Unlocking the Gridlock in Los Angeles County's Transportation System: The Local Economic Benefits of High-Speed Rail

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Executive Summary

Proposition 1, the "Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century", is a bond measure on the November 2008 California ballot to provide the state portion of funds to construct a high-speed rail (HSR) system linking California's major cities, including Los Angeles, the Bay Area, Orange County, San Diego, and cities in the Central Valley. Within Southern California, the planned route for the train runs from Palmdale to downtown Los Angeles, with trains continuing to Anaheim in Orange County, and also to San Diego via points in the Inland Empire. The $9.95 billion state bond represents about one third of the system's projected first phase of construction costs, with the remainder coming from federal, private, and other sources.

One key purpose of the HSR system is to provide greater access and choice of transportation modes, which will increase mobility throughout California. It will reduce travel time between downtown areas of these cities, leading to many resulting benefits which are described in this report. The trip from Los Angeles to San Francisco, for example, is expected to require two and one half hours, a savings of at least 50% over auto travel, and also a considerable door-to-door time savings over air travel.

These benefits to passengers will induce many to move from their cars or from air service to the train, which will provide important ancillary benefits, as outlined in this report. First, it will reduce traffic on freeways and air traffic lanes already heavily congested—Los Angeles has the worst highway congestion in the nation, and one of the busiest airports--and likely to become more so in coming years because of anticipated continuing population growth. Second, it will reduce air pollution, including greenhouse gas emissions, both because of fewer high-emitting auto and airplane trips, and because of reduced time spent idling in traffic. This is particularly important in Los Angeles, which has the second worst air quality in the nation. (The worst, in Riverside, is largely the downwind result of air emissions in Los Angeles county[2].)

HSR will also encourage and facilitate denser development near each of its stations, further reducing automobile traffic. As this report will show[3], HSR will also help attract companies and industries whose employee time is especially valuable, and so produce considerable value per hour[4]. Again, this is particularly important for Los Angeles, whose economic cycle has historically been substantially more volatile than California as a whole, and has seen a precipitous decline in manufacturing employment over the last generation due to productivity improvement, offshoring, and defense downsizing in the 1990s. L.A. could greatly benefit from attracting more high-value-added industries with more stable revenues and employment.

At least 41% of trips on the HSR system will be for business,[5] and the largest number of trips—more than 18 million—will be within Los Angeles County[6]. While the system has been designed with intercity travel in mind, *the most common passengers will be Los Angeles area commuters*. In fact, Los Angeles will receive benefits substantially disproportionate to its contribution to the state portion of the cost of the HSR project, making the largest share of trips while paying only about one-fourth of the state portion of the project's construction costs (based on L.A.'s share of the state tax base).

Trips diverted from the highways reduce highway congestion, and so also save time for those drivers remaining. Since those drivers spend less time in their vehicles stopped in traffic, less fuel is burned per mile traveled, so fewer pollutants—including greenhouse gases—are emitted from tailpipes. These savings, in time, fuel, and environmental impact, free up resources that drivers can spend on other consumption or investment. The initial direct savings created by trips diverted to high speed rail will "ripple" through the economy several times, resulting in total savings (including indirect savings) substantially larger than the initial savings.

In addition, HSR will change land use patterns. By raising property values along rail corridors, HSR will also encourage and facilitate denser development near each of its stations, further reducing automobile traffic. Development densities can be expected to increase near HSR stations. Mixed residential/commercial "infill" developments, such as Pacific Court in Long Beach or Holly Street Village in Pasadena, will become more common. Less land will be used per unit of population, or per dollar of gross domestic product. Nearly 35,000 fewer undeveloped acres will be consumed by development in L.A. County by 2035 if HSR is instituted.[7] This is equivalent to an area about 20% larger than all of the land area of San Francisco County, or more than 10% of the areas of either Santa Cruz or San Mateo counties. The wetlands preserved alone (370 acres) would be larger than some cities in Los Angeles county. The energy savings and pollution avoided will be the equivalent of removing one million vehicles from our state's roads.

The table below summarizes the economic benefits of HSR operations.

Economic and Efficiency Benefits of HSR in Los Angeles County (2006 dollars)

2020				
Output Added	Employment added	Earnings added	Efficiency gains	Total household benefits[8]
$6.9 B	54,800 Jobs	$2.0 B	$0.4B	$2.4 B

2035				
Output Added	Employment added	Earnings added	Efficiency gains	Total household benefits[9]
$12.1 B	96,300 Jobs	$3.6 B	$0.8B	$4.4 B

The anticipated increase in Los Angeles' aggregate gross domestic product is more than the entire GDP of twenty California counties. These gains will add 2 to 4% to

the area's economic growth, equivalent to a moderately strong year, *each year, throughout the operating lifetime of the HSR system*.

The gains from HSR operation will reduce the area's unemployment by between 1% and 2%. The Los Angeles metropolitan area's unemployment rate in July 2008 (the most recent available) is 7.5%, or 1.8% above the nation's 5.7%.

Area household incomes will increase by $208 per person in 2020, or over $800 per family of four. By 2035, incomes will rise by $328 per person, or about $1,300 per family of four (over $100 per month).[10] This is roughly equivalent to one third of a family's total bill for energy (gasoline, natural gas, and electricity) for one year, or what the average family spends on food over three months.

