

REVIEW OF PB “MARGINAL BENEFIT” REPORT

AJM Engineering
Jack Mallinckrodt
3 May, 2005

BACKGROUND

Transit improvements are supposed to improve overall (meaning not only transit riders') regional mobility by diverting some auto riders to transit, thereby reducing the volume of traffic on the road and thereby reducing road congestion and travel time.

However, the CenterLine light rail system was designed to operate in an exclusive fixed guideway, at street-level, within existing arterial street ROW. Inevitably, that guideway itself would have *adverse* impacts on street traffic, first--by taking two street lanes for its right-of-way, and second --by permanently blocking off (cul-de-sac) unsignalized cross-streets and partially preempting green light time in favor of light rail at signalized cross-streets.

Thus CenterLine or any such guideway transit project may be either beneficial or detrimental to overall traffic congestion depending on the relative magnitude of the countervailing effects of its transit ridership benefit, vs. its street disruption.

THE 1999-2000 CenterLine EIRs Gives First Inkling

The 1999 and 2000 CenterLine EIRs found that *by itself*, without mitigation of its adverse impacts on street traffic, the CenterLine light rail system was counterproductive to traffic congestion and mobility as compared to the no-build alternative¹. It was conjectured that mitigation, that is, street widening (then not yet planned nor analyzed in detail), could overcome the adverse impacts of the fixed guideway light rail for an overall positive traffic impact. This is, of course, true by definition, but forces one to ask,

Wouldn't we then be even *better* off to build *only* the mitigation and drop the counterproductive light rail

THE 2003 CENTERLINE PROJECT EIR

The 2003 CenterLine DEIR redefined the CenterLine PROJECT as a *bundle* of

- a 9.3 mile Light Rail system down Bristol Street,
- an approximately 13 lane-mile Bristol Street, widening, and
- a 12% Bus service expansion.

¹ December 2000 CenterLine DEIR: “Compared to the No Build Alternative, all build alternatives would have more adverse impacts on the environment (without mitigation) for traffic circulation, displacements, public services, visual quality, cultural resources, noise/vibration, hazardous materials, water resources, natural resources, parks/trails, and environmental justice. Mitigation measures are proposed to reduce these impacts.”

Only the overall bundled project performance was analyzed and reported, and indeed, was found overall beneficial to traffic congestion and mobility.

In the formal comment period, November 2003, AJM Engineering noted that this bundling effectively cloaked the performance of the Light Rail component itself, and recommended that the study should be “debundled” to show whether the contribution of the Light Rail component itself was beneficial or adverse to overall traffic. There has never been any response to that comment.

THE 2004 AJM ENGINEERING STUDY

In July 2004 AJM engineering presented to the OC TA board its own study of the debundled capacity impacts of the light rail element of CenterLine. With the tools at hand it was not possible to estimate the impacts of the guideway obstruction to cross-track traffic so in spite of the fact that it might well be the major adverse impact, that effect was simply ignored. The other two effects analyzed were

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Auto traffic removed from the street by LR ridership	26,000 veh-mi/day
Street capacity lost by ROW taking	96,000 veh-mi/day
Street capacity lost by cross street blocking	???
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Overall net capacity impact	loss of <u>more than</u> 70,000 veh-mi/day

with corresponding increase in congestion and all its ill effects. Further, it was found that simply *removing* the light rail element and all the adverse impacts of its guideway would result in

*a 61% increase in overall transportation benefit –
at a cost saving of \$1 billion.*

AJM STUDY REVIEW

For the next four months, OCTA staff, working with AJM, reviewed the AJM analysis but found no correction or refutation. No report of that review was published.

AJM urged OCTA to undertake a comprehensive OCTAM computer model analysis of this issue in order to definitively refute or confirm the AJM findings, and submitted recommended criteria for the analysis,

THE PARSONS-BRINKERHOF MARGINAL BENEFIT STUDY

In November, 2004, OCTA agreed to undertake such a study, and tasked Parsons-Brinkerhof to conduct the study in accordance with AJM recommended criteria attached thereto, and hereto as “Attachment A”. AJM was not, however, a party to the final discussions of just how those requirements would be implemented. The study results were published March 14, 2005.

Critique

The study was *not* conducted according to that specification, in several critical respects, most importantly the following

1. It Studied the wrong problem

The specific cases to be modeled to derive the marginal benefit of Light Rail were carefully defined in Attachment A, in relevant part as follows

Begin Quote:

“Definitions

As used herein, italicized ...

