

A453 Widening M1 Junction 24 to A52 Nottingham



Technical Note: 4 Lane Single Carriageway Accident Rates

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INFORMATION FOR EXECUTIVE READER

Summary Section

Each section within this report has been summarised for ease of reading by the executive reader. The summary section is highlighted as shown below for ease of location.

Summary

- Summary information for the executive reader

Deliverables

Where appropriate, at the end of each section the discipline project deliverables are included and highlighted as shown below.

Deliverables

- The deliverables of the section

1. INTRODUCTION

Summary

- This Technical Note presents the findings of an investigation to determine the average accident rates of 4 lane single carriageway roads (S4) operating under a 30mph and 40mph speed limit.

1.1 GENERAL

- 1.1.1 An important part of the economic assessment of Trunk Road schemes is the calculation of the benefits from any predicted reduction in the number and severity of accidents. The average accident rate for the type of new carriageway should be used to assess new schemes. For the majority of carriageway types, an average accident rate is given in Section 1 Part 2 of the 'COst and Benefit Analysis' (COBA) manual contained within Volume 13 of the Design Manual for Roads and Bridges (DMRB). However, the COBA manual does not contain information for the 4 lane single carriageway (S4) road type that is proposed for the urban section of the A453 Widening Scheme. White Young Green has been asked by the Highways Agency to calculate predicted accident rates (including severity splits) for the S4 section of road to be used in the economic assessment of the A453 Widening Scheme.
- 1.1.2 Details of predicted accident rates are presented in **Table 1**.
- 1.1.3 The results of the accident analysis are presented in **Appendix A**.

2. ACCIDENT RATES FOR 4 LANE SINGLE CARRIAGEWAY ROADS

Summary

- Predicted accident rates and accident and casualty severity splits have been calculated for 4 lane single carriageway (S4) road types with speed limits of 30mph and 40mph, and a combined 30/40mph speed limit
- Accident rates were calculated using actual accident data for S4 roads obtained from Highway Authorities, and traffic data obtained from the Department for Transport's website.
- The predicted accident rates calculated were:
 - 1.136 PIA/million veh km for S4 30mph
 - 0.488 PIA/million veh km for S4 40mph
 - 0.769 PIA/million veh km for S4 30/40mph combined.
- These rates compare favourably with predicted COBA accident rates for S2 and dual carriageway urban roads.
- These rates also compare favourably with observed accident rates for A class urban roads as reported in the DfT Transport Statistics Bulletin – Road Casualties in Great Britain: 2004.
- It is considered that the observed accident rate and severity splits for S4 40 mph roads are appropriate to use in the safety economic assessment for the scheