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Dynamics of the Suburban Activity Center

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DYNAMICS OF THE SUBURBAN ACTIVITY CENTER: RETROFITTING FOR PEDESTRIAN/TRANSIT USE

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PREFACE

Suburban congestion is a much-discussed phenomenon, although its nature and dimensions are poorly understood. During the Winter term of 1989, several students in the Transportation and Land Use class in the Department of Urban Studies and Planning, Portland State University, examined in term papers transportation issues related to suburban activity centers, particularly the Washington Square center area of suburban Portland.

This report is a synthesis of work derived from the student's term papers. Four of the students continued their research in a collaborative way and presented their joint finding at a workshop at the University of Washington sponsored by TransNOW, the consortium of universities conducting transportation research in the Pacific Northwest. Together with presentations by students from the University of Washington, the one day workshop explored a number of transportation issues related to suburban activity centers. Dr. Scott Rutherford, Associate Professor of Civil Engineering, organized and moderated the workshop, and Dr. Nancy Nihan, Director of TransNOW, hosted it.

Following the workshop, Rodney Jennings prepared this synthesis report of the findings of the PSU student research team. The contributions of other masters of urban planning students are acknowledged. They are Clyde Dixon, William Harper, and Matt Newman. The group process was a useful learning experience, about transportation and suburban activity centers, and about the conduct of research.

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Retrofitting the Suburban Activity Center

Suburban Activity Centers (SACs) have been called the new downtowns by some writers. These centers are characterized by high levels of employment and retailing, either in clusters and or along corridors adjacent to suburban freeways (Baerwald, 1982). In the 1980's, fast growth in SACs has increased congestion in many of them to the point that traffic is nearly at a standstill (Work, 1987). The problems of the SACs can be attributed primarily to one factor, the almost complete orientation of these centers to the automobile. While the first downtowns developed in an era of the primacy of the pedestrian, the horse and buggy, and the streetcar, the design, and indeed total existence of the SACs, is attributable to the automobile. There is a notion that only if some of the pedestrian/transit oriented characteristics of the traditional downtown could be brought to the SAC, many of the associated problems might disappear.

Closer examination reveals that "retrofitting" the activity center, using a variety of land use and transportation strategies, is fraught with difficulty. The difficulty is increased if one's ultimate goal is to make the SAC function similar to a traditional downtown. Two issues in particular stand out: 1) what exactly is a suburban activity center and; 2) given the nature of the suburban activity center, is it feasible, or even possible to retrofit an activity center?

In answer to the first question, SACs are a new phenomena, and there is not presently a great deal of information about them. The typology of the SAC has yet to be defined. How does one look? How does one function? The conclusive answers to these questions have yet to be found. The dynamics of the central business district (CBD) were described in some detail by Horwood and Boyce (Horwood and Boyce, 1959), where they separated the downtown into what they called a core and a frame. In the CBD core were found white collar offices and retail stores, while in the surrounding frame were found service and light manufacturing uses requiring more space and thus lower rents. Many of these, such as print shops, provided support functions to core activities, while others, such as auto repair shops, did not. Even today, there is some confusion as to what constitutes the CBD, as witnessed by the expansion of the traditionally

planned downtown area in Portland, Oregon to include a much larger central city area. With the advent of the SAC, the elements that make up the CBD will have to be redefined again.

Unfortunately, the term "suburban activity center" has entered the lexicon of the planning profession without a clear meaning. The term has become a blanket to describe what are really a variety of different types of centers characterized by diverse patterns of land use. Unlike the CBD, where a rationality behind the spatial outlay of land uses is evident, a clear picture of the inner workings of the suburban activity center and its relation to the outer urban system has yet to be drawn. This lack of knowledge hampers efforts to develop rational plans for activity centers, as will be demonstrated in a case study in section II of this paper.

Typology of the Suburban Activity Center

The typology of the SAC has yet to be conclusively defined. Doing so is compounded by two difficulties: 1) the high rates of growth in SACs in the 1980's and; 2) the fact that many SACs are evolving in already partially developed areas where retail, industrial, and residential uses were located earlier along freeways and arterials. The typology problem caused by the first point is that the knowledge and information base of planners has yet to catch up with astounding changes in the suburban landscape. The 1980's have witnessed explosive growth of new offices in America's suburbs. Almost overnight it seems, many suburban activity centers now rival Central Business Districts in the size and scope of their commercial activities. Houston's City Post Oak center, for example, grew from about 1.6 million square feet of office space in 1970 to 20 million by the mid 1980's (Black, 1983). This area now rivals the downtowns of Atlanta and Minneapolis in the sheer size of commercial space. One study estimates the growth in total office space (of which the majority was suburban) between 1981 and 1985 at around 300 million new square feet a year. This changed the proportion of total office space that is suburban from 49% in 1981, to 57% in 1985 (Hughes and Sternlieb, 1986). The growing service sector of the economy has provided

the employment base to fill these new office developments, creating the stresses and strains on the street network that communities are witnessing today. The growth of suburban activity centers has been so fast that analysis detailing their shape and function is only now beginning to occur. Baerwald's dichotomy between cluster type centers and corridor type centers in the Minneapolis-St. Paul region was an early attempt to do so. But, other significant variables affecting activity centers are not considered in his analysis. These include, among others, employment base, mixture of uses, and land area.

