Growing With Transit: Creating Transit Supportive Development in an Automobile-Focused World

by

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ABSTRACT

This thesis develops a practical framework for the use of land use techniques in station areas to bolster transit ridership. Linking land use with transportation is increasingly important as more cities face the difficult issue of maintaining effective movement in a car-focused world. Many cities are pursuing expensive projects including rapid transit in their search for new, more efficient alternatives. If these interventions are to be successful, the influences of land use must be considered. There remains a deficiency in the literature, however, of instructive formulas to guide cities interested in using land use as a tool for improving the effectiveness of transportation interventions.

A small sampling of the current research on land use and transit identifies mutable elements of land use with the power to increase transit effectiveness. These are 1) density 2) diversity and 3) design for multi-modal use. The literature offers little guidance for how to use these land use factors as tools for influencing transportation interventions.

An initial framework was developed from a review of the most influential design strategy in use today, the Transit Oriented Development concept developed by Peter Calthorpe. This initial framework was then used in the examination of two cases. Two projects in the Portland, OR area were examined, Gresham Central Apartments and the Beaverton Round project —one completed and widely deemed successful, the other stalled in construction and the recipient of criticism. A set of guidelines was developed from the lessons learned through these cases studies that was then focused upon the Martinez Nadal station area in San Juan, Puerto Rico.

The resulting framework revealed the most important considerations for creating transit supportive development: The density of every project in the area should be high enough to promote the efficient use of developable land available at the station and along the alignment. Each project should increase the diversity of uses in the station area and along the entire alignment. Lastly, there should be a functional link between development and transit. Pedestrian connections should be provided between all development and the station that is: 1) direct 2) interesting and 3) safe.

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Acknowledgments are deserved by many.

Thank you to Nigel Wilson for involving me in the Tren Urbano project. I learned a great deal through this experience. I think the world would benefit from more opportunities when planners and transportation engineers worked together. Thanks also to everyone at the Tren Urbano office. Ken Kruckemeyer and Joseph Coughlin were dedicated advisors. Ralph Gakenheimer and Eran Ben Joseph provided helpful guidance to keep me on the right path. Thanks for reading all those pages and for replying to all my e-mails and for reminding me that this was not that big of a deal. Kim Knox at TriMet was helping me along even before my ideas had evolved into a proposal. Mark Schuster was there when I wanted to throw the proposal away. Thank you to Phil Whitmore at Metro, Richard Ross with the City of Gresham, John Engle in Beaverton, Selwyn Bingham at BCB and to Stastny and Brun Architects, Inc. for their willingness to answer my questions and provide the information needed for my case studies. Thanks to Amy Brown for always having the right word, and to Rachel Gakenheimer for being strong and dedicated when I wasn't. This project would never have been possible without the help and support of my parents. You two knew that I could do this before I did. I am glad you were right. Thanks to Alex and Tracy, I can complain with the best of them but you two were always there with supportive words for me no matter how bad it got. Thanks go out to Malcolm too. Chris, thanks for the study breaks. You knew how to keep me writing and thinking about subjects that had nothing to do with transit. You kept me sane. I believe I still owe you a drink. For being particularly supportive in past 14 days, Evan, cheers. Thanks you all. This is for you.

Growing with Transit: Creating Transit Supportive Development in an Automobile-Focused World.

Eryn K. Deeming

List of Tables and Figures

1 Chapter One: Introduction

The sustainable transit metropolis of tomorrow will embody an intimate fit between their transit services and built forms.

-Robert Cervero, 1998[i]

Many cities in the United States are increasingly focusing attention on the development of rail transit systems, and billions of federal dollars are providing the capital to fund this 'railvolution'. Land use will be a key component in making these emerging systems successful.

The relationship between land use and transportation is difficult to understand. Quantifying the effects of land use has proven complex. For these reasons it has not always received that attention that it deserves by transportation researchers or practitioners. Few are confident about how to approach this amorphous relationship much less how to quantify its effects. Recent research has, however, revealed that a compelling reciprocal relationship exists; it has shown that certain aspects of land use are determinants of mode choice. Studies identify three elements of land use with the power to influence transportation choices. Researchers such as Robert Cervero (1997, 1998), at the Institute of Urban and Regional Development at the University of California Berkeley, have shown that transit ridership levels can be improved by 1) increasing land use densities; 2) diversifying land uses; and 3) designing development in a way that caters to the pedestrian, particularly when these tactics are employed within a ¼ mile radius of a transit station.

Attention to these aspects of how land is developed in the vicinity of a new transit system will increase the mode share which that system is able to capture, making it more successful in the long run. Studies show that it would irresponsible to ignore the impact of land use on transportation regardless of how complex or difficult to measure the relationship is. It would be foolish to ignore its usefulness as a tool for the future

success of transit systems currently under construction and being planned across the country.

As new transit systems are developed, government agencies need guidance on how to pursue the most transit conscious use of land surrounding transit stations. Often, transit agencies and municipalities own developable land in these influential areas. How should development of these parcels be approached? The new urbanism, an architectural movement which began in the early eighties proposed a scheme for creating such a development pattern. Peter Calthorpe formulated it his popular book, The Next American Metropolis (1993) and called it Transit Oriented Development (TOD). Calthorpe's work has been influential, but that, I will argue, is primarily due to the fact that his is the only instruction book available on the subject. He has been the only person to offer a comprehensive and comprehensible design scheme for changing traditional development patterns in more transit supportive ways. Calthorpe's ideas about a regional approach to metropolitan growth are strong, his endorsement of transit networks is commendable and his concept of TOD is revolutionary. However, because his manual for how to create that pattern remains so theoretical it is deficient for the majority of cities who need guidance. It is neglectful to the realities of the market and the motivations of the development community. It does not offer a practical set of guidelines for approaching development around transit stations.

Cities, transit agencies and regional governments confronting the challenge of manipulating land use patterns in the areas surrounding transit stations need more pragmatic advice. This thesis seeks to begin the process of developing a better framework; the ultimate product will be a set of guidelines that can be used in cities confronting transit supportive development, like San Juan, Puerto Rico where a fixed guideway heavy rail system is set to begin operation in the Spring of 2002.

land use and transportation

LAND USE	TRANSPORTATION	ENVIRONMENTAL QUALITY
Development Patterns Density Location Of Activities Design	Modal Options Travel Conditions Travel Patterns Costs of Options (Utility)	Air Quality Energy Use Greenhouse Gases Loss of Open Space

Land use and transportation are interrelated factors in city function and city form. Land use effects transportation by physically arranging the activities that people want to access. Changes in the type, location and density of land uses will change people's travel choices because they help to determine the most convenient and feasible mode of travel. Transportation, in turn provides the means for moving goods, people and information from one place to another. The level to which transportation can provide access to an area will help determine how that area will develop. Changes in transportation networks make some places more accessible and therefore more attractive to development. Transportation technology has the power to influence both dispersion and concentration in city form; for example, as the relative cost of travel has declined, activities in urban and suburban areas have dispersed. At the same time, transportation facilities have supported concentrated development at the places where they confer the greatest accessibility. Traffic, congestion and concerns about the health risks associated with increasing air pollution levels in cities have caused many to reevaluate the travel patterns that dominate most US metropolitan areas. The answer of how to confront these problems lies in understanding the important relationship between these factors.

In the twentieth century the developmental patterns of cities has been closely interrelated with the history of transportation innovation. Each new technological improvement changes how people move and affects the size, density and the mixing of activities within cities. For the most part, the geographic size of any given city through time has been a factor of its current transportation technology. Throughout history,

where people live and where they work has been determined by how far and how fast they can travel. The Railroad era of late 1800s into the 1900s allowed large industrial cities to develop further from ports and rivers. The railroad provided an efficient means of bringing coal, iron ore, grain and other raw materials to large urban factories where they could be processed into consumer goods and redistributed to distant places. Before mechanized transportation people walked where they needed to go. As a result cities were compact places with housing and commercial activities centered around the rail stations and ports. By the 1890s the invention of electric streetcars changed population densities and distributions by increasing the accessibility of more distant places. After the 1920s the popularization of the automobile changed city size again. New transportation technologies facilitated an explosion in the geographical size of cities as people moved away from the dirty industrial centers to homes in residential areas further away. After World War II the automobile and home ownership came within economic reach of more citizens. At the industrial era, jobs and commercial activities followed people to the suburbs. So began the proliferation and growth of today's multi-nucleated, dispersed metro areas. As transportation improves, and the nature of work changes metro regions have become larger in area and lower in density and land uses have become more separated by use.

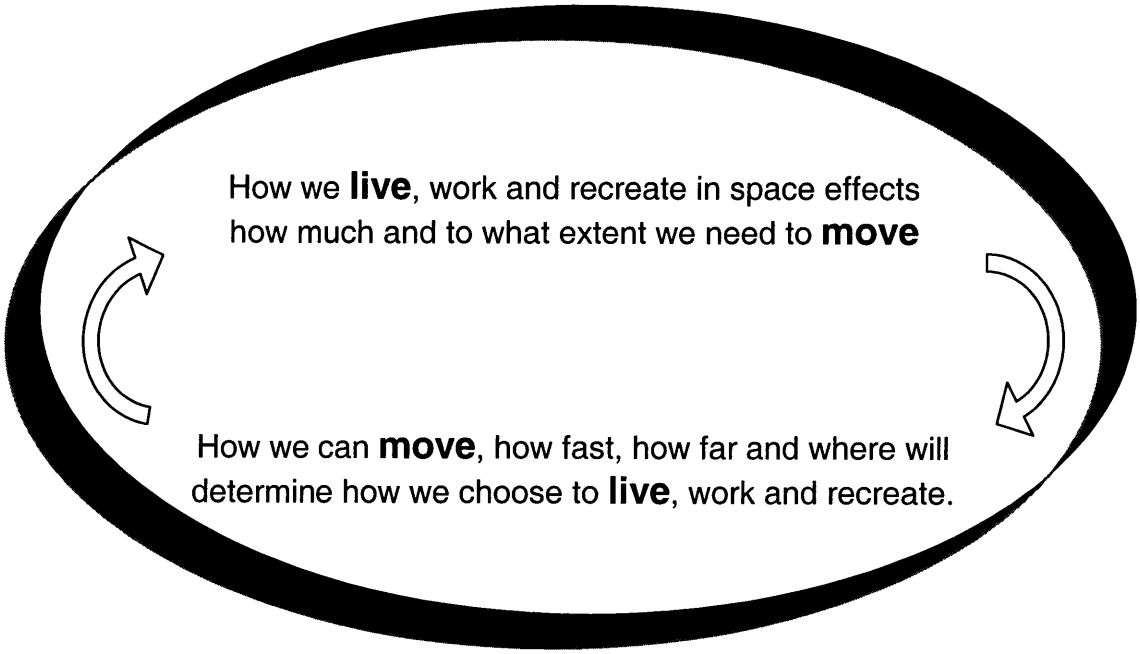
Increased accessibility has been always been an important goal of transportation planners. Accessibility is a reflection of the ease of movement between places and the amount of activities reachable from specific locations. Improvements in transportation have generally enabled greater accessibility; first the streetcar increased accessibility opening up new, more distant land on the periphery for development. Later, the car greatly increased accessibility. However, as the costs of car ownership have decreased and ownership has become feasible for a greater percentage of the population, accessibility is becoming increasingly constrained. Congestion, parking requirements and long commutes that result from higher automobile ownership have choked accessibility in many cities. The separation of uses in cities, a phenomenon that began as the city decentralized has increased the need for automobile travel by increasing the distance between the average individual's daily activities. A different kind of building

design emerged after the automobile gained popularity which precludes arrival by anything but a car, making walking unattractive even where it is possible. These factors have actually worked to decrease pedestrian and bicycle mobility in the average US city. At the same time, these trends have made it very difficult to go back to any mode of travel other than the automobile, assuring its continued dominance.

Public transit will struggle to be competitive with the automobile in a city whose form was defined by the car. Pickrell (1992) questioned the viability of rail transit. This report claimed that transit operations have not proven wildly successful in new communities around the United States.[ii] Trasit use has been declining for the past decade and a half. In the United States, just 1.8 percent of all person trips were made by transit in 1995 down from 2.2 percent in 1983 and 2.4 percent in 1977. 4.5 percent of all commute trips were made by transit in 1983. By 1995 that share had fallen to 3.5 percent.[iii] One reason for the decline in transit use is that providing an alternative to the automobile only partially remedies the situation. There is more behind the dominance of the automobile than what is embodied in the technology alone. Our culture has an affinity for the car, but more importantly we have developed a city form that caters to it. The car has become entrenched in the American way of life not only because of the popular culture but because it has so heavily influenced the form of our cities. Trying to change travel patterns and increase mobility by altering transportation technology alone yields unsuccessful results because it fails to acknowledge the relationship between urban form and transportation.

Our current dominate mode of transportation has created a land use pattern that has left us dependent on it. The future requires that we rethink our approach to land use and transportation decisions, that we understand how the two work together to support one another. It requires thinking about two things:

1. How we live, *and*
2. How we move



If we are truly interested in creating transit systems that will attract riders three things need to be considered:

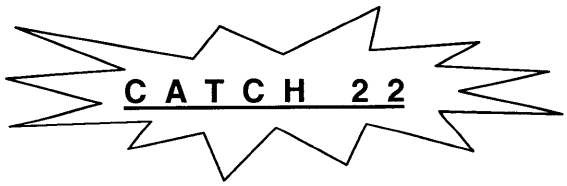
1. Can deliberate changes in land use change travel patterns in a positive way? (ie: reduce number of cars on road and vehicle miles traveled (VMT)?
2. What changes would have to occur?
3. How likely is it that these changes would occur on a large enough scale to have an effect?

Recent research on land use has begun to show how deliberate changes in land use do have the power to change travel patterns in a positive way. It also reveals the necessary components required to affect that change.

This thesis makes the assertion that a practical framework can be developed that dramatically increases the likelihood of the success of transportation interventions. General theory seems to agree that the market alone will not fix the problem of creating these development patters. Municipal areas that have built transit have identified very

little effect upon land use patterns on a grand scale. Adam Smith's invisible hand leaves no room for forcing development where there is not the market to support it. Something has to get the cycle moving. In the long term, property values will go up as ridership increases and the system expands, but getting developers and investors to think in the long term can be very difficult. Getting the private market to do something different, something that has not been proven in the market can be even more difficult. Real Estate is a follow-the-leader game. No one really wants to be first, everyone wants to be second—right after the guy who did really well. In addition, development patterns do not change quickly, because real estate is durable. Changing development patterns is inherently a slow process. There has been little analysis that has tried to illuminate the answers to such questions such as whether developments that have been built near transit stations in recent years have actually resulted in increased patronage for that transit system.

Development will occur near transit in a way that supports its use when there are enough riders to provide a market demand



There will be more riders on transit when more people live and work in ways that allow them to conveniently ride transit.

organization

Chapter two will introduce research concerning the effects land use upon transit ridership levels. That research identifies three land use categories each with observable influence over transit use: density, diversity and design for multi-modal use.

Chapter three explores new urbanism's work on transit oriented development and explains why this approach is ill equiped to resolve the challenge of permanently changing patterns of development. Calthorpe's prescriptions and design scheme will be evaluated in detail and his assumptions questioned in the development of a more comprehensive and pragmatic approach. A preliminary framework will summarize the lessons taken from Calthorpe's work.

In chapter four that framework will be cast upon two development projects near Portland, OR. One successful project and one project that is a failure will reveal the weaknesses and omissions in the framework created in chapter three. Lessons will be collected and then used to update and refine the guidelines.

Chapter five introduces the case of San Juan, Puerto Rico. San Juan has highest number of cars per mile of paved road of any metropolitan area in the US. This distinction leaves San Juan plagued by congestion and haunted by its future prospects if this pattern is not changed. Currently under construction, Tren Urbano, a 17 km heavy rail transit line, offers hope to this car dominated city. Tren Urbano is scheduled to open for service in 2001. It is at the ideal stage to begin thinking seriously about land use. The framework created will be turned

upon San Juan in chapter five and a development plan will be created for the area surrounding the Martínez Nadal station. This exercise will offer another opportunity for the framework to be tested in a real world situation; it will display the criteria more plainly and it will provide a concrete example of the recommendations at work.

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[i] Robert Cervero, *Transit Metropolis*, (Washington, D.C., Island Press:1998) 72.
[ii] Don H. Pickrell, "A Desire Named Streetcar: Fantasy and Fact in Rail Transit Planning", Journal of the American Planning Association vol 58 no 2, 158-76.
[iii] Cervero, 2.

2 Chapter Two: Identifying the Influences of Land Use on Transit

Transit investments that fail to lure motorists out of cars and into trains and buses will do little to conserve energy, reduce pollution, or relieve congestion.

-Robert Cervero, 1998

overview

For many years, one side of the transportation land use relationship has remained less clearly understood. Only recently has research begun to illuminate how particular kinds of land use will effect travel behavior. As was presented earlier, this has been in part due to the complexities involved in measuring its effects. Yet such research to making smart transportation and land use planning decisions. It is the first step toward formulating how land use choices might become allies in the effort to create successful transit systems; how they might be employed to increase transit ridership. The research reveals three dimensions of urban form found to most powerfully influence travel behavior. Cervero (1998) labels them the three Ds: density, diversity and design. The research compiled here reveals that if an urban landscape can be created which is conducive to transit it will be compact, consist of a variety of uses and users, and will accommodate pedestrian as well as vehicular movement.[i]

density

Among the experts producing this research, it is widely agreed that increasing urban density is the single most effective factor in increasing transit ridership over time. Intermetropolitan studies, both domestic and international, and corridor studies conducted within metropolitan areas have shown that increased densities reduce vehicle miles traveled by automobile and increase transit mode shares. Although density varies greatly between different metropolitan areas and even within a particular city, it has been found that changes from low densities to moderate densities can have marked effects on the transit ridership levels where it is experienced.

Boris S. Pushkarev and Jeffrey M. Zupan produced a well known and often sited work in 1977 called *Public Transit and Land Use Policy.* There's was the first study to identify the key determinants of transit demand and it offered important evidence of the influences of land use factors. There's was also the first to point to density as a factor influencing transit ridership. Pushkarev and Zupan's work found that three factors determine the use of transit in a particular area: 1) the density of the downtown or employment/commercial clusters (measured in non-residential floor space 2) car ownership and 3) the quality of transit service. Together these three factors were found to determine the proportion of transit trips between residential areas and employment or commercial clusters along a transit route.

Car ownership was identified as one of the factors with direct influence on transit ridership, but many of the determinants of car ownership per household, according to Pushkarev and Zupan, were also related to density.

- The number of cars per household is a function of density, the quality of transit service (distance to stations and frequency), household income and the number of residents 16 years and older.
- Higher residential densities affect auto ownership and use as a result of the associated higher costs, congestion, inconvenience and better transit service. Considering households of the same size and income, a tenfold increase in residential density was found to result in a reduction of 0.4 autos per household. At densities of 7 dwelling units per acre transit use increases dramatically.
- The density of transit destinations also affects auto ownership. Higher density employment and commercial centers decrease auto ownership and use among people who travel to such centers daily.

Thus Pushkarev and Zupan concluded, to increase transit use the following conditions must exist in an urban area:

- High density downtown or other clusters of employment and commercial activity;
- Moderate to high density residential neighborhoods in close proximity to employment centers and clustered around transit stations
- High quality transit service (proximity and frequency of service.[ii]

Other studies followed which similarly pointed to the role of density in procuring transit ridership. In the late eighties, Cervero found that for moderate levels of transit (with 15 minute headways) to receive transit modal splits as high as 15-20 percent, workplace densities had to be a minimum of fifty workers per acre. Such densities would corresponded to office building densities of around 2 FAR (floor to area ratio).[iii] In 1989, Cervero set about investigating how "edge city" environments influenced travel behavior. He classified America's largest suburban activity centers on the basis of size, density, land use composition, and site designs/amenities. He found all of these factors to be significant predictors of transit modal choice, with densities being the dominant factor. Dense, suburban downtowns and edge cities where activities

cluster averaged more than 20 times as many transit commute trips by their workforce as sprawling, low-density, and single use office parks.[iv]

Since a strong determinant of mode choice is convenience of access, it follows logically that increasing the number of people who live near a transit system will also increase the number of people who choose to ride the system. Later work by Cervero in 1994 found evidence that residents within convenient walking distance (generally taken as ¼ mile[1]) of rail transit stations were more likely to commute to work by rail. In some San Francisco Bay Area transit-based housing developments, residents were as much as five times more likely to commute by rail than the average person in the surrounding county. When collecting mode splits for station area residents, Cervero found that, for the housing sites surveyed, residents were two to five times more likely to use rail than was the average person in the surrounding county. This evidence is consistent with earlier survey research reported by Bernick and Carroll in 1994 which found that 37.5 percent of residents in transit based housing East San Francisco Bay commuted using BART when BART's overall mode split was 8 percent.[v]

The degree to which density has been found to effect transit mode share has also been a subject of study. Statistical comparisons between cities and across corridors within cities have suggested that every 10 percent increase in population and employment densities yields between a 5 and an 8 percent increase in transit ridership, controlling for other factors (such as lower incomes, restricted parking, and better

[1] a ¼ mile is generally taken as the greatest distance the average person is willing to walk. See Untermann, "Accommodating the Pedestrian".

transit services generally associated with more compact settings).[vi] In the early eighties, Bernick and Cervero (1997) developed demand models to evaluate density effects on heavy rail transit. Bernick and Cervero used 1990 ridership and land use data for 34 BART stations. Land use data were compiled for station area catchments, defined as the continuous area that captured 90% of all access trips to and egress trips from each particular BART station[2]. On average an increase of 10 workers per acre for a radius of one to two miles of each station increased the week day turnstile counts entering and leaving that station by 6.5 per 1,000 catchment population. Additionally, an increase of 1,000 inhabitants per square mile added an average of eight more rail trips per 1,000 residents.[vii]

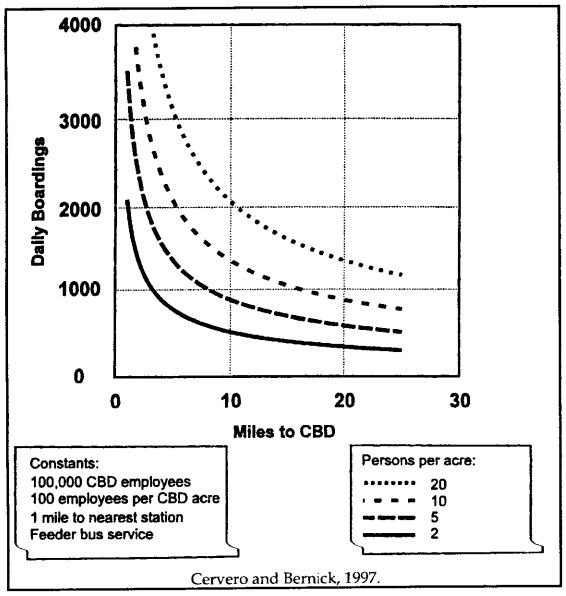

Table 1: Daily Boardings and Population Density

The National Research Council in a project under the Transit Cooperative Research Program (TCRP) updated Pushkarev and Zupan's work in 1995. Working with the findings from Pushvarev and Zupan's original work, this study concentrated on how densities, downtown employment and travel distance influence transit ridership. Using data from 19 light rail lines in 11 U.S. cities, the study founded that ridership increased exponentially with both central business district (CBD) employment

[2] BART's average catchment area was around 90 miles with a radius of about seven miles.

and employment density, controlling for a host of other variables including income. Higher ridership levels also occurred with higher residential densities. The elasticity between ridership and employment density was fairly high . Controlling for other factors, every 10 percent increase in population densities surrounding the stations studied was associated with a 6 percent increase in boardings at those stations. Table 1 shows how daily boardings fall with both increases in population density and distance to CBD. Assuming that the station is 10 miles from the CBD, these experiences show that a neighborhood with an average of 20 persons per gross acre (small lot single family with some duplexes) could be expected to produce 2000 daily boardings, compared to just 900 daily boardings for a neighborhood averaging 5 persons per acre (5,000 to 6,000 square foot lots)[viii]

Findings relating to density's effect upon and transit often occur along side research concerned with density and auto use. This is because, as Pushkarev and Zupan discovered, auto ownership and VMT are closely related to transit use. In recent years, John Putcher (1998, 1999) has conducted numerous international surveys in an effort to better understand the transportation situation in the United States. Putcher compared transit modal splits among 12 countries in Western Europe and North America . On average, European cities were 50 percent denser with more mixed-use neighborhoods than their American counterparts. He also found that the percentage of all trips made by automobile in the U.S. cities was more than double that of the majority of Western European countries which along with substantially higher automobile taxation policies, he argued, was responsible for transit ridership rates two to three times higher[ix].

