

January 2005

A SUSTAINABLE FUTURE FOR PLEASANTON: EVALUATING LAND USE ALTERNATIVES

by **Dahlia Chazan**

The City of Pleasanton's comprehensive review of its General Plan presents an opportunity to evaluate the city's land use decisions in terms of sustainability, broadly defined as balancing environmental, economic, and social equity concerns. Given current restrictions on housing locations, the city has essentially two main options for accommodating housing within its current boundaries: 1) Single-use housing development on the edge of the city and within existing residential areas, some of which would require rezoning land currently zoned Commercial/Office/Industrial (conventional development pattern); and 2) Comprehensive, transit-oriented mixed-use infill development, of which the Hacienda Business Park site represents the clearest opportunity (transit-oriented development).

Within the context of Bay Area progress toward sustainability, this report examines the impacts of each main housing strategy for the city of Pleasanton. In particular, it uses transportation patterns from existing developments to compare additional conventional housing development to transit-oriented development in Pleasanton. A transit-oriented development (TOD) built at the Dublin/Pleasanton BART station would be similar to existing TODs at other BART stations throughout the East Bay, such as Pleasant Hill and other BART stations in southern Alameda County. These other station areas, therefore, allow the outcomes of a potential TOD in Pleasanton to be compared to additional conventional development.

Projected transit ridership for TOD residents in Hacienda Business Park totals 36.67 percent of commuter trips. With more people able to take transit (and most likely others able to walk to local workplaces), new residents of Pleasanton at a Hacienda TOD would contribute less to local traffic congestion and would drive 46 percent fewer miles during commute hours than would the same number of residents of conventional housing.



This 46 percent reduction in gasoline consumption and increased use of transit has important environmental, economic, and social equity benefits to the community. The environmental benefits include reductions in air pollution and corresponding reductions in air pollution-related diseases and water quality impacts. The community will also reduce its contribution to global climate change by reducing its emissions of greenhouse gases.

The TOD compares favorably with conventional development in economic terms, including impacts, associated with the cost of time spent commuting, of combating global climate change due to carbon dioxide emissions, and of exporting capital for petroleum products produced outside of the community.

These environmental and economic impacts affect some people disproportionately. For example, people with fewer economic resources pay a relatively high cost in time spent commuting, from health impacts associated with air pollution, and from diversion of local capital to pay for imported petroleum products rather than local and regional transit.

BACKGROUND

The City of Pleasanton is currently undertaking a comprehensive review of its General Plan. According to City staff, there is little undeveloped residential land within the city, but significant undeveloped commercial/office/industrial (COI) areas remain (17 percent of the COI area has no building approvals associated with it).ⁱ Much of the undeveloped land in this category that is in the city's urbanized area is found in Hacienda Business Park, which has been developing since the 1980s. The Park's investors have expressed interest in revisiting previous approvals to explore new land use patterns. These patterns could include mixed-use, transit-oriented development with a significant housing component on some of the land that remains, particularly in proximity to the Dublin/Pleasanton BART station.

The purpose of this study is to evaluate the sustainability impacts of housing alternatives in the City of Pleasanton's new General Plan. The new General Plan will determine where housing will be built in the City over at least the next decade. In particular, updating the Land Use Element of the General Plan gives the City the opportunity to determine its vision for accommodating housing within city limits.

City staff has identified a variety of housing-related issues to be addressed during the General Plan update process. One key issue is the need to re-designate some additional land for residential development in order to build the units identified in the City's Housing Element and how to best do this within the City's voter-approved housing cap. Decision makers will also consider whether to encourage mixed-use development near BART stations, and whether to designate land for higher-density development in order to accommodate its Regional Fair-Share housing needs.ⁱⁱ Recent housing development in the City has been primarily lower-density (one to two units per net acre) housing on the southeastern perimeter, such as the Ruby Hill project.ⁱⁱⁱ

City decision makers could choose to continue with this conventional pattern of growth on the edge of the city's urbanized area (but within its Urban Growth Boundary) or they could choose to focus on using existing infrastructure for housing development on already urbanized land. While there are many independent reasons why either type of development may be pursued and many gradations between those two paths, for the purposes of this report, the options will be defined starkly as a choice between:

- a. Accommodating housing on undeveloped land currently designated for Commercial/Office/Industrial use, primarily located on the City's periphery, but also within the developed area (conventional development pattern); and
- b. Comprehensive, transit-oriented mixed-use infill housing located entirely within the urbanized area that makes use of existing infrastructure. The primary opportunity for this type of development to be examined in this study is transit oriented development in Hacienda Business Park (transit-oriented development).

