TRAFFIC MANAGEMENT AND RESTRAINT BY PARKING CONTROL IN GREATER LONDON

A. D. May, Department of Planning and Transportation, Greater London Council

This paper sets out the objectives and methods of parking control as used for traffic restraint in Greater London and advocates control predominantly by pricing. Using results of surveys summarized in the report it suggests that a 15 percent reduction can be achieved in car commuting to Central London.

•THE Greater London Council (GLC) is the strategic planning and traffic authority for Greater London and has set out in the Greater London Development Plan broad strategies and policies for London's future. The plan provides a framework for the 33 local planning authorities whose responsibilities include parking provision and control.

In discussing transportation planning, the plan accepts that full demand for road use cannot be met by building new primary roads and that some means of regulating this demand (other than the inefficient deterrent of congestion) is required (1). To this end, the plan supports traffic restraint measures that have the following characteristics:

1. Flexibility—so that demand can be adjusted to match traffic and environmental needs in a changing transport network without imposing too severe a restriction on any element of the community;
2. Selectivity—so that greater control can be imposed on the journey to work and other trips for which public transportation is available;
3. Equity—so that the measures can be accepted by the community at large; and
4. Simplicity—so that the measures are easy to administer and enforce.

The potential restraint measures fall into three categories:

1. Parking controls, placed on either the availability or use of parking space;
2. Charging for use, by establishing, for example, supplementary licensing or road pricing (2); and
3. Physical controls, by using, for example, bus lanes, pedestrian areas, and road closures.

The plan recognizes that, of these measures, parking control is most readily available and advocates its use as the main restraint tool. However, it foresees the need for other types of restraint in the future.

BASIS OF PARKING POLICY

The GLC's parking policy has been developed over a number of years. Its framework is set out in the plan, but some of its details are still being determined as experience is gained in the use of parking control as a restraint tool.

Objectives

The main objectives are those of flexibility, selectivity, equity, and simplicity. In addition to these objectives, which are common to all restraint methods, there are three main considerations arising from the need to provide parking space as a service:

1. Finance—Any subsidy to the motorist in apportioning costs of parking supply and operation will need to be justified and should not conflict with the need for restraint.

2. New provision—New parking places should be provided if the demand justifies them after restraint has been imposed and if the financial objectives can be met.
3. Operational efficiency—Those who use parking spaces should be able to do so with the minimum of inconvenience. In practice this means that, except in unusual circumstances, some spare spaces must always be available and that all forms of publicly operated parking should be operated so as to be internally compatible.

Areas of Control

Because parking control provides a restraint on the trip end, it will be most effective if imposed in areas with high concentrations of trip ends. Because these are also the areas best served by public transport, restrictions on car use will cause the user less inconvenience. The areas in which it is proposed to exercise control are the Inner London parking area, a 40-square-mile area that includes the central area and a surrounding belt of shopping, office, and higher density residential districts, and the 24 town centers outside this area that have been designated in the plan as the main centers of attraction in Outer London. These areas are shown in Figure 1.

Control on Supply

Limits on the number of parking spaces would clearly help to reduce trip ends in an area; however, they provide a very inflexible means of control and do not of themselves ensure that the available space is used in the required way. Without control of use, the limited number of spaces would operate on a first-come, first-served basis, thus accommodating predominantly commuter parkers, and would also be heavily oversubscribed, leading to inefficient use because drivers would have to search for parking spaces.

Current policy therefore places more stress on control of use and only imposes stringent controls on supply when use cannot be controlled.

For efficient operation, the policy recommends that some spare capacity should be available even at peak-demand periods. Peak occupancies of 85 percent for on-street parking and 90 to 95 percent in public parking lots are recommended.

Within the overall supply, some change from on-street to off-street provision could take place. However, the extent will be limited by the cost of conversions [in Central London average costs per parking space per year, including debt charges, are $720 for multistory parking lots and $140 for meters (3)] and by the need to maintain some short-term parking space within easy reach of all points of attraction in the area.

