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SAMPLE SURVEY OF THE ROADS OF GREAT BRITAIN – 1974/75

by

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SAMPLE SURVEY OF THE ROADS OF GREAT BRITAIN – 1974/75

ABSTRACT

In 1973 a sample of approximately 1300 sites on the British road system was selected for the purpose of making a traffic census. It was decided to follow this up by surveying the road characteristics at these sites, to provide estimates of the prevalence of various geometrical and other features.

This report describes the selection of the sites, the survey carried out, and a selection of the results which were obtained. Such results provide background information useful in assessing the effects which various road features can have on accidents.

1. INTRODUCTION

In order to assess the effect of various road features on accidents it is useful to know the frequency with which such features are encountered. A complete survey of the road system of Great Britain is, obviously, impossible, but a survey carried out at a random sample of sites can be applied to the road system as a whole.

Such a survey was carried out during the period 1957–59, in conjunction with a traffic census¹. A sample of 1100 sites, representative of the road system as a whole, had been selected for the traffic counts, and further visits were made to the sites to observe their geometrical and other features.

Another large traffic census, this time at 1300 sites, was carried out in 1966², but on this occasion road characteristics were not observed. Thus by the early 1970s the results of the road survey were becoming rather outdated. In the meantime there had been many improvements to existing roads, and much new construction including the building of much of the motorway network.

When a new traffic census was planned for 1973, and a sample of 1300 sites was selected for that purpose, it was decided to carry out a new survey at those sites. The observations were made between mid-1974 and mid-1975. Therefore these results are already a little dated, due mainly to difficulties encountered in obtaining reliable road mileage estimates from which to derive scaling factors (see Section 3.2).

This report, unlike that for the earlier survey¹, is confined to results of the survey of road features. The results of the traffic counts are used as a basis for the Department of Transport's regular traffic estimates, but have not been published in detail. In general the two sets of results are used separately, though links between them are possible.

In addition to providing background information on the extent to which various features are present on the country's road system, the data may be used to derive accident rates for roads with differing geometrical and other features in greater detail than is possible using just the regular traffic estimates based on 200 sites. For example, estimation of national average rates for roads with differing widths and numbers of carriageways might be possible, preferably using accident data from a period close to that of the survey.

Continuing improvement and construction of the road network will lead to the figures in this report giving a progressively-less-accurate description of the current system. While it is impossible to give a good estimate of current accuracy without making a (partial) follow-up survey, 'educated guesses' may be made of the sign and size of likely discrepancies. For instance, the installation of mini-roundabouts has become a popular form of junction alteration over the period since 1974, so that the number of such roundabouts given in this report is likely to be a considerable underestimate of the present number. Equally data on the number of junctions is likely to change very slowly, that on road widths rather less slowly, while data on lighting and parking restrictions will change fast.

2. THE SAMPLE

2.1 Selection of sample points

The sampling frame for the method used consists of a map on which all the roads in the population being sampled can be distinguished. The maps used for the majority of the work were the Ordnance Survey 1-in-25,000 series. These maps, which cover the whole of Great Britain except for some of the more remote parts of Scotland, are marked with the National Grid, and show all roads up to the date of the last revision. One-inch-to-the-mile Ordnance Survey maps were used for the remaining areas.

Suppose that large numbers of short lines of equal length, randomly oriented and located, are superimposed on the map. Any infinitesimal section of road is as likely to be cut by one of these lines as is any other section. Thus the intersections of lines and roads forms a random sample of the roads being sampled. As well as being random, however, the sample is required to be independent, ie the chance of any particular point being chosen should be independent of the positions of the other points. This is not true of the sample determined by the intersections of lines and roads since the points will tend to cluster, several to each short line. One way of avoiding this difficulty would be to use very short lines, so that there would be a negligible chance of a single line cutting more than one road; it is more practicable, however, to use lines of moderate length to select an initial sample of two or three times as many points as will finally be required, and to take for the final sample every second or third point in the initial sample.

Instead of placing short lines at random over the map, a form of systematic placement was used. Eight lines were placed on each 10 km x 10 km grid square with the arrangement shown in Figure 1. The short lines lie either on the grid lines or at 45° to them. This procedure was carried out separately for A-class roads, for B-class roads, and for other roads. For A-class roads the short lines were (the scaled equivalent of) 1700 feet in length, for B roads they were 600 feet long, and for other roads 400 feet long. Any points where the lines intersected roads of the appropriate class were then added to the list of prospective sites.

Local Authorities in whose area the sites lay were asked to state the class of road and the speed limit at each site, which enabled the sites to be broken down by class of road and subdivided into built-up (sites with a speed limit of 40 mile/h or less) and non-built-up (sites with higher speed limits).

The final categories of road were thus:—

Trunk	}	Each subdivided into built-up (BU) and non-built-up (NBU)
Principal		
Class II		
Other (Class III or unclassified)		

A further category of road, Motorways, was added, making nine categories in all.

