EXECUTIVE SUMMARY

THE AUSTIN-SAN ANTONIO PROPOSAL

Commuter rail has been proposed as an alternative to highway construction in the Austin-San Antonio corridor. Commuter rail would involve upgrading a freight railroad right-of-way between the two metropolitan areas. The line would operate over a 110 mile route from Georgetown, through Austin, San Marcos, New Braunfels and San Antonio to Kelly Air Force Base, at speeds up to 79 miles per hour.

The ridership projection is reasonable. A feasibility report for the Texas Department of Transportation, the *Carter-Burgess Report,* projects ridership of 8,000 daily, increasing to 11,000 in 2020. This ridership projection is considered realistic, if not somewhat low.

The ridership projection is inconsequential. Compared to the daily traffic in the corridor, the projected ridership is minuscule. At its peak, Interstate 35 has a daily volume of over 200,000 vehicles.

Commuter rail would have little impact on traffic congestion. It is estimated that the proposed system would remove less than 0.5 percent of traffic in Austin and less than 0.4 percent of traffic in San Antonio. On average, the number of vehicles removed by commuter rail would be less than one out of every 200.

Commuter rail travel times would be longer than auto. Commuter rail would require one hour and 43 minutes to travel from downtown Austin to downtown San Antonio, a trip that the American Automobile Association estimates at one hour and 20 minutes by automobile. If time for travel to stations, parking and waiting for trains is considered, commuter rail can be expected to be at least 45 minutes slower, each way, than the automobile.

Capital costs will be near $500 million, but could be higher. The *Carter-Burgess Report* projects capital costs at $475 million. However, cost projections in the early stages are often inaccurate – and invariably low. A recent National Academy of Sciences report confirms that underestimation of costs and overestimation of usage is a normal pattern for large infrastructure projects, such as commuter rail lines. The report stated ... *cost overruns of 50 to 100 percent are common and that overruns of more than 100 percent are not uncommon...* The Austin-San Antonio commuter rail line could require up to twice as much money to build (nearly one billion dollars).

The commuter rail line will be costly to operate. Based upon data in the *Carter-Burgess Report,* it is estimated that the cost of operating the Austin-San Antonio commuter rail line will be more than double the average cost per passenger mile of other new commuter rail routes. This does not include an adjustment for the higher capital costs that are expected (above).

A new luxury car could be provided to each new rider. The cost per new rider is so high, that it would be less expensive to lease each new rider a new luxury automobile, such as a BMW 7 series or a Lincoln Town Car. The annual cost per new daily commuter would be $12,200.

The cost per automobile removed could finance six Habitat for Humanity houses. Not all new riders will be former automobile drivers. It is estimated that the cost to attract an automobile driver will be nearly $40 per trip. This equates to $17,500 annually, which is one-half the amount required to build a Habitat for Humanity house in San Antonio, or enough to pay the mortgages on nearly six such houses.

The commuter rail line will require a tax increase. It is expected that funding will be obtained from the federal government and from a new local tax. The new local tax is estimated at the equivalent of a 0.125 cent sales tax. Because of cost overruns, this tax could be as high as 0.5 cents (four times as high).

The commuter rail line may not be safe. The commuter rail line will have more than 100 grade crossings. Grade crossings significantly retard safety and pose the potential for catastrophic accidents, such as recently occurred outside Chicago when a truck, apparently seeking to evade a properly operating crossing gate, was hit by an Amtrak train, which was incapable of reacting quickly enough due to its 79 mile per hour speed (the same top speed as is projected for the Austin-San Antonio commuter rail line).

The Austin-San Antonio commuter rail system would be more costly than highway improvements. It is estimated that the Austin-San Antonio commuter rail line will have costs per passenger mile 10 times that of the most effective bus systems and three times that of building and operating a new freeway lane in both directions over the entire route (includes the private costs of automobile operation and ownership).

There are alternatives that can reduce traffic congestion. Traffic congestion has been reduced by expanding freeways in Houston and Phoenix. High occupancy vehicle (HOV) lanes and high occupancy toll (HOT) lanes carry substantially more person trips than commuter rail lines operating in the same corridor in Washington and Los Angeles. Paris intends to build 60 miles of automobile-only tunnels under the city to reduce traffic congestion, despite its intensely developed rail system. Further, technological advances are expected to substantially increase the capacity of urban freeways. There is sufficient space to expand Interstate 35 throughout most of the proposed route, and additional traffic relief will be provided by the proposed State 130 highway.

There is no hope for the Austin-San Antonio commuter rail line to reduce traffic congestion. The nation's new commuter rail systems have had virtually no impact on adjacent roadway traffic volumes. The traffic problems facing Los Angeles, San Diego, Miami-Fort Lauderdale-West Palm Beach and Washington, D.C. are worse today than before commuter rail opened. The same will be true of the Austin-San Antonio corridor. The *Carter-Burgess Report* projections indicate minuscule commuter rail usage in relation to automobile traffic in the corridor.

The local planning process: Careening toward 1984. Nonetheless, local officials may be positioning themselves to recommend the project. According to the Capital Area Metropolitan Transportation Planning Organization: *The Austin-San Antonio Carter-Burgess Report ... concluded that passenger rail on the existing Union Pacific (UP) line that parallels IH 35 between Georgetown and San Antonio is both technically and financially feasible. Passenger rail service on the UP line would offer an alternative to the automobile for intercity travel in the congested and fast-growing IH 35 corridor*. Any inference based upon the *Carter Burgess Report* that the Austin-San Antonio commuter rail project could play a material role in the corridor would be a serious overstatement, recalling the "doublespeak" of Orwell's *1984,* which declared:

WAR IS PEACE
FREEDOM IS SLAVERY
IGNORANCE IS KNOWLEDGE[1]

Adopting the Austin-San Antonio commuter rail project as a strategy for dealing with travel demand would be an "Orwellian" declaration by local officials that:

MINUSCULE IS SIGNIFICANT.

[1] George Orwell, *1984* (New York: Penguin Putnam), 1950.

I. INTRODUCTION

A passenger rail corridor is proposed between Austin and San Antonio as a strategy to deal with growing highway traffic congestion. This report is an analysis of that proposal. Earlier in the year, an analysis of the national experience with commuter rail was published and that document has been incorporated as Appendix I of this report. Because rail based strategies are often suggested as a strategy for reducing air pollution, a new section (Appendix II) has been added.

II. THE AUSTIN-SAN ANTONIO COMMUTER RAIL CORRIDOR

According to the Carter-Burgess *Austin-San Antonio Commuter Rail Study*,[2] (*Carter-Burgess Report*) the Austin-San Antonio corridor faces serious highway capacity limitations:

> *While travel by private automobile is the dominant mode of transport, future expansion of the highway network in this corridor will be unable to keep up with the anticipated growth. As such, it is necessary to explore and evaluate any and all viable transportation alternatives within the corridor, including commuter rail service.*[3]

Description of the System

The *Carter-Burgess Report* examines a preferred 110 mile commuter rail system that would operate from Georgetown, through downtown Austin and downtown San Antonio to Kelly Air Force Base. The system would serve both the interurban market (between the two metropolitan areas) and the commuter market (to downtown Austin and downtown San Antonio).

- During peak morning and evening travel hours, service would be provided at least half hourly to and from the two downtown areas.

- Throughout the day, services with 90 minute intervals would be provided from Georgetown to Kelly Air Force Base.

- The 84 mile route from San Antonio to Austin would take 1:43 (49 mile per hour average). The top speed would be 79 miles per hour.

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[2] Carter-Burgess, produced under Texas Department of Transportation Contract, March 1999 (*Carter-Burgess Report*).

[3] *Carter-Burgess Report*, p. 1-1.

- Terminal to terminal service (Georgetown to Kelly Air Force Base) would take 2:28, an average of less than 55 miles per hour.

- Trains would be diesel propelled, each with two bi-level (double deck) coaches with a capacity of 140 each (280 per train).

- Annual fare revenues are projected at $14 million, which are estimated to cover approximately 55 percent of the operating costs and none of the capital costs.

- Public subsidies would be provided primarily from a new sales tax of 0.125 cents.

Ridership

The *Carter-Burgess Report* forecasts weekday ridership at approximately 8,000 in 2000,[4] rising to 11,000 by 2020. The 2000 forecast would amount to approximately 2,700 per downtown oriented corridor.[5] This figure is equal to that of the Tri-Rail system in the Miami-Fort Lauderdale area and the Virginia Railway Express in the Washington, D.C. area. It is also well below the new commuter rail system average of 3,858. As such, the *Carter-Burgess Report* ridership projections are considered to be reasonable, if not somewhat conservative. Both of the 2000 and 2020 figures appear to be reasonable, if not somewhat conservative.

Ridership in Context: The Travel Market

The projected ridership level is inconsequential in comparison with the travel volume along the I-35 corridor between Austin and San Antonio (Table 1). Daily commuter rail line ridership compared to Interstate 35 traffic volumes is illustrated in Figure 1, which has been magnified to the maximum extent feasible for presentation on the page. Even at this magnification the commuter rail passenger volume is barely perceivable in the chart. Moreover, commuter rail growth will be minimal compared to traffic growth to 2020, which is illustrated in a similarly magnified chart (Figure 2).

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4 The system would not be operational by 2000, but the *Carter-Burgess Report* projects ridership for that year based upon planning data.

5 There are three downtown oriented corridors: South to downtown Austin, North to downtown Austin, and South to downtown San Antonio. The Kelly Air Force Base to downtown San Antonio corridor is very short and is therefore not counted as a downtown oriented corridor.

TABLE 1 FREEWAY TRAFFIC AND COMMUTER RAIL VOLUMES				
Location	**2000**		**2020**	
	Daily Vehicles on I-35	**Daily Commuter Rail Passengers**	**Daily Vehicles on I-35**	**Daily Commuter Rail Passengers**
Austin: Town Lake	210,000	1,583	330,000	2,150
San Antonio: Airport/I-410	162,000	957	235,000	1,300
Data in Commuter Rail Analysis. 2000 commuter rail passengers estimated using overall commuter rail projected ridership change between 2000 and 2020.				

The 2000 commuter rail and Interstate 35 person trips are illustrated in Figure 3, which has also been magnified (a small dark sliver, representing commuter rail volume, can be barely discerned for route segments 2 through 7).[6]

The overall growth in daily commuter rail demand from 2000 and 2020 is compared to the Interstate 35 person volume demand in Figure 4, which has also been magnified.

- The eight lanes of Interstate 35 in central Austin are projected to carry 210,000 vehicles daily in 2000. Based upon national vehicle occupancy data, this converts to as many as 336,000 persons daily.[7] This is 84,000 persons per two way lane couplet on an eight lane freeway.[8] The commuter rail line would carry less than 1,600 daily riders at its peak central Austin point, or less than 0.5 percent of the travel demand.[9]

- The eight lanes of Interstate 35 near San Antonio International Airport at I-410 are projected to carry 162,000 vehicles daily in 2000. This converts to

6 Route segments are as follows: (1) Georgetown to Round Rock, (2) Round Rock to McNeil Junction, (3) McNeil Junction to US 183, (4) US 183 to RM 2222, (5) RM2222 to downtown Austin, (6) downtown Austin to Ben White, (7) Ben White to San Marcos, (8) San Marcos to New Braunfels, (9) New Braunfels to Selma, (10) Selma to San Antonio International Airport/I-410, (11) San Antonio International Airport/I-410 to downtown San Antonio, (12) downtown San Antonio to Kelly Air Force Base. Interstate 35 usage based upon 1.6 persons per vehicle.

7 National data indicates that the average vehicle occupancy is approximately 1.6. Local data is not available according to the Austin Transportation Study.

8 336,000 divided by four.

9 According to the *Carter-Burgess Report,* at the peak loading point the commuter rail line would carry 2,300 riders daily in 2020. The 2000 figure is estimated by reducing the 2020 figure by the 2000 to 2020 system-wide rate of ridership change.

nearly 260,000 persons daily[10] and 65,000 persons per two way lane couplet on an eight lane freeway.[11] The commuter rail line would carry fewer than 1,000 daily riders at the same point, or 0.4 percent of travel demand.

- At its low traffic point between Austin and San Antonio (New Braunfels), the four lanes of Interstate 35 carry 49,000 vehicles daily. This converts to 78,000 persons daily[12] and 39,000 persons per two way lane couplet on a four lane freeway.[13] The commuter rail line would carry 800 daily riders in the New Braunfels area in 2000, barely one percent of travel demand.

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10 National data indicates that the average vehicle occupancy is approximately 1.6. Local data is not available according to the Austin Transportation Study.

11 336,000 divided by four.

12 National data indicates that the average vehicle occupancy is approximately 1.6. Local data is not available according to the Austin Transportation Study.

13 336,000 divided by four.

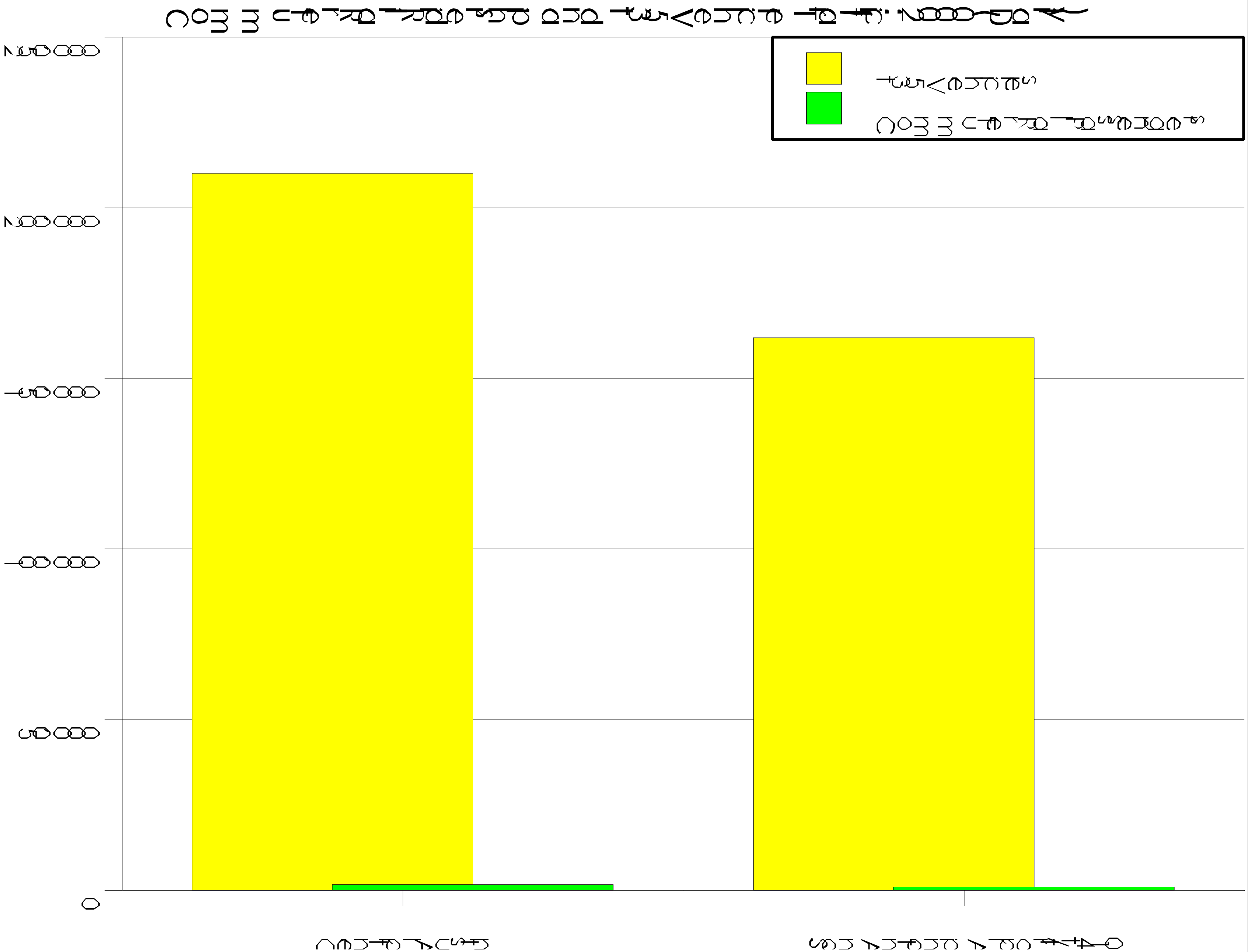

Chart magnified to maximum size to make it possible to perceive commuter rail volumes.

Figure 1
Calculated from U.S. Census Bureau data.

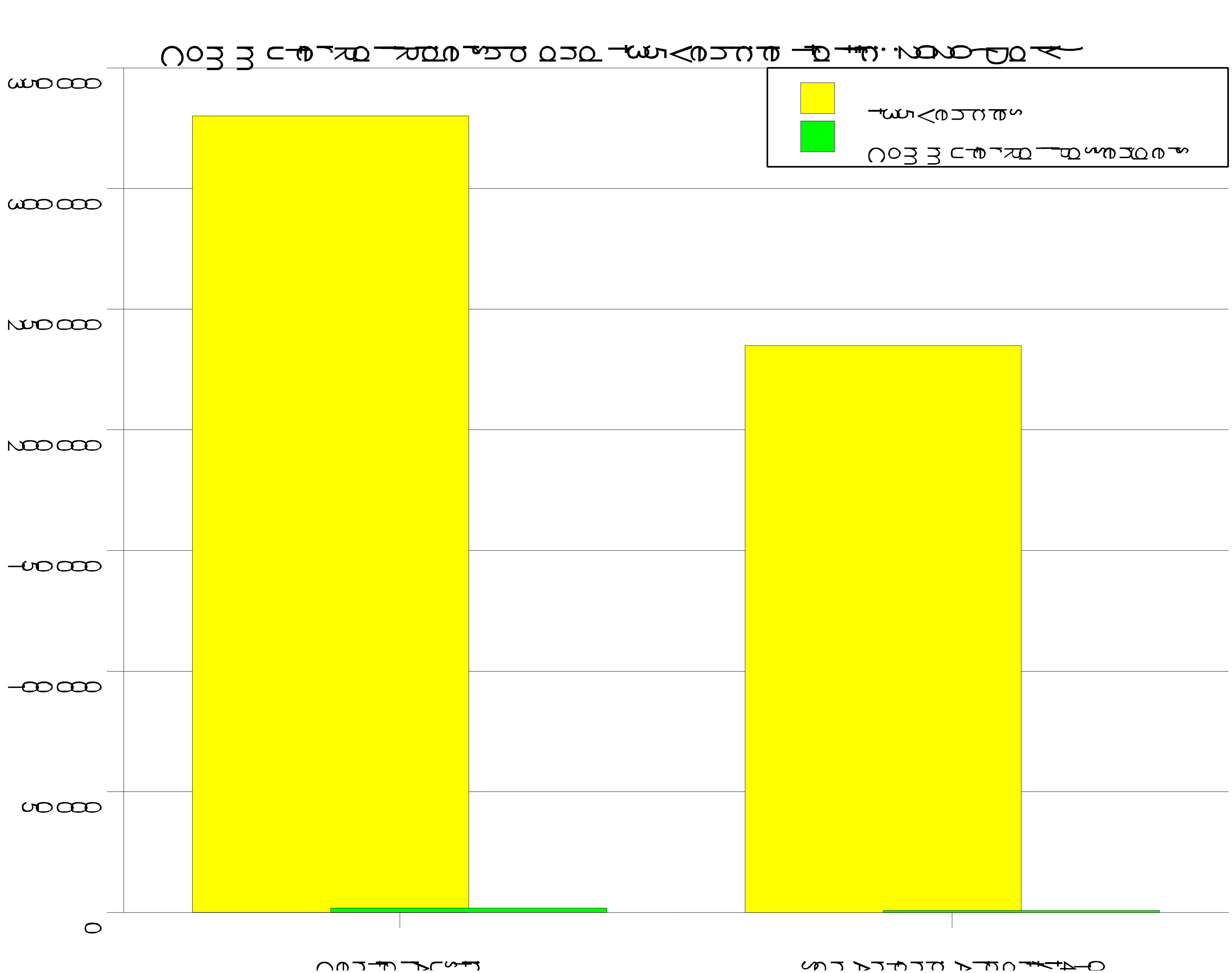

Chart magnified to maximum size to make it possible to perceive commuter rail volumes.