Country	Percent of trips by travel mode				
	Auto	Public Transport	Bicycle	Walking	Other
USA	89	2	1	6	3
Canada	76	10	2	10	2
England and Wales	65	14	4	12	5
France	54	12	4	24	6
Italy	52	16	4	24	4
Germany	49	16	12	22	1
Switzerland	46	20	10	24	3
Sweden	46	11	10	29	4
Netherlands	45	7	28	18	2
Austria	45	13	9	28	5
Denmark	42	14	20	21	3

Table 2: Percent Trips by travel mode in Europe and North America

John Pucher (1999)[x]

Studies of travel behavior have shown that the effect of density upon vehicle miles traveled (VMT) is greatest when going from very low densities to moderate ones. Although most of the studies in this area have focused on automobile use rather than the use of transit, some research appears to imply that the negative exponential relationship existing between automobile use and density exists between density and transit ridership as well. In an Oakland study conducted for the Metropolitan Transportation Commission, using 1981 superdistrict data in the Bay Area , Garvin Harvey found a strong negative exponential relationship between residential densities and the amount of vehicular travel — a doubling of density results in a 30 percent decline in VMT/household.[xi] John Holtzclaw (1994) studied 28 California communities and found that the number of automobiles and the vehicle miles traveled per household fell by ¼ as density doubled, and fell by approximately 8 percent with a doubling of

transit services levels. His work concluded the greatest benefits occur when going from low densities of around 4 dwelling units per net residential acre to 10-15 units per acre.[xii] Such density increases are equivalent to a jump from spacious, quarter- acre home sites (10,000 square foot lots) to a mixture of small-lot detached units, duplexes and triplexes, or townhouse development. These relationships hold not only within metro areas but also between them as well. For instance, Newman and Kenworthy's plot of gas consumption versus urban densities across 30 international cities followed a decay function as well.[xiii]

These results are not limited to changes in automobile use, however. Transit demand also rises most sharply when increases are made from very low to moderate densities. In the case of New York City, for example, a 1984 study by W. Smith showed that neighborhoods with 5 dwelling units per acre averaged 0.2 daily transit trips per resident while comparable neighborhoods with 15 units per acre averaged 0.7 daily trips per capita. In very dense New York neighborhoods, the benefits to transit ridership were dramatic. At residential densities of 100 dwelling units per acre, Smith found that each New York resident was averaging around one mass transit trip per day. The important point is that the increase was not proportional to the rise in density. High rise densities are not required to support transit services. Because the relationship between density and transit ridership follows a negative exponential function, like auto use was shown to, the greatest effects for transit will come from initial density increases from low density to more moderate ones. [xiv]

The literature strongly argues that density is a determinant of transit use. More work remains to be done to solidify the subtleties of this relationship, but a set of guidelines have been created by the research to date. Transit patronage is higher in areas with higher density housing and where employment is clustered at greater densities. A 10 percent increase in population and employment densities, it has been found, will result in somewhere between a 5 and an 8 percent increase in transit ridership although this research deserves greater testing upon heavy rail systems. It is clear, however, that the relationship between density and transit use follows a decay formula, meaning that greater increases in density will not always equal as great increases to transit use. The most benefit for transit will occur as densities increase from low to moderate levels; from 4 or 5 dwelling units per acre to 12 or 15. More comprehensive research is required before it can be stated with confidence how great the effects of increased density will be on future transit ridership, but has undoubtedly been proven that density is a factor and one with considerable influence.

diversity

Another important aspect of land use that has been found to effect transportation patterns is the mix of land uses and activities across space. The separation of urban activities in many American cities has increased the amount of travel required to achieve daily activities and has blamed for the increasing traffic problems confronting them in recent years. The separation and isolation of different land uses has made the public transportation less attractive since accomplishing many activities when they are spread across the landscape is more difficult with inflexible

systems, particularly fixed rail. Thus, the separation of uses has made the automobile the transportation mode of choice.

The separation of urban activities is a phenomenon that began in the 1920s when the logic of Euclidian zoning principles was introduced on the American landscape. The intention driving zoning policies was the health and welfare of citizens. Originally zoning employed the police power to prevent noxious industrial land uses from locating near residential areas, relegating in a logical way each use to its proper place. Today the practice has become more complex, but its propensity for separations has remained strong. The weakness in this institution, according to Bernick and Cervero (1997) is not the principle of zoning control but the way it has been employed to segregate use by type. Over the years the practice has divided cities into use areas, either residential, office, retail or industrial. Although the noxious industrial uses which had introduced the practice have declined, the separation has continued. The negative effects of the past policies are now becoming clear as continued research demonstrates how activity mix affects travel behavior and in then end the mode of choice in segregated American cities.[xv]

The logic behind the research which follows says that mixing different activities and thus land uses will make it more convenient for people to ride transit or walk instead of driving between destinations in the city because it will place those activities closer together. Mixing land uses provides the opportunity for more efficiency in parking requirements and can facilitate even bi-directional travel flows. It can also

create a sustainable environment by conserving space. Allowing for shared parking between different uses in close proximity can shrink the size of a suburban activity center by as much as 25%.[xvi] These elements, the research proposes, reduce overall trips and have the power to influence mode choice by producing a land use pattern more conducive to transit use.

Some studies indicate that every 20 percent increase in the amount of floorspace at a traditional development devoted to retail and commercial services can induce a 4.5 percent increase in public and collective transit use.[xvii] Cervero (1989) proposed and proved that mixed-use developments could help reduce the dependence on the automobile by internalizing midday trips and thus allowing workers to utilize alternative transportation opportunities for their commute.[xviii]

Cervero's work indicates that multi-tripping does lead to increases in transit usage. The effect seems logical. Imagine for a moment that a customer arrived by rail transit to do their grocery shopping. If that person could also take in their laundry, have their shoes repaired, buy stamps and visit a doctor or get a haircut, it would represent a reduction in the number of trips that individual had to take to achieve the same ends. If that person also lived near the station or to another station along the rail alignment they might have chosen to use public transportation for the entire journey. Mixing land uses and urban activities therefor allows for much greater transportation efficiencies, and mixing them around transit stations can increase the likelihood of transit being chosen.

Cambridge Systematics conducted a study in early nineties which helped to confirm Cervero's findings. Their research explored the relationship between work environment and commute mode among 330 companies in the Los Angeles region that had introduced Transit Demand Management or TDM measures in their firms. They found that transit captured 6.4 percent of commute trips in "diverse mix" employment areas versus only 2.9 percent of commute trips in "no mix" areas despite the fact that TDM programs had been instituted in both.[xix] Conveniently sited retail outlets meant transit riders could do their shopping en route during lunch breaks or on their way home in the evening, thus accomplishing their commute and shopping in a single trip.

A survey conducted in 1994 by METRO, the regional planning association in the Portland, Oregon metropolitan area revealed that when good transit, headways of 15 minutes or less, was provided to mixed use neighborhoods a higher mode share for transit was captured than occurred in other areas of the region. Neighborhoods with both mixed use and good transit service had a mode share for transit of 11.5 percent, according to the survey, compared to only 1.2 percent in the rest of the region. Auto ownership was lower in those neighborhoods as was VMT per capita as well.[xx]

METRO

Metro Travel Behavior Survey Results

(all trip purposes, all income groups)

Land Use Type	Mode Share % Auto	% Walk	% Transit	% Bike	% Other	Vehicle Miles per Capita	Auto Ownership per Household
Good Transit/Mixed Use	58.1%	27.0%	11.5%	1.9%	1.5%	9.80	0.93
Good Transit Only	74.4%	15.2%	7.9%	1.4%	1.1%	13.28	1.50
Remainder of Multnomah County	81.5%	9.7%	3.5%	1.6%	3.7%	17.34	1.74
Remainder of Region	87.3%	6.1%	1.2%	0.8%	4.6%	21.79	1.93

Source: Metro 1994 Travel Behavior Survey 2-Jul-97

Table 3: Metro Travel Behavior Survey

Additional research has also revealed, however, that a relationship exists between diversity and density, one that makes it difficult to approach them separately. One of the more systematic attempts to evaluate the role of activity diversity in affecting mode choice was conducted by 1000 Friends of Oregon as part of the *Making the Land Use Transportation Air Quality Connection* or LUTRAQ study. Working with local travel demand forecasters they reviewed the structure of the regional forecasting model in an attempt to make it more sensitive to the effects of density, land use mix and urban design. The researchers were successful in demonstrating that a measure of mixed-use —the number of retail jobs in a transportation analysis zone — was statistically significant in explaining automobile ownership and the choice between motorized and non-motorized modes. However, while the variable was significant, the measure itself

contains elements of both density and land use mix. This suggests the interdependence of density and land use mix and on the difficulty of separating their influences.

The complementary influences of land use mix and density were studied in a series of models of boardings at stations in the Chicago Transit Authority System (CTS) and Metra commuter rail. Models were developed to explain station boardings as a function of the presence or absence of specific land uses within a ½ mile radius of the station, the number and types of employment, the number of households and measures of income and transit service. The most satisfying explanatory model resulted from the inclusion of measures of land use mix and of residential and employment densities. Models that used one of the variables but not both were not as successful in explaining variations in boardings.

Although not as well studied as density, diversity is clearly another important land use factor with the power to increase transit use. The level to which mixed-use influences ridership levels remains unclear, but research associating land use changes with transit use have identified this as another factor worth consideration.

design for multi-modal use

Absolutely vital to the efficiency of any mixed-use environment is the degree to which a person can move efficiently and comfortably without a car. The lack of pedestrian friendly environments is commonly understood as a crucial difficulty in encouraging people out of their cars. Personal automobiles offer not only very high

levels of mobility but also high levels of comfort. Encouraging people to make use of alternatives to driving means making them available but also making those alternatives attractive. Therfore, as important as creating a situation where different activities intermingle, an environment must exist where people feel comfortable walking. Studies into the role of land use elements on transit have identified the design of walking environments as another important factor influencing mode choice.

The LUTRAQ study conducted by 1,000 Friends of Oregon, was a five year effort to provide an alternative to a new bypass freeway planned in Portland. Preliminary studies of the bypass showed that
the highway wasn't needed for existing development, only future growth, and that the growth would likely to continue a prevailing pattern of low-density, single-use development. The challenge taken on by the LUTRAQ project was to find an alternative to the bypass construction. LUTRAQ provided an integrated land use, transit, transportation demand management alternative which in the Spring of 1995, the Transportation Department found LUTRAQ to be an equal or superior alternative in every respect to the bypass. As was mentioned earlier, LUTRAQ remodeled traditional traffic deman models. In addition to the discoveries concerning mixed use, work conducted as part of the LUTRAQ study found that pedestrian environment influenced vehicle miles traveled in many Portland neighborhoods. A measure of pedestrian friendliness, labeled the Pedestrian Environmental Factor (PEF) was developed. Every transportation analysis zone in the region was then assigned a ranking of 1 to 3 each on the following attributes: street connectivity, sidewalk continuity, ease of street crossing

on principal arterials, and topographic constrains to pedestrian mobility. A comparison of the composite rankings showed that households in the most pedestrian friendy areas (with scores of 11-12) produced less than half as many VMT as households in the most pedestrian-hostile neighborhoods (with scores of 4).[xxi]

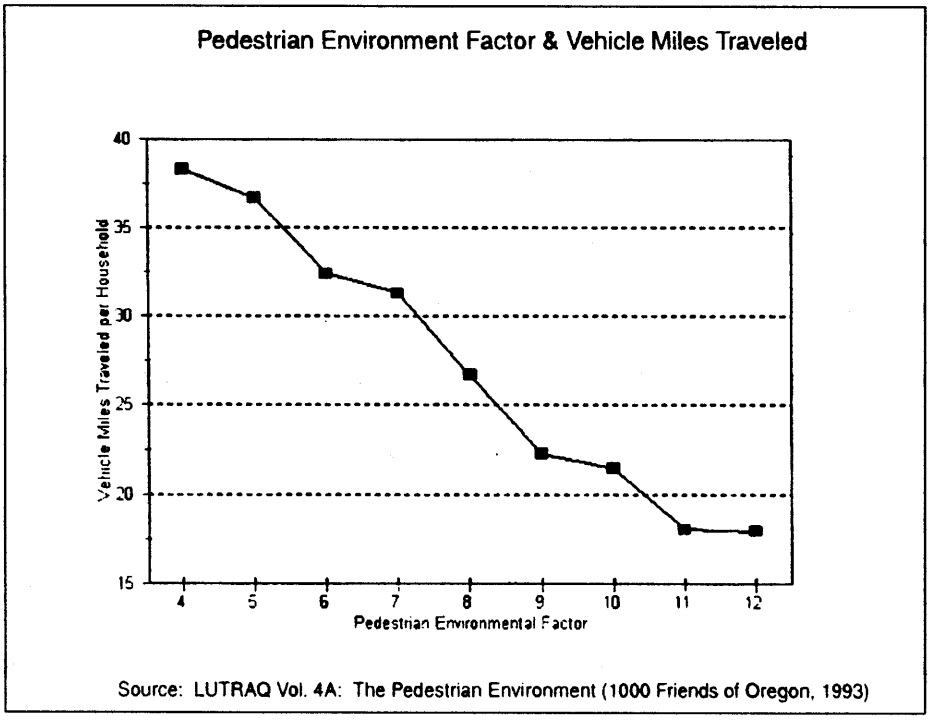

Table 4: Pedestrian Environment Factor and Vehicle Miles Traveled

Reid Ewing (1996) conducted a comparative study using travel survey information to test for significant differences in overall vehicle hours of travel between Palm Beach, FL communities. The effort was aimed at identifying whether, controlling for household income and location, land use would influence household travel patterns and if so, in what ways. Ewing found that development patterns did have a significant

effect on household travel. Placing the same households in more accessible locations will cut down significantly on their vehicular travel.[xxii]

In a similar study, Bernick and Cervero (1997) conducted matched-pair analysis of seven sets of San Francisco Bay Area neighborhoods. Neighborhoods with comparable household incomes, levels of transit services, topology and geography were matched each pair consisting of a "transit" neighborhood and a "automobile" neighborhood. Transit neighborhoods were labeled based on their street systems and historic patterns of development. Bernick and Cervero found that the San Francisco Bay Area's transit-oriented neighborhoods generated around 70 percent more transit trips and 10 percent more pedestrian and bicycle trips than nearby auto-oriented neighborhoods.[xxiii]

Randall Crane (1996) has suggested that evidence of the effect of pedestrian environment upon automobile and transit use has been inconclusive.[xxiv] Studies to the contrary have been few and far between. The reason for this is the difficulty of quantifying an environment that is conducive to pedestrian mobility. The LUTRAQ study was the first to attempt to quantify these design elements for study purposes. Future land use research will hopefully produce more.

conclusion

It is the suggestion of this chapter that if rail transit is added to a city to motivate a change in the travel behavior of its citizens, the land use patterns in that city must also be pushed in new directions. The evidence collected here has shown that specific changes in land use can motivate changes in travel patterns and in transit ridership specifically. The next chapter will go further into depth on the three land use categories introduced here, illuminating more specifically how they can be used in ways that can take advantage of the positive transit benefits demonstrated by the research collected.

[i] Robert Cervero, The Transit Metropolis, (Washington D.C.: Island Press, 1998) 72.
[ii] Boris Pushkarev and Zupan, Public Transit and Land Use Policy (Bloomington: Indiana University Press, 1977).
[iii] Robert Cervero, "Land-Use Mixing and Suburban Mobility" Transportation Quarterly Vol 42 No 3 July, 1988).
[iv] Robert Cervero, "Transit Supportive Development in the United States: Experiences and Prospects" IURD final report (University of California at Berkeley, 1993),16.
[v] Robert Cervero, "Transit based housing in California: Evidence on Ridership Impacts". Transportation Policy 3 1994, 174-83.
[vi] Robert Cervero, 1998, 72.
[vii] Michael Bernick and Robert Cervero, Transit Villages In the Twentieth Century (New York: McGraw-Hill, 1997), 75.
[viii]Bernick and Cervero, 72.
[ix] Cervero, 1998, 73.
[x] John Putcher , Presentation to Tren Urbano January Conference, 1999.
[xi] Cervero, 1993, 18.
[xii] John Holtzclaw, "Residential Patterns and Transit, Auto Dependence and Costs" (San Francisco: Resources Defense Council, 1994).
[xiii] Peter Newman and Jeff Kenworthy, Gasoline Consumption and Cities: A comparison of U.S. Cities with a Global Survey.
[xiv] W. Smith, "Mass Transit for High Rise, High-Density Living" Journal of Transportation Engineering (1984).
[xv] Bernick and Cervero, 59.
[xvi] Bernick and Cervero, 62.
[xvii] Ibid,
[xviii] Robert Cervero, America's Suburban Centers, (Boston: Unwin Hyman, 1989).
[xix] Bernick and Cervero, 87.
[xx] Metro, Metro Travel Behavior Survey, 1994.
[xxi] Parsons Brinkerhof, Quade and Douglas, Inc, LUTRAQ, "Makng the Connections, technical report", 1997, 18.
[xxii] Reid Ewing, Best Development Practices, (Washington D.C.: Planners Press 1996.)
[xxiii] Bernick and Cervero, 111.
[xxiv] Randall Crane. "On Form versus Function: Will the New Urbanism Reduce Traffic or Increase It?" Journal of Planning Education and Research. Vol. 15. 1996, 117-126.

3 Chapter Three: Searching for a Framework

Clearly we need a new paradigm of development;
a new vision of the American Metropolis and a new
image of the American Dream

Peter Calthorpe, 1993

overview

According to current research the critical land use elements influencing transit ridership are density, diversity and design. Using this knowledge to effect ridership on transit requires understanding how to use these elements to create transit supportive development patterns in areas where they have not existed before. A recent architectural movement has introduced a manual for creating these kinds of patterns but the design pattern is too theoretical to be helpful for new start cities like San Juan. It remains too separated from real world experience and far too conceptual to offer useful, specific recommendations. A new, more pragmatic framework for approaching transit supportive development is required-- a framework that is realistic and one that recognizes the complexities of what it is proposing.

literature on transit supportive development

A set of pragmatic urban planning and design principles emerged in the late eighties as an architectural movement called the New Urbanism. The shift from the inventive object building of modernism had lead to an increased interest in typological convention in the eighties. At the same time concern was mounting in the field about the status of American cities and their suburbs where Ebenezer Howard's humanistic ideals had been lost somewhere in the cul du sacs of modern residential development. New Urbanism emerged as a reaction to modernism, but it was equally a reaction to an American city that they felt was losing its urbanism. As the city spread ceaselessly it had become segmented, its land uses segregated, its transport mechanized, and its

public spaces fragmented. It had lost something vital. Armed with a strong belief in design's power to influence behavior and a disdain for auto-oriented suburban sprawl, the New Urbanists promised a more socially integrated, aesthetically pleasing, self-sufficient and civic spirited urban landscape. The movement reverted to the architecture and convention of traditional 19th century town-making principles, coining the term Traditional Neighborhood Development or TND for the projects they were creating. Seaside, a resort community in Florida conceived in the early eighties by developer Robert Davis and designed by architects Andres Duany, and Elizabeth Plater-Zyberk propelled the movement into the public eye as the first physical manifestation of the New Urbanism.

The pedestrian pocket concept developed almost simultaneously with TND, but somewhat separately. Guided by similar principles, the thinking was led by architects Douglas Kelbaugh, Daniel Solomon and Peter Calthorpe. A suburban village concept like TND, the pedestrian pocket incorporated four important, interrelated characteristics: 1) a mixed–use core area of office retail and residential uses from which all residents live within "walking distance", 2) an employment component so that residents might have the opportunity to live and work within the development, 3) the use of public space to impart a sense of community and civic involvement, and 4) a design which aimed to generate street life and create a pedestrian friendly environment while 5) establishing a sense of tradition despite its newness. The pedestrian pocket, unlike TND however, turned attention toward regionalism and transportation , two concepts ignored in TND. Pedestrian Pockets presented a more holistic approach emphasizing the quality of the "pieces" but rooted in convictions about regional planning and the importance of transit.

Through the continued attention of Peter Calthorpe the pedestrian pocket evolved into a more comprehensive prescription and gained a new title, Transit Oriented Development or TOD. Calthorpe's book, *The Next American Metropolis: ecology, community, and the American dream* published in 1993, presented TOD for the first time.

Calthorpe had broadened the New Urbanism's ideals and strategies by projecting them upon an environmental and regional perspective, creating a vision of walkable nodes strung along a regional transit network. At the center of Calthorpe's strategy was the incorporation of public transit into suburban developments. For him, this aspect was essential in trying to create the kind of car-free environment that the New Urbanists espoused. The first half of the book presents this vision, but the second half is dedicated to the presentation of guidelines for the creation of TOD. Calthorpe calls the book "part polemic, part tool, part proof by assertion, part manifesto."[1] The second half of the book provides an easy to understand manual for urban design which is tied to and supports transit use. *The Next American Metrropolis* has impacted the profession the most because of this contribution. Calthope's was the first and remains the only work to do this. As such, it is the tool book of choice, if only by necessity, for anyone interested in pursuing transit -oriented development. It provides an excellent conceptual framework, but is very weak as a practical one. TOD is a revolutionary vision that lacks applicability in cities with as diverse a set of station areas as San Juan. Calthorpe would have been superhuman had he developed a successful polemic, tool and manifesto in one work. *The Next American Metropolis* is a great guidance tool, but is inadequate as an instruction book for cities looking for a practical set of realistic tools to use for creating development at stations.

the difficulty with strict prescriptions and covenants

The New Urbanist movement has been questioned and criticized on many levels. Seen as, "enclaves for the privileged" and called "the New Suburbanism" many of the New Urbanism's critiques have stemmed from a concerns about its universal applicability. In its function as a manual, Peter Calthorp's work suffers from similar faults. John Kaliski writes that New Urbanism, "...authoritatively presents numbers and rules and then associates them with a prescription for small town ambiance. According to history and experience, disappointment will result if those rules are followed too literally."[2] A walk through the most common criticisms of the New

Urbanism will reveal why Peter Calthorpe's tools are not adequate for the role they attempt to fill.