Since all governments are dependent for revenues on the health of the private economy, the accelerated economic growth brought about by HSR will pay dividends for L.A. County and each of its cities. L.A. County can expect to see revenue increases of $136 million per year in 2020 and $408 million per year in 2035. For all local jurisdictions within L.A. County's boundaries, their added revenues will be $348 million and $626 million in 2020 and 2035 respectively. (All figures are in 2006 dollars.[11])

In summary, *HSR will generate more benefits* annually *to Los Angeles alone from added economic activity than the entire cost of the Prop. 1 bond*, whose expense will be borne only partly by Angelenos, and will be spread over many years.

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I. Introduction

Proposition 1, the "Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century", is a bond measure on the November 2008 California ballot to provide the state portion of funds to construct a high-speed rail (HSR) system linking California's major cities, including Los Angeles, the Bay Area, Orange County, San Diego, and cities in the Central Valley. Within Southern California, the planned route for the train runs from Palmdale to downtown Los Angeles, with trains continuing to Anaheim in Orange County, and also to San Diego via points in the Inland Empire. The $9.95 billion state bond represents about one third of the system's projected first phase of construction costs, with the remainder coming from federal, private, and other sources.

One key purpose of the HSR system is to provide greater access and choice of transportation modes, which will increase mobility throughout California. It will reduce travel time between downtown areas of these cities, leading to many resulting benefits which are described in this report. The trip from Los Angeles to San Francisco, for example, is expected to require two and one half hours, a savings of at least 50% over auto travel, and also a considerable door-to-door time savings over air travel.

These benefits to passengers will induce many to move from their cars or from air service to the train, which will provide important ancillary benefits, as outlined in this report. First, it will reduce traffic on freeways and air traffic lanes already heavily congested—Los Angeles has the worst highway congestion in the nation, and one of the busiest airports--and likely to become more so in coming years because of anticipated continuing population growth. Second, it will reduce air pollution, including greenhouse gas emissions, both because of fewer high-emitting auto and airplane trips, and because of reduced time spent idling in traffic. This is particularly important in Los Angeles, which has the second worst air quality in the nation. The worst, in Riverside, is largely the downwind result of air emissions in Los Angeles county[12].

HSR will also encourage and facilitate denser development near each of its stations, further reducing automobile traffic. As this report will show[13], HSR will also help attract companies and industries whose employee time is especially valuable, and so produce considerable value per hour[14]. Again, this is particularly important for Los Angeles, whose economic cycle has historically been substantially more volatile than California as a whole, and has seen a precipitous decline in manufacturing employment over the last generation due to productivity improvement, offshoring, and defense downsizing in the 1990s. L.A. could greatly benefit from attracting more high-value-added industries with more stable revenues and employment.

In order to make an informed decision on the merits of Prop. 1, one pertinent criterion is the economic impact of a high speed rail system. A reasonable question that must be answered is: Do the benefits of the HSR justify its projected cost?

A statewide economic analysis was published in 2003 by Cambridge Systematics (hereafter, "Cambridge"), and updated in 2007[15]. This report describes the expected

local economic impacts in Southern California—in Los Angeles County specifically. Its estimates are derived from the Cambridge statewide studies. This report is not a true cost-benefit study in that it does not purport to be comprehensive in enumerating all the benefits of HSR. However, even its partial estimates suggest that the system is a worthy investment for Los Angeles taxpayers.

The remainder of this report is in three sections. Section II discusses the benefits of an HSR system in qualitative terms, with particular emphasis on how HSR can help alleviate some of Los Angeles area's transportation problems. Section III is the heart of the report: quantitative estimates of some of the direct and indirect economic benefits, including improvements in worker and commuter efficiency because of reduced travel times, resulting growth in local governments' revenues, and environmental improvements due to reduced air emissions and reduced consumption of undeveloped land (i.e., higher urban densities encouraged by HSR). Section IV concludes by restating the primary quantitative findings in terms most relevant to a typical resident of Los Angeles County.

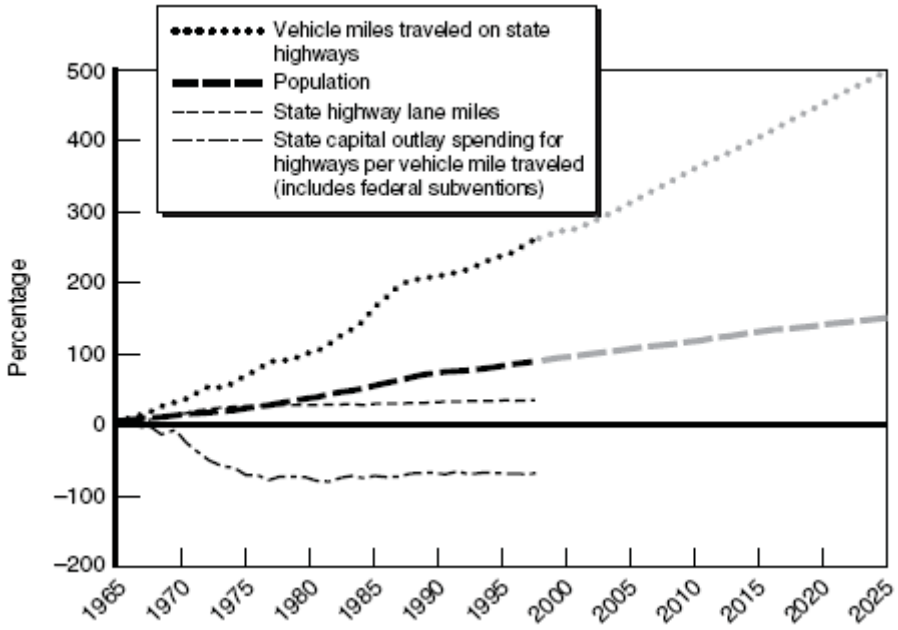
II. Major Benefits of a High Speed Rail System to Los Angeles

The Problem of Highway Congestion in L.A. County

It is a truism to acknowledge that the Los Angeles County passenger and cargo transportation system is dominated by road vehicles. The vast majority of passenger trips (e.g., commuting) occur in personal automobiles. Cargo also clogs the freeways. While considerable cargo that is transshipped through L.A.-area ports moves by rail to other North American destinations, part of its journey is by truck, especially for many cargo containers with local destinations.

