



Wilbur Smith Associates'
Traffic and Revenue Forecasts:
Plenty of Room for Error

Reston Citizens Association
January 27, 2012



January 25, 2012

The Honorable Bob McDonnell, Governor, Commonwealth of Virginia
The Honorable Victor Mendez, Administrator, Federal Highway Administration
The Honorable Sharon Bulova, Chairman, Fairfax County Board of Supervisors
The Honorable Scott York, Chairman, Loudoun County Board of Supervisors
Mr. Michael Curto, Chairman, Metropolitan Washington Airports Authority Board

Dear Honorable Lady and Gentlemen,

The Reston Citizens Association (RCA) is pleased to provide you the attached analysis of the traffic and revenue (T&R) forecasts of Wilbur Smith Associates, Inc. (WSA), now known as CDMSmith, approved by the RCA Board on January 23, 2012. Our examination indicates that WSA has made many very large errors in its forecasts that have been costly to investors, bondholders, governments, and toll road users who have relied on them to approve construction of major toll road projects.

As our recommendations propose, we believe that it is imperative that a second, independent T&R forecast be completed by another forecasting group before any decision is made to move forward with the construction of Phase 2 of the Silver Line. We recommend that the Virginia Department of Transportation take on that task given its expertise and the intention of the Commonwealth to provide \$150 million of state tax revenues to help finance Phase 2 Silver Line construction.

At the same time, we call upon the “funding partners”—MWAA and Fairfax and Loudoun counties—to defer any decision to proceed with Phase 2 until that independent analysis has been completed and substantive differences between the two studies resolved. We also ask that they make the upcoming WSA T&R forecast and the Virginia-sponsored study available to the public as soon as possible, and engage the public in discussion about the merits and means of proceeding before any decision is made.

Finally, we believe the federal government, specifically the Federal Highway Administration, has a longer term obligation to develop through an open and inclusive process a set of “best practices” for T&R forecasting that will set regulatory standards for federal funding—grants, loans, and guarantees—of toll road and other road infrastructure projects.

We believe you will find our attached study comprehensive, disciplined, and balanced in looking at the issue of WSA's previous T&R forecasts and that you will agree with us that it is vital to take the time and invest the money to make sure that you are making a well-informed decision to proceed.

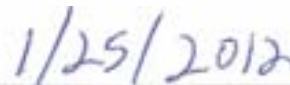
RCA has long supported Metrorail to Dulles, and we still do. We do not, however, support a multi-billion dollar decision to proceed that is less informed than it could and should be and that would see Dulles Toll Road users paying well over half of the total cost of the Silver Line—a cost that will likely run to more than \$14 billion in debt servicing and other obligations over the coming decades. We believe a better understanding of the costs and the possibility of re-allocating those costs more equitably will come from pursuing our recommendations.

We welcome your feedback on our analysis and the opportunity to discuss the T&R forecasting issue with you at a time and place of your convenience. If you have any questions, please contact Terry Maynard, principal drafter of this report, at 703-476-5376 or terrmayn@yahoo.com. In the meantime, we appreciate your taking the time to read our analysis. We believe you will find it compelling.

Respectfully submitted,



Colin Mills, President
Reston Citizens Association
On behalf of the RCA Board of Directors



Date

Distribution:

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Key Findings

- “Optimism bias,” the overestimating of toll road traffic and revenue in forecasts, is endemic in the industry. One industry expert estimated the mean forecast error at 25%-30% above actual traffic based on data from 104 toll roads worldwide.
- A major national study and industry and media research indicate sponsor political bias and profits are key drivers of “optimism bias” in addition to a variety of methodological issues.
- Data in the national study show that, for 26 US toll roads that provided data, the average overestimate of revenues for each toll road for each year of the first five years of operation was 109%—*more than double actual revenues*. Wilbur Smith Associates (WSA) accounted for half the identifiable forecasts, and their results were little different than others’.
- Limited research suggests that there is little difference in the long term accuracy of traffic and revenue forecasts for existing toll roads although results may be better near term.
- We cannot find any recent case in which an existing toll road has absorbed an additional multi-billion dollar debt and succeeded financially. To the contrary, we found that the Pennsylvania and Indiana toll roads face default on recent large debt issuances.
- In four recent cases we examined where WSA toll road traffic and revenue forecasts drove approvals and financing, two toll roads went bankrupt and two went through restructurings with losses to owners and bondholders and additional taxes and/or tolls for residents.
- In two pending toll bridge cases for which WSA has been the forecaster, their forecasts have met with major methodological challenges from local citizens groups. Subsequent forecasts by other consultants indicated WSA’s forecasts were overly optimistic by half or more.
- WSA’s forecasts for the Dulles Toll Road show huge—and unexplained—discrepancies in toll and revenue forecasts between its 2005 and 2009 reports. WSA’s 2009 forecasts for 2030 tolls are nearly quadruple and revenues double those in the 2005 report.
- Along with similar results for other toll roads, analysis of WSA’s forecasts suggests its initial forecasts for a proposed toll road understate the tolls needed to maximize revenues. Later reports tend to overstate traffic demand and revenues.
- WSA used the highest available estimates of population and employment data for Fairfax County in building its two Dulles Toll Road forecasts. Checked against 2010 data, the forecasts for employment were overstated by 25% in the 2005 report and 52% in the 2009 report, contributing to near certain overestimates in the forecast. The same data selection issue appears in other WSA forecasts we reviewed.

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Preface

This report examines the traffic and revenue forecasting work of Wilbur Smith Associates, Inc., (WSA) the company that the Metropolitan Washington Airports Authority (MWAA) has used to prepare two traffic and revenue forecasts. MWAA has asked WSA to conduct a third detailed study as it prepares to seek financing on the bond market for Phase II construction of the Metrorail Silver Line. The statements made about WSA in this report do not attempt to state that its previous forecasts are worse (or better) than its competitors except when specific facts or statistical analysis presented here indicates that may be the case. We have not examined the work of other traffic and revenue forecasting companies and can make no such judgment.*

The vital point to be taken from this assessment is that some of WSA's forecasts—like those of their competitors--contain major overestimates of future toll road traffic demand and revenues, and those inaccuracies have led to financial distress for groups with an interest in particular projects. In the context of a general industry propensity to overestimate traffic and revenues ("optimism bias"), we examine WSA's performance compared with "other" such companies in a small sample statistical analysis, examine the accuracy of the two WSA studies for MWAA, discuss the adverse impacts several of WSA's studies have had on toll road stakeholders, and comment on some current cases in which WSA's forecasts are in dispute.

In the current context, such inaccuracies may lead to poor decisions by MWAA, county, and state, and federal leaders about whether to proceed with the Metrorail Silver Line and who pays and how construction costs should be paid. In particular, with Dulles Toll Road (DTR) users pegged to pick up 54% or more of the line's construction costs—now put at \$3 billion—including 75% of Phase 2 construction costs, we believe it is important that public officials make a judicious decision based on the best information available. We offer some recommendations on how to proceed.

** Last spring, CDM, Inc., acquired Wilbur Smith Associates, Inc. In December, CDM, Inc., changed WSA's brand name to "CDMSmith". We have used Wilbur Smith Associates (WSA) in this report to maintain continuity with the work WSA has done for MWAA on the Dulles Toll Road and for other toll facilities.*

Recommendations

We believe the significant number of cases in which WSA has made major errors in its traffic and revenue (T&R) forecasts, including errors in its forecasts for the Dulles Toll Road, warrants a series of actions before MWAA, Fairfax County, and Loudoun County move to approve construction of Phase 2 of the Silver line. These recommendations involve actions by federal, state, local, and MWAA officials.

US Department of Transportation/Federal Highway Administration

- Do *not* approve TIFIA funding for the Metrorail funding partners until a second independent T&R forecast for the DTR has been prepared by Virginia and any material substantive differences between it and WSA's next forecast have been satisfactorily resolved.
- Longer term, oversee a process involving transportation T&R forecasting practitioners, toll facility operators, toll facility bond financing rating and issuing companies, and appropriate federal, state, and local government transportation officials to develop concrete and transparent national "best practice" standards for the forecasting of toll facility traffic demand and revenue forecasts. Make strict adherence to these "best practices" a requirement for federal funding. If necessary, pursue Congressional legislation to implement these "best practices."

Virginia Department of Transportation

- Conduct an independent T&R study from another T&R consultant to be completed before approval of Phase 2 of Metrorail construction.
- Resolve any substantive material differences between the outside T&R forecast and the new WSA T&R forecast before authorizing the use of state funds on Phase 2.

Dulles Metrorail Funding Partners (Fairfax County, Loudoun County, & MWAA)

- Do *NOT* approve work on Phase 2 of Metrorail until a second Virginia state-sponsored independent T&R forecast has been completed and material substantive issues between it and WSA's forecast have been resolved.
- Present the new (third) WSA DTR T&R forecast to the public as soon as possible for comment and feedback, and well before any consideration of approval of Phase 2 of Metrorail.
- Conduct a public outreach program to elicit community comment on toll, tax, and other issues raised by the possible construction of Phase 2, and adjust the current funding agreement accordingly.

Executive Summary

Wilbur Smith Associates, like other toll road traffic and revenue forecasters, has a record of badly overestimating toll revenues that could lead to major financial risks for the Dulles Toll Road (DTR), MWAA, and Virginia, and much higher tolls for DTR users than it forecasts.

Within a few weeks, Wilbur Smith Associates (WSA), a South Carolina-based toll facility consulting firm, will complete the third in a nearly decade-long series of traffic and revenue (T&R) forecasts on the Dulles Toll Road (DTR). This new study will be of vital importance to Restonians and other area toll road users because:

- It is intended to be the financial justification for the “funding partners”—Metropolitan Washington Airports Authority (MWAA), Fairfax County, and Loudoun County—to proceed with construction of Phase 2 of the Silver Line.
- It will detail the major DTR debt servicing and other financial obligations required to fund the Silver Line over the next 40-50 years.
- It will describe the large toll hikes DTR users will face during this time.

Based on the most current estimates of projected cost of Silver Line construction, we anticipate that the construction of Phase 2 of the Silver Line, combined with the ongoing construction of Phase 1, will generate a debt service and toll road operation and maintenance payments totaling some \$15 billion over the next 40 years or so if construction of Phase 2 proceeds as planned. If this obligation is undertaken, Dulles Toll Road users are likely to see one-way full distance tolls rise to \$15-\$20 or more within 20 years—a massive increase over current tolls and a three- to four-fold increase in “real dollar” terms.

Given the importance of the forthcoming WSA study in informing decision makers and the public about future toll road costs, the Reston Citizens Association (RCA) believes it is important to examine the reliability of toll road traffic and revenue forecasts and, more specifically, that of WSA. To give that look some perspective, we put it the context of issues surrounding “optimism bias” in T&R studies as documented by the National Academy of Sciences (NAS).

“Optimism bias” has become a well-documented phenomenon in travel demand and revenue forecasts for toll roads. The problem is severe enough that the National Academy of Sciences’ Transportation Review Board asked the National Highway Cooperative Research Program (NHCRP) to conduct a “synthesis” study of best practices in the field. The report analyzed the causes of the phenomenon—a combination of methodological and study sponsor bias issues combined with a disconnect with the financial community—and suggested some solutions.

Unlike the toll roads in the NHCRP study, the Dulles Toll Road (DTR) has been a successful toll road for more than a quarter century, and the popular view is that forecasts for existing toll roads tend to be more accurate than for new ones. We would argue that adding \$3 billion of new Metrorail construction debt to the DTR without enhancing its ability to handle traffic is, in

effect, the same as financing an additional toll road. In two current cases where toll road operators have added huge new debts to existing toll roads—\$5.8 billion for the Pennsylvania Turnpike and \$3.0 billion for the Indiana Toll Road—both are nearing default after a half-dozen years. In fact, we can find no recent examples where large new debt on a toll road for capital investment in another major transportation infrastructure project has succeeded financially. While research in comparing the accuracy of revenue forecasts for new vs. existing is limited, work by Robert Bain, one of the world’s foremost toll road forecasting experts, indicates that the two tend toward the same degree of error over time, although short-term results may be better for existing toll roads.

Bain has pointed to the cause of these endemic overestimates in an article aptly titled, “Big Numbers Win Prizes.” He begins his article:

A number of high profile investor financed toll roads around the world are currently failing to meet expectations. This has less to do with the present economic climate and more to do with a market readiness to be seduced by hopelessly optimistic traffic and revenue projections; with lenders relying too heavily on elaborate transaction structuring for protection. The time is right for a paradigm shift with a renewed emphasis placed on understanding the demand fundamentals and less willingness to accept forecasts at face value – especially those that resemble statements of advocacy rather than unbiased predictions...¹

A series of articles in the Denver Post in May 2006 provided some specific examples of this overestimating phenomenon for several US toll roads, some of which involved WSA, which are documented in this report.

An examination of the data provided in the NHCRP study mentioned above points to the huge forecasting errors in the first five years of operation for 26 toll roads. When the “actual performance” data in Table 1 of that report is converted to measures of forecast error, the results were an average forecast overestimate of 109%—more than double—for each road for each of the first five years of operation. While WSA’s forecasts were marginally better than its competitors on average (118% vs. 127% overestimates for 24 identifiable forecasts), the forecasts of the other companies improved over the five-year horizon of the database, and WSA’s forecasts did not. They all were clearly inadequate for planning future toll road revenues, financing, and toll rates.

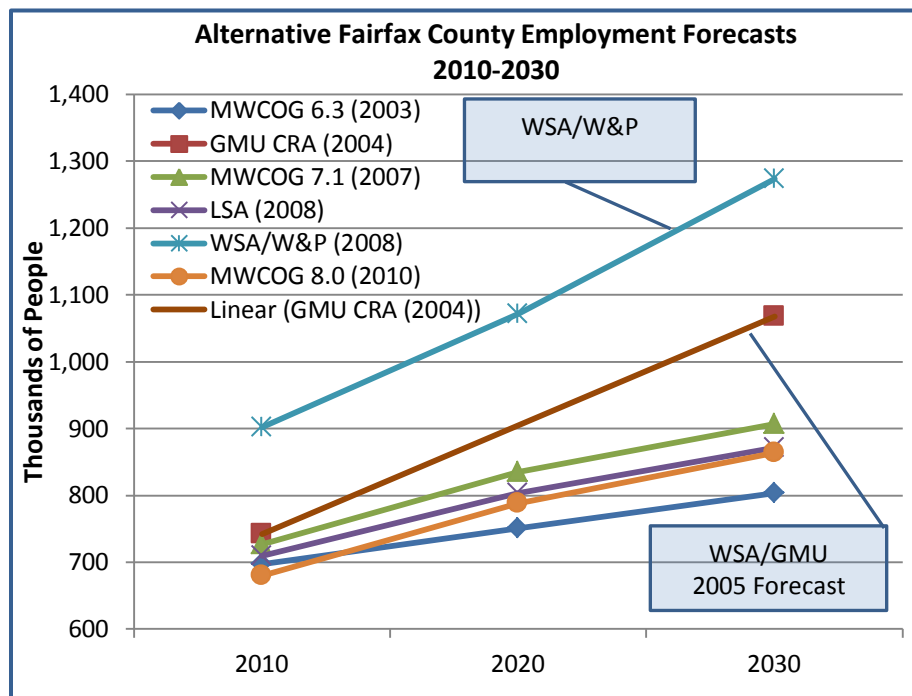
Four case studies of WSA toll road T&R forecasts indicate that WSA’s overestimates have had major adverse impacts on toll road owners and operators in the subsequent years of operation. In two of the studies, the toll roads went into bankruptcy within a decade. In all four cases, bondholders took substantial losses; equity investors lost most of their value if they were not wiped out in distress sales; and the necessary restructuring added tens, if not hundreds, of

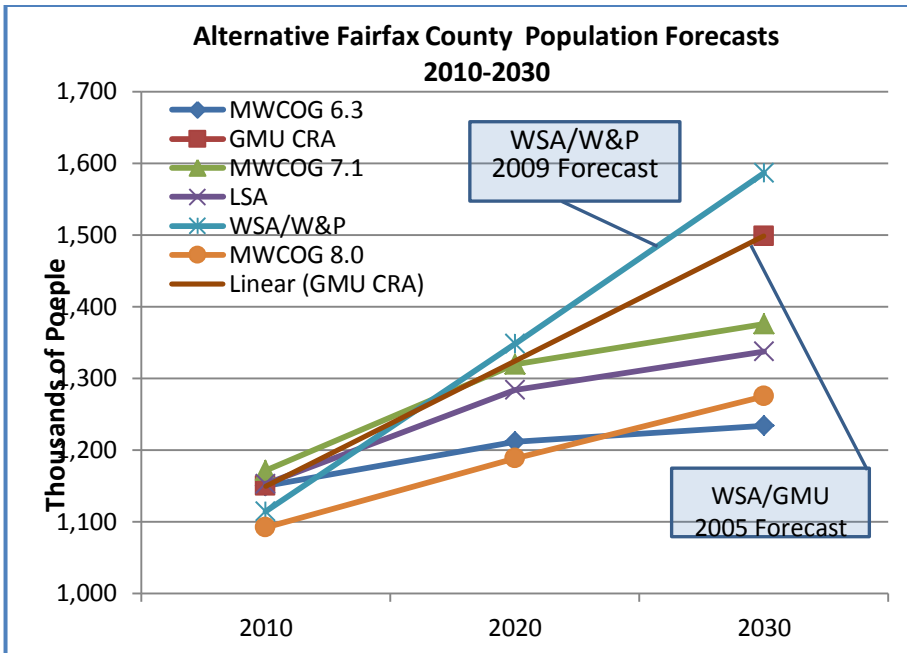
¹ “Big Numbers Win Prizes: Twenty-One Ways to Inflate Toll Road Traffic & Revenue Forecasts,” Robert Bain, Project Finance International, Issue 406, 8 April 2009, Thomson Reuters, London.

millions to debt servicing costs over extended payment periods for state and local jurisdictions. Toll road users were often forced to absorb those extra costs through higher tolls.

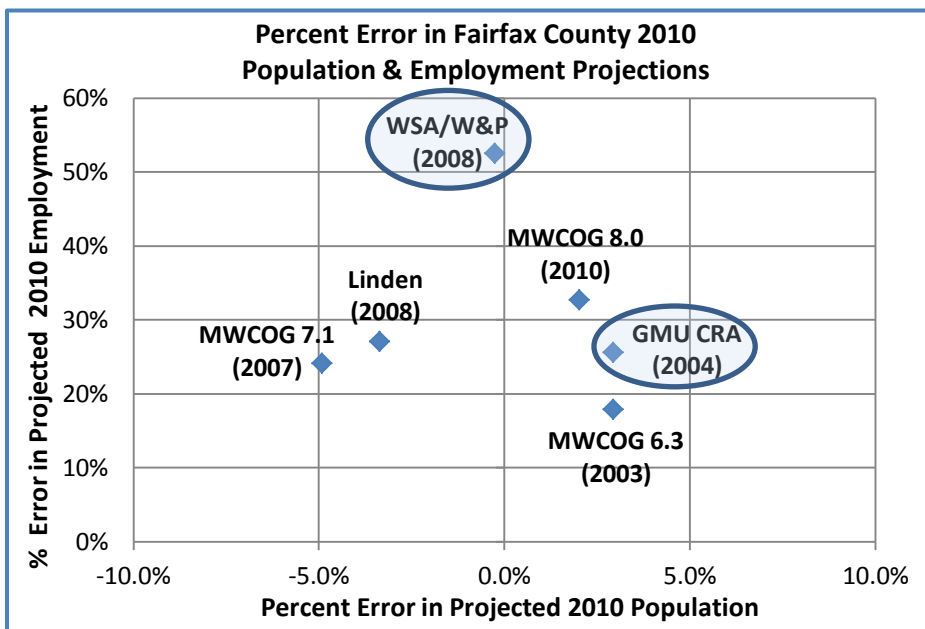
We also looked at two pending toll bridge cases, one in Michigan, the other in Alaska, in which WSA has offered forecasts that are disputed by other consultants, industry insiders, and local citizens groups. In Alaska, local citizens groups have highlighted WSA’s overestimates of area population and employment growth over the next several decades. These support higher traffic and revenue outputs in WSA’s T&R forecasts. In Michigan, Halcrow Group—a British toll road forecasting consulting company—forecast traffic and revenues for a proposed bridge to Windsor, Ontario, at running less than half of those forecast by WSA. In both cases, most observers expect large public funding will be required to launch construction and guarantee long-term debt servicing payments. There have been no final decisions to proceed.

We then took a closer look at WSA’s T&R forecasts for traffic and revenue on the Dulles Toll Road. On the input side, we examined the population and employment growth forecasts for Fairfax County used in each study. Our results indicate that WSA used the most aggressive available population and employment forecasts in both cases—one by GMU’s Center for Regional Analysis for its 2005 forecast and one by Woods & Poole, Inc., for its 2009 forecast. It chose these over the then-current and more accurate Metropolitan Washington Council of Governments (MWCOG) forecasts in both cases, and its 2009 report actually disregarded the socio-economic forecast provided by its forecaster, Linden Street Associates (Alexandria), which discounted the MWCOG estimates, in favor of the more aggressive Woods & Poole forecast.

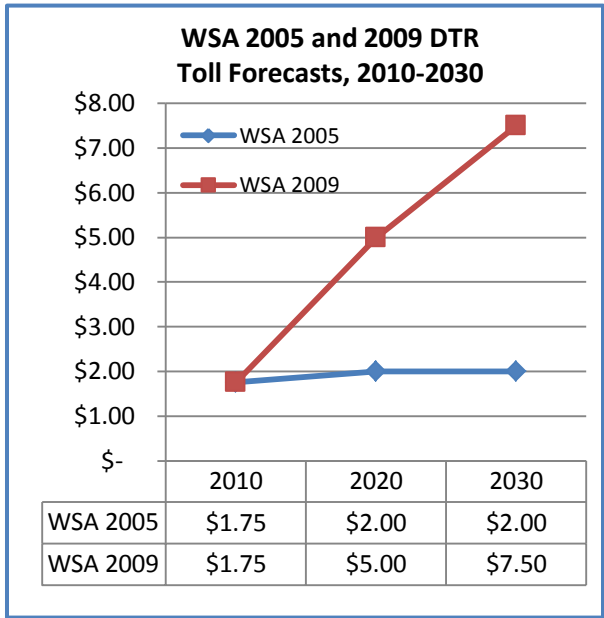
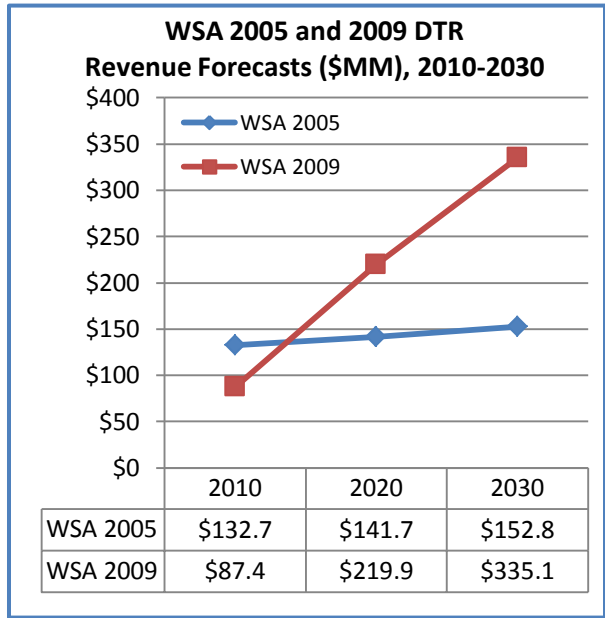




WSA’s use of the most aggressive population and employment forecasts led to mixed results when they were compared with 2010 US Census information—the only data point that can be checked at this time. We discovered that all the population forecasts, including WSA’s, were within five percentage points of accurately forecasting Fairfax County population (including the City of Fairfax and the Town of Falls Church) in 2010. On the other hand, the WSA employment forecast for 2009 had the greatest error among the available 2010 employment forecasts (52%-some 300,000 employees) among those available by a considerable margin. And WSA’s 2005 forecast overestimated 2010 employment by 25%.



Examining the results of WSA’s two DTR T&R forecasts can best be described as perplexing because of the immense difference in their results. WSA reports a doubling of revenues and a near quadrupling of tolls for 2030 in its 2009 forecast as can be seen in the tables below. Neither WSA nor MWAA has offered an explanation for the massive difference in these forecasts. Nonetheless, it appears that WSA, on behalf of its 2005 VDOT client, was trying to minimize the toll rate and revenue impacts of Metrorail construction as VDOT entered into negotiations to transfer the management concession to MWAA. An agreement between VDOT and MWAA in late 2006 gave MWAA operating control of the Dulles Toll Road.



The discrepancies apart, we believe that both forecasts are flawed in forecasting 2030 tolls and revenues.

- We doubt that revenues will peak at a toll of \$2.00, even if that is adjusted for inflation (about \$3.25 in 2030 at 2.5% inflation—the rate used by WSA), as projected by the 2005 forecast.
- We doubt that as many toll road users would be willing to pay a \$7.50 one-way toll (2030 dollars —about twice the current toll in “real” dollars) as WSA forecasts in its 2009 study.

Our examination of population and employment input data used by WSA in several forecasts indicates that it virtually always used the most optimistic data available in its forecasts. This includes its 2005 and 2009 forecasts for the Dulles Toll Road. The results indicate a major overestimate of employment in Fairfax County in 2010, the only year against which we can validate WSA’s forecast. The same argument holds true when looking at the series of forecasts prepared in the ongoing Knik Arm Toll Bridge plan in Anchorage, Alaska. WSA claims that its three studies have their base in work done by the state’s demographic expert organization, the

University of Alaska, Anchorage, Institute for Socio-Economic Research (ISER). Yet WSA never shows its use of the work in its forecasts and ISER has challenged the validity of WSA's claim.

Our review of WSA's forecasting indicates that WSA has made numerous and substantial errors in overestimating future traffic demand and revenues on many toll roads, including the Dulles Toll Road, and often used questionable data inputs. Our concern is that WSA's forthcoming toll and revenue forecast of the Dulles Toll Road for its client, MWAA, will embed a similar large overestimate of toll road traffic and revenues. Such an overestimate implies a substantial future financial risk for the Dulles Toll Road, and WSA's past overestimates calls into question moving ahead with Phase 2 under the existing financial plan.

Based on our analysis, we believe that the consistent, large overestimates of future toll revenues we have observed in WSA's forecasts creates a substantial risk to the viability of the current financial plan for Metrorail's Silver Line and the Dulles Toll Road. The risk in WSA's overestimates comes in five ways:

- The risk that the financial community will not fund MWAA's Dulles Toll Road debt or require state or federal guarantees or funding for an investment grade rating.
- The risk that toll rates would need to double those forecast by WSA to meet debt servicing and other expenses.
- The risk that the higher toll rates on the Dulles Toll Road as forecast by WSA--or possibly double those forecasts--will limit the economic development potential of the Dulles Corridor as well as force traffic on to already congested nearby roads.
- The risk that MWAA would have to use airport revenues to pay Dulles Toll Road debt servicing obligations.
- The risk that MWAA may default or need to restructure its debt servicing agreements, resulting in more debt over a longer period and even higher tolls for toll road users.

Recommendations

We believe the significant number of cases in which WSA has made major errors in its traffic and revenue (T&R) forecasts, including errors in its forecasts for the Dulles Toll Road, warrants a series of actions before MWAA, Fairfax County, and Loudoun County move to approve construction of Phase 2 of the Silver line. These recommendations involve actions by federal, state, local, and MWAA officials.

US Department of Transportation/Federal Highway Administration

- Do *not* approve TIFIA funding for the Metrorail funding partners until a second independent T&R forecast for the DTR has been prepared by Virginia and any material substantive differences between it and WSA's next forecast have been satisfactorily resolved.
- Longer term, oversee a process involving transportation T&R forecasting practitioners, toll facility operators, toll facility bond financing rating and issuing companies, and appropriate federal, state, and local government transportation officials to develop concrete and transparent national "best practice" standards for the forecasting of toll facility traffic demand and revenue forecasts. Make strict adherence to these "best practices" a requirement for federal funding. If necessary, pursue Congressional legislation to implement these "best practices."

Virginia Department of Transportation

- Conduct an independent T&R study from another T&R consultant to be completed before approval of Phase 2 of Metrorail construction.
- Resolve any substantive material differences between the outside T&R forecast and the new WSA T&R forecast before authorizing the use of state funds on Phase 2.

Dulles Metrorail Funding Partners (Fairfax County, Loudoun County, & MWAA)

- Do *NOT* approve work on Phase 2 of Metrorail until a second Virginia state-sponsored independent T&R forecast has been completed and material substantive issues between it and WSA's forecast have been resolved.
- Present the new (third) WSA DTR T&R forecast to the public as soon as possible for comment and feedback, and well before any consideration of approval of Phase 2 of Metrorail.
- Conduct a public outreach program to elicit community comment on toll, tax, and other issues raised by the possible construction of Phase 2, and adjust the current funding agreement accordingly.

Introduction

Within a couple of months, Wilbur Smith Associates (WSA), a South Carolina-based toll facility consulting firm, will complete the third in a nearly decade-long series of traffic and revenue (T&R) forecasts on the Dulles Toll Road (DTR). This new study will be of vital importance to Restonians and other area toll road users because:

- It is intended to be the financial justification for the “funding partners” —MWA, Fairfax County, and Loudoun County—to proceed with construction of Phase 2 of the Silver Line.
- It will detail the major DTR debt servicing and other financial obligations required to fund the Silver Line over the next 40-50 years.
- It will describe the massive toll hikes DTR users will face during this time.

Based on the most current estimates of projected cost of Silver Line construction, we anticipate that the construction of Phase 2 of the Silver Line, combined with the ongoing construction of Phase 1, will generate debt service and toll road operation and maintenance payments totaling over \$14 billion over the next 40 years or so if construction proceeds. If this obligation is undertaken, Dulles Toll Road users may see one-way full length tolls rise to \$15-\$20 or more within 20 years—an order of magnitude increase in current tolls—even in the absence of financial restructuring.

Given the importance of the forthcoming WSA study in informing decision makers and the public about future toll road costs, we believe it important to examine the reliability of toll road traffic and revenue (T&R) forecasts and more specifically the work of WSA. To give that examination some perspective, we put it the context of issues surrounding “optimism bias” in T&R studies as documented by the National Academy of Sciences (NAS) and others.

Dulles Toll Road users may see one-way full length tolls rise to \$15-\$20 or more late in the debt cycle—an order of magnitude increase in current tolls—even in the absence of financial restructuring.

“Optimism Bias” in T&R Studies

Researchers—including those in the toll consulting industry—have documented the “optimism bias” in T&R forecasts for a number of years; that is, their propensity to forecast more traffic and higher revenues than subsequent experience demonstrates. The results are not purely academic: In some cases with devastating consequences, toll roads have defaulted on their bonds, bondholders have taken losses in restructurings, taxpayers have been forced to take on debt that should have been paid by toll revenues, and toll rates have escalated to try to compensate for the low level of traffic—often without success. All of this underlines the importance of reviewing such studies critically ahead of any decision to proceed.

In a 2009 research paper, Robert Bain, an international toll road forecasting consultant and lead author of a 2002-2005 series of reports by Standard & Poors on toll road forecasting, pulled together research results from a variety of industry and academic research on toll road forecasting issues. Using the database of more than 100 worldwide toll roads the S&P studies, he calculated that revenues were .77 of forecast expectations—a 30% forecast overestimate—in the first year and improved only marginally in the initial five years, never better than .80 of forecast expectations—a 25% forecast overestimate.² This range appears to be the generally accepted average of toll road forecast “optimism bias.”

The National Highway Cooperative Research Program (NHCRP) Synthesis Study

The problem was of sufficient urgency that the NAS Transportation Research Board commissioned a “synthesis” study of the problem through its National Highway Cooperative Research Program (NHCRP). The result was a 2006 report, [Estimating Toll Road Demand and Revenue: A Synthesis of Highway Practice](#), which states the core problem as follows:

For toll facilities to be financially viable and/or attractive to potential investors (public-private partnerships, etc.) in the future, the facility must be seen to be able to generate sufficient revenue from operations to cover debt service cost, and potentially other project and maintenance costs over the lifetime of the facility. This requires a reliable and credible forecast of the expected revenues, which are functions of the estimated traffic demand and toll rates for the facility. However, in the past, industry experience in the toll demand forecasts upon which these are based have been quite varied, in that demand (and the accompanying revenues) has ranged from overestimated in many cases to occasionally underestimated. In addition, the accuracy of when specific levels of demand are projected to occur has been mixed, with problems being particularly acute in the short-term facility ramp-up period. The resultant variations have had significant impacts on both the actual revenue streams and on the facility’s

² [“Error and Optimism Bias in Toll Road Forecasts,”](#) *Transportation*, Vol. 36, No. 5, September 2009, Springer, Netherlands, pp. 4 & 6-8. Mr. Bain’s writings are available at <http://www.robbain.com/articlesandpapers.htm>.

debt structuring and obligations. This has led to concerns among facility owners and the financial community (which rates and insures and/or invests the bonds that are issued for the facility's implementation) about the accuracy, reliability, and effectiveness of the demand forecasts upon which the revenue projections are based.

The focus of the report's analysis is the comparison of the forecasts and results for the first five years of operation of 26 US toll roads. The report makes the following comments about these toll roads (pp. 20-22, emphasis added), reflected in the following table:

- ***The results do not improve with newer facilities***, which might have been expected given that the state of the practice in modeling generally is improving. The performance does not necessarily improve for a given authority [i.e., even as a history of models and forecasts is built up by (or for) a given authority, the performance does not necessarily improve as a new facility is planned].
- ***There is little consistency by year within a given facility***, although the performance for some facilities improves when traffic and revenue forecasts are updated, based on actual in-operation performance. (The most recently opened facilities are too new to have recorded data for any but the initial year or two).
- ***Most of the results demonstrate an underperformance*** (actual is lower than projected), albeit with some notable exceptions. However, the under/over-performance may vary within a given facility by year.
- ***At least some of the results reflect updated forecasts*** (although the existence of updates may not have been noted in the source material). This is corroborated by the survey of practitioners: In response to poor initial performance, some respondents indicated that their model was recalibrated or the model networks were reconfigured; the demand forecasts or the revenue forecasts were revised. Other responses included revisions to the financial schedule, changes to the staging or timing of the project, or the implementation of annual updates and peer reviews. On the other hand, several respondents noted that the forecasts were accepted and used as is (i.e., no impact).
- ***Even with the availability of updated forecasts, only a small number of projections are within 10% of the actual revenues***. These are indicated in bold type in the table.

**TABLE 1
ACTUAL REVENUE AS PERCENTAGE OF PROJECTED RESULTS OF OPERATION**

Authority/Facility	Year of Opening	Year 1	Year 2	Year 3	Year 4	Year 5
Florida's Turnpike Enterprise/Sawgrass Expressway (6)	1986	17.8%	23.4%	32.0%	37.1%	38.4%
North Texas Tollway Authority/Dallas North Tollway (6)	1986, 1987	73.9%	91.3%	94.7%	99.3%	99.0%
Harris County Toll Road Authority (Texas)/Hardy (6)	1988	29.2%	27.7%	23.8%	22.8%	22.3%
Harris County Toll Road Authority (Texas)/Sam Houston (6)	1988, 1990	64.9%	79.7%	81.0%	83.2%	78.0%
Illinois State Toll Highway Authority/Illinois North South Tollway (6)	1989	94.7%	104.3%	112.5%	116.9%	115.3%
Orlando-Orange Expressway Authority/Central Florida Greenway North Segment (6)	1989	96.8%	85.7%	81.4%	69.6%	77.1%
Orlando-Orange Expressway Authority/Central Florida Greenway South Segment (6)	1990	34.1%	36.2%	36.0%	50.0%	NA
Oklahoma Turnpike Authority/John Kilpatrick (3)	1991	18.0%	26.4%	29.3%	31.4%	34.7%
Oklahoma Turnpike Authority/Creek (3)	1992	49.0%	55.0%	56.8%	59.2%	65.5%
Mid-Bay Bridge Authority (Florida)/Choctawhatchee Bay Bridge (38,39)	1993	79.8%	95.5%	108.9%	113.2%	116.7%
Orlando-Orange Expressway Authority/Central Florida Greenway Southern Connector (6)	1993	27.5%	36.6%	NA	NA	NA
State Road and Tollway Authority (Georgia)/GA 400 (3)	1993	117.0%	133.1%	139.8%	145.8%	141.8%
Florida's Turnpike Enterprise/Veteran's Expressway (3)	1994	50.1%	52.9%	62.5%	65.0%	56.8%
Florida's Turnpike Enterprise/Seminole Expressway (3)	1994	45.6%	58.0%	70.7%	78.4%	70.1%
Transportation Corridor Agencies (California)/Foothill North (3)	1995	86.5%	92.3%	99.3%	NA ¹	NA ¹
Osceola County (Florida)/Osceola County Parkway (3)	1995	13.0%	50.7%	38.5%	40.4%	NA
Toll Road Investment Partnership (Virginia)/Dulles Greenway (3)	1995	20.1%	24.9%	23.6%	25.8%	35.4%
Transportation Corridor Agencies (California)/San Joaquin Hills (3)	1996	31.6%	47.5%	51.5%	52.9%	54.1%
North Texas Tollway Authority/George Bush Expressway (3)	1998	152.2%	91.8%	NA	NA	NA
Transportation Corridor Agencies (California)/Foothill Eastern (3)	1999	119.1%	79.0%	79.2%	NA ¹	NA ¹
E-470 Public Highway Authority (Colorado)/E-470 (3)	1999	61.8%	59.6%	NA	95.4% ²	NA ³
Florida's Turnpike Enterprise/Polk (3)	1999	81.0%	67.5%	NA	NA	NA
Santa Rosa Bay Bridge Authority (Florida)/Garcon Point Bridge (42,43)	1999	32.6%	54.8%	50.5%	47.1%	48.7%
Connector 2000 Association (South Carolina)/Greenville Connector (3)	2001	29.6%	NA	NA	NA	NA
Pocahontas Parkway Association (Virginia)/Pocahontas Parkway (44,45)	2002	41.6% ⁴	40.4%	50.8%	NA	NA
Northwest Parkway Public Highway Authority (Colorado)/Northwest Parkway (46,47)	2004	60.5%	56% ⁵	NA	NA	NA

Sources are cited in parentheses.

Notes: Bold type reflects actual within 10% of projected. NA = traffic and revenue report not available or not provided.

¹For these years, the Transportation Corridor Agencies combined the revenues (earnings) for the two facilities (Foothill North and Foothill Eastern). Accordingly, the individual performance for the two facilities cannot be calculated.

²Data reflect updated traffic and revenue study (40,41).

³Incomplete information (missing November and December).

⁴This is approximated owing to construction delays that only allowed the facility to be open for one-quarter of the expected full year.

⁵Projected performance for the 2005 fiscal year (48).

In brief, what the table shows is that the revenue forecasts for these 26 toll roads *overestimated* revenues by 109% on average each year for the first five years of operation—*more than double the actual revenues*--an amount that would have a decisive impact on the ability to service toll road debt obligations.³

... the revenue forecasts for these 26 toll roads (in the NHCRP study) overestimated revenues by 55% on average each year for the first five years of operation, an amount that would have a decisive impact on revenues and the ability to service toll road debt obligations.

The report draws a number of conclusions, primarily focused on methodological issues, but it also states (p. 41, emphasis added):

- *According to the literature, **questions regarding the performance of the models and forecasts have been posed mainly by the financial community, rather than by the transportation modeling community** (with some notable exceptions). The latter community has focused on improving the methodological basis of modeling and its underlying data, as demonstrated by the extensive literature and research on the topic. However . . . this emphasis has not generally rectified the performance problems. In other words, this suggests that **there is a disconnect between the developers of the models and their users**, with the latter having evolved from the traditional decision makers to those with different or more rigorous decision-making criteria.*
- *In turn, this suggests that **those in the transportation community who are making investment decisions regarding tolled facilities do not always know which questions to ask of their modeling and forecasting efforts—in other words, the analytical and modeling capabilities available to them have not always kept pace with the needs**. This was demonstrated by the large number of explanations that were cited in the literature and in the survey as causes of performance failures. In some cases, the explanations were contradictory; in particular, the financial community cited application as a key problem, whereas survey respondents cited model method as the problem. This can be explained in part by the relative newness of toll roads in some parts of the country and the corresponding lack of a long-term performance history. It also can be explained by the changing nature of the*

³ Throughout this study, we report the difference between forecasted and actual traffic and revenues as the “forecast error”—the percent error in the estimate over actual revenues, usually an overestimate. This is consistent with the focus of this paper on forecast overestimates although many sources report this difference as a real underperformance. The error is not in the reality reality, it is in the forecast—the focus of this report.

*tolled facilities, in which parts of a facility (i.e., individual lanes) are now being tolled: this changes the analytical requirements significantly. **The problem is exacerbated by the “confidential” or “proprietary” nature of the forecasts and methods that are developed for toll roads, and also by “optimism bias” on the part of the sponsor, local elected officials, or other advocates of the proposed toll road.***

A review of the toll road forecasting literature prepared by two researchers at the University of Texas sums it up this way:

“What this (*discussion*) suggests is that projects with greater uncertainty (and thus risk) overestimate initial traffic volumes by a greater amount, on average, experience a longer ramp-up duration (to reach stable volumes), and stabilize at lower final traffic volumes (versus predictions). Moreover, the magnitude of risk is greater for projects not commissioned by banks (*e.g.*—MWAA), which is not so surprising given that banks are much more directly accountable for investors’ monies than are public agencies (*such as* MWAA). Moreover, other project commissioners (public agencies, interest groups, and bidders) may have interests that are best served when predicted traffic volumes are high (Bain and Wilkins 2002).⁴

In short, there is strong reason to expect “optimism bias” in T&R forecasts sponsored by groups that would benefit from upwardly biased forecasts to garner needed official and financing approvals.

T&R Forecasting for Existing Toll Roads

In general, one would expect T&R forecasts for established toll roads would be more accurate than those for new roads because of the availability of a history of relevant data showing responses in toll road use to changes in tolls, employment, population, alternative routes, and other factors that drive forecast calculations. For example, the Dulles Toll Road (DTR) has more than a quarter century of tolling experience that reflects the many changes—largely toward urbanization and increased traffic handling capacity—in suburban northern Virginia.

Looking at the Dulles Metrorail project, the first question to ask is whether adding the large costs of new railroad construction to the costs of operating a toll road is really the same as T&R forecasting for an existing toll road alone. MWAA’s latest projections indicate MWAA needs to issue more than \$3 billion in debt, plus reserve and financing costs, to finance the full construction of the Silver Line, all of which will be paid for by DTR users over at least the next 40 years at a debt servicing cost of well more than \$15 billion.

⁴ [“Understanding and Accommodating Risk and Uncertainty in Toll Road Projects: A Review of the Literature,”](#) Jason D. Lemp & Kara M. Kockelman, University of Texas (Austin), *Transportation Research Record: Journal of the Transportation Research Board*, January 11, 2010, p.4.

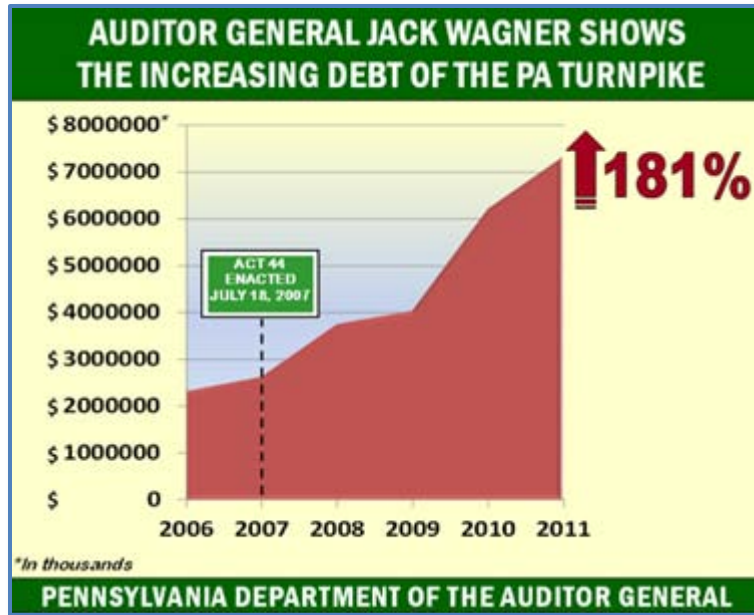
Such a massive addition of debt servicing requirements will almost certainly lead to a ten-fold increase in DTR tolls—actually, nine-fold in WSA’s 2009 forecast—to more than \$20 each way in an accurate forecast. We would argue that, in effect, the forecasting risks under these circumstances are likely to be as high as those in forecasting for a new toll road. From an economics perspective, while the elasticity of demand for use of the DTR may remain relatively

Such a massive addition of debt servicing requirements will almost certainly lead to a ten-fold increase in DTR tolls—actually, nine-fold in WSA’s 2009 forecast—to more than \$20 each way in an accurate forecast.

constant over small toll rate increases, that is, a known increase in tolls will result in a reasonably accurate forecast of demand loss and, in turn, generate a reasonably accurate revenue forecast. The massive increases in inflation-adjusted tolls—even over time—to meet DTR debt servicing obligations will cause a substantial increase in elasticity, meaning fewer people will use the toll road (by diverting to alternative roads or to the Metrorail service) and toll revenues could actually begin to fall.

And the threat of forecast overestimates need not be limited to the long term. The recent record of having one toll road pay the substantial expenses of other transportation facilities shows that this can be risky within a very few years. Within the last month, the Pennsylvania state auditor general has informed the Turnpike Commission that the Turnpike—which has been in successful operation for more than 75 years—is nearly bankrupt. A news release from the Auditor General’s office state: “Auditor General Jack Wagner warned today (*January 5, 2011*) that Pennsylvania taxpayers could be on the hook for billions of dollars of additional debt if the General Assembly does not soon amend or appeal Act 44 of 2007, which requires the Turnpike Commission to provide \$450 million a year in infrastructure funding to the Pennsylvania Department of Transportation. . . Wagner’s letter noted that, like the City of Harrisburg and Jefferson County, Ala., the Pennsylvania Turnpike was in danger of becoming financially insolvent and defaulting on its debt obligations.”⁵ Under Act 44, the Turnpike Commission is required to make annual payments of \$450 million to PennDOT for 46 more years without a new revenue source. This annual payment would add at least \$20 billion in additional debt to the Pennsylvania Turnpike Commission. If the Commission were to default on the obligations then Pennsylvania taxpayers would be required to assume the Turnpike Commission’s debt obligations.”

⁵ [“Auditor General Jack Wagner Says Debt-Ridden Pa. Turnpike Commission’s Existence is in Jeopardy,”](#) News Release, Office of the Pennsylvania Auditor General, January 5, 2012.



Pennsylvania Act 44 saddled the turnpike with the costs of maintaining other state highways and some public transit, including in Pittsburgh and Philadelphia. Transfers to the Pennsylvania DOT have been averaging about \$750 million per year since 2008. To enable itself to do this, the Turnpike created an additional \$5.3 billion in debt above its then-existing \$2.9 billion debt. The Turnpike has also kept O&M steady and raised tolls 25% to meet its higher debt obligations. TOLLROADnews reports, “But interest on burgeoning debt has more than consumed that extra cash flow. Net interest expense has shot up from \$70m/year in 2007 to \$290m/year in 2011. The Turnpike was breaking even in 2007, but now is losing \$170m a year - before making any of these huge payouts to PennDOT.”⁶ Such an outcome for a well-established interstate turnpike does not bode well for the addition of some \$3 billion in debt to the Dulles Toll Road to be paid by toll road users in our view.

A similar situation may be emerging for the Indiana Toll Road (ITR), another long established tollway that was leased for 75 years to a private consortium comprising MacQuarie (Australia) and Cintra (Spain), two huge transportation infrastructure management companies, for \$3.8 billion—the highest bid by \$1 billion. The partners created Statewide Mobility Partners LLC (SMP) to operate the concession as equal partners, each investing about \$380 million and together borrowing more than \$3 billion. In the run up to the 2006 sale, the state auditor valued the road at \$1.9 billion and sought two T&R forecasts, one by WSA. (It is not clear that SMP used in the WSA forecast in its bidding and financing plan; it probably conducted its own.) The second forecast by “Crowe Chizek & Co assumed much smaller debt by the concessionaire and higher equity - about one tenth the debt (SMP) actually assumed. Debt service was put at a mere \$24.8m in 2010 versus the actual \$268m in interest.”⁷

⁶ [“Pennsylvania Turnpike 'drowning in debt,' faces bankruptcy if legislature doesn't repeal imposts - state auditor general,”](#) TOLLROADSnews, #5689.

⁷ [“London news wire says Indiana TR concession in financial trouble,”](#) TOLLROADSnews, June 26, 2011, #5371.

Sold by Indiana at the peak of the global economic expansion, toll road traffic on the ITR was running at about 35% below forecast and revenues about 17% below forecast by 2010, according to [TOLLROADSnews](#).⁸ It reports, “Debtwire, a London Financial Times wire service claims the Indiana Toll Road Concession Company (ITRCC) is in danger of defaulting on its debt as early as the first months of next year (2012). The wire says ITRCC has been rapidly ‘burning through’ an interest reserve account which threatens to put it out of compliance with reserve provisions of its \$4.1b in bonds.”⁹ Similarly, Bloomberg reported that, while toll road revenues had doubled since the takeover:

“The venture is meeting its debt obligations only by borrowing more money, and may default before loans mature in 2015, according to disclosures for a 2010 public offering of Macquarie Atlas Roads Group (MQA) . . .

Macquarie Atlas Roads’ 2010 prospectus says revenue from the highway is “expected to remain insufficient to cover debt service obligations over the medium term.”

A \$150 million line of credit had about \$71.5 million left as of Dec. 31, according to Statewide Mobility Partners’ 2010 financial statement.

“These reserves may be insufficient to support the project until the existing debt facilities mature in June 2015,” the prospectus said. “Should this occur, any default under the loan documents may lead to lender actions which may include foreclosure of the project assets or bankruptcy.”

The banks probably will extend the terms of the loan rather than allow a default, said John Schmidt, a Chicago-based attorney with Mayer Brown LLP who worked on the Indiana Toll Road project.¹⁰

Like the Pennsylvania Turnpike, the addition of several billion dollars in new debt on a well-established toll road has put the financial future of the road and its concessionaires at risk. **In fact, we have been unable to identify any situation in which the addition of multi-billion dollar debt to an operating toll road has succeeded although we do not discount the possibility.**

Despite this anecdotal evidence of the failure of newly debt-burdened toll roads, there is little systematic research available comparing the accuracy of T&R forecasts for new vs. existing toll roads. Reporting by Robert Bain in a recent article surveying practitioners of traffic forecasting—consultants, government officials, and academics/researchers—suggests that they

⁸ Ibid.

⁹ Ibid.

¹⁰ [“Indiana Road Burdened by Debt Reveals Public-Private Risks,”](#) Carol Wolf, Bloomberg, June 27, 2011.

do not believe that their forecasts for existing roads are substantially more accurate than those for new toll roads over the longer term.¹¹ He conducted a survey of practitioners via a professional journal asking for their assessment of the reasonableness of traffic forecasts in four scenarios (tolled and toll-free, new and existing) over four timeframes. He received responses from 48 practitioners (two of whom were discounted as extreme “outliers”) reporting their view of the level of confidence (“reasonableness”) in traffic demand forecasts.

**Practitioners’ Assessment of Traffic Forecast Reasonableness
(Confidence Interval, omitting outliers): New vs. Existing Roads**

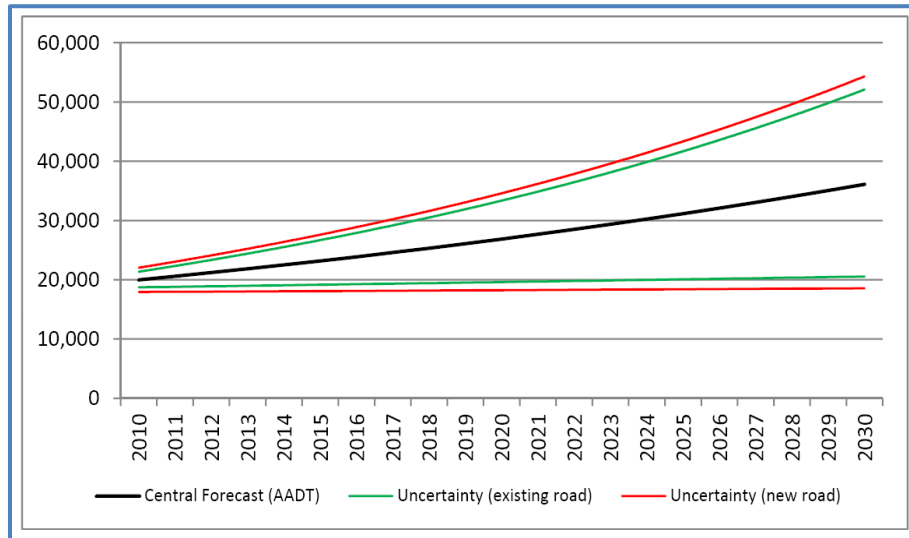
Forecast Horizon	Existing Road	New Road	Forecast Confidence Interval: Existing vs. New Road (%)
Next Day	± 7.5%		
1 Year	± 12.5%	± 17.5%	71%
5 Years	± 20%	± 27.5%	73%
20 Years	± 42.5%	± 47.5%	89%

Derived from Table 2, Bain, “The Reasonableness of Traffic Demand Forecasts,” Traffic Engineering and Control, Vol. 52, No. 5, May 2011, p. 216.

Although Mr. Bain did not break down the difference between toll and toll-free roads, the survey responses indicated that while practitioners are confident forecasts for existing roads are about 25-30% more accurate than those for new roads in their early years, they see little difference in the two forecasts (11% more accuracy for existing roads) over a 20-year span. This is logical in that, for new toll roads, there is a good deal of uncertainty as to how drivers will respond during what may be considered the “ramp-up” period. On the other hand, over a 20-year period, generally the same uncertainty about the forces driving toll road use exists for both new and existing toll roads. These 20-year projections represent about half of the life of toll road financing. We would expect the confidence interval for both new and existing toll roads to expand (i.e.—less confidence over longer periods) at about the same rate over the 40-50 year horizon of toll road financing, despite starting with smaller uncertainty as the graph below suggests.

¹¹ [“On the Reasonableness of Traffic Forecasts,”](#) Traffic Engineering and Control, Vol. 52, No. 5, May 2011, 213-217.

Uncertainty Envelopes in Traffic Demand for New and Existing Roads among Practitioners



From Bain, "The Reasonableness of Traffic Demand Forecasts," Figure 6, corrected. The chart hypothesizes a road handling 20,000 vehicles per day at the outset with volume growing 3%/year.

We would expect the confidence interval for both new and existing toll roads to expand (i.e.—less confidence over longer periods) at about the same rate over the 40-50 year horizon of toll road financing . . .

Why the Over-Estimation? "Big Numbers Win Prizes"

Bain, who was the lead author of a series of Standard & Poors (S&P) toll road forecasting studies that documented optimism bias in toll road forecasting between 2002-2005, puts a different slant on the NHCRP’s techno-bureaucratic explanations for forecast overestimates in a 2009 article entitled “Big Numbers Win Prizes.” His article begins,

A number of high profile investor financed toll roads around the world are currently failing to meet expectations. This has less to do with the present economic climate and more to do with a market readiness to be seduced by hopelessly optimistic traffic and revenue projections; with lenders relying too heavily on elaborate transaction structuring for protection. The time is right for a paradigm shift with a renewed emphasis placed on understanding the demand fundamentals and less willingness to accept forecasts at face value – especially those that resemble statements of advocacy rather than unbiased predictions. . .

