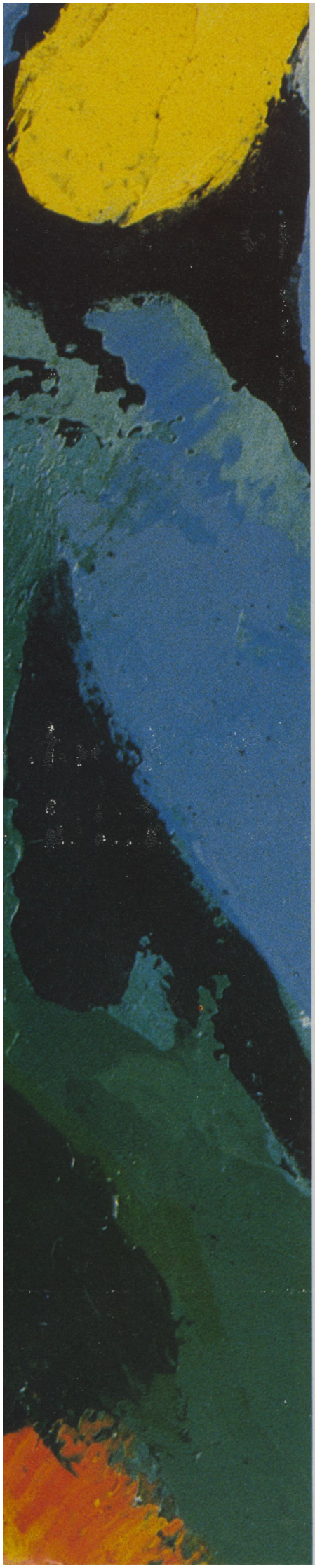


Department of the Environment, Transport and the Regions

METHODOLOGIES FOR DEVISING PARKING STANDARDS

Peak parking accumulation:

Report of further analysis of sample of TRICS sites
(Technical Note)

Llewelyn-Davies

February 1999

Llewelyn-Davies

METHODOLOGIES FOR DEVISING PARKING STANDARDS

(Technical Note)

Peak parking accumulation:

Report of further analysis of sample of TRICS sites

Brook House Torrington Place London WC1E 7HN Telephone 0171 637 0181
Facsimile 0171 637 8740

February 1999

Contents

List of Tables

List of Figures

Figures (unnumbered) follow at the end of the report giving parking accumulation plots for each site in the sampley

1 Introduction

1.1 Relationship to previous work

The research reported here forms part of the DETR project "Methodologies for Devising Parking Standards". In December 1998, a report submitted to the Department[1] contained a preliminary analysis of parking accumulation data at a sample of TRICS sites. This report provides a fuller analysis of the TRICS sample, including both summary charts and individual parking accumulation plots for each of the sites.

1.2 Overall purpose of the analysis

1.2.1 The analysis of the TRICS sample sites has been focussed specifically on the issue of parking accumulation. As far as we are aware, there have hitherto been few attempts to analyse TRICS data for parking accumulation on an hourly basis, at least on the scale attempted here. TRICS is used mostly for the purpose of determining typical peak traffic generation rates rather than peak parking accumulation. Also TRICS analysis usually is based on an aggregation of similar sites to the one being planned, rather than disaggregation of individual sites as included here.

1.2.2 The car parks surveyed are in every case Private Non Residential (PNR) car parks. The purpose is to gain a better understanding of the take-up of parking space at different types of development, and in particular to compare parking demand with parking supply. The pattern of demand and supply is considered in relation to a theoretical reduction of supply by one third at each site.

1.2.3 The analysis focuses on the following questions:

- To what extent are car parks at Private Non Residential development utilised, and what is the pattern of peak demand?
- What is the variation between land uses in the pattern of parking accumulation?
- What is the variation between different sites of the same land use?
- What relationship is there (if any) between the rate of parking provision (spaces per 1,000 square metres of Gross Floor Area) and peak parking demand?

---

[1] Llewelyn-Davies for Department of the Environment, Transport and the Regions, Methodologies for Devising Parking Standards project, "Report of further studies: response to DETR letter of 19th November 1998.

- What relationship is there (if any) between peak parking demand and the level of public transport provision at the site?

Analysis of parking demand in relation to the location of the site (e.g. town centre, inner ring, suburban, out of town) would potentially be useful, but location information in the TRICS database provides insufficient detail to make such analysis meaningful.

1.3 *Acknowledgements*

1.3.1 Assistance and support in the preparation and interpretation of the TRICS data used in this research is gratefully acknowledged from Essex County Council, JMP Consultants, and W S Atkins consultants.

2 Method

2.1 The sample of sites

2.1.1 From the national TRICS database of development sites, a sample of 126 sites was selected. A few of the sites were excluded from some of the analyses because of missing data. The sample was selected on the following criteria:

- Sites where parking accumulation had been surveyed within the last five years (1994 or later);
- Sites to represent as many land use categories as possible;
- For land uses with multiple examples, an attempt was made to select sites from a range of types of area (e.g. metropolitan boroughs, shire counties, and different regions).
- Where there were multiple examples from the same local authority area for the same land use category, a site was selected which provided the most recent data.

2.1.2 The land use categories best represented are A1 retail (food, non-food, and general or mixed retail) and B1 Business. Together these account for 80% of the sample.

2.1.3 Some categories of land use are not represented in the TRICS database, or are represented by only a few sites. Available cases were included where the survey date criterion was met.

2.1.4 The land uses with only a few sites available in the sample are:

- B2 General Industry (7 sites)
- B8 Storage or distribution (6 sites)
- C1 Hotel (one site)
- C2 Residential Institutions (two sites, both hospitals)
- D1 Non-residential institutions (one site, a college)
- D2 Assembly and leisure (11 sites, 3 of which excluded from some analyses)

2.1.5 The land uses not represented at all, either in the TRICS database or in the sample are:

- B3, B4, B5, B6, B7 (special industrial groups)
- C3 Dwelling houses

2.1.6 *Comment on the TRICS sample*

2.1.7 The major categories represented in the TRICS database, and also in our sample are A1 (divided in this report between "General", "Food" and "Non-food" retail), and B1 (office/business and residential-compatible industry).

2.1.8 The range of surveys undertaken by TRICS tends to reflect the primary interests of the members of the TRICS group, and thus has not been geared to gaining a comprehensive picture of traffic or parking generation across the entire spectrum of land uses. It is probably fair to say that the TRICS database has to date primarily served the retail planning process.

