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MEMORANDUM

Date: August 6, 2004

To: Allison Brooks, East Bay Community Foundation
James Paxson, Hacienda Owners Association

From: Richard W. Lee, Ph.D., AICP

Subject: Review of Literature on TOD Trip Generation Relevant to Hacienda Business Park
1031-1991

INTRODUCTION AND OVERVIEW

This memo presents the results of a literature review of studies documenting the effectiveness of Transit Oriented Development (TOD) in the reduction of vehicular trip-making. It is intended as a guide for development and redevelopment proposals in Hacienda Business Park proximate to the Dublin/Pleasanton BART station.

The studies chosen consider the effects of density, mixed use, pedestrian-friendly design and proximity to transit – all key components of TOD. Nearly 40 studies were reviewed, ranging from large-scale national studies of travel behavior to local traffic generation studies. The full set of literature reviewed is listed in the bibliography.

Although the literature review was quite extensive, this memo focuses on several documents that are particularly relevant, well grounded, and statistically valid. Bay Area studies, particularly of BART and other rail station areas with above average socioeconomic profiles, are emphasized.

The review *did not* include an evaluation of strategies that do not include a land-use related component. Thus, employer-based transportation demand management (TDM) strategies, small or incremental increases in transit service, and pricing programs are *not* under study. The effect of such programs would be in addition to the land use factors described in this memo.

The memo concludes with a summary of the trip reduction potential of TOD proposals for Hacienda Business Park and recommendations for achieving and maximizing the reduction of vehicular trips, as well as suggestions for further study.

LITERATURE REVIEW

This section of the memorandum summarizes the literature review regarding the impact of TOD land use and urban form factors on reduced vehicular trip generation. This literature review covers a variety of sources and authors, focusing on the past 10 years, but also covering important earlier studies such as Pushkarev and Zupan's *Public Transportation and Land Use Policy*, whose findings have been borne out and elaborated by subsequent investigations.

This literature review included two other very comprehensive literature reviews by Cervero and Seskin (1995) and Cervero and Ewing (2002). This was supplemented by a search of the Bureau of Transportation Statistics TRIS online database for literature published between 1998 and 2003, and a search of UC Berkeley's Harmer E. Davis Transportation Library's databases. To glean the results of completed studies not yet published in journals, a similar search was conducted of the nearly 1,400 technical papers presented at the 82nd Transportation Research Board Annual Meeting in January 2003.

Four specific questions guided the literature review:

1. What land use factors contribute to reduced vehicle use around stations?
2. What specific empirical evidence about travel behavior exists (for example what percent of people within 1/2 mile of transit use it)?
3. Is there evidence of specific California and Bay Area relationships between land use, private vehicle use, and transit ridership?
4. What particular characteristics (existing and planned) offer prospects for reduced vehicle trip rates in Hacienda Business Park?

Land Use Factors That Reduce Vehicular Travel: Density and other "D"s

At the residential (production) end, the principal land use factors that reduce vehicular use are generally the same as those that promote transit ridership. This is an important point to note since there have been many studies of how to promote transit ridership. These factors have been aptly summarized as "the three Ds": Density; Diversity (land use mixture); and Design (e.g., provision of convenient sidewalks and other pedestrian amenities that encourage walking). A fourth "D" – accessibility to concentrated regional Destinations (such as downtown San Francisco) is also a key factor in transit use, as is a fifth "D", Distance to a major transit station. Of these D-factors, density of residential uses at the origin end and the intensity or concentration of non-residential uses at the destination end are viewed as the most significant quantifiable land use variables.[1]

Density

The effectiveness of increased densities near transit in reducing vehicle use is borne out by an abundance of studies over time. Most of the debate in the literature is not over the efficacy of density in promoting transit use, but over the degree of effectiveness and the means, specific mechanisms and co-factors that reduce vehicle use in higher density settings. A correlation between density and lower car use is not inevitable – high density in an area lacking destinations to walk to, or without transit service, or with transit service that does not meet residents needs, may have negligible effects on travel patterns. In general however, density, especially near transit, increases transit patronage and reduces private vehicle use by reducing the time and cost of accessing transit, and by increasing the number of destinations within walking distance, eliminating the need for a vehicle for some trips.