Bidding strategy success and the ability to raise significant quantities of debt often rely on strong projections of demand; even beyond credibility in situations where the short-term benefits of winning overshadow any possible longer-term costs. This is true in cases where profits are front-loaded or where, for practical or reputational reasons, procuring agencies may be open to subsequent contractual renegotiation.

In short, the procurement process in general – and bid evaluation criteria specifically – reward high traffic and revenue forecasts, not accurate ones. . .¹²

“In short, the procurement process in general – and bid evaluation criteria specifically – reward high traffic and revenue forecasts, not accurate ones...”
--from Robert Bain, “Big Numbers Win Prizes”

The Denver Post “Truth Be Told” Series

In mid-2006, Denver Post reporter Chuck Plunkett wrote a three-part series of investigative reports on T&R forecasting that put some real-life examples into the preceding and took a much less sanguine view of the reasons behind optimistic toll road forecasts than those reported by the NHCRP. Put in the context of the newly opened Colorado Northwest Parkway (the last entry on the NHCRP table above), Plunkett looked into the factors driving over-optimistic forecasts.

Three companies nationally do most of the revenue projections relied upon to sell bonds to cover road construction costs. Their representatives offer several possible explanations for consistent overestimates of road popularity.

Two scenarios never mentioned are troubling to securities experts:

Cases where the consultants doing the revenue and traffic forecast either had an interest in seeing the road get built or were later awarded additional work on that road.

Cases where the road's revenue projections were used as a negotiating tool to secure favorable financing terms rather than as an impartial scientific study.

Both situations apply at metro Denver's Northwest Parkway.¹³

¹² [“Big Numbers Win Prizes: Twenty-One Ways to Inflate Toll Road Traffic & Revenue Forecasts,”](#) Robert Bain, Project Finance International, Issue 406, 8 April 2009, Thomson Reuters, London.

¹³ [“Roads to Riches, Truth Be Told: Part I,”](#) Denver Post, May 28, 2006.

Slow starters

Of 22 operating toll roads, only five were close to or exceeding revenue projections at the end of their third full year. In four cases, highlighted below, revenue estimates were prepared by traffic consultants or, as at the Northwest Parkway, subconsultants who were promised or granted future work worth millions of dollars if the roads were built. Traffic consultants provide an array of explanations for why roads don't meet projections, such as recessions, terrorist attacks and fuel costs.



- Also backed with local vehicle-registration fees
- ▼ Also backed by gas tax and other revenues
- + The road grossed 54 percent of 2005 projections and is expected to miss 2006 by at least that much
- Industry estimates
- Also backed by development-impact fees
- Also backed by property taxes

TOLL ROAD	TRAFFIC CONSULTANT	PROJECTIONS	
		% OF 1ST FULL YEAR	% OF 3RD FULL YEAR
Colorado			
E-470 ●	Vollmer	61.8%	60.3%
Northwest Parkway	Vollmer PBC/C&B	66.7%	+
California			
Eastern/Foothills ■	Wilbur Smith	78.6%	77%
San Joaquin Hills ■	Wilbur Smith	50.5%	55.5%
Florida			
Osceola Parkway	URS	34%	50.1%
Polk Parkway	URS	67.5%	78.4%
Seminole Parkway	URS	45.6%	70.7%
Southern Connector Ext.	URS	102.2%	95.4%
Veterans Expressway	URS	57.9%	65%
Georgia			
Georgia 400	Vollmer	122.2%	142.9%
Oklahoma▼			
Cherokee Turnpike	Wilbur Smith	87.2%	97.1%
Chickasaw Turnpike	Wilbur Smith	21.2%	24%
Creek Turnpike	Wilbur Smith	49%	56.3%
John Kilpatrick Turnpike	Wilbur Smith	18%	29.3%
South Carolina			
Southern Connector	Wilbur Smith	34.5%	35.3%
Virginia			
Chesapeake Expressway	Wilbur Smith	139%	145.5%
Pocahontas Parkway	Wilbur Smith	51.5%	58.5%
Texas			
Camino Colombia	URS	6% ●●	N/A
Fort Bend Parkway	Wilbur Smith	76.7%	N/A
Hardy Toll Road ■■	Wilbur Smith	15.6%	26.3%
President Bush Turnpike	Wilbur Smith	84.8%	175.1%
Sam Houston Tollway ■■	Wilbur Smith	56.3%	74.4%

Sources: Tolling authorities, bond documents, revenue reports and traffic consultants
 Chuck Plunkett, Jonathan Moreno | The Denver Post

“... a review by *The Denver Post* of tolling projects in eight states finds there is no incentive for the estimates to be accurate. Even when wrong, the bonds are simply refinanced and the consultants are paid again for their work on new studies to support the new bonds.”

--Chuck Plunkett,
 “Roads to Riches,”
Denver Post, May 28, 2006

The Post article indicates that the practice of overstating forecasts is fairly common and at least implicitly accepted by those involved.

Though consultants say they abhor mistaken studies, a review by The Denver Post of tolling projects in eight states finds there is no incentive for the estimates to be accurate. Even when wrong, the bonds are simply refinanced and the consultants are paid again for their work on new studies to support the new bonds.

New investors, now earning a higher return, pay off the old investors and hope that enough development follows the new road to make good on the payments. Even in a worse case, such as a Texas toll road that defaulted on \$75 million in bonds, taxpayers or insurers can be counted on to bail out the lenders. And the same consultants are hired again and again.

Additionally at the Northwest Parkway, a consultant on the traffic study was promised a lucrative job - paying \$350 an hour - if the road was built. Another consultant on the study was promised a contract to serve as oversight engineer if the deal went through. That contract proved to be worth \$5.7 million.

Similar situations have occurred elsewhere.¹⁴

Reviewing WSA's Performance in the NHCRP Dataset

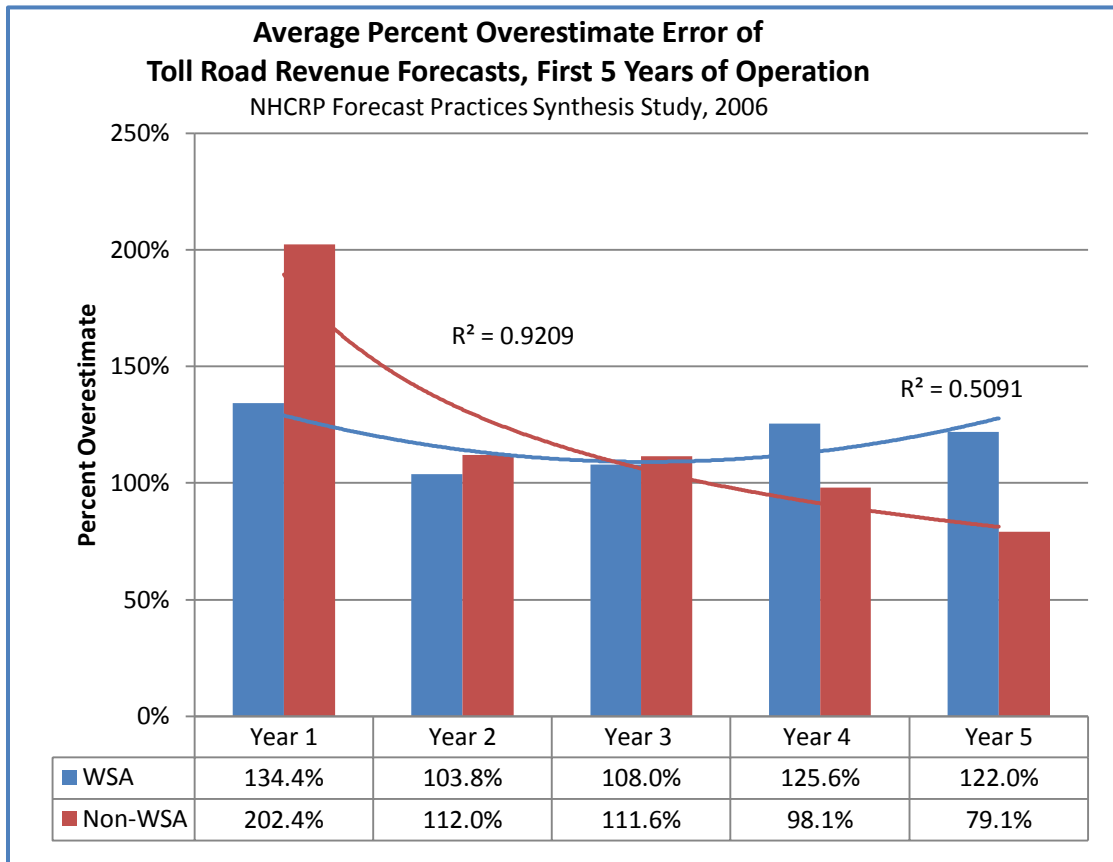
Wilbur Smith Associates—recently acquired by CDM Inc.—is a major, if not the dominant player in the world of T&R forecasts and has been for more than a half century. Over this timeframe, it has “completed over 1,000 toll traffic and revenue studies, many of which have been used in support of over \$61 billion in toll facility finance throughout the United States and the world,” according to one press release.¹⁵ These T&R studies have covered all kinds of tolled facilities—roads, bridges, parking garages, airports, etc. These studies have frequently been used as the basis of toll revenue bond issuances rated by the major bond rating companies. Narrowing our focus to toll roads and, in particular, a more detailed look at WSA's record as reflected in the table shown above from the NHCRP “synthesis” project, indicates it is far from immune to “optimism bias.” The table reflects the results of the first five years of experience on 26 toll roads. In fact, WSA was the principal forecaster on twelve of those studies.

Our analysis of WSA's forecasts recorded in the table in Appendix A indicates they were, in general, the same as their competitors in the extreme degree of inaccuracy in their forecasting of future toll revenues. Together, they overestimated future revenues by an average of 123% per year per toll road while WSA was marginally better at 118% vs. 127% for the non-WSA toll

¹⁴ Ibid.

¹⁵ “[Wilbur Smith Associates Chosen to Provide Traffic and Toll Revenue Consulting Services for Knik Arm Toll Bridge Project](#),” KABATA Press Release, April 20, 2006.

roads. More worrying is that, while the non-WSA forecasts started with a much greater error, they improved substantially over the five-year period. On the other hand, WSA’s forecasts improved little over the first five years of toll road operation and a “best fit” trendline suggests errors could increase over time. The atrocious overestimates of revenue by all the forecasters reflected in this data highlight the difficulty in forecasting demand in the “ramp-up” period of a new toll road. They are inadequate for planning future revenues, financing, and toll rates.



WSA’s Overestimates Have Had Adverse Consequences ...

WSA’s overestimates of future toll road demand and revenues have led to adverse outcomes for some toll road owners, debt holders, and the public on occasion. We have examined four recent cases in which WSA T&R forecasts overestimated toll revenues and led to unsustainable financing arrangements that resulted in debt restructurings, bankruptcies, or distress sales. These cases include: The Southern Connector (SC), the Pocahontas Parkway (VA), the San Joaquin Hills Toll Road (CA), and the South Bay Expressway (CA). See Appendix B for details.

In general, these four toll roads each garnered their final construction approvals and their financing as a result of T&R forecasts prepared by WSA in the year or so before construction began. All were highly dependent on public financing even though three of them were part of

what was called a public-private partnership. All of these toll roads experienced an under-performance in traffic and toll revenues from their respective WSA forecasts from the outset of toll road operation and, over time, were forced to re-structure their financing and two of the toll roads were eventually forced to declare bankruptcy. All the toll roads are still operating and all are still underperforming their most recent T&R forecasts.

In all four of the cases, the overestimates in WSA's T&R forecasts for these new toll roads were evident within a year or two of the beginning of toll operations. How long it took to move from that recognition to financial restructuring, sale, or bankruptcy depended largely on the financial reserves and access to alternative funding available to the toll road management. In the worst case, it took less than three years for the new South Bay Expressway to declare bankruptcy from its late 2007 opening, a situation complicated by a law suit from the road's developers seeking additional compensation. In the end, South Bay's equity investors were wiped out, bondholders took a major loss, San Diego had to take over the previously public-private partnership, and the value of the endeavor sunk by nearly half.

Despite recognizing WSA's T&R estimates had been overly optimistic, the toll road operators still asked WSA to perform an additional T&R forecast to support debt negotiations and restructurings. These forecasts proved to be overly optimistic as well—then on toll roads with established revenue records. For example, WSA was called upon to perform a second T&R forecast for the San Joaquin Hills toll road in 1997—one year after it had opened and four years after its first forecast—to re-finance the road's bonds because revenues were underperforming by 40% (an overestimate of 250%) and the bond market offered better financing opportunities. Press reports indicate WSA attributed the revenue underperformance on the recession and poor economic conditions in southern California. Subsequently, the toll road operator asked another forecasting company, Vollmer Associates, to provide a T&R forecast as revenues continued to slip below WSA's forecasts. Vollmer forecast that the toll road would earn less than half the revenue forecasted by WSA in 1997.

In general, the restructurings that began with WSA's toll road revenue overestimates ultimately ended up costing the public more in debt service payments and higher tolls than WSA had last forecast. This is most evident in the case of San Joaquin Hills in which San Diego County bought the toll road from the collapsed private sector partners (MacQuarie and California Transportation Ventures) and will end up paying about \$900 million more (22%) in debt service than laid out in the 1997 WSA forecast-based bond refinancing. And tolls have routinely increased at accelerated schedules as the revenue forecasts have underperformed. For example, tolls on the 8.8 mile Pocahontas Parkway have risen from \$1.00/\$1.50 (SmartTag/cash) when it opened in 2002 to \$2.00 in 2005 to \$3.00/\$2.75 (peak/non-peak) this year. Transurban plans to raise toll rates to \$4.00 by 2016 and is permitted to raise them by at least 2.8% per year thereafter. In contrast, WSA foresaw revenue maximization at tolls of \$2.00-\$2.50 in its initial 1996 forecast.

... And Some WSA Forecasts Are Disputed in Current Proposals

We have also examined two cases in which major toll bridge construction proposals are under consideration —the Knik Arm Toll Bridge (AK) and the New International Trade Corridor (NI)—where there is a significant dispute about the validity of the WSA T&R forecasts that support them. (Our review of these cases is available in Appendix C.) In short:

- The Knik Arm Toll Bridge is a plan to build a toll bridge from Anchorage across the Cook Inlet to Mat-Su Borough on the opposite shore. It includes two phases: Phase I would build the 2-lane bridge and the immediate access on either side; Phase II would widen the Bridge to four lanes, change the approach to downtown Anchorage and widen approaching roads on the north side of the bridge beyond in Mat-Su Borough.
- The New International Trade Corridor (NITC)—formerly and better known as the Detroit River International Crossing (DRIC)—would add a second toll bridge between Detroit and Windsor, Ontario, Canada, a major cross-border corridor between the US and Canada.

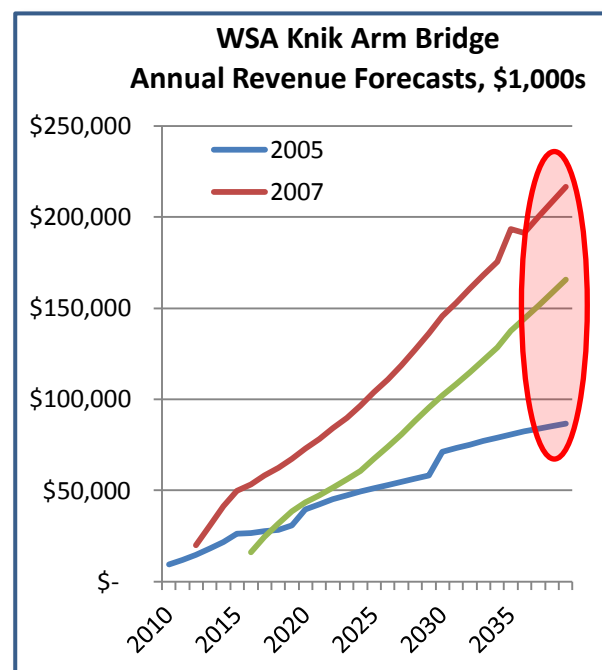
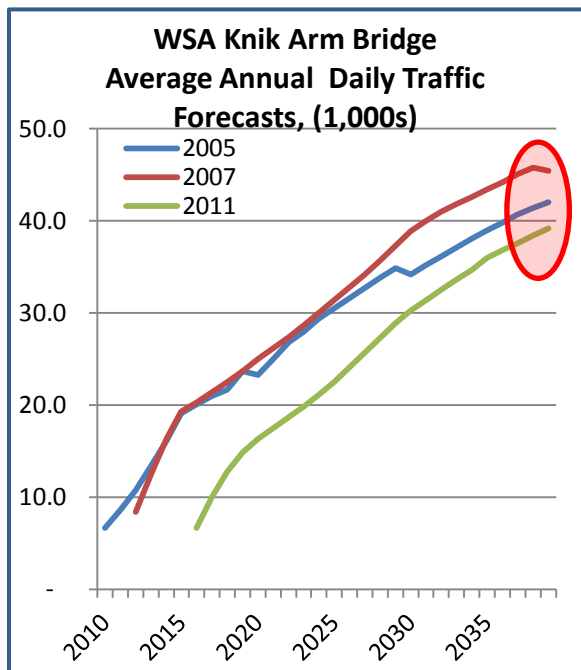
These ongoing discussions provided an additional insight into the scope and nature of the overestimates in WSA's T&R forecasts.

In both cases, critics—a competitor in the Detroit case, a citizen's group in the case of the Knik Arm Bridge—have challenged the demographic figures used to generate seemingly over-optimistic forecasts in some depth. In fact, in the NITC/DRIC case, the owner of the Ambassador Bridge hired a major British transportation consulting firm, Halcrow Group, and two other groups to provide alternative analyses. The Halcrow report suggested that the population and employment projections offered by WSA were far too high and that, by 2035, traffic on a new span would be about half what WSA projected. In an unusual move, WSA responded with a two-page critique of the Halcrow report, including some criticisms we believe are unfounded as detailed in Appendix C.

A very much similar dialogue has been occurring in Alaska where WSA has provided three T&R forecasts—a 2005 preliminary forecast, a 2007 final forecast used to support the sponsoring authority (KABATA) in its application for TIFIA funds, and a 2011 update forecast to support KABATA's latest TIFIA application. The Institute of Social and Economic Research (ISER) at the University of Alaska, Anchorage--the generally acknowledged Alaskan center of expertise in Alaskan demographic forecasting--has offered the principal counterpoint to WSA's population, employment, and other demographic forecasts. WSA has said its several forecasts have been based on two ISER forecasts (2005 and 2009) that were massaged by intermediaries hired by the firm, specifically HDR in 2005 and IRC—a small Dallas, Texas, socio-economic forecasting firm with no apparent specific Alaskan knowledge—in 2007. In all three WSA forecasts, the population and employment projections to the 2030s were significantly higher than those provided by ISER with a possible single exception: ISER's 2009 study foresaw higher employment in Mat-Su in 2035 than did WSA, and this exception remains in dispute.

Opponents of the two bridge proposals have also been also been critical of the feasibility of the proposals because the WSA T&R forecasts badly overestimate toll revenues meant to pay debt service obligations, and these overestimates will likely mean higher tolls and/or more public (taxpayer) funding than forecast. And not just local critics are concerned. Crain's Detroit Business reported on WSA's 2010 forecast for the Windsor link: "The infrastructure investment community considers the Wilbur Smith study wildly optimistic. There's not a lot of confidence in the traffic demand study," said Brian Chase, an investment analyst on large infrastructure projects for the Washington D.C.-based International Finance Corp., part of the World Bank Group."¹⁶ In a subsequent article, Crain's reported, "The private-sector companies interested in building a new Detroit River crossing are divided in their belief if toll revenue can cover the project's cost. Some say tolls will be enough, but most prefer direct payments from the government (or government-run bridge authority) instead. That eliminates or significantly reduces private-sector risk if the tolls aren't enough to pay the bridge -- potentially leaving Michigan taxpayers (or Canadian taxpayers, or both) on the hook if a subsidy is needed."¹⁷ Those supporting the bridge are seeking state financing, but were turned down at least temporarily in a vote by the Michigan Senate's Economic Development Committee late last year in a divided Republican vote with all Democrats abstaining.

In Alaska, concerns about WSA toll revenue overestimates are focused on how much additional state support the increasingly costly span will require. A look at WSA's three traffic and revenue estimates shows a huge range in revenue projections after the ramp-up years (2020 and beyond) although traffic projections vary only moderately.



¹⁶ "[DRIC traffic study questioned by industry insiders](#)," Crain's Detroit Business, May 24, 2010.

¹⁷ "[Private sector wary of tolls to finance new bridge](#)," Crain's Detroit Business, May 3, 2010.

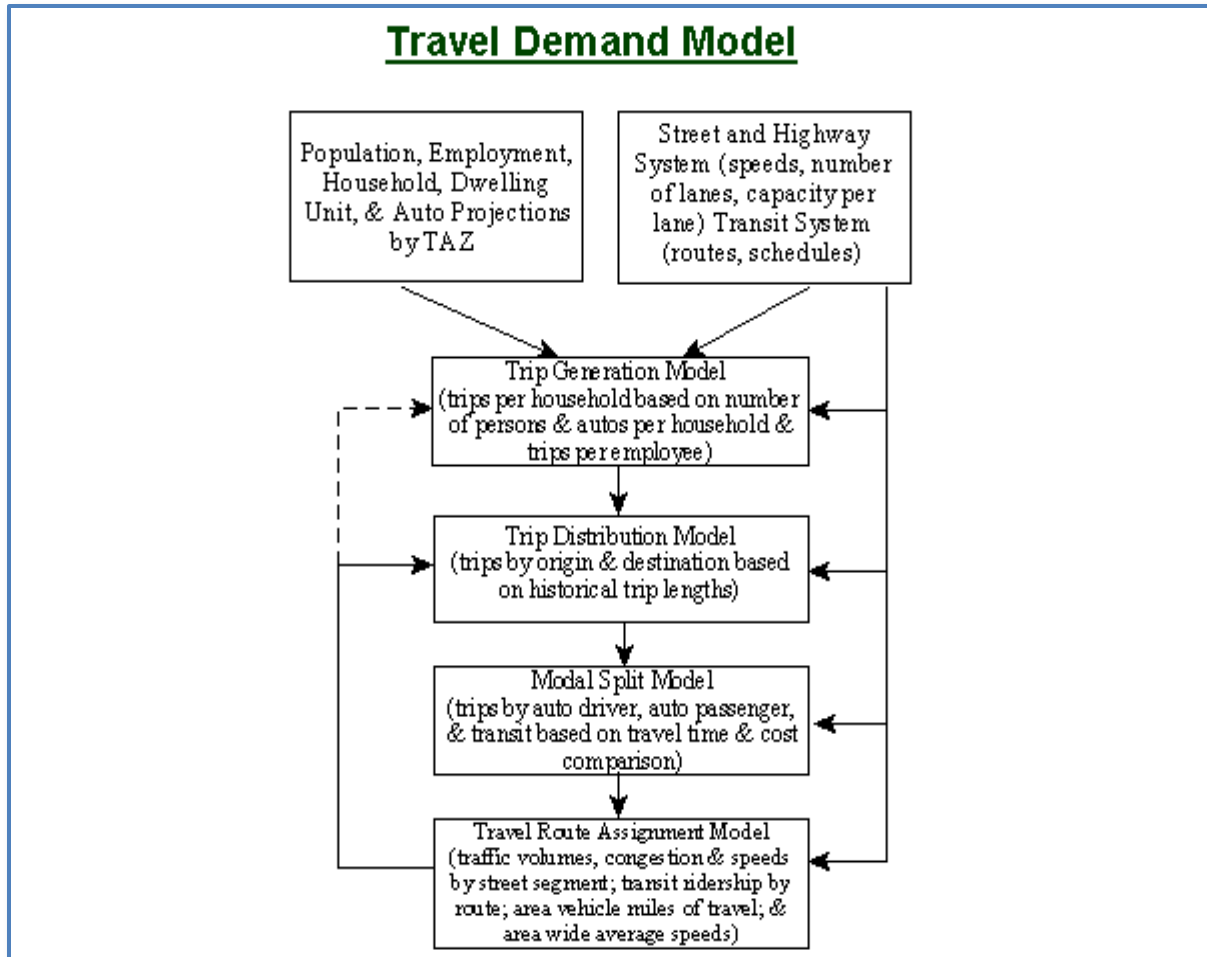
The 250% variance in projected 2039 Knik Arm Bridge toll revenues—from \$86.6 million in WSA’s 2005 preliminary forecast to \$216.7 million in its final forecast just two years later, and its 2011 updated forecast at \$165.6 million—highlights the vagaries of the forecasting process for even a single forecaster using different inputs and probably updated models. Clearly higher tolls have a role in forecasting the much higher revenues in the later estimates (and they are noted in the WSA reports). They almost certainly also include a much lower elasticity of demand (the change in demand caused by a change in price) because there is little difference between 2039 traffic demand in the highest (2007) and lowest (2011) forecasts, and the most recent forecast is less than 18% lower than the 2007 peak traffic forecast.

Inputs to WSA’s Dulles Toll Road Forecasts: Fairfax County Population & Employment

“While WSA believes that some of the projections or other forward-looking statements contained within the report are based on reasonable assumptions as of the date in the report, such forward looking statements involve risks and uncertainties that may cause actual results to differ materially from the results predicted. Therefore, following the date of this report, WSA will take no responsibility or assume any obligation to advise of changes that may affect its assumptions contained within the report, as they pertain to: socioeconomic and demographic forecasts, proposed residential or commercial land use development projects and/or potential improvements to the regional transportation network.”

--Excerpt from legal disclaimer in WSA 2009 Comprehensive Study, p. 5-13.

The quality of a T&R forecast—like most quantitative forecasts—is highly dependent on the quality of the data it uses for its inputs. In typical T&R forecasts, this data is processed through an analytical model that shows the impact of these inputs on traffic demand, tolls, and revenues. As depicted below in a figure from the NHCRP synthesis study, the modeling process includes a variety of inputs, including socioeconomic variables. Among these socioeconomic variables, probably the two most important are the projected population and employment for the “zone” the toll road serves. Population and employment are projected either by the forecaster directly or, more frequently, area socioeconomic forecasters who have a greater familiarity with the drivers of regional population and economic growth. As might be expected, the greater the rate of population and employment growth, the greater the future forecast demand for toll road use, a ready recipe for over-estimating future toll revenues, especially for the long term.



The Four-Step Travel Demand Model highlights the importance of population and employment inputs.

Robert Bain discusses the accuracy of population forecasts in a recent paper, saying:

In terms of accuracy, an initial review of the literature on population projections appears positive (see – for example – Shaw, 2007). However two common trends emerge. Although accurate at the aggregate (state or national) level, forecasting performance deteriorates rapidly (a) as the study area shrinks – towards the zone sizes typically used in transport modelling – and (b) as the forecasting horizon expands. Smith and Shahidullah (1995) calculate errors for 20-year small-area population projections lying between 25% and 35%. Yet 13% of respondents to the survey suggested that 20-year traffic forecasts would have an associated predictive range of $\pm 15\%$ or less, and only one-third of respondents reported possible ranges in excess of $\pm 30\%$. And census tract analysis by Smith, Tayman and Swanson (2001) suggest average errors of 45% and 54% for 25-year and 30-year population projections respectively. These are horizons frequently used in

traffic forecasting and are wide intervals for a variable often used to part-explain traffic growth.¹⁸

In general, population—and almost certainly other less easy-to-measure socio-economic variables—forecasts are increasingly inaccurate as the study area shrinks and the forecast horizon expands. At the same time, most forecast practitioners are much more confident in their forecasts than their results warrant. We look at these judgments in the context of WSA’s DTR T&R studies incorporating population and employment forecasts for Fairfax County.

“Although accurate at the aggregate (state or national) level, forecasting performance deteriorates rapidly (a) as the study area shrinks – towards the zone sizes typically used in transport modelling – and (b) as the forecasting horizon expands. . .”

--Robert Bain,

“Big Numbers Win Prizes”

WSA’s Two Dulles Toll Road Forecasts

WSA has prepared two toll and revenue studies for MWAA as it has planned the construction and financing of rail to Dulles airport and Loudoun County, now officially called the Silver Line.

