OPTIONS IGNORED, OPPORTUNITIES LOST: AN ANALYSIS OF AFFORDABLE TRANSPORTATION OPTIONS FOR AUSTIN

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EXECUTIVE SUMMARY

Capital Metro has proposed building a 52 mile light rail system, and has asked for voter approval on the November 7 ballot. Austin faces a very serious transportation problem, with the demand for automobile travel expected to increase as the population continues to increase. If roadway construction continues at the historic rate, it is projected that traffic volumes will exceed capacity by 64 percent by 2025. In 1997, (latest data) roadway demand exceeded capacity by three percent.[1] Light rail will make little or no difference with respect to traffic congestion, and will consume billions of dollars that could be used to more effectively deal with the increased travel demand.

It would be preferable for local authorities to undertake an independent (non-Capital Metro), comprehensive mobility and access study of all options for improving traffic congestion in the Austin area. This would include roadway improvements, roadway transit improvements (bus), traffic management strategies, and light rail. The mix of strategies adopted should be based upon the extent to which each alternative provides usable additional transportation capacity[2] cost effectively. The criteria for selecting transportation alternatives should be:

cost effectiveness per addition of usable transportation capacity.

This report provides a preliminary discussion of the alternatives that are available to the Austin area.

The conclusions are as follows:

- Light rail is exceedingly expensive, costing as much as leasing a new luxury car for each auto driver attracted. Light rail's impact upon traffic congestion would be slight; less than one percent of the traffic on IH-35 and MoPac would be removed by light rail.

- Densifying and centralizing, so-called "smart growth," or directed growth strategies will, if successful, worsen traffic congestion and air pollution.

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1 Texas Transportation Institute.

2 Usable transportation capacity is capacity that it is reasonable to assume will be used. For example, some proponents often suggest that light rail can carry as much as 12 times the capacity of a single freeway lane. While such volumes are never approached, because the passenger demand for light rail is so small. In fact, during peak hour, light rail systems tend to carry less volume than a single lane of freeway, and if the previous bus riders are excluded from the calculation, the volume is even less.

- Because they are open to car pools and single occupant automobiles paying a toll, Busway-High Occupancy Toll (HOT) lanes reduce traffic congestion on adjacent freeway lanes.

- High speed busways, constructed in such a manner to accept car pools, and single occupant cars paying a toll, would be 1/20th the cost of light rail per passenger mile (Busway-HOT lanes) and would carry 8.8 times the volume of light rail. High speed bus service would provide a higher level of transit service to riders, operating significantly faster.

- Surface busways could be built for much less than light rail, and provide superior transit service. Light rail capital costs in Austin will likely be 22 times as great as that of a Busway-HOT lane per person mile.

- From an economic development perspective, construction of rubber tire transit systems retain a far higher percentage of local tax dollars in the local community. Since the vast majority of equipment, materials and engineering services associated with light rail are produced outside the state of Texas, Austin taxpayers will be exporting their local taxes to other states and to foreign countries. Busways are designed and constructed primarily with local labor and materials.

- Traffic signal synchronization for buses could increase travel speeds at a comparatively low cost.

- Even general purpose freeway lanes would be less expensive than light rail, at one-eighth the cost per person mile.

- Over the 1982-1997 period, roadway capacity has not kept up with population growth. While population was rising 106 percent, lane miles of roadway increased by only 66 percent.

- Over the next 25 years, highway traffic demand is projected by CAMPO to more than double in the Austin area. At the same time, transit's share of trips is projected to stay virtually the same. Roadways would represent the overwhelming portion – 98 percent – of new demand. It thus seems inexplicable that local transportation officials would commit such a large proportion to expensive transit strategies that by their own projections would accomplish so little.

- Factors with respect to Austin's roadway system tend to exacerbate traffic congestion. For example:

    Among the 60 largest urbanized areas, only Austin does not have an east-west freeway operating completely through the metropolitan area.

    Austin has only one north-south freeway that operates through the entire metropolitan area (IH-35).

Alone among major Texas metropolitan areas, Austin does not have a belt or loop route (such as Interstate 610 in Houston or Interstate 410 and State Route 1604 in San Antonio).

It can be argued that Austin does not even *have* a freeway network, since complete interchanges do not exist between freeways, such as at IH-35 and US-183.

Austin's street arterial system is below standard, with few through major north-south arterials and virtually no through major east-west arterials.

- The lowest possible cost for the light rail line, $46 million per mile, is 15 percent above the worst case freeway lane cost of $40 million per mile.

- If Capital Metro funding dedicated to light rail were instead dedicated to building 52 miles of Busway-HOT lanes (rather than 52 miles of light rail), sufficient funds would remain with which to build general purpose freeway lanes when combined with toll revenues. Such a redirection in funding would reduce traffic congestion in 2025 by 39.4 percent compared to only 0.6 percent if spent on light rail. Under this scenario, Austin traffic would be at 99 percent of road capacity rather than at 64 percent above capacity as is projected.

From the national and international experience, these transportation solutions have been proven valuable and productive tools in a large number of cities, generally being extremely competitive when measured against other transportation options, specifically including urban rail.

However, Capital Metro and the other responsible governmental agencies in the Greater Austin area not only have the capacity of doing such studies of multiple transportation options, they have the responsibility to do so – and they have not. Before a multi-billion dollar light rail plan is approved, the reasonable alternatives must first be examined. This is simply too large, and too important, a decision to be made without objectively evaluating all alternatives.

I. TRANSPORTATION IN AUSTIN: THE SITUATION AND PROSPECTS

The most important transportation issue facing the Austin area is improving rapidly deteriorating traffic congestion. Austin's success or failure in this regard will have considerable impact upon the high quality of life for which the area is well known. If traffic congestion continues to worsen, people will spend more time in traffic congestion and less time at leisure and with their families. Moreover, with worsening traffic congestion, Austin can expect to become less competitive in the future, as companies seeking new locations and local firms seeking to expand are likely to locate outside the Austin area.

The adopted Capital Area Metropolitan Planning Organization (CAMPO) 25-year "Regional Transportation Plan" notes that Austin can no longer rely upon single occupant commuting for its future mobility. As a result, the plan calls for expanding the "person carrying capacity" of transportation corridors. A principal tactic in this strategy is construction of a 52 mile light rail system. Through 2025, approximately 40 percent of transportation tax capital funding would be spent on transit. In fact, as it will be shown below, light rail does not increase transportation corridor capacity in relation to alternative investments, such as Busway-HOT lanes and general purpose freeway lanes.

Currently, transit carries a small percentage of trips in the Austin area, at approximately 2.1 percent.[3] Inexplicably, however, the massive steering of funding to transit results in little impact. Over the next 25 years, highway traffic demand is projected by CAMPO to more than double in the Austin area. At the same time, transit's share of trips is projected to stay virtually the same, a goal that may be difficult to achieve. In the US from 1980-1990 only two major urban areas - Houston and Phoenix - experienced increases in their work trip market share.[4] All other urban areas lost market share.

In reality, then, despite CAMPO's position that the Austin area cannot continue to rely on the automobile, roadways would represent the overwhelming portion – 98 percent – of new demand. It thus seems inexplicable that local transportation officials would commit such a large proportion of resources to expensive transit strategies that by their own projections would accomplish so little.

The most fundamental transportation problem facing Austin is that highway (auto and truck) demand continues to increase as the population increases. Even the agencies promoting light rail (CAMPO and Capital Metro) recognize this reality.

Austin has grown rapidly, having consistently been one of the fastest growing metropolitan areas in the United States for the past 50 years. That growth is expected to continue, with CAMPO projecting at least a doubling of population by 2025.

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3 Calculated from CAMPO total trip data.

4 Latest data available.

This growth has resulted in continually worsening traffic congestion.

- In 1982, Austin's roadway system was sufficient to accommodate demand, operating at 78 percent of capacity.
- By 1997, Austin's roadway system was operating at three percent above capacity.[5]
- The Interstate 35 corridors have become one of the most congested in the nation.[6]

Over the 1982-1997 period, roadway capacity has not kept up with population growth. While population was rising 106 percent, lane miles of roadway increased by only 66 percent.[7]

Factors with respect to Austin's roadway system tend to exacerbate traffic congestion. For example:

- Among the 60 largest urbanized areas, only Austin does not have an east-west freeway operating completely through the metropolitan area.
- Austin has only one north-south freeway that operates through the entire metropolitan area (IH-35).
- Alone among major Texas metropolitan areas, Austin does not have a belt or loop route (such as Interstate 610 in Houston or Interstate 410 and State Route 1604 in San Antonio).
- It can be argued that Austin does not even *have* a freeway network, since complete interchanges do not exist between freeways, such as at IH-35 and US-183.[8]
- Austin's street arterial system is below standard, with few through major north-south arterials and virtually no through major east-west arterials.

Part of the reason that Austin's freeway system is so underdeveloped is that when the interstate highway system was planned in the middle 1950s, Austin was not a major metropolitan area. As a result, the interstate system in Austin was limited to the single IH-35 roadway between Dallas-Fort Worth and San Antonio.

Traffic will get significantly worse if effective counter measures are not employed. While

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5 Texas Transportation Institute Roadway Congestion Index.

6 Cambridge Systematics, Inc., *Unclogging America's Arteries: Prescriptions for Healthier Highways*, American Highway Users Alliance (Washington: 1999).

7 Freeway equivalent lane miles, calculated from Texas Transportation Institute data.

8 A complete interchange allows connection from any direction to any direction.

traffic congestion is a serious issue in the Austin area, other areas experience traffic volumes that are much worse.

- Los Angeles traffic volumes per square mile are more than double that of Austin and approximately 75 percent higher in San Jose, despite significant rail building programs.[9]

- European and Asian urban areas have traffic volumes per square mile that are 48 percent and 85 percent higher than major US metropolitan averages. This is despite the fact that European and Asian urban areas rely to a much greater degree upon transit than in the US (below).

Austin could be poised for much worse traffic congestion. If the trend of the last 15 years is applied to the next 25, it is possible that Austin's roadways could be operating at nearly 64 percent above capacity.[10] This would be considerably worse than the present situation in Los Angeles, which at 51 percent above capacity, has the most congested roads in the nation. At this traffic congestion level, it is likely that the average time lost because of traffic congestion during peak hours will increase by 150 percent, an additional one hour and 15 minutes per capita.[11] The actual additional delay per driver would be even greater.

II. Light Rail

Capital Metro has proposed to build a 52 mile light rail system, which has been placed before the voters for approval on the November 2000 general election ballot.

Traffic Congestion: No Relief: Proponents have stated or implied that light rail will reduce traffic congestion in the Austin area. Reduction of traffic congestion was a major point in Denver Regional Transportation District General Manager Cal Marsella's recent presentations in the area. But the data do not support these claims.

There is no evidence from anywhere in the nation that light rail has materially reduced traffic congestion. For example, total light rail ridership along the most busy Dallas light rail corridor has removed the equivalent of eight days of traffic *growth* from the area's freeways. This means that, because of light rail, the traffic volume reached on October 25 would have been reached instead on October 17 if light rail had not been built.

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9 Daily vehicle miles per square mile.