2.1.9 It should be noted that the TRICS database sites are not considered (or intended) to be representative of development activity across the country. Some land use types are more heavily represented than others, and the geographical spread also is uneven. However, the sample derived for the analysis in this paper is considered to be reasonably representative of the range of sites in the database as a whole.

3 Summary of Results

3.1 Peak parking demand

3.1.1 Table 1 provides a summary of peak parking demand for 121 of the sites in the sample for which individual plots have been produced. The summary table shows the following results.

- Of the car parks at 121 sites, 97, or 80%, were never recorded as being full. ("Never" in this context relates to the information recorded in the database).
- Almost two thirds of the sites (62%) were never more than two thirds full.

The pattern for all sites in the sample is shown in Figure 1

- The extent of car park utilisation varied somewhat between land uses:

The pattern for main land use categories is shown in Figure 2.

- Land uses with excess parking supply most evident
  - A1 Both Food and Non-Food
  - C1 Hotel (only 2 sites)
  - D1 College (only 1 site)
  - D2 Leisure
- Land uses where parking supply was more often fully taken up, though still with significant over-supply in some cases were:
  - B1 Business
  - B2 Industrial

3.2 Relating parking demand to supply

3.2.1 **Figure 3** relates the peak parking demand to the size of the car park at the site. It should be noted that in the TRICS database, parking accumulation sometimes exceeds 100% of supply. In this analysis we have given 100% as the maximum possible accumulation, since it is not known what happens in practice to the excess demand (e.g. whether it is a data error, or whether cars are double parked, or whether the size of the car park has been under-estimated).

3.2.2 There is no apparent relationship between the size of car park provided and the proportion of it taken up at peak times. There is a slight clustering of results around the two-thirds level of peak demand.

3.2.3 **Figure 4** provides the same information for each land use type (excluding those with only a few sites in the sample). Again, there is no apparent relationship for any land use type between parking supply and percentage of take up at the peak.

3.2.4 **Figure 5** shows the relationship for the whole sample between peak demand and the parking supply ***rate*** in terms of number of car parking spaces per 1,000 square metres of Gross Floor Area (GFA). As with size of car park, there is no obvious relationship between the parking provision ratio and peak parking demand.

3.2.5 **Figure 6** gives the same information disaggregated by main land use type. Again the picture for each category is a more or less random scatter of results.

3.3 Public transport supply

3.3.1 For most of the sites in the sample, TRICS provides an estimate of the quantity of public transport access to the site. This is classified according to five broad headings (very low, low, medium, high and very high). **Figure 7** shows the mean peak parking level within each category of public transport accessibility.

3.3.2 It may at first seem surprising that peak parking demand (as a percentage of supply) is somewhat higher at sites with higher levels of public transport access. However, factors that may explain this result include:

- Larger car parks being provided in locations with poor public transport;
- Areas with higher public transport access having higher levels of parking pressure, and hence multiple use of the car parks in private developments.

3.3.3 However, the assessment of public transport accessibility in the database is known to be variable, and the information is not recorded at all sites.

3.4 *Site by site analysis*

3.4.1 At the end of this report charts for individual sites are arranged by main land use category, with a cover sheet at the start of each section. Within each section, sites with multiple day plots are at the beginning, but otherwise the plots are in no particular order.

3.4.2 The individual plots show the hourly parking accumulation in relation to parking capacity. A horizontal line is drawn on the chart at the two-thirds capacity level. These provide a visual impression of the extent of car park use and highlight the conclusion that many car parks are underused, some extensively so.

3.4.3 Where a plot is for a single day of the week, it has been assumed that this is the day on which peak parking occurs. This has in most cases been ascertained from the TRICS database. However, it may be that the pattern of peak day demand changes over time, for example because of changes in shop opening times. Current patterns may therefore in some cases differ from those shown in the surveys. It should also be noted that there is likely to be variation in peak demand from week to week, for example due to Christmas shopping in December, and the data do not allow analysis of such variation.

3.4.4 Furthermore, the data in the TRICS database is for the majority of sites more than two years old. It is possible that parking accumulation will have increased since the survey date. **Figure 8** shows the peak parking demand by the year of survey of the individual sites. This does indicate fewer sites with low levels of utilisation in the 1997 surveys compared to those in the 1994 surveys. The reason for better utilisation rates in sites more recently surveyed may be due to a number of factors, not just increasing car access. For example more recent development sites may have lower levels of parking provision, or they may be subject to planning conditions for the car park to be available for public use.

3.4.5 The data therefore must be regarded as providing a general indication of peak parking accumulation.

3.4.6 For some sites, mostly non-food retail, the parking accumulation is shown for 5 or 7 days of the week. These charts show considerable day to day variation of parking accumulation at retail sites. At the two B1 sites where multiple-day data are shown, the pattern of parking accumulation is much more consistent between the five weekdays but, as expected, markedly lower at the weekends. As might be expected at employment locations, there is little weekday variation at business and industrial sites.

4 Conclusion

4.1 Response to basic questions

4.1.1 To what extent are car parks at Private Non Residential development utilised, and what is the pattern of peak demand?

Overall there is a high degree of under-use of PNR car parks, with roughly two thirds of the sample sites being rarely if ever more than two thirds full. Parking demand at about three-quarters of the sample sites never (in the survey period) reaches car park capacity.

4.1.2 What is the variation between land uses in the pattern of parking accumulation?

Retail and leisure sites tend to have greater variation through the day and through the week than employment-related sites such as B1 and B2. The employment related sites also tend to have higher levels of peak demand compared to parking capacity. Car parks at industrial estates in particular tend to be full during weekday working hours.

4.1.3 What is the variation between different sites of the same land use?

There is wide variation between different sites. This may be due to differences in parking standards applied at the time, variation in the quality of access by other modes and, related to this, the site location. These explanations are, however, largely speculative. What is clear is that the conventional use of the TRICS database, which in the planning of new schemes gives a parking-supply rate for "comparable" developments, may in practice be multiplying problems of over-provision.

4.1.4 What relationship is there (if any) between the rate of parking provision (spaces per 1,000 square metres of Gross Floor Area) and parking demand?

Taking the sample as a whole, or by land use category, there is no general relationship, and over-supply (or under-supply) of parking in terms of peak demand has to be explained in terms other than simply the rate per GFA. This supports the view that account should be taken of wider accessibility and location issues at each site.

4.1.5 What relationship is there (if any) between parking demand and the level of public transport provision at the site?

There is a tendency for peak parking accumulation to be higher at sites with good public transport access.

4.2 Overall conclusion

4.2.1 Had rates of parking supply at the sample sites been applied at one third below the rate prevailing at the time of permission, peak parking (and hence car access generally) would have been unaffected at two thirds of the sites.

