# Report and comments on the Northwest Corridor Transportation and Environmental Planning Study. Published July 2008

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**By;**

**Daniel Brand, Senior Consultant, CRA International**
**David Cuneo, Associate Principal, CRA International**

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**Comments on final Northwest Corridor Transportation and Environmental Planning Study (TEPS)**

## EXECUTIVE SUMMARY

The City of Golden has carefully reviewed the traffic and financial elements of the Colorado Department of Transportation's (CDOT) Northwest Corridor Transportation and Environmental Planning Study (TEPS) Final Report (July 2008).[1] We appreciate the cooperation of the TEPS Study Team in furnishing us with additional study documents in response to our supplemental data request to CDOT.

We conclude that the TEPS's financial analysis includes fundamental errors that cause it to overstate the amount of potential revenue and bonding capacity from the proposed "Combined Alternative" by a factor of at least 2-3 times. These errors render the TEPS financial and traffic analyses useless without correction, as discussed below. The result of completely correcting all of the errors other than a large underestimate of likely operations and maintenance (O&M) costs is that only 6% of the $922 million construction cost of the Combined Alternative could be financed from the toll revenue bond proceeds. And if the toll road O&M cost is based on even only a portion of the Northwest Parkway's most recent publicly available operating and maintenance cost, none of the construction cost can be financed with revenue bonds.

CDOT's TEPS report recommended the Combined Alternative, a 20.1 mile long series of connected roadways in the Northwest Corridor between the Northwest Parkway and C-470 in Golden. These roadways included an 11-mile four-lane limited access toll road between SH 93 and SH 128 with a connection to the Northwest Parkway. The TEPS report presents the total cost of this Combined Alternative as $922 million in 2005 dollars, and estimates that $135-230 million of the total cost can be paid for with bond proceeds backed by the revenue from the tolled section. This leaves a funding shortfall of $692-787 million to be paid for by public funds. Stated another way, this means that 15% to 25% of the cost of the Combined Alternative could be paid for out of bond proceeds, according to the TEPS report.

The toll road portion of the Combined Alternative, now called the "Jefferson Parkway" by its proponents, would be split off from the remaining non-tolled Regional and Principal Arterials of the Combined Alternative. Its proponents have issued a request for expressions of interest for a toll concession to construct and operate part or all of it and are also planning to seek inclusion of the toll road as part of the Denver Regional Council of Governments' (DRCOG) official transportation plan using the TEPS report as its planning basis. However, the TEPS study and its DEIS predecessor study never considered the stand-alone toll road as an alternative in the study, and no results are given for it in the TEPS report.

[1] The City of Golden also has concerns regarding some other elements of the TEPS Study, but these are outside of the scope of this report.

This analysis identifies and quantifies the effects of six important problems with the analysis and results for the entire Combined Alternative financial analysis presented in the TEPS Report. Completely correcting all but one of the six fundamental problems reduces the TEPS study estimate of $135- $230 million construction bond proceeds by 57%-75% to $57.7 million, or only 6% of the $922 million construction cost of the Combined Alternative. Completely correcting all the problems means that none of the construction cost can be financed.

We identified the magnitude of these problems by rerunning the DRCOG model and duplicating the TEPS study revenue bond calculations and changing the input values to account for the effects of each problem. The six problems, with their *individual* effects on the construction bonding capacity are:

1. The TEPS study failed to subtract O&M costs from toll road revenues in all estimates but the low-range TEPS study estimate. This renders estimates higher than the $135 million low range unrealistic and unusable.

2. The TEPS report drastically underestimated future operating and maintenance expenses for the toll road for even this "low range" estimate by holding them essentially constant in real dollars, even though the report acknowledges that they should increase significantly in the future. Partially correcting this error leads to a 23% reduction in potential bond proceeds. And, if the TEPS study used the most recent publicly-available O&M costs for the Northwest Parkway, there would be no revenue bond proceeds.

3. The TEPS report overestimated the number of highway trips by using freeway trip tables rather than the appropriate trip tables for the toll road and arterials making up the Combined Alternative. Correcting this error by itself leads to a 37% reduction in potential bond proceeds.

4. The TEPS report's modeling also overstates traffic and revenue by coding the portion of the Combined Alternative on US 6 in Golden as a six-lane freeway rather than a regional arterial. Correcting this error results in an 11% reduction in potential bond proceeds.

5. The TEPS report also relies on borrowing costs from almost three years ago that are 0.5 percentage points lower than current costs. Correcting these costs to current borrowing costs reduces the potential bond proceeds by 10%.

6. The TEPS financial analysis also unrealistically assumed an immediate initiation of full traffic on the toll road without a ramp-up period, contrary to the experience of every new toll road. Inclusion of even a very optimistic ramp-up period would reduce potential bond proceeds by 6%.

