The Orange County Transportation Authority Major Investment Study

Jack Mallinckrodt, Ph.D., Engr..
AJM Engineering
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OCTA with Parsons-Brinkerhof, consultant, has completed a 3 year $3.1 million Major Investment Study and Technical Analysis and conducted an extensive public outreach campaign to define Orange County (California) transportation needs and solutions for the next 20 years. Staff have interpreted the results of these efforts as ambiguous and therefor "indicating the need for a multi-modal approach". On this basis they have proposed and the board has endorsed a Locally Preferred System consisting of Bus expansion and Light Rail.

The program and recommendation were marred by persistent staff bias against the most effective alternative, (unrestricted roads additions) and advocacy of the least effective (light rail and HOV lanes). The final recommendation reflects the staff prior judgements, sweeping aside the objective findings of the study which are almost totally opposite. We will briefly review the MIS history, the study result, and finally the adopted "Locally Preferred System".

I. THE STUDY PHASE

The study was focussed on the central Orange County corridor and on 7 alternative candidate improvements including

No build (other than as already committed)
"TSM". A 49% bus service expansion
"Enhanced Bus System", a 116% bus system expansion
"HOV" or carpool restricted lane additions
Light Rail, two closely similar systems differing only in minor alignment details.
Unrestricted freeway lane additions, physically identical to the HOV additions.

The latter alternative was initially deleted in mid-study, then later reinstated over the strenuous objections of staff, see below.

Each alternative was designed to a preliminary level sufficient to support budgetary cost estimates. The centerpiece of the performance analysis was the OCTAM (Orange County Traffic Analysis Model), a 1600 zone regional full traffic modeling program, including extensive current and projected year 2015 demographic and economic database, and state-of-the-art trip generation, trip distribution, modal choice (drive-alone, carpool, transit at

the top level), and route assignment modules. The modal choice and trips models were calibrated to agree with current actual trips and mode choice.

OCTAM runs provided traffic volumes, travel times, and average speeds on each link under each alternative for year 2015. These results in turn supported estimates of regional total travel-time, (arguably and by DOT guidelines, the best single indicator of congestion) freeway decongestion, arterial decongestion, total regional carbon monoxide (CO) emissions and fuel consumption, comprising the fundamental comparative benefits summarized in Summary Table 1.1. of the final evaluation report (Ref. 10).

Errors in the Study. (Refs. 12-20)

- During the course of the study, AJM discovered, corrected, and disclosed eight *major* methodology errors (detailed in Appendix 2 here) of such seriousness that, arguably, any one of them, uncorrected, would have changed roads from its first place cost effectiveness rating to last place.
- *All* of these errors were in the direction of significantly understating the benefits and overstating the cost of roads alternatives.
- In addition, the report contained at least 15 instances of misleading, euphemistic transit advocacy (Ref. 18), directly contradicting the objective study findings.
- Once the hard errors were discovered and disclosed, the staff and consultant, for the most part, eventually acknowledged and corrected them, (but not the misleading euphemisms).

Deletion and Reinstatement of the Mixed-Flow Roads alternative.

- In mid-study, July 1995, staff recommended and the OCTA board ratified summary dismissal of the mixed-flow (unrestricted) roads alternative on the basis that they would not qualify for federal support.
- For the next year, AJM repeatedly objected that this was a terrible mistake, deleting what would surely prove to be far the most effective alternative (even *without* federal aid) and argued for its reinstatement.
- In August 1996, with the strong support of one director, Salterelli, the mixed flow alternative was reinstated to full analysis status.
- In December 1996, the full, 7-alternative technical analysis results were released (Ref. 5).

2. THE STUDY RESULT (detailed in Appendix 1)

Notwithstanding the many instances of pro-transit bias, once the major errors (detailed in Appendix 2) had been corrected by the contractor, the objective findings of the contractor's final report (Ref. 10) provide the strongest possible statement of the superiority of unrestricted mixed-flow roads additions and inferiority of light rail and HOV (High-Occupancy-Vehicle or carpool-restricted) lane additions.

Unrestricted, mixed-flow roads additions were found to provide the most benefit per dollar in <u>every quantified mobility and air-quality</u> measure (detailed in Appendix 1).

