Encouraging Public Transportation Through Effective Land Use Actions

May 1987
ACKNOWLEDGEMENTS

This document was prepared by staff of the Service Planning and Market Development Division. Eileen Kadesh (Market Development Planner), under the supervision of Rick Walsh (Manager, Service Planning and Market Development) and Bill Roach (Supervisor, Market Development) was the principal author. The project was begun under the direction of Martin Baker (Supervisor, Capital Program Management).

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Ronald J. Tober
Director of Transit

T/SD-4/10
INTRODUCTION

This document is a companion to Metro's Transportation Service Guidelines, which describes the conditions for establishing and evaluating new and existing transportation services, and the Metro Transportation Facility Design Guidelines, which provides information on the standards used by Metro in the design of transit and ridesharing facilities. It provides information for local planning staffs on the effects of land use decisions on public transportation service and provides guidelines for the private sector on how to design new projects to be compatible with public transportation. A short summary of each section and its objectives can be found on pages vii-xi.

Coordination between land use and public transportation should occur at the following levels in the land use planning process: 1) comprehensive plan policies, 2) zoning ordinances, and 3) the environmental review and building/site plan review process. Since funds for public transportation services are limited, there needs to be a better understanding of what factors are involved in distributing these services and what actions local communities can take to promote conditions which can support higher service levels. At the federal level, the Urban Mass Transportation Administration has called upon local jurisdictions and the private sector to assume a greater role in the provision of public transportation services. Consequently, a need exists for local jurisdictions and the private sector to assist Metro in developing markets for transit and ridesharing as well as establish street networks that allow reasonably direct transit service to local communities.

Benefits to transit and ridesharing from closer coordination between public transportation and land use planning are:

- Higher transit ridership and auto occupancy;
- Lower transit operating costs;
- Improved access for transit vehicles; and
- Increased financial support for public transportation through public-private sector partnerships.

T/SD-4/9
Local jurisdictions benefit through:

- Reduced demand on roadway capacity;
- Improved access to activity centers and greater mobility for residents;
- Reduced parking needs; and
- A more pedestrian-oriented environment.

Benefits that can be realized by the private sector when public transportation is considered in the initial design stages of a new project include:

- Reduced parking needs, which translate into cost savings;
- Greater marketability of the project;
- Fewer delays in the development review process, with attendant cost savings; and
- Increased chance of project approval.

There are also benefits to the public. These include:

- Higher levels and quality of service within a fixed budget;
- More transportation options; and
- Environmental benefits.

This manual will examine some of the most effective land use tools and transportation management approaches that have been developed to enhance the use of public transportation. We will also evaluate their impact and suggest how local governments and the private sector might incorporate such programs into the land use planning process.
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SUMMARY OF CONTENTS

SECTION 1: The Role of Public Transportation

Highlights

- Traffic congestion is no longer limited to downtown areas.
- New trends have developed in response to suburban traffic problems: increased clustering and diversification of development within activity centers, cooperative financing, and use of non-conventional public transportation vehicles.
- The combination of rapid growth, decreased federal funding, and increased construction and maintenance costs have severely limited local road funds' ability to keep pace with needed capital improvements.
- The projected increase in high occupancy vehicles (HOVs) must occur by the year 2000 or demand on the regional highway system will become extremely critical.

Contents

Section 1 discusses:

- Underlying reasons for suburban traffic congestion.
- Metro's public transportation services.
- What future development patterns and growth in travel demand mean for local jurisdictions.
- How much of the travel demand can be expected to shift to HOVs to compensate for the shortfall in local roadway funding.
- Current estimates of transit mode split in selected local communities.
SECTION 2: Factors Considered in Planning Public Transportation Service

Highlights

- High densities, concentrated travel corridors, a growing economy, and strong central areas are conducive to good public transportation. Low densities, dispersed development, and weak central areas limit ridership.

- Transit and ridesharing can operate most efficiently between areas of high or medium density and residential areas in close proximity. Markets involving lower densities, long distances, or people with atypical commute patterns are better served by carpools and vanpools. Nevertheless, increasing sprawl hinders the effectiveness of all HOV modes.

Contents

Section 2 covers:

- Factors involved in planning productive transit service.

- Constraints limiting the extent to which service can be modified, many of which are within local jurisdictions' control.

- Actions local jurisdictions can take to support transit and ridesharing.
SECTION 3: Planning a Development Which is Compatible with Public Transportation

Highlights

- A compatible development is located in an existing built-up area and in close proximity to transit, can potentially generate transit and rideshare trips, and provides quality pedestrian access.

- Transit service is closely interrelated with population and employment density.

- Increased population densities along existing transit corridors increase transit productivity.

- Building site layout and street patterns play an important role in determining whether tenants or customers of a project will use transit.

Contents

Section 3 provides:

- Factors that make a development compatible with public transportation.

- Guidelines for population and employment density thresholds that support local transit service.

- Guidelines for practical walking distances to bus stops.

- Design features of building site plans that encourage tenants of a project to use public transportation.

- Considerations for accommodating transit when planning street networks.

- A public transportation compatibility worksheet for use by developers and local planners.
SECTION 4: Parking Management

Highlights

- Parking management can deal with on-street parking supply, off-street parking supply, pricing, fringe parking, and enforcement and adjudication.

- The possibility of lower parking construction costs might lead a developer to commit to transportation management actions in exchange for lower parking requirements.

- A local jurisdiction can grant parking reductions without being subject to spillover, by requiring a portion of the development site to be held in reserve in case additional parking is needed in the future.

- Elimination of free employee parking is an important step toward discouraging single occupant vehicle (SOV) trips and lowering development costs.

- For parking charges to encourage people to use transit or rideshare without adverse spillover impacts, there must be a ban on parking on residential streets or other nearby free facilities to guard against spillover.

- Minimum parking requirements in suburban King County are too high and should be reduced at least 18 percent.

Contents

Section 4 contains:

- A definition of parking management and its multiple objectives.

- Factors influencing parking demand.

- "Rule-of-thumb" costs for parking construction.

- A range of parking management strategies and cities where these strategies are being used.

- The concept of maximum parking requirements and conditions where they are appropriate.

- The concept of "flexible" parking requirements, including a means for allowing parking reductions without spillover parking.

- Factors affecting the success of fringe parking.

- Parking requirements by type of use in King County jurisdictions.

- Parking requirements for office, retail, and multifamily developments in local jurisdictions throughout the United States.
SECTION 5: Mechanisms for Incorporating Public Transportation Needs into the Development Review Process

Highlights

- Local jurisdiction planning staffs have an opportunity to incorporate public transportation needs at a number of steps in the planning process.

- In reviewing development site plans, Metro's major concerns are internal circulation and accessibility to public transportation.

- A variety of specialized zoning techniques can be adopted by local jurisdictions to bring about public transportation-oriented land use development.

Contents

Section 5 covers:

- Where to incorporate public transportation needs in the local planning process.

- What Metro looks for when reviewing SEPA documents.

- Special zoning techniques that can be adopted by local jurisdictions to bring about public transportation-oriented land use development.
Section 1:
The Role of Public Transportation
I. THE CHANGING ROLE OF PUBLIC TRANSPORTATION

Until recently traffic congestion was principally a downtown problem. That is no longer the case, however. Some of the worst traffic jams now occur outside the urban core on circumferential highways, in suburban centers, and on approaches to suburban office parks. People commuting from one suburb to another or driving from their suburban homes to a shopping center are as likely to run into heavy traffic as are commuters on their way downtown. If present trends continue, lack of suburban mobility may become the central transportation issue of the late 1980's.¹

Nationwide, the number of work trips to central city areas fell by 4.5 percent between 1970 and 1980, while those to suburban jobs rose by nearly 15 percent.² Most forecasters expect this trend to continue throughout this century; they predict that the largest growth in highway travel will be in nonradial directions oriented toward dispersed suburban centers.³

There appear to be several basic reasons for this increasing traffic congestion:⁴

1. Lower fuel costs.

2. Higher auto ownership.

3. Suburban "megacenters" or large-scale mixed activity complexes which generate high volumes of traffic on fully developed highway networks; and

4. Widely dispersed origins and destinations ill-suited to conventional bus and rail transit.

Given existing land use trends, public transit can serve only a fraction of the total travel demand. Development of transit centers with schedule coordination can overcome this problem to some extent by making existing suburban services operate more efficiently. Expanding conventional transit to dispersed subregional centers will continue to be very costly, however, and future technological breakthroughs that will
markedly improve productivity appear unlikely. It is in such suburban settings that ridesharing will play an increasingly important role.

It is expected that the need for public transportation will grow. About 30 percent of our society will continue to depend on some form of transit or ridesharing. One element of this market, the elderly population, will increase substantially in the years ahead. In addition to being served by fixed route transit, the elderly and handicapped market will be served by shared-ride taxis, dial-a-ride, and other specialized transportation services.

Congestion is also likely to increase in suburban areas since road expansion is expected to be minimal. While suburban areas are projected to grow by about 60 percent over the next 20 years, transportation system capacity (the road network) will not be able to keep pace with this growth.

Several important trends are emerging in response to this transportation crisis:

1. Clustering and diversification of development within activity centers, which reduces the need for travel and enables these centers to be served more efficiently by transit.

2. Changes in the role of the public and private sectors regarding provision of public transportation services. Attention is shifting to the government as a facilitator or coordinator rather than the owner and operator of public transportation. "Cooperative financing," the notion that private developments must bear a larger share of the cost of public infrastructure, is gaining wider acceptance.

3. Greater use of non-conventional transportation service approaches, such as contracts with taxi operators, and operation of vanpool programs, shuttles, custom buses, and carpools, rather than total reliance on full-size buses.

Resolving the looming transportation crisis will require a new partnership between the private sector, local municipalities, transportation agencies and public transpor-
tation providers. Formation of such a partnership is already occurring in metropolitan areas throughout the country as well as in the Puget Sound area.

II. THE ROLE OF PUBLIC TRANSPORTATION IN KING COUNTY

A. Description of Metro Service Area

The Municipality of Metropolitan Seattle provides transit and ridesharing services to a 2,128 square mile service area. Metro's 1985 service area population was 1,346,400 with an annual transit ridership of 64.6 million.

In addition to transit services, Metro's ridesharing program directly serves about 10,000 people per year through the ridematch program and about 1,500 people per year through the vanpool program, with about 5 million shared passenger trips per year resulting from the ridesharing services. Metro's ridesharing activities include ridematching, operation of public vanpools, shared use vans, park-and-pool lots, and promoting employer/developer HOV parking.

B. King County Development Trends

King County's development trends reflect those of the nation as a whole, with population growth occurring much faster in dispersed suburbs than in the central city area. King County's 2000 forecast population of 1.64 million is nearly 30 percent greater than the 1980 population of 1.26 million.\(^7\) Three-fourths of the population growth is projected to occur in unincorporated areas of King County and one-fourth in the suburban cities.\(^8\) Seattle's share of the county population is expected to decline,\(^9\) although the city's absolute population is expected to stabilize.

In contrast to population trends, most of the employment growth (80 percent) will occur in cities.\(^10\) By 2000, more than half of all jobs will be in Seattle, and only one-sixth of the jobs will be in unincorporated King County.\(^11\) Table 1 shows King County employment trends between 1980 and 2000.
Table 1

POPULATION AND EMPLOYMENT GROWTH
FORECAST FOR SELECTED KING COUNTY ACTIVITY CENTERS

<table>
<thead>
<tr>
<th></th>
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<td>Tukwila (TAZ 143)*</td>
<td></td>
<td>3,593</td>
<td>4,913</td>
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<td>20,930</td>
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<td>815</td>
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<td>33,238</td>
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<td>-46.2</td>
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<td>First Hill (FAZ 6111)</td>
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<td>Northgate (FAZ 6221)</td>
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<td>30,293</td>
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<tr>
<td>Kent (FAZ 3500/3600)</td>
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TAZ = Traffic Analysis Zone
FAZ = Forecast Analysis Zone

Source: PSCOG
With the 30 percent increase in population projected for King County between 1980 and 2000, more vehicle trips will ensue and greater pressure will be placed on local roadways, many of which are already at capacity levels.

To refer to the level of traffic congestion on a roadway, traffic engineers use the term "level-of-service." Level-of-service (LOS) is a qualitative measurement based on vehicle operating speed, travel time, traffic interruptions, safety, and driving comfort. LOS is described by a letter scale from A to F, with "A" representing the best service and "F" representing the worst service. Figure 1 illustrates the level-of-service concept.

In Bellevue, 45 intersections are projected to reach LOS E or below by 1990-1995 if no improvements are made in existing conditions. By the year 2000, nine key intersections in the University of Washington business district are projected to reach LOS E or worse in the p.m. peak. And, even with programmed improvements, five arterials on the Soos Creek Plateau in south King County are forecast to operate at LOS F daily by 1990, with between 30 and 100 percent more traffic than they were designed to handle.

In addition to the increased number of trips, the average trip length is expected to increase from 7.7 miles in 1980 to 8.2 miles in the year 2000 because of declining densities of population and employment. Between 1980 and the year 2000, population in the Puget Sound region is projected to increase 34 percent, while travel (measured by vehicle miles traveled) is projected to grow by 41 percent.

Historically, either surplus highway capacity has existed or funds have been available to provide needed improvements for traffic growth. In the past few years, however, rapid growth, decreased federal funding, and increased construction and maintenance costs have severely impacted the ability of local road funds to keep pace with needed capital improvements.
**Level of Service A** describes a condition of free flow with low volumes and high speeds. Freedom to select desired speeds and to maneuver within the traffic stream is extremely high. On freeways average travel speeds near 60 mph generally prevail. (Volume to capacity ratio less than or equal to 0.6)

**Level of Service B** is in the zone of stable flow, with operating speeds beginning to be restricted somewhat by traffic conditions. Drivers still have reasonable freedom to select their speed. On freeways speeds of over 57 mph are maintained. (Volume to capacity ratio greater than 0.6 but less than or equal to 0.7)

**Level of Service C** is still in the zone of stable flow, but speeds and maneuverability are more closely controlled by the higher volumes. The selection of speed is now affected by the presence of others, and maneuvering within the traffic stream requires substantial vigilance on the part of the user. Average travel speeds on freeways are still over 54 mph (Volume to capacity ratio greater than 0.7 but less than or equal to 0.8)
**Level of Service** D approaches unstable flow. Speed and freedom to maneuver are severely restricted. Small increases in traffic flow will generally cause operational problems at this level. Average travel speeds on freeways are 46 mph. (Volume to capacity ratio greater than 0.8 but less than or equal to 0.9)

**Level of Service** E represents operating conditions at or near the capacity of the highway. Freedom to maneuver within the traffic stream is extremely difficult. Any incident can be expected to produce a serious breakdown with extensive queuing. Average travel speeds on freeways are approximately 30 mph. (Volume to capacity ratio greater than 0.9 but less than or equal to 1.0)

**Level of Service** F describes forced flow operation at low speeds, where volumes are above theoretical capacity. Operations within the queue are characterized by stop-and-go waves and are extremely unstable. Vehicles may progress at reasonable speeds for several hundred feet or more, then be required to stop in a cyclic fashion. (Volume to capacity ratio greater than 1.0)


**FIGURE 1** (continued)
For King County, high priority road improvements through 1990 are estimated to be in excess of $200 million.\textsuperscript{17} The current 1984–89 Capital Improvement Program of approximately $90 million will only address about 45 percent of the identified needs.\textsuperscript{18} By contrast, ten years ago there was a very minimal funding shortfall. The funding shortfall for local roads and streets in the Puget Sound region as a whole for 1983–1988 is shown in Figure 2. Expenditures for local roads and streets within King County during the past 20 years are shown in Table 2.

