Comparing Costs of Options for Reconstructing the 12th and 27th Avenue Bridges Over the Miami River

Option 1: Build New Draw Bridges Over the River

Option 2: Build Tunnels Under the River

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Prepared For

Miami River Commission

February, 2003

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Executive Summary

This preliminary look at the comparative costs of using either bascule bridges or tunnels to span the Miami River at 12th Avenue and at 27th Avenue is not a comprehensive engineering study, but rather an effort to reason through whether or not a tunnel can plausibly be a cost-effective competitive option to a bascule bridge.

On strictly an initial cost basis, it is reasonable to assume that the tunnel options will be more expensive than the bridge options, but the differential is not as large as one might first expect, and there is some credible evidence to suggest that the differential is quite small. The analysis here assumes bascule bridge options would cost $25 million for each crossing, and that tunnel options would cost $40 million for each crossing. The range of bridge costs is rather narrow, and based on recent local experience with bridge construction. However, surveying several sources identifies a broad range of tunnel cost estimates from $24 million to $85 million. The analysis presented here focused on a tunnel cost estimate of $40 million, near the middle of the range of estimates. Thus, based on initial costs only, tunnels are assumed to be at a $15 million per crossing disadvantage.

Viewing the costs from a total 70-year life cycle perspective changes the calculations dramatically. While ordinary operating costs for the bridge and tunnel options may not be significantly different, the bridge solutions will likely require major rehabilitation every 20 years, at a cost equal to 40 percent of the original capital expenditure. Even more significantly, the bridge solutions continue the congestion delays generated by daily openings to accommodate commercial and recreational vessels. Quantifying these two cost considerations, which play out over the 70-year expected life of the crossings, more than reverses the initial capital cost disadvantage of the tunnels and demonstrates that the tunnels can be slightly less expensive solutions over the entire time period. Using a 100-year project life identifies a larger life-cycle cost advantage for the tunnel alternative, while using a 50-year project life identifies a small cost advantage for the bridge alternative. Whichever project life is chosen, however, the point is that on a life-cycle basis, bridges and tunnels compare more closely on an economic basis than they do if only initial project costs are considered.

Since economic evaluations based on total life-cycle costing are more appropriate than economic evaluations based on initial capital expenditures, it is reasonable to conclude that both tunnel and bascule bridge options should be considered as viable options in the more detailed planning that should be undertaken to decide a course of action.

Introduction

The debate over how best to move motor vehicles across the Miami River – to use bascule bridges like the ones currently in place or to use tunnels – is not a new one. The issue resurfaces each time an existing bascule bridge needs major rehabilitation or replacement. In Miami, these debates have always been resolved in favor of bascule bridges, which can be seen by the large number of such bridges in Miami, and the absence of any tunnels in Miami.

While the bridge vs. tunnel debate in Florida may not be new, the economics behind the debate are constantly changing, raising the possibility that the outcome of the debate may change as well as time passes. The gap between the full life-cycle costs of bridges and tunnels may be closing for at least four reasons.

- Vehicular traffic on surface roads grows over time, so that the traffic interruptions caused by the bascule bridges delay more and more trucks and motorists. Since the tunnel alternative (unlike the bridge alternative) eliminates the traffic delays associated with bascule bridges, the tunnel has an increasing advantage over time.

- The value of time lost in congestion grows over time as well, because it is correlated with income, which is generally rising in real terms. Thus, not only does the amount of congestion increase over time, but the value of that time lost in congestion increases as well. The impact on the bridge vs. tunnel debate is the same, which is that tunnels – by virtue of eliminating the congestion associated with bascule bridge openings – have an increasing advantage over time.

