

April 30, 2007

WHITE PAPER ANALYZING THE PROPOSED DRAFT ENVIRONMENTAL IMPACT STATEMENT TOLL ROAD ALTERNATIVES IN THE NORTHWEST CORRIDOR

SUMMARY

OBJECTIVE

This paper analyzes the benefits and costs of the Northwest Corridor Study Draft Environmental Impact Statement (DEIS) toll road alternatives. Both the mobility benefits and the toll revenues are included in the paper and are compared to the costs of building the toll road alternatives. The paper also examines whether an alternative could produce the same or more benefits at the same or a lower cost.

This summary presents our major findings. Additional details of the findings are presented in separate appendices, referenced in each section, as appropriate. Appendix A provides a more detailed description of the alternatives referred to in the next section. The reader is invited to refer to each appendix for a more complete presentation of the findings summarized here, including many additional maps, traffic volume and congestion plots, tables and figures.

THE ALTERNATIVES

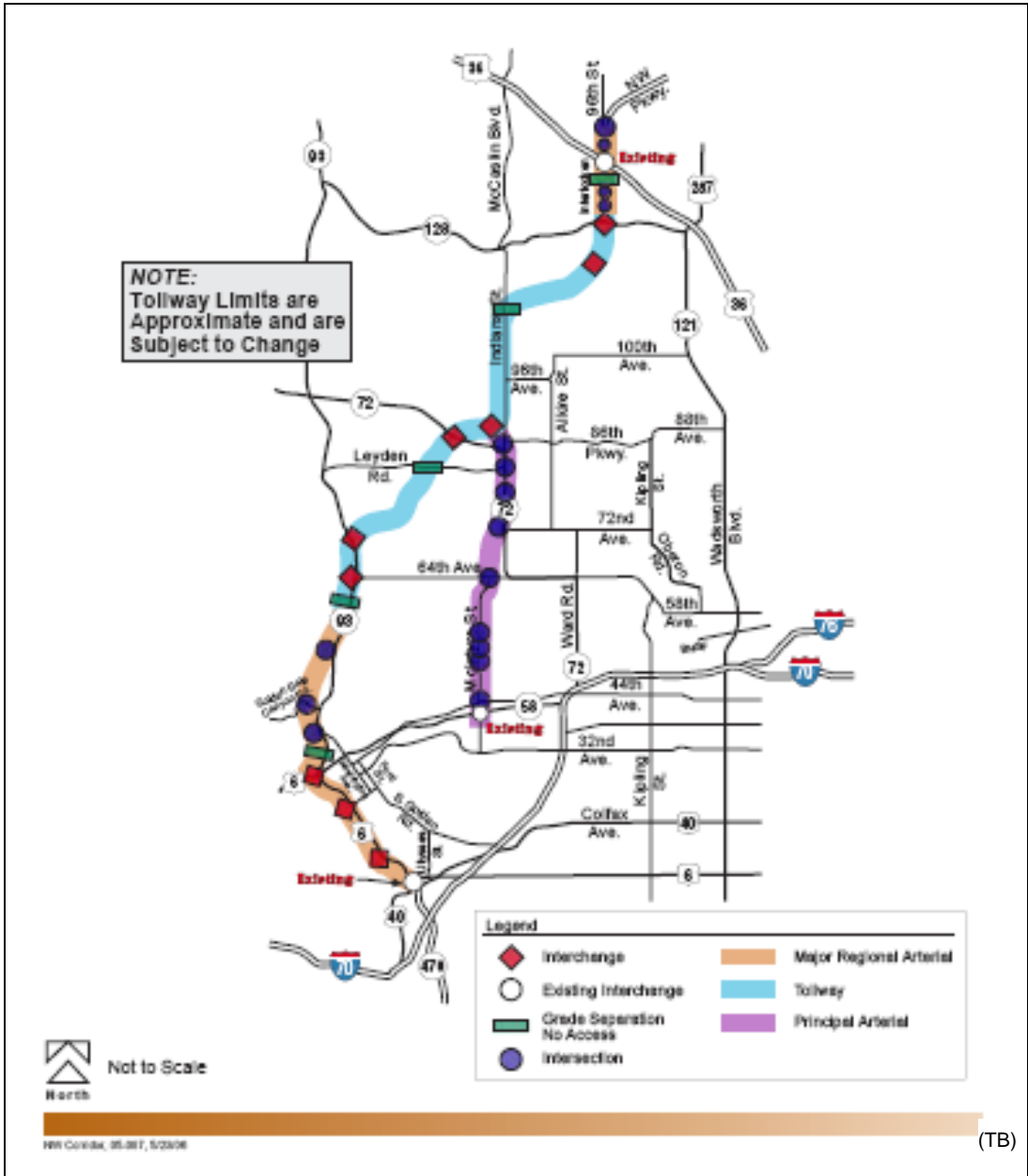
The proposed toll road by itself, identified in the DEIS as the “TB” alternative, is a new four-lane toll road on a new right of way, shown in blue in the figure below. We assume in this paper that TB would be open to traffic in 2010.

The DEIS also includes a “Modified Combined” (MC) alternative consisting of TB plus three major additional non-tolled improvements connecting to the toll road as shown in the figure below. These are widening Indiana/McIntyre to a four-lane principal arterial, widening SH 93 to a six-lane regional arterial between the new toll road and I-70/C-470, and building a six-lane regional arterial section connecting the toll road to the Northwest Parkway. We assume the MC additions to TB will open in 2020. In addition, for the toll revenue forecasts, we report the results of an alternative MC opening date of 2035.

We also present the benefits and costs for a third “Needs Based Alternative” (NBA) that doesn’t include the proposed toll road or any new limited-access highways. This alternative is not included in the DEIS, but should be analyzed for the DEIS to contain a reasonable range of alternatives. The NBA is based on the Jefferson County 2002 Addendum to the Countywide Transportation Plan made in association with Arvada, Golden, Lakewood, Westminster and Wheat Ridge.

The County's 2002 Addendum to the Countywide Transportation Plan also includes a small number of "Fiscally Constrained" (FC) projects. These are proposed to be built between now and 2025, regardless of what other highway improvements are made as a result of the DEIS process. The NBA would be built in addition to, or as a supplement to, the FC projects. However, the toll road alternatives, TB and MC, could potentially be built with or without the FC projects. The impact of the FC projects on toll road traffic and revenue is an important consideration in the decision to build a toll road, and we investigate whether building a toll road in the Northwest Corridor could produce serious pressure not to build any competing free capacity.

TB and MC alternatives



Source: Colorado Department of Transportation

BENEFITS

All the benefits reported here are the results of comprehensive runs of the latest available Denver Regional Council of Governments (DRCOG) regional travel demand model, Version 93.3, Cycle 14. All the volumes, travel times and congestion information are for the year 2030. We are grateful for the kindness and cooperation of the DRCOG staff in supplying us with their model, and the DEIS Study Team for providing us with the networks for the toll road alternatives, TB and MC, and the base No Action network.

Shortest Travel Times and Paths on Each Northwest Corridor Study Area Alternative (Appendix B)

A trip from the end of the Northwest Parkway through the Study Area to I-70 at Exit 259 on the toll road, TB, without the MC additions, has the same travel time as on the NBA. And since mobility is not only measured by travel time, but also by the cost of travel, the more inclusive measure of mobility is “economic travel time” which includes both the time and cost of travel. When toll costs are included in the economic travel times, the times on TB are always much longer than on the NBA. When the MC additions are added to TB, travel times on travel paths that use MC have shorter travel times than NBA, but the economic travel time is the same.