Typological problems caused by the second point are also exemplified by Baerwald's dichotomy. Cluster type development centers around a major activity center, like a regional mall, while a corridor center develops around a freeway or major thoroughfare, where large industrial uses may have located earlier. The growth of office space in the suburbs is the last stage in the decline of the preeminence of downtowns in American metropolitan areas, and signifies the emergence of the suburb as a complete urban entity with all of the activities found in a complete downtown. Unlike the central city, however, where residential, industrial, and commercial uses all developed at approximately the same time, different activities have developed in stages in the suburbs. Suburban residential developments began in the 1920's and 30's, followed soon after by small retail shopping centers and strips in the 1930's and 40's and the development of large regional malls in the 1950's, 60's, and 70's. Industrial and manufacturing uses also began the move to the suburbs in the post-war era. The movement of office growth in the 1980's is the latest stage in this evolution. Much of the present morphology of many SACs is due to the addition of offices to the earlier activities that first moved into the suburbs.

A significant attempt to define the different forms that activity centers can take is found in Cervero (Cervero, 1988). His study focuses on what are termed suburban employment centers (SECs), which are essentially SACs with significant levels of employment. Despite its employment focus, Cervero's analysis is a good starting point in defining the morphology of the SAC.

The study uses data from 57 centers and uses factor analysis to divide them into a typology of seven different categories. Four factors are used to make the division: 1) size and scale, 2) density, 3) land use composition and 4) site design. Each of the factors is composed of a group of related variables. The variables making up the density factor are average story of buildings, employees per acre, floor area ratio, parking spaces per employee, and the average proportion of land covered by buildings. The size and scale factor is measured by total employees, total floor space (area), and total restaurants (related to numbers of employees). The design factor is composed of proportion of land covered by buildings, total square feet devoted to employment (working area) and total acreage. Finally, the land use factor is composed of average lot size, proportion of floor space in retail use, and an equation Cervero calls the land use entropy index that measures the mixture of land uses in a center.

The seven "types" of employment centers found in the analysis are termed office parks, office concentrations, large MXDs (large mixed-use), moderate MXDs (moderate mixed use), sub-cities, and office growth corridors. Office parks are low density, mostly single use centers, often with a master-planned landscaped environment, and with ample amounts of free parking. Their size (using Cervero's factor) is relatively small. Office centers and concentrations are larger and denser than office parks, but are still primarily devoted to one use, offices. Large MXDs are large in size of total area, are similar to office concentrations in the size and density of the workforce, and have a wide mixture of retail, office, and industrial land uses[1]. Moderate size MXDs resemble the larger ones except that they are smaller and usually have lower densities. Sub-cities are centers which rival traditional downtown's in the size, density, and mixture of activities that occur within them. All feature structured parking for which a fee is charged. All include at least one regional mall, a hotel with convention facilities and some higher income housing. This category includes many of the more famous suburban centers, such as Tysons Corner, Virginia and Bellevue,

[1]Interestingly, the two Minneapolis/St. Paul centers identified in Baerwald's study, one a corridor along I 494 and one a cluster surrounding the Edina regional mall, are combined by Cervero into one large center which is classified as a large MXD.

Washington. Large scale office growth corridors are the most amorphous category. They are very large, some covering over 80 square miles, and are located along freeways or major arterials, giving them a linear form.[1]

This breakdown gives a sense of the variety inherent in SACs. However, it gives little knowledge of the internal circulation patterns within different types of SACs. The issue of internal circulation is an important aspect of the SAC dynamic that needs to be addressed.

Circulation Among Land Uses in Activity Centers

A key issue in deciding whether or how to retrofit an activity center is determining what need there is for a transportation system that allows for internal circulation among land uses. It is readily apparent that in the traditional CBD, there is ample opportunity to move from one use to another by foot and, in most central cities, by transit (especially in those with a transit mall or heavy rail system). However, the simple existence of the network is not evidence in itself that there are a significant number of trips being made between one use and another. True, in most of todays SACs, it is presently difficult for a pedestrian to travel between one building (say an office) to another (say a retail mall). Some have fledgling internal transportation systems, such as vanpools (found around airports), that move from building to building across parking lots. It is assumed that those who wish to make a midday non-home based trip to lunch or to shop, etc., are now driving automobiles. The question becomes one of whether there is a market for a transit/ pedestrian alternative to the auto to provide trips between activity center buildings. If it were possible for an individual to travel between one use and another by any mode other than the automobile, would they do so? Even in the most congested activity centers, traffic is primarily a problem only during peak hours. At other times of the day, when traffic is light, an auto trip

[1]Because of the unique characteristics of the office growth corridors, Cervero preselected them out before undergoing the factor analysis technique.

across the way to the mall or two miles down the street to a restaurant is probably easy and appealing. It may be very difficult to design a pedestrian/transit environment that will offset the attractiveness of the auto. The conclusion is, even if an alternative to the auto is supplied in the SAC, will it be used?

At present, due to the huge growth and lack of knowledge about SACs described earlier, there is a dearth of evidence surrounding what sorts of non-home based trips are made in the SAC. However, indirect evidence for and against internal circulation in activity centers is available in the form of van services and the emergence of new small shopping centers on the arterials entering and leaving activity centers.

The presence of vans transporting people between buildings in a SAC is incontrovertible evidence that there is significant internal circulation in a SAC. This form of transportation is often found in SACs that have formed around airports, environments where a significant number of people do not have the alternative of a car. Van services are not common in other activity centers, though one was proposed for the City Post Oak SAC in Houston (Black, 1983). This indicates that there may not be a great demand for movement between uses in activity centers.

Harper has discovered evidence against internal circulation in the new resurgence of an older form of suburban development, the smaller shopping center (Harper, 1989). Figure 1 shows the role such convenience centers play in the transportation/land use interaction. Most trips to and from larger retail centers are probably home based. Workers make shopping trips as well, but many of them occur to and from work in small shopping centers. The question is how many trips occur between the place of work and the larger retail center. It is probable that many trips that might have gone to a larger center will go to smaller shopping centers that are conveniently located on the arterials leading to and from employment centers.

