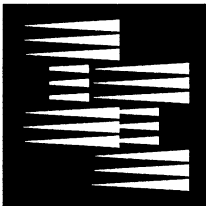


# INDEPENDENCE ISSUE PAPER

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## Stop That Train Part II A Reply to RTD

by Stephen Mueller & Dennis Polhill



INDEPENDENCE INSTITUTE

14142 DENVER WEST PARKWAY, SUITE 185

GOLDEN, COLORADO 80401

(303) 279-6536 FAX (303) 279-4176

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## **Stop that Train, Part II: A Reply to RTD**

*By Stephen Mueller & Dennis Polhill*

### **Executive Summary**

In March 1993, the Independence Institute published an Issue Paper titled *Stop that Train*, which contended that the plans of the Regional Transportation District (RTD) to build a Light Rail Transit (LRT) system throughout the metro area were flawed. The Issue Paper suggested that expanded use of special traffic lanes for busses and carpools (HOV lanes) would be a more cost-effective method of improving mass transit.

RTD published a 28-point reply to the *Stop that Train* paper, arguing that the issue paper made numerous factual errors. The RTD response is a commendable effort to engage in factual debate, and plays a constructive part in the process of public education on the light rail issue. But although RTD makes some constructive points, many of RTD's defenses of metro-wide light rail are unpersuasive. This new Independence Paper, *Stop that Train: Part II*, analyzes and responds to each of the 28 points made by RTD.

In short:

- Ignoring all facts to the contrary, RTD claims the cost per rider will be \$2.50, lower than any LRT system built anywhere.
- Though RTD publications and RTD board members stated that the MAC light rail line was to be used as a demonstration, RTD now claims that the notion of a demonstration line was not "official policy."
- RTD assumes that the federal government will provide 80% of the construction funding. However, Washington has provided only 44.5% of costs for other similar programs around the nation; and the pressure to balance the federal budget suggests that federal transit subsidies will not increase, and may decline.
- When all the facts are analyzed, special lanes for busses and carpools are more cost-effective than light rail. When Houston abandoned light rail for bus and high occupancy vehicle (HOV) lanes, Houston Mayor Bill Lanier explained, "HOV lanes cost us less per mile than rail by a good bit, and they move more people...not only transit passengers but also those people able to double up or triple up in cars to form car pools."

## Point and Counterpoint

### SUMMARY OF RTD COMMENT:

#### **1. The MAC line goes "through" Five Points, not "to" Five Points.**

##### AUTHORS' RESPONSE TO RTD:

The MAC line does extend several blocks beyond Five Points, although most people think of the northern spur of the MAC project as connecting Five Points with downtown.

#### **2. RTD challenges the accuracy of the Institute's claims about forecasting errors made in other cities during light rail planning.**

RTD cites ridership projections in other cities made just prior to the opening of new systems, rather than during the time when the systems were being sold to the public. In addition, RTD uses the obscure parameter of "vehicles operating cost per hour" (how much it costs to operate light rail trains for one hour), rather than the more fundamental measure: total system cost.

According to the U.S. Department of Transportation's report *Federally Funded Rail Systems*, Portland's actual cost per rider was nearly three times the original cost projection. Projected cost was \$1.68 per rider; actual was \$5.19 per rider. Portland had the lowest actual cost per rider of all the systems studied by the U.S. DOT. Average actual cost is \$9.19 per rider. Average actual cost per rider is 5.4 times the average projected cost.

RTD's \$2.50 per rider estimate suggests that a LRT system in Denver will be twice as efficient as the most efficient system ever built (Portland) and three times more efficient than the average LRT system.

RTD complains that data from the St. Louis light rail system were not included. Those data were not included because the Department of Transportation study was published in 1989 and the St. Louis LRT opened in 1993. Although St. Louis LRT has relatively high ridership, there is a \$10 million per year operating deficit, and a statewide sales tax is being considered to cover the shortfall. (*Governing*, Feb. 1994.)

#### **3. RTD argues that the Issue Paper did not include \$95 million capital cost for Bus/HOV lanes.**

The numbers that the authors used were directly from RTD's own publications

regarding the Southwest Corridor. RTD is pointing out a major flaw in its presentation of the facts—not in Mueller and Polhill's issue paper. This comment underscores the need to reevaluate RTD's decision to move ahead with light rail: the LRT analysis was based on incomplete information.

The costs of the North I-25 Bus/HOV lanes cited by RTD do not relate directly to the costs of the Southwest Corridor, and RTD knows it. This is another example of mixing apples and oranges to confuse people. Each project must stand or fall on its own merits.

#### **4. RTD disputes that there was a promise that the MAC system would be a "demonstration" project.**

Jack McCroskey, the former chair of the RTD Board, and a person who was instrumental in moving the MAC system forward, stated in public testimony that he personally made over 200 presentations at which he promised as an RTD representative that the MAC would be a demonstration project, and that it would take two years to adequately evaluate this technology for use in Denver. (Mr. McCroskey is currently a Senior Fellow with the Independence Institute.) On April 19, 1994 former RTD chair Byron Johnson reiterated in the *Rocky Mountain News* that MAC was a demonstration project. An RTD flyer dated "1/94" states that the MAC line "will demonstrate what light rail is and the benefits it can provide." (RTD, *Central Corridor Light Rail Line*, Jan. 1994).

Recent editorials in Denver's major newspapers agree that this promise was made to the community, and that it is foolish to proceed with additional light rail design and construction until the citizens of Denver actually have an opportunity to see what they would be buying. ("What Demonstration Line?" *Rocky Mountain News*, Mar 24, 1994; Gene Amole, "Light Rail Rides a Wrinkled Track," *Rocky Mountain News*, Mar 24, 1994; "RTD Should Prove Support Before Extending Light Rail," *Denver Post*, Mar 25, 1994.)

As RTD points out, the "official resolutions" for the MAC "do not specify a waiting period." Whatever what the official resolutions state, MAC was plainly sold to the public as a demonstration project.

#### **5. RTD questions the Issue Paper's figure that only 5% of Downtown Denver Commuters will regularly ride Light Rail.**

RTD's assertion that 26% of downtown commuters currently use RTD busses includes nearly 40,000 passenger boardings per day on the 16th Street Mall Shuttle. Using the Mall Shuttle is hardly "commuting."

## A REPLY TO RTD

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The authors ask RTD to produce the numbers and percentage of commuters expected to be served by light rail if the \$1.5 billion dollar transportation plan (Scenario D of Decide the Ride) were actually constructed.

### **6. RTD challenges Mueller and Polhill's contention that signal retiming for the MAC will disrupt traffic flow.**

When the MAC demonstration project opens in October, this statement will be verifiable by the average motorist.

### **7. "Reserved Right of Way" vs. "Reserved Lanes"**

RTD commented that there is a technical difference between reserved right of way and reserved lanes. This is correct, but not a significant distinction. The fact is that in both cases, future conflicts with other forms of transportation improvement will be created.

RTD's response concerned only the MAC system in downtown Denver. In the Southwest Corridor, the LRT system will indeed operate in reserved rights-of-way, as specified in the Issue Paper.

### **8. RTD claims voters' 1980 rejection of LRT is not applicable to current proposals.**

The 1980 election results included an RTD proposal to build a metro-wide LRT system similar to the current proposals. Yet RTD is spending nearly 30% of its current budget on LRT construction and "rapid transit development"—neither of which are related to improving the bus system.

If RTD is spending 30% of its budget on LRT without the authority of the people, then by ceasing this wasteful outlay and applying the funds to the existing bus system, service could be increased without any increase in taxes or any increase in efficiency.

### **9. RTD challenges Mueller and Polhill's general description of public transportation users.**

The issue paper recognizes that the economic status of many RTD riders has changed, but it also recognizes that the attraction of more affluent ridership has not been without cost to the taxpayers of the district. RTD should publish the marginal costs involved in attracting new ridership as a part of the alternatives analysis for the Southwest Corridor.

### **10. RTD disputes the economic viability of taxi cabs.**

## A REPLY TO RTD

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RTD states that taxis are less capital intensive than LRT, but that they are more labor intensive due to smaller vehicle capacity. As of August 1992, RTD's stated operating cost (*not* including capital cost) per mile was \$2.85 and RTD's cost per hour was \$45.56. RTD averaged only 1.46 passengers per mile over the approximately 30 million miles covered by their fleet of 773 buses. Are busses really more cost effective at their operations than taxis?

RTD cited cost figures for vans to serve physically challenged riders in their comment. These costs are much greater than the average costs for demand-responsive services due to the specialized equipment costs for these vans.