- The first report, prepared for the Virginia Department of Transportation (VDOT) in 2005, was called the Dulles Toll Road Rate Adjustment Review. Insofar as we have been able to determine, the study is not available online, apparently because of its massive size. Nonetheless, VDOT has published the appendices to the report online, including a socio-economic assessment by GMU’s Center for Regional Analysis that includes population and employment forecasts used in the WSA forecast.
- The second report, prepared for MWAA in 2009, was Dulles Toll Road Consulting Services: Comprehensive Traffic and Revenue Study, Final Report. The report appears to be truly comprehensive. It includes chapters on traffic and toll trends, DTR travel patterns, a corridor growth assessment, an overview of its traffic and revenue forecast method (including its forecasts), and some sensitivity testing. It adds appendices concerning a stated preference survey it conducted and an independent corridor growth assessment by Linden and Associates that includes population and employment forecasts.

In the following sections, we take a look at the results of those two studies and some of the data that was used in their preparation.

¹⁸ Bain, Ibid.

The WSA 2005 Dulles Toll Road Rate Adjustment Review

The 2005 WSA report was prepared for the Virginia Department of Transportation (VDOT) as it was examining the potential for turning over management of the toll road to an outside entity, subsequently MWAA. The report included a socio-economic forecast published in August 2004 by GMU's Center for Regional Analysis (CRA), a key regional research center used frequently by Fairfax County and other local jurisdictions, as well as the private sector, for regional and local economic analysis and projections. Its forecast specifically covered Fairfax and Loudoun counties, including population, employment, and households. CRA discussed its methodology for making its population and employment forecasts in some detail. It is somewhat critical of two other area forecast sources—the Metropolitan Washington Council of Governments (MWCOCG) and NPA Data Services, a private firm in Alexandria.

The CRA forecast has this to say about MWCOCG's effort, and specifically MWCOCG's then-current Round 6.3 forecast:

The COG forecasts are prepared by the respective jurisdictions and reflect institutional parameters (current land use policies as set in adopted Comprehensive Plans) and therefore do not necessarily reflect the levels of growth that could be supported by the market. . . .

In general, the forecasts developed by COG over the last two decades have understated the actual amount of growth that has occurred, primarily as a result of reflecting predominant local government policy to constrain growth. . . .¹⁹

GMU CRA then describes the five-stage process it used to generate its independent forecast (based on MWCOCG's Round 6.3 forecast) for population, employment, and households for Fairfax and Loudoun counties. It describes the results as follows:

"The COG forecasts are prepared by the respective jurisdictions and reflect institutional parameters (current land use policies as set in adopted Comprehensive Plans) and therefore do not necessarily reflect the levels of growth that could be supported by the market. . . ."

--GMU CRA 2004 Review of WCOG Socio-economic Forecasts

¹⁹ [Review of Metropolitan Washington Council of Governments Socioeconomic Data Forecasts](#), GMU Center for Regional Analysis, August 2004, pp. 2-3

The principle (sic) difference between the baseline forecast and the (GMU CRA) alternative forecast developed herein will be permitted densities. The Round 6.3 Forecast is constrained by public policy imposed limits to holding capacity. The alternative forecasts, where these differ from the baseline, reflect the magnitude of growth that would occur naturally within the Study Area in the absence of current regulatory constraints and could be captured if these constraints are modified.²⁰

The result, as might be expected from the above methodological description, is that GMU CRA offered to WSA a significantly higher forecast for population and employment in Fairfax County (and Loudoun) over the horizon to 2030 than did MWCOG.

The WSA 2009 Comprehensive Traffic and Revenue Study

This large study examined a host of factors affecting future traffic demand on the DTR and ultimately generated a page-long forecast of transactions and revenues by year needed to meet the expected bond servicing and other requirements of the toll road. As part of its effort, it contracted with a local socioeconomic consulting firm, Linden Street Associates (LSA), to provide forecasts on population, employment, and other factors. WSA did not use the LSA report in its final report. It said this about LSA's socioeconomic work:

An independent review of the socioeconomic growth of the DTR corridor was undertaken by Linden Street Associates (LSA). The original socioeconomic projections were as provided by the MWCOG, which were used in the latest version of the regional travel demand model (released March 2008). Based on the LSA review and a more recent review by WSA, some slight modifications were made to the MWCOG data, generally in the range of less than five percent of the original forecasts, which resulted in a slightly more conservative forecast. The original LSA report is included as an appendix to the traffic and revenue study.²¹

An independent evaluation of socioeconomic forecasts for the DTR corridor was conducted as part of the study by Linden Street Associates, Inc. The traffic model was updated to reflect the input of both the travel pattern and characteristic surveys and minor modifications to underlying socioeconomic forecasts. The project configuration was coded, and the model was calibrated to more reasonably represent observed traffic volumes throughout the Dulles corridor.²²

The LSA report is worth examining. Like the 2004 GMU CRA report, its analysis starts with the then-current MWCOG forecast (Round 7.1a) for population, employment, and households.

²⁰ Ibid, p. 4.

²¹ [Dulles Toll Road Traffic and Revenue Consulting Services, Comprehensive Traffic and Revenue Study, Final Report](#), July 2009, p. ES-3.

²² Ibid, p. 1-6.

Unlike the GMU CRA report, however, LSA saw the MWCOG data as on the high side and took a more conservative stance than GMU in its adjustments. It explains these adjustments to the Fairfax County population forecast:

MWCOG round 7.1a estimates for population growth and households in Fairfax County are summarized below, along with an adjusted estimate that was prepared based on the factors identified in this report. For Fairfax County, the MWCOG Round 7.1a estimated growth rates for each TAZ has been reduced by up to 20 percent for the 2005-2010 period. The MWCOG estimated growth rate for the 2010-2020 period was reduced by up to 10 percent, for Fairfax County TAZs, while there was no adjustment for the 2020-2030 period. This estimating approach was designed to take into account the slowing overall economic conditions prevalent at the current time, and an estimated recovery period that will extend into the early part of the next decade.

Item	Jurisdiction	2010 (MWCOG)	2010 (Adjusted)	2020 (MWCOG)	2020 (Adjusted)	2030 (MWCOG)	2030 (Adjusted)
Population	Fairfax County	1,171,296	1,152,406	1,319,111	1,283,634	1,375,912	1,337,307
Households	Fairfax County	426,019	418,982	479,218	466,298	500,121	485,997

Table 26. Comparison of MWCOG Round 7.1 and adjusted estimates of Fairfax County population and household growth.

LSA also reduced MWCOG’s forecast for employment in Fairfax County in a similar conservative vein, but without explanation, reporting as follows:

Jurisdiction	2010 (MWCOG)	2010 (Adjusted)	2020 (MWCOG)	2020 (Adjusted)	2030 (MWCOG)	2030 (Adjusted)
Fairfax County	726,660	709,869	835,258	803,576	907,211	871,730

Table 28. Comparison of MWCOG Round 7.1a and adjusted estimates of Fairfax County employment growth.

The data WSA actually used in its report is sourced to Woods and Poole Economics, Inc. (W&P). The forecasts are based on historical compound average growth rates (CAGR). There is no discussion of how or why these were adjusted for the future, although the overall growth rate is smaller than the preceding decade (1990-2000). Here is WSA/W&P’s data in WSA’s final report for population and employment in area counties²³:

²³ Ibid, pp. 4-7 to 4-10.

**Table 4-10
Population Forecast up to Year 2030
(thousands)**

	2000	2010	CAGR	2020	CAGR	2030	CAGR	CAGR 2000-2030
Fairfax County ¹	1,007.14	1,113.76	1.0%	1,348.11	1.9%	1,586.10	1.6%	1.5%
Loudoun County	173.88	321.54	6.3%	463.61	3.7%	605.71	2.7%	4.2%
Arlington County ²	319.03	347.99	0.9%	361.60	0.4%	377.16	0.4%	0.6%
District of Columbia	571.80	587.18	0.3%	587.77	0.0%	591.96	0.1%	0.1%
Montgomery County	<u>877.71</u>	<u>951.42</u>	0.8%	<u>1,025.64</u>	0.8%	<u>1,104.70</u>	0.7%	0.8%
	2,949.56	3,321.89	1.2%	3,786.73	1.3%	4,265.63	1.2%	1.2%

Notes:
¹Fairfax County includes the county, Fairfax City, and Falls Church City.
²Arlington County includes the county and Alexandria City.
 Source: Woods and Poole Economics, Inc; September 2008 (data obtained June 2009)

**Table 4-12
Employment Forecast up to Year 2030
(thousands)**

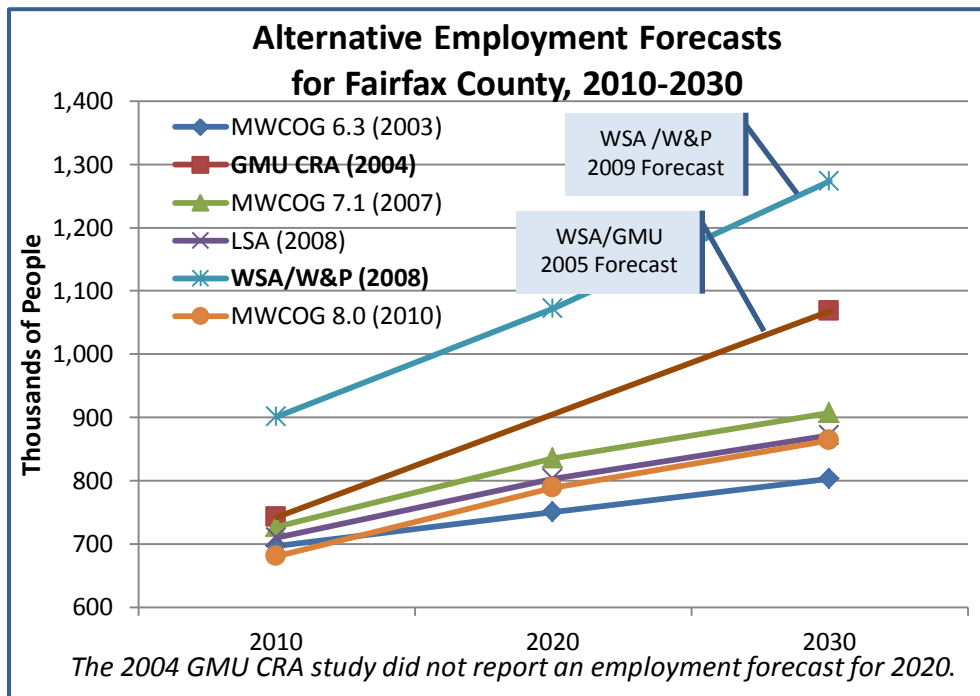
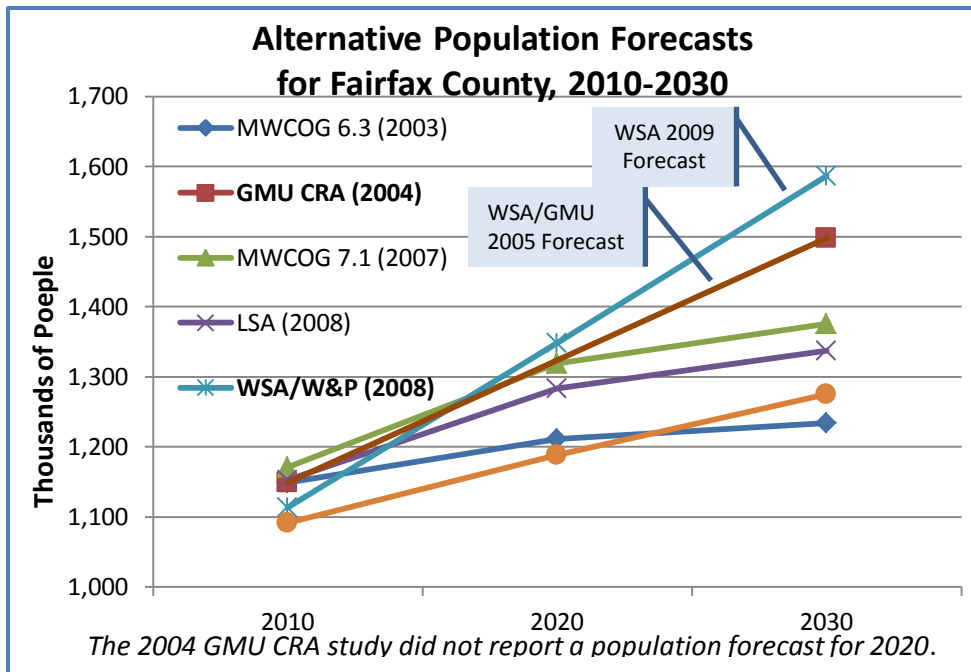
	2000	2010	CAGR	2020	CAGR	2030	CAGR	CAGR 2000-2030
Fairfax County ¹	747.72	901.64	1.9%	1,072.04	1.7%	1,273.16	1.7%	1.8%
Loudoun County	111.17	186.55	6.3%	260.90	3.4%	365.81	3.4%	4.1%
Arlington County ²	315.49	332.04	0.5%	356.36	0.6%	383.38	0.7%	0.7%
District of Columbia	756.98	841.17	1.1%	926.76	1.0%	1,009.62	0.9%	1.0%
Montgomery County	<u>598.30</u>	<u>691.51</u>	1.5%	<u>782.25</u>	1.2%	<u>882.58</u>	1.2%	1.3%
	2,529.66	2,952.91	1.6%	3,400.31	1.4%	3,914.55	1.4%	1.5%

Notes:
¹Fairfax County includes the county, Fairfax City, and Falls Church City.
²Arlington County includes the county and Alexandria City.
 Source: Woods and Poole Economics, Inc; September 2008 (data obtained June 2009)

The data WSA actually used in its report is sourced to Woods and Poole Economics, Inc. The forecasts are based on historical compound average growth rates (CAGR). There is no discussion of how or why these were adjusted for the future . . .

Assessing the WSA Population and Employment Input Forecasts

To better understand the potential impact of these population and employment forecasts for Fairfax County, including Falls Church and Fairfax City, on toll revenue forecasts, we examined them as depicted below.



What is immediately apparent in these two charts is that WSA used the population and employment forecasts that generated the largest values in 2020 and 2030. In particular, by using the Woods & Poole forecasts in its 2009 forecast, WSA increased its 2030 population forecast by 249,000 (19%) and its employment forecast by 402,000 (46%) over those projected by Linden Street Associates (LSA) in its 2008 support study for the WSA 2009 forecast. It is not clear why the alternative forecasts were chosen beyond the brief explanation provided by WSA in its report.

In general, however, higher population and employment forecasts lead to higher estimates of toll road demand and could contribute significantly to revenue overestimation. WSA, in effect, highlights this point in its report by noting, "Employment growth in an area is typically followed by a proportional increase in demand on transportation infrastructure."²⁴

What is immediately apparent in these two charts is that WSA used the population and employment forecasts that generated the largest values in 2020 and 2030. In particular, by using the Woods & Poole forecasts in its 2009 forecast, WSA increased its 2030 population forecast by 249,000 (19%) and its employment forecast by 402,000 (46%) over those projected by Linden Street Associates (LSA) . . .

As noted earlier, in its 2009 comprehensive study, WSA explained its use of the higher forecasts as follows: "Based on the LSA review and a more recent review by WSA, some slight modifications were made to the MWCOG data, generally in the range of less than five percent of the original forecasts, which resulted in a slightly more conservative forecast." A comparison of the WSA/Woods & Poole population and employment forecast with those by MWCOG and LSA indicates this statement is not accurate.

**Percent Difference in WSA/W&P Population and Employment Forecasts
From Linden Street Associates and MWCOG, 2009**

Forecast Year	Linden Street Assoc.		MWCOG 7.1a	
	Population	Employment	Population	Employment
2010	-3.3%	27.0%	-4.9%	24.1%
2020	5.0%	33.4%	2.2%	28.3%
2030	18.6%	46.1%	15.3%	40.3%
Average Difference	6.8%	35.5%	4.2%	30.9%

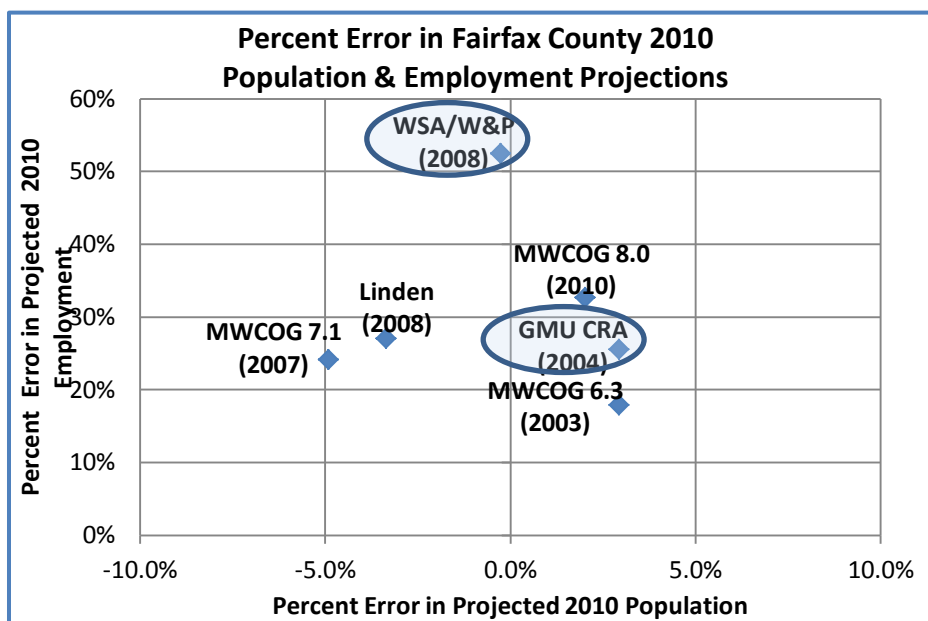
All data from WSA's 2009 comprehensive traffic and revenue study.

²⁴ WSA Comprehensive Traffic and Revenue Study, July 21, 2009, p. 4-8.

- WSA/W&P’s population forecasts are little different than those provided by either LSA or MWCOG in the shorter term, although they significantly exceed both forecasts in 2030.
- WSA/W&P’s employment forecasts *massively* exceeded those provided by both LSA and MWCOG in 2010—one year after the forecast was published.

With the single exception of WSA/W&P’s population forecast for 2010, all WSA/W&P’s forecasts were less conservative than those available from MWCOG and LSA over a 20-year horizon, contrary to its report statement above.

Although we cannot know whether any of the 2030 forecasts are accurate, we did compare the various MWCOG, WSA, LSA, and GMU CRA forecasts against data from the US Census Bureau, including the US 2010 Census for population and US Census Bureau Quick Workforce Indicators (QWI) (2Q2010) and 2007 Economic Census for local employment data for the two towns included in Fairfax County forecasts.²⁵ We then compared the various forecasts against the US Census results. The following graph displays the percentage error in the several forecasts against that US Census Bureau data.



Date indicates year in which the population and employment data was published.
 Encircled data points were used in WSA’s 2005 and 2009 forecasts.

²⁵ The QWI indicates Fairfax County had 569,830 employees in 2Q2010 and the 2007 Economic Survey indicates that Fairfax City had 18,000 employees and Falls Church had 3,742. While the 2007 Economic Survey is dated, employment in these communities accounts for less than four percent of combined total employment. Given the economic climate since 2007, we doubt there has been a statistically significant change in these community counts. We have no explanation as to why population and employment forecasts for the Town of Herndon—which also lies within Fairfax County’s boundaries—were not included in these forecasts.

The data show that all the forecasts for 2010 population in Fairfax County (including Fairfax City and Falls Church) were reasonably accurate (+/-5%), but that all except one of the employment forecasts overestimated employment levels by more than 20 percent. By far the worst employment forecast, although it was made less than two years before the 2010 census, was the Woods & Poole estimate used by WSA in its 2009 comprehensive traffic and revenue study. At more than 900,000 employees, it overestimated Fairfax County employment by 52%. Less dramatically, the 2004 GMU CRA study overestimated employment by 144,000, some 26%. And the most dated—and maligned—of the projections, the MWCOG 6.3 forecast, proved to be the most accurate with a less than 3% overestimate of population and a less than 18% overestimate in forecasting employment in 2010.²⁶

We believe it is reasonable to assume that the forecast errors for 2010 are more likely to expand in the out years for these several forecasts, especially those used by WSA which were the highest of the employment forecasts available and, on the employment side, massively over-stated Fairfax County employment in 2010.

Outputs from WSA’s Dulles Toll Road Forecasts: Tolls and Revenues

WSA’s 2005 and 2009 toll and revenue forecasts came up with dramatically different results that have never been fully explained and leave readers questioning how the two could be so different. In brief:

- The 2005 WSA forecast highlighted daily ridership in 2030 would reach 369,000 users and toll revenues would peak out at \$153 million when tolls reached \$2.00—the toll on the Dulles Toll Road in 2011.
- The 2009 WSA forecast projected daily 2030 ridership would reach 263,000 with tolls at \$7.50 and revenues climbing to \$353 million—and tolls and revenues would continue to climb throughout the forecast horizon to 2047.

[TOLLROADSnews](#), the online professional toll road magazine edited by Peter Samuel, an industry expert, provided this extensive comment about the two forecasts in April

By far the worst employment forecast, although it was made less than two years before the 2010 census, was the Woods & Poole estimate used by WSA in its 2009 comprehensive traffic and revenue study. At more than 900,000 employees, it over-estimated Fairfax County employment by 52%.

²⁶ On a side note, the error in MWCOG employment forecasts for 2010 increased as they moved from Round 6.3 to 7.1 to 8.0.

2011:

The question not being well addressed yet, but likely to be subject of increasing inquiry, is how much higher toll rates will yield in extra revenue to MWAA. Two strikingly different scenarios for the Dulles Toll Road have been produced by traffic and revenue forecasters.

In February 2005 with the tollroad under state jurisdiction Virginia DOT received a quite sober forecast of the revenue potential of the Toll Road to fund the Dulles Rail line. . .

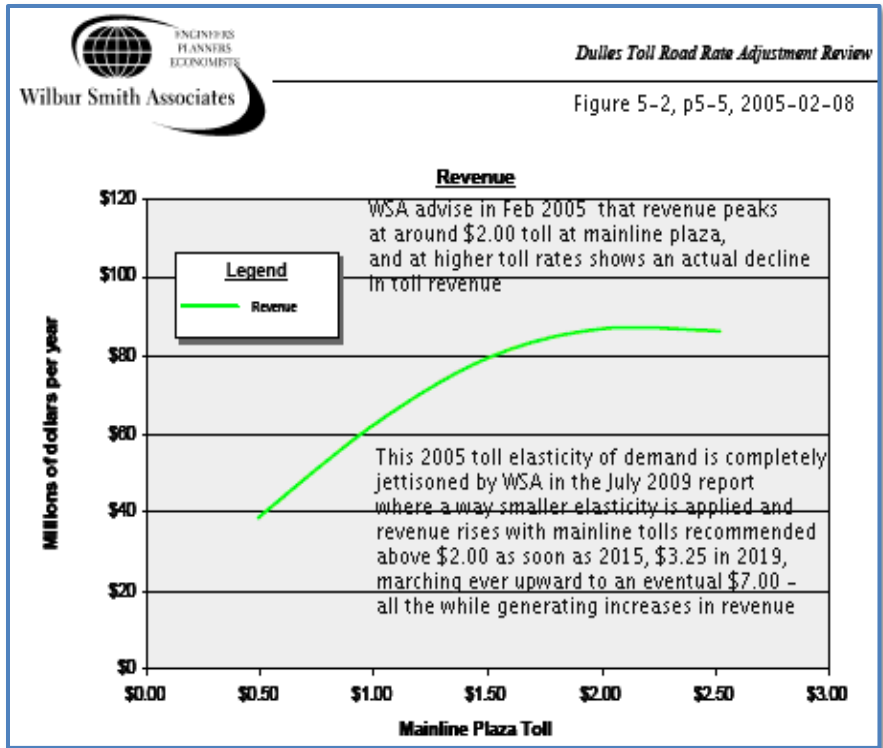
The 2005 report titled Dulles Toll Road Rate Adjustment Review by the leading traffic and revenue consultants Wilbur Smith Associates (WSA) suggested a mainline toll of \$1.50 and new distance based tolls at the ramps. . .

Toll rates they wrote "cannot be increased without bound. At a high enough price, potential customers will find other ways of completing their journeys, and will not pay the higher toll..." (p5.2 Dulles Toll Road Rate Adjustment Review, WSA February 2005)

The February 2005 report was definite in saying the toll rate could not go above \$2.00. There is a graph showing that shows revenue hitting a peak around the \$2.00 (see nearby). Beyond that the toll elasticity of demand was such that the proportionate loss of customers would be more than any proportionate increase in toll rates, and revenues would start to fall. Any further hike in tolls would reduce revenues. . .

"The February 2005 report was definite in saying the toll rate could not go above \$2.00. There is a graph showing that shows revenue hitting a peak around the \$2.00 (see nearby). Beyond that the toll elasticity of demand was such that the proportionate loss of customers would be more than any proportionate increase in toll rates, and revenues would start to fall. Any further hike in tolls would reduce revenues."

--TOLLROADSnews, April 11, 2011



The typed text above was inserted by TOLLROADSnews.

An expansive new view

WSA's 2009 report to MWAA has an expansive new view of the revenue potential of the Dulles Toll Road. Completely gone for MWAA is any reference to the limits beyond which revenue will reach a maximum of the kind mentioned in the 2005 report to VDOT.

It is a corridor of high income people with a high value of time saved, and they say "the longterm economic and demographic outlook is very favorable." . . .

This time around there is little loss of traffic and strong revenue increase - a completely different elasticity of demand from that derived for the 2005 report.

WSA are figuring in a strong growth in underlying traffic, and growing value of time in an already prosperous corridor as offsetting most of the effect of the higher toll rates in depressing traffic.

Revenue soars under the 2009 forecast along with the steeply higher tolls. . .

Why the forecasting flip 2005 to 2009?

Critics of MWA are bound to ask: why the huge discrepancy between the two forecasts from the same forecaster.

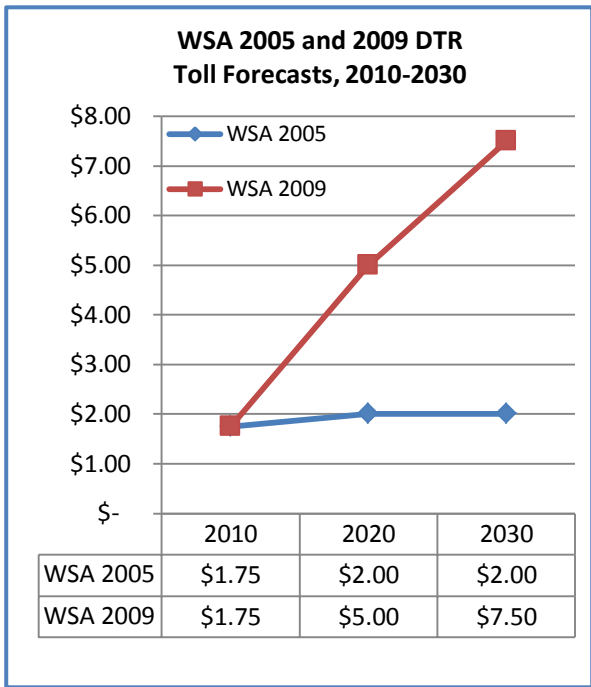
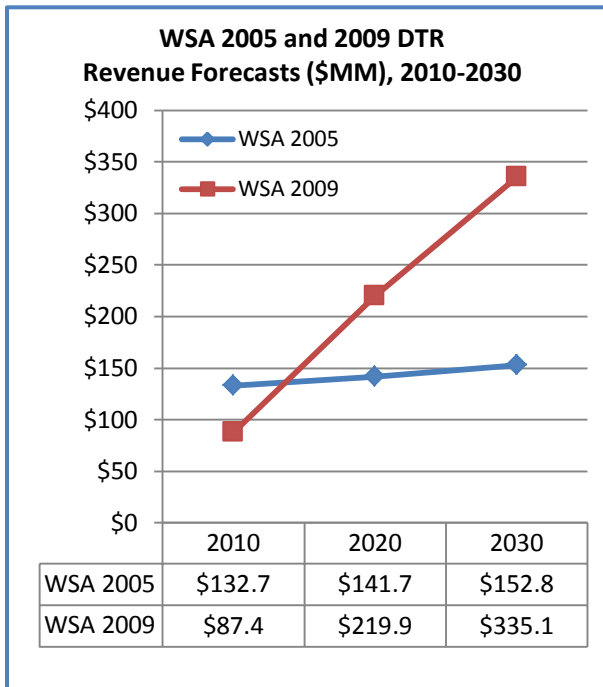
Why does the first emphasize limits, the second seem so expansive.