The 1980's have seen significant growth in one-stop shopping centers, neighborhood centers, and convenience centers. Harper's analysis of them demonstrates that they thrive on the auto traffic moving along major arterials. Many of these centers locate on the periphery of SACs, making them easily accessible to SAC workers. They have seen increasing profitability, partly

due, no doubt, to the huge increases of office workers commuting to and from activity centers. Table 1 details the dimensions of these new smaller centers. They are designed to feed off the traffic stream on major arterials. The list of the top ten most frequent tenants found at convenience centers reveals that many of them (restaurants, VCR rentals) are the kind that are attractive to the commuter traveling to and from work. Larger one-stop shopping centers also have larger tenants, such as grocery stores, that a commuter can stop at on the way home.

On the demand side, Harper has identified increases in the types of consumers who will utilize these new small centers (Table 2). The number of vehicles and trips to work is increasing. At the same time, the number of non-work trips has increased substantially, while the number of journeys directly from home to work has decreased. This indicates that many trips home are diverted along the way to small shopping centers. Because the orientation of small shopping centers is completely towards the auto, the strong relationship between them and the auto commuter might be very difficult to counteract with a pedestrian or transit alternative. They are located on busy arterials and are quite dispersed, both factors making the provision of alternative modes difficult.

Potential For Retrofitting Activity Centers

Given the competition from the automobile, what then is the likelihood of successfully retrofitting an activity center for transit or pedestrian users? Table 3 provides a framework detailing the probabilities of success of different retrofitting strategies in SACs, depending on the density of development and mixture of uses within a center. The assumptions used in the table are that the potential for pedestrian circulation will be greatest with higher densities and a mixture of uses. However, lower densities will make a pedestrian solution difficult. Transit alternatives are expected to be sensitive to density as well. However, because part of Cervero's density factor is due to the coverage ratio (proportion of area covered by buildings) and the number of parking

spaces per employee, and part is due to the height of buildings (FAR, average story) and the number of employees per acre, there may be cases of low density where large buildings with many employees are spaced great distances from one another. If the density of employees per building is high enough, it may be worthwhile to run a transit system between buildings in the activity center.

As Table 3 shows, those SACs with high densities and a broad mixture of uses (predominantly sub-cities and large MXDs) are better candidates for some type of pedestrian/transit retrofit. In fact, a PRT (personal rapid transit) system was planned for Houston's City Post Oak sub-city in the early 1980s. It was to be privately funded by landowners in the area, and was expected to be profitable (Black, 1983). Also, the sub-city of Bellevue, outside of Seattle, has developed a pedestrian mall to link a regional mall at one end of the sub-center to a transit station at the other end (Miles and Hinshaw, 1987).[1] Where densities are lower but there is still a high mixture of uses (predominantly large MXDs and moderate MXDs), the likelihood of successfully integrating into a pedestrian network an SAC that will be used is probably not good. Distances between buildings will be too great for most pedestrians to be willing to cross. The high mixture of uses in a large or moderate MXD might allow for a transit alternative, given significant density at each stop. In a situation where densities are high, but the primary land use is offices (office concentrations), a pedestrian/transit retrofit might work if there is significant office to office travel for deliveries, etc. Still, it is probably more likely that most of these trips will be made by car. Where densities and land use mixture are both low (office parks), it is least likely that their will be enough trips to make a pedestrian or transit retrofit worthwhile. Because of the large scale of Cervero's office corridor classification (sometimes up to 80 square miles), the notion of internal circulation seems less important and is not treated in the breakdown.

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[1]In this case, a pedestrian network is being added to provide internal circulation, while the transit station will provide a link to the region. Although Bellevue's plan is more than a retrofit of an earlier situation, since it also includes restrictions and incentive programs geared towards new development, it is an attempt to place a pedestrian network in a formerly unfriendly environment.

Types of Retrofit Alternatives

A detailed analysis of possible ways to retrofit activity centers is beyond the scope of this paper. This section is intended to give the reader a general idea of some of the issues involved and a few examples of the kinds of things that might be done.

Increasing the possibility of internal pedestrian circulation is contingent primarily on two things, increasing the density and decreasing the distance between buildings within activity centers. Transit is dependent on high densities at individual stops, with either several buildings within walking distance from a stop, or one large building. The densities of land uses between individual stops are less important.

Keeping these points in mind, two possible "tools" for retrofitting are examined. One, mixed use, is primarily pedestrian in orientation. The other, personal rapid transit (PRT), is a transit tool. The former alternative involves adding new uses to currently existing office parks, retail malls, or other space consuming structures. This innovative retrofit technique was used successfully at the Oakridge mall in Vancouver, B.C. (Moore, 1986). Offices, housing, and structured parking were built over portions of old surface parking. Although the Oakridge mall is only one building, not an activity center, mixed use could be used in the larger office and retail centers in activity centers to give them better pedestrian circulation. Some of the space now vacant or devoted to parking could conceivably be converted to office, residential, or commercial uses. Because mixing land uses leads to a demonstrated reduction in the amount of parking that needs to be supplied (Barton Aschman and Assoc. Inc. 1983), doing so may be possible in many cases without the need for new parking. In other cases, doing so may require the addition of structured parking, and may, therefore, not be possible until the price of land increases to the point where structured parking is economically feasible.

The benefit of mixed use is that it increases the density at each transit stop as well as creating pedestrian connectivity between uses within a mixed use center. This allows an office worker, for example, the opportunity to walk through the center to make a small shopping trip.

This solution, carried to the extreme, could lead to numerous unconnected mixed use centers. This would solve the internal circulation problem by providing every need on the spot, so that all trips could be made by walking.