As compared to the HOV restricted alternative the unrestricted, mixed-flow alternative was found to provide

- 7 x the travel-time savings
- 2.5 x the freeway decongestion
- 2 x the Arterial decongestion
- 16 x the CO emissions reduction,

and when corrected for a not yet acknowledged error (Ref. 20),

- 12 x the reduction of energy consumption.

at *half* the total net cost of the HOV alternative .
Light rail and HOV (carpool restricted) lane additions (physically identical to the unrestricted mixed-flow lane additions, differing only in the operating regulations) shared last place (most wasteful, i.e., least benefit per dollar) in each of these categories.

It is hard to imagine a more clear-cut and compelling study result.

3. THE OUTREACH PHASE

This was not the result OCTA staff had expected and tried to achieve. Staff response was to cast a smoke screen of obfuscation over the whole study and attempt to sweep it under the rug:

- By comparing to a host of irrelevant or misleading measures other than cost/benefit they concluded that “no single alternative solves the corridor’s mobility challenges and thus demands "a multimodal approach” (Ref. 8):
  - Comparing benefits between alternatives without accounting for cost differences as great as 7(light rail) to 1 (roads) (Ref. 8, Plate 6 and Ref. 5, Table S-1, line 10; Ref 10, sec 1.5).
  - Comparing on basis of “FTA Criteria” (ridership gain) which was known and admitted to be biased and inapplicable to roads (Ref. 8, Plate 6).
  - Comparing projected rail costs favorably with national averages, which are themselves disgraceful (Ref. 8, Plate 6, Ref. 21).
  - Characterizing their own optimistic *projections* of rail ridership as indicating a “demand for rail” (Ref. 8, Plate 6).
- By placing primary emphasis on the *opinion* polls of an intentionally uninformed and unrepresentative public:
  - *None* of the study performance results, nor total net cost, nor cost effectiveness results were made known to the public who were subsequently polled as to their preference.
  - Results were heavily biased by euphemistic descriptors for transit (“*Optimize* use of present system” and “Fully Utilize the Present System” to describe the 49% bus expansion alternative, “Innovative bus system” to describe the 116% bus system expansion) and pejorative descriptors for roads (“ Extend SR-57 *as a tollway*”) (Refs.3, 9, 10).

- Inputs were strongly dominated by the respondents to the direct mailout, an intentionally uninformed, and "non-scientifically" selected, that is, not-representative sample (Ref. 10).
- Slanted interpretation of poll results. Typically: a bare majority (54% vs 46%) of intentionally *uninformed* respondents favoring keeping $340 million for light rail is described as "Strong support" (Ref. 10).

How different would the outreach results have been:

- if the alternatives had been described straightforwardly rather than in terms of prejudicially selected euphemisms and pejoratives,
- if the respondents had not been kept in the dark as to the outstandingly superior performance effectiveness of roads over rail.
- if the respondents had been selected representatively?

With all these fundamental problems, little if any significance can be attached to the poll results.

4. THE OCTA RECOMMENDATION ("Locally Preferred Strategy")

From this smoke and haze, staff concluded and recommended and OCTA directors endorsed the need for a "multi-modal approach", interpreted as moderate bus system expansion, a light rail system, and (initially, but later cancelled) an HOV element.

1. BUS ELEMENT

- 49% Bus service expansion.
- By the target year 2015 we will need about that to maintain present essential safety net transit service levels (Ref. 6).

We endorse the bus element as the most effective way to serve the transit dependent. It would certainly have been done even if there had not been an MIS; arguably it should have been considered part of the baseline no-build alternative. It should be implemented, over time, *as need develops*.

2. RAIL ELEMENT

- Orange County Rail has been under intensive study for 8 years.
- It has repeatedly proven cost ineffective compared to bus, locally and nationally (Refs 1, 29) for areas like Orange County.
- Based on national averages, *gross cost* of light rail ($1.12 /ps-mi (person-mile)) is twice that of bus ($0.59/ps-mi, Ref. 22, 1994), 20 times that of urban freeways, ($ 0.051/ps-mi Ref 33), 40 times that of all roads nationally ($0.028/ps-mi Ref. 27).
- The OCTA MIS study (Refs. 5,10) found rail alternatives 3 times as costly as moderate bus expansion (TSM, Alt. 2) and 5 to 30 times as costly as mixed-flow roads in all mobility and air quality measures, for the same benefit (Ref. 10, Summary Evaluation Table 1.1 and Appendix 1).
- To improve Orange County congestion to the national norm today would require some 30% increase of countywide usable transportation capacity today, over 50% by year 2015 (Ref. 1, 30). Many areas comparable to Orange County provide

such capacity with roads. No area like Orange County handles more than 5% of its workload by *all* mass transit much less rail; even New York city, only 33%. For Orange County to ever handle more than 5% of its transportation volume by rail would be beyond any precedent.