The City of Pleasanton has made major strides toward achieving sustainability in recent years, including developing green building guidelines for commercial builders, and making energy rebates readily available to residents. Despite the interest in sustainability in Pleasanton and the rest of the Bay Area, analysis of the sustainability impacts of land use decisions remains rare. More sustainable choices would lead to less-clogged roads, increased use of public transportation, and reduced air pollution. Instead, the opposite has occurred all too often. This report complements existing efforts in Pleasanton and the region to move toward sustainability by evaluating land use alternatives and how they can help Pleasanton accelerate its progress. Such efforts will help Pleasanton model sustainable practices for the rest of the Bay Area and improve quality of life for its citizens.

SUSTAINABILITY IN THE SAN FRANCISCO BAY AREA

Redefining Progress has prioritized measuring the true sustainability impacts of human activities in the Bay Area and throughout the world. Such choices range from an individual's decision to turn off the lights and turn down the thermostat to a municipal government's program requiring energy-saving appliances. Only by understanding the consequences of their choices can decision makers at all levels help advance toward sustainability.

The definition of *sustainability* varies depending on who is providing it, but generally includes the 'three Es': Economy, Equity, and the Environment. Redefining Progress works primarily with two 'composite' indicators of sustainability, both of which give an overall picture of progress toward sustainability. The first, the Ecological Footprint,

focuses on whether a population's resource use is within the limits imposed by the supply of biological resources. The second, the Genuine Progress Indicator, highlights economic progress in monetary terms. Together, they capture many elements of environmental and economic sustainability explicitly, and equity implicitly.

The social equity component of sustainability is less clearly measurable at the regional level, but some of the most important elements of equity are in the economic and environmental arenas. For example, the Genuine Progress Indicator helps us see how economic impacts may impact members of a community differently.

ECOLOGICAL FOOTPRINT

A recent report^{iv} found that the San Francisco Bay Area's Ecological Footprint is equivalent to an area just smaller than that of the states of California and Oregon combined. On average, individuals in the region have a per capita Ecological Footprint of 20.90 acres (See Table 1).

The Ecological Footprint measures humanity's use of nature. A population's Ecological Footprint is the biologically productive area required to produce the resources to support it and absorb the wastes it generates. Since people use resources from all over the world, Ecological Footprint accounts add up the extent of these areas by converting the resources used by a population into land area—wherever those resources may be located on the planet.

The size of the region's Ecological Footprint is important for several reasons. First of all, it indicates the extent of the region's ecological impact: is it using more resources than are locally available? Perhaps more usefully, from a policy perspective, the Ecological Footprint allows the region to discern the areas of environmental impacts that are most important by

evaluating them with a common metric. For example, in the Bay Area impacts associated with transportation are a key component, representing nearly one fifth of the region's Footprint.

The transportation component of the Ecological Footprint is highlighted throughout this report because land use decisions on the part of local governments have a major impact on a community's transportation Footprint. Most of the transportation Footprint is due to emissions of carbon dioxide by passenger vehicles. When vehicles burn gasoline or diesel, they emit pollutants that threaten human health, along with carbon dioxide. Carbon dioxide contributes to global climate change, which will affect people in this region and around the world for decades to come.

The transportation component of the Ecological Footprint varies in part due to local and regional land use policies that influence how far people drive and alternatives to driving. For example, the transportation component of the Footprint is well below average in San Francisco, at 2.16 acres per capita, and San Francisco has higher residential density (number of housing units in an acre) than any other county in the region. Across the region, smaller transportation Footprints are associated with higher residential density, which can facilitate greater use of transit, walking, biking, or shorter car trips. Land use policies can help people use such alternatives through design, locating housing near transit, and a variety of other options, making transportation access more equitable for all users.

GENUINE PROGRESS INDICATOR

A recent report on the Bay Area's Genuine Progress Indicator found that the region's real economic progress in a year is about 45% lower than is indicated by the region's Gross Regional Product.^v The Genuine Progress Indicator (GPI) measures economic well-being

	Energy land	Crop land	Pasture	Forest	Built area	Fishing Grounds	Total
Energy	2.92	0.00	0.00	0.00	0.00	0.00	2.92
Housing	0.24	0.00	0.00	0.63	0.25	0.00	1.13
Food	1.71	3.38	0.44	0.00	0.00	0.63	6.16
Goods & Services	4.73	0.40	0.06	1.82	0.22	0.00	7.23
Transportation	3.80	0.00	0.00	0.00	0.01	0.00	3.81
Recycling	-0.35	0.00	0.00	0.00	0.00	0.00	-0.35
Total	13.05	3.78	0.50	2.46	0.48	0.63	20.90

Table 1. The Bay Area's Ecological Footprint. Acres Per Capita. *Redefining Progress, 2004. Bay Area's Ecological Footprint.*

and was developed to address some of the major shortcomings of Gross Domestic Product (GDP) and its regional corollary, Gross Regional Product (GRP). GDP is a measure of the volume of formal economic activity and attracts the attention of policy makers and the media. By counting all economic activity as positive, GDP overlooks some significant economic contributions and costs.

GPI, in contrast, classifies expenditures of time and money as positive or negative in order to estimate economic well-being. It adds the value of benefits such as housework and volunteer work and deducts costs such as declining environmental quality, income inequity, and social breakdown. The Bay Area's GPI results indicate that true economic well-being in the region is well below that expressed by the GDP. The region's GPI is \$16,972 per capita, while the GDP suggests that economic well-being is nearly double at \$31,056 per capita. See Table 2 for examples of GPI categories and their values in the Bay Area.

The details of the GPI measurement are less important than understanding the concept that measuring regional progress is valuable and also applicable at the sub-regional level. Are our measurement tools giving local and regional governments the right signals to ensure that residents are moving toward higher quality of life? Local and regional governments make decisions that affect how

much time people spend commuting (a component of the GPI), for example, and can help develop alternatives that allow people greater flexibility in how they spend their time away from work.

SUSTAINABILITY IN ALAMEDA COUNTY

Alameda County's sustainability indicators highlight many of the same concerns as those of the region. The county has an Ecological Footprint of 20.57 acres per capita, nearly 31 million acres total, which greatly exceeds the county's actual land area of 471,000 acres. It has a per-capita GPI of \$13,200 versus a per-capita GDP of \$26,700, which suggests a rosier economic picture. Both of these measures show room for progress toward sustainability in Alameda County. Land use decisions at the county and local level are one critical way that Alameda County governments can move toward smaller Footprints and greater economic progress for *all* county residents.

TRANSIT-ORIENTED HOUSING DEVELOPMENT IN PLEASANTON

What exactly is transit-oriented development (TOD)? And, how are the outcomes from TOD measured? There is a great deal of literature on this topic, and definitions vary from simply referring to development near transit; to intensifying development near transit stations; to mixed-use near transit designed to reduce auto dependence; to moderate to high density near transit. Some also refer to a short walk time to the transit station, or pedestrian/bicycle friendliness.^{vi}

One practical solution to assessing the impacts of TOD is to find local TODs that are making a difference in the transportation habits of station area residents and use those as a basis for comparison. Fortunately, a recent study funded by CalTrans (Lund study, hereafter) included a comprehensive analysis of TODs around the state of California.^{vii} This allows a direct comparison between TODs in other parts of the East Bay and the potential transit-oriented development in Hacienda Business Park. The project used four primary criteria:

- a. Sites should be located in suburban areas that are being intentionally developed as TODs (in some cases, transit-oriented infill developments were also included);
- b. Sites should be located in station areas with service headways of 15 minutes or less (except in the case of commuter rail, where headways range from 20 to 50 minutes);

Selected GPI Categories	Monetary Value
Adjusted Income	\$125,937,320,578
Volunteer Work	\$13,225,961,483
Housework	\$34,203,719,511
Net Capital Investment	\$13,499,748,169
Roads	\$2,555,171,042
Air Pollution	-\$1,404,854,463
Commuting	-\$15,342,250,192
Household Air Pollution Abatement	-\$356,920,163
Solid Waste	-\$314,109,539
Loss Farmlands	-\$100,694,200
Loss Wetlands	-\$375,040,000
Non-Renewable (Consumption)	-\$13,336,872,160
CO2 Emissions	-\$5,765,953,385
Ozone Depletion	-\$8,250,125,732
Water Pollution	-\$1,275,346,880
GPI Per Capita	\$16,974
GDP Per Capita	\$31,056
Population	6,783,760

Table 2. Total Value of Selected Bay Area GPI Categories.