A possible transit retrofit alternative is personal rapid transit (PRT). One PRT system, TAXI 2000, allows for individual trips at relatively high speeds on separated guideways. Its electronic propulsion system is low in air and noise pollution (Anderson). The major benefit of PRT as a retrofit alternative is that it allows for individual non-stop trips between buildings in an activity center (Fig. 5). PRT could connect a retail mall with an office tower, for example.

These two examples are by no means the only ways that greater internal circulation could be supplied to activity centers, they are only meant to be suggestive of the range of possibilities open to the retrofitter.

Case Study: Retrofitting Portland's Washington Square SAC

Students and faculty at Portland State University analyzed the potential for retrofitting the Washington Square SAC in the spring of 1989. The Washington Square SAC is located along Highway 217 in the affluent western suburbs of the Portland metropolitan area. The exact extents of the activity center are a matter of some debate. Cervero, for example, in his treatment of 57 centers classified the center as part of a much larger office corridor extending along the I-5 freeway to the south and the Sunset freeway to the north. Students and faculty engaged in the study debated whether to include a new master-planned office development across the 217 highway as well. This indicates some of the level of confusion that exists as to what constitutes an activity center.

The dimensions and growth trends at Washington Square were outlined by Newman (Newman, 1989). Newman's study took a perspective that focused on the Washington Square retail mall as the central point in the activity center. The 110 acre single level retail mall is the

number one retail location in the state of Oregon. Surrounding the mall are three smaller malls which are anchored by discount clothing stores (Fig. 5). Two of these are adjacent to the regional mall, the other is located across the 217 highway. A hotel is located to the north of the mall, about one quarter mile away. Offices are located in the Lincoln Center office park about one half mile west of the mall and across the highway in the Cascade Tower and the Koll business center, a master-planned office park. At present, there are few pedestrian links between these uses. It is possible to open up a pathway between the hotel and the regional mall that would probably be used. Many hotel visitors are without cars and might wish to purchase gifts for friends back home. A clearer pedestrian pathway could also be opened between the Lincoln Center offices and the mall. It is unclear, however, what the level of usage would be.

Newman contrasted Washington Square with another Portland area activity center clustered around a retail mall, Lloyd Center (Table 4). Because of its location in the central city and consistent single ownership over the lifetime of the activity center, development in it has remained compact and coordinated. Although it has a level of activity similar to Washington Square, with hotels, offices, etc., its smaller size makes it very friendly to pedestrians and transit riders. Washington Square, on the other hand, has a fractured ownership pattern and is spread over a much larger space, making pedestrian and transit circulation difficult.

Growth trends at Washington Square indicate that it is heading towards a situation of greater auto dependency in the future. Figure 2 shows that employment in the activity center is expected to increase by close to 20% in the next 20 years. Figures 3 and 4 show that traffic increases are also expected. Increases of 8% per year were seen along highway 217 between 1983 and 1987. Even greater increases in traffic over the next 20 years are projected along 217 and Scholls Ferry Road, a major activity center arterial. The case study group examined strategies to meet this future growth.

Regional Context

Portland's metropolitan transportation planning agency, Metro, currently proposes two strategies for the future of transportation in Portland. They are light rail transit (LRT) and highway improvements. This dual approach is meant to provide for projected growth in population and employment. The plan rests on the assumptions that new highways and diversions to light rail can offset future congestion related to growth. Major proposals of the plan include an extensive radial light rail system and a new bypass freeway running on the western perimeter of the metro area. The plan calls for significant interchange improvements along 217 in the Washington Square activity center. As an alternative to the LRT, Dixon has proposed a region wide PRT system that could be cheaper and divert more auto trips than light rail (Dixon, 1989).

PRT and Washington Square

Because the RTP calls for substantial intersection improvements along Highway 217 adjacent to Washington Square, an alternative PRT proposal to these improvements was explored. The PRT alternative has many advantages, one of which is its ability to connect an internal circulation network with the larger regional transportation network proposed by Dixon. The potential for successfully implementing a PRT system to supply internal circulation to the Washington Square SAC was explored. A possible alignment connecting major buildings was laid out (Fig. 5). Included as an alignment stop was a new parking garage near the southern end of the the site, adjacent to Highway 217. The idea was that employees could then leave the highway and immediately park their cars and continue the journey to work on the PRT. This would alleviate rush hour congestion on the street network within the activity center. Preliminary costs and benefits were estimated (Table 5). The total costs of building a 3 mile system with 16 stations and 50 vehicles were estimated at $18 million ($1.8 million annually). Annual operating costs were also estimated at $1.8 million, for a total annual cost of $3.6 million. The next stage of the

estimation process involved assumptions about the number of annual trips that would be made on such a system. There is little evidence on how many internal trips actually would be made between buildings in the activity center. With a low estimate of 1.8 million trips a year, the cost per trip would be $2.00, while with a higher estimate of 2.4 million it would be $1.50.

These are relatively expensive numbers when compared with the auto alternative. To get a measure of possible competitiveness with the auto, benefits based on the possible time savings of PRT trips over auto were estimated. Assuming a time value of $10 an hour (based on a reasonable hourly wage), benefits of time savings were calculated. Benefits were estimated at $1.00 for six minutes, $2.00 for twelve minutes, and $3.00 for 18 minutes. This analysis indicates that an auto would have to be approximately nine minutes slower than a PRT vehicle for significant trips to be diverted, assuming, of course, that the demand for trips even exists. In the Washington Square SAC, the potential for the success of this particular retrofit alternative is far from clear. The analysis also leaves out the costs and benefits associated with providing a parking structure. Some of the costs of building structured parking might be offset by opening up for development space previously devoted to parking. In any event, the lack of information about internal circulation makes a rational evaluation of the PRT alternative difficult.