**TABLE 2**

**CAPITAL OUTLAY FOR LOCAL ROADS AND STREETS WITHIN KING COUNTY: 1965 – 1984**  
(In millions of dollars, based on 1985 dollars)

<table>
<thead>
<tr>
<th>Year</th>
<th>Amount</th>
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<tr>
<td>1965</td>
<td>$94.2</td>
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<tr>
<td>1970</td>
<td>152.7</td>
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<tr>
<td>1975</td>
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<tr>
<td>1980</td>
<td>144.9</td>
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<tr>
<td>1984</td>
<td>157.8</td>
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Puget Sound Region
1983-1988

Inflated Dollars 1.423

Constant Dollars 1.060

Other Funds .275

Property Taxes .278

State MVF .208

FAUS .058

Capital Outlay .426

Debt Service .112

Maint. And Operation .522

Other Funds .328

Property Taxes .323

State MVF .213

FAUS .058

Capital Outlay .605

Maint. And Operation .706

Debt Service .112

Funds Available
Funds Required
Funds Available
Funds Required


FIGURE 2
Funding Shortfall for Local Roads and Streets
C. Transit/Rideshare Mode Split

The important role of public transportation in accommodating regional travel demand is recognized in both the Puget Sound Council of Government's (PSCOG's) Regional Transportation Plan (September 1982) and the King County Comprehensive Plan (April 1985). The Regional Transportation Plan for the Central Puget Sound Region states:

With the categorical constraints imposed on expansion of the freeway-expressway system, the solution to the transportation needs in major regional corridors has to depend on strategies directed toward an increase in transit mode-split and vehicle occupancy, especially during the peak periods.19

King County's Comprehensive Plan recognizes that:

High quality transit can be superior to the private automobile in public and private capital and operating costs, and in consumption of land, materials, and energy, if residential and employment densities are high enough to support significant transit use... The King County Comprehensive Plan calls for development patterns in Urban Areas that will support good transit, which in turn will provide better service to planned growth.20

Although 1980 transit usage accounted for a relatively small percentage of region-wide travel (3.9 percent of total trips, 1.7 percent of non-work trips, and 9.7 percent of home-to-work trips), transit was much more important in those portions of the region with high-density development.21 The focal point of transit usage is the Seattle Central Business District (CBD), where transit serves over 40 percent of peak hour work trips.22 Table 3 shows estimated transit mode splits for selected Seattle area communities in Metro's service area.

By the year 2000, transit's share of total trips is projected to increase to 6.0 percent, while the percentage of work trips by transit is projected to increase to 11.0 percent.23

As the planned high occupancy vehicle lanes on the state highway network in the Seattle metropolitan area near completion, the role of ridesharing will also grow in importance. Even a small increase in auto occupancy can have a significant effect on peak period congestion. For example, the total peak
### TABLE 3

**ESTIMATED 1980 TRANSIT AND RIDESHARE WORK TRIP MODE SPLIT FOR SELECTED SEATTLE AREA COMMUNITIES**

<table>
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<th></th>
<th>Transit Trips (%)</th>
<th>Carpool/Vanpool Trips (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(2 person)</td>
</tr>
<tr>
<td>Seattle CBD</td>
<td>43.5</td>
<td>23.6</td>
</tr>
<tr>
<td>Duwamish</td>
<td>6.9</td>
<td>17.2</td>
</tr>
<tr>
<td>University Area</td>
<td>23.2</td>
<td>12.5</td>
</tr>
<tr>
<td>Tukwila-Kent</td>
<td>1.9</td>
<td>15.5</td>
</tr>
<tr>
<td>Renton</td>
<td>2.3</td>
<td>15.9</td>
</tr>
<tr>
<td>Bellevue CBD</td>
<td>4.9</td>
<td>11.4</td>
</tr>
<tr>
<td>First Hill</td>
<td>17.6</td>
<td>14.6</td>
</tr>
<tr>
<td>Sea-Tac</td>
<td>2.6</td>
<td>11.9</td>
</tr>
<tr>
<td>Northgate</td>
<td>4.1</td>
<td>13.0</td>
</tr>
</tbody>
</table>

hour auto occupancy level in the city of Kent is about 1.2 persons per vehicle. PSCOGL's forecast for 2000 is 1.46 persons per vehicle for total peak hour travel. If this 25 percent increase in the vehicle occupancy level were achieved for north-south travel crossing the northern study area boundary (176th/180th Streets and Petrovitsky Rd.) it would eliminate the 5-10 percent capacity deficiency that was estimated using current occupancy levels. The estimated 1.06 volume/capacity ratio for screenline EW-1 (north of S. 180th St.) would decrease to about 0.85 (from LOS F to LOS D).

If the projected increase in HOV usage does not occur, the demand on the regional highway system will become extremely critical. As an illustration, the difference between having an average vehicle occupancy of 1.38 and 1.44 in the year 2000 would create a demand for three additional lanes of freeway traffic during the peak hour for 12 miles. At four million dollars per urban freeway lane-mile, this would amount to $144 million. This figure is based on an assumption of 6,000 additional vehicle trips in the peak hour.

It should be noted that average vehicle occupancy (AVO) may have actually decreased since 1980, however. Data collected at 47 employment sites throughout the region in 1985 showed the average AVO to be down from 1.38 persons per car in 1980 to 1.10 persons per car. Sites that had transportation management programs had significantly higher ridesharing rates than sites without such programs.
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Section 1: The Role of Public Transportation


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6 Ibid., p. 89.

7 King County Department of Planning and Community Development, 1986 Annual Growth Report, p. 5.

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9 Ibid., p. 3.

10 Ibid., p. 6.

11 Ibid., p. 6.

12 City of Bellevue, Transportation Element of the Comprehensive Plan, October 1983, pp. 21-22.

13 TDA, Inc., University District Transportation Program: Projected Future Conditions (Baseline)

14 King County Planning Division, North Soos Creek Plateau Study, December 1981, p. 49.

15 Interview with Bob Sicko, Transportation Planner, PSCOG.

16 Interview with Ted Rosinbum, Transportation Planner, PSCOG.

17 Op Cit., 1984 Annual Growth Report, p. 225, updated by Bill Hoffmann, Chief, Transportation Planning section, King County Department of Planning and Community Development.

18 Ibid., p. 225.

20 King County Comprehensive Plan, April 1985, p. 119.


22 Ibid., p. 55.

23 Ibid., Bob Sicko.

24 Ibid., Bob Sicko.

25 Ibid., Bob Sicko.

26 Ibid., Bob Sicko.

27 Ibid., Bob Sicko.

28 Op Cit., Regional Transportation Plan, p. 90.

29 Wilsey and Ham, City of Kent Transportation Study, Task Three: Travel Forecasts, October 1982, p. 67.

30 Interview with Jerry Schutz, Planning and Research Engineer, Washington State Department of Transportation, October, 1985.

Section 2:
Factors Considered in Planning Public Transportation Services
I. THE PUBLIC TRANSPORTATION MARKET

In planning public transportation services, Metro tries to provide King County residents with a wide range of transportation options.

Metro's public transportation market consists of transit passengers, carpoolers, vanpoolers, and paratransit users.

King County area commuters do not always use the same mode of transportation every day, but change modes, depending on individual circumstances. When bus riders commute home by a different mode than they used to get to work, they are almost equally likely to carpool or drive alone.\(^1\) Carpooling is the mode used next most frequently by single occupant vehicle drivers, and the bus is HOV commuters' alternate mode.

The factors involved in planning transit service are much different from those involved in planning ridesharing services. The primary points on which the two differ are listed below:

- **Target market** - While ridesharing is aimed at a commuter market, transit service is designed to provide mobility for midday, evening, and weekend riders (where justified by population density), in addition to commuters.

- **Flexibility** - Carpools and vanpools can be tailored to the schedules, origins, and destinations of individual riders, while transit service cannot deviate from a specific route, unless operating in a demand-responsive mode.

- **Density** - Carpooling and vanpooling are much more suited to low-density, suburban areas than fixed-route transit (although suburban areas can be served successfully with transit service from park-and-ride lots.)
Cost - The major portion of the cost of operating carpools and vanpools is normally borne by the riders, while less than one-third of the cost of operating transit service is borne by transit passengers. Also, transit service is much more expensive to operate than carpools or vanpools because paid transit operators are required.

Personalization of service - Although transit service may be scheduled to serve particular shifts at individual companies, it does not involve personalized service to individual riders, as ridematching does.

A. Transit Service Demand and Bus Route Planning

1. Overview

Frequently, planners are asked why bus routes are continually changed and expanded. The primary answer is that the urban area itself is always in a constant state of change. The financial health and productivity of the transit system depends on keeping apace with this process of growth. Alterations in service patterns usually reflect changes in ridership due to such factors as:

- population growth or decline
- development of new employment centers, schools, or residential areas
- ability to operate on new streets or expressways

A secondary reason for altering service is that ridership does not always develop as anticipated by planners. Until the establishment of Metro Transit in 1973, transit operators in the Seattle area had neither the public mandate nor the financial resources to keep pace with the growth in travel demand. Public transit had suffered a continuously declining share of the area's travel market since the end of World War II, the bus route network was obsolete in some older Seattle neighborhoods, and many developing suburban communities had no service whatsoever.
Metro developed ten-year comprehensive plans with the goal of reaching specific ridership targets in 1980 and 1990, based on year-to-year improvements in service and facilities. However, because of the fluctuating nature of the regional economy and the lack of comprehensive regional land-use controls guiding the location of activity centers, planners and policy-makers have had to adjust the transit system to actual transportation needs.

2. Forecasting Transit Demand

Provision of transit service to a local community is dependent on:

- the vitality of its activity centers
- residential patterns and densities
- socio-economic characteristics of the population, including auto ownership, income, employment status and sex of the traveler
- the location of residences, shops, schools and employment areas
- travel patterns
- the ease or difficulty of circulation and parking
- the ease of bus access, as determined by the street network
- the pedestrian environment.

High densities, concentrated travel corridors, topographic barriers, a growing economy, and strong central areas result in high ridership while low densities, dispersed development, and weak central areas have the opposite effect.

Table 4 shows population densities for selected East King County jurisdictions. 1980 population densities ranged from 2.0 households per acre in East Sammamish to 8.3 households per acre in Kirkland. Seven dwelling units per acre has been suggested as a threshold for supporting local transit service. If households are considered to be the equivalent of dwelling units, all but one Eastside area in Table 4 fell below this threshold in 1980. The low population densities in the suburbs can be contrasted with some 1980 Seattle population densities, e.g. U-District--
14.6 households per acre, Capitol Hill (13.3), Ballard (10.7), Columbia/Rainier Beach (8.2), Northgate (7.5), and West Seattle (8.7).

For short-range operations planning, transit demand is usually gauged by the recent ridership trends and population and employment growth in the planning sub-area. King County and local jurisdictions are good sources of short-range data on these key indicators. The Puget Sound Council of Governments also issues Small-Area Forecasts of Population and Employment, a compilation of historic trends and future projections calculated by Local Planning Area. The future forecasts show population and employment by 10-year intervals. Direct contacts with large firms locating in the sub-area are also valuable, as they can provide information on the residential distribution and general characteristics of their work force.

Route planners try to keep abreast of proposed development through the environmental review process. When a new major employment site is about to locate within the service area, the planners will work to determine potential employee commute patterns as early as possible. Bus service extensions and changes typically follow employment and population rather than leading development. Because mode choice is most volatile when individuals are changing their commute patterns, it is important that service be provided in advance of new development whenever feasible.

For smaller suburban centers, information on employee commute patterns may be crucial in determining whether transit demand is at the "threshold" level necessary to begin service. The "threshold" is the level of ridership necessary to achieve acceptable peak hour productivity on a route that has a minimum of three one-way peak hour trips. For example, a suburban office park with 1,000 employees can expect a minimum transit mode split of about 2 percent (20 people). Three times that number of riders would be required at a minimum for new service.
### TABLE 4

**LAND AREAS AND POPULATION DENSITIES FOR SELECTED EASTSIDE AREAS**

<table>
<thead>
<tr>
<th>PSCOG FORECAST AND ANALYSIS ZONE</th>
<th>LAND AREA IN RESIDENTIAL ACRES</th>
<th>POPULATION</th>
<th>AVERAGE HOUSEHOLD SIZE (PERSONS PER HOUSEHOLD)</th>
<th>DENSITY (HOUSEHOLDS PER ACRE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Issaquah</td>
<td>253</td>
<td>495</td>
<td>4,200</td>
<td>6,328</td>
</tr>
<tr>
<td>East Bellevue</td>
<td>1,058</td>
<td>1,700</td>
<td>23,023</td>
<td>24,583</td>
</tr>
<tr>
<td>Kirkland</td>
<td>878</td>
<td>1,095</td>
<td>18,911</td>
<td>22,851</td>
</tr>
<tr>
<td>Redmond</td>
<td>374</td>
<td>1,222</td>
<td>7,147</td>
<td>15,194</td>
</tr>
<tr>
<td>East Sammamish</td>
<td>417</td>
<td>2,048</td>
<td>5,978</td>
<td>12,673</td>
</tr>
<tr>
<td>Mercer Island</td>
<td>1,373</td>
<td>1,700</td>
<td>19,819</td>
<td>21,527</td>
</tr>
</tbody>
</table>

Source: PSCOG, Population and Employment Forecasts (March 1984)
When the threshold for providing transit service is not reached, Metro has a range of services available to encourage ridesharing at a work site. For a discussion of these programs, see part B.


Once general travel "desire lines" are known in a given sub-area, planners must examine the existing transit network, if there is one, and the street and highway system to determine the practicality of reorienting service to better meet the actual travel demand. Often, the constraints to achieving this objective are formidable. Past operating practices, existing ridership orientation, budget limitations, street patterns and even the availability of on-street bus layover space can influence or limit the degree to which service can be modified. In addition, the service must be designed so that it is clear and understandable to the public; changes must be coordinated with other planning and public works agencies to expedite bus flow and to ensure that streets in nearby developing suburban areas are able to accommodate buses.