Having categorised each site in the initial sample the final sample was selected by taking the appropriate number of points from each category. The final sample included the 200-point census sites (sites at which regular monthly counts of traffic volume are made).

The sites were then marked on the 1-in-25000 maps. The distribution of sites between road classes and regions is given in Table 1.

2.2 Selection of sections of road

In addition to the sample of points it was necessary to have a sample of sections of road in order to count the frequency of such items as bends, bridges, signs, etc.

For simplicity it was decided that each point should have one section associated with it and that the sections should be of the following lengths:

Sections on trunk roads, principal roads and class II roads: BU – ½ mile; NBU – 1 mile.

Sections on class III and unclassified roads: all areas – ¼ mile.

To define each section the standard procedure was to start at the point and proceed in a generally northerly direction along the road for the appropriate distance. However, a number of special cases and difficulties arose.

It was required that the whole of each section should lie in the same stratum, ie that it should not change from one class of road to another, nor from a built-up to non-built-up area, but when the sites were visited it was found in some cases that the pre-selected section crossed a BU/NBU boundary. In such cases it was permitted to follow the section until the boundary was reached, and then to follow the road in the opposite direction from the point until the required length had been surveyed.

For other cases of difficulty some rules were laid down:

- 1) If the section reached the edge of the map before the required length the section followed the road from the point in the opposite direction.
- 2) If the road ended before the required length, the section was made up of two or more parts, the second being started at the opposite end of the same piece of road.
- 3) If the whole road was less than the required length, the map was scanned to find an end point of the required type further south than the other end; the 1-km columns of the map were scanned in a specified order so as to prevent any subjective element affecting the end-point chosen.

When the sections had been chosen they were outlined in red ink on the 1-in-25000 maps.

2.3 Selection of junctions

Since the selected sections include only one or two arms of the junctions through which they pass, the junctions on the sections do not form a satisfactory sample of junctions as a whole. However, a satisfactory sample of junctions can be formed from those lying on the sections by means of the following rule:

the probability that a given junction shall be included in the sample of junctions is the proportion of the arms of the highest class (motorway, trunk, principal, II, other) represented at the junction that are included in the section.

Thus, for example, in the middle of a trunk section a junction where there was no other trunk arm would be included, and a cross-roads where another trunk road crossed the section would have a 50 per cent chance of inclusion. The decision to include or exclude a junction when the probability is not 0 or 1 was made by means of a table of random numbers.

Applying the above rule, random (though not independent) samples are obtained of junctions at which there are one or more motorway arms, of junctions at which the highest class represented is trunk, of junctions at which the highest class represented is principal, of junctions at which the highest class represented is class II, and of junctions at which all the arms are 'other' roads. The sampling fractions for these random samples are the same as for the sections of the highest class of road represented.

3. SURVEY OF ROAD CONDITIONS

3.1 Details of the survey

The survey was carried out between mid-1974 and mid-1975 by teams from the Laboratory; each team usually consisted of three people. The information for each point and section was recorded on two types of data sheet (Figures 2 and 3).

Figure 2 is in two parts; the left-hand side refers to conditions at the point, and the right-hand side to features encountered on the associated section. During the course of the survey it was found difficult to complete the items relating to reflectorisation of white lines and to the position of wheel tracks, and these questions were generally unanswered.

The sheets were completed by entering measured values, ticks or strokes as appropriate. Where conditions differed on opposite sides of the road, 'N' (nearside) and 'O' (offside) were entered where appropriate.

For each of the selected junctions a separate data sheet (Figure 3) was prepared. An arrow showing the direction of travel was placed against one of the eight types of junction illustrated to show the relation of the arms in the lower part of the sheet. If the layout did not conform to one of these types a drawing of the layout was made in the space provided on the right of the sheet. The information in the lower half of this sheet was recorded for each arm of the junction separately.

The methods of making the measurements and the definitions used are described in the Appendix.

During the course of the survey it was found that a few sites were not on public roads, and were therefore excluded. Some sites, mainly those on the Scottish Islands other than Skye, were not visited, while in some other cases incomplete data were collected. These sites too, are omitted from the survey, leaving a final sample of 1224 sites.

In addition to the geometric data gathered by the survey teams, local authority engineers were asked to provide information on the category of street lighting (where the road was lit) and road surface construction, as these could not be easily assessed visually during a short visit.

3.2 Scaling up the sample results to represent all roads

In scaling up the results from the sample points to represent the roads of the whole country, it was assumed that each point is representative of a certain number of kilometres of road. For example, for trunk roads in the built-up part of the North West region, there are five points representing 200 km of road (estimated road lengths of each class in each region are given in Table 2); thus each point is taken to represent $\frac{200}{5} = 40$ km.

Applying these scaling factors, and then summing over the eleven regions, gave estimates of the length of road in Great Britain with a given width, gradient, etc.