- c. Sites should have at least 50 residential units or 100 employees;
- d. All sites should be located within walking distance of the transit station (ideally this distance was no more than 1/4 to 1/3 of a mile, but could be up to 1/2 mile if the walking route to the station was determined to be pedestrian-friendly).

A transit-oriented development at the Dublin/Pleasanton BART station in Hacienda Business Park (HBP) could meet all of these criteria:

- a. HBP landowners are proposing an ‘intentional’ TOD, where very limited station-area development exists today;
- b. Service headways at the Dublin/Pleasanton station are 15 minutes on weekdays;
- c. Available building sites around the station can accommodate a minimum of 859 new units, in addition to businesses/retail uses; and
- d. Several of the proposed TOD locations within HBP are within ¼ to 1/3 of a mile of the station. A regular shuttle bus route reduces the transit time to the station to less than ten minutes for those that are further (between ½ and 1 mile from the station). Headway on the shuttle bus can be further reduced in advance of additional housing being built in the office park. In addition, by virtue of building housing directly adjacent to jobs in the business park, some residents of the new housing will be able to get to work by foot, bicycle, or shuttle bus, without the need for a private vehicle.

While density, proximity to transit, and regularity of transit service are important to the success of a TOD, it is crucial not to overlook design considerations. The

first requirement described by Lund is that TOD sites be ‘intentionally designed’ as TODs. Additional design considerations include mixed-use that allows both residents and workers to do their daily shopping and errands within the development and walker-friendly design that includes landscaping and sidewalks.^{viii} Such considerations ensure people feel comfortable taking advantage of the conveniences associated with living and working close to transit.

By meeting the criteria outlined in the Lund study, TOD in HBP should meet or exceed the expectations set by other, similar station-area developments around the East Bay. In order to use TODs that are most similar to such a potential development at the Dublin/Pleasanton BART stations, only those TODs associated with BART stations in the East Bay are included in this study. These are station areas surrounding the Pleasant Hill BART station and a collection of station areas surrounding BART stations in southern Alameda County.^{ix}

The first comparison between Pleasanton and other station areas is demographic (see Table 3). In terms of income and education, residents of Pleasanton are higher paid and more highly educated than residents of communities in the East Bay with existing TOD. However, the Lund study found that these variables did not help predict transit use among station area residents.

Pleasanton residents are also slightly more likely to live in a single-family home and to have two or more vehicles. Households with two or more vehicles are less likely to use transit. But, the Lund study found that BART station-area residents were highly likely (64 to 67 percent) to choose their location due to its transit access, despite the fact that the majority of residents had one or more vehicles available per driver. This comparison suggests that the behavior of new station-area residents would be likely to mirror that of their

	Median Income	% High School or higher	% Bachelor's degree or higher	% Single Family detached homes	% 2 or more vehicles available	% Work in City of Residence	% Work in Central City
Fremont	76,579	88.4	43.2	59.8	69.3	31.63	4.68
Hayward	51,177	75.1	19.9	49.5	59.4	27.65	12.20
Union City	71,926	80.5	29.5	63.4	73.2	13.68	8.43
Pleasant Hill	67,489	93.1	42.5	59.4	60.3	15.95	10.32
Average	66,793	84.3	33.8	58.0	65.6	22.2	8.9
Pleasanton	90,859	94.2	47.3	65.2	72.6	31.82	6.33

Table 3. Characteristics of Communities with BART TODs in the East Bay. *United States Census, 2000.*

counterparts in the rest of the East Bay. A recent statewide survey similarly found that a majority of

Californians would choose a small home and a short commute over a large home and a long commute (53 versus 42 percent).^x

Pleasanton residents are slightly more likely to work in Pleasanton than in Oakland, Alameda County’s Central City as defined by the Census Bureau. Thirty percent of Pleasanton residents work in the city.^{xi} New TOD residents would have the opportunity to live and work in Hacienda Business Park. This proximity may reduce the likelihood that they will commute on BART, but such residents could take advantage of the opportunity to walk or take a local shuttle to work. Currently, approximately 15 percent of HBP employees live in Pleasanton and a similar number live in nearby Livermore.^{xii} The number of employees who are local provides opportunities for current workers to become future residents of a TOD at the Dublin/Pleasanton BART station.