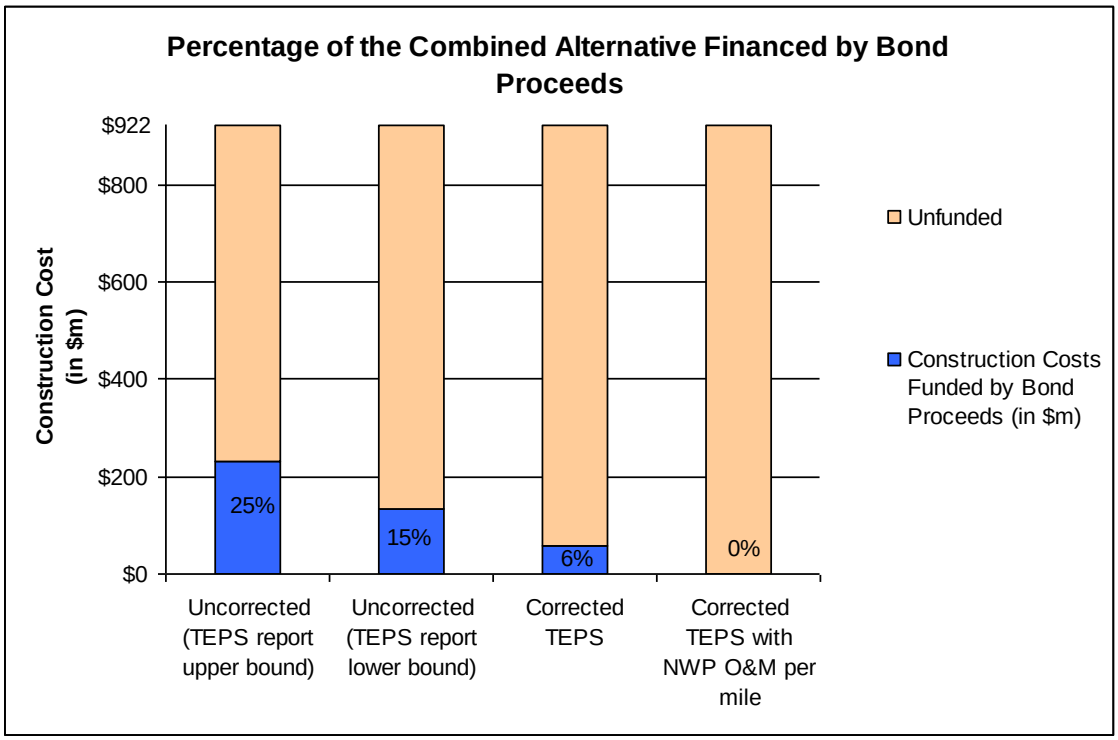
Each of these problems is described in detail in this report. It is important to note that the overall percent reduction of the $135- $230 million estimate of bond proceeds is not simply the sum of all the individual percent reductions, but the cumulative effect of correcting all of these errors.

The conclusion of this analysis is that the TEPS study grossly overestimates the traffic, revenue and construction cost bonding capacity for the Combined Alternative, including the section of toll road now called the "Jefferson Parkway." Given the problems we describe in this analysis, even the chances of financing 6% of the $922 million construction cost of the Combined Alternative are remote, and not likely to be embraced by any investor. The 6% is well within the range of the statistical noise of the construction cost estimate. Figure 1 illustrates the small, or zero amounts of the Combined Alternative's costs that can be financed by bond proceeds after correcting revenues and O&M costs.

Under these circumstances, there is no business case for attracting an investor to incur *both* the revenue risk *and* the construction cost risk. Further, the financial estimates of the TEPS report can not be used for financial planning or feasibility assessments without correction of its fundamental errors.

We would also note that the consequence of splitting off the Jefferson Parkway from the Combined Alternative is to lose a third to a half of the traffic on the tolled Jefferson Parkway because the Regional and Principal Arterials in the Combined Alternative no longer feed traffic into it. And, because the O&M costs of the toll road may be nearly half, or more likely, all of the revenue stream from traffic on the Combined Alternative, halving the traffic on the toll road leaves no reliable revenue available for construction cost financing of the toll road alone

**Figure 1: Construction Costs Funded by Bond Proceeds**




Source: CRA International analysis based on TEPS Study and Northwest Parkway 2007 Budget.

**Authors:**

The lead author is Daniel Brand, a Senior Consultant at CRA International and a former Associate Professor at Harvard University and Senior Lecturer at MIT. Mr. Brand was also Transportation Undersecretary for the state of Massachusetts. He is a well-known transportation expert with over 40 years of research and consulting experience in urban and intercity transportation policy and investment analysis. His areas of expertise include toll road, transit and high speed rail travel demand and revenue forecasting, intelligent transportation systems (ITS) and other new transportation technology evaluation studies; and transportation fare, pricing, marketing and economic impact projects. For example, Mr. Brand managed nearly 20 years of revenue bond feasibility studies for over 6 billion dollars of revenue bond financings of New York's Metropolitan Transportation Authority. He has also been the Chairman of three major Transportation Research Board (National Academy of Sciences) Committees, including Passenger Travel Demand Forecasting, New Transportation Systems and Technology, and Intelligent Transportation Systems.

David Cuneo is the other contributing author. He is an Associate Principal at CRA International who specializes in travel demand forecasting, transportation planning, network modeling, and economics. Much of his recent work has focused on toll facilities. He served as project manager for all of CRA's recent toll work in the Hampton Roads region of Virginia including toll rate and toll feasibility studies. He has also played key roles in CRA toll road projects in Texas (Houston Grand Parkway Market Valuation; the independent review of the Austin Phase 2 Toll Plan), and the $20 billion New Jersey Turnpike Asset Monetization Study. Prior to joining CRA, Mr. Cuneo was a Specialist in the Revenue Management Group of Northwest Airlines, a Research Assistant at the ITS Laboratory at MIT, and a Transportation Planner/Engineer at Parsons Brinckerhoff. Mr. Cuneo received his MS in Transportation from the Massachusetts Institute of Technology.

## THE REPORT

### Introduction

This report provides the City of Golden's review and analysis of the traffic and revenue elements of CDOT`s July 2008 Northwest Corridor Transportation and Environmental Planning Study (TEPS) Final Report. The City of Golden has carefully studied both the final report and the additional documents provided in response to our data request. We appreciate the cooperation of the TEPS Study Team in furnishing us with the additional documentation.

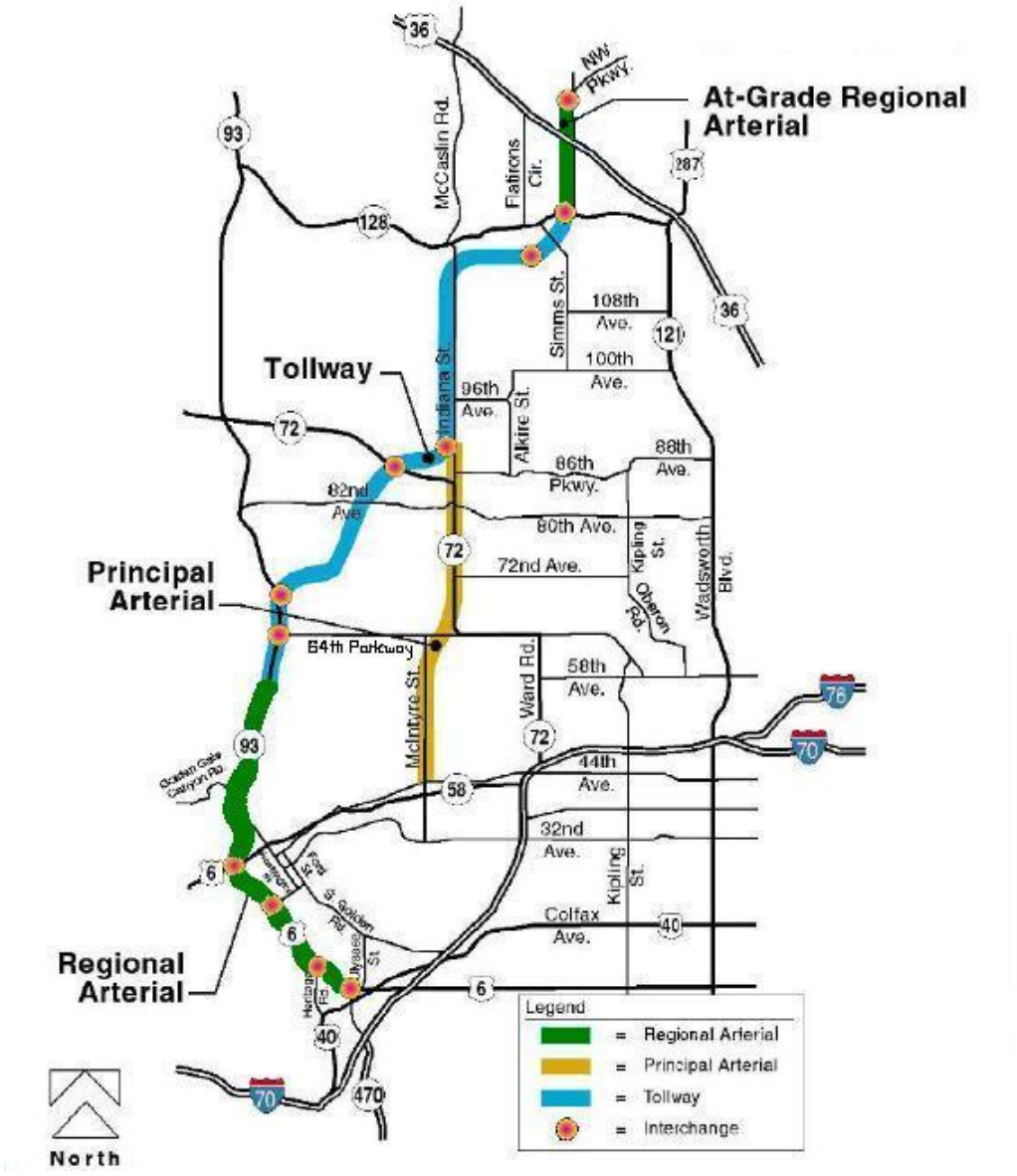
We first provide a brief description of the TEPS's recommended Combined Alternative, and its toll road portion now called the "Jefferson Parkway", followed by a summary of our findings, and detailed explanations of each finding.

### The TEPS Report Combined Alternative

The TEPS report recommended the Combined Alternative, a 20.1-mile-long series of connected roadways in the Northwest Corridor between the Northwest Parkway and C-470 in Golden. As shown in Figure 2 below, it would consist of a six-lane Regional Arterial between the Northwest Parkway and SH 128, an 11-mile, four-lane limited access Toll Road connecting to SH 93 just south of the 64th Parkway, and a six-lane Regional Arterial through Golden along SH 93 and US 6 connecting to C-470 and I-70. The Combined Alternative also includes a four-lane Principal Arterial along Indiana and McIntyre Streets between the Toll Road section's Indiana Street interchange and SH 58.

The TEPS report presents the total cost of this Combined Alternative as $922 million in 2005 dollars, and estimates that $135-230 million of the total cost can be paid for with proceeds from bonds backed by anticipated toll revenues. Even on its face, this leaves a funding shortfall of $692-787 million to be paid for by public funds. Stated another way, this means that 15% to 25% of the cost of the Combined Alternative could be paid for out of bond proceeds, according to the TEPS report.

**Figure 2. The Combined Alternative**




*Source: Figure 2.3-4 of TEPS Report corrected by CRA to match the actual description in the TEPS report.*

## The Combined Alternative and the Jefferson Parkway

This analysis focuses on the TEPS report recommended Combined Alternative and its toll road segment, now called the Jefferson Parkway by its proponents. The proponents propose to split off the proposed Jefferson Parkway from the unfunded non-tolled Regional and Principal Arterials of the Combined Alternative. Its proponents have issued a request for expressions of interest for a toll concession to construct and operate part or all of it. However, the TEPS study and its DEIS predecessor study never considered it as an alternative in the study, and no results are given for it in the TEPS report.

There are more than enough problems with the TEPS analyses of the Combined Alternative to cast substantial doubts on the traffic, revenue, and bonding capacity for the "Jefferson Parkway" toll road portion alone. We have independently studied the Jefferson Parkway alone, and have found it to generate about half the traffic as it would if the rest of the unfunded Combined Alternative were built.

