Reason

November 2007

Miami Toll Truckway: Preliminary Feasibility Study

By Robert W. Poole, Jr.

POLICY STUDY 365

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Executive Summary

The Port of Miami is a major contributor to the Miami-Dade economy. But the Port's continued growth is threatened by present and projected congestion on the area's roadways. Since the large majority of incoming cargo has local destinations (for which rail is uneconomical), trucks will continue to be the principal means of transporting containers to and from the Port. Hence, additional roadway capacity for goods-movement is essential.

Because the majority of Port-related truck traffic moves east-west, the focus of this study is on an east-west truck-only roadway or "truckway," built mostly along existing rail and roadway rights of way. Because the cost of such a truckway is in the billion-dollar range, and conventional funding sources of that magnitude are unlikely to be available, the study makes a preliminary feasibility assessment of financing the cost of the truckway via tolls.

Four alternate east-west routes were examined. Each poses its own challenges, but each appears to be feasible. Any of the four would provide a barrier-separated two-lane roadway permitting nonstop, high-speed access from the planned Port Tunnel to the Florida East Coast intermodal rail yard west of Miami International Airport, and beyond that to the warehouse and distribution center area northwest of the airport in Doral and Medley. The western end of the truckway would connect to the Homestead Extension of Florida's Turnpike. Each alternative uses a combination of elevated, tunnel, and surface routes. The estimated costs range from a low of $1.1 billion to a high of $1.3 billion, in 2007 dollars.

The traffic analysis used recent (2005) data on truck traffic on five major east-west routes, two of which are toll roads (SR 112 and SR 836). "Low" and "High" estimates were made of total trucks that might shift to the truckway in order to save time. Then separate value-of-time-savings analyses were done for Port-related (drayage) truck trips and other truck trips. Dray operators would be able

to make four round-trips per shift using the truckway, compared with only three under today's congested conditions. Since those operators are paid by the trip, it would be worth their while to pay a toll in order to generate more net revenue per day. A lower value of time savings (consistent with national studies) was used to estimate possible toll rates for non-dray trucking.

Truck traffic (dray and non-dray) and toll revenues were projected over a 40-year period. To assess the basic economic feasibility of the truckway, the net present value (NPV) of 40 years worth of toll revenues was compared with the NPV of truckway construction cost. That calculation showed that, under the assumptions made, toll revenues could support 54 to 58 percent of the project's cost. Toll rates and toll revenues could be higher if legal authority can be obtained to operate dual-trailer/dual-container rigs on the truckway, but quantifying that effect was beyond the scope of this preliminary study.

The toll truckway would be a good candidate for development as a long-term concession, as is being planned for the Port Tunnel and several other large Florida roadway projects. It would require a mix of public and private funds, and the study suggests several possible approaches to such mixed funding. Florida already has the necessary public-private partnership enabling legislation. The only other legal change that would be helpful would be federal and state permission to operate dual-trailer rigs on the truckway.

The toll truckway would produce significant benefits. It would enable the Port and the associated goods distribution industry to continue expanding, when that growth might otherwise be curtailed due to traffic congestion. It would increase roadway safety by shifting many east-west trucks from congested corridors onto their own separate right of way. It would reduce projected congestion on five principal east-west arteries, especially the Dolphin and Airport expressways. And by shifting many trucks out of stop-and-go congestion, it would reduce truck-related emissions. Therefore, the study recommends that further steps be taken to explore the feasibility of such a toll truckway in greater detail.

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Part 1

Introduction and Rationale

Goods movement is one of South Florida's major industries. The annual dollar volume of cargo making use of the Port of Miami, the Miami River, and Miami International Airport (MIA) exceeds $40 billion.[1] Nearly all the cargo moving to and from these three key sites goes by truck, with major east-west movements between the Port and the distribution centers and rail yard west of the airport. (There is little truck traffic between the Port and MIA itself.) Truck traffic contributes to Miami-Dade's severe traffic congestion, the sixth worst in the nation as measured by the area's travel-time index.[2]

Shifting a significant portion of these cargo movements to rail is unlikely. There is little room at the Port for the large land area that would be needed for an on-dock rail facility. Of the containers that come into the Port by ship, only 11 percent are transferred to the Florida East Coast (FEC) intermodal yard west of the airport. And a recent study of freight access at the port concluded that "the vast majority of cargo originates or terminates within 50 miles [of the Port], making rail uncompetitive with truck in both cost and service."[3]

The Florida Department of Transportation, Miami-Dade County, and the City of Miami are jointly funding a new Port Tunnel for improved highway access to the Port. When completed, this facility will provide a direct link for trucks between the Port and I-395, which will relieve congestion on the streets of downtown Miami. However, the increasing volume of trucks will continue adding to the congestion on I-95 heading north and on the major east-west routes between the Port and the distribution centers and rail yard west of MIA.

The purpose of this preliminary study is to explore the feasibility of a dedicated east-west truck-only facility, connecting the new Port Tunnel with the area west and northwest of MIA. At the outset, it is reasonable to expect this to be a costly proposition of the same order of magnitude as the Port Tunnel (a $1 billion project) due to limited right of way options and the high cost of land in built-up Miami-Dade County. As such, this new "truckway" is unlikely to be fundable from conventional highway sources (primarily fuel taxes). Therefore, this study examines the potential of toll financing.

Trucking companies generally oppose toll roads, but there are two reasons why such companies may find a toll truckway in Miami-Dade County worth considering. One is to save time by avoiding congestion on the area's roadways. Drayage operators who haul containers to and from the Port are paid by the trip; hence, if they can operate on an uncongested corridor nonstop between the Port and the distribution centers, they may be able to make more trips per day. Such drivers would be better off economically if the net result of paying tolls is higher net income.

The second factor is the possibility of hauling greater payload on each trip (for which the trucking company could charge more). Dual-container chassis rigs would permit a single tractor to pull two standard 40-foot containers instead of one. Such rigs are considered "long combination vehicles" (LCVs) and are not allowed on most highways in Florida (though they are permitted on the mainline of the Florida Turnpike). The rationale is that mixing dual-trailer rigs with autos and other vehicles in dense urban traffic increases the risk of accidents. But it may well be possible to obtain legal permission to operate such rigs on a separate right of way, such as the proposed truckway.

The financial feasibility of a similar truckway has already been explored in the Los Angeles metro area and provides a template for assessing a toll truckway in Florida. This proposed truckway is included in the long-range transportation plan of the Southern California Association of Governments, the metropolitan planning organization (MPO) for the greater Los Angeles metro area. In its ultimate form, it would consist of 142 centerline miles of grade-separated truckway, connecting the Ports of Long Beach and Los Angeles with the distribution centers of inland Riverside County and later the rail and truck trans-shipment areas of Barstow on I-15. SCAG's feasibility studies suggest that this $16.5 billion project could be self-supporting from toll revenues, if LCV configurations were allowed to operate.[4] Likewise, allowing LCV configurations on a toll truckway in Florida would help the trucking industry haul more cargo faster using less fuel (and thus less emissions), drawing more truckers to pay the toll and enhancing the truckway's ability to pay for itself largely or solely through toll revenues.

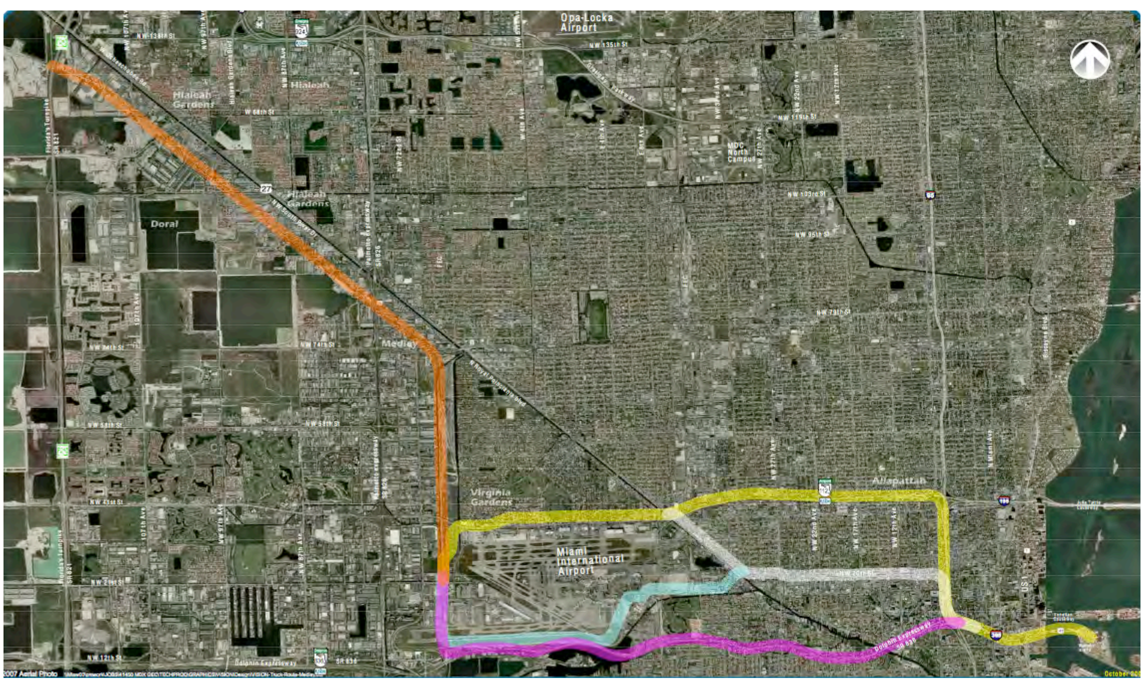
In subsequent sections of this report, we examine possible east-west routes for a Miami truckway, estimate the construction costs for each route, make preliminary estimates of truck traffic, explore the value gains that would justify toll-paying, compare revenues and costs over a 40-year period, and discuss other potential benefits of such a truckway. Finally, the report concludes with a set of recommendations.

Part 2

Route Alternatives

Four possible east-west routes were considered for the basic truckway, from the Port of Miami to the Florida East Coast (FEC) Hialeah Yard, west of the airport, as shown in Figure 1. Each would connect to a "Medley Extension" that would extend northward along the FEC yard to just south of the Miami River, then along FEC right of way northwest to the Homestead Extension of Florida's Turnpike (HEFT). The four alternatives for the basic truckway (Port to FEC) would make use of right of way along portions of I-395, I-95, SR 112 (Airport Expressway), the South Florida Rail Corridor (MIC to Downtown), and SR 836 (Dolphin Expressway), in various combinations.

Figure 1: Route Alternatives for East-West Truckway



Map courtesy of HNTB.

All four options would begin as an elevated truckway from the exit of the Port Tunnel along the I-395 right of way to I-95, about 2.2 miles. From there, Option I (Northern route) would add elevated truck lanes northward along I-95 and then westward along SR 112, crossing the Miami River at NW 36th Street. To traverse Miami International Airport (MIA), the truckway would be built as a tunnel beneath the northern part of the airport, parallel to NW 36th Street. At Ludlum Road, one branch would head south to NW 25th Street, on FEC land, while the other (also on FEC land) would be the previously described Medley Extension. Thus, except for the portions built at-grade on FEC land, the 10-plus miles of the basic Option I would all be built either elevated or in tunnels.