The highway system on which all these vehicles travel was designed for only a fraction of present volumes of traffic. Figure 1 shows that the number of vehicle miles traveled in the state has grown more than three times as fast as population, and nearly ten times as fast as highway lane miles have been added. The result, not surprisingly, is intense congestion, with frequent long delays.

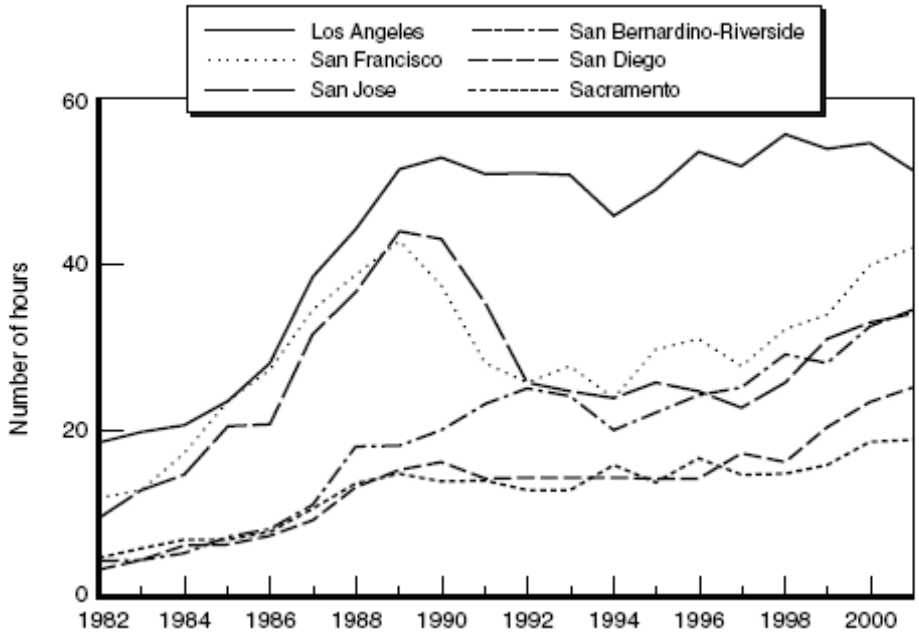
Figure 1.
Indicators of Highway Supply and Demand Growth in California



Source: PPIC, Hanak and Baldassare, 2005

As any local motorist knows, congestion is worst in the Los Angeles area. Two transportation specialists have noted that "Los Angeles County has the worst traffic congestion in the country…." [16] L.A. has held this dubious distinction for every year since 1982, according to the Texas Transportation Institute. By the early 1980s, commuters in L.A. faced the longest traffic delays (20 hours per year), but those delays tripled in the next few years, and at 59 hours per commuter per year have remained the highest in California, as shown in Figure 2.

Figure 2.
Annual Hours of Delay on Major California Highways by Metro Area



Source: PPIC, Hanak and Baldassare 2005 (from Texas Transportation Institute 2003).

Traffic congestion has both human, efficiency and environmental consequences.

- Human: Denser traffic means more opportunities for vehicle accidents, causing not only property damage (wrecked vehicles), but injuries and deaths.

- Efficiency: As Benjamin Franklin said, "time is money". Workers stuck in traffic are less productive. Goods being shipped to customers are less valuable to customers when their arrival is delayed. (And drivers must be paid more for the extra time they must take.) Highway congestion therefore depresses economic productivity.

  Even if commuters sacrificed only their leisure time, not work time, delays still have social and economic consequences. For example, educational research shows that childrens' performance in school is heavily dependent on parental involvement in their schooling—which is impossible while the parent is stuck commuting on a congested freeway. In addition, wear and tear on vehicle parts (e.g., on brakes in stop-and-go traffic), plus fuel consumed while idling, are additional economic costs.

- Environment: Tailpipe emissions are the largest source of greenhouse gases, and in Los Angeles, the largest producer of other air pollutants as well. Emissions per

mile travelled are inevitably higher when travel times are slowed because of congestion. Emissions that occur when a vehicle is stationary in traffic are all cost and no benefit. The South Coast Air Quality Management District estimates the costs of air pollution associated with highway congestions to be in the multiple billions of dollars.[17]

The Benefits of High-Speed Rail

The Los Angeles *Times* has editorialized that "Even though it's a gamble, high-speed rail would help California cope with its transportation problems." [18]

A faster transportation method, such as high speed rail, will produce both *direct* and *indirect* benefits. Direct benefits relate to the time saved and greater convenience enjoyed by HSR passengers. Indirect benefits relate to the reduction in highway congestion engendered by the diversion of trips off the freeways, and associated environmental benefits (e.g., reduction in pollution). Additional, even more indirect benefits stem from businesses (and jobs) that are attracted into Los Angeles County as a result of the greater convenience and reduced delays made possible by HSR.