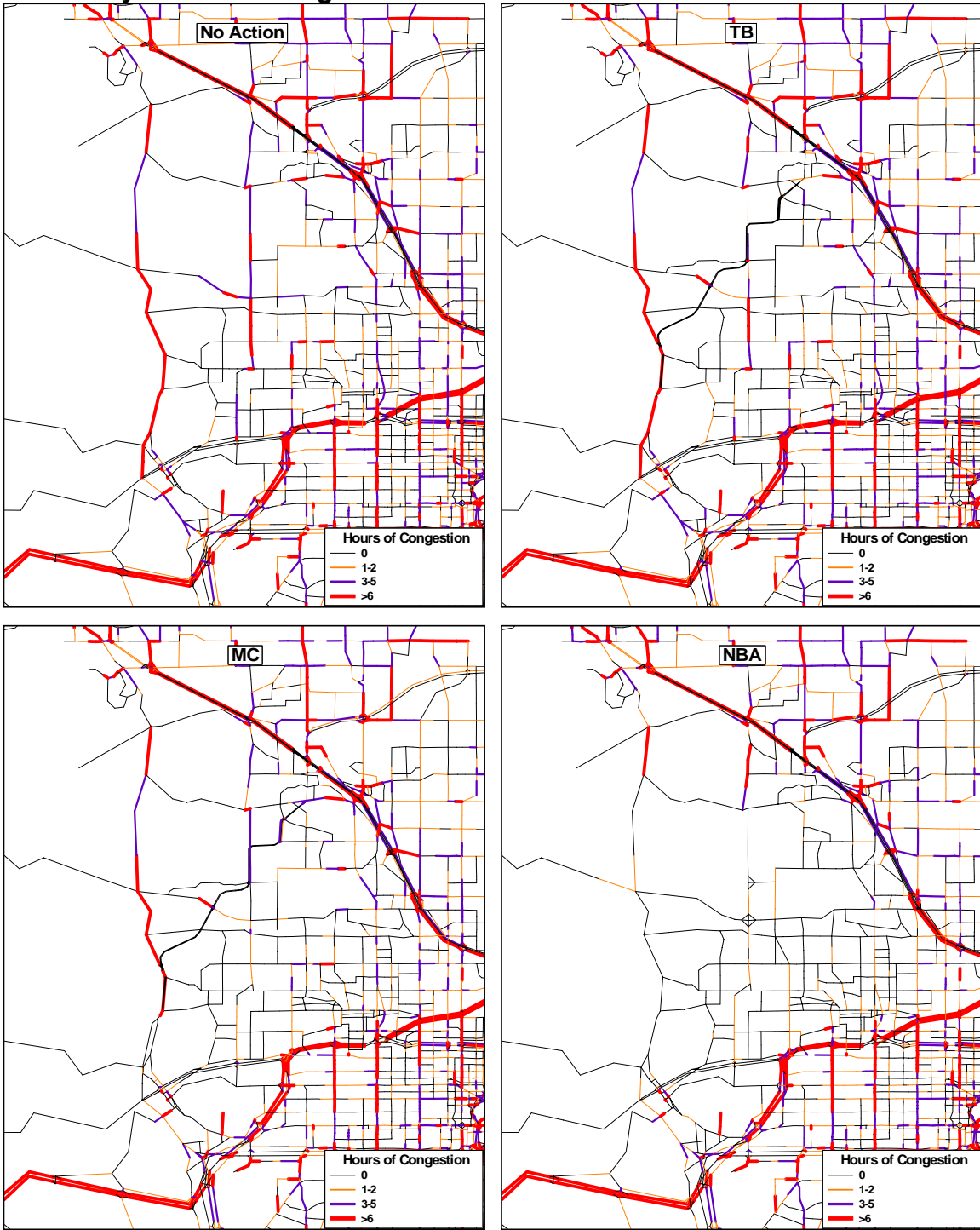
Indeed, most trips between the Northwest Parkway at I-25 and I-70 at Exit 259 that might be assumed to use the Northwest Parkway and TB or MC are not using this path because they already have a shorter route between their origins and destinations. This is because the shortest paths and economic travel times between the Northwest Parkway at I-25 and I-70 at Exit 259 are not on TB or MC. The result is that far fewer than one percent of passenger vehicles, and no heavy trucks traveling between these two locations use the Northwest Parkway and TB, and only 18 percent of passenger vehicles and again, no trucks use the Parkway and MC. Many other trips through the study area between important locations in the region also don't use the toll road; for example, trips between Boulder and I-70. For these trips, travel times on the NBA are always shorter than on the toll road alternatives.