Because the number of sample points on any particular class of road in a single region could be very small, the survey does not give very reliable estimates for most features unless some aggregation is carried out, either over the regions or over road class. It must be stressed that the primary purpose of the survey was to provide national estimates.

Further, for some features which were found only rarely, the estimates are very uncertain even on a national scale.

4. RESULTS

All results quoted below refer to roads in Great Britain, exclusive of motorways.

4.1 Width of carriageway and lane markings

Table 3 shows that the average carriageway width decreases with the class of road, except in the case of trunk and principal roads in built-up areas, and that roads in non-built-up areas are narrower than roads of the same class in built-up areas.

There is a considerable difference in average width between Regions; trunk and principal roads in BU areas, for example, varying between 10.7m in the North West and 7.8m in Wales and in the South West.

The length of road in various width groups is shown in Table 4.

Lane markings are more common on the higher classes of road (see Table 5), and on trunk and principal roads 85–90 per cent of the road length has some form of lane marking.

4.2 Curvature

Table 6 shows the percentage of the road length of each class and in each Region which has a radius of curvature of less than 900m. Roads in NBU areas are more curved than those in BU areas. There are considerable differences between Regions, the percentage of road length which is curved varying between 3 and 31 in BU areas, and between 1 and 41 in NBU areas.

4.3 Gradients

The percentages of road length with different gradients are summarised in Table 7. In both BU and NBU areas nearly 30 per cent has a gradient less steep than 1 in 100, whereas the previous survey¹ showed

nearly 50 per cent with gradients less steep than 1 in 100. Inspection of the Table shows that in the present survey there has been a greater tendency to show shallow gradients, which are difficult to measure over a short distance. For gradients of about 1 in 30 or steeper there is good agreement in the totals between the two surveys. Table 8 shows that the average gradient of trunk roads is less than that of principal roads, and that the gradient of both classes is generally less than that of lower-class roads. For all classes of road together there is little difference in the average gradient between BU and NBU areas.

4.4 Development

The types of development at the roadside are shown in Table 9. In BU areas about 90 per cent of the road length has been developed, mainly with houses, while in NBU areas about 15 per cent of the total road length has been developed.

4.5 Footpaths

The proportions of road length with and without footpaths are shown in Table 10. In BU areas 74 per cent of the total road length has a footpath on both sides and 15 per cent on one side only. In NBU areas the proportions are 3 and 12 respectively. In both types of area footpaths are more likely to be found on trunk and principal roads than on roads of a lower class.

4.6 Waiting restrictions

In BU areas about one-third of trunk and principal roads are subject to waiting restrictions (Table 11) and about 10 per cent of lower-class roads are also subject to restrictions. In NBU areas about one-third of trunk roads are designated as clearways, and about 10 per cent of principal roads are also clearways. Very few roads in NBU areas, other than trunk and principal, are subject to waiting restrictions.

4.7 Features on sections

Associated with each sample point was a section of road on which various features were counted. Estimated totals of each of these features are shown in Table 12.

The number of bends per kilometre is greater in NBU areas than in BU areas, and is also greater on the lower classes of road. Bends are difficult to define (see Appendix), and it has been found that the definition varies considerably with the observer, which may partially account for the large differences between the results of the present survey and the previous survey¹.

The number of junctions encountered per km is about five times as great in BU areas as in NBU areas, but does not vary greatly with the class of road. It should be noted that the number of junctions per km would need to be adjusted according to the numbers of arms in order to provide an indication of the number of junctions in the country; each 4-way junction, for example, is encountered on each road passing through it.

Private accesses were only counted in NBU areas, where the number of such accesses per km increases as the class of road decreases.

4.8 Sample of junctions

Junctions have been classified into 3-way, 4-way and other in broad types (Table 13). In both BU and NBU areas there is a preponderance of 3-way junctions, the majority of these being T-junctions, which form about 70 per cent of the total in both BU and NBU areas.

At each of the selected junctions a note was made of the presence or absence of such items as traffic lights, advance direction signs, 'Stop' or 'Give Way' signs etc, and these are summarised in Table 14. It is estimated that there are about 5,000 traffic light installations in the country, mainly in BU areas, where about 4 per cent of 4-way junctions are controlled by traffic lights.

Advance direction signs are more common in NBU areas, where they occur on about 3½ per cent of all arms; in BU areas they occur on about 1½ per cent of all arms.

Give way signs are encountered more frequently in NBU areas, where the percentage of minor arms controlled by such signs is about 22 at 3-way junctions and about 60 at other junctions.

4.9 Road lighting

Over 90 per cent of the road length in built-up areas has some form of lighting, compared with around 15 per cent in non-built-up areas. Tables 15, 16 and 17 show breakdowns of this lit length by, respectively, the category of the lighting, type of lantern used, and mounting height of the lanterns.

Tables 15 and 17 show that, as one would expect, better quality lighting (as represented by high categories and high mounting heights) tends to be installed more on trunk and principal roads than on lower-class roads. Table 16 illustrates the extent to which low pressure sodium lanterns predominate, especially in installations outside built-up areas.