RTD's response does not refute the fact that for less dense urban areas, taxis and buses are better and cheaper than fixed guideway systems that can only serve a very small percentage of the population on a regular basis and are not flexible to adjust for changing needs.

### **11. RTD disputes Mueller and Polhill's assertion that population density should be a key factor in selecting an LRT alternative.**

Higher density provides more ridership and more economic viability and reduced public subsidy (tax subsidy). It is unlikely that people will commute out of their way to ride LRT.

*Stop that Train* disputes RTD's ridership forecasts primarily because of RTD's admitted omission of carpoolers from their calculations. This is critical to the calculation of the cost effectiveness of the various Southwest Corridor alternatives.

*Stop that Train* uses RTD's cost forecasts for the Southwest Corridor, but as RTD pointed out in their Comment Number 3, their own projections are in error. Trip generation modeling, which is dependant on population density and land use, is basic to the appropriateness of LRT technology.

The debate on ridership merely points to the reasonableness of following thru with the promised "demonstration project," so that actual costs and riderships can be observed.

### **12. RTD disputes Mueller and Polhill's claim that RTD is planning a 63 mile, \$1.5 Billion LRT project.**

These figures were presented by RTD at every Decide the Ride meeting. "Scenario D" (the blue one) discusses this proposal by RTD. Because of the RTD Board's recent approval of the LRT alternative in the Southwest Corridor, this figure is now over 70



miles.

It is interesting to note RTD's reference to the DRCOG 2015 Plan in this response. RTD says that the 2015 Plan "represents only projects that the region can afford," and it includes \$508 million for 23 miles of light rail. At the Decide the Ride meetings, attendees are asked to choose between four alternatives with the following LRT mileages: Scenario A, 14 miles of LRT; Scenario B, 14 miles of LRT; Scenario C, 59 miles of LRT; or Scenario D, 73 miles of LRT. According to the 2015 Plan, therefore, Decide the Ride Scenarios C and D should not even be considered.

RTD says that roadways, interchanges, and road widening projects will account for 70% of the total spending related to the 2015 plan, and that the 23-mile LRT system would account for only 14.5% of the total. Which portion of this plan requires additional tax subsidies, and which can cover its costs with user fees? Which portion will enhance the capacity of our roadway network? Which portion will have the largest impact on reducing traffic congestion? Which will allow the shipping of goods and services in addition to people?

RTD quotes a Colorado Department of Transportation study of the costs to widen I-25 between the 6th Avenue exit and the Lincoln exit. Much of this section of the highway is elevated. In other words, I-25 is a long system of bridges which enable I-25 to traverse the land adjacent to the Platte River, and also the city's southern rail connections. The figure quoted for widening one of the most expensive sections on the entire highway system is hardly a representative figure for the average cost of highway widening projects.

Citizens should note that the \$14.4 million per mile construction cost used in *Stop That Train* is only for the Southwest Corridor Alternative. The 2015 Plan indicates that an average LRT construction cost in Denver should be \$22 million per mile. This is nearly 50% higher than for the Southwest Corridor, where RTD already owns the right of way.

### **13. RTD challenges Mueller and Polhill's statement that RTD is seeking an additional 1% sales tax.**

RTD sought the authority for a 1% sales tax increase at the legislature. Readers are welcome to check the bill themselves; its number is HB 94-1040. The word "additional" is in the proposed legislation, ultimately making the potential sales tax burden for RTD a full 1.6%. Adding 1% to the current .6% nearly triples RTD's tax burden.

A 1% increase in the sales tax represents an additional burden of approximately \$400 per family per year for an average family of four.

At the Decide the Ride meetings, RTD only promoted a .5% sales tax increase to the public, but RTD requested authority from the legislature for twice that much.

#### **14. RTD challenges Mueller and Polhill's use of a "cost per mile" comparison between alternatives.**

Cost per mile is a valid engineering criterion for project evaluation. It facilitates more comprehensible comparisons between alternatives of unequal length.

*Stop That Train* uses RTD cost figures throughout. Because alternatives presented by RTD were not equivalent, the cost per mile parameter was generated to reduce confusion to the reader. The cost ratio parameter was generated for the same reason.

The authors' intent was to use the comparison to highlight the fact that in real terms, light rail is the most expensive alternative in the Southwest Corridor. This assertion is one of the primary arguments against the selection of Light Rail as the preferred alternative in the corridor. RTD admitted in its response that Light Rail does have the highest cost per mile of the alternatives in the Southwest Corridor Study.

In RTD Comment Number 16, RTD stated that carpoolers should not be included in the Bus/HOV ridership calculations. They say that the Bus/HOV lane will be constructed in every scenario (busway, LRT, or commuter rail). The authors note that there is no line item showing this expense in the other alternatives. The purpose of an engineering comparison is to compare costs between the alternatives, and yet RTD is overlooking Bus/HOV lane construction expense in all but the Bus/HOV alternative. The authors respectfully submit that RTD's numbers are wrong, and that the true costs of alternatives have been misrepresented. RTD is conducting a marketing campaign using inconsistent representations.

Following RTD's logic, to make the four SW corridor options comparable, no cost should be attached to the Bus/HOV alternative.

#### **15. RTD disputes cost savings for privatization of 20% of the bus system.**

RTD has vigorously opposed the concept of privatization. RTD admits that contracting out bus operations initially resulted in savings of 45%, but, notes RTD, the savings have diminished. The fact that economies captured by contracting out have diminished does not prove that there are no economies.

The authors' intent in including the 45% figure was to question the actual operating costs

## A REPLY TO RTD

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RTD has projected in the alternatives involving bus operations. The authors do not have access to RTD's most recent bids for privatized bus routes, but it was known that historically the privatized routes have been more cost effective. For RTD to fulfill its responsibility to providing the best service at the least cost, increased privatization should be implemented. RTD should evaluate alternatives for system expansion using the lowest possible costs to the taxpayers.

Even without the author adjustments for savings from bus operation privatization, LRT is still considerably more expensive on a cost per rider basis (when the full use of the bus/HOV lane is included in the ridership projections). Instead of 24 cents per rider with a privatized system, the unprivatized cost would be 31 cents per rider. The LRT alternative is represented by RTD as \$2.50 per rider. The unprivatized cost figure uses RTD's own numbers with an adjustment to including carpoolers in the ridership calculations.

### **16. RTD questions Mueller and Polhill's Ridership Projections.**

RTD's failure to include carpoolers in its analysis is the major flaw in the Southwest Corridor Alternatives study. By including only "passenger boardings" RTD misrepresents the true economic costs and benefits of the Bus/HOV lanes. Thus, RTD's Alternatives Study incorrectly favored Light Rail Transit.

Bus/HOV lanes are relatively new to Denver. There are very few. Generally Denver's congestion is so low that HOV lanes do not function at a capacity typical of other cities. Thus, although RTD's HOV traffic count of 1200 VPH may be accurate for the time being, it might be reasonable to expect that number to go to 2400 VPH (the number estimated in *Stop That Train*) as congestion increases and people become accustomed to using them.

Using RTD's 1200 VPH figure yields 25,000 riders per day in an HOV lane. Adding 8400 bus passengers per day yields 12.2 million passengers per year to share the \$5.2 million cost of Bus/HOV. The cost per rider increases to \$.43. The LRT option is represented by RTD to be \$2.50. LRT is still five times as expensive as Bus/HOV. Remember, that \$2.50 assumes that RTD's LRT will be more efficient than any other system ever built.

After the Colorado Department of Transportation has completed its planned widening and improvements, the capacity of Sante Fe should be significantly improved. The issue paper did not project carpool ridership based on the full capacity of the 2 HOV lanes for a twenty-four hour period, but rather only a small percentage of that number. Mueller and Polhill invite RTD to include the numbers in its alternatives study.

**17. RTD claims it is “physically impossible” to make Bus/HOV service levels equal LRT service levels.**

The authors incorrectly referred to “service level” instead of “frequency of service.” There is a very specific definition for “service level” in the mass transit nomenclature which may indeed make it difficult to achieve an equal level of service between the two alternatives. It is not, however, physically impossible to operate busses and LRT at reasonably equivalent frequency of service. To make alternatives reasonably understandable to laypeople the alternatives must be as similar as possible.

The authors would like RTD to disclose exactly how many new busses will be used in the Bus/HOV alternative as presented in the Southwest Corridor Study, and how many additional busses RTD would have to use to make the ridership levels comparable to those projected for the LRT. Such information would allow RTD (and independent analysts) to calculate the additional cost for this increased level of bus service—instead of RTD simply saying it would be “substantial.”