10 Assumes the 1982-1997 roadway construction to population increase ratio, annualized, to 2025. An attempt was made to obtain present and 2025 lane mile information from CAMPO to prepare a more reliable estimate of future traffic relative to roadway supply. CAMPO was unable to provide this information. It would seem reasonable for preparation of this type of information to have been a part of the process leading to the adoption of the CAMPO *2025 Plan* on June 12, 2000. It appears that the regional planning agency has no idea of the future traffic implications of its own plan.

11 Estimated from a regression analysis of the relationship between the Roadway Congestion Index and hours of peak hour delay per capita from 1997 Texas Transportation Institute data.

Moreover, the Greater Austin Chamber of Commerce concluded, after careful study, that light rail would not reduce traffic congestion.[12] Karen Rae, Capital Metro's General Manager, indicated that "*...nothing we do will reduce congestion*."[13] The national experience confirms that she is right.

Light rail will not even make a perceivable difference on adjacent freeways. Based upon an analysis of Austin traffic and optimistic light rail projections it is estimated that the presence of light rail will reduce traffic volumes on IH-35 and MoPac by only 0.8 percent by 2025 (Figure 1). At the same time, traffic volumes are expected to increase more than 60 percent (Figure 2).[14]

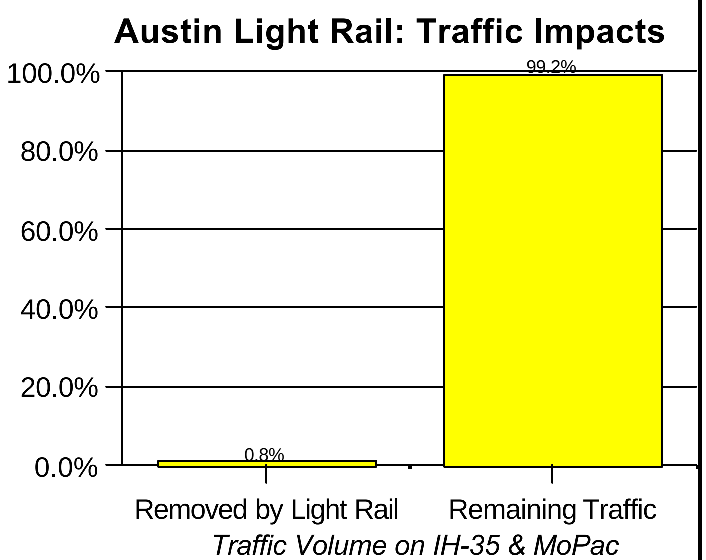

Figure 1
Source: Estimated from CAMPO & Capital Metro projections.

12 Greater Austin Chamber of Commerce, *Light Rail Blue Ribbon Task Force Report*, August 2000. The Chamber noted, however, light rail might reduce traffic congestion in the future. As is outlined below, no local planning projections or assumptions are consistent with this view. Even by 2025, light rail will, according to local projections, have no perceivable impact on traffic congestion, with overall traffic volumes projected to increase by more than 100 percent in the area.

13 *Austin American-Statesman*, August 16, 2000.

14 Assumes average national light rail trip length of 4.1 miles (1998 National Transit Database).

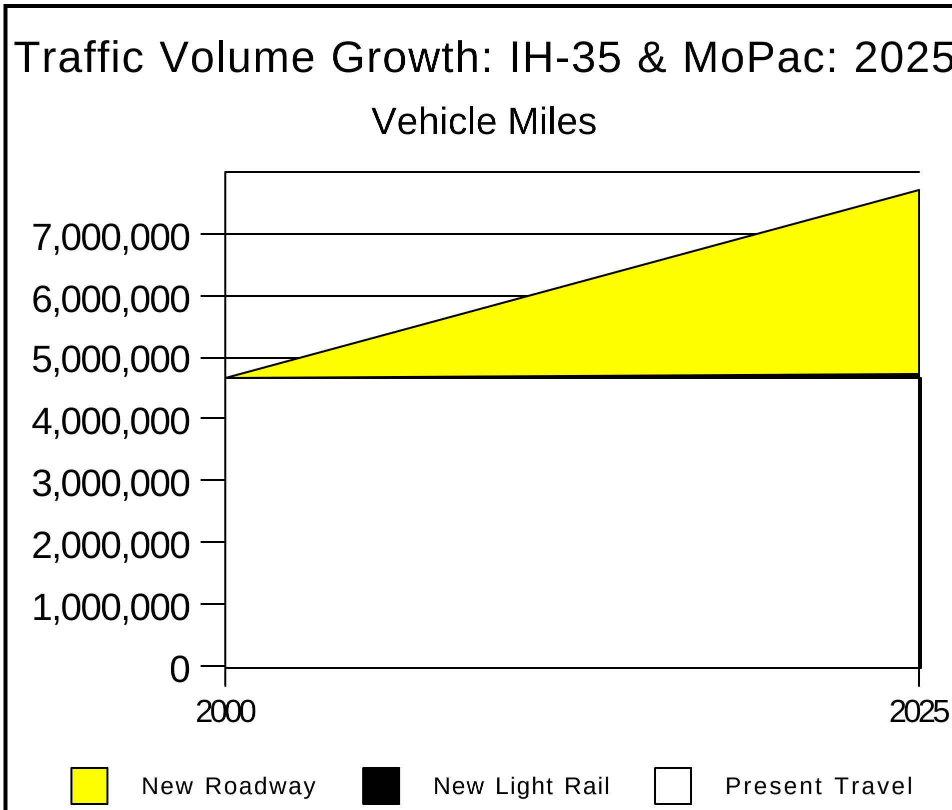

Figure 2
Source: Estimated from CAMPO & Capital Metro projections.
Chart Size Increased to Make Light Rail More Visible

Denver Case Study: Recently, Denver's transit general manager, Cal Marsella, participated in various Austin events in support of the Capital Metro light rail proposal. Mr. Marsella noted that ridership on Denver's new Southwest light rail line is above projections and that the project had been completed within budget. In this regard, Denver's new light rail line represents one of the most successful such ventures in the nation. But the Denver data itself betrays serious flaws in the Austin light rail planning process.

- Capital Metro projects daily ridership of 43,200 in its opening year (2007). In substantial contrast, Denver's Southwest line was projected to carry approximately 8,000 riders in the opening year, and is carrying 11,000. Thus, Capital Metro's projection is nearly four times that of Denver's Southwest line. There is reason to believe that Austin's line would carry fewer riders than Denver's (Figure 3).

- Denver is a considerably larger urban area, with a much larger downtown area.

- The Denver Southwest line is largely grade separated (separated from cross streets by bridges and underpasses, and virtually no "on-street" operation), which makes it possible to operate at nearly 30 miles per hour. In contrast, Austin's line will operate from 12 to 20 miles per hour. This slower operation will make the line less attractive to automobile commuters, who would generally find their work trips lengthened by using light rail.

- Denver's Southwest light rail line, which was built to a great extent on an existing grade separated rail right-of-way, had a capital cost of approximately $170 million. In contrast, just two elevated segments considered by the Capital Metro board of directors at its September 25 meeting would add a similar amount to the project.

- Denver has been less successful in controlling the cost of its newer IH-25 line, which has escalated in cost by more than 50 percent over the past year.[15]

Like Austin, Denver's aggressive rail plans will yield little new transportation benefit. The Denver metropolitan planning organization projects that public transit's market share will be improved only from 1.6 percent to 2.4 percent by rail systems through 2025.

Thus, comparison with Denver calls into serious question Capital Metro's ridership projection. Comparison with Denver also supports the concern that substantial cost escalation could yet occur.

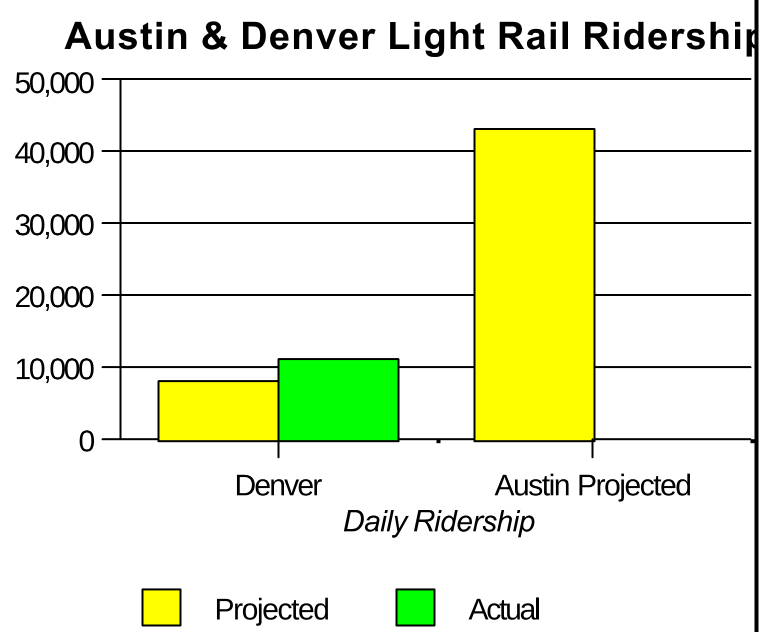

Figure 3
Source: Denver RTD & Capital Metro

The High Costs of Light Rail: Capital Metro indicates that the cost per new rider would

[15] Calculated from Federal "New Starts" Report, 2000 and 1999.

be $11.70 each way. This equates to $5,265 annually for a new commuter,[16] which is more than sufficient to lease a Ford Taurus.[17]

Based upon Capital Metro ridership estimates of new riders attracted to transit, the estimated cost per automobile driver attracted to light rail would be $18.90 per one-way trip.[18] This is equal to more than $8,600 annually per new former automobile commuter. This is more than the annual cost to lease each new commuter a Lexus 400LS sedan, which has a retail price of $54,000 (Figure 4).[19]

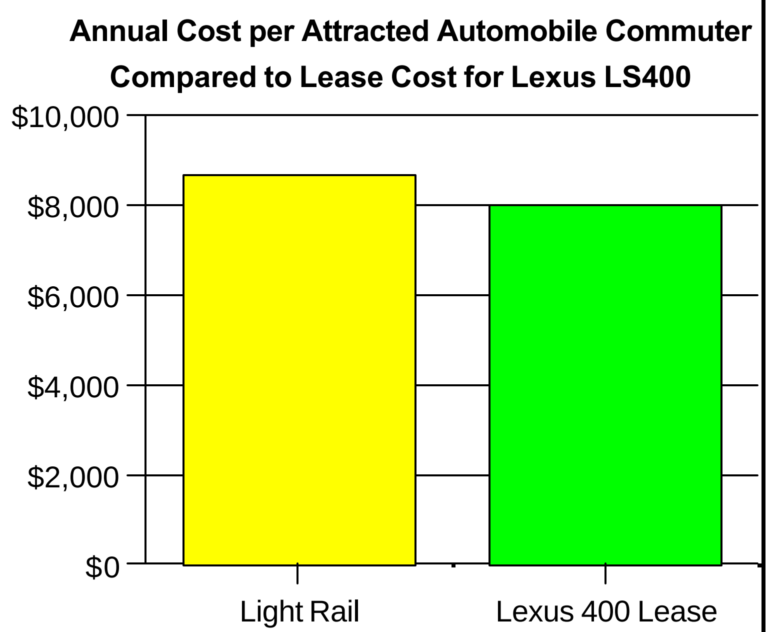

Figure 4
Source: Estimated from Capital Metro data and lease rates quoted on the Internet.