Control on Use

Four main methods of control are available, either individually or in combination. They are as follows:

1. Time limits on the availability of parking space—Such limits could be imposed, for instance, to limit supply during the peak periods. Although they provide a somewhat more flexible means of control than limits directly on the supply of parking space and are relatively easy to enforce, the limits are not equitable because they do not permit essential parking during the control periods and they put undue pressure on the spaces that are not similarly controlled. In Central London, at least, they would have to be very restrictive because more than 30 percent of on-street spaces are still unoccupied by the end of the morning peak.
2. Time limits on parking duration—These limits are imposed mainly on meter parking. They provide space for short-term parkers, who are predominantly on shopping, business, and leisure trips, and deter the car commuter. However, they also deter the essential long-term parker and particularly the resident, who should be encouraged to leave his car at home. Of particular concern is the difficulty of enforcing such limits adequately.
3. Allocation by permit to certain classes of user—Such allocation is usually used to safeguard certain users, such as residents, rather than to restrain those users who are not favored. It is clearly selective but may not be a sufficiently flexible means of

control because, for administrative reasons, fairly broad classes of users have to be defined. Although easy to enforce, this type of allocation does not necessarily ensure availability of space to the permit holder.

4. Pricing—Pricing provides a highly flexible means of control that can be used to discourage certain types of users and encourage others. By charging at different levels in different types of parking space, a satisfactory distribution of parking can be obtained, demand can be kept below the supply level, and some return on investment can be obtained. The main drawback is that pricing favors the wealthier members of the community and particularly those who have their parking charges paid for them. A survey in 1966 indicated that 28 percent of Central London car commuters had their parking expenses refunded (4). Even so, willingness to pay provides some measure of need to park, and increases in parking charges can be expected to have some effect on the majority of users.

DETAILED POLICY AND ITS IMPLEMENTATION

Types of Parking Spaces Available

The detailed parking policy is best considered in terms of the different types of spaces available. These are as follows:

1. Free, uncontrolled on-street spaces that are being eliminated as controls are introduced.
2. Free, controlled on-street spaces that are provided where demand is low. Controls dictate the places in which cars may park, in the interests of safety, but not the way in which spaces are used.
3. Paid for, controlled on-street spaces that are usually regulated by meter although some ticket machines are used. The control period is usually 8:30 a.m. to 6:30 p.m., Monday through Saturday.
4. Residents' on-street space permits that are obtained from the local authority. The resident pays either daily or for longer periods to use such space in the zone in which he lives. The control period is identical to that for meters.
5. Publicly available off-street parking lots that are operated by the local authority.
6. Publicly available off-street parking lots that are operated privately. In these, the private operator determines the terms of operation.
7. Private off-street parking lots that are attached to nonresidential developments. Use of these is restricted to trips connected with the development; they are predominantly attached to office development. Legally, they cannot be used as public parking lots.
8. Private off-street parking lots that are attached to residential developments. These operate in the same way as in the preceding item.

Table 1 gives the current distribution of parking spaces by type in the central area, the remainder of the Inner London parking area, and three strategic centers: a large shopping and office center (Croydon), a smaller shopping center (Woolwich), and a medium-sized shopping center in which parking has not yet been controlled (Wood Green). It can be seen that, in Central London and Croydon, private nonresidential parking forms the largest single element of the total supply and public parking spaces form the second largest group. In the remainder of the Inner London parking area (about 20 percent of which has on-street controls) and in Wood Green, uncontrolled on-street spaces predominate. Woolwich is typical of many of the shopping centers with on-street controls in having the largest proportion of spaces in public parking lots.

Patterns of Use of Different Types of Parking

Use of different types of parking spaces was recorded in a study of nonresidential parking spaces conducted in Central London in 1966 (4), which is summarized in Table 2. Free on-street space had the highest peak occupancy, average levels of peak-period arrivals, turnover, and duration, and an even distribution of trip purposes. Experience since the survey suggests that, as the number of free spaces has fallen, occupancy has

Figure 1. Centers of activity in Greater London.