Figure 2

Calculated from U.S. Census Bureau data.

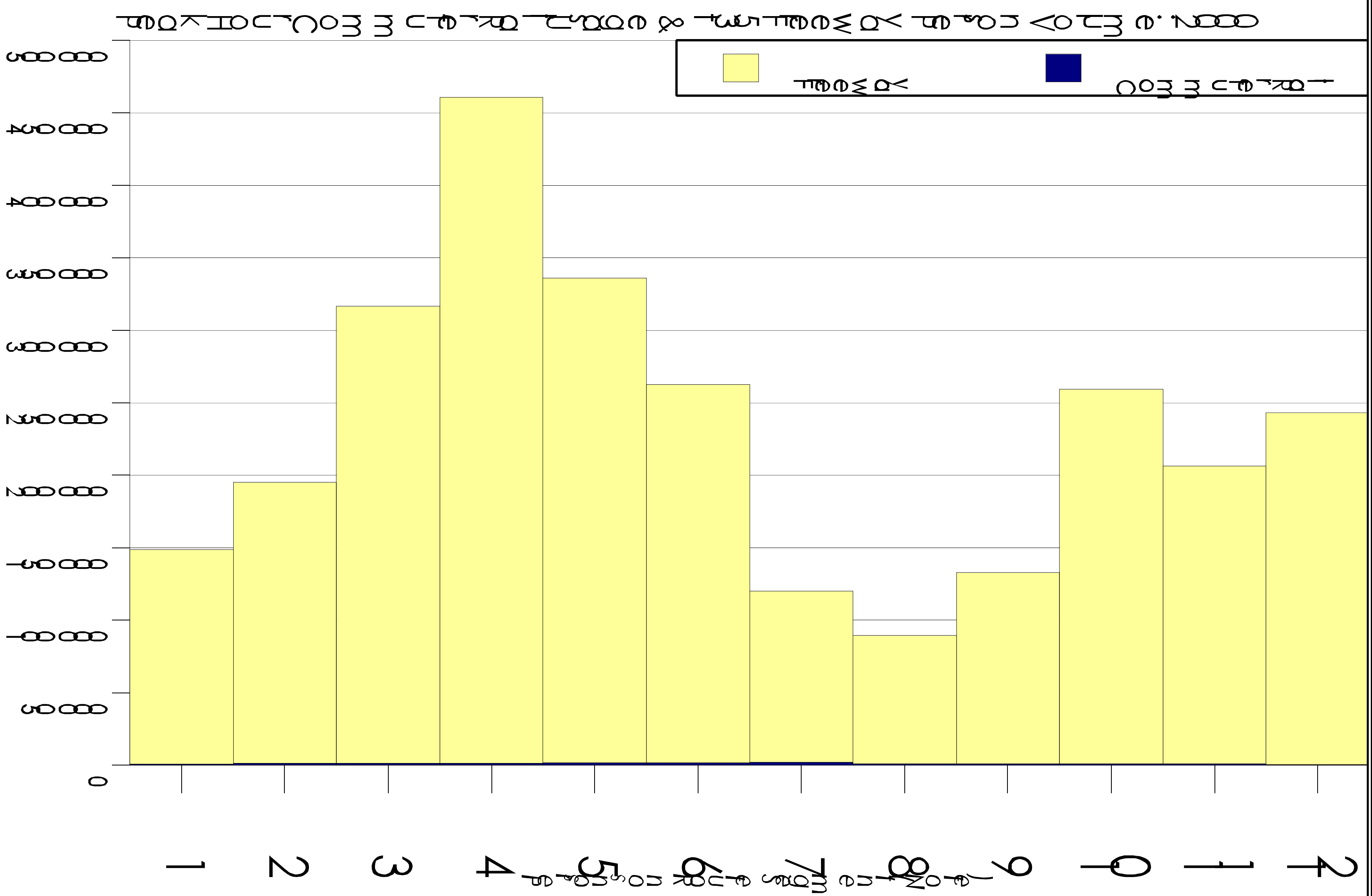

Chart magnified to maximum size to make it possible to perceive commuter rail volumes.

Route segments are as follows:

(1) Georgetown to Round Rock	*(2) Round Rock to McNeil Junction*
(3) McNeil Junction to US183	*(4) US183 to RM 2222*
(5) RM 2222 to downtown Austin	*(6) downtown Austin to Ben White*
(7) Ben White to San Marcos	*(8) San Marcos to New Braunfels*
(9) New Braunfels to Selma	*(10) Selma to San Antonio International Airport/I-410*
(11) San Antonio International Airport/I-410 to downtown	*(12) downtown San Antonio to Kelly Air Force Base*

Figure 3

Estimated from Austin Transportation Study and *Carter-Burgess Report* data.

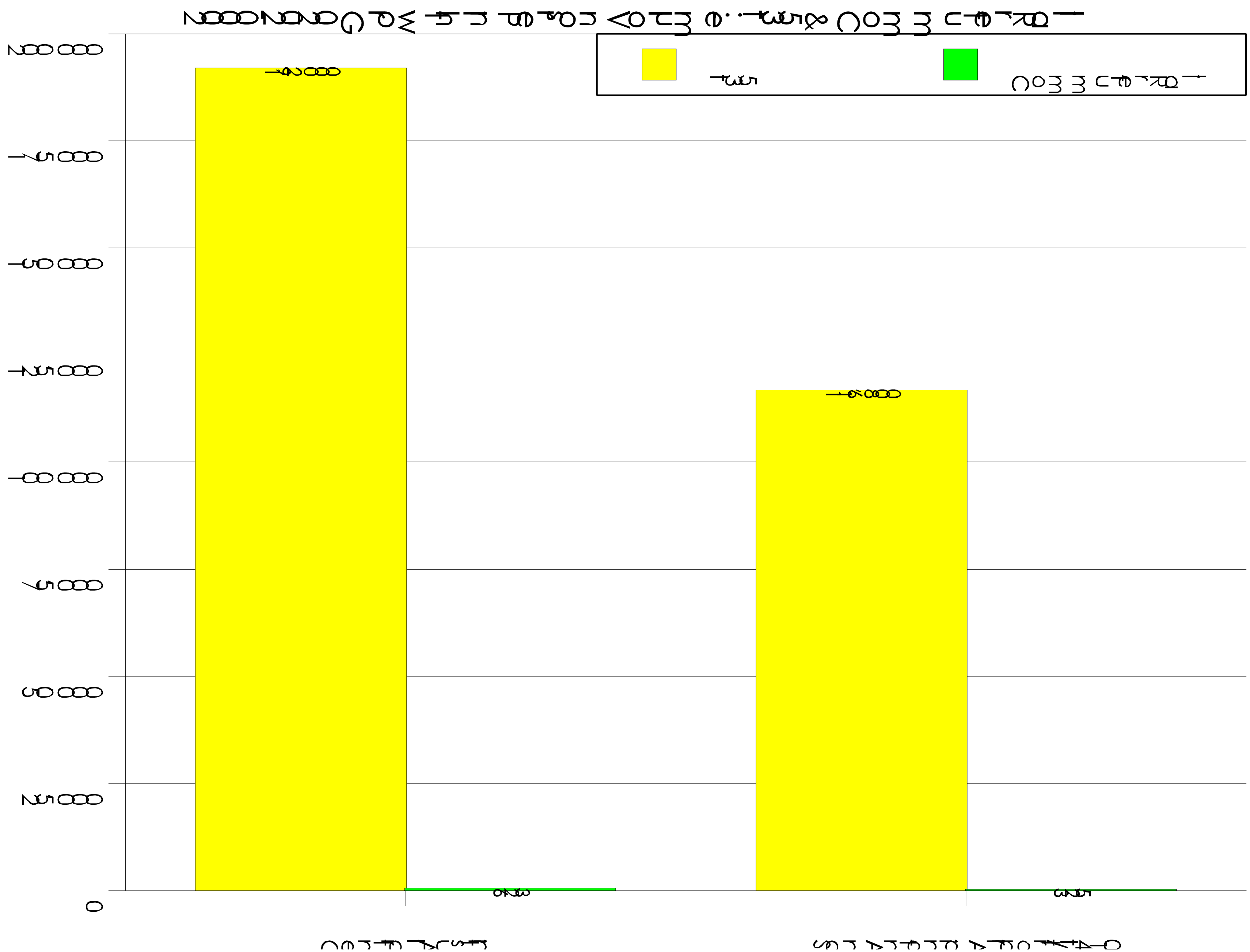

Chart magnified to maximum size to make it possible to perceive commuter rail volumes.

Figure 4

Calculated from *Feasibility Analysis* data.

Peak Hour Volumes: Even during peak travel periods, commuter rail would carry an infinitesimal share of the travel market. *Two-way* commuter rail volume at the highest loading point would barely equal 1/10th of the ***hourly*** passenger capacity of a one-way single lane on Interstate 35 (Figure 5).

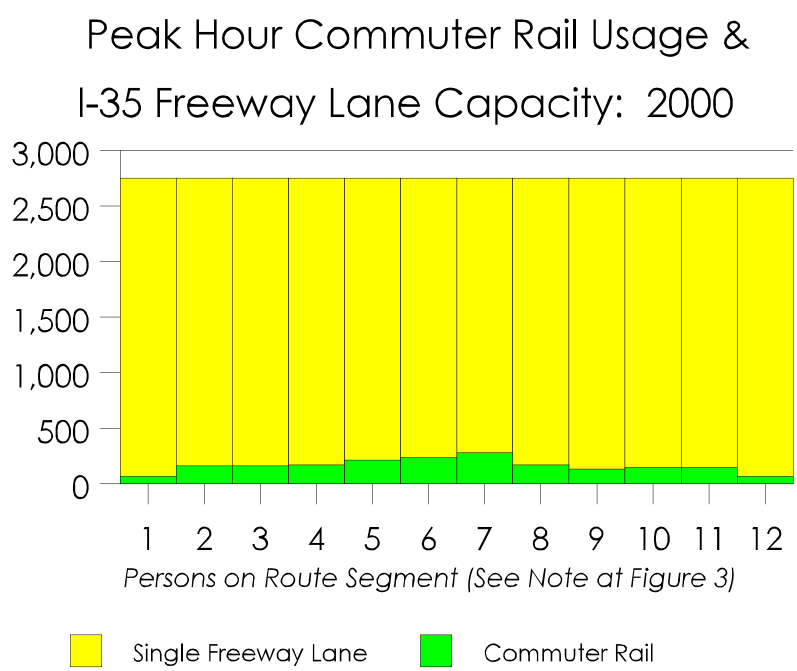

Figure 5
Estimated from data in *Carter-Burgess Report*.

Impact on Traffic Congestion: Even these infinitesimal comparative commuter rail volumes overstate the materiality of commuter rail in the corridor. The impact on traffic congestion would be *even less*.

- A large number of commuter rail passengers *will not* be former automobile drivers, and as a result the number of cars removed from the highways will be less than the number of commuter rail passengers. Some commuter rail passengers would otherwise have been passengers (automobile, van or bus). Other ridership would be "induced" – trips that would not have been taken on roadways. It can be expected that no more than 70 percent of the commuter rail riders will have been former drivers.[14]

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[14] Based upon the national experience, outlined in Appendix I.

- Person (passenger) volume on highways is considerably higher than vehicle volume. During peak hours, person volumes are at least 10 percent higher than vehicle volumes, while overall person volumes (throughout the day) tend to be approximately 60 percent higher than vehicle volumes (1.62 persons per /vehicle).[15]

At the higher commuter rail ridership levels projected for 2020:

- Commuter rail would remove less than 0.5 percent of freeway traffic in Austin (1,500 vehicles out of 330,000) on Interstate 35 – one out of every 220 vehicles. *Today*, the average freeway lane in Austin carries nearly 20 times as many vehicles on a daily basis than commuter rail would remove in 2020 (Figure 6 and Table 2).[16] Even with the higher 2020 ridership levels, the commuter rail line would remove barely 1/20th of the volume of a *single* freeway lane.[17]

- Commuter rail would remove less than 0.4 percent of freeway traffic in the San Antonio International Airport/I-410 area (900 vehicles out of 235,000) on Interstate 35 – one out of every 260 vehicles. *Today*, the average freeway lane in San Antonio carries more than 25 times as many vehicles on a daily basis.[18]

This means that it would take nearly 20 commuter rail lines to accommodate the volume of a single freeway lane. This, of course, is an academic comparison, since building multiple commuter rail lines in the corridor would have little impact on commuter rail demand, which is minuscule in comparison to overall travel demand in the corridor. Similarly commuter rail would reduce Interstate 35 traffic by a virtually imperceivable amount.[19] Because freeways cannot be expanded less than one lane, for commuter rail to be a substitute for freeway expansion requires that it remove the traffic volume of a freeway lane – from 25 percent of traffic on an eight lane freeway to 50 percent on a four lane

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[15] Nationwide Personal Transportation Survey urban area vehicle occupancy rate, U.S. Department of Transportation, (1995).

[16] Calculated from data in *Highway Statistics: 1997*, Federal Highway Administration.

[17] It is estimated that a maximum of 266 vehicles would be removed. This compares to an hourly two-way single lane capacity of approximately 5,000 vehicles.

[18] Calculated from data in *Highway Statistics: 1997*, Federal Highway Administration.

[19] The *Carter-Burgess Report* cites only two locations for freeway volumes (Town Lake in Austin and the San Antonio Airport/I-410). Interstate 35's highest volume in the corridor is north of Airport Boulevard, well north of central Austin. According to ATS data, 288,400 vehicles use this section of roadway daily.

freeway.

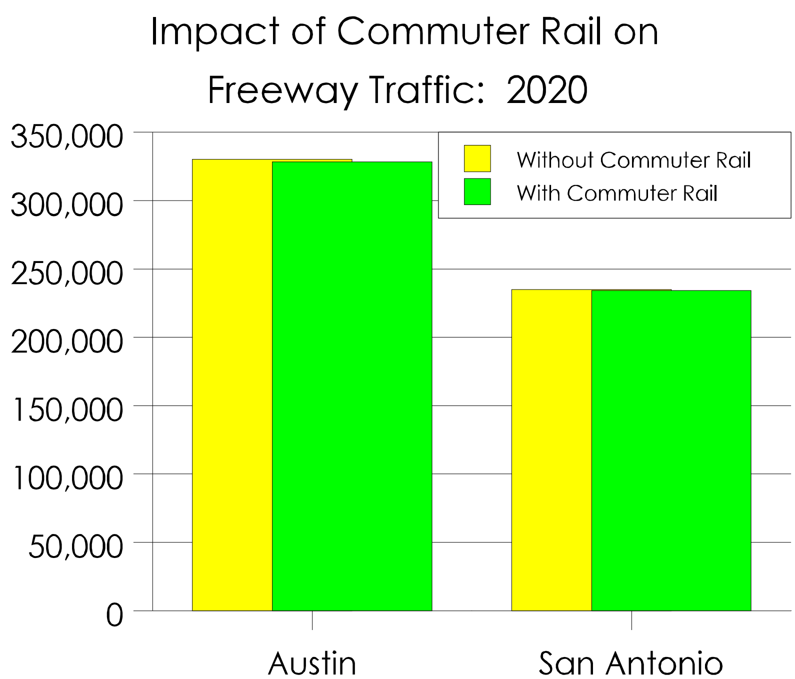

Figure 6
Estimated from *Carter-Burgess Report* data.

TABLE 2
INTERSTATE 35 TRAFFIC VOLUME WITH AND WITHOUT COMMUTER RAIL: 2020

Traffic Point	Without Commuter Rail		With Commuter Rail	
	Vehicles without Commuter Rail	Vehicles Removed by Commuter Rail	Vehicles with Commuter Rail	Traffic Reduction due to Commuter Rail
Central Austin	330,000	1,505	328,495	0.5%
San Antonio International Airport/I-410	235,000	910	234,090	0.4%

Rail projects are often proposed to solve longer term transportation problems. However, forecasts in the *Carter-Burgess Report* indicate that the Austin-San Antonio commuter rail line will have a *less significant* impact on traffic congestion as time passes. Between 2000 and 2020, commuter rail would lose from 6.4 percent to 13.6 percent of its market share (Table 3).[20] At the point of

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[20] This is a planning estimate. The year 2000 is used in the *Carter-Burgess Report* as a reference point. Service would begin in 2009, and the market share loss from 2009 to 2020 would be less than the planning estimate. It is clear, however that there would be a loss, which could be in the range of

greatest travel demand (Austin) and at the point of highest commuter rail market share (New Braunfels) commuter rail market share is minuscule both in 2000 and 2020 (Figures 7, 8, 9 and 10).

The *Carter-Burgess Report* forecasts lead to a conclusion that commuter rail is not a meaningful strategy for addressing transportation capacity in the Austin-San Antonio corridor.

TABLE 3
COMMUTER RAIL IMPACT ON TRAVEL DEMAND AND I-35 TRAFFIC

Location	Commuter Rail Percentage of Travel Demand			I-35 Traffic	
	2000	2020	Change in Market Share	2000	2020
Austin: Town Lake	0.47%	0.41%	-13.6%	0.53%	0.46%
New Braunfels	1.02%	0.96%	-6.4%	1.15%	1.07%
San Antonio Airport/I-410	0.37%	0.35%	-6.4%	0.41%	0.39%

Estimated from data in *Carter-Burgess Report*.

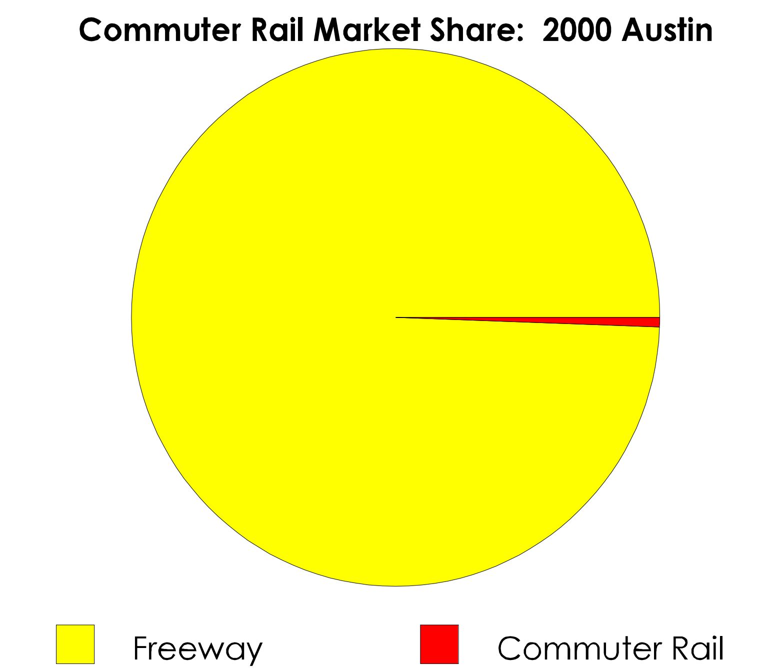

Figure 7
Estimated from *Carter-Burgess Report* data.

four to eight percent.

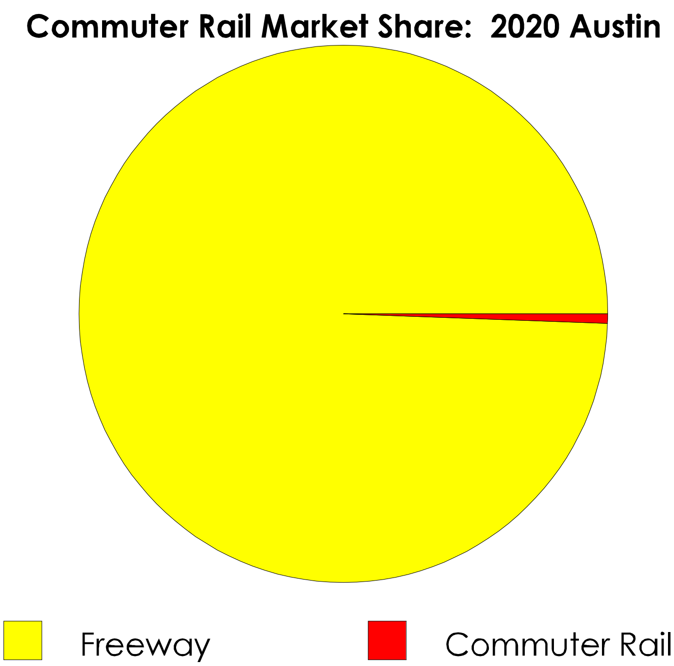

Figure 8

Estimated from *Carter-Burgess Report* data.