Congestion Levels (Appendix C)

The DRCOG model produces very useful measures of congestion by calculating the forecast volume to capacity ratio (V/C) on every link in the entire regional network in each of ten intervals during the day, one as short as a half hour in the morning peak. The model's very reasonable definition of a seriously congested roadway during any interval is a V/C ratio of 0.95 or greater. The hours of such congestion per day that can be expected on each road section in 2030 can be plotted for each alternative, and the hours and miles of congested travel can be summed for the entire region and the Study Area. The figure below shows the

hours of congestion per day on each link in the Study Area for the No Action alternative, TB, MC and the NBA. Appendix C provides congestion plots for all the alternatives. These plots are graphic displays of future congestion levels and show a progression of decreasing congestion in the Study Area, proceeding from the No Action alternative, to the toll road alternatives, TB and MC, and culminating in a remarkably congestion-free Study Area in 2030 with the County NBA.

2030 Daily Hours of Congestion



Source: CRA International

Traffic Volumes (Appendix C)

The forecast traffic volumes on the toll road are very small. As shown on the figure below, they are a small fraction of the volumes on SH 93 or Indiana Street. Building the MC additions increases the toll road volumes, but they are still half the volumes on SH 93 or Indiana at most. They are also, at most, only a third to a half the volume on the Northwest Parkway for TB and MC, respectively. In fact, the volumes are so small on all the toll roads, including on the Northwest Parkway, that there is no congestion on any of the toll roads in the congestion plots described above, not even in the peak morning half hour. This indicates a lack of need for these projects. And building the FC projects further reduces the toll road volumes by 33 percent for TB and by 18 percent for MC. Appendix C provides traffic volume plots for all the alternatives.

The lack of volume on TB and MC deserves considerable attention because it shows that people avoid paying tolls, and that there is little traffic through the corridor that will benefit from the toll road in the first place. As discussed in the travel time and shortest path section above, the explanation for the low toll road volume, and the fact that most Northwest Parkway trips don't use the toll road, is that the toll road is not the shortest route in time and cost for the cross region movement which gives rise to the "regional need" for a circumferential highway around Denver that proponents of the completion of the 470 Beltway have asserted. Most of the traffic between locations in the region bordering the Study Area doesn't benefit from, and therefore doesn't use the toll road, even with the MC additions. The toll road alternatives also don't relieve congestion on the actual shortest route for whatever limited cross region traffic there is, *i.e.*, I-25 to I-76 to I-70. This is shown in the volume plots below by the very small changes in volume on I-70 between TB and MC. The No Action volumes on I-70 (shown in Appendix C) are essentially identical to TB. The same can be said for the impact of the toll road on traffic and revenue on the Northwest Parkway. In fact, the impact of the toll road, TB, by itself is zero. This means the toll road does not serve a "regional need" to close the "gap" in the circumferential highway around Denver.

Daily Mobility Benefits (Appendices D and E)

Regional travel models produce as standard outputs the vehicle hours of travel (VHT) and vehicle miles of travel (VMT) for each alternative being evaluated. The reduction in VHT from the No Action alternative is an important measure of the mobility benefit from building any set of highway improvements. And by adding the toll cost to the travel time on any toll facility included in an alternative, the more inclusive and meaningful economic travel time savings are also easily calculated. The quite advanced DRCOG model produces not only these standard VHT and VMT outputs, it also summarizes the vehicle hours and miles of travel under the congested conditions described above. Note that toll costs do not enter into these congestion calculations; they are simply the total hours and miles of travel that people encounter serious congestion during their daily car trips.

The table below provides the improvements in all these mobility measures over the No Action alternative for TB, with and without the FC projects, as well as for the FC projects alone, and for the NBA. The table shows a remarkable progression of improved mobility results, with the NBA being far better than the toll road, TB, with twice the benefits in most cases, even when the toll road is combined with the FC projects. For most of these measures, the FC alternative actually does better than TB by itself.