Direct Benefits

The California High-Speed Rail Authority (CHSRA) classifies potential trips by trip type (e.g., business, commuter, recreation, and other) and by distances traveled (within or between specific regions). If commuting is included as business-related travel, then CHSRA expects at least 41% of trips will be for business.[19] Furthermore, the largest number of trips—more than 18 million—will be within Los Angeles County.[20] While the system has been designed to include intercity travel, CHSRA believes that *the most common passengers will be Los Angeles area commuters*.

This is logical. Drivers will convert to HSR based largely on the amount of time they can save. For intercity travelers, time savings within Los Angeles County is a small fraction of their total trip. But for commuters, their entire commute on the roads is in congestion, so a switch to HSR can greatly reduce they proportional delay they suffer. In Los Angeles, the time savings can be very significant. Metrolink reports that 80% of its riders are former auto commuters; in some corridors it carries more people than an adjacent freeway lane at rush hour.[21]

The more valuable a commuter's or traveler's time is, the more their time saved is worth to them. Therefore it is reasonable to expect that the ridership of HSR, for both intercity and intraregional trips, will skew towards higher incomes. So simple market forces will maximize the total value of time saved--for the riders themselves, and therefore for the area's economy.

Indirect Benefits: Economic Growth

Trips diverted from the highways reduce highway congestion, and so save time for those drivers remaining. Since those drivers spend less time in their vehicles stopped

in traffic, less fuel is burned per mile traveled, so fewer pollutants—including greenhouse gases—are emitted.

These savings, in time, fuel, and environmental impact, free up resources that drivers can spend on other consumption or investment. If, say, a driver saves $5 in gas per week, they may spend that $5 in (say) Starbucks. Starbucks' baristas in turn will either spend or invest their higher income. Thus the initial direct savings created by trips diverted to high speed rail will "ripple" through the economy several times, resulting in total savings (including indirect savings) substantially larger than the initial savings. The ratio of the two savings—total divided by initial direct savings—is called the *multiplier*. Regional input-output economic models tabulate the purchases by one industry to all the others in the economy in order to compute these multipliers. Generally the multiplier associated with a given industry is roughly correlated with the industry's productivity: the more value the industry adds, the more resources it commands, and the more it can consume or invest by purchasing from other industries[22]. In addition, the accelerated economic growth made possible by HSR will also pay dividends to local governments in the form of increased tax revenues.

The final economic benefit is the most indirect, but amply demonstrated by the experience of HSR in other countries. The option to commute or travel with little delay will remove an important handicap in Los Angeles' competition for jobs. Unquestionably, traffic congestion is L.A.'s single greatest competitive disadvantage, because so many challenges stem from it. Some employers that had been discouraged from locating in the area because transportation or air quality problems made it difficult to attract skilled employees will now reconsider locating here. Those most attracted will be employers in industries that pay high wages, since their employees' time is most valuable. Such industries and occupations tend to have the highest multipliers, so they will stimulate the most added economic activity.

Indirect Benefits: Environmental Protection

As mentioned above, reduced highway congestion means reduced air pollution, including of greenhouse gases. As mentioned earlier, Los Angeles has the second-worst air quality in the country, behind only Riverside, whose air quality is largely the downwind result of L.A. emissions. In addition, HSR will change land use patterns. Development densities can be expected to increase near HSR stations. Mixed residential commercial "infill" developments, such as Pacific Court in Long Beach or Holly Street Village in Pasadena, will become more common[23]. Less land will be used per unit of population, or per dollar of gross domestic product. Higher densities will increase land values near HSR stations—as has been evidenced in every HSR development throughout the world[24]--and will attract more productive employers, as noted earlier.

The next section quantifies some of these benefits.

III. Quantitative Estimates of HSR's Benefits to Los Angeles County

Cambridge Systematics, under contract to the California High–Speed Rail Authority, produced two reports on the statewide economic impact of HSR.[25] Each report used a regional input-output model to estimate the employment impacts of the HSR project. This report will also employ multipliers from another input-output model, the U.S. Dept. of Commerce Bureau of Economic Analysis's Regional Input-Output Modeling System, RIMS II[26]. This will allow us to both translate statewide impact estimates to the L.A. region, and broaden Cambridge's estimates from employment to also include output (gross domestic product, the value of all goods and services impacted by HSR) as well as household earnings (personal income).

This section reports these impacts in terms of both direct and indirect effects, in aggregate terms. The report's final section interprets the aggregate results in more intuitive terms.

Economic Benefits

Table 1 summarizes Cambridge Systematics' model-based estimates for the region and the state of job growth relative to a 2002 base, if HSR either is or is not constructed. Table 1a, extracted from Cambridge's 2007 report, shows employment and population estimates for each of several Southern California counties (including Los Angeles) at two points in time (2002 and 2020) and under three different scenarios: A 2002 base case; in 2020 where HSR is not constructed ("No Project"); in 2020 if a high speed train is constructed ("HST(Base)"). The difference between the second and third cases is assumed to be primarily the result of the high speed train. Table 1b presents the same information for 2035.

Cambridge's regional economic model reports that the reduced travel times brought about by HSR will attract employers that will create nearly 55,000 additional jobs by 2020, and over 96,000 by 2035 (summarized in Table 1c). Those added jobs will attract more people, and will result in greater economic activity.