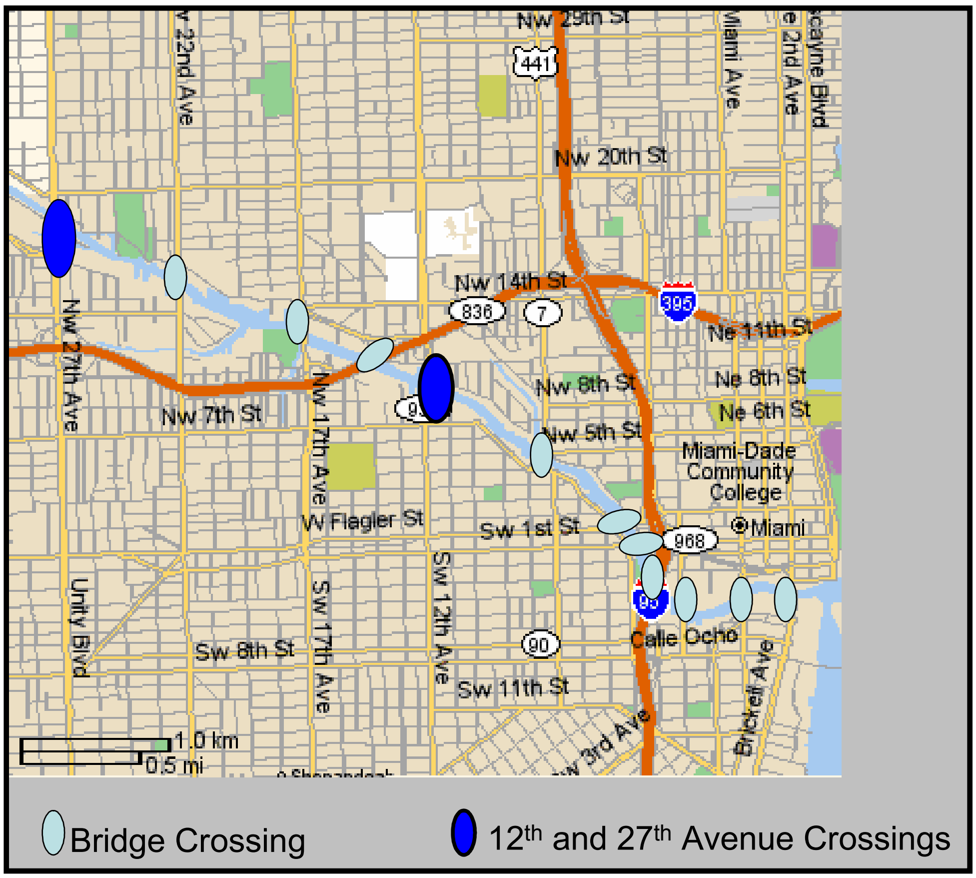
- The value of land near the Miami River increases over time as well, and since tunnels offer "land creation" benefits by making available development rights on the areas of the covered tunnel approaches, tunnels may have a third advantage over bridges.

- Plans to dredge the Miami River and stimulate economic development along its banks will stimulate activity on the River and increase the required openings of the bascule bridges. More openings feed back to further increase congestion associated with the bridge (but not with the tunnel), so that the relative economics of tunnels vs. bridges increases in favor of the tunnels.

This issue paper takes a preliminary look at the 27th Avenue and 12th Avenue crossings of the Miami River, assessing bascule bridge and tunnel options on the basis of 70-year life cycle costs, including initial capital expenditures, ongoing operations and maintenance, and impacts on traffic congestion.

The Miami River is a 5.5 mile waterway that runs between the Miami International Airport and Biscayne Bay. In the two crossings being investigated, the river is about 180 feet wide and about 17 feet deep. Today, the river is crossed by 12 highway bridges, 10 of which are drawbridges that allow pleasure boats and commercial freighters passage to and from Biscayne Bay. The other two fixed bridges are high enough to support motor vehicle traffic without any disruption to the marine traffic. The bridges are locked down to permit only vehicle traffic from 7:30 to 9 am and from 4:30 to 6 pm, except as required for law enforcement, emergencies, and special marine traffic. This is an unusual step for a Federal navigable channel. This rush-hour curfew, however, is not in effect on Saturdays, Sundays, and holidays. Aside from these exceptions, the bridges open on demand to facilitate boat movements. Exhibit 1 provides a map showing the location of the 12th and 27th Avenue Bridges.