Comparison of Year 2030 Daily Mobility Benefits Relative to No Action of NBA, FC and TB

	FC	TB	TB w/ FC	NBA
Regional VHT	-2,079	-4,535	-4,856	-6,623
Regional Economic Travel Time	-2,227	-3,139	-4,056	-6,457
Regional Congested VHT	-7,483	-5,537	-13,938	-27,401
Regional Congested VMT	-108,622	-91,234	-250,215	-528,471
Study Area Congested VHT	-5,428	-3,329	-10,862	-21,477
Study Area Congested VMT	-101,975	-78,225	-237,098	-498,533

Source: CRA International

Similar to the table above, the table below presents the same mobility measures, comparing MC, with and without the FC projects, and the NBA. It compares the alternatives using the model output for the Northwest Corridor Study Area, which is the area of most interest to study participants. The progression of results go from the NBA being worse than MC on the first mobility measure in the table to being close on the next measure, to better than MC on the last two (congestion) measures. The relative ranking of the alternatives using the corresponding model

output for the entire region is essentially unchanged from the study area results presented here.

Comparison of Year 2030 Daily Mobility Benefits Relative to No Action of NBA, FC and MC

	MC	MC w/ FC	NBA
Study Area VHT	-5,263	-5,951	-2,925
Study Area Economic Travel Time	-1,992	-3,219	-2,811
Study Area Congested VHT	-14,733	-19,979	-21,477
Study Area Congested VMT	-243,178	-378,836	-498,533

Source: CRA International

In this case, the table shows that adding the FC projects to MC increases mobility in every case over the MC alternatives alone. This means that, even though the addition of the FC projects to MC reduces traffic volumes on MC, and therefore also toll revenue, as presented below, it is not in the public interest to forgo the FC projects despite likely pressures not to make any improvements that may decrease toll road traffic and revenue. And if the MC improvements are not built as additions to TB (e.g., for lack of funds), the first table above showed that TB alone is actually worse than the FC projects alone on four of the six important mobility measures in the table. The real possibility that the MC additions will not be built is all the more reason to not succumb to pressures against building beneficial non-tolled facilities in order to get people to pay tolls for facilities of questionable importance.

The last two rows of this (second) table show the study area congested daily VHT and VMT. It is impressive that the NBA reduces serious congestion more than the MC alternatives; indeed, much more than even MC with FC on the important congested VMT measure. Noteworthy is that NBA reduces congested VMT in the study area by 19 percent, v. MC with the FC alternative's reduction of 14 percent and MC's reduction of only 9 percent. It is a very important finding that expensive limited-access highways are not needed to produce such a large mobility improvement.

Toll Revenues

The toll revenue from the toll road portions of the toll road alternatives may be called the "commercial benefit" from building these alternatives. We have calculated the net present value (NPV), or total discounted 35-year 2010-2044

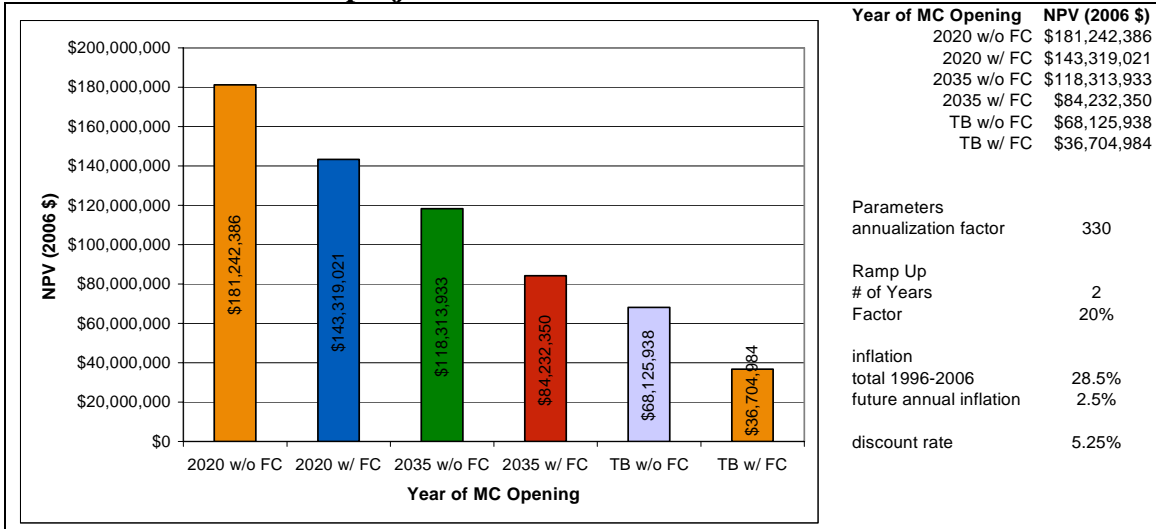
net toll revenue for each alternative, using best and worst case assumptions.¹ The best case assumes annual Operating and Maintenance (O&M) costs of \$3.5 million per year in the opening year of 2010 (2010 dollars) and a 5.25 percent discount rate. The worst case assumes \$5 million per year in 2010 (2010 dollars) in O&M costs and a 6.25 percent discount rate. The assumed O&M costs are both substantially less than the O&M costs of the Northwest Parkway on a per-mile basis. That is, using the current per-mile O&M costs of the Northwest Parkway, the O&M cost of the toll road, TB, would be approximately \$6.4 million per year in 2010 (2010 dollars). We assume lower costs to account for possible fully automated toll collection that may be installed, but these costs would still be more than the toll revenue in the early years without MC. This means that the financing would have to be done with Capital Appreciation Bonds to amortize the debt in the early years from the bond proceeds, which increases the interest/discount rate. Therefore, the discount rates assumed correspond to a mix of Capital Appreciation Bonds and Current Interest Bonds based on the current 4.5 percent 30-year AAA municipal bond rate.