RTD’s projection of long intervals in-between busses for the Bus/HOV alternative affect both projected ridership calculations and creates longer total travel times for passengers. In addition, RTD’s assertion that the Bus/HOV lanes will not be operating at capacity means that travel times for carpoolers in the HOV lanes will be further reduced in comparison to the normal traffic lanes. RTD’s travel times stated in the Southwest Corridor Alternatives study do not show this reduction, which is another major oversight in the RTD study.

Figures six and seven in *Stop that Train* used RTD’s own stated “passenger boardings per day” figures for the Southwest Corridor Bus/HOV and Busway ridership figures. The authors added their projections for carpoolers in the HOV lanes for the Bus/HOV alternative to appropriately calculate the total number of users of the Bus/HOV lanes. There should be no additional operating expense for RTD for simply counting multi-occupant cars that RTD admits will actually be in the lanes. Based on RTD’s own numbers, combined with basic reasoning concerning the inclusion of carpoolers, the authors stand by the numbers in Figures six and seven.

**18. RTD tries to justify its claim of zero air pollution by the LRT.**

Every educated person knows that there is no physical process on earth that is non-polluting. The real story in RTD’s response is that there is indeed pollution associated with the LRT system—in direct contradiction of RTD’s published brochures.

RTD is claiming that the construction of a light rail transit system will enhance the region’s air quality. Readers need to understand that in comparison to the total amount

## A REPLY TO RTD

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of air pollution which is generated by the two million people in the Denver area, putting several thousand people per day into light rail vehicles will have virtually no impact on the overall air quality of the region. RTD can figure to the seventh decimal place the pounds of carbon monoxide and grams of particulates saved by using an LRT vehicle instead of a diesel powered bus or private automobile, but the resulting numbers will still be insignificant in comparison to the overall pollution.

The brown cloud is primarily dust, known as PM-10. The distribution is 10% vehicle exhaust, 15% industrial, 45% street sand, and 20% other. Street sand will decrease as alternative deicing chemicals come into application. If vehicle exhaust (10%) decreased by the expected RTD ridership (1.7%) then the benefit of LRT to the Brown Cloud is  $10\% \times 1.7\% = .17\%$ . Conversely (the best case scenario), if the construction of LRT will make 47% of the cars disappear (as RTD claims) then the impact on the Brown Cloud is  $10\% \times 47\% = 4.7\%$ . How much capital expense can be justified for a .17% to 4.7% impact on the Brown Cloud?

### **19. RTD misstates the basis of Figure 8.**

Figure 8 converted RTD's own figures for carbon monoxide (CO) and PM10 pollution for the Bus/HOV, busway, and commuter rail projects to pounds generated per day, and included an average relationship between stationary power generation sources and mobile transportation related sources to obtain an average value for the LRT alternative. This is stated in the chart.

### **20. RTD disputes validity of Rep. Bob Carr's economic criteria.**

RTD is pushing LRT in the Southwest Corridor based on an assumption that RTD will be able to acquire a full 80% federal funding for construction. RTD's assumption is questionable. RTD would be prudent to minimize the risk by recommending an alternative with a higher probability of federal approval at the 80% level, and lower capital costs than the LRT system.

There is no "free" money. There will be a real cost to local taxpayers to cover capital investment and operating costs not covered by the federal government. RTD has claimed that the construction of a LRT system to Littleton will be an economic stimulus all along the Southwest Corridor, but RTD has never exactly defined the economic benefits or made an economic analysis available.

RTD has never addressed the costs to the remainder of the district for the construction of the proposed Southwest Corridor LRT system. Will other parts of the district (including Aurora, Arvada, Northglenn, and Lakewood) forgo bus service improvements to finance Littleton's "pork barrel" project?

## A REPLY TO RTD

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Many local governments in the Southwest Corridor were given a presentation that included the teaser of "free money" from Washington. In the 1980s and 1990s, however, Washington has approved about 44.5% of the construction financing, not the 80% being claimed by RTD. The local government officials need to realize that the actual costs to their citizens for RTD's services could be much higher than RTD has promised. If the Feds provide 44.5%, then the local match is 55.5%, not 20%. Where will this money come from?

U.S. Rep. Bob Carr's subcommittee's actions suggest a trend at the federal level to pull back from the high percentage of federal matching funds. It is both factual and appropriate to mention this trend in the Issue Paper. The full House of Representatives rarely takes action on subcommittee reports since reports, by definition, do not require action.

### 21. RTD disputes Figure 9's numbers.

RTD claims that the authors have "incorrectly represented" four of the nine LRT systems listed in Figure 9. It is instructive to examine the differences between RTD's figures and the authors' figures:

SYSTEM	AUTHOR's LENGTH	RTD's LENGTH	AUTHOR's RIDERSHIP	RTD's RIDERSHIP
San Diego	36	15.9	45000	53500
Portland	15.1	15.2	24500	25000
Sacramento	18.3	18.3	23400	24000
St. Louis	18	17	22000	25000

The only major difference between RTD and the authors involves San Diego. San Diego opened a 16 mile base line in 1981, as indicated in the table. RTD has failed to include the four extensions to the San Diego system that have occurred since 1981 in their mileage totals. The total system length in San Diego is indeed 36 miles, which was correctly stated in the issue paper. (*Governing* magazine, Feb. 1994, page 39).

### 22. RTD tries to discredit the "Pickrell Report."

RTD claims that the "Pickrell Report" has been widely discredited. RTD's unsubstantiated assertion is not persuasive.

## **A REPLY TO RTD**

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The concerns brought to light by Don Pickrell need to be a part of the public debate which surrounds this issue. There is a long history of inflated public promises by transit agencies for projected ridership on their fancy streetcars, and gross underestimations of the total costs for these system. The authors suggest a complete review of RTD's figures by an independent auditing agency prior to any decision to spend more tax dollars on light rail. The best results could be obtained by examining the MAC system during its second year of operation.

Please note that RTD changed its ridership projections for the Southwest Corridor as recently as January 1994. RTD's December 1993 publications showed the projected LRT ridership to be several thousand passengers per day lower than their current figures, and the Bus/HOV lane usage several thousand riders higher. These projections were the result of a "peer review," which brings into question the validity of RTD's original ridership models.

### **23. RTD's financing of the MAC system.**

The authors' statement was that the federal government was unwilling to fund any portion of the MAC demonstration project. RTD's response was that they did not seek federal funding. Both statements are correct. If there was a good chance that the federal government would have been willing to fund part of the MAC, and RTD did not seek such funding, RTD would have acted with extreme indifference to the needs of Colorado taxpayers; the authors presume that RTD, in not seeking federal funding, was not derelict, but was instead perspicacious.

### **24. Discussion of the St. Louis LRT System.**

An additional statewide tax is apparently the only way St. Louis could keep its light rail running. (The tax has passed the Missouri House and is expected to pass the Senate.) How much support do you think people in Grand Junction or Durango would give for RTD to operate a light rail system in Denver? The undisputed fact is that only 27.7% of the operating costs of the St. Louis system are covered by farebox revenues—and the remaining operational expenses must be covered by a taxpayer subsidy.

RTD admits that virtually every public transportation system requires a taxpayer subsidy. The managerial challenge facing public administrators employed by RTD should be to minimize this subsidy.

### **25. RTD claims lower percentage of federal funds for LRT construction in St. Louis.**

The percentage of federal funds used in St. Louis was artificially lowered by including the St. Louis government's donation of a right-of-way for the LRT as part of St. Louis's financial contribution to the LRT system.

Besides, the point of *Stop that Train* was that the anticipation of 80% federal matching funds is risky assumption for local governments, and potentially a heavy burden for local taxpayers. RTD's claim that there was an even lower percentage of federal participation in the St. Louis system simply solidifies the authors' position, by reducing the average percent of federal participation further.

## **26. RTD disputes Mueller and Polhill's averaging methodology in Figure 11.**

RTD was correct that the authors simply took the arithmetic average of individual projects. We agree that RTD's stated method to obtain an average rate of federal participation is preferable, and we will be using their 44.5% figure rather than our 51.5% when we approach this issue in the future.

Accepting RTD's revised calculation simply reinforces *Stop that Train's* warning that anticipating of 80% matching funds is risky for local governments.

## **27. RTD claims bus subsidies are equal to or greater than LRT subsidies.**

RTD's claim that similar or greater subsidies are necessary to support the operation of bus transit systems is unsubstantiated.