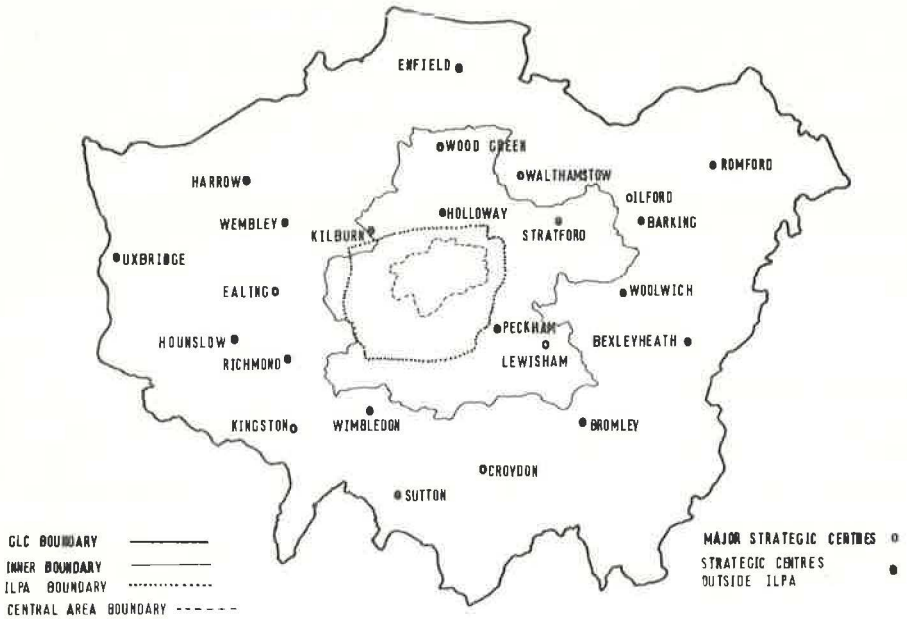

Table 1. Distribution of parking spaces in London areas, 1972.

Characteristic	Central Area (10.4)[a]		Remainder of ILPA[b] (40)		Croydon (2.0)		Woolwich (0.15)		Wood Green (0.4)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
On-street parking										
Free and uncontrolled	5,000	4	252,000	61	Nil	—	Nil	—	2,500	73
Free and controlled	Nil	—	Nil	—	2,200	10	500	18	Nil	—
Metered	21,000	17	9,000	2	1,400	7	300	11	Nil	—
Residents only	8,000	6	22,000	5	Nil	—	Nil	—	Nil	—
Total	34,000	27	283,000	68	3,600	17	800	29	2,500	73
Off-street parking										
Public, officially operated	5,000	4	4,000[c]	1	5,400	26	700	25	200	6
Public, privately operated	27,000	21	9,000[c]	2	200	1	300	11	Nil	—
Total public	32,000	25	13,000	3	5,600	27	1,000	36	200	6
Private nonresidential	45,000	36	53,000	13	5,700	27	600	21	300	9
Private residential	15,000	12	65,000	16	400	2	400	14	400	12
Total off-street	92,000	73	131,000	32	17,300	83	2,000	71	900	27
Grand total	126,000	100	414,000	100	20,900	100	2,800	100	3,400	100

[a]Area in square miles.
[b]For enumeration purposes a somewhat larger area has been used.
[c]Estimated proportions based on proportion of inner London public parking lot spaces operated by the local authority.

Table 2. Use of different types of parking spaces.

Type of Space	Free On-Street (uncontrolled)	Metered On-Street	Public Off-Street	Private Nonresidential
Peak occupancy (percent)	87.4	84.3	67.5	72.6
Percentage of all arrivals during morning peak (7:00 to 10:00 a.m.)[a]	29.5	14.8	56.9	48.0
Turnover[a]	2.24	5.62	0.94	1.15
Average duration[a] (hours)	4.5	1.6	7.5	6.1
Percentage of all arrivals[a]				
Work trips	39	20	44	65
Employers' business trips	24	37	28	16
Shopping and personal business	17	29	19	10
Other purposes	20	14	9	9

[a]Parking was surveyed from 6:00 a.m. to 8:00 p.m.

reached virtually 100 percent with most spaces being used all day by commuters. The results for the other types of space are, however, more typical of present conditions. Meters have high turnover, low duration, a small proportion of all arrivals during the morning peak, and a low proportion of all arrivals making work trips. Public off-street spaces have low turnover, high parking duration, a high proportion of morning peak arrivals, and a high proportion of work trips. Private nonresidential spaces operate similarly but have an even higher proportion of work trips.

On-Street Parking

All on-street parking is to be controlled within the Inner London parking area and in the strategic centers outside this area. New areas are controlled as demand for uncontrolled on-street space spreads. The original on-street control policy drafted in 1966 laid down the following priorities for allocation of street space:

1. In the interests of safety and traffic movement, street corners and other critical points should be kept clear of standing vehicles by restrictions on both waiting and loading;
2. Suitable curbside lengths, including the full length of main roads where practicable and loading gaps in side roads, should, by use of waiting restrictions, be kept clear of parked vehicles;
3. A reasonable number of spaces for short-term parking should be provided in groups near centers of attraction and in smaller numbers elsewhere, with parking meters enforcing time limits (up to 2 or 5 hours) and collecting charges; and
4. All-day parking should be permitted in the remaining curbside space, under arrangements giving preference to residents.