4.10 Road surface construction

Table 18 shows that hot rolled asphalt is the predominant surface type on trunk and principal roads, with surface dressing also used extensively on principal roads outside built-up areas. On lower-class roads surface dressing covers about 55 per cent of the length in built-up areas and about 85 per cent in non-built-up areas.

5. DISCUSSION

This report has described the selection of a sample of approximately 1300 sites on the road system of Great Britain, the surveying of road geometry and other features at those sites, and examples of estimates that can be made of the prevalence of selected features on the road system as a whole.

The tabulations presented summarise most of the data collected. However, each feature is tabulated in isolation, whereas in reality some features are certainly associated with each other. For example, curvature and gradient are correlated through being dictated, to some extent, by the 'difficulty' of the terrain in which the road lies. Although no interactive breakdowns have been given, the possibility exists of producing such tables. On the other hand, there are obviously limitations on the detail which can be reasonably obtained from a limited sample of sites.

The results can help to explain certain variations in accident frequency. For example, the national accident report form gives, among the information supplied about accidents occurring at junctions, a classification of the junction type. The different numbers of accidents occurring at different types of junction can be explained, to a large extent, by variation in the total numbers of the respective junction types, which can be estimated from these data.

The accident data used in such comparisons should ideally be taken from a period close to that of this survey. Continuing improvement and construction of the road network is likely to make the figures in this report a progressively-less-accurate description of the current system, so that they should be used with increasing caution as time passes.

6. ACKNOWLEDGEMENTS

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7. REFERENCES

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TABLE 1
Numbers of sites in sample

Region	Motorways	Built-up areas				Non-built-up areas				Total
		Trunk	Principal	Class II	Other	Trunk	Principal	Class II	Other	
Scotland	5	7	17	8	25	37	47	21	14	181
Northern	6	1	7	0	11	3	9	5	12	54
Yorks & Humberside	5	6	15	7	31	10	13	6	16	109
North Western	10	5	20	7	29	12	8	3	6	100
East Midlands	5	12	10	4	13	10	16	6	22	98
West Midlands	9	8	10	6	15	15	16	10	12	101
Wales	2	9	15	8	14	15	15	7	19	104
Eastern	3	7	23	10	34	13	13	15	25	143
South Western	5	4	18	4	14	17	25	11	32	130
London Highways	2	1	28	5	34	0	1	0	0	71
South Eastern	7	5	23	9	32	11	26	6	14	133
Total	59	65	186	68	252	143	189	90	172	1224

TABLE 2

Kilometres of road in Great Britain (1973)

Region	Motorway	Built-up areas				Non-built-up areas					
		Trunk	Principal	Class II	Other	Total	Trunk	Principal	Class II	Other	Total
Scotland	150	47	752	1,114	8,586	10,499	3,034	6,566	5,432	22,339	37,371
Northern	116	76	620	393	7,210	8,299	718	1,207	1,262	9,465	12,652
Yorks & Humberside	177	275	1,012	573	10,480	12,340	650	1,268	1,310	10,467	13,695
North Western	332	200	1,444	874	14,107	16,625	563	649	441	4,690	6,343
East Midlands	121	212	753	512	7,501	8,978	1,019	1,746	1,600	12,366	16,731
West Midlands	220	219	941	632	9,624	11,416	884	1,577	1,553	11,634	15,648
Wales	42	468	1,115	1,661	11,159	14,403	1,165	1,284	1,202	12,532	16,183
Eastern	127	264	1,064	835	9,411	11,574	1,233	2,425	2,980	20,796	27,434
South Western	211	323	1,085	623	9,296	11,327	1,044	2,615	2,356	26,631	32,646
London Highways	34	172	1,382	552	10,301	12,407	47	21	18	146	232
South Eastern	222	134	1,316	977	10,631	13,058	703	1,965	1,489	12,878	17,035
Total	1,752	2,390	11,484	8,746	108,306	130,926	11,060	21,323	19,643	143,944	195,970

TABLE 3

Average width of roads (metres) in regions

Region	Built-up areas			Non-built-up areas		
	Trunk and Principal	Class II and Other	All	Trunk and Principal	Class II and Other	All
Scotland	9.9	7.2	7.4	6.7	4.4	5.0
Northern	8.3	6.6	6.7	8.4	4.9	5.4
Yorks & Humberside	9.9	6.4	6.7	8.3	4.5	5.1
North Western	10.7	6.7	7.1	8.9	5.5	6.1
East Midlands	8.9	6.1	6.4	7.2	4.7	5.1
West Midlands	9.0	6.0	6.3	8.7	4.4	5.1
Wales	7.8	6.0	6.2	6.8	3.6	4.1
Eastern	8.0	5.9	6.2	8.1	4.9	5.3
South Western	7.8	6.2	6.4	8.1	4.2	4.7
London Highways	10.6	7.4	7.8	—	—	—
South Eastern	8.9	6.3	6.6	9.4	4.6	5.4
All regions	Trunk	8.9	6.7	Trunk	8.7	5.0
	Principal	9.2		Principal	7.2	
		Class II		Class II	5.6	
		Other		Other	4.3	

