A critique of the MCV Associates cost-benefit analysis of the proposed reopening of Klingle Road

Jack A. McKay, Ph.D.
Mount Pleasant, Washington, DC
November 10, 2002

The essence of this report is the use of the Berger time delay calculations to determine the total time savings that would follow from reopening Klingle Road. These time delays were calculated using a standard computer model, the Highway Capacity Software code. The difference in time delays between "Build 1" and "No Build" conditions yields a measure of the total driver time saved as a result of reopening Klingle Road.

Perhaps this table, drawing the numbers from the Berger report for the Connecticut and Porter intersection, morning rush hour, will make the calculations clear:

	no build:			build 1:			
	vph	sec/v	s/hr	vph	sec/v	s/hr	diff
Porter eastbnd	560	910.3	509768	469	282.1	132305	377463
Porter westbnd LT	140	742.6	103964	140	742.6	103964	0
Porter westbnd strt	548	150.3	82364	343	40	13720	68644
Porter westbnd RT	270	38.8	10476	270	38.8	10476	0
Connecticut northbnd	747	42	31374	747	42	31374	0
Connecticut southbnd	3201	20.9	66901	3201	20.9	66901	0
	====		====	====		====	====
Totals	5466		804847	5170		358740	446108

The first numeric column is the traffic flow in vehicles per hour. The second is the time delay per vehicle, in seconds. The third numeric column is the product of the two, that is, the total time delay imposed by the intersection, in vehicle-seconds per hour. These are repeated for the "Build 1" condition. The last column is the difference in delay time products, in vehicle-seconds per hour.

Similar calculations can be made for the other intersections, but it is sufficient to examine only the Porter-Connecticut intersection. As is evident from MCV Exhibit 1, essentially all of the time savings follows from this intersection. The other intersections actually accumulate to a reduction in the overall delay, the greater delays at Woodley exceeding the additional savings at Connecticut-Garfield.

The result above, 446108 vehicle-seconds per hour, is 124 vehicle-hours per hour. MCV obtained 132 vehicle-hours per hour, evidently having taken averages in a different manner. The difference is insignificant.

Then, assuming a three-hour rush "hour" duration, the total savings achieved by "Build 1" is 372 hours per day. A similar result will be obtained for the evening rush. Thus I obtain a result on the order of 744 hours per day, or 186,000 hours per year. Compare the MCV final result: 179,837 hours per year. Thus we can understand how MCV arrived at its numbers, which in turn are employed to obtain measures of the pollutant emissions, and the financial savings.

But a closer inspection of this procedure reveals that, while it is numerically correct, it is invalid. It is well known that the computer models of intersection performance, including the HCS, fail when the intersection is substantially overloaded, that is, when the ratio of traffic load to intersection capacity, v/c, is larger than one. The Porter eastbound condition in particular, which is responsible for 85% of the predicted time savings, has a v/c value of 2.93. One does not have to be a trained traffic engineer to see that, if the traffic arriving at an intersection is almost three times the maximum number that can pass

through the intersection, and endlessly growing backup, and endlessly increasing delay times, result. The computer models cannot handle that situation.

The computer model here predicts that eastbound Porter Street drivers will suffer a delay time of 910 seconds (15 minutes) at the Connecticut Avenue intersection, and that this time would be reduced to 282 seconds (4.7 minutes). That is the bulk of the time savings predicted by the Berger calculations. But it is obviously an invalid result. The computer model predicts that the wait time is currently 554 seconds (10 minutes) at this intersection, but eastbound drivers on Porter Street are certainly not waiting ten minutes in line to pass through that intersection, nor is there such a huge backup for three hours nonstop through the morning rush.

Consequently the time savings predicted for Porter Street eastbound is not credible. Since that is the bulk of the overall time savings predicted, the total time savings is also not credible. Consequently the MCV calculations, which hinge on this calculation of time savings, are not valid.

Mr. Tangherlini of DDOT described this situation quite well: *"If an intersection significantly exceeds its design capacity (i.e., more cars going through the intersection than it was designed for), standard computer models generate meaningless wait-times. These delay numbers for current conditions and for 2017 are not 'real' numbers. Traffic engineers know that such high delay figures do not reflect reality; thus, to avoid misunderstanding, the simple notation 'over-capacity' is often used in reporting traffic studies. DDOT regrets that this practice was not followed here."* (Letter to Councilmember Phil Mendelson, August 14, 2002.)