Table 1a
Cambridge's Projections of 2020 Southern California Employment and Population

	Employment 2020			Population		
	2002 Existing Conditions			2002 Existing Conditions		
County		No-Project	HST (base)		No-Project	HST (base)
Los Angeles	5,452,745	6,699,802	6,754,661	10,007,779	11,575,693	11,615,933
Orange	1,878,327	2,656,136	2,673,920	2,910,976	3,431,869	3,438,194
Riverside	656,839	1,076,667	1,075,097	1,681,186	2,773,431	2,748,494
San Bernardino	731,420	1,128,243	1,144,253	1,816,378	2,747,213	2,786,344
San Diego	1,754,622	2,606,408	2,638,258	3,066,423	3,917,001	3,935,842
Southern California*	10,473,953	14,167,255	14,286,189	19,482,742	24,445,207	24,524,807
Rest of State	2,722,219	3,563,921	3,566,922	5,080,451	6,790,870	6,806,197
Statewide Total	19,787,892	26,437,467	26,676,703	35,802,238	45,448,627	45,618,157

Source: Cambridge Systematics, 2007[27]

Table 1b
Cambridge's Projections of 2035 Southern California Employment and Population

	Employment 2035			Population		
	2002 Existing Conditions			2002 Existing Conditions		
County		No-Project	HST (base)		No-Project	HST (base)
Los Angeles	5,452,745	7,406,409	7,502,773	10,007,779	13,302,934	13,454,864
Orange	1,878,327	2,870,740	2,901,398	2,910,976	3,910,017	3,950,770
Riverside	656,839	1,162,051	1,163,500	1,681,186	3,983,299	3,965,826
San Bernardino	731,420	1,220,510	1,245,657	1,816,378	3,798,899	3,867,414
San Diego	1,754,622	2,867,144	2,921,375	3,066,423	4,789,883	4,870,658
Southern California*	10,473,953	15,526,855	15,734,703	19,482,742	29,785,032	30,109,532
Rest of State	2,722,219	3,809,552	3,815,877	5,080,451	8,420,610	8,475,119
Statewide Total	19,787,892	28,873,042	29,317,201	35,802,238	55,210,045	55,901,305

Source: Cambridge Systematics, 2007

Table 1c
Employment Effects of HSR in Los Angeles County
(change in county jobs due to HSR operation)

2020	2035	% highly compensated
54,800	96,300	47%

Source: Difference between county "no project" and "HST" employment in Tables 1a and 1b, respectively. "Highly compensated" pertains to particular sectors identified in footnote 36.

Table 1c reports the number of additional jobs in L.A. County that will result from the area's increased attractiveness due to lessened transportation challenges. A mentioned earlier, this will be especially attractive to industries that are highly productive and can therefore afford to pay their employees well. Financial, insurance, and real estate services are examples.[28] The increase in regional output and household income will be more than proportional to the increase in jobs.

To put these figures in perspective, employment in the Los Angeles metropolitan statistical area in 2005 (the most recent year available) was 4,565,000. So the gains from HSR operation will reduce the area's unemployment by between 1 and 2%. Los Angeles' unemployment rate in July 2008 (the latest available) was at 7.5%, or 1.8% above the nation's 5.7%. Furthermore, Los Angeles county has seen a substantial decline in manufacturing employment, due to productivity improvement, offshoring, and defense downsizing in the 1990s. In addition, historically the L.A. area has been more economically volatile than the state as whole, so secular increases in employment attracted by HSR would smooth out future cyclical swings.

In addition to these recurring increases in employment, the Los Angeles area can expect to receive one-time benefits during the nearly decade long construction period, from roughly 2011 to 2020. Construction spending in the area would total somewhere between $4.4 billion and $13.1 billion under different estimation methods. This would generate between 90,000 and 266,000 construction jobs in the L.A. region over the course of the project, or between roughly 9,000 and 27,000 jobs per year.[29] These jobs would be especially important to the region's economy because Los Angeles construction industry has suffered especially in the present economic downturn, falling more than the statewide average of 15.7% from the early 2006 peak[30]. These added construction jobs are not included in the tables, in order to be conservative.

Table 2
Output and Earnings Impacts of HSR in Los Angeles County
(2006 dollars, in billions)

Increase in Gross Domestic Product (GDP)		Increase in Household Earnings (Personal Income)	
2020	2035	2020	2035
$6.9 B	$12.1 B	$2.0 B	$3.6 B

Source: Author's calculations based on relative multiplier values from RIMS II.[31]
Includes only recurring economic impacts of HSR operation; one-time construction spending impacts are described above.

The Bureau of Economic Analysis' Regional Input-Output Multiplier System (RIMS II), reports that each $1 million in increase in final demand to area industries creates $2.23 million in total output (gross domestic product), $657,000 in household earnings, and 17.724 jobs. Therefore, the output, earnings, and employment

multipliers—i.e., the total effect per $1 million dollars in added direct economic activity—are 2.23 (output or GDP), 0.657 (earnings or household income), and 17.724 (employment or jobs). Put another way, on average each new job (direct and indirect jobs combined) is associated with $125,862 in added output and $37,071 in added household income[32]. These estimates are broadly consistent with the median income of $36,890 in 2005.[33] Cambridge's job estimates from Tables 1a to 1c were translated through the mechanism of the Bureau of Economic Analysis' RIMS II multipliers to produce the results in Table 2.

Thus high-speed rail will add $6.9 billion by 2020 and $12.1 billion in constant (inflation-adjusted 2006) dollars by 2035 to the area's economy[34] as a result of the behavioral responses mentioned earlier. L.A. County's total personal income in 2004 was just over $329 billion[35], so these gains will add 2 to 4% to the area's economic growth, equivalent to a moderately strong year, *each year*.