**The Findings of this Analysis: Summary**

This analysis identifies and quantifies the effects of six important defects in the traffic and financial analysis for the entire Combined Alternative presented in the TEPS Report. The effect of the six problems reduces the TEPS study estimate of $135- $230 million construction bond proceeds by 57%-75% to $57.7 million. This means that only 6% of the $922 million construction cost of the Combined Alternative could be financed from the toll revenue bond proceeds. And if we use even only a portion of the Northwest Parkway's most recent publicly available operating and maintenance costs as the TEPS O&M cost, none of the construction cost could be financed with revenue bonds

We identified the magnitude of these problems by rerunning the DRCOG traffic model and duplicating the TEPS study calculations included in the revenue bond calculation sheets we were provided and changing the input values to correct for the effects of each problem. The six problems, with their *individual* effects on the construction bonding capacity are:

1. Failure to subtract O&M costs from toll road revenues in the $230 million estimate: the starting bond proceeds are the low end of the range, $135 million.
2. Underestimate of future operating and maintenance expenses for the toll road: 23% reduction, and more likely, the complete elimination of any bonding capacity.
3. Overestimate of highway trips: 37% reduction.
4. Wrong coding of southernmost Regional Arterial section: 11% reduction
5. Increase in borrowing costs: 10% reduction
6. Omission of ramp-up in traffic and revenue: 6% reduction.

Each of these problems is described in detail in the next sections of this report. It is important to note that the overall percentage reduction of the $135- $230 million estimate of bond proceeds is not simply the sum of all the individual percentage reductions. This is because the effect of each problem is reduced by the reductions of the other contributing problems.

**The Detailed Findings of this Analysis**

Our analysis found six major problems with the TEPS Study.

1. <u>Failure to subtract O&M costs from toll road revenue in bonding capacity calculations</u>

Page 2-74 of the TEPS report says that: "The magnitude of revenues from either of the tolled alternatives (Tollway and Combined) will cover the cost of debt service, tolling operations, and roadway maintenance." The supporting document entitled "Toll Revenue Analysis" (attached) indicates that this is not the case. The middle paragraph of page 1 of "Toll Revenue Analysis" describes the Combined Alternative's $135 - 230 million range of projected bond proceeds included in the TEPS report Table 2.5-2 as the bond proceeds with and without subtracting the O&M costs:

> "To determine the range of bond proceeds available for construction, two scenarios were analyzed. The first scenario assumed that all operations and maintenance costs would be covered by the tolling revenues, leaving less remaining bond proceeds for construction. The second scenario assumed that none of the operations and maintenance costs would be covered by the tolling revenues, leaving more remaining bond proceeds for construction." (underline added).

Any public or private authority owning and/or operating a toll road is normally responsible for paying its operating and maintenance costs. Indeed, page 2-73 of the TEPS report states: "Revenue from tolls can be used to fund facility maintenance for the tolled alternatives, but other funding sources would be required for alternatives without tolls". This means the estimates of bond proceeds available for construction need to be computed *after* subtracting O&M costs from toll revenue. The Jefferson Parkway proponents have also made this clear; Bill Ray, the Executive Director of the proposed Jefferson Parkway (toll road) Authority, is quoted in "TOLLROADSnews", Dec. 11, 2008:

> "As the public authority, we plan to assemble and own the land and the facility and to get all the necessary permits, but we hope to find private partners to raise the money to design, build, maintain and operate the facility under a long term contract."

Therefore, the amount of the bond proceeds available for construction as estimated in the TEPS study is simply the $135 million low end of the range of values given in the report. This means that only 15% of the $922 million cost of the Combined Alternative could be paid for out of bond proceeds as estimated in the TEPS report.

2. Underestimate of O&M costs

The TEPS study severely underestimates the O&M costs it projects to subtract from toll revenue in future years to compute its bond proceeds available for construction (the $135 million low end of its range of bond proceeds). Page 2-73 of the report states:

> "The magnitude of maintenance operations will increase as the facility matures, resulting in higher costs per year. Shortly after construction, the average annual maintenance costs are estimated to range from $125,000 to $175,000 per mile. As the road matures, the annual maintenance costs will be substantially higher ranging from $350,000 to $475,000 per mile".

The comment that maintenance costs will increase is correct. In the TEPS study revenue bond calculation sheets, maintenance costs increase from $173,000 per mile to $473,000

per mile over the 35 year financing period from 2013 to 2048. However, the TEPS report and analysis does not actually reflect increasing operations and maintenance costs. These maintenance cost increases are essentially constant in real dollars over the 35 year financing period. The detailed financing calculation tables of annual costs and revenues we were provided in response to our data request show that these maintenance costs are inflated at a constant annual rate of 3.0%. This hardly amounts to "substantially higher" costs; indeed, they may not even keep up with inflation. We are never told what general (CPI) inflation rate is assumed in the study, but a 5.0% annual cost inflation rate is used to convert 2010 dollar capital costs to 2005. Also, the annual "toll operating costs" in the detailed financing calculation tables are only inflated at a constant annual rate of 2.9%, beginning with $195,000 per mile in 2013 and ending with $515,000 per mile in 2048. Total O&M costs therefore increase from $368,000 per mile in 2013 to $988,000 per mile in 2048 which means they are essentially constant in real terms, not "substantially higher" as the road matures in future years.

The impact of these very low and slowly inflating O&M costs on the calculation of bond proceeds available for construction is dramatic. Toll revenues in current dollars for the Combined Alternative are calculated to grow at the annual rate of 7.55% from 2013 to 2030, while the total O&M costs to be subtracted from toll revenues grow at the combined rate of 2.9%. The result is that net revenues to be applied to debt service grow at the impressive rate of 9% to 10% during this seventeen year period.

Even more telling is a comparison of these TEPS study O&M costs with the Northwest Parkway O&M costs for 2005 to 2007, the last three years it was operated as a public highway authority, and for which data are available. In 2007, "O&M" costs were $504,711 per mile, up 20% from $422,142 per mile in 2005. And these O&M costs don`t even include another $207,484 per mile in 2007 for "personnel and administrative expenses," which are listed separately from "O&M" expenses. Professional services are also listed separately, and are over half the size of O&M expenses for 2007. But even without counting any expenses in the Northwest Parkway 2007 Approved Budget document other than their classification of "O&M expenses", their $504,711 per mile in 2007 dollars is 37% higher than the $368,000 per mile in 2013 dollars used in the TEPS study. And when we inflate the $504,711 Northwest Parkway O&M cost per mile by a modest 5% per year to 2013, the resulting $676,361 O&M cost per mile is 84% higher than the first year O&M cost used in the TEPS study. If we add in only the 2007 "personnel and administrative expenses" of $207,484 per mile and inflate them at 5% per year to 2013, the total Northwest Parkway O&M cost per mile is $954,410, or 2.6 times the first year O&M cost used in the TEPS study. And note that these early Northwest Parkway O&M costs don`t include the cost of periodic heavy maintenance (resurfacing, etc.) for which annual contributions to a reserve fund would be required.

As an additional test of the reasonableness of the O&M costs in the TEPS report, we compared the resulting expense ratio (the ratio of O&M costs to gross toll revenue) to the well established experience of this ratio in the toll road industry. For the Combined Alternative, the detailed financial calculation tables we were provided show this ratio to be 44% in the assumed first year of operation (2013), dropping to 21% in 2030, and

leveling off at 18% for the last ten years of operation ending at 2048. These ratios can be compared with an average expense ratio of 50% for 21 publicly operated toll road authorities, and 36% for 7 private concessionaires that we compiled from their latest (mostly FY 2007) annual reports. Many of the toll roads operated by these organizations are quite "mature", and as expected, the ratios increase with age, not decrease. Also, many, if not most of the toll roads are well equipped with electronic toll collection (ETC), now the industry standard.

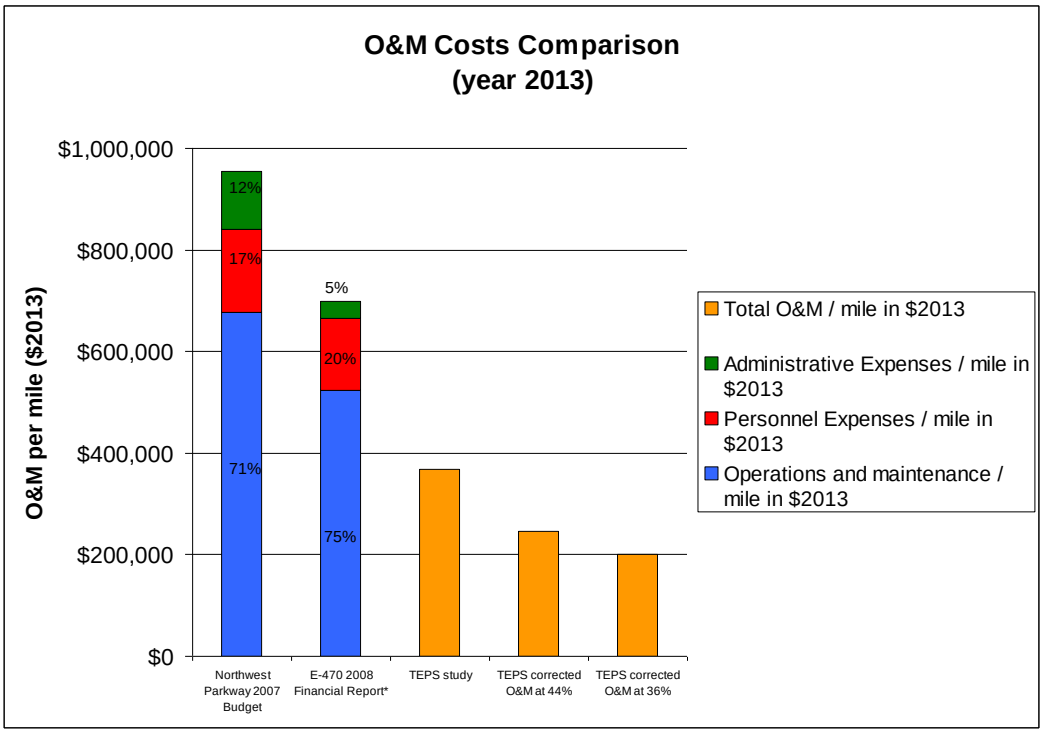
It is entirely reasonable to ask what the impact is of holding the expense ratio constant at 44%, but assuming the same annual revenues projected for the Combined Alternative in the TEPS study. Given the very low volumes and revenue on the toll road ("Jefferson Parkway") portion of the Combined Alternative,[2] 44% of the gross revenue does not provide much O&M money, and none for periodic heavy maintenance such as repaving every 20 or so years. Nevertheless, duplicating the calculations in the TEPS supporting bond calculation sheets using all the same factors (e.g., coverage ratios, etc.) and assumptions but holding the expense ratio constant at 44% reduces the $135 million construction bond proceeds estimate in the report by 23% to $103 million. Stated another way, this means that just 11% of the estimated $922 million cost of the Combined Alternative can be financed out of revenue bond proceeds. And if we made the even more optimistic assumption of an expense ratio of 36%, equal to the average for the private concessionaires quoted above, the result is to reduce the $135 million construction bond proceeds by 13% to $118 million. This means that only 13% % of the estimated $922 million cost of the Combined Alternative can be financed out of revenue bond proceeds for this reason alone.

These bonding capacity impacts do not include the impact of increasing the TEPS study O&M costs to bring them into line with Northwest Parkway O&M costs. Figures 3 and 4 below compare the O&M costs per mile in the TEPS study (the middle of the five bars) to four other cases for the years 2013 and 2030. The left hand bar in each figure shows the 2007 O&M costs from the Northwest Parkway, inflated at 5% per year as described above. The second bar shows the 2008 E-470 costs per mile from the E-470 2008 Financial Report, again inflated at 5% per year. Note that these E-470 costs also do not have periodic heavy maintenance costs included in them. The 2007 E-470 Financial Report gives an idea of the magnitude of these heavy maintenance costs as it notes that $8 million dollars of resurfacing was completed in 2007. The third bars in Figures 3 and 4 show the O&M costs used in the TEPS study for 2013 and 2030, respectively. The 2013 first year O&M cost is $368,000 per mile, as described above. The fourth and fifth bars in each figure are the 2013 and 2030 O&M costs per mile set equal to 44% and 36% of the final corrected TEPS gross revenue for all six identified errors. Note how dramatically the relative size of the TEPS study O&M cost (the middle bar) decreases between 2013 and 2030. As discussed above, this is due to the TEPS study keeping these

[2] In the Combined Alternative, daily volumes in 2030 on the toll road are, at most, two thirds the volume on Indiana Street (25K on the toll road vs 37K on Indiana). Without the new arterial connections to the toll road in the Combined Alternative, the toll road volumes drop by a third to a half.

costs essentially constant in real terms, not “substantially higher” as the road matures in future years.