Roy Nakadegawa (an elected board member of BART in San Francisco and a retired city engineer) provides an interesting cost comparison of the Los Angeles LRT with bus systems. In terms of subsidy per rider per year, the Los Angeles LRT requires a taxpayer subsidy of \$7,600 per year per rider vs. \$490 for buses. 15.5 times as expensive! (Roy Nakadegawa, Transportation Research Board Paper 89-0419, *Considerations for Cost Effective Transit*, Jan. 1990.) Nakadegawa summarizes: "with limited funding in all areas of government, all transit alternatives should be carefully evaluated. Transit needs are developing in all areas of congestion. Phasing in various higher capacity systems on a step by step basis should be mandated."

Nakadegawa compares an extension of the BART light rail system with a bus/HOV alternative. For equal ridership BART would have 2.7 times the capital cost and 9.4 times the annual operating cost of the bus/HOV alternative. Nakadegawa notes that if the bus fare subsidy was increased from 80% to 100% (free to riders), ridership would



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increase 700% and still require \$13.34 million per year smaller operating subsidy than BART. And it would save \$35 million per year in the amortization of the capital cost differential.

The Fifth World Conference on Transportation Research was held in Yokohama, Japan in 1989. Research presented by three Canadians (M. Nisar, A.M. Khan, and W.F. Johnson) concludes:

Transitways are a relatively new option to the conventional rail based systems for low to medium density urban areas. For volumes of up to 16,000 persons per hour per direction and even somewhat higher volumes; transitways using high capacity articulated buses provide a cost-efficient rapid transit service perhaps even cheaper than the LRT option under normal circumstances. The transitway is less capital intensive and for a range of volume levels, it offers comparable or less operational costs. As for level of service, the central business district oriented users can expect comparable or somewhat better service (due to less transfer) than the LRT. The transitway system is better suited to serving dispersed activity centers and non-central business district travel needs. Transitways offer the flexibility of developing rapid transit system incrementally whereas a rail based system has to be built at once.

RTD's statement raises many interesting issues. How many busses will \$1.425 billion buy, and at what frequency of service would they be operating on the streets of Denver? \$1.425 Billion (scenario D in Decide the Ride) is the equivalent of more than \$2,700 for a family of four in the Denver area. Could we save money if we paid people to work at home?

The one cent sales tax increase recently under consideration in the Colorado legislature would place a tax burden of approximately \$400 per year on the average family of four. \$400 dollars per year rivals the level of property tax support charged by school districts for most families in the Denver area. The authors question such a high level of tax subsidies for public transportation, particularly in comparison to the funding needs for other worthwhile public agencies. Exactly what problems will RTD solve if we fund their organization with several billion dollars over the next several decades?

### **28. RTD claims it is unbiased.**

In contrast to RTD's claim that it has presented its analysis in an unbiased, straightforward, and accurate manner, this Issue Paper has demonstrated that RTD is biased toward light rail. RTD has spent at least \$1.4 million for its alternatives study, but the Independence authors donated their work in the public interest, and have absolutely nothing to gain. The concerns presented are based on a reasonable

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understanding of the numbers and technology, and a solid background in and commitment to the public works profession. In contrast, RTD has a very direct interest in the light rail debate, since the choice of light rail over bus/HOV would give RTD a vastly larger budget and sphere of authority.

The authors believe that RTD has caught a desire named streetcar and has lost its objectivity. RTD has bound itself to the LRT technology, and has demonstrated an unwillingness to evaluate accurately transit alternatives.

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TOM TANCREDO is President of the Independence Institute.

DENNIS POLHILL is a Senior Fellow of the Independence Institute, and chair of its Infrastructure Task Force. He is a former City Engineer and Director of Public Works and a Past President of the Colorado Chapter of the

American Public Works Association. He is a registered Professional Engineer in twelve states with Masters Degrees in Public Works Management and Civil Engineering.

STEPHEN MUELLER is the Pavement Management Engineer for the City of Aurora, and a member of the Independence Institute's Infrastructure Task Force. He is a Past President of the Colorado Society of Engineers, and a current Director of the Colorado Engineering Council. He was recently named the "1993 Engineer of the Year" by the Colorado Chapter of the American Public Works Association. He has a Masters Degree in Public Administration and is a registered Professional Engineer.

The opinions expressed herein are solely those of the authors.

# NEWS

INDEPENDENCE INSTITUTE  
14142 Denver West Parkway #101  
Golden, CO 80401  
(303) 279-6536

For Immediate Release  
March 8, 1994  
RECEIVED Contact: Dennis Pohill  
(303) 279-6536

MAR 15 1994  
R. T. D.  
PLANNING & DESIGN  
STOP THAT TRAIN !  
RTD.  
BOARD OFFICE  
MAR 14 1994  
RECEIVED

How many transportation related public works boondoggles can this state afford?

The Regional Transportation District is setting the stage for the development of a massive light rail transit (LRT) system for the metropolitan area. They are doing this even before the ink can dry on their pledge to see if their short segment of LRT from Aurora to Five Points will work, before expanding the line.

Nine other American cities have constructed similar transportation systems and in every case, actual costs exceeded projected cost and actual ridership fell short of projections. There is NO evidence that Denver will be any more successful than these other cities.

Stephen Mueller and Dennis Pohill have analyzed the RTD proposal, looked at the demographics and the history of similar projects and declared the Denver plan a "disaster."

Colorado has the opportunity to avoid the embarrassment of another expensive, taxpayer supported "white elephant."

①  
②

Response to the Independence Institute Issue Paper:

"Stop that Train:  
RTD's Light Rail Boondoggle is on a Fast Track for  
Disaster"

1. The News Release incorrectly defines the extent of the Central Light Rail corridor which actually extends 5.3 miles from Broadway at I-25, through Five Points, to 30th Avenue and Downing Streets.
2. There are twenty-seven projects to expand existing rail projects in various stages of planning and design. Even among the nine cited in the paper, not all were over budget estimates and/or under ridership projections. For example, Portland built its light rail system for \$7.5 million less than the estimate in the federal Full Funding Agreement. Portland's operating costs per vehicle hour have proven to be 30% below projections, while ridership has actually exceeded the final ridership projections made prior to opening. In Buffalo, the original cost estimates were for a surface light rail system. Local input caused the system design to be changed to a predominately underground system, thereby increasing costs substantially. Actual costs came in only 5% over federal Full Funding Agreement estimates. Finally, St. Louis has experienced average ridership in the first year of operation that exceeds expected ridership by about 33%. It should be noted that the Federal Transit Administration's review procedures have improved so much that any forecasting errors made in the past would not be repeated today.



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March 8, 1994

## Stop that Train: RTD's Light Rail Boondoggle is on a Fast Track for Disaster

By Stephen R. Mueller P.E. and Dennis PoHill P.E.

Denver was once served by over 150 miles of trolley lines which boasted a ridership of 36 million passengers per year in the early 1900s. This was at a time in Denver's history when the population was only 110,000 residents. The introduction of the motorbus (which doesn't require a fixed guideway) and the rapid growth in the availability and affordability of personal automobiles put an end to the golden era of streetcars. In 1945, daily ridership had fallen to 22,500, or less than 8 million per year. The last trolley service ran on the streets of Denver on June 3, 1950. A private bus company provided mass transportation services for many years, but with declining ridership, it was unable to survive. When the private company ceased operations, voters agreed to provide publicly subsidized bus services through a new government agency: the Regional Transportation District (RTD).

From the beginning, RTD has promoted expensive alternatives to the bus system. In fact, RTD is spending more than \$100 million dollars of "excess tax revenues" to build a short segment of LRT ("Light Rail Transit") near the middle of Denver.

### In Brief...

■ RTD is pushing a major public relations campaign to build an expensive light rail transit (LRT) system in southwest Denver, and eventually the whole metro area.

■ In nine US cities that constructed LRT projects, actual costs exceeded projections and ridership fell short of projections. Actual cost per rider exceeded projections by an average of 5.4 times.

■ Contrary to RTD's claim that LRT is the least expensive of several alternatives, LRT is about 10 times as expensive as building dedicated highway lanes for buses and carpools. (3)

■ The MAC demonstration project carried a promise to the people that LRT could be observed in operation for two years before a proposal for an enlarged system would be advanced. RTD has an obligation to honor this promise. (4)

3. The Colorado Department of Transportation is spending approximately \$95 million to construct the High Occupancy Vehicle (HOV) lanes on South Santa Fe Drive. The authors have consistently failed to account for these costs. When these costs are added to the \$36 million capital costs for the Transportation Systems Management alternative, the total capital costs of this alternative increase to approximately \$130 million. The cost for the 6-mile Santa Fe HOV system exceeds \$20 million per mile. The capital costs of the 6.6 mile North I-25 Bus/HOV lanes exceed \$30 million per mile. By comparison, the capital costs for the 8.7 mile light rail alternative in the Southwest Corridor are less than \$15 million per mile.