Exhibit 1: Map of the Miami River and the 12th and 27th Avenue Bridges



Economic Analysis

Initial Capital Expenditures A frequently cited rule-of-thumb in transportation engineering is that tunnel construction costs two to three times as much as bridges, and that simple rule of thumb explains why there are so many more bridges than tunnels in operation today. In most situations tunnel congestion savings and tunnel operating and maintenance costs savings are not large enough to cover the initial capital cost disadvantage.

In the case of the Miami River, however, the rule-of-thumb about initial capital expenditures may not apply, because the bridge option over a Federal navigable channel, by Federal law, has to be a high fixed-span bridge or a bascule bridge, either of which is considerably more expensive than a typical low-span bridge. Consequently it is necessary to look more carefully at the two options.

In the case of the bascule option, there is considerable experience in the Miami River Area. The current reconstruction of the 2nd Avenue bridge is about a $25 million project. A reconstruction project about 6 years ago cost $22 million, and the Brickel Bridge cost close to $40 million. Without surveying the 12th Avenue and 27th Avenue locations in detail, based on the information above it seems reasonable to expect a new bascule bridge at either location to cost about $25 million.

In the case of the tunnel option, there are three ways to compute an initial capital cost estimate in this preliminary review.

- The only tunnel in South Florida is the Kinney tunnel under the New River, built in 1961 for $6.6 million. It is 4,193 ft. long portal to portal (considerably longer approaches than would be needed at the Miami River locations), and took 15 years to design and 3 years to construct. The initial cost of $6.6 million, when inflated to current year prices, would be about $40 million in today's dollars. The inflation is based on an average of two price indices from the Statistical Abstract, one a Federal Highway Administration construction cost index, and one a Turner Construction Co. construction cost index.

- An order of magnitude cost estimate from Parsons Company, in Washington D.C. for a tunnel under the Miami River, pegged the cost of a single tunnel at $24 million. Anthony S Caserta, an expert on tunnel construction at the Federal Highway Administration, was not surprised at this low cost estimate for the tunnel, given his experience and understanding of the scope of the project, and he thought it was plausible that it could be realistic.

- Over a five year period, Parsons Brinckerhoff undertook a series of studies exploring the options of a 140 ft. bascule bridge, a high fixed-span bridge, and a tunnel on the S.E. 17th St. Causeway, near the present Marriott Hotel and Eisenhower Blvd, in Ft. Lauderdale, connecting the mainland with the offshore island. They explored a large number of options: several bridge designs and several tunnel designs. The waterway to be traversed is one of the busiest sections of the entire Atlantic Intercoastal Waterway and includes the course of a major sailboat race. In 1994, PB estimated the costs of the drawbridge to be $22 million, and tunnel costs were estimated to be between $77 and $94.5 million

With construction cost estimates ranging from $24 million (Parsons Company in 2003) to $85 million (the mid-point of the estimates in the PB study of 1994 in Fort Lauderdale), there is obviously much uncertainty about what the true construction costs might be. Since the escalation of the Kinney Tunnel Capital costs ($40 million) falls between the two extreme estimates, it seems reasonable to use $40 million in this preliminary analysis of the options as a base price.

Continuing Operating Costs The average annual operating and maintenance costs of seven bascule bridges crossing the Miami River in the year ending October, 2002, was $212,000. In addition to this average annual cost, approximately every 20 years bascule bridges need a major rehabilitation, at a cost of approximately 40% of the initial construction cost.

The operating costs of a tunnel are primarily energy costs for ventilation and lighting, and cleaning costs. Today, annual cleaning costs in the Kinney tunnel are estimated at $140,000 per year, and viewed as the major operating expense.

It seems reasonable to conclude that the annual operating maintenance expenses of the bridge and tunnel options will be approximately equal, except that the bridges require the major refurbishing every 20 years, which puts them at some disadvantage.