A second important comparison between a potential TOD at the Dublin/Pleasanton BART station and other station areas is residential density, particularly as compared to the surrounding city (See Table 4). Residential density simply refers to the number of people who live on each acre of land. Both Pleasanton and the cities in the East Bay that currently house TODs have low residential densities typical of the East Bay. However, the densities present in the TODs around the South Alameda County and Pleasant Hill BART stations are easily achieved in the area surrounding the Dublin/Pleasanton BART Station.

	TOD	Surrounding City
South Alameda County BART station areas	11.23	4.18
Pleasant Hill BART Station Area	9.17	6.14
Hacienda Business Park		
Low Estimate	35.72	4.56
Medium Estimate	48.23	4.56
High Estimate	63.93	4.56

Table 4. Residents per Acre in Existing East Bay BART TODs and Potential Hacienda Business Park TOD. *United States Census 2000; estimates of HBP population are based on personal conversions with James Paxson and Brian Swift.*

Therefore, to the extent that the effectiveness of a TOD is determined by residential density, Pleasanton is comparable to these existing East Bay TODs.

The above estimates for persons per acre in HBP are based only on probable residential areas, not those that are currently developed with industrial uses. If the same number of people is divided by the net acreage of the entire park, the density is reduced to a range of nine to 16 persons per acre, which is much lower than the actual density of the mixed-use residential portion of the park. However, even at that reduced density, a TOD at Hacienda would be comparable to other successful and relatively low-density TODs in the region and could be expected to have similar outcomes.

The study compares transit usage in TODs with usage in surrounding areas based on the conclusion developed above that other station areas in the region can reasonably be used to predict the outcome of a TOD at the Dublin/Pleasanton BART station. Such a comparison will help determine whether such a TOD would have sustainability benefits for both the city and the region. Table 5 compares the current percent use of transit in the BART station areas with that in surrounding cities. Pleasanton is comparable to both Pleasant Hill and, particularly, South Alameda County cities in its citywide use of transit.

A recent study of mixed-use TODs in the Portland, Oregon, region used direct observation of mode split and trip generation to evaluate the effectiveness of such developments in reducing the number of automobile trips.^{xiii} *Mode split* refers to the breakdown of transportation used, including driving alone, carpooling, walking, bicycling, and using public transportation. *Trip generation* refers to the number of times a member of the household leaves for some destination off of the property, including the trip to work, to do errands, and to visit friends. Many studies refer to trip generation only for automobile trips, but this one expanded the definition to include transit and pedestrian trips as well.

The study showed that the mixed-use TODs in Portland generated fewer automobile trips as well as fewer trips overall. Some trips were diverted to transit or walking, but smaller household sizes were proposed as an explanation for the smaller total number of trips. The data suggest that standard trip generation rates often used by transportation engineers to determine needed roadway capacity for new developments do not fully reflect more ‘specialized’ development patterns such as TOD. While the specific numbers will not be the same in other locations, this study adds to

the evidence that TOD can help reduce vehicle miles traveled, resulting in a host of potential sustainability benefits.

POPULATION SCENARIOS FOR PLEASANTON HOUSING

The study considered three population scenarios. The low and high population projections were based on the amount of housing that could be accommodated in the space available for mixed-use housing at Hacienda Business Park. Current conditions at the park were used to develop a range of densities to be considered at each property. Maximum and minimum numbers of potential residents resulted from this exercise. The mid-range population estimate is based on the number of units that remain under the City of Pleasanton’s housing cap according to Pleasanton City staff: 1,700 units. The city’s average household size was then used to produce population figures from housing units.

For the sake of a clear comparison between two alternatives, this study assumes that the population associated with three population scenarios could be accommodated either within a new TOD in Hacienda Business Park, or in conventional Pleasanton housing. In addition, it assumes that if people became residents of conventional Pleasanton housing their travel habits would be similar to those of current Pleasanton residents.

RESULTS

This study projects transit ridership of approximately 37 percent among HBP station-area residents, assuming that a Hacienda TOD is similar to other stations in the East Bay in its effect on transit ridership for commute-hour travel (Table 5). Again, this does not include additional residents who may switch to walking, bicycling, or a short shuttle ride due to a potential TOD’s location within the Park and its mix of residential, office, and commercial uses.