4. The official resolutions of the RTD Board of Directors regarding the Central Light Rail project do not specify any waiting period for consideration of additional light rail corridors. At the time, individual members of the RTD Board may have indicated a preference for a waiting period, but this position was never adopted as an official policy.

Regional Transportation District

March 18, 1994

**LIGHT RAIL**

Page 2

RTD is now advocating a plan to reintroduce streetcar-like vehicles. The costs will be substantial, and the benefits questionable. Figure 1 shows the distribution of the commuting population in the year 2015. The Denver Regional Council of Government (DRCOG) expects that 2/3 of the trips will be from one suburban location to another suburban location. Only one third of the trips will be from the suburbs to downtown Denver. Light rail experiences in other American cities indicate that only about five percent of the commuters who are actually going downtown can be expected to regularly use the proposed light rail system. Please note that 5% of the one third is only 1.7% of the total commuting population.

Light rail may create more problems than it solves. Traffic signals are being re-timed to accommodate the light rail demonstration project (MAC project) which is currently under construction. Signal retiming will diminish the signals' effectiveness for automobile traffic and thereby increase traffic congestion, and in turn, add to the automobile component of Denver's air quality problem. Since the MAC system will operate primarily at ground level on reserved rights of way, other transportation improvements will be prevented at locations where the MAC exists. RTD promised that the MAC demonstration project would provide an opportunity to prove and demonstrate the benefits of LRT before proposals for an expanded system would be considered. If the benefits of LRT are so great that these promises must be abandoned, then let the benefits be stated publicly.

Figure 1: PROJECTED COMMUTERS

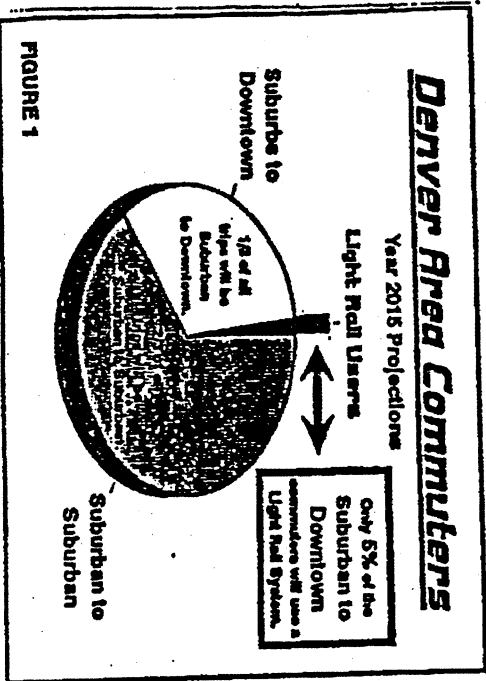


FIGURE 1

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5. No source is provided for the statement that 5% of downtown commuters take light rail in other American cities. The authors base their year 2015 "projections" for Denver on current-day information from an undocumented source. In addition, this "projection" is based on cities that have not completed full build-out of their light rail systems.

RTD currently carries 26% of all downtown commuters, and the Denver Regional Council of Governments projects this number will increase to 47% in 2015 (source: "2015 Interim Regional Transportation Plan", DRCOG, October, 1993). Much of this increase is attributable to people using light rail.

6. Signal retiming has been used effectively throughout the metro area to create better traffic flow, reducing congestion at intersections. RTD is working with the City and County of Denver to ensure that the signal retiming will optimize traffic flow for both automobiles and the light rail vehicles. On the 16th Street Mall, the signals were retimed for the Mall Shuttles without causing delays or congestion for auto traffic on crossing streets.

7. In downtown Denver, the Central Corridor Light Rail project will operate in reserved lanes adjacent to general traffic lanes, not in reserved light-of-way. This is consistent with the adopted Master Plan for the downtown Denver area.

8

Currently, RTD is pushing a plan to extend the MAC project to Littleton, along Santa Fe Drive. The Southwest Corridor project will add 8.7 miles at a projected cost of \$125 million. When a similar plan appeared before the voters in a 1980 election, the voters rejected it.

9

Transportation is necessary for continued economic health. Mass transportation fills a need in a highly mobile society. Mass transportation generally services the poor, the pre-driving-age youth, the elderly, and the physically challenged.

In recent times, providers of mass transportation have sought to encourage broader ridership, particularly in crowded metropolitan regions. They have extolled the virtues of taking a bus or a train instead of an automobile. They are trying to attract a different clientele: more affluent, environmentally aware, and "politically-correct" commuters. Mass transportation systems have become safer, cleaner, and faster as a result of this strategy. Costs have also risen in proportion to the improvements in service.

Taxpayers will pay for expanded service as long as they receive a benefit. People have been conditioned to believe that if they ride mass transportation, highways will be less crowded and cities will be less polluted. The truth is that these high cost LRT systems have not eased traffic congestion in a single metropolitan region. The air quality benefits of these systems have yet to be confirmed.

10

Mass transportation services can be provided in a variety of forms. The most common forms are taxi cabs and bus systems. Less common are light rail and heavy rail transit (HRT) systems. The simple reason that there are many more cab and bus companies (at least when the government does not create oligopolies) is that they are less capital intensive and more economically viable than LRT and HRT systems. Independently driven vehicles serve more people better and cheaper than fixed guideway systems unless a very special set of circumstances exist. Taxpayers pay for a portion of the costs of every LRT or HRT system in this country. There are no revenue-neutral or revenue-generating light rail systems in the U.S. Every single one of them operates at a loss.

11

A key factor for choosing a fixed guideway system over a bus system is population density. A metropolitan region must have a population density of 16,000 to 20,000 people per square mile, in order for a fixed guideway mass transportation system to pay for itself. If the population density is less, the system will require a taxpayer subsidy. This will certainly be the case with any light rail system for the Denver area. Denver's population density is about 3,000 people per square mile.

Instead of presenting the full economic picture, RTD is conducting a misleading public information campaign calling for the immediate construction of an LRT system in the Southwest Corridor.

8. The 1980 election was for a local sales tax increase to finance a 73 mile light rail system. The 8.7 mile long Southwest Corridor project will require an increase in local taxes.

9. A recent survey<sup>1</sup> indicates that over one-half of RTD's patrons ride the bus by choice, meaning that they had an automobile available for the trip they made on RTD. In addition, over half of RTD's patrons have annual household incomes greater than \$25,000.

10.

While taxi cabs and similar demand-responsive systems are less capital-intensive than LRT, they are not necessarily more economically viable. These services are more labor-intensive than LRT due to the smaller capacity of the vehicles, leading to higher operating and maintenance costs. RTD contracts with a private contractor to provide demand-responsive service to persons with disabilities in Adams County. The cost of this service is \$16.69 per passenger trip, which is almost seven times the projected cost per rider of the Southwest Corridor LRT.

11.

Population density alone is not the key factor in selecting a fixed guideway system. RTD has compared the cost and ridership forecasts for Bus and LRT alternatives in the Southwest Corridor and LRT was found to be the most cost-effective.

<sup>1</sup> "Regional Transportation District: 1993 Rider Survey" (The Howell Research Group, July, 1993)

The Southwest Corridor is one of several "public transportation corridors" that has been studied by RTD. While the \$125 million cost of a light rail system may sound manageable, it should be remembered that the Southwest Corridor is a very small portion of a much larger system. When RTD's total plan is unveiled, only the new Denver International Airport will exceed the total system cost. If RTD intends to establish a 63 mile light rail system for the entire Denver area, the total system cost will be nearly \$1.5 billion. In the early 1900s, Denver's trolley system was more than twice this size, and still an economic failure. Denver's service area has expanded more than twentyfold since the early 1900s, and population density has declined.

In the 1994 State Legislature, RTD has asked for the authority to increase sales tax by 1%. This would generate \$211,000,000 per year in new taxes to RTD and provide a bonding capacity of \$2 billion to \$4 billion.

The debate on LRT needs to center around RTD's plan for the entire Denver metropolitan region, not just the relatively small Southwest Corridor. People outside of this corridor should understand that they will pay for a LRT system that they may never use. Taxpayers in the entire district need to understand the commitment that RTD is seeking for the entire mass transportation system, and then compare these total costs to the reasonably expected benefits of the system. There are other expenditure options for the money RTD is asking the citizens of Denver to spend.