Motor Vehicle Congestion Costs Using tunnels rather than drawbridges to replace the 12th and 27th Avenue crossings would have a positive effect on traffic, since there would be no interruptions for bridge openings for these two crossings.

To understand the value of reduced traffic congestion, it is first necessary to understand how traffic is interrupted by the current crossings. Daily logs for the two bridges were reviewed for a twelve-month period ending July 31st, 2002. These logs track each bridge opening, noting the time of the opening and also the duration of the opening. Exhibit 2 summarizes the data captured in those logs, showing noticeably different profiles for each bridge.

Exhibit 2: Average Bridge Openings by Day of Week and Average Delay per Opening

	27th Avenue Openings per Day	12th Avenue Openings per Day
Sunday	6	25
Monday	7	20
Tuesday	8	21
Wednesday	10	23
Thursday	9	21
Friday	9	23
Saturday	8	26
All Days	8	23
Average Minutes per Opening	6.3	4.3
Average Daily Traffic Delay in Minutes	50	98

Source: tabulation of daily bridge logs

The 27th Avenue bridge opens, on average 8 times per day, for an average duration of 6.3 minutes. The bridge openings are more likely during the week than on the weekend, with weekend traffic being 20 percent less than weekday traffic. Overall, traffic is interrupted about 50 minutes per day by bridge openings on the 27th Avenue Bridge.

In contrast to the 27th Avenue Bridge, the 12th Avenue Bridge is open 23 times per day, or almost three times as much as the 27th Avenue Bridge. The average opening duration is 4.3 minutes, which is fully 2 minutes less per opening than the 27th Avenue Bridge. The 12th Avenue Bridge openings are more likely during the weekend than during the week, with weekend traffic being 20% more than weekday traffic. Overall, traffic is interrupted about 98 minutes per day by 12th Avenue Bridge openings.

Exhibit 3 looks more specifically at the distribution of bridge openings by time of day. The twelve hours from 7 am to 7 pm are shaded in the table, and represent about 80 percent of all delay generated by the bridges. This fraction is important, because most of the daily traffic over the bridges occurs during these times. The 20 percent of delay which occurs from 7 pm to 7 am can be assumed to cause minimal traffic delay, because the streets are relatively empty during these times.

Once the pattern of bridge interruptions is defined (Exhibits 2 and 3) it can be combined with data on traffic patterns and traveler characteristics to estimate the value of eliminating the bridge disruptions. Exhibit 4 and 5 summarize the calculations included, and discussing them line-by-line is the most effective way to describe the calculations. Exhibit 4 includes data for the 27th Avenue Bridge and Exhibit 5 includes data for the 12th Avenue bridge.

Data from the Florida DOT suggests that there are 52,500 vehicles using the 27th Avenue Bridge daily, and 25,000 vehicles using the 12th Avenue Bridge daily. These traffic volumes are assumed to grow by 1 percent per year over the 70 year evaluation period. This assumption is broadly consistent with the historical traffic flows over the bridges. The Florida DOT data and the traffic growth assumption are the basis of the Average Daily Traffic estimates in Exhibits 4 and 5.

The bridges operate differently during the morning and evening rush hours (assumed to be 7 am to 9 am and 4 pm to 6 pm) than during the rest of the day. During the rush hours, the bridges are not opened on demand, but may be opened if the situation permits. Thus the likelihood of encountering an open bridge is lower during the peak periods than during the off peak periods.