16 Assumes 225 days of commuting annually, twice per day (this figure accounts for vacation, holiday, sick and personal time off, but *not* for bus-to-rail and rail-to-bus transfers).

17 This is not to suggest leasing cars as a strategy for improving transportation. It is simply to put in context the extravagance of expenditure necessary to attract a new rider to light rail.

18 Capital Metro estimates the cost per new trip at $11.70 in its federal "New Starts" report. The $18.90 figure is derived using the national average automobile drivers attracted to light rail, based upon comprehensive ridership surveys conducted by transit agencies (28 percent of light rail riders are former automobile commuters). An alternative calculation using the Capital Metro assumption that 46 percent of light rail riders will be new riders, the regional 1.4 automobile vehicle occupancy ratio and a factor for induced trips yields a figure of $19.90. Typically, nearly 15 percent of light rail ridership is "induced," meaning that the new trip would not have been taken if light rail were not available.

19 Quotation from www.lineback.com, October 5, 2000.

The cost per person mile[20] for each passenger attracted to light rail would be $2.86,[21] nine times the $0.32 allowed by the Internal Revenue Service (IRS) as an expense for the full cost of automobile operation in a business.[22] The cost per person mile for each automobile driver attracted to light rail would be $4.71, 15 times the IRS allowed deduction (Figure 5).

Finally, while there are *no* Federal grant funding programs that can be utilized to cover light rail construction costs than cannot also be utilized for "rubber tire" transit options. There *are*, however, Federal funds that can be utilized for bus that *cannot* be utilized for rail (Appendix A).

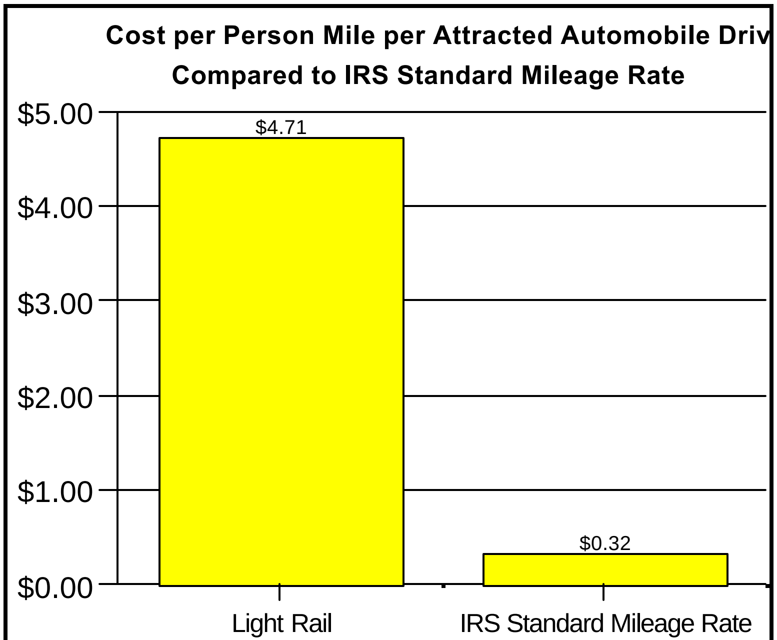

Figure 5
Source: Estimated from Capital Metro data and IRS.

Further, the cost per new annual commuter is approximately 60 percent higher than the annual cost of educating a student in Texas elementary and secondary schools (Figure 6).[23]

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20 A single mile traveled by a single passenger.

21 Based upon application of the national average light rail trip length of 4.09 miles (1998 National Transit Database) to Capital Metro projections.

22 Includes purchase price (depreciation), maintenance, fuel and insurance.

23 *Snapshot '99*, Texas Education Agency, www.tea.state.tx.us.

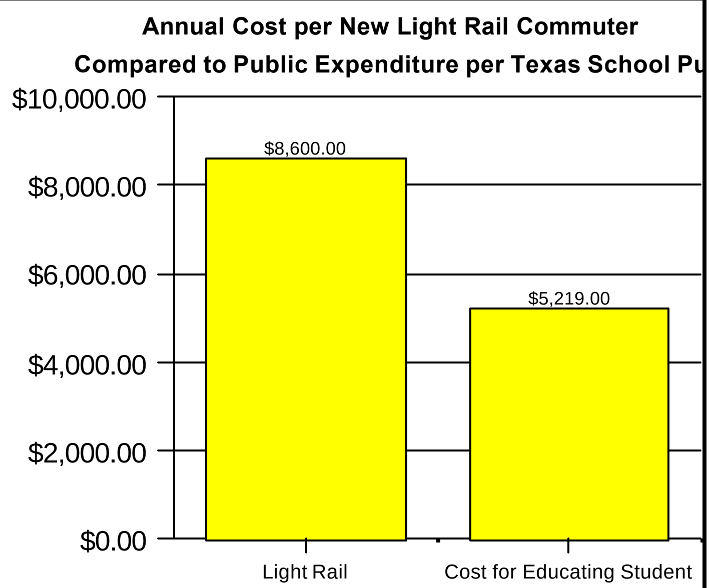

Figure 6
Source: Estimated from Capital Metro data and *Snapshot '99*, Texas Education Agency, www.tea.state.tx.us.

Finally, the cost per new automobile driver attracted to light rail would be greater than the average income of the lowest quintile (20 percent) of US households (Figure 7).[24]

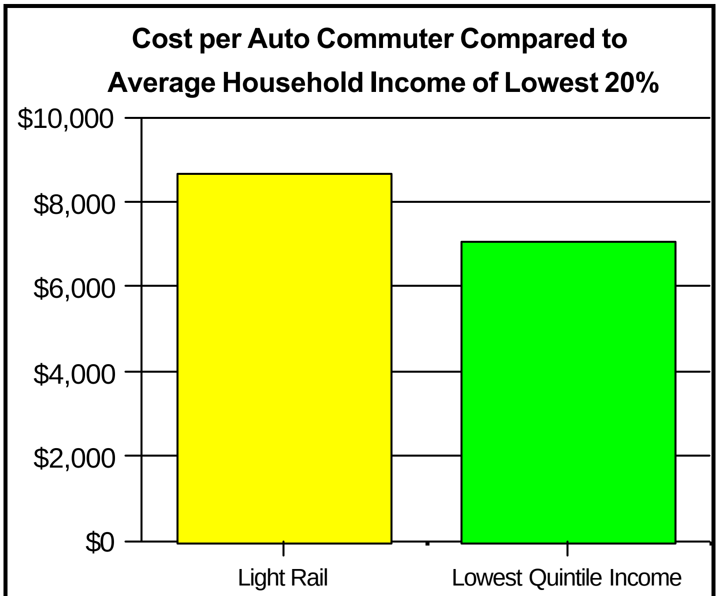

Figure 7
Source: Estimated from Capital Metro data and US Department of Labor Consumer Expenditure data.

24 In 1998, the average earned income for the lowest quintile of households (consumer units) was $7,049, approximately 20 percent below the cost of attracting each annual automobile commuter).

III. SMART GROWTH

Directed growth, or “smart growth” has been proposed as a strategy, in concert with light rail, for reducing traffic congestion and air pollution. Advocates of “smart growth” suggest that by making settlement more dense and by restricting the physical expansion of the urban area (by limiting utility service areas or imposing urban growth boundaries), the demand for automobile travel will decline. Transit oriented development, along transit lines, would be mandated or strongly encouraged. It is anticipated that many more trips will be taken by transit, bicycling and walking. In Austin, the aggressive light rail ridership projections depend, to some degree, on reorienting and densifying population and employment growth along the light rail corridor, in the hope of reducing automobile demand. While the Greater Austin Chamber of Commerce notes the potential for smart growth combined with light rail to reduce traffic congestion in the long term future, no supporting projections are provided. Capital Metro’s long term projections indicate just the opposite – that traffic congestion will be much worse and that light rail will make no difference.

Smart growth will only make things worse. Smart growth can be expected to worsen both traffic congestion and air pollution, based upon the experience with higher density and transit oriented development elsewhere. It is logical to assume that the addition of more inhabitants with more autos (and more transit buses) into a given area will result in more congestion.

For example, European urban areas tend to have population densities more than four times that of US urban areas. Canadian urban areas are more than two times more dense while Asian urban areas are 14 times as dense (Figure 8).[25]

[25] This section is based upon an international analysis of transport and environmental trends in 46 international cities. Internet: www.demographia.com/dbx-intlair.htm. Data calculated from Jeffrey R. Kenworthy and Felix B. Laube, An International Sourcebook of Automobile Dependence in Cities: 1960-1990 (Boulder, CO: University Press of Colorado), 1999.

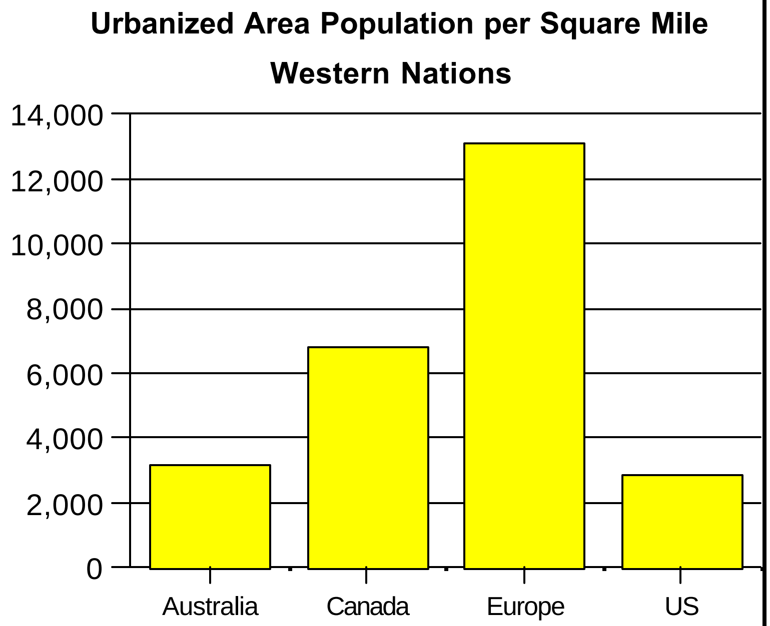

Figure 8
Source: Footnote 25

At the same time, European urban areas have much more transit oriented development. As a result, public transit carries a much higher percentage of urban travel in these more dense areas. In the United States, public transit accounts for less than two percent of urban travel. In Europe, transit's market share is more than 20 percent, while nearly eight percent ride transit in Canada. Asian transit market shares are much higher, at nearly 40 percent (Figure 9).