The effect on transit ridership of making station areas more attractive to transit riders through mixed-use development is less well-studied. There may be additional benefits in increased ridership among people visiting the TOD area.^{xiv} This includes both people who work in the station area and people who are visiting for other purposes, such as shopping or entertainment. If station areas are designed to help

such visitors make the most of their transit trips, they are more likely to use transit on repeated visits and extend the benefits of TOD beyond those for commuting.

This study predicts changes to peak hour (combined morning and evening peak hour of the commute) vehicle miles traveled (VMT) using outcomes for comparable TODs as a basis for comparison. VMT is a standard measure of distance traveled during prime traffic hours within a geographic area.

ENVIRONMENTAL IMPACTS

Table 6 presents the population figures for each level of development, the vehicle miles that would be traveled under each population projection, and the resulting environmental Impacts. VMT were converted to gallons of gasoline using standard gas-mileage conversions.

Local: Local VMT is directly tied to local environmental impacts as vehicle travel translates into gasoline consumption. Residents experience the impacts associated with gasoline use, such as air pollution, health trouble resulting from air pollution, and air pollution’s contribution to local water quality problems.

The environmental impacts of TOD are consistently 46 percent lower than those associated with conventional development in Pleasanton. This carries through the environmental impact categories of gasoline consumption, carbon dioxide emissions and carbon Footprint.

The percent difference between conventional and TOD housing is in many ways more important than the figures presented because these figures represent only the two peak hours of travel in the morning and in the evening. While the total number of vehicle miles traveled is difficult to estimate from peak travel, some transportation planners use a rule of thumb of ten times the evening peak hour figure. In the case of

	BART Station Area	Surrounding City	Increase in transit share
Pleasant Hill BART	44.90%	13.80%	31.10%
South Alameda County BART	37.80%	5.80%	32.00%
Current Pleasanton BART station area	11.45%	5.12%	
Projected Pleasanton BART with TOD	36.67%		

Table 5. Commuter Transit Ridership in TODs and Surrounding Areas. *United States Census 2000; Lund et al Figure 5-6.*

Pleasanton, the evening peak hour represents 55 percent of the total peak trips, so the 46 percent difference between impacts for TOD and conventional development could be up to 5.5 *times* that in the tables in this study.

This study compared TOD’s potential contribution to the city’s *total* peak hour transportation impact to that of conventional development accommodating the same number of people. For the low population estimates, carbon dioxide emissions associated with TOD represent 2.28 percent of the whole city’s emissions, while the same number of people in conventional development would emit 3.30 percent of emissions. With more people included in the TOD, the differences increase: 4.42 percent versus 6.34 percent for medium population projections and 6.96 versus 9.85 for high population projections. The environmental benefits increase with greater population, but they are significant even at the lowest level of population increase.

Global: The carbon dioxide emitted by burning gasoline in the Pleasanton area contributes to the city’s carbon Footprint and to global climate change. The carbon Footprint is equivalent to the amount of forest area that would be required to sequester, or incorporate into the living tissues of trees, the carbon dioxide emissions from gasoline consumption. It is a useful way of visualizing the impact of carbon dioxide emissions associated with burning fossil fuels. The carbon Footprint ranges from 530 acres with a TOD and the smallest projected additional population to 2,482 acres for conventional development and the largest population. In comparison, the entire Hacienda Business Park has an area of 875 acres. The carbon Footprint of conventional development at the medium population estimate represents an area that is nearly *double* this area.

ECONOMIC IMPACTS

The environmental impacts of land use alternatives correspond directly with economic impacts in Pleasanton. Again, these figures represent *only* impacts associated with peak hour travel. Total economic impacts could be as much as 5.5 times these figures when all driving is considered. The economic impacts summarized in Table 7 include both short-term and long-term components. The export of capital is an immediate impact associated with spending on gasoline. Commuting costs are also felt immediately. In contrast, the cost of CO2 emissions, representing contributions to global climate change, are felt over time.

Short-term: In the short-term, conventional development would result in greater costs for individuals paying more at the pump for their transportation needs, sending local dollars out of California to places where petroleum is extracted and refined. Transit agencies lose these funds that could go into fare boxes, continuing their circulation in the community through wages to local employees and benefits of improved service.