Options II (Mid-North route) and III (Mid-South route) would both make use of a section of the South Florida Rail Corridor (SFRC) right of way from downtown Miami to MIA. This single-track line (with 50-foot right of way) runs along North River Drive for about five miles and turns east at NW 23rd Street, extending to I-95 where it turns south to I-395. On portions of this line, the tracks are missing. The recent study of rail convertibility in Miami-Dade County found that this route is not critical to rail freight, has low potential for moving people (transit), and low priority for joint use.[5] Land use along this corridor is mostly industrial and medium-density residential; there are numerous grade crossings. We have assumed that the portion of the truckway along this right of way would be built as an elevated structure. The Option II route would continue northwesterly to NW 36th Street, where it would use the same tunnel configuration along the northern boundary of MIA as Option I. The Option III version would cross the Miami River at NW 33rd Avenue and continue as an elevated route along NW 21st Street to MIA. Once reaching the airport, it would be built as a tunnel following the right of way of Perimeter Road. At approximately Ludlum Road, the tunnel would turn north, under MIA's southern runway, to follow the FEC right of way to NW 25th Street.

Option IV would be built as an elevated structure above the SR 836 right of way from I-95 to LeJeune Road, then as a tunnel one-half mile to MIA, where it would continue as a tunnel, the same as for Option III.

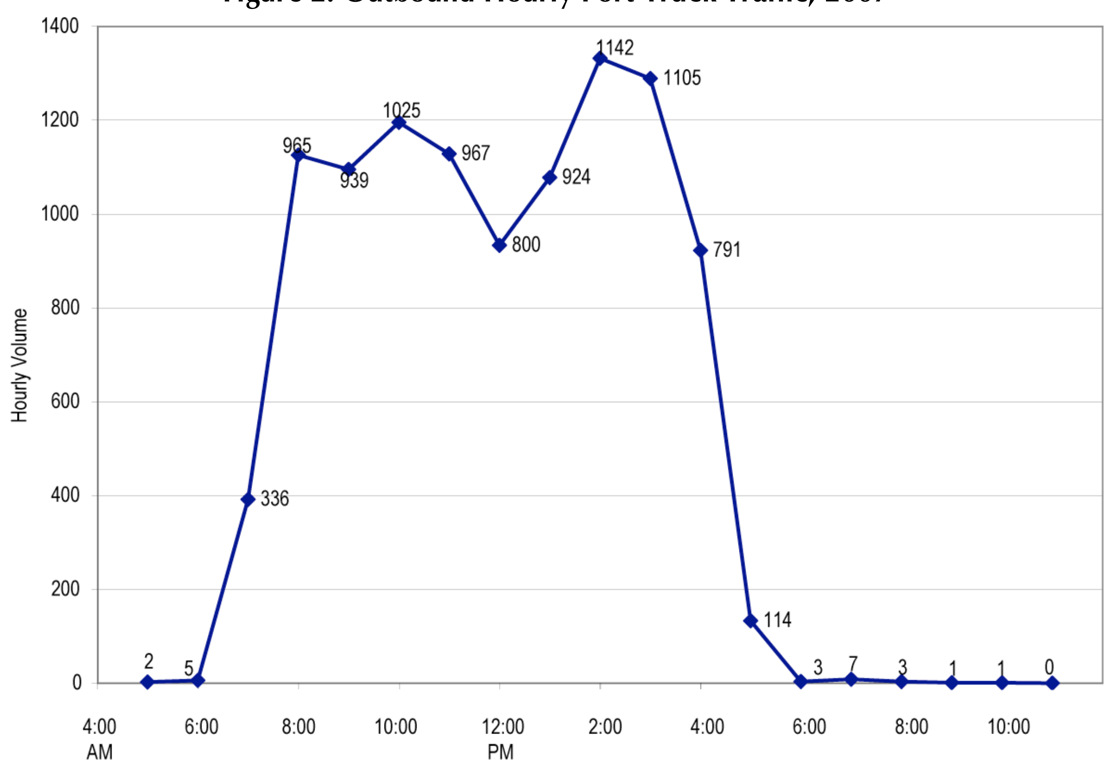
All four options would present challenges, despite relying mostly on existing expressway and/or railroad rights of way, plus tunneling to cross MIA. The SR 112 corridor is narrow, and a Metrorail line runs along its north side between NW 12th and NW 27th Avenues (and is planned to continue further west almost to LeJeune Road). With a median too narrow to support piers for the elevated roadway, the truckway would most likely have to run along the expressway's south side. Whether this could be done without property takes is not clear, but no such costs have been included in the cost analysis below.

There are no current plans for using the SFRC corridor between I-95 and the Miami Intermodal Center (MIC) for rail transit, and since most of the rail transit plans that do exist will take decades to get funded and built, this route might be easier to use than the Northern (SR 112) option. Given the large number of cross streets along this corridor between I-95 and NW 33rd Ave., it was initially conceived of as a trenched (below-grade) configuration. However, cost estimates from FDOT District 6 suggested that such construction would be more expensive than elevated. Another challenge for this corridor is the existence of a major power line.

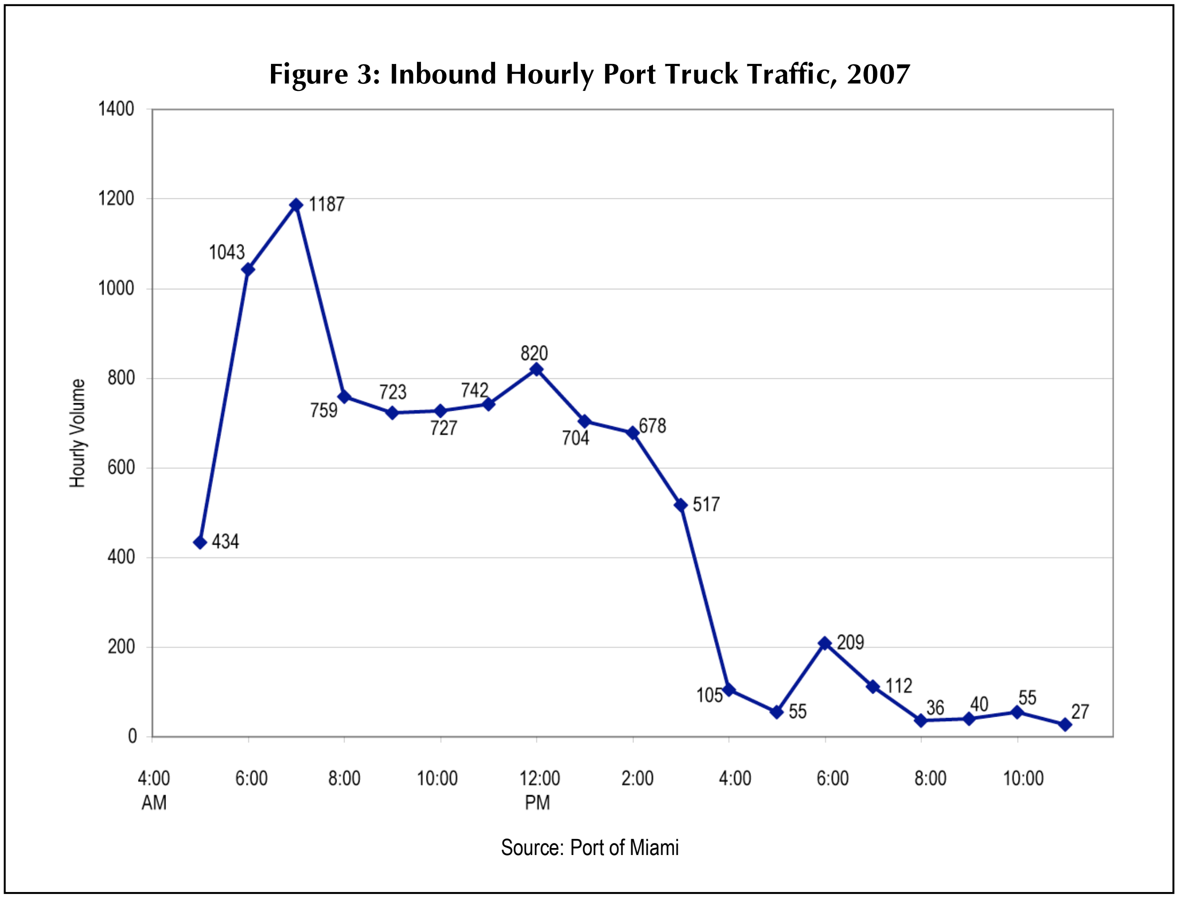
The Mid-South route (Option III) has its most challenging section between the Miami River and the eastern boundary of MIA. After crossing the river, this elevated roadway would have to thread its way past the new MIC and various industrial and commercial land uses, before dipping into a tunnel to cross the airport property. (A more expensive version, not costed here, would build this section, too, as a tunnel.)

The Southern (Option IV) route along SR 836 presents its own challenges. The Miami-Dade Expressway Authority (MDX) hopes to add express toll lanes to most or all of SR 836, some of which would have to be elevated due to land-use constraints. This suggests possible joint use of such lanes as express toll lanes for commuters peak-period/peak-direction, and as toll truck lanes during other times. However, analysis of truck movements to and from the Port by time of day shows that outbound/westbound is heavy from 8 AM to 4 PM, while inbound/eastbound truck traffic is heavy from 6 AM to 3 PM (see Figures 2 and 3). Thus, peak-direction truck traffic significantly overlaps peak-direction auto traffic, making such joint use infeasible. Since right of way constraints may preclude adding both express toll commuter lanes and toll truck lanes to SR 836, the Southern route looks problematic. But since MDX's express toll lanes planning is focused mostly on the section between LeJeune Road and the Homestead Extension of Florida's Turnpike (HEFT), it might be feasible to add toll truck lanes to SR 836 between LeJeune and I-95, with those lanes shifting to tunneled configuration from LeJeune westward. Thus, the western portion of SR 836 would host express toll lanes for cars while the eastern portion hosted toll truck lanes.

Figure 2: Outbound Hourly Port Truck Traffic, 2007



Source: Port of Miami



All four options assume that the east-west traverse of MIA is entirely in tunnels. That is primarily because Federal Aviation Administration regulations prevent MIA from making use of airport land area for non-airport purposes. MIA is bound by these regulations because it receives federal grants under the Airport Improvement Program. On the north side (Options I and II), using a tunnel would have the added advantages of imposing zero noise or visual impacts on adjacent Miami Springs and Virginia Gardens. On the south side, using a tunnel would make it easier to comply with FAA height restrictions, as well as avoiding interference with surface drainage in that area.

In terms of land acquisition, in all four options we have assumed that right of way (ROW) would be purchased from FEC, along its Hialeah rail yard and its corridor parallel to the Miami River between NW 74th Street and HEFT. All other ROW is owned by public agencies and is assumed to be available at no charge, except for the section of Option III between NW 33rd Ave. and MIA, which is also assumed to be purchased.