B. Determining the Market for Ridesharing

As shown in Figure 3, transit generally works best between areas of high or medium density and close proximity, while vanpooling and carpooling are better suited to markets involving high to medium densities, long distances, or people with atypical commute patterns.

It is estimated that of the 56.5 percent of all commuters who drive alone to work, 38 percent could and would rideshare under the right conditions.\(^8\) (That represents 21.5 percent of all commuters).\(^9\)

Metro provides a variety of supportive services designed to promote ridesharing. These include:
FIGURE 3
Transit and Rideshare Markets

- **Ridematching services** - Applications by individuals to provide transportation or join another vehicle for commute trips are matched with other applicants in a centralized computer file for the purpose of encouraging multiple-person vehicle trips to and from the same general area and time periods.

- **Vanpool services** - Vanpool services include the administration of the Metro vanpool program, the management of VAN (Vanpool Association Northwest), and the provision of information and assistance to the administrators of local employer or developer sponsored vanpool programs.

- **Employer involvement program** - This includes the marketing of services and programs to employers and their employees.

- **Destination parking management program** - Such programs are developed where requested by an employer or local jurisdiction with parking problems. They involve problem identification and analysis, and recommending solutions and methods for evaluation. Typical products could include priority parking plans for HOVs, demonstration programs for carpool certification and recommendations for promotion, signage and/or HOV subsidies.

- **Developer involvement program** - This program assists a developer in defining a transportation management plan in response to requirements of the local jurisdiction for the purpose of mitigating traffic impacts to and from the project site.

- **Flexible working hours/Flex-time** - This involves working with employers on the scheduling of employee work periods to encourage commuting other than during peak traffic hours. Flex-time can assist in relieving traffic congestion and facilitate travel by HOV modes.

- **Origin parking program** - Origin parking programs include the development and administration of a leased park and pool/ride commuter
parking lot system, and parking management activities with developers, jurisdictions, or employers for origin based commuter parking facilities.

- Custom or "subscription" bus services - A custom bus is typically commuter-oriented, operating fixed routes and schedules tailored to the travel times and patterns of "subscribers." The service is open to the general public. Routes are usually over 10 miles in length and serve locations normally unable to support regular bus services.

Metro has Commuter Service Representatives assigned to specific geographic districts who contact large employers to assist with establishment and ongoing support of company sponsored rideshare and transit programs. The responsibilities of Commuter Service Representatives include training of new Employee Transportation Coordinators, attending community and business organization meetings, and assisting companies with surveys of employee commute modes.

Local jurisdictions can support transit and ridesharing activities by:

- Reducing parking requirements for new development projects, in combination with rideshare programs;
- Requiring or increasing charges for parking;
- Requiring development to participate in or provide rideshare programs or improved access to transit;
- Providing for passenger load facilities in dense employment locations.
References

Section 2: Factors Considered in Planning Public Transportation Service


3  Interview with Mike Bergman, Transit Planner, Municipality of Metropolitan Seattle.


5  Ibid., p. iii.

6  Ibid., p. iii.

7  Ibid., p. iii.

8  Ibid., p. iii.

9  Ibid., p. iii.
Section 3:
Planning A Development Which Is Compatible With Public Transportation
I. LAND USE FACTORS AFFECTING TRANSIT USE

A number of factors determine whether a public transportation market exists and whether it will be easy for the tenants of a particular development to use public transportation. A "compatible" development should reflect most of the following characteristics:\(^1\)

A. It should be located within the existing developed area.

B. It should represent a medium to high intensity use of the site.

C. It should be near a transit center or an existing or planned transit route whose service levels are adequate to attract peak period commuters (generally, 30 minute headways, minimum).

D. If possible, it should have the ability to generate off-peak (midday and evening) ridership.

E. It should have the potential to generate transit trips. Transit supportive uses include medium to high density residential uses, office buildings, and high intensity commercial activity.

F. The site plan should orient the development to the street, rather than separate the building from the street by parking. Direct building entrances and walkways to the street and transit should be provided.

G. Parking supply should be minimized within local requirements.

Each of these factors will be reviewed individually in the following pages. This section also culminates with a Public Transportation Compatibility Worksheet (Figure 8).
A. Density

Transit service and density are closely interrelated, both at the point of origin and at the destination end of trips. Metro supports increased population densities along existing transit corridors. Local jurisdictions should use proximity to existing public transit as one criterion when zoning increase changes are requested. Developers requesting a rezoning of property to a high density development would receive a more favorable response if that property is located on an existing transit line, within 800 feet of a bus stop.

1. Residential Density

Transit service areas with residential density in the range of 2400–3700 persons/sq. mile have displayed consistently higher per capita ridership than areas with about 1850 persons/sq. mile.\(^2\)

Higher density communities also provide the ridership density and shorter trip lengths that mean improved cost recovery, leading, in turn, to increased levels of service.

Net residential density (density of the residential acreage, excludes land that is vacant or zoned for other purposes) can be related to a desirable threshold of concentration, which can support cost-effective and relatively frequent local transit service. A threshold of seven dwellings per residential acre can be used as an indicator of the minimum residential density supporting local transit service, based on:\(^3\)

- A minimum threshold density of seven dwelling units per acre suggested by Pushkarev and Zupan (based on experience in the New York region).

- An average residential density of seven to eight dwelling units per acre specified as a desirable density by King County's adopted Comprehensive Plan.
A standard for residential density along collector streets of eight to 12 dwelling units per acre in King County's Comprehensive Plan.

Residential densities of at least seven dwelling units per acre are considered necessary to economically justify use of local bus routes operating with 30 minute service. As residential density rises to 30 dwelling units per acre, transit usage has been found to triple. At 50 dwelling units per acre, transit trips made by residents of a particular development become more numerous than auto trips.

A local example of transit use resulting from high population densities is Metro's #10 bus route, which circulates between Capitol Hill and the Seattle CBD. For the purpose of this example, one dwelling unit is considered to represent one household. Route 10 traverses more than seven census tracts, which have residential densities averaging 13.3 households per acre. With 10-15 minute headways even during midday hours, Route 10 achieves a relatively high productivity of 101 passengers per revenue hour.* This is measured as average passengers per revenue hour, based on all-day counts in both directions. Route 10's high productivity compares with the average system productivity of 26 passengers per revenue hour. Route #10 ranks second highest of all routes serving areas entirely within the Seattle city limits. It should be noted that for high transit mode splits to occur, pockets of high residential density need to be located reasonably close to and geographically aligned with areas of high employment density.

*Revenue hour is an aggregation of time during which service is available to carry passengers; it excludes layover, deadhead or other "non-revenue" service time.
2. **Employment Density**

An employment density of 50 employees per employment acre has been suggested as an indicator of significant transit use. This figure is based on a study performed for Metro which compared 1975 employment and population data from PSCOG with 1977 Metro origin-destination survey data for important activity centers. As the number of employees per acre increased from 25 to 60, the transit mode split increased from 1 percent to a range of 6 percent to 11 percent. The study concludes that transit ridership increases significantly when employment density exceeds approximately 50 employees per acre for employment or activity centers with more than 10,000 jobs. It should be emphasized that the site threshold is an important factor in determining whether there will be a "pay-off" for increasing density (see discussion on "Forecasting Transit Demand" in section 2, I.A.2.)

Table 5 shows net employment densities for selected major activity centers in King County.

**TABLE 5**

**EMPLOYMENT DENSITY FORECASTS FOR SELECTED MAJOR ACTIVITY CENTERS**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6010</td>
<td>Seattle CBD (including Regrade)</td>
<td>137,000</td>
<td>710</td>
</tr>
<tr>
<td>6212</td>
<td>University Distr.</td>
<td>42,000</td>
<td>65</td>
</tr>
<tr>
<td>4900</td>
<td>Bellevue CBD</td>
<td>33,000</td>
<td>302</td>
</tr>
<tr>
<td>6221</td>
<td>Northgate</td>
<td>21,000</td>
<td>49</td>
</tr>
<tr>
<td>5410</td>
<td>Overlake/Redmond</td>
<td>19,000</td>
<td>18</td>
</tr>
<tr>
<td>5200</td>
<td>Bel/Red</td>
<td>15,000</td>
<td>33</td>
</tr>
<tr>
<td>5810</td>
<td>Duwamish</td>
<td>24,000</td>
<td>41</td>
</tr>
<tr>
<td>3600</td>
<td>Kent Industrial</td>
<td>31,000</td>
<td>15</td>
</tr>
<tr>
<td>3020</td>
<td>Central Federal Way</td>
<td>11,000</td>
<td>14</td>
</tr>
</tbody>
</table>

B. **Location of Development**

Although transit access is often considered to be a low-priority factor in the location decision of most developers, it will become increasingly important as traffic congestion increases and conditions to mitigate traffic are levied on new developments, or if energy costs increase.

When a new development is located within an existing activity center, the cost of providing public facilities and service to that development will be lower than if it is located in an undeveloped area. For this reason, King County encourages most commercial and industrial development to locate in existing urban activity centers, where public facilities and services are already in place or needed improvements can be provided cost-effectively.⁷

Clustering of activities also results in a concentration of trip ends. When a recreation complex, health unit, public library and senior citizens' center, for example, are all situated adjacent to a shopping mall, the transit routes that serve the shopping mall also allow people to travel to the other activity centers without transferring.

The **King County Comprehensive Plan** defines "Urban Activity Centers" as major concentrations of commercial and industrial development.⁸ The plan encourages high-density housing in such centers, including multifamily housing and mixed-used development. With housing and commercial uses in the same structure or on the same site, employees are able to combine work and shopping trips.

The Urban Activity Centers envisioned in the **King County Comprehensive Plan** vary in size.⁹ Some are intended to be major concentrations of employment and trade, such as downtown Bellevue and Federal Way. Others may be relatively small, for example, 80 to 100 acres — with office and manufacturing square footage not much greater than the retail square footage. Urban activity centers are planned to be approximately three to six miles apart, allowing for short work and shopping trips while providing for distinct and separate centers.¹⁰
Metro's long range planning also focuses on major activity centers. Peak-hour service is concentrated in a number of "secondary urban areas" — the University District, First Hill, the Bellevue CBD, and the Duwamish Industrial Area — in addition to the Seattle CBD. The plan calls for midday coverage to focus on a system of transit centers to be located in suburban activity centers. These activity centers include Bellevue, Northgate, Aurora Village, Kirkland, Overlake, Eastgate, Issaquah, Tukwila, Auburn, Burien, and Federal Way. Transit centers are generally facilities where buses on a number of different routes will be scheduled to arrive within a five minute period, allowing passengers to transfer between the routes with a minimum wait. Since off-peak headways are normally much less frequent (30-60 minutes) than peak-hour headways, and direct point-to-point service between activity centers is often unavailable without a transfer, transit centers are an efficient way to make the most of existing service.

Developments located within an existing activity center will be able to offer tenants increased access to regional travel opportunities.

C. Proximity to Existing Transit Service

The decision of where to locate a new development should include some consideration of proximity to existing transit service. Some points that should be kept in mind by the developer are:

Distance

- People can be expected to walk no more than 500-1000 ft. to a bus stop. This distance should not be measured in a straight line to the bus stop, but should be the actual distance walked, given circuitous roadway patterns and a lack of walkways in subdivisions.

- Age, income level, and auto availability appear to have a marked impact on median walking distance. People older than 45 are willing to walk slightly less far than younger people. At distances of about 750 feet or more, access on foot by seniors declines rapidly. Steep grades greatly
reduce walking speeds and particularly deter seniors from walking anything but a fraction of average distances.

- Occasional users who ride the bus no more than once a week are inclined to walk less to reach a bus stop, particularly in high income areas.¹³

**Stability**

- Transit routes on major arterial streets are less likely to change.

**Access**

- If a residential development is not going to be located within walking distance of a transit route, it should at least be within easy driving distance of a park-and-ride lot. The principal draw area for a park-and-ride lot extends from one mile beyond the lot (toward the principal destination) to six to ten miles outbound.

**Shuttle Service**

- The developer might consider providing shuttle service for tenants to a nearby transit center or Park-and-Ride lot.

**Site Design**

- Providing bus turnouts, adequate curb radii, concrete pads for shelters, and roadways designed for transit vehicle access can help make a case for an employment complex, residential development, or shopping center to obtain on-site transit service. Standards for accommodating transit and ridesharing vehicles can be found in Metro's *Transportation Facility Design Guidelines*, April 1985.

- Parking should be put in back instead of in front of the development to decrease walk distances for transit users. (See Figures 4 and 5.)
FIGURE 4
Shopping Center Design

Source: L. E. Miller, Community Planning for Public Transit, Transit Services Division, Ministry of Municipal Affairs and Housing, Province of British Columbia, 1976.
EFFECT OF SITE LOCATION ON TRANSIT PERFORMANCE

from: Lavallin Inc., for CMHC, 1979

CURRENT PRACTICE

REDUCED SETBACK

BUS STOP AT BUILDING


FIGURE 5
Effect of Site Location on Transit Performance
Several studies indicate that proximity to timed transfer operations or transit centers can stimulate retail business at shopping centers and increase accessibility to employment sites. A survey of merchants at Aurora Village Mall in north King County in December 1985 showed that 79 percent of the retailers believed the Aurora Village Transit Center to be a positive benefit for the mall; 19 percent of the merchants were able to tie increases in sales to the existence of the transit center. Other communities where beneficial impacts have occurred include:

- **Vancouver, B.C.** - Store managers at Lougheed Mall reported a "definite sales increase" after a transit center was implemented in their parking lot.

- **Edmonton, Alberta and Portland, Oregon** - Managers of the major shopping centers where timed transfers are operating noted increases in the number of customers using transit.

- **Orange County, California** - A study conducted in 1982 for Orange County Transit District by JHK & Associates at ten shopping centers served by the transit system indicated that between 19 percent and 65 percent of all shoppers and shopping center employees who came by transit would not have made the trip to the center if the bus had not been available. Of these, between 37 percent and 100 percent said they would have gone to another shopping center instead.

Even businesses in the vicinity of passenger shelters can benefit when transit riders stop in to buy food or run an errand while waiting to catch the bus. A Metro survey conducted at five major bus stops in downtown Renton, Washington in June 1985 indicated that 70 percent of the 445 passengers responding patronized nearby businesses while waiting to transfer or catch a bus. Types of businesses patronized included retail stores (41 percent), restaurants (32 percent), banks (14 percent), professional offices (7 percent), and other businesses (6 percent).
D. **Mixed Use Development**

The number of persons who live in an activity center and work elsewhere will decline as the size and diversity of the center increases. Balancing residential development (trip productions) with commercial/industrial development (trip attractions) in reasonably close proximity, assists transit systems by:

1. Shortening trip lengths and allowing transit to concentrate more service on shorter line segments, and

2. Creating more reverse direction trips which will afford better use of transit and highway resources in the "off-peak" direction.\(^{16}\)

A mixed use development is one which contains a variety of uses in one project. By combining office, residential, and retail uses, the need to travel can be reduced because many tenants do not have to go elsewhere to shop or work. Such developments work best if regional shopping, cultural, and entertainment activities, as well as high-density residential uses, are clustered in activity centers convenient to the transportation system.