Exhibit 3: Average Bridge Openings and Delays by Hour of Day

	27th Ave	27th Ave	27th Ave		12th Ave	12th Ave	12th Ave
Hour of Day	Avg Mins. Per Opening	Avg Openings per Hour	Avg Delay per Hour in Mins		Avg Mins. Per Opening	Avg Openings per Hour	Avg Delay per Hour in Mins
0	0.0	0.0	0.0		5.0	0.4	1.8
1	7.8	0.1	0.9		4.6	0.4	2.0
2	7.7	0.1	0.6		4.7	0.2	0.9
3	7.0	0.0	0.2		5.5	0.2	0.9
4	8.0	0.1	0.4		4.4	0.2	1.0
5	6.3	0.1	0.7		5.2	0.3	1.3
6	5.5	0.1	0.6		3.7	1.0	3.6
7	7.1	0.2	1.4		5.1	0.4	2.3
8	5.3	0.1	0.6		3.9	0.3	1.0
9	6.1	0.7	4.4		4.6	2.1	9.6
10	5.9	0.9	5.3		4.7	1.9	8.8
11	6.3	0.9	5.4		4.4	2.2	9.8
12	5.9	0.8	4.6		4.6	2.1	9.6
13	6.4	0.8	5.3		4.6	1.6	7.6
14	6.4	0.7	4.3		4.3	1.4	6.0
15	5.7	0.5	2.8		3.7	2.2	8.1
16	6.8	0.3	2.1		3.6	1.2	4.2
17	5.7	0.2	0.9		3.7	0.4	1.4
18	6.5	0.3	1.8		3.4	1.4	4.8
19	5.9	0.4	2.3		4.1	1.1	4.4
20	7.0	0.3	1.9		4.2	0.6	2.4
21	7.5	0.1	0.8		4.0	0.6	2.5
22	9.0	0.1	1.0		4.0	0.4	1.7
23	7.3	0.1	0.6		6.4	0.4	2.9
AllHours	6.3	7.8	49.1		4.3	22.9	98.5

Source: tabulation of daily bridge logs

About 95 percent of the traffic over each bridge is auto traffic and 5 percent is truck traffic. In this analysis it is assumed that each person in an auto (assumption is 1.1 persons per vehicle) values time at $6.00 per hour in 2003, and each truck values time at $20.00 per hour in 2003. The values of time escalate at 1 percent per year to reflect the growth of income over time.

The likelihood of a vehicle being delayed in the peak or off peak is determined by the ratio of delay time expected during the time period to the total minutes in the time period. So the number of persons or trucks delayed is the total persons or trucks crossing multiplied by the probability or likelihood of a bridge opening.

The average delay per person is assumed to be half of the total time the bridges are opened. Some of those delayed are caught just as the bridges open, and endure the full bridge opening time as a delay, but others of those delayed are caught just at the end of the bridge opening, and experience almost no delay. Thus, half of the total time the bridges are opened represents an average of these two extreme situations.

The cost of delay per person is simply the number of persons delayed per day multiplied by the average delay per person and the assumed average value of time per person. The cost of delay per truck is simply the number of trucks delayed multiplied by the average delay per truck and the assumed average value of truck time.

Taking 300 days per year to scale up the average day to an annual total produces an annual cost of delay in dollar terms (300 days per year acknowledges that weekend days are lighter than weekdays, and that only about 300 times the average daily traffic will be observed during the course of a year).

The annual cost of delay grows over time, even in real terms, because the traffic volumes are increasing, because the values of time for individuals are increasing, and because river traffic is increasing, leading to more bridge openings per day. Discounting these annual streams of delay costs using a 5 percent real discount factor produces a present value of delay of $12.1 million for the 27th Avenue Bridge and $7.8 million present value of delay for the 12th Avenue Bridge.

Non-Quantifiable Factors It's possible that the tunnel options, as compared to the bridge options, might generate some additional river-side land in the form of air rights over the portal entrances and exits. Since land in the area is valuable, additional space next to the river could be sold or developed to generate cash flow to offset whatever initial capital cost disadvantage tunnels might have.

Summary of Economic Analysis Pulling together the initial capital cost differentials, the operating differentials and the congestion reduction differentials between bridges and tunnels shows that tunnels are actually less expensive than bridges over a 70 year period. In Exhibit 6, the combination of these factors shows two tunnels to be $1.4 million less than bridges over the life cycle. Exhibit 6 combines the individual cost and benefit cash flows using a five percent real discount rate. This rate may be too high, in real terms, and if lower, would result in an increased advantage for the tunnel.