Conclusion

If there is a distinct lesson to be learned from this paper, it is that an information base and theoretical underpinning need to be developed for the concept of the suburban activity center. Cervero's analysis has begun this process in the area of land use and commuting patterns. The inner workings of the activity center are still, for the most part, a mystery. A key finding of this analysis and case study is that the exact nature of the internal circulation patterns within activity centers is not known. The presence of new small shopping centers indicates that many of the shopping trips made by new activity center workers probably occur on the way to and from work.

Although the presence of a transit/pedestrian system linking activity center uses seems, on the surface, to be a good idea, there is no guarantee that if such a system existed that it would be used. The issue of internal circulation within the suburban activity center is one that needs to be addressed before actions are taken to retrofit them for pedestrian and transit uses.

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Ten Most Frequently Found Tenants in Convenience Centers
(In Order of Frequency Rank)

	Median GLA (Square Feet)	Median Sales Volume per Square Foot GLA	Median Total Rent per Square Foot GLA
Medical and Dental Offices	1,250	n/a	$10.09
Restaurant with Liquor	2,500	$132.32	11.07
Beauty Shop	900	60.45	10.20
Cleaners and Dyers	1,200	44.32	9.00
Convenience Market	2,500	184.79	5.63
Real Estate Office	1,000	n/a	8.50
Fast Food/Carryout	1,435	206.48	11.42
Other Offices[1]	991	n/a	7.47
Video Tape Rentals	1,200	55.93	11.20
Restaurant without Liquor	2,500	206.48	11.42

[1]Offices other than financial, medical, or dental.
Source: *Dollars & Cents of Convenience Centers: A Special Report*, ULI, 1988.

Comparison of Median Results for Convenience Centers, Community Centers, and Neighborhood Centers[1]

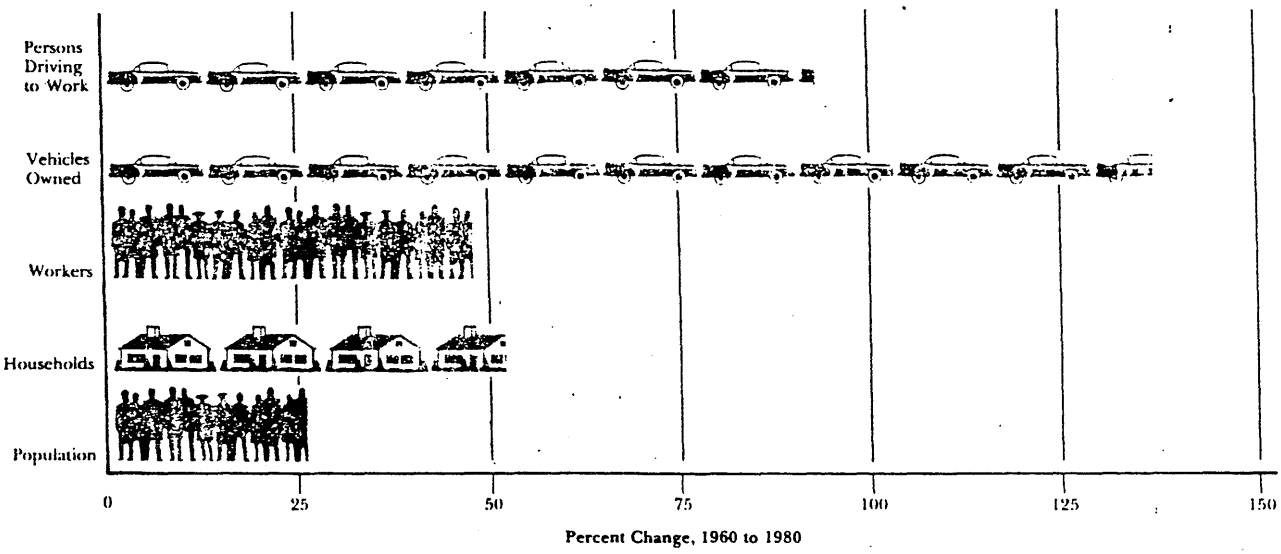
	Convenience Centers	Community Centers	Neighborhood Centers
Tenant Sales	$140.58	$144.40	$167.56
Operating Receipts	8.66	5.19	6.31
Operating Expenses	2.42	1.63	1.69
Net Operating Balance	5.65	3.44	4.22

[1]Dollar figures are per square foot of GLA.
Source: *Dollars & Cents of Convenience Centers: A Special Report*, ULI, 1988; *Dollars & Cents of Shopping Centers: 1987*, ULI, 1987.

	Median Percent Change 1984–1987	Median 1984	Median 1987
Super Regional[1]			
Mall Tenant Sales	27.9%	$139.97	$179.02
Total Operating Receipts	28.0	12.97	16.60
Total Operating Expenses	45.6	4.74	6.90
Net Operating Balance	23.5	7.49	9.25
Regional[1]			
Mall Tenant Sales	26.2%	$124.65	$157.32
Total Operating Receipts	22.4	8.27	10.12
Total Operating Expenses	38.7	3.18	4.41
Net Operating Balance	11.9	4.96	5.55

TABLE 1

Commuting and Related Demographic Trends, 1960 to 1980



Sources: The 1960, 1970, and 1980 Decennial Censuses, U.S. Department of Transportation, Federal Highway Administration, 1986.