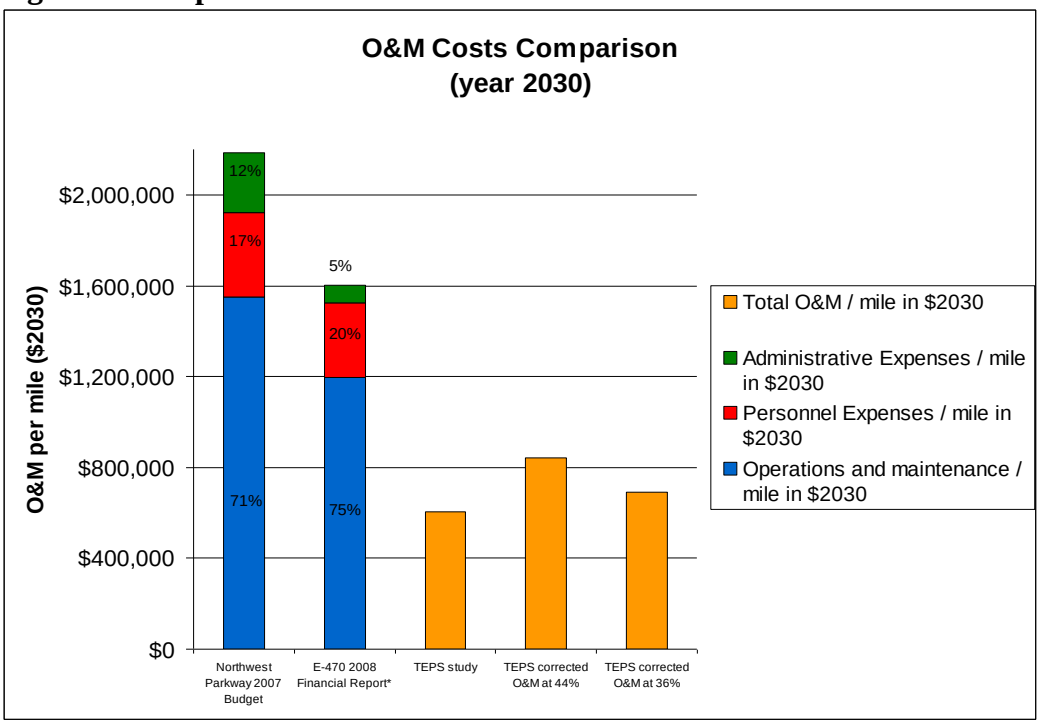
**Figure 3. Comparison of O&M Costs for Opening Year**




Source: CRA International based on Northwest Parkway 2007 Budget, E-470 Investor Report, and TEPS Study

| **Comparison of O&M Costs for Opening Year ($2013)** | Northwest Parkway 2007 Budget | E-470 2008 Financial Report* | TEPS | TEPS corrected O&M at 44% | TEPS corrected O&M at 36% |
|---|---|---|---|---|---|
| Operations and maintenance / mile in $2013 | $676,361 | $523,188 | | | |
| Personnel Expenses / mile in $2013 | $163,396 | $142,260 | | | |
| Administrative Expenses / mile in $2013 | $114,653 | $33,663 | | | |
| **Total O&M / mile in $2013** | **$954,410** | **$699,111** | **$368,000** | **$245,091** | **$200,529** |

**Figure 4. Comparison of O&M Costs for 2030**




Source: CRA International based on Northwest Parkway 2007 Budget, E-470 Investor Report, and TEPS Study

| **Comparison of O&M Costs for 2030** | Northwest Parkway 2007 Budget | E-470 2008 Financial Report* | TEPS | TEPS corrected O&M at 44% | TEPS corrected O&M at 36% |
|---|---|---|---|---|---|
| Operations and maintenance / mile in $2030 | $1,550,231 | $1,199,156 | | | |
| Personnel Expenses / mile in $2030 | $374,507 | $326,063 | | | |
| Administrative Expenses / mile in $2030 | $262,786 | $77,155 | | | |
| **Total O&M / mile in $2030** | **$2,187,525** | **$1,602,375** | **$603,057** | **$844,964** | **$691,334** |

3. Overestimate of highway trips

Wilbur Smith & Associates (WSA) developed forecasts of traffic and revenue on the study`s two final alternatives involving toll roads (the Combined Alternative, and a "Tollway" running the entire length of the corridor) using their proprietary approach. As an input to their forecasting, they used the highway "trip tables" (the highway origin and destination trips between all zones) from the DRCOG model that the study team forecast would use a complete limited access high speed freeway (no tolls) between the Northwest Parkway and C-470. Naturally, the freeway attracts more traffic in the corridor than a competing toll road or a short toll road combined with non-limited-access arterial streets

would attract. Nevertheless, without any explanation in the TEPS report, the two alternatives involving toll roads had the freeway trip table "assigned" to them. This unreasonably and unsupportably inflates the traffic estimates for the Combined Alternative.

We have rerun the DRCOG model to estimate the impact on toll road revenue and bond proceeds of using the freeway trip table instead of the trip table produced using the Combined Alternative. As in 2 above, we duplicated the calculations in the bond calculation sheets to determine the reduction in bond proceeds available for construction. Using the correct trip table reduces gross revenue by 27%, which results in a 37% reduction in the bond proceeds available for construction *for this reason alone* (i.e., O&M costs are kept at their original level). This reduces the $135 million estimate to $85 million, and means that just 9% of the estimated $922 million cost of the Combined Alternative can be financed out of bond proceeds.