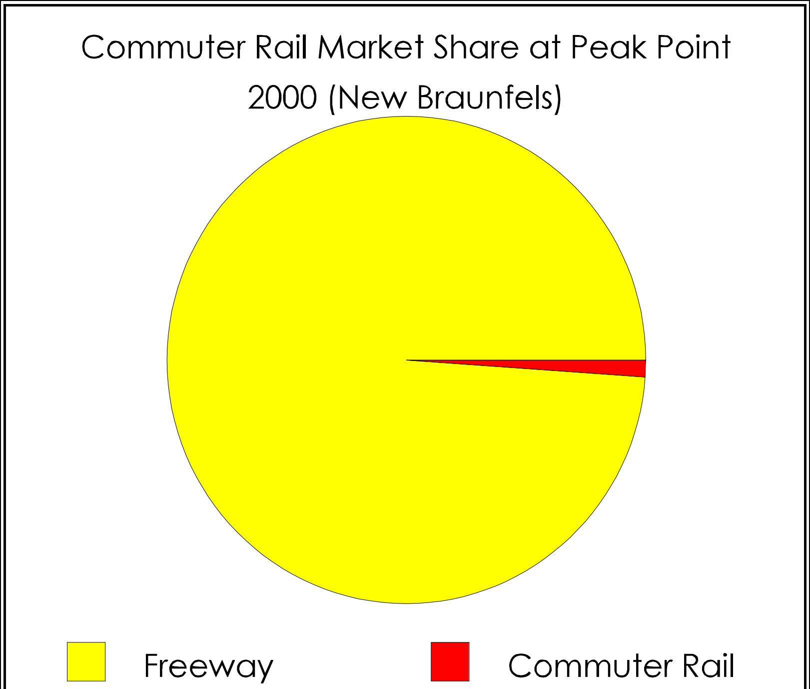

Figure 9
Estimated from *Carter-Burgess Report* data.

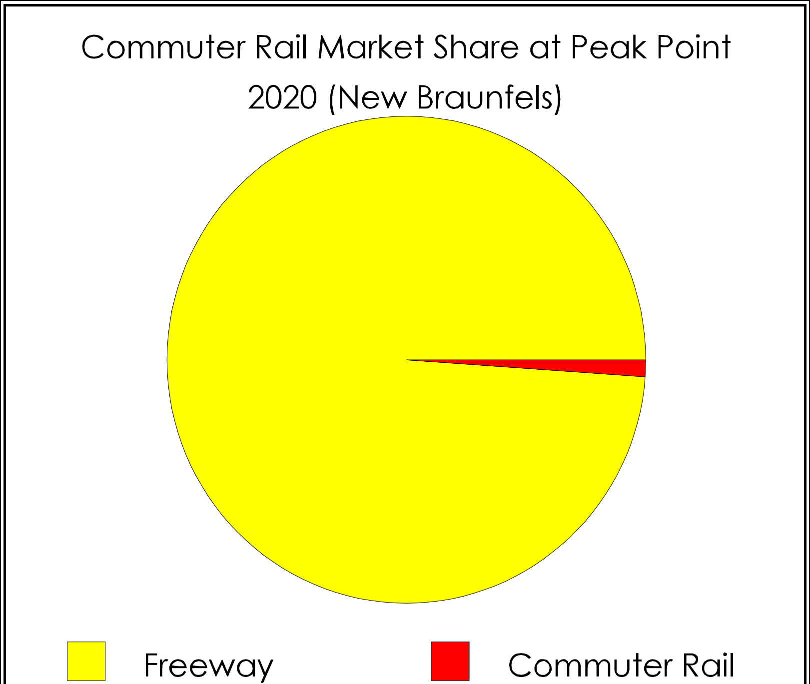

Figure 10
Estimated from *Carter-Burgess Report* data.

Travel Time

Travel time from Austin to San Antonio is projected at one hour and 43 minutes (1.7 hours). This is only 49 miles per hour. When traffic operates at the speed limit, the same trip can be made by automobile in under one hour and 15 minutes (1.25 hours) and national travel atlases suggest that travelers should plan on one hour and 20 minutes (1.33 hours) (Figure 11).[21]

Moreover, virtually every trip on the Austin-San Antonio commuter rail line would require access by automobile, taxicab or mass transit at one or both trip ends. As a result, commuter rail's travel time disadvantage would be even greater. For example, a trip beginning five miles southeast of the San Antonio station and ending at the University of Texas could be expected to take two hours and 23 minutes (2.4 hours) by commuter rail.[22] The same trip by automobile would, on average, take no more than one hour and 35 minutes (1.6 hours). Commuter rail would take the traveler 48 minutes longer in each direction (Figure 12). A round trip would take one hour and 36 minutes longer. Commuter rail's substantial travel time disadvantage is a principal reason for its inability, even in the projections of the *Carter-Burgess Report*, to attract meaningful numbers of automobile drivers.

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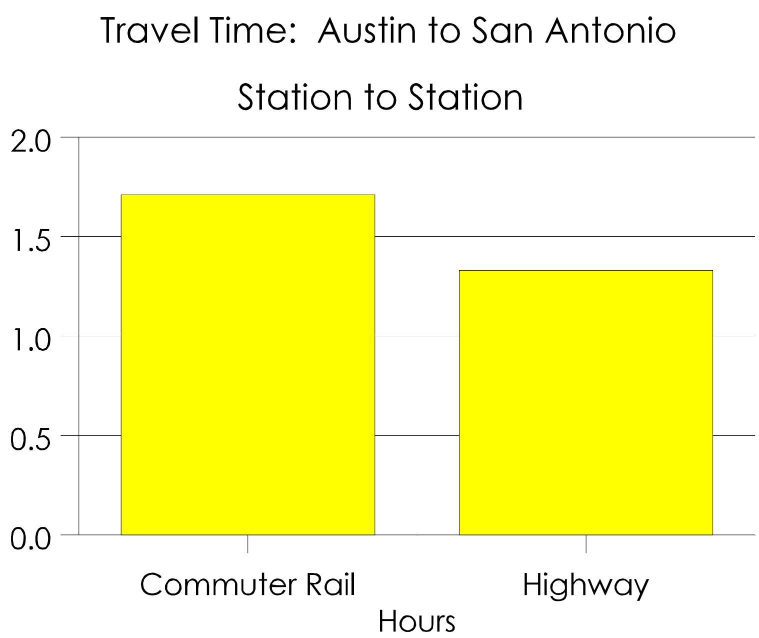
[21] In fact, commuter rail operating speeds will be slower than the normal travel time by automobile on the more circuitous US-281 and US-290 route between San Antonio and Austin. Assumes an additional 15 minutes travel time between these two destinations.

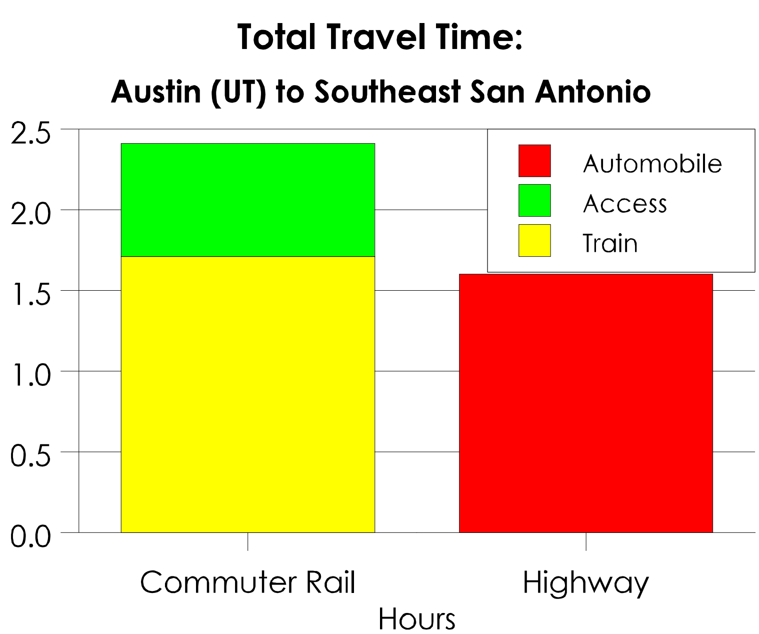
[22] Assumes 15 minutes at the San Antonio station for parking and train waiting time and 10 minutes at Austin station for leaving the train and obtaining a taxicab. Assumes an additional 15 minutes travel time by personal automobile in San Antonio and taxicab in Austin. If mass transit service were used at either trip end, the trip time would tend to be considerably longer.



Note: time calculated does not include travel to/from train stations to final destination

Figure 11

From *Rand McNally 1997 Road Atlas* and estimated from *Carter-Burgess Report* data.



Note: Estimated travel time from a point five miles southeast of San Antonio station to the University of Texas in Austin

Figure 12

From *Rand McNally 1997 Road Atlas* and estimated from *Carter-Burgess Report* data.

Costs

Capital Costs: The Austin-San Antonio commuter rail project is projected to cost $475 million to build. At $4.3 million per mile, this is slightly above average for new commuter rail systems (above), but considerably below that of the most expensive system, in Dallas, which had costs nearly 60 percent higher ($6.8 million per mile). This indicates a potential for substantial cost escalation.

Underscoring the potential for cost overruns is the fact that cost projections in the early stages are often inaccurate – and invariably low. A recent National Academy of Sciences report confirms that underestimation of costs and overestimation of usage is a normal pattern for large infrastructure projects, such as commuter rail lines.[23] The report stated:

> *... cost overruns of 50 to 100 percent are common and that overruns of more than 100 percent are not uncommon...*

There are always detailed explanations for cost escalation – some are more valid than others. But in publicly financed projects the "bottom line" is the same – the cost of unreliable forecasts is paid by taxpayers, who as often as not have been led to believe that their bill would be considerably less. According to Dr. Charles Lave, Chair of the Economics Department at the University of California at Irvine, urban rail consultants can feel pressured to manipulate computer modes to produce favorable projections. He suggests that consultants should be required to post a bond to guarantee reasonableness of their projections.[24] The national and international experience with similar projects suggests that the final costs could be as much as $700 million to $950 million (above). Indeed, the potential for even higher costs is substantial. As planning proceeds, safety considerations could require construction of overpasses to remove some or all of the more than 100 at-grade crossings and could add up to $700 million in additional capital costs to the project.[25]

Operating Costs: The projected operating costs are $10.42 per railcar mile, which is approximately 20 percent below the average for new commuter rail systems, but above the most cost effective (Table 4). The operating cost estimate is likely to be low.

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23 Mette K. Skamris and Bent Flyvbjerg, "Accuracy of Traffic Forecasts and Cost Estimates on Large Transportation Projects," *Transportation Research Record* (Washington, D.C.: Transportation Research Board, National Research Council), 1996.

24 Charles A. Lave, "Playing the Rail Forecasting Game," *TR News*, September-October 1991.

25 Based upon the *Carter-Burgess Report's* estimate of $7 million per grade crossing.

TABLE 4
OPERATING COSTS PER RAILCAR MILE

Commuter Rail Line	Cost per Railcar Mile
Los Angeles	$13.07
Miami	$9.11
San Diego	$20.32
Washington	$9.96
Average	$13.11
Austin-San Antonio	$10.42

Costs per Passenger Mile: Using the data in the *Carter-Burgess Report*, it is estimated that the commuter rail line would cost $0.85 per passenger mile to build and another $0.59 per passenger mile to operate (1998$). This combined capital and operating cost of $1.44 per passenger mile is nearly double the average for new commuter rail lines (Figure 13 and Table 5).

TABLE 5
NEW COMMUTER RAIL SYSTEMS:
ESTIMATED OPERATING AND CAPITAL COSTS PER PASSENGER MILE: 1996

Urbanized Area	Operating Cost	Capital Cost	Operating & Capital Cost
Los Angeles	$0.29	$0.45	$0.74
Miami	$0.30	$0.32	$0.62
San Diego	$0.67	$0.42	$1.09
Washington	$0.20	$0.13	$0.33
Average	$0.37	$0.33	$0.70
Austin-San Antonio (2000)	$0.85	$0.59	$1.44

Calculated from U.S. Department of Transportation data and data from commuter rail agencies.

Annualized rail capital costs calculated by discounting system capital costs at seven percent over 40 years.

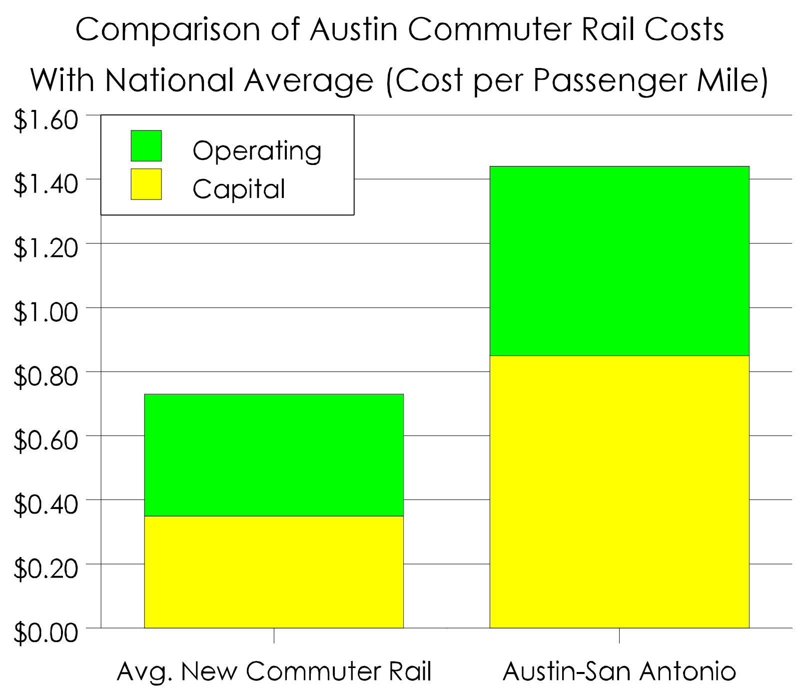

Figure 13
Calculated from *Carter-Burgess Report* data. Average data from Table 3.

Cost per New Trip: The cost per new trip would be $27.17 *each way*, or $12,200 annually for a daily commuter (Table 6).[26] This is more than enough to lease each new rider a luxury car, such as a Lincoln Town Car or BMW 740 ***in perpetuity***.[27] And, it is enough to lease each new rider *five* new economy cars, such as a Dodge or Plymouth Neon. Over a 40 year career, this would calculate to nearly 0.5 million dollars (Figure 14 and Table 6) for each new commuter.

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[26] Assumes 450 one-way trips (two per day, 225 work days).

[27] Based upon newspaper advertisements for new automobiles in the first quarter of 1999. Includes all costs of ownership, including down payment or capital reduction payment, monthly payment and seven percent sales tax.

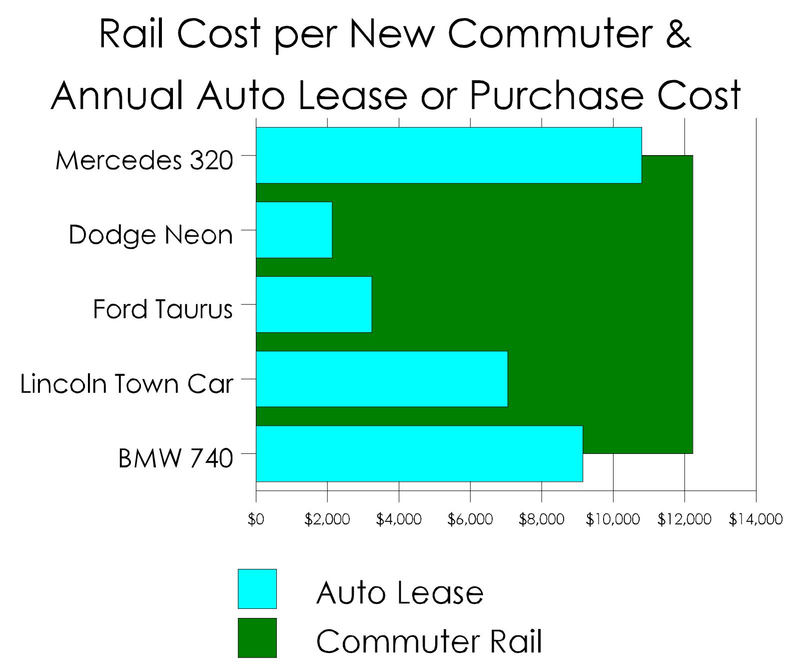

Figure 14
Calculated from *Carter-Burgess Report* data and new 1999 automobile newspaper advertisements.

Cost per Automobile Driver: Because the fundamental objective of the proposed commuter rail line is to alleviate highway traffic congestion, a complete analysis requires calculation of the cost required to attract an automobile driver (remove an automobile from the highway). As noted above, it is likely that no more than 70 percent of the commuter rail ridership will be former automobile drivers. As a result, the cost per automobile driver attracted will be higher than the cost per new transit trip. The cost per automobile driver attracted would be $38.82 *each way* or $17,500 annually for a daily commuter (Table 6).[28] Over a 40 year career, this would calculate to nearly $700,000.

This is a considerable amount of money. For example:

- $17,500 annually is equal to the annual mortgage payments on nearly six Habitat for Humanity houses. For the same price a Habitat for Humanity house could be built every two years (Figure 15).[29]

28 Assumes 450 one-way trips (two per day, 225 work days).

29 According to Habitat for Humanity of San Antonio, Inc., the average monthly mortgage for a Habitat house is $250 to $275. The cost of a Habitat house is $35,000. Data from Habitat for Humanity of San Antonio website. Internet: www.taylorent.com/hfhsa/index.com.

- $17,500 is 2.5 times the average annual household income of the lowest quintile (lowest 20 percent) nationally (Figure 16).[30]

- $17,500 is enough to lease a BMW 700 series luxury car and pay for round trip air fares for the recipient and four friends to visit the plant in Germany.

TABLE 6
COST PER NEW COMMUTER AND AUTOMOBILE DRIVER ATTRACTED

Cost per:	One-Way Trip	Annual	40 Year Career
New Passenger	$27.17	$12,228	$489,124
Automobile Driver	$38.82	$17,469	$698,748

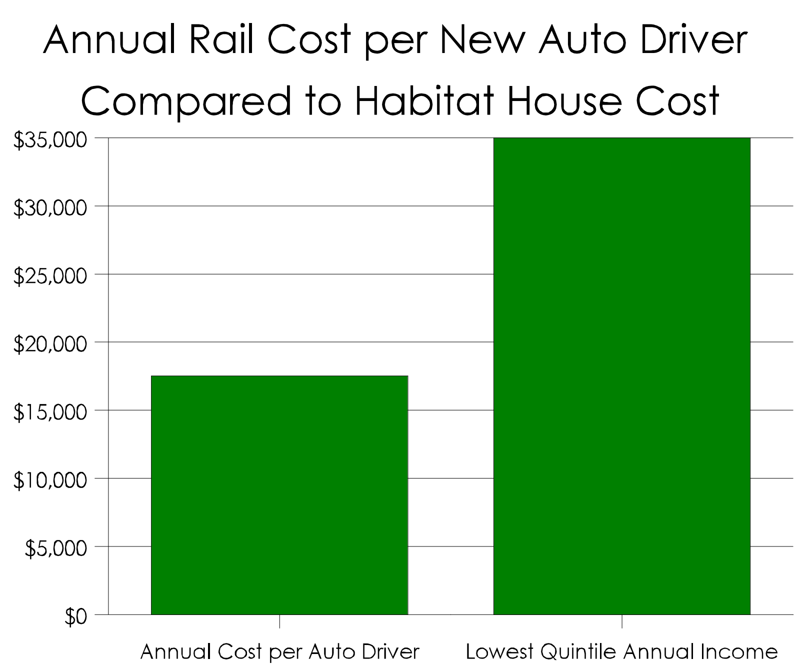

Figure 15
Calculated from *Carter-Burgess Report* and information from Habitat for Humanity of San Antonio.

[30] Household income data from U.S. Bureau of Labor Statistics (Consumer Expenditures series).