There are four main lines of criticism commonly railed against the New Urbanism: it is just another form of sprawl, it's only for the rich, it is all look and no content, and it's not reflective of today's development realities. For the most part Calthorpe's TOD work suffers from the same weaknesses.

Many criticize the fact that although the New Urbanism is a reaction against the kind of suburban development happening in recent years, most of its tangible examples and even most of its design schemes are themselves on greenfield sites on the fringe or urban areas. Alex Krieger has said, "even when inspired by notions of traditional patterns of settlement, such continuous expansion, so uniquely American, harms all existing towns". Todd Bressi has also warned of the danger of large scale developments on the fringe.[3] In a recent Places article Bressi said, "urban design practice and education continue to be associated primarily with large scale interventions, such as urban redevelopment or planned new communities other design problems and urban issues deserve the attention of the urbanist movement".[4] In a 1998 article in Architecture Magazine Krieger accused the New Urbanism of retreating on its most treasured value and choosing the path of least resistance. "This nation," Krieger writes, "has generally taken the easier path vis-à-vis urbanization. It has since colonial times attempted to solve urban problems by starting over – a very unurban response. I worry that New Urbanists fall victim to this dubious American tradition."[5] Others similarly deride the movement claim's of being anti-suburban saying the appeal of the New Urbanism is a yuppie flight phenomenon. TOD, occurs almost exclusively on green field sites. Creating a TOD requires a big parcel of land, and it seems, single ownership. Situations where that kind of control and that kind of land are available is very rare. This helps to explain why so few actual TOD projects exist.

The yuppie flight claim leads into the next major criticism: New Urbanism is only for the rich. Vincent Scully points out that the projects developed and "their new towns have been largely luxury affairs."[6] This has become a less convincing argument in recent years. The Congress for the New Urbanism, the organization of NU's most strident supporters, has recently entered into a relationship with HUD for improving public housing projects using the tenants of the New Urbanism. The movement has also pushed for the inclusion of various housing types within its projects, from apartments above retail stores in the core commercial area to granny flats in alleys to single family detached units. This invariably implies an inclusion of differnt levels of housing price as well. The first New Urbanist developments created were exclusive enclaves, which explains the criticism it has received. Although Calthorpe's designs do not endorse exclusivity his framework can not be easily adapted to established urban areas. His TOD caters to those who can afford homes on the periphery. TOD is not responsive to the redevelopment needs of already established areas, where the less privileged of the world usually live and where, not surprisingly, there is the most need for transit supportive development.

Thirdly, the New Urbanism is criticized for being all look and no content. The movement overemphasizes architecture's ability to affect behavior, a tenant of the modernism movement that the New Urbanism was in rebellion against. Despite its claims against modernism, the new urban movement proclaims physical determinism all over again. In Towns and Town Making Principles, the first book proclaiming New Urbanism's principles, Kreiger offered a critical reflection. Ebenezer Howard's Garden City is most important antecedent of the New Urbanism, especially of Calthorpe's work. Howard's vision of concerning politics, self-sufficiency and social balance was obliterated in the realization of the garden suburbs concept. Only an appearance of his vision remained. Katz warns the New Urbanism against making the same mistake, "is the New Urbanism substituting appearances for reality as well?" he asks.[7] In the same book, Patrick Pinnel offers a similar critique. "These porticos and steeples, obelisks and

tempiettos wig wag motorists around quite well and will make for great postcard views, but the aura of their representing diminutive things in the life of the community is absent."[8] Pinnel points out that building something that looks meaningful will not make up for a fundamental lack of meaning. Are appearances of the new urbnaism substituting for reality? he asks. Nico Calavita pushes the New Urbanism to face the market realities of its claims. "Can we create a community spirit through the creation of the right sized spaces when, as Cornel West tells us in Race Matters a 'market morality' seems to be guiding us and our institutions' behavior."[9] The New Urbanism can not become so preoccupied with its concept that it forgets the building blocks that are available for its creation. Design, no matter how accomplished, will not make you exempt from market realities. Peter Calthorpe suffers from this neglect of realism as well.

The last criticism stems from the previous. The New Urbanism is not reflective of today's development realities. Melvin Webber put it well when he asked, "Can the neighborhood or TOD centers function as a social and activity focus of the community when efficiency considerations are making community facilities, from libraries to supermarkets too large to serve an area within a 2,000-foot radius?"[10] Kreiger points out an elemental hypocrisy claiming that the densities called for by the New Urbanists, including Calthorpe, are too low to support much mixed-use.[11] Leary says that we need context-specific solutions not general schemes. Several critics warn against the universal solution and call instead for proposals tailored to each community. "It is better to build incrementally on what exists, to create new towns in the image and spirit of the old, using the natural and built environment and the public and private investment already there," writes Leary.[12]

Calthorpe would reply to these arguments as he does in his book challenging the idea that the physical form of communities is the result of free choice, the market's wisdom, and the statistical sum of our collective will. "In reality our patterns of growth are as much a result of public policy and subsidies, outdated regulations, environmental

forces, technology, and inertia as they are the invisible hand of Adam Smith" writes Calthorpe in the Next American Metropolis. He maintains that public policy and marketing strategies are out of sync with today's culture, and he is right. The problem is that despite his claims a few pages latter in the very same book, he creates a manual which ignores the fact that the market is a formidable influence in any respect. It is highly questionable whether Calthorpe is capable of turning his words into a useful design scheme.

finding a middle ground

developing new suggestions for approaching station area development

Calthorpe's manual for creating a TOD follows the three elements identified by the research that can increase transit mode share. They fail for many of the reasons outlined above. It proclaims another form of sprawl, it's only for the rich, it is all look and no content, and it's not reflective of today's development realities. An examination of each of the elements proposed by Calthorpe will reveal how this is true.

density

As was established in the proceeding chapter, the intention behind increasing density in station areas is simply increasing the number of destinations and origination points along the transit system. More destinations and origination points will lead to increased travel in the corridor, increasing the likelihood that transit might be chosen as the desired means of travel.

Calthorpe makes several recommendations concerning density in his TOD formula. They start at the general but quickly become specific. There is a contradiction in Calthorpe's scheme. He says that the "size and location of core community areas should reflect anticipated market demand," yet a mere paragraph later, however, he sets forth average and minimum densities for residential and office development.[13] The average residential gross density is 18 dwelling units/acre, the minimum, 12 dwelling

units/acre. The absolute minimum average density, he says, should be no lower than 15 dwelling units/acre. These prescriptions are not reflective of a market influence at all.

His guidelines outline similar requirements for the retail component of the project. Calthorpe defines the types of uses, and their respective sizes. The core area, he says, must be at least 10% of total TOD site area and have a minimum of 10,000 square feet of retail space adjacent to the transit stop.[14] Appropriate uses in the core area according to Calthorpe include retail shops, professional services, service commercial uses, restaurants, cinema, health clubs and other entertainment facilities. He delineates the floor area dedicated to different uses in the core area as follows:

Convenience shopping and services	(10,000-25,000 square feet)
Specialty retail centers	(60,000-120,000 square feet)
Community centers with convenience shopping and department store	(120,000 square feet or greater)
Neighborhood centers with supermarket, drug store and supporting uses	(80,000 to 140,000 square feet)

Recommendations follow concerning the office component of the TOD. "Office areas " he says, "should promote efficient utilization of land near transit stops."[15] FARs should encourage multi-story and structured parking. This, he says, encourages the development of multi-story buildings for office as well as retail uses with structured parking. Offices without structured parking should be a minimum FAR of 0.35. Retail must have min FAR of 0.30 according to his scheme. These densities are far below the FAR of 2 which Cervero found was necessary to promote transit use. Interestingly, Calthorpe also says that as land values rise, presumably from additional growth in the area, structured parking will become more feasible. He fails to explain how this will happen, however. Underlying Calthorpe's formula is an encouragement of efficient use

of land at the greatest densities that the market will bear. His use of numerical translations for efficient land use, however, reveals his lack of understanding of the market forces which drive the formation of those urban densities.

problems with calthorpe's density model:

The market influences density

Density is determined in a manner that maximizes the profit from development. The costs associated with developing a project, the cost of acquiring the property and cost of construction, must be less than the return from sale or rental of that development. If this does not happen, the project will not be profitable and will never be built. The higher the demand for a piece of property, based on its location for instance, the higher a price it will generate. The more expensive a property is, the more units a developer will try to squeeze in to maximize their profit. Another way to think of how the market determines density is focusing on demand. One would expect developers to always build as much as possible on any piece of property. The more square feet they build, the more they will have to sell or rent. Developers do not always build tall buildings, however. The reason for this is the effect of demand. Developers will only build as much as they can sell, only as much as there is a proven demand for. It makes no sense to build a 10 story office tower if you can only rent 5 floors of space, or to build 20 houses when there are only 12 people in need of a home. This is the economic rule of supply and demand in action. The density that will be built by the private sector depends heavily on the demand for that property. Artificially attempting to dictate higher densities can be very difficult. Building more than is needed will result in unused space. Most private developers want to avoid this and will not build a project which calls for a higher density than the market will support.[16] Understanding these dynamics and incorporating that understanding into a framework for transit supportive development is essential to making that framework viable.

Communities often oppose increased density

Increasing densities can also be difficult in environments where the local community is opposed to that density. If higher density building types contrast with the existing buildings in an area there might be local opposition to their construction. High densities sometimes mean taller buildings which might bring a different character of people into the neighborhood. Such change can ignite opposition.

Realistic goals for density at station areas:

- The goal is the efficient use of land within walking distance of a transit station. Increases to existing densities, and the minimum average density required will depend on the context. It must be decided in every individual area.

Does the project make the most efficient use of land around the station?

- Efforts should be made to encourage development that occurs at higher densities than the area average. Densities for projects near a transit station should be the greatest that the market at the time would allow.

Is the density of the project in question the highest the market would allow?

- To be realistic, the further development in station areas should take a long term approach. All development should happen in a way that plans and allows for more intense densification in the future.

Does the project allow for more intense densities in the future?

diversity

Increasing the density of development at station areas will increase the number of destinations and origination points along the transit alignment. Increasing the diversity of development at transit stations means multiplying the kinds of destinations and origination points which exist along the alignment. Assuring, for instance, the existence of a multitude of uses at one station area will multiply the number of people

choosing to use transit for their trip, because they will have the opportunity to do many activities at one location. This is the theory of multi-tripping. Expanding the number of housing units and employment centers convenient to transit stations will also increase ridership by assuring that more commute trips could occur via transit.

Another dimension of this approach portends that mixed-use environments are often the most popular and lively in a city. Jane Jabobs understood this well. She wrote, "The district, and indeed as many of its internal parts as possible, must serve more than one primary function; preferably more than two. These must insure the presence of people who go outdoors on different schedules and are in the place for different purposes, but who are able to use many facilities in common."[17] Mixed-uses can act to make an environment lively by assuring the presence of many people at different times of day, each using the area in a different way. Environments like these are enjoyable to experience, they feel safer and they facilitate social interaction. Oscar Newman "eyes on the street" and design for safety.

The pattern of land use has other advantages beyond its benefits to transit: It provides freedom to those who can not drive by providing destinations within walking distance, it can have a positive fiscal impact for local governments when commercial development is part of the mix, it often has a positive impact on residential property values when commercial and civic uses are close by (but not next door), it can help provide greater security with more people coming and going, and it can help rejuvenate troubled neighborhoods. Bringing housing into an area can help to change the atmosphere; particularly if it is housing which people intend to stay in for the long term. Things begin to change when people move to an area and start to make it their home. That kind of claiming and feeling of ownership creates neighborhoods. Healthy neighborhoods attract other people. Anyone interested in increasing ridership on transit would understand that developing neighborhoods is creating destinations. Mixed-uses can be a powerful tool for building attractive destinations. For twenty years the Urban Land Institute (an organization for developers) and the Association of Homebuilders

have proclaimed the advantages of mixed-use development. Even the businesspeople have begun to understand the benefits.

Calthorpe understands these benefits and encourages diversity in his plans, but his proscriptions lack acknowledgment of the real world realities. Again, Calthorpe's interest in diversity in his TODs starts a very theoretical level. In order to be a successful TOD the area must consist of retail and service opportunities, employment generating uses (office, light industrial) and housing.[18] "Core commercial should provide a place for residents and employees to purchase basic goods and services," he says. Yet it quickly ventures into the specific and prescriptive. "All TODs must be mixed-use and contain a minimum of He makes recommendations of how exactly that mix of land uses should look in any development deserving of the label transit oriented. By percent of land area within an urban TOD his recommendations delineate as follows:[19]

public	5-15%
core/employment	30-70%
housing	20-60%

Yet, Calthorpe also demonstrates some comprehension for how real estate developers make their decisions by suggesting the use of density bonuses to encourage mixed-use development. As an incentive for developers to provide office and residential uses in the core commercial areas, Calthorpe suggests that retail developments in core commercial areas be granted leeway from the maximum FAR standards if they add additional floors of residential and or office use.[20] This can increase the diversity in the core area by reacting to a developer's desires to build square feet, but it also presumes a market for that space in those use categories.

difficulties associated with creating mixed-use:

Mixed-use is new

Creating a mixed-use environment is difficult for many of the same reasons that creating higher densities can be a challenge. It can require a manipulation of the market; forcing it in ways it will not go naturally. There is evidence that the real estate world has begun to discover the financial benefits of mixed-use development, but that discovery has yet to set in motion a major change in the way developers do business. The idea of mixing uses at a fine grain in a particular area is new, it is different, and it may require a manipulation of the market to allow it to occur.

A fine grained mix of uses requires certain densities

The next dilemma highlights the relationship between factors of land use illuminating how density helps to create and support mixed-use. Maintaining a mix of land uses can be difficult and nearly impossible in a low density environment even ignoring the disjunctive zoning policies which might make it illegal. Small mom and pop stores do not occur in suburban housing developments because of zoning which often disallows them, but also because
the density of that development is not great enough to support their business.

The densities which Calthorpe suggest are most likely incapable of supporting the mixed-use urban variety he espouses. There must be a realization that creating mixed-use environments requires even higher densities than transit alone. Retail businesses need customers, some types of retail even more than others. Providing these customers will often require the utilization of the density of activities already in area, beyond the new development. It might require positioning retail stores in ways so that they can take advantage of customers coming from outside the area, both in the train but also in their cars. The diversity of land uses will be discussed further and in more detail in the section which follows.

Uses only survive where there is a market

The general rule is: different uses only survive where there is a market for them. Having a restaurant or a small boutique might be a very good idea in theory, but if it can not get the customers it needs, it will not survive in a real development. Developers react to what the market tells them, and that message rarely proclaims mixed-use.

Residential development can be difficult to encourage

A difficulty for any effort aimed at increasing the diversity of uses around transit stations will be in trying to encourage residential development. Marlon Boarnet and Randall Crane have pointed out that the city's parochial, fiscal and economic interests conflict in most cases with transit-based housing. According to their studies, local municipalities, in general, will prefer to use rail transit stations for economic rather than residential development. The direct benefits, as they see it, usually point to use of unoccupied property in tax generating capacities. This tendency toward office or commercial development can and often does preclude residential development from taking place around stations, increasing the separation of land uses that leaves travel by alternative modes difficult.[21]

Realistic goals for diversity at station areas:

◊ Mix land uses at the finest grain that the market will bear

Are land uses mixed at the finest grain possible give the current market conditons?

◊ There is no "magic mix". Uses appropriate for each area will depend on the site, the market demand and the needs of the community.

Does the activity mix respond to the community needs and desires as well as to the requirements of the market?

◊ Should be thought of as an evolving process. More uses will become viable as the area evolves and more people visit.

Does the project allow for the continued proliferation of uses in the area?

◊ Uses should seek to maximize activity at all times of the day. It should try to bring different people into daily interaction, making the area a pleasant and fun place to be and strengthening its attraction as a destination.

Does the project seek to maximize activity at all time of the day?

design for multi-modal use

Providing for multi-modal transportation is vital to creating a transit supportive development pattern. People must be able to get to the train station before they will take the train. The design of the area around the station will influence how direct, safe and comfortable that journey will be for a person arriving by foot. The designers of stations provide for park and ride lots, kiss and ride facilities and bus or jittney drop off points because they understand that arrival is important for transit service. The forgotten mode is the pedestrian. In the long run the real alternative to the automobile is not the train, it is the foot. In addition, designing in a way which accommodates foot traffic will act to make the area a more attractive destination. People enjoy being in areas where they feel comfortable. Working to develop such an area, will ultimately make it a more popular destination. Designing for multimodal use can 1) make station areas more attractive destinations, and 2) they can make journeys which utilize the train easier and more convenient.

People living or working near a station must be willing to walk to the transit station or they won't take the train; they must be willing to walk between uses in the station area or mixed-use and high density mean absolutely nothing. The provision of direct and comfortable walking environments is a powerful tool for taking advantage of the uses and attractions near a station, those already built and those yet to be developed. Since these are the destinations that will encourage train ridership making them easily accessible from the station is an important next step. A set of comfortable, safe and direct walking paths can act like a funnel for the station, guiding people in. Just like

long waiting times reduce ridership, obstacles between points of departure or destinations and the nearest station will make trips less convenient. Arriving by foot needs to be understood as the other "intermodal transfer", as important as passengers arriving by bus or jitney. The pedestrian's journey to and from the station must be given equal attention.

Design for multimodal transportation has a critical role in the ethos of the New Urbanism. The "Charter of the New Urbanism" asserts several principles which support the concept of diversifying mobility. "Many activities of daily living should occur within walking distance, allowing independence to those who do not drive.... Interconnected networks of streets should be designed to encourage walking...." 'The primary task of all urban architecture and landscape design is the physical definition of streets and public spaces as places of shared use." "Streets and squares should be safe, comfortable and interesting to the pedestrian. Properly configured, they encourage walking and enable neighbors to know each other and protect their communities"[22]

Calthorpe's rudimentary goal for the design in a TOD calls for the configuration of shops in such a way which balances pedestrian and automobile comfort, visibility and accessibility.[23] He explains the intent of design saying, "to attract foot traffic to local shops, the configuration of streets, entrances, and parking must provide a comfortable route for pedestrians. Traversing large parking lots and access roads designed for heavy traffic will discourage them."[24] There should be a "Main" street of smaller shops with parking in the rear which creates a pleasant place to walk and connects residential areas and parks with shops and transit stop.[25] The street pattern should be simple, memorable and direct, avoiding circuitous routes. Streets should converge at common destinations where possible to decrease traveling distances to common popular destinations. Clear, formalized, and interconnected systems should be employed to make common destinations visible. They can also provide the shortest and most direct path for pedestrians, a factor that will encourage walking. A street pattern which is circuitous

and complex will discourage pedestrians. Variation and human scale detail in architecture is encouraged, as it will also support a walking environment.

Such variation can be created with articulated building facades that provide visual interest to pedestrians. Street level windows, balconies, porches, bays, arcades are similar techniques for increasing the variation. Primary building entrances should be physically and visually oriented toward streets, parks, and plazas not to the interior of blocks. Residential entries must orient to streets. He says that the configuration of destinations is important to encourage movement. Taller buildings provide visual interest. As expected he uses specific numbers to incorporate these points into the scheme. Set backs should minimized, no more than 20 feet for multi-story office buildings, 10-15 feet for residential. Sidewalks should be 15-20 feet wide.[26]

Calthorpe's greatest contribution is in this category of design. As an architect he is well versed in the effect of design on pedestrian use. He has obviously studied Untermann who has done a great deal of work on the subject of pedestrian movement and design. His work provides valuable guidance for creating a place where people will feel comfortable walking, but again he ignores the difficulties inherent in making this happen. He also forgets the need to create paths to existing destinations and the difficulty of creating direct paths when existing infrastructure makes this difficult.

Most of new construction in recent years is big and standardized. Many developers don't even hire an architect, they use a standard form. In this world, expecting variation can be a loosing battle, yet variation can be key in making walking attractive. Inducing a change in the way buildings are designed, particularly in the suburbs will not be easy. In addition, large block buildings with uninterrupted walls have become standard. It is a design aspect that emerged from the technology of the automobile. As people acquired the ability to move at higher speeds, detailed articulation lost its imporance. The bigger is better mentality has made creating places that the pedestrian can comfortably navigate difficult. Small development doesn't

happen as much today. Making big places pedestrian friendly as well as car friendly is a difficult design challenge even where it has been attempted.

difficulties associated with creating design for multi-modal use:

It is a new idea

Pedestrian access today is presented as a new concept although at the beginning of this century it was the only concept there was. Most design as of late, has conceived of arrival solely by automobile. As has been discussed, pedestrians can easily feel uncomfortable and unsafe in a automobile environment. Providing for the pedestrian requires providing the amenities that will make their use of the area convenient, comfortable and safe, and that represents a very new and unfamiliar idea for conventional developers.

Pedestrian Amenities cost money

Developments will orient themselves toward pedestrians when they know that a significant number of their customers will arrive by foot. Investment in amenities for pedestrians will be viewed as an unnecessary expense unless it is proven that that additional amenity will increase their profit margins. Developers decide which amenities they will provide as part of a development project based on how much they feel they can receive for them in additional profits. If that amenity adds less to the overall selling price or rent for the property than its costs the developer to build, it will not be built. An amenity will only be added to a project if it adds incremental value to the sales price. The value of amenities can be measured by what is called a hedonic price equation[1]. A hedonic price equation considers the market price that a development is worth to be a function of the levels of all observable characteristics of that development.[27]

[1] In its most simple form, linear hedonic equations look like this: $P= \acute{\alpha}+\beta_1 X_1 + \beta_2 X_2 +... + \beta_n X_n$ where P is the market price for the development and X is the observable characteristic.

It requires the reorganization of parking

Parking lots are a major impediment to successful pedestrian movement. The provision of large amount of surface level parking separates buildings across the landscape. Reduction in parking lead to a 25% reduction in the area of development. People do not feel very comfortable in parking lots. They don't like to walk across them. They are an environment meant for cars and as such they are dangerous and unpleasant places for pedestrians. Why will the average person drive around for twenty minutes to find a parking place close to the mall entrance? People don't want to walk across the parking lot. Local zoning usually requires a high number of parking places. Business owners also want them to provide for their customers, residents or employees. Reducing parking requirements or reconfiguring parking can be a difficult thing to do.