4.2.2 Of the one third of sites with higher peak demand (i.e. over two thirds of capacity), sites with customer parking (A1 retail and D2 leisure in particular) would be affected on only certain days of the week, and at certain times of the day. Such peaks of demand within the week could, in theory at least, be levelled out using charging or other management devices.

4.2.3 This overall finding suggests both a positive and negative aspect of a theoretical proposal to reduce PNR parking one third below current norms.

4.2.4 The positive side is that such a proposal would be unlikely to cause any major upheaval in the development industry or planning process. The one third reduction may therefore offer a reasonable basis for a national limit on PNR supply.

4.2.5 The negative side is that a third reduction will have virtually no impact on traffic generation or mode split, and greater reductions would need to be implemented locally to achieve such an impact..

5 *Tables and Figures*

TABLE 1 SUMMARY OF TRICS SAMPLE AND PARKING ACCUMMULATION

LAND USE	Number of Cases	Car Park Ever Full? YES	Car Park Ever Full? NO	Ever more than 2/3 Full? YES	Ever more than 2/3 Full? NO
A1 General Retail	3	0	3	2	1
A1 Food	43	7	36	13	30
A1 Non-Food Retail	33	8	25	12	21
B1 Business	14	3	11	8	6
B2 Industrial	7	4	3	4	3
B8 Storage & Distribution	6	0	6	2	4
C1 Hotel	1	0	1	0	1
C2 Hospital	2	1	1	1	1
D1 College	1	0	1	1	0
D2 Leisure	11	1	10	3	8
TOTAL CASES	121	24	97	46	75
% OF TOTAL	100	20	80	38	62

Note: cases included here are those for which individual parking plots have been produced

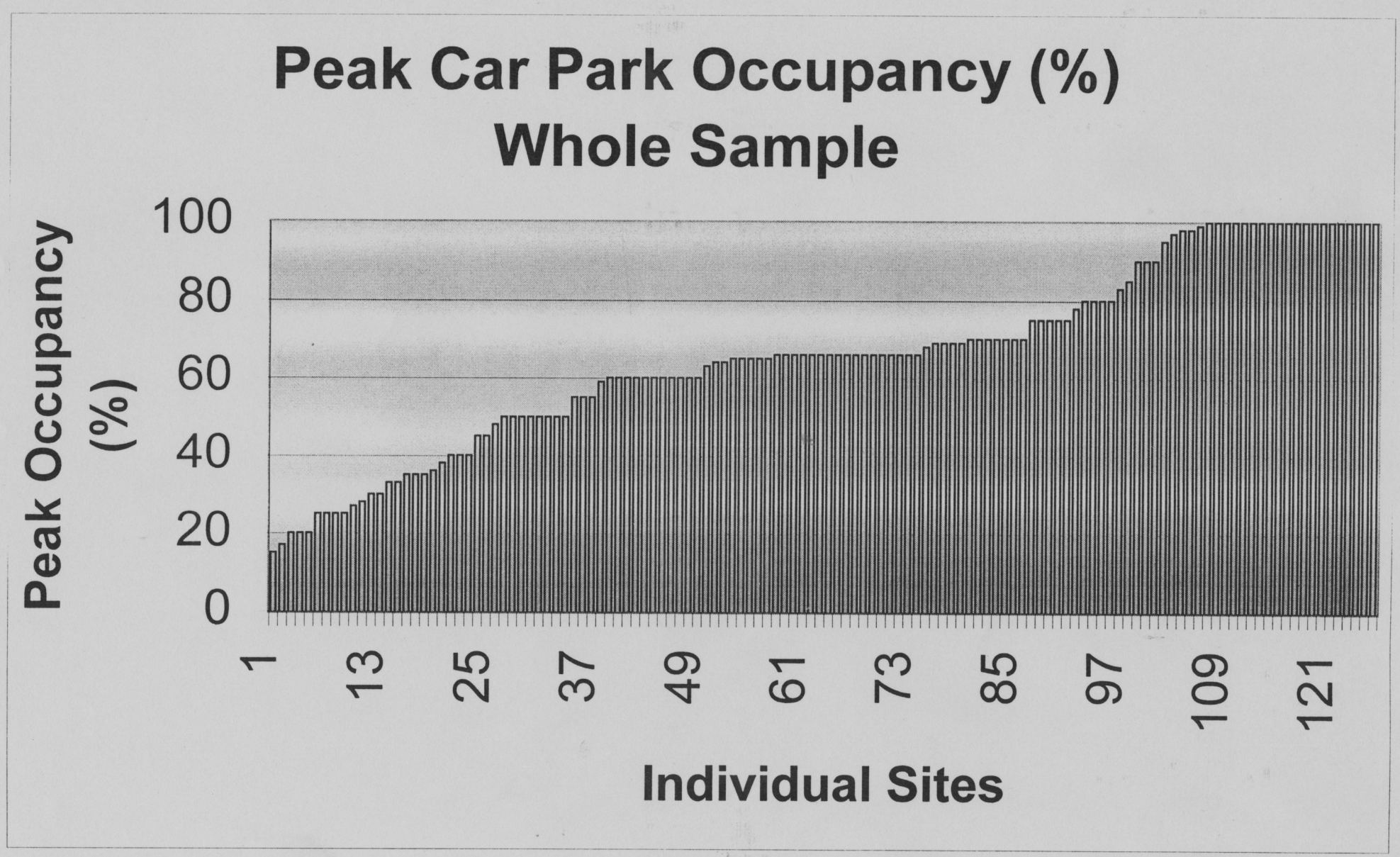
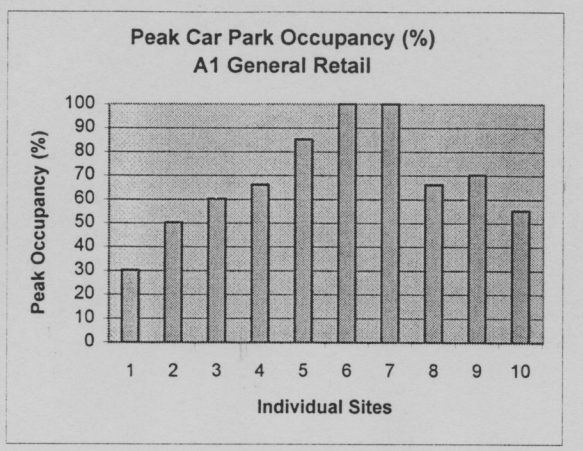
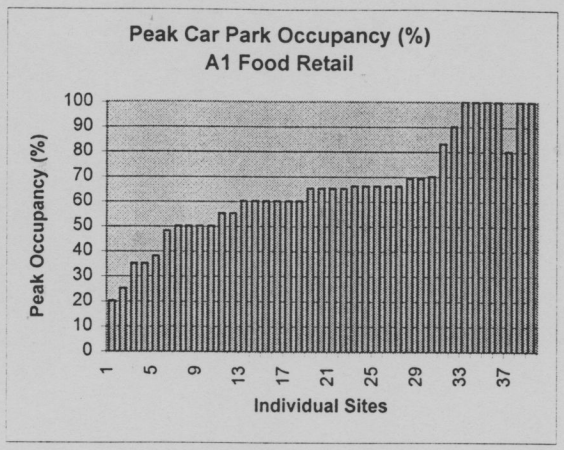
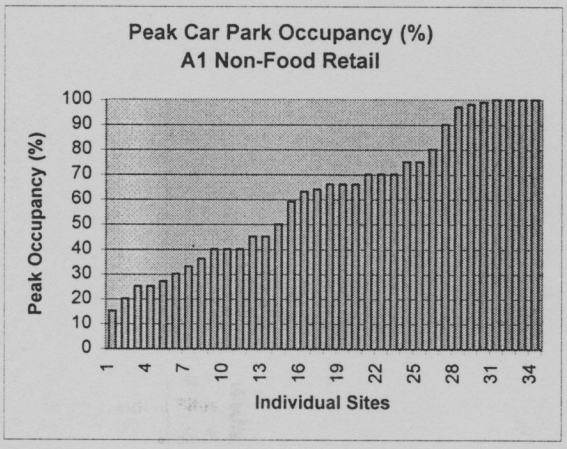
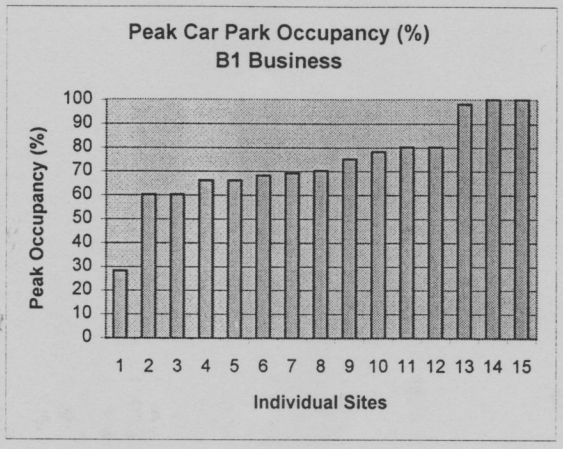