Vehicle Trips by Purpose
(Average Number of Annual Per-Household Trips)

Purpose	1969	1983	Percent Change, 1969–1983
Home-to-Work	445	414	−7.0%
Shopping	213	297	+39.4
Other Family or Personal Business	195	272	+39.5
Social and Recreational Activities	312	335	+7.4
All Purposes	1,396	1,486	+6.4%

Source: *Summary of Travel Trends: 1983–1984 NPTS*, U.S. Department of Transportation, Washington, D.C., November 1985.

Average Daily Vehicle Miles Traveled, by Purpose, and by Size of Urbanized Area, 1983
(Average Miles per Household)

Urbanized-Area Population	Purpose		
	Work	Nonwork	Total
500,000–199,999	7.7	20.1	27.8
200,000–749,999	10.0	20.3	30.3
750,000–1,249,999	9.4	19.1	28.5
Over 1,250,000			
No Rail System	12.9	20.6	33.5
With Rail System	9.7	15.1	24.8

Source: *Survey Data Tabulations: NPTS 1983–1984*, U.S. Department of Transportation, Washington, D.C., November 1985.

TABLE 2

Table 3

SAC DENSITY/MIXTURE		MODE PEDESTRIAN	MODE TRANSIT	SAC TYPE (CERVERO)
DENSITY	HIGHER	+	+	SUB-CITY
MIXTURE	HIGHER			LARGE MXD
DENSITY	LOWER	-	*	LARGE MXD
MIXTURE	HIGHER			MOD. MXD
DENSITY	HIGHER	*	*	OFFICE
MIXTURE	LOWER			CONC.
DENSITY	LOWER	-	_	OFF. PARK
MIXTURE	LOWER			

Likelihood of Success
of Ped/Transit Retrofit
+ Good
* Unsure
- Poor

Table 4

ACTIVITY CENTER COMPARISON

	LLOYD CENTER	WASHINGTON SQUARE
YEAR OPENED	1960	1974
SITE DIMENSIONS	35 ACRES	110 ACRES
GLA	1,300,000 SQ FT	1,200,000 SQ FT
GROSS SALES	$225 MILLION	$250 MILLION
MALL DESIGN	3 LEVELS OPEN	SINGLE LEVEL ENCLOSED
EXPANSION PLANS	200,000 SQ FT EXPANSION GLASS ENCLOSED	NONE PLANNED
PARKING	6,500 STRUCTURED	7,000 SURFACE
ADDITIONAL USES	OFFICE GOVT OFFICES HOTELS CINEMAS COLISEUM CONV CENTER RESIDENTIAL	RETAIL OFFICES HOTEL CINEMAS INDUSTRIAL OFFICE PARK RESIDENTIAL

Table 5
WASHINGTON SQUARE PRT

COST

CAPITAL

3 MI x $3M / MI	=	$9M
16 Stations		$6M
50 Veh x $60K	=	$3M
Total		$18M
Annual Cost		$1.8M

OPERATING $1.8M

TOTAL $3.6M / YR

COST $2.00 Per Passenger Trip @ 1.8M Trips / Year
$1.50 Per Passenger Trip @ 2.4M Trips / Year