Structured parking is expensive. It requires a high land value to justify its construction, and therefore a certain density of development is required before its construction makes financial sense. There is a value break where land reaches a price of $30 to $40 per square foot where the expense of the property
will necessitate the building of structured rather than surface level parking.[28] Of course this all depends on the construction costs in a particular market, but in general at the point where land cost becomes more expensive than construction, it becomes uneconomical to use additional property for surface level parking. For example, since one parking space requires 300 square feet of land, at a land cost of $35 per square foot, each space will cost $10,500 before construction. Since the construction cost of structured parking is often in the $10,000-$12,000 per space range, at this point construction of structured parking makes good economical sense. It allows for more parking on less land.

Realistic goals for design for multi-modal use at station areas:

* Development should be compact rather than spread out. Surface level parking should be reduced.

Does the development encourage compact rather than spread out development and reduce surface level parking.

* Major activities should be integrated with the transit system. Buildings should fit with and complement the transit system.

Is there a functional link between development and transit?

* Continuous and direct routes should be provided to the transit station for all modes, pathways; walkable blocks and direct site lines will encourage pedestrian use.

Are continuous and direct routes provided from the station to and from important destinations in the area?

Preliminary Framework for Transit Supportive Development

Density • *efficient* • *above average* • *responsive*	Does development around the station make the most **efficient** use of land around the station that the market would allow?	Does the project allow for the development of more intense density in the future?
Diversity • *fine grained* • *responsive* • *activity maximizing*	Are land uses mixed at the **finest grain** possible given the current market conditions? Does the activity mix **respond** to community needs and desires as well as to the requirements of the market? Does the project seek to **maximize activity** at all times of day?	Does the project allow for the continued proliferation of uses in the area?
Design for multimodal use • *compact* • *integrated* • *linked*	Does the development encourage **compact** rather than spread out patterns and reduce surface level parking? Are **continuous , direct and pleasant multimodal routes** provided from the station to and from important destinations in the area? Do buildings **fit in** with the station and complement it?	Is the groundwork set for allowing multimodal access to future development in the area?

Figure 1

technical approach

Two case studies will be developed in chapter three which will seek to develop the preliminary criteria for supportive development into a more concrete and specific set of guidelines. Two station area development projects in the Portland, OR metropolitan area have been chosen for this examination, one a success and one a failure. Since its completion, the Gresham Central project has been widely deemed a success. The Beaverton Round is currently stalled in construction and has been the recipient of increased criticism. These cases were chosen because they were both envisioned as transit supportive projects from their inceptions. As a success and a failure, these cases, it is hoped, will also reveal the most critical elements required to produce a successful transit supportive project. In addition, both were built in the same metropolitan area and were thus acted upon by comparable policy environments and market influences. Lessons derived for the creation of these case studies were gained from interviews and secondary sources.

conclusion

The Transit Oriented Development concept developed through the auspices of the New Urbanism lacks applicability for the urban areas that need specific and realistic guidance the most. It remains a theoretical concept without the acknowledgement of the development realities necessary to make it a practical framework for approaching land use around transit stations. A more reasonable framework for approaching transit supportive development is required. This chapter developed a preliminary set of guidelines that outline the most important aspects of Calthorpe's approach but which avoid TOD's prescriptive nature and with a knowledge of market realities aims for a more realistic approach upon development in station areas.

The next chapter will take this framework a step by using the lessons gained from two case studies in Portland, OR to develop a complete and applicable set of critical guidelines for creating successful transit supportive station area developments in new start cities like San Juan, Puerto Rico.

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[1] Peter Calthorpe, The next American metropolis : ecology, community, and the American dream (New York, N.Y. : Princeton Architectural Press, 1993), 11.
[2] John Kaliski, "Reading New Urbanism" Design Book Review 37/38 Winter 1996/1997, 536.
[3] *Ibid.*
[4] Nico Calavita, "The New Urbanism" Journal of the American Planning Association, Autumn 1994, 534.
[5] Alex Krieger, "Whose Urbanism" Architecture November 1998 v87 n11, 76.
[6] Calavita, 535.
[7] Calavita, 536.
[8] Andres Duany and Elizabeth Plater Zyberk, Towns and town-making principles. (Cambridge, MA: Harvard University Graduate School of Design, Rizzoli, 1991) 107.
[9] Calavita, 537.
[10] Calavita, 536.
[11] Krieger, 75.
[12] Susan Handy, "Neotraditional Development: The Debate" Berkeley Planning Journal, v6, 1991, 140.
[13] Calthorpe, 58.
[14] Calthorpe, 77.
[15] Calthorpe, 78.
[16] DiPasquale, Denise and William C. Wheaton, Urban Economics and Real Estate Markets (New Jersey: Prentice Hall,1996) 73-80.
[17] Jane Jacobs, The Death and Life of Great American Cities (New York: Vintage Books, 1961) 153.
[18] Calthorpe, 63.
[19] *Ibid.*
[20] Calthorpe, 81.
[21] Marlon Boarnet and Randall Crane, "L.A. Story: A Reality Check for Transit-Based Housing", Journal of the American Planning Association, Spring 1997, 189.
[22] The Congress for the New Urbanism, "Charter of the New Urbanism", 1998.
[23] Calthorpe, 79.
[24] Calthorpe, 78.
[25] Calthorpe, 64.
[26] Calthorpe, 79.
[27] Boarnet, 67.
[28] Interview, Phil Whitmore, January 19th 1999.

4 Chapter Four: The Case Studies

THE ROUND AT BEAVERTON CENTRAL is a unique solution to the charge of planning a mixed use development adjacent to light rail, old downtown, auto oriented circulation routes, and new ever growing suburban land uses. How you may wonder is our solution unique? Rather than being determined by the spread sheet -it respects it. It is not driven by the automobile -it facilitates it. And finally, it is not driven by a train station -it embrace it. It is really quite simple. Our plan for this project is founded on the basic needs of human beings. The needs of human beings to live, work, and play in a fully animated civic neighborhood. The needs of people to be safe, and find value and wonderment as they go from here to there.

From promotional materials of the Beaverton Round Project

The previous critique of Calthorpe's model for TOD lead to a reformulated set of goals to guide development around transit. Directed by current research these goals worked from Calthorpe's recommendations but were tempered by a realism that Calthorpe's work lacked. They have not been tested in the field. Efforts were taken to make these criteria realistic and practical, but coming to an intelligent understanding of how to produce transit supportive development requires a more extensive look into the realities of this type of development. It is hoped that further refinement of the criteria will emerge from the projection of these criteria upon two case studies. One is considered a successful project, one a failure.

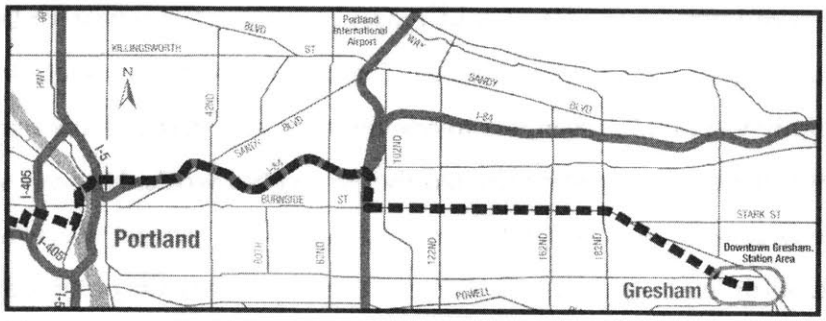
the projects

The Gresham Central Apartments and the Beaverton Round project are the two projects that will be used in this examination. They are both recent projects built along the Portland, OR metropolitan area light rail line. They each provide examples of the complexity of creating transit supportive development patterns, but do so in different

ways. The primary goals of both included a commitment to the development of dense, mixed-use, pedestrian friendly projects, and each offer an example of what happens when these kind of ideas meet the real world. Regardless of the public benefit that might result from the projects or the benefits to the transit provider because of the land use patterns created, these projects represented challenges because they created patterns of use and design different from the norm. Special and even extreme measures were required before development could begin, and one project is still struggling through the construction process. Because the projects are both located in the same metropolitan area they are subject to similar market forces, political influences and municipal regulation. They are also located near transit stations controlled by the same transit authority. The externalities affecting the two developments are comparable. This next chapter examines a project success together with a project failure to flush out the most critical elements required for transit supportive development. It is hoped this examination will help to reveal those subtle differences that mean the difference between a transit supportive development that works and one that doesn't.

The Gresham Central Apartments are located near the Gresham Central Station on the eastern end of Portland's light rail line. The Beaverton Round project surround the Beaverton Central station on the new westside extension which began service in 1998. The Gresham Central Apartments were completed in May 1996. They were the first transit oriented project initiated by TriMet, the tri-county metropolitan transit authority, and carried out by a private developer. The Gresham Central apartments are widely considered a success by those within the Portland area and beyond. In contrast, the Beaverton Round project, still under construction has encountered considerable hardship and received staunch criticism. Permanent financing has not been secured for the project and as a result the construction process has been put on hold. As this paper is written, the project remains stalled in construction.

THE GRESHAM CENTRAL APARTMENTS at Gresham Central Station



EASTSIDE MAX CORRIDOR

Gresham is a suburb 17 miles east of the city of Portland. Interstate 84 provides easy access from Gresham to Portland International Airport and into downtown Portland. With a population of 81,865 in 1997 Gresham is Oregon's fourth largest city and it is growing steadily. Gresham experienced a 20% increase in population between 1990 and 1997.[i] Portland's light rail line, the Metropolitan Area Express, fondly referred to as MAX, began service to Gresham in 1986. The site owned by TriMet along the alignment at Gresham Central was identified for a transit supportive development very early on. TriMet led the development of this project and although the organization never contributed directly to the financing of the project, the significant time and attention given to the project ensured its success. The development project was overseen and carefully directed from land acquisition to ribbon cutting by one man at TriMet, former project manager Phil Whitmore.

The Gresham Central Apartments are built on a 2.6 acre site and include 90 units of 1, 2 and 3 bedroom, market rate apartments. The project achieves a gross density of 35 units to the acre, a figure higher than the surrounding area. 134 parking spaces are provided behind the buildings, allowing units to face directly onto the street or the pedestrian promenade which connects the project to the Gresham central station. The promenade provides pedestrian amenities and a convenient connection between the project and the MAX station. It also serves as a useful pedestrian way between the

Gresham Central station and other uses in the surrounding area. The historical downtown is not far from the station and the pedestrian way provides a means of access that had not existed previously. Gresham Central became a poster boy for ULI because of how close its units are to the transit tracks. The housing really interacts with the transit, it is highly visible to passengers inside the train and people have responded positively to this interplay. TriMet initiated the project but worked closely with the developer, the Gresham Development Company, L.L.C. The project was funded privately with additional support for infrastructure improvements obtained by TriMet through Federal Highway Administration TOD funds.

Work on the Gresham Central project began in 1990. TriMet owned a 0.7 acre parcel along the MAX alignment near the Gresham Central station resulting from their right of way acquisitions for track construction. TriMet decided to use this parcel to leverage transit supportive development near their station. A Development agreement was drafted with the Gresham Development Company, L.L.C. for development of the property. Federal Transit Administration or FTA policy at the time prohibited TriMet from selling property for anything less than fair market value if it had been acquired using FTA funding.[1] Despite this obstacle, TriMet found a developer interested and committed to their vision despite the small profit margins anticipated. The development agreement signed by TriMet and the Gresham Development Company, L.L.C. established TriMet's sale of the site for a fair market value when the developer acquired a neighboring site and agreed to build a transit oriented housing project on the combined parcels. A minimum density of 35 units per acre was agreed upon and it was decided that a pedestrian promenade would be built as a part of the project to connect the site with the Gresham Central transit station. TriMet agreed to leverage the funds to pay for that $700,000 amenity. The agreement was very clear in its specifications. There were four specified pre-construction performances that TriMet required from the

[1] This federal policy on joint development has since been revised and clarified with respect to program income in relation to real estate acquired with funds under Federal transit law. See: Appendix B of FTA Circular 9300.1 "Joint Development Projects" or summary in Federal Register, March 14, 1997 (Volume 52, Number 50)

developer. First round designs, including site and floor plans, were required as were construction drawings to ensure to TriMet's satisfaction that the project would be built according to its transit oriented intentions. In addition, all parties involved agreed that the permits would be obtained before TriMet agreed to the project. Proof of equity capital and permanent financing for the project was required. The clarity and strict requirements outlined in the development agreement between TriMet and the Gresham

Development Company developed clear lines of communication and assured a productive relationship between the parties.

Despite cautious planning, the development at this site was complex and required constant attention from TriMet. A great deal of negotiation with a variety of government agencies was required to make the development happen. It is likely that the project would never have survived the bureaucratic messiness it faced without the strong commitment of the project director at TriMet, Phil Whitmore. The site contained easements that made it essentially unbuildable when the developer first received it. In addition, it was soon uncovered that the title for TriMet's property was shared with the local Power Company, this meant that nothing could be done on the land without the approval of PGE. These facts brought the fair market value of the site way down, but also made development on the site incredibly complex. The entire project from development agreement to ribbon cutting would require ** years of work.

TriMet sold the property, despite the complications to the developer for $26,000 in 1992 and returned the property's value to the Federal Treasury, as required by the Federal Transit Authority. To allow development on the site, TriMet began working to alleviate the constraints on the property. It would be a process that would last many years. The easements were ultimately organized into one centralized location freeing up the rest of the property for development. To assure the efficient use of the property the easement area would also serve as the pedestrian promenade, TriMet also requested the fee on the lease from the power company in exchange for a 30 foot easement on the

property. PGE accepted this agreement and in 1993 agreed to quit their claim on the land in exchange for the easement which was added to the common easement under the planned promenade.

Funding for the project was sought from several sources, all in an effort to write down the building costs for the developer and pay for the pedestrian areas TriMet had committed to building. A total of $70,000 ultimately had to be obtained to pay for these additions. A CMAQ/TOD grant was requested and granted to pay for pedestrian promenade through project[2]. A State Housing Bond was also pursued from the Oregon Department of Housing. An additional $400,000- $600,000 could be obtained from the Housing Administration if the project contained at least 40% affordable housing units. This additional financial contribution was not required in the development agreement but it was established jointly by TriMet and Gresham Development that the additional capital from including affordable housing would bring additional amenities to the endeavor that could increase is success as a transit oriented project. Structured parking was one such amenity. It was felt that structured parking could increase the density of the project and increase its orientation toward both the station and the surrounding community. As the project sought approval from the City of Gresham, however, strong opposition was mounted against the affordable housing so ultimately this dimension and the funding it promised could not be realized.

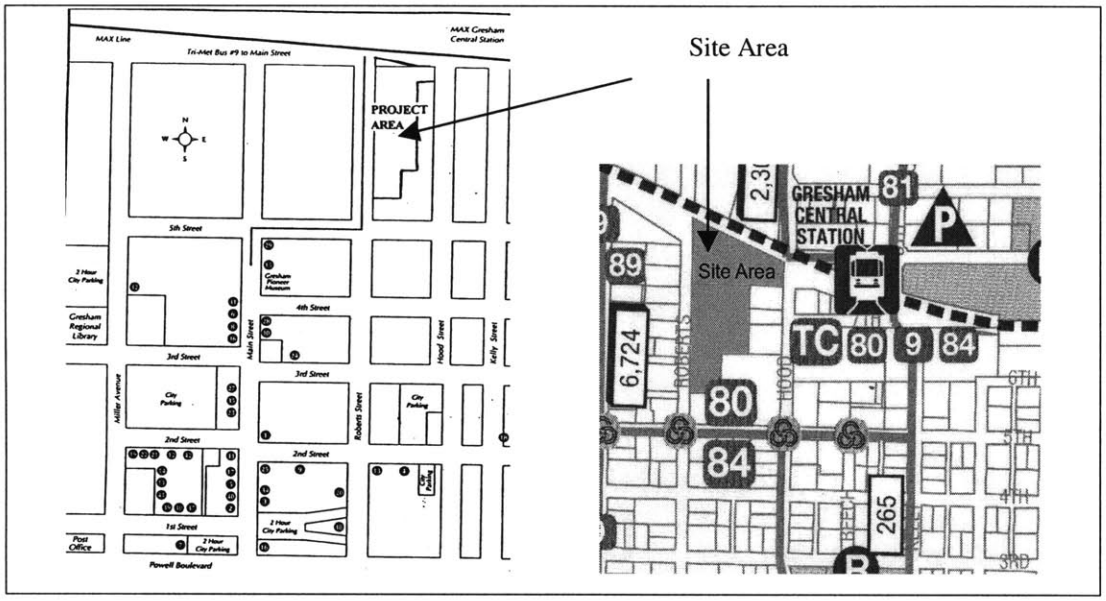
Additional negotiation with Gresham was required before the project could move forward, because an array of fees was placed on the project by the city. There was a $250,000 fee for city system development charges, a $43,000 parks fee and then a

[2] CMAQ/TOD grants in Oregon are administered by the Oregon Department of Environmental Quality through $3.5 million in Congestion Mitigation and Air Quality (CMAQ) funds intended for use in the operation of a Transit Orient Development (TOD) program in the Portland metropolitan area. CMAQ grants come from the Federal Highway Administration (FHWA) in cooperation with the Federal Transit Administration (FTA) as a part of Intermodal Surface Transportation Efficiency Act (ISTEA) funding. CMAQ funds are intended for use in the acquisition of land, or the design and construction of public transportation amenities.

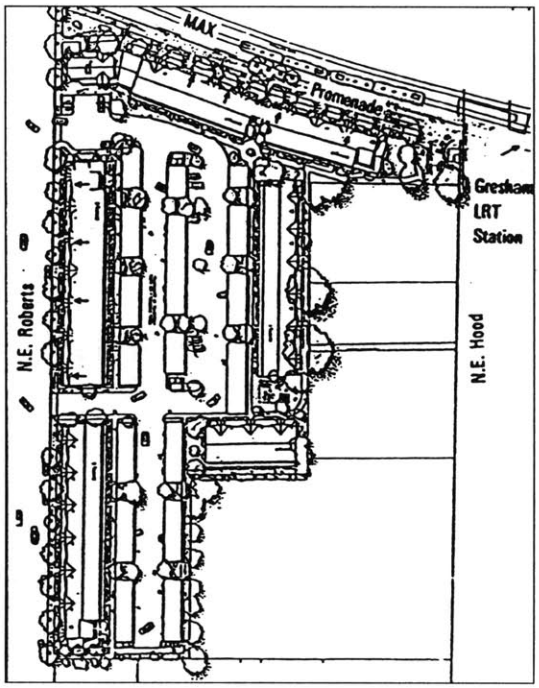
Gresham Central Apartments

Photo 1: Gresham Central Building Facades along Roberts Street

Photo 2: Gresham Central Pedestrian Promenade



Map 1: Gresham Central Context Maps



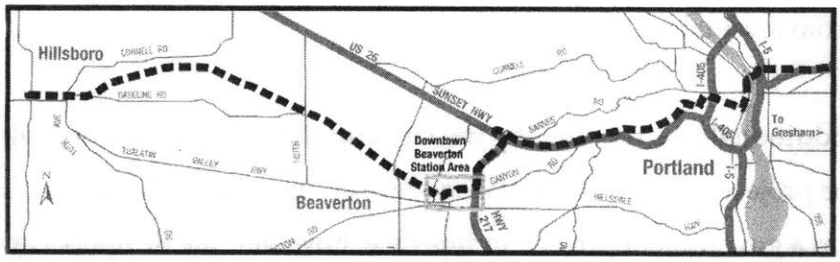
Map 2: Gresham Central Site Plan

$90,000 lean on the property placed by the city for street improvement. Diligence from TriMet eventually led to an altered easement, a waver from the parks fee in exchange for public ownership of the pedestrian promenade and ultimately a ten year tax abatement from local taxes.

The additional fees required by the city and the loss of the affordable housing portion of the project created a financial squeeze on the project. A 10% profit is usually expected from a government project. In this case, however, the developer was down to a 4% profit, and even facing a breakeven scenario. Gresham Development and its investors were willing to accept this because they liked the project and they foresaw the long term benefits from their investment. It is unlikely that the project would have been as successful if it were not for this dedication on the part of the Gresham Development Company.[ii]

Overall, the Gresham Central Apartments have been viewed as a successful project, and the pedestrian promenade is its most often mentioned attribute. According to Gresham city planner, Richard N. Ross, AICP the project directly links the apartments to MAX. It introduced a new kind of living situation to the Portland suburbs— transit living. But more importantly for the city, it introduced link between the MAX station and the rest of downtown. It is inviting to everyone in the area. There were not a lot of pedestrians in Gresham, but today people use the promenade, because it is an attractive place to be. Most importantly, the Gresham Central project has provided an example that others have begun to follow. The site area of this one project is only 2.58 acres, but it is effecting a change in the way development is happening in the entire area, just by example. It is visible and has proven very influential. The city is currently pursuing a street improvement project in order to expand the pedestrian environment throughout the downtown. According to Ross, the Gresham Central Apartments have "influenced the area even more than the Gresham downtown plan."[iii] Also, Gresham Central benefited from a very patient developer and from a dedicated staff at TriMet. Without that continued dedication this pioneering project would have been impossible.

THE BEAVERTON ROUND at Beaverton Central



WESTSIDE MAX CORRIDOR

The townsite of Beaverton, OR was platted in 1868. It became an officially incorporated town in 1893, formed comfortably around the two major railroad lines that ran through the area. Beaverton and its surroundings remained primarily agricultural until the mid-nineteen-fifties when it began its growth into a suburb like many in the Portland area, primarily composed of single family homes.

Today Beaverton is one of the fastest growing communities in the state; growing both in population and as a major employment center. The city experienced a 24.23% change in population between 1990 and 1997. Seven miles west of Portland, Beaverton is traversed by two major freeways, US 26 which runs directly into Portland and Highway 217 which runs North/South connecting Beaverton with Portland's southern suburbs and with Interstate 5 (I-5). Beaverton is also connected to downtown Portland via the Westside extension of MAX. A suburban community, Beaverton has earned the most attention recently from the major companies that have made it there home. Nike's World Campus is located in Beaverton as are offices of Intel, Fujitsu, Sequent, Tetronix, Epson, NEC, Intersolv, Ncube , and other high tech firms who have earned the Beaverton area the proud title "the silicon forest".[iv]

The Round at Beaverton Central is a high density mixed-use development located close to Beaverton's historical downtown and in the heart of its heavily used

commercial district. The Round is located on a 7.5 acre site with the Beaverton Central light rail station in the middle. The light rail line runs through the project site and is treated as a centerpiece of the development. The design acknowledges the station forming a curve with its buildings which literally embraces the MAX tracks. There are 90 units to the acre of housing incorporated in the project as well as a variety of diverse uses including housing, retail, office, hotel and entertainment. There is only 1 parking space per housing unit provided in the project which is significantly less than similarly sized projects in the area. The majority of parking is provided in two parking garages rather than in surface lots which would have required a significant portion of the project site and reduced building area. The developer of the project is the BCB Group and the architects are Stastny Brun Architects, Inc.