### Four Transit Alternatives

The RTD has developed four alternatives for transit in the Southwest Corridor. Unfortunately, the alternatives are not comparable.

#### 1. TSM

The Transportation System Management (TSM—better known as Bus/HOV Lanes) alternative consists of the construction of 6.0 mile Bus/High Occupancy Vehicle (HOV) lanes in the middle median of an expanded South Santa Fe Drive. Both buses and privately owned vehicles with a specified number of riders would be allowed to use this facility. RTD has named this plan "TSM," although the Bus/HOV lane concept is well known to the general public. RTD estimates capital (construction and new equipment) costs for this design at \$35 million.

#### 2. BUSWAY

The Busway alternative consists of the construction of a 8.7 mile long busway. A Busway is a road built for the exclusive use of buses. Busway capital costs are estimated at \$100 Million.

12

13

12. The Regional Transportation Plan for the Year 2015 includes all the proposed transportation projects within the region which are planned to be constructed by the year 2015. This Plan, by federal mandate in the Intermodal Surface Transportation Efficiency Act of 1991, is "fiscally constrained", meaning that the plan only contains projects which the region can afford, using current and reasonably expected funds. The total cost for all the identified projects, roadway and transit, is approximately \$3.5 billion. Of this total, only \$508 million, or 14.5%, is attributable to 23 miles of light rail transit. New roadways, interchanges, and road widening projects account for \$2.5 billion, nearly 70% of the total.

As a point of comparison, the cost to widen I-25 would be much higher, on a per mile basis, than light rail construction. A recent study conducted for the Colorado Department of Transportation (CDOT) to widen I-25 by one lane in each direction between 6th Avenue and Lincoln Avenue estimated that it would cost approximately \$900 million or over \$52 million per mile.

13. The Bill being considered by the 1994 Colorado State Legislature would restate authority previously granted to RTD, to charge a sales tax 1/10 of a total of 1%. This authority was contained in the original legislation which created RTD in 1989; the authority to charge a sales tax higher than the present 0.6% expired in 1991. A major provision of this Bill is that voter approval must be secured for any increase in RTD sales tax. If the voters were to approve a sales tax increase, each 0.1% increase would raise approximately \$20 million in additional revenue per year.

### 3. LRT

In the Light Rail Transit alternative, the MAC demonstration would be extended 8.7 miles. RTD has acquired most of the necessary right of way, but the capital construction and equipment acquisition costs for this spoke of the LRT system is estimated at \$125 million.

### 4. Commuter Rail

The Commuter Rail alternative is also referred to as Heavy Rail Transit (HRT). It consists of the construction of 17.2 miles of two new railroad tracks separate from the freight main tracks along South Santa Fe Drive. The Commuter Rail alternative is expected to require \$150 million of capital expenditures.

### Summary and Analysis of the Alternatives:

Figure 2 is a table which summarizes the four alternatives that RTD has presented for the Southwest Corridor. It defines the lengths and costs of each of the alternatives and presents the cost ratios of the alternatives using TSM as the base expenditure.

Figure 2: CAPITAL COSTS

Alternative	Length	Capital Cost	Capital Cost Ratio	Costs per Mile	Cost per Mile Ratio
1. TSM (Over/ROV Lanes)	6.0 Miles	\$ 35 Million	1	\$ 5.8 Million	1
2. Bypass	8.7 Miles	\$100 Million	2.9	\$11.5 Million	2.0
3. Light Rail Transit	8.7 Miles	\$125 Million	3.6	\$14.4 Million	2.5
4. Commuter Rail	17.2 Miles	\$150 Million	4.3	\$ 8.7 Million	1.5

Figure 2 shows that the construction of the physical facilities and the acquisition of the equipment necessary for the TSM alternative is only forty percent (cost ratio 1:2.5) of the LRT alternative on a cost per mile basis. Light Rail Transit is the most expensive option on a per-mile basis. The finding is in direct opposition to RTD's brochures that show LRT to be the most cost-effective transit alternative in the Southwest Corridor. Figure 3 is a bar graph showing the costs per mile of the various alternatives.

Figure 4 is a table which compares the projected operating costs of the 4 alternatives on a cost per mile basis. The figure shows little differences between the alternatives.

14.

It is not meaningful to consider the cost of the TSM alternative on a per-mile basis, because this alternative consists primarily of new bus purchases and spot improvements at intersections. The article correctly identifies the LRT alternative as having the highest cost per mile of the alternatives. However, because LRT attracts many more riders than the other alternatives, it is the most cost-effective on a cost per passenger basis.



Figure 3: CAPITAL COSTS PER MILE

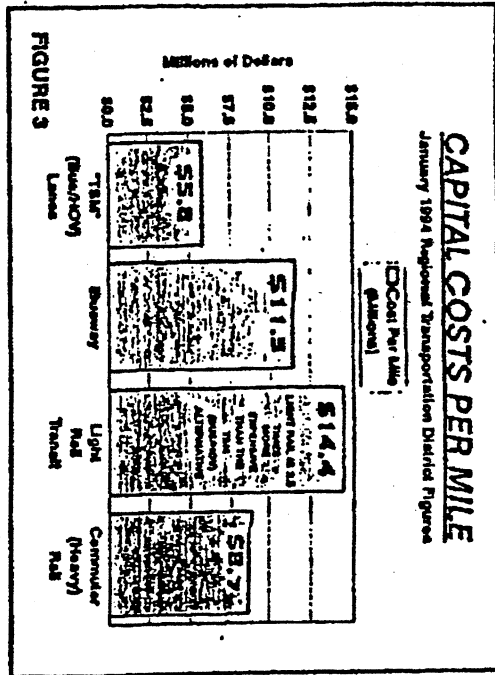


FIGURE 3

Figure 4: OPERATING COSTS

Alternative	Length (Miles)	Operating Costs	Operating Cost/Mile
1. TRAIL (Bus/NOV Transit)	6.9	\$3.1 Million	\$.45/Mile
2. Light Rail	6.7	\$4.3 Million	\$.64/Mile
3. Light Rail Transit	6.7	\$4.3 Million	\$.64/Mile
4. Commuter Rail	17.2	\$6.8 Million	\$.39/Mile

15

Figure 5 shows that RTD's high operating costs for both the TSM and busway alternatives can be mitigated through privatization. RTD was legislatively mandated to privatize 20% of its bus routes. The result has been a 45% reduction in operating costs on those routes. Thus, if RTD elects to contract out either of these alternatives, the operating costs can reasonably be expected to decline by about 45%. These privatized operating costs are shown in Figure 5.

Figure 5: PRIVATIZED OPERATING COSTS

Alternative	Operating Costs (Privatized)	Operating Cost Ratio	Operating Cost/Mile (Privatized)	Operating Cost/Mile Ratio
1. TSM (One/HOV Lane)	\$ 1.7 * Million	1	\$ .28 Million	1.1
2. Busway	\$ 2.6 * Million	1.5	\$ .25 Million	1
3. Light Rail Transit	\$ 4.3 Million	2.5	\$ .49 Million	2.0
4. Commuter Rail	\$ 6.8 Million	4	\$ .39 Million	1.6

\* decrease RTD numbers adjusted by authors

### RTD's Ridership Projection

In RTD's *Southwest Corridor Spoilright*, the ridership projection of only 8,400 passenger boardings per day does not include carpools. A highway traffic lane has a capacity of approximately 2,400 vehicles per hour. Peak hour traffic counts are typically 10% of the 24 hour total. An HOV lane can therefore be expected to carry 24,000 vehicles per day. Assuming an average of 2.1 passengers per vehicle, 50,000 carpool passengers per day plus the bus passenger volume should be used in the ridership projection. *Spoilright* has neglected to state how many buses will be using this 35 million dollar facility. Assuming that each articulated bus is carrying 50 passengers, it would take 168 bus trips per day to yield 8,400 passengers. This is 84 round trips per day, or an average of 3.5 round trips per hour in year 2015.

To compare TSM and LRT, the elements analyzed should be comparable (applies to all). If TSM service level is allowed to equal LRT, TSM ridership will equal or exceed LRT. If carpool ridership is accounted for conservatively, passenger trips per day increase from 8,400 to at least 58,400. Figure 6 represents the authors' efforts to lift through the RTD numbers and represent the system costs in comparative terms. The operating costs of TSM and busways have been reduced by 45% to account for

17

16.