In practice, amendments to these priorities have been made, or are being considered, as follows:

1. In the interests of traffic restraint, parking is not necessarily permitted at all the lengths of curb not excluded previously;
2. Some parking spaces are being removed as off-street parking lots are open in the immediate vicinity;
3. Long-term parking is generally being charged for; and
4. Proposals are being considered for permits for local employees or merchants in areas where spare space is available after residents' needs have been met in order to give them priority over park-and-ride commuters.

In Central London, meter charges vary from 6 to 24 cents per hour, but a fare of 48 cents per hour is proposed to combat excess demand. In the strategic centers, charges vary from 12 cents for 5 hours to 12 cents for ½ hour. Residents' permit charges vary from 24 to 36 cents per day and from $1.20 to $6.60 per month. The rate levied depends more on the local authority's attitude toward subsidizing its residents than on the need to equate demand to supply.

Public Parking Lots

The local authorities at present can only dictate the conditions of operation in parking lots that they operate. These form about one-quarter of all public parking spaces in Inner London and three-quarters of the spaces in Outer London. However, the GLC has recently been given powers to require that all privately operated public parking lots in areas that it designates are operated according to conditions set out in licenses issued by the local authority. Subject to any modifications the GLC may make, local authority parking lots should be operated on the same basis. The GLC is able to place overall conditions on the control of an area, and both the GLC and the local authority are able to dictate the conditions on the license, which could affect traffic patterns in the following ways:

1. Maximum number of spaces in an area for all parking, short- or long-term parking, or casual or regular parking may be specified;

2. Capacity of each parking lot must be specified;
3. Scale of charges, including the minimum and maximum charges, can be specified for each parking lot;
4. Proportion of spaces to be made available in each parking lot for casual or regular parking can be specified; and
5. Times of opening and closing of each parking lot can be specified.

The ways in which these powers are to be used are still being discussed, but the following have been suggested:

1. All areas with on-street control should, in time, also be subject to off-street control through licensing.
2. Control would predominantly be by pricing.
3. Charges during the working day (7:00 a.m. to 7:00 p.m.) would be levied at a fixed rate per hour, with a minimum level equivalent to about 75 percent of the 1-hour meter charge in the area. It is anticipated that this would provide high enough charges to discourage many long-term parkers and would also discourage illegal long-term parking at meters. If necessary, surcharges could be made for durations of more than, say, 6 hours.
4. Residents would be able to purchase season tickets at a rate lower than the normal fixed hourly rate.
5. Except in special cases, prepaid parking could not be obtained other than by residents because such season tickets tend to encourage greater use of the vehicle.
6. Charges would in theory be levied so as to equate demand to about 90 to 95 percent of supply to ensure that space was available to those requiring it.

In practice, when licensing is introduced, 90 to 95 percent occupancy will not be achieved in all areas, either because short-term parking demand is not high enough or because the additional traffic would itself cause congestion. In these cases, some removal of meter bays may be justified in streets adjacent to the parking lots to encourage great use of off-street parking. It is hoped that decisions on future parking lot developments will be dictated largely by financial considerations and hence by the demand for short-term parking and for residents' places (at the charging levels imposed by licenses in the area) that cannot be accommodated in existing parking lots even after long-term parkers have been restrained.

Private Nonresidential Parking Lots

No controls can be placed on the use of these, and it is therefore important to control the future supply of such space. To this end, new standards have been laid down in the plan for parking provision in offices and shops, and criteria have been established for assessing parking requirements in other types of development. The new standards are compared with the earlier standards given in Table 3. The old standards were for minimum provision, with the idea that developments should account for all parking demand that they generate. The new standards are maximum standards, designed to provide for the operational needs of the building, including space for vehicles garaged on site, staff vehicles used for essential purposes during the day, and some visitors' vehicles. There is also provision for those employees for whom public transport is not available. These standards were based on a detailed study of business traffic generation (5), in which it was found that 80 percent of parking spaces in some office parking lots were used solely for commuting.

The local authorities have been asked to introduce standards within the ranges based on the availability of public transport in individual areas; to date, new standards of between 1 space per 10,000 ft^2 and 1 space per 12,000 ft^2 have been introduced in 85 percent of the 10-square-mile central area.