[1] Going beyond land use (and the scope of this memo) yet another D, Demographics, is a very significant factor (especially if car ownership is included with income and ethnicity/immigrant status as a demographic variable). For example, Dowell Myers of the School of Policy, Planning and Development, University of Southern California has established that recent immigrants are much more likely to use transit (presentation to the Alameda County CMA on April 27, 2000). Myers' research indicates that immigrants travel habits converge over time, and there is little difference between the travel patterns of native-born residents and those of immigrants who have been in the U.S. for several decades.

An analysis of the 1995 Nationwide Personal Transportation Study (NPTS, a survey of over 40,000 travelers nationwide) found that the share of total travel by private vehicle (drivers plus any passengers) was strongly and inversely correlated with residential density. The percentage of all travel by car was:

- 92 percent for all densities of between 1,000 and 4,000 persons per square mile (Pleasanton currently has a gross density of 3,000 persons per square mile)
- 90 percent for all densities of between 4,000 and 10,000 persons per square mile (San Leandro and San Mateo are in this range).
- 69 percent for densities above 10,000 persons per square mile (e.g., Berkeley, Daly City, and San Francisco).

What of the non-vehicular trips? The NPTS indicates that for all density levels listed above, walk and bike trips were one and one-half to nearly two and half times as numerous as transit trips. Thus, a reasonable rule of thumb is that there will be twice as many daily walk and bike trips as transit trips in most areas.

Effects of Mixed Use or Land Use Diversity

A review of more than forty studies for the U.S. Environmental Protection Agency concluded that integrated complementary land uses (i.e., increasing land use Diversity) can also be highly effective at reducing vehicular use (Criterion Planners/Engineers and Fehr & Peers Associates 2001). As a stimulus to transit ridership, the research record on mixed use is itself mixed. A study (Cervero1996) of the 1985 American Housing Survey -- which includes questions about household travel illustrates these mixed results: Cervero found that if retail shops are within 300 feet, transit ridership is encouraged; if retail is 300 feet to 1 mile away, residents are likely to drive and link a short shop trip onto their journey to work. This study found that mixed land use does seem to encourage non-motorized trips, and is in fact a better predictor of non-motorized trips than is residential density.

Regarding mixed-use in employment centers. Cervero concluded in another study (1989) that suburban employment centers (SECs) with significant retail exhibit a 3 percent increase in transit/ridesharing use with every 10 percent increase in retail uses in the SEC. The ability to accomplish midday errands and convenience shopping on foot influences some commuters to take transit or carpool. (See below for a discussion of employment density and rail ridership).

Station Area Design Characteristics That Support Transit Ridership

Design that minimizes walk times by providing sidewalks and walkways that are complete and direct can increase walking as well as walking access to transit. A variety of studies (e.g. Cervero 1993, Cervero and Gorham 1995, Dill 2003) have found that design matters for pedestrians. There are upper limits to what design can to do to encourage walking: Untermann (1984) and others suggest that one-half mile is the most Americans can be expected to walk under ideal circumstances.

The exact effect of such design features is not easily isolated, but most researchers have concluded that the effect of design alone is less than that of density, and that design changes are most effective in conjunction with higher densities. Using regression analysis to compare existing neighborhoods that were transit-oriented to demographically comparable auto-oriented neighborhoods in the Bay Area as

well as the Los Angeles area, Cervero and Gorham (1995) found that density had more than twice as much impact as neighborhood design. Moreover, Cervero and Gorham found that pedestrian-friendly design is more effective at higher densities than at lower densities.

Land Use Density and Intensity Thresholds That Support Transit

Residential Densities

A variety of sources recommend residential densities for different modes of transit service to be viable. Areas with viable transit in turn exhibit lower vehicular trip generation rates.