The cost savings cited in the article are not accurate. The figure of 45% savings is taken from the *Denver RTD Privatization Performance Audit Update*; July, 1992-June, 1991, and it represents the direct operating cost savings shown for contractors in the twelve months from July 1990 to June 1991. When the total cost of the private contracts to RTD is included in the cost comparison, the same audit shows a 12.5% savings in actual costs over the same twelve-month period.

RTD's recent experience with rebids of contracts for privatized service had a 43% increase over the prior contracts. The costs for privatized service are now comparable to RTD costs.

16.

The ridership projections for the alternatives do not include carpools, although the carpool lanes on South Santa Fe will be available under all alternatives. It is not appropriate to include carpools in the TSM alternative ridership estimate without also including carpools in the estimates for the other alternatives. The analysis presented here is further flawed by the assumption that carpool usage will be equal to the capacity of the carpool lanes. Actual usage projections should be used, if carpools are considered in the evaluation of the alternatives.

The stated capacity of 2,400 vehicles per lane per hour is a theoretical capacity for freeways. South Santa Fe Drive is a major urban arterial with traffic signals. The actual observed capacity of the general traffic lanes on Santa Fe is 1,300 vehicles per lane per hour.

The capacity of the HOV lanes on Santa Fe is limited by the traffic signals at the crossing streets and by the fact that the left-turning cars will have to cross the lanes prior to each intersection. The estimated capacity of the HOV lanes on Santa Fe is 1,200 vehicles per lane per hour.

17.

It is physically impossible to make TSM service levels equal those of LRT because buses and carpools in the HOV will operate at slower speeds than LRT. Traffic flows in the HOV lane will be interrupted by traffic signals and left turns. For TSM to carry the same number of riders as the LRT, the operating costs for TSM would increase substantially. This analysis assumes that the TSM operating cost does not increase with increased usage. Therefore, the analyses presented in Figures 6 and 7 are invalid.

**Light Rail**

privatization of bus operations. Capital costs have been amortized to reflect annual debt service on capital of approximately 10%. TSM ridership has been increased to account for carpool users. The results are quite dramatic. The LRT alternative is about 10 times as costly as bus/HOV lanes (TSM). (\$2.33 per ride versus \$0.24 per ride respectively.)

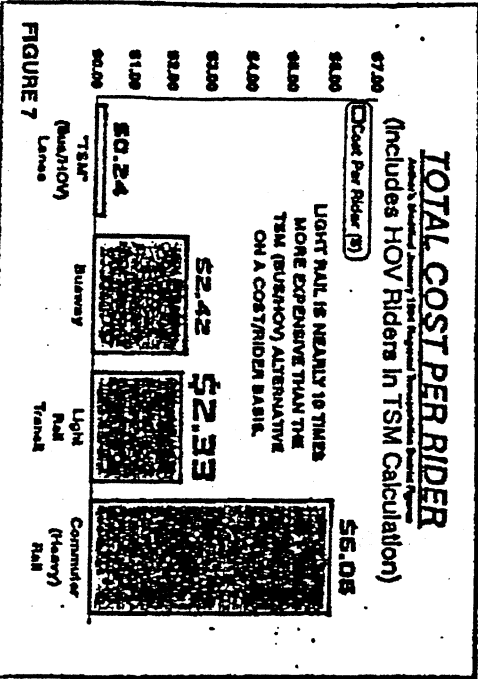
RTD claims that the "Total Investment per Rider" is lowest for the LRT alternative. (Southeast Corridor Spotlight, vol. 2, Number 1, January 1994). Figures 6 and 7 demonstrate otherwise.

**Figure 6: TOTAL COST PER RIDER, DATA**

Alternative	Capital Cost	Annual Amortization of Capital Cost	Operating Costs (Privatized)	Total Annual Cost	Riders per Year	Total Cost per Rider
1. TSM (Bus/HOV Lanes)	\$35 Million	\$3.5 Million	\$1.7 Million	\$5.2 Million	213 Million	\$0.24
2. Bypass	\$100 Million	\$10.0 Million	\$2.6 Million	\$12.6 Million	53 Million	\$2.33
3. Light Rail Transit	\$125 Million	\$12.5 Million	\$4.3 Million	\$16.8 Million	7.2 Million	\$2.33
4. Commuter Rail	\$150 Million	\$15.0 Million	\$4.8 Million	\$21.8 Million	3.6 Million	\$6.05

\* Indicates RTD numbers adjusted by authors

**Figure 7: TOTAL COST PER RIDER, GRAPH**



**FIGURE 7**

### Environmental Benefit Projection

Everyone is trying to improve the air quality of the Denver metropolitan area. The expenditure of \$125 million on a LRT system for the Southwest Corridor may not improve the region's air quality. RTD claims that the LRT system will create no pollution because LRT uses "clean" electric motors. But electricity must be produced in power generating plants. Power plants generally are about 30% efficient. (Nuclear plants are slightly higher; coal and oil fired power plants are slightly less efficient.) The 70% power efficiency loss is related to impacts to the environment in the form of thermal pollution, hydrocarbon emissions, particulate emissions, and other pollutants.

Moreover, there are additional losses in transmission, transforming, and in running the LRT electric motors. There are real economic reasons for the fact that a BTU of electricity costs three times as much as a BTU of natural gas.

Thus, LRT may partly "solve" the automobile air pollution problem by centralizing the pollution at the site of electricity generation.

Ultimately, the greatest environmental impact will be determined by system efficiency. If LRT is running empty trains or consumes maximum power at power plant peak demand times, then the negative environmental impacts could be enormous. RTD's claim that there are no environmental impacts is not correct.

Figure 8 provides an example of the particulate pollution which is generated by a power station in comparison to transportation related pollutants. Particulates are the major component of Denver's "brown cloud." Carbon monoxide is usually not a problem pollutant for power generating facilities.

Figure 8: POLLUTION

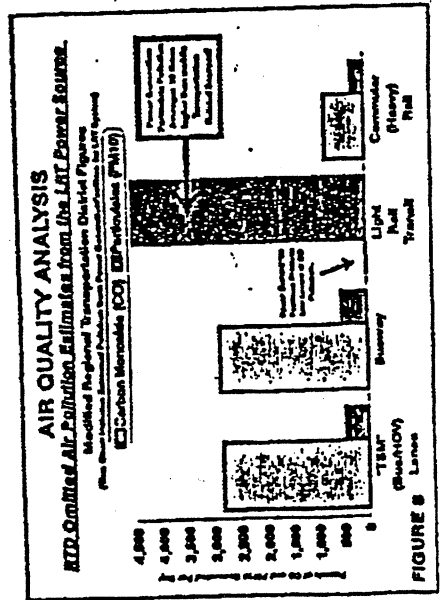


FIGURE 8

18

18. The potential stationary source (i.e. power plant) impact to air quality resulting from implementation of LRT in the Southwest Corridor has been addressed by RTD. RTD staff has coordinated with the Public Service Company (PSCO) regarding this air quality issue. RTD provided PSCO with preliminary estimates of the electrical requirements for an 8.7 mile LRT line in the Southwest Corridor. According to PSCO, this electrical demand for LRT will be less than 0.04% of their peak generating capacity and is insignificant in terms of its impact on PSCO's generation and distribution system. Additionally, if the emissions contribution of electric power generation is considered in the evaluation of the LRT alternative, the evaluation of the TSM and Busway alternatives should consider the emissions associated with the refinement of the diesel fuel used by these alternatives.

In order to compare modes of travel for air quality analysis purposes, it is more useful to look at emissions on a per passenger mile basis. Hydrocarbons and carbon monoxide emissions are reduced by more than 99% when the use of light rail is substituted for an average commuter automobile trip. In addition, nitrogen oxide emissions are reduced by more than 80% and particulate emissions decrease by more than 90%. These reductions take into account the contribution from power plant emissions associated with light rail transit.

19. This chart appears to inappropriately assign the full particulate matter pollution associated with a power plant to the LRT alternative.

*Handwritten signature: Robert...*

**Recent Light Rail Experience in Other Cities**

Local government officials have been swayed by a desire named streetcar. Michigan Congressman Bob Carr, Chairman of the House Appropriations Subcommittee on Transportation, is concerned that urban transit officials are seduced by light rail as a status symbol. Carr's subcommittee has adopted similar economic criteria for judging transit projects. Figure 9 lists the nine systems built during the 1980s and 1990s.