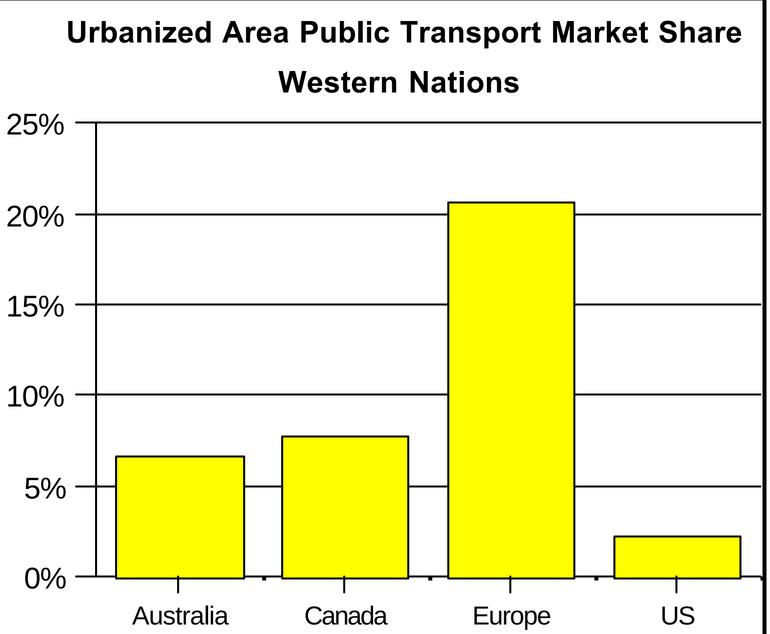

Figure 9
Source: Footnote 25

To achieve these much higher transit market shares, much higher levels of transit service are provided. European urban areas provide 16 times as much transit service per square mile,[26] while Canadian urban areas provide five times as much transit service per square mile as in the United States (Figure 10). By comparison Asian urban areas provide nearly 70 times as much service.[27] These much higher service levels mean that much more of the urban area is accessible by automobile competitive transit. This is possible, because these urban areas are smaller (more dense) and generally have larger percentages of employment in the central area.

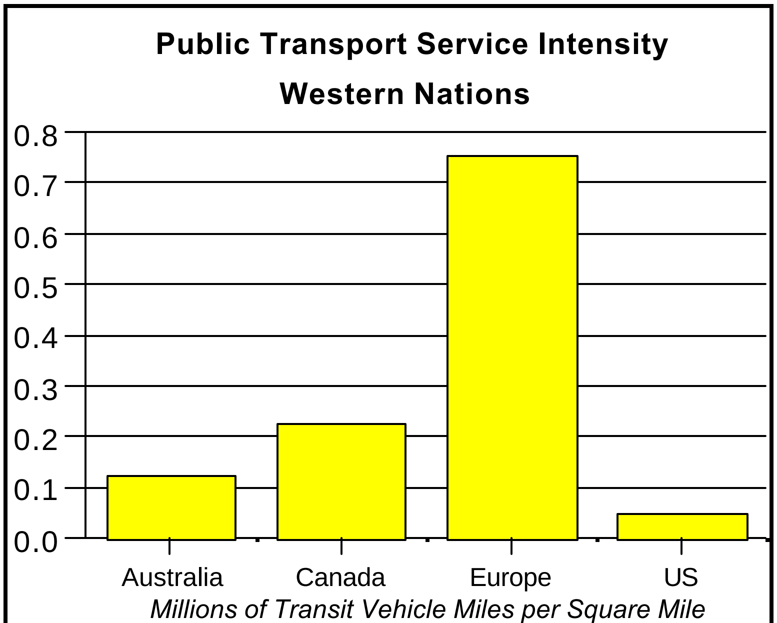

Figure 10
Source: Footnote 25

But much higher transit service levels do not result in lower levels of traffic congestion. As any tourist to Europe or Asia can attest, traffic congestion is much worse in their large urban areas than in the United States. Traffic volumes per square mile in Europe are approximately 50 percent higher, while Canadian volumes are nearly 20 percent higher. Traffic volumes are more than 80 percent higher in the much more dense Asian urban areas (Figure 11).

26 This is an overly conservative estimate, because much of the European service is on higher capacity rail systems.

27 The Asian data is not shown on figures because it would make it more difficult to perceive the differences between the United States, Australia and Canada.

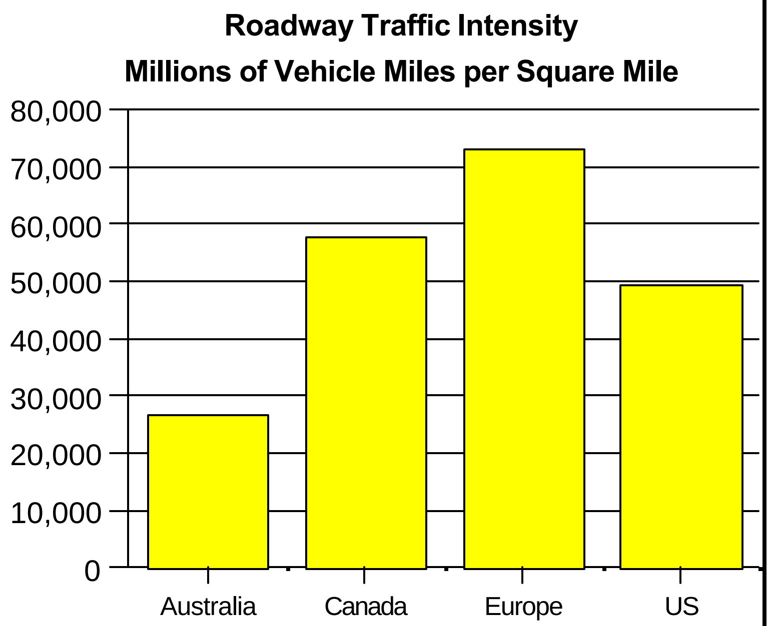

Figure 11
Source: Footnote 25

As a result, traffic speeds are slower where densities are higher. In the United States, average roadway speeds in urban areas are nearly 32 miles per hour. European speeds are under 20 miles per hour, while Canadian speeds are less than 25 miles per hour. The highly dense Asian urban areas have speeds less than 16 miles per hour (Figure 12). As a result, the hours of motor vehicle operation per square mile are much greater in Europe, Canada and Australia. Given the fact that air pollution rises as urban automobile speeds decline and as "stop and start" operation increases, this adds to air pollution (Figure 13).

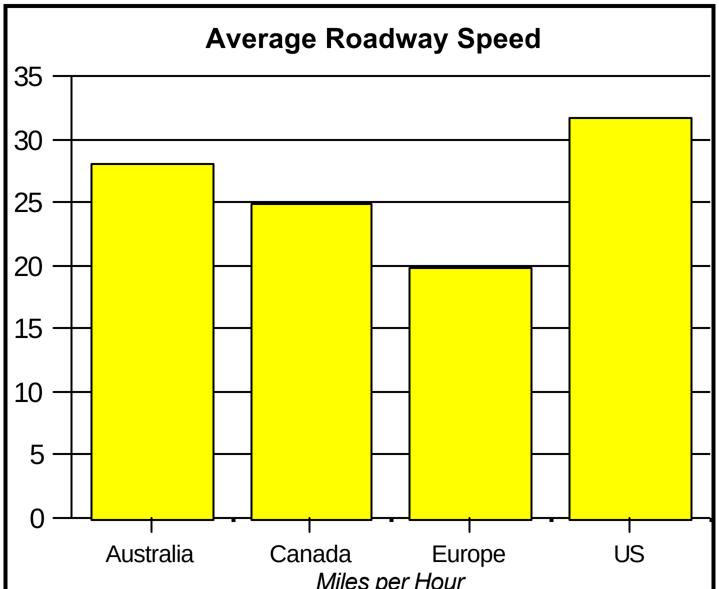

Figure 12
Source: Footnote 25

And the data shows just that. American urban areas have considerably lower air pollution levels than European and Canadian urban areas. Asian urban areas are by far the most polluted (Figure 14).

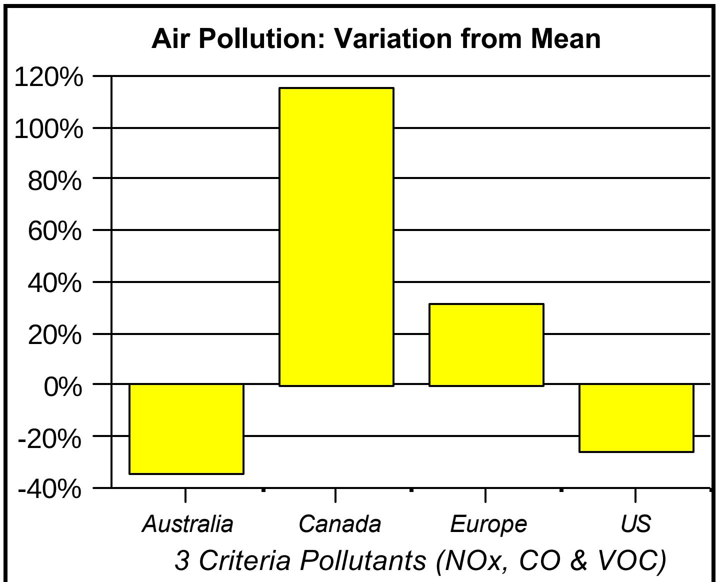

Figure 13

At the same time, the lower density differences in the United States produce similar contrasts. Generally, as population density rises, so do traffic volumes per square mile.

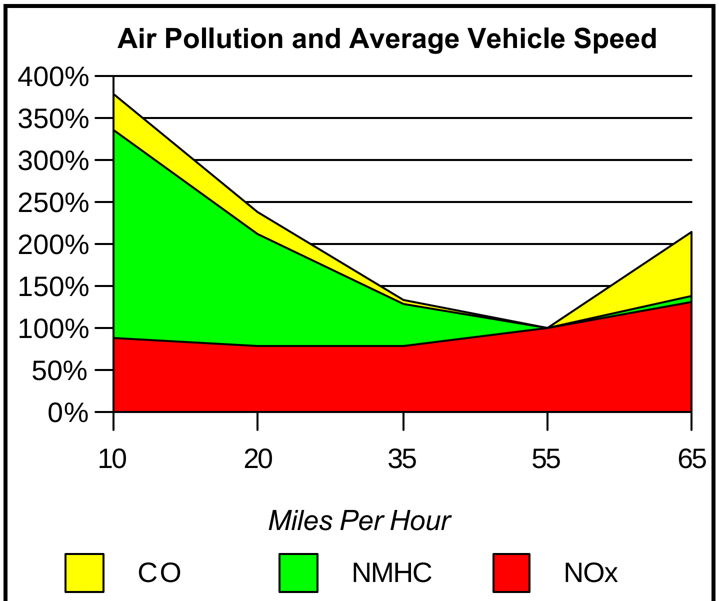

Figure 14

Calculated from EPA data. Index based upon pollution at 55 miles per hour equaling 100.