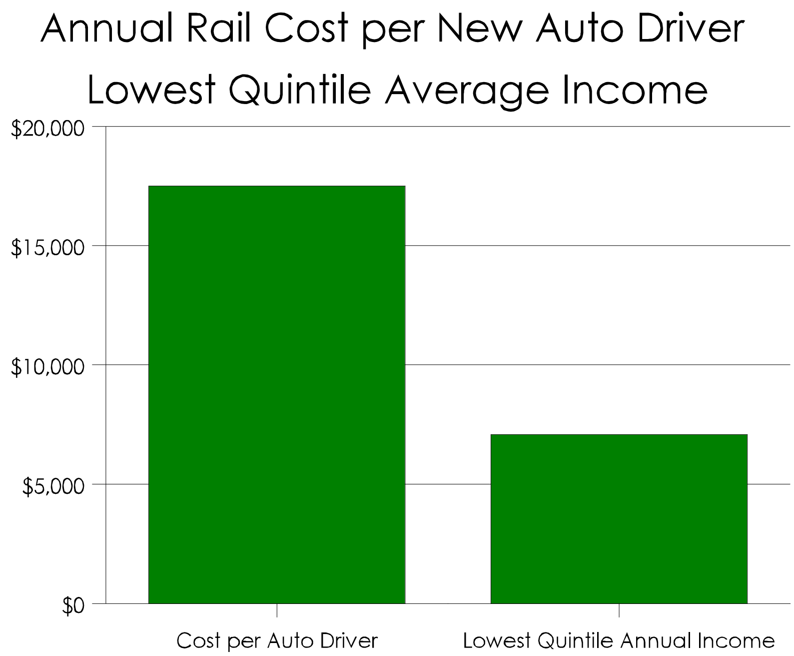

Figure 16
Calculated from *Carter-Burgess Report* and
U.S. Department of Labor data.

Revenues

Passenger fares are forecast in the *Feasibility Study* to amount to $14 million annually, which would cover 58 percent of the forecast operating cost and none of the forecast capital cost. A local taxing source equivalent to a 0.125 cent new sales tax would be required, assuming that all five counties through which the system operates choose to participate. If any county does not participate, a higher tax would be required in the remaining counties. Other funding is assumed from the federal government.

Other factors could drive the local tax much higher. If cost escalation similar to the international experience occurs (50 percent to 100 percent), the new sales tax would be two to three times as high (between 0.25 cents and 0.375 cents). If a large number of additional grade separations are required, the new local sales tax would need to be up to four times as high as the proposed 0.125 cents (up to 0.5 cents). If counties along the route choose not to participate, then the sales tax would be even higher. Under this scenario, it is doubtful that sufficient sales tax revenues could be obtained from the approving counties given that most communities are at or near their sales tax rate cap already.

Safety

The Austin-San Antonio commuter rail line would have approximately 120 grade crossings. As the March, 1999 Bourbonaise, Illinois crash demonstrates, grade crossings by highway traffic poses a serious risk to rail passengers. In that case a truck driver, apparently attempting to evade safety barriers, was hit by Amtrak's *City of New Orleans*, which was traveling at the same 79 miles per hour as is planned for the Austin-San Antonio commuter trains. The 11 fatalities in this crash all occurred in a single sleeping car that had a capacity of only 44 passengers.[31] The Austin-San Antonio commuter rail cars will have a capacity of 140 passengers, which would create the potential for a much greater loss of life than occurred in the Illinois accident.

Moreover, commuter rail is a comparatively unsafe form of transport. Among public transit modes, only light rail has a higher fatality rate. Commuter rail's fatality rate is nearly double that of the national urban street and highway rate (Figure 17), and 40 times that of U.S. airlines.

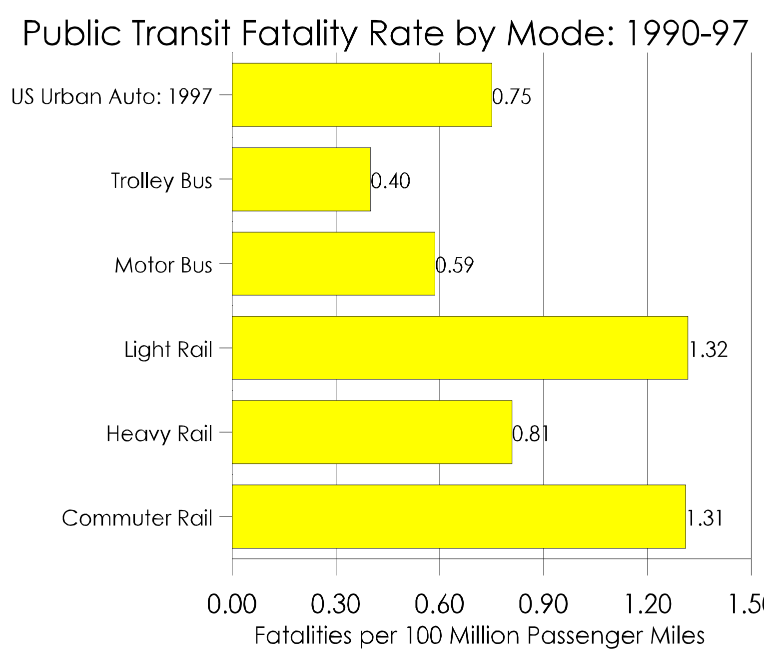

Figure 17
Calculated from U.S. Department of Transportation data.

Comparative Cost

31 "Amtrak on Hot Seat," *Chicago Sun Times*, March 17, 1999.

Even more so than other projects, the Austin-San Antonio commuter rail corridor is less cost effective than bus and highway alternatives.

Commuter Rail Compared to Bus: The Austin-San Antonio commuter rail line would be more expensive than a bus system providing service of the same characteristics. The cost per passenger mile of $1.44 (capital and operating) is more than four times the national bus benchmark and 10 times that of the most cost effective bus operator (Table A-5).

Commuter Rail Compared to Freeway Lane: According to the *Carter-Burgess Report*, a freeway lane could be added in each direction over the entire route for $425 million, $50 million less than building the commuter rail line. This relatively small cost differential becomes huge when converted to a cost per passenger mile (Figure 18 and Table 7). The capital and operating cost of the commuter rail line is more than seven times as much as the freeway lane (including the private costs of vehicle ownership and operation).[32] By comparison, other new commuter rail projects were much more cost effective, being only triple the per passenger mile cost of a new freeway lane in each direction. Most of the freeway cost involves the private cost of automobile operation. Taxpayer subsidies per passenger mile will be more than 50 times the government funding (highway user fees, including gasoline taxes) that would be required to build another feeway lane.

[32] The freeway lane cost per passenger mile is conservative. It assumes a 1997 average vehicles per lane mile of 12,000. Based upon current projections, a new freeway lane constructed today would exceed that volume by 2020 (traffic is forecast to increase 45 percent to 57 percent in the *Carter-Burgess Report*).

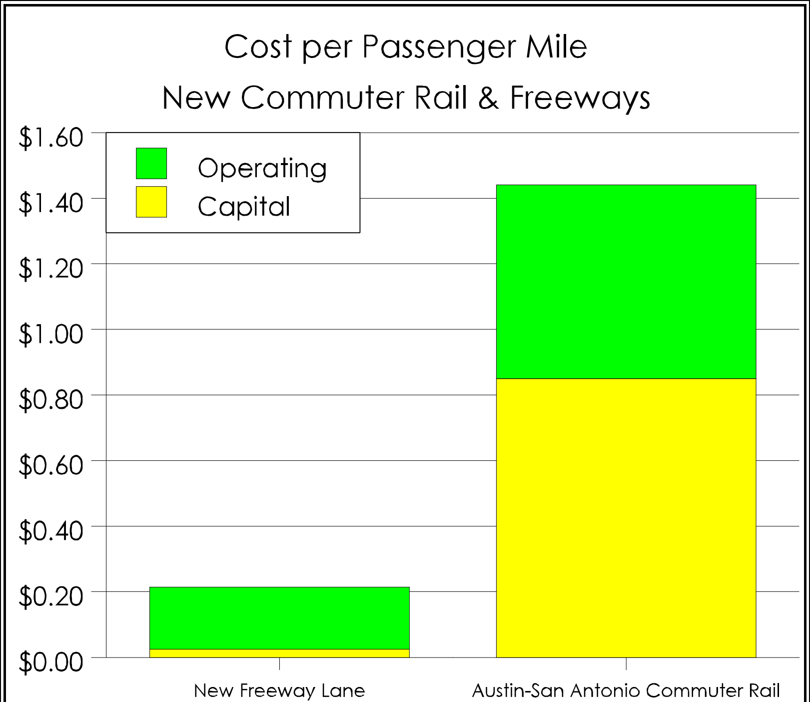

Figure 18
Calculated from U.S. Dept. of Transportation and Texas Department of Transportation data

TABLE 7
COMMUTER RAIL AND HIGHWAY LANE COSTS PER PASSENGER MILE

Type of Cost	Commuter Rail	Freeway Lane Couplet	
		Cost	Commuter Rail Cost Compared
Capital Cost	$0.850	$0.025	3,400%
Operating Cost	$0.591	$0.189	313
Total	$1.441	$0.214	673%

III. REALISTIC STRATEGIES FOR REDUCING TRAFFIC CONGESTION

For at least two decades, a primary purpose of U.S. public transit policy has been to attract people out of automobiles. In some urban areas there is a strong policy preoccupation with limiting the use of automobiles, and a key tactic in this strategy has been the development of commuter rail.

The currently popular "new urbanism" theories purport to offer ways to reduce automobile dependency, especially through higher population densities and rail transit. But to succeed in a material sense, new urbanist policies would need to be directed toward dismantling suburbs and forcing people to move into the central cities. Moreover, jobs would need to be relocated into the traditional downtown areas. Such a prescription is well beyond the political tolerance typical of modern democratic societies. "New urbanists" do not even seriously advocate the draconian policies that would be required to achieve their stated objectives. A more appropriate term might be the "new suburbanism." At most, new urbanist policies will produce small islands of somewhat higher density in a sea of low density suburbs. New urbanist policies could hasten the coming of a new suburbanization, and much more dispersed living patterns than exist today. They could hasten the next wave of suburbanism, bringing even less compact development beyond urban growth boundaries. More people are likely to choose to live outside the urban growth boundary, in smaller communities, which will gradually become larger. More businesses are likely to locate outside major urban areas. Residents inside urban growth boundaries will make longer journeys to shop at the new, larger retail establishments in exurban areas. The changes being brought by the information technology revolution (such as the Internet) already promise to make the urban centers less important.

People will not be forced out of their cars because the modern American urban area has developed around the personal mobility of the automobile. There are a number of strategies to reduce traffic congestion. All require accommodating the demand for personal mobility, rather than employing wishful thinking to restrict it.

Roadway Expansion

Despite rhetoric that suggests that roadway expansion is too expensive or infeasible, reasonable strategies are available.

- New highways can and should be constructed. Despite widely propogated myths to the contrary, it is possible to build additional road capacity to reduce traffic congestion. Houston and Phoenix have successfully *reduced* traffic congestion through sufficient expansion of their freeway systems, and are the only urbanized areas to have accomplished such a reduction between 1982 and 1996.[33] This does not require the return to the neighborhood-destroying highway construction that was associated with urban renewal in the 1950s and 1960s. For example, some European cities are building "metroroute" auto-only freeway tunnels to alleviate traffic congestion. For example, Paris, with the western world's most intensely developed urban rail system, will build 60 miles of under city tunnels to alleviate traffic congestion.[34] This represents a recognition that, despite exceedingly high costs, additional capacity must be provided for growing travel demand. Even higher would be the costs to the economy of allowing traffic congestion to become worse. In San Antonio and Houston, freeway capacity has been cost effectively expanded through double-decking, which is less expensive than tunneling. But over most of the Austin to San Antonio corridor, no such alternatives are necessary. The current Interstate 35 right-of-way is sufficiently wide to allow construction of additional lanes to meet demand for decades to come. In this respect the *Carter Burgess* report is unnecessarily alarmist in its assertion that *future expansion of the highway network in this corridor will be unable to keep up with the anticipated growth.* Future expansion will be unable to keep up with anticipated growth only if it is not undertaken. This is not to suggest that the traffic growth within the highly urbanized portions of Austin and San Antonio can be accomodated so inexpensively as between the two cities. But these are problems *within* the two urban areas, and cannot not be alleviated by a commuter rail system *between* them.

- Traffic bottlenecks should be removed. For example, in some cities the number of through lanes is substantially reduced through freeway interchanges. The result is traffic congestion, which could be alleviated by the addition of relatively short lane sections. In Milwaukee, the addition of a freeway lane in each direction for three miles would eliminate a serious capacity problem anticipated on the entire Interstate 94 corridor in 2010.[35]

- High occupancy toll lanes (HOT lanes) can reduce congestion in general purpose lanes. The Route 91 high occupancy toll lane in the Los Angeles

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33 Texas Transportation Institute.

34 Christian Gerondeau, *Transport in Europe* (Boston, MA: Artech House, Inc.), 1997.

35 Wendell Cox, *Light Rail in Milwaukee* (Milwaukee: Wisconsin Policy Research Institute), 1998.

area has reduced the period of peak congestion by an hour in each direction daily. Each day, nearly 40,000 people travel on the Route 91 HOT lane, 25 times the 1,700 carried on the nearby commuter rail line (Figure 19).

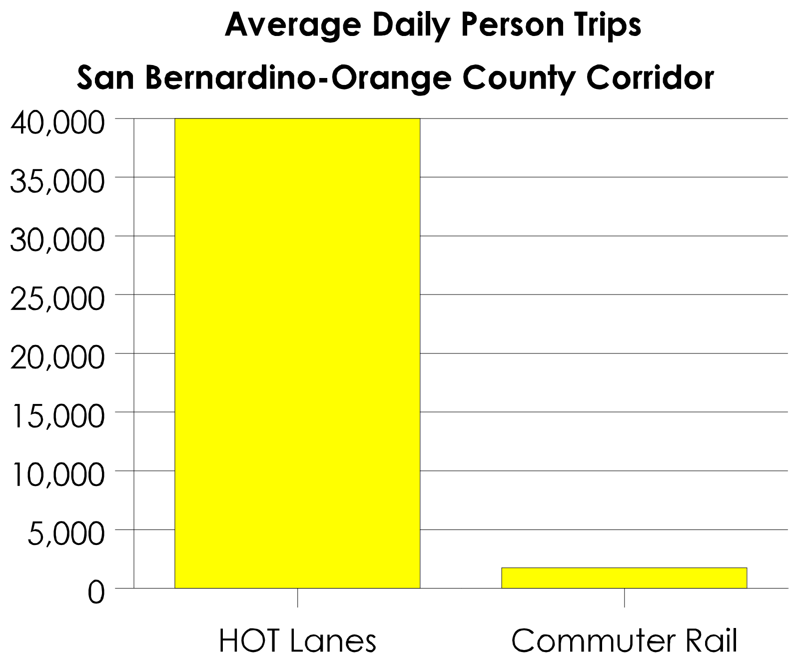

Figure 19
Calculated from U.S. Department of Transportation and General Accounting Office data.

- High occupancy vehicle lanes (HOV lanes) carry significantly higher volumes than new commuter rail systems. In the Washington, D.C. area, the Shirley highway HOV lane carries nearly 51,000 daily person trips *during peak hours*, more than eight times the *all day* volume of the new commuter rail line, which operates in the same corridor (Figure 20). This facility improves automobile travel times in each direction by more than one-half hour.[36] In Los Angeles, the El Monte Busway-HOV lane carries 40,000 daily person trips, more than five times the volume of the San Bernardino commuter rail line, which is the most productive of the new Los Angeles commuter rail lines.[37]

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[36] Highway data from Metropolitan Washington Council of Governments, *1997 Performance of Regional High-Occupancy Vehicle Facilities on Interstate Highways in the Washington Region,* 1998.

[37] Jonathan E. D. Richmond, *New Rail Transit Investments - A Review* (Cambridge: Harvard University John F. Kennedy School of Government), 1998.

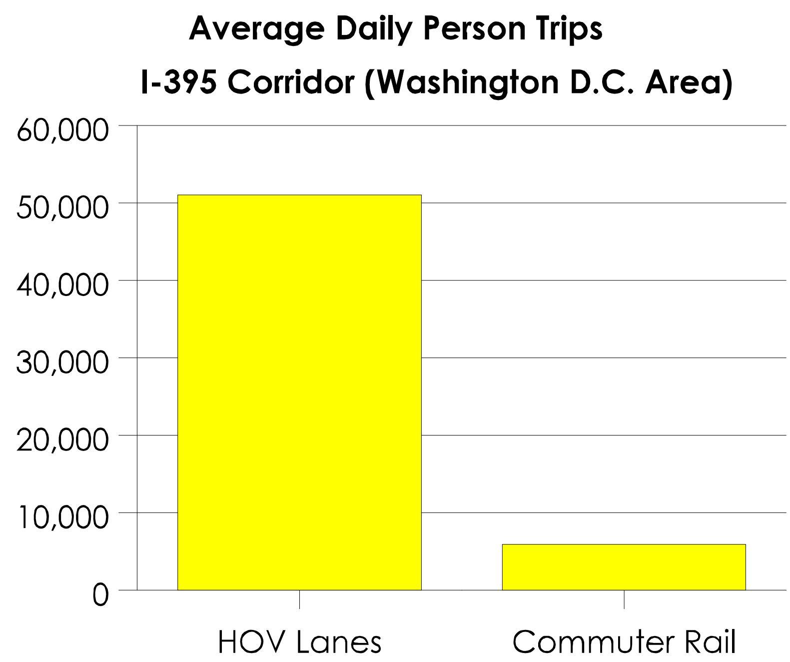

Figure 20
Calculated from U.S. Department of Transportation and General Accounting Office data.

IV. Technological Progress and Changing Demand

Further, technological and changing demand are likely to significantly reduce the demand for road space in the longer term future (10 to 20 years).

Intelligent Transportation Systems: Greater use of computer technologies, through intelligent transportation systems (ITS), is expected to improve traffic congestion without major system expansion.

- Improved traffic signalization is already improving travel times in some corridors.
- On-board navigation systems are already assisting automobile drivers in identifying less congested alternative routes and thereby improving average travel speeds in urban areas.
- The automated highway will bring interactive speed control, with computers controlling steering and braking on congested urban freeways. It is expected that roadway capacities could be more than doubled by

this technology. Japan plans to have an automated highway in operation in a decade.[38]

- In the more distant future, "autonomous automobiles" would combine the features of both the automated highway and navigation systems. Autonomous automobiles would rely on geo-positioning systems capable of guiding automobiles within tolerances measured in inches. The autonomous automobile will be capable of quickly transporting its passengers to virtually any destination on the road network (freeways to local streets), improving roadway capacity, average speeds and safety. It is possible that technology will eventually deliver highway based systems that combine the personal mobility advantages of the automobile with the theoretical advantages of mass transit.

Transportation Demand: As the information technology revolution continues, expanded use of the Internet, personal computers, mobile telephones and other communications technologies are already moderating travel demand.

- Some companies are "hoteling," a strategy by which employees who spend considerable time outside the office are assigned temporary instead of permanent offices.

- Telecommuting is increasing, and it is likely to increase even more in the future. From 1995 to 1997 telecommuting increased nearly 30 percent.[39] In 1990 it was projected that telecommuting will remove between 50 billion and 150 billion passenger miles nationally from roadways by the year 2000.[40] By 1997 there were indications that the lower projection for 2000 had already been achieved.[41] It would thus appear that telecommuting has already removed as much as 25 percent more passenger miles than are carried by all public transit bus, light rail, heavy rail and commuter rail services combined (approximately 50 billion annually).

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38 Internet: *ITS Online* http://www.itsonline.com/nahsc1.html.

39 "U.S. Telecommuting Trend Surpasses 11 Million: Strong Economy, Internet Spur Growth," Emerging Technologies Research Group, Internet: http://etrg.findsvp.com/prls/pr97/telecomm.html.

40 "Telecommuting Forecasts Released," Telecommuting Research Institute (Los Angeles), 1990. By 1997, the year 2000 forecast of total telecommuters had been exceeded.

41 The Emerging Technologies Research Group Internet report noted above indicated that the number of telecommuters in 1997 exceeded the projection for 2000 made in 1990.

- Telecommuting is likely to be expanded by the establishment of "telework" centers that allow employees to commute shorter distances and be connected by computer to offices that are farther away.