The Round was initiated by the city of Beaverton, original town of the site. The planning of a development near the Beaverton Central was a result of the city's strong desire to create a new definition for their city with different kind of development. Beaverton was interested in improving their commercial area's identity and character, because like many other American suburbs Beaverton had lost its traditional downtown. Their historic downtown are still maintained the railroad tracks that once defined it but had now become an area dominated by strip malls, shopping complexes, fast food restaurants and car dealerships. The city owned site along the MAX right of way was seen as the means to affect the desired change.

The city's site was 8 ½ acres between Hall Boulevard, Watson Avenue and Henry Street in the commercial district of town. Ownership had turned over to the city when a waste water treatment plant on the site was demolished in 1974. Soon the site became a focus for the city's desire for a more traditional, dense, mixed-use, pedestrian friendly downtown. Numerous studies were conducted to determine its best use: economic, carrying capacity and environmental studies were commissioned. A plan to place a new City Hall on the site was suggested but never carried through. It was not until TriMet announced its west-side light rail extension project and it become clear that

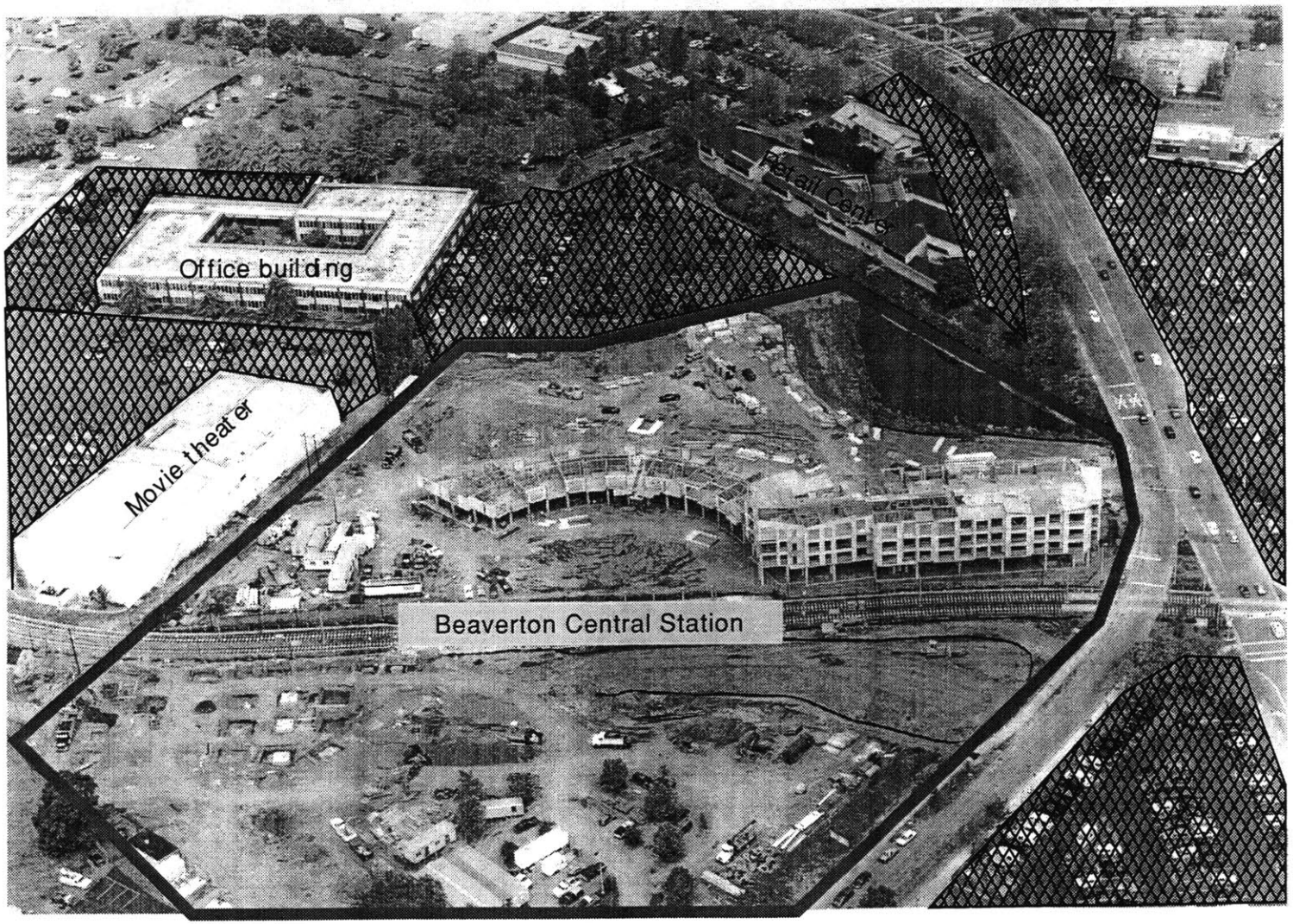
MAX would traverse the precious property that the city realized that this was a classic site for a dense Transit Oriented Development. The city saw as an opportunity to return to its roots by realigning development with the train. The parking ratio at the development is much lower than average suburban developments. The entire project has 810 parking spaces, accommodated for in two structures. Parking is accumulated in a seven floor structure on the South end of the parcel and another 2 floor structure with 300 spaces on Crescent Road.

In 1994 a group was formed to pursue this option. An RFQ (Request for Qualifications) was produced for development on the property. The RFQ made it clear that this was intended to be a project which took advantage of its location near the station and which made the project the focus for the centerless downtown Beaverton. The BCB Group, Inc. which consisted of a civil engineer, an architect and the Bingham construction company proposed a mixed-use development with a main plaza oriented toward the Beaverton Central transit station. Their plan dedicated specific square feet of total project area to a variety of uses including: 180 units of housing (condos, live and work units); 85,000 square feet of retail; 320,000 square feet of office space; a 10 screen movie theater; 153 unit hotel; 810 space parking garage and a restaurant. Their plan was very well received and won the bid. BCB was successful primarily because their plan had identity, it spoke to the city's desire for creating a high density center in contrast with the land uses currently existing in the area. The project's mix of activities, its proposed densities and its dedication to public space made the proposal a hit.

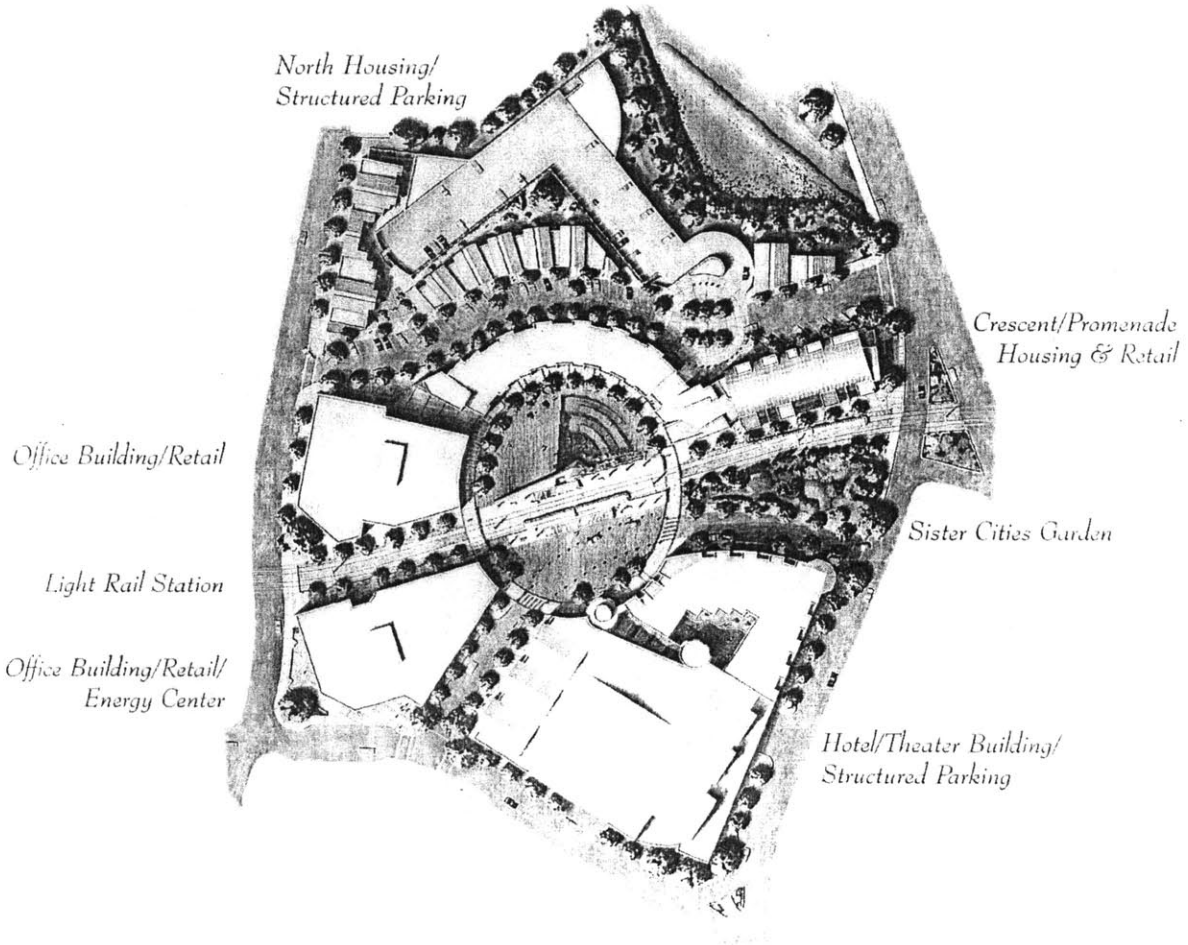
WHITAKER/ELLIS BUILDERS, INC.

THE ROUND AT BEAVERTON CENTRAL
DATE: 3·30·98

The Beaverton Round Site Area



The Beaverton Round



The City Council agreed on the concept and agreed to enter into a contract with the BCB group for a public/private development project signing a Design and Development Agreement (DDA) in August of 1996. The agreement between the city and BCB stated that the city owned property would be given to BCB (a $2.7 million valuation). The City agreed to conduct remediation on site and agreed to donate approximately $3.8 million in subsidies to the project in the form of forgiven development fees and a tax abatement for the housing portion of the project ($3 million every ten years). The City also agreed to provide needed infrastructure on the site. The infrastructure improvements agreed to included:

- 3 major roads on the site
- major sewer, water and storm drainage infrastructure
- $800,000 in pedestrian improvements (pedestrian ways connect the property to the station and the plaza)

A portion of the plaza construction.

BCB committed itself to the production of the development they had proposed and which had been approved by Beaverton's City Council.

The actual production of the project proposed by the BCB group proved more difficult than either that group or the city had anticipated. Financial problems plagued the project from the beginning, increasing the contribution required by the city and eventually stranding the project without the needed capital to continue construction.

The development scheme being pursued by the BCB group changed over the duration of the project as a result of the difficulties encountered and reevaluated market demands. Total square footage was reduced for every use in the project. The latest plans available now show 100 housing units in final plan instead of the 180 agreed to in the original DDA, 85,000 square feet of retail became 50,000 square feet of retail, and the amount of office space has been reduced from 320,000 square feet to 250,000 square feet.

The site turned out to be a very difficult one to develop. As brownfield sites often are, the site was difficult and expensive to prepare for redevelopment. Remediation of the site cost the city nearly $6.8 million, much more than anticipated. In addition, it was found that the site contained five wetlands. Reducing the buildable land decreased the siting options for buildings and constrained the overall density that could be achieved on the parcel.

A high level of coordination between a variety of different agencies was required to make this project possible. 12 agencies were involved in planning for the site including: U.S. Housing and Urban Development Department, U.S. Environmental Protection Agency, TriMet (Portland metropolitan urban transportation authority), Oregon Department of Transportation (ODOT), Metro (Portland metropolitan planning organization), Washington County, and the City of Beaverton. The number of agencies involved made every decision or change in the project a tedious process. Dealing with so many different people and public agencies was a struggle that bogged down the development of the project significantly.

The additional unexpected remediation costs incurred by the project left the development team in search of additional funds from a variety of sources as well. The project received additional support from a unique partnership with a subsidiary of Portland General Electric called Microclimates. Microclimates agreed to provide state of the art communications systems and utilities for the project. Modular systems produced by Microclimates are being installed as an element of the infrastructure and will allow for a one rate billing system on all electric services in the project. Individual controls for heating and cooling systems will be provided in every unit, and six T1 connections will be installed in each retail space. These high tech additions set the project apart from its competitors by providing a marketable high tech amenity. As such, the project can provide quality office space for "silicon forest", high technology, firms. In addition, the project includes several live/work residential spaces, anticipating the growth in work at home employment situations. This contribution from Enron and the forwarding

thinking nature of the developer has made the project unique and set it up for success in the growing technologically minded market, however, these innovations have not been enough to secure the project enough financing to keep construction moving forward.

To fund its commitments to the project, the city applied for and was granted a Congestion Mitigation Air Quality Transit Oriented Development (CMAQ- TOD) grants totaling $1.2 million for use strictly in infrastructure improvements (pedestrian ways and roads). In addition, the project received support from TriMet in the form of subsidized transit passes to be offered to residents. TriMet has made the Beaverton Round a part of its Transit Oriented Development Pass Program. As such, new tenants in any of the 154 multi-family condo units at the Round will be provided with free transit passes for specified periods of time as part of their tenant marketing materials.

The Beaverton Round project was planned as a mixed-use, high density, pedestrian friendly development. The promotional materials for the project tout the Round's unique solution to the charge of planning a mixed-use environment adjacent to transit. It was planned as a destination – a new center for Beaverton as well as a new direction for the city's future- a place of civic pride, civic ownership and civic life. In many ways the project's plans imply that the project will achieve these things. In addition, the Round has achieved many of its goals, but there are significant weaknesses apparent in this project. These weaknesses might explain why the Round has been denied financing and why in the end it might never be capable of achieving the kind of success its planner's expect of it.

At 90 units to the acre the project represents a significant increase above the standard density of projects in Beaverton. As planned, the Round will bring a large number of people into the vicinity of the Beaverton Central station. The incredible mix of uses in the project helps achieve this goal. Just about every conceivable use has been incorporated into this project. It really takes advantage of its location in Beaverton's central commercial district, taking all the uses that already exist and thrive in the area

but bringing them together in a more compact and accessible way. Of course it is also the mix of uses that has caused the stall in construction that the project is currently facing[v].

The round has run into troubles because BCB group has not secured permanent financing. "Bank folks do not think outside of their boxes" says developer Selwyn Bingham. There is a distinct lack of forward thinking financial people. Of course they are not paid to be forward thinking. Most financiers do not like to be risk takers and what that means is that most financiers are not prepared to lend to mixed-use projects. According to Bingham, the number one problem facing the Round is the reluctance of financiers to lend capital for a mixed-use project. Mixed-use mortgages do not exist in the "conservative" financial environment in Portland. Most lenders have specialties in which they are comfortable lending. They are a hotel lender, a entertainment lender, a residential lender or an office lender, but rarely all four.[vi]

Another difficulty is that the project does not allow for change. There is little room for the project or its surroundings to evolve because it is enclosed design and because within that enclosure everything is owned by a single entity and every use has been carefully designated. Nor does the project suggest the evolution of the areas surrounding the project. As was said before the project suffers from a complete disregard for the uses around it

There are many strong aspects of the design at the Round. Extensive pedestrian amenities have been incorporated within the project. The buildings are designed to physically embrace the station. The way each of the project's diverse uses open onto the station area will ensure the kind of activity and life that the pedestrian plaza around the station will need to thrive. These amenities will bring more people from the project area onto the train and conceivably from the train into the area. The Sister Cities garden along Watson Avenue, the promenade in front of the retail buildings, the paths leading to the North housing area and the streets that feed each of the buildings all provide safe

and comfortable connections for autos *and* pedestrians to the plaza around the MAX station. Yet somehow all of this is not enough.

The Round suffers from a problem of trying to do and be everything. Calthorpe advocates an idea popular amongst the new urbanism that is left over from the new town movement that preceded it: do everything and do it right away. This is not a strategic state of mind because it often does not work. You do not need to build a complete village around every transit station and will probably fail if you try. A development project should try to be one brick in the wall. The most successful areas in a city are usually those that are the product of multiple ownership and time.

Jane Jacobs is a proponent of complexity and thus of age diversity in neighborhoods. "The district must mingle buildings that vary in age and condition, including a good proportion of old ones" she wrote.[vii] A recent criticism of Battery Park City in New York displays a similar sentiment Abby Bussel criticized Battery Park for lacking the diversity that makes New York New York. Battery Park (BPC) was another early product of the New Urbanism. Completed in the early eighties the project marked a return to urbanism creating a mixed-use environment to link Manhattan with its waterfront. Bussel criticizes BPC for forgetting the critical element of time.

> The idea was noble, but it failed to keep in mind the great diversity that makes New York a dynamic, sometimes chaotic city, where people turn streets and parking lots into shopping bazaars, buildings and street light stanchions into billboards, parks into theaters.[viii]

A person who worked there commented, "I am excited by its parks and open spaces, but apalled by its bland architecture, lifeless streets, and 'old NewYork' artificial flavoring."[ix] The Round needs to realize the dangers of trying to do too much all at once. The effect of time is necessary for a successful urban environment. A project that is too planned can lack complexity. BPC planner and designer Cooper Eckstut said in retrospect, BPC could have benefited from "more accidents".[x]

William Lennertz, a new urbanist architect in Portland, criticizes the project's design in a most poignant way "who would really want to live there?" he asks. Although the design of the project creates a high density, mixed-use pedestrian environment directly around the station, it does not connect to its surrounding environments. It can be imagined that living at the Round would be similar to living on an island. Although it bills itself as an urban environment, what is accessible from those housing units does not extend beyond the project's limits. Remember that at 8 ½ acres, this project site is only 600 feet in diameter. Being transit oriented, it does connect itself to everything along the transit line, but it has missed the crucial element of connecting with its surroundings.

The Round could be a very isolated place. Part of the isolation will stem from the way the project very literally turns it's back on the surrounding community. The way the project embraces the station, inescapably leaves it with its other end greeting visitor's arriving from outside. It appears that the design leaves hard edges along all of the project's outside edges. If the project's aim was to create a new center for the city, it has failed because it fails to acknowledge the rest of Beaverton in any way. There is no acknowledgement of what is going on beyond the streets that surround the project. There are many popular destinations in this area. In order to be a true center for Beaverton the project would need to connect to these uses and provide connections between them and the transit station. The Beaverton Round as planned will never be successful doing this because it is too inwardly focused.

The city of Beaverton has invested $10 million in this project, far more than they had ever anticipated. More funds are currently being sought. The project would have benefited from more complete due diligence before the DDA was signed. In addition, the agreement should have contained a clause that required permanent financing before construction could begin. This was a risky project that shouldn't have assumed easy

financing. Having a delay after construction has begun is more costly than an earlier on would have been.

lessons learned

The Gresham Central Apartments and the Round at Beaverton Central together offer several important lessons. This section summarizes that instruction.

- Educating lenders about mixed-use financing would be a good way of preparing the market to produce such projects. Yet, it should be understood that mixed-use can happen on its own. It does not need to be forced. This means understanding how to create an environment conducive to the further expansion of diverse uses rather than trying to incorporate all of them into every project. This kind of approach could do more harm to that development than it will help.
- One project does not need to be the answer. It is only one brick in the wall.
- Think ¼ mile radius. Station area development must work toward developing an accessible environment in the entire ¼ mile surrounding the station.
- Designing a pedestrian friendly environment is the number one priority. Showing people that walking is a viable and that transit is a preferable option will be the first step in encouraging a new pattern of metropolitan travel.

- Each project should attempt to be a role model. Only Haussman could completely change a city and even he couldn't reshape Paris in one day.
- Joint development, outlined in a comprehensive development agreement, is the most efficient way to control development with less public cost.

Table two summarizes the significant lessons learned from the two case studies. It reveals that the preliminary framework was most useful when it was used on the entire ¼ mile area surrounding the station. When projected on only one project the framework was not able to capture the most important elements, nor really reveal one's projects weaknesses over the other.

Revising the Transit Supportive Development Framework

		Beaverton		Gresham	
	Preliminary Framework	Beaverton Round	1/4 mile radius	Gresham Central	1/4 mile radius
DENSITY	efficient	YES	NO	YES	YES
	above average	YES	NO CHANGE	YES	NO CHANGE
	responsive	NO	NO	YES	YES
DIVERSITY	fine grained	YES	NO	NO	YES
	responsive	NO	NO	YES	YES
	activity maximizing	YES	NO	NO	YES
DESIGN	compact	YES	NO	YES	YES
	integrated	YES	NO	YES	YES
	linked	YES	NO	YES	YES

Figure 2

DENSITY:

Density needs to be considered on a regional level. Although seven dwelling units per acre and FARs of 2 are probably good minimum densities to keep in mind, the densities at each station area should be determined based on the needs of the entire region and the availability of developable land along the transit alignment. The determination of density requirement is therefore going to vary based on the individual station area. Once regional growth is estimated and the amount of land available to accommodate that growth along the transit alignment is determined, the average density required at each station to accommodate that growth can be resolved. This was done in the Portland area. Since the areas with the opportunity to shape transit ridership are small relative to the overall Portland region, it was determined that every station area must accommodate densities 50-100% higher than what is typically developed.[xi] Obviously this density requirement will vary depending on the individual situation in a particular area. In general, however, the highest densities should occur within 2-3 blocks of the station since theses have the most power to affect ridership.

The encouragement of development is the first step in increasing density. Public investment can help to produce densities around stations that are greater than what is typical. Less public investment will be required where normal densities are higher.

In general, the single greatest variable for achieving higher density is through methods to accommodate parking—either reduced parking requirements, shared parking arrangements or structured parking facilities. There is a need in most metropolitan areas for prototypical projects that reduce parking and/or rely on parking systems to accommodate higher densities successfully without substantial public costs.

The critical question is: *Is the density of each project high enough to promote the efficient use of developable land available along the alignment?*

DIVERSITY:

The ¼ mile radius of the station should seek to include housing and employment. The finer grain of mixed-use within this area the better, but it should be acknowledged that mixed-use like this often evolves. Every project does not need to be mixed-use to be successfully transit supportive nor does every station area need to be surrounded by a little village like Calthorpe's TODs. Mixed-use can be difficult to create because it needs a market to survive. That should be acknowledged and accommodated for.

Retail and entertainment uses are important for two main reasons. They provide activity by attracting people at different times of the day who then can support the development of more uses. They provide convenience; different uses that can be used by those who live and work in the area and reduce trips. The first step in achieving successful mixed-use is to assure that zoning codes allow for all uses and that other obstacles do not exist which might keep smaller uses out of the area. Then take development step by step realizing that it is difficult to create a fine grained mixed-use environment in one swoop. Bringing more people to the area will create markets for finer uses. Start with the bigger uses and leave room for smaller ones to develop latter on.