TABLE 4

Percentage of road with carriageway of various widths

Width*		Built-up areas			Non-built-up areas		
Metres	Feet	Trunk and Principal	Class II and Other	All	Trunk and Principal	Class II and Other	All
1.8– 2.4	6– 8					1	1
2.4– 3.0	8–10		1	1		15	13
3.0– 3.7	10–12		<1	<1	1	12	10
3.7– 4.3	12–14		3	2	<1	10	8
4.3– 4.9	14–16		5	4	<1	14	12
4.9– 5.5	16–18	1	12	11	4	19	16
5.5– 6.1	18–20	5	19	18	13	14	13
6.1– 6.7	20–22	10	19	18	17	9	11
6.7– 7.3	22–24	13	10	10	18	2	5
7.3– 7.9	24–26	9	17	16	23	2	6
7.9– 8.5	26–28	9	6	7	2	1	1
8.5– 9.1	28–30	5	2	3	1	<1	<1
9.1– 9.8	30–32	13	3	4	4	<1	1
9.8–10.4	32–34	7	1	1	3		1
10.4–11.0	34–36	2	1	1	<1		<1
11.0–11.6	36–38	6	1	1			
11.6–12.2	38–40	4		<1	1		<1
12.2 and over (incl duals)	40 or over (incl duals)	15	1	2	10		2

* 16–18 feet, for example, includes roads of exactly 16 feet but not those of exactly 18 feet. In practice the measurements were made in feet, and the first column gives the metric equivalents of the ranges defined in imperial units.

TABLE 5

Percentage of road with various lane markings

Type of area	Lane markings	Class of road				
		Trunk	Principal	Class II	Other	All
Built-up	None	14	14	19	78	67
	Broken line	82	84	78	22	32
	Single continuous line	—	<1	1	1	1
	Continuous and broken line	—	—	2	—	<1
	Double continuous line	4	2	—	—	<1
Non-built-up	None	10	12	29	82	65
	Broken line	73	83	68	17	32
	Single continuous line	1	—	—	—	<1
	Continuous and broken line	10	4	3	—	1
	Double continuous line	6	1	—	1	1

TABLE 6

Percentage of road length which is curved*

		Built-up areas	Non-built-up areas
By class of road	Trunk	20	28
	Principal	18	20
	Class II	22	31
	Other	15	21
	All (excluding motorways)	16	23
By region	Scotland	17	22
	Northern	17	14
	Yorkshire & Humberside	3	1
	North Western	12	18
	East Midlands	6	10
	West Midlands	10	22
	Wales	24	25
	Eastern	14	15
	South Western	31	41
	London Highways	16	—
South Eastern	23	36	

* Radius of curvature <900m

TABLE 7

Percentage of road length with various gradients
(to nearest 'round' value)

Gradient (%)	Built-up areas	Non-built-up areas
20	1	1
10	6	4
7	7	5
5	9	7
3	10	15
2½	6	11
2	14	10
1	20	20
0	28	27

TABLE 8

Average slope by class of road and by region

		Percentage	
		Built-up areas	Non-built-up areas
By class of road	Trunk	1.8	1.8
	Principal	2.0	2.0
	Class II	1.7	2.3
	Other	2.8	2.6
	All (except motorways)	2.6	2.4
By region	Scotland	2.0	2.1
	Northern	1.9	3.2
	Yorkshire & Humberside	3.9	1.8
	North Western	2.4	1.7
	East Midlands	3.4	2.2
	West Midlands	2.3	3.5
	Wales	3.3	4.2
	Eastern	1.8	0.7
	South Western	3.0	3.4
	London Highways	2.2	—
South Eastern	2.5	1.7	

TABLE 9

Percentage of road with various types of development*

Type of area	Type of development	Class of road				
		Trunk	Principal	Class II	Other	All
Built-up	No building	12	12	25	8	10
	Houses, flats	67	63	62	85	81
	Shops, garages	11	14	9	2	3
	Offices, Public buildings	3	8	1	3	3
	Industrial	7	3	3	3	3
Non-built-up	No building	85	84	84	84	84
	Houses, flats	14	15	14	13	14
	Shops, garages	<1	—	—	1	<1
	Offices, Public buildings	<1	—	—	1	<1
	Industrial	<1	2	2	1	1

* Where the type of development differs on opposite sides of the road, each type has been allotted half the appropriate road length.