The nation's most dense urban areas, such as Los Angeles, San Jose and Honolulu have traffic volumes per square mile that are nearly double that of the average urban area

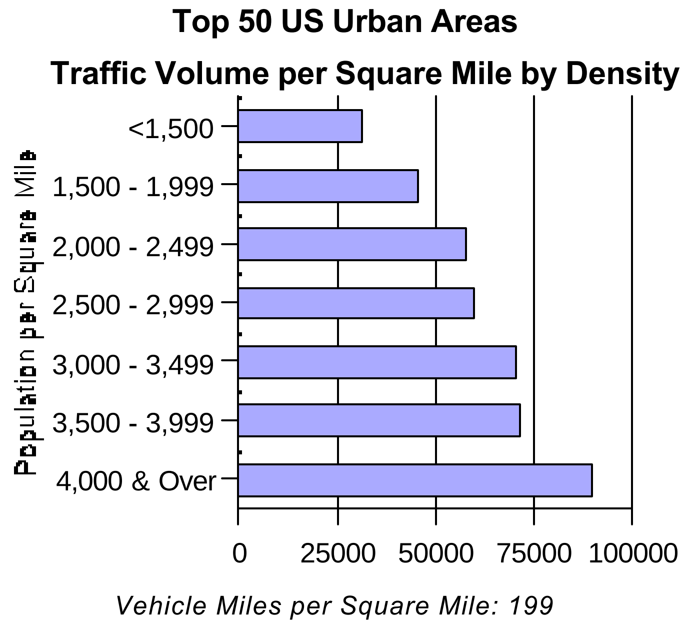

Figure 15

(Figure 15).

All of these comparisons make the clear case that more intense traffic congestion and air pollution is associated with higher densities.

It is also important to understand that the higher public transit market shares of Europe, Canada and Asia are either stagnant or falling, as people in those areas become more affluent. European cities have suburbanized at a significant rate, with central city population declines being the rule rather than the exception. In Stockholm, London, Paris, Hamburg, Copenhagen and most other European cities, all growth has been suburban growth. This has occurred independent of highway construction, since European cities tend to have much less well developed freeway systems. In Australia, there are few urban freeways, yet Australian urban areas have expanded at virtually the same population density as American urban areas.

Major efforts in a number of cities have failed to attract people from automobiles to public transit. At best, where large investments have been made, such as in Zurich, transit has made a one or two percent market share gain. This is not because people do not like transit or love automobiles. It is because modern urban areas develop in a dispersed and decentralized pattern, and it is impossible to design transit systems that can effectively meet such dispersed demand. For example, very effective transit service is provided from the suburbs of Paris, where 80 percent of the population lives, into the city. But traveling around the suburbs of Paris by transit can be as inconvenient as in US suburbs. Auto competitive service is simply not available for most trips.

The problem with "smart growth" is that it forces more cars and more traffic into smaller areas. It does not take great intellect to understand that more of something in a constrained space increases crowding. For example, population densities in the Ballston, Virginia (Washington, DC area) rail station area are now five times that of surrounding neighborhoods. Traffic volumes are four times as high. It is true that the average amount of auto travel per person has declined, but the decline has been small, and the overall impact on the community has been to significantly increase traffic congestion, and by extension, air pollution.

Because "smart growth" or directed growth increases population densities while failing to produce a compensating reduction in auto use, it makes traffic congestion and air pollution worse.

Local Economic Impact of Light Rail Construction Expenditures: One common justification for the construction of light rail is that it will create benefits in the form of increased local economic and job growth. However, an examination of such claims show that they have little justification and, in fact, the construction of streets and roads and the operations of "rubber tire" transit systems both generate more activity.

Light rail proponents generally claim that rail construction generates Federal grant funding. While this is generally true, the funding percentage is now commonly 50 percent at the beginning, with the true funding percentage generally far lower at the end of the project, after the local agency absorbs 100 percent of the almost inevitable project cost overruns. Of course, many highway projects can also generate Federal and other external funding, sometimes at rates higher than 50 percent. Bus capital projects are commonly Federally funded at up to 75 percent or 80 percent of the total cost (very large bus projects, such as busway construction, may be funded at lower percentages, but certainly not lower than those of light rail projects).

In understanding the impact of spending on governmental transportation projects, it is important to understand the economic concept of "transfer payments." In essence, the source of the spending is your taxes, some local, some state, some Federal, depending upon the exact funding program. While virtually all spending will generate some positive local economic impact, to determine if the project will have a positive impact, it must first be determined if spending on the governmental project will have a greater economic impact than leaving the funds in the hands of the taxpayers, where they would be spent for each taxpayers' own purposes. In other words, do you believe that you, or your government, is better at spending your dollars for your economic benefit?

Regarding *local* economic impact, rail design and construction projects are rarely effective in generating positive activity. One of the main reasons is that a large portion of the services and materials for rail projects are spent outside of the local area, meaning that most local tax funds from light rail projects are exported and create jobs outside the Austin area. Commonly, very little of the outside services for planning and design is performed by local firms, particularly in areas, such as Austin, that are not among the largest urban areas. These and other "soft" costs (such as project management) ranged from 21.4 percent to 40.4 percent of eight U.S. light rail projects of the 1990s.[28]

Of course, most of the materials and components that go into light rail projects are commonly manufactured or supplied by entities outside of the local economy, including, but not limited to, light rail cars, rails, special trackwork, power supply systems, maintenance and service equipment, train control systems, ticket vending machines, signaling, and communications systems.

After these big-ticket items are accounted for, what is generally left is the actual construction contracts. (Note: While these contracts often appear to account for the majority of the total project cost, they generally include the provision of large quantities of expensive materials.) In cities the size of Austin, some share of these contracts may, or may not, go to local firms – but there are simply not very many firms in Austin that have experience in building light rail lines. The percentage of payroll going to Austin residents may not be very large, especially for many of the more specialized, more highly paid, specialties.

In fact, the construction of light rail is far less productive in generating jobs than the operation of bus service. In Los Angeles, for example, a dollar of expenditure for governmental bus operations generated approximately 6.4 times the number of jobs as a dollar spent on rail construction.[29] Since almost all bus operating jobs are held by employees who live in the area they serve, these jobs stay local, and the economic power of the spending of their paychecks does also.

Therefore, when all factors are taken into account, the construction of light rail is generally a net negative economic event for most cities.

IV. ROADWAY RAPID TRANSIT

Carrying Capacities: Managed freeway lanes (busway-high occupancy toll lanes (HOT lanes)) can accommodate even higher volumes of passengers than light rail. A Busway-HOT lane combines buses, car pools and cars not meeting the car pool requirement, which are charged electronic tolls.

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28 Schimpleler – Gannett Fleming – A Joint Venture, *2025 System Plan Development – VIA Metropolitan Transit – Financial Assessment Report*, March 29, 2000, Figure 11, "Comparison of Costs of Light Rail Transit Systems to the Estimated Costs of Light Rail in the VIA 2025 Systems Plan," page 43.

29 Calculations for Los Angeles County Metropolitan Transportation Authority, based on MTA data, from Thomas A. Rubin and James E. Moore II, *Ten Transit Myths: Misperceptions About Rail Transit in Los Angeles and the Nation*, Reason Foundation Policy Study No. 218, November 1996, page 13.

Since bus operations generated approximately 40 percent of the cost of operations through passenger fares, advertising, and other operating revenues, bus operations was well over ten times as productive in creating jobs per dollar of *public* expenditure.

During peak hours, it is estimated that a Busway-HOT lane open to three or more person car pools would accommodate the following average passenger volumes during peak hours:

- 35 buses, each carrying an average passenger load of 25
- 750 high occupancy vehicles (minimum of three passengers per vehicle), each with an average of three passengers
- 750 vehicles paying tolls, each with an average of 1.25 passengers [30]

In total, this hypothetical lane would carry 4,138 passengers at an average speed of 55 mph (Table 1).

A Busway-HOT lane would produce far more transportation benefit to the Austin area than the proposed light rail transit system. A Busway-HOT lane would carry 8.8 times the volume of light rail.

Table 1
Comparison of Light Rail, Roadway Rapid Transit and Freeway Improvements

	Light Rail	Roadway Rapid Transit			
		Buses	High Occupancy Vehicle (HOV) Lane	Toll (HOT) Lane	Total: Roadway Rapid Transit
Vehicles/Hour	18	35	750	750	1,535
Additional Capacity (Autos Removed)	< 750	<750	750*	750	2,250
Average Passenger Load	72	25.00	3.10	1.25	2.70
Hourly Passenger Volume	1296	875	2,325	938	4,138
Average Travel Speed	20	55	55	55	55
Passenger Mile Equivalents	25,920	48,125	127,875	51,563	227,563
Freeway Lane Equivalents	0.45	0.84	2.22	0.90	3.96
Light Rail Person Mile Equivalents	1	1.86	4.93	1.99	8.78

30 As is explained in Texas Public Policy Foundation's *Trolley Folly: A Critical Analysis of the Austin Light Rail Proposal: Appendix A*, these are intended as representative values for carrying capacity, not precise projections for a specific lane in Austin. The actual value could be significantly higher or lower. For example, if the lane was opened to HOV-2 travel, then the carrying capacity of each HOV vehicle would drop, but the number of HOV vehicles might increase. If the number of buses, and/or their carrying capacity, were to increase, then the total carrying capacity could significantly increase. For example, on the El Monte Busway/HOV lane serving downtown Los Angeles along the San Bernardino (I-10) Freeway, there are currently 75 buses per hour, over double what is assumed for Austin. In other cities, such busways carry hundreds of buses per hour, but it is highly unlikely that there is a level of transit demand in Austin to justify this level of service.

Table 1 Comparison of Light Rail, Roadway Rapid Transit and Freeway Improvements
Light Rail 6 trains with 3 cars per peak hour. High Occupancy Vehicle Lane requires three persons per car. * To the extent that HOV encourages higher levels of carpooling, the number of vehicles removed could be greater.

Capital Costs: According to Capital Metro, the capital cost of the currently proposed light rail will run from approximately $920 million to $1,200 million for the first twenty miles, or approximately $46 million to $60 million per (bi-directional) mile of route. For the full 52-mile system Cap Metro projects a cost of $1.9 billion to $2.2 billion, or approximately $37 million to $42 million per route mile.[31]

Busway-HOT lanes are generally more costly than general purpose freeway lanes. At a minimum, this can be limited to little more than special lane markings and signage. At the other extreme, there may be special entry and exit ramps, bus transfer stations, park-and-ride lots and toll facilities. It is assumed that the added cost of Busway improvements will range from $2 to $4 million per mile. This yields a maximum average cost per mile of $18 million for a Busway-HOT lane (the costs for a general purpose freeway lane are outlined below). This is approximately 30 percent of the cost per mile of light rail. Thus, the highest possible cost for a Busway-HOT ($44 million per mile) is approximately the same as the lowest possible cost for light rail ($46 million).[32]

However, the Busway-HOT lane carries more than eight times the travel volume as light rail. The higher volumes make the cost advantage of the Busway-HOT lane even greater. It is estimated that light rail capital costs are more than 22 times as great as that of a Busway-HOT lane per person mile (Table 2).