Significant Lessons Gained from the Portland Case Studies

	BEAVERTON	GRESHAM
	Beaverton Round	Gresham Central
DENSITY	Density must be considered on a regional and alignment wide level. Decisions about what densities are appropriate at any one station area will depend on the amount of growth occurring in the entire metropolitan area and upon the developable land available along the transit alignment. Other factors such as scrappage, the rate at which buildings are replaced, should also be considered in this equation as well.	
DIVERSITY	One project does not need to do it all. Fine grained mixed use will occur when an area develops over time through different market fluctuations and under a variety of different developers	By setting an example of the different development types and styles possible, a single use project has the power to influence development beyond its site area: every project does not need to be mixed-use for an area to develop into a diverse environment.
DESIGN	Making an area multi-modal means creating direct, interesting and safe pedestrian connections between the transit station and all destinations near the station. Limiting this effort by not considering those destinations beyond one site area is dangerous. The entire area must be considered.	Leading by example is a strong way to encourage smart design. The pedestrian promenade is a model for multi-modal connections in the entire area, serving as an example as streets near the station are improved. Serving people beyond patrons of your development is an important consideration.

Figure 3

Density should also be considered on the regional or system wide level. If only housing is build around all the transit stations, no one will use the system. Likewise if only office is build around transit stations, few people will make their trips with only transit. Public investment and energy should focus on creating a balance of activities along the entire system. It should also be understood that if densities are high enough and development is built correctly with buildings embracing the streets and pedestrian ways, it creates markets for retail and other services.
The critical question is: *Does each project increase the diversity of uses in the station area? Along the entire alignment?*

DESIGN:

The design of buildings and the layout of neighborhoods around transit stations is the most important element for consideration. It is the element most critical to creating a successful transit supportive community. There are several tools for site design:

- Providing direct multi-modal circulation routes to the station
- Accommodating the pedestrian with wide paths, sidewalks and safe crossings so that people will walk from the station.
- Massing and entrances should be designed opening onto the street to create an active streetscape.
- Create variety in building articulation and make it at a human scale along pedestrian routes to make them more interesting and thus encourage walking.
- Provide places for people to sit, both shaded and sunlit places that provide views onto the surrounding area.

The goal for transit supportive development is that each project act to make the station area an active, vibrant neighborhood or district, meaning that there are people on the street at different times of day and constant activity outside.

Learning from the Beaverton Round's mistakes, these elements can not be considered within just one development. They must be a part of every development and they must be used between developments to provide circulation amongst them. Design for multi-modal use can not be limited to a certain area it must be a tool that provides connections to as many destinations as possible within walking distance of the station. The Gresham Central Apartments demonstrated how the provision of a public promenade could influence development through the area. It also illustrated how a strategically planned public area can influence the circulation patterns of those beyond the project. The entire neighborhood has benefited from the promenade that the Central Apartments provided.

The critical questions are: *Does the design of each development provide a functional link between each development and the transit station? Are pedestrian connections between development and the station 1) direct 2) interesting and 3) safe*

conclusions

An examination of two projects built according to the tenants of density, diversity and design for multi-modal use has provided a useful set of guidelines. These projects illuminated the important elements needed for successful transit supportive development. The lessons gained from that examination changed the framework developed earlier into this set of questions:

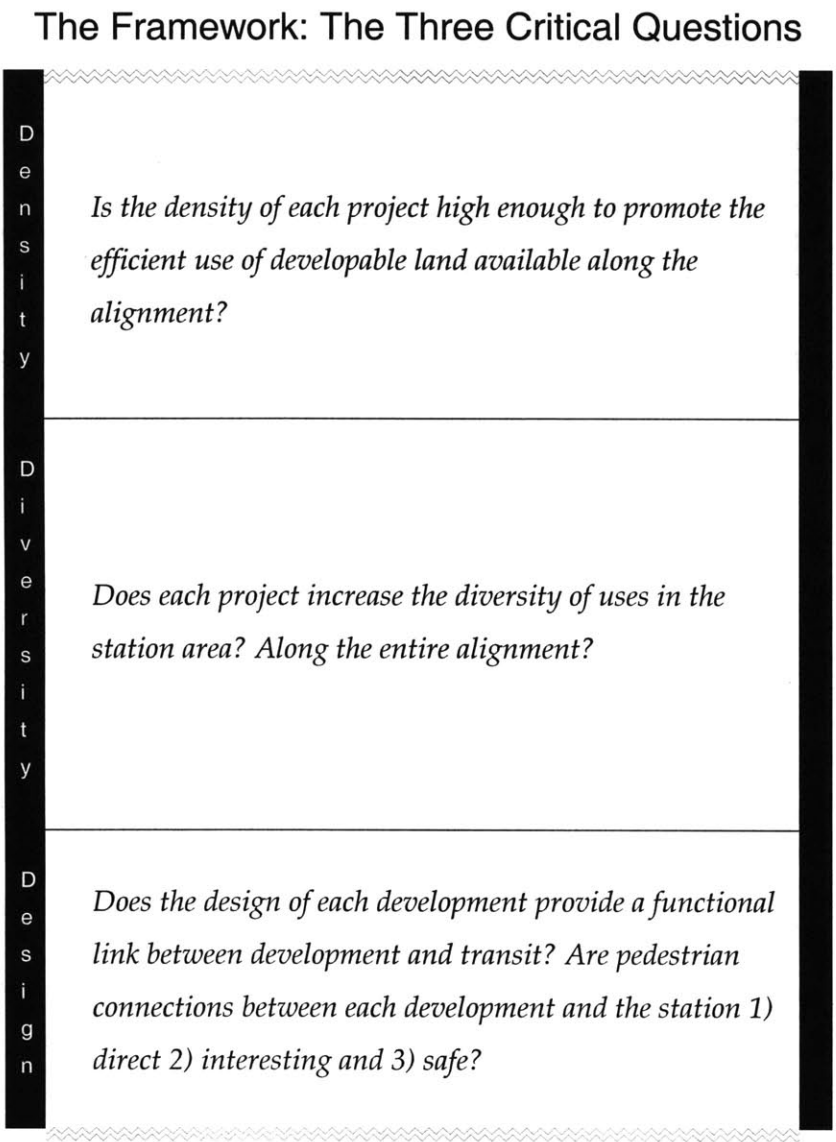

The Framework: The Three Critical Questions
Density
Is the density of each project high enough to promote the efficient use of developable land available along the alignment?
Diversity
Does each project increase the diversity of uses in the station area? Along the entire alignment?
Design
Does the design of each development provide a functional link between development and transit? Are pedestrian connections between each development and the station 1) direct 2) interesting and 3) safe?

Figure 4

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[i] City of Gresham, <http://www.ci.gresham.or.us/greshamarea/facts.htm>.
[ii] Phil Whitmore, Personal interview, 22 February, 1999.
[iii] Richard N. Ross, Personal interview, 1 March, 1999.
[iv] TriMet, Light Rail Station Area Development Profile, "Downtown Beaverton," June 1995.
[v] John Engle, Personal interview, 18 February, 1999.
[vi] Personal interview, Selwyn Bingham, 4 February, 1999.
[vii] Jane Jacobs, The Death and Life of Great American Cities, (New York: Vintage Books, 1961),187.
[viii] Abby Bussel, "Simulated City" Progressive Architecture, LXXV, 5, May 1994, 64.
[ix] Bussel, 65.
[x] Bussel, 66.
[xi] METRO, "Joint Development and TOD's: ISTEA and the Land Use Connection", May 1997.

5 Chapter Five: Transit Supportive Development at Martinez Nadal

The best prescription for filling trains and buses and winning over motorists to transit, is to find a harmonious fit between transit systems and the cities and suburbs they serve.
Robert Cervero, 1998.

introduction

The land use goals formulated and then refined by two the Portland projects provided a framework of three critical questions to be used in approaching the creation of transit supportive development. The application of this framework upon an existing station area will demonstrate the framework's various elements in action while further testing its usefulness. In addition, this exercise will provide a concrete example for San Juan of how the ideas presented here can influence a change in their growth patterns and increase the potential ridership on their new transit system, Tren Urbano, scheduled to open in a little over two years.

san juan, puerto rico

The San Juan metropolitan area is the home to more than 37 percent of Puerto Rico's total population of approximately 3.5 million. Like other metropolitan areas nationwide, San Juan is dealing with the negative impacts of an inadequate transportation system. The automobile dominates the transportation system in San Juan and is leading to high levels of congestion and delay on the regions highway system.

With more than 3.2 million vehicular trips per day, the region has one of the highest traffic densities in the world. Future volumes are forecast to reach 4.6 million by 2010.[i] Through the years various studies conducted by different administrations have all indicated that the best way to alleviate the area's acute and chronic traffic congestion would be through the development of a high-capacity rail transit system operating on its own dedicated guideway. In 1994, the Puerto Rico Department of Transportation and Public Works and the Puerto Rico Highway and Transportation Authority (PRHTA) began intensive work to create that system. The result of these efforts is Tren Urbano, a fixed guideway heavy rail transit system, scheduled to open for operations in the Spring of 2002. The development of Tren Urbano is a major step toward the future of efficient movement in the San Juan metropolitan area.

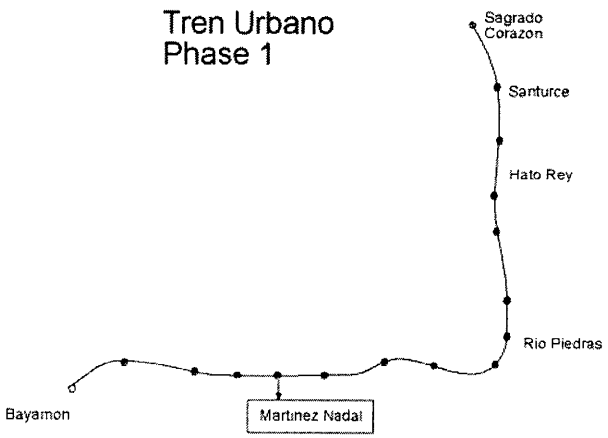

Figure 5:
Tren Urbano Phase One Alignment

The initial alignment of Tren Urbano, currently under construction, is 17 kilometers in length with 16 stations (see Figure 5). The alignment runs north and south through Santurce and Hato Rey, the most dense commercial districts of San Juan, turns west in Rio Piedras and follows the 65th Infantry right of way through the more recently settled suburban areas of San Juan, Guaynabo and Bayamón.

the martínez nadal station area

The site chosen for these recommendations is the area within a ¼ mile radius around the Martínez Nadal station. Martínez Nadal lies along the 65th Infantry right of way between the Torrimar and Los Lomas stations (see Figure 5). The station is at grade.

Martínez Nadal was chosen because of the potential for joint development in the area. There is substantial potential for additional development near the station at Martinez Nadal because of its location, because there is a great deal of developable land owned by the transit authority surrounding the station and because there are many existing resources in the vicinity. Martinez Nadal is not typical of the station areas along Tren Urbano's alignment. Of course there really is no "typical" station area; every station area is unique. Martinez Nadal will serve only as an example to explain the ideas developed in this thesis. The critical questions developed in chapter four have been used to produce physical recommendations at this station but those material manifestations of the framework should not be seen as universal solutions for use at every station area. Each station area is going to be unique and will necessitate the development of distinctive interventions to achieve transit supportive development goals.

In addition to land that is undeveloped at Martìnez Nadal there are several sites near the station currently occupied by light industrial uses. These sites offer additional opportunity through potential redevelopment. The Puerto Rico Highway and Transportation Authority is in the process of acquiring many of these properties for use

in station related activities. Most of this property is currently being considered for park and ride facilities. The station's location along PR-20 makes Martínez Nadal a prime candidate for park-and-ride operations. This is the station most convenient for the citizens of Guaynabo the majority of whom will arrive at Martinez Nadal by car. The Environmental Impact Statement anticipated that 16.1 percent of the 2010 daily boardings at Martinez Nadal would drive to the station. That is 910 people per day arriving by car. Park and Ride facilities should be considered a vital component of securing the most riders at this station. Land unused by parking, however, offer the possibility for future joint development. In addition, surface parking lots might offer an opportunity for redevelopment at a future date if their parking spaces could be redistributed into a structure.

Martínez Nadal is provided excellent regional access from PR-20, Expreso Martínez Nadal, which connects the site to San Juan and the active San Patricio neighborhood to the North, and the city of Guynabo to the South. PR-19 and PR- 21 are local streets which provide access to the area. There is potential for this area to develop into a major multi-modal area because of the excellent access provided by PR-20 and the additional connection provided by Tren Urbano. The highway will provide vehicular access to the area supporting business enterprises until significant ridership on Tren Urbano is established. Martínez Nadal is near enough to the San Patricio area to benefit from the high level of activity currently happening there. Two miles to the north, San Patricio is home to several upscale housing and office developments, a regional shopping center and movie theater.

The Metropolitan Hospital, a generator of significant traffic is within a ¼ mile of the Martínez Nadal station. There is a professional park associated with the hospital and a condominium project, Villa Magna, between the hospital and the station. A development is in the planning stages on a property just adjacent to the station on the east. The developer there is pursuing the development of a office complex with some retail development and structured parking. There are two public housing projects, within the vicinity of Martínez Nadal, one within the ¼ mile radius southeast of the station called Alamdea Towers. The other project is just beyond a ¼ mile is north of the station between PR-20 and the Los Lomas neighborhood. Both could benefit from the increased regional mobility that Tren Urbano will offer and both should be viewed as resources for potential ridership.

The Martínez Nadal station will attract a great deal of public attention because it will be one of the first stations along the Tren Urbano alignment to be completed. Martínez Nadal will serve as the main station for the test track where the first trains will be tested and where the first customers will have the opportunity to ride the train. The Martínez Nadal station is envisioned as a venue for public celebration of system opening. As such, the station area must be equipped to accommodate a large number of people as early as September 2000, the date when the first test train is scheduled to arrive in Puerto Rico. The station stands to attract a high level of attention because of these opening celebrations and will have the potential to serve as an important indicator for the kinds of improvements Tren Urbano might bring to the entire metropolitan area.

PRHTA has plans for several road improvements in the area surrounding the station that will add to the accessibility of the station and the sites surrounding it. The road improvements already planned include the construction of a new road called Station Boulevard connecting the station to PR-21. Action plans created by the Tren Urbano office say "this street will be the principal vehicular, pedestrian and visual corridor to the headhouse from PR-21".[ii] PR-21 will be widened and improved with sidewalks, lightening and other pedestrian amenities between PR-20 and the hospital. PR-19 will also be reopened after construction is complete. PR-19 will go under PR-20 and connect with Station Boulevard near the headhouse.

There are problems at the site that should be considered as well. The greatest being the lack of regular activity in the area currently. A priority for any development scheme will be bringing more people to the area. The more people in the area the more people likely to ride the train. More activity in the station area will attract more development making the area a destination and increasing ridership again. Park and Ride facilities must be maintained to accommodate the riders arriving by automobile. Contamination is a possibility that should be considered given the land's prior use as a light industrial area. The demand in this area is unknown and that could cause problems for future development. Job growth, housing demand and vacancy rates are all unknown. Research should be done to establish these factors before a final development scheme is created. Zoning in the area will have to change if mixed-use is

to be allowed. A reduction in the parking requirements might also be required before dense development can occur here.

the framework

There are three main elements that all design at the Martinez Nadal station should seek to employ. These are the guidelines established in chapter four.

1. *Density of every project in the area should be high enough to promote the efficient use of developable land available at the station and along the alignment.*

2. *Each project should increase the diversity of uses in the station area and along the entire alignment.*

3. *Design interventions should create a functional link between development and transit. Pedestrian connections should be provided between development and the station that is: 1) direct 2) interesting and 3) safe.*

PRHTA should make sure that the development which occurs along the Tren Urbano alignment meets these requirements. These three criteria will serve as the basis for the development scheme created for Martínez Nadal over the following pages.

development program at martínez nadal

PRHTA should seek to be heavily involved in every decision made about the area surrounding their station. They have a significant stake in what happens here. Martínez Nadal should be seen as an opportunity to set an example of what is possible

all along the alignment. Like in Gresham, others might learn from their example and pursue similar projects of their own. Using a lead-by-example modus operandi for encouraging transit supportive development throughout the San Juan metropolian area might make the most sense considering the transit agency's limited powers. Tren Urbano should encourage others to follow their lead, through municipal or Commonwealth regulation or through joint development of their own. The best strategy to creating a prototypical pattern will involve defining the project, employing those elements in a development plan and then in conclusion, revisiting the most important elements and goals for the area. That is the method that has been used here to develop the design scheme at Martìnez Nadal.

DEFINING THE PROJECT

1. Establishing density requirements:

A determination of what densities should be sought at this station should be based on the anticipated regional growth of the San Juan Metropolitan area and upon available land along the entire alignment. Without this information, however, recommendations will be based on an increase above existing densities in the area. The residential densities at the neighboring stations are between six and ten units to the acre. The approximate density of residential development at Torrimar is 6 units per acre at Los Lomas it is approximately 10 units per acre. The EIS for Tren Urbano estimated the percentage of riders arriving by foot to both of these primarily residential stations at 65 and 62 percent respectively. The expected walk percentage is significantly less at

Martínez Nadal, only 30 percent, however this percentage could be greatly increased if a high level of residential density is created here.

The density of the Los Lomas neighborhood north of the station is approximately nine units per acre. The Alameda Towers public housing is 190 units per acre, the Villa Magna condominiums are 160 units to the acre or less. Based on these area figures, the density at Martínez should not be lower than 20 units per acre. A more comprehensive study of the entire alignment and growth trends in San Juan would be required to make this analysis more comprehensive.

2. Establishing the uses:

There are three areas surrounding the Martinez Nadal station where potential development is possible (see Figure 6). These are the areas that PRHTA is in the process of acquiring. These are the areas whose development potential will be considered.

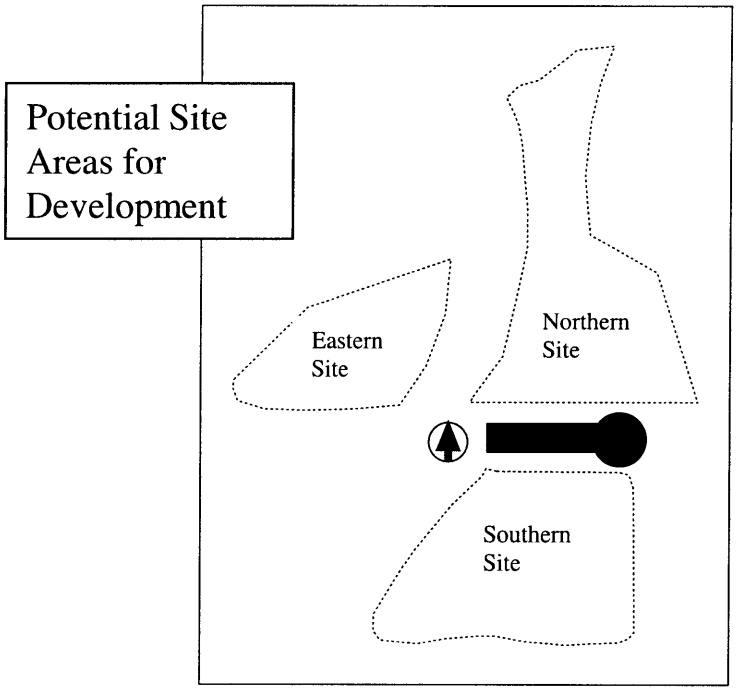

Figure 6: Potential Sites for development

Establishing the uses that should be included in the development plan involves identifying the uses that already exist in the area and then thinking about what might be best for the area in the future. This should, of course, keep in mind how the market might effect the area, and how the number and diversity of uses might evolve in the future. The analysis will also involve thinking about the uses which exist along the entire Tren Urbano alignment. Without a comprehensive study of what those uses are, this analysis will be based on experience and photographs.

Increasing the number of riders at Martinez will happen as more people are brought to the area. Making this area a destination I think should start with making it a neighborhood. The first new use in the area, apart from the private office building

already under construction southeast of the station, should be housing. PRHTA should pursue a joint development project to produce a housing development near the station. Not only will housing initiate the process of increasing the population in the station area and thereby changing its perception as a no man's land, but it will be an opportunity for a creating San Juan's first transit-oriented housing project. The residents here will be very likely to use the train for their travels since it will be so convenient. They will be particularly apt to ride Tren Urbano if the connections between the housing development and the station are created effectively. Housing fronting public streets can provide safe, comfortable and interesting walking paths. This was evidenced at the Gresham Central Apartments. Such projects should be encouraged to facilitate pedestrian movement in the area.

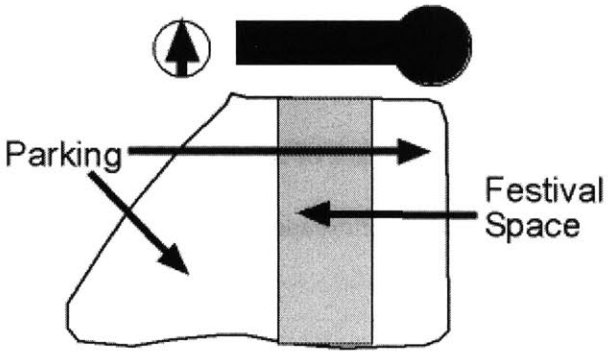

Figure 7: Temporary Use of Southern Site

The area directly south of the station owned by PRHTA should be used part for parking and part for celebration grounds and a temporary market place (see Figure 7). Public art and park amenities could be commissioned to liven up this area while it remains unbuilt. Eventually PRHTA should pursue the creation of more office space and retail, if the market will bare it in this area.

The more time that passes after operations begin the greater the demand for this property will be. There is a high likelihood that a movie theater could eventually be incorporated into this area. It would be the only movie theater along the alignment. The theater would be additionally supported by the access provided by PR-20. Such an entertainment use would be likely to bring people to the area in the evenings and on the weekends when the offices are empty.

A high rise tower of condominiums similar to the ones that exist further North at San Patricio might also be feasible in the area. Housing should be considered here because the highway will act as a deterrent for pedestrian traffic from the station. If housing is located on this site, the pull of the station will bring people across. With the right amenities for walking, the increased pedestrian traffic along PR-19 brought by the housing development might act to encourage more back and forth movement despite the freeway overpass. An open space or park should be created along the PR-19 edge of the property to make the path more attractive. A small amount of retail could survive on the ground level of a condo development if the population increase in the area is great enough.

3. Producing a pedestrian environment:

Four steps will be followed as the design scheme for the area is created. These are: Identification of destinations, finding the walkable area, providing a network of multi-modal connections and creating design details to encourage pedestrian movement.

Identify pedestrian destinations: Locate nearby stores, schools and residential areas that attract or generate pedestrian activity:

Map 4 shows the important destinations in the station area and just beyond. As mentioned earlier these include: the Metropolitan hospital, and professional park, the condominiums Villa Magna, the Alameda Towers public housing, the barrio south of PR-21, the Los Lomas neighborhood north of the station, another public housing project beyond Las Lomas, and the Pueblo Extra grocery store on the opposite side of PR-20.