The Planned Southern California Toll Truckway

The Ports of Long Beach and Los Angeles handle over 40 percent of all containers entering the United States from Asia. Despite implementing a successful rail access project—the Alameda Corridor—the ports still rely on trucks in drayage operations to move the large majority of containers. Those containers must be transported to a huge area of warehouses and distribution centers about 55 miles inland. By 2000, that truck traffic was heavily impacting traffic on the north-south Long Beach Freeway (I-710) and on several east-west freeways, especially I-10 and SR 60. Projections done for the Ports showed large growth in that truck traffic (as well as in rail traffic) over the subsequent 25 years.

The MPO for the greater Los Angeles Region is the Southern California Association of Governments. In the late 1990s SCAG began studying the feasibility of adding truck-only toll lanes to selected freeways, in order to provide a separate route for trucks between the ports and the Inland Empire, a densely populated area about 50 miles east of the port. Later studies extended the concept to I-15, which heads northeast from the Inland Empire to a major rail division point at Barstow. An initial feasibility study of two truck-only lanes in each direction on SR 60 identified many benefits, but found that toll revenues could finance only 30 percent of the projected cost. In subsequent studies, for similar facilities on I-710 and I-15, SCAG considered the possibility of allowing LCVs to operate on the truck-only facilities.

The 2004 SCAG report includes the following findings:

- "By permitting up to double the payload and carrying capacity of presently authorized truck sizes and weights in California, the operation of LCVs along dedicated truck facilities offers the potential of fewer total trips and less regional vehicle miles traveled (VMT), a corresponding reduction in vehicle emissions, and more importantly for private equipment operators, greater capital utilization margins."
- "In an urban context, better equipment utilization factors would be realized, as well, through the greater operating speeds and system reliability possible along free-flowing truckways, resulting in utilization factors once again several multiples greater than those currently attainable."[6]

Based on these revised concepts, SCAG's further studies took a fresh look at potential toll rates and toll financing. The initial system, from the ports to the Inland Empire (along the right of way of I-710 and SR 60) would extend 58.8 miles, and with two lanes (mostly elevated) in each direction. It was estimated in 2004 to cost $6.5 billion. The subsequent extension along I-15 to Barstow would add another 86 miles and cost another $10 billion.

SCAG followed up with a preliminary financial assessment of the entire $16.5 billion regional toll truckway system. Assuming tolls that averaged 56 cents/mile and conventional public-agency toll financing (using 100 percent tax-exempt debt), the project was judged to be financially feasible. It was assumed that toll revenue bonds covered $12.1 billion and a TIFIA loan from the federal government covered the remainder of the capital costs. Other assumptions included a 5 percent interest rate, traffic growth of 2.6 percent per year, average trip length of 37 miles, and average annual daily truck trips (AADTT) of 143,500.

The toll truckway system was included in the Goods Movement section of SCAG's 2004 long-range transportation plan, *Destination 2030*. A bill authorizing pilot projects for goods movement using toll-funded public-private partnerships was passed by the California Legislature in 2006, but was seen by the private sector as unworkable. Caltrans and the governor's office are pursuing revised legislation in the 2007 session.

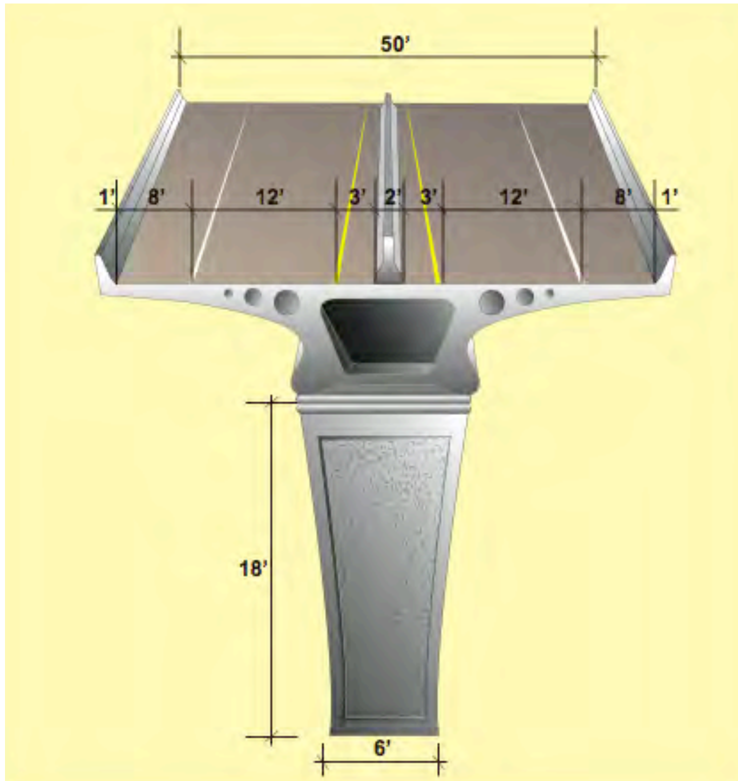
Part 3

Configuration and Cost Estimates

Since both tunneling and elevated roadways are very costly, and since demand for a toll truckway is uncertain, we have chosen to model a minimal facility for purposes of this analysis. There are good reasons why users would prefer two lanes in each direction for such a facility: that would permit easy passing of slower-moving vehicles, and it is easier to keep traffic moving if a vehicle breaks down in one of the two lanes. But a four-lane facility would cost nearly twice as much as a two-lane facility. A two-lane-with-passing/breakdown-capacity design would still provide much of the benefits of a four-lane facility, and could make the difference between one that gets created and one that does not due to excessive cost. And if traffic demand for the two-lane facility proves to be more robust than projected, in future years it would be worth considering the development of a parallel facility, with the initial truckway becoming one-way and the new one serving traffic in the opposite direction.

Figure 4 shows the proposed cross-section of a typical elevated section. As can be seen, each direction has a full 12-foot travel lane, a 3-foot inner shoulder, and an 8-foot outer breakdown lane. Including a central Jersey barrier and outside sound walls, the total width is 50 feet. A generic cost estimate for such elevated sections was obtained from Figg Bridge, a well-known designer of precast segmented bridge structures, such as the elevated express toll lanes that opened in 2006 on Tampa's Crosstown Expressway. Their generic cost estimate includes design, construction management, and a contingency, and is based on 2007 construction costs. For a 47-foot wide structure, that generic cost would be $35.9 million per mile. For a 59-foot width, it would be $45.1 million per mile. These costs do not include any major interchanges, since whether there would be intermediate interchanges is a decision that depends on more detailed traffic studies than were possible in this preliminary feasibility study.[7] For our 50-foot width elevated segments, to be conservative we used $45 million per mile.

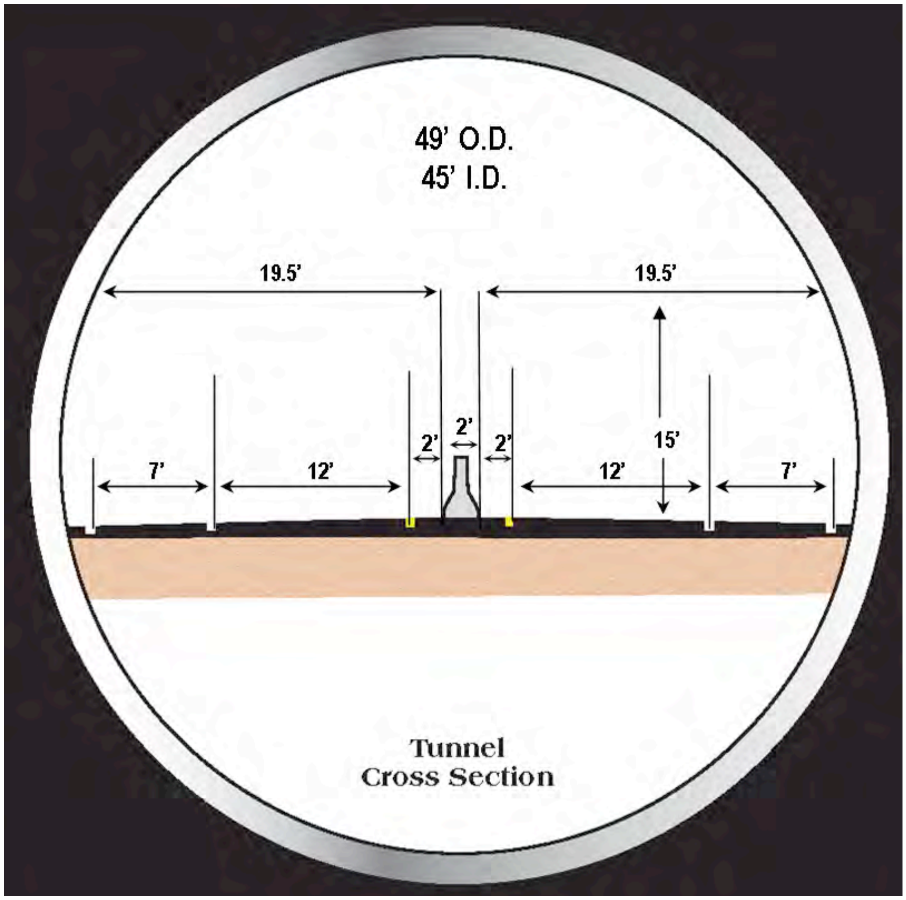
Figure 4: Typical Truckway Elevated Section



Drawing courtesy of TranSystems Corp.

Tunnel excavation costs are proportional to cross-sectional area; hence, the cost of a tunnel goes up as the square of its radius. For this reason, tunnels almost never have breakdown lanes. Figure 5 shows the proposed cross-section for the tunnel portions of the truckway. It provides for a 12-foot lane each way, with 19.5 feet of full-truck-height width each way, which should be just enough for one truck to pass a disabled truck that has pulled to one side[8]. The longest tunnel segment, in Option III, is just over three miles in length; in Options I and II, the only tunnel segment would be 2.6 miles long. Total outside diameter of the tunnels would be 49 feet, inside diameter 45 feet. This is within the capability of the current generation of tunnel boring machines (TBMs).

Figure 5: Typical Truckway Tunnel Cross-Section



Drawing courtesy of TranSystems Corp.

A generic estimate for tunnel costs was obtained from Odebrecht Construction, one of the bidders on the Miami Port Tunnel project. Given the water table problem in Miami, any tunnel segment would require extensive ground treatment ahead of the tunnel boring machine (cement and chemical grouting consolidation). For a single two-lane tunnel of 45-foot inside diameter, the cost would be $180-220 million per mile, including the launch pit for the tunnel boring machine (TBM), portals, the tunnel with precast segments, concrete invert, electrical and mechanical equipment, etc.[9] Our cost calculations used $200 million/mile; once again, these are 2007 costs.

Cut-and-cover tunneling is generally less costly than the use of a TBM, if there are no surface structures in the way. Depending on which of the four route options were selected, it might be possible to use cut-and-cover for portions of the tunnel, thereby somewhat lowering that portion of the construction cost. But to be conservative, we have assumed that all tunneling would take place via TBM.