TABLE 10

Percentage of road length with and without paved footpaths

Type of area		Trunk	Principal	Class II	Other	Total
Built-up	With footpath both sides	76	76	61	75	74
	With footpath one side only	19	17	29	14	15
	Without footpath	5	7	11	11	11
Non-built-up	With footpath both sides	6	5	0	2	3
	With footpath one side only	19	28	13	9	12
	Without footpath	75	67	87	88	85

TABLE 11

Percentage of road with and without waiting restrictions

Type of area	Type of restriction	Class of road				
		Trunk	Principal	Class II	Other	All
Built-up	None	72	63	78	91	87
	Clearway	1	4	4	—	1
	Other restriction	27	34	17	9	12
Non-built-up	None	66	90	99	99	96
	Clearway	34	10	—	—	3
	Other restriction	—	—	1	1	1

TABLE 12
Numbers of various features

Feature	Built-up areas					Non-built-up areas				
	Trunk	Principal	Class II	Other	Total	Trunk	Principal	Class II	Other	Total
Number of features										
Pelican crossing	550	1,500	160	1,600	3,800	-	-	-	-	-
Zebra crossings - with refuge	290	2,600	140	1,200	4,200	-	-	-	-	-
Zebra crossings - without refuge	650	3,500	970	4,000	9,100	-	-	-	-	-
Refuge (no Zebra or junction)	660	1,600	270	-	2,500	-	50	-	-	50
Subways	60	240	-	-	300	40	230	-	-	270
Footbridges	50	140	140	-	330	-	-	-	-	-
Level crossings	-	60	100	-	160	-	-	150	1,900	2,000
Lay-bys	1,200	4,300	2,800	17,000	25,000	8,100	9,600	3,300	23,000	44,000
Bends	2,100	10,700	9,200	176,000	198,000	9,500	28,400	32,000	352,000	421,000
Double bends	310	2,000	1,700	13,800	18,000	2,300	4,900	10,000	61,000	78,000
Narrow bridges	70	510	500	2,900	3,900	130	500	1,200	19,000	21,000
Low bridges	30	270	270	800	1,400	30	350	250	2,300	2,900
Warning signs (not junction)	3,100	13,300	8,100	63,000	87,000	4,200	9,700	7,400	31,000	52,000
Features per km										
Bends per km	0.88	0.93	1.05	1.63	1.51	0.86	1.33	1.63	2.45	2.15
Double bends per km	0.13	0.17	0.19	0.13	0.14	0.21	0.23	0.51	0.42	0.40
Private access per km										
3-way junctions per km	4.77	4.67	4.12	4.92	4.84	2.03	2.78	2.97	4.44	3.98
4-way junctions per km	1.14	1.31	1.45	1.49	1.47	0.84	0.84	0.90	1.24	1.14
Other junctions per km	0.21	0.08	0.03	0.05	0.06	0.01	0.01	0.00	0.00	0.00

TABLE 13

Numbers of different types of junctions

Type of junction	Built-up areas	Non-built-up areas
Roundabout – conventional	2,900	490
– mini	110	0
3-way T-junction	370,000	125,000
Other	39,000	38,000
Total	410,000	165,000
4-way No stagger	91,000	10,400
Staggered	12,400	3,500
Total	104,000	13,900
Other, more than 4-way	3,900	70
Total, All types	520,000	180,000

TABLE 14

Numbers of features at junctions

Type of feature	Class of major road					
	Built-up areas			Non-built-up areas		
	Trunk and Principal	Class II and Other	Total	Trunk and Principal	Class II and Other	Total
<u>At 3-way junction</u>						
Traffic lights with no pedestrian signal	680	0	680	90	0	90
Traffic lights with pedestrian signal	270	0	270	0	0	0
Sign posts	5,900	13,200	19,100	10,500	53,000	64,000
Advance direction sign	5,700	3,000	8,600	8,400	3,600	12,000
Warning sign	4,700	10,400	15,100	10,600	14,100	24,600
Bar lines	0	0	0	0	0	0
Refuges	6,800	12,300	19,000	860	4,000	4,900
Grass islands	2,300	3,900	6,200	2,300	24,000	27,000
Ghost islands	1,500	5,400	6,900	970	0	970
Words on carriageway	2,200	4,600	6,800	280	0	280
Stop signs	1,400	4,100	5,500	180	0	180
Give Way signs	9,500	25,000	35,000	13,200	26,000	39,000
Zebra crossings	2,000	370	2,300	0	0	0
Pelican crossings	280	0	280	0	0	0
<u>At other junctions</u>						
Traffic lights with no pedestrian signal	2,200	1,300	3,500	30	0	30
Traffic lights with pedestrian signal	410	140	550	0	0	0
Sign posts	4,100	3,200	7,300	4,100	4,000	8,100
Advance direction sign	9,800	3,100	12,900	8,300	1,400	9,700
Warning sign	7,600	5,400	13,000	6,100	13,400	19,500
Bar lines	0	270	270	80	0	80
Refuges	9,400	4,200	13,700	1,200	0	1,200
Grass islands	1,000	100	1,100	2,100	3,600	5,700
Ghost islands	1,000	210	1,200	1,200	0	1,200
Words on carriageway	2,100	7,900	10,000	730	260	1,000
Stop signs	2,100	3,700	5,800	650	420	1,100
Give Way signs	7,200	38,000	45,000	7,600	10,400	18,000
Zebra crossings	2,700	170	2,900	0	0	0
Pelican crossings	220	0	220	0	0	0