Pushkarev and Zupan (1977) examined this issue thoroughly in the 1970s; their basic conclusions regarding density thresholds for various modes of transit have been used regularly, and have generally been substantiated by other research. In essence, Pushkarev and Zupan recommend residential densities of:

- At least 4 dwelling units per acre or more for minimal (bus) transit
- 9 dwelling units per acre units per acre or more for light rail transit
- 12 dwelling units per acre units per acre or more for rapid rail transit (e.g. BART)

Two important caveats regarding Pushkarev and Zupan study:

1. The study is over 25 years old, and many of the data are older still.
2. Much of Pushkarev and Zupan's data was drawn from the New York region, which, particularly in the 1970s, had a bias toward transit use, all other factors held equal.

The level of auto-ownership and auto-oriented development in the Tri-Valley in 2004 means that there are considerably fewer tendencies to use transit compared to the New York region. Thus, while the land use thresholds for various types of transit developed by Pushkarev and Zupan are still valid, they should generally be viewed as absolute minimum thresholds in auto-oriented regions such as Pleasanton and neighboring jurisdictions.

Employment Intensity

A complementary issue to residential density thresholds (and somewhat overlooked in studies of the land use and transit connection) is the issue of commercial densities required to support transit use. Non-residential densities are often referred to as "intensities" and can be expressed in terms of total square footage, total employment, employment density, or floor area ratio (FAR).

Pushkarev and Zupan note desirable intensities for the employment or destination end. To anchor a rapid transit system this is quantified as 50 million square feet of non-residential floorspace. (Regional Plan Association 1977, Figure 6.4) This corresponds to 50,000 – 125,000 employees assuming one employee/400 square feet (Downtown Oakland is in this range, and downtown San Francisco far exceeds it).

Seattle Metro recommended a minimum concentration of 10,000 employees to support cost-effective bus transit. This same study stated that a density of 50 employees per acre also would be required (Seattle Metro, 1987). The City of Portland (2000) adopted a 1.0 FAR minimum in designated light rail station areas. The U.S. DOT/Snohomish County *Transit Oriented Development (TOD) Guidelines* state that FARs above 2.0 are required to support transit. By comparison, a typical suburban office complex has an FAR of 0.5 or less (Cervero 1989).

Frank and Pivo (1995) found that employment densities to be at least as important as residential densities in promoting transit use. Using Seattle-area data, they found that bus transit ridership to employment centers rises to about 10 percent when there are about 100 employees/acre, and exceeds 33 percent when employment densities exceed 200/acres (these employment densities roughly correspond to FARs of 1.0 and 2.0).

Over what area do these densities and intensities need to occur? Cervero and Duncan (2002, p. 14) suggest that a one-mile radius of the destination transit station is relevant. The preponderance of other studies suggest that between one-quarter and one-half mile is the upper limit of what most Americans are willing to walk for transit access purposes. (See Cervero and Seskin, TCRP Research Results Digest, June 1995, esp. Figures 14-16).

Bay Area and BART Station Area Study Findings

The 1990 U.S. Census found that 17.8 percent of the total work trips by those living within 1/2 mile of a BART station were made on BART (Cervero 1993a). In a survey of station area adult residents living in 11 multifamily, mainly rental, housing developments near BART (all but three within one-third mile of BART station), Cervero found a higher BART work mode split of 33 percent in the early 1990s.

A later study using year 2000 Bay Area Travel Survey (BATS) (Cervero and Duncan 2002, p. 12) found that 19.6 percent of residents living within 1/2 mile of BART commuted via transit in that year. This is slightly higher than the 1990 Census BART mode split for workers within the 1/2-mile radius (17.8 percent). This suggests that the proximity effects of rail are not too different from when Cervero conducted his earlier study.

Holtzclaw et al's 2002 study confirms numerous earlier studies by Holtzclaw in the Bay Area and elsewhere in California that a doubling in density results in a 20-30 percent reduction in vehicle miles traveled (VMT). Only a fraction of this is due to more transit use, and Holtzclaw's principle data sources (e.g., Department of Motor Vehicles odometer checks) makes transit's specific contribution difficult to ascertain. Nonetheless, the fact that virtually all vehicles in California are required to receive annual emissions tests (and odometer readings and registration address are noted at the time of testing) means that Holtzclaw's database represents nearly a 100 percent sampling of the state's vehicles, and this makes his estimate extremely solid from a statistical standpoint.