For purchased ROW on the surface, we obtained data from FDOT District 6 on recent land acquisition costs.[10] The average cost per square foot in areas near the four possible corridors ranged from $75 (Mid-North) to $107.50 (Northern), but with a fairly wide range in each case. Translating this into cost per linear foot for a 50-foot ROW led to a range of from $19.8 million per mile to $28.4 million per mile. Since land values are highly location-specific, we used an average value of $23 million per mile for at-grade ROW.

Table 1 sums up the costs for Options I through IV, including the Medley Extension. For example, the Northern route (Option I) includes three elevated sections, along I-395, I-95, and SR 112; a tunnel under the airport; and at-grade (surface) construction at the FEC yard and along FEC right of way to the Turnpike (HEFT). The table shows the number of miles for each segment, who owns each portion of the right of way, the unit cost (per mile) of construction for each type, an estimate of right of way cost per mile for each segment, and the total of construction and right of way costs.

As the table reveals, the total project cost ranges from $1.10 billion (Option II, Mid-North) to $1.32 billion (Option III, Mid-South), in 2007 dollars. This is in the same ballpark as the Port of Miami Tunnel, which is a four-lane facility in comparison with the two-lane truckway proposed here.

Table 1: Cost of Truckway Alternatives

Route/Segment	Miles	ROW	Type of Construction	Unit cost ($M/mi.)	Cost ($M)	ROW ($M/mi.)	ROW cost ($M)	Total ($M)
Northern								
I-395 to I-95	2.175	FDOT	Elevated	45	97.9	0	0.0	
I-95 to SR 112	1.625	FDOT	Elevated	45	73.1	0	0.0	
SR 112 to MIA	3.7	MDX	Elevated	45	166.5	0	0.0	
MIA to Ludlum	2.625	MIA	Tunnel	200	525.0	0	0.0	
Ludlum to 25th St.	0.75	FEC	Surface	7	5.3	23	17.3	
Medley extension	8.5	FEC	Surface	7	59.5	23	195.5	
	19.375				927.3		212.8	1140.0
Mid-North								
I-395 to I-95	2.175	FDOT	Elevated	45	97.9	0	0.0	
SFRC to MIA	4.475	SFRC	Elevated	45	201.4	0	0.0	
MIA to Ludlum	2.625	MIA	Tunnel	200	525.0	0	0.0	
Ludlum to 25th St.	0.75	FEC	Surface	7	5.3	23	17.3	
Medley extension	8.5	FEC	Surface	7	59.5	23	195.5	
	18.525				889.0		212.8	1101.8
Mid-South								
I-395 to I-95	2.175	FDOT	Elevated	45	97.9	0	0.0	
SFRC to Miami River	3.25	SFRC	Elevated	45	146.3	0	0.0	
33rd Ave/21st St.	1.325	County	Elevated	45	59.6	20.5	27.2	
MIA to west end	3.075	MIA	Tunnel	200	615.0	0	0.0	
Tunnel under	0.5	MIA	Tunnel	200	100.0	0	0.0	

Table 1: Cost of Truckway Alternatives								
Route/Segment	**Miles**	**ROW**	**Type of Construction**	**Unit cost ($M/mi.)**	**Cost ($M)**	**ROW ($M/mi.)**	**ROW cost ($M)**	**Total ($M)**
runway								
FEC to 25th St.	0.5	FEC	Surface	7	3.5	23	11.5	
Medley extension	8.5	FEC	Surface	7	59.5	23	195.5	
	19.325				1081.8		234.2	1315.9
Southern								
I-395 to I-95	2.175	FDOT	Elevated	45	97.9	0	0.0	
SR 836 to LeJeune	3.925	MDX	Elevated	45	176.6	0	0.0	
LeJeune to MIA	0.55	City	Tunnel	200	110.0	0	0.0	
MIA to west end	2.375	MIA	Tunnel	200	475.0	0	0.0	
Tunnel under runway	0.5	MIA	Tunnel	200	100.0	0	0.0	
FEC to 25th St.	0.5	FEC	Surface	7	3.5	23	11.5	
Medley extension	8.5	FEC	Surface	7	59.5	23	195.5	
	18.525				1022.5		207.0	1229.5

Part 4

Potential Traffic and Revenue

A. Basic Truck Traffic

How much truck traffic might use an east-west toll truckway if it were built? During the same time period as this toll truckway feasibility study was taking place, the Miami-Dade MPO had commissioned the Corradino Group to do a study analyzing the county's truck traffic, in order to propose a truck route system for Miami-Dade County.[11] We were able to make use of data from that study.

Trucks currently use a number of east-west arteries, all of which suffer from congestion during peak hours of the day. We identified five principal arteries which trucks may use to get from the I-95/downtown Miami area to the areas west and northwest of MIA, including Medley. From north to south, they are as follows:

- SR 932, which is NW 103rd Street in Miami, W 49th Street in Hialeah;
- SR 112 (toll)/US 27, the Airport Expressway and Okeechobee Road;
- SR 836, the Dolphin Expressway (toll);
- SR 986, Flagler Street;
- U.S. 41, SW 8th Street (Calle Ocho).

Table 2's first column shows the truck annual average daily traffic for 2005; this is the annual total of trucks of three or more axles using that roadway divided by 365 days. Our estimation procedure was to assume that the closer the truckway route is to a truck's current east-west route, the higher the probability that the trucker will opt to use the truckway to avoid congestion and save time. Thus, with the likely truckway route somewhere between SR 112 on the north and SR 836 on the south, trucks using those two routes today would have higher probability of using the truckway than those using roads further to the north or south. For each east-west route, we made a low and a high percentage estimate; alternate estimates would yield alternate results. As the last line of the table shows, we ended up with a "low" estimate of 3,787 and a "high" estimate of 5,520 daily truckway trips.

Table 2: Potential Truckway Traffic, 2005					
E-W Route	TAADT	Low %	Truckway Low	High %	Truckway High
SR 932	2078	5	104	10	208
US 27, SR 112 avg	2797	40	1119	60	1678
SR 836	3735	60	2241	80	2988
SR 986 (Flagler)	1849	10	185	20	370
US 41 (SW 8th St.)	2762	5	138	10	276
Total	13221		3787		5520

These are estimates for the fraction of east-west trucks that would choose to use the truckway if it were available in 2005, given the levels of congestion in 2005. Presumably, all vehicle traffic will continue growing in coming decades, and with few planned additions to east-west highway capacity, congestion will be worse a decade or so in the future, when such a truckway might open for traffic.

How much will truck traffic grow over the next 25 or more years? The Port of Miami Freight Access Study refers to 5 percent annual growth in port traffic, but the graph on p. 2-5 of that report shows that growth from 2000-2005 was closer to 4 percent per year. And p. 2-8 of that study cites a Port of Miami Traffic and Demand Study (of Sept. 8, 2003) as projecting daily vehicle trips to/from the Port increasing from 13,600 in 2006 to 24,350 by 2025. That equates to only about 3 percent per year. In an interview with the author, Port Director Bill Johnson pointed out that growth in Port business is increasingly constrained by traffic congestion on the region's roadway system.[12] Presumably, addressing that congestion would permit a higher rate of growth in Port activity.

Thus, for purposes of projecting truckway traffic, we assumed that general growth in Miami-Dade truck traffic over the next decade would be 3 percent per year, due to continued and gradually worsening traffic congestion. Once the truckway opens, offering faster and more reliable trips, we assume that Port-related traffic that opts to use the truckway will increase, from then onward, at a 5 percent annual rate, consistent with expectations for the growth in Port activity if Miami-Dade's roadway congestion constraint can be addressed (and also consistent with the growth assumptions used in the recent Port Freight Access Study). Non-Port-related truck traffic is assumed to continue growing at 3 percent per year.

B. Value of Time in Drayage Operations

A key factor in east-west goods movement in Miami-Dade is the movement of containers on trucks between the Port and two western destinations: the FEC's Hialeah Yard west of MIA and the large cluster of distribution centers in the Doral/Medley area. That traffic is referred to as drayage: the short-haul movement of trailers or containers from one point to another over a short distance. Drayage truck owner/operators in Miami, like those in most such operations, are paid by the trip.

Thus, traffic congestion, by increasing the time it takes to make such trips, potentially reduces the number of trips a driver can make per shift (per day). If a toll truckway offers large enough time savings to increase the number of trips a driver can make per day, assuming the toll is not "too high," it will make sense for the driver to pay such tolls in order to increase his daily net income. Thus, with a toll that yields such results, we can expect that nearly all drayage trips will opt to use the truckway.

But how much time would the truckway save, and how much would that saved time be worth? Data obtained from the Port of Miami Terminal Operating Company (POMTOC) show the following breakdown of a typical drayage trip:

Port entry/waiting time/departing: ....63 min.
Round-trip travel time: ....70 min.
Customer arrive/depart: ....20 min.
Total round trip: ....153 min. = 2.55 hours[13]

Thus, in an eight-hour day, at 2.55 hours per round-trip, a driver can make only 3.1 trips.

Given that 85.5 percent of drayage trips are to distribution centers (about 13 miles from the Port) and 14.5 percent of them are to the FEC yard (10.5 miles), the weighted average (one-way) dray is 12.6 miles. The total round-trip travel time of 70 minutes implies an average travel speed of just 21.6 mph. If the truckway permitted an average speed of 60 mph, the time spent on travel would average just 25.2 minutes per round-trip—a net savings of 44.8 minutes per round-trip. (Also note from Figures 2 and 3 that nearly all drayage trips take place between 6 AM and 6 PM, so the average travel times used here reflect trips made mostly during heavy-traffic hours.) Hence, the revised drayage trip works out as:

Port entry/waiting time/departing: .... 63 min.
Round-trip travel (average) .... 25 min.
Customer arrive/depart .... 20 min.
Total round trip: ....108 min. = 1.8 hours

With the round trip reduced to 1.8 hours, an eight-hour shift yields 4.4 possible trips. So the time savings produced by using the truckway will permit an increase from three trips per day to four trips per day (or for those now working more than eight hours, an increase from four trips per day to five).

POMTOC reports that a typical drayage driver takes home a gross of $147 per round trip.[14] Thus, by making one additional round trip per day, the driver would gross that additional amount. An economist would argue that a rational person would pay up to $146 to gain $147, reasoning that a net gain of $1 is still a net gain. In the real world, a sensible driver would probably be willing to pay up to half the additional gross amount in order to obtain a still-sizeable net increase. On that basis, consider a $9 toll, each way, as of 2007. That would mean an outlay of $18 per round trip, so with the increase to four round trips per day, that would mean $72 in new daily outlays. Subtracting that from the gross income increase of $147 leaves the driver with a net gain of $75 per day. That is a deal most drivers should be glad to accept, especially with the tolling being done entirely via Sunpass, an electronic tolling system. (Trucking companies wanting high performance and reliable, fast deliveries could require their drivers to use the truckway, and could verify that they do so via the company's Sunpass account.)

C. Non-Drayage Trucking

Not all Port traffic goes east-west, and not all east-west truck traffic is drayage. These factors must be taken into account in projecting truckway usage.

First, we know that 65 percent of Port containers are for local destinations, and for simplicity assume that virtually all of that moves east-west. That leaves 35 percent heading north and therefore not a candidate for truckway use. But 11 percent of the total leaves the area by rail at the FEC yard, after being drayed from the Port. Thus, we assume that total east-west truck traffic equals 76 percent (65 plus 11) of total Port container traffic. We also know that current daily Port truck volume is 2,100. Thus, 76 percent of that is 1,596 potential daily east-west truckway trips due to drayage.