Peak Car Park Occupancy (%)
Whole Sample
Peak Occupancy (%)
100
80
60
40
20
0
1
13
25
37
49
61
73
85
97
109
121
Individual Sites

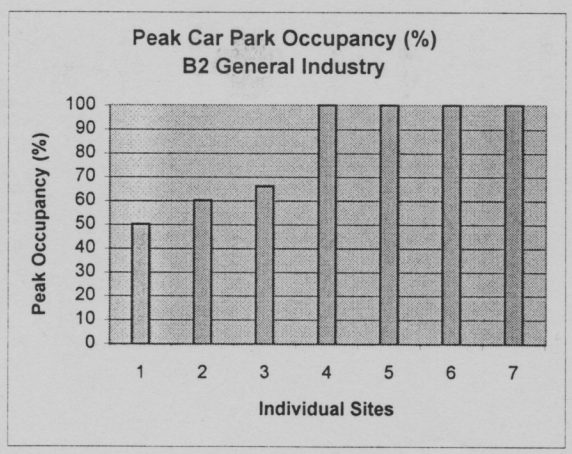
Figure 1

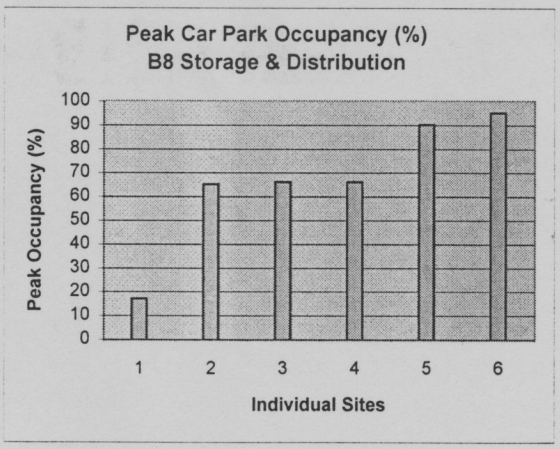

Peak Car Park Occupancy (%)
A1 General Retail
Peak Occupancy (%)
Individual Sites


Peak Car Park Occupancy (%)
A1 Food Retail
Peak Occupancy (%)
Individual Sites


Peak Car Park Occupancy (%)
A1 Non-Food Retail
Peak Occupancy (%)
Individual Sites


Peak Car Park Occupancy (%)
B1 Business
Peak Occupancy (%)
Individual Sites


Peak Car Park Occupancy (%)
B2 General Industry
Peak Occupancy (%)
Individual Sites


Peak Car Park Occupancy (%)
B8 Storage & Distribution
Peak Occupancy (%)
Individual Sites

