,500	-22,100		29,400	-32,200		28,500	10,100		900
SR 836	NW 137th Ave	HEFT	2.43	43,500	NA	43,500	44,500	NA	44,500	15,600	36,100	51,700	1,000		1,000	-27,900		8,200	28,900		-7,200
	HEFT	SR 826	3.87	172,900	NA	172,900	124,700	29,400	154,100	101,600	40,300	141,900	-48,200		-18,800	-71,300		-31,000	23,100		12,200
	SR 826	NW 42nd Ave	3.66	235,700	NA	235,700	160,900	58,100	219,000	143,500	53,300	196,800	-74,800		-16,700	-92,200		-38,900	17,400		22,200
	NW 42nd Ave	I-95	3.26	187,900	NA	187,900	130,700	50,200	180,900	100,700	50,700	151,400	-57,200		-7,000	-87,200		-36,500	30,000		29,500
SR 112	Okeechobee Rd	I-95	3.39	134,100	9,600	143,700	93,900	31,000	124,900	63,400	40,100	103,500	-40,200	21,400	-18,800	-70,700	30,500	-40,200	30,500	-9,100	21,400
I-95	I-195	Golden Glades	7.5	263,300	62,000	325,300	266,700	68,300	335,000	261,200	64,700	325,900	3,400	6,300	9,700	-2,100	2,700	600	5,500	3,600	9,100
	Golden Glades	Broward/Miami-Dade County Line	5	212,200	39,600	251,800	212,100	36,800	248,900	215,600	39,800	255,400	-100	-2,800	-2,900	3,400	200	3,600	-3,500	-3,000	-6,500
I-395	I-95	MacArthur Causeway	4.37	117,300	NA	117,300	110,800	NA	110,800	50,300	46,300	96,600	-6,500		-6,500	-67,000		-20,700	60,500		14,200
I-195	I-95	Alton Rd	4.25	127,700	NA	127,700	122,900	35,200	158,100	75,900	48,300	124,200	-4,800		30,400	-51,800		-3,500	47,000		33,900
Existing Toll Road Subtotal			76	1,926,700	9,600	1,936,300	1,607,200	289,000	1,896,200	1,327,800	503,400	1,831,200	-319,500	21,400	-40,100	-598,900	30,500	-105,100	279,400	-9,100	65,000
New Toll Road Subtotal			9	245,000		245,000	233,700	35,200	268,900	126,200	94,600	220,800	-11,300		23,900	-118,800		-24,200	107,500		48,100
Existing Non Toll Road Subtotal			41	1,795,600	238,200	2,033,800	1,637,400	551,700	2,189,100	1,610,200	571,200	2,181,400	-158,200	42,800	155,300	-185,400	52,700	147,600	27,200	-9,900	7,700
Total			126	3,967,300	111,200	4,215,100	3,478,300	35,200	4,354,200	3,064,200	1,169,200	4,233,400	-489,000	24,139,100	139,100	-903,100	-764,000	18,300	414,100		120,800

Table: HEBS ridership

Name	Ridership		Route Miles		Ridership Per Mile		Rank	
	Scenario A	Scenario B	Scenario A	Scenario B	Scenario A	Scenario B	Scen A Rank	Scen B Rank
HE01: I 75/SR 826/SR 836	1,200	920	25.4	25.4	47.3	36.2	8	7
HE02: HEFT North	140	90	21.3	21.3	6.6	4.2		
HE03: I 75/HEFT	120	70	20.5	20.5	5.8	3.4		
HE04: HEFT/Turnpike/I 95	1,200	1,630	16.5	16.5	72.7	98.7	2	2
HE05: Aventura/I 95	1,100	750	19.6	19.6	56.0	38.2	5	6
HE06: SR 826 N & EW	730	690	21.3	21.3	34.2	32.4	10	9
HE07: SR 826 N/I 95	1,650	1,850	18.1	18.1	91.3	102.4	1	1
HE08: SR 826 N	440	260	15.1	15.1	29.1	17.2		
HE09: SW 8 St/SR 836/MIC	880	490	13.7	13.7	64.1	35.7	3	8
HE10: SW 8 St/SR 836/CBD	1,440	1,100	25.1	25.1	57.4	43.8	4	5
HE11: SR 836/CBD	700	790	12.9	12.9	54.3	61.3	6	3
HE12: SR 836/MIC	420	360	8.1	8.1	51.9	44.5	7	4
HE13: SR 826 S/SR 836 W	100	60	10.8	10.8	9.2	5.5		
HE14: SR 826 S/SR 836/MIC	340	220	8.0	8.0	42.6	27.6	9	10
HE15: SR 826 S & N	170	90	19.2	19.4	8.9	4.6		
HE16: SR 112/I 195	580	390	19.8	19.8	29.3	19.7		
HE17: HEFT S/SR 836	80	170	28.8	28.8	2.8	5.9		
HE18: HEFT S/SR 874	560	90	25.0	25.1	22.4	3.6		
Total	11,850	10,020	329.4	329.7				

Notes:

1) The HEBS model ridership was adjusted using the factors calculated by comparing the 95 express expected riderhip to model output

Table: AEBS ridership

Name	Scenario B	Route Miles	Ridership Per Mile	Scen B Rank
AC1R1: A1A	10,560	25.2	418.3	2
AC2R1: NE 2 Ave	1,130	14.5	77.9	
AC2R2: Biscayne Blvd	5,540	14.2	389.3	3
AC2R3: SR-7/7 Ave	2,700	12.2	222.1	
AC3R3: 42/37 Ave	2,830	13.2	214.4	
AC3R5: 27 Ave	2,540	19.4	130.9	
AC4R1: 87 Ave	9,530	21.7	438.7	1
AC4R2: 72 Ave	5,500	18.3	300.5	6
AC4R3: FEC	2,360	10.6	222.4	10
AC5R1: 107/117 Ave	5,060	22.8	222.3	10
AC5R2: 137/107 Ave	4,660	32.1	145.1	
AC6R3: SW 152 St/Busway	1,930	10.4	185.2	
AC7R1: NW 203 St	1,960	14.9	131.3	
AC8R1: NW 186 St N	2,600	18.5	140.7	
AC8R2: NW 186 St S	3,760	16.9	222.4	
AC9R1: NW 135 St	1,610	14.0	115.3	
AC9R2: NW 119th St	2,700	15.1	179.1	
AC10R1: NW/NE 79 St	1,170	13.3	88.2	
AC10R2: NW 62nd St	1,830	16.5	111.0	
AC11R1: NW 36 St	4,060	15.5	261.6	7
AC12R1: NW 7 St	4,680	15.0	312.1	4
AC12R2: NW 8 St	990	16.0	61.9	
AC12R3: Flagler St	4,930	16.1	306.2	5
AC13R3: SW 104 St	2,990	12.1	248.1	8
AC13R4: SW 72 St/Sunset	1,410	12.2	115.3	
AC13R5: SW 88 St/Kendall	2,220	10.0	221.8	9
Total	91,250	420.6		

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