From Table 2, however, we made estimates that if the truckway existed now, it might capture between 3,787 and 5,520 total daily trips. The difference between these totals and the 1,596 drayage trips is the number of all other east-west trucks that might opt to use the truckway to save time. These trucks would range from three to five axles, and if the toll is charged per axle, the rates would vary. (The truckway could also be open to two-axle trucks, though the numbers in Table 2 did not include any trucks of that configuration.) Local delivery trucks (including parcel/express) are typically paid by the hour, whereas private fleet trucks (Wal-Mart, etc.) may be paid either per mile or per hour. It is difficult to generalize about the willingness of drivers, trucking companies, or shippers to pay for time savings in a congested urban area 10 years or more in the future. But the percentages in Table 2 are an attempt to estimate that fraction willing to pay for time savings.

How much would these non-dray trucks pay for time savings? The previous calculation for drayage operators works out to $24 per hour saved. That is on the low end of various studies of the value of time in trucking. A landmark study of truck-only toll lanes for Atlanta estimated the value of time at $35 per hour for heavy trucks and $18 for light-duty trucks.[15] Both the Federal Highway Administration and the Texas Transportation Institute use values of time significantly higher than those. Because of the range of sizes of trucks in the non-dray category, we will estimate the average one-way toll for this entire group at $6.

D. Projecting Truck Toll Revenue

Tables 3 and 4 summarize the “low” and “high” projections of truck traffic and revenue. We assume the truckway opens in 2016. To obtain year 2016 values of average daily truck traffic, we assumed 3 percent annual growth in the current dray and non-dray truck estimated derived previously. Once the truckway is open, we assume thereafter 5 percent annual growth for the Port-related dray traffic and 3 percent annual growth for other truck traffic.

The previously estimated toll rates were based on 2007 conditions. Hence, for the spreadsheet calculations we adjusted the $9/dray trip toll and average $6/non-dray trip toll by an assumed consumer price index increase of 3.5 percent per year to arrive at the 2016 toll rates. Annual CPI adjustment continues for the 40-year projection period, consistent with the new Florida law mandating inflation-adjustment of tolls on the Florida Turnpike. The sum of average daily tolls for “dray” and “other” is multiplied by 365 days to yield the gross annual toll revenue in millions. Consistent with toll road practice, we assume that the first 15 percent of each year’s toll revenue is reserved for operating and maintenance expense, giving a net annual toll revenue that is 85 percent of the gross amount.

The final two columns in the table enable us to calculate the net present value (NPV) of the 40-year stream of net toll revenues. This permits the NPV of revenues to be compared with the NPV of the cost of building the truckway (in Part 5). The NPV calculation uses a 6 percent discount rate and a base year of 2012, the year we assume the project is financed. As can be seen, the NPV of revenues for the “low” traffic case is $702 million; for the “high” case it is $912 million.

Table 3: Truckway Traffic & Revenue, Low Case

Year	AADT-Dray	AADT-Other	Toll, Dray	Daily $, Dray	Toll, Other	Daily $, Other	Gross An. $M	Net An. $M	NPV factor	NPV $M
2016	2145	2944	$12.21	$26,190	$8.18	$24,082	$18.35	$15.60	0.7921	$12.35
2017	2252	3032	$12.64	$28,462	$8.47	$25,673	$19.76	$16.80	0.7473	$12.55
2018	2365	3123	$13.08	$30,932	$8.76	$27,368	$21.28	$18.09	0.705	$12.75
2019	2483	3217	$13.54	$33,615	$9.07	$29,176	$22.92	$19.48	0.6651	$12.96
2020	2607	3313	$14.01	$36,531	$9.39	$31,103	$24.69	$20.98	0.6274	$13.17
2021	2738	3413	$14.50	$39,700	$9.72	$33,157	$26.59	$22.60	0.5919	$13.38
2022	2875	3515	$15.01	$43,144	$10.06	$35,347	$28.65	$24.35	0.5584	$13.60
2023	3018	3621	$15.53	$46,887	$10.41	$37,682	$30.87	$26.24	0.5268	$13.82
2024	3169	3729	$16.08	$50,954	$10.77	$40,171	$33.26	$28.27	0.497	$14.05
2025	3328	3841	$16.64	$55,374	$11.15	$42,824	$35.84	$30.47	0.4688	$14.28
2026	3494	3956	$17.22	$60,178	$11.54	$45,653	$38.63	$32.83	0.4423	$14.52
2027	3669	4075	$17.83	$65,399	$11.94	$48,668	$41.63	$35.39	0.4173	$14.77
2028	3852	4197	$18.45	$71,072	$12.36	$51,883	$44.88	$38.15	0.3936	$15.01
2029	4045	4323	$19.10	$77,238	$12.79	$55,309	$48.38	$41.12	0.3714	$15.27
2030	4247	4453	$19.76	$83,938	$13.24	$58,963	$52.16	$44.33	0.3503	$15.53
2031	4459	4587	$20.46	$91,220	$13.70	$62,857	$56.24	$47.80	0.3305	$15.80
2032	4682	4724	$21.17	$99,133	$14.18	$67,009	$60.64	$51.55	0.3118	$16.07
2033	4916	4866	$21.91	$107,733	$14.68	$71,435	$65.40	$55.59	0.2942	$16.35
2034	5162	5012	$22.68	$117,078	$15.19	$76,153	$70.53	$59.95	0.2775	$16.64

Table 3: Truckway Traffic & Revenue, Low Case

Year	AADT-Dray	AADT-Other	Toll, Dray	Daily $, Dray	Toll, Other	Daily $, Other	Gross An. $M	Net An. $M	NPV factor	NPV $M
2035	5420	5162	$23.47	$127,235	$15.73	$81,183	$76.07	$64.66	0.2618	$16.93
2036	5691	5317	$24.30	$138,273	$16.28	$86,545	$82.06	$69.75	0.247	$17.23
2037	5976	5477	$25.15	$150,268	$16.85	$92,261	$88.52	$75.24	0.233	$17.53
2038	6275	5641	$26.03	$163,303	$17.44	$98,355	$95.51	$81.18	0.2198	$17.84
2039	6588	5810	$26.94	$177,470	$18.05	$104,852	$103.05	$87.59	0.2074	$18.17
2040	6918	5985	$27.88	$192,865	$18.68	$111,777	$111.19	$94.52	0.1956	$18.49
2041	7264	6164	$28.86	$209,597	$19.33	$119,160	$120.00	$102.00	0.1846	$18.83
2042	7627	6349	$29.87	$227,779	$20.01	$127,031	$129.51	$110.08	0.1741	$19.16
2043	8008	6539	$30.91	$247,539	$20.71	$135,421	$139.78	$118.81	0.1653	$19.64
2044	8409	6736	$31.99	$269,013	$21.43	$144,365	$150.88	$128.25	0.1565	$20.07
2045	8829	6938	$33.11	$292,350	$22.18	$153,901	$162.88	$138.45	0.1477	$20.45
2046	9271	7146	$34.27	$317,711	$22.96	$164,066	$175.85	$149.47	0.1389	$20.76
2047	9734	7360	$35.47	$345,273	$23.76	$174,902	$189.86	$161.38	0.1301	$21.00
2048	10221	7581	$36.71	$375,225	$24.59	$186,455	$205.01	$174.26	0.1235	$21.52
2049	10732	7808	$38.00	$407,776	$25.46	$198,770	$221.39	$188.18	0.1169	$22.00
2050	11268	8043	$39.33	$443,150	$26.35	$211,899	$239.09	$203.23	0.1104	$22.44
2051	11832	8284	$40.70	$481,594	$27.27	$225,895	$258.23	$219.50	0.1038	$22.78
2052	12423	8533	$42.13	$523,372	$28.22	$240,815	$278.93	$237.09	0.0972	$23.05
2053	13045	8789	$43.60	$568,774	$29.21	$256,721	$301.31	$256.11	0.0923	$23.64
2054	13697	9052	$45.13	$618,115	$30.23	$273,677	$325.50	$276.68	0.0874	$24.18
2055	14382	9324	$46.71	$671,737	$31.29	$291,754	$351.67	$298.92	0.0776	$23.20
										$701.78

Table 4: Truckway Traffic & Revenue, High Case

Year	AADT-Dray	AADT-Other	Toll, Dray	Daily $, Dray	Toll, Other	Daily $, Other	Gross An. $M	Net An. $M	NPV factor	NPV $M
2016	2145	5274	$12.21	$26,190	$8.18	$43,141	$25.31	$21.51	0.7921	$17.04
2017	2252	5432	$12.64	$28,462	$8.47	$45,991	$27.18	$23.10	0.7473	$17.26
2018	2365	5595	$13.08	$30,932	$8.76	$49,028	$29.19	$24.81	0.705	$17.49
2019	2483	5763	$13.54	$33,615	$9.07	$52,267	$31.35	$26.64	0.6651	$17.72
2020	2607	5936	$14.01	$36,531	$9.39	$55,719	$33.67	$28.62	0.6274	$17.96
2021	2738	6114	$14.50	$39,700	$9.72	$59,399	$36.17	$30.75	0.5919	$18.20
2022	2875	6297	$15.01	$43,144	$10.06	$63,323	$38.86	$33.03	0.5584	$18.44
2023	3018	6486	$15.53	$46,887	$10.41	$67,505	$41.75	$35.49	0.5268	$18.70
2024	3169	6681	$16.08	$50,954	$10.77	$71,964	$44.87	$38.14	0.497	$18.95
2025	3328	6881	$16.64	$55,374	$11.15	$76,717	$48.21	$40.98	0.4688	$19.21
2026	3494	7088	$17.22	$60,178	$11.54	$81,784	$51.82	$44.04	0.4423	$19.48
2027	3669	7300	$17.83	$65,399	$11.94	$87,186	$55.69	$47.34	0.4173	$19.75
2028	3852	7519	$18.45	$71,072	$12.36	$92,945	$59.87	$50.89	0.3936	$20.03
2029	4045	7745	$19.10	$77,238	$12.79	$99,084	$64.36	$54.70	0.3714	$20.32
2030	4247	7977	$19.76	$83,938	$13.24	$105,628	$69.19	$58.81	0.3503	$20.60
2031	4459	8217	$20.46	$91,220	$13.70	$112,605	$74.40	$63.24	0.3305	$20.90
2032	4682	8463	$21.17	$99,133	$14.18	$120,042	$80.00	$68.00	0.3118	$21.20
2033	4916	8717	$21.91	$107,733	$14.68	$127,971	$86.03	$73.13	0.2942	$21.51
2034	5162	8979	$22.68	$117,078	$15.19	$136,424	$92.53	$78.65	0.2775	$21.83
2035	5420	9248	$23.47	$127,235	$15.73	$145,434	$99.52	$84.60	0.2618	$22.15