The charts below show that revenue from tolls on the Northwest Corridor toll road alternatives is lowest for the toll road, TB, without the MC additions, but with the construction of the FC projects. They are highest for the MC additions to TB built in 2020, but without the FC projects. This is because the MC additions to TB increase traffic and revenue and, the earlier they are built, the higher the NPV, or relative bonding ability of the revenue will be. Conversely, the addition of the FC projects lowers the traffic and revenue on the toll road, even with the MC additions to TB.

All alternatives assume the toll road, TB, will open in 2010. The NPV of the net revenue stream over a 35-year period ranges from a high of \$181 million (2006 dollars) to a low of about \$37 million for the best case, and from \$119 million (2006 dollars) to about \$6 million for the worst case, depending on the year, if ever, of opening of the non-tolled MC additions to TB, and whether the FC projects are built in 2020, or never.

¹ In both cases, future toll rates and O&M costs are increased by 2.5 percent annual inflation. Net toll revenue for each year is calculated by subtracting O&M costs from gross toll revenue. NPVs are calculated by summing the annual stream of net revenues for each alternative, and applying the assumed discount rate.

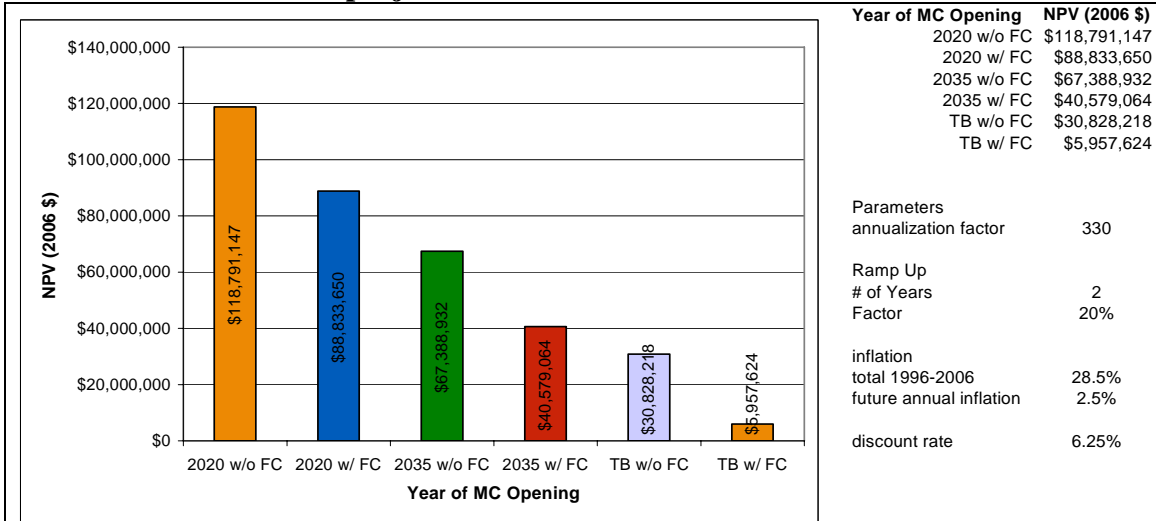
Total Discounted 2010-2044 Net Toll Revenue (NPV) of TB and MC alternatives with and without the FC projects – Best Case



Note: Fiscally Constrained projects open in 2020 when included in the alternative.