Figure 9: LIGHT RAIL SYSTEMS OPENED IN THE 1980S AND 1990S

City	Length	Year Opened	Average Weekly Trips
1. Baltimore	22.5	1992	13,000
2. Buffalo	6.2	1985	29,900
3. Los Angeles	21.4	1990	40,000
4. Pittsburgh	22.5	1987	32,500
5. Portland	15.1	1986	24,500
6. Sacramento	18.3	1987	29,400
7. San Diego	34.9	1981	45,000
8. San Jose	21.9	1987	21,000
9. St. Louis	18.9	1993	22,000

The need for new criteria is illustrated by the experience of the last 15 years. During the 1980s and 1990s, nine U.S. cities have constructed light rail systems. Don H. Pickrell, USDOT National Transportation Systems Center Economist, said in a 1990 study that actual LRT ridership averages 66% to 85% lower than initial forecasts, and actual capital costs average 13% to 50% higher than original estimates. Thus, average cost per rider is 5.4 times greater than originally projected. RTD's projections merit intense scrutiny to ensure that they are accurate and to ensure that Denver does not repeat the experience of these other nine cities.

Figure 10 is a listing of the capital costs of the nine LRT systems built during the 1980s and 1990s. It is important to note that the Federal Government does not typically bear the full costs of construction for an LRT. In Denver's case, the federal government was unwilling to contribute any funds to the MAC demonstration project. Systems operations and maintenance are generally the responsibility of the local jurisdictions.

Figure 11 shows that the federal government's average "contribution" for construction of LRT systems has been 51.3%. St. Louis is currently facing a ten million dollar per year operating deficit—even though the federal government paid for 98.5% of

(20)

(21)

(22)

(23)

(24)

20. The criteria contained in the House Appropriations Subcommittee on Transportation were NOT adopted by the House of Representatives.

21. Several of the LRT systems in this table are incorrectly represented. The correct data follows:

System	Length	Daily Riders
San Diego	18.9	53,500
Portland	15.2	25,000
Sacramento	18.3	24,000
St. Louis	17.0	25,000

22. The so-called "Pickrell" Report, prepared in 1989 for the US Department of Transportation, has been widely discredited. Mr. Pickrell used ridership and cost estimates developed in the earliest planning stages of his arbitrarily selected projects. Actual costs and ridership numbers, once the various projects were opened, show that the estimates provided by the subject transit agencies to the Federal Transit Agency, and upon which finding decisions were based, were YAWI accurate. In some cases, notably Portland, St. Louis, and Washington, D.C., the light and heavy rail projects constructed were actually built for less money and attracted more riders than predicted. Mr. Pickrell also assumed that the estimating techniques used in the period between 1988 and 1981 would still be in use today, and that therefore, all current and future rail project cost and ridership estimates would be subject to errors made in the past. These techniques have been refined by the transit industry, consultants, and the federal government to the point where the estimates made during the final project planning stages for recently completed projects have proven to be much more reliable.

23. RTD did NOT seek federal funding for the Central Light Rail project (MAC).

24. St. Louis is NOT currently facing an operating deficit. The deficit crisis was eased by the state of Missouri which, for the first time in that state's history, has acknowledged that state aid for public transportation is appropriate and necessary. This support is being provided partly because of the success of St. Louis' light rail system, which has experienced ridership in the first year of operation that is one-third higher than expected. There are few, if any, public transit systems in the world, including bus systems, that are revenue-neutral. Public transportation modes, including the automobile, are all subsidized directly or indirectly by taxpayers.

the LRT system construction. Figure 12 graphically demonstrates required local taxpayer subsidy to cover the operations of LRT system. Not a single system is revenue-neutral in covering its operating cost. St. Louis is now proposing a state-wide sales tax increase to finance its desire for streetcar.

Figure 10: FINANCES OF RECENTLY CONSTRUCTED LRT SYSTEMS

City	Cost (Millions)	Federal Funding (Millions)	Operating Cost Covered by Fares
Baltimore	\$364.0	0	25.0%
Buffalo	\$535.8	\$421.4	32.5%
Los Angeles	\$877.0	0	15.6%
Pittsburgh	\$339.0	\$429.1	27.8%
Portland	\$214.0	\$176.3	47.1%
Sacramento	\$176.0	\$98.0	30.9%
San Diego	\$308.4	\$53.4	69.0%
San Jose	\$500.0	\$250.0	11.0%
St. Louis	\$351.0	\$345.6	27.7%

25

26. Figure 10 has an inaccurate entry for the total cost of the St. Louis system. As its local match, St. Louis provided right-of-way which was valued at \$125 million. The Federal Transit Administration (FTA) accepted the right-of-way as the local match, which amounted to approximately 26.3% of the project cost. Therefore, the total St. Louis project cost should be \$476 million and the federal "contribution" would be 73.9% - not 98.5%.

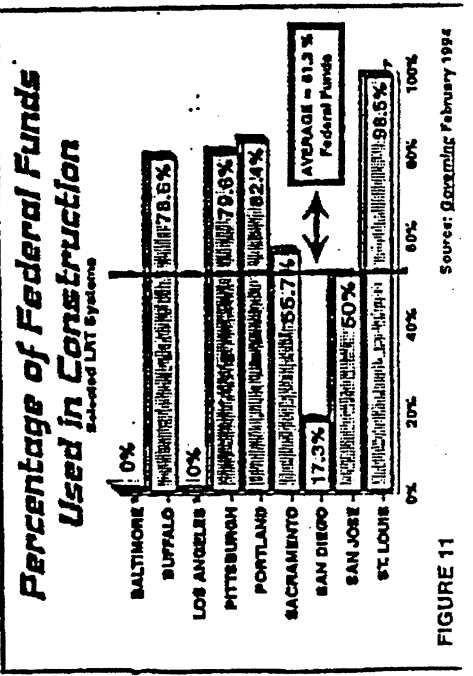


Figure 11: FEDERAL FUNDS

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26. The method used to calculate the average federal funds percentage is not valid. The authors merely added up the percentages and divided by nine. The proper way to figure the average federal share would be to first average the total projects costs then divide this into the total average federal share for all nine systems listed. Using the correct method shows that the average federal contribution is actually 44.8% of the average light rail project cost.

**LIGHT RAIL**

In Houston, local officials rejected plans for a LRT system in favor of a 105 mile system of HOV lanes. Mayor Bill Lunker said that HOV lanes "cost us less per mile than the rail by a good bit, and they move more people....not only transit passengers but also those people able to double up or triple up in cars to form carpools." Figure 12 shows the enormous subsidies required in cities that chose light rail over HOV.

Figure 12: LIGHT RAIL SUBSIDIES

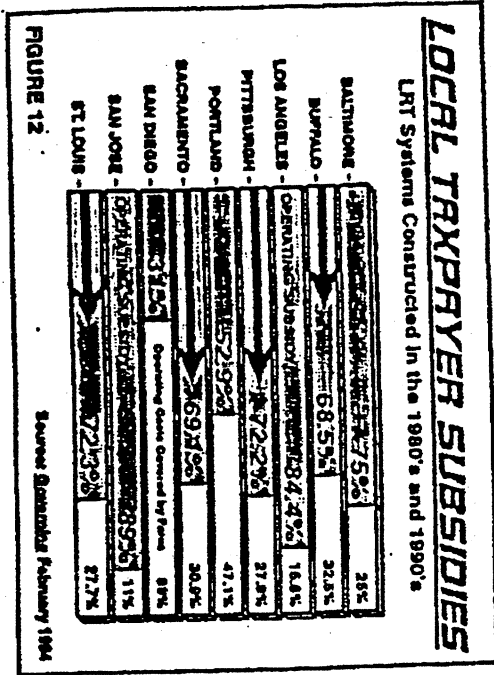


FIGURE 12

**Conclusion**

A light rail system for the Denver metropolitan area or for the Southwest Corridor has serious problems of cost, service levels, and environment. A full and accurate representation of the total costs and benefits must be disclosed before the citizens of Colorado are subjected to another political boondoggle.

All transit alternatives should be carefully evaluated. In the short term, it would seem prudent to minimize the amount of public capital put at risk by committing to a single technology and hasten to pick public policy options that maximize the options available in the future. Is LRT really the best use of \$125,000,000 in the Southwest Corridor? And is LRT the best use of \$1,500,000,000 metrowide?

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27. While subsidies are required to support the operation of light rail transit systems, smaller or greater subsidies are required to support the operation of bus transit systems.

28. The RTD's Southwest Corridor Alternatives Analysis has endeavored to present the information called for in the conclusion in an unbiased, straightforward and accurate manner.

Regional Transportation District

March 18, 1994

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