- Telecommuting is also likely to be expanded to the extent that new urbanist land use policies are successfully implemented. As urbanized areas are constricted in their physical growth, traffic congestion will increase substantially, creating incentives to avoid the work trip altogether and convert to telecommuting. Moreover, as people continue to express their preferences for less dense housing patterns, much more rapid development of larger lots is likely to take place outside bureaucratically delineated urban growth boundaries, which will also increase telecommuting.[42]

Criteria

In considering future transportation projects, transportation agencies and officials should rely on three criteria suggested by U.S. House of Representatives Majority Whip Tom DeLay.[43] These criteria were suggested with respect to urban rail, but are appropriate for any major transportation improvement, including commuter rail and highways (Table 8).

> ***Whether we build rail should depend upon three criteria.***
>
> - ***The first has to do with reducing traffic congestion. Rail's success is not demonstrated by the number of people on the train, rather it is demonstrated by how many cars it takes off the road. The number must be material.***
>
> - ***The second test is financial -- that whatever rail accomplishes, it should do so for less than any other alternative.***
>
> - ***And the third criteria is just as important -- that the alternative finally selected must be the result of objective and rigorous planning and studies, whose design and processes are not skewed for or against***

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42 Sir Peter Hall's *Cities in Civilization* describes the resistance of Stockholm area residents to planning dictates that required higher housing densities. In recent years, most new housing has been single family detached (New York: Pantheon, 1998).

43 A member of the Transportation Appropriations Subcommittee.

any alternatives.[44]

TABLE 8 DELAY MAJOR TRANSPORTATION IMPROVEMENT PRINCIPLES EVALUATION CRITERIA	
No.	**Criteria**
1	EFFECTIVENESS: The proposed project must materially reduce traffic congestion during peak hours.
2	COST EFFICIENCY: The proposed project must be the most cost effective strategy for achieving the traffic congestion reduction.
3	OBJECTIVITY: The planning process must have included an objective analysis of all reasonable alternatives.

V. 2000, 2020 AND 1984

The practical policy question facing transportation decision makers is whether the traffic growth that will unavoidably occur will be accomodated gracefully. The demand for additional road space can no more be accomodated by building commuter rail than the demand for housing can be accomodated by erecting dormitories – they do not provide people what they want or where they want it. Where sufficient road capacity is not provided, traffic congestion will worsen, which impacts not only personal mobility, but also freight movements. In the longer term, economic development will begin to bypass such areas. Communities that provide sufficient highway capacity will have an advantage in economic development and their residents will face less traffic congestion.

The nation's new commuter rail systems have had virtually no impact on adjacent roadway traffic volumes. The traffic problems facing Los Angeles, San Diego, Miami-Fort Lauderdale-West Palm Beach and Washington, D.C. are worse today than before commuter rail opened. New commuter rail passenger volumes pale by comparison to that of single freeway lanes. Intercity rail as a commuter rail strategy has been even less effective. The new commuter rail systems developed up to this time do not represent a practical alternative to highway investment, because they cannot attract meaningful numbers of automobile drivers.

[44] "Look at the data before climbing aboard light rail," by Representative Tom DeLay (U.S. House of Representatives Majority Whip), op-ed in the *Houston Chronicle*, June 21, 1998. Highlighting not in original.

The proposed Austin-San Antonio corridor projections generally suggest performance even less significant than the national experience with new commuter rail. Despite ridership projections that appear to be reasonable:

- The commuter rail line will not relieve traffic congestion, because the projected ridership is insignificant in the context of travel demand in the corridor.

- The commuter rail line is likely to cost more than forecast.

- The commuter rail line is exceedingly expensive compared to alternatives.

- Because costs are likely to be higher than anticipated, a higher sales tax is likely.

- There are potential safety concerns.

Nonetheless, local officials may be positioning themselves to recommend the project. According to the Capital Area Metropolitan Transportation Planning Organization:

> *The Austin-San Antonio Carter-Burgess Report ... concluded that passenger rail on the existing Union Pacific (UP) line that parallels IH 35 between Georgetown and San Antonio is both technically and financially feasible. Passenger rail service on the UP line would offer an alternative to the automobile for intercity travel in the congested and fast-growing IH 35 corridor.*[45]

The data in the *Carter-Burgess Report* indicates that the Austin-San Antonio commuter rail line would reduce 2000 automobile use by 0.5 percent in Austin 0.4 percent in San Antonio and 1.1 percent in mid-corridor (New Braunfels), where travel demand is the lowest.[46] These numbers would be *lower* in 2020. As a result, any inference based upon the *Feasibility Study* that the Austin-San Antonio commuter rail project could play a material role in the corridor would be a serious overstatement, recalling the "doublespeak" of Orwell's *1984,* which declared:

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[45] Internet: http://www.ci.austin.tx.us/ats/railstudy.htm.

[46] It is reiterated that the projections described were developed for the project by consultants to the Texas Department of Transportation. This report has not criticized these projections, indeed it considers the projections reasonable. The problem is that the projections are also insignificant in relation to the travel demand in the corridor. Further, the commuter rail demand is compared herein only to the travel demand on Interstate 35. The diversion from roadways would be an even smaller percentage if compared to the demand on Interstate 35, State Route 1 and surface arterials in Austin.

WAR IS PEACE
FREEDOM IS SLAVERY
IGNORANCE IS KNOWLEDGE[47]

Adopting the Austin-San Antonio commuter rail project as a strategy for dealing with travel demand would be an "Orwellian" declaration by local officials that:

MINUSCULE IS SIGNIFICANT.

[47] George Orwell, *1984* (New York: Penguin Putnam), 1950.

APPENDIX I: THE NATIONAL EXPERIENCE WITH NEW COMMUTER RAIL

AI-I. COMMUTER RAIL: BACKGROUND

Urban areas around the nation are grappling with the related problems of traffic congestion and traffic generated air pollution. In major U.S. metropolitan areas, traffic congestion increased 25 percent from 1982 to 1996.[48] In sharp contrast to rising traffic congestion, significant progress has been made in reducing air pollution, largely due to improved vehicle emission technology.

A number of urban areas have built or are considering commuter rail systems as a strategy to attract automobile drivers and thereby to reduce traffic congestion. As such, commuter rail is considered to be an alternative to investment in highways.[49]

Often arguments for public initiatives rely on numbers that are present without context, such as ridership figures for transit projects. But to be meaningful, numbers require context. The citing of an apparently large number tells nothing of its significance. For example, billions of nanoseconds[50] have elapsed since the reader began reading this sentence, but in the context of an hour or even a minute this large number is insignificant. On the other hand, one century is very significant in the context of the average life time. Similarly, the fact that 375,000 persons daily ride New York's commuter trains is not significant in itself. It becomes significant only when compared to another number, such as the number of jobs in the New York central business district. That 5,000 passengers daily may ride a commuter rail line will be insignificant in an area where there are millions of daily trips or where adjacent freeway volumes are measured in the hundreds of thousands.

As a result, this report relies primarily on numbers cited in context. Two types of

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48 Calculated from Texas Transportation Institute (Texas A & M University) Roadway Congestion Index data (United States Department of Transportation Federal Highway Administration supported project).

49 The author is often labeled as "anti-rail" by rail proponents. In fact, when a member of the Los Angeles County Transportation Commission, Wendell Cox authored the amendment that dedicated 35 percent of transit sales tax receipts to building rail (1980), in the hope of reducing traffic congestion. This measure provided the local funding for three rail lines on which construction was begun in the 1980s. As new urban rail systems were opened in the 1980s and 1990s, it has become clear that their traffic impact has been minimal. The author operates from the assumption that traffic congestion is a serious problem and that the resources available for alleviation are limited. Mis-allocation of resources to ineffective strategies, as urban rail systems have proven to be, has the effect of worsening traffic congestion. The author would be eager to endorse any rail program that cost effectively and materially reduced traffic congestion or its growth.

50 A nanosecond is one-billionth of a second.

measures are generally considered:

- Ridership, which is converted into measures such as ridership per downtown oriented corridor or ridership per mile and compared to similar measures for other modes of transport (such as buses or highways) and measures of congestion; and,

- Costs, which are converted into measures such as costs per passenger, cost per passenger mile and compared to the same cost measures for other modes of transport.

Commuter rail operates over freight railroad rights-of-way to downtown railroad stations. Trains are up to 10 cars long or more, and may be "double-decked." Examples of commuter rail systems include Chicago (Metra), New York (Long Island Railroad, Metro-North Railroad and New Jersey Transit) and Philadelphia. Commuter rail has a significant cost advantage over other urban rail alternatives (such as light rail and heavy rail) and can be implemented more quickly. Commuter rail tends to cost under $5 million per mile. By comparison, light rail systems, such as in Dallas, can cost up to $50 million per mile and heavy rail (full grade separated systems such as the New York subway system or Washington's Metro) can cost more than $300 million per mile. The principal reason for the lower costs of light rail is that systems are not grade separated. Commuter rail is also different from the "high speed" rail systems that have been built in Europe and Japan, and which operate at 130 to 200 miles per hour on double-tracked exclusive,[51] grade separated rail rights-of-way.

Augmentation of existing intercity (Amtrak) service is a less expensive strategy for implementing commuter rail, because service improvements generally involve more modest right-of-way upgrades.

Commuter rail is used to carry passengers to the nation's largest downtown (central business district, or "CBD") areas[52] (Table A-1).

- **Historic Systems**: There is a long history of commuter rail service in six metropolitan areas (New York, Chicago, Boston, Philadelphia, San Francisco and Washington-Baltimore).

- **New Systems**: In recent years, five other metropolitan areas have built

[51] High speed passenger rail only.

[52] Ridership per downtown oriented corridor is used because most commuter rail ridership is to or from downtown areas.

commuter rail lines. Los Angeles has built a six line regional system. Washington has built a two line system, while San Diego, Dallas-Fort Worth and Miami-Fort Lauderdale-West Palm Beach have built single lines.

Historic Systems

Nearly 97 percent of the nation's commuter rail ridership is on the historical systems (Figure A-21). Five of the metropolitan areas have multi-route systems, while San Francisco has a single route. Ridership per downtown oriented corridor ranges from 3,900 daily in Washington-Baltimore to nearly 27,000 in San Francisco and New York.

TABLE A-1
CHARACTERISTICS OF U.S. COMMUTER RAIL SYSTEMS
2ND QUARTER 1998

CENTRAL BUSINESS DISTRICT	Ridership	Downtown Oriented Corridors	Average per Downtown Oriented Corridor	Ridership % of National	CBD Employment	CBD Rank
HISTORICAL SYSTEMS						
New York	750,200	28	26,793	55.9%	1,733,000	1
Chicago	289,700	12	24,142	21.5%	336,000	2
Boston	118,900	13	9,146	8.8%	148,000	7
Philadelphia	93,900	13	7,223	7.0%	248,000	5
San Francisco	26,900	1	26,900	2.0%	184,000	6
Washington-Baltimore	19,400	5	3,880	1.4%	452,000	3 & 11
Subtotal	1,299,000	72	18,042	96.6%	3,101,000	
NEW SYSTEMS						
Los Angeles	26,300	5	5,260	2.0%	288,000	4
Miami- Fort Lauderdale	8,300	3	2,767	0.6%	75,000	35 & 43
Washington	5,900	2	2,950	0.4%	324,000	3
San Diego	3,900	1	3,900	0.3%	48,000	32
Dallas	1,900	1	1,900	0.1%	112,000	14
Subtotal	46,300	12	3,858	3.4%	806,000	
ALL SYSTEMS						
Totals	1,345,300	84	16,015	100.0%	3,907,000	
Calculated from American Public Transit Association and U.S. Census Bureau data.						

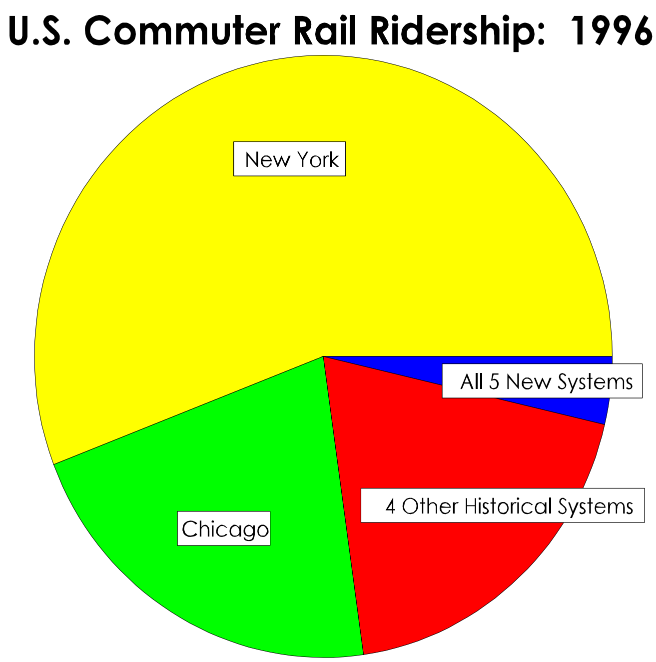

Figure A-21
Calculated from American Public Transit Association data.

Most commuter rail ridership involves work trips to and from downtown. In the four largest commuter rail metropolitan areas (Boston, Chicago, New York and Philadelphia), commuter rail's downtown market share ranges from 9.4 percent to 24.7 percent of total employment. Commuter rail carries a much smaller share of commuters to outside downtown locations, ranging from 0.8 percent to 1.6 percent in the four metropolitan areas (Figure A-22).[53]

53 All journey to work data is from the 1990 Census. Later data will not be available until after release of 2000 Census data.

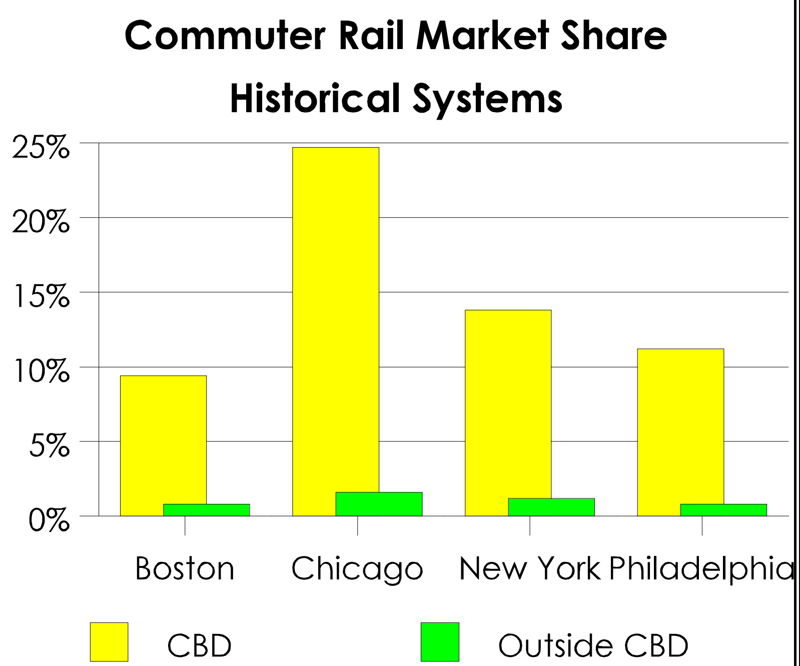

Figure A-22
Calculated from U.S. Census Bureau data.

New York: New York has 56 percent of the nation's highest commuter rail ridership, carrying 750,000 passengers per day (375,000 riders each way). New York also has by far the nation's largest downtown area (which includes both "downtown or lower Manhattan" and "midtown Manhattan") with 1,733,000 jobs. It is at least five times larger than the next largest downtown (Chicago). In New York, the central business district accounts for 18.5 percent of metropolitan employment. Commuter rail's central business district work trip market share is 13.8 percent. Approximately 73 percent of New York commuter rail work trips are to or from the central business district. Outside the central business district, the commuter rail work trip market share is 1.2 percent. By comparison, the area outside the central business district – sprawling over an area 1.5 times larger than the state of Delaware – attracts only 27 percent of commuter rail work trips. In New York's central business district, there are approximately 25,000 workers per square mile who use commuter rail. Outside downtown, the number is barely 30 per square mile. Despite its substantial passenger volumes, fares represent approximately half of commuter rail operating costs (excluding capital costs).

Chicago: Chicago carries 22 percent of the nation's commuter rail ridership: 336,000 daily (168,000 riders each way). Chicago has the nation's second largest downtown area, and the highest downtown commuter rail work trip market share, at 24.7 percent. However, more than 90 percent of Chicago area employees work outside downtown, in an area that sprawls over 1,500 square miles. Commuter rail's work trip market share is 1.6 percent outside downtown. Passenger fares represent approximately half of commuter rail operating costs (excluding capital costs).

Boston: Boston carries nine percent of the nation's commuter rail riders, at 119,000 daily (59,500 riders each way). Boston has the nation's seventh largest downtown area, with 148,000 employees. Commuter rail's downtown work trip market share is 9.4 percent. Outside downtown, commuter rail's work trip market share is 0.8 percent. Because the transit agency also operates other modes (bus and rail), commuter rail fare information is not available.[54]

Philadelphia: Philadelphia carries seven percent of the nation's commuter rail riders, at 94,000 daily (47,000 riders each way). Philadelphia has the nation's fifth largest downtown area, with 248,000 employees. Commuter rail's downtown work trip market share is 11.2 percent. Outside downtown, commuter rail's work trip market share is 0.8 percent. Because the transit agency also operates other modes, commuter rail fare information is not available.

Historic Commuter Rail and Suburban Employment Centers: Even in large suburban employment centers that have frequent commuter rail service, work trip market share is very small – 0.9 percent in White Plains (New York area) and 0.5 percent in downtown San Jose (San Francisco area). In the San Francisco International Airport area fewer than 200 of 47,000 workers use commuter rail (0.4 percent), despite a high level of commuter rail service.

AI-II. NEW COMMUTER RAIL IN AMERICA

Approximately 3.4 percent of the nation's commuter rail ridership is on the newer systems. Ridership per downtown oriented corridor ranges from 1,900 daily in Dallas to 4,400 in Los Angeles.

[54] The National Transit Database does not require reporting of fare revenue by mode (for example bus, light rail, heavy rail and commuter rail).

Los Angeles: Los Angeles has upgraded existing freight rail rights-of-way to develop by far the nation's most comprehensive new commuter rail system.[55]

- The system has six routes and 45 stations and extends for 415 miles and cost more than $1.2 billion.

- Ridership is 26,300 daily (13,150 riders each way).
- Overall ridership is 5,260 per downtown oriented corridor.

- Four of the downtown oriented routes carry from 3,000 to 5,000 passengers daily (1,500 to 2,500 riders each way). **On these routes, the one way *daily* ridership is less than a single freeway lane's *one-hour* capacity.** The San Bernardino route carries approximately 7,500 daily (3,750 riders each way), approximately 1.5 hours capacity of a single freeway lane. The San Bernardino route had the most bus service before commuter rail was established.

- The sixth route, the San Bernardino to Orange County line, is the nation's first new suburb-to-suburb commuter rail route. It also has the lowest ridership of any new commuter rail route, fewer than 1,750 daily passengers (875 riders each way). This *daily* ridership is less than one-third of the *hourly* capacity of a freeway lane.

- The operating speed averages 41.5 miles per hour,[56] which is higher than the average Los Angeles peak hour freeway speed (35 miles per hour). For most trips, however, this speed advantage is nullified by the time required to transfer to a downtown shuttle bus and travel to the final destination. Further, travel by express bus can be as fast as commuter rail.[57]

- It is estimated that 70 percent of commuter rail riders formerly drove automobiles.[58]

- Nonetheless, it is estimated that commuter rail removes only 0.9 percent of

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[55] Los Angeles has also built separate light rail and subway systems.

[56] Average peak hour speed information from the Texas Transportation Institute Roadway Congestion Index data.

[57] For example, an express bus trip from Montclair, in the San Bernardino commuter rail corridor, is faster to the downtown financial center.

[58] Southern California Commuter Rail Authority Internet site: www.metrolinktrains.com.

traffic from adjacent freeways.[59]

- The cost per passenger mile is $0.74, and fares cover 16 percent of operating and capital costs. Non-user tax subsidies are more than 80 percent.