Dill (2003) studied the land use effects on rail ridership in the Bay Area at the work end using large-scale employer-based surveys conducted in the early 1990s. Travel data from a very large set of employer-based surveys in the mid-1990s were obtained for BART station area workplaces as well as Caltrain and Santa Clara light rail (Valley Transit Authority or VTA) station area employers. Employers not near rail serve as a comparison group. The results indicate that a worksite's being near a rail station (particularly within ¼ mile) greatly increases the chances of employees using rail. Proximity to a BART station had a much greater

effect than proximity to a Caltrain or VTA station. Outside of San Francisco, Oakland and Berkeley, Dill found that about 6 percent of all work trips to worksites within one-half mile of rail stations were by rail.

Recent Studies That Develop Specific Peak Hour TOD Trip Generation Rates

The following studies are all of developments with significant TOD components and which also have significant similarities to Hacienda Business Park and the Dublin-Pleasanton BART station area. All but the first are from the Bay Area.

Portland TOD Study

The goal of this study by Lapham (2001) was to identify TOD trip generation rates and the components of TODs that lead to lower trip generation rates. The author identified eight TODs in Portland, OR. Six of the TODs are located along the Portland MAX light rail system and two are located along major bus lines. While Portland's MAX system has lower speed and capacity compared to BART, it offers comparable access to regional attractions.

To measure the TOD trip generation rates AM and PM traffic counts were taken at each location (this is the method employed in most ITE trip generation studies). Lapham then compared the TOD rates to ITE trip generation rates. The study found the TOD trip generation rates for apartments to be lower than ITE 6th Edition rates for apartments (ITE Land Use 220) or mid-rise apartments (Land Use 223) (Table 1). The study also found TOD transit usage was between 11 and 16 percent versus a 5 percent city average.

Lapham also created a regression equation to identify TOD characteristics that contribute to vehicle trip generation rates. The resulting equation was statistically significant, although from a small sample, and generally confirms this and previous TOD literature findings. In particular, Lapham found that vehicle trip-making decreases with density increases, and in the presence of mixed use within 1/4 mile.

Pleasant Hill BART Station Area Specific Plan Amendments Environmental Impact Report (EIR)

The Pleasant Hill BART station area has undergone considerable development over the past two decades. In general this area is similar from a socioeconomic standpoint to Dublin-Pleasanton, and is also similar from a transportation perspective as well; each is served by BART and is near a major regional freeway interchange.

As part of the analysis for the most recent Station Area Specific Plan Environmental Impact Report (EIR) in the late 1990s, unique trip generation rates were developed for the office and residential components of mixed use station area. These were based on extensive surveys and traffic counts and were thoroughly vetted in the course of an extended and intensive public review process.

San Mateo Bay Meadows Specific Plan (2002)

This detailed EIR analysis is based on a variety of travel surveys of employers and residences on the Peninsula (a traditionally suburban area with incomes higher than Pleasanton and the Tri-Valley). These are supplemented and cross-referenced with other studies, including Cervero (1993a) and the Portland and Pleasanton Hill studies described above. The Bay Meadows Specific Plan envisions mixed uses, higher density, and good pedestrian and transit access. Similar to Pleasant Hill and Dublin-Pleasanton, the site is near a major regional freeway interchange. This development will be centered on a Caltrain station, which at the present time offers less frequent service to fewer regional destinations compared to

BART. Thus the trip reduction potential may be somewhat less compared to the Pleasant Hill and Dublin-Pleasanton station areas.

Pleasanton Apartment Trip Generation Study

In 2002, TJKM Transportation Consultants conducted machine traffic counts at five apartment complexes in north Pleasanton near the Dublin-Pleasanton BART station. Counts were taken in both the a.m. and p.m. peak hour. No counts were made at office locations.