In contrast, conventional development would save commuters time. Time spent commuting is generally greater for Pleasanton commuters who take transit, so TOD could add to their total trip times. This results in an increased cost of commuting for transit-oriented development. The current situation may not tell the whole story however, as proximity to transit should *reduce* total commute times for transit riders by reducing the time it takes to reach the transit station. Some TOD residents will also be able to bypass transit entirely because they will be closer to their workplaces and leisure activities.

Projected new Population	Low Population		Medium Population		High Population	
	TOD	Conventional	TOD	Conventional	TOD	Conventional
New Population	2,338	2,338	4,624	4,624	7,494	7,494
Peak VMT per day	5,133	7,499	10,152	14,832	16,453	24,037
Peak VMT per year	1,874,000	2,737,000	3,706,000	5,414,000	6,005,000	8,774,000
Gallons gasoline (annual)	85,000	124,000	168,000	245,000	272,000	397,000
Lbs CO₂ emitted (annual)	449,000	656,000	889,000	1,298,000	1,440,000	2,104,000
Lbs CO₂ emitted (annual per capita)	192	281	192	281	192	281
Carbon Footprint (annual in acres)	530	774	1,048	1,532	1,699	2,482

Table 6. Traffic and Environmental Impacts of TOD versus Conventional Development in Pleasanton.

Infrastructure costs form another economic comparison between TOD and conventional development. These are generally paid by the developer but ultimately borne by home buyers. The specifics of this comparison cannot be quantified thoroughly in this study but bear mentioning because they affect not just municipal coffers, but also the costs to new homebuyers. HBP currently has sufficient infrastructure to support the highest projected levels of new mixed-use housing (along with corresponding commercial and office uses), while conventional development on the edge of the city would require new infrastructure to be provided. Because developers pass on new infrastructure costs to homebuyers, they bear this burden.

Additionally, the costs of maintaining such infrastructure would be greater for more extensive roadways, sewer lines and other forms of infrastructure built for conventional, sprawling development. Pleasanton would not have to pay these maintenance costs for any development that takes place within Hacienda Business Park because the park pays for the maintenance of its own infrastructure.

A recent study conducted by the Brookings Institution Center on Urban and Metropolitan Policy described ways that smarter growth could provide fiscal benefits to local governments.^{xv} The study's authors found that there are two main categories of fiscal benefits to smarter growth, which encompasses TOD into its definition:

- *Economies of Scale*: Efficiencies associated with serving more people in a smaller (more dense) area.
- *Economies of Geographic Scope*: Efficiencies associated with increases in numbers of people close to existing major facilities.

Beyond such fiscal benefits, however, they cited evidence of real economic benefits to communities that developed in smarter growth fashion, including:

- Increase in housing prices due to *spatial containment* (managing new development so it is within defined geographic areas), and
- Increase in housing prices due to *creation of benefits* such as convenience, enhanced public transit, and lower service costs.

Long-term: Increased gasoline consumption in turn results in greater spending to combat the effects of global climate change. According to a recent report by the Union of Concerned Scientists, effects of climate change in California could include higher summer temperatures, decreased winter precipitation, and increases in winter temperatures that could threaten the state's snowpack.^{xvi} Governments and individuals will pay the costs associated with such predictions. Those costs, too, increase by 46 percent with a conventional development scenario over TOD. The methods for estimating the costs, however, are nascent and most likely *underreport* the actual local costs associated with climate change as they continue to be studied.

The Brookings study described other, more regional-scale economic benefits, including:

- Regional property value increases due to *regional growth management* policies that enhance tax bases, create wealth through housing appreciation, and boost property tax collections,
- Increased average labor productivity associated with *employment density* of counties,
- Higher productivity associated with *compact cities* that have efficiently integrated transportation systems, and
- A correlation between growth management and the improvement of *market share* (growth in personal income relative to other regions).

There are no guarantees that all of the economic benefits listed here would result from a TOD in

Projected new Population	Low Population		Medium Population		High Population	
	TOD	Conventional	TOD	Conventional	TOD	Conventional
Annual Cost of CO ₂ Emissions	\$149,000	\$217,000	\$294,000	\$430,000	\$477,000	\$696,000
Annual Commuting cost (time value)	\$46,000	\$35,000	\$90,000	\$69,000	\$147,000	\$112,000
Annual Export of Capital for Oil	\$88,000	\$128,000	\$173,000	\$253,000	\$281,000	\$410,000

Table 7. Economic Impacts of TOD versus Conventional Development in Pleasanton.