BENEFITS

Time Savings / Trip	6 Min	12 Min	18 Min
Benefit @ $10 / Hour	$1.00	$2.00	$3.00

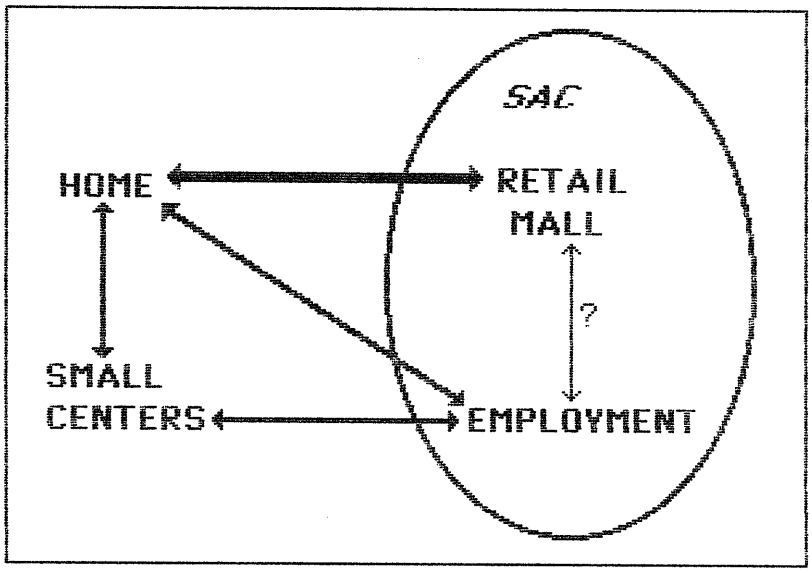


FIGURE 1

FIGURE 1

WASHINGTON SQUARE
EMPLOYMENT GROWTH

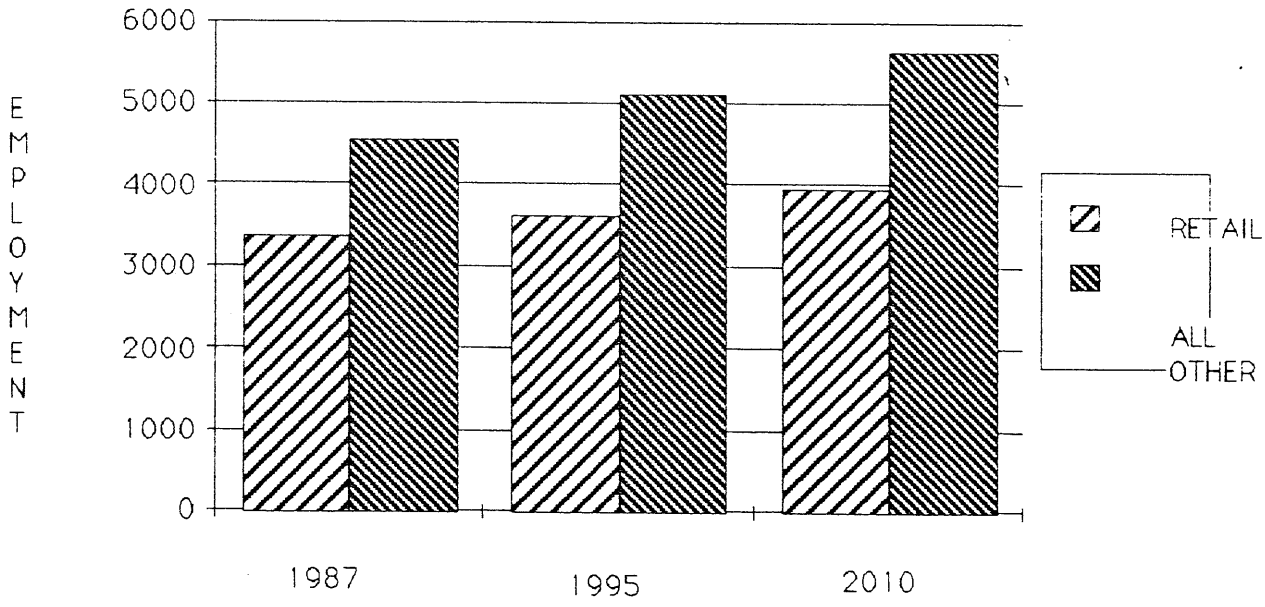


FIGURE 2

PEAK HOUR TRAFFIC VOLUME

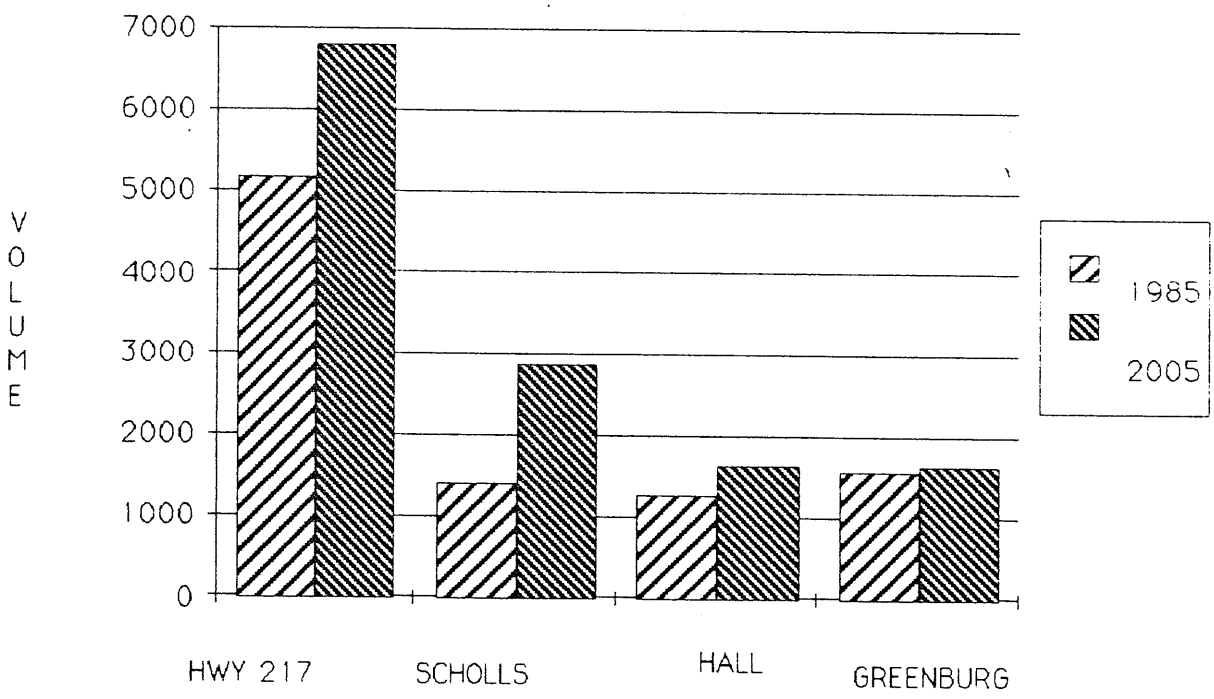


FIGURE 3