As noted above, these figures on recurring benefits do not include the $3.3 billion to $9.8 billion in one-time direct construction expenditures. Each construction dollar will generate $2.44 in total economic activity, adding $8.0 to $23.9 billion to the region's GDP, and $2.7 billion to $8.0 billion in household income, over the construction period[36]. We omit them from our totals in order to be conservative.

These are measurable economic benefits. There will also be more difficult to observe efficiency benefits and environmental benefits.

Efficiency benefits

Cambridge estimates that commuters on the HSR line linking L.A. and San Diego will save 871,000 hours in 2020 and 1,148,000 hours in 2040 in avoided auto delay time, while those commuting on the Antelope Valley to L.A. line will save 599,000 to 719,000 hours in 2020 and 2040 respectively. Given the average hourly wage in the area, this translates to efficiency gains of between $179.4 million (in 2020) and $265.1 million (in 2040), measured in 2006 dollars[37]. This almost certainly underestimates the efficiency benefits, since more parental time at home can be expected to lead to better educational performance by the household's children. In addition, the greatest beneficiaries of HSR will be those workers whose compensation is well above the area average (i.e., who value their time the most), which will lead to the largest ripple effects.

In addition to auto travel savings, air travelers into and out of the L.A. basin would save an additional 5.3 million hours in 2020 and 10.5 million hours in 2040, or between $301 million (2020) and $599.3 million (2040) in 2006 dollars.

Combined Economic and Efficiency Benefits

Combining the various recurring economic benefits—direct and indirect, plus efficiency benefits--produces Table 3. This is a very conservative estimate, as noted earlier.

Table 3
Combined Economic and Efficiency Benefits of HSR in Los Angeles County
(2006 dollars)

2020				
Output Added	Employment added	Earnings added	Efficiency gains	Total benefits to households[38]
$6.9 B	54,800 Jobs	$2.0 B	$0.4B	$2.4 B

2035				
Output Added	Employment added	Earnings added	Efficiency gains	Total benefits to households[39]
$12.1 B	96,300 Jobs	$3.6 B	$0.8B	$4.4 B

Source: Tables 1c, 2, and author's calculations

In other words *HSR will generate more benefits from added economic activity* annually *in Los Angeles alone than the entire cost of the Prop. 1 bond,* whose expense will be borne only partly by Angelenos, and will be spread over many years.

Indirect Benefits: Local Government Revenues

Since all governments are dependent for revenues on the health of the private economy, the accelerated economic growth brought about by HSR will pay dividends for L.A. County and each of its cities. For brevity, this section will discuss only the county and its local jurisdictions (cities, school districts, redevelopment agencies, and special districts) as a group.

Los Angeles County receives about 20% of its revenue from property taxes, another 37% from other taxes and fees (e.g., sales taxes), and 43% from state and federal assistance (much of it financed by taxes paid by county residents.)[40] The County's revenues are 6.8% of total household income. When all local jurisdictions within the county are included, total local revenues are 17.4% of household income.[41] Thus based on the estimated increase in household displayed in Table 3 above, L.A. County can expect to see revenue increases of $136 million per year in 2020 and $408 million per year in 2035. For all local jurisdictions within L.A. County's boundaries, their added revenues will be $348 million and $626 million in 2020 and 2035 respectively. All figures are in 2006 dollars.[42]

Environmental benefits stemming from higher real estate values

The HSR will raise real estate values near train stations[43], which will attract higher densities of development and reduce consumption of vacant land by urban "sprawl." This effect has been established by past experience in every other HSR development in the world. As a local example, property values along light rail corridors in Los Angeles were found to command a premium of as much as 16%[44]. Such a premium would be welcome, since average residential real estate prices in L.A. have declined by nearly 50% from their 2006 peak (with wide variation among micromarkets in Los Angeles.)

Based on standard planning factors about land consumption, Cambridge estimates that nearly 35,000 fewer acres will be consumed in L.A. County by 2035 if HSR is instituted.[45] In addition, 370 acres of wetlands that would otherwise be encroached upon by urbanization will be avoided if HSR encourages denser development. Proportionately this will represent a significant increase the amount of surviving wildlife wetland habitat remaining in Los Angeles.

Air quality improvements would be significant. Although high-speed trains consume 163 times the energy per mile traveled of passenger autos, the High-Speed Rail Commission's ridership forecasts anticipate far more than 163 passengers per train[46]. High-speed trains consume half as many BTUs (a unit of energy) per passenger mile traveled as do passenger road vehicles.[47] To a notable degree, air emissions correlate with energy consumption. HSR would reduce statewide energy consumption by autos by one-sixth, and energy consumption from all transportation sources (i.e., reflecting the energy consumed by trains) by over 18%. The CHSRA estimates that the energy savings and pollution avoided will be the equivalent of removing one million vehicles from the state's roads[48]. A large share of these savings—proportionately more than one-third, based on population--would come from the L.A. region.

According to Cambridge, emissions of most pollutants (e.g., carbon monoxide, PM10, or carbon dioxide, which is a greenhouse gas) would be reduced by roughly 1% in the South Coast basin. The South Coast Air Quality Management District's socioeconomic report on its 2007 Air Quality Management Plan (AQMP) estimates the annual benefits of that plan to be $16.9 billion in 2006 dollars. While HSR will not alone allow AQMD to meet its goals, it will have a considerable effect. The congestion relief component of the AQMP alone—to which HSR will significantly contribute--is expected to provide $1.1 billion in quantifiable economic benefits.[49]

Airplane emissions would be reduced more than those from autos—by 4% to 11%--as many intercity trips could be made by HSR instead of by airplane.[50] These numbers again underestimate the full environmental benefit to Los Angeles County because some estimates exist only at the state level (e.g., most energy consumption, and greenhouse gases) and do not exist at the regional level.