King County allows residential densities of 48 units per acre for mixed use developments in urban activity centers.\(^{17}\) Even higher residential densities are permitted in areas with frequent transit service. Similarly, developers of office buildings are encouraged to develop at high employment densities and locate near retail stores and services.

Higher densities and reduced parking requirements are offered as incentives for mixed use developments that provide additional amenities such as enclosed parking, usable public space and major landscaping, and convenient transit access.

Mixed use developments are beneficial to local jurisdictions because they can:

1. Generate business in retail areas.
2. Provide opportunities for shared parking.
3. Reduce the use of automobiles for lunch hour and after-work shopping trips.
4. Support more frequent transit service.
5. Make activity centers lively places in evenings and on weekends.

E. Design Form

Even if a development is located close to bus service, tenants of a project may not be motivated to use transit if the building orientation does not provide convenient transit access. There are a number of simple design features that can improve transit compatibility. These include:

Location of Parking

- Buildings should be directed toward bus stops and pedestrian approaches rather than toward parking lots. Shopping centers, for example, very seldom provide any attractive way for a pedestrian to reach the "front door" from the street without a lengthy walk through what is invariably an automobile-oriented zone. Transit operators are hesitant to enter parking lots where the bus can be tied up in long traffic queues.

Site planning guidelines that favor large setbacks from street frontages either for parking or landscaping purposes, place the transit patron at a disadvantage in terms of the distance between the bus stop and main entrance. Parking lots and large landscaped areas should be situated at the sides or rear of the building, as shown in Figure 5.

Pedestrian Amenities

- Foot travel can be stimulated by connecting complexes with attractive, landscaped walkways and pedestrian arcades.

- Paved all-season walkways and adequate lighting should be provided between the building and nearest transit stop.
On-Site Provisions for Transit

- Provisions should be made for on-site bus turn-outs, passenger shelters, and large vehicle turnarounds.

- Paved passenger standing areas should be provided at all potential bus stop locations.

- Public transit routings through the center of the development should be encouraged so that as many people as possible are within short walking distance of stops. (See illustrations in Figures 6 and 7.) Bus service should penetrate major office parks rather than skirt their perimeters and provide front entrance drop-offs and boardings. A recent study indicated that a transit service utilizing a direct central routing could operate at better than one-third the cost of a peripheral routing given the same service levels and population density.\(^\text{18}\)

F. Street Layout

The incorporation of transit route planning early in the subdivision design process will, in most cases, ensure that walking distances to transit are kept to acceptable levels. Community planning and road system design should also provide for the incremental extension of transit routes without the need to restructure or substantially revise existing service.

The following guidelines may assist local jurisdiction staff in planning a street network which can be efficiently served by public transit:

- Design arterials and transit service in advance of development, to connect clusters.

- Encourage neighborhood and service area designs that minimize street lengths and the percentage of area devoted to streets.
Variations on Current Design Practice to Promote Direct Access to Transit


FIGURE 7
Peripheral versus Central Routing
Apply suitable roadway geometrics to accommodate bus turning maneuvers. (Refer to Metro Transportation Facility Design Guidelines, April 1985.)

Ensure that streets identified for possible transit usage be structurally capable of supporting the weight of transit vehicles.

Curvilinear and discontinuous streets (cul-de-sacs) typical of suburban residential areas may restrict the routing of buses and make it difficult for transit to provide service within easy walking distance of most residents. A simple connection of the central collector street through the entire neighborhood would permit direct transit services to operate within a few hundred feet of all residents.

A grid system with a regular hierarchy of local, collector, and arterial streets, or a pie-shaped configuration with arterials and collector streets radiating out from the center of the city provide easy access to property. Radial street networks which focus on a group of passenger destinations such as a shopping/recreation center give this center more direct accessibility potential than a grid network does.

Sidewalks should be provided on at least one side of the street carrying transit. Sidewalks and an attractive pedestrian environment are particularly necessary on collector and arterial roads.

Bicycle access to transit centers, park-and-ride lots, freeway flyer stops, and other major bus stops should be encouraged by local jurisdictions. Wide curb lanes (13 feet minimum) or striped bike lanes should be considered for major streets leading to transit facilities.

Minimize overall walking distances by:

appropriate location of the collector roadway system to be used by transit
placing all high-density developments on the streets serviced by transit and placing all medium density developments on streets carrying transit, or in closer proximity to such streets than low-density development.
FIGURE 8
PUBLIC TRANSPORTATION COMPATIBILITY WORKSHEETS

Authoritative evaluations of the public transportation compatibility/incompatibility of proposed developments can only be made on a case by case basis. The worksheet should be interpreted flexibly, recognizing that design detail in individual circumstances are the determinate of what can or cannot be made compatible with public transportation. For broader application you may wish to develop separate worksheets which acknowledge the unique attributes of specific types of land uses.

A. Relationship to Transit

1. Is the site within a quarter mile of a Metro route in an urban area, or within a half mile of a Metro line in a suburban area?  
   Yes  No

2. Can an existing Metro line sufficiently serve the transportation needs of the development?  
   Yes  No

3. Will the proposed development take advantage of nearby public transportation?  
   Yes  No

4. Would potential users want to use transit to go there?  
   Yes  No

B. Orientation to Automobiles

1. Is the development feasible without relying primarily on automobile access?  
   Yes  No

2. Would the proposed development function in a manner that could be characterized as other than a primarily automobile oriented use? (Would parking requirements be compatible with transit/ridesharing?)  
   Yes  No

3. Are the number of parking spaces provided greater than that required by the local jurisdiction?  
   Yes  No

4. Are carpools and vanpools given priority parking spaces closest to the building entrance?  
   Yes  No

5. If there is a charge for parking, is there a discount for HOVs (high occupancy vehicles)?  
   Yes  No

C. The Site Plan

1. Does the site plan orient the development to the street?  
   Yes  No

2. Does the site plan treat parking in a manner as to not separate the development from the street by parking?  
   Yes  No

3. Does the site plan provide direct building entrances to the street and to transit?  
   Yes  No
4. Are there passenger loading zones where carpools and vanpools can pick up riders?  

5. Does the site plan provide weatherization improvements for pedestrians?  

6. Does the site plan provide for direct quality pedestrian access to transit?  

7. Does the site plan allow for pedestrian and transit amenities such as street trees and passenger shelters?  

D. Trip Generation

1. How many automobile trips will the proposed use generate both in the peak and off-peak hours?  

2. Is the developer proposing any incentive programs to reduce SOV (single occupant vehicle) trips generated by the development?  

3. What is the potential of the proposed development to generate transit/ridesharing trips in both peak and off-peak?  

4. What is the proposed development's potential to generate pedestrian trips?  

E. Intensity of Use

1. What is the proposed population/employment density of the proposal?  

2. Does the proposed development represent a high, medium, or low intensity use of the site?*  

*Based on findings by Pushkarev and Zupan, the following figures may be used as thresholds for residential intensity:  
high = 15+ dwelling units/acre  
medium = 7-14 dwelling units/acre  
low = less than 7 dwelling units/acre  

Source: Tri-Met, Planning with Transit -- Land Use and Transportation Planning Coordination, May 1979, page 34.
REFERENCES

Section 3: Planning a Development Which Is Compatible with Transit

1 Tri-Met, Planning with Transit -- Land Use and Transportation Planning Coordination, May 1979, p. 30.


4 Boris S. Pushkarev and Jeffrey M. Zupan, Public Transportation and Land Use Policy, 1977, p. 140.

5 Ibid., p. 30.


7 Op Cit., King County Comprehensive Plan, p. 72.

8 Ibid., p. 69.

9 Ibid., p. 70.

10 Ibid., p. 73.

11 L.E. Miller, Community Planning for Public Transit, Transit Services Division, Ministry of Municipal Affairs and Housing, Province of British Columbia, May 1976.

12 Op Cit., Guidelines for Public Transit in Small Communities, p. 20.

13 Ibid., p. 20.


15 OCTD, "Orange County Transit District Service to K-Mart Plaza: Passenger Survey Results," October 1982, p. 3.


17 Op Cit., King County Comprehensive Plan, p. 72.

18 Op Cit., Guidelines for Public Transit in Small Communities, p.25.
Section 4: Parking Management
I. OVERVIEW

A. Definition and Goals of Parking Management

Parking management can be defined as actions taken to alter the supply, operation, and/or parking demand of a jurisdiction's parking system and to further the attainment of local transportation, economic, environmental, and other objectives.¹

Policies governing the supply and price of parking are increasingly undergoing revision in cities seeking to revitalize their economy and reshape development. To many planners, engineers, elected officials, and others, parking management appears to be viewed primarily as a system of disincentives intended to:

- Discourage automobile travel, particularly travel by single-occupant automobiles.
- Control or reduce the supply of parking.
- Increase parking rates.

This "restrictive" perception of parking management is only one aspect of such a program.

In some communities, parking management programs have been implemented to reduce automobile traffic and alleviate its negative impacts. In other communities, the strategies are intended to encourage nonwork travel to central business districts as a means of promoting economic growth.

Merchants are often reluctant to consider any changes in municipal parking supplies that might reduce their competitive position with retailers who offer free customer parking. Employers and employees also resist changes because parking is seen as part of an overall benefits package. However, there is a major difference between all-day parking by employees and short-term parking of less than four hours duration for retail business. It is normally easier to deal with parking supply restrictions for employees whose cars sit in the same place for eight hours or more.
Several practical considerations have influenced officials in some cities to call for the development of policy coordination mechanisms that could enhance the effectiveness of parking, transit, and ridesharing policies. These considerations are:

- A growth rate in auto ownership of 2.5 times the population growth rates during the past 20 years.
- The increasingly prohibitive expense of structured parking. Construction costs have reached $20,000 a space in downtown Seattle for underground parking. This figure is higher when maintenance costs are added.
- Proposed cuts in federal funding for transit.
- Limited urban freeway construction.

Cities may incur the following benefits from limiting parking spaces:

- **More efficient use of space** - Parking takes up space that could be used for housing, employment and tax revenue generation.
- **Greater equity** - Where there is a charge for parking, the user pays a portion of the cost of providing the parking, just as the transit user has to pay for part of the transit cost.
- **Reduced traffic and roadway maintenance costs** - More parking generates more traffic, which requires more road space. This, in turn, increases the cost of maintaining and providing roads.
- **Aesthetic gains** from less asphalt and more opportunities for open space and landscaping.

The private sector can also benefit from reducing parking in exchange for providing transit and ridesharing incentives or pedestrian amenities. Cost savings per parking space eliminated can range from $1,000 to more than $15,000, depending on land costs and type of parking facility.

Table 6 indicates typical viewpoints of various groups with an interest in parking.
B. Factors Affecting Parking Demand

The primary factors believed to affect parking demand are:

- General land use and type of operation
- Development setting (e.g., density of surrounding development)
- Temporal effects (e.g., hour of day, season of year)
- Price of parking
- Availability of parking
- Transit services
- Ridesharing incentives.

A key question in determining the amount of parking to provide at a new building site, particularly a large retail development, is whether to design for the highest ultimate demand or for a lesser figure which lowers parking construction costs but accepts an occasional parking overflow. Design for the highest demand is usually viewed as an unwise investment of resources, and a conscious decision is made to live with a problem for those few days when there is unusually high demand.
<table>
<thead>
<tr>
<th>Interest groups involved</th>
<th>Primary relevant objectives</th>
</tr>
</thead>
</table>
| Developers/owners        | - minimize parking facility cost  
                          | - provide access for users (more important for certain types of users, e.g., commercial)  
                          | - ensure leasability/salability of property |
| Employers/business       | - provide environment for attracting adequate work force or customers (access is key to that environment) |
| establishment operators  |                             |
| Users (employees, shoppers, residents, etc.) | - provide adequate access (minimize travel time, maximize convenience) 
                          | - minimize transportation cost |
| Community (usually those adjacent to facility under consideration) | - minimize intrusion by users (traffic or parking on neighborhood streets) |
| Lenders                  | - Ensure that facilities built are economically viable (this really means satisfying the objectives of those groups i.e., employers and users) |
| County agency staff      | - promote coordinated and managed land development  
                          | - enhance access to facilities (mobility)  
                          | - reduce traffic congestion, air pollution and energy consumption  
                          | - minimize cost to county and its citizens  
                          | - should consider the objectives of all above groups and maintain a balance that is in the overall public interest |

1 The objectives are generalized for each group. Specific groups or individuals could have objectives which differ from those listed.

Research on variations in parking use by time of day, day of week, and season of the year has provided the following guidelines for office buildings:

- Based on a parking count conducted over seven consecutive weekdays, it is estimated that a one-day count would be expected to lie within ± 5–8 percent of the true seasonally adjusted average with 95 percent confidence.

- Pre-Labor Day counts are about 6 percent lower than post-Labor Day counts.

- Parking demand in the summer months is 6–8 percent lower than other seasons, with little difference between demand in fall, winter and spring.

- If January is taken as the peak demand month, the demand at an office building in July would be expected to be about 91 percent of the peak demand.

- Accumulation of parked cars tends to peak at two distinct points during the day: 10 - 11 a.m. and 2-3 p.m.

C. Costs of Parking Construction

An acre of land provides about 135 parking spaces. Assuming industrial land costs $7-10 per square foot and construction costs an additional $4-6 per square foot, the total cost of one surface parking space, the least expensive form of parking, ranges from $3,500 - 5,100 in 1985 dollars. Structural parking typically costs $6,000-$8,000 per space. Costs for underground structures are usually at least double the cost of above-grade parking. (See Figure 9.) Providing 200 spaces in an underground garage could cost well over $2 million. In fact, construction costs for underground parking in CBD office towers may be as high as $20,000 per space. Paved parking areas also require annual maintenance, which typically costs from $150-175 per space.
This chart indicates that the annualized cost per space of surface parking rises steeply as land costs rise. The annualized cost per space for below-grade parking is high because of the additional excavation work involved. The same is true for structured above-grade parking, but costs for the latter are somewhat more sensitive to land costs.

Land costs are an important factor in the overall cost of parking and in determining the most cost-efficient type of parking. Developers constructing surface parking for a commercial project in a suburban area might not be as interested in getting their parking requirements reduced as developers of an office tower in a CBD location, where land costs are generally much higher.

The possibility of saving money on parking construction might lead a developer to commit to transportation management actions in exchange for lower parking requirements. If the zoning requirement in a large metropolitan area CBD is one space per 1,000 square feet of development, a major office development with 300,000 square feet would incur parking construction costs of approximately $4-5 million. Reduction of just ten spaces in a two-level underground parking structure could justify an annual expenditure of up to $4,000 in a program to promote ridesharing. Research has shown that operating an organized ridesharing program can reduce employee parking demand by an average of 22 percent.