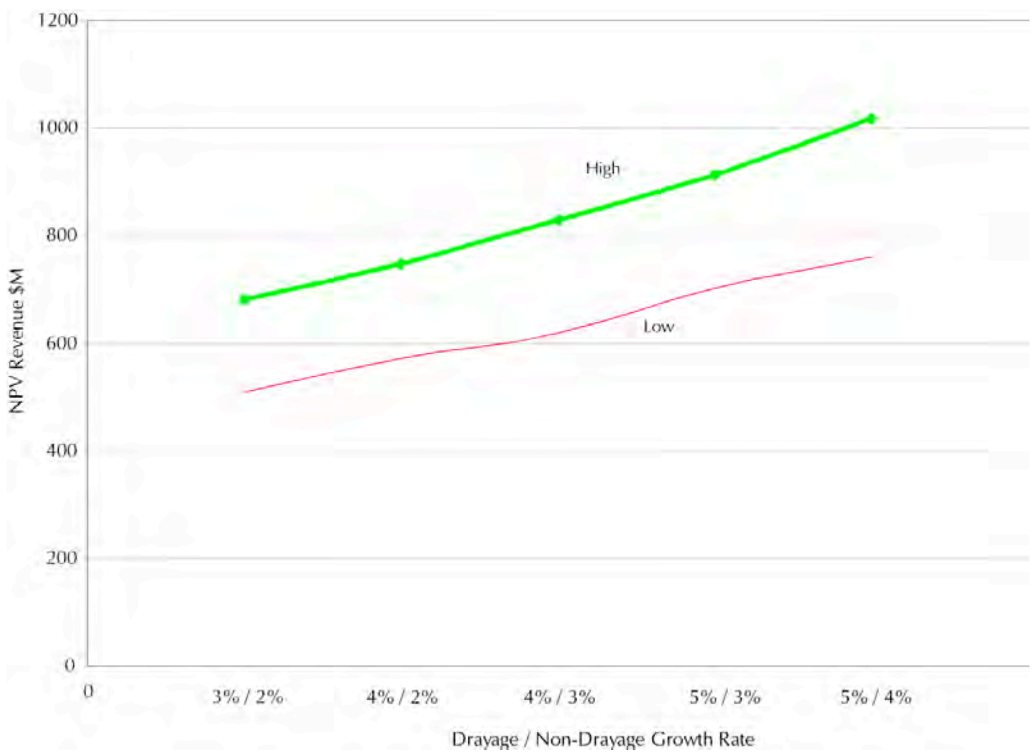
Table 4: Truckway Traffic & Revenue, High Case										
Year	**AADT-Dray**	**AADT-Other**	**Toll, Dray**	**Daily $, Dray**	**Toll, Other**	**Daily $, Other**	**Gross An. $M**	**Net An. $M**	**NPV factor**	**NPV $M**
2036	5691	9525	$24.30	$138,273	$16.28	$155,040	$107.06	$91.00	0.247	$22.48
2037	5976	9811	$25.15	$150,268	$16.85	$165,281	$115.18	$97.90	0.233	$22.81
2038	6275	10106	$26.03	$163,303	$17.44	$176,198	$123.92	$105.33	0.2198	$23.15
2039	6588	10409	$26.94	$177,470	$18.05	$187,835	$133.34	$113.34	0.2074	$23.51
2040	6918	10721	$27.88	$192,865	$18.68	$200,242	$143.48	$121.96	0.1956	$23.86
2041	7264	11043	$28.86	$209,597	$19.33	$213,468	$154.42	$131.26	0.1846	$24.23
2042	7627	11374	$29.87	$227,779	$20.01	$227,568	$166.20	$141.27	0.1741	$24.60
2043	8008	11715	$30.91	$247,539	$20.71	$242,598	$178.90	$152.07	0.1653	$25.14
2044	8409	12067	$31.99	$269,013	$21.43	$258,622	$192.59	$163.70	0.1565	$25.62
2045	8829	12429	$33.11	$292,350	$22.18	$275,704	$207.34	$176.24	0.1477	$26.03
2046	9271	12801	$34.27	$317,711	$22.96	$293,914	$223.24	$189.76	0.1389	$26.36
2047	9734	13185	$35.47	$345,273	$23.76	$313,327	$240.39	$204.33	0.1301	$26.58
2048	10221	13581	$36.71	$375,225	$24.59	$334,023	$258.88	$220.04	0.1235	$27.18
2049	10732	13988	$38.00	$407,776	$25.46	$356,085	$278.81	$236.99	0.1169	$27.70
2050	11268	14408	$39.33	$443,150	$26.35	$379,604	$300.31	$255.26	0.1104	$28.18
2051	11832	14840	$40.70	$481,594	$27.27	$404,677	$323.49	$274.97	0.1038	$28.54
2052	12423	15286	$42.13	$523,372	$28.22	$431,406	$348.49	$296.22	0.0972	$28.79
2053	13045	15744	$43.60	$568,774	$29.21	$459,900	$375.47	$319.15	0.0923	$29.46
2054	13697	16216	$45.13	$618,115	$30.23	$490,277	$404.56	$343.88	0.0874	$30.05
2055	14382	16703	$46.71	$671,737	$31.29	$522,659	$435.95	$370.56	0.0776	$28.76
										$911.76

E. Sensitivity Analysis

The toll revenues projected in Tables 3 and 4 depend on several assumptions. Two of the most critical are the rate of growth in truck traffic and the assumed rate of inflation. To test the sensitivity of these baseline results, we carried out additional spreadsheet calculations (not shown). The results were as follows.

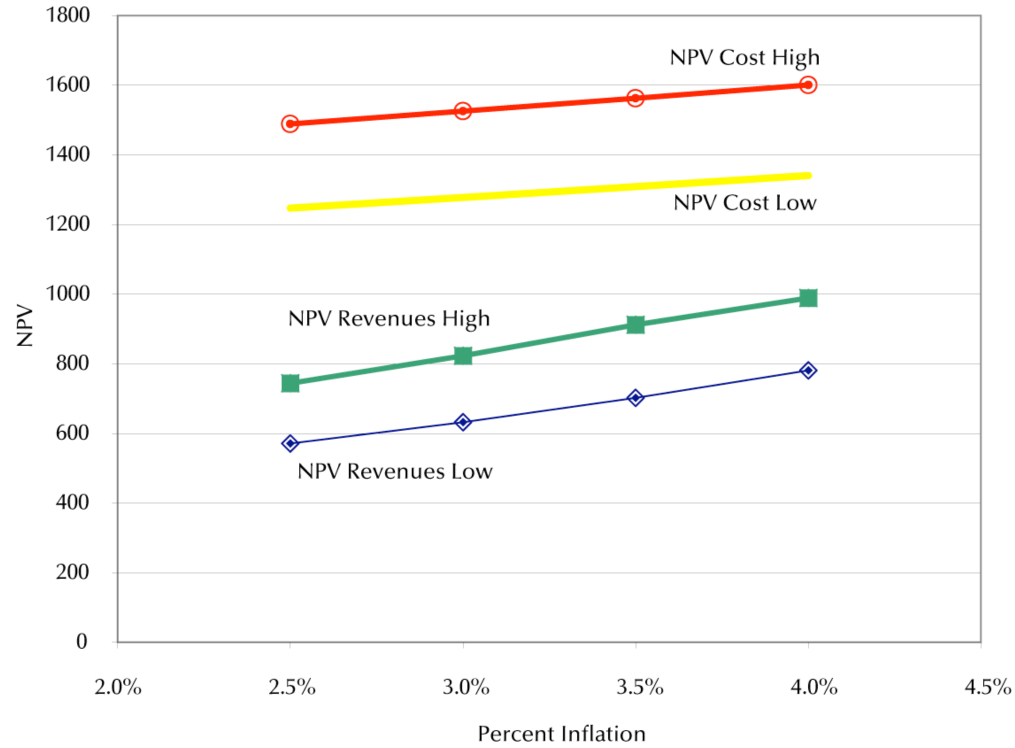
For the growth in truck traffic, our baseline case (after defining “low” and “high” starting levels of traffic that shifts to the truckway) assumed 5 percent growth in dray traffic and 3 percent growth in other truck traffic. Designating this baseline case as “5%-3%,” we did other runs ranging from “3%-2%” to “5%-4%.” As can be seen in Figure 6, the resulting net present value (NPV) of toll revenue ranged from as low as $508 million to a high of $1,108 million.

Figure 6: Revenue Sensitivity to Truck Traffic Growth Rate



The toll revenues also depend on the assumed rate of inflation (Consumer Price Index), which is 3.5 percent in those baseline tables. The United States has been in an unusually low-inflation period during the past decade, and when projecting inflation over a 40-year analysis period, it seems unwise to assume that such low inflation rates would prevail. We settled on 3.5 percent as the most likely value over this time period. For sensitivity testing, we did additional runs using inflation rates ranging from 2.5 percent to 4.0 percent. Those results are shown in Figure 7. Since the assumed CPI also affects projected construction costs in 2012, this figure also shows the NPV of those costs as a function of the CPI assumption.

Figure 7: Sensitivity to Inflation Rate (CPI)



Part 5

Project Feasibility

A. Economic Feasibility

A basic rule of thumb in project finance is that a project is potentially self-supporting if the net present value (NPV) of its revenues is greater than the net present value of the cost of creating it. How does the proposed truckway measure up?

In 2007 dollars, the estimated capital costs (design and construction) of the four alternatives range from $1,102 million (Mid-North) to $1,316 million (Mid-South). We have assumed that the project is designed and financed by 2012, and then constructed over a four-year period to open in 2016. The basic NPV calculation must compare the costs in 2012 with the NPV of revenues in 2012. The latter numbers are what we computed in the last column of Tables 3 and 4.

To complete the calculation, we must escalate the estimated 2007 construction costs to 2012 values. It is well-known that highway construction costs have increased at a rate greater than inflation in recent years. Most of the attention has focused on double-digit increases in the cost of *materials* (steel, concrete, asphalt, etc.). But *total* highway construction cost increases (including labor) have been less dramatic. The American Road & Transportation Builders Association (ARTBA) provides the following numbers for *total* highway construction cost increases:

- 2003..............................2.4%
- 2004..............................5.5%
- 2005..............................7.7%
- 2006..............................6.5% (est.)

Engineering News-Record's most recent annual Construction Cost Index projection for 2007 was 2.7 percent.[16] ARTBA's chief economist suggests that due to the large uncertainties in predicting future construction costs, the consumer price increase is the least-bad approach for inflating current construction cost estimates to future-year estimates.[17] Thus, inflating the above 2007 costs by our assumed 3.5 percent CPI gives a "low" figure for 2012 of $1,309 million and a "high" figure of $1,503 million.

Thus, for the base year of 2012, the NPV of revenues is $702-912 million, compared with the NPV of costs at $1,309-1,563 million. Thus, the NPV calculation suggests that the toll truckway could cover 54 to 58 percent of its costs out of toll revenue. Other sources—conventional highway funding via fuel taxes, transportation sales taxes, and/or some sort of value-capture mechanism—would be required for the balance of the costs.

On the other hand, it should also be noted that the traffic and revenue projection in Part 4 did not explicitly take into account the possible higher toll revenues that might be realized if the truckway is allowed to accommodate dual-trailer/dual-container rigs (LCVs) at a higher rate of toll. Modeling such impacts would be complex, and is beyond the scope of this preliminary feasibility study. A more detailed study, taking that factor into account, might project larger toll revenues than what has been estimated here, bringing the project closer to being self-supporting.