TABLE 15

Percentage of road with various categories of lighting

Category	Built-up areas				Non-built-up areas					
	Trunk	Principal	Class II	Other	All	Trunk	Principal	Class II	Other	All
A1	16	19	4	4	4	3	2	-	-	<1
A2	38	35	23	6	11	3	6	3	3	3
A3	19	20	11	4	6	1	1	1	2	1
B	2	5	19	54	47	-	1	3	5	4
Sub-standard	4	7	15	16	15	-	2	-	4	3
Footway	1	3	2	5	4	-	<1	-	1	1
Mixed	-	-	-	<1	<1	-	-	-	-	-
Total lit*	88	93	78	92	92	8	15	7	15	14

* Includes road lit to an unknown standard

TABLE 16

Percentage of road with various types of lighting

Type of light	Built-up areas				Non-built-up areas					
	Trunk	Principal	Class II	Other	All	Trunk	Principal	Class II	Other	All
Low pressure sodium	67	54	53	38	41	7	10	6	9	9
High pressure sodium	-	1	3	-	<1	-	1	-	-	1
Mercury	15	29	11	27	25	-	3	1	2	2
Tungsten	3	3	7	18	15	-	1	-	2	2
Mercury and Tungsten	-	-	-	2	1	-	-	-	-	-
Gas	-	-	3	2	2	-	-	-	<1	<1
Other	-	2	1	1	1	-	-	-	-	-
Total lit*	88	93	78	92	92	8	15	7	15	14

* Includes road with lighting of unknown type

TABLE 17

Percentage of road with lights at various mounting heights

Mounting height	Built-up areas					Non-built-up areas				
	Trunk	Principal	Class II	Other	All	Trunk	Principal	Class II	Other	All
Up to 6m	6	12	31	72	63	—	5	4	9	8
7-9m	54	50	38	12	18	2	4	4	3	3
10-11m	20	24	8	2	5	2	5	—	1	2
12m	4	1	—	1	1	3	1	—	—	<1
Over 12m	—	2	—	<1	<1	—	—	—	—	—
Total*	88	93	78	92	92	8	15	7	15	14

* Includes road with lighting at unknown mounting height.

TABLE 18

Percentage of road with various surface construction

Surface type	Built-up areas					Non-built-up areas				
	Trunk	Principal	Class II	Other	All	Trunk	Principal	Class II	Other	All
Surface dressing	14	17	56	55	51	20	53	81	87	79
Hot rolled asphalt	69	60	22	12	18	59	26	9	2	9
Dense asphalt	2	5	5	4	4	2	2	2	1	1
Open-textured macadam	2	2	4	7	6	6	5	2	3	3
Dense macadam	7	8	10	9	9	7	12	7	3	5
Concrete-brushed	—	—	—	1	1	1	1	—	—	<1
Concrete-grooved	—	1	—	1	1	1	—	—	—	<1
Other	—	4	3	9	8	4	1	—	2	1

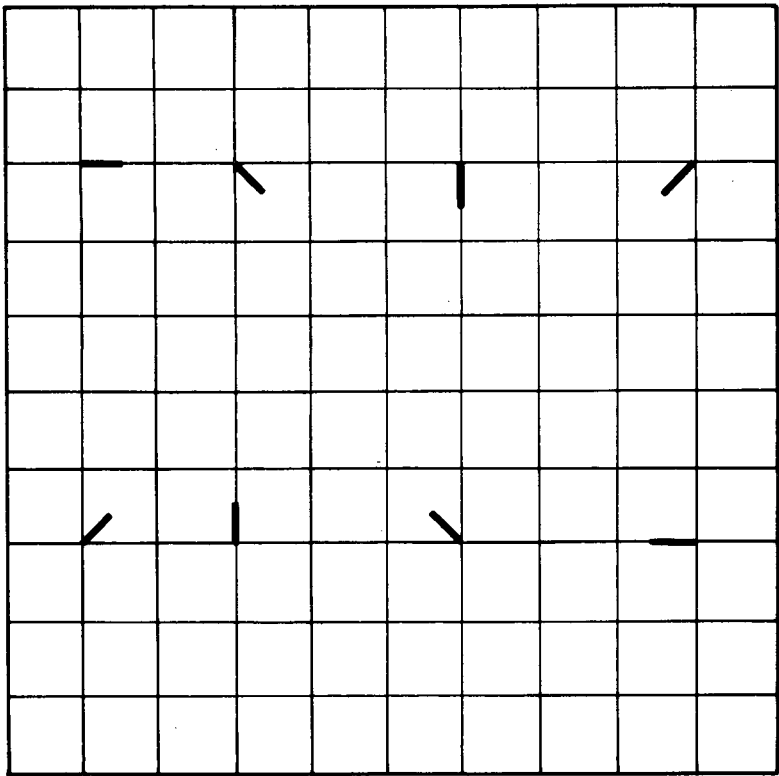
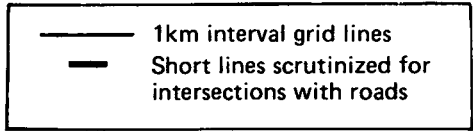