It is useful to note here that the percent reduction in gross revenue will always be smaller than the reduction in net revenue since, after the subtraction of O&M costs, the same dollar reduction in revenue will be a larger percentage of net revenue than gross revenue.

4. Wrong coding of Southernmost Regional Arterial section

Despite the TEPS report describing the southern portion of the Combined Alternative as a "Regional Arterial", the network for the 2.65 mile US 6 portion (from SH 58 to C-470 / I-70) for traffic and revenue forecasting was coded in their forecasting model *as a six lane Freeway,* rather than a Regional Arterial. This drastically overpredicts the speeds and capacity on this important section of the Combined Alternative and results in higher traffic and revenue forecasts. In the DRCOG model for the area that this section of US 6 passes through, this network coding difference has the impact of increasing the free flow speeds from 51 mph to 64 and 66 mph (about 27%), and increasing the lane capacity from 1,250 vph to 2,000 vph, or by 60%. This is inconsistent with the proposed Combined Alternative and is a rather egregious mistake in the network coding.

We have rerun the DRCOG model to estimate the traffic and revenue effect of this substantial increase in speed and capacity of the Combined Alternative as it was coded for the forecasts in the TEPS report. The increase in speeds with forecast volumes on the coded freeway section is actually 40%. This is a larger increase in speeds than for free flow speeds (40% vs. 27%) because of the additional capacity of the coded freeway section. We found this coding error to cause an 8% difference in gross revenue. And as in 2 and 3 above, we duplicated the calculations in the bond calculation sheets to determine the reduction in bond proceeds available for construction, resulting in an 11% reduction in the bond proceeds available for construction *for this reason alone.* This reduces the $135 million TEPS report estimate to $120.2 million.

5. Increase in borrowing costs

Borrowing costs are currently higher than when the TEPS study made its revenue bond financing calculations. They are 52 basis points (0.52% interest rate) higher according to Bloomberg's 30 year municipal bond rates for February 2009 compared to July 2006. By mid April 2009, the increase was 55 basis points. This means that bond proceeds will be less because more of the toll revenue must pay off the debt at a higher interest rate. We duplicated the revenue bond calculations with the 52 basis point higher interest rate,, resulting in a 10% reduction in the bond proceeds available for construction, again *for this reason alone*. This reduces the $135 million TEPS study estimate to $121.4 million available for construction, or about 13% of the $922 million construction cost.

6. Omission of ramp-up of traffic and revenue

The annual revenue stream used in the revenue bond calculation sheets we were provided did not take into account any ramp-up of traffic and revenue in the first few years of operation. It is well known that traffic ramps up over the first few years as people change their commuting routes and residence and employment locations to take advantage of the accessibility offered by the new road, whether or not it is a toll road. National Cooperative Highway Research Program (NCHRP) Synthesis 364 defined the ramp-up period of toll facilities as "time for traffic volumes to reach their full potential, without considering growth, after the opening of a new toll facility." It further suggests that the ramp-up period may last for several years.[3] We have applied quite modest two year ramp-up factors of 60% and 80% of forecast TEPS revenue in their assumed first two years of operation (2013 and 2014) and found a 6% reduction in the bond proceeds available for construction. The impact of this small short term reduction in bond proceeds is relatively large because of the time value of money. Revenue early in the project is discounted much less than revenue earned much later in the financing period.

**Summary of Quantitative Impacts on Construction Bonding Capacity**

The combined effect of completely correcting all but the O&M cost problem identified above reduces the TEPS study estimate of $135- $230 million construction bond proceeds by 57%-75% to $57.7 million. This means that only 6% of the $922 million construction cost of the Combined Alternative could be financed from the toll revenue bond proceeds. If instead of 44%, we made the even more optimistic assumption of an expense ratio of 36%, equal to the average for the private concessionaires quoted above, the result is to reduce the $135 million construction bond proceeds by 51% to $66.7 million. This is still only 7% of the estimated $922 million cost of the Combined Alternative.

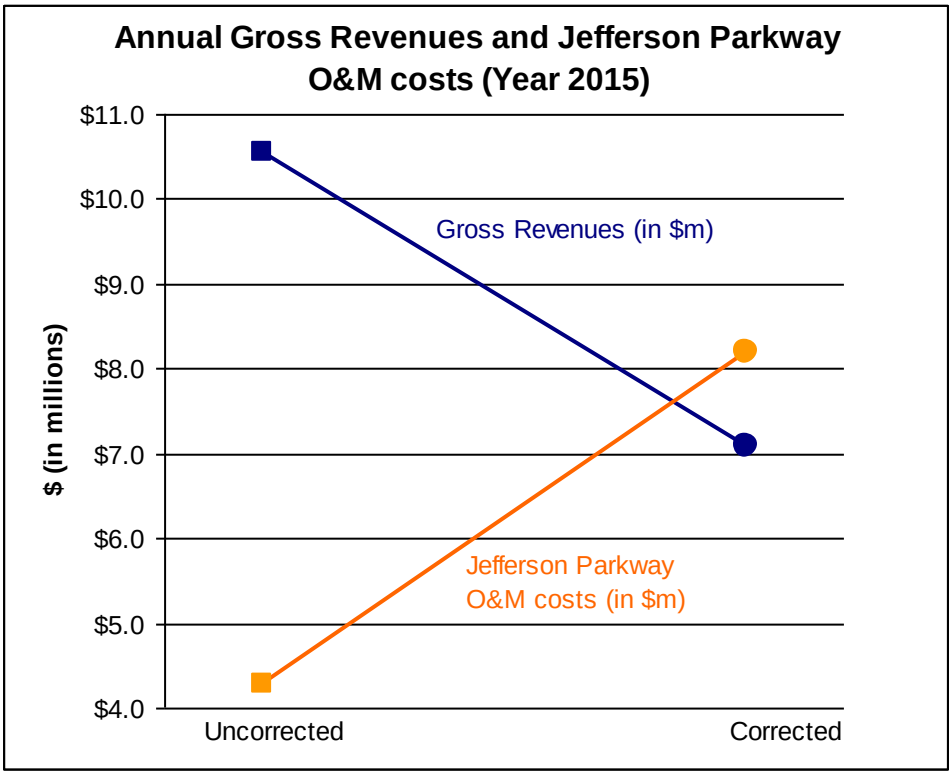
The above calculations of these combined effects included not only lowering the gross revenue from rerunning the DRCOG model with the changed inputs to correct problems 3, 4, and 6, but also recalculating the bonding capacities with lower O&M costs equal to 44% or 36% of the new lower gross revenue. This produces lower O&M costs. If we had

