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Workshop on statistics on the volume of road traffic (vehicle-kilometres)

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How the National Road Traffic Estimates are made

Transmitted by the Government of the United Kingdom

Amendment History

Version number	Date of Amendment	Section amended	Summary of change
1.1	March 2004	All sections	Completely revised
1.2	April 2004	Minor Roads paragraph 17	Minor change to improve accuracy in methodology description.
1.3	May 2004	Paragraph 22	Amended link to CLIP web site
1.4	August 2004	Paragraph 18	Amendment made to description of minor road methodology
1.5	November 2004	Paragraph 20	Updated the Road Traffic Statistics email address in line with changes made at DfT
1.6	July 2005	Paragraph 18 and other minor amendments	Minor road methodology updated
1.7	August 2005	Paragraph 1	Minor amendment made: replaced "...in 2005..." with "...in 2004...".

1. INTRODUCTION

In 2004, motor vehicles travelled about 498 billion kilometres while pedal cycles travelled 3.9 billion kilometres along the public roads of Great Britain. How is this information obtained? It is obtained from the traffic counts conducted about many different types of roads and information on road lengths. However, it is not easy to convert count data to total traffic data

The road network consists of about 50,000 kilometres of motorways and class "A" roads, with a further 340,000 kilometres or so of minor roads. The road system as a whole is thus much too extensive to allow the collection of comprehensive traffic data for every part. Moreover, the density of traffic carried (and the mix of traffic by vehicle type) varies enormously from place to place and from hour to hour. Flows are less than 100 vehicles a day on many minor roads but exceed 160,000 a day on some motorway links. Even within a road class, one site may easily carry ten times as much traffic as another. Flow also varies by time of day, by day of week and by month of year. Furthermore, there is variation within the variation - car traffic levels, for example, may change relatively little over the seven days of the week, but goods traffic is usually at far lower levels on Saturdays and Sundays than on other days. These characteristics mean that estimating national traffic volumes requires a fairly complicated sampling design, the collection of substantial volumes of data and complex computational procedures. This note describes the new methodology used for the traffic estimates from 1993 onwards.

Estimation of traffic levels uses information from both manual and automatic counts. They are each described briefly below.

2. THE MANUAL COUNTS (PREVIOUSLY REFERRED TO AS THE ROTATING CENSUS AND THE BIENNIAL COUNTS)

These counts operate somewhat differently for major and minor roads. The major roads are split into five road classes: motorways, trunk roads and principal roads with the latter two divided into urban and rural roads. Urban¹ roads are defined as those within the boundaries of the Urban Area polygons for settlements of 10,000 population or more, based on the 2001 Population Census. On the outskirts of urban areas, bypasses are normally treated as rural even if part of the road may lie within the urban area polygon. Conversely, roads between urban areas with short lengths outside the polygons are normally treated as urban. Minor roads are divided into 6 classes: B class, C class and U (unclassified) roads, each sub-divided into urban and rural.

For major roads (motorways and A-roads), the traffic on every link - normally a section of road between consecutive junctions with other major roads - must be regularly assessed. This is done by counting the traffic at a statistically random point on most links at regular intervals - traditionally, once every three years in England and Wales and once every six years in Scotland². It is recognized that, with the exception of motorways, traffic levels will vary along the length of a link. However, the procedure of counting at a statistically random point on each link can be

¹ Before 8 May 2003, roads were, instead, classified as built-up and non built-up. Built-up roads were those with a speed limit of 40mph or less. Non built-up roads were those with a higher speed limit.

² Since 1999, the frequency of counting has been broadly based on the variance of the traffic of the link (variance of average flow * link length). Intervals are every one, two, four and eight years in England and Wales. In Scotland they are two, four, eight and sixteen years. However, Scotland is proposing to increase its budget for traffic counting and so may come into line with level of counting in England and Wales.

expected to lead to good estimates at national level although estimates on some individual links may be less reliable.