Fig. 1 Arrangement of short lines on each 10km x 10km grid square

DATE:
TIME:

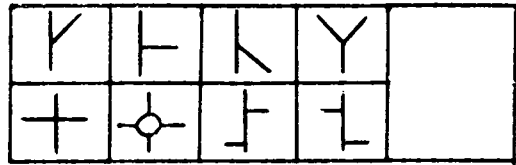
WEATHER:

AT POINT											ON SECTION																																		
Ref No	Map		Wheeltracks		N	O	Length - miles		No. of pieces																																				
M.T.P.2.O.	Div		(see note)		N	O	Pelican crossings																																						
Road number			Gradient		1 in		Zebras, with refuge																																						
County or Borough			Camber		1 in		" no refuge																																						
Speed limit			Superelevated?				Refuge, no xing or junction																																						
Carriageways			1	2	Curvature		Subways																																						
Width - ft and ins			0-500	5-1500	15-3000	3000 -	Straight	Footbridges																																					
Reservation - ft & ins			Safety fence		centre	N/side	O/side	Level crossings																																					
Lanes		1	2	3	4	6	Level		above		Normal	Below	Lay-bys																																
Lines		B	C	B&C	2C	Buildings + 50 yds		None				Bends																																	
Catsyes		Yes	No	Other reflect- ing stud		Houses, Flats						Double bends																																	
Edge Marking		Line		Yes	No	B	C	Shops, garages				Steep hills																																	
		Studs		Yes	No	Offices, public buildings						Road narrows																																	
Clearway			Yes	No	Industrial								Narrow bridges																																
Parking or waiting restr.			Yes	No	Road lighting		Lit	Unlit					Low bridges																																
Paved footpaths			0	1	2	Film No								Warning signs (NOT junction)																															
At roadside		Kerbs		Altitude										Veh. access (eg farm tracks) NEU only																															
		Vertical	Sloping	Flush or None		Expos.								Other comments																															
Paved						Notes: B = Broken C = continuous								Junctions with:-																															
Flush grass						Wheeltracks:- Measure in rektion to white line on 2 lane roads only								<table border="1"> <thead> <tr> <th></th> <th>3-way</th> <th>4-way</th> <th>>4-way</th> <th>Number Selected</th> </tr> </thead> <tbody> <tr> <td>M</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>T</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>P</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>O</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>			3-way	4-way	>4-way	Number Selected	M					T					P					2					O				
	3-way	4-way	>4-way	Number Selected																																									
M																																													
T																																													
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2																																													
O																																													
Raised verge																																													
Bank or wall																																													
hard shoulder																																													

Fig. 2 1300 point sample — main data sheet

Ref No

Map No



With
Ped
Signal

Traffic lights

--	--

Sign post

--

Film No

--

Exposure No.

--

Class		Approach	Ahead	On left			On right		
				1	2	3	1	2	3
On Approach	(M.T.P.2.0)								
	Control (S.G.O)								
	A.D.Sign (✓, x)								
	Warning sign (✓, x)								
	Dual or single (D, S)								
	Rumble strips (✓, x)								
	Bar lines (✓, x)								
In Mouth	Refuge (✓, x)								
	Grass island (✓, x)								
	Ghost island (✓, x)								
	Words on c'way(✓, x)								
	Line across c'way(✓, x)								
	Zebra (✓, x)								

Fig. 3 1300 point sample – data sheet for junctions

8. APPENDIX

DEFINITIONS AND METHODS OF MEASUREMENT

Curvature. This was measured by viewing the road through a glass plate, marked with curves of various radii, which was held at arms length.

Gradient. This was measured by placing a flat metal bar, 60 cm long and fitted with a spirit level, along the length of the road and raising one end of the bar until it was level. A vertical rule placed against the raised end was graduated to show the gradient as 1 in x.

Camber. This was measured starting from 60 cm from the kerb using the same apparatus as was used for measuring the gradient.

Buildings. The category ticked was that which was most common within 50 metres in both directions from the point. If the opposite sides of the road differed, two categories were ticked.

Bends. These include any curve signed as a bend and any curve which the observer judged to be sharp enough to be classed as a bend. It follows that the classification of a bend varied with the observer.

Double bends. These include anything signed as a double bend and any other cases where one bend was followed immediately, or almost immediately, by another.

Bridges. 'Narrow' or 'low' bridges are usually signed as such, but in some cases the observer may judge that other bridges should be included.

ABSTRACT

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