Did MWA demand a rosy scenario forecast?

How can a sober forecast in 2005 be reconciled with such an exuberant, no-limits forecast in 2009?

There is already discussion of an independent review or inquiry into MWA's handling of this project.²⁷

The 2009 WSA forecast does not explain why there is such a difference in the two forecasts nor, to our knowledge, has WSA subsequently been forthcoming in explaining the difference in the results, and no public official questioned the difference. Using data from the two reports published in TOLLROADSnews,²⁸ the following figures highlight the prospective doubling of revenues and near quadrupling of tolls between the two forecasts in 2030.



²⁷ ["Washington Airports Authority control of Dulles Toll Road looking shaky over \\$325m misspend,"](#) TOLLROADSnews.com, April 11, 2011, #5258.

²⁸ Ibid.

The only reason we can surmise is WSA, on behalf of its VDOT client in 2005, was trying to minimize the toll and revenue impacts of Metrorail construction as VDOT entered into negotiations to transfer the toll road concession to MWAA. A 2006 agreement between VDOT and MWAA gave MWAA operating control of the Dulles Toll Road.

We believe, however, that both forecasts are flawed in forecasting 2030 tolls and revenues.

- We doubt revenues will peak at a toll of \$2.00, even if it is adjusted for inflation (about \$3.25 in 2030 at 2.5% inflation—the rate used by WSA), as projected by the 2005 forecast. Accepted at face value, the benign 2005 revenue maximizing toll rate forecast would have seemed more than adequate to meet the then-moderate financial needs of Silver Line construction costs—then estimated at about \$2.5 billion, less than half current estimates. We are concerned that the combination of a moderate construction cost and low revenue-maximizing toll rate forecasts in 2005 may have been an important factor in MWAA deciding to take on the long-term DTR lease.
- We doubt as many toll road users would be willing to pay a \$7.50 toll (2030 dollars—about twice the current toll in “real” dollars) as WSA forecasts in its 2009 study. We also know that the 2009 forecast underestimates the total cost of Silver Line construction—then put at \$5 billion, now at \$5.6 billion. Moreover, we believe that the elasticity of demand for the toll road will be greater than WSA’s toll forecast implies and, therefore, revenues will be substantially below those WSA forecasts. In our view, either—and maybe both—toll revenues will fail to meet debt servicing and other financial obligations and/or toll rates will need to be much higher than WSA forecast in 2009.

Conclusion

Our review of WSA's forecasting efforts for the DTR and other toll facilities indicates substantial errors in over-estimating future traffic demand and revenues on toll roads have been common, and some have resulted in adverse outcomes. We do not know if this record is worse or better than WSA's industry competitors because we have not examined their performance. We are concerned, however, that WSA's forthcoming toll and revenue forecast of the Dulles Toll Road for its client, MWAA, will have these same large errors.

WSA and Other Traffic & Revenue Forecasting

We have no overall reason to believe that WSA's T&R forecasts are better or worse than those provided by its competitors in this field. The only significant comparison we have made here stems from the NHCRP study which indicates that WSA's T&R forecast overestimates are virtually the same as their competitors'—an average 123% overestimate for both in the small data sample (first 5 years of experience for 24 toll roads) in the NHCRP report with WSA displaying a marginally lower error than its competitors.

We have anecdotal insights from the two cases we examined where other T&R consultants were brought in to provide alternative forecasts (San Joaquin Hills toll road and the Detroit-Windsor toll bridge). Both cases resulted in much lower traffic and revenue forecasts, but there were mitigating circumstances in both. The alternative Detroit-Windsor bridge forecast by Halcrow Group was sponsored by a competing bridge owner whose interests were served by a lower forecast. And in the San Joaquin Hills case, the new forecast was based on data for a toll road which had been operating for a decade—providing important additional inputs to its study—that were not available to WSA in its 1990s studies.

Our concern, however, is whether a single forecast from a single forecaster—in this case, WSA—ought to be sufficient to make a multi-billion dollar financial decision. We believe it is not given the performance of WSA's T&R forecasts we have documented.

Our examination of vital population and employment input data used by WSA in its forecasts indicates it has almost always used the most optimistic data available to make its forecasts.

This includes its 2005 and 2009 forecasts for the Dulles Toll Road. In its 2005 study, it utilized population and employment forecasts provided by GMU CRA which characterized official MWCOG forecasts as understating the area's growth potential. Then, in 2009, it *discarded* the conclusions of the contractor it hired to do its socio-economic forecast, Linden Street Associates, Inc., of Alexandria, which had discounted the official MWCOG forecasts as over-reaching. Instead, it used forecast data provided by Woods & Poole, Inc., another local demographic analysis shop, which was much more aggressive. As we have noted, in the one data point from those two studies we were able to check for Fairfax County—data from the US Census Bureau in 2010—the 2005 WSA forecast over-stated county employment by 25% and

the 2009 study overstated it by 52%. In both cases, all the population forecasts we examined were within a reasonable five percentage points of the US Census 2010 count.

The same arguments hold true when looking at the series of forecasts prepared in the ongoing Knik Arm Toll Bridge plan. WSA claims its three studies have their base in work done by the state's demographic expert organization, the Institute for Socio-Economic Research (ISER), University of Alaska, Anchorage. Yet WSA never shows its use of ISER's work in its forecasts and ISER has challenged the validity of WSA's claim. In fact, as with the DTR studies mentioned above, WSA had a third party massage the ISER material before its inclusion in its reports. In fact, for its 2007 "final" report, it turned to a small Texas company with no knowledge of Alaska's economy or demography to handle the processing of ISER's work. The result led to the highest forecasted traffic and revenues of WSA's three reports on the Knik Arm Bridge.

WSA demonstrated a disturbing pattern in their initial T&R forecasts for a project, such as its 2005 T&R forecast for the DTR, to minimize the revenue maximizing toll requirement. These estimates would ease the minds of skeptics, serve to disarm critics, and facilitate moving forward on a project. In the Greenville Connector case, the maximum revenue maximizing was put at \$2.00-\$2.50 in their initial forecast. WSA foresaw \$4.00 as being the revenue maximizing toll for the Detroit-Windsor bridge in its 2010 forecast, which was criticized by insiders as being far too optimistic. And in 2005, WSA forecast the revenue maximizing toll for the Dulles Toll Road would be \$2.00—and included a graph to make the point.

As might be expected by this consistent use of aggressive inputs and sanguine early forecast products, our review indicates that, where we checked the record on more than a dozen toll roads, WSA has routinely overestimated annual toll revenues by more than half. In our analysis of the overestimates of 12 new toll roads WSA prepared forecasts in the last two decades, its average overestimate for each toll road for each year of the five-year period was 127%. In fact, about one-quarter (12) of the 46 observations in that data set had less than a 50% error and less than a fifth (9) had less than a 25% error. In only two out of 46 observations did it *underestimate* toll revenues. In the four case studies we examined (three of which are in the NHCRP data sample), WSA's revenue forecasts often overestimated revenues by half and more. Where there have been follow-on toll and revenue forecasts by WSA's competitors—such as Halcrow Group's forecast for the Detroit-Windsor toll bridge and Vollmer Associates' forecast for the San Joaquin Hills toll road, traffic and revenue forecasts were typically cut in half from those earlier offered by WSA.

Based on our analysis, we believe that the consistent, large overestimates of future toll revenues we have observed in WSA's forecasts create a substantial risk to the viability of the current financial plan for the Dulles Toll Road. In a nutshell, that plan currently calls for Dulles Toll Road users to pay about \$3.0 billion for Silver Line construction costs--\$1.8 billion of the construction costs for Phase 2 and about \$1.2 billion for Phase 1—excluding sizable (30% or more) reserves and financing costs, according the latest MWAA financial information. That plan will likely result in debt servicing payments exceeding \$14 billion over the next 40 years or so. The risk in WSA's overestimates affects the Silver Line project in five ways:

- **The prospect that the financial community will not fund MWAA's Dulles Toll Road debt or require state or federal guarantees or funding for an investment grade rating..** As has been observed in WSA's forecasts for Alaska's Knik Arm Bridge and Detroit's NITC toll bridge, the private sector has become increasingly wary of toll revenue bonds and, to proceed at all, is insisting on state backing of those potential bonds. So far, Alaska is considering some short-term backstopping to cover losses in the first decade (\$150 million) and a guarantee for the bonds over time (\$3.2 billion), and a Michigan legislative committee recently voted against a similar course of action. Moreover, while Alaska has been turned down three times once for TIFIA loans and twice for TIGER grant financing by the Federal Highway Administration, MWAA has been discreetly told not even to apply, in part because its financing requirement is so large.
- **The prospect of toll rates double those last forecast by WSA over the long term.** Indeed, if the forecast is off by half as we have observed, then tolls would need to be at least double those forecast by WSA, and that does not count the loss of traffic on the toll caused by those doubled tolls. RCA's April 2010 assessment put that revenue "elasticity of demand" at .68; that is, a doubling of tolls would likely see a little more than a two-thirds increase in revenues—meaning MWAA may still not be able to meet its debt servicing obligations.
- **The prospect that much higher toll rates on the Dulles Toll Road forecasted by WSA will force a substantial flow of traffic on to already congested nearby roads.** This includes major arterials (Route 7, Route 50, and maybe I-66) and local roads (including Baron Cameron, Sunset Hills, Sunrise Valley, and Fox Mill/Lawyers roads in the Reston area). If this occurs, it would hugely increase traffic on virtually all the roads in western Fairfax County at least as far as the beltway from I-66 north to the Potomac, especially during peak traffic periods. As local residents know well, those roads are already among the most traffic-saturated in the county at peak traffic periods.
- **The prospect that MWAA would have to use airport revenues to pay Dulles Toll Road existing debt servicing obligations.** Although contrary to the "funding partners agreement" (MWAA, Loudoun County, and Fairfax County), an increasing inability to meet Metrorail debt service obligations over a decade or so could force MWAA to abandon this article. A similar Chinese Wall was breached in Orange County, California when, in 2005, the Transportation Corridors Agency was forced to dip into the revenues of a more successful toll road to help bail out the failing San Joaquin Hills Toll Road, a tactic that ultimately failed. Moreover, this would place MWAA in a difficult position with Congress which oversees the fees it charges aviation customers.
- **The prospect that MWAA will default or nearly default on its bond servicing agreements and be forced to restructure through negotiation or bankruptcy.** We do not believe this is an insignificant risk as the critical situation of the Pennsylvania Turnpike illustrates. The addition of major new debt to the long established Turnpike

has driven it to near bankruptcy as Pennsylvania's Auditor General reports. It is unclear if this worst case scenario occurs who would be held responsible for the unpaid debt in a default—MWAA, the franchise operator of the Dulles Toll Road, or the Commonwealth of Virginia, which owns it. Whoever it is, it would mean higher debt servicing costs over a more extended timeframe as a result of restructuring at the minimum. Whether those higher costs would be paid by higher toll rates or higher state (or possibly local) taxes, it would only add to the daily expenses faced by northern Virginians while providing no new value.

Recommendations

We believe the significant number of cases in which WSA has made major errors in its T&R forecasts warrants a series of actions, almost all before MWAA, Fairfax County, and Loudoun County move to approve construction of Phase 2 of the Silver line. These recommendations involve actions by federal, state, local, and MWAA officials.

US Department of Transportation/Federal Highway Administration

- Do *not* approve TIFIA funding for the Metrorail funding partners until a second independent T&R forecast for the DTR has been prepared by Virginia and any material substantive differences between it and WSA's next forecast have been satisfactorily resolved.
- Longer term, oversee a process involving transportation T&R forecasting practitioners, toll facility operators, toll facility bond finance rating and issuing companies, and appropriate federal, state, and local government transportation officials to develop concrete and transparent national "best practice" standards for the forecasting of toll facility traffic demand and revenue forecasts that must be met to garner federal funding. If necessary, pursue Congressional legislation to implement.

Virginia Department of Transportation

- Conduct an independent T&R study from another T&R consultant to be completed before approval of Phase 2 of Metrorail construction.
- Resolve any substantive material differences between the outside T&R forecast and the new WSA T&R forecast before authorizing the use of state funds on Phase 2.

Dulles Metrorail Funding Partners (Fairfax County, Loudoun County, & MWAA)

- Do *NOT* approve work on Phase 2 of Metrorail until a second state-sponsored independent T&R forecast has been completed and material substantive issues between it and WSA's forecast have been resolved.
- Present the new (third) WSA DTR T&R forecast to the public as soon as possible for comment and feedback, and well before any consideration of approval of Phase 2 of Metrorail.
- Conduct a public outreach program to elicit community comment on toll, tax, and other issues raised by the possible construction of Phase 2, and adjust the current funding agreement accordingly.

Appendix A: Revenue Forecast Error in NHCRP Data, WSA and Non-WSA, in Percent

Wilbur Smith Associates	Year Opened	Revenue Forecast Error					Average Error
		Year 1	Year 2	Year 3	Year 4	Year 5	
Harris County Toll Road Authority (Texas)/Hardy (6)	1988	242%	261%	320%	339%	348%	302%
Harris County Toll Road Authority (Texas)/Sam Houston (6)	1988	54%	25%	23%	20%	28%	30%
Orlando–Orange Expressway Authority/Central Florida Greenway North Segment	1989	3%	17%	23%	44%	30%	23%
Orlando–Orange Expressway Authority/Central Florida Greenway South	1990	193%	176%	178%	100%		162%
Oklahoma Turnpike Authority/ John Kilpatrick (3)	1991	456%	279%	241%	218%	188%	276%
Oklahoma Turnpike Authority/ Creek (3)	1992	104%	82%	76%	69%	53%	77%
Transportation Corridor Agencies (California)/Foothill North (3)	1995	16%	8%	1%			8%
Transportation Corridor Agencies (California)/San Joaquin Hills (3)	1996	216%	111%	94%	89%	85%	119%
North Texas Tollway Authority/ George Bush Expressway (3)	1998	-34%	9%				-13%
Transportation Corridor Agencies (California)/Foothill Eastern (3)	1999	-16%	27%	26%			12%
Connector 2000 Association (South Carolina)/Greenville Connector (3)	2001	238%					238%
Pocahontas Parkway Association (Virginia)/Pocahontas Parkway (44,45)	2002	140%	148%	97%			128%
	Average Error	134%	104%	108%	126%	122%	118%

Non-WSA Forecasts	Year Opened	Revenue Forecast Error					Average Error
		Year 1	Year 2	Year 3	Year 4	Year 5	
Florida’s Turnpike Enterprise/Sawgrass Expressway (6)	1986	462%	327%	213%	170%	160%	266%
North Texas Tollway Authority/Dallas North Tollway (6)	1986	35%	10%	6%	1%	1%	10%
Mid-Bay Bridge Authority (Florida)/ Choctawhatchee Bay Bridge (38,39)	1993	25%	5%	-8%	-12%	-14%	-1%
Orlando–Orange Expressway Authority/Central Florida Greenway Southern Connector	1993	264%	173%				218%
Florida’s Turnpike Enterprise/ Veteran’s Expressway (3)	1994	100%	89%	60%	54%	76%	76%
Florida’s Turnpike Enterprise/ Seminole Expressway (3)	1994	119%	72%	41%	28%	43%	61%
Osceola County (Florida)/Osceola County Parkway (3)	1995	669%	97%	160%	148%		268%
Toll Road Investment Partnership (Virginia)/Dulles Greenway (3)	1995	398%	302%	324%	288%	182%	299%
E-470 Public Highway Authority (Colorado)/E-470 (3)	1999	62%	60%		95%		72%
Florida’s Turnpike Enterprise/Polk (3)	1999	23%	48%				36%
Santa Rosa Bay Bridge Authority (Florida)/Garcon Point Bridge (42,43)	1999	207%	82%	98%	112%	105%	121%
Northwest Parkway Public Highway Authority (Colorado)/Northwest Parkway	2004	65%	79%				72%
	Average Error	202%	112%	112%	98%	79%	127%

Annual performance within 10% of forecast is in bold.

Revenue Forecast Error = 1/(Revenues/Forecast) - 1 as presented in NHCRP 364 in Table 1 which reports (Revenues/Forecast).

Appendix B: Toll Road Financial Restructurings, Bankruptcies, and Sales from WSA Forecasts (Case Studies)

Reporting on these events is infrequent and sometimes conflicting, in part we suspect because none of the parties wants to divulge the details of these toll road financing failures. The cases we discuss here have a reasonable degree of press and other coverage, however, and we have tried to put together a brief picture of the events and consequences as they unfolded. They do not represent all WSA T&R forecast overestimates, but rather are indicative of the consequences of several of their faulty forecasts.

We would also note that the four toll roads discussed here are generally characterized as “peripheral” toll roads, roads built in anticipation of major forthcoming growth around the edge of a large metropolitan area. In general, this kind of toll road has been less successful than “radial spoke” toll roads, such as the DTR, through developed areas that provide downtown-suburban access, especially those built with the optimism of the mid-2000s. Limited research on this phenomenon by Petter Naess, Bent Flyvbjerg, and Soren Buhl gives some credence to this view, although their study looked at European roads and included both toll and non-toll roads with the latter dominating the sample.²⁹

Southern Connector (Greenville, SC)

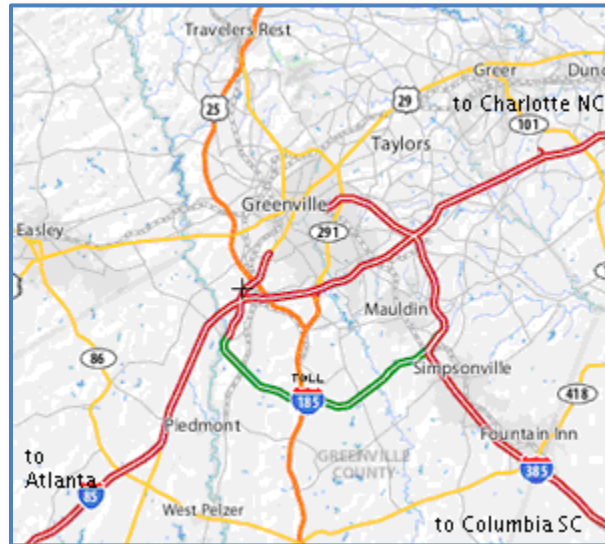
The Southern Connector is a toll road around the southern edge of Greenville, SC, linking I-85 with I-385, that was put forward by a controversial local entrepreneur, Richard Carr. According to a 1997 article in *Forbes* magazine, Mr. Carr had been the head of a failed construction management company and had developed a public-private partnership water treatment plant in Apache Junction, AZ, using tax-free municipal bonds that had failed in 1997 and became the subject of a lawsuit with the bond insurer, Allstate.

He is now pushing yet another public-private project, this one a 16-mile, four-lane toll highway in Greenville, S.C. to connect Interstate 85 with Interstate 385. Motorists would pay a toll of 75 cents each way.

This, too, was a deal that developers coveted, but local voters appear to be against it. In early 1995 Carr set up a limited-liability company, Interwest Carolina Transportation Group, to do the deal. Carr's group includes a local feasibility firm, Wilbur Smith Associates. This time the financing amount is close to \$200 million, and Lehman Brothers will assist Mesirow.

²⁹ [“Geographical bias in traffic forecasts? An analysis of accuracy in road-traffic forecasts in cities vs. peripheral regions.”](#) Naess, Flyvbjerg, & Buhl, 2005. The paper also reinforces the notion that forecasts for toll-free roads tend to be more accurate than those for toll roads.

When the toll road came up for bid, two experienced highway construction management companies, Flour Daniel and Perini, Harbert-Yeargin, using Smith's figures from a 1994 study to formulate their bids, lost out to Carr's group, which has never built a toll road. How did Carr's Interwest win the contract? By projecting traffic and toll revenues 50% higher than in the original study made by Smith, now on Carr's project team.³⁰



The Southern Connector route is well south of Greenville.

The Southern Connector was put in the county's 1988 20-year Transportation Plan. Operating responsibility for the project, including a 50-year lease, was awarded to the not-for-profit corporation, Connection 2000 Association, the first ever under a federal tax provision which allowed private financing to be tax-free—a so-called "63-20" project, referring to the tax clause. After a multi-year lawsuit that ultimately determined that no referendum was needed to build the toll road, construction began in 1998. The 16-mile toll road was opened in 2001. The construction was financed by a series of bond issuances, as explained by AllBusiness, a D&B Company.

The bonds were issued in 1998 in three series: \$66.2 million of Series A senior current-interest bonds, \$87.4 million of Series B senior zero-coupon bonds, and \$46.6 million of Series C subordinate capital-appreciation bonds. Two of the three series were rated BBB-minus by Standard & Poor's at the time they were issued.

Lehman Brothers and Mesirow Financial Inc. were co-underwriters of the bonds. Sinker & Boyd PA, now Haynsworth Sinker Boyd PA, was bond counsel. Kutak Rock LLP was special tax counsel and underwriters' counsel.

³⁰ ["Moonshine Bonds,"](#) Forbes, July 7, 1997.

The financial adviser was Southern Municipal Advisors Inc., the former firm of Teresa Cawley, who was sanctioned by the Securities and Exchange Commission for violating the municipal market's fair-dealing rule by failing to disclose the use of a lobbyist to obtain muni business from Broward County, Fla.

The financial troubles of the 16-mile, four-lane toll road, which connects Interstates 85 and 385 in Greenville County, S.C., and includes four interchanges and 23 bridges, began soon after it opened in 2001.

The traffic estimates for the project proved unrealistic. The road never had enough traffic to generate the revenue it needs to pay debt service, credit analysts and market participants said.

"The project was 'stillborn from the beginning,' said Richard Lehmann who publishes the Distressed Debt Securities Newsletter in Miami Lakes, Fla. In similar roadway defaults, he said the bonds remain in default "for decades" until the issuers can generate enough funds to catch up on payments and repay bondholders in full."

AllBusiness.com

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Some of the bonds were insured in the secondary market by ACA Financial Guaranty Corp., which was A-rated at the time. ACA currently is in run-off and probably will not be able to pay any bondholders.

Standard & Poor's has since downgraded the bonds it rated - including those insured by ACA - to CC and CCC. ACA officials could not be reached for comment.

The Connector 2000 Association in May requested that the South Carolina Department of Transportation implement a series of toll increases, based on a revenue study conducted by Stantec Consulting Services Inc. The SCDOT granted the toll increase in August, raising rates 25cents to \$1.25 for two-axle vehicles that pay in cash.

But the toll hikes may be window dressing, according to analysts and market participants. The toll road's problem has always been generating traffic, they said.

The SCDOT has an obligation to maintain toll rates at a rate that will pay the debt service. "Unfortunately, this is impossible due to the lack of traffic on the road, but SCDOT wants to show good faith to the bondholders by responding to the request to keep tolls at least at their optimally productive rates," the association said in its second-quarter financial statement. . .

U.S. Bank said it has hired Macquarie Capital, part of Macquarie Group Ltd., to serve as its financial adviser and develop restructuring proposals, which could include a restructuring of the debt, a bankruptcy filing, forbearance, or the appointment of a receiver.

Macquarie will be paid negotiated fees and expenses, including a monthly advisory fee. The fees, which will be paid prior to debt service, will range from a minimum of \$750,000 to \$4.63 million, the bank said. The adviser fees, like other trustee fees, are paid prior to debt service, the bank said.

Meanwhile, the Financial Industry Regulatory Authority and its predecessor, NASD, has taken enforcement action against several brokers for violating the muni fair-dealing rule by excessively trading the Connector zero-coupon bonds at higher and higher prices.³¹

PPA turned to a second T&R forecasting firm, Canadian consultants Stantec, for a new study it published in 2009. It found, ". . . the 16-mile highway needed to boost toll rates by 50% to 75% just to maximize its revenues. From 2007 to 2008, the last period covered in the study, traffic fell 3.4% and revenues fell 3.9%. The operator sought and received permission from the state transportation department to boost tolls, and got approval for three 25-cent increases on its top fee of \$2.50, with the final hike scheduled for 2016. . . It was too little, too late."³²

The Connector 2000 Association defaulted on its bond payments in January 2010 and filed for Chapter 9 bankruptcy in June. The [Transport and Project Finance](#) blog reported:

. . . The association owes US\$278 million to the U.S. Bank National Association (the bond trustee), US\$90.9 million to HSBC Bank USA and US\$8.28 million to the S.C. Department of Transportation. . .

The road suffered from weak demand exacerbated by the lack of projected development in the southern portion of the Greenville, SC, metropolitan area. The

³¹ ["Trustee: Default Ahead for S.C. Toll Bonds,"](#) Patrick Temple-West, AllBusiness.com.

³² ["Toll Road Less Traveled Driven to Bankruptcy,"](#) Will Swarts, Smart Money, July 7, 2010.

original traffic study projected 21,000 transactions a day within months of opening whereas actual transactions per day in 2001 were less than 7,500. In 2009, toll revenues amounted to just \$5.3 million, one-third of the \$16 million initially projected for 2009. The weak results were crystallized in 2008 when debt service increased from US\$3.5 million to \$9.7 million.

According to Bloomberg data, a Connector 2000 bond maturing in 2023 traded on 18 June 2010 at 27 cents on the dollar, to yield 23.6%, whereas zero-coupon bonds with the same maturity traded on 21 June 2010 at 7 cents on the dollar to yield 17.8 percent. As of April 30, Oppenheimer Funds Inc. held \$18.4 million of Connector 2000 bonds. Pioneer Investment Management held \$1.5 million valuing the bonds at about 11 cents on the dollar. Goldman Sachs Asset Management, which held \$15 million of the zero-coupon bonds as of March 31, valued the bonds at just 3 cents on the dollar.³³

The bankruptcy of the Greenville Connector resulted in a major restructuring of the finances of the toll road, including massive “haircuts” for bondholders. As explained in Bond Buyer,

Judge David R. Duncan, whose court is in Spartanburg, S.C., approved the plan Friday, under which bondholders’ current debt — which contains current interest as well as zero-coupon bonds and was issued in 1998 — will be exchanged for new zero-coupon bonds as soon as next month. . .

Under the restructuring, each holder of the Connector’s 1998 bonds will get a share of the new bonds depending on what bonds they currently hold. The new debt will be zero-coupon bonds and will have a par amount of about \$150 million. However, the bonds will have an accreted value of \$598 million at their maturity dates, the latest of which will be July 20, 2051.

Zero-coupon bonds are original-issue discount bonds for which no periodic interest payments are made. They are issued at a deep discount from par, accreting at the rate represented by the offering yield at issuance, to their full value at maturity.

Roughly \$134 million of the \$200.2 million bonds the Connector issued in 1998 were zero-coupon bonds. Of the \$200.2 million of bonds, \$66.2 million were Series A current interest bonds, \$87.39 million were Series B senior zero-coupon bonds and the remaining \$46.59 million of Series C bonds were subordinate zero-coupon bonds.

The accreted value of the outstanding debt is \$320 million.

³³ [“Infrastructure Market Update: 27 June 2010,”](#) Transport and Project Finance, June 27, 2010.

No bond documents or ratings are needed for the bond exchange, sources said. The Series 2011A senior bonds will have 11 maturities and three term maturities through July 2051.

The Series B senior subordinated bonds will have three maturities through July 2051. Bondholders with subordinate debt will receive Series C junior-subordinated capital appreciation bonds that mature in July 2051.