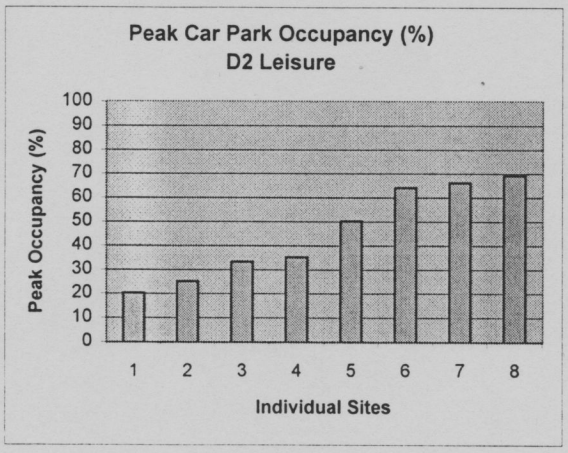
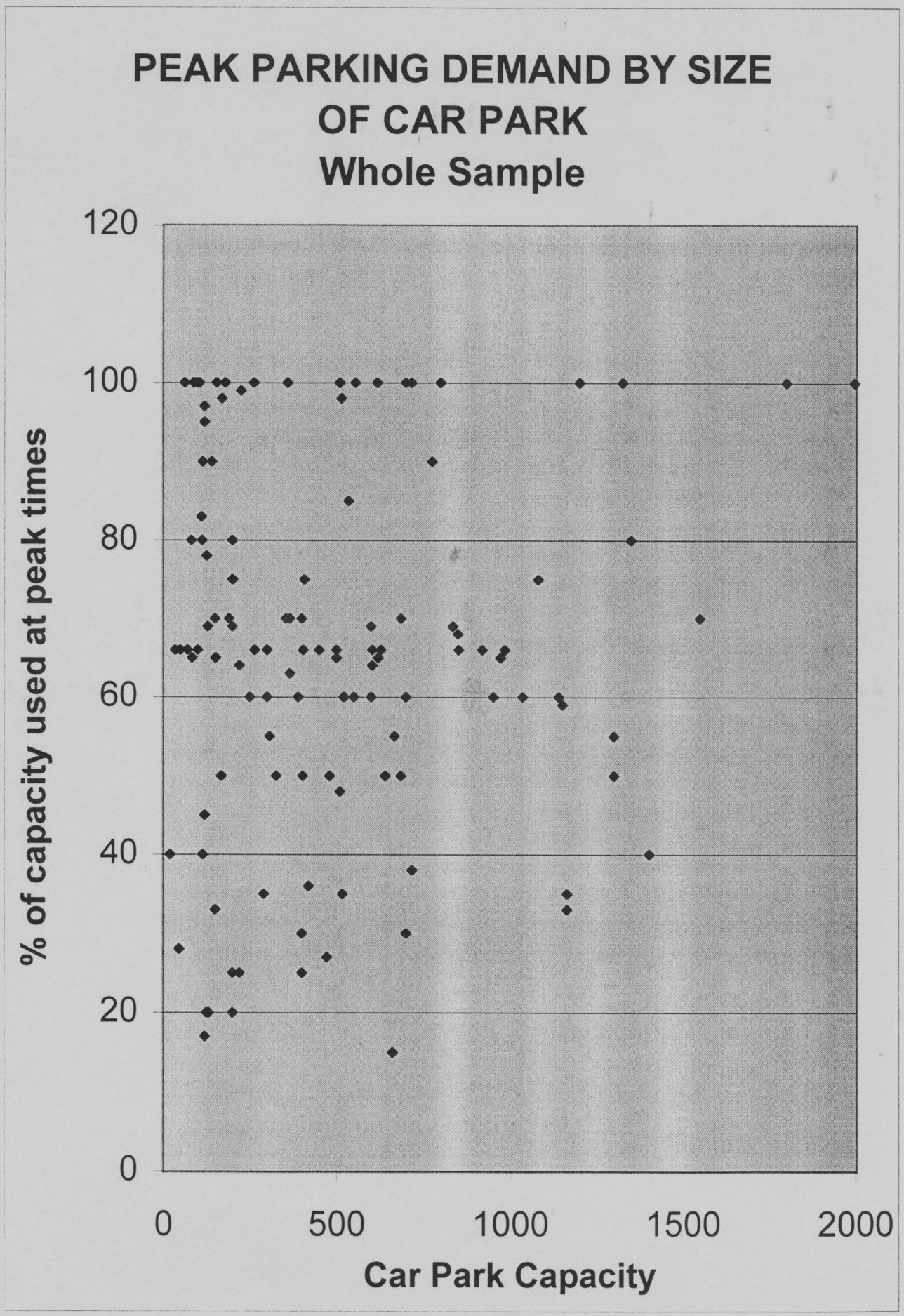
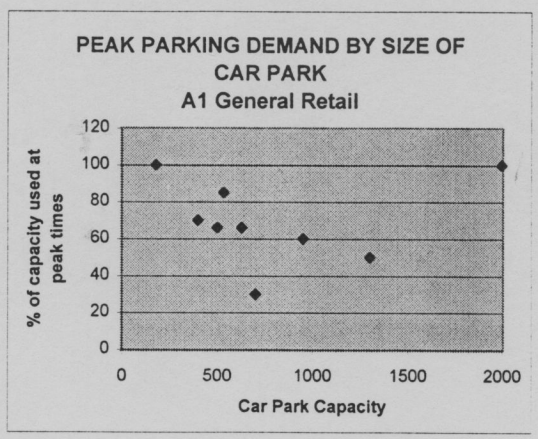
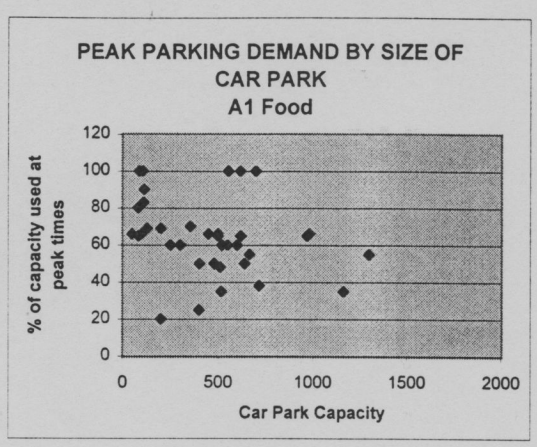