Table 2
Comparison of Light Rail, Roadway Rapid Transit and Freeway Improvement
Capital Costs per Person Mile

	Light Rail	Roadway Rapid Transit
Capital Cost per Bi-directional Mile (Millions)	$46	$18
Light Rail Person Mile Equivalents	1.00	8.78

[31] All of these projected costs are significantly below the average of other light rail systems proposed for Federal funding, which is approximately $70 million per mile. U.S. Department of Transportation, *Annual Report on New Starts – Proposed Allocation of Funds for Fiscal year 2001 – Report of the Secretary of Transportation to the United States Congress Pursuant to 49 U.S.C. 5309(o)(1)*, March 6, 2000.

[32] In this comparison, if operating costs and revenues were considered, light rail would fare poorly. Freeway express bus services generally have some of the highest farebox recovery ratios of all transit modes.

Table 2
Comparison of Light Rail, Roadway Rapid Transit and Freeway Improvement
Capital Costs per Person Mile

Capital Cost per Light Rail Person Mile Equivalent	$46	$2

Finally, a Busway-HOT system would provide additional important advantages:

- Average speeds would be higher than light rail, making the system more attractive to downtown automobile commuters. Because of their higher operating speeds, busways are considered rapid transit, unlike street-running light rail. Moreover, many other travelers to locations other than downtown would benefit from the higher speeds of the Busway-HOT lanes, whether in car pools, single occupant automobiles paying tolls or such new non-downtown bus services as may be established.

- Busway-HOT systems provide better utilization of right-of-way space, carrying many more people than is practically possible by light rail.

- Because they are open to car pools and single occupant automobiles paying a toll, Busway-HOT lanes reduce traffic congestion on adjacent freeway lanes. The HOT lane on Route 91 in southern California reduced traffic congestion enough to reduce the period of daily traffic congestion by one hour.[33]

V. NON-FREEWAY BUS SERVICE IMPROVEMENTS

Other bus strategies can also be used to improve transit service cost effectively.

Bus Malls: Bus transit malls have been successful in the United States. One of the best examples in the U.S. is in Portland. It operates on a pair of bus-only streets, with semi-enclosed bus stops with electronic displays showing the arrival times for the next bus on each route. While the Portland light rail system has gained considerable national publicity, few members of the public, and even relatively few transit professionals, recognize that the bus transit mall carries far more passengers to and from downtown Portland. Indeed, in 1994, eight years after the East Side (Banfield) light rail line opened, light rail accounted for approximately 10,000 daily downtown boardings and alightings, compared to 66,000 on the bus mall.[34]

A bus mall could be operated in Austin by allowing Capital Metro buses sole use of

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33 “Express Lanes Hit Break Even,” *Public Works Financing,* Vol. 120 (July/August 1998).

34 Young Park, Tri-County Metropolitan Transportation District of Oregon Rail Corridor Planner, “Portland Transit Mall Findings Report” (Final Draft Report), American Public Transportation Association Rapid Rail Conference, page 35.

designated lanes on selected streets. This can be difficult, given the impacts of such designations on parking, delivery, and drop-offs. However, at least the same level of inconvenience would be created by the light rail system. It appears that there is no reason why bus transit malls could not receive similar consideration.

There is the potential to establish a busway network, with lanes on IH-35 and MoPac and connecting East-West surface busways. This would provide for high-speed, single vehicle transit trips to the downtown area for a large number of existing and potential Capital Metro bus passengers. It would also provide for very productive, cost-effective routing and scheduling of buses. This type of busway operation would be faster than light rail.

As in the case of Portland, a bus mall in Austin would provide higher transit capacity than light rail. Based upon bus operating characteristics, it is estimated that buses could provide four or more times as much capacity as light rail.[35] This theoretical figure is confirmed by the experience of the Ottawa (Canada) downtown busway, which carries 9,500 people per hour in the peak direction.[36]

Further, a bus mall has far more growth capacity than a light rail transit mall. Given the length of the North-South blocks in the Austin central business district (CBD), approximately 270 feet, three car trains are the longest that can be operated.[37] Based on the experience in other street-running light rail cities, it does not appear that service

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[35] It is assumed that all trains and buses will have a peak load equal to a common maximum scheduled load for each vehicle type. For light rail, passenger loads equal to 200 percent of seated load are assumed (72), or 144 per light rail car. With 18 cars per hour per direction, this equals 2,592 boardings per hour. (This level of ridership is almost certainly significantly overstated, but, since a common peak load factor is being used for both light rail and bus, the relative degree of overload should be roughly equal).

It is assumed that each bus will be the standard 40-foot, 102" wide vehicle, with 40 seats (Capital Metro operates a mixed fleet, with 40-foot buses ranging from 38 to 49 seats - (American Public Transportation Association, 1999 Transit Vehicle Data Book, page 50). 40 is less than the simple average. A 150 percent load factor is assumed, or 60 passengers per bus. Therefore, to carry the same 2,592 boardings, 44 buses would be required.

This amounts to one bus every 82 seconds in the peak direction, or 1 minute and 22 seconds. This is actually a low level of service for a busway. For a properly designed busway, three, to four buses per minute can be easily accommodated and higher volumes are not impossible, if needed. However, it is extremely doubtful if Austin will require 240 buses per hour at any time in the foreseeable future.

[36] John Kain, Ross Gittell, Amrita Daniere, Sanjay Daniel, Tsur Somerville and Liu Zhi, *Increasing the Productivity of the Nation's Urban Transportation Infrastructure* (Washington, DC: Federal Transit Administration, 1992).

[37] Author's measurement, measured from the "inside line" for pedestrian walkways. Note that this is a slight overmeasurement for certain blocks, which makes it somewhat questionable if "standard" sized light rail vehicles, which are nominally 90 feet, can be operated in three car trains. If shorter cars, such as 80 feet, are the longest that will "fit," the train carrying capacity would be significantly lowered. For example, the 80 foot vehicles utilized by Denver Regional Transit District on its light rail line (Siemens) have 64 seats, vice the 72 assumed above.

frequencies of greater than five minutes could be operated (twelve trains per hour in peak direction). The bus mall capacity could easily be double, even triple, the light rail transit mall capacity (see methodology in footnote 35).

With the planned six trains per hour, there will be ten minutes between trains in each direction, and longer during non-peak hours. This under-utilization of road space could become a political issue, as drivers in congested conditions note the comparatively empty light rail lanes. On the other hand, a bus mall serving the same transit could accommodate seven to eight times as many vehicles (buses) over the same period.

Bus transit malls, properly designed and implemented, can produce significant advantages for both bus passengers, automotive travelers, pedestrians, and businesses. By separating buses, with their frequent stops, from automotive traffic, the speed of travel can be increased for both. Moreover, bus based strategies can reduce travel time for transit commuters, because service would be more frequent than on light rail (waiting time would be reduced).

Bus transit malls have a significant capital cost advantage over light rail transit malls. Both require certain changes to the auto traffic patterns, signage, signaling, etc. Both also require stations or stops, although those for bus can be far simpler than those for light rail, depending upon the specifics of the operating plans (paid boarding areas and high-platform boardings would significantly increase such costs). There are many expensive requirements for light rail that are not required for bus malls, such as the rails, special trackwork, and power supply system, as well as ticket vending machines. It is not unlikely that a difference in cost over $100 million in the downtown section alone might occur.

VI. Bus and Rail Costs Compared

Light rail proponents may claim that light rail has lower operating costs. However, this is a questionable claim. Light rail, nationally, had an average operating cost per passenger of $1.83 in 1998.[38] Motor bus reported $2.05 for the same year.[39] Light rail can appear to be cost effective, because a single driver can operate a train carrying 200 to 400 passengers while a bus driver can rarely exceed 70 to 80 (on standard sized buses). But there is much more to costs than driver wages and benefits. System and right-of-way maintenance is much more costly for rail systems. Further, the capital costs of light rail are two to three times the operating costs, significantly greater than that of buses. Bus capital costs are generally no more than 20 percent of operating costs.[40]

Finally, high ridership bus routes generally have lower operating costs than light rail lines.

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38 American Public Transportation Association, *Transit Fact Book 2000*, Table 90, "Light Rail National Total Data Fiscal year 1998," page 140.

39 American Public Transportation Association, Table 79, Bus National Total Data, Fiscal year 1998, page 130.

40 Internet: http://www.publicpurpose.com/ut-railcapop.htm.

Light rail lines are generally constructed only in the most heavily utilized bus corridors, which have much lower than average costs per passenger (because of their higher ridership). Overall, on the basis of comparable service on comparable routes (the only valid comparison), bus generally has *lower* operating costs than light rail and virtually always have far lower total costs (capital and operating costs).

VII. Signal Pre-emption and Limited Stop Service

However, many of the advantages of higher-capacity, higher-speed bus service can be gained without bus transit malls. Through two very simple, low cost techniques – traffic signal preference and limited stop service – bus operating speeds can be increased by up to 25 percent. Not only does this make bus far more competitive with automotive travel, it actually significantly reduces operating and capital costs – since the buses are traveling so much faster, any given level of service can be operated with fewer buses and operators.[41]

Limited stop service can also significantly speed up bus operations. Rather than arranging stops every two or three blocks, spacing stops approximately every mile can reduce operating times by as much as 10 percent. Obviously, such limited stops should be placed at the greatest traffic generators, such as major employers, medical and educational institutions, governmental offices, large residential centers, and transportation hubs.

Traffic signal preference has been discussed for the proposed light rail line. If it can be implemented for the light rail alignment, it can certainly be implemented for buses, at least in the same corridor.[42]

Higher frequency bus services increase transit ridership. Studies have shown that for every one percent increase in bus service, an increase in ridership of 0.8 percent or more is normally achieved. The success of high frequency bus systems is reflected by Capital Metro's UT Shuttle, which carries passenger loads that are competitive with some of the

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[41] However, the faster travel speed generally significantly increases ridership, which requires more buses on the street. Therefore, while total costs may not necessarily be significantly reduced, more passengers are being carried at a lower cost and subsidy per passenger, not an undesirable result.

[42] Greatly simplifying, there are two ways to implement signal preference for transit. The "easy" way is to do it on a route-by-route basis. The "hard" way is to implement it as part of a city-wide upgrade of the transit signal control system. (While it is technically possible to implement signal preference on an intersection-by-intersection basis, this is rarely a good idea for transit operations because of the huge negative impact on the rest of the surface traffic network.)