- Los Angeles has the nation's fourth largest downtown, with 288,000 jobs. Downtown represents approximately four percent of metropolitan area employment. Although approximately 70 percent of the commuter rail ridership is to and from downtown Los Angeles, this represents less than 10,000 daily commuters.[60]

- Approximately 0.4 percent of the locations within the served urbanized areas is within walking distance of a commuter rail station.[61]

- The daily ridership on all six Los Angeles commuter lines combined is less than that of San Francisco's single line and less than the average single line in New York.

- Current automobile traffic growth rates every *five weeks* exceed what commuter rail carries in a year.[62]

- The average Los Angeles freeway lane carries 40 times the daily volume per mile as the commuter rail system (Figure A-23). An eight lane freeway carries *160 times* as many persons daily as a commuter rail line in Los Angeles.[63]

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[59] Calculated from Caltrans freeway volume data.

[60] Southern California Commuter Rail Authority Internet site: www.metrolinktrains.com.

[61] The served urbanized areas include Los Angeles, Riverside-San Bernardino, Oxnard-Ventura and Lancaster-Palmdale. Figure calculated from U.S. Census Bureau and *Jane's Urban Transport Systems* data.

[62] Analysis of traffic growth from 1990 to 1996, using Federal Highway Administration data.

[63] Calculated from U.S. Department of Transportation data for 1996. Assumes the national vehicle occupancy rate of 1.6 and the local average daily volume per freeway lane.

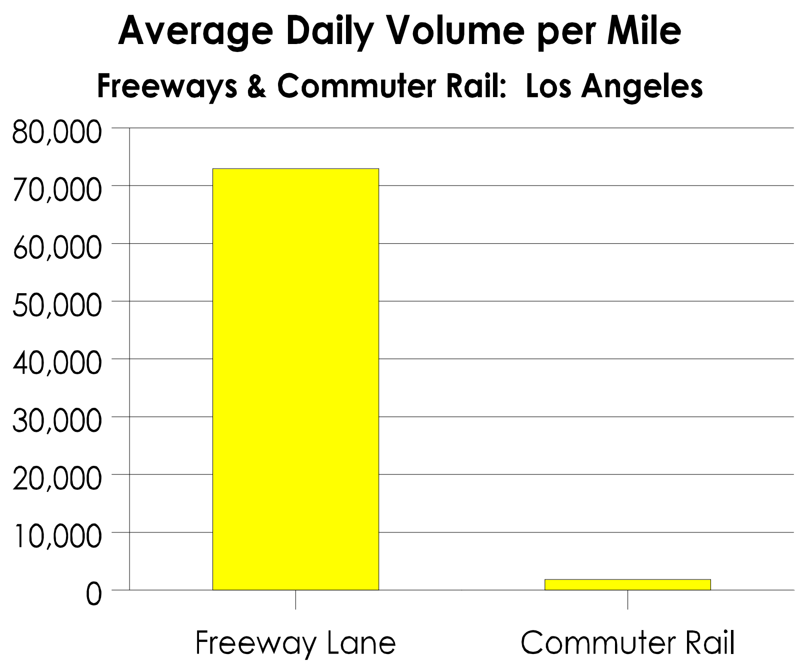

Figure A-23
Calculated from U.S. Department of Transportation data.

Washington: A new commuter rail line with two legs has been developed from the Virginia suburbs into Washington, D.C.[64]

- The 96 mile, 18 station route was developed at a cost of $131 million.

- Ridership is 5,900 daily (2,950 riders each way).

- Daily ridership per downtown oriented corridor is 2,950, or 1,475 riders each way. *Daily* ridership is less than half the capacity of a single freeway lane per *hour*.

- Average speed is 34.5 miles per hour, less than the Washington peak hour freeway average of 39 miles per hour.

- The cost per passenger mile is $0.33, and fares cover 49 percent of operating and capital costs. This is the highest fare recovery ratio of any new commuter rail system for which data is available. Non-user tax subsidies are approximately 50 percent.

- The system primarily serves Washington's downtown area (including the

[64] Washington has also built a new subway system ("Metro").

federal employment center), which is the nation's third largest, with 324,000 jobs. Downtown represents 13.7 percent of metropolitan employment.

- Approximately 0.9 percent of the locations within the served urbanized area is within walking distance of a commuter rail station.[65]

- Current automobile traffic growth rates every *two weeks* exceed what commuter rail carries in a year.

- The average Washington freeway lane carries 19 times the daily volume per mile as the commuter rail system (Figure A-24). An eight lane freeway carries 76 times as many persons daily as a commuter rail line in Washington.[66]

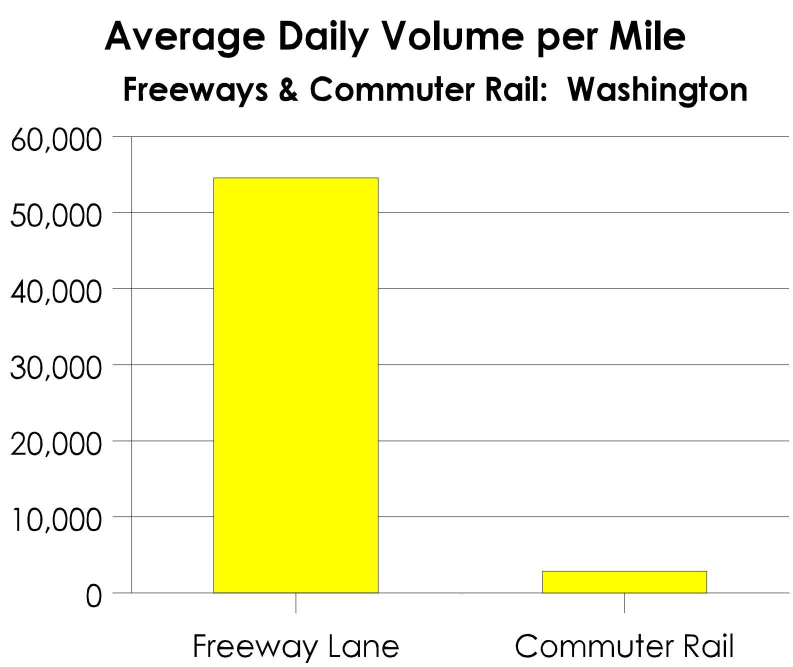

Figure A-24
Calculated from U.S. Department of Transportation data.

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65 The served urbanized areas includes the Virginia and District of Columbia portions of the Washington urbanized area.

66 Calculated from U.S. Department of Transportation data for 1996. Assumes the national vehicle occupancy rate of 1.6 and the local average daily traffic volume per freeway lane.

Miami-Fort Lauderdale-West Palm Beach: A new commuter rail line was developed from Miami to Fort Lauderdale and West Palm Beach in the late 1980s.[67] The route was built to alleviate traffic congestion during the reconstruction of Interstate 95 and was to continue operation only if ridership had reached 14,000 per day. The ridership target was not reached, yet service continued.

- The 64 mile, 15 station line was developed for approximately $325 million.
- Ridership is 8,300 daily (4,150 riders each way).
- Daily ridership per downtown oriented corridor is 2,800, or 1,400 riders each way. *Daily* ridership is less than half the capacity of a single freeway lane per *hour*.[68]
- It is estimated that the line has attracted approximately 1.1 percent of traffic from the adjacent highways (Interstate 95 and the Florida Turnpike).[69]
- The operating speed is 41 miles per hour, which compares to an area peak hour freeway speed average of 43 miles per hour.
- The cost per passenger mile is $0.62, and fares cover 13 percent of operating and capital costs, the lowest of any new commuter rail system for which data is available. Non-user tax subsidies pay approximately 85 percent of costs.
- Miami has the nation's 35th largest downtown, with 41,000 jobs, while Fort Lauderdale's ranks 43rd with 34,000 jobs. The downtown areas represent 1.6 percent of Miami-Fort Lauderdale metropolitan employment.
- Approximately 0.4 percent of the locations within the served urbanized area is within walking distance of a commuter rail station.[70]

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[67] Miami as also built a new heavy rail system.

[68] Three downtown oriented corridors are served by this single line. These include service from the north to downtown Miami (by means of a connection by that city's heavy rail system) and from the north and south to downtown Fort Lauderdale.

[69] Calculated from Florida Department of Transportation freeway traffic volume data. Assumes 70 percent of commuter rail riders previously drove automobiles for the trip.

[70] The served urbanized areas include Miami, Fort Lauderdale and West Palm Beach.

- Current automobile traffic growth rates every *three weeks* exceed what commuter rail carries in a year.

- The average Miami freeway lane carries 12 times the daily volume per mile as the commuter rail system (Figure A-25). An eight lane freeway carries 48 times as many persons daily as a commuter rail line in Miami.[71]

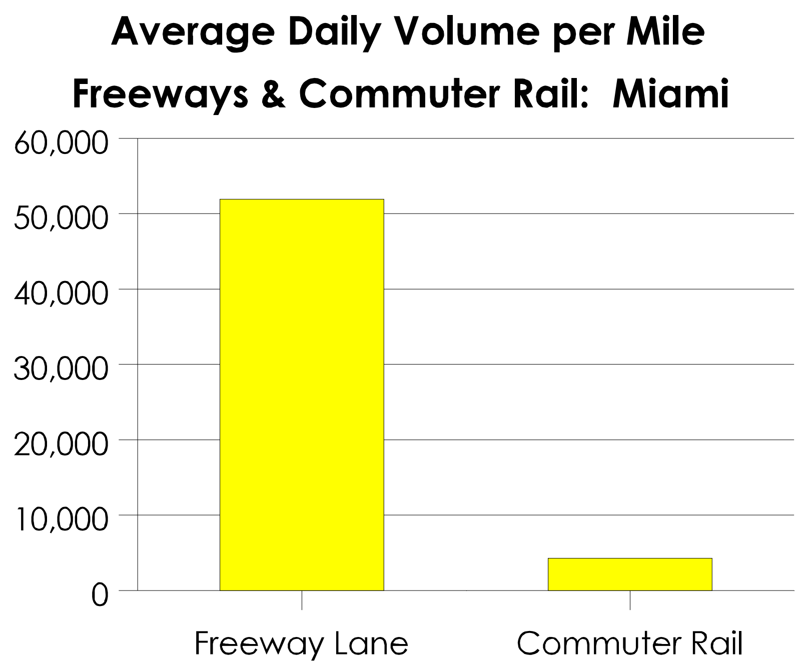

Figure A-25
Calculated from U.S. Department of Transportation data.

San Diego: A commuter rail line has been developed from Oceanside to downtown San Diego.[72]

- The 43 mile, nine station line was developed for $125 million.

- Ridership is 3,900 daily (1,950 riders each way).

- Daily ridership per downtown oriented corridor is 3,900, or 1,950 riders each way. *Daily* ridership is less than half the capacity of a single freeway lane

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[71] Calculated from U.S. Department of Transportation data for 1996. Assumes the national vehicle occupancy rate of 1.6 and the local average daily traffic volume per freeway lane.

[72] San Diego has also built a new light rail system.

per *hour*.

- It is estimated that commuter rail removes approximately 0.6 percent of traffic from the adjacent freeway (Interstate 5).[73]

- The operating speed is 42 miles per hour. This compares to the San Diego peak hour average freeway speed of 42 miles per hour.

- The cost per passenger mile is $1.09. Fare information is unavailable.[74]

- San Diego has the nation's 32nd largest downtown, with 48,000 jobs. Downtown represents approximately four percent of metropolitan area employment.

- Approximately 0.3 percent of the locations within the served urbanized area is within walking distance of a commuter rail station.[75]

- Current automobile traffic growth rates every *three weeks* exceed what commuter rail carries in a year.

- The average San Diego freeway lane carries 28 times the daily volume per mile as the commuter rail system (Figure A-26). An eight lane freeway carries 112 times as many persons daily as a commuter rail line in San Diego.[76]

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[73] Calculated from Caltrans freeway traffic volume data. Assumes that 70 percent of commuter rail riders previously drove automobiles for the trip.

[74] The federal National Transit Database reporting system does not require transit operators to report fare income by mode (bus or rail). As a result, commuter rail fare information is not available for transit agencies that operate commuter rail and other modes.

[75] The served urbanized areas includes the Virginia and District of Columbia portions of the Washington urbanized area.

[76] Calculated from U.S. Department of Transportation data for 1996. Assumes the national vehicle occupancy rate of 1.6 and the local average daily traffic volume per freeway lane.

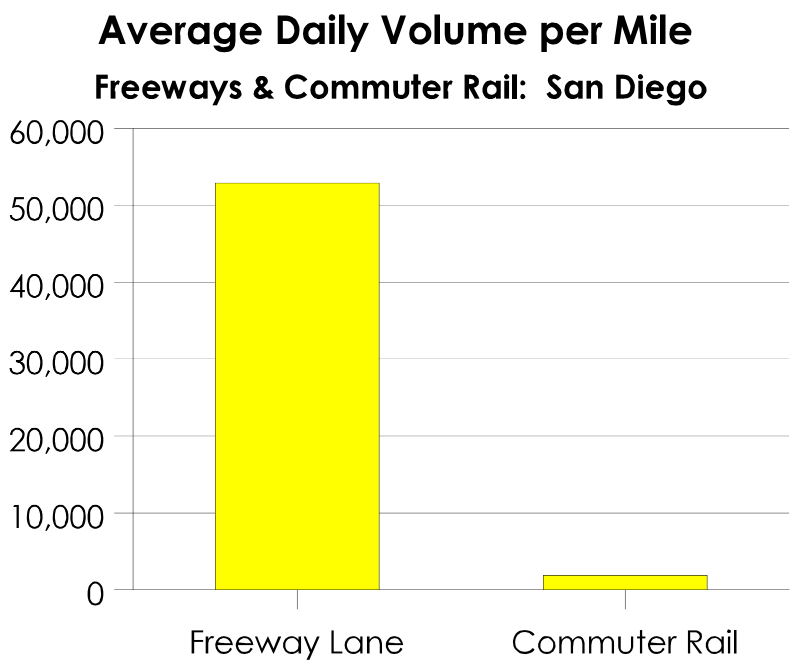

Figure A-26
Calculated from U.S. Department of Transportation data.

Dallas: Dallas has opened the first segment of a commuter rail line[77] that will eventually extend to Fort Worth.[78]

- The 10 mile segment was developed at a capital cost of $68 million.
- Ridership is 1,900 daily (950 riders each way).
- Daily ridership per downtown oriented corridor is 1,900, or 950 riders each way. *Daily* ridership is less than half the capacity of a single freeway lane per *hour*.
- The cost per passenger mile in 1998 is estimated to have been in excess of $2.50.[79] Fare information is unavailable.[80]

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[77] Dallas has also built a new light rail system.

[78] Complete information is not available on Dallas because the system opened more recently.

[79] Based upon data in DART 1998-9 budget.

[80] The federal National Transit Database reporting system does not require transit operators to report fare income by mode (bus or rail). As a result, commuter rail fare information is not available for transit agencies that operate commuter rail and other modes.

- Dallas has the nation's 14th largest downtown, with 112,000 jobs. Downtown represents approximately 5.6 percent of the Dallas-Fort Worth metropolitan area employment.

AI-III. THE INTERCITY RAIL STRATEGY

While intercity rail is a less costly strategy for implementing commuter rail, its practical capacity for removing automobiles from highways is even less. This is illustrated by the intercity rail market between New York and Philadelphia, which are the largest adjacent metropolitan areas in the United States, with a combined population of approximately 26 million – more than 50 percent more than the state of Texas. The 90 mile route between the two downtown areas is by far the nation's most heavily traveled intercity rail corridor. Yet, Amtrak estimates that its service on this route removes only 500 automobiles per hour (250 in each direction), which is less than one-tenth the capacity of a freeway lane.[81]

Los Angeles-San Diego: The state of California has upgraded this Amtrak line and significantly increased service on this 130 mile route between two metropolitan areas with a combined population of more than 18 million. Approximately 3,500 daily passengers are carried (1,750 each way). The U.S. Government Accounting Office has estimated that this rail service removes approximately 2,200 automobiles per day.[82] The one-way *daily* traffic diverted of 1,100 vehicles is less than one-half the *hourly* capacity of a single freeway lane. By comparison, overall traffic volumes on the adjacent Interstate 5 range from 115,000 to 340,000 vehicles daily. It is estimated that at the peak traffic volume point, the intercity rail service reduces traffic by less than 0.7 percent, while at the low traffic volume point, the reduction is less than 1.9 percent along the freeway (Interstate 5) in the corridor (Figure A-27).[83]

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81 According to Amtrak press briefing information prepared for an American Highway Users Alliance press conference in Washington, September 27, 1995.

82 "Amtrak: Issues for Reauthorization," Testimony of the U.S. General Accounting Office, March 13, 1995.

83 Applies the U.S. Government Accounting Office estimate to freeway traffic volumes in the corridor.

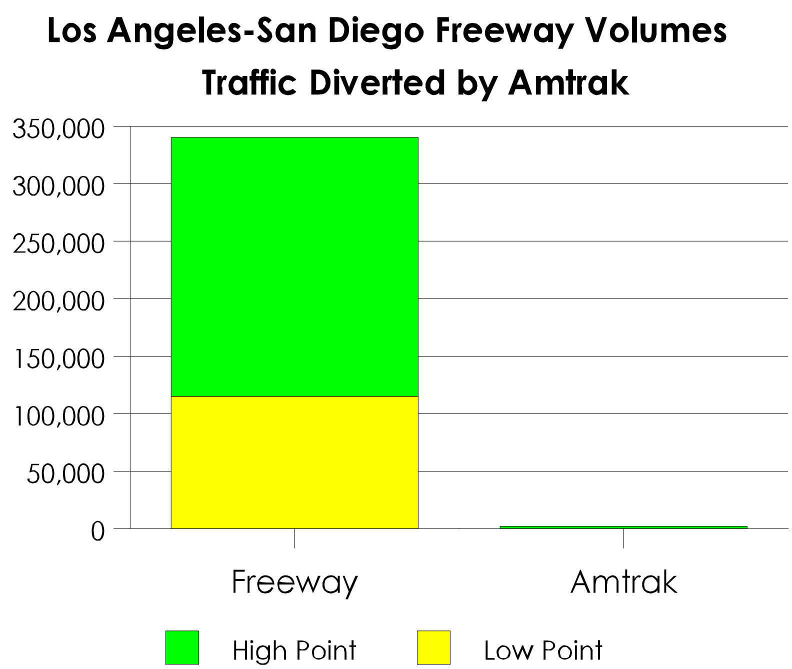

Figure A-27
Data from Caltrans and U.S. Government Accounting Office.

San Francisco Bay Area-Sacramento: The state of California has established an intercity rail service (the *Capitols*) operating from San Jose and Oakland in the San Francisco Bay area to Sacramento (distances of 80 and 130 miles, respectively). These metropolitan areas have a combined population of nearly eight million, more than three times that of the Austin and San Antonio metropolitan areas combined. Ridership is approximately 1,100 per day. This compares to daily freeway traffic volumes of 90,000 to 240,000 vehicles on the adjacent Interstate 80. It is estimated that at the peak traffic volume point, this service reduces traffic by less than 0.3 percent, while at the low traffic volume point, the reduction is less than 0.7 percent along the freeway in the Interstate 80 corridor (Figure A-28).[84] It is estimated that the *Capitols* remove no more than 20 percent *daily* of a freeway lane's *hourly* capacity.

[84] Estimated using the U.S. Government Accounting Office method for estimating automobile driver attraction to intercity rail in the Los Angeles to San Diego corridor.

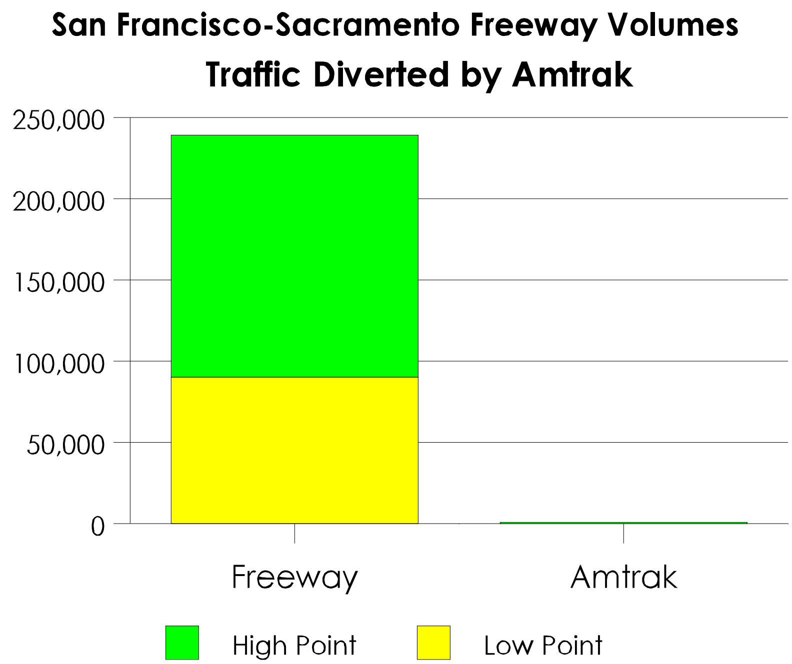

Figure A-28
Data from Caltrans and U.S. Government Accounting Office.

Portland-Seattle: The states of Oregon and Washington developed a cooperative financing arrangement to increase intercity rail service in the 190 mile corridor from Portland to Seattle to reduce traffic congestion. Ridership is approximately 1,500 daily. It is estimated that this service (the expanded service and the service that was previously provided) removes approximately 600 automobiles from the adjacent freeway (Interstate 5) on a daily basis.[85] By comparison, average daily traffic volumes per freeway lane are 90 times greater in Portland and 89 times greater in Seattle (Figure A-29). An eight lane freeway would carry 350 times the volume of the intercity rail service.

85 Calculated from U.S. General Accounting Office Amtrak ridership and cost information. GAO assumes that 64.2 percent of Amtrak passengers would drive automobiles for their trips if no rail service were available.

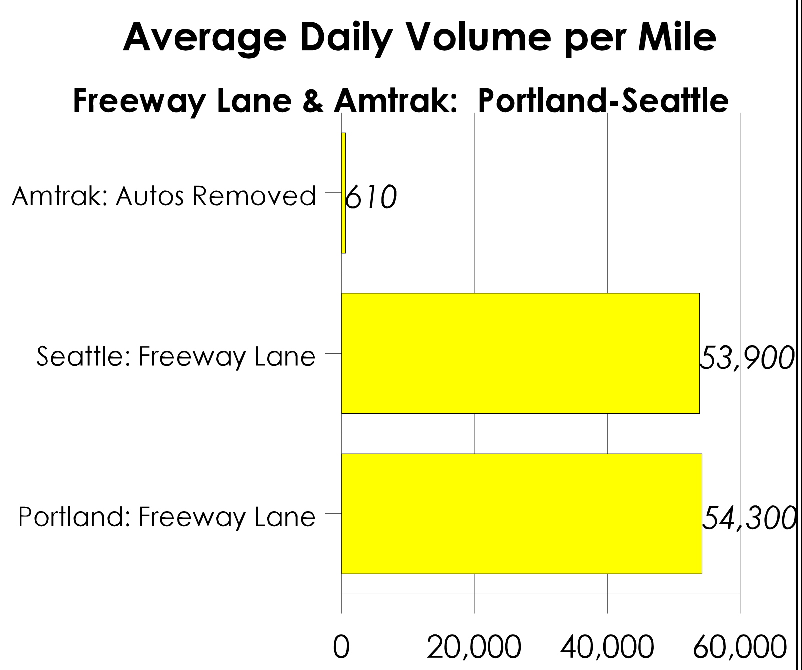

Figure A-29
Calculated from U.S. Department of Transportation and General Accounting Office Data.

Charlotte-Raleigh: The state of North Carolina is financing additional Amtrak trains between Charlotte and Raleigh to reduce traffic congestion. Ridership is approximately 100 daily. One bus in each direction could accommodate this load.[86] It is estimated that the service removes approximately 70 automobiles from the adjacent freeway (Interstate 85) on a daily basis.[87] By comparison, average daily traffic volumes per freeway lane are 670 times greater in Charlotte and 600 times greater in Raleigh (Figure A-30). An eight lane freeway would carry approximately 2,500 times the volume carried by intercity rail.

86 The current bus schedule is also nearly as fast, at 12 minutes slower for the nearly four hour trip.

87 Calculated from U.S. General Accounting Office Amtrak ridership and cost information. GAO assumes that 64.2 percent of Amtrak passengers would drive automobiles for their trips if no rail service were available.

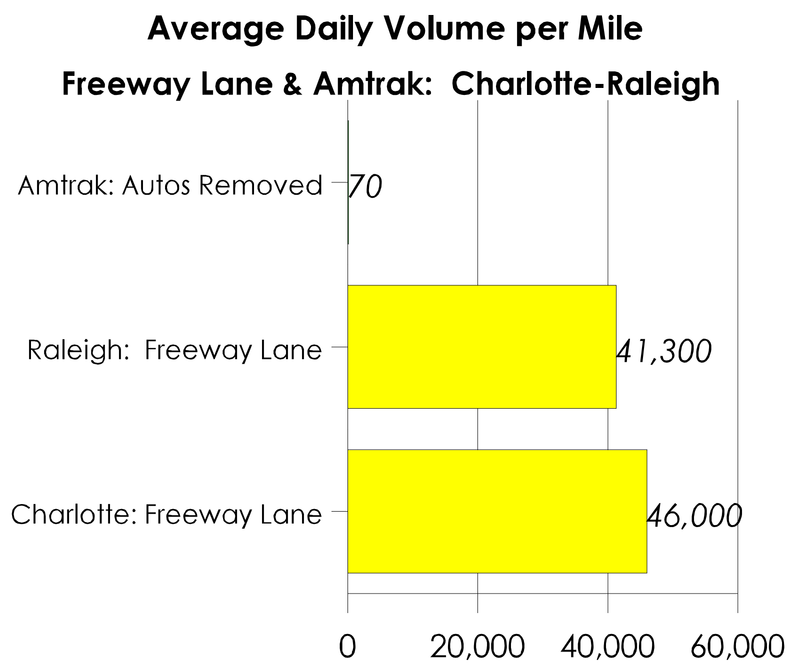

Figure A-30
Calculated from U.S. Department of Transportation and General Accounting Office data.

St. Louis-Kansas City: The state of Missouri is financing additional Amtrak trains between St. Louis and Kansas City to reduce traffic congestion. Ridership is approximately 400 daily. It is estimated that the service removes approximately 240 automobiles from the adjacent freeway (Interstate 85) on a daily basis.[88] By comparison, average daily traffic volumes per freeway lane are 190 times greater in St. Louis and 135 times greater in Kansas City (Figure A-31). An eight lane freeway would carry 750 times more volume as intercity rail in St. Louis and 500 times more in Kansas City.

88 Calculated from U.S. General Accounting Office Amtrak ridership and cost information. GAO assumes that 64.2 percent of Amtrak passengers would drive automobiles for their trips if no rail service were available.

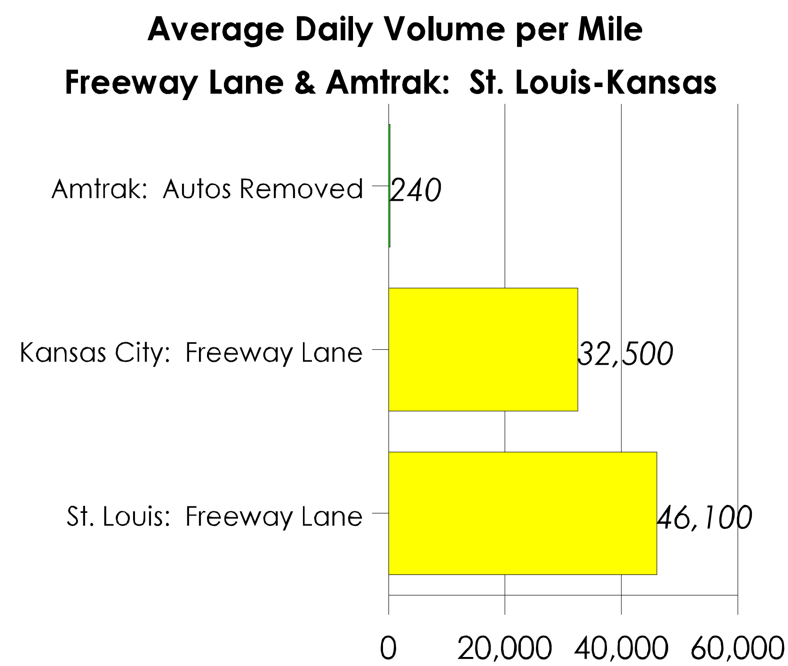

Figure A-31
Calculated from U.S. Department of Transportation and General Accounting Office data.

AI-IV. FINANCIAL ANALYSIS

New Commuter Rail Costs and Revenues

On average, the new commuter rail systems have cost $3.8 million per mile to develop. All of these systems have involved the upgrade of freight rail rights-of-way. Much higher costs would be likely to build a completely new commuter rail line. Dallas has built the most expensive system at $6.8 million per mile, while the Washington system was the least expensive, at $1.4 million per mile (Table A-2).

TABLE A-2 NEW COMMUTER RAIL SYSTEM CAPITAL COSTS			
Urban Area	**Cost (Millions)**	**Length (miles)**	**Cost/Mi (millions)**
Dallas	$68	10	$6.820
Los Angeles	$1,240	415	$2.988
Miami	$323	64	$5.058
San Diego	$125	43	$2.880
Washington	$131	96	$1.365
Average			$3.822

Cost per passenger mile on the new systems ranges from $0.33 in Washington to $1.09 in San Diego (Table A-3). The average cost per passenger mile in 1996 was $0.70. Among the new systems for which fare recovery data is available, Washington, D.C. is highest (48.6 percent), while Miami is lowest (12.6 percent).

TABLE A-3 NEW COMMUTER RAIL SYSTEMS: ESTIMATED OPERATING AND CAPITAL COSTS PER PASSENGER MILE: 1996			
Urbanized Area	**Operating Cost**	**Capital Cost**	**Operating & Capital Cost**
Los Angeles	$0.29	$0.45	$0.74
Miami	$0.30	$0.32	$0.62
San Diego	$0.67	$0.42	$1.09
Washington	$0.20	$0.13	$0.33
Average	$0.37	$0.33	$0.70
Calculated from U.S. Department of Transportation data and data from commuter rail agencies. **Annualized rail capital costs calculated by discounting system capital costs at seven percent over 40 years.**			

Intercity Rail: The costs per passenger mile of intercity rail are 20 percent below that of conventional commuter rail (Table A-4 and Figure A-32).

TABLE A-4 OPERATING COSTS: COMMUTER RAIL & INTERCITY RAIL		
State	**Route**	**Cost per Passenger Mile**
CA	Los Angeles-San Diego	$0.48
CA	San Francisco-Sacramento	$0.51
MO	St. Louis-Kansas City	$0.45
NC	Charlotte-Raleigh	$0.99
OR-WA	Portland-Seattle	$0.38
Average		$0.56
Commuter Rail		$0.70
Intercity Rail Compared to Commuter Rail		-20.0%

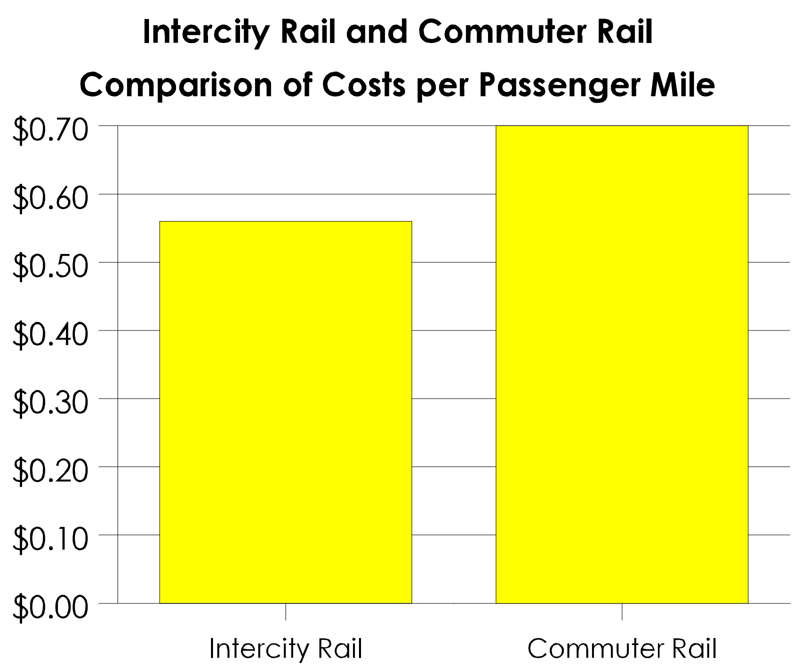

Figure A-32
Calculated from U.S. Department of Transportation and General Accounting Office data.

Cost per Automobile Driver Attracted: Commuter rail costs per attracted automobile driver average $22 per ride, ranging from $12 in Washington to $30 in San Diego.[89] The annual cost per attracted automobile driver averages $9,900, which is enough to lease the new rider a new $50,000 to $70,000 luxury car (for example, a "top of the line" Lexus, Jaguar or BMW) in perpetuity (Figure A-33). Over a 40 year career, this represents a cost per former automobile driver of nearly $400,000.

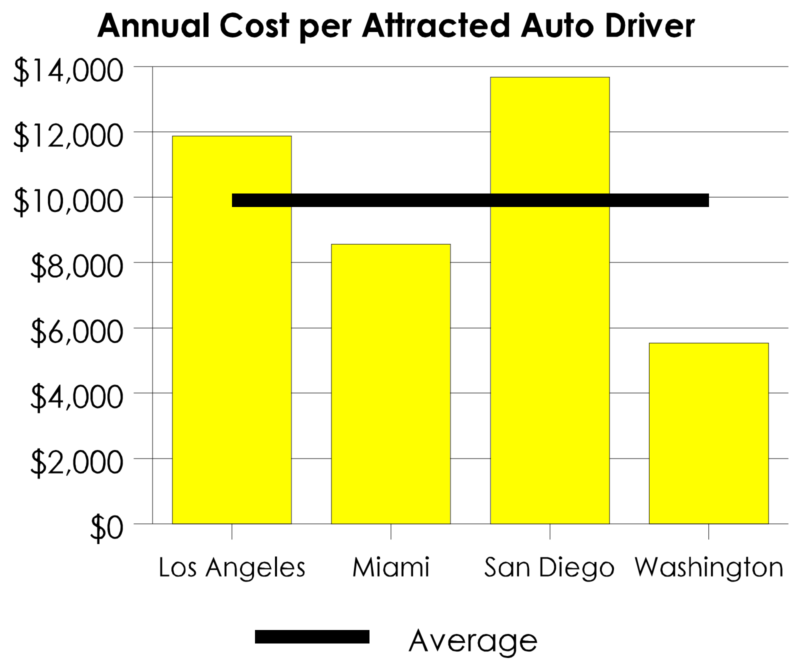

Figure A-33
Calculated from U.S. Department of Transportation and General Accounting Office data.

New Commuter Rail and Bus Costs

Proponents cite data showing that rail system costs per passenger mile are lower than that of bus systems. Such comparisons are invalid, for two reasons:

1. In the United States, rail-bus comparisons virtually never include the cost of capital (vehicles and facilities). Rail systems are more capital intensive than bus systems.

2. Rail systems operate on the transit routes with greatest demand (in fact, rail lines usually replace the best bus routes). Bus systems operate virtually all of the rest of the transit system, including those with the least demand. As a result, most bus cost figures are an average that includes the entire

89 Assumes 70 percent of commuter rail riders are former automobile drivers. Capital costs discounted over 40 years at seven percent.

range from most productive to least productive routes. The most cost effective bus routes can be more than 70 percent less expensive per passenger mile than the average bus route.[90]

On average, commuter rail costs per person mile are more than twice as expensive as the most cost efficient bus systems (national bus benchmark). Commuter rail is even less cost effective when compared to high volume express bus services. Commuter rail costs nearly five times more than the nation's most efficient express bus system (Academy Lines in the New York metropolitan area). This cost differential is similar to the five-to-one cost ratio identified in the U.S. Department of Transportation research on heavy rail and light rail and comparable bus systems (Table A-5 and Figure A-34).[91] Each of the new commuter rail lines is more costly than both the national bus benchmark and commuter bus services.

TABLE A-5
ESTIMATED NEW COMMUTER RAIL AND BUS COSTS PER PASSENGER MILE: 1996

Urbanized Area	Commuter Rail Costs: Operating & Capital	Rail Cost Compared to Bus Benchmark	Rail Cost Compared to National Best Commuter Bus
Los Angeles	$0.74	227.4%	514.0%
Miami	$0.62	189.6%	428.5%
San Diego	$1.09	332.7%	752.0%
Washington	$0.33	102.5%	231.8%
Average	$0.70	213.0%	481.6%

Calculated from U.S. Department of Transportation data and data from commuter rail agencies.

1996 bus benchmark: $0.326, including capital costs (average of top five transit authority bus systems). Bus capital costs assumed at 17.6 percent of total operating and capital cost (estimated from National Transit Database).

Note: The least costly commuter bus operation (Academy Lines in New Jersey) had an estimated operating and capital cost per passenger mile of $0.144 in 1996.

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90 Before the Los Angeles light rail lines were built, the most productive routes were nearly 70 percent less costly per passenger mile than the system average (Calculated from 1984 Southern California Rapid Transit District route data reports).

91 John Kain, Ross Gittell, Amrita Daniere, Tsur Summerville and Liu Zhi, *Increasing the Productivity of the Nation's Urban Transportation Infrastructure*, United States Department of Transportation Federal Transit Administration, January 1992.

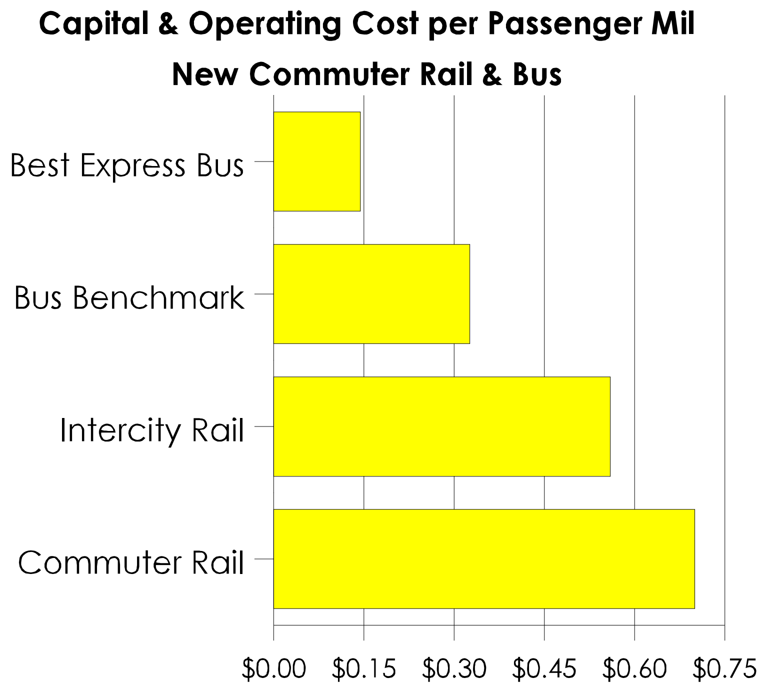

Figure A-34
Calculated from U.S. Department of Transportation data.

Commuter Rail and Highway Costs

It is often claimed that commuter rail is less costly than building a new freeway lane. When evaluated on a comparable basis, however, the highway alternative is less costly (Box A-1). Each day, the average urban freeway lane (one lane in each direction) carries more than 20 times as many passengers as the average new commuter rail line, and an eight lane freeway carries more than 80 times more volume (Figure A-35).[92]

[92] Daily volumes calculated from Federal Highway Administration and Federal Transit Administration data. Freeway lane average is for urbanized areas with more than one million population in 1996.

BOX A-1
COMPARING APPLES AND ORANGES: COMMUTER RAIL AND FREEWAY COSTS OUT OF CONTEXT

Proponents often claim that commuter rail is less costly to develop than a new freeway lane. On the surface this is true. A new freeway lane in an urban area costs an average of $9.2 million per mile, more than double that of the commuter rail average of $4.0 million (1996$). Outside urban areas, however, the freeway lane cost drops to $1.2 million per mile, less than one-third that of a commuter rail line.

This is, however, a misleading comparison because a commuter rail line carries a much smaller volume of person trips than a single freeway lane (in two directions). The simple cost comparison of commuter rail and a freeway lane is akin to comparing the cost of a small apartment with that of a large home – the apartment will cost less, but is not a replacement for the large home for a family requiring the additional room. In comparing commuter rail and highway improvements, valid comparison requires a comparison in the context of persons moved. Cost per person mile is an appropriate measure.

Similarly, proponents often claim that commuter rail has a greater person carrying capacity than a freeway lane. While this is true theoretically, no new systems have been able to attract even a significant fraction of the volume carried by the average freeway lane.

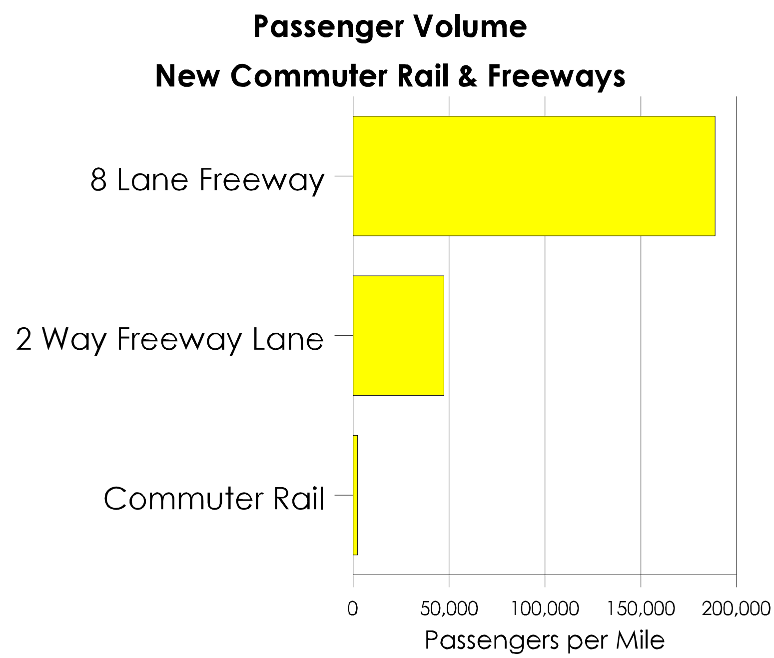

Figure A-35
Calculated from U.S. Department of Transportation data.

Commuter rail's small passenger volume relative to that of a single freeway lane causes its costs per passenger mile to be much higher, despite its construction cost advantage (Figure A-36 and Table A-6).

- The capital costs of new commuter rail lines are more than 10 times as expensive per passenger mile than a new urban freeway lane (two directions).
- The operating costs of a new commuter rail line are twice per passenger mile than a new freeway lane (this includes all costs of owning and operating an automobile, such as the costs of purchase, maintenance, insurance and operation).[93]

- Overall, commuter rail is estimated to be 3.27 times more costly to develop and operate than a new freeway lane (per passenger mile).

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93 Automobile costs calculated from Gross Domestic Product data for all expenditures on automobiles. This cost is lower than other frequently quoted automobile operating and capital costs, which assume a lower average automobile age than is reflective of the national situation.

TABLE A-6
COMMUTER RAIL AND HIGHWAY LANE COSTS PER PASSENGER MILE IN 2000$

	Commuter Rail	Freeway Lane (2 Directions)	Commuter Rail Cost Compared to Freeway Lane Cost
Capital Cost	$0.359	$0.034	1,056%
Operating Cost	$0.398	$0.197	202%
Total	$0.757	$0.231	328%

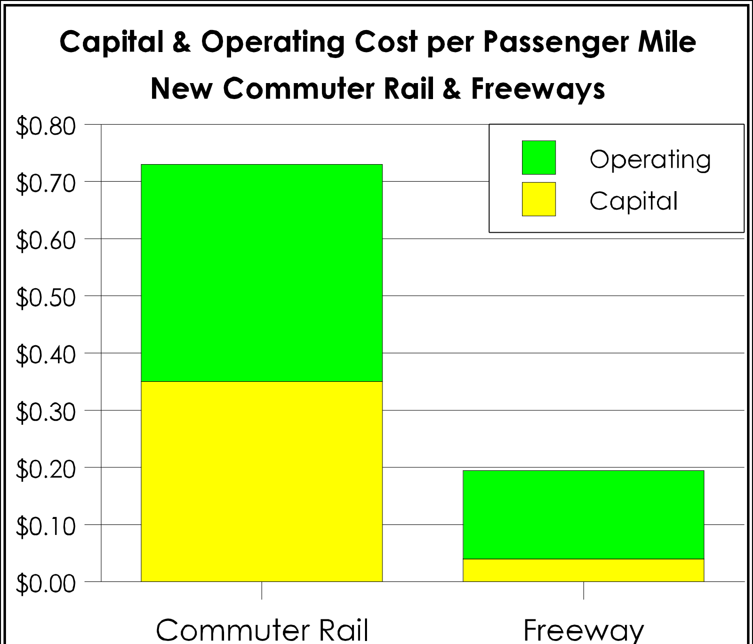

Figure A-36
Calculated from U.S. Department of Transportation data.

Moreover, the costs of commuter rail are predominantly paid by general taxpayers, not by the users of the service. In contrast, virtually all costs of building and operating a new freeway lane are paid by the users through gasoline taxes and other user fees (Box A-2), with no net general taxpayer subsidy (Figure A-37).

BOX A-2
STREETS AND HIGHWAYS:
SELF SUPPORTING IN THE UNITED STATES

Opponents of highway investment often claim that highways do not pay for themselves, because they are supported by general taxation. While streets and highways are supported by general taxation (such as property taxes), this is necessitated by the fact that highway user fees (such as fuel taxes) are diverted for other uses, (such as mass transit), which creates a deficit that is funded by general taxation. In 1996, U.S. highway user fees exceeded the construction, maintenance, debt service and administrative costs of the highway system. Highway user fees totaled $99.7 billion, compared to street and highway expenditures of $98.2 billion (*The Intercity Transport Fact Book* Internet:
www.publicpurpose.com/ic-hwy-hf10-96.html).

Some analysts even classify highway user fees as subsidies. The same logic would classify consumer payments to the municipally owned Los Angeles Department of Water and Power (DWP) as subsidies, while payments to Southern California Edison, a private electric utility, by neighboring consumers would not be considered subsidies. In fact, neither payment would be a subsidy; they would each be user fees.

Moreover, it may not be reasonable to expect highway users to pay the full cost of highways, because of the immense general benefits that they produce for the community. In addition, streets and highways would be required even if there were no automobiles.

Governments collect enough money from highway users to support the street and highway system. Indeed, street and highway function could be entrusted to self financing government or private corporations, similar to the Tennessee Valley Authority, without raising highway user fees. On the other hand, no public transit system in the nation would be self supporting – each would continue to require subsidies provided by non-users.

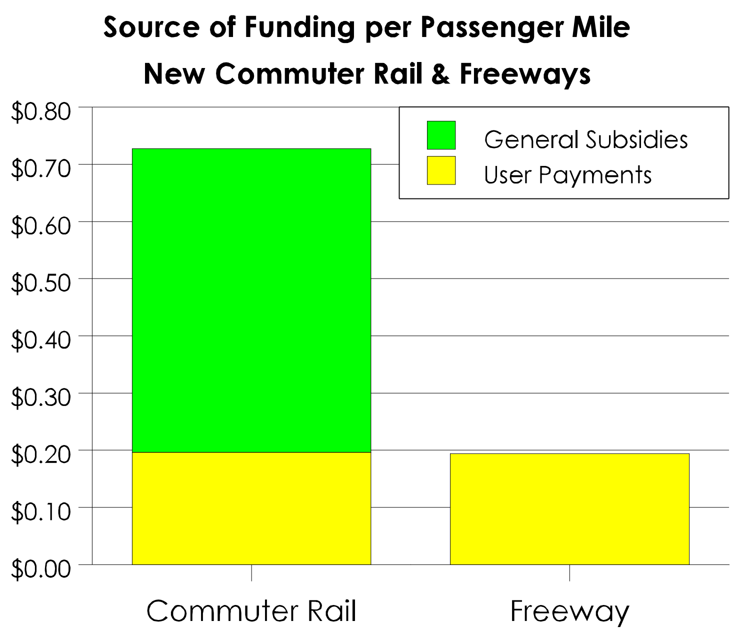

Figure A-37

Calculated from U.S. Department of Transportation data.

AI-V. TRAFFIC CONGESTION

From the small volumes carried by the new commuter rail systems, it is apparent that their impact on traffic congestion has been minimal. This is confirmed by an analysis of the impact of commuter rail on the Texas Transportation Institute Roadway Congestion Index (Table A-7 and Figure A-38). Where the Roadway Congestion Index exceeds 1.00, there is a shortage of roadway space. A Roadway Congestion Index of 1.05 indicates that traffic relative to roadway capacity is five percent higher than a Roadway Congestion Index of 1.00. In five urban areas with historic systems, commuter rail carries enough passengers to downwardly impact the Roadway Congestion Index (without commuter rail, traffic congestion would be somewhat greater). The most significant impacts are in New York and Chicago.

However, in new applications commuter rail ridership is so small that the Roadway Congestion Index would be unchanged in each of the new commuter rail cities if riders switched to automobiles.[94]

[94] Roadway Congestion Index adjusted to estimate impact of commuter rail riders who would otherwise drive automobiles (assumes 70 percent of commuter rail riders would drive automobiles for the trip).

TABLE A-7 IMPACT OF COMMUTER RAIL ON ROADWAY CONGESTION INDEX: 1996			
Metropolitan Area	**Actual Roadway Congestion Index**	**Without Commuter Rail**	**Impact of Commuter Rail**
PRE-1980 SYSTEMS			
New York	1.15	1.23	7.0%
Chicago	1.28	1.33	3.9%
Boston	1.08	1.11	2.8%
Philadelphia	1.05	1.07	1.9%
Washington-Baltimore	1.29	1.29	0.0%
San Francisco	1.33	1.34	0.8%
Historic System Average	1.20	1.23	2.5%
NEW SYSTEMS			
Los Angeles	1.57	1.57	0.0%
San Diego	1.21	1.21	0.0%
Miami	1.20	1.20	0.0%
Washington	1.43	1.43	0.0%
New System Average	1.35	1.35	0.0%

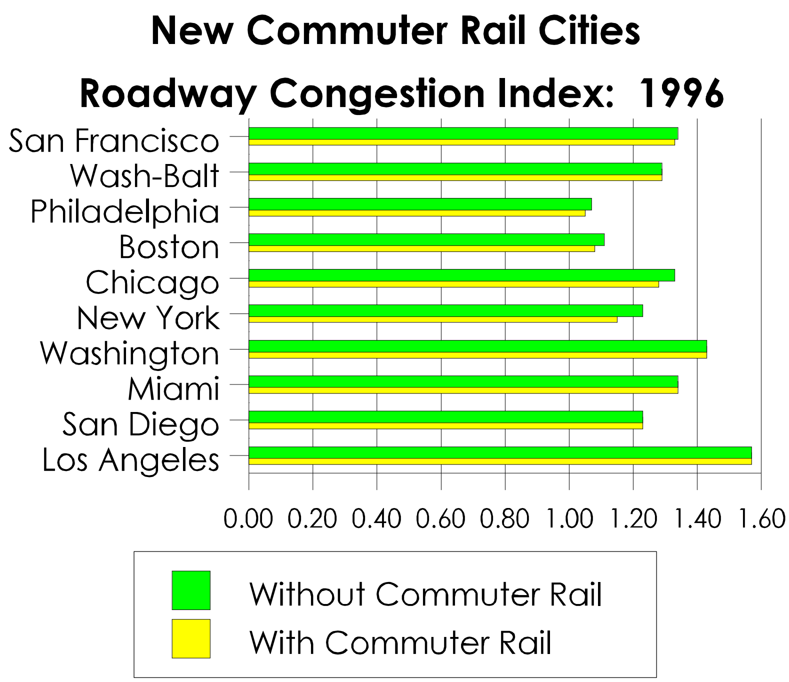

Figure A-38
Calculated from U.S. Department of Transportation data.

Because they have no perceivable impact on traffic, the impact of the new commuter rail systems on air pollution, energy consumption, traffic safety and commercial development is negligible.

Why commuter rail attracts so few automobile drivers: New commuter rail and intercity rail systems have failed to reduce traffic congestion for three fundamental reasons.

- **No speed advantage:** New commuter rail lines generally provide little or no speed advantage compared to highway alternatives. Even where average rail speeds are above that of adjacent freeways, commuter rail tends to require time consuming transfers and shuttle bus trips at the end of the line. As a result, automobile commuting is typically faster than rail commuting in the new rail cities. Because they require no transfers, express bus services are competitive with rail.

- **Few locations are served along the rail line**: New commuter rail stations tend to be four or more miles apart (Figure A-39). Usually connecting bus service is provided at the downtown station to provide access to downtown locations that are not within walking distance (generally one-quarter mile or more). But little, if any, connecting bus service is provided from stations outside downtown to employment centers beyond walking distance. This significantly reduces commuter rail's practicality for non-downtown commuting.

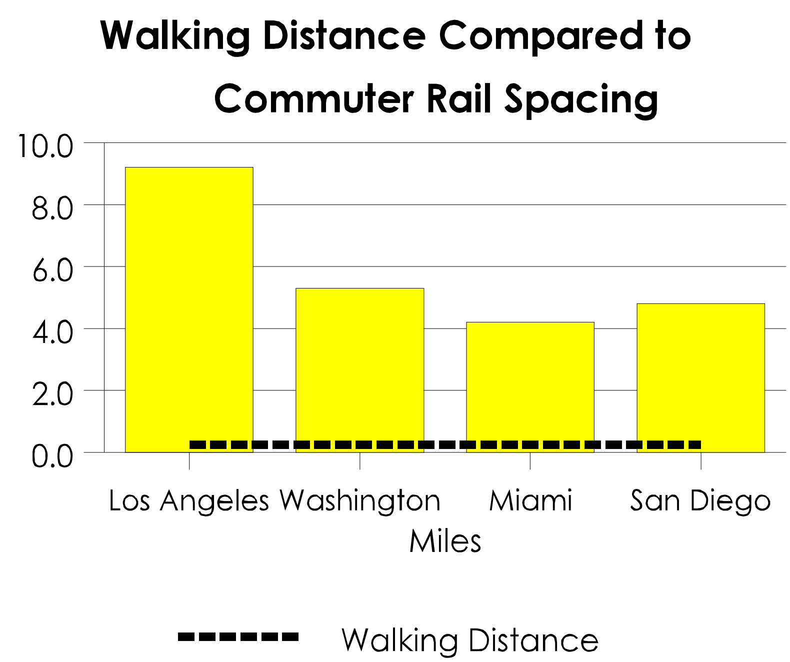

Figure A-39
Calculated from *Jane's Urban Transport Systems* data.

- **Most locations in the urban area are not served:** In new commuter rail cities, 99.5 percent of the urban area is beyond walking distance from a station (Figure A-40). As a result, the overwhelming majority of jobs cannot be reached by commuter rail.

New Commuter Rail Systems

Area Within Walking Distance of Stations

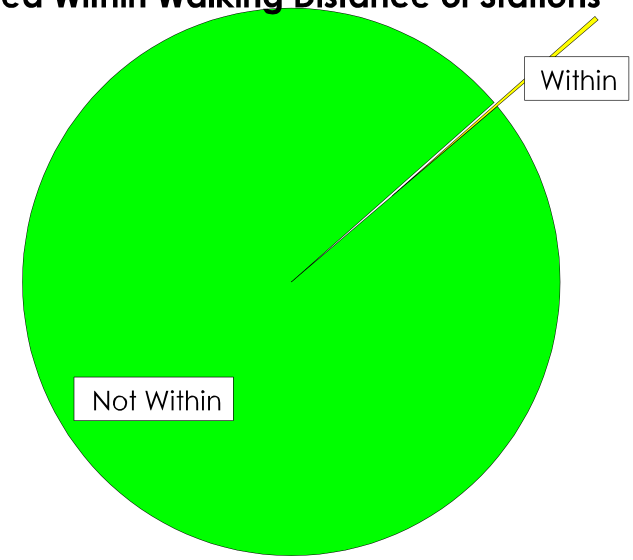

Figure A-40
Calculated from U.S. Census Bureau and *Jane's Urban Transport Systems* data.

Practically commuter rail serves only downtown. But downtown generally accounts for 10 percent of employment and no more than one percent of the land area. With most jobs located outside downtown, there is little potential for new commuter rail systems to reduce traffic congestion.

APPENDIX A-II: REDUCING AIR POLLUTION

Considerable progress has been made in improving air quality in the United States.

Virtually none of the air pollution improvement is attributable to transit, much less urban rail systems such as commuter rail. Because urban rail does not materially reduce automobile use, it cannot materially reduce air pollution. This is confirmed by United States Department of Transportation reports.[95]

- The nation's most comprehensive and expensive new rail system (Washington, D.C.) is credited with removing barely one percent of emissions in the area.[96]

- New rail systems make only modest air quality improvements because ... *only part of the additional ridership of these systems is drawn from SOV (single occupant vehicle) users. Others are drawn from buses, car pools and latent demand.*[97]

Moreover, attracting drivers from automobiles does not always reduce air pollution. Many of the automobile drivers attracted to rail drive to rail stations (at "park and ride" lots). The shorter trips to rail stations may produce nearly as much pollution as the former longer trips:

> *... many riders access rail stations by automobile, meaning their trips still entail engine cold starts and subsequent cooling down. This generates the bulk of HC (hydrocarbon) emissions – 65 percent from a 10 mile trip – because of an automobile's relative inefficiency and higher emission rates while warming up and higher gasoline evaporation rates when cooling down.*[98]

Rail systems are an exceedingly expensive strategy for reducing air pollution. According to the United States Environmental Protection Agency and the United States Department of Transportation, a number of far more cost effective

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95 Report of the Secretary of Transportation to the United States Congress, *Report on Funding Levels and Allocation of Funds*, annual.

96 United States Department of Transportation and Environmental Protection Agency, *Clean Air through Transportation: Challenges in Meeting National Air Quality Standards*, August 1993.

97 United States Department of Transportation and Environmental Protection Agency, *Clean Air through Transportation: Challenges in Meeting National Air Quality Standards*, August 1993.

98 United States Department of Transportation and Environmental Protection Agency, *Clean Air through Transportation: Challenges in Meeting National Air Quality Standards*, August 1993.

strategies exist, such as improved traffic control, telecommuting, flexible work schedules and improved parking management.[99]

Automobile and light truck travel has expanded substantially, at the same time that a major reduction in air pollution has occurred. Virtually all of the motor vehicle air pollution improvement is the result of improved emission technology. From 1970 to 1992, annual road travel increased by more than 100 percent. At the same time, transportation related carbon monoxide emissions fell 32 percent, volatile organic compound emissions fell 53 percent and nitrogen oxide emissions rose by one percent.[100] The number of unhealthful air quality days dropped by more than two thirds in U.S. metropolitan areas from 1987 to 1996,[101] and automobile pollution is expected to drop approximately 25 percent from 1996 to 2010,[102] despite continued growth in miles traveled. A recent press report indicated that 1997 was the best year for air pollution in the Los Angeles area for the past 50 years[103] — this despite a tripling of population and an even greater increase in street and highway traffic. Most of the improvement in air quality is attributable to improved vehicle emission technology. And further improvements are on the way. Recently Daimler-Chrysler announced its intention to market a zero emission fuel cell vehicle by 2004.[104] This follows previous announcements by Toyota and Honda to market very low emission gasoline and hybrid (gasoline-electric) cars in the near future.

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99 United States Department of Transportation and Environmental Protection Agency, *Clean Air through Transportation: Challenges in Meeting National Air Quality Standards,* August 1993.

100 United States Department of Transportation Federal Highway Administration, *Transportation Air Quality: Selected Facts and Figures*, 1996.

101 United States Environmental Protection Agency, *National Air Quality and Emissions Trends Report, 1996.*

102 Calculated from United States Environmental Protection Agency, *National Air Pollutant Emission Trends Report, 1900-1996*, 1997.

103 "Skies Blue Again in L.A. – Cleanest Air in 50 Years," *San Francisco Chronicle,* December 30, 1997.

104 Jeffrey Hall, "Auto Makers Are Racing to Market 'Green' Cars Powered by Fuel Cells," *The Wall Street Journal*, March 15, 1999.