Peak Car Park Occupancy (%)
D2 Leisure
Peak Occupancy (%)
Individual Sites

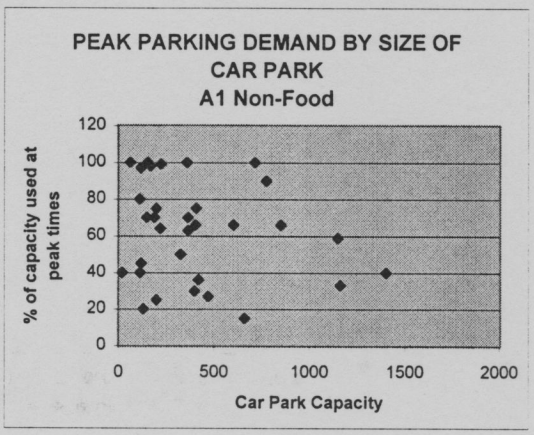
Figure 2

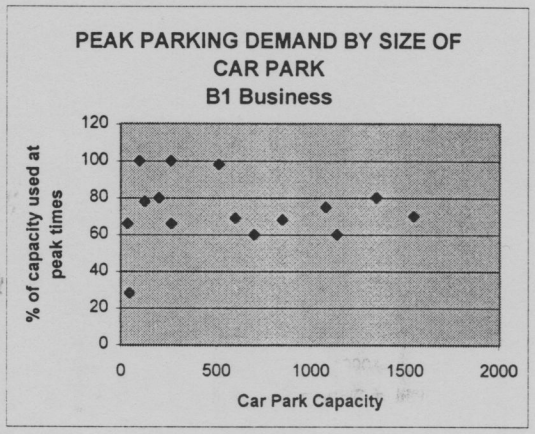
Figure 3

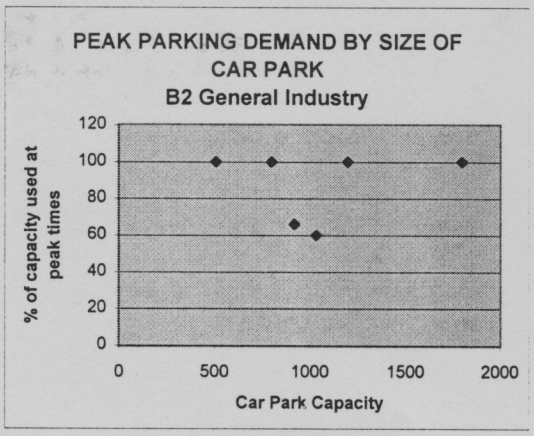

PEAK PARKING DEMAND BY SIZE OF CAR PARK
Whole Sample
% of capacity used at peak times
120
100
80
60
40
20
0
0
500
1000
1500
2000
Car Park Capacity

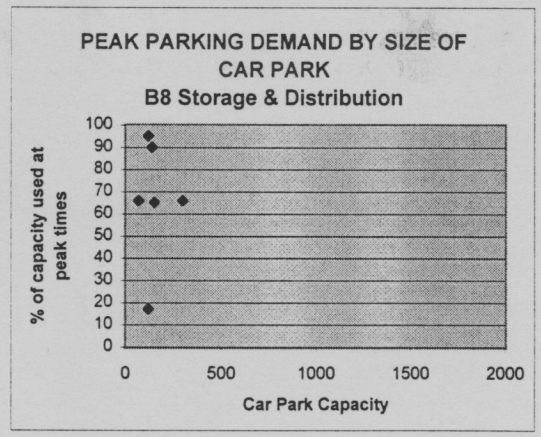

PEAK PARKING DEMAND BY SIZE OF CAR PARK
A1 General Retail
% of capacity used at peak times
0
20
40
60
80
100
120
0
500
1000
1500
2000
Car Park Capacity


PEAK PARKING DEMAND BY SIZE OF CAR PARK
A1 Food
% of capacity used at peak times
0
20
40
60
80
100
120
0
500
1000
1500
2000
Car Park Capacity


PEAK PARKING DEMAND BY SIZE OF CAR PARK
A1 Non-Food
% of capacity used at peak times
0
20
40
60
80
100
120
0
500
1000
1500
2000
Car Park Capacity


PEAK PARKING DEMAND BY SIZE OF CAR PARK
B1 Business
% of capacity used at peak times
0
20
40
60
80
100
120
0
500
1000
1500
2000
Car Park Capacity


PEAK PARKING DEMAND BY SIZE OF CAR PARK
B2 General Industry
% of capacity used at peak times
0
20
40
60
80
100
120
0
500
1000
1500
2000
Car Park Capacity


PEAK PARKING DEMAND BY SIZE OF CAR PARK
B8 Storage & Distribution
% of capacity used at peak times
0
10
20
30
40
50
60
70
80
90
100
0
500
1000
1500
2000
Car Park Capacity

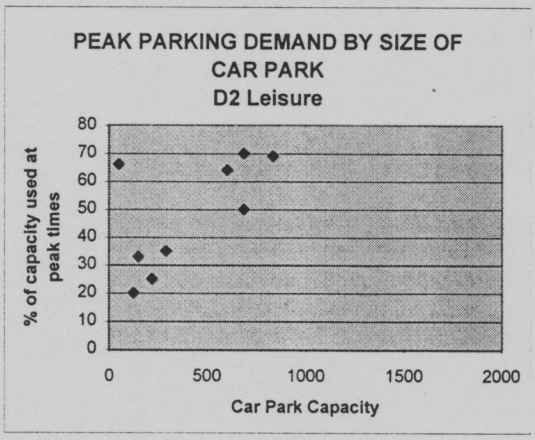
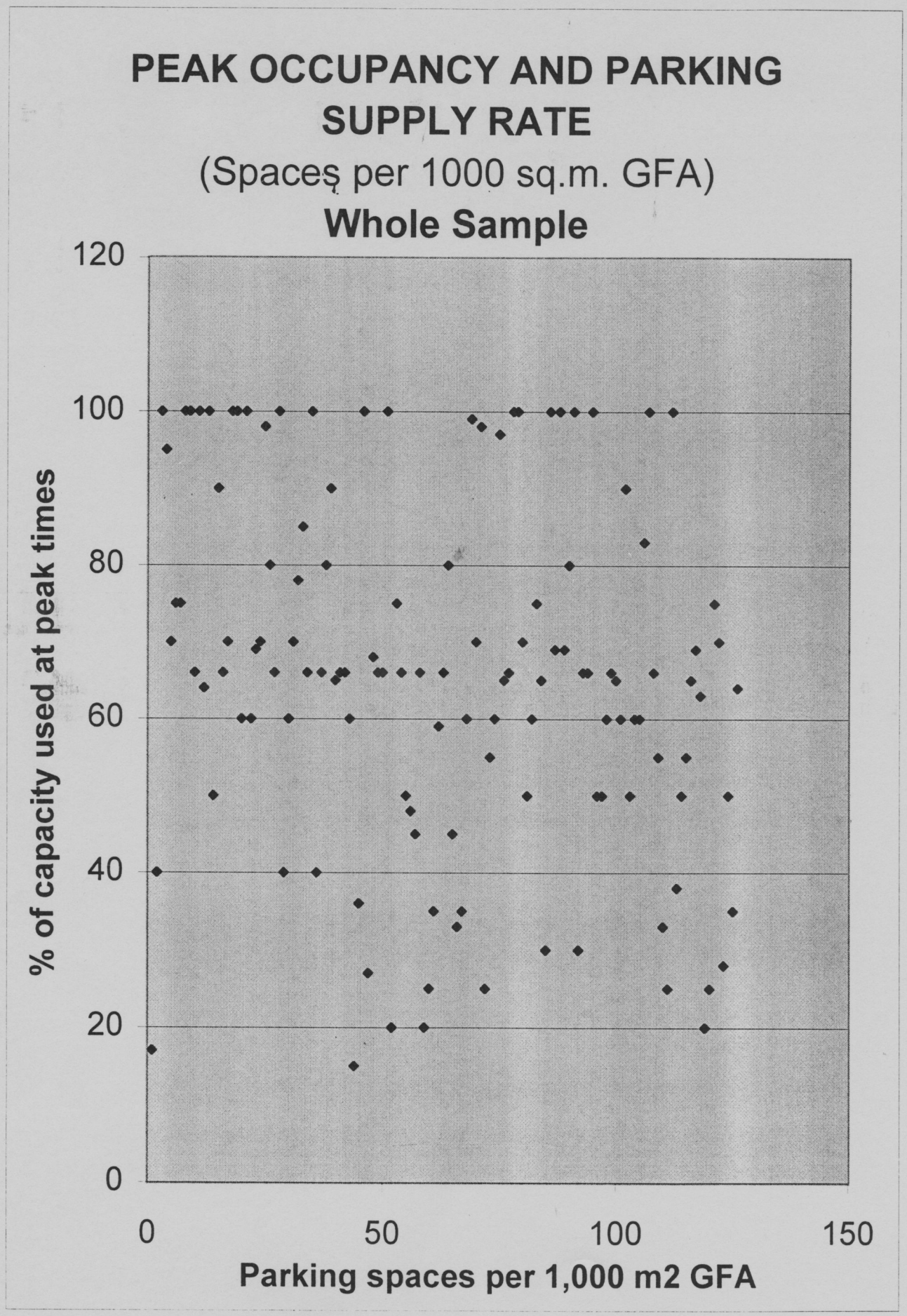
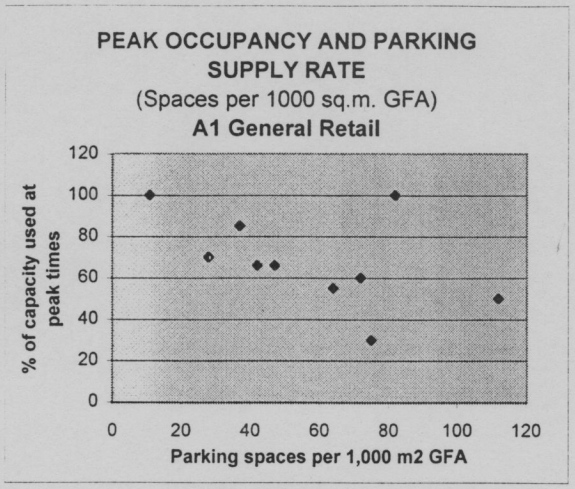