- The OC Metrolink, called "highly successful", at current usage, 4500 riders per day , is carrying less than 1/1000 of the total Orange County Traffic served by roads (Note 1). Its contribution to congestion relief is immeasurably small.
- Several of the polled groups recommend *against* adoption of the light rail alternatives (5 or 6), because of their cost ineffectiveness but did recommend continued study *to search for a more cost effective light rail alternative.*'

  But the staff recommendation is not a search for more effective rail alternatives, but a *continuation* of the next $6 million of detailed design on *these* same disproven alternatives (Ref. 11, p. 11).

3. HOV Element.
Initially, the staff recommendation included an HOV lane element.
Subsequently, it was discovered (!) that this option was already programmed under a different program so it was deleted from the recommendation.

Performance of the Locally Preferred Strategy (LPS)
The final report included data from which one (if *seriously* interested) can derive the fundamental benefit/cost measures (See Appendix 1). The OCTA chosen system or LPS, ranks in either last, or next to last place (*least* cost effective) among all the defined alternatives in every fundamental quantified benefit.

Appendix 1 further defines and derives a single "total benefit/cost" measure as the sum of the percentage improvements in all the five above identified fundamental benefit measures, per unit total net cost. In this respect, the OCTA chosen strategy ranks *dead last* in cost effectiveness, eight times as costly as ordinary mixed-flow roads improvements for the same total benefit.

In short, the 3.1 million dollar contracted OCTA Major Investment Study was a perfunctory sham. The system OCTA has finally chosen to promote and pursue, reflects staff prior judgements, in direct contradiction of objective study findings and national precedents. This decision mocks the entire rational process of alternatives comparison, and the efficiency objective of the Intermodal Surface Transportation <u>Efficiency</u> Act under which OCTA seeks funding.

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14. "Rebuttal to the OCTA Reply", DHS, February 17, 1995.
15. Letter from Jack Mallinckrodt to Thomas Wilson, Chmn., Corridor Working Group, Feb. 21, 1996.
16. Memorandum to Corridor Citizens Advisory Committee, Subject: "DHS Critique of MIS Task 4.1 Report", May 6, 1996.
17. Memorandum, Jack Mallinckrodt to Nancy Michaili, July 28, 1996, Subject: Response to your answers.
18. "DHS Critique of MIS Draft Evaluation Report Dated December 1996", DHS, 12/29/96.
19. "Questions and Comments on Service and Patronage Methodology Report, Task 5.4, Dated November 1996", DHS, January 29, 1997.
20. Memorandum, Jack Mallinckrodt to Nancy Michaili, Subject: "ENERGY CONSUMPTION CALCULATION", April 7, 1997.

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25. Rubin, Thomas, and Moore, James, “Why Rail Will Fail: An Analysis of the LA County Metropolitan Authority’s Long Range Plan”, Reason Foundation, Policy Study No. 209, July, 1996.
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30. “Orange County Transportation Perspective”, DHS, Rev. August 11, 1993.
31. “Carpool Lane Effectiveness”, DHS, March 16, 1992.
32. “Why Carpool Lanes Don’t Work”, DHS, April 8, 1990.
33. “Cost Comparison of Transportation Alternatives”, DHS, Aug. 18, 1992.
34. “Highway Subsidies-’93”, DHS, rev. Jan 1996.
35. “We *Can* Build or Way Out”, DHS, July 8,1990.