II. PARKING MANAGEMENT STRATEGIES

Parking management strategies can be classified into the following categories:

- On-street parking supply
- Off-street parking supply
- Pricing
- Fringe parking
- Enforcement and adjudication

*As an example of what $4,000 could buy in terms of ridesharing services, Metro has calculated the cost of a developer-sponsored vanpool program, based on one 12-passenger van operated over a period of 50 years. In 1986 costs, the annual subsidy per rider would be $120 at a $10/seat/month subsidy level, and the initial investment would be $2,784. This cost does not include purchase or replacement of vehicles.
A study of parking management approaches used in 20 communities throughout the country (shown in Figure 10) indicated that the jurisdictions with the most ambitious programs are Baltimore, Boston, Portland, San Francisco, Seattle, Washington, D.C., and Montgomery County, Md. Each of these jurisdictions has implemented a range of actions that generally covers all six categories. These parking management programs are still working well several years after initial implementation and are having the intended effect on traffic congestion and/or reduction of long-term parking.

A. On-Street Parking Supply

1. Residential Parking-Permit Programs

RPPP's are one of the most widespread forms of on-street parking supply restrictions. They are typically implemented to control the excess parking demand created by persons who live outside a neighborhood but park their vehicles there in order to shop, work, or attend school nearby. RPPP's were determined to be constitutional in a 1977 U.S. Supreme Court decision.  

In most cities the ordinances created to establish RPPP's contain usage criteria that must be met by a neighborhood or district if it is to be eligible for a RPPP. The criteria usually require that a traffic survey conducted during peak parking periods reveal 75 percent overall use of available parking space and at least 15 percent nonresident use. Restrictions on nonresident parking range from complete prohibition to limited parking privileges for a duration of two or three hours. A limitation of RPPP's is the increased level of enforcement required.

2. Preferential Parking for HOVs

 Preferential parking for HOVs refers to the practice of signing spaces closest to the building entrance for use by carpools and vanpools. It also refers to subsidizing parking rates for HOVs. Off-street preferential parking programs normally involve setting aside a certain number of
**EXHIBIT 4**

**SELECTED PARKING MANAGEMENT TACTICS IN USE BY OR PROPOSED FOR SELECTED JURISDICTIONS**

<table>
<thead>
<tr>
<th>Parking Management Tactics</th>
<th>Jurisdiction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Parking Permit Program (RPPP)</td>
<td>•</td>
</tr>
<tr>
<td>Carpool/Vanpool Preferential Parking</td>
<td>•</td>
</tr>
<tr>
<td>Institutional TSM Plans</td>
<td>•</td>
</tr>
<tr>
<td><strong>Off-Street Supply in Activity Centers</strong></td>
<td>•</td>
</tr>
<tr>
<td>Expand or Restrict Supply in CBD and Activity Centers</td>
<td>•</td>
</tr>
<tr>
<td>Zoning Requirements</td>
<td>•</td>
</tr>
<tr>
<td>— Maximum and No Minimum Parking Requirements</td>
<td>•</td>
</tr>
<tr>
<td>— Joint Use</td>
<td>•</td>
</tr>
<tr>
<td>Constrain Normal Growth in Supply</td>
<td>•</td>
</tr>
<tr>
<td>— Maximum Ceiling (i.e., Freeze) on CBD Supply</td>
<td>•</td>
</tr>
<tr>
<td>— Reduced Maximum Parking Requirements Through HOV and Transit Incentives</td>
<td>•</td>
</tr>
<tr>
<td>— Restrict Principal Use Parking Facilities</td>
<td>•</td>
</tr>
<tr>
<td>Construct New Municipally-Owned Parking</td>
<td>•</td>
</tr>
<tr>
<td>— CBD</td>
<td>•</td>
</tr>
<tr>
<td>— Neighborhood Shopping Districts</td>
<td>•</td>
</tr>
<tr>
<td>Carpool/Vanpool Preferential Parking</td>
<td>•</td>
</tr>
<tr>
<td><strong>Fringe and Corridor Parking</strong></td>
<td>•</td>
</tr>
<tr>
<td>Fringe Lots</td>
<td>•</td>
</tr>
<tr>
<td>Park and Ride Lots</td>
<td>•</td>
</tr>
<tr>
<td>Carpool/Vanpool Lots</td>
<td>•</td>
</tr>
</tbody>
</table>

**Key:**
- • - Implemented
- o - Planned

**Source:** U.S. DOT, Study of Parking Management Tactics: Volume 1, 1980.

**FIGURE 10**

Parking Management Tactics in Use by or Proposed for 20 Selected Jurisdictions
EXHIBIT 4 (Continued)

<table>
<thead>
<tr>
<th>Parking Management Tactics</th>
<th>Jurisdiction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pricing</td>
<td>O</td>
</tr>
<tr>
<td>Increase Parking Rates</td>
<td>O</td>
</tr>
<tr>
<td>Differential Pricing Programs</td>
<td>O</td>
</tr>
<tr>
<td>- Rates Favor Short-Term Parker</td>
<td>O</td>
</tr>
<tr>
<td>- Geographical Rate Differentials</td>
<td>O</td>
</tr>
<tr>
<td>- Carpoools/Vanpools</td>
<td>O</td>
</tr>
<tr>
<td>Free Downtown Parking</td>
<td>O</td>
</tr>
<tr>
<td>Parking Tax</td>
<td>O</td>
</tr>
<tr>
<td>Surcharge on Parkers Arriving During “Prime Time” (i.e., 6:30 – 9:30 am)</td>
<td>O</td>
</tr>
<tr>
<td>Enforcement and Adjudication</td>
<td>O</td>
</tr>
<tr>
<td>- Aggressive Ticketing</td>
<td>O</td>
</tr>
<tr>
<td>- Booting</td>
<td>O</td>
</tr>
<tr>
<td>- Towing</td>
<td>O</td>
</tr>
<tr>
<td>- Administrative Adjudication</td>
<td>O</td>
</tr>
<tr>
<td>- HOV Enforcement</td>
<td>O</td>
</tr>
<tr>
<td>Marketing</td>
<td>O</td>
</tr>
<tr>
<td>Monthly Parking Convenience Stickers</td>
<td>O</td>
</tr>
<tr>
<td>Advertising (Media Ads, Brochures, Maps)</td>
<td>O</td>
</tr>
</tbody>
</table>

**Key:**
- **O** - Implemented
- **O** - Planned

FIGURE 10 (continued)
spaces in a surface parking lot or garage for carpools. Often, these spaces are also discounted by the developer or employer.

On-street preferential parking programs for carpools or vanpools allow participants to park downtown all day at specific metered locations for small monthly fees by displaying a permit. Carpoolers are exempted from hourly parking limits and fees of meters.

Portland, Oregon and Seattle, Washington have the best-known on-street preferential parking programs for carpools.\textsuperscript{16} In both programs carpools are defined as groups of three or more people. An evaluation of the Portland program indicated that two-thirds of the people subscribing to the program were already carpooling or previously used transit.\textsuperscript{17} Cost savings was the primary reason for becoming involved in the program.
B. Off-Street Parking Supply in Activity Centers

This parking management approach involves use of development controls to restrict the growth of CBD parking supply by adopting a "no-minimum" or "low minimum" parking requirement, along with a low maximum to discourage increased parking construction. In some cities, joint use of parking facilities is also allowed.

Other cities permit developers to reduce the amount of required parking if certain transit-related conditions are met (such as locating near a transit facility) or if a developer-funded transit/ridesharing incentive program is implemented.

The most comprehensive applications of restrictions in off-street parking supply have occurred in Chicago, Portland, San Francisco, and Seattle.

1. Mandatory Ceilings

Research conducted on local parking policies for Montgomery County, Maryland warns that too restrictive a cap on parking may divert development to other locations which are less desirable from both a land use and transportation perspective. The study notes that planners should be cautious about such programs (setting maximums and low minimums) in low cost suburban areas since an undersupply of parking will not usually result in diversion of trips to alternate modes, but in the overflow of parking onto nearby streets.18

Strict limitations on parking in the absence of comprehensive, targeted transit/ridesharing services are seen as best suited for densely developed locations where existing alternate modes are readily available. A delicate balance exists in the desire of an employer to remain at a location and the pressure placed on his/her employees to shift their mode of travel.19 Recent experience on mode shifts induced by restrictive parking supply strategies (in this case a residential parking permit program) was obtained in Old Town, Alexandria, Virginia. About
17 percent of the commuters affected by the parking permit program reported switching to carpools or buses.\textsuperscript{20}

Discussions with developers active in Montgomery County, Maryland indicated little or no need for maximum parking requirements.\textsuperscript{21} These developers felt that the cost of land and parking construction are already an effective limitation on parking.

2. Flexible Parking Requirements

Flexible parking requirements relax the amount of off-street parking called for in local zoning codes in return for developer support of public parking, mass transit, or ridesharing programs. Whether the introduction of flexible parking requirements is appropriate in a given jurisdiction depends upon both that city's or county's overall transportation and development objectives, and the existing traffic conditions, transit service, and parking supply.\textsuperscript{22} As a general rule, developers will enter into agreements that reduce the parking requirements if the actions called for in the agreements are easy to implement and less expensive than providing the parking.\textsuperscript{23}

For many years Chicago has granted a 10 percent reduction in the amount of required parking for buildings that have a direct connection with an underground transit station. A 15 percent reduction is granted for providing underground pedestrian circulation. More common are reductions for simply connecting to an underground pedestrian facility or for being close to a subway or the overhead "L" rail system.\textsuperscript{24}

In September 1981, the city of Sacramento, California enacted provisions in its zoning ordinance whereby the minimum is reduced by 5 percent for provision of bicycle facilities, 15 percent for marked carpool/vanpool spaces, and 60 percent for a program to purchase transit passes for use by occupants of the new offices.\textsuperscript{25} There are no other means available to obtain parking reductions. Since the ordinance was passed, there have been six applications for development or conversions in the eligible zone, three of which are requesting parking reductions based on ridesharing.
In downtown Seattle the long-term parking requirement for new developments for all uses except lodging may be reduced by providing additional subsidized carpool spaces, vanpools, or subsidized transit passes. One vanpool may be substituted for six parking spaces, not to exceed a 10 percent reduction. Each carpool space in excess of those required may be substituted for 1.9 parking spaces, with the provision that no more than 50 percent of the long-term parking spaces provided should be set aside or discounted for carpools. A 15 percent reduction may be achieved by providing free transit passes to all employees in the building for at least five years.

While most banks and lending institutions still require some on-site parking as a condition for financing the development, many developers indicate they would prefer to build only as much parking as necessary to attract building tenants. The return in investment from leasing floor area as office space far exceeds the return on investment from parking operations. Parking produces less revenue and incurs daily operating costs in addition to building heating, maintenance, etc.

Many North American cities have successfully limited CBD parking by lowering or eliminating the minimum parking requirements in their zoning code. Among these cities are Chicago, Denver, Edmonton, Portland, Oregon, San Francisco, St. Paul, Seattle, Toronto, Vancouver and Calgary. Table 7 indicates the CBD parking policies developed in each of these cities. Most of these cities have found that restrictions on CBD parking supply have not been a deterrent to development.26

One way a jurisdiction can grant parking reductions without being subject to spillover parking problems is to require that a certain area of the development site be set aside and held in reserve in case additional parking is determined to be needed in the future. In Dallas, parking relaxations granted by variance are allowed only with the required
<table>
<thead>
<tr>
<th>City</th>
<th>Maximum</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denver</td>
<td>No parking required in CBD except in urban renewal area.</td>
<td>CBD office space is expected to reach 44 million sq. ft. by 1985.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Of the 60,000 parking spaces in greater CBD area, 24,000 spaces are in fringe lots.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Recent CBD construction has shown that it is not necessary to have parking in or next to buildings to encourage development.</td>
</tr>
<tr>
<td>Edmonton</td>
<td>1 space/1,000 gsf in bldg. or within 400 ft of entrance.</td>
<td>Overall CBD parking averages 1 space/2.68 employees.</td>
</tr>
<tr>
<td></td>
<td>1 space/2,000 gsf if building has direct access to a pedestrian way.</td>
<td>Number of employees in CBD estimated to be 80,000 in 1986.</td>
</tr>
<tr>
<td></td>
<td>1 space/25,000 gsf if direct access to LRT</td>
<td>City has maintained good rapport with the developers.</td>
</tr>
<tr>
<td>Portland</td>
<td>1 space/1,000 gsf - 1 space/1,429 gsf, depending on building's proximity to transit</td>
<td>City directing high density development to its main transit corridor and freezing the number of allowable downtown parking spaces at the 1973 level of 38,870 (includes on and off-street).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The City believes downtown development has not been deterred by these restrictions.</td>
</tr>
<tr>
<td>San Francisco</td>
<td>1 space/4,285 sq. ft. of office space</td>
<td>Maximum allowable parking bylaw adopted in 1968 for core area to address air quality problems.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>City</th>
<th>Maximum</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>St. Paul</td>
<td>No maximum in CBD</td>
<td>No minimum in CBD</td>
</tr>
<tr>
<td>Toronto</td>
<td>1 space/1,453 nsf</td>
<td>1 space/1,668 nsf</td>
</tr>
<tr>
<td>Vancouver</td>
<td>1 space/1,000 gsf</td>
<td></td>
</tr>
<tr>
<td>Seattle</td>
<td>1 space/1,000 gsf unless special approval given</td>
<td>.67 spaces/1,000 gsf of office + .1 for short-term parking</td>
</tr>
<tr>
<td></td>
<td>No maximum outside downtown area</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 space/1,000 gsf outside downtown area</td>
</tr>
</tbody>
</table>

- The City uses pricing, a fringe parking shuttle bus, and skywalk system to create incentives and disincentives. Over half of CBD parking is for short-term use, fringe parking for long-term parkers.
- Developers initially opposed policies, but buildings have been successfully leased (93% occupancy rate).
- 1 space per 5.2 employees average in CBD.
- 1 space per 3 employees average in CBD.
- City requires 30-40% of the allowable parking to be reserved for carpools and vanpools in CBD office buildings.
- Principal use parking garages and lots not allowed in downtown core, only allowed in CBD periphery if no adverse effect on traffic flow or street capacity.
- 1 space/2,500 gsf actually being provided in CBD.
- Although developers would rather not have any restrictions placed on them, they have been generally supportive of an HOV parking program when required to mitigate the traffic impacts of their developments.
- Average of 1 space per 2.64 employees in CBD.
<table>
<thead>
<tr>
<th>Maximum</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calgary</td>
<td></td>
</tr>
<tr>
<td>On-site parking limited to 20% of total parking required. Rest of</td>
<td>o Peripheral parking structures connected to CBD through climate-controlled pedestrian walkways.</td>
</tr>
<tr>
<td>requirement fulfilled by cash-in-lieu payments used by city to build</td>
<td></td>
</tr>
<tr>
<td>peripheral parking structures.</td>
<td>o Cash-in-lieu program originally voluntary. Became mandatory.</td>
</tr>
<tr>
<td></td>
<td>o Developers complained because construction of municipal parking</td>
</tr>
<tr>
<td></td>
<td>structures lagged behind cash contributions. Developers did not</td>
</tr>
<tr>
<td></td>
<td>receive any guarantees on the use of spaces when built (e.g., spaces</td>
</tr>
<tr>
<td></td>
<td>not dedicated to a particular building or its tenants). No benefits</td>
</tr>
<tr>
<td></td>
<td>to buildings that have excessive walking distances to the parking</td>
</tr>
<tr>
<td></td>
<td>structure.</td>
</tr>
</tbody>
</table>
parking held in reserve. The reserve space may be used by the developer for warehousing, but at the end of three or four years, a traffic and parking study must be submitted to the city to demonstrate that the parking relaxation has had no adverse consequences on the community.