PEAK PARKING DEMAND BY SIZE OF CAR PARK
D2 Leisure
% of capacity used at peak times
0
10
20
30
40
50
60
70
80
0
500
1000
1500
2000
Car Park Capacity

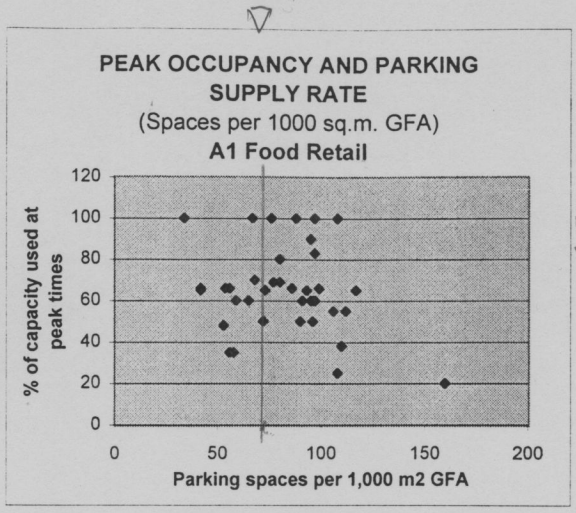
Figure 4

Figure 5

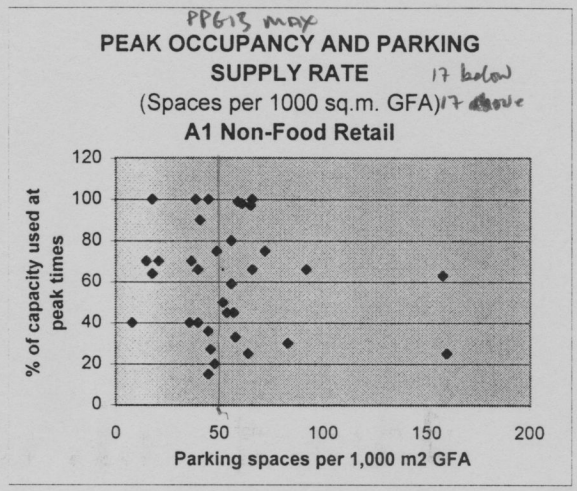

PEAK OCCUPANCY AND PARKING SUPPLY RATE
(Spaces per 1000 sq.m. GFA)
Whole Sample
120
100
80
60
40
20
0
% of capacity used at peak times
0
50
100
150
Parking spaces per 1,000 m2 GFA