The possibility of encouraging owners of existing private parking lots to convert their spaces either to public lots or to other uses is being investigated. It is not expected that requests for voluntary action will be very successful although, as parking charges and land values rise, some owners may find alternative uses attractive. In the long term, powers may be needed to control the use of such spaces, and consideration

is being given to imposition of a tax for ownership of private parking spaces and to the possibility of compulsory purchase of such spaces.

Private Residential Parking Space

Because it is considered important to encourage the resident to keep his car at home during the day, the plan includes a requirement that at least one parking space be provided for each new dwelling. In areas of low car ownership, however, a minimum of half the required spaces can be made available initially, provided that space is set aside for full provision at a later date.

EFFECTS OF POLICY TO DATE

Parking Supply

Table 4 compares parking supply in the central area in 1962, soon after on-street parking controls were introduced and before the GLC's parking policy had been developed, with conditions that prevail today. It can be seen that the reduction of 26,000 spaces produced by on-street controls has been almost balanced by increases of 8,000, 10,000, and 7,000 in public, private nonresidential, and private residential space respectively. The proportion of spaces in the central area that were publicly controlled has risen from 14 to 29 percent. The increase of 10,000 in the number of private nonresidential spaces indicates the effect of the old standards for parking provision in a period of considerable postwar redevelopment. The pattern elsewhere in London has been similar. Some 40,000 spaces have been lost through on-street controls elsewhere in the Inner London parking area, and 10 strategic centers have on-street parking control now, compared with 1 in 1962. Figure 2 shows the present extent of on-street control. In all these areas, sizable increases in off-street parking have occurred.

Parking Use

Figure 3 shows trends in evening peak-period traffic on a representative road network in Central London over the past 20 years. The rate of growth has fallen from about 7 percent per annum to zero since 1964, whereas level of employment in the area has remained virtually constant. This reduction can be attributed largely to parking control. The figure also includes trends in numbers of car occupants entering Central London during the a.m. peak; although the pattern here is somewhat less clear, there has been a reduction in the growth rate since 1964. That there has not been a fall in peak-period flows is largely the result of increases in supply of off-street space and occupancy of all types of parking space. Table 5 gives estimates of occupancy of parking spaces at the end of the peak period in 1966 and 1972.

Detailed Effects on Use

Two surveys have been made of the effects of introducing meter zones: one of a $^3/_4$-square-mile extension to an existing zone (6), the other of a $^1/_2$-square-mile isolated zone (7). The following results are of interest:

1. On-street parking accumulation fell by 69 and 67 percent in the two surveys.
2. Peripheral parking can considerably reduce effectiveness of control unless controls extend at least $^1/_2$ mile from the main center of attraction. In the isolated zone, increased peripheral parking compensated for 45 percent of the reduction in the zone.
3. Meter control obviously has most effect on long-term parking but can also reduce short-term parking. In the isolated zone, short-term parking at 10:00 a.m. fell by 44 percent.

Traffic Movement

The main effects of parking control to date have been seen in improved traffic conditions within the control areas. Figure 4 shows trends in journey speed, measured over 100 miles of road in Central London, in recent years, and compares these with

Table 3. Parking standards for offices and shops.

Area	Spaces per Square Foot of Gross Floor Area	
	Old Standard[a]	New (GLDP) Standard[b]
Offices		
Central area	1/2,000	1/5,000 to 1/12,000
Inner London	1/2,000	1/2,000 to 1/8,000
Outer London	1/500	1/400 to 1/2,000
Shops		
Central area	1/2,500	1/5,000 to 1/12,000
Inner London	1/2,500	1/2,000 to 1/8,000
Outer London	1/1,000	1/400 to 1/2,000

[a]Minimum standards. [b]Maximum standards.

Table 4. Parking supply in Central London.

Type of Space	1962		1972		1982	
	Number	Percent	Number	Percent	Number	Percent
On-street						
Free and uncontrolled	48,000	38	5,000	4	Nil	—
Metered	12,000	9	21,000	17	21,000	16
Residents only	Nil	—	8,000	6	9,000	7
Total	60,000	47	34,000	27	30,000	23
Off-street						
Public	24,000	19	32,000	25	28,000	21
Private nonresident	35,000	28	45,000	36	48,000	36
Private resident	8,000	6	15,000	12	27,000	20
Total	67,000	53	92,000	73	103,000	77
Grand total	127,000	100	126,000	100	133,000	100
Percentage under public control	14		29		44	

Figure 2. On-street parking control zones, 1972.