NOTES:

1. 1997 Orange County traffic volume, person-miles/day

Roads and cars	67,900,000	98.7 %	(1)

Bus	833,030	1.2 %	(2)
Rail (Metrolink)	75,510	0.1%	(3)
Total OC	68,836,200	100.0 %	

Sources: 1. CALTRANS, Dist 12, "CA State Highway Log", 1995, and OCTA, "Traffic Flow Map", 1994
2. DOT/FTA, "Transit Profiles", 1995
3. OCTA "NewsLine", Feb. 1997

Growth factors for updates to 1997 +2.6%/yr

APPENDIX 1

Short Summary of MIS Mobility and Air-Quality Findings

All the quantitative benefit and total net annualized cost findings of the study are given in the top 6 rows of Table A1, all taken from the Summary Evaluation, Table 1.1 of Ref 10, with the following exception. The energy consumption item, row 5 is revised from the original to correct a serious error in the methodology for energy consumption. The original results were based on an assumed *constant* 23 miles per gallon average fuel economy under all alternatives. This assumption ignores the reduction of energy consumption due to congestion reduction, to the disadvantage of roads, and placing roads in *worst* place in this measure. In fact, fuel economy varies significantly with average speed just as do emissions, particularly CO2, which is an almost perfect indicator of energy consumption. With correction based on current California Air Resources Board EMFAC7G methodology, for the year 2015 conditions, the improvement in energy consumption with reduced congestion (as reflected in increased average speed) turns out to be a more important factor than the corresponding increase in mileage traveled, so that taking both factors into account properly moves roads from last place to first place in reduction of energy consumption, as shown in line 5 here..

The cost tabulated in row 6 is the total (annual O&M plus annualized capital) cost, net of any fare or toll income. It is essential to normalize the benefits with respect to these costs since, as seen on line 10, the total net annualized cost varies over a range from $28 million (unrestricted roads) to $191 million (light rail). To compare benefits of alternatives with such widely varying cost *without taking into account these cost differences* as OCTA has done (Ref. 10, sec. 1.5) is seriously misleading and prejudicial to the least expensive alternatives (roads). Benefit/cost ratio (or its inverse) is the proper comparison, developed in the rest of Table A1.

The specific measure developed in A1 is the percent benefit per $100 million dollar of Total Net Annualized Cost, (and its inverse, cost/benefit) in each of the fundamental benefits quantified in the Report, Table 1.1. lines 7-11:

- Travel Time Savings (total regional), %
- Freeway Decongestion (fraction of freeway lane-miles at LOS D or better in AM peak period), %
- Arterial Decongestion (Fraction of arterial lane-miles at LOS D or better in AM peak period), %

- CO Emissions (total regional), %
- Energy Consumption (total regional), %

and a "Total Benefit" defined as the equally weighted sum of the above five measures in line 12, %.

The roads alternative ranks first (maximum benefit per unit cost) in *every* quantified benefit measure. HOV lanes, Light Rail, and the OCTA chosen LPS, share last place honors. These are plotted in Figure A1. for *each* fundamental benefit measure. Notably, in the very environmental measures that have for so long motivated the push for HOV lanes and light rail in preference to roads, significantly more benefit would be realized with roads for the same cost.

The cost per *total* benefit is tabulated in line 14 and plotted in Figure A1. The OCTA chosen LPS would cost eight times as much as ordinary unrestricted roads additions for the same benefit.

From all this, there emerges a clear message with respect to cost effectiveness :

- *The mixed flow Roads and Freeways alternative affords significantly the most benefit per $ in all of these most fundamental benefit measures.*
- *Light rail is the very worst thing we can do with limited funding (confirming national statistics).*
- *As compared to roads, for the same benefit, of every eight dollars spent for light rail or for the OCTA choice composite system, seven dollars are wasted.*

It is impossible to imagine a more clear-cut result

We have a serious and worsening transportation capacity shortfall. Funding is almost impossibly tight. If we are serious about solving the problem, cost effectiveness must be first consideration. Adequate roads, certainly not light rail, must be first priority.

OCTA has not in any way refuted nor countered any of these arguments. Rather, they have simply ***ignored*** *the issue of cost effectiveness.*

Table A-1 and Figure A-1 on next page

The following table summarizes all the MIS quantified environmental benefits and cost.