Light Rail means the currently preferred light rail element of the Locally preferred CenterLine alternative, including its inseparable impacts of ROW taking from what would otherwise be functional street lanes, cross street blockading and partial preemption of crossing intersections. ... (emphasis added)

Benefit: Means the fundamental measures of transportation benefit defined in Measures section below

Approach: Carry out and analyze two traffic analysis runs, and their difference, with transportation networks corresponding to:

Run A. the current preferred alternative (presumably the 2003 "IOS"), **including** *light rail*, deriving and reporting certain fundamental measures of overall transportation net *impacts* and *benefits* to be defined below, denoted *benefit(A)*

Run B. the identical network with the identical Bristol street widening, implying eight traffic lanes in some places, but **without** *light rail* and deriving the same fundamental *impact* and *benefit* measures, denoted *benefit (B)* ...

For each benefit measure, derive

LR Marginal *benefit* = *benefit (A)* minus *benefit (B)*”

End Quote

Unfortunately, the study did not do that.

In lieu of RUN A, it modeled and calculated
ALT 1 (LRT) comprising the current preferred alternative
Including the light rail ridership but
excluding its adverse guideway impacts.

In lieu of Run B, the no-light rail alternative as defined in the statement of work, (Attachment A) it modeled:

ALT 2 (BSW) Identical network as ALT1 except:
*minus the light rail ridership (but not minus its guideway impacts),
plus widening Bristol Street from 6 to 8 lanes between Civic Center
Drive and Warner Street*

Evidently, widening Bristol street from 6 to 8 lanes was intended to represent the total effect of removing the guideway. However it fails to do so in four important respects:

- 1) It is only 2.4 miles, or 4.8 lane-miles rather than 18+² lane-miles of the at-grade portion of the CenterLine Light Rail.
- 2) It takes no account of the "Downtown Santa Ana" segment along Civic Center Drive and Santa Ana Blvd and the Civic Center to 17th segment.
- 3) It fails to account for any of the adverse impact on cross-track traffic. This could well be even more significant than the impact of ROW taking on along-track traffic. (The most severe impacts found in the August 2003 Traffic and Circulation Study were on the cross track (N-S) traffic on Ross street, Broadway, and Main in the "Downtown Santa Ana" segment.)
- 4) Widening Bristol Street from 6 to 8 lanes is an overkill and probably beyond the point of diminishing returns for street widening. Therefore it under-represents the impact of the actual lanes taken, from 6 to 4 lanes.

In short then, the "no-light-rail" alternative B specified by AJM and in the statement of work Attachment A was not run. Alt 1 was not a reasonable approximation to it.

Nowhere in any of the calculations was the full adverse traffic impact of the guideway modeled or calculated.

The differences shown between Alt 1 and Alt 2 as redefined are NOT the marginal benefit of light rail

2. Screenlines.

The Statement Of Work, Attachment A, called for

"8. Screenline automobile vehicle count and mean speed , AM and PM peak, for two, two mile long screenlines, running generally E-W and N-S centered on Bristol Street at McFadden."

² This figure 10+ includes the taking of street parking area on the downtown Santa Ana segment. Thi is based on the grounds that that parking area is presumably at least as valuable as street traffic lanes otherwise it would presumably be used for traffic lanes.

The intent of this specification, both screenlines at or intersecting the guideway was that they should provide independent verification and reasonableness check of the of the impact of guideway obstruction for traffic both along and across Bristol Street.

N-S and E-W screenline counts were indeed given, but for significantly different screenlines centered on Flower and Segerstrom. The difference is significant. The E-W screenline is 1.5 miles from the southern end of the of the at-grade guideway where significant impacts might be expected.

Whether or not intentional, this choice of screenlines, counter to the Statement-Of-Work Attachment A, had the effect of significantly attenuating any possible indications of adverse guideway impacts. In fact, it probably made little if any difference since the adverse impacts of the guideway simply were not modeled, that is, did not exist in either modeled alternative.

3. Rail vs Bus Alternatives

Comparison of the Light Rail Guideway vs Bus Guideway alternatives provides some useful information. Specifically it was found that in spite of reduced headways (presumably, to compensate for the smaller bus/train capacity) the bus alternative attracted only about 52% of the ridership of the light rail alternative.

This means that the overall total net adverse impact of the fixed guideway bus system, had it been calculated would be even worse than that of the fixed guideway light rail system on two accounts,

- 1) smaller beneficial ridership, and
- 2) presumably, (if the same traffic light preemption protocol were adopted), the same or greater adverse traffic impact (since there would be more preemption events corresponding to reduced headways)

SUMMARY.

The central point of the AJM analysis of July 2004 was the previously ignored adverse street traffic impacts of the fixed guideway. The marginal benefit traffic modeling study was proposed and study parameters were recommended and incorporated in the SOW which, if carried out, would have provided a definitive estimate of the overall total net impact of fixed guideway light rail in the CenterLine project.