Next Steps

The reason the economic analysis presented here is preliminary is that there are several additional steps that should be taken to finalize the analysis, before proceeding with one or another of the two options.

- Site-specific engineering work needs to be carried out to produce better estimates of the capital cost differentials between a draw bridge and a tunnel.
- More detailed traffic modeling should be completed to firm up the estimates of congestion impacts on motor vehicle traffic.
- More detailed definition of the operating costs of the two alternatives needs to be completed.

Exhibit 4: Value of Delay Calculations for the 27th Avenue Bridge

27th Avenue	2003	2004	2005	2073
Average Daily Traffic over Bridge (Both Directions)	52,500	53,025	53,555	105,355
Percent of Traffic in 7-9 am and 4-6 pm Periods	40%	40%	40%	40%
Total Minutes of Bridge Delay during Peak Periods	4.7	4.7	4.8	9.4
Total Minutes of Bridge Delay during Off-Peak Periods	34.6	34.9	35.3	69.4
Peak Traffic (Vehicles per Peak Period)	21,000	21,210	21,422	42,142
Off-Peak Traffic (Vehicles per Peak Period)	31,500	31,815	32,133	63,213
Probability of Delay During Peak Period	2%	2%	2%	4%
Probability of Delay During Off-Peak Period	7%	7%	7%	14%
Vehicle Occupancy (Persons per Veh)	1.1	1.1	1.1	1.1
Percent of Traffic which is Trucks	5%	5%	5%	5%
Value of Time ($ per Hour) for Auto Drivers and Passengers	$6.00	$6.06	$6.12	$12.04
Value of Time ($ per Hour) for Trucks	$20.00	$20.20	$20.40	$40.14
Average Length of Delay in Peak (Minutes)	3.15	3.15	3.15	3.15
Average Length of Delay in Off Peak (Minutes)	3.16	3.16	3.16	3.16
% Peak Traffic Delayed	2.0%	2.0%	2.0%	3.9%
% Offpeak Traffic Delayed	7.2%	7.3%	7.3%	14.5%
Average Daily Cost of Delay to Peak Auto Persons	$135	$139	$144	$1,094
Average Daily Cost of Delay to Off-Peak Auto Persons	$749	$772	$795	$6,055
Average Daily Cost of Delay to Peak Truck Traffic	$22	$22	$23	$174
Average Daily Cost of Delay to Off-Peak Truck Traffic	$119	$123	$127	$966
Average Days per Year	300	300	300	300
Annual Cost of Delay to Peak Auto Persons	$40,612	$41,843	$43,110	$328,203
Annual Cost of Delay to Off Peak Auto Persons	$224,760	$231,570	$238,587	$1,816,381
Annual Cost of Delay to Peak Truck Traffic	$6,477	$6,673	$6,876	$52,345
Annual Cost of Delay to Off Peak Truck Traffic	$35,847	$36,933	$38,052	$289,694
Cost of Delay per Peak Person in Auto Delayed	$0.32	$0.32	$0.32	$0.63
Cost of Delay per Off-Peak Person in Auto Delayed	$0.32	$0.32	$0.32	$0.63
Cost of Delay per Peak Truck Trip Delayed	$1.05	$1.06	$1.07	$2.11
Cost of Delay per Off Peak Truck Trip Delayed	$1.05	$1.06	$1.07	$2.11
Total Annual Cost of Delay	$307,696	$317,019	$326,625	$2,486,623
Discount	1.00	0.95	0.91	0.03
Present Value of Delay	**$12,126,420**			

Note: Years 2006-2072 are included in the present value of Delay estimate but excluded from this table for presentation purposes