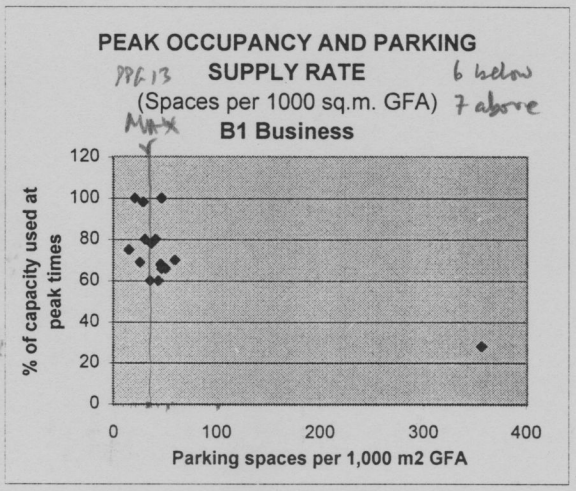
PPG13 2001 MAX

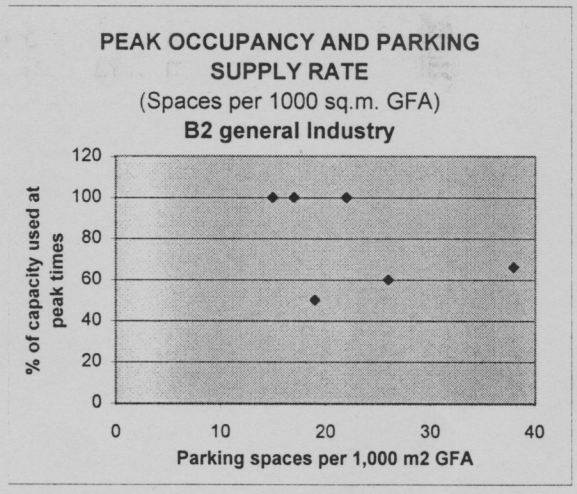


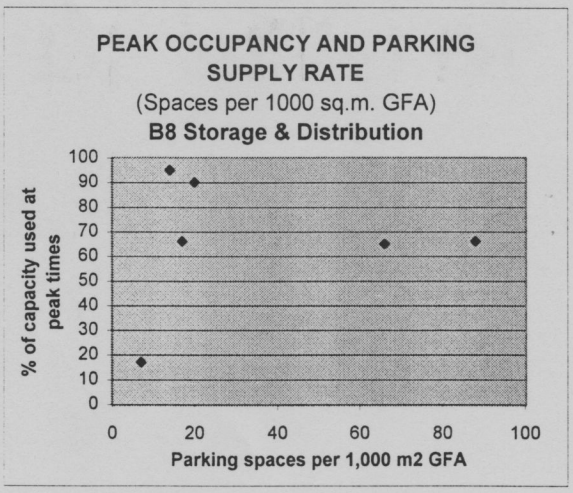


13 less than max
23 more than max









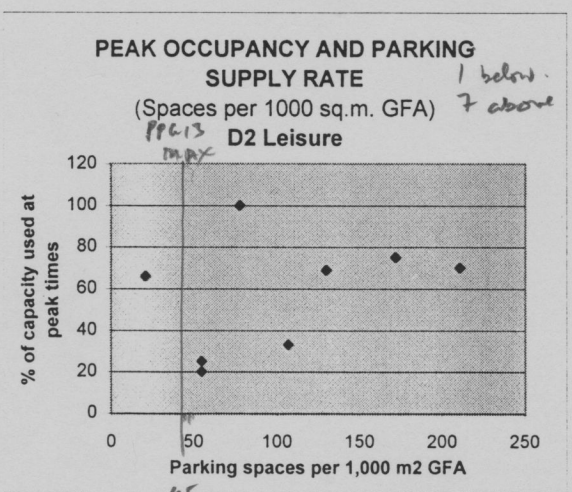


Figure 6

Figure 7

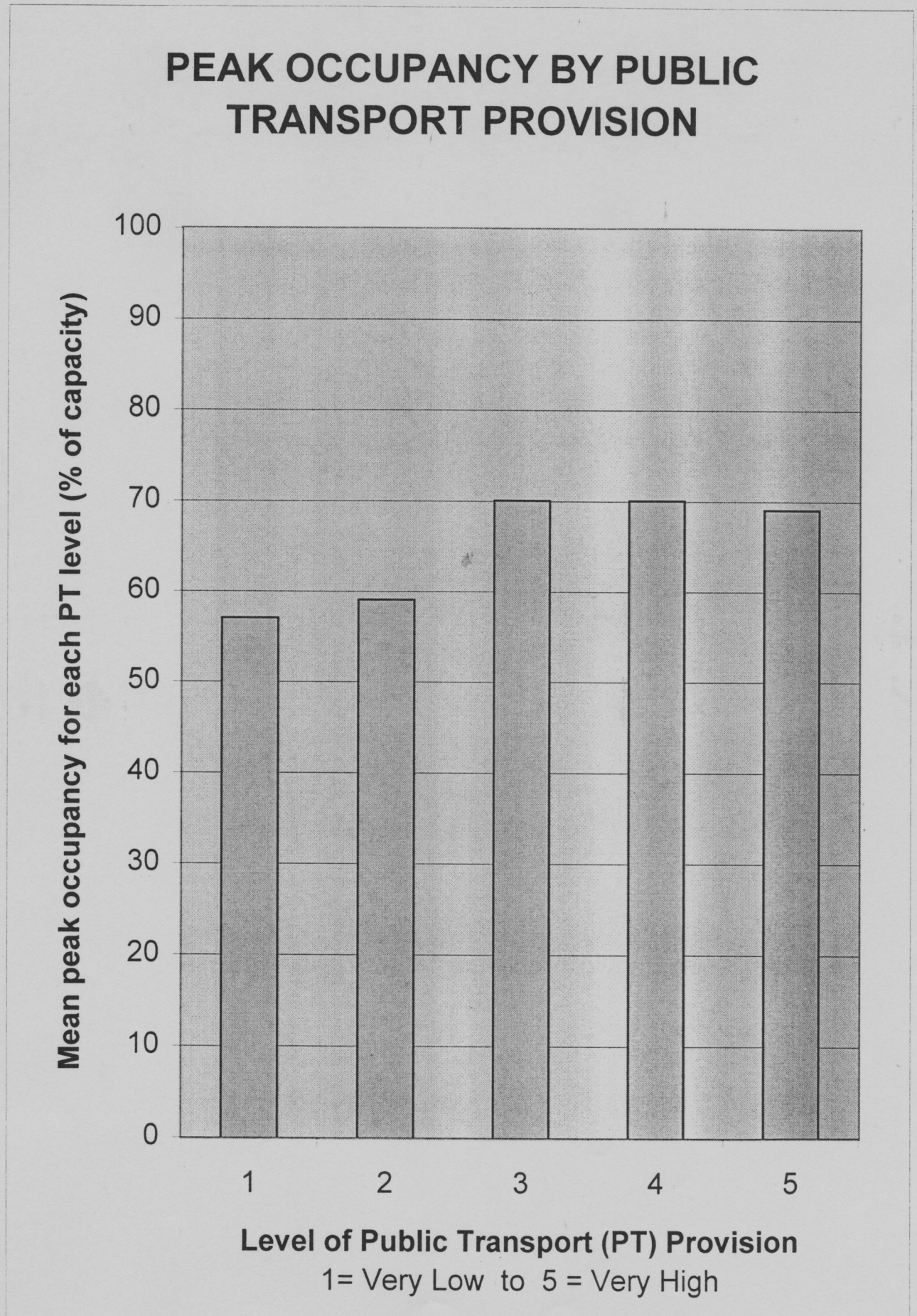

PEAK OCCUPANCY BY PUBLIC TRANSPORT PROVISION
Mean peak occupancy for each PT level (% of capacity)
100
90
80
70
60
50
40
30
20
10
0
1
2
3
4
5
Level of Public Transport (PT) Provision
1= Very Low to 5 = Very High

FIGURE 8

PEAK PARKING DEMAND BY YEAR OF SURVEY