SCDOT will take over maintenance of the road during the life of the 40 license agreement. As part of the deal, the department's subordinate position in the flow of revenues has been elevated so that the state will get some toll revenue funds ahead of bondholders.³⁴



The Denver Post series mentioned earlier points out why WSA's gross overestimates of traffic and revenue might have occurred:

In Greenville, an authoritative but flawed set of traffic and revenue projections prepared by the nationally known company Wilbur Smith Associates helped persuade investors in 1998 to loan a newly created toll authority \$200 million. Greenville's Southern Connector was born.

³⁴ "[Judge OKs Connector Bond Plan](#)," Bond Buyer, March 29, 2011

From that \$200 million, Wilbur Smith collected more than \$12 million for a pair of contracts the authority promised the company if the bonds were sold - even as the company prepared the revenue projections that justified the loan.³⁵

The fact that WSA received \$12 million when the Southern Connector's bonds were sold, in part because of its role in carrying out the preliminary engineering for the project, offers a good explanation of why WSA upped its forecast for the toll road by 50% in 1997 before construction ever began as reported by Forbes.³⁶ It is also consistent with Dr. Bain's observation, noted earlier, that, "the procurement process in general – and bid evaluation criteria specifically – reward high traffic and revenue forecasts, not accurate ones."³⁷

"From that \$200 million [loan proceeds], Wilbur Smith collected more than \$12 million for a pair of contracts the authority promised the company if the bonds were sold - even as the company prepared the revenue projections that justified the loan."

--Denver Post

The fact that WSA received \$12 million when the Southern Connector's bonds were sold offers a good explanation of why WSA upped its forecast for the toll road by 50% in 1997 before construction ever began

In brief, the Greenville Connector failed because a 1997 WSA T&R forecast substantially overestimated the traffic and revenues the toll road could produce. Its forecast for both traffic and revenues were excessive throughout the decade before the toll road failed. At default, bondholders were forced to take major losses in a restructuring that will see bond payments extended with no interest. The Connector 2000 Association continues to manage the toll road and periodically increases tolls as proposed by the 2009 Stantec T&R forecast. The road is still vastly underutilized.

³⁵ ["No 2-way street, Truth Be Told: Part II,"](#) *Denver Post*, May 29, 2006. WSA provided both the T&R forecast and co-led preliminary engineering and design work for the toll road, the "pair of contracts" described in this article.

³⁶ *Ibid*, Forbes, July 7, 1997.

³⁷ ["Big Numbers Win Prizes . . ."](#) *Ibid*.

Pocahontas Parkway

The Pocahontas Parkway, like Greenville's Southern Connector, was constructed as a "63-20" not-for-profit toll road in southern Richmond, VA, under the management of the Pocahontas Parkway Association (PPA). It opened for operation in mid-2002. Construction cost was \$314 million. The state of Virginia provided \$27m in tax monies to the project, the remainder being raised by the PPA in the tax-exempt capital markets. [TOLLROADSnews](#) provides this background on the financial details of the project:

The project is complex and the first non-profit involving a private sector developer in Virginia. FD/MK (Flour Daniels/Morrison Knudsen) has a fixed price design-build contract with VDOT, which will own and operate the facility. The state under the agreement appoints a not-for-profit corporation the Pocahontas Parkway Association (PPA) as the statutory operator (the term concessionaire is not used but it seems to amount to that) responsible for raising capital funds and entitled to collect tolls. The PPA will issue \$371m of toll revenue bonds to cover construction costs, developer fees, some VDOT expenses and to establish a fund to cover early year losses. \$18m of loans will come from a State Infrastructure Bank and \$9m spent by the state on design is donated to the project. . .

FD/MK as the developer will get a developer's fee of \$6m on financial closing. Jim Carroll head of FD/MK says the negotiated fee covers the partnership's costs but is not really enough to encourage further proposals if there is a risk of their not reaching fruition. The group in effect has gained a substantial negotiated bid design-build project. It walks away once the project is built.



Pocahontas Parkway's bridge over James River with interchange with I-95 at left, at right the way to Richmond Airport and the Norfolk area via I-64. Development expected along the road.

This 145' high bridge allows ship traffic on the James River to reach Richmond. It is one of two such bridges on the nine mile toll road. (Photo: from [TRN](#))

WSA's traffic forecasts for the 895 are indeed for 20k vehs daily with \$1.50 tolls in the opening year 2002 but for 28k in '03 rising to 37k in '10 and 49k in '20. That is based on it getting 14% of traffic in a corridor between I-64 and VA-10. The strength of the 895 project as compared to the Gway is that it saves about 14km (9mi) and 10 to 20 mins as compared to the unpriced alternatives, perhaps a third more than the Dulles Gway time savings and twice the distance savings. The financing for 895 also apparently loads the debt service further back than the Gway. It projects over 2x debt service coverage through '05 and then 1.3x.

The plan of finance has no explicit provision for operating expenses . . . So the VA taxpayers bear the risk of paying operating costs in case of difficulty paying the bondholders, something which is not spelled out in any of the press materials on the project. By one account the operating costs have been estimated by VDOT at only \$3.5m/year.

. . . according to WSA calculations the maximum revenue generating toll rate is between \$2.00 and \$2.50 so there could be scope for improving the viability of the project through raising tolls. The WSA estimates also used lower growth forecasts than local officials provided, judging them to have a boosterish element.

Revenues did not meet expectations from the outset of the toll road's operation. In 2004, TOLLROADSnews reported:

Wilbur Smith Assoc in a study done in 1996 projected opening year traffic of about 20k veh/day rising to a maximum 38k/d in 2015 according to our reporting (TRnewsletter #14 April 1997 p10). On that basis the traffic shortfall is about a third. The Virginia DOT which originally wanted to build the project itself with tax monies had forecasts of 90k without tolls in 2015.

High traffic forecasts were behind VDOT's insistence that the twin spans be built for striping to 2x4 lanes and all the interchange ramps. The interchange ramps are large bridge projects in their own right, because of the great drop in elevation from the maritime shipping clearance height under the bridge down to I-95 running along the bank of the river. Fluor, the developer first proposed building just one span of the bridge initially and deferring two ramps. The extra capacity would have reduced the capital cost and debt service obligations. However VDOT was keen to get the complete project done and Fluor went along with that.³⁸

Within a year, PPA officials began looking for a private investor to buy out the toll road as revenues continued to lag forecasts and a default was foreseen. PPA and VDOT entered into confidential negotiations with a private sector consortium comprising

³⁸ ["Pocahontas Parkway revenues about half forecast,"](#) TOLLROADSnews, February 18, 2004, #582.

Depfka Bank PLC—an Ireland-based bank—and Transurban (USA), Inc.—the US subsidiary of an Australian transportation infrastructure management corporation—in mid-2005 to sell the toll road. By mid-2006, the consortium had negotiated a deal with VDOT and PPA that was subsequently approved by all the parties' leadership, Transurban's first US venture. The following summarize its core features:³⁹

- The purchase price was about \$522 million and covered all the outstanding debt on the toll road as well as VDOT's and PPA's costs in negotiating the deal.
- Transurban received the right to serve as Operator for the toll road for a term of 99 years unless it defaulted on its debt or, any time after 40 years, VDOT can terminate the concession if it is in the Commonwealth's best interests.
- Transurban obtained the right to set tolls on the road according to a schedule that saw tolls rising from \$3.00 in 2006 to \$6.25 in 2016. Toll raises beyond that point are allowed based on inflation and economic growth, but never less than 2.8% per year.
- Transurban assumed responsibility for the operation and maintenance of the toll road at its own expense in accordance with Virginia standards. It must pay these expenses before it pays debt servicing costs.
- Transurban agreed to build a 1.6 mile Richmond Airport Connector toll road from the Pocahontas Parkway to the airport and then operate and maintain it.
- Transurban agreed to fund a reserve account at 110% of expected maintenance costs.
- VDOT agreed to compensate Transurban for any revenue loss occurring because VDOT built a roadway within three miles of the James River bridge, except under some limited circumstances, and any damages occurring from new or additional taxes or fees local or state officials might impose.
- VDOT reserved the right to approve any new parkway re-financings except under several specified circumstances, and noted that neither VDOT nor Virginia guaranteed any portion of the debt or equity.

Although Transurban has seen growth globally over the last four years, it has experienced losses on the Pocahontas Parkway—which comprises less than two percent of its global toll revenues—every year since it acquired it according to its annual reports. Traffic has declined slightly since Transurban took—probably driven by higher tolls and especially the effects of the 2008-2009 recession—but revenues have grown slightly over the last five years on average and losses are falling over time. In February 2011, automobile tolls on the parkway were \$3.00 during peak commuting periods (staying at \$2.75 otherwise)—well above the WSA forecast that a \$2.00 toll would maximize toll revenues, yet traffic and revenue grew.

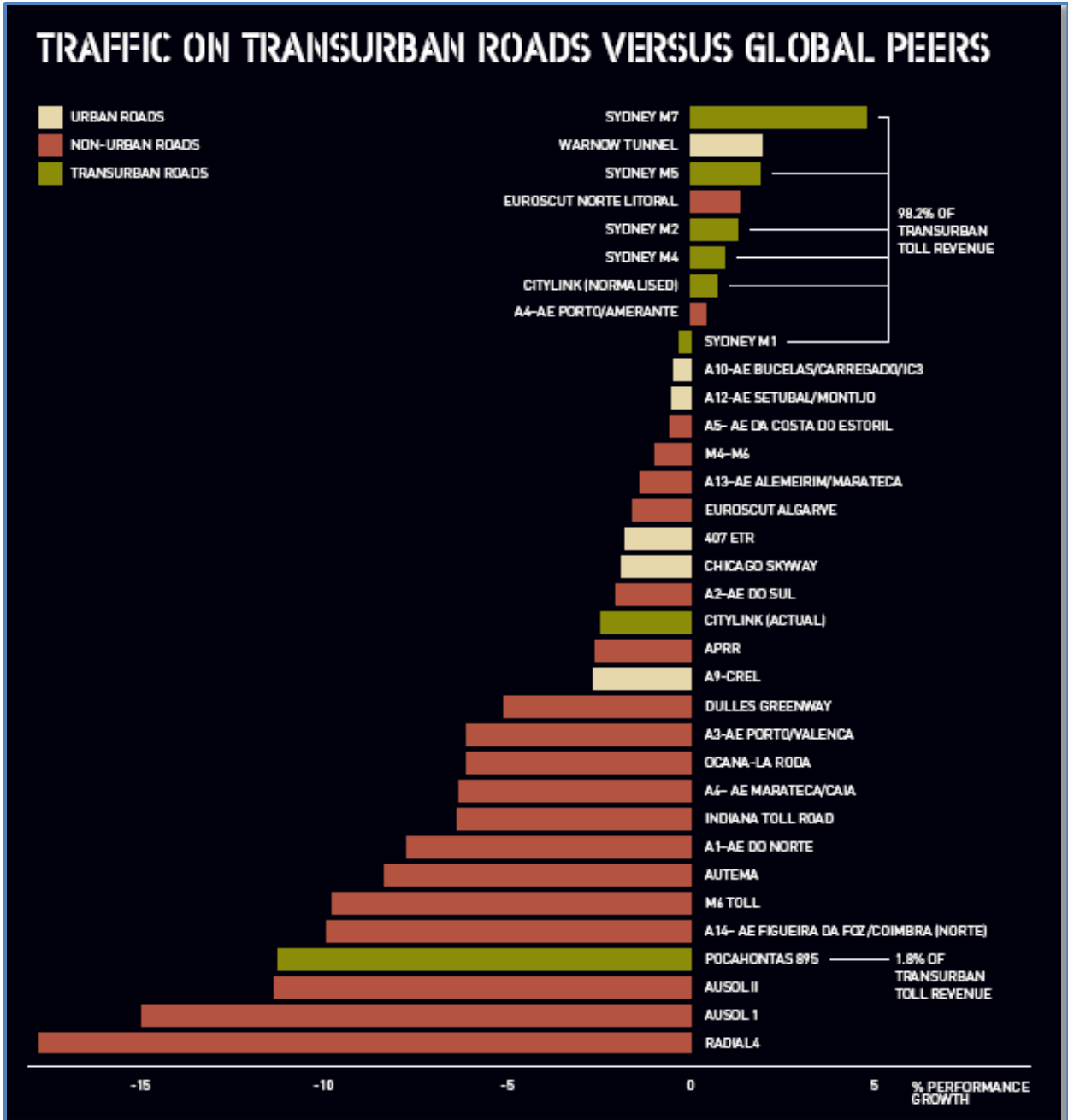
³⁹ Letter to VDOT from Michael Kulper, Transurban re: [Pocahontas Parkway Association Public-Private Partnership](#), May 2, 2006.

**Transurban Prorated Profit and Performance
For Pocahontas Parkway, 2007-2011**

FY (ends June 30)	Profit/Loss (US\$MM)	Traffic Growth	Revenue Growth
2007	NA	3.1%	8.7%
2008	NA	0.0%	7.7%
2009	-\$16.5	-11.6%	0.6%
2010	-\$15.7	-5.9%	-0.7%
2011	-\$10.0	1.8%	2.4%

Data from Transurban annual reports, 2007-2011.

As reflected in the graphic (next page) from Transurban’s 2009 annual report, the Pocahontas Parkway was the worst performing toll road in the company’s portfolio, and one of the worst performing worldwide in a sample of toll roads shown by Transurban. In general, toll roads did poorly that year because of the global recession.



Source: *Transurban Annual Report, 2009, p.5.*

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San Joaquin Hills Toll Road (Orange County, CA)

In the mid-1990s, WSA prepared two T&R forecasts for two proposed toll roads in Orange County, CA: The San Joaquin Hills and the Foothills/Eastern toll road, for the county’s Transportation Corridors Agency (TCA). The studies were used to finance the construction of the two tollways. While traffic and revenue performance for the Foothills/Eastern toll road generally lived up to the WSA forecasts’ expectation, San Joaquin Hills forecast fell far short almost immediately.



The San Joaquin Hills toll road opened for business in November 1996, three years after WSA had prepared its first T&R forecast for the then-proposed toll road. Officials were pleased at its opening:

The SJH was completed 4 months ahead of schedule and on price by a partnership of Keewit and Granite under a design-build arrangement. System integrator and toll operator is Lockheed. Dubbed SR-73 the road will be maintained by the state's Caltrans. Construction cost was over \$800m and total project cost is put at \$1.5b. In bond financing documents the SJH developer Transportation Corridors Agencies (TCA), a joint powers agency of 11 local municipalities, showed forecasts of daily traffic for the first full year as 75,000 and the first week figures are about half that level. The forecast for 2010 was 120kv/d. The roadway has a 27m free median for expansion to a max 12-lanes, the present width of competitive I-5 located mostly parallel 10 to 15km away.⁴⁰

In 1997, within a year of the toll road’s opening, it went through a re-financing in part to take advantage of the then low available interest rates,⁴¹ and in part because traffic and revenues were not living up to the expectations of WSA’s 1993 forecast. TOLLROADSnews captures it this way:

⁴⁰ [“SJ Hills pike opens with 44k v/d,”](#) TOLLROADSnews, December 29, 1996, #1936.

⁴¹ Some, and possibly all, of the San Joaquin Hills bonds re-financed in 1997 were zero-coupon bonds, according to municipal bond trading sources.

The San Joaquin Hills (SJH) pike in Orange Co Calif is refinancing a billion dollars of debt to take advantage of lower interest rates and improve its chances of coping with lower than expected revenues. By midyear the SJH was running 52,000 tolls/day which at an average toll of \$1.65 gives annual revenues of \$31m — way short of the 98,000 daily tolls and \$62m that Wilbur Smith Associates predicted for the first year in forecasts prepared for the bond issue of 1993. (These numbers are 12/10 of the raw WSA figures, which assumed a March 1 startup.) In other words the road was doing barely more than half the forecast level.

At least there has been steady growth in traffic through this year. Each month has been seeing a 1,000 to 2,000 rise, an average of 2 to 3%/month. By mid-Aug AADT was 53k. By year's end daily tolls should be in the 60k to 65k range, based on growth in the first half of the year and annual toll revenues running \$36m to \$40m. If this kind of growth is maintained then by mid-98 daily toll trips should be 70k to 80k, revenues/yr \$45 to \$52m. The original WSA forecasts pitched average daily tolls in 1998 at 106k and revenues at \$72m.

A new traffic and revenue study (T&RS) has been prepared by WSA for the debt refinancing as we write. It attributes the forecasting fiasco of 1993 to the southern California economy and the failure to anticipate the extent of the recession there. Even in 1997 it says employment was lower than in 1990 and 21% less than projected in 1992. Hadn't noticed the cold war was ending and that the Pentagon mightn't be going to need all that stealth gear and other cool fight'n stuff that the LA area churned out, eh? In addition the new WSA T&RS acknowledges a "much more extended ramp-up period than had been anticipated," and says other downers were poor signage, low public awareness and little demand from truckers.

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--TOLLROADSnews

The new study projects daily trips (revenue) at the turn of the year at 64k (\$38m) rising to 78k (\$51m) by end 1998, 97k (\$63m) in 2000, 164k(\$144m) in 2010. WSA projects the year 2000 97k trips as producing point daily flows ranging between 50k and 70k, or between 8 and 10% of total corridor traffic. The corridor is big! I-5 and I-405 run will over 500k veh/day. In large part what the SJH gets is spillover from I-5/I-405 congestion, which makes forecasting tough. . .

Ed Regan of WSA, the local paper said, presented the TCA with revised forecasts recently which said traffic would most likely be 59% of that originally forecast for this year — 57k AADT rising to 93% of the previously forecast 2024 traffic level assuming “moderate” economic growth.

Morgan’s wrote that the Transp Corridors Agencies (TCA), owner of the SJ Hills appears to have sufficient financial reserves through 2005 but that its margin for error is “small.” Colleen Clark the agency’s financial officer agrees with that based on the current debt structure. The agency now hopes to refinance about \$1b of 1993 debt on which it is presently paying 7% and to move over to c5.5% debt. The av \$15m/yr saving will give the agency a margin for setbacks, she says.⁴²

Here is how [TOLLROADSnews](#) reported the situation in February 2000, just three years after the revised WSA forecast and debt re-financing:

Walter Kreutzen CEO of the S Calif TCA toll roads says the San Joaquin Hills Toll Road has not been performing up to projected traffic and revenue levels. The authority can service its debt but could breach debt service coverage ratios in bond covenants. Revenue in the second half of the calendar year was \$23.3m suggesting for the full financial year the toll road may garner \$47m to \$50m compared to the \$58m projected by Wilbur Smith in their 1997 study and the number used in the financing plan. As a result the toll road could as soon as 2002 drop below the 1.3 cover of revenue to debt service that is required in the bond covenants.

The TCA is reducing its earnings projections to 82% of those in the 1997 WSA study as ‘ramp-up’ seems to have been completed. Part of the



⁴² “SJ Hills/CA-73 Refinancing for Orange Co pike,” [TOLLROADSnews](#),

revenue shortfall is due to the board's failure to raise the mainline toll by 25c to the assumed \$2.25. No moves to raise tolls, but the TCA is establishing a "cash defeasance portfolio" of \$37m to guarantee repayment of an expected \$45m shortfall between now and 2007.

The portfolio will come largely from the TCA's share of monies finally being recovered from Orange County in the bankruptcy debacle of 1995 when 'innovative' financing and divers 'smart' cash management schemes put the county government and many associated agencies into a multi-billion-\$ financial black hole.

The 'defeasance portfolio' will write down debt in order to maintain the 1.3x cover. TCA is also looking for ways to cut costs and improve revenues. Weekday tolls collected on the SJH are running at 83k and average daily at 73.4k, an approx 10% increase over a year ago. However most of the growth appears to have been in the first half of the year.⁴³

Toll revenues continued to underperform WSA's second forecast and, at the request of TCA, Vollmer Associates—another T&R forecasting firm—provided a new forecast in 2003. As reported by the Los Angeles Times:

Toll revenue for the struggling San Joaquin Hills turnpike through western Orange County will earn less than half the money predicted when the highway was refinanced six years ago, a new traffic study (by Vollmer Associates) shows. . .

The new traffic and revenue study by Vollmer Associates, a consulting firm hired by the TCA, is dramatically different from research completed in 1997 by Wilbur Smith & Associates. The Smith analysis was done in anticipation of refinancing about \$1.4 billion in San Joaquin Hills bonds at lower interest.

Toll revenue for the highway was about \$61.1 million for 2002-03, far lower than the \$79.6 million predicted by Smith & Associates. Figures for the highway show the gap between actual and projected revenue has been widening steadily over the last few years, prompting two Wall Street ratings agencies to lower their assessments of San Joaquin Hills bonds to junk status.

In the new study, Vollmer estimates that revenue will be \$78.7 million for the highway in fiscal year 2010-11. In contrast, the Smith firm projected that revenue would be \$144.3 million for the same year.

⁴³ "[San Joaquin Hills Drops Forecast](#)," TOLLROADSnews, February 19, 2000, #2531. In [a June follow-up in TOLLROADSnews](#), Peter Samuel reports that WSA's Ed Regan, head of WSA's forecasting unit, complained about the treatment of WSA in this article, saying WSA wasn't "sacked." It's not clear that TOLLROADnews said or implied that, but, as TRN reports, there was strong criticism among TCA and other officials of the WSA forecasts.

For fiscal year 2025-26, Vollmer predicts that toll revenue will be about \$133 million, less than half the original \$312 million forecast by Smith & Associates.⁴⁴

In November 2005, as the performance of the toll road versus the WSA forecast worsened, the TCA was forced to make a deal to draw funds from the successful sister Foothills/Eastern toll road to help pay the debt on the San Joaquin Hills tollway.

Under the recent bailout deal, the Foothill-Eastern will give the San Joaquin Hills \$120 million and low-interest loans of up to \$1.4 billion to help defray bond repayments.

The loans will come from surplus toll revenue for the heavily trafficked Foothill-Eastern. In exchange, the San Joaquin Hills board agreed not to sue the Foothill-Eastern, which is planning to construct a new 16-mile tollway, the Foothill South. San Joaquin Hills officials say that new road will remove even more traffic from their already struggling highway. This agreement allows construction of the Foothill South, the final segment of Orange County's planned 67-mile toll-road system. That segment has been on the drawing table since 1981; officials now say construction could begin in 2007, and the Foothill South could be opened to commercial traffic by 2009.⁴⁵

Still, the San Joaquin Hills financial situation worsened in the ensuing years as traffic and revenue underperformed expectations by ever increasing margins—with WSA's overestimates at 126% for transactions and 159% for revenues in 2010—as this table from [TOLLROADSnews](#)⁴⁶ indicates:

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⁴⁴ ["Tollway Forecast: a Rough Road,"](#) Los Angeles Times, August 6, 2003.

⁴⁵ ["The Bell Tolls: Revenue Relief for a Traffic Slump,"](#) Zach Patton, [Governing](#), January 2006.

⁴⁶ ["San Joaquin Hills 73 bondholders agree to stretch bond term,"](#) [TOLLROADSnews](#), May 14, 2011, #5304. It is not clear that TRN produced this table; it may be from a TCA or other document.

FISCAL YEAR	ACTUAL TRANSACTIONS	PROJECTED TRANSACTIONS	% OF PROJECTION	ACTUAL TOLL REVENUES	PROJECTED TOLL REVENUES	% OF PROJECTION
2010	25,308,372	57,435,000	44.1%	\$87,095,815	\$138,459,000	62.9%
2009	26,810,458	54,501,000	49.2%	\$88,419,923	\$131,269,000	65.8%
2008	30,057,878	51,596,000	58.3%	\$91,434,068	\$123,104,000	74.3%
2007	31,096,854	50,210,000	61.9%	\$89,058,936	\$111,704,000	79.7%
2006	30,622,020	47,527,000	64.4%	\$81,929,005	\$105,608,000	77.6%
2005	29,585,828	44,779,000	66.1%	\$75,645,139	\$98,307,000	76.9%
2004	29,415,339	42,772,000	68.5%	\$67,031,360	\$85,716,000	78.2%
2003	27,024,334	39,783,000	67.9%	\$61,147,499	\$79,642,000	76.8%
2002	26,055,147	37,011,000	70.4%	\$56,864,910	\$73,996,000	76.8%
2001	26,054,876	35,391,000	73.6%	\$50,901,371	\$63,314,000	80.4%
2000	26,660,797	32,300,000	82.5%	\$46,818,996	\$57,911,000	80.8%
1999	24,653,673	28,480,205	87.3%	\$42,645,223	\$50,962,000	83.7%
1998	20,902,595	23,318,000	89.6%	\$33,927,997	\$37,916,000	89.5%
1997	11,153,013	11,153,000	100.0%	\$16,668,231	\$19,900,000	84.8%

In May 2010, TCA sought agreement from bondholders to extend the term of the bonds and reduce the debt service ratio:

This slippage behind forecasts on which the original financial plan was based, has caused the SJH to slip slowly toward default on various provisions of its old bond covenants.

The announcement said they were seeking consent from bondholders to amend the 1993 and 1997 Indentures in order, among other things to:

- 1. Change the agency's debt service coverage ratio requirement from 1.3 to 1.0 times with the ability to use cash available in reserves to meet the debt service coverage ratio requirement.*
- 2. Consent from National Public Finance Guarantee Corp., formerly MBIA, the insurer of certain 1997 bonds, for the Indenture amendments.*
- 3. In the form of a Supplemental Indenture, amend certain terms of \$430 million of convertible capital appreciation bonds that have maturity dates in 2018, 2020, 2022, 2023 and 2024, including changing the originally scheduled maturity dates.*

They announced May 13 they had received the required number of consents from bondholders to amend the Indenture of Trusts for bonds issued to fund construction of the SJH73 Toll Road.⁴⁷

Bond Buyer described the debt servicing effects of the changes this way:

As debt service has risen, the (TCA) agency's revenue projections have fallen, reaching only 69% of its original forecasts in fiscal 2010, according to Moody's Investors Service.

The restructuring could save the toll road agency \$550 million in debt service costs from fiscal 2012 through fiscal 2024, but debt service in each fiscal year from 2025 through 2036 would rise by \$43 million, according to the MSRB disclosure filing.⁴⁸

The overall impact of the 2011 restructuring of the 1997 debt was to extend payments by seven years and increase total payments by nearly \$900 million or 22% to \$4.9 billion between 2012 and 2043, according to TCA's official notice of the restructuring.⁴⁹ Moody's promptly downgraded the core bonds from Ba2 to B1.⁵⁰

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⁴⁷ Ibid.

⁴⁸ ["Toll Road Courts Investors,"](#) Randall Jensen, Bond Buyer, April 29, 2011.

⁴⁹ ["Notice to Municipal Securities Rulemaking Board of Significant Event,"](#) San Joaquin Hills Transportation Corridor Agency, May 25, 2011.

⁵⁰ ["Notice to Municipal Securities Rulemaking Board of Significant Event \(Ratings Change\),"](#) San Joaquin Hills Transportation Corridor Agency, June 16, 2011.

South Bay Expressway (San Diego, CA)

State Route 125 was conceived in the late 1980s as a north-south route on the eastern edge of the San Diego metropolitan area that would serve new residents and businesses there and ease congestion on the parallel I-5 freeway which runs north from the Mexican border. Built in stages beginning in the early 1990s, the fourth and southern-most link—the South Bay Expressway (either SBX or SBE) toll road—was completed and launched in November 2007. The 9-mile Expressway was notable for being the first private toll road development to use TIFIA financing and the first to use bank debt and private equity, [according to the Federal Highway Administration](#). The opening had been delayed by thirteen months as construction, especially a three-quarter mile long bridge over the environmentally sensitive Otay River floodplane, proved more challenging than had been expected. All told, the expressway cost \$658 million to build, including the TIFIA loan (\$140 million) and bank debt (\$340 million) backed by toll revenues, investor equity (Macquarie Infrastructure Group--\$130 million), and \$48 million in donated right of way.