Identify convenient walking distance:

Map 4 also demarcates the ¼ mile radius around the station. Keep in mind, however, that the train's embankment creates an obstacle to pedestrian movement. A means for crossing the tracks exists only at the station itself. The highway (PR-20) represents another significant obstacle for movement. Although both PR-19 and PR-21 pass under the highway, overpass environments are historically unpleasant environments for pedestrian travel. Even if they are made safe, they might be perceived as unsafe areas. Special consideration will have to be given for these to be successful pedestrian paths.

Provide a network of pedestrian linkages: identify logical pedestrian travel patterns to and through the site:

Map 5 identifies the important vehicular and pedestrian circulation through the site area. These patterns are based on the destinations previously identified. A priority should be given to providing paths which are conducive to pedestrian travel. Suggestions for doing so include: providing wide sidewalks, preferably 10 feet wide with street trees to provide a buffer between slower and faster moving traffic; allowing parallel parking as an additional buffer; designating high traffic and low traffic roads, and delineating them by width or making some only one way to vehicles.

Design Details for Pedestrians: Focus particular attention on exterior details along the pedestrian network:

The pedestrian environment along the links identified should be engineered to provide safe, direct, and interesting travel. The previous paragraph identified techniques for improving the street system. In addition, buildings should be oriented toward those paths. Active commercial or intimate scale housing should line streets to provide safe and interesting pedestrian environments. If retail can be supported as the development matures, it should be focused along these paths. Facades should be broken up along the paths and articulation should work to make them interesting for their users. Benches, water fountains and public art will add to the pedestrian environment as well.

THE DEVELOPMENT PLAN

I suggest taking several strategic steps at this station area and then taking the time to let the area evolve; influence and then guide should be the motto.

1. ROAD IMPROVEMENTS: the first step in developing this station area should be the improvement of the roads and pedestrian connections through the area. Providing pedestrian amenities including wide (10 foot) sidewalks along the planned roads will encourage walking to the station. A priority should be placed on establishing connections to the existing activities in the vicinity and integrating pedestrian connections throughout the area. Map 6 highlights the recommended pedestrian paths along the roadways in addition to a set of additional roads to open up the area north of the station. In addition to the new roads already planned this scheme encourages the creation of several more new roads. These roads will break up the

area into sites for reasonably sized buildings. The scale of buildings has a role to play in determining an area's feel. Limiting the scale of development will increase the likelihood that the area will form at a human, and more comfortable, pedestrian scale. Public spaces are also noted on this map. Public areas will provide needed open space and will draw attention to important view corridors. The actions suggested here help achieve a design for multi-modal use in the area.

2. PUBLIC PARTICIPATION: Public participation should be encouraged as the road improvements are planned and executed. Local artists should be commissioned and encouraged to make use of community participation and local talent. Public art should be incorporated wherever possible to endear a sense of community investment in the improvements and to begin the process of creating a neighborhood at Martinez Nadal. There is a citizenry in the area that identifies with the area. This is evident from the decorations they use to identify themselves. The banner in the photograph below is evidence of a certain amount of community identify that exists in this neighborhood along PR-21 (see Photo 4). That community identity is a resource that should be taken advantage of as plans for this area evolve. The existing residents should be seen as a resource. Their support or opposition has the power to make or break potential plans.

Photo 5: View west along PR-21. Villa Magna Condominiums in the distance on the right.

In addition, universal development goals can only go so far. There is a limit to what this framework can do. It should be understood that the involvement of the public will take these development plans from unspecific strategies and make them into unique development schemes specific to San Juan and to the Martinez Nadal area. This is a vital step that can not be ignored.

3. TEMPORARY CELEBRATION SPACE: Build a temporary surface parking lot and public celebration area south of the station for the initial opening day festivities (see Figure 7). The celebration area would be another excellent opportunity to commission public art. The area should be used by the direct community and by citizens from the entire San Juan area for markets and fiestas. A temporary celebration space is a perfect opportunity for introducing the area to the city and encouraging its continued use in the future.

4. DIVERSITY AND DENSITY: Maps 7 and 8 show the proposed uses that could be developed at Martinez Nadal. A private developer should be sought who will build a transit supportive housing project north of the station headhouse. This is an important project that should be pursued right away. I suggest rowhouse development create a density of 20 units per acre of housing. Lining the new streets with housing will give the area a neighborhood feeling and will also provide a safe, comfortable and interesting walk for its residents and for residents from Los Lomas traversing the area to reach the station. Public investment and assistance will help insure that the project is designed in a transit supportive manner. I suggest a joint development project with a strong development agreement clearly outlining the expectations between the developer and Tren Urbano. On the part of the site nearest to the station, office and retail development should be encouraged. This development might not be possible right away. The market for retail might need time to develop, but these uses will provide a buffer between the station and the neighborhood above it. It is suggested that the station be surrounded by active activities. Map 9 shows the densities suggested on the various sites surrounding the station.

5. A high rise housing building should be considered for the western site adjacent to the Pueblo Extra. Housing is the best use on this property. The site is not far from the station and is within a reasonable walking distance for residents. The area south

of the station should be considered for development in the future. The surface parking could at that time be consolidated into a structure.

The southern site is going to be an area which, as mentioned before, will evolve over time. In terms of design buildings should line the Station Boulevard in order to make this an attractive corridor. Building facades should be broken up to enliven the visual atmosphere. If there is demand by the time this development is pursued, commercial activities might be focused upon this area. They should be encouraged to locate along Station Boulevard and directly across from the station. These efforts will help ensure that Station Boulevard becomes an active and attractive corridor accessing the station. Smaller one way roads bisecting the site break up the large parcel and provide scale for the buildings built in the area. These roads increase the direct routes, particularly for pedestrians, to the station but they also constrain the size of buildings. Housing should also be considered in this area. It is recommended that it be sighted near the existing housing along PR-21 and that it occur above office space. The site south of the station will have horizontal and vertical mixed-use.

Office buildings are suggested in this area because they will increase the employment base along the alignment and increase activity at this station area during the day. Underground parking is preferred. The land near the station is too valuable for the ridership benefits it can provide to be used for surface parking. In the long run, surface parking will not be the most efficient use of these properties. If land values rise to high enough levels in this area, structured or underground

parking will become feasible without large public subsidies. Providing time for the area to evolve slowly will allow time for land values to rise in this way. A movie theater should be considered as additional use. As an activity which attracts patronage primarily in the evenings and on weekends, a movie theater offers the opportunity for joint parking agreements. The movie theater might, for example, enter into a fomal agreement with Tren Urbano to share the underground park and ride facilities, using its parking spaces during the off hours. Of course, Tren Urbano should actively seek control in the development that happens in all areas around the station to assure that they occur in the most transit supportive ways. Map 10 provides a visual image of how the area might look at full buildout and what uses might exist where.

important goals and phasing

The following goals should be pursued at Martìnez Nadal:

- Improve and construct roads and create pedestrian paths. Provide access to the existing activities in the area for pedestrians and vehicular traffic.
- Pursue the joint development of housing north of the station include a small retail component nearest to the station.
- Leave open land south of the station for initial opening activities: festival space, temporary markets. Commission public art and keep the area well maintained.
- Eventually pursue joint development on the sites south of the station. Office, Retail, movie theater, restaurants.

- The eastern site should develop as highrise housing.
- Reduce the land dedicated to park-and-ride facilities by eventually developing underground parking.
- Reduce parking for development by seeking to reduce municipal parking requirements and encouraging structured parking in all joint development.

The Framework: Application at Martinez Nadal

	3 Critical Questions	Actions at Martinez Nadal
DENSITY	Is the density of each project high enough to promote the efficient use of developable land available along the alignment?	(based on estimations from neighboring residential stations) □ 20 dwelling units per acre north of the station □ 100 dwelling units per acre west of the station □ FAR of 2 for retail buildings north of the station □ FAR of 4 for buildings South of the station
DIVERSITY	Does each project increase the diversity of uses in the station area? Along the entire alignment?	□ A row housing project north of the station and high-rise housing project west □ Office space, retail, a movie theater and some housing south of the station □ North parcel should be developed first and the rest should be allowed to evolve. □ Area south of the station should serve as a temporary festival space and surface park and ride lot, bringing people to the area
DESIGN	Does the design of each development provide a functional link between development and transit? Are pedestrian connections between each development and the station 1) direct 2) interesting and 3) safe?	□ street improvements and construction to provide multi-modal connections through the area and scale for development □ orient buildings toward roads and paths □ public spaces anchor visual corridors □ active commercial facades or intimate scale housing provide interesting paths through area to the station

Figure 8

more ideas

Tren Urbano planners should envision themselves first and foremost as educators. It is the transit authority's responsibility to introduce the idea of a new kind of development pattern to the people of San Juan. Taking the time and spending the energy now to market the concept will do much in the future as the inevitable complications of producing a new pattern of development arise.

PRHTA and the Tren Urbano staff are in a unique position to provide a regional perspective. They can provide the much needed regional link between all the municipalities that the transit system bisects, coordinating actions and disseminating information. This could be a important role for PRHTA to consider.

Joint Development could be a useful tool for PRHTA . Different strategies for the involvement of PRHTA in joint development will be appropriate depending upon approval of proposed legislation. The lessons gained from the case studies highlighted the importance of the development agreement. This covenant between the public agency and the private developer must be clear and specific. The requirements should be outlined plainly. The government agency should be careful to make explicit what they expect from the project. They should require pre-approval from all government agencies with influence upon the project and require that all financing be assured before construction begins. The important factor is that all requirements and expectations are clearly articulated to avoid confusion in the future.

Since the PRHTA has control over all roads in Puerto Rico, they are in an excellent position to create paths for pedestrians. Widening sidewalks and adding street trees can do a great deal for the pedestrian environment along streets. These improvements can be influential for encouraging pedestrian travel and can be a powerful tool for increasing ridership on Tren Urbano.

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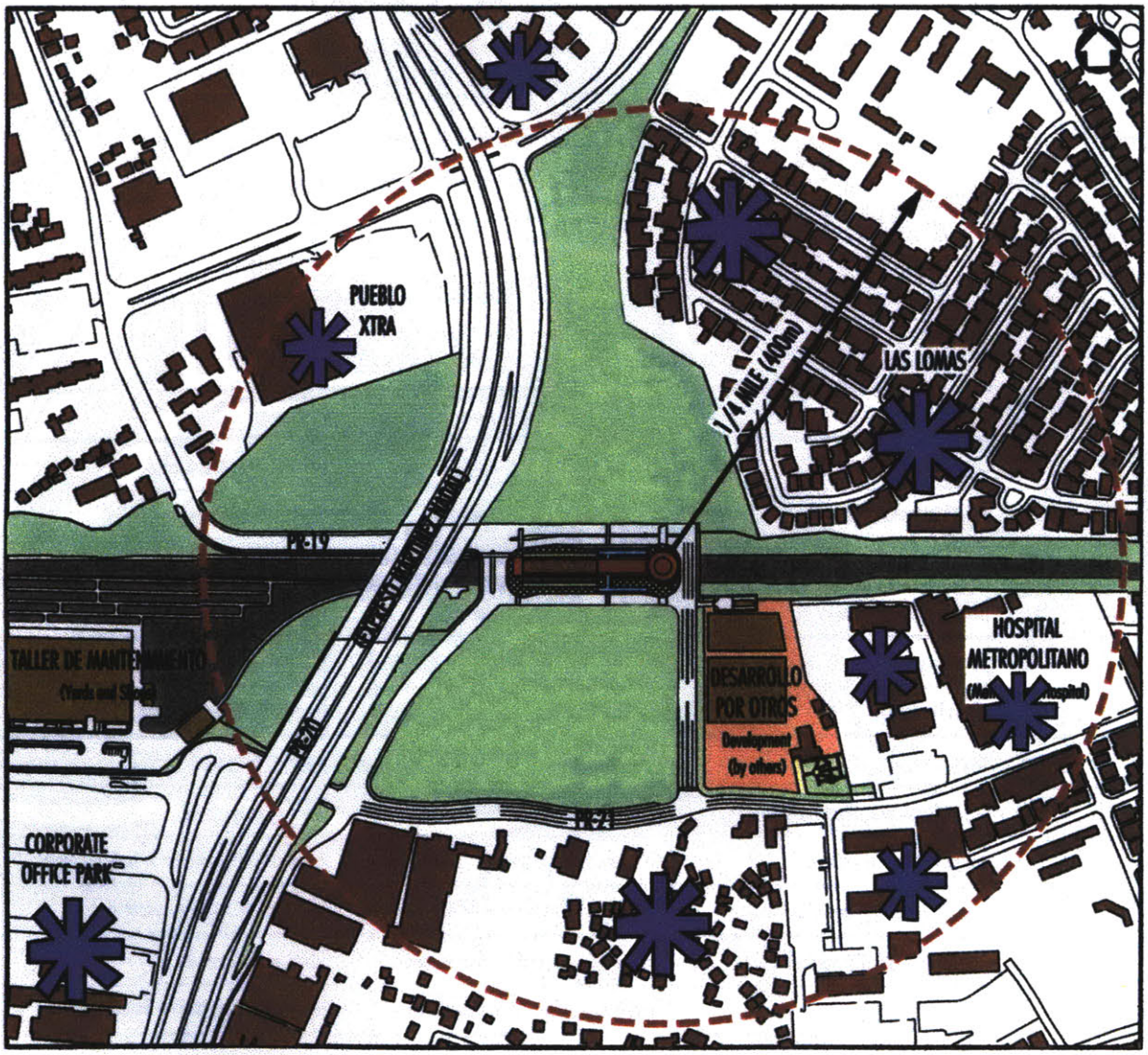
[i] Geoffery A. Fosbrook, Jr, "Puerto Rico's Tren Urbano, MT, March/April 1997, 48.
[ii] Tren Urbano, Opening Day Action Plans Book Two, 12.

Martinez Nadal Station Area

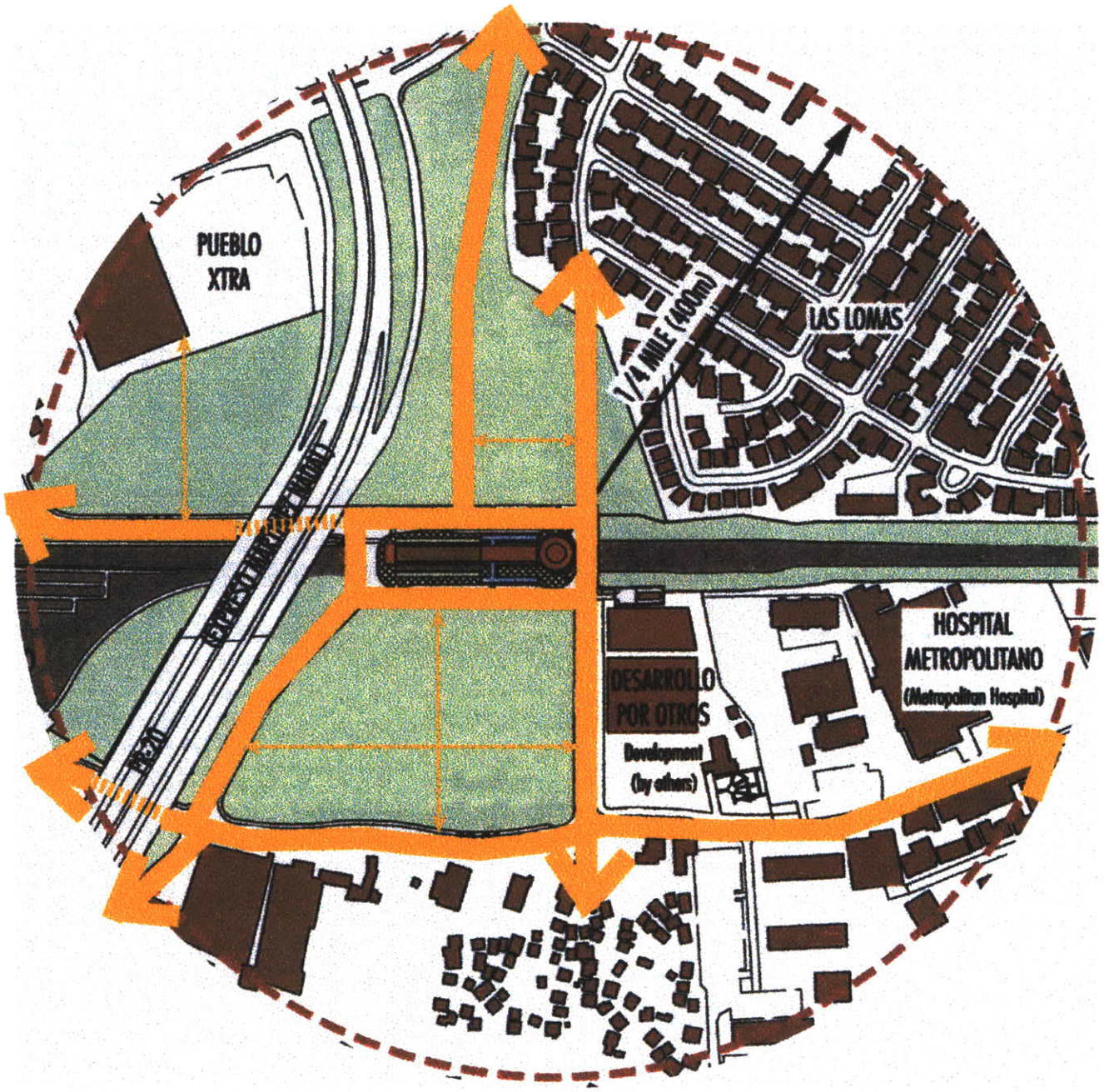


1/4 mile station area

existing destinations

potential land for redevelopment

Martinez Nadal Station Area

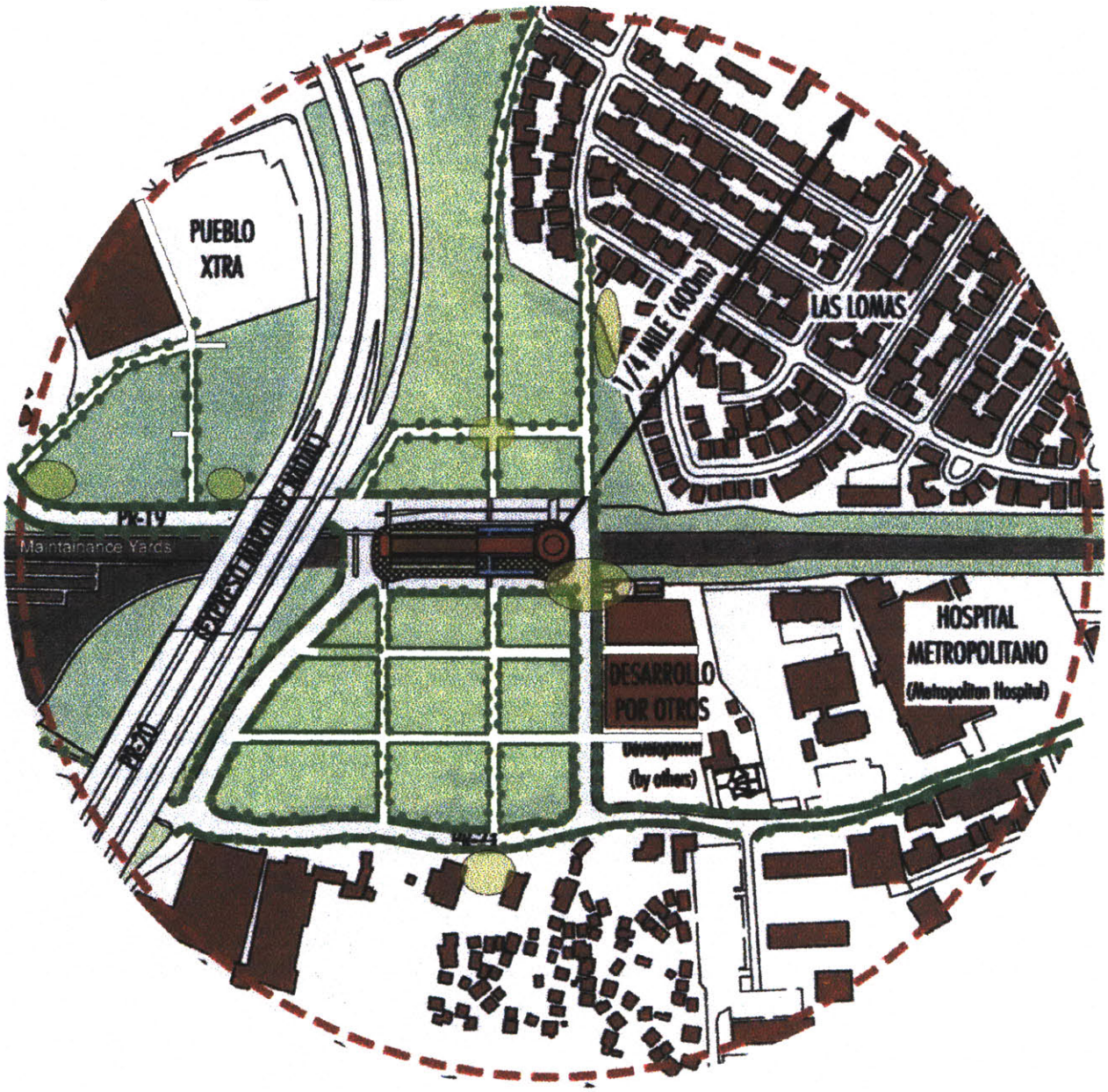


Existing and Proposed Pedestrian and Vehicular Paths

ERYN K. DEEMING
TREN URBANO 1999

Martinez Nadal Station Area

Proposed Design Strategy



Public Spaces

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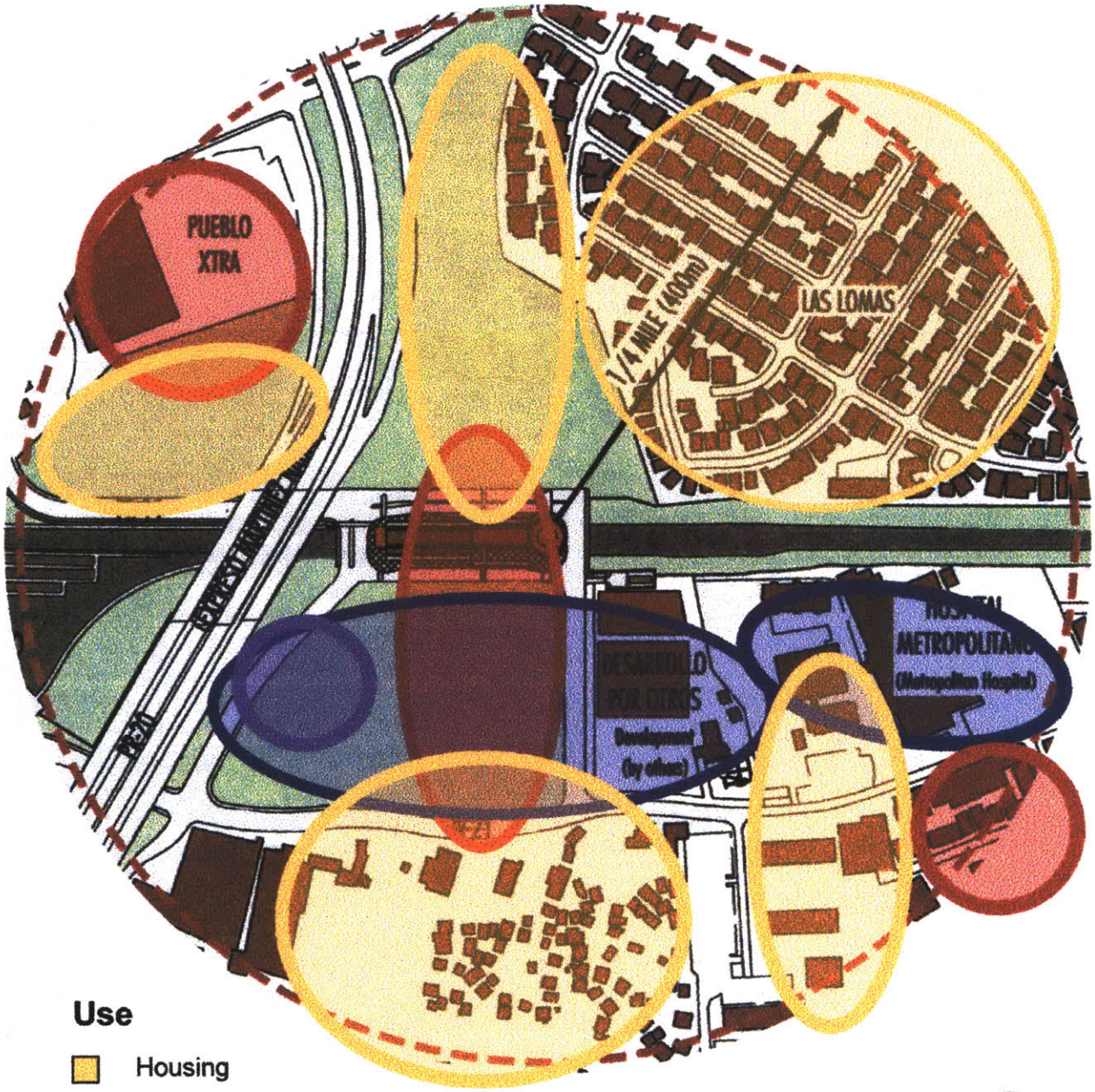
TREN URBANO 1999