In total, about 5,100 major road sites are scheduled to be counted in 2005. In addition to traffic count data, information is collected about the characteristics of each link, such as its length and the road class and road width at the place of the count. At each chosen point, trained enumerators count vehicles of each of eleven types (pedal cycles, two-wheeled motor vehicles, cars and taxis, buses and coaches, light vans, and six separate categories of goods vehicle) for the 12 hours from 7am to 7pm. These counts are all scheduled to take place on weekdays, but not on or near to public holidays or school holidays. To minimize the effects of possible seasonal factors, counting is confined to the so-called "neutral weeks". These are namely most weeks in March, April, May, June, September and October.

Some major road links are unsafe to count or are too short to be worth counting in the normal way. In these cases, traffic estimates are derived from the judicious use of flow data on adjacent links. These are called derived links. Further, because all links are now defined as ending at a local authority boundary, some links are treated as dependent links. In these cases, it is assumed that the flow is the same along all of the link. So, a count in one local authority can be used as a proxy for the flow on the dependent link. In 2004, there were 15,473 normal links, 1,226 derived links and 1,041 dependent links. Complete coverage of the minor road network is not attempted as it is too extensive. It is not practicable to define the minor road network in terms of individual links; even if all the links could be identified, their number would be far too great to allow traffic data for each link to be collected. Minor road traffic estimates are therefore made by grouping minor roads into one of the six road classes³. An attempt is then made to measure the average flow on each of these road types by carrying out a number of counts along them. A random sample of approximately 4,500 sites across GB is visited each year. These same sites are counted each year. Most of these counts are carried out in neutral weeks. However about 200 counts per year, the "summer-winter counts", are carried out in non-neutral weeks and on weekends. These 200 sites are visited each year and are mainly used to provide extra information about two-wheeled traffic throughout the year. This is because pedal cycles and motor cycles are not always accurately identified by automatic counters (see paragraph 9).

The manual counts have the advantage over automatic counts of complete coverage of major road sites and moderately good coverage of minor roads. However, the data (hourly by vehicle type), are very sparse since traffic is counted for only 12 hours on each visit. Thus these counts give no information about traffic at night, at weekends, over public holiday periods, and little about the seven non-neutral months. In calculating national traffic estimates, therefore, use must be made of data from automatic counters.

3. THE AUTOMATIC COUNTS (PREVIOUSLY REFERRED TO AS THE CORE CENSUS)

The automatic counters fill the gaps left by the manual counts. There are some 160 sites in GB outside of London where traffic is monitored continuously using automatic sensors, which classify the traffic into vehicle type. The numbers of vehicles of each type detected are combined into hourly totals and stored on-site until it is downloaded during the night to a computer in the

³ These include: urban and rural 'B' roads, 'C' roads and unclassified roads

DfT headquarters building. The automatic counting equipment recognizes 22 different types of vehicle; these are then combined to provide estimates for the eleven vehicle types⁴ used by DfT.

The automatic counters do not give 100% accuracy. For example, the equipment cannot classify vehicles into their different types when the traffic is moving very slowly (5mph or less). They also have a tendency to malfunction, though the new sensors recently introduced, are more reliable than the previous ones. The equipment cannot distinguish between cars and car-based vans and can also have difficulty distinguishing between some types of buses and coaches and goods vehicles having similar axle spacing and chassis height. The equipment is also prone to failing to identify two-wheeled vehicle traffic, both bicycles and motorcycles⁵. Nevertheless, they do have the big advantage over manual counts that they operate continuously and so can give a complete picture of traffic at the points where they are sited.

The automatic counters in London are slightly different to those outside London. There are 56 automatic counters in London and they are "volumetric" classifiers that only distinguish between short (up to 5.2 metres) and long (greater than 5.2 metres) vehicles. They need 24-hour manual counts every three months to provide estimates of the breakdown of traffic by vehicle type in each hour of the day. These counters suffer from similar problems as those outside London, but are more reliable than the automatic counters used outside London.