The city of Bellevue is using this same concept of setting aside land for parking to permit parking reductions in outlying areas. The delayed parking provision has been part of Bellevue's Land Use Code since 1983. Only landscaping is allowed on the land held in reserve for parking. No structures of any kind are permitted.

C. Pricing

Free or subsidized parking encourages auto use over public transit and rideshare use. On a national scale, it is estimated that 75 percent of all cars driven to work are parked free in spaces provided by employers; free on-street parking raises that percentage to 93 percent.27

Conditions in the Puget Sound region match very closely with the national data.28 Research has shown that approximately 20 percent of those who now drive alone and receive free parking would form carpools or begin using public transit if they were required to pay for parking at their workplace.29

Pricing approaches can take a number of forms:

- General increases in parking rates.
- Preferential parking rates for short-term parkers.
- Preferential parking rates for carpools and vanpools.
- Parking taxes.
- Flexible transportation subsidies.
- Other selected strategies such as elimination of monthly parking contracts.

One example of a large employer who substantially increased parking rates for employees is the federal government of Canada. Increasing parking rates for
federal employees in the City of Ottawa had several significant travel impacts, including a) a 23% reduction in the number of employees driving to work, b) an increase in average vehicle occupancy from 1.33 to 1.41, and (c) a 16% increase in transit ridership among Canadian federal employees.31

Preferential HOV pricing strategies can take the form of free or low-cost parking or can be differential rates based upon vehicle occupancy. An example of this type of differential parking rate that has been applied by some private firms is shown below:

<table>
<thead>
<tr>
<th>Parking Price</th>
<th>Paid for by Employer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Occupant</td>
<td>0%</td>
</tr>
<tr>
<td>Two-person carpool</td>
<td>50%</td>
</tr>
<tr>
<td>Three-person carpool</td>
<td>100%</td>
</tr>
<tr>
<td>Vanpool</td>
<td>100%</td>
</tr>
</tbody>
</table>

Preferential HOV pricing strategies have been successful in attracting carpools. The rate of use of the HOV spaces has generally exceeded 75% in Montgomery County, Maryland.31 In Seattle the use of HOV spaces is in excess of 95 percent for public spaces and about 35 percent for off-street spaces in private buildings.32

The elimination of free employee parking is the first step toward discouraging single-occupant vehicle trips. Some ways to eliminate SOV parking subsidies are:

- Increase employee pay commensurate with former parking subsidy.
- Create alternative transportation fringe benefits for employees (e.g., subsidies for carpools, vanpools, subscription bus service and public transit bus passes).
- Eliminate the parking subsidy for new employees.
- Provide less employee parking and charge full prices for parking as new company facilities are built or leased, with a complementary increase in transportation fringe benefits.
One disadvantage of charging for parking is that it encourages employees to find free parking elsewhere, often on nearby residential streets. For parking charges to attract people to transit and ridesharing, there must be a ban on parking on residential streets or other nearby free facilities. However, the cost of enforcement may exceed the benefits derived.

A study done in Montgomery County, Maryland found that employees were willing to walk fairly long distances to avoid parking costs. Employees in a building in White Flint, Maryland were seen to have walked as much as 1,500 ft. or more to avoid parking charges.

The relationship between parking demand and price is very inelastic (not responsive to change). Only drastic parking price increases will create any sizeable reduction in parking traffic. Modest increases in parking charges over a period of time have little impact on mode choice. If all-day parking charges are doubled, say from $2.00 to $4.00 all at once, it could alter parking habits of as many as 22 percent of the existing users. These 22 percent would perhaps seek other, less convenient locations with cheaper rates, consider carpooling or transit, or seek sources of parking subsidy from the employer.

Flexible transportation subsidies are inducements offered by employers to encourage employees to commute to work by transit, carpool, vanpool, or buspool instead of driving alone.

One of the most successful employer-subsidized, flexible transportation programs is operated by Atlantic Richfield Company at its corporate headquarters in downtown Los Angeles. ARCO subsidizes all transportation modes for its 2,196 employees. Employees are given the choice of commuting alone and paying half of the monthly parking fee for a space owned or leased by the company, or switching to another transportation mode, which the company subsidizes at the following rates:
TRANSPORTATION SUBSIDIES PROVIDED BY ARCO

Single driver - 50 percent of parking price
Two-person carpool - 75 percent of parking price
Three-person carpool - 100 percent of parking price

As of January, 1985 a new federal law requires employers to add transportation subsidies exceeding $15 per month to the employee's W-2 form for tax purposes. As a result of this change, ARCO provides a $15 subsidy for modes other than automobile or ridesharing vehicles parking in the company's garages. (The law does not affect subsidy of parking spaces.)

Approximately 56 percent of ARCO's employees commute to work in high occupancy vehicles.38 This compares with Los Angeles' overall goal of 55 percent for company ridesharing during periods of heavy smog.

D. Fringe Parking

The use of fringe parking lots along with express bus or shuttle service to employment sites is one parking management technique that can help keep cars out of congested downtown areas. Fringe lots are facilities located outside, but in close proximity to the CBD, which serve transit travelers destined to the CBD.

This type of program may be established by a local unit of government, by the transit agency, or by an employer. In order to make fringe parking attractive, remote parking lots should be located a sufficient distance from the work site (not less than one mile from the CBD or high concentration employment center) to make the mode change worthwhile in terms of total travel time for passengers. Unless parking supply is restricted and parking charges are high, fringe parking tends to work better close to the origin end of a trip (e.g., at park-and-ride lots) than at the destination end of a trip where an employee can easily drive the rest of the way.
The success of fringe parking lots depends heavily on the level of transit service linking the lot with the nearby activity center. The following service characteristics must normally be present for a lot to work well:

- Adequate transit capacity must be available
- Service should be provided at 5-10 minute headways during peak periods
- Transit service to the lot should be available at a reasonable frequency during mid-day and early evening hours
- Overall trip travel time and cost of using the facility should be roughly comparable to that for trips by auto to the activity center.

Two other factors which influence a fringe lot’s use are security and ease of access.

E. Enforcement and Adjudication

Several cities have initiated aggressive policies regarding the enforcement of parking regulations in order to increase their general revenues and improve traffic circulation and the use of on-street parking. This has been accomplished in Boston and Washington, D.C. by increasing the level of ticketing and developing procedures to apprehend violators who have not paid outstanding citations. In Washington, D.C. enforcement responsibilities for parking violations were transferred from the police department to the traffic department. Through a combination of ticketing, towing, booting, and administrative adjudication, the program has been able to achieve the following results:

- Creation of an estimated $25 million in net revenue annually for the city.\(^{39}\)
- An increase in the number of legal hours parked at metered spaces from 13 to 56 percent and a decrease in illegal hours from 84 to 31 percent.\(^{40}\)
III. PARKING SUPPLY IN KING COUNTY

A. Overview

A study of suburban employment center parking demand conducted by staff members of Commuter Pool (now part of Metro) and PSCOOG in 1983 found that minimum parking requirements in suburban King County are too high and should be reduced by at least 18 percent. The study concluded that, in the Seattle area, efforts to promote ridesharing may be more successful when employee densities exceed 4.5 employees per 1,000 gross square feet and parking supply dips below .80 space per employee.

Table 8 indicates the off-street parking requirements of each local jurisdiction within King County. These local requirements can be compared with parking requirements for office buildings, multi-family dwellings, and retail uses in selected jurisdictions elsewhere in the country. (See Tables 9, 10 and 11.) Most King County cities require 4.0 to 5.0 spaces per 1,000 gsf for office and commercial uses. This figure exceeds the 3.0 spaces per 1,000 gsf recommended by the Federal Highway Administration for office development as a reasonable base parking requirement outside CBDs or densely built-up areas.

B. Bellevue's Experience with Parking Management

An abundance of parking exists at most employment sites in suburban King County. For example, the city of Bellevue's parking supply rate for offices was 4.4 spaces/1000 sq. ft. in 1980. A total of 15,000 parking spaces was available for retail and office use, compared with a CBD employment level of 12,000. Since 1981 the City has implemented the following measures to encourage HOV use:

- Minimum parking requirements were lowered to 2.0 spaces per 1000 sq. ft.
Maximum parking requirements slightly lower than the present level of estimated demand were established. The maximum for office use was set at 3.0 spaces/1000 sq. ft., whereas city staff felt that the demand was about 3.3 spaces.

Developments are required to meet all parking demand on-site. (With allowable parking supplies well below demand, HOV use must be correspondingly high.)

The first building in the Bellevue CBD to be constructed under the terms of the new zoning code was 450 Bell Terrace. The building houses 1,200 Pacific Northwest Bell Telephone employees, with only 410 parking stalls provided in the parking garage. To encourage PNB employees to use transit or carpool, a $60/month parking fee was imposed for garage spaces, along with discounted or free parking for carpools. With intensive assistance provided by Seattle/King County Commuter Pool (now part of Metro) and the City of Bellevue ridesharing staff, a 50 percent employee carpool participation rate has been achieved. An additional seven to eight percent use transit.

While the PNB example is a special case because many of the company's employees previously used transit to commute to the company's former site in downtown Seattle, the Bellevue city staff believe it is still indicative of the higher mode splits for HOVs which can be achieved when parking supply is limited.

As a condition of receiving a building permit, the city requires new commercial developments within the Bellevue CBD to demonstrate that parking demand does not exceed on-site supply of between two and three spaces/1,000. A minimum of 20 hours per month of the project building management time must be reserved for the purpose of coordinating and marketing transit and HOV alternatives. The requirement of accommodating all parking demand on-site is being addressed in different ways by each developer. Four major office projects constructed within the past three years are Plaza Center, Skyline Tower, One Bellevue Center and Rainier Plaza. Listed below are the parking charges and occupancy rates for each building:
<table>
<thead>
<tr>
<th></th>
<th>Single-Family Residential</th>
<th>Multi-Family Residential</th>
<th>Office</th>
<th>Commercial</th>
<th>Manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Kent</strong></td>
<td>2 per dwelling unit</td>
<td>2 per dwelling unit if 49 or less dwelling units, 1.8 for 50+ units</td>
<td>1 per 250 gsf</td>
<td>1 per 500 gsf for most retail, 4.5 per 1,000 for shopping centers of less than 400,000 gsf, 5 per 1,000 if more</td>
<td>1 per 1,000 gsf</td>
</tr>
<tr>
<td><strong>Auburn</strong></td>
<td>1 for 2 bdr 2 spaces for 3 bdr</td>
<td>1½ spaces for 1-2½ bdr 2 spaces for 2½ or more</td>
<td>1 per 250 gsf</td>
<td>1 per 350 gsf 1 per 250 for &quot;nuisance&quot; businesses</td>
<td>1 per 750 gsf</td>
</tr>
<tr>
<td>(Has required more than minimum)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Renton</strong></td>
<td>2 per dwelling unit</td>
<td>1½ per dwelling unit</td>
<td>5 per 1,000 gsf</td>
<td>5 per 1,000 gsf</td>
<td>1 per 1,000 gsf</td>
</tr>
<tr>
<td>(Has no parking requirement in CBD)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Tukwila</strong></td>
<td>2 per dwelling unit</td>
<td>2 per unit</td>
<td>2.5 per 1,000 gsf</td>
<td>2.5 per 1,000 gsf (3.5 is what most commercial is using)</td>
<td>1 per 1,000 gsf</td>
</tr>
<tr>
<td><strong>Bellevue</strong></td>
<td>Non-CBD</td>
<td>Non-CBD</td>
<td>CBD Core: Min=2 per 1,000 nsf Max=2.7 per 1,000 nsf Non-CBD Core: Min=2.5/1,000 nsf Max=3.0/1,000 nsf Non-CBD (Proposed) Min=4/1,000 nsf Max=5/1,000 nsf</td>
<td>Retail CBD 3.3 per 1,000 gsf 5 maximum Non-CBD 4-5/1,000 nsf, depending on size</td>
<td>1.5 per 1,000 nsf (other than high technology and light industry)</td>
</tr>
<tr>
<td>(Proposed)</td>
<td>2 per dwelling unit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Redmond</strong></td>
<td>2 per dwelling unit</td>
<td>Studio-1.2 1 Bdr -1.5 2 Bdr -1.8 3 bdr -2</td>
<td>Community Business Zone 4.0-Min 5.0-Max Professional Office District &amp; Commercial Office District 3.5-Min 4.5-Max</td>
<td>Business Park/ Industrial 2 to 1,000 gsf 3 to 1,000 max</td>
<td></td>
</tr>
<tr>
<td><strong>Suburban res</strong></td>
<td>2 for 3+ bdr for urban res</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