The debt financing was offered on the basis of a 2003 WSA T&R forecast, all the more out of date due to delays in the toll road's construction. In fact, the toll road was launched and the forecast used as the basis of financing just as the United States was entering "The Great Recession." Here's how TOLLROADSnews reports the consequences:

On traffic and revenue SBE (South Bay Expressway) say in their (bankruptcy) court filing that in 2007 as the tollroad neared completion foreclosures were up 2.5 fold in the county. Real estate values dropped 45 to 55% with the housing collapse between 2005 and 2009. Cross border traffic with a high percentage of trucks at the southern end of the tollroad has dropped 30%.

Unemployment went from under 4% to over 10%.

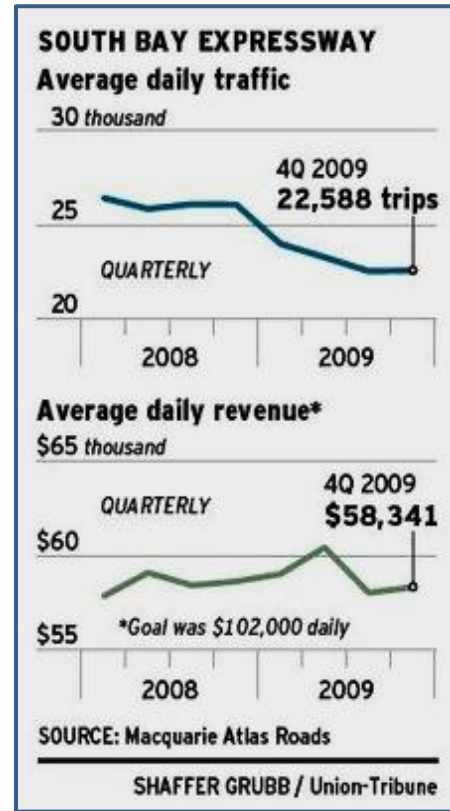
Feeling pinched many people drove less and stuck to free routes.

Traffic and revenue forecasts underlying the financing plan for the SBE projected 60k vehicles/day in 2009 whereas traffic was in fact 23k/day, or 38% of forecast level.

Toll revenue in 2008 was \$22m or 70% of the forecast \$31m.

In 2009 toll revenue was \$21m, about half of the \$42m forecast.

They say: "As a result, (SBE) are unable to maintain sufficient liquidity to meet their debt service obligations and are having to use reserves for such obligations."



In brief, the WSA 2003 forecast was badly out of touch with the economic reality of 2007-2009. The financial problems were compounded by a lawsuit by the toll road's builders and others claiming they were owed many millions more than they had been paid.

Unable to come to an out of court settlement with the builders and chewing up the remaining financial reserves as a result of traffic much less than had been forecast, South Bay Expressway filed for bankruptcy under Chapter 11 on March 10, 2010.

Unable to come to an out of court settlement with the builders and chewing up the remaining financial reserves as a result of traffic much less than had been forecast, South Bay Expressway filed for bankruptcy under Chapter 11 on March 10, 2010. The Federal Highway Administration—which had lent \$140 million to the effort through the TIFIA program—noted subsequent developments:

On December 30, 2010, SBX LP filed a Plan of Reorganization (Plan) with the Bankruptcy Court, pursuant to which SBX LP was converted to a Delaware limited liability company, South Bay Expressway, LLC, and the debt of the Bank Lenders and TIFIA was restructured. The Bankruptcy Court confirmed the Plan on April 14,

2011, which includes the settlement of all litigation matters with the contractor, Caltrans, and certain other parties.

Under the Plan, TIFIA's secured claim is \$99 million, of which approximately \$93 million is debt (the new loan amount) and \$6 million is equity. TIFIA's unsecured claim is \$73 million, or 42 percent of the \$172 million outstanding balance.

All future toll revenues will be shared pro rata between TIFIA (32 percent) and the Bank Lenders (68 percent). In addition, TIFIA will share pro rata with the Bank Lenders in any equity distributions. The Bank Lenders and TIFIA hold 100 percent of the restructured debt and own all of the equity in the reorganized company. Although DOT wrote down a portion of the principal balance, TIFIA is scheduled to recapture more than 90 percent of the original loan by the final maturity date of 2042 through higher interest rates.⁵¹

The reorganized company, South Bay Expressway, LLC, emerged from bankruptcy on April 28, 2011, concurrent with the financial close of the restructured loans.

As a result of this settlement, MacQuarie Group and CTV—the California private tollroad investment group—co-owners of the toll road had their investments wiped out. The lenders—private and TIFIA—took a 42 percent “haircut” on their outstanding loans in exchange for proportional equity—68% private, 32% TIFIA—in the failed toll road. The new owners set up a Delaware corporation, South Bay Expressway LLC. According to U-T San Diego, the new company was valued at \$287 million in assets and \$288 million in liabilities.⁵²

Their next step was to sell the toll road. In December 2011, SANDAG (San Diego Association of Governments) agreed to purchase the toll road at a price of \$341.5 million, according to San Diego Source. It continues:

SANDAG is paying \$341.5 million for the operational rights. About \$240 million, raised through the utilization of a TransNet sales tax loan provision and by swapping the SR-125 purchase with a project that would have added managed lanes to Interstate 805, is being paid in cash. The remaining money comes from a promissory “Series D” note, which SANDAG will pay out only if it continues charging tolls after all loans mature on Dec. 31, 2042, and the assumption of SBX’s \$92.5 million federal TIFIA loan. An escrow account of \$7.5 million is also attached to the sale.

No immediate changes will be noticeable to SR-125 drivers, said SANDAG Chair Jerome Stocks in a statement.

⁵¹ [South Bay Expressway, Project Profiles](#), Federal Highway Administration.

⁵² [“South Bay Expressway emerges from bankruptcy,”](#) U-T San Diego, April 14, 2011.

“But in the coming months, the board will move to cut the tolls, bringing congestion relief to South Bay decades sooner than previously planned, removing the need to build other facilities elsewhere, and saving \$268 million in taxpayer money,” Stocks added.

SANDAG has estimated that it can decrease toll rates by around 40 percent, increasing the road’s use and decreasing the need for the second of two planned managed lane additions on I-805. A contract has also been signed to retain the toll road’s existing staff during a six-month transition phase.⁵³

In less than three years, the value of the public-private partnership that cost \$658 million dipped to \$342 million, private and public lenders lost 42% of the value of the bonds through restructuring with a promise to get most of it back over a longer timeframe, the once private roadway is now a public toll road, and TransNet sales tax revenue—previously intended for road improvement purposes elsewhere—were used to pay some of the debt.

⁵³ “SANDAG purchase of South Bay Expressway complete,” James Palen, The Daily Transcript, San Diego Source, December 21, 2011.

Appendix C: Challenges to WSA Forecast in Pending Toll Bridge Projects (Case Studies)

WSA continues to produce T&R forecasts for planned toll projects of all kinds, including toll bridges. At least two of those projects have been under discussion for some time: The Knik Arm Toll Bridge near Anchorage, Alaska, and the New International Trade Corridor (NITC), formerly the Detroit River International Crossing (DRIC), Detroit, Michigan. An important part of the debate about the economic feasibility of these two projects pertains to forecasts WSA provided over the years. We take a brief look at these debates in the following paragraphs.

Knik Arm Toll Bridge (Anchorage, AK)

Wikipedia provides this basic background on the Knik Arm Bridge:

The Knik Arm Bridge is a controversial proposed highway crossing of the Knik Arm portion of Cook Inlet, north of Anchorage, Alaska. . .

The bridge would expand the commuter belt for Anchorage, Alaska's largest city, by cutting an hour or more from journeys from the southern part of the Matanuska/Susitna Valley (Mat-Su). The southern part of the Mat-Su currently has very few inhabitants; a justification critics cite for calling the project a "Bridge to Nowhere." Proponents say the bridge would stimulate new housing construction in Mat-Su. It would also provide an alternate route from Anchorage to Wasilla. Cost estimates for the bridge vary wildly; more conservative estimates put the cost as high as \$1.5 billion. . . .⁵⁴

As Wikipedia suggests, the focus of criticism has been on different views of the population growth in the Mat-Su area across from Anchorage along with major cost uncertainties, although environmental impact issues have also played an important role in the ongoing debate. The essence of the debate from a T&R forecasting perspective is whether the WSA forecasts are sufficiently accurate to support a judgment that reasonable tolls will generate revenues adequate to satisfy debt servicing requirements.

WSA prepared a "preliminary" T&R forecast in 2005 for [the Knik Arm Toll Bridge Authority \(KABATA\)](#), the organization charged with developing the bridge, that included work by a subcontractor, HDR, designated by KABATA to provide an economic growth model for the Draft Environmental Impact Statement (DEIS). HDR contracted the work to Northern Economics, Inc. (NEI), an Anchorage economic analysis firm, which drew on work of the University of Alaska's (Anchorage) Institute of Social and Economic Research (ISER) to build its assessment of two scenarios: Mat-Su's growth with and without Knik Arm Bridge.

⁵⁴ "[Knik Arm Bridge](#)," Wikipedia.



The underlying ISER study was comprehensive. The 230-page document included three dozen pages of discussion of the methods, assumptions, analysis, and conclusions in the ISER effort.⁵⁵ The nearly 200 remaining pages were tables of data depicting the results of the various analyses in the report. For example, it forecasted 2030 population in Mat-Su Borough as 188,000 without a bridge and 204,000 with one, a difference of 16,000. Despite the comprehensive demographic work provided by ISER which WSA cited as its demographic source in its 2007 “final” T&R forecast, nowhere in WSA’s final “preliminary” report are any details of these demographic forecasts laid out—no tables, graphics, discussion, etc.--so it is unclear what population forecasts WSA used in its T&R forecast.

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The WSA forecasts played a particularly important role in the ongoing debate about the financial viability of Knik Arm Toll Bridge because of the planned importance of toll

⁵⁵ Memorandum on the Economic and Demographic Impacts of a Knik Arm Bridge, Scott Goldsmith, ISER, University of Alaska (Anchorage), September 2005.

revenues to financing its construction and operation. WSA’s 2005 forecast included an assessment by CITIGroup Global Markets, Inc., of the bonding capacity of the proposed bridge. The analysis, based on WSA’s concurrent preliminary revenue projections, indicated the bridge had an estimated \$242 million bonding capacity with a 2.0 debt servicing ratio to sustain the minimum “investment grade” (BBB-) bond rating. At the time, this was about half the roughly \$500 million forecast cost of the first phase of the project (the bridge linking Anchorage and Mat-Su).

WSA prepared its “final” T&R report in 2007, which was used by KABATA in its application for TIFIA funding. Its demographic work was performed by Insight Research Corporation (IRC), a small Dallas, TX, company with which WSA had worked before on Texas transportation infrastructure projects. Specifically, WSA used IRC’s May 2007 “[Independent Economic Overview and Development Forecast](#).” Its basic economic conclusion is that constructing the bridge would have a net \$18 billion impact on the economy in the area of the Anchorage-Mat-Su area in the 2007-2030 period through the “economic ripple effect.”⁵⁶

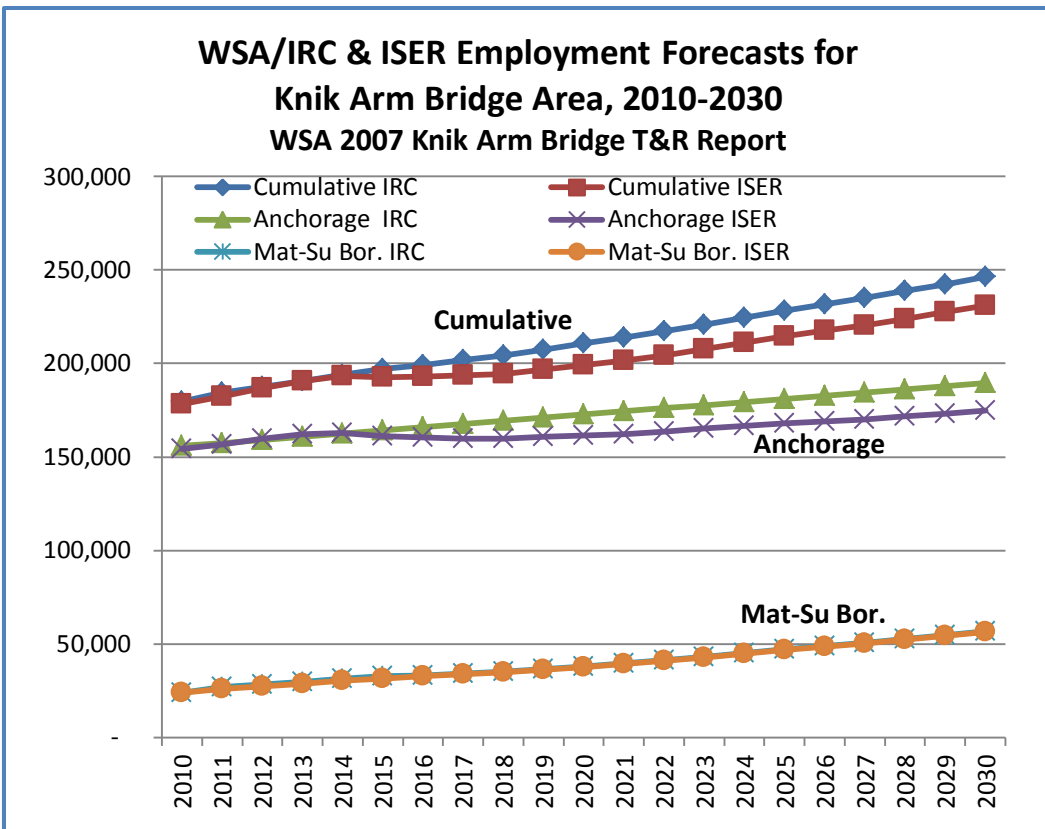
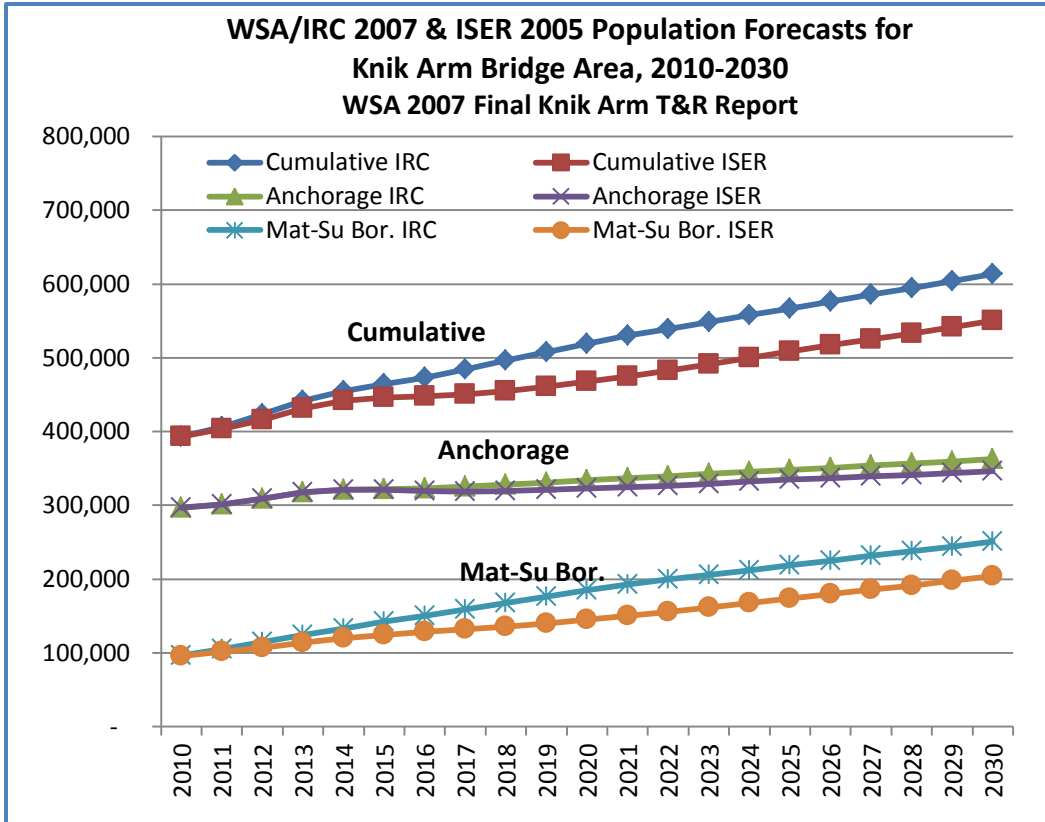
In the process of building its economic forecast, IRC consistently used higher population and employment numbers than those in the 2005 ISER report, as shown in the figures below. WSA’s use of the significantly larger IRC population (11.4% cumulative for the Anchorage and Mat-Su areas) and employment (6.6% cumulative) forecasts for 2030 and years prior in its “final” T&R forecast almost certainly is a factor in forecasting higher traffic demand and, ultimately, higher toll revenues for the proposed Knik Arm Toll Bridge.

- IRC forecasts 14.4% more population for Anchorage in 2030 than ISER and a 23% greater population in Mat-Su population.
- IRC forecast 6.6% greater employment (including an 8.5% difference in the Anchorage forecast) for 2030 than ISER did in 2005. In the 2030 end year for both projections, only the difference between the IRC and ISER employment forecast for Mat-Su Borough is insignificant. Indeed, looking at the annual data, IRC appears to have simply added 400 jobs to the ISER calculations for Mat-Su Borough for every year following the forecasted bridge construction period, 2016-2030, without explanation.⁵⁷

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⁵⁶ [Independent Economic Overview and Development Forecast](#), IRC, May 2007, p. 37.

⁵⁷ IRC adds between 1,000-1,400 jobs in Mat-Su during the bridge construction phase, 2011-2015, to the ISER report



In 2007, WSA produced a “final” T&R forecast which was included in the package submitted by KABATA for a \$279 million TIFIA direct loan—the maximum one-third of projected total project-related cost (\$837 million) allowed by TIFIA legislation. The FHWA subsequently rejected the KABATA application in November 2010. As explained by financial analysts Jamie Kenworthy and Bob French in January 2011:

In December 2010, KABATA admitted that the project will need a “state guarantee” to be financed by a private partner. The March 1, 2010 failed TIFIA letter of interest (essentially a loan application) pledged “annual appropriations of the state legislature” to cover the large (estimated at \$40 million/year) expected shortfall between bridge toll revenues and bridge costs including bond repayments. In a private briefing to the Alaska Department of Revenue on March 23, 2010, KABATA staff put forward two financial scenarios: 1) a publicly-financed project with no private partner; and 2) a private partner putting 9% of the money in and receiving an estimated 64% of the money out over 40 years, with the State of Alaska signing a “letter of credit” (labeled as “off balance sheet financing”) to, in effect, guarantee bond repayment. While the KABATA Board did not review the March documents, and has not formally discussed any financials for the Bridge, at KABATA’s December, 15, 2010 news conference, KABATA staff admitted they are seeking a “state guarantee.”

The federal 3/1/10 application, the March briefing, and the December statement are all tacit admissions that the private partnership concept is likely dead in the sense of a private entity willing to assume the downside risk of the project. Quite importantly, previous support for the Knik Arm Bridge by the Anchorage Assembly and AMATS has been contingent on no further state or local monetary support.

In 2009, ISER updated its Anchorage and Mat-Su demographic forecasts on the impact of the Knik Arm Bridge as part of its work on an EIS for a new highway—the Seward Highway to Glenn Highway (“H2H”)—that would affect development in the two areas. Included in the new report was a comparison with its 2005 report. In general, the new report forecast lower population and employment growth for the two localities in 2030 than its 2005 report generally based on (a) the ongoing Great Recession and (b) delays in constructing the Knik Arm Bridge. As shown in the pair of tables below from the 2009 report, virtually all the cumulative forecast impact was on population, a forecast cut of 38,000 people.

**Comparison of ISER 2005 and ISER/H2H 2009
Area Population and Employment Forecasts**

Anchorage + Matsu Total Employment				Anchorage + Matsu Population			
	Knik Base	H to H Base	Difference		Knik Base	H to H Base	Difference
2005	224.36	223.23	-1.13	2005	358.41	351.87	-6.54
2010	236.83	231.5	-5.33	2010	393.33	369.52	-23.81
2015	254.93	242.8	-12.13	2015	445.67	384.22	-61.45
2020	262.64	264.4	1.76	2020	467.52	431.66	-35.86
2025	281.74	291.3	9.56	2025	508.83	487.32	-21.51
2030	302.24	301.5	-0.74	2030	550.56	512.06	-38.5
2035		307.1		2035		522.18	
Growth rate	1.20%	1.21%		Growth rate	1.73%	1.51%	

Source: Economic and Demographic Projections for Alaska and Greater Anchorage, 2010–2035, Scott Goldsmith, ISER, UAA, December 2009. p. 69.

Debate continued over the cost of the toll bridge project as estimates escalated and the prospect declined that toll revenues would cover most of those costs. In December 2010, the Federal Highway Administration approved the Record of Decision (ROD) permitting work to begin on the Knik Arm Bridge, but many in Alaska were still wondering how much it will cost, and who would end up paying for it. Undeterred by the rejection of their initial TIFIA application, KABATA asked WSA to update its T&R forecast as part of a new federal loan application package and re-applied for TIFIA financing based on the FHWA ROD signing.

On February 25, 2011, WSA provided an “update” of its 2007 “final” T&R forecast. Few changes in the socio-economic inputs are discernible. It fails to provide sufficient population data, for example, to test its consistency with the earlier 2007 IRC or 2009 and 2005 ISER studies. While stating that it based its new forecast on the work in the ISER 2009 forecast, it does not show either ISER’s or any new population and employment data at the municipality level, except in a single pair of tables showing population and employment in 2035, shown below.

Table 7
Projected Area Households (2010 to 2035), *Baseline*

Geography	Year		Average Annual % Change
	2010	2035	2010-35
Anchorage Municipality	112,500	142,700	1.0%
<u>Matanuska-Susitna Borough</u>	<u>29,700</u>	<u>74,600</u>	<u>3.8%</u>
Study Area	142,100	217,300	1.7%

Note: Values rounded to the nearest 100

Table 8
Projected Area Employment (2010 to 2035), *Baseline*

Geography	Year		Average Annual % Change
	2010	2035	2010-35
Anchorage Municipality	161,400	199,200	0.8%
<u>Matanuska-Susitna Borough</u>	<u>23,800</u>	<u>51,700</u>	<u>3.2%</u>
Study Area	185,200	250,900	1.2%

Note: Values rounded to the nearest 100; 2010 employment levels based on the 2007 study

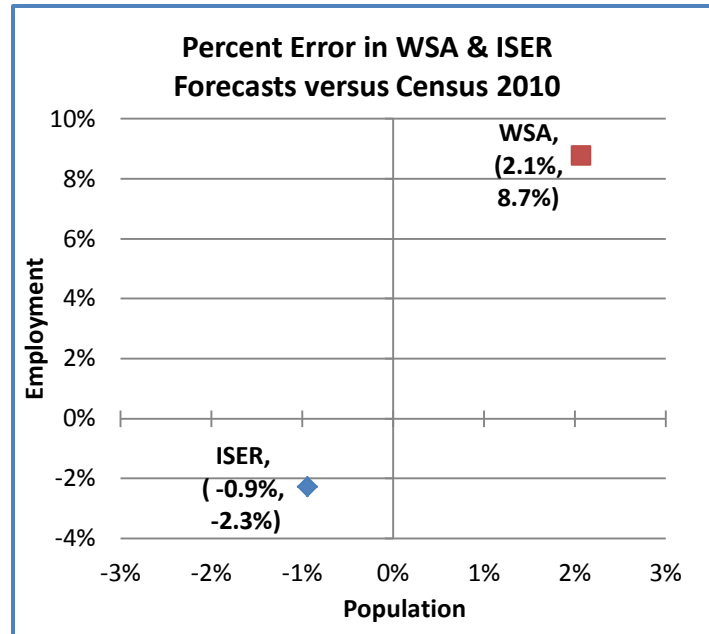
Source: *Proposed Knik Arm Bridge Traffic and Toll Revenue Update Study*, WSA, February 25, 2011, p. 12.

For comparison purposes:

- The 2011 WSA “update” T&R report implicitly puts baseline 2035 Anchorage and Mat-Su households at 217,300 or a population of 588,592 (using a household size factor of 2.64 for Anchorage and 2.84 for Mat-Su as both ISER and IRC did for all estimates, 2000-2030, in previous reports). The ISER/H2H 2009 study puts population at 522,180 in 2035. WSA’s population number is 12.7% higher.
- The WSA “update final” T&R forecast puts baseline 2035 Anchorage and Mat-Su employment at 250,900 while ISER’s 2009 forecast puts it at 307,100. WSA’s estimate is 18.3% less than ISER/H2H forecast for 2035.⁵⁸

As shown below, a check of WSA’s and ISER’s forecast performance against Census 2010 data indicates that WSA’s 2011 forecast—completed after the census—was optimistic in forecasting both population and employment. ISER slightly underestimated both in its December 2009 forecast.

⁵⁸ E-mail exchanges with ISER researchers indicate they believe WSA may have used a different definition of “employment” than ISER to achieve this lower published 2035 baseline employment estimate. Unfortunately, WSA has not published the basis for their employment projection.



In recent months, the Alaskan legislature has moved forward to provide \$150 million to cover anticipated toll revenue shortcomings in the first decade of the project and is considering a guarantee of up to \$3.2 billion in Knik Bridge debt as the project becomes more costly. Concurrently, the debate over WSA's T&R forecasts has continued.

- In an April 24, 2011, letter, Scott Goldsmith, lead author of the ISER analyses wrote a letter to co-chairs of the state's House and Senate finance committees noting:

First, the economic viability of KABATA depends on tolls, which depends on trips, which depends on population. Since we don't know what population numbers drive the analysis we cannot judge the economic viability of the project.

Without a clear statement from KABATA about what population projection numbers they are using, and how they are using them, it is impossible to judge the quality of their analysis and the economic viability of their project. KABATA documents have never clearly indicated what numbers they are using. I am concerned that important decisions are being made without this crucial information and that the ISER work may be misrepresented.

*The Wilbur Smith Associates (WSA) February 25, 2011 letter to Andrew Niemiec entitled **Proposed Knik Arm Bridge Traffic and Toll Revenue Update Study** purports to use the 2009 ISER population projection as well as those from other analysts, but inexplicably the Study does not present any population numbers. It is thus impossible to verify what numbers were actually used, and more importantly how they drive the prediction of tolls. . .*

*This only adds to the confusion around the prediction of toll revenues that was in the original WSA study done in 2007 (**Proposed Kink Arm Bridge Final Traffic and Toll Revenue Forecast** and July 27, 2007 letter to Darryl Jordon entitled **Updated Traffic and Revenue Forecasts**). That study contained 2 very different sets of population projections—the 2005 ISER projection and a much higher projection created by Insight Research Corporation from Dallas, Texas. As with the Update Study, it is impossible to verify what population numbers were actually used in the prediction of tolls.*

The Insight Research Corporation projections produce an estimate of Matsu population growth between 2010 and 2030 that is 43% higher than the ISER (and Alaska Department of Labor) projections. We need an unequivocal and independently verifiable presentation of the analysis to determine what the population growth assumptions really are.

Second, the incorporation of the 2010 population count for the Matsu Borough—as discussed by KABATA in its March 24, 2011 testimony to the House Transportation Committee--does not invalidate the ISER projection and more importantly it does not change the forecast of toll revenues.

The 2010 Census population figure for the Matsu Borough was 88,995, 11% higher than ISER (2009) and also considerably higher than ADOL official population figures for the immediately preceding years which were used to calibrate the ISER projections. Revising the ISER projection upward in the base year of 2010 would increase subsequent year population estimates by 11% but would not change the projected growth rate of the population in subsequent years.