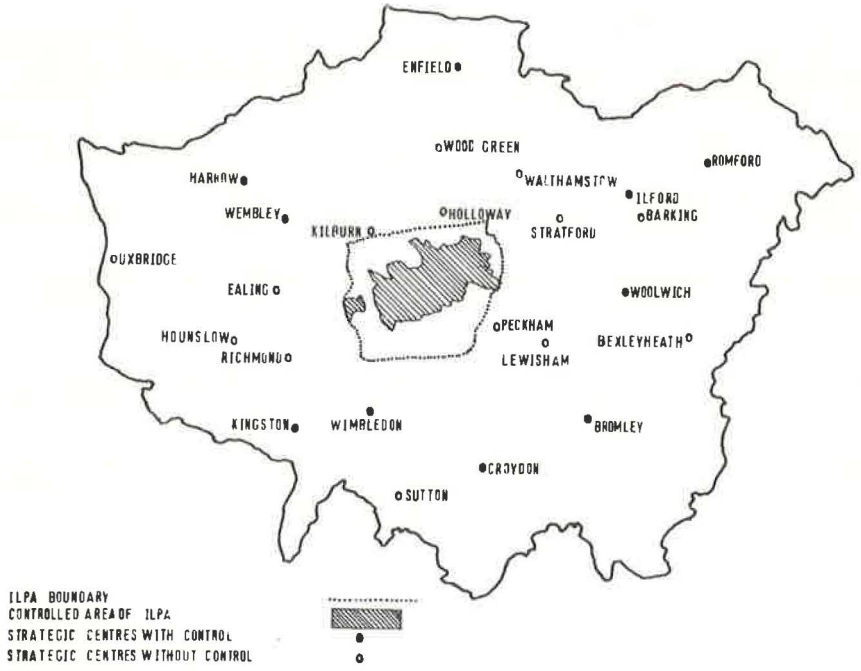

Figure 3. Trends in traffic flow, Central London.

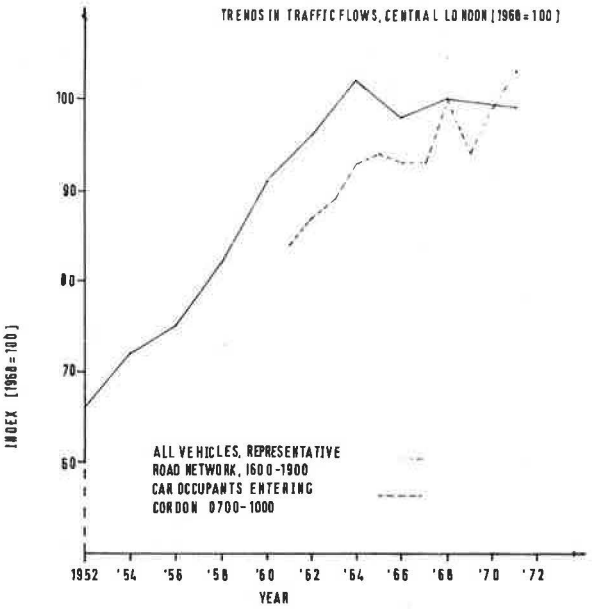

Table 5. Occupancy of parking spaces at 10:00 a.m., Central London.

Date	Type of Space	Number of Spaces	Cars Parked at 10:00 a.m.	Occupancy at 10:00 a.m.	Percentage of All Spaces	Percentage of All Cars Parked
1966[a]	On-street, free	30,000	24,900	83.1	27	34
	On-street, metered	14,500	9,400	64.9	13	13
	Total on-street	44,500	34,300	77.0	40	47
	Off-street, public	25,500	14,600	57.6	23	20
	Off-street, private[b]	40,000[c]	24,200	60.6	37	33
	Total off-street[b]	65,500	38,800	59.2	60	53
	Grand total[b]	110,000	73,100	66.5	100	100
1972	On-street, free	5,000	4,700	95	5	6
	On-street, metered[b]	21,000	14,500	69	20	20
	Total on-street[b]	26,000	19,200	74	25	26
	Off-street, public	32,000	20,800	65	31	28
	Off-street, private[b]	45,000	33,300	74	44	46
	Total off-street[b]	77,000	54,100	70	75	74
	Grand total[b]	103,000	73,300	71	100	100
1982	On-street, free	Nil	—	—	—	—
	On-street, metered[b]	21,000	13,600	65	22	22
	Total on-street[b]	21,000	13,600	65	22	22
	Off-street, public	28,000	9,200	33	29	15
	Off-street, private[b]	48,000	39,800	83	49	63
	Total off-street[b]	76,000	49,000	65	78	78
	Grand total[b]	97,000	62,600	65	100	100