Source: CRA International

Total Discounted 2010-2044 Net Toll Revenue (NPV) of TB and MC alternatives with and without the FC projects – Worst Case



Note: Fiscally Constrained projects open in 2020 when included in the alternative.

Source: CRA International

Building the FC projects, with an opening in 2020, makes a significant difference in these toll revenues. Considering the best case, for TB only (MC never built), the difference is \$31 million, or 46 percent of the revenue without the FC projects. With the MC additions to TB in 2020, the difference is \$38 million, or 21 percent of the revenue without the FC projects. With the MC additions to TB in 2035, the difference is \$34 million, or about 29 percent of the revenue without the FC projects. These reductions in the toll revenues from building the FC projects

would likely produce serious pressures not to build these projects. This is despite the fact that, as shown above, these projects provide more travel time savings in the region than the toll road itself (TB), and adding TB to the FC alternative actually reduces the regional travel time savings.

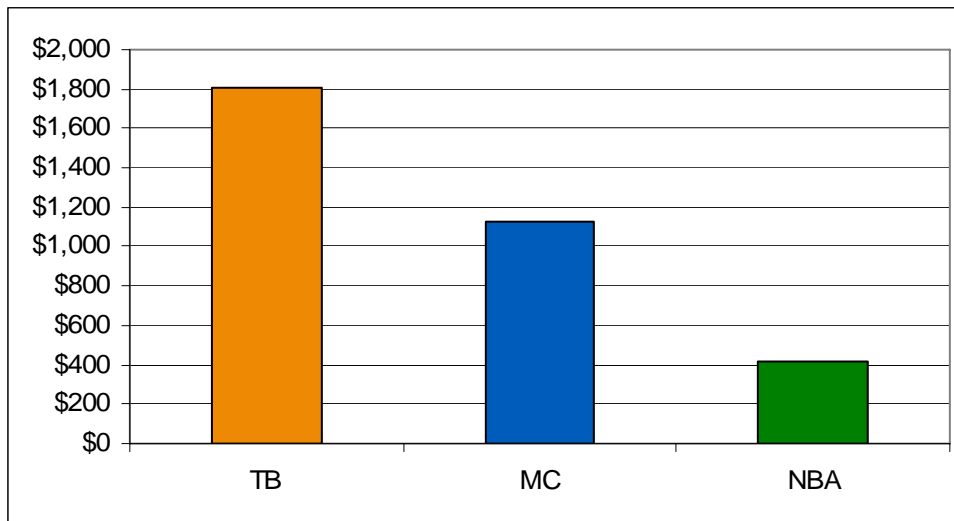
COSTS

The construction costs of the alternatives have been estimated by Muller Engineering, as follows (2006 dollars):