From limited exposure to the existing traffic control system in Austin, it appears that a major investment in a significant upgrade of the entire system may be highly justified and could produce very large improvements in traffic flow.

best bus systems in the world.[43]

VIII. HIGHWAY EXPANSION

Highway Costs: Another alternative for accommodating the increasing travel demand in Austin is additional general purpose freeway lanes (available at all times to all traffic). While the combined Roadway Rapid Transit alternatives will carry greater passenger volume than a general purpose freeway lane, this does not necessarily equate to more vehicles removed from adjacent roadways. Since generally less than one-third of passengers on busways[44] are former automobile drivers (national data), the congestion reduction impact could be better served with addition of a general purpose lane over other options."[45] General purpose freeway lanes carry significantly higher passenger volumes than light rail lines,[46] at 2.22 times the volume.[47]

The costs of constructing freeway lanes, and Busway-HOT lanes, like all major transportation capital projects, varies widely depending upon the specifics of each proposed project. It would be premature to project costs for such projects at this early stage of the discussion of transportation improvements for Austin. However, it is possible to project a range of costs for such projects by reference to the costs of recent and current freeway widening and construction projects. For example:

- The current project to add a lane in each direction to IH-35 in Williamson County will cost $1.3 million per one-way lane mile.[48]
- A Texas Department of Transportation official has estimated an average cost of $6.0 million per one way lane mile ($12.0 million per bi-directional) for "freeway

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[43] *The 1999 Texas Transit Opportunity Analysis: Capital Metropolitan Transit Authority (Capital Metro)*, Texas Public Policy Foundation, February, 1999, www.tppf.org/tran3.html.

[44] Average of national surveys; assumes the same factor as light rail.

[45] A comprehensive and objective analysis of all alternatives in each corridor would provide more definitive information on this issue.

[46] Specifically, during peak periods, this light rail line would have three-car trains operating on ten minute frequencies, which is six trains per hour in each direction. A travel speed of 20 mph has been assumed, which is the high end of the 12 to 20 mph expected range of speed, to be as favorable as possible to light rail. Source details may be found at *Appendix A*, footnote 2.

[47] In this analysis, the fact that light rail carries many former bus riders has not been considered. Generally, at least one-half of light rail riders are former bus riders. Thus, a new general purpose freeway lane would add more than four times the new capacity of a light rail line.

[48] Texas Department of Transportation, Construction Division, *Construction and Maintenance Report*, September 1, 2000, page 266. Texas Department of Transportation Contract 0015-08-108, is to, "Add one mainlane in each direction" on IH-35 for a distance of 13.273 miles, at a cost of $34,199,589.69. This is $2,576,628 per bi-directional lane mile, or $1,288,314 per directional lane mile.

expansion in the densest metropolitan area," based on averages from recently bid or constructed projects in the San Antonio area."[49] This does not include the cost of right-of-way acquisition, which, depending upon the specific project, may or may not be required.

- The Dallas North Central Expressway expansion cost approximately $20 million per one-way lane mile and could represent the upper bound (worst case) cost for freeway expansion.[50]

Therefore, it would appear that $14 million[51] per a bi-directional freeway lane is a reasonable average for constructing a general purpose lane, within a range of from $3 million to $40 million.

These figures are overall averages for projects of a moderate length, approximately eight to fifteen miles. There are segments in the Austin area where the cost per mile would be considerably higher, such as near downtown and the Colorado River crossing on IH-35. However, other segments could be expanded comparatively inexpensively, using right-of-way already owned by the state.

It thus appears that under virtually any circumstances, light rail is more expensive to construct than a freeway lane. The lowest possible cost for the light rail line, $46 million per mile, is 15 percent above the worst case freeway lane cost of $40 million per mile. When the relative carrying capacity of light rail and general purpose freeway lanes are compared, then the freeway lane is well over twice as cost-efficient as the light rail proposal, measured in terms of peak hour passenger miles produced per dollar of capital expenditures.

Moreover, the cost of light rail is more than three times that of the average freeway lane ($14 million). The higher volumes make the cost advantage of the general purpose freeway lane even greater. It is estimated that light rail capital costs are more than seven times as great as that of a general purpose freeway lane per person mile (Table 3).[52]

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[49] Memorandum, John P Kelly, P.E., District Engineer, to John Milam, VIA Executive Director, "San Antonio Area Highway Costs," January 21, 2000. (Note: The "average" included the freeway double decking near the San Antonio central business district [CBD].)

[50] Memorandum from John P. Kelly, P.E., "For North Central Expressway in Dallas, which cost $600 million for 10 miles, and converted from four to six lanes to eight lanes of freeway, the cost was about $20 million per lane mile, including right-of-way. This was probably the most expensive freeway project in Texas. (This included about $100,000,000 in right-of-way costs.)"

[51] Assumes $2 million per bi-directional mile for right-of-way acquisition.

[52] Actually, the relative productivity of the general purpose freeway lane is significantly higher than this. The above analysis does not include operating and maintenance costs (O&M). The O&M costs of a freeway are very small per passenger or passenger-mile, compared to that of light rail. Since there is no public sector cost to operate cars and trucks on freeways, while there are very significant costs for operating light rail trains and maintaining light rail rights-of-way.

Thus, the addition of general purpose freeway lanes is a cost effective and prudent approach to accommodating the increase in automobile demand that virtually all concede will occur. Some have suggested that freeway lanes produce additional traffic ("induced demand"), but the experience of urban areas around the nation demonstrates that traffic volume has increased largely without regard to the extent of roadway expansion (Appendix B). But where roadways have been expanded, there is more capacity and travel delays are reduced.

Table 3
Comparison of Light Rail, Roadway Rapid Transit and Freeway Improvement Capital Costs per Person Mile

	Light Rail	Exhibit: Roadway Rapid Transit	Freeway: General Purpose Lane
Capital Cost per Bi-directional Mile (Millions)	$46	$18	$14
Light Rail Person Mile Equivalents	1.00	8.78	2.22
Capital Cost per Light Rail Person Mile Equivalent	$46	$2	$6

IV. Realistic Alternatives

Over the past 15 years, Austin's population has risen 106 percent, while freeway and arterial lane miles have increased only 66 percent.[53]

Local transportation and planning officials expect Austin's traffic volumes to continue to grow. This continuing increase in automobile demand is anticipated even with light rail and even under an assumption that so-called "smart growth" will slow the geographic expansion of the city. As was indicated above, light rail, even by the projections of the proponents, would remove so few cars from the road that its impact would be imperceivable. So-called "smart growth" would actually increase traffic congestion and air pollution.

While light rail passengers do pay fares, there is not a single light rail line in the U.S. that collects fares that are close to covering operation and maintenance costs. None collect fares that cover a penny of capital cost. The latest available national data is that fares covered slightly under 30 percent of Light Rail operations and maintenance costs in 1998 (American Public Transportation Association, Table 90).

In doing this and other cost-efficiency comparisons, operating costs and revenues, technically, should be considered. However, since all the transportation modes other than light rail have superior operating cost-effectiveness to light rail, and the differences on capital costs are so large, there is little reason to do the additional calculations, which would only show light rail to be even more comparatively costly.

53 Texas Transportation Institute. Lane miles are expressed in freeway equivalent miles.

Thus, the expensive and highly interventionist strategies of light rail and smart growth are *not* plausible strategies for accommodating traffic growth. Unless additional capacity is provided, Austin's traffic congestion will continue to get much worse. And it can get *much* worse. As was noted above, the more dense, transit oriented cities of Europe have 50 percent higher traffic intensity than American cities. And, traffic moves more than one-third slower in those cities than in American cities.

A comprehensive review of Austin's longer term transportation situation should include an objective analysis of all alternatives.

Funding: *The 1999 Capital Metropolitan Opportunity Analysis* found that Capital Metro could provide its current level of service at one-half its current tax rate (one-half cent sales tax).[54] The other one-half cent Capital Metro tax could be committed to more effective mobility options, such as roadway rapid transit and roadway expansion. A preliminary analysis indicates that much greater transportation benefits are likely to be achieved through such a strategy.

If the excess one-half cent Capital Metro tax were committed to building a 52 mile (104 one-way lane miles)[55] Busway-HOT system (rather than a 52 mile light rail system), funding would remain that could be used to build new general purpose lanes.[56] These tax funds could also be augmented by tolls to expand the general purpose freeway system.[57] These two funding sources could finance an estimated 439 additional miles of general purpose freeway lanes in addition to the 104 one-way miles of Busway-HOT, for a total of 543 total lane miles.[58] This would reduce traffic congestion from the projected 64 percent above capacity in 2025 to one percent below capacity (Roadway Congestion index of 0.99), assuming continuation of recent road expansion and population growth trends.[59] It is estimated that this would reduce per capita daily peak hour travel delays throughout the Austin area 65 percent compared to building light rail, approximately one hour per capita

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54 *The 1999 Texas Transit Opportunity Analysis: Capital Metropolitan Transit Authority (Capital Metro)*, Texas Public Policy Foundation, February, 1999, www.tppf.org/tran3.html.

55 A cost of $18 million per two way lane miles is projected. 52 two way miles coverts to 104 lane miles.

56 Assumes a 50 percent federal funding match rate.

57 Toll revenues are estimated at one-half the rate of the Route 91 HOT lane in southern California. Based upon Edward Sullivan, *Evaluating the Impacts of the SR-91 Variable Toll Express Lane Facility Final Report*.

58 Assumes a cost of $7 million per one-way lane mile and a federal match rate of 70 percent, which is below the 80 percent match rate for such projects.

59 Applies Texas Transportation Institute Roadway Congestion Index formula.

per week.[60]

If the excess one-half cent Capital Metro tax were committed only to the expansion of general purpose freeway lanes, approximately 452 new lane miles could be constructed. This would reduce traffic congestion from the projected 64 percent above capacity in 2025 to six percent above capacity (Roadway Congestion Index of 1.06), assuming continuation of recent road expansion and population growth trends. It is estimated that this would reduce per capita daily peak hour travel delays throughout the Austin area 58 percent compared to building light rail, approximately one hour per capita per week (Tables 4 and 5).

**Table 4
One Way Miles of Usable Transportation Capacity:
Preliminary Estimates**

	Light Rail	Busway-HOT	Freeway
Light Rail	104	0	0
Busway-HOT	0	104	0
General Purpose Freeway Lanes	0	439	452
Total Freeway Lane Mile Equivalent	0	543	452
Roadway Congestion Index	1.63	0.99	1.06
Contribution to Reduction of Traffic Congestion	-0.6%	-39.4%	-35.1%

**Table 5
Sources and Uses of Capital Funding: Preliminary Estimates
In Millions**

Source	Light Rail	Busway-HOT	Freeway
Capital Metro (Sales tax)	$950	$950	$950
Federal Transit Match	$950	$468*	$0
HOT Lane Toll Revenues	$0	$440	$0
Federal Highway Match	$0	$2,151	$2,217
Total Sources	$1,900	$4,009	$3,167
Uses			
Light Rail	$1,900	$0	$0
Busway-HOT	$0	$936	$0
General Purpose Freeway Lanes	$0	$3,073	$3,167
Total Uses	$1,900	$4,009	$3,167

60 Estimated using linear regression analysis for 68 urban areas estimating the relationship of traffic congestion to average delay per eligible driver in 1997 ($r2$=.74).

Table 5 Sources and Uses of Capital Funding: Preliminary Estimates In Millions
* Building Busway-HOT lanes equivalent in length to light rail (52 bi-directional, 104 one-directional lane miles) can be done at approximately one-half the per mile cost of light rail. Therefore, while the federal transit matching funds are one-half that of light rail (reflecting lower capital costs), the remaining local tax funds are available for general purpose lanes which also receive a federal highway funds match.

Under either of these alternatives, it may be possible to use some of the funding to build the planned State Route 130 roadway for operation without tolls.