[a]Source: reference 4. [b]Excludes residents' spaces. [c]Estimate revised since publication of reference 4.

the spread of on-street parking control. A steady fall in evening peak speeds up to 1958 has been replaced by a rise to above the 1952 level. A similar, though less pronounced, pattern is indicated by the off-peak speeds. In both cases, the rise has coincided with the development of on-street control. Although other factors such as traffic management measures have obviously helped, parking control has played a major part in the improvement.

ANTICIPATED EFFECTS OF PARKING CONTROL

Parking Supply

Table 4 also gives predictions of parking supply in 1982 based on the policies described in this paper. The main effects are as follows:

1. All on-street spaces will have been controlled. Although the table does not indicate it, some on-street spaces could well be removed as space in public car parks is freed of long-term parkers.
2. Public car parks will be developed only as short-term and residents' demands arise; the figure shown assumes completion only of parking lots that currently have planning permission together with closure of all temporary sites. Some addition could occur as a result of conversion of private nonresidential spaces. All public parking lot spaces would be controlled.
3. Growth in private nonresidential space would only be 3,000 as compared with 10,000 in the previous decade. This would be the direct result of introduction of the plan standards. Some reduction could in practice occur as a result of conversion of spaces.
4. Private residential space would increase by more than 50 percent.
5. The total number of spaces would rise by 7,000.
6. The proportion of spaces that were under public control would rise from 29 to 44 percent.

Similar trends would be expected elsewhere; in the remainder of the Inner London parking area, the number of spaces is expected to be about 350,000 (a reduction of about 15 percent) with about 36 percent under public control. It is hoped, too, that parking could be controlled in all strategic centers; already eight additional centers are planning on-street controls.

Parking Use

It is expected that some reduction in peak-period traffic generation can be achieved through parking control in the next decade. Table 5 also gives estimates of occupancy of parking places at the end of the peak period in 1982. The estimates are based on the following assumptions:

1. Patterns of meter use would remain as currently set up with peak occupancy kept to 85 percent,
2. Use of public parking lots would be controlled by licensing to match existing parking lots that favor short-term parkers, and
3. Peak occupancy of private nonresidential parking lots would approach 100 percent with distribution of occupancy remaining the same as is now prevalent.

If these assumptions hold true, it can be seen that the number of cars parked in Central London by the end of the peak period could fall by 15 percent in the next decade.

Effect of Control on Charges

Effects of licensing parking lots have been estimated from a survey of lot use and charging structure in nine parking lots in London's West End. Table 6 gives results that indicate that hourly charging structures attract less than half the peak-period arrivals per space found in lots with low hourly rates for long-term parking. At present, 84 percent of parking spaces in Central London have lower hourly rates for 8 hours of parking than for 2 hours of parking.

Figure 4. Trends in journey speed in Central London.

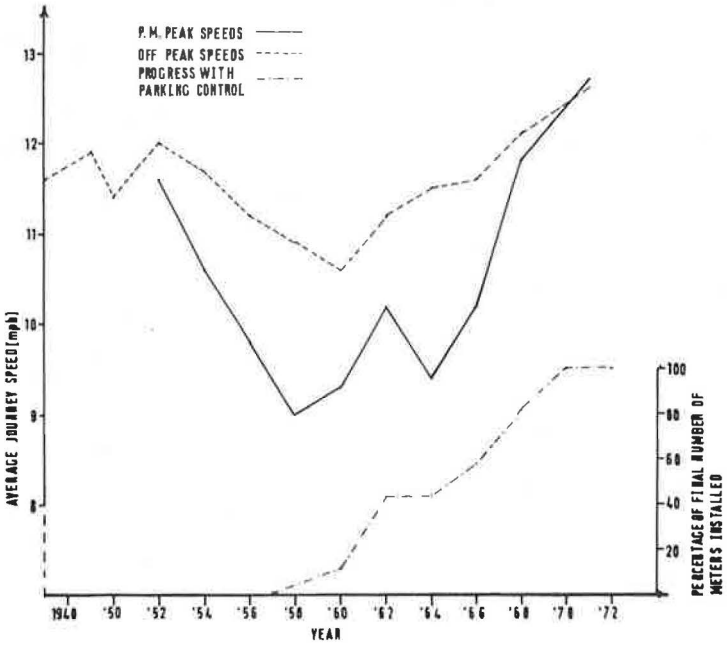

Table 6. Effect of charging structure on arrival and duration patterns at sample public parking lots.