T/SD-4/2
<table>
<thead>
<tr>
<th></th>
<th>Single-Family Residential</th>
<th>Multi-Family Residential</th>
<th>Office</th>
<th>Commercial</th>
<th>Manufacturing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bothell</td>
<td>3 per dwelling unit</td>
<td>2 per dwelling unit</td>
<td>4 per 1000 gsf</td>
<td>First 2000 gsf-1/200 gsf Greater than 2000 gsf-1/400 gsf</td>
<td>2/1000 gsf</td>
</tr>
<tr>
<td>Issaquah (No maximums)</td>
<td>2 per dwelling unit</td>
<td>2 per dwelling unit</td>
<td>4 per 1000 gsf</td>
<td>5 per 1000 gsf</td>
<td>1 per 1000 gsf</td>
</tr>
<tr>
<td>King County</td>
<td>2 per dwelling unit</td>
<td>1 1/2 per dwelling unit</td>
<td>1 per 200 gsf</td>
<td>1 per 200 gsf</td>
<td>1 per 1000 gsf</td>
</tr>
<tr>
<td>Des Moines</td>
<td>2 per dwelling unit</td>
<td>2 per dwelling unit</td>
<td>1 per 200 gsf</td>
<td>1 per 200 gsf</td>
<td></td>
</tr>
<tr>
<td>Normandy Park</td>
<td>No parking requirements.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kirkland</td>
<td>NA</td>
<td>NA</td>
<td>1 per 300 gsf</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Mercer Island</td>
<td>1 per dwelling unit</td>
<td>2 per dwelling unit</td>
<td>1 per 300 gsf</td>
<td>Retail = 1 per 400 gsf</td>
<td>1 per 3 employees with a minimum of 6 spaces</td>
</tr>
<tr>
<td>Seattle</td>
<td>1 space per 4 rooms</td>
<td>1 space per 4 rooms</td>
<td>Downtown .67 spaces per 1000 gsf in areas with high transit access, .94 spaces per 1000 gsf in areas with moderate transit access for long-term parking + 0.1 space per 1000 gsf for short-term parking. Maximum of 1 space per 1000 gsf unless special approval given. Outside downtown minimum requirement is 1 space/1000 gsf. No maximum.</td>
<td>Retail .40 spaces per 1000 gsf in areas with high transit access, .70 spaces per 1000 gsf in areas with moderate transit access for long-term parking. Short-term requirement is .5 space per 1000 gsf.</td>
<td>.20 spaces per 1000 gsf</td>
</tr>
<tr>
<td>JURISDICTION</td>
<td>PARKING REQUIREMENTS (Spaces/1,000 GSF)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----------------------------------</td>
<td>----------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eno Foundation</td>
<td>Min. - 0.8, Max. - 13.3, Mean - 3.33</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washington Metro Area</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Montgomery County</td>
<td>2.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gaithersburg</td>
<td>3.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rockville</td>
<td>3.33</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prince George's County</td>
<td>4.0 1st 2,000 GSF + 2.5 for additional GSF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>District of Columbia</td>
<td>0 - 1.67, depending on Zone</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alexandria</td>
<td>2.5 - 3.0, depending on planning district</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arlington</td>
<td>3.33 1st 5 floors + 2.5 for additional units</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fairfax County</td>
<td>4.5/1,000 NSF(^1) + 1.0/company vehicle</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate to Large Cities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Baltimore, MD</td>
<td>0.5 - 2.5 depending on Zone</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Orleans, LA</td>
<td>2.0 - 2.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oakland, CA</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phoenix, AZ</td>
<td>3.33</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Richmond, VA</td>
<td>2.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>St. Paul, MN</td>
<td>5.0/1,000 SF &quot;usable floor area&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tampa, FL</td>
<td>1.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suburban Counties or Municipalities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bellevue, WA</td>
<td>Min. 2.0, Max. 3.0/1,000 Net SF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cambridge, MA(^2)</td>
<td>1.0 - 1.67 min.; 1.5 - 3.33 max.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evanston, IL</td>
<td>2.5/1,000 GSF over 2,000 GSF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Henrico Co., VA</td>
<td>3.33</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oak Park, IL</td>
<td>2.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tempe, AZ</td>
<td>5.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walnut Creek, CA</td>
<td>4.0/1,000 GLSF</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) Net square feet.

\(^2\) Maximums may be exceeded but with FAR penalty. This has been done on some occasions.


**TABLE 9**
Parking Requirements for Office Buildings in Selected Jurisdictions
<table>
<thead>
<tr>
<th>JURISDICTION</th>
<th>PARKING REQUIREMENTS (Spaces/unit)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eno Foundation</td>
<td>Mean - 1.2, Min. - 0.5, Max. - 2.0</td>
</tr>
<tr>
<td>Washington Metro Area</td>
<td></td>
</tr>
<tr>
<td>Montgomery County</td>
<td>1 BR - 1.0, 2 BR - 1.25, 3+ BR - 1.5</td>
</tr>
<tr>
<td>Gaithersburg</td>
<td></td>
</tr>
<tr>
<td>Rockville</td>
<td>1 BR - 1.0, 2 BR - 1.25, 3+ BR - 1.5</td>
</tr>
<tr>
<td>Prince George's County</td>
<td>1 BR - 1.33, 2 BR - 1.66, 3 BR - 1.99</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>0.25 - 1.0/unit</td>
</tr>
<tr>
<td>Alexandria</td>
<td>1 BR - 1.0, 2+ BR - 1.5</td>
</tr>
<tr>
<td>Arlington</td>
<td>1.13 1st 200 units + 1.0 for additional units</td>
</tr>
<tr>
<td>Fairfax County</td>
<td>1.5/unit</td>
</tr>
<tr>
<td>Moderate to Large Cities</td>
<td></td>
</tr>
<tr>
<td>Baltimore, MD</td>
<td>0.25 - 1.0/unit</td>
</tr>
<tr>
<td>New Orleans, LA</td>
<td>1.0/unit</td>
</tr>
<tr>
<td>Oakland, CA</td>
<td>1.0 - 1.5/unit</td>
</tr>
<tr>
<td>Phoenix, AZ</td>
<td>1 BR - 1.3; 2 BR - 1.5; 3+ BR - 2.0</td>
</tr>
<tr>
<td>Richmond, VA</td>
<td>1.5/unit</td>
</tr>
<tr>
<td>St. Paul, MN</td>
<td>1.5/unit</td>
</tr>
<tr>
<td>Tampa, FL</td>
<td>1.0/unit</td>
</tr>
<tr>
<td>Suburban Counties or Municipalities</td>
<td></td>
</tr>
<tr>
<td>Bellevue, WA</td>
<td>Min. 1.0/unit, Max. 2.0/unit</td>
</tr>
<tr>
<td>Cambridge, MA</td>
<td>1.0/unit</td>
</tr>
<tr>
<td>Evanston, IL</td>
<td>1.0 for units 700 SF; 1.25 for units 700 SF</td>
</tr>
<tr>
<td>Henrico Co., VA</td>
<td>1.5/unit</td>
</tr>
<tr>
<td>Oak Park, IL</td>
<td>1.0/unit (max. 2.0/unit)</td>
</tr>
<tr>
<td>Tempe, AZ</td>
<td>1 BR - 1.5; 2-3 BR - 2.0</td>
</tr>
<tr>
<td>Walnut Creek, CA</td>
<td>1.25 - 1.67/unit</td>
</tr>
</tbody>
</table>

1/ Zoning, Parking and Traffic, Eno Foundation, 1972 - Compilation of over 300 zoning ordinances around the country.


**TABLE 10**
Parking Requirements for Multi-Family Dwellings in Selected Jurisdictions
<table>
<thead>
<tr>
<th>JURISDICTION</th>
<th>PARKING REQUIREMENTS (Spaces/1,000 GLSF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eno Foundation</td>
<td>Mean - 4.4, Min. - 1.0, Max. - 13.3</td>
</tr>
<tr>
<td>Washington Metro Area</td>
<td>10/1,000 SF patron area + 3.33 - 0.67/1,000 SF add 1 area(^{1/})</td>
</tr>
<tr>
<td>Montgomery County</td>
<td>5.56 for floors at grade + 2.5 for other floors(^{2/})</td>
</tr>
<tr>
<td>Gaithersburg</td>
<td>7.5 up to 10,000 GLSF + 5.0 for additional area</td>
</tr>
<tr>
<td>Rockville</td>
<td>By parking generation group: 6.67/1,000 GSF normal; 10.0 high; 2.0 low</td>
</tr>
<tr>
<td>Prince George’s County</td>
<td>No req’t 1st 1,000 GSF; 0 - 5/1,000 GSF additional area</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>3.03 - 5.22 for buildings over 20,000 GLSF</td>
</tr>
<tr>
<td>Alexandria</td>
<td>5.0/1,000 GLSF</td>
</tr>
<tr>
<td>Arlington</td>
<td>5.0 for 1st 1,000 GLSF + 6 for each additional 1,000 GLSF</td>
</tr>
<tr>
<td>Fairfax County</td>
<td>1.66 - 3.33/1,000 GLSF</td>
</tr>
<tr>
<td>Moderate to Large Cities</td>
<td>1.66 - 5/1,000 GSF</td>
</tr>
<tr>
<td>Baltimore, MD</td>
<td>2.5 - 5/1,000 GLSF</td>
</tr>
<tr>
<td>New Orleans, LA</td>
<td>-</td>
</tr>
<tr>
<td>Oakland, CA</td>
<td>5.0/1,000 GLSF</td>
</tr>
<tr>
<td>Phoenix, AZ</td>
<td>6.67/1,000 SF &quot;usable floor area&quot;</td>
</tr>
<tr>
<td>Richmond, VA</td>
<td>2.0/1,000 GSF</td>
</tr>
<tr>
<td>St. Paul, MN</td>
<td>Min. 4.0/1,000 GSF, Max. 5.0/1,000 GSF</td>
</tr>
<tr>
<td>Tampa, FL</td>
<td>1.11 - 2.0 min.; 1.67 - 4.0 max.</td>
</tr>
<tr>
<td>Suburban Counties or Municipalities</td>
<td>3.33/1,000 GSF over 2,000 GSF</td>
</tr>
<tr>
<td>Bellevue, WA</td>
<td>5.0/1,000 GLSF</td>
</tr>
<tr>
<td>Cambridge, MA</td>
<td>Oak Park, IL 2.0/1,000 GSF</td>
</tr>
<tr>
<td>Evanston, IL</td>
<td>Henrico Co., VA 4.0/1,000 GSF</td>
</tr>
<tr>
<td>Henrico Co., VA</td>
<td>Walnut Creek, CA 3-4SF parking/1 GSF floor area</td>
</tr>
</tbody>
</table>

\(^{1/}\) Regional shopping centers in separate category with 5.41/1,000 GLSF
\(^{2/}\) For shopping centers over 600,000 GLSF, 5.0 for floors at grade plus 2.5 for other floors


**TABLE 11**
Parking Requirements for Retail Uses in Selected Jurisdictions
<table>
<thead>
<tr>
<th>Monthly Parking Rate for SOV's</th>
<th>Monthly Parking Rate for 3-Person Carpool</th>
<th>Reserved Parking for Carpools?</th>
<th>Occupancy Rate (as of 12/86)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plaza Center</td>
<td>$37</td>
<td>$27</td>
<td>No</td>
</tr>
<tr>
<td>Skyline Tower</td>
<td>$43</td>
<td>$20</td>
<td>Yes</td>
</tr>
<tr>
<td>One Bellevue Center</td>
<td>$55 (covered)</td>
<td>No discount</td>
<td>No</td>
</tr>
<tr>
<td>Rainier Plaza</td>
<td>$35 (surface)</td>
<td>No Discount</td>
<td>No</td>
</tr>
</tbody>
</table>

Although Skyline Tower offers both preferential parking spaces and a discount for carpoolers, the developer has not been able to realize significant ridesharing usage because of the low building occupancy rate.

If the City determines that the development is not meeting all of its parking demand on-site, a Transportation Management Plan designed to reduce single-occupant vehicle trips must be submitted. The building permit agreement sets a ceiling on the developer's cost to implement that plan.

C. The City of Seattle's Experience with Preferential Carpool Parking Requirements

The city of Seattle requires each new downtown development to meet its parking demand on-site through a substantial commitment to ridesharing. In 1978 the city adopted specific policies authorizing city agencies to require measures to mitigate adverse parking impacts as part of the environmental review process. One of these mitigating measures was a requirement to provide preferential parking spaces for carpool or vanpool vehicles.

The city's downtown parking policies had two major objectives: to encourage alternatives to SOVs, and to control the supply of parking spaces downtown. Amendments to the zoning code removed the minimum parking requirement for certain areas of downtown and placed a ceiling on the amount of parking that could be provided by a project. These amendments, however, focused only on limiting the supply of parking and did not enact specific measures to
promote alternatives to SOVs. The assumption was made that limiting the supply of parking would automatically encourage ridesharing.45

In 1981 the city established a method for estimating the parking demand of downtown buildings. The methodology started with an estimate of the number of employees, based on the projected square footage, and then allocated these employees to several modes of arrival. A large percentage was estimated to use transit, based on existing and projected levels of transit ridership. An estimate of 10% or less of the employees was assumed to ride bicycles or walk. The remaining employees were divided into two groups: those who drove alone to work and those who rode with others. Demand in terms of the number of parking spaces was then determined, with the specific number of SOVs isolated.

To accomplish the goal of increasing the number of employees ridesharing, the city developed a carpool parking set-aside requirement. The number of SOV spaces was divided by three (the minimum number of individuals necessary to qualify as a carpool on the freeway HOV lanes at the time) and the resulting number of spaces had to be set aside for the exclusive use of carpools. If such spaces were empty by 9:30 a.m., they could then revert to short-term parking. In no event, however, were the set-aside spaces to be leased as long-term parking for non-carpool vehicles.

To promote carpool use within the project, the developer was also required to undertake the following actions:

1. Establish a transportation coordinator within the building.
2. Conduct periodic promotional efforts to encourage employee use of transit and carpools.
3. Grant a designated Commuter Pool representative right of entry to the parking facilities to monitor results on a quarterly basis.

The city was to reevaluate the effectiveness of the ridesharing conditions 12 months after the building achieved 80 percent occupancy.
By mid-1981, several of the office buildings approved with ridesharing conditions were completed and occupied. The effectiveness of the ridesharing program was evaluated on the basis of the following criteria:

1. Effectiveness in reducing the opportunity for long-term SOV parking
2. Use of the carpool set-aside spaces
3. Private sector acceptability, and
4. Enforceability of ridesharing conditions

From 1979-1982, Seattle's program of requiring ridesharing conditions on building permits theoretically reduced long-term parking supply for SOVs by 42 percent. However, at no time did verified carpools and vanpools occupy more than 2 percent of the total number of parking spaces set aside for HOVs in the garage facilities. Five possible reasons for this lack of use were:

1. Employees who formerly drove alone and might have carpooled and parked at the site were now arriving at the building by transit, bicycle, walking, or were being dropped off.
2. Employees were parking at other, less costly locations nearby.
3. The original estimate of long-term parking demand may have been too high.
4. The carpool parking set-aside may not have been properly administered by the developers. It appeared that some developers were allowing tenants of a project to park SOVs in long-term spaces owned by the developer in another section of the CBD, while converting the carpool set-aside spaces at the new project to short-term parking.
5. Carpoolers working in buildings close to the city's public carpool parking area may have chosen to park there rather than at their building because the city's rate was $10.00 per month, as opposed to the market rate of $80.00.
Evaluation of the ridesharing program's acceptability to developers indicated that the program failed on this point. Developers resented restrictions on the use of their long-term parking supply and perceived the carpool parking set-aside as a threat to the marketability of their project. In addition, the ridesharing requirement was often applied at the end of the permit-approval process.

Within the past few years the city's ridesharing requirement for new CBD office buildings has changed somewhat, based on the lessons learned during the first few years of the program. The primary changes are:

1. The traffic mitigation requirements have been incorporated into the city's zoning code, rather than being handled as part of the environmental review process. This enabled developers to know the requirements in advance of the review of a development proposal.