AVERAGE DAILY TRAFFIC
HIGHWAY 217

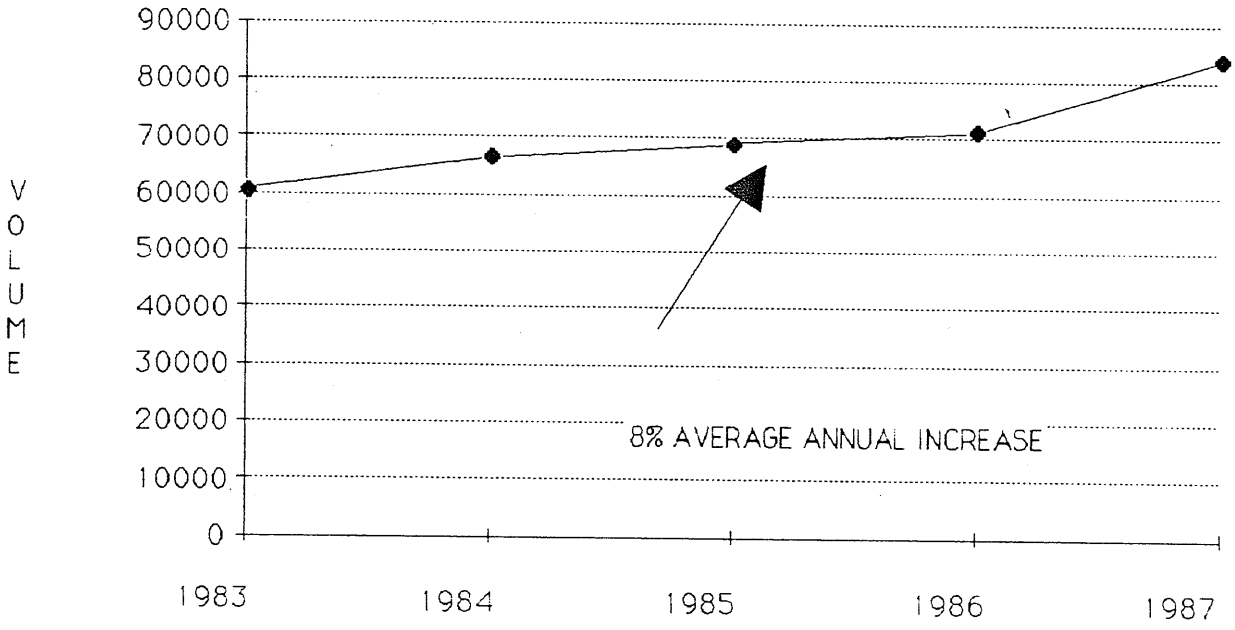


FIGURE 4

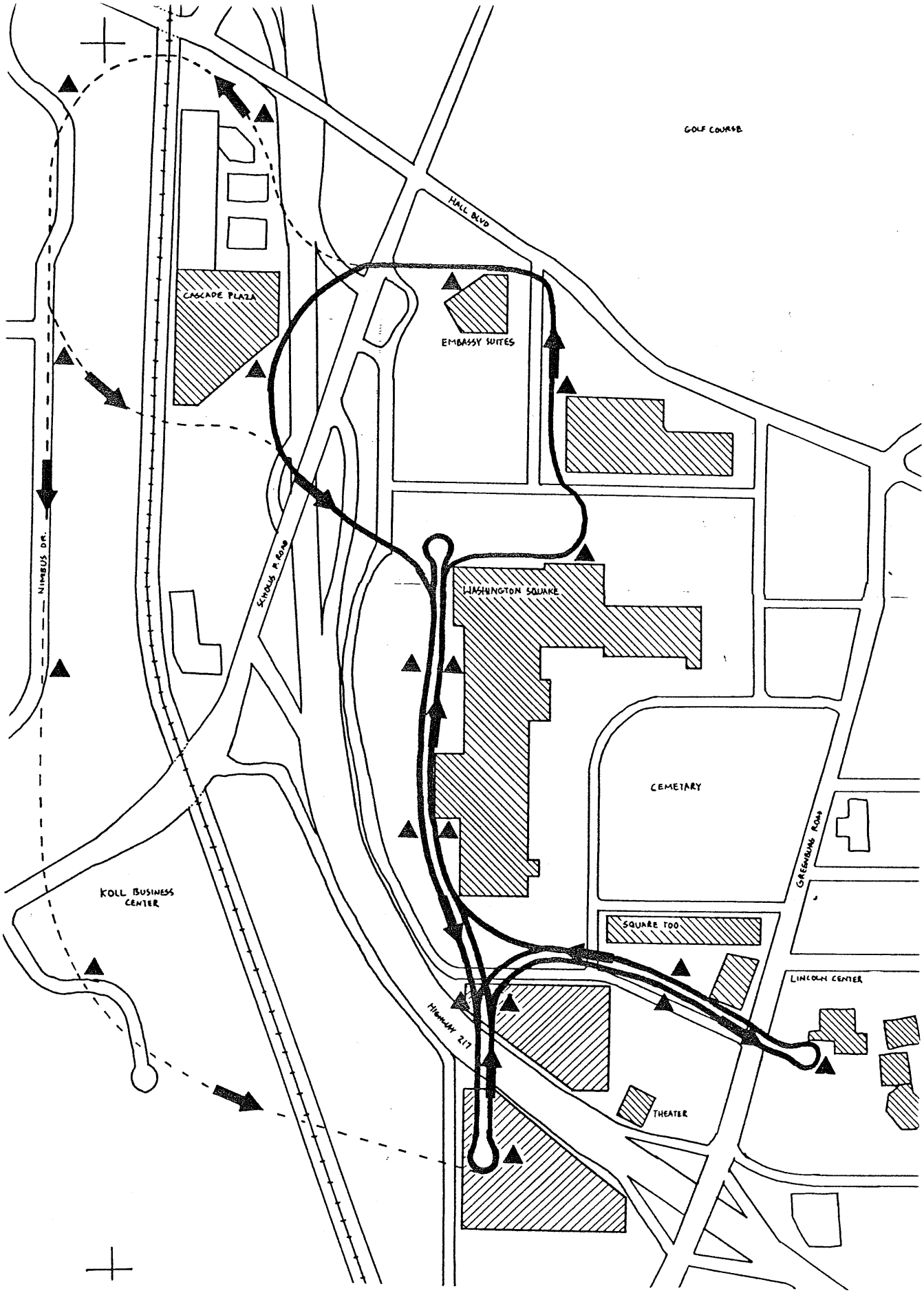

GOLF COURSE
HALL BLVD
CASCADE PLAZA
EMBASSY SUITES
NIMBUS DR.
SCHOOL ROAD
LIVINGTON SQUARE
CEMETARY
GREENBURG ROAD
KOLL BUSINESS CENTER
SQUARE TOO
LINCOLN CENTER
HIGHWAY 217
THEATER

FIGURE 5