Pleasanton or other cities, but even a small proportion of them could help a region such as the Bay Area, and the cities within it.

EQUITY IMPACTS

Economic Inequity: The impacts of land use alternatives on people are closely tied to the economic differences between TOD and conventional development. By exporting capital to pay for gasoline, the city receives less money for its transit service and is therefore less able to invest in expansion and maintenance of services. This can result in reduced services available for lower-income people, children, and seniors, who are more likely to be dependent on transit, particularly in low-density areas like Pleasanton. Time spent commuting is a cost that then rests even more heavily on these populations. TOD appears well-suited to help reduce that cost.

Environmental Inequity: Environmental considerations that are difficult to quantify at the local level are also a primary source of inequity associated with different land use types. This study quantifies that conventional development in Pleasanton is associated with a 46 percent increase in gasoline consumption over that predicted for transit-oriented development. The air quality models are not yet in place to determine the costs of treating air pollution related disease at the local level, but figures from the region's GPI (see Table 2) suggest that the costs can be high. Currently the per-person costs of treating air pollution related health problems in Alameda County are over \$85 each year.^{xvii} While a TOD at the Dublin/Pleasanton BART station will make only a small contribution to stabilizing these climbing costs, it could be a step in that direction.

CONCLUSION

Evaluating outcomes using sustainability criteria is a relatively new approach, but the components of sustainability: a clean environment, a healthy economy, and equitable distribution of resources, benefit everyone. A transit-oriented development at Dublin/Pleasanton BART station has the potential to improve the sustainability of Hacienda Business Park in which it would be located, the city of Pleasanton, and the region as a whole. Sustainability improvements in HBP would add incrementally to progress in the region as a whole. And, they would continue to show how many different models there are for sustainable development in a diverse place like the Bay Area. The potential for improved environmental

outcomes in the form of improved air quality, improved economic outcomes as spending stays in the community, and equity in the form of improved local access to transit are concrete outcomes that benefit everyone, whether they work and live in HBP or not.

NOTES

ⁱ City of Pleasanton, Planning Department Staff. February 19, 2004. General Plan Update Memo No. 1: Land Use Overview.

ⁱⁱ *ibid*

ⁱⁱⁱ City of Pleasanton, Planning Department Staff. July 12, 2004. General Plan Update Memo No. 6: Southeast Pleasanton Area.

^{iv} Redefining Progress. 2004a. Bay Area's Ecological Footprint. Available:

http://www.regionalprogress.org/county_ca_bayarea.html

^v Redefining Progress. 2004b. Bay Area Loses \$104 billion in Economic Activity. Available:

http://www.regionalprogress.org/more_ca_bayarea.html.

^{vi} Cervero, R., C. Ferrell, and S. Murphy. Transit-Oriented Development and Joint Development in the United States: A Literature Review. Transit Cooperative Research Program. Research Results Digest. October 2002, Number 52.

^{vii} Lund, H.M, R. Cervero, and R.W. Willson. Travel Characteristics of Transit-Oriented Development in California. Final Report. January 2004. Available: <http://www.csupomona.edu/%7Erwwillson/tod/Pictures/TOD2.pdf>.

^{viii} Cervero, R et al. 2002.

^{ix} Hayward, South Hayward, Union City, and Fremont stations.

^x Baldassare, M. Public Policy Institute of California Statewide Survey November 2004. Special Survey on Californians and their Housing.

^{xi} City of Pleasanton Annual Baseline Traffic Report – 2003. Page 11.

^{xii} Hacienda Employer Transportation Survey. September 16, 2003. Survey results are approximate because the study was not statistically robust.

^{xiii} M. Lephram. March 2001. Transit Oriented Development – Trip Generation & Mode Split in the Portland Metropolitan Region. Portland State University.

^{xiv} The Lund study examined TOD workers in some detail. However, Pleasanton-area employment studies, particularly of HBP employees, are somewhat limited and not sufficient to make significant conclusions.

^{xv} Muro, M. and R. Puentes. March 2004. Investing in a Better Future: A Review of the Fiscal and Competitive Advantages of Smarter Growth Development Patterns. A Discussion Paper Prepared by The Brookings Institution Center on Urban and Metropolitan Policy.

^{xvi} The Union of Concerned Scientists. 2004. Climate Change in California: Choosing Our Future. Available: <http://www.climatechoices.org/>.

^{xvii} Redefining Progress. 2004b.