Source: Everglade Economics

Exhibit 5: Value of Delay Calculations for the 12th Avenue Bridge

12 Avenue	**2003**	**2004**	**2005**	**2073**
Average Daily Traffic over Bridge (Both Directions)	25,000	25,250	25,503	50,169
Percent of Traffic in 7-9 am and 4-6 pm Periods	40%	40%	40%	40%
Total Minutes of Bridge Delay during Peak Periods	9.4	9.5	9.6	18.9
Total Minutes of Bridge Delay during Off-Peak Periods	69.4	70.1	70.8	139.3
Peak Traffic (Vehicles per Peak Period)	10,000	10,100	10,201	20,068
Off-Peak Traffic (Vehicles per Peak Period)	15,000	15,150	15,302	30,101
Probability of Delay During Peak Period	4%	4%	4%	8%
Probability of Delay During Off-Peak Period	14%	15%	15%	29%
Vehicle Occupancy (Persons per Veh)	1.1	1.1	1.1	1.1
Percent of Traffic which is Trucks	5%	5%	5%	5%
Value of Time ($ per Hour) for Auto Drivers and Passengers	$6.00	$6.06	$6.12	$12.04
Value of Time ($ per Hour) for Trucks	$20.00	$20.20	$20.40	$40.14
Average Length of Delay in Peak (Minutes)	1.91	1.91	1.91	1.91
Average Length of Delay in Off Peak (Minutes)	2.18	2.18	2.18	2.18
% Peak Traffic Delayed	3.9%	4.0%	4.0%	7.9%
% Offpeak Traffic Delayed	14.5%	14.6%	14.7%	29.0%
Average Daily Cost of Delay to Peak Auto Persons	$78	$80	$83	$630
Average Daily Cost of Delay to Off-Peak Auto Persons	$494	$509	$524	$3,993
Average Daily Cost of Delay to Peak Truck Traffic	$12	$13	$13	$100
Average Daily Cost of Delay to Off-Peak Truck Traffic	$79	$81	$84	$637
Average Days per Year	300	300	300	300
Annual Cost of Delay to Peak Auto Persons	$23,391	$24,100	$24,830	$189,033
Annual Cost of Delay to Off Peak Auto Persons	$148,219	$152,710	$157,337	$1,197,821
Annual Cost of Delay to Peak Truck Traffic	$3,731	$3,844	$3,960	$30,149
Annual Cost of Delay to Off Peak Truck Traffic	$23,639	$24,356	$25,094	$191,040
Cost of Delay per Peak Person in Auto Delayed	$0.19	$0.19	$0.19	$0.38
Cost of Delay per Off-Peak Person in Auto Delayed	$0.22	$0.22	$0.22	$0.44
Cost of Delay per Peak Truck Trip Delayed	$0.64	$0.64	$0.65	$1.27
Cost of Delay per Off Peak Truck Trip Delayed	$0.73	$0.73	$0.74	$1.46
Total Annual Cost of Delay	$198,980	$205,009	$211,221	$1,608,043
Discount	1.00	0.95	0.91	0.03
Present Value of Delay	**$7,841,884**			

Note: Years 2006-2072 are included in the present value of Delay estimate but excluded from this table for presentation purposes

Source: Everglade Economics

Exhibit 6: Summary of Economic Analysis for Providing Two River Crossings with Tunnels instead of Bascule Bridges