Those requirements were not complied with in critical respects. The resulting study did *not* in any way model --- or provide data from which one could derive --- the adverse impact of the guideway, or the total net impact of the fixed guideway light rail system. Its findings have nothing to do with the specified intent, to determine the marginal benefit of light rail.

WHERE WE STAND

Thus after nearly a year of review and analysis, the AJM results of July 2004, namely:

1. The adverse traffic impacts of the exclusive, at-grade, fixed guideway are more than three times the beneficial impact of its ridership.
2. Simply removing the light rail and its guideway from the project would result in a 60% increase in net total project traffic benefits, at a cost saving of a billion dollars, and

stand unrefuted. To them we can now add:

3. Substituting bus for light rail in the same fixed guideway would have the same or greater adverse guideway impact (more crossing light preemption and smaller (52%) beneficial ridership, both of which would drive the total fixed guideway transit system impact even further negative. A lose-lose trade-off.

ATTACHMENT A (Statement of Work)

Draft Recommended Criteria for Modeling Study of Light Rail Marginal Benefit

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December 6, 2004

Objective: To define and specify a minimal traffic modeling analysis to determine the marginal transportation and environmental benefit attributable to the Light Rail element of the CenterLine project. This is a draft proposal including a number of TBDs to be finalized in further discussion with technical staff to establish feasibility and prior agreement on any eliminations, shortcuts or simplifications that can be made without compromising this essential objective.

Definitions:

As used herein, italicized:

Region: means the CenterLine analysis area

Trips: means the linked, or end-to-end, origin-destination person-trips matrix for the region. To be held constant throughout the A and B analyses.

Light Rail means the currently preferred light rail element of the Locally preferred CenterLine alternative, *including* its inseparable impacts of ROW

taking from what would otherwise be functional street lanes, cross street blockading and partial preemption of crossing intersections.

Benefit: means the fundamental measures of transportation benefit defined in Measures section below.

Impact: A negative benefit

Vehicle Type: means automobile, bus, and rail

Approach: Carry out and analyze two traffic analysis runs, and their difference, with transportation networks corresponding to:

Run A. the current preferred alternative (presumably the 2003 "IOS"), **including** *light rail*, deriving and reporting certain fundamental measures of overall transportation net *impacts* and *benefits* to be defined below, denoted *benefit(A)*

Run B. the identical network with the identical Bristol street widening, implying eight traffic lanes in some places, but **without** *light rail* and deriving the same fundamental *impact* and *benefit* measures, denoted *benefit (B)* .

C. For each such measure, derive

LR Marginal *benefit* = *benefit (A)* minus *benefit (B)*

The A run *may* not be necessary *if* and only if all the essential network input definition data and *benefit* measures are available from the retained data from the analysis of that preferred alternative in the 2003 EIR.

The two runs must use the identical origin-destination *trips* table. (No feedback to the trips generation and distribution steps.)

Measures to be reported for each, (A and B) alternative:

1. *Trips*: *Regional* aggregate number = sum of all elements of O-D *trip* matrix.
2. PHT, person-hours/day, *Regional* total end-to-end travel-time including out-of-vehicle wait and walk. This is NOT the SUMMIT surrogate but actual person travel time.
3. VHT, *Regional* aggregate vehicle-hours/day, by *vehicle type*.
4. VMT, *Regional* aggregate vehicle-miles/day, by *vehicle type*.
5. PMT, *Regional* aggregate person-miles/day, by *vehicle type*.

6. Average speed calculated as PMT/PHT, by *vehicle type*.
7. Point-to-point travel times for a small number (5-10?) of representative trips within the *region*, AM and PM peak hours, by *vehicle type*.
8. Screenline automobile vehicle count and mean speed (TBD), AM pk and PM pk, for two, 2 mile long screenlines, running generally EW and NS, centered on Bristol Street at McFadden, (TBD)
9. Regional aggregate emissions, tons/day, for CO (? others TBD), calculated including average speed correction factors, (e.g. EMFACS) reported by *vehicle type* and total
10. Regional aggregate energy consumption, BTU/day or fuel equivalent calculated including average speed correction factors for the automotive components, by *vehicle type* and total.

The speed correction factors prescriptions represent procedures that are not incorporated or reported in the most recent EIR's but were, in the 1997 Major Investment Study.

Reporting

The report of results should as a minimum:

1. Quote this specification and affirm that the analysis was done as specified except as may be noted.
2. For each specified *benefit* measure, document:

benefit (A),
benefit (B), and
marginal *benefit* of LR = *benefit* (A) minus *benefit* (B)

End Attachment A