Summary of TOD Trip Generation Rates

Peak hour vehicle trip generation rates for two key land uses (Apartments and Office) from the foregoing four studies are summarized in Table 1 below, which compares these TOD rates to the standard rates currently adopted for use in traffic impact studies in the City of Pleasanton.

Examining Table 1, it is evident that all of the TOD trip rates are lower – generally significantly lower – than the standard Pleasanton rates. The TOD rates for Apartments are on average 20 percent lower in the AM peak hour and 24 percent lower in the PM peak hour. Only the Pleasant Hill and San Mateo studies developed office trip rates, but these rates are lower that the Pleasanton rates by roughly the same margin as the apartment rate: the Pleasant Hill rate is 23 percent lower for Office uses in the AM peak and 24 percent lower in the PM peak hour. The San Mateo office rate for the PM peak hour is 36 percent lower.

RECOMMENDATIONS AND CONCLUSIONS

In summary, the literature review indicates the vehicular trip reduction potential of TOD is real and substantial. Based on the findings presented in Table 1 above, it is reasonable to expect that office and apartments in a Hacienda Business Park TOD would generate on the order of 20 percent fewer trips compared to the standard trip rates used by the City of Pleasanton.

Such a reduction in trip rates may prove to understate the effectiveness of TOD, given the findings of a soon to be released study *Travel Characteristics of Transit-Oriented Developments in California* by researchers at California State Polytechnic University, Pomona, and the University of California, Berkeley (Lund et al, forthcoming, 2004). This study measured travel behavior of TOD residents, workers and shoppers statewide, including the Bay Area. Specifically the study measured mode choice, which when combined with levels of trip making, is the basis for trip generation.

The study's findings are dramatic: the overall work trip transit share for TOD residents was 26.5 percent, almost five times the surrounding city rate of 5.4 percent. In other words, the vehicular trip reduction due to transit alone was 21 percent for work trips. If walk, bike and carpooling rates are also higher than average, the vehicle trip rate would be lower still. This new study provides further evidence that TOD trip generation rates should be different than normal rates. One of the study's conclusions is that using average trip rates based on trip generation studies in auto-oriented areas could place unnecessary and burdensome mitigation requirements on a TOD.

Transit Oriented Development proposals for Hacienda Business Park (HBP) should follow the guidelines below. These guidelines are aimed at enhancing use of transit, walking and other low impact modes, and thus reducing private vehicle trips:

1. Residential densities should be at least 12 units per gross acre, and ideally higher (Holtzclaw's studies of density and VMT throughout California and elsewhere indicate that vehicle miles traveled per capita decline by approximately 25 percent with each doubling in residential density).

2. Future commercial development should have a floor area ratio of at least 1.0 and ideally 2.0 or greater.

3. Plans should include pedestrian-oriented retail and services that are complementary to planned office and residential uses. In other words, uses should be aimed primarily at serving needs and wants of residents and employees of Hacienda Business Park. To the extent such complementary uses generate off-site trips, they should focus their demand in off-peak periods. For example, a lunchtime restaurant that also offers fine dining would tend to draw patrons outside of the AM and PM peak traffic hours.

4. During the 1980s, Hacienda Business Park established a national reputation for promoting alternative transportation commutes using incentives and disincentives independent of land use and urban design. This tradition should be continued and augmented in conjunction with the development of TOD at Hacienda Business Park.

The literature review revealed a paucity of vehicular trip generation studies based on physical counts of vehicles entering and leaving TOD sites. The absence of TOD generation studies based on actual vehicle counts has been attributed to the lack of fully developed TODs until recently. Moreover, the grid-based street networks of many TODs create more access points than conventional suburban development. This increases the cost and complexity of trip generation studies because it increases the number of locations at which traffic counts must be collected. Nonetheless, traffic generation studies that establish more precise TOD peak hour vehicular trip generation rates would provide very useful information for transportation planners and traffic engineers.