However this would not lead to an 11% increase in predicted toll revenue if accurate information exists about the actual number of trips generated in 2010. If the number of trips is accurate, but the population is underestimated by 11%, it means that the estimate of the number of trips per person is about 11% TOO HIGH. With accurate population information, the ratio of trips to population would fall by 11%. Consequently the predicted toll revenues would not be impacted by a recalibration to the census population figure.⁵⁹

- Financial analyst Jamie Kenworthy briefed the Committee on Anchorage Metropolitan Area Transportation Solutions (AMATS) on August 29, 2011, on the risks in the KABATA Knik Bridge financing proposal, including some of its underlying demographic factors as prepared by Scott Goldsmith.⁶⁰ Among these is this comparison of KABATA/WSA and other population forecasts for Mat-Su Borough:

⁵⁹ [Letter from Scott Goldsmith to the chairs of the Alaskan state Senate and House Finance Committees re KABATA Population Projections](#), April 4, 2011.

⁶⁰

Mat-Su Borough Projections

KABATA Data			
Year	Population	Households	Source
2030	250,700	<i>92,169</i>	Insight/WSA '07
2035	<i>202,912</i>	74,600	WSA '11

Non-KABATA Data			
Year	Population	Households	Source
2030	169,000	<i>62,132</i>	ISER '09
2034	152,456	<i>56,050</i>	12/2010 AK Demographer
2035	<i>160,929</i>	59,165	ISER '09, H2H

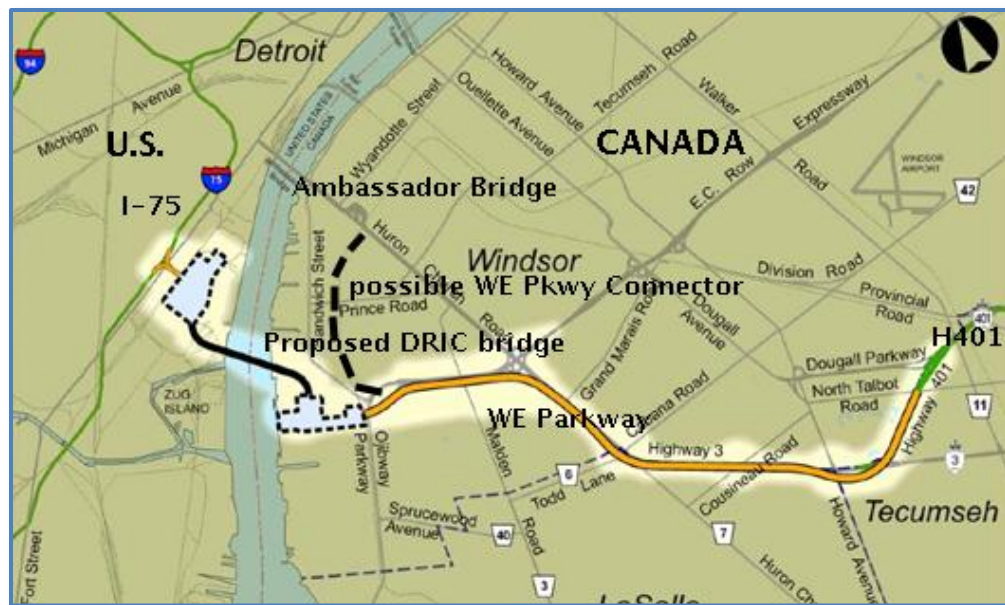
2010 Census counted 88,995 people in 31,824 households or 2.72 persons/household on average. The 2.72 number is used in this analysis (i.e., calculated #s shown in italics).

- Also in August 2011, Mr. Kenworthy wrote a critique of KABATA's financial plan supporting its FY2010 TIFIA application. His report judged that debt repayments would likely total \$5.75 billion over 36 years versus KABATA's estimate of \$3.2 billion, a \$2.5 billion (80%) difference. His argument was based on three factors:
 - The KABATA plan assumed \$306 million in TIFIA financing, which it was unlikely to receive in light of the rejection of its earlier proposal and the roughly one billion dollars available nationwide in new TIFIA funds.
 - The KABATA plan used much higher estimates of population (30% higher for Mat-Su than ISER/H2H 2009), higher tolls (more than 60% higher), and more bridge traffic (over 100% higher) based on an Alaskan DOT estimate that assumed no tolls.
 - KABATA assumes an excessive 12% payout to equity investors when Alaska has traditionally limited payouts to 10%.

In late 2011, KABATA was moving to assess properties it would need to condemn to build the Knik Arm Bridge although critics argue it does not have the authority to do that in the absence of committed 100% financing. Its most recent TIFIA loan application is pending; three previous TIFIA loan applications and two TIGER grant applications have been rejected, according to public records. To date, Alaska is still considering whether to provide \$150 million to the project to cover expected shortfalls in toll revenues over the first decade of the bridge's operation and a \$3.2 billion long-term guarantee for the bridge's financing.

New International Trade Corridor (NITC) Toll Bridge (Detroit, MI)

The New International Trade Corridor (NITC) toll bridge plan—formerly known as the Detroit River International Corridor (DRIC)—proposes to build a second toll bridge across the Detroit River between Detroit, MI, and Windsor, Ontario, Canada. Two existing privately-owned toll bridges (Ambassador and Blue Water), a tunnel, and a truck ferry crossing already link Detroit and Windsor and have been in operation for decades. Combined, they are known as the Detroit-Windsor Gateway. This gateway is the busiest land trade link along the US-Canadian border accounting for 28% of US-Canadian trade, according to the Canadian Treasury. Proponents of the new toll bridge have argued, on the basis of WSA forecasts, that future cross-border traffic—especially commercial truck traffic—dictates the need for a new bridge and that it can be generally financially self-sufficient using bridge toll revenues. The bridge and its links would also enable traffic to avoid congested downtown routes on both sides of the border.



There are essentially two distinct parts to this project: the bridge and links to I-75 in the United States, and the Windsor-Essex Parkway linking the bridge to Canada’s “interstate” Highway 401. A June 2011 estimate put the capital cost of the total project at about \$3.7 billion with roughly \$950 million for the actual bridge construction to be financed by tolls. The nearly three-quarters balance would be paid for by additional taxes in Canada and Michigan. These taxes would cover the toll plazas and associated government inspection stations on both sides of the border (~\$775 million), the I-75 interchange (~\$386 million), and the ~\$1.6 billion Windsor-Essex Parkway.⁶¹ In brief, the bridge, which is to be paid for out of toll revenues, accounts for about one-quarter of the total cost of the project.

⁶¹ [“DRIC finances revisited - comeback to the bridge company sponsored Conway report,”](#) TOLLROADSnews, June 2, 2011.

Bilateral negotiations on the bridge and its links had been going on between the United States and Canada for years and many required steps to advance the bridge had been completed by 2009, including a US Final Environmental Impact Statement and a FHWA Record of Decision. New attention was directed at the proposed bridge, however, when the Michigan state legislature authorized in September 2009 the spending of \$2.5 million “to continue to advance preliminary legal, financial, engineering and environmental permitting to prepare for seeking a private sector toll concessionaire to finance, build, and operate the bridge. . . The budget legislation specifically requires an investment grade traffic and revenue (T&R) study for submission by Michigan DOT to the legislature by May 1 next year (2010).”⁶²

WSA prepared the mandated T&R forecast, delivering two “draft” studies, one in February 2010, the second in May 2010. The February study was a “traffic only” study whereas the May report was a “refresh and update,” adding a brief section on “Annual Toll Revenue Estimates.” The brief, added section included one paragraph of text and a full-page table providing toll revenue estimates by type of vehicle (passenger vs. commercial) for the period 2016-2065.⁶³ We have not compared the two studies line-by-line to see if there are differences in their underlying traffic and revenue driving factors.

From a T&R forecasting perspective, this study differs from the others we have examined in that:

- Potential DRIC bridge users have immediately available alternative crossings operating at less than capacity they can use if they so choose.
- The alternative routes have the opportunity to lower or raise their tolls to compete more effectively with the new DRIC crossing, and adding more uncertainty to forecasting DRIC toll revenues.
- The DRIC crossing will rely much more on commercial vehicle traffic originating beyond the immediate Detroit-Windsor area than other bridges and roads we have examined. In general, this makes regional population and employment forecasts *less* important than in other cases.

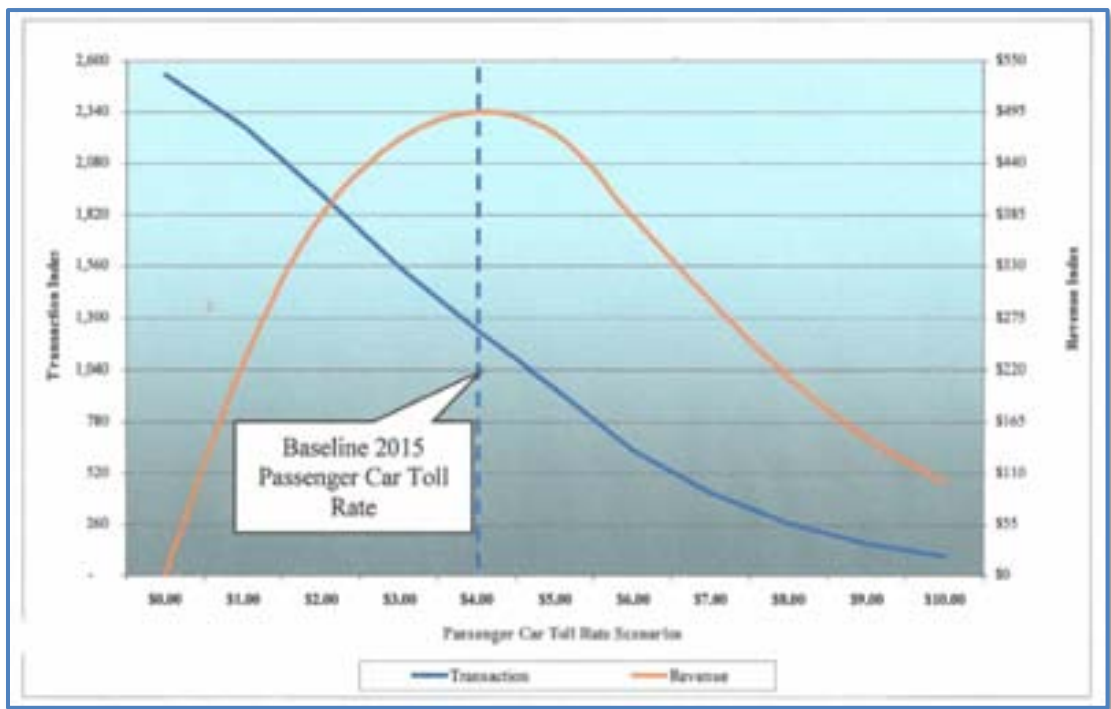
All of this creates more uncertainty in the traffic and revenue forecasting results, which WSA does, in fact, acknowledge in its forecast.

⁶² [“Michigan legislators call for T&R study, prelim legal, engineering for 3rd Detroit crossing,” TOLLROADSnews](#), September 30, 2009.

⁶³ [Preliminary Results of the Comprehensive Toll and Revenue Study for the Detroit River International Crossing Project Forecast Refresh and Update](#), May 2010, pp. 6-27 – 6-28.

One of the more important findings in the WSA forecast is that, in 2015, the revenue maximizing toll for passenger cars using the proposed bridge is \$4.00 as shown in the figure below.⁶⁴ WSA assumes that the new DRIC toll bridge would always charge the same toll as the Ambassador Bridge and the Detroit-Windsor Tunnel, and more than the more distant Blue Water toll bridge. It calculates the future toll rates for these spans based on a 2.3% inflation rate as described in the table (Table 6-4) below.⁶⁵ A clear implication of these assumptions and forecasts is that the revenue maximizing toll for the bridge, while based largely on regional per capita income, grows only with inflation.

A clear implication of these assumptions and forecasts is that the revenue maximizing toll for the bridge, while based largely on regional per capita income, grows only with inflation.



⁶⁴ Ibid, p. 6-15. There is a 10% discount on electronically collected tolls.

⁶⁵ Ibid, p. 6-4 and p. 6-9.

Table 6-4 Nominal Toll Rates for Travel Demand Modeling (SU.S.)			
Crossing	Passenger Car		Commercial
	Peak	Off Peak	All Day
2009			
Ambassador Bridge	\$3.60	\$4.00	\$17.43
Detroit-Windsor Tunnel	\$3.60	\$4.00	\$7.03
Blue Water Bridge	\$1.50	\$1.50	\$8.86
2015			
Ambassador Bridge	\$4.13	\$4.58	\$19.98
Detroit-Windsor Tunnel	\$4.13	\$4.58	\$8.06
Blue Water Bridge	\$2.87	\$3.50	\$20.26
2025			
Ambassador Bridge	\$5.18	\$5.76	\$25.08
Detroit-Windsor Tunnel	\$5.18	\$5.76	\$10.11
Blue Water Bridge	\$3.61	\$4.40	\$26.72
2035			
Ambassador Bridge	\$6.50	\$7.22	\$31.48
Detroit-Windsor Tunnel	\$6.50	\$7.22	\$12.70
Blue Water Bridge	\$4.53	\$5.52	\$33.54

Source: *WSA Final T&R Report for DRIC, May 2010.*

To its credit, WSA finishes its forecast with a reasonably complete risk assessment, outlining the assumptions that might lead to “high” or “low” traffic and revenue outcomes (see Table 7-5 below). As depicted in Figure 7-15 in the WSA report, this results in a broadening band of potential outcomes by 2091, the end point of the forecast. At that end point, toll revenues could vary by a billion dollars or so from a roughly \$1.5 billion annual revenue “base” forecast in 2091.

Table 7-5 Risk Assessment Assumptions			
Parameters	Low Case	Base Case	High Case
Toll Escalation	Low growth rate at 2.0%	Grow at CPI (2.3% annually)	High growth rate close to existing crossings' historical growth at 5% for first 5 years of new bridge operation, decreasing 1% every 5 years until reach CPI and remain at CPI for years beyond
Toll Rate	New crossing: growth at 2.0% Existing crossings: 10% lower than toll rates growing at 2.0%	Grow at CPI (2.3% annually)	New crossing: growth at specified rate Existing crossings: 10% higher than specified growth rate
Ramp-up	75 percent - year 1, 85 percent - year 2, 95 percent - year 3	90 percent - year 1, 95 percent - year 2	95 percent - year 1
Border Crossing Time - Passenger Car	New crossing: 20% higher than baseline values Existing crossings: 20% lower than baseline values or shortest crossing time	New crossing: 6.6 min Ambassador Bridge: 6.6 min Detroit Windsor Tunnel: 5.6 min Blue Water Bridge: 5.3 min	New crossing: 20% lower than baseline values or shortest crossing time Existing crossings: 20% higher than baseline values
Border Crossing Time - Commercial Vehicle	New crossing: 20% higher than baseline values Existing crossings: 20% lower than baseline values or shortest crossing time	New crossing: 13.5 min Ambassador Bridge: 13.5 min Detroit Windsor Tunnel: 14.6 min Blue Water Bridge: 14.6 min	New crossing: 20% lower than baseline values or shortest crossing time Existing crossings: 20% higher than baseline values
Crossing Choice Model	New crossing constant of Passenger car is -0.2 New crossing constant of commercial vehicle is -0.3	New crossing constant of Passenger car is 0.0 New crossing constant of commercial vehicle is 0.0	New crossing constant of Passenger car is +0.2 New crossing constant of commercial vehicle is +0.3
Corridor Growth	Low corridor growth	Baseline corridor growth	High corridor growth

Note:
 1. The passenger car border crossing times of the baseline shown in the above table are the average of all periods and two directions and are for presentation purpose only.
 2. The commercial vehicle border crossing times of the baseline shown in the above table are the average of the two directions and are for presentation purpose only.

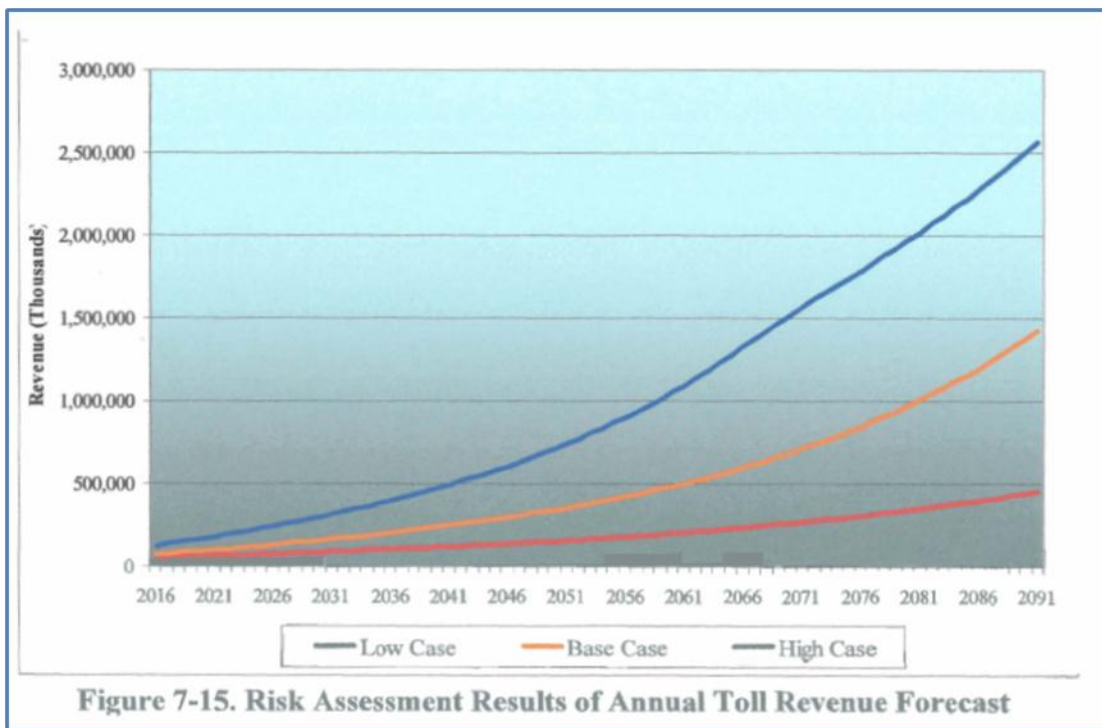


Figure 7-15. Risk Assessment Results of Annual Toll Revenue Forecast

Virtually simultaneously with the publication of the WSA T&R forecast, Halcrow Group—a British international consulting firm—provided a different forecast at the behest of the Detroit International Bridge Company (DIBC), owner of the Ambassador Bridge, and a stark opponent of the construction of another bridge across the Detroit River. The Halcrow report provided a much more pessimistic forecast of the traffic and revenues. In general, Halcrow had a more pessimistic view of the growth of post-recession truck traffic and foresaw a decline in auto traffic after the recession ended in the Detroit-Windsor gateway area. Detroit area employment, a key factor in cross-border car trips was expected to recover to end-2008 levels, but then to continue the slow secular decline under way for several decades. Halcrow reported a variety of factors would drive truck traffic in the gateway area (see Table 4 below).⁶⁶

Table 4 - Econometric Model Drivers

Direction	Bridges	Cars		Trucks	
		Main	Secondary	Main	Secondary
US → Canada	Ambassador	Detroit MSA Employment	Real FX	US Real Consumption	Motor Vehicle Production Canada
	Blue Water	Detroit MSA Employment	Real FX		
	Detroit Windsor	Detroit MSA Employment	Real FX	Detroit MSA Employment	Real FX
Canada → US	Ambassador	Detroit MSA Employment	Real FX	Canadian GDP	Motor Vehicle Production Canada
	Blue Water	Detroit MSA Employment	Real FX		
	Detroit Windsor	Detroit MSA Employment	Real FX	Detroit MSA Employment	Trucks (1 period lag)

The bottom line was Halcrow foresaw less than half the auto and truck traffic than WSA over the bridge in 2035, the only year for which we have directly comparable data.⁶⁷

2035 Traffic Forecasts--WSA and Halcrow (Millions of Vehicles)			
	WSA Base	Halcrow	Difference
Cars	6.0	2.5	3.5
Trucks	4.9	2.4	2.6
Total	10.9	4.8	6.1

⁶⁶ Ibid, [TOLLROADSnews](#), May 27, 2010.

⁶⁷ Data from the [WSA DRIC Final T&R Report](#), May 2010, and "[Halcrow study for bridge co suggests little demand for major new Detroit-Windsor bridge: 13.2k/day](#)," [TOLLROADSNews](#), May 27, 2010.

Nonetheless, WSA's report received broad criticism as overly optimistic from a variety of industry experts. [TOLLROADSnews](#) had this to say about the WSA study:

The Wilbur Smith forecasts were based heavily on population and general economic growth predictions. Michigan population was assumed to grow 0.4%/yr 2008-2030 versus stagnation in recent years. WSA came up with average daily truck crossings for 2035 at the Detroit River of 38,500 of which DRIC would get 44% or 16,900 to the Ambassador Bridge's 12,800 (33%) and Blue Water Bridge 7,300 (19%).

But that 38,500 is a fantastic increase on present numbers - 2006 was 14,400 trucks/day and 2009 was 10,130. We've assumed 2010 gets a 20% increase in truck traffic over 2009 so they get about 12,150 trucks crossing this year.

Even so the 2035 truck traffic forecast of WSA of 38,500/day is over 3.1 times the possible 2010 level and 2.7 times the pre-recession high in 2006.

Halcrow put total 2035 truck traffic at the crossings at 17k/day v WSA's 38.5k/day.

WSA put truck traffic at the DRIC alone at about the total Halcrow see for the aggregate of all the crossings in 2035.

It is quite unclear how WSA derived their numbers. And even assuming the revival of population growth in Detroit the relation between population and heavy truck traffic looks tenuous.⁶⁸

Crain's Detroit Business reported that private investors were divided on whether the bridge could pay for itself. "Some say tolls will be enough, but most prefer direct payments from the government (or government-run bridge authority) instead. That eliminates or significantly reduces private-sector risk if the tolls aren't enough to pay (for) the bridge -- potentially leaving Michigan taxpayers (or Canadian taxpayers, or both) on the hook if a subsidy is needed."⁶⁹

The Halcrow report added to the furor over the need and financing for another toll bridge in the gateway region. WSA responded with a two-page critique of the Halcrow report. It noted, "The result in the Halcrow report appear to be too heavily influenced by limiting factors that are not entirely representative of the border crossing demand. This approach will skew the results. In WSA's opinion, the economic analysis issued by Halcrow is too narrow in its geographic and industrial scope."⁷⁰ In its critique, WSA focuses on the geographic and auto

⁶⁸ "[Halcrow study for bridge co suggests little demand for major new Detroit-Windsor bridge: 13.2k/day](#)," [TOLLROADSNews](#), May 27, 2010.

⁶⁹ "[Private sector wary of tolls to finance new bridge](#)," Crain's Detroit Business, May 3, 2010

⁷⁰ "[Wilbur Smith and Associates comments on the Halcrow Report](#)," May 2010.

industry focus narrowness of the Halcrow report, its unrealistically low forecasts for truck and auto traffic growth, and emphasizes that “the WSA forecast was completed using a number of separate, industry-recognized methodologies, including an origin-destination study and a stated-preference survey. No such studies appear to have been undertaken in the Halcrow analysis.”

At least some of what WSA states is not fully accurate. For example, the WSA memo states “The Halcrow report is too focused on the Detroit-Windsor area, whereas over 60 percent of the traffic for the crossing has its origins or destinations outside the local area.” Using official Canadian data, Halcrow updates official 2000 gateway traffic to 2008 as its baseline. As shown below, the Halcrow report shows that about two-thirds of the auto traffic is locally based (roughly 21,100 of 33,600 vehicles), but that only about one-quarter of the truck traffic (3,100 of 12,500) is locally based (Greater Detroit-Windsor).⁷¹ In fact, it suggests that less than 8% of all traffic is strictly local. Even stretching “local area” to all of Michigan and the Windsor region, Halcrow puts the longer distance origin/destination of vehicles using the gateway crossings at 77%—higher than WSA’s stated 60%. This high percentage of non-local traffic origination/destination is intuitively logical—most of the autos are probably commuters, most of the trucks are likely long-distance haulers, and most of the traffic (especially that from/to the I-70/80/90/75 corridors in the US) has few other efficient choices for cross-border transit. It’s a distinction WSA does not draw in its criticism.

Table 13: 2008 AADT Car Trip Table

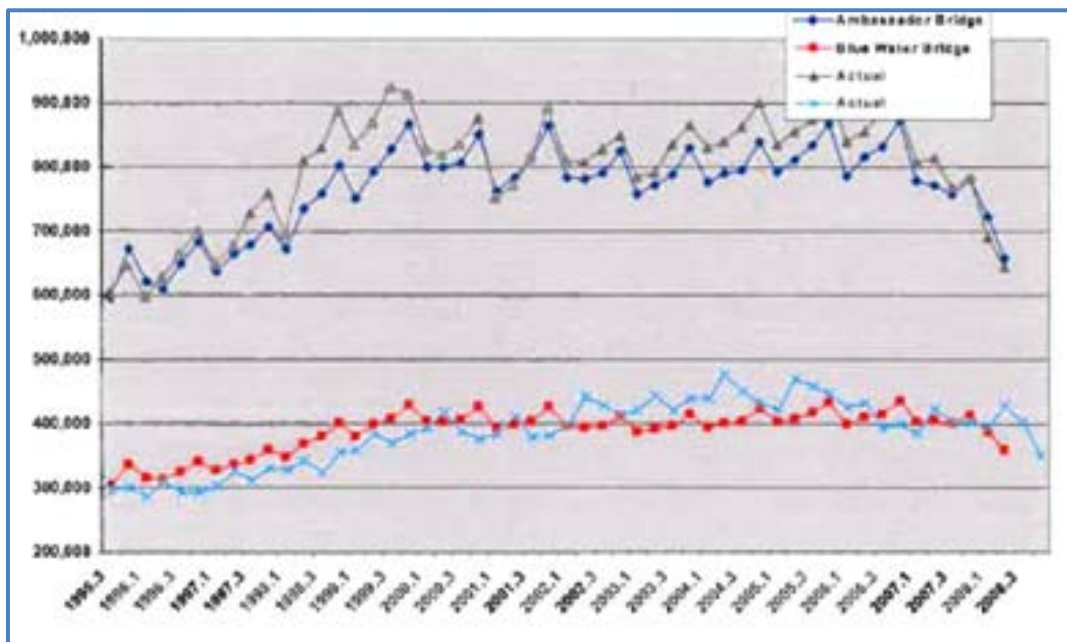
	Greater Detroit	Greater Port Huron	Rest of Michigan	US West	US East	Greater Windsor	Greater Sarnia	Rest of Canada	TOTAL
Greater Detroit						9,250	490	1,080	11,720
Greater Port Huron						80	1,430	320	1,820
Rest of Michigan						480	380	930	1,790
US West						210	40	380	630
US East						380	30	450	860
Greater Windsor	9,250	80	480	210	380				10,400
Greater Sarnia	490	1,430	380	40	30				2,360
Rest of Canada	1,080	320	930	380	450				4,060
TOTAL	11,720	1,820	1,790	630	860	10,400	2,360	4,060	33,640

⁷¹ Executive Summary, Halcrow Detroit Gateway Traffic Analysis, Section 1.6 (Crossing Choice Model), May 2010.

Table 14: 2008 AADT Truck Trip Table

	Greater Detroit	Greater Port Huron	Rest of Michigan	US West	US East	Greater Windsor	Greater Sarnia	Rest of Canada	TOTAL
Greater Detroit						720	10	1,110	1,840
Greater Port Huron						10	10	100	120
Rest of Michigan						140	20	760	920
US West						350	40	2,290	2,680
US East						100	10	580	690
Greater Windsor	720	10	140	350	100				1,320
Greater Sarnia	10	10	20	40	10				90
Rest of Canada	1,110	100	760	2,290	580				4,840
TOTAL	1,840	120	920	2,680	690	1,320	90	4,840	12,500

Moreover, Halcrow back-tested its model on data from previous years and the results suggest their modelling methodology has reasonably accurate forecasting ability—assuming the future looks something like the past—as suggested by these figures from the Halcrow report.



According to an October 11, 2011, press report, the Michigan Senate Economic Development Committee failed to approve a bill authorizing a new bridge between Detroit and Windsor, Ontario. The vote was 3-2 against the bill with all Democrats abstaining. The future of the bridge proposal is uncertain at this point, although proponents are expected to push forward.