Table A1-2

MIS ALTERNATIVES MOBILITY AND ENVIRONMENTAL BENEFIT								REF:
BENEFITS: (Per MIS Final)	UNITS	Fwy Lns	+49%Bus	+116%Bus	HOV Lns	Lt Rail	OCTA Choice	S-1
Travel Time Saving	%	1.7	1.8	2.7	0.2	2.6	2.3	ln.1
Freeway Decongestion	%	5	0	1	2	1	2	ln.4
Arterial Decongestion	%	2	1	2	1	2	2	ln.5
CO Emissions	%	1.6	1.8	2.7	0.1	2.4	2.3	ln.16
Energy Consumption	%	1.2	1.5	2.4	0.1	2.2	2	ln.17*
TotalNetAnnual Cost (TNAC)	$million/yr	28.3	41.8	97.3	45.9	186.7	202.3	ln. 10
BENEFITS/COST	UNITS	MF Roads	49% Bus	116% Bus	HOV Roads	Rail1	OCTA Choice	
Travel Time Saving / TNAC *100	% / $100mill /y	6.01	4.31	2.77	0.44	1.39	1.14	
Freeway Decongestion / TNAC *100	% / $100mill /y	17.67	0.00	1.03	4.36	0.54	0.99	
Arterial Decongestion/TNAC *100	% / $100mill /y	7.07	2.39	2.06	2.18	1.07	0.99	
CO Emissions*100	% / $100mill /y	5.65	4.31	2.77	0.22	1.29	1.14	
Energy Consumption*100	% / $100mill /y	4.24	3.59	2.47	0.22	1.18	0.99	
TOTAL BENEFITS/COST	% / $100mill /y	40.6	14.6	11.1	7.4	5.5	5.2	
TOTAL RELATIVE BENEFIT / COST	Rel.Benefit	1	0.36	0.27	0.18	0.13	0.13	
TOTAL RELATIVE COST / BENEFIT	Rel Cost	1	2.8	3.7	5.5	7.4	7.8	

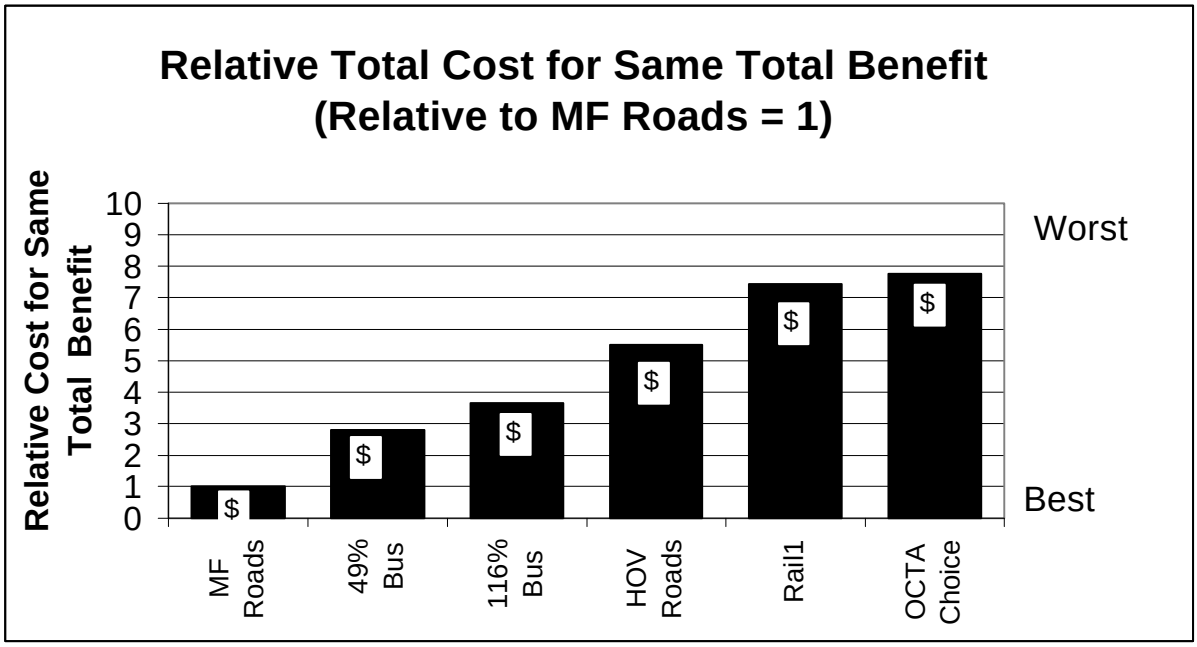
S-1 is Summary Eval Table S-1 in MIS Final Report

* = line 17* corrected for erroneous constant mileage assumption in original.