Martinez Nadal Station Area

Proposed Diversity



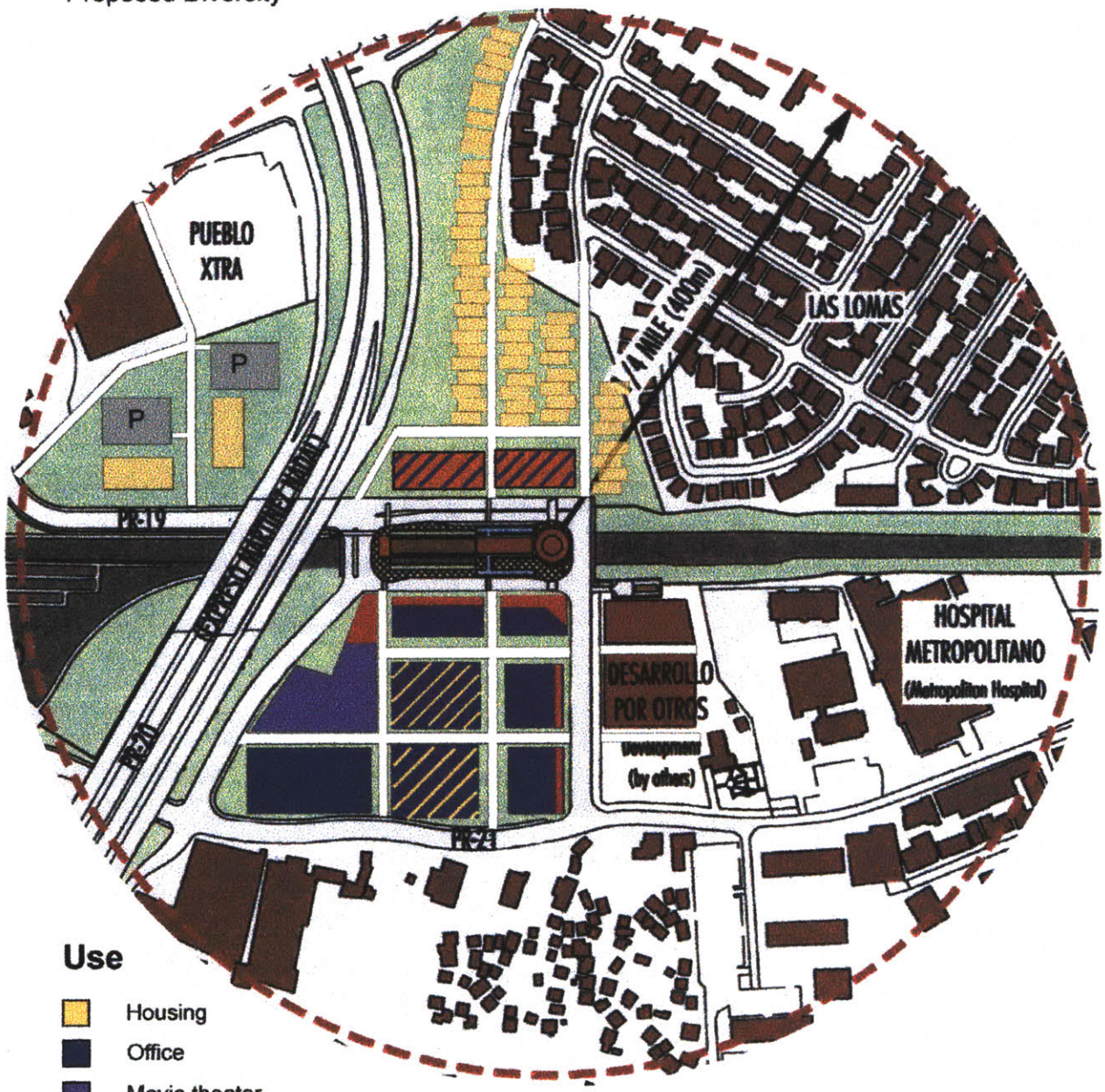
Use

- Housing
- Office
- Movie theater
- Retail

ERYN K. DEEMING
TREN URBANO 1999

Martinez Nadal Station Area

Proposed Diversity



Use

- Housing
- Office
- Movie theater
- Retail
- Housing over office
- Office over retail

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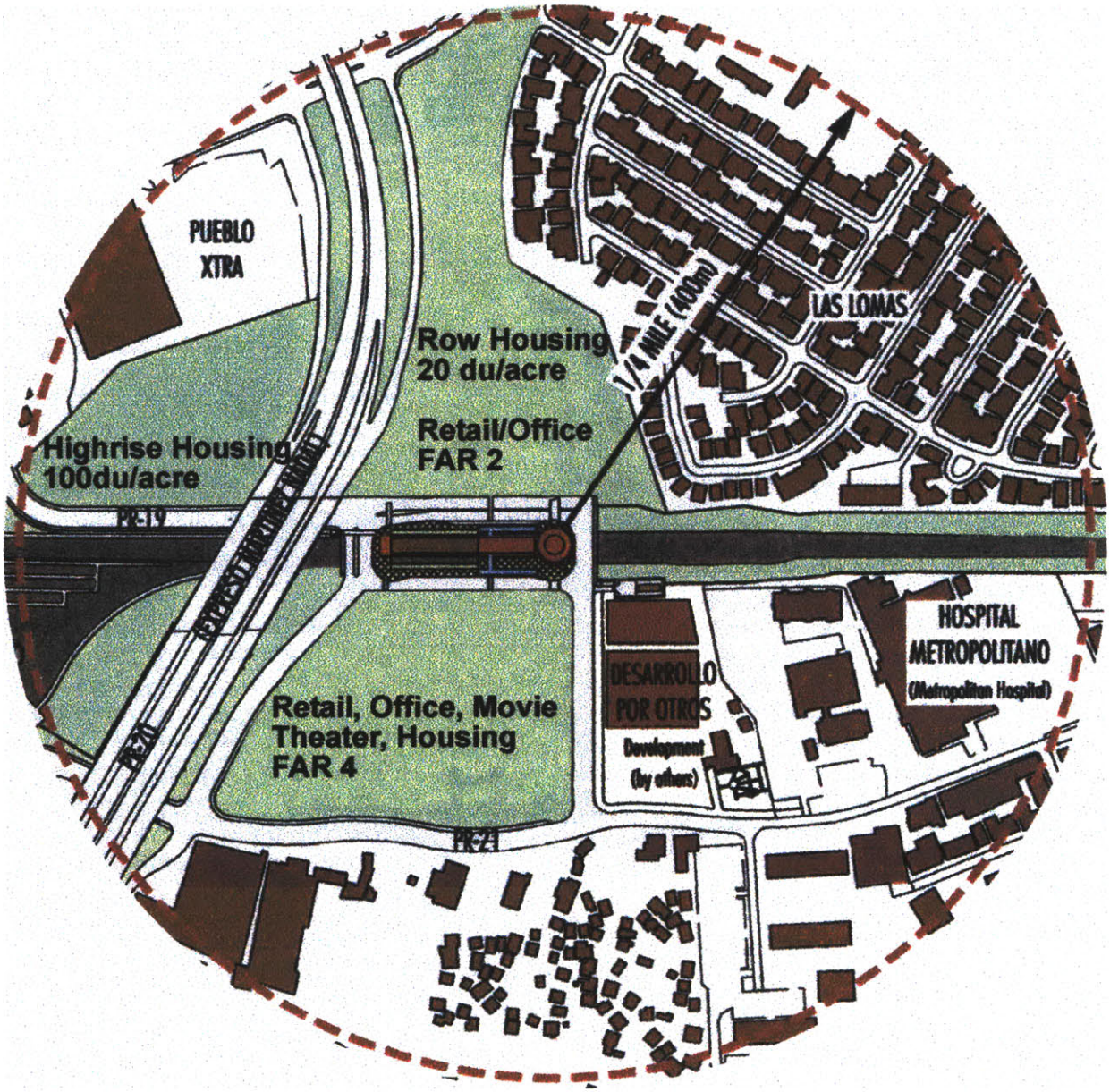
TREN URBANO 1999

Martinez Nadal Station Area

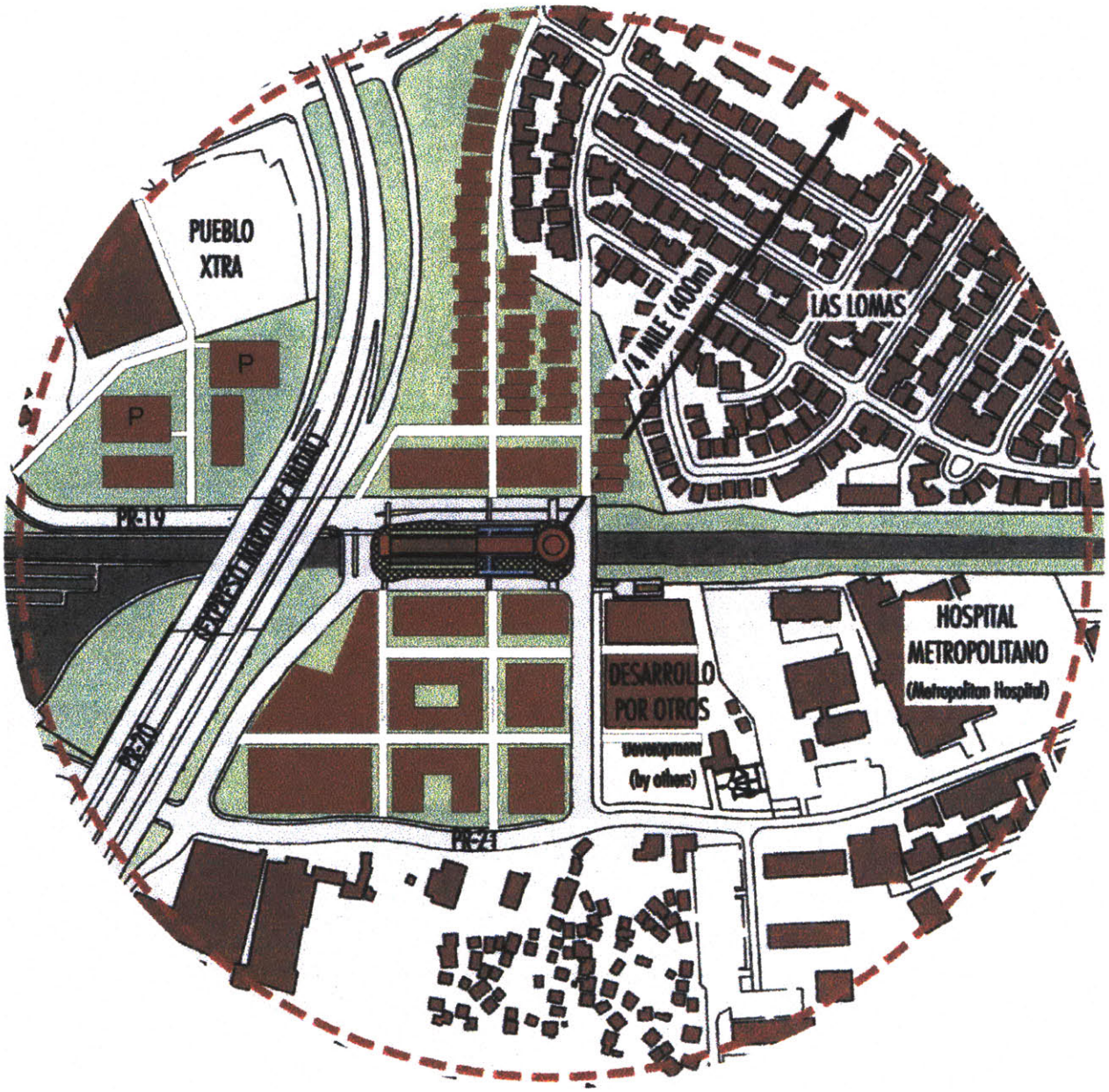
Proposed Density



ERYN K. DEEMING
TREN URBANO 1999

Martinez Nadal Station Area

Proposed New Development



P Parking Structure

ERYN K. DEEMING
TREN URBANO 1999

6 Chapter Six: Conclusion

The physical shape of the built environment is determined by how we live. It is shaped not only by the market and the demand for certain activities, but also shaped in by how we move ourselves and our products from place to place. Yet how we travel also has an effect upon the shape of the built world. It is impossible to consider land use without also considering transportation and it is just as impossible to approach transportation issues without confronting land use. They have a mutually supportive relationship, as tied to one another as economics and politics. A discussion of one will inevitably lead to the other.

It has been difficult for transportation and land use planners to approach land use and transportation planning in a coordinated way. There has been a reluctance to consider land use in transportation decisions and in particular to acknowledge land use as a tool with the power to influence the effectiveness of those decisions. This reluctance stems partially from the fact that the influence of land use on transportation is difficult to quantify. Transportation planners have tended to ignore land use planning as an ally in their major decisions because there has been a lack of convincing evidence to explain how the relationship works. Fortunately researchers such as Robert Cervero have been working to unmask that mystery, steadily expanding the body of knowledge and regularly publishing convincing figures which solidify its effects. Increasingly, transportation and land use planners are entering into the same conversations, and slowly a relationship is developing and a common language is taking form. The building of urban rail transit systems in cities across the country has increased the coordination between the two fields because it has brought them together in ways that has not happened previously.

the research

Research to date has successfully identified the three elements of land use with the greatest influence upon travel behavior and increasedtransit ridership. In no way complete, the research has convincingly narrowed down these three factors. They are density, diversity and design for multi-modal use. Factors which reduce automobile use and increase the number of trips taken on transit include: attracting more people to station areas, increasing the diversity of everyday activities accessible via rail and providing an environment where walking between the station and nearby destinations is viable. Enough convincing research exists to show that this is the case even if the exact degree to which they effect ridership remains somewhat unclear. Many of those studies were presented earlier in this work.

These three factors provide a place to start coordinating land use with transit planning. However, if land use is ultimately to be used in concert with transportation efforts to promote rail transit more work needs to be done. The next step requires understanding how to use density, diversity and design in station areas to positively affect ridership levels. What exists to assist in that understanding is a design scheme and concept championed by Peter Calthorpe in the *Next American Metropolis* and a series of attempts by transit agencies, municipalities and private developers across the country to produce transit supportive projects near their transit stations. This thesis builds from Calthorpe's work, too theoretical and conceptual to be useful for the majority of cities, as well as the experience of two project attempts in the Portland, OR metropolitan area to create a practical framework for approaching growth around stations – an approach for creating transit supportive development. It attempts to fill the void in practical advice for new start cities which are considering the utilization of land use as a tool for increasing ridership. These recommendations target transit supportive development at the site level, attempting to explain how to approach development at a transit station to achieve the greatest result upon transit ridership.

the guidelines

The case studies highlighted the importance of several factors: connectivity, phasing and public investment. Connectivity is an important factor in the successful design of a transit supportive station area. All development within walking distance of the station should be functionally linked to the station and to the uses around it. This will encourage station accessibility for pedestrians. Phasing is an important consideration. One project does not need to be the answer for an entire area. Station areas should be allowed and expected to evolve over time. The most intense use and diverse, active environment will develop in the right conditions over time. Public investment can help to create the environment conducive to that growth and can jump start the kind of projects that will influence further development in the area.

In addition, the case studies revealed several new perspectives upon the three D's. Density should be thought of as intensifying the most influential zone around the station, the area within walking distance generally understood as ¼ mile radius around the station. Intensifying this zone of influence, realizing that the strategy for intensifying the area around each particular station will be unique is the key to creating the right densities. The densities required at any station area will have to be calculated based on the amount of available land along the entire alignment and the growth rate in the metropolitan area where the transit line has been built. Once that goal figure has been set, development should be planned and built in accordance with that figure. Which will create the most efficient use of the land.

Diversity and design should be approached as attempts to maximize the zone of influence, making the most beneficial use of the density in the zone. The goal here is making the area around the transit station an easily accessible and interesting area. Increasing the diversity of uses in the station area is the first way to maximize the benefits within this zone. Providing a functional link between all development within the zone and the transit station will also maximize the influence of development by

increasing the likelihood of pedestrian movement between them. If pedestrian, as well as auto, connections are created in the area, providing direct, interesting and safe links to the station, greater maximization of station area development would be achieved. The Round at Beaverton Central did not maximize its zone of influence despite the fact that it will achieve very high densities in a mixed use and pedestrian friendly environment. The zone of influence is greater than the project itself but its design fails to acknowledge the potential connections it might make to the surrounding community.

The analysis, of Calthorpe's work and the case studies leads to the development of the following guidelines for approaching transit supportive development. All projects built in the area of the station, within walking distance generally understood as ¼ mile, should be able to answer the following questions in the affirmative:

1. *Is the density of each project high enough to promote the efficient use of developable land available along the alignment?*

2. *Does each project increase the diversity of uses in the station area? Along the entire alignment?*

3. *Does design provide a functional link between development and transit? Are pedestrian connections between development and the station 1) direct 2) interesting and 3) safe.*

martìnez nadal

The final step in this examination casts the guidelines upon an actual site area surrounding the Martìnez Nadal station along the original alignment of Tren Urbano in San Juan, Puerto Rico. Scheduled to open for operations in 2001, this is the best possible time to evaluate and pursue the optimal development of the area. The recommendations for San Juan fall into the following four categories:

1. Create a plan for the area by including the existing community in decisions affecting the area. Make zoning changes to allow a different kind of growth.
2. Make road improvements and plan new roads to provide direct and continuous multi-modal connections through the area and produce a physical framework for future development.
3. Actively pursue a joint development housing and retail development north of the station.
4. Maintain festival space and park and ride facilities south of the station until land values rise and market interest increase to the point that very dense office, retail and entertainment uses are viable and structured or underground parking becomes cost effective.

future work

There is much more work to be done on this subject. This thesis has offered a first step but there are many questions that remain unanswered. For example, more work could be done in analyzing how development built around transit has affected transit ridership. No evidence from developments built as transit-oriented projects has ever been collected to prove their effect on transit ridership. The work that does exist focuses on older developments built before the automobile as examples of transit supportive communities. The lack of successful transit supportive developments has been to blame for this omission in the past, but data should be available soon to allow for a before and after study of the effects of these projects on ridership levels. A better cataloguing of the projects that have been developed nationwide as transit supportive projects should be collected, which would then assist in this study. The techniques that agencies have at their disposal for encouraging and facilitating the transit supportive development would be an important next step in this research. Cities could learn from the techniques used by others in the creation and encouragement of new development patterns. Specific design techniques for increasing pedestrian accessibility and usage have been developed but should be collected in a way that would be more useful for transit.

Techniques for financing public private projects should also be collected. The FTA's approach and support for joint development should be analyzed to evaluate its effectiveness in supporting this kind of development in the cities where it has been used.

There are several areas for further investigation and research in San Juan. Specific financing and design tools for use in San Juan would be incredibly beneficial for the Tren Urbano project, and a more complete and specific plan for the growth around the Martinez Nadal station should also be undertaken. The possibilities and limitations of joint development for Tren Urbano should be explored. This work focused primarily on affecting choice ridership. Further work should be conducted to investigate the use of station area development as a economic development tool. In addition, a comprehensive study of the growth patterns in San Juan would enable others to make specific recommendations for facilitating growth in the areas along the Tren Urbano alignment where it will be most supportive of the system. A study of the growth trends and a predictive study of the effects Tren Urbano will have on land values in station areas would be useful as well.

last words

The pursuit of a growth pattern that can support the success of new transit systems is a noble one. Creating a framework and a set of goals for creating these development patterns at all station areas is complex. It is a challenge to make them effective without making them overly general. Each station will be different and will require unique solutions, however, there are a few goals and lessons diverse station areas can benefit from. Because the research on the subject is still in its infancy, understanding exactly how to use density, diversity and design and understanding their impact on increased transit ridership is still not completely understood. In addition, attempting to shape development patterns in a democratic system and in a capitalistic society presents a challenge. It requires either counteracting the market's invisible hand by controlling it

with regulations or understanding the market well enough to manipulate and influence it in certain ways to achieve the stated goals. Such an attempt is going to be especially complex in San Juan where the political environment is particularly dynamic and contentious and where coordination against party lines in rare.

These are difficult propositions, as the two case studies examined revealed. There is no single answer for how to create transit supportive development patterns everywhere and no proven prototype for using land use to increase the success of a transit system. However, finding the necessary answers will take time. There is a learning curve that has only begun to be scaled. This thesis has attempted to provide a useful step toward the goal of successful coordination and utilization of land use decisions to achieve better transit operations. Further work will make the required strategies more clear. Gaining an understanding of the relationship between transit and land use can have great power, particularly if we can learn how to use one to affect the other. This is an understanding that will allow us not only to foresee the results of our actions, but to harness their power, and will bring us one step closer to finding a successful balance.

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