These traffic congestion improvements compare to the approximately 0.5 percent congestion impact of light rail projected by CAMPO.

The extent and intensity of the traffic congestion could be significantly less with roadway rapid transit and roadway improvements (Figure 16). Finally, these preliminary estimates are theoretical, and are not accompanied by detailed proposals for roadway expansions. Whether the associated roadway expansions that could significantly reduce traffic congestion are technically or politically feasible is a question that would be addressed in more detailed planning. The important factor, however, is that a comprehensive mobility and access analysis be completed that considers all potential measures to minimize traffic congestion including Busway-HOT lanes and freeway expansion.

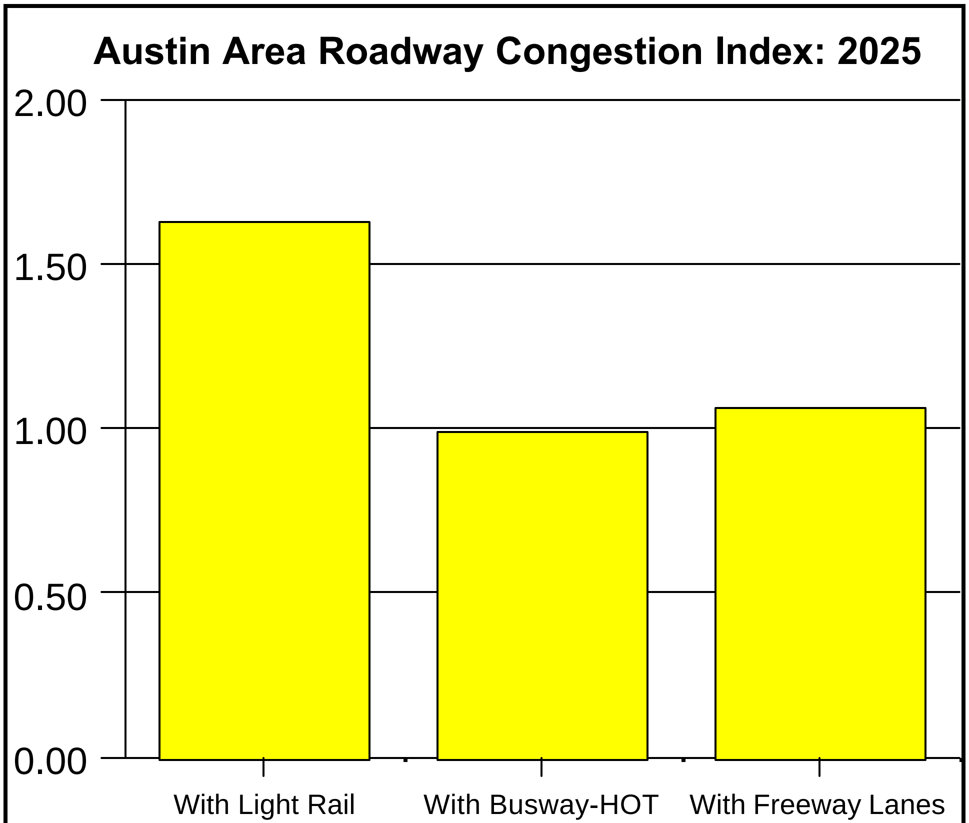

Figure 16

Source: See Text

Assumes continuation of recent roadway expansion and population growth trends.

APPENDIX A: FEDERAL TRANSIT GRANT PROGRAMS

It appears that one of the reasons that proponents are recommending light rail is the promise of Federal funding. While it is true that the Federal Transit Administration Section 5309 Discretionary Transit Grant "New Start" funds can be utilized to pay up to 75 percent of the costs of light rail construction and other capital costs, the intense competition for these funds makes Federal funding assumptions of over 50 percent for large projects – Capital Metro's assumption – unrealistic. Indeed, even 50 percent funding is far from certain, given the extremely long list of competitors for these funds.

Moreover, the title of this funding program is "New Starts" – *not*, as is often mistakenly claimed, "New *Rail* Starts." Indeed, there are many major busway programs that have been funded through this program, including Houston's extensive Busway/HOV network.[61] In fact, since busways generally have far higher scores on the FTA selection criteria than do rail mode proposals, it is not at all unreasonable to project that it may be easier to gain funding for bus transit projects than for rail projects, when the criteria is productivity and cost-effectiveness.

Also, Busways are generally far less expensive than light rail projects. This means that:

- Since Busways require less funding for the entire project, it is generally far easier to gain approval for such projects in the very crowded competition for funding.
- It is generally easier to gain the actual appropriation of funds over a shorter period of time than rail projects, which often have their funding spread over five or more years.
- Since the total cost of busways is generally far less than light rail projects, there is a greater chance to gain a higher percentage of Federal funding.
- Even if the Federal funding percentages are the same for a Busway as light rail, the lower overall costs means that the local costs are far lower.

Finally, the "New Starts" program is not the only Federal Section 5309 grant program. Besides the "New Starts" program, which currently receives 40 percent of total Section 5309 funding, there is also a Bus program, which receives 20 percent of total program funding. While "New Starts" funds can be utilized for either bus *or* rail, the Bus funds can *only* be utilized for bus.[62] As a result, the potential amount of funding for busways is greater

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61 In 1998, 21.3 percent of "New Starts" grants went for bus projects. American Public Transportation Association, page 35.

62 The third program, "Fixed Guideway Modernization," unlike the other two, is allocated by formula, not on a project-by-project discretionary basis. Funding for this program is allocated under an extremely complex formula based on fixed guideway transit operations in prior years, after the guideway has been in operation for seven years.

than that of light rail.

There would be absolutely no difference in funding under this program between rail and Busway for many years, until the seven year "waiting period" is satisfied. To the extent that the lesser complexity and lower costs of Busway construction and operations allows Busways to go into operation sooner and/or for a larger quantity of guideways to be constructed and/or operated, then Busways could eventually generate more Fixed Guideway Modernization funding than light rail.

APPENDIX B: INDUCED TRIPS

There is an ideological, if not theological, view among planners that there is no point to building additional highways – that they will be filled up by new traffic as soon as they are opened. But highways have become overcrowded because little new construction has occurred in urban areas. European and Canadian cities have far less effective roadway systems and have greater traffic congestion and air pollution as a result.

If the mere provision of additional highway capacity were a primary generator of additional traffic, then it would be expected that per capita street and highway travel would have increased significantly more in urbanized areas that expanded their highway systems at a greater rate. This, however, is not the case. From 1982 to 1996, the variation in roadway construction among major urban areas was much greater than the variation in increased travel per capita (Figure 17):[63]

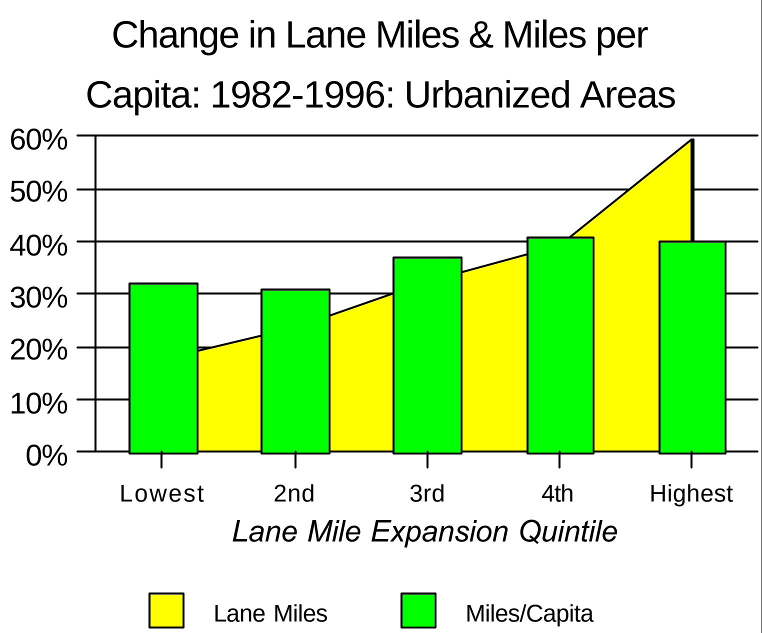

Figure 17
40 Largest Urban Areas
Calculated from Texas Transportation Institute data.

There is a rather weak and insignificant relationship between roadway expansion and the increase in vehicle miles traveled per capita.[64] It is possible to build sufficient highway

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63 Analysis of Texas Transportation Institute RCI data, 1982 to 1996, urban areas of more than one million population.

64 Lane miles per capita is used to factor out the traffic volume increasing impact of larger population. A regression analysis found the relationship between lane miles added and the change in vehicle miles per capita to be not statistically significant in urban areas of more than one million population (r2 of 0.009).

capacity to accommodate demand. This does not, however, guarantee that there is the political will do so.

This is not to suggest that there may be a small increase in miles traveled as a result of new roadways. Faster roadways make it possible for people to gain access to more distant locations without increasing their travel time, which could encourage longer trips. But the actual time traveling is not likely to increase. This is illustrated by the fact that the average journey to work time has changed little in recent years. As traffic congestion becomes worse, people, over time, make adjustments so that their travel times do not materially increase. Even if the increase in road capacity does not result in a reduction in travel time and/or increases in travel speeds, building new lanes does increase the number of vehicles, and people, moving through the corridor, a valuable and productive result.

CREDENTIALS

Thomas A. Rubin, CPA, CMA, CMC, CIA, CGFM, CFM is an independent consultant. He served as Controller-Treasurer (Chief Financial Officer) of the Southern California Rapid Transit District in Los Angeles, which was at the time the nation's third largest public transit agency, with an annual budget of more than $1 billion. During his tenure, the light rail Blue Line was opened and much of the $5 billion subway (recently opened) was constructed. Mr. Rubin was the founder of the public transportation practice of Deloitte Haskins & Sells (now Deloitte & Touche, LLP), which he led for more than 12 years. He has been involved in auditing more than 60 public transit agencies and has provided consulting assistance to more than 100. In recent years, Mr. Rubin has been the principal transit expert for the NAACP Legal Defense and Educational Fund, Inc. and the Bus Riders Union of Los Angeles, in their successful legal effort to stop the diversion of financial resources from the largely low income ridership bus service to the expensive rail system.

Wendell Cox is principal of Wendell Cox Consultancy, an international public policy firm. He has provided consulting assistance to the United States Department of Transportation and was certified by the Urban Mass Transportation Administration as an "expert" for the duration of its Public-Private Transportation Network program (1986-1993). He has consulted for public transit authorities in the United States, Canada, Australia and New Zealand and for public policy organizations. Mr. Cox served three years as the Director of Public Policy at the American Legislative Exchange Council, where he oversaw the development of state model legislation and policy reports. Mayor Tom Bradley appointed him to three terms on the Los Angeles County Transportation Commission, where he authored the tax amendment that provided the initial funding for building light rail and the subway. He was elected chairman of the American Public Transit Association Planning and Policy Committee (comprised of transit planning department officials) and the American Public Transit Association Governing Boards Committee (comprised of transit board members). Mr. Cox also chairs the Financial Analysis Committee of the Amtrak Reform Council.