B. Legal Feasibility

Several legal issues need to be addressed in future planning for a toll truckway along the lines discussed in this study. One set of legal issues concerns multi-trailer (LCV) rigs; the other concerns airport land use at MIA.

The federal government has been regulating truck sizes and weights since the beginning of the Interstate highway system in 1956. In 1975, Congress increased the allowable size and weight of trucks on the federal-aid system, in response to trucking industry concerns about soaring fuel costs. But in the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA), Congress enacted a "freeze" on state truck size and weight limits, for trucks operating on the Interstate system. This freeze, which is still in effect, permits LCVs to continue operating on any roadway states allowed them on as of 1991 (e.g., the mainline of Florida's Turnpike, many other eastern toll roads, and numerous highways in the mountain west), but prohibits states from adding to the network of roads on which LCVs can operate.

The trucking industry would like to operate LCVs on Interstates and turnpikes nationwide, as well as on specialized truck lanes. But during the most recent federal reauthorization debates (in 2004-5), the American Trucking Associations and the Association of American Railroads (which has historically lobbied against LCVs) entered into a truce on LCVs, under which both agreed not to lobby for any changes to the 1991 freeze. Hence, there was no serious debate on this issue leading up to enactment of SAFETEA-LU in 2005.

Several studies of truck-only toll lanes have suggested that allowing LCVs to operate on barrier-separated facilities in states where their use would otherwise be prohibited would be a feasible way to expand the scope of LCV operations nationwide, but in a manner that did not create safety problems. Indeed, when Reason Foundation released its 2002 policy study of LCV-friendly toll truckways[18], the National Safety Council (which had previously lobbied against LCVs) endorsed the concept.

In order for a Miami toll truckway to be able to accommodate dual-trailer/dual-container rigs, federal law would most likely have to be changed during the next reauthorization of the federal program, in 2009-10. One possibility would be to create a pilot program for LCV-friendly toll truckways, under which such projects in Los Angeles, Miami, and possibly other areas could be developed, with federal seed money and ongoing research.

A longer-shot possibility, in the absence of such legislative change, would be to seek an exemption from the federal LCV freeze under the Federal Highway Administration's SEP-15.[19] This program permits waivers from various regulatory and statutory requirements to permit states to experiment with new approaches, especially relating to public-private partnerships.

Assuming federal permission is obtained, either via legislative change or via a SEP-15 waiver, Florida law would also have to be changed. Ideally, the change would permit dual-trailer/dual-container rigs to operate not just on the Miami toll truckway but also on HEFT between the truckway's western terminus at HEFT and the Turnpike mainline at the Miami-Dade/Broward border. That would facilitate the nonstop routing of LCVs from the Port and the distribution centers all the way north to Orlando and beyond.

One further legal issue concerns right of way for the toll truckway tunnel beneath Miami International Airport. Federal grant assurances, required under the FAA's Airport Improvement Program, generally prohibit airports from using airport land for non-airport purposes. Although that is the usual interpretation of what the grant assurances require, there are many cases in which airports have been allowed to generate revenue from non-airport-related uses of portions of their land (e.g., the Denver and DFW airports generate revenue from gas wells on airport land, and others lease land to farmers and golf course operators.[20]) Thus, although there are many advantages to our proposed plan to traverse MIA via a tunnel (which avoids using any of the airport's surface land area), it might be less costly for the truckway developer to lease surface land on the airport for at least a portion of the route, if this could be done without interfering with other airport uses.

A related legal question arises with our Options III and IV, both of which are shown as tunneling under the western portion of MIA's southerly runway (9/27). Very likely, the FAA would have to give permission in order for this to be done, but there are precedents. When Atlanta added its fifth runway, that new runway included a bridge over I-285, built wide enough to accommodate the highway's planned expansion from 10 lanes to 18.[21] A deep-bore truck-only tunnel beneath a runway should be less of a risk to the runway than an 18-lane freeway accommodating all sorts of traffic.

C. Public-Private Partnership Feasibility

The toll truckway would be a good candidate for a long-term public-private partnership (PPP), in the form of a long-term concession. This type of PPP is especially attractive for large-scale projects that are not feasible to build in small increments (as many highways are built) and which therefore require raising large sums up front. The Port of Miami Tunnel is being developed under a long-term concession, but in that case, the project is not being funded out of toll revenue. Instead, the State of Florida, Miami-Dade County, and the City of Miami are committing in advance to a 35-year schedule of payments; on the basis of those commitments, the winning consortium will be able to finance the project, as well as designing, building, operating, and maintaining it. Comparable large-scale tunnel projects in Europe and Australia have been financed based on toll revenues, but the nature of the Port Tunnel—with a non-tolled bridge alternative—made tolling the Tunnel not feasible if it was to succeed in diverting most or all of the truck traffic away from downtown Miami streets.

The disadvantage of the "availability payments" financing plan for the Port Tunnel is that it relies entirely on existing funding sources. By contrast, a toll project generates new revenue for transportation infrastructure. In the case of Miami-Dade goods movement, the State, County, and City may be relatively tapped out after funding the Port Tunnel and would not be in a good position to make comparable funding commitments to a second billion-dollar project in Miami-Dade.

Florida's recently revised PPP law permits long-term toll concessions of up to 50 years to be entered into by FDOT and local toll agencies such as the Miami-Dade Expressway Authority. FDOT District 4 in Broward County is pursuing such a toll concession for its planned express toll lanes on I-595, and the Tampa-Hillsborough County Expressway Authority is in the bidding process for a toll concession for a new toll road in the Tampa area.

A long-term toll concession is especially advantageous in the case of megaprojects like the proposed toll truckway, since such projects have a tendency toward cost overruns. Moreover, startup toll projects have a history of failing to meet their early-years traffic and revenue projections. Financing a project of this scale and risk level might well be beyond the relatively conservative financial constraints that apply to public sector toll agencies such as MDX. In a well-designed long-term toll concession, it should be possible to shift both the construction risk and the traffic and revenue risk to the private-sector partner.[22]

The economic feasibility results from this study suggest that the toll truckway should be able to cover more than half its costs via toll financing (even without the higher revenues that would be possible if LCVs are allowed to use the facility). Obviously, a far more detailed traffic and revenue study would be needed in order to make a decision to go forward to implement such a project. Based on the preliminary results of this study, the funding of the truckway would have to include some degree of public funding. There are a number of ways this could be done:

- The state could provide a "down payment" to reduce the amount to be financed via toll revenues to less than 100 percent of the total (e.g., 60 percent); in Texas, this kind of state assistance is called "toll equity." When the state is a co-investor in this manner, PPP deals typically include revenue sharing in future years.
- The state or other public-sector entities could build portions of the project, e.g., reconstructing I-395 from the Port Tunnel to I-95 (currently undergoing a preliminary

design and environmental study), to include barrier-separated truck lanes, thereby reducing the scope of what would have to be financed out of toll revenues; alternatively, the I-395 rebuild could itself be done as a toll bridge project, with all vehicles paying tolls.

- The toll truckway PPP could seek subordinated loan funding from the Federal Highway Administration's TIFIA program. Long-term TIFIA loans carry a low interest rate and have a lower priority for repayment than the toll revenue bonds and other private-sector debt financing.
- These few examples do not exhaust the possibilities. The upcoming PPP procurement for the Broward County I-595 project will consider a number of creative alternatives.

Part 6

Other Considerations

A. Congestion Reduction

Besides facilitating goods movement in Miami-Dade County, the toll truckway would help to relieve congestion on the county's overburdened highways. Congestion in the overall Miami metro area (which includes Broward County) ranks sixth-worst in the nation, according to the Texas Transportation Institute.[23] The travel time index (the ratio of trip time at rush hour to trip time at off hours) is 1.38, but a recent study by Prof. David Hartgen at the University of North Carolina projected that, based on the current Miami-Dade long-range transportation plan, this would increase to 1.84 by 2030[24]; for comparison, the current travel time index for extremely congested Los Angeles is 1.50. The current long-range plan adds little highway capacity over the 25-year planning period, which is especially ominous for goods movement.

Based on Tables 3 and 4, the proposed toll truckway would take between 5,089 and 7,419 trucks per day off major east-west roadways in Miami-Dade County in its first year, 2016. That may not sound like much, but since a truck takes up as much space on the roads as two to three cars, the impact would be more like removing up to 15-22,000 cars per day from those congested east-west roads. Those daily averages were developed by dividing annual truck traffic by 365 days; since a much smaller fraction of trucks operates on weekends than on weekdays, the impact on weekday traffic would be even greater. Moreover, these effects would likely be concentrated on the major east-west arteries: the Dolphin and Airport Expressways, NW 103rd Street, Okeechobee Road/US 27, Flagler Street, and SW 8th Street/US 41.

While many other steps would be necessary to bring about widespread congestion relief in Miami-Dade County, development of the toll truckway would make a significant contribution to this goal. And if the majority of its cost were paid for out of toll revenues, this congestion relief would be something of a gift to hard-pressed motorists, since they would (mostly) not be paying for it.

There is a potential trade-off between toll truck lanes and express toll lanes for automobiles, in the case of our Option IV which would use SR 836 (Dolphin Expressway) for a portion of its route. If Miami-Dade Expressway Authority intends to eventually build such express toll lanes on SR 836 between LeJeune Road and I-95, one factor it would have to assess would be the relative costs and benefits of using available space in that right of way for either express toll lanes or the proposed toll truckway. It would require a far more detailed study than this one to assess those tradeoffs.

B. Air Quality

Two misperceptions must be dealt with regarding the air quality impacts of building the proposed toll truckway. One concerns the wisdom of building any new roadway capacity at a time of great concern about air quality. The other concerns specifically the impact of diesel trucks on air quality and health.

The first common misperception is based on the fact that transportation plans must, by federal law, conform to air quality plans. Several decades ago, when motor vehicle tailpipe emissions were far higher than they are today (or than they will be in coming decades as older-generation vehicles continue to be retired from the fleet), air quality models equated increases in vehicle miles traveled (VMT) with increases in emissions. This shifted a major focus of transportation planning to reducing VMT (by fostering alternatives to driving—such as carpooling, using transit, walking, bicycling, etc.). It also led to scaling back many previous plans to expand roadway capacity.

More recent models incorporate the ongoing turnover of the vehicle fleet, in which previous generations of motor vehicles (which had to meet far less stringent emission standards) continue to be retired and be replaced by new vehicles with very low emissions. Consequently, VMT increase is no longer necessarily accompanied by an increase in total emissions. In fact, the long-term trend in most metro areas is a decline in emissions that has accompanied continued growth in VMT.

Hence, the fact that a project would add a few dozen lane-miles to the county's limited-access system should not be considered a strike against it. In fact, since the truckway would probably accommodate truck trips that would be taking place in any case, it may not lead to any net increase in VMT. In fact, it might produce a small decrease in VMT, to the extent that it provides a shorter, more direct east-west route for many truck trips. In addition, by permitting uncongested operations at a steady speed of 55 or 60 mph, the emissions produced by trucks using the toll truckway would be less than what they would produce if operating in stop-and-go/idling conditions on existing roadways.