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TABLE 1
TOD TRIP RATES COMPARED TO CITY OF PLEASANTON TRIP RATES

	AM PEAK HOUR								
		Pleasant Hill BART		**San Mateo**		**Portland TOD**		**Pleasanton Apts.**	
Land Use	**Pleasanton Trip Rate**	**Rate**	**Reduction**	**Rate**	**Reduction**	**Rate**	**Reduction**	**Rate**	**Reduction**
Apartments	0.47	0.33	-30%	0.44	-6%	0.29	-38%	0.43	-9%
Office	1.56	1.2	-23%						
	PM PEAK HOUR								
		Pleasant Hill BART		**San Mateo**		**Portland TOD**		**Pleasanton Apts.**	
Land Use	**Pleasanton Trip Rate**	**Rate**	**Reduction**	**Rate**	**Reduction**	**Rate**	**Reduction**	**Rate**	**Reduction**
Apartments	0.58	0.41	-29%	0.49	-16%	0.38	-34%	0.47	-19%
Office	1.44	1.1	-24%	0.92	-36%				

Note: All reductions are compared to City of Pleasanton Rates.
Sources:
Pleasanton Trip Rates Per Email Communication, 12/17/03 from Jeff Knowles, City of Pleasanton, to James Paxson, Hacienda Business Park.
Pleasant Hill - Pleasant Hill BART Station Area Specific Plan DEIR, 8/97.
Hexagon Transportation Consultants, San Mateo Corridor Plan and Bay Meadows EIR.
Portland TOD study by M. Lapham, Portland State University.
Pleasanton Apartment Survey – TJKM Transportation Consultants, 11/02.

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Hacienda Transit Oriented Development Literature Review

Reference List and Bibliography (Key references in **Bold**)

Cervero, R, *America's Suburban Centers – The Land Use Transportation Link*, Unwin Hyman, Boston, 1989.

Cervero, R, "Built Environments and Mode Choice: Toward a Normative Framework", *Transportation Research Part D*, Volume 7, 2002, pp. 265-284.

Cervero, R, "Mixed Land-Uses and Commuting: Evidence from the American Housing Survey," *Transportation Research-A* Vol. 30 No. 5, 1996, pp. 361-377.

Cervero, R, *Ridership Impacts of Transit-Focused Development in California*, University of California at Berkeley Institute of Urban and Regional Development, 1993a.

Cervero, R, *Transit-Supportive Development in the United States: Experience and Prospects*, Federal Transit Administration, 1993b.

Cervero, R and C. Radisch, "Travel Choices in Pedestrian versus Automobile Oriented Neighborhoods," *Transport Policy* Vol.3 No 3, 1996, pp. 127-141.

Cervero, R and K. Kockelman, *Working Paper 674: Travel Demand and the Three Ds: Density, Diversity, and Design*, University of California at Berkeley Institute of Urban and Regional Development, 1997.

Cervero, R and M. Duncan, *Residential Self-Selection and Rail Commuting: A Nested Logit Analysis*, University of California Transportation Center, Berkeley, California, 2002.

Cervero, R and R. Ewing, *Travel and the Built Environment-Synthesis*, University of California at Berkeley Institute of Urban and Regional Development, 2002.

Cervero, R and R. Gorham, "Commuting in Transit versus Automobile Neighborhoods," *Journal of the American Planning Association,* Vol. 61 No 1, 1995, pp. 210-225.

Cervero, R and S. Seskin, *An Evaluation of the Relationships Between Transit and Urban Form.* TCRP Research Results Digest Number 7, 1995.

City of Pleasanton, *City Council Information Report: 2002 Employer Transportation Survey Results.* December 3, 2002.

City of Portland, *Planning and Zoning Ordinance, Chapter 33.450* "Light Rail Transit Station Zone", dated April 15, 2000.

Contra Costa County*, Draft Environmental Impact Report for the Amendments to the BART Pleasant Hill Station Area Specific Plan,* August 1997.