- TB: \$600 million
- MC: \$1.550 million
- NBA: \$634 million to \$706 million

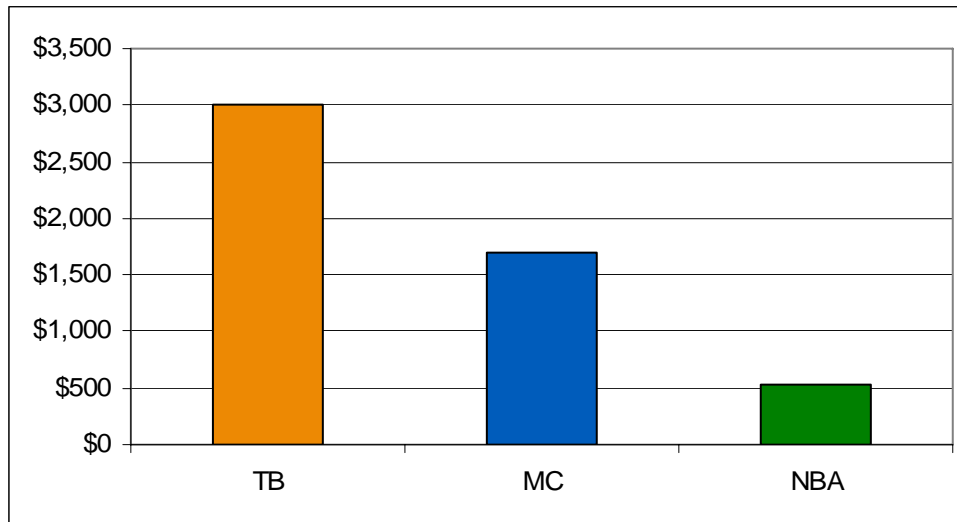
It is useful to compare these costs with the benefits of the three alternatives. A large number of possible cost/benefit ratios can be constructed. For example, the following two figures divide the construction costs of TB, MC, and NBA by the daily minutes of congested travel time saved at the regional and study area levels respectively. At the regional level, the construction cost per daily minute of congested travel time saved for TB (\$1,806) is over four times that for NBA (\$1,806 v. \$420), while MC's cost is over twice that for NBA (\$1,128 v. \$420). At the study area level, the advantage of NBA is even more pronounced, with TB costing about six times NBA (\$3,004 v. \$535) and MC costing over three times NBA (\$1,697 v. \$535).

Construction Cost per Daily Minute of Regional Congested Travel Time Saved



Source: CRA International

Construction Cost per Daily Minute of Study Area Congested Travel Time Saved



Source: CRA International

Comparison of Toll Revenues to Toll Road Costs

The NPVs of the toll revenue stream are a measure of the relative borrowing ability of the revenues from each of the toll road alternatives. Unfortunately, the actual borrowing power or capitalization ability of bonds backed by revenue streams are much less than their NPVs. Bankers reduce the NPVs by the cost of insurance, the required debt-coverage ratios of 1.25 to 1.75, and other factors (e.g., “haircuts”) that further limit the borrowing power of the toll revenue stream.

Without the MC additions, the NPV of TB’s revenue stream ranges from a worst case of approximately \$6 million to a best case of \$68 million, depending on the O&M costs and discount rate assumptions and whether the FC projects are built. After the reductions for insurance costs, coverage ratios, and other “haircuts”, it is doubtful that bankers would bond any remaining revenue stream, given the uncertainties with toll revenue projections nationally and in the Denver Region. Very charitably, assuming about half the best case situation, there might be \$30 million of bonding capability from the toll road, TB, alone. This is five percent of the \$600 million estimated cost of the toll road without the MC additions, and must be considered in the noise of this estimated cost.

With the MC additions built already in 2020, the NPV of the revenue stream ranges from approximately \$88 to \$181 million. Again, even charitably assuming half the best case amount remaining for bonding after deductions for insurance, coverage ratios and other “haircuts”, the bonding ability of the revenue stream might be \$90 million. And again, this amount is approximately 5 percent of the MC construction cost estimate of \$1.550 billion, and must be considered in the noise of this estimated cost.

CONCLUSIONS:

In summary, the conclusions of this White Paper are:

- 1) The toll road provides very little mobility benefit to travelers residing in, and passing, through the Northwest Corridor;
- 2) The toll revenues from the toll road are essentially worthless as a means of paying for the toll road. And the expensive MC alternative that adds arterial roads connecting to the toll road doesn't change this result;
- 3) Constructing the FC projects substantially reduces the toll revenues.
- 4) The FC projects actually provide greater mobility benefits than the toll road.
- 5) Since toll revenues are weak in all cases, building a toll road in the Northwest Corridor will produce serious pressure to not build *any* competing non-tolled capacity to encourage drivers to pay tolls.
- 6) The toll road, TB, doesn't increase toll revenues for the Northwest Parkway;
- 7) The County NBA offers far greater mobility and congestion reduction benefits than the toll road, TB, at roughly the same cost; and
- 8) The County NBA also provides comparable or better mobility and congestion reduction benefits at far less cost and disruption than the expensive (and uncertain) MC alternative.