[3] Kriger, David, Suzette Shiu, and Sasha Naylor, *NCHRP Synthesis 364: Estimating Toll Road Demand and Revenue*,Transportation Research Board, Washington, D.C., 2006, page 6

kept the O&M costs at 44% of the original TEPS study gross revenue, the reduction in bonding capacity would have been even higher (71%-83% to $38.6 million).

And finally, when O&M costs per mile are equal to even only a portion of the Northwest Parkway costs, none of the construction cost can be financed with revenue bonds. That is, if the O&M costs in the TEPS study were increased to match only the Northwest Parkway "O&M" cost per mile without "personnel and administrative expenses" and any annual reserve fund contribution for periodic heavy maintenance, and increased at 5% per year, the bonding capacity would be zero. Figure 5 and Table 1 below, show why this is the case. The TEPS study gross revenue in 2015 is $10.6 million, while its O&M cost is $4.3 million. However, problems 3 and 4 above reduce the gross revenue in 2015 (after the ramp-up period) by 33% to $7.1 million, while the O&M cost based *only* on the Northwest Parkway "O&M cost" in Figure 3 (without personnel and administrative expenses and any heavy maintenance reserve fund contribution) increases the O&M cost to $8.2 million. Thus, the curves cross and there is no net revenue for construction cost bond financing. The problem of not enough revenue is exacerbated by the need for gross revenue to not only be greater than O&M costs, but to be greater by a very high coverage ratio for such a risky investment as this toll road.

**Figure 5 Combined Alternative Gross Revenues and Costs (2015)**




Source: CRA International analysis based on TEPS Study and Northwest Parkway 2007 Budget.

**Table 1. Combined Alternative Gross Revenues and Costs (2015)**

| Year 2015 | 2015 Gross Revenues (in $m) | O&M (in $m) |
|---|---|---|

| | | |
|---|---|---|
| Uncorrected | $10.6 | $4.3 |
| Corrected | $7.1 | $8.2 |

## Additional Important Problems with the TEPS Study

There are other problems with the TEPS study that we have identified, but have either not had time to make the necessary model runs to quantify their effect, or they show some important contradictions between what the TEPS study said they did, and what they actually did. Nonetheless, they reinforce the fact that the TEPS Study cannot be used to demonstrate the financial feasibility of the Combined Alternative or any component of it. An example of these problems follows:

Confusion on assumed toll rates

The per mile toll rates assumed in the TEPS study actually increase at less than the rate of inflation assumed for the value of time (willingness to pay the tolls), even though the study team says the toll rate will increase due to increasing congestion. Specifically, WSA states in their September 30, 2005 letter to FHU`s Elliot Sulsky:

> "Based on that analysis and review of current and planned future rate increases on E470, a through trip average per mile rate of approximately $0.23 per mile was chosen increasing to $0.31 per mile by 2030. Value of time and (vehicle) operating cost parameters were inflated by 2.5 percent per year which in combination with increasing congestion will cause the optimal toll rate to move upward."

This implies that the toll rate increases faster than the value of time, because the increasing congestion provides more time savings, and thus more use of the toll road. But the toll rate increases about 35% over the 17 years from 2013 to 2030 at an annual rate of about 1.8%, while the value of time increases 52% at its rate of 2.5% per year. Thus, the study team actually assumed the toll rate decreased in real terms over the forecast period, even though their explanation says it increases. This confusion between real and current or nominal dollars appears elsewhere in the study. For example, point 2 above describes the study`s estimates of the per mile toll road maintenance costs which are supposed to be "substantially higher" in the future as the toll road "matures." In reality, the costs do not increase "substantially," and as far as we can tell from the information in the report and the documents we have received, the costs are essentially constant in real terms.

## Conclusion

The TEPS study grossly overestimates the traffic, revenue and construction cost bonding capacity for the Combined Alternative, which includes the section of toll road now called the "Jefferson Parkway." Given the problems we describe in this analysis, even the chances of financing the 6% of the $922 million construction cost of the Combined

Alternative are remote, and would not be embraced by any rational investor. The 6% is well within the range of the noise of the construction cost estimate. Under these circumstances, there is no business case for attracting an investor to incur *both* the revenue risk, *and* the construction cost risk. And if we use even only a portion of the Northwest Parkway's most recent publicly available operating and maintenance costs as the TEPS O&M cost, none of the construction cost can be financed with revenue bonds.

We would also note that the consequence of constructing only the Jefferson Parkway from the Combined Alternative is to lose a third to a half of the traffic on the Jefferson Parkway, because the Regional and Principal Arterials in the Combined Alternative no longer feed traffic into it. And because the O&M costs of the toll road may be nearly half, or more likely, all of the revenue stream from traffic on the Combined Alternative, any substantial reduction of traffic on the toll road will effectively leave no reliable revenue available for construction cost financing of the toll road alone

And finally, it is important to point out that the TEPS study never considered the section of toll road now referred to as the Jefferson Parkway as a study alternative. There are no traffic and revenue forecasts for this toll road in the report. There are not even separate construction cost estimates for this toll road section of the Combined Alternative in the report. Therefore, there is no basis for including it in DRCOG`s fiscally constrained transportation plan using the TEPS report as its planning basis.