4. ANNUAL AVERAGE DAILY FLOWS (AADFs)

The data for all manual counts done in neutral months⁶ are combined with information from automatic counters on similar roads to provide an estimate of the AADF at that site. This is normally done by multiplying the raw count data by factors derived from the automatic counts in that same year. There are a large number of such expansion factors since there are separate factors for each vehicle type, day of counting and expansion factor group⁷. Because these counts are done in neutral weeks, the expansion factors used do not usually vary too much from year to year, except when bad weather has restricted traffic during the winter months. For cars, the factors are usually between 1.15 and 1.25 (except on motorways and in London where the factors are higher) while for goods vehicles the factors vary between 0.75 and 0.9 - lower because of the greater drop in traffic at weekends.

The automatic counters provide a reasonable guide to changes in traffic over time. This information is used in two ways. Firstly, it is used to provide provisional quarterly estimates of traffic, which are published on the sixth Thursday following the end of a quarter. Secondly, they are used to provide growth factors between consecutive years. These growth factors are used for links not counted, or not counted satisfactorily in the latest year. In these cases, the AADF for the previous year is multiplied by the appropriate growth factor to give a reasonable estimate of the AADF for the latest year.

⁴ These include: Pedal cycle, two-wheeled motor vehicle, car, light goods van, bus, rigid 2 axle lorry, rigid 3 axle lorry, rigid 4 or more axle lorry, 3 axle or 4 axle articulated, 5 axle articulated and 6 axle or more articulated.

⁵ This deficiency underpins the need for the extra sites for manual counting on minor roads in the summer and winter months

⁶ Counts done in the summer and winter months are not grossed-up: the sites are normally counted at the same time of the year each year and so are compared directly with each other.

⁷ There are now 22 expansion factors groups. These are based on type of area (from holiday area to Central London), road category and, in some cases, traffic flow level.

5. USE OF AADFS IN CALCULATION OF ANNUAL TRAFFIC ESTIMATES

Different procedures are used for major and minor roads in converting AADF data to traffic estimates. The difference arises because the link concept cannot be applied to minor roads.

Major roads

A major road link of length 2km with an AADF of 50,000 has a traffic figure of 100,000 vehicle-kilometres ($2 \times 50,000$). This equates to 36.5 million vehicle kilometres a year. Because every major road link is counted, in principle, total traffic on major roads can be obtained by summing the traffic figures for every link.

As mentioned in paragraph 6, some links are not counted. In these cases, the traffic flows are derived from adjacent links using suitable formulae (derived links) or using the flow of the adjacent link as a proxy (dependent links).

Minor roads

In the base year (currently 1999), for each minor road class in each local authority an AADF is estimated based on a sample of traffic counts, including those projected forward from counts done in earlier years. These AADFS are then multiplied by the total road length for the relevant minor road category to give an estimate of traffic for that road category.

Traffic for the latest year is then obtained by calculating changes in traffic flows, after taking into account any changes in road length. For the 2000 to 2003 estimates, the flows were derived from the automatic road counts. For the 2004 estimates, traffic flows from the manual counts were used. This is plausible, since some of the newest will be quiet roads on housing estates whilst others will be busy roads recently declassified from major road status.

6. QUARTERLY AND ANNUAL ESTIMATES OF TRAFFIC

As mentioned in paragraph 12, the automatic counters are used to provide provisional quarterly estimates throughout the year. A first estimate for the year is published in early February, and this is largely based on automatic count data. A final estimate for the year is normally published in early May and this is produced by putting together the estimates for major and minor road traffic as detailed above.

7. AVAILABILITY OF DATA

Basic quarterly data are included in the quarterly statistical bulletin Traffic in Great Britain, which can be obtained by contacting [Road Traffic Statistics](#). The data are also included on the DfT web site. They can be downloaded from the correct PDF file which can be located under http://www.dft.gov.uk/stellent/groups/dft_control/documents/contentservertemplate/dft_index.hcs?t?n=7405&l=4

More detailed information is available in the annual publication. This again is available free, but also available from the DfT web site. It can be found at the following site: http://www.dft.gov.uk/stellent/groups/dft_control/documents/contentservertemplate/dft_index.html?n=8170&l=4

Advice on how to conduct local transport surveys can be found at the following web site: <http://www.clip.gov.uk/subgroups.asp?lsection=6&ccat=57>

Some users need more detailed data for particular areas or particular roads. These can be supplied, though there is a charge payable by external customers.