The other concern is about diesel emissions. Nearly all trucks are powered by diesel engines, and diesels emit particulates, which are known to cause respiratory problems and possibly contribute to lung cancer. In other settings, some groups have argued against truck-only roadways out of concern over diesel particulate emissions.

While those emissions are of legitimate concern with today's diesel truck fleet, that fleet is also in the process of turning over, as has already happened with the automobile fleet. Low-sulfur diesel fuel replaced all previous diesel fuel in October 2006, to facilitate the mandated introduction of cleaner diesel engines on all trucks sold starting in 2007. Those engines, using low-sulfur fuel, will produce 90 percent less particulates and 50 percent less NOx emissions. Even tougher diesel emission standards will come into force in 2010. Over the next two decades, nearly the entire fleet of diesel trucks in the United States will be replaced by these new generations of diesel-powered trucks. Mike Tunnell of the American Transportation Research Institute modeled the impact of the new standards on diesel truck emissions as the fleet turns over. He estimates that by 2015, there will be 63 percent less particulates and 53 percent less NOx from the national diesel truck fleet, with further reductions beyond that as fleet turnover continues.[25] Thus, by the projected year the Miami toll truckway opens, 2016, diesel fleet emissions will already be less than half the level they are today, and headed further downward.

C. Safety

An additional benefit of the proposed toll truckway is increased safety. Cars and trucks—especially trucks with trailers—differ markedly in size, weight, maneuverability, and crash-worthiness. Car-truck collisions almost always cause more damage, injury, and death to the occupants of the car, for understandable reasons. In an ideal world, cars and heavy trucks would operate on their own separate roadways, minimizing the chances of car-truck accidents. In the roadway system as it has evolved in America, that is not a realistic possibility. However, the separation of significant numbers of trucks, especially heavy trucks, from other traffic will be a net gain for highway safety. When Reason Foundation released its original policy study on the toll truckway concept in 2002, the National Safety Council endorsed the concept of allowing larger and heavier trucks to operate on these barrier-separated lanes.

A Miami truckway that would separate large numbers of trucks from congested roadways is also likely to be popular with motorists, who are also taxpayers and voters.

D. Aesthetics and Noise

The proposed truckway involves between 6.1 and 7.5 miles of elevated roadway, approximately 50 feet in width. Even though much of this would run along expressway rights of way, some would pass industrial, commercial, and some residential areas. There will likely be opposition to this design approach from some of the adjoining landowners.

A recent Reason Foundation policy paper reviewed a number of innovative design concepts aimed at making large highway projects into better neighbors.[26] Two design approaches from that paper are relevant to the proposed elevated portions of the truckway.

First, thanks to state-of-the-art segmental box girder construction, it is possible to build a wide elevated roadway supported on slender central piers, leaving largely open space beneath and a clean, sculpted look for the roadway. Figure 8 contrasts this new approach with the former approach, on Tampa’s Crosstown Expressway. The new elevated express toll lanes opened in 2006. This five-mile elevated structure was assembled from about 3,000 pre-cast segments, each nine feet long and 60 feet wide. Cast off-site, they were trucked to the site and hoisted into place. Once a full span is assembled from 15 such segments, they are compressed into a single structure by steel cables drawn through cast-in conduits and put permanently into tension. The support pillars are six feet square and located 140 feet apart.

Figure 8: Tampa's New Elevated Express Toll Lanes vs Conventional Elevated Construction

Source: Tampa-Hillsborough County Expressway Authority

The second example is from an elevated toll road in Melbourne, Australia—the Melbourne CityLink. A portion of this roadway passes close by high-rise residential structures, and thus presented a noise-impact problem. The developer/operator, Transurban, addressed this by creating a "sound tube" structure curving over the top of the elevated roadway, open to the sky on top and to the non-residential properties on one side but filled in with sound-attenuating cladding on the other side (see Figure 9). Because that cladding extends up and over a portion of the roadway, it provides more noise shielding than would a conventional sound wall.

Figure 9: Melbourne CityLink Sound Tube

Source: Transurban

E. Business and Economic Growth

The Greater Miami Chamber of Commerce has documented the factors taken into account by companies considering moving into or out of the region, as well as decisions on whether and where to expand. Congestion and mobility are increasingly serious concerns in such decision analysis. While Miami-Dade has devoted considerable attention and resources to expanding transit options for motorists, those alternatives do not move goods. For short-distance goods movement, trucks are the only realistic option, and trucks require adequate highway capacity.

We have previously noted the serious concerns expressed by the Port director about the negative effects of the Miami area's traffic congestion on the continued growth of the port's activities. Given the large contribution to the Miami-Dade economy made by the Port and the distribution center/warehousing industry, it makes sense to ensure that transportation policy focuses on reducing traffic congestion and providing adequate highway infrastructure for goods movement.

Part 7

Conclusions and Recommendations

This preliminary study has looked into the potential feasibility of an east-west truck-only roadway, to provide better access for truck movements from the Port of Miami and the eastern part of the metro area to the rail yard and distribution centers located west and northwest of Miami International Airport. At this initial level of detail, the project appears to be feasible. That is:

- There are four possible routes that such a truckway could take, using mostly existing highway or rail rights of way;
- The truckway would offer substantial time-saving benefits for east-west truck trips, large portions of which take place during morning and afternoon rush hours, thereby adding to congestion;
- Trucks operating drayage service to and from the Port could add at least one round-trip per day, thanks to the truckway, making it worth their while to pay significant tolls;
- Tolls based on time savings for other truck trips also appear reasonable;
- Enough truck traffic would likely use the truckway to permit a majority of its costs to be financed based on toll revenues;
- The truckway would be a good candidate for development via a long-term public-private partnership (as is being done with the Port Tunnel);
- The truckway would provide benefits in the form of reduced traffic congestion and increased highway safety, without negatively affecting air quality;
- Benefits could be even greater if legal authority can be obtained for dual-trailer/dual-container rigs to operate on the truckway.

Based on these preliminary conclusions, a number of possible next steps would be in order. These include:

1. A review of this study by the MPO's Freight Transportation Advisory Committee (FTAC) and potential recommendation of the truckway's inclusion in the next revision of the MPO's long-range transportation plan.
2. Possible modification of the scope of work of FDOT District 6's current PD&E study on I-395, to ensure compatibility with a possible toll truckway in that corridor.

3. A review by FDOT District 6 and Miami-Dade Expressway Authority to decide which would be the lead agency to pursue development of the toll truckway.
4. An investment-grade traffic and revenue study, to assess in far more detail potential usage, values of time, and potential revenue.
5. Legal research regarding use of the truckway by LCVs.
6. Legal research regarding any FAA constraints on tunneling under Miami International Airport.
7. Economic analysis to quantify the benefits of an east-west truckway to the Miami-Dade economy.

Acknowledgements

We gratefully acknowledge the cooperation of the Florida Department of Transportation (District 6), the Miami-Dade Expressway Authority, the Miami-Dade Metropolitan Planning Organization, the Port of Miami, Miami International Airport, HNTB, Corradino Associates, POMTOC, Figg Bridge, Odebrecht Construction, and TranSystems in providing information and assistance with various aspects of the research that went into this policy study. All findings, conclusions, and recommendations in this study are those of the author and should not be interpreted as the position of any of these entities.

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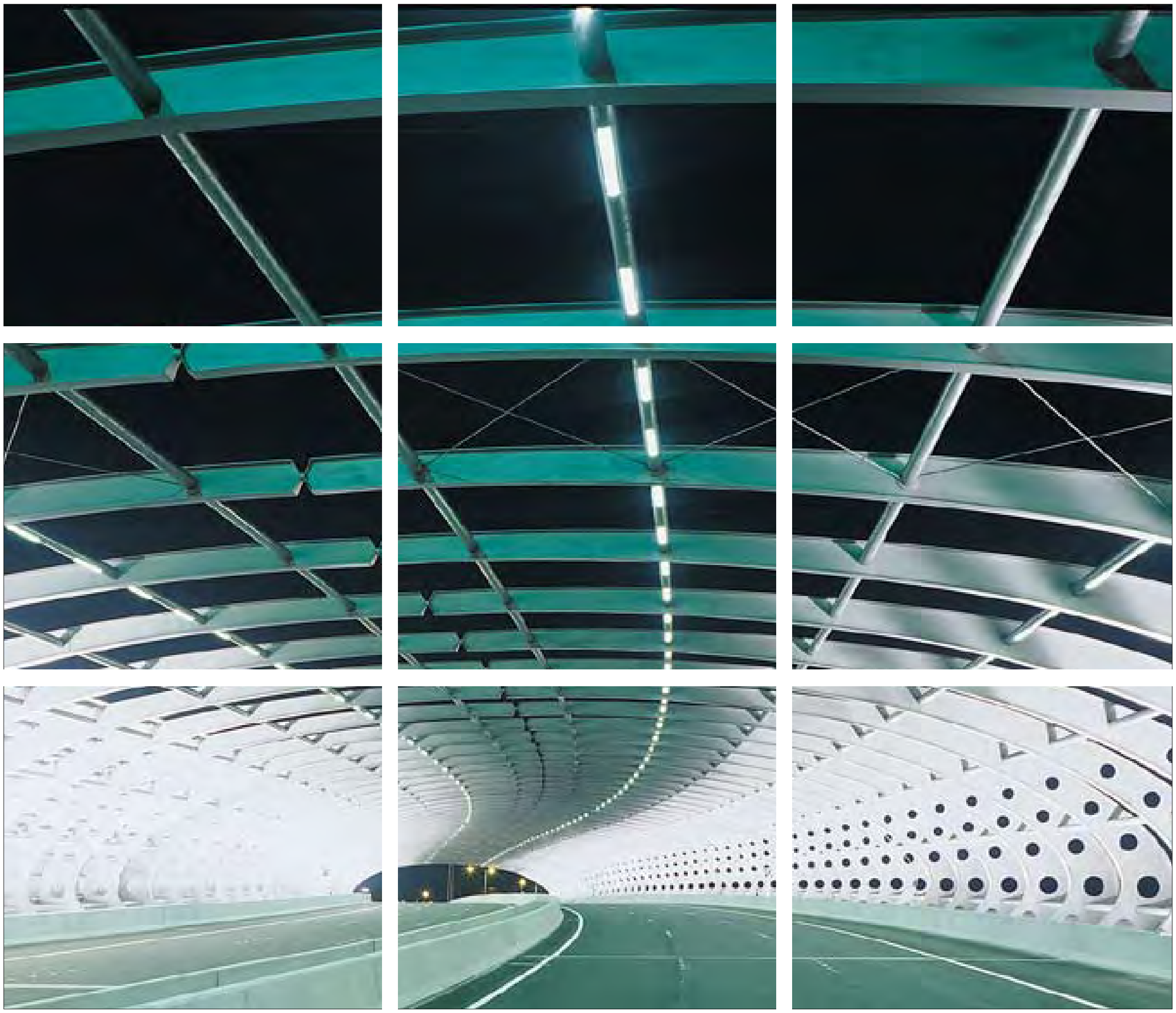

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