Scientists have demonstrated verifiable health impacts of such pollutants. Environmental economists have demonstrated that such pollutants inflate health care

expenditures and reduce lifespans[51]. Thus avoided pollution will generate real, but uncalculated, monetary benefits to Los Angeles' populace.

Distributional implications

Los Angeles County will receive benefits more than proportional to its contributions to the HSR project. County taxpayers will be responsible for about one-fourth of the state portion of the project's costs. (L.A. county personal income is 26% of total California personal income[52].) But as noted above, the largest share of the trips made on HSR will be by L.A. are commuters. And as noted earlier, the resulting congestion relief will partly alleviate two of the county's greatest competitive disadvantages: traffic congestion and poor air quality. This will bolster the area's attractiveness to employers, narrowing the margin between the county's unemployment rate and national or state benchmarks.

IV. Conclusions

Section III outlined the economic and environmental benefits of high-speed rail to Los Angeles County. But large, aggregate numbers can be difficult to grasp. This concluding section attempts to characterize the benefits in terms more resonant for the average resident and his or her family.

Economic and Efficiency Benefits

A less congested transportation system can help the region attract more highly compensated jobs (about half of all jobs attracted to the L.A. region), boosting employment, total output, and household income. The increase in aggregate gross domestic product is more than the GDP of twenty California counties[53].

The gains from HSR operation will reduce the area's unemployment by between 1 and 2%. The Los Angeles metropolitan area's unemployment rate in July 2008 (the most recent available) is 7.5%, or 1.8% above the nation's 5.7%[54].

Area household incomes will increase by $208 per person in 2020, or over $800 per family of four. By 2035, incomes will rise by $328 per person, or about $1,300 per family of four ($100 per month).[55] This is roughly equivalent to one third of a family's total bill for energy (gasoline, natural gas, and electricity) for one year, or what the average family spends on food over three months.[56]

There will be additional and substantial one-time benefits associated with the construction phase of the project (outlined in Sec. III), but this report concentrates on the recurring benefits from HSR operations, in order to be conservative.

Fiscal Benefits to Local Governments

The added economic growth will increase tax revenues to local jurisdictions within the county (including L.A. County and L.A. city) on the order of $348 million per year by 2020 and $626 million per year by 2035.

Environmental Benefits

High speed rail will increase property values along its corridors (and especially near stations), which will encourage higher density development. This will preserve 56 square miles that would otherwise fall to "urban sprawl". This is equivalent to an area about 20% larger than all of the land area of San Francisco County, or more than 10% of the areas of either Santa Cruz or San Mateo counties. The wetlands preserved alone would be larger than some cities in Los Angeles county.

The estimates contained in this report are deliberately conservative, in that they do not attempt to quantify all the benefits of HSR, including all health and many environmental benefits, as well as the one-time economic activity of the construction

phase. Nevertheless, even the deliberately underestimated impacts we report are quite substantial.

Prop. 1's $10 billion bond is a considerable cost, which deserves special scrutiny in difficult economic and fiscal times. But the high-speed rail system will produce significant relief to L.A. County's inadequate transportation system, allowing the area to attract more high quality employers—and their jobs. These jobs will provide substantial and tangible economic and environmental benefits to area commuters, and taxpayers, over the system's lifetime that will be many times the cost of the bond.

Endnotes

[1] Dr. Philip J. Romero is Dean of the College of Business and Economics at California State University, Los Angeles (Cal State LA), and a professor of economics. The views expressed in this report have not been reviewed, and are not endorsed by, either Cal State LA or the California State University system.
[2] City air quality rankings from *Reader's Digest*, "50 Cleanest (Dirtiest) Cities in America", July 2005.
[3] Based on Cambridge Systematics' statewide reports, as noted.
[4] See previous note.
[5] California State Senate, Committee on Transportation & Housing, Oversight Hearings for the California High-Speed Rail Authority, June 2008, Chart 3, p. 19.
[6] *Ibid*, Chart 4, p. 20.
[7] California High-Speed Rail Authority, California High-Speed Train Final Program Environmental Impact Report/Environmental Impact Statement, 2005, Ch. 5, p. 5-21.
[8] Adds household earnings to efficiency gains to estimate household benefits.
[9] See previous note..
[10] Author's calculations based on economic benefits reported in Table 3 and regional population projections from Cambridge Systematics, Inc., Economic Growth Effects of the System Alternatives for the Program Environmental Impact Report/ Environmental Impact Statement, July 2003, p. 1-7, table 1.4.
[11] Author's calculations based on tax rates shown in text applied to 2020 and 2035 personal income increase projections listed in Table 3.
[12] City air quality rankings from *Reader's Digest*, "50 Cleanest (Dirtiest) Cities in America", July 2005.
[13] Based on Cambridge Systematics' statewide reports, as noted.
[14] See previous note.
[15] Cambridge Systematics, Inc., Economic Growth Effects of the System Alternatives for the Program Environmental Impact Report/ Environmental Impact Statement, July 2003 and August 2007 eds.
[16] Cervero, Robert and Dunn, Michael, Land Value Impacts of Rail transit Services in Los Angeles County, Urban Land Institute, June 2002.
[17] South Coast Air Quality Management District, Final 2007 AQMP Socioeconomic Report, June 2007.
[18] *Los Angeles Times*, "Believe in the Bullet Train", May 3, 2007.
[19] California State Senate, Committee on Transportation & Housing, Oversight Hearings for the California High-Speed Rail Authority, June 2008, Chart 3, p. 19.
[20] *Ibid*, Chart 4, p. 20.
[21] California State Senate, Committee on Transportation & Housing, op. it, paragraph #12, and Table 2.
[22] One limitation of input-out/multiplier analysis is worth mentioning. Estimates of the impact of a change (e.g., HSR) assume that the structure of the economy remains essentially the same, so the pattern of resource flows are preserved. While this can be problematic for a small economy, it is plausible for a $300 billion-plus economy like Los Angeles County's.
[23] According to Cervero and Duncan, each development was built in anticipation of nearby rail.
[24] For a survey of the effects of HSR on property values, see Cervero, Robert and Dunn, Michael, Land Value Impacts of Rail Transit Services in Los Angeles County, Urban Land Institute, June 2002.
[25] Cambridge Systematics, Inc., Economic Growth Effects of the System Alternatives for the Program Environmental Impact Report/ Environmental Impact Statement, August 2007 ed.
[26]Bureau of Economic Analysis, U.S. Department of Commerce, Regional Input-Output Multiplier System (RIMS II), 2004.
[27] Cambridge Systematics, Inc., Economic Growth Effects of the System Alternatives for the Program Environmental Impact Report/ Environmental Impact Statement, August 2007 ed.
[28] The sector is formally designated "FIRE" (financial, insurance, and real estate), which pays wages well above the state average. Other well-paying sectors include manufacturing and the non-retail components of "TCU and Trade" (transportation, communications, and utilities). Table 1c includes 2/3rds of projected added FIRE and Services employment, and 1/3 of TCU and Trade, and Construction and Manufacturing.
[29] Regional construction spending estimates from Forward Observer, 'Allocating Construction Costs of California High Speed Rail (CHSR)", unpublished, Aug. 26, 2008. Employment estimated by applying the construction industry employment multiplier from RIMS II (see below for citation).
[30] California Dept. of Finance, *California Statistical Abstract, 2006,*