2. The definition of "carpool" was changed from three persons to two persons.

3. The carpool parking set-aside has been replaced by a requirement which gives the developer the option of either setting aside at least 20 percent of the long-term parking spaces for use by carpools, or providing a minimum of a 30 percent discount on the parking rates for carpoolers.

As of December 1986, the city has agreements for carpool parking provision with about 18 buildings. There are about 1,900 off-street carpool parking spaces in buildings and 640 additional spaces in the public carpool parking area.
REFERENCES

Section 4: Parking Management


4. Ibid., p. 34.

5. Ibid., p. 37-38.


7. Ibid., p. 7.

8. Ibid., p. 7.


10. These construction costs are derived from costs in downtown Seattle.


13. Jan Aarts and Jeffrey Hamm, The Effect of Ridesharing Programs on Suburban Employment Center Parking Demand, Seattle, Wa., January 1984, p. 11.


15. Ibid., p. 2.


20. Ibid., p. 62.
21 Ibid., p. 153
23 Ibid., p. 7.
24 Ibid., p. 4.
25 Ibid., p. 4.
26 Op Cit., *New Directions in Central Business District Parking Policies*.
30 Op Cit., *New Directions in Central Business District Parking Policies*.
32 Telephone interview with Alan Bennett, Seattle Ridesharing Coordinator, March 28, 1986.
36 Ibid., p. 13.
41 Op Cit., *The Effect of Ridesharing Programs on Suburban Employment Center Parking Demand*
42 Ibid., p. 16.


46 Ibid., p. 489.
Section 5:

Mechanisms For Incorporating Public Transportation Concerns Into The Development Review Process
I. FACTORS CONSIDERED BY METRO IN REVIEWING DEVELOPMENT PROPOSALS

Local jurisdiction planning staffs have an opportunity to incorporate public transportation concerns at a number of steps in the planning process:

- Comprehensive plans
- Transportation/community plans
- Educational institutions' general development/facilities plans
- Neighborhood/community plans
- Zoning code
- Development site plans

In reviewing environmental impact statement documents, Metro staff have the following general concerns regarding any type of development or action:

1. General traffic impacts - To what extent will traffic to and from the project contribute to congestion on roadways in the vicinity of the project?

2. Is the development of sufficient density by itself to warrant possible consideration of transit service or, if transit service is already present, a bus zone with shelter facilities?

3. Has the developer proposed measures to reduce single-occupant vehicle trips to and from the site? Is there an opportunity for employer-sponsored, Metro-assisted transportation management programs?

4. Is the developer proposing programs consistent with local and regional ridesharing goals?

5. Is the amount of parking being provided higher than the local jurisdiction's requirement?

In reviewing development site plans, Metro's concerns focus principally on internal circulation (in particular, whether a bus could use the road system) and accessibility to public transportation service if the development is of sufficient size that it may need service.
In areas of significant traffic congestion, such as downtown Seattle and downtown Bellevue, Metro reviews proposed development projects on the basis of the following points:

- Access of coaches to bus zones
- Access of pedestrians to zones unimpeded by street furniture, or vehicles coming or going to structured parking garages, lots, etc.
- Spacing between zones
- Opportunities for on-site rideshare programs or joint programs with adjacent sites.

Particular types of projects are reviewed for the following factors:

**Office/Industrial/Manufacturing**

- If transit service is available, Metro evaluates how far employees would have to walk to the nearest bus stop. Is the developer providing a direct pedestrian connection, or does the employee have to walk through an expanse of parking to reach the bus stop? Is a passenger shelter being provided?

- Is it practical to route service through the development? If so, attention needs to be paid to roadway system geometries, pavement thickness, congestion and bus turnaround areas.

- Is the proposed parking supply greater than that required by the local jurisdiction and likely to discourage use of high occupancy vehicles?

- Has the project proponent developed a Transportation Management Plan (TMP) or an on-site rideshare program? The elements of a TMP may include, but are not limited to, the following:
  
  a. Distribute information concerning alternative transportation modes to employers for their employees or directly to employees.
b. Provide ridesharing information.

c. Provide a Commuter Information Center if there is a large employer or central location with protected pedestrian access.

d. Encourage employers to participate in subsidized vanpool programs.

e. Provide transit pass and carpool/vanpool subsidies to employees using these modes.

f. Participate in the provision of shuttle or other paratransit services to and from key transit centers, park-and-ride lots, etc.

g. Provide a preferential HOV parking program.

h. Participate in a Transportation Management Association, if one exists.

i. Sell transit passes on-site.

j. Encourage employers to allow flexible working hours for as many employees as possible.

**Shopping centers**

- Location, traffic, and access are the greatest concerns
- Internal road network should accommodate the movement of coaches
- Route facilities (e.g., passenger shelters) should be readily accessible to shoppers
- Opportunities for leased park-and-pool space are reviewed
- Opportunities for rideshare incentives for employees and subsidies for customers are evaluated.
Residential subdivisions

- If transit service is available, accessibility to route facilities is of more concern. This is particularly true where some type of open space area buffers the roadway from the development.
- The road system may need more attention if it is practical to route service through the development.
- Metro encourages provision of rideshare materials in common spaces, if they exist (such as apartment building lobbies).

Road improvement projects

- Road improvement projects are primarily a concern to Metro because of possible impacts on bus service. Metro needs to be provided with adequate notice of any forthcoming road work which has the potential to delay or otherwise disrupt normal service.
- Geometrics and pavement thickness for new roadways should be designed to standards that accommodate transit vehicles.
- Opportunities for HOV facilities are evaluated.
II. SPECIAL ZONING TOOLS AVAILABLE FOR ENCOURAGING PUBLIC TRANSPORTATION

A variety of specialized zoning techniques can be adopted by local jurisdictions to bring about public transportation-oriented land use development. These zoning techniques include the following:

- **Planned Unit Development**\(^1\)

  Rather than approving a large development on a lot-by-lot basis, the local government approves the entire project or large portions of the project at one time, in exchange for the developer dedicating various public amenities within the projects. The local governing body may be able to require dedication of land for transit facilities such as bus turnouts, benches, shelters, landing pads, and similar items.

- **Floating Zoning**\(^2\)

  A floating zone is a zoning district adopted in a zoning ordinance but not fixed to any location in the community. Floating zoning is usually intended to locate one or more particular uses in an area devoted to other uses. It is often used to locate planned unit developments. By allowing planned unit developments, more transit orientation is likely to occur.

- **Bonus or Incentive Zoning**\(^3\)

  Zoning incentives are provisions built into a zoning code that permit an applicant to acquire expanded development rights, such as higher densities, in exchange for providing some public benefit, including locating near existing transit service. Another possible form of this concept is to require less parking from developers near existing transit service.
Mixed-Use Zoning

This concept allows dissimilar but compatible uses within the same area. Use of this concept can provide more efficient use of transit by generating trips at all times of the day.

Special Districts

Some cities such as Portland, Oregon have set up a special commercial district in the downtown area. The main goal of the commercial district is to control types of land use and limit auto use by controlling the cost of parking. Another technique is to develop critical area overlays with special transportation system management requirements designed to reduce single-occupant vehicle traffic.

Special Neighborhood Commercial Zones

This concept involves the establishment of small shopping centers within each neighborhood. This can result in less auto travel and a greater orientation toward public transit.

Land Banking

Land banking refers to the practice of state or local governments acquiring land in advance of development to ensure the continuing availability of sites, control timing, location, type and scale of development; prevent urban sprawl; and reserve for the public those gains in land values resulting from governmental activity. Although a controversial practice, land banking can be useful in encouraging transit-supportive development, particularly as part of an overall corridor development strategy.

Transit Zoning Districts

The establishment of a transit zoning district could be considered wherever a major fixed transit facility, such as a transit center, exists. The adoption of a
new zoning classification similar to other special district classifications would be required. This would allow consideration of higher density residential uses and also encourage "mixed use" development through rezoning and incentives near transit facilities. Site design review would be required for all new development proposed in the zone.

The general approach involves rezoning blocks immediately around the transit facility to allow higher-density residential development and prohibit automobile-oriented uses. The zoning code would be amended to require pedestrian improvements near transit facilities. Developers would be encouraged to develop land in a way that serves the public interest by allowing density bonuses and/or reducing parking requirements.

Transit compatible zoning has been used in the Portland, Oregon area, where a new light rail line opened in Fall, 1986. In 1982 the City of Gresham, a suburban terminus of the light rail line, created two special land use designations: a central urban core area and transit development districts. The central core area was formed to promote mixed use development (retail/residential/office) within the city's downtown area. Three transit development districts of 10-11 acres in size were established, each surrounding a light rail station. The primary uses allowed in these districts are high-density residential and business office development. Residential density within the transit development districts ranges from 24-45 dwelling units per acre. Up to 75 dwelling units per acre is permitted if the developer provides a direct pedestrian connection from the residential complex to the light rail station. The city has also upzoned several existing residential areas, attempting to allow increases in density while maintaining the character of the older residential neighborhoods. Gresham hopes to develop a special parking district, where developers would have a choice of providing their own parking or paying an "in-lieu-of" fee. The city would then use the latter to create municipal parking and promote shared parking opportunities. Multnomah County is using a similar approach to promote transit-compatible development around its new light rail stations.
Transportation Systems Management Ordinance

Adoption of a TSM ordinance would enable a local jurisdiction to impose traffic mitigation requirements on commercial, residential, and retail developers as a condition of development. By incorporating such requirements into the zoning code, as opposed to the EIS review process, local governments provide developers a better opportunity to include the cost of a TSM program in their project budget at the outset of their proposal.
REFERENCES

Section 5: Mechanisms for Incorporating Public Transportation Concerns into the Development Review Process


2 Ibid., p. 12

3 Ibid., p. 12

4 Ibid., p. 13

5 Ibid., p. 13

6 Ibid., p. 13

7 Op Cit., Planning with Transit—Land Use and Transportation Planning Coordination, pp. 39-40

8 Ibid., pp. 40 and 42
APPENDIX
PHONE NUMBERS FOR METRO SERVICES

Ridematch - 625-4500
Transit pass subsidy - 684-1716
Custom bus - 684-1543
Environmental review - 684-1612
Memorandums of Agreement (City of Seattle) - 684-1607
Transportation Management Plans (Other than City of Seattle) - 684-1613
Carpool certification program - 684-1607
Transportation Systems Management (TSM) Ordinance - 684-1620
Downtown Seattle Transit Project - 684-1420
Transit Centers - 684-1636
Park-and-Ride/Pool lots - 684-1652
Vehicle specifications - 684-1629
General route information - 447-4800
METRO CONTACT PERSONS FOR KING COUNTY SUBAREAS

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King County

Maple Valley

Algona/Pacific

Ala"
GLOSSARY

**bonus zoning** - a zoning tool which permits developers to be awarded a bonus, such as increased density, in exchange for providing desired amenities, such as additional open space or wider sidewalks.

**cooperative financing** - the concept that private development must bear a larger share of the cost of public infrastructure.

**custom bus service** - bus service open to the general public which is typically commuter-oriented, operating fixed routes and schedules tailored to the travel times and patterns of "subscribers."

**demand responsive** - refers to a transportation service that does not stay on a fixed route, but deviates to provide door-to-door service to customers who phone in advance.

**destination parking** - refers to parking management programs at the activity center end of a trip, such as employment sites.

**delayed parking provision** - a provision written into a zoning code that allows a developer to build less parking in exchange for reserving a portion of the site as landscaping, in case additional parking is needed in the future.

**employee density** - the number of employees per 1,000 square feet of work space.

**flexible parking requirements** - parking requirements that relax the amount of off-street parking called for in local zoning codes in return for developer support of public parking, mass transit, or ridesharing programs.

**floating zoning** - a zone that floats over the county until it is affixed to a particular parcel of land. In typical application, the local jurisdiction creates a zone outlining certain uses and when a property owner submits an application for development that can go in only that type of zone, the legislative body may designate such a zone on the official zoning map.

**fringe parking** - parking facilities located outside, but in close proximity to, the CBD.

**headway** - time interval between successive in-service vehicles traveling in the same direction, usually expressed as an average number of minutes.

**HOVs** - high occupancy vehicles; vehicles carrying three or more persons (two under specific circumstances).

**land banking** - large scale acquisition of land directly by governmental bodies.

**level-of-service (LOS)** - a qualitative measurement of the level of traffic congestion on a roadway, based on vehicle operating speed, travel time, traffic interruptions, safety and driving comfort. Measured on a scale from "A" to "F" with A indicating the best service and F indicating the worst service.
mandatory ceilings - refers to an upper limit placed by a local jurisdiction on the number of parking spaces that can be provided by a developer.

mixed use development - a development which contains a variety of land use types in one project.

mixed use zoning - zoning which permits a combination of usually separated uses within a single development.

mode split - the percentage of overall trips made by different means of transportation.

net residential density - density of the residential acreage; excludes land that is vacant or zoned for other purposes.

origin parking program - refers to parking programs developed at the origin, or home, end of a trip, such as park-and-ride/pool facilities.

parking management - actions taken to alter the supply, operations, and/or parking demand of a jurisdiction's parking system and to further the attainment of local transportation, economic, environmental, and other objectives.

passenger loading zones - locations designated for picking up transit, carpool, or vanpool passengers.

planned unit development - a development characterized by a unified site design for a number of housing units, clustering buildings, and providing common open space, density increases and a mix of building types and land uses. It permits the planning of a project and the calculation of densities over the entire development, rather than on an individual lot-by-lot basis.

productivity - a measure of the ridership of a transit route, as a ratio of the route's capacity.

residential parking permit program - a form of on-street parking supply restriction designed to control the excess parking demand created by persons who live outside a neighborhood but park their vehicles there in order to shop, work, or attend school nearby.

revenue hour - an aggregation of time during which service is available to carry passengers; it excludes layover, deadhead, or other "non-revenue" service time.

secondary urban area - areas just outside the Seattle Central Business District which have an expected high transit demand.

special districts - districts established to accommodate a narrow or special set of uses or purposes, such as open-space districts, transit impact districts, or research park districts.

SOVs - single-occupant vehicles.

transit zoning districts - a zoning approach which involves rezoning blocks immediately around a transit facility to allow higher-density residential development.
Transportation Management Association - an organization that seeks collaboratively to solve parking, transportation and access problems of growing urban centers through non-capital intensive programs.

Transportation Systems Management (TSM) Ordinance - an ordinance passed by a local jurisdiction which requires developers to provide incentives to building occupants to use alternatives to the private auto.

trip attractions - destinations which attract a large number of trips.

trip productions - land use types which produce a large number of trips at the origin end, for example, multi-family housing.

volume/capacity ratio - a measure of traffic congestion on a particular roadway. If the volume/capacity ratio is greater than 1, then the traffic volumes exceed the design capacity of the roadway.
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