REF: MIS "Final Evaluation Report", OCTA, June 1997

This following graph plots the Total Cost per unitTotal Benefit as derived above.

Figure A1-1



APPENDIX 2
HISTORY OF *MAJOR* ERRORS IN THE MIS

The following major errors in the MIS study evaluation were originally detected and disclosed by AJM. Major errors are defined to include only those that, undetected, would have seriously compromised or killed the viability of an alternative.

1. CRITIQUE: In November 95 Evaluation Report, "Benefit" calculated as "Ridership Share Captured from other modes". This does not measure the benefit of roads.
IMPACT: Roads Killer. Understates *real* benefits of roads by a factor of 50 times.
INITIAL RESPONSE: Rejection. Agreed inapplicable but could not correct it since it is a "required measure for MIS" "It would disqualify the report for federal funding". Subsequently AJM provided direct letter testimony from an FTA author of the staff- quoted reference that the ridership criterion was inapplicable to multimodal MIS studies.
PRESENT STATUS: Partially corrected. No longer put forth as a measure of roads benefit, but still put forth as an advantage of rail.

2. CRITIQUE: MF alternative summarily deleted on staff recommendation. AJM objected that this would rule out the surely most cost effective alternative.
IMPACT: Killer. MF Roads would be dead for duration of this 20 yr. plan.
INITIAL RESPONSE: Rejection. "We have to do this by board direction".
PRESENT STATUS Corrected. Reinstated by board reconsideration, Aug. 12,1996.

3. CRITIQUE: Cost differential for HOV over mixed-flow not accounted for.
IMPACT: Understate regular/ HOV advantage factor of appx. 2.5 times.
INITIAL RESPONSE :Rejection. "These costs are based on actual precedents"
PRESENT STATUS: Cost differences *partially* taken into account. $190 million capital cost difference representing HOV Flyover connectors not included in MF. Difference in roadway width is still not accounted for.

4. CRITIQUE: Erroneous Time Delay Benefit Calculation.
IMPACT: Understated time savings effect of roads alternatives by factor of approximately 3 times.
INITIAL RESPONSE: Rejection. Evasive answer.
PRESENT STATUS: Unclear. PBQD agreed that our original critique of the November 1995 methodology was correct and the error would be corrected as AJM suggested. As of the December 1996 report, however, there are still serious internal inconsistencies among several travel-time indicators, two others suggesting travel-time savings about three times those listed in Summary Evaluation Table S-1. However, in spite of several requests, the methodology used to find the "Travel-Time Savings" in Table S-1 has never been revealed.

5. CRITIQUE: Improve Roads cost Effectiveness by dropping SR57 extension .
IMPACT: Cost effectiveness of roads alternative further degraded by about 25%.

INITIAL RESPONSE: None.
PRESENT STATUS Partial. SR57 dropped from program as public-built road but effect remains in comparative cost results.

6. .CRITIQUE: Roads alternatives subjected to arbitrary 69% (sic) bottom line contingency addition.
IMPACT: Roads appear most expensive in terms of capital and total cost.
INITIAL RESPONSE: None.
PRESENT STATUS: Partially corrected. Arbitrary contingency reduced to about 35%.

7. CRITIQUE: Erroneous 12.9% emissions *increase* for roads alternative.
IMPACT: Killer. Made regular roads appear worst, rather than best in terms of emissions reductions.
INITIAL RESPONSE; Rejection, AJM is wrong. Evasive reasoning.
PRESENT STATUS: Corrected. Emissions *decrease* of 1.6%, consistent with travel- time reduction.

8. CRITIQUE: Energy consumption for roads alternative stated as 1.1% *increase*, obviously wrong and inconsistent with emissions reductions. Found to be due to erroneous assumption of a *constant*, 23.1 mpg irrespective of speed factor.
IMPACT: Correction would change 1.1% *increase* (worst) to 1.1% *decrease* (best) in energy consumption.
INITIAL REACTION: None.
PRESENT STATUS: Open, uncorrected.

SUMMARY: All these errors represent major, if not fatal hits on the viability of roads alternatives. There is no reason to believe that any of them would have been detected or corrected but for the efforts of AJM.