Criterion Planners/Engineers and Fehr & Peers Associates, "Index 4D Method: A Quick Response Method of Estimating Travel Impacts of Land Use Changes", *United States Environmental Protection Agency Technical Memorandum*, 2001.

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Dill, Jennifer, "Transit Use and Proximity to Rail: Results from Large Employment Sites in the San Francisco Bay Area", *Transportation Research Board Annual Meeting CD-ROM*, 2003.

Dunphy, R. and K. Fisher, *Transportation, Congestion, and Density: New Insights*, Urban Land Institute, 1993.

Ewing, R. and R. Cervero, *Travel and the Built Environment*, 1998**.**

Fehr & Peers Associates, *Travel Forecasting Approach for Smart Growth Twin Cities*, 2002.

Fehr & Peers Associates, *4D Application to SACMET Travel Demand Model*, 2003.

Frank, L. and G. Pivo, "Impacts of Mixed Use and Density on Utilization of Three Modes of Travel: SOV, Transit and Walking," *Transportation Research Record* 1466, 1995.

Hexagon Transportation Consultants, San Mateo Land Use/Transportation Plan Bay Meadows Phase II Specific Plan: Responses to Traffic Questions. March 2002

Holtzclaw, J. and R. Clear, H. Dittmar, D. Goldstein, and P. Haas. "Location Efficiency: Neighborhood and Socio-Economic Characteristics Determine Auto Ownership and Use - Studies in Chicago, Los Angeles, and San Francisco, *Transportation Planning"*. 2002.

Lapham, Michael *Transit Oriented Development – Trip Generation and & Mode Split in the Portland Region*. Portland State University, March 2001.

Lawton, T., *Travel Behavior – Some Interesting Viewpoints: The Urban Environment Effects and a Discussion on Travel Time Budget, A Discussion on Selected Data from the 1994/1995 Household Survey*, Portland Transportation Summit, 1998.

Lund, H., R. Cervero and R. Willson, *Travel Characteristics of Transit-Oriented Development in California.* California Department of Transportation. Forthcoming 2004.

Miller, E. and A. Ibrahim, "Urban Form and Vehicular Travel: Some Empirical Findings," Transportation Research Board 77th Annual Meeting, 1998.

Parsons, Brinkerhoff, Quade, & Douglas, R. Cervero, Howard/Stein-Hudson Associates, J. Zupan, *TCHRP H1:* Part I, Transit Urban Form, and the Built Environment: A Summary of Knowledge. Part II, *Commuter and Light Rail Transit Corridors: The Land Use Connection.* 1996.

Pushkarev, B. and J. Zupan, *Public Transportation and Land Use Policy*, Indiana University Press, 1977.

Regional Planning Association, *Building Transit-Friendly Communities (draft)*, 1997.

Regional Plan Association of New York, Transit Modes Related to Residential Density (table) 1977.

Ross, C. and A. Dunning, *Land Use Transportation Interaction: An Examination of the 1995 NPTS Data.* 1997.

Seattle METRO (Municipality of Metropolitan Seattle). *Encouraging Public Transportation Through Effective Land Use Actions* (DOT-I-87-5), 1987. United States Department of Transportation, 1997.

Snohomish County Transportation Authority, A Guide to Land Use and Public Transportation for Snohomish County, Washington, United States Department of Transportation, 1989, pp 3-1:3-9.

Spillar, R. and G.S. Rutherford, "The Effects of Population Density and Income on Per Capita Transit Ridership in Western American Cities," *ITE 1990 Compendium of Technical Papers*, 1990, pp. 327-331.

Still, K, S. Seskin, and T. Parker, "Chapter 3: How Does TOD Affect Travel and Transit Use," *Caltrans Statewide Transit-Oriented Development Study*, pp. 46-50, 2000.

TJKM Transportation Consultants, *Summary of Pleasanton City Apartment Trip Rates* November 25, 2002

Untermann, R. *Accommodating the Pedestrian*. 1984.

U.S. DOT *Personal Travel in the U.S. Volume II: A Report of Findings from the 1983-84 Nationwide Personal Transportation Study*. 1986.