Year	Differential Capital Costs	Differential Changes In Operating Costs	Differential Changes in Traffic Congestion	Total Differential Change	Discount Factor	Discounted Net Benefit Stream
2003	(30,000,000)		506,676	(29,493,324)	1.00	(29,493,324)
2004	-		522,028	522,028	0.95	497,170
2005	-		537,846	537,846	0.91	487,843
2006	-		554,144	554,144	0.86	478,690
2007	-		570,935	570,935	0.82	469,709
2008	-		588,235	588,235	0.78	460,897
2009	-		606,059	606,059	0.75	452,250
2010	-		624,423	624,423	0.71	443,766
2011	-		643,344	643,344	0.68	435,440
2012	-		662,838	662,838	0.64	427,271
2013	-		682,922	682,922	0.61	419,255
2014	-		703,615	703,615	0.58	411,389
2015	-		724,936	724,936	0.56	403,671
2016	-		746,902	746,902	0.53	396,098
2017	-		769,534	769,534	0.51	388,667
2018	-		792,851	792,851	0.48	381,375
2019	-		816,876	816,876	0.46	374,220
2020	-		841,628	841,628	0.44	367,199
2021	-		867,130	867,130	0.42	360,310
2022	-		893,405	893,405	0.40	353,551
2023	-	20,000,000	920,476	20,920,476	0.38	7,884,707
2024	-		948,367	948,367	0.36	340,409
2025	-		977,104	977,104	0.34	334,023
2026	-		1,006,711	1,006,711	0.33	327,756
2027	-		1,037,215	1,037,215	0.31	321,607
2028	-		1,068,644	1,068,644	0.30	315,574
2029	-		1,101,025	1,101,025	0.28	309,653
2030	-		1,134,387	1,134,387	0.27	303,844
2031	-		1,168,760	1,168,760	0.26	298,143
2032	-		1,204,175	1,204,175	0.24	292,550
2033	-		1,240,662	1,240,662	0.23	287,061
2034	-		1,278,256	1,278,256	0.22	281,676
2035	-		1,316,988	1,316,988	0.21	276,391
2036	-		1,356,894	1,356,894	0.20	271,206
2037	-		1,398,009	1,398,009	0.19	266,118
2038	-		1,440,371	1,440,371	0.18	261,125
2039	-		1,484,015	1,484,015	0.17	256,226
2040	-		1,528,982	1,528,982	0.16	251,419
2041	-		1,575,312	1,575,312	0.16	246,702
2042	-		1,623,046	1,623,046	0.15	242,074
2043	-	20,000,000	1,672,226	21,672,226	0.14	3,078,446
2044	-		1,722,896	1,722,896	0.14	233,076

Year	Differential Capital Costs	Differential Changes In Operating Costs	Differential Changes in Traffic Congestion	Total Differential Change	Discount Factor	Discounted Net Benefit Stream
2045	-		1,775,101	1,775,101	0.13	228,703
2046	-		1,828,888	1,828,888	0.12	224,413
2047	-		1,884,306	1,884,306	0.12	220,202
2048	-		1,941,402	1,941,402	0.11	216,071
2049	-		2,000,228	2,000,228	0.11	212,018
2050	-		2,060,837	2,060,837	0.10	208,040
2051	-		2,123,283	2,123,283	0.10	204,137
2052	-		2,187,620	2,187,620	0.09	200,307
2053	-		2,253,907	2,253,907	0.09	196,549
2054	-		2,322,203	2,322,203	0.08	192,862
2055	-		2,392,568	2,392,568	0.08	189,243
2056	-		2,465,065	2,465,065	0.08	185,693
2057	-		2,539,759	2,539,759	0.07	182,209
2058	-		2,616,716	2,616,716	0.07	178,791
2059	-		2,696,006	2,696,006	0.07	175,437
2060	-		2,777,697	2,777,697	0.06	172,145
2061	-		2,861,864	2,861,864	0.06	168,916
2062	-		2,948,582	2,948,582	0.06	165,747
2063	-	20,000,000	3,037,927	23,037,927	0.05	1,233,347
2064	-		3,129,979	3,129,979	0.05	159,586
2065	-		3,224,820	3,224,820	0.05	156,592
2066	-		3,322,536	3,322,536	0.05	153,654
2067	-		3,423,212	3,423,212	0.04	150,771
2068	-		3,526,938	3,526,938	0.04	147,943
2069	-		3,633,808	3,633,808	0.04	145,167
2070	-		3,743,916	3,743,916	0.04	142,444
2071	-		3,857,361	3,857,361	0.04	139,771
2072	-		3,974,242	3,974,242	0.03	137,149
2073	-		4,094,666	4,094,666	0.03	134,576
	Sum of total discounted differentials					1,417,717

Source: Everglade Economics