Ratio of 8-Hour Charge to 2-Hour Charge	Sample Size	Average Ratio to Capacity of: Arrivals, 8:00 to 10:00 a.m.	Arrivals, 10:00 a.m. to 6:30 p.m.	Duration of <4 Hours	Duration of 6 to 10 Hours
1	3	0.53	0.50	0.18	0.43
2 to 3	3	0.58	0.58	0.27	0.41
4	3	0.25	0.99	0.54	0.20

Table 7. Effect of changes in charges at four parking lots.

Parking Pattern	Before	After	Change (percent)
Arrivals, 8:00 to 9:00 a.m.			
Affected parking lots	628	121	-81
Unchanged parking lots	300	309	+3
All parking lots	928	430	-60
Arrivals, 8:00 to 10:00 a.m.			
Affected parking lots	897	314	-65
Unchanged parking lots	702	685	-2
All parking lots	1,599	999	-37
Arrivals, 10:00 a.m. to 6:00 p.m.			
Affected parking lots	266	516	+94
Unchanged parking lots	478	596	+25
All parking lots	744	1,112	+49
Durations (660-space lot)			
Less than 3 hours	73	217	+200
More than 7 hours	496	116	-77
Median duration (hours)	8.9	3.2	-72
Purpose (660-space lot)			
Work	528	178	-66
Employer's business	39	94	+140
Other	64	154	+140

Further indication of the effects of charging structure was obtained when charges at four Central London parking lots were raised to 12 cents per hour from between 36 and 72 cents per day. Table 7 gives effects on arrivals at the four parking lots and at a similar number of unaffected spaces in the area. It also shows the effect on duration and trip purpose at one of the four lots, which has 660 spaces.

Peak-period arrivals at all sites combined fell 37 percent, whereas off-peak arrivals rose 49 percent because spare space was available. Work trips fell 66 percent and longer durations decreased by 77 percent. Employer's business and "other" trips increased by 140 percent, and short durations increased 200 percent.

PROBLEMS WITH PARKING CONTROL

Although parking control can greatly affect traffic generation, it does have some disadvantages. Enforcement of on-street controls is expensive and not very efficient. Problems arise because of the complexity of the regulations and the procedures involved in processing fines. These difficulties are made worse as demand gets out of step with supply, and surveys show that the level of enforcement is deteriorating (8). Some improvement can be expected from simplified procedures and unified control of on- and off-street parking.

Even if parking control is effective, it does not affect through traffic. This problem can be reduced by extending controls; only 15 percent of trips crossing the Inner London parking area cordon go through the area, whereas the figure is 25 percent for the central area. To have greater effect, supplementary licensing or road pricing would be needed, but even so parking controls would have a role as a complementary restraint measure.

ACKNOWLEDGMENT

The author wishes to thank the Greater London Council for permission to publish this paper. The opinions expressed are his and do not necessarily reflect Council policy.

REFERENCES

1. Greater London Development Plan—Revised Written Statement. Greater London Council, 1972.
2. Maycock, G. Implementation of Traffic Restraint. Transport and Road Research Laboratory, RRL Rept. 422, 1972.
3. Parking Policy: A Reassessment, 1970. City Engineer's Department, Westminster.
4. Thomson, J. M. Some Characteristics of Motorists in Central London. London School of Economics, 1968.
5. Generation of Business Traffic in Central London. Greater London Council, Research Paper 3, 1968.
6. Stopher, P. R. Finsbury and St. Pancras Parking Survey—Part II. Greater London Council, Research Memorandum 49, 1968.
7. Berthoud, R. The Effect of Parking Meters on Parking Behaviour. Greater London Council, Research Memorandum 187, 1969.
8. Yates, L. B., and Hewing, R. B. Parking Offences and Parking Tickets. Greater London Council, Research Memorandum 233, 1970.