[31] Bureau of Economic Analysis, U.S. Department of Commerce, Regional Input-Output Multiplier System (RIMS II), 2004.
[32] Author's calculations. For output, computation is: Total added output per job = $1 M added demand / 17.724 jobs multiplier x 2.23 output multiplier = $125,826. Similar computation performed for household earnings.
[33] California Dept. of Finance economic forecast, April 2008, http://www.dof.ca.gov/HTML/FS_DATA/LatestEconData/documents/FRCAFOR0408.xls.
[34] "Change in output" captures the increase in gross domestic product, the sum of the value of all goods and services produced in the area economy.
[35] *California Statistical Abstract*, 2006.
[36] Regional construction spending from Forward Observer, op cit, translated to output and earnings using RIMS II construction industry multipliers.
[37]California High-Speed Rail Authority, Economic Growth Effects of the System Alternatives for the Program Environmental Impact Report/ Environmental Impact Statement, July 2003. Figures updated to constant 2006 dollars by the author. Assumes, based on Cambridge, a value of traveler time of $57.06 per hour for business and commuting trips, and $41.85 per hour for non-business trips; both figures are adjusted to 2006 dollars.
[38] Adds household earnings to efficiency gains to estimate household benefits.
[39] See previous note.
[40] County of Los Angeles Annual Report 2007-08, p. 8.
[41] Authors' calculations from *ibid* and *2006 California Statistical Abstract*, Tables D-8 and M-14. Local governments in California receive about 2/3rds of their locally generated tax revenues from property taxes, one sixth from sales taxes, and one sixth from other taxes and fees. See Legislative Analyst Office, *California's Tax System: a Primer*, April 2007.
[42] Author's calculations based on tax rates shown in text applied to 2020 and 2035 personal income increase projections listed in Table 3.
[43] Cervero, Robert and Dunn, Michael, Land Value Impacts of Rail transit Services in Los Angeles County, Urban Land Institute, June 2002.
[44] Cervero and Duncan, op. cit, Figure 4, p. 28.
[45] Cambridge Systematics, Inc., California High-Speed Train Final Program Environmental Impact Report/Environmental Impact Statement, 2005, Ch. 5, p. 5-21.
[46] For relative energy consumption, author's calculations based on ibid, p. 3.5-4, table 3.5-1.
[47] Ibid, p. 3.5-16, table 3.5-5.
[48] California High Speed Rail Authority, http://www.cahighspeedrail.ca.gov
[49] South Coast Air Quality Management District, Final 2007 AQMP Socioeconomic Report, June 2007. p. 3-2.
[50] Ibid, Ch. 3, pp. 3.3-22 to 3.3-24, tables 33.7 and 33.8.
[51] See for example, California Air Resources Board Report 99-293, THE ECONOMIC VALUE OF RESPIRATORY AND CARDIOVASCULAR HOSPITALIZATIONS.2003, or South Coast AQMD, *op cit.*
[52] Dept. of Finance, *California Statistical Abstract*, 2006.
[53] Counties' GDPs from Dept. of Finance, *California Statistical Abstract*, 2006, www.dof.ca.gov.
[54] Unemployment figures from the Bureau of Labor Statistics, www.bls.gov.
[55] Author's calculations based on economic benefits reported in Table 3 and regional population projections from Cambridge Systematics, Inc., Economic Growth Effects of the System Alternatives for the Program Environmental Impact Report/ Environmental Impact Statement, July 2003, p. 1-7, table 1.4.
[56] Typical family expenditures by category are from the Bureau of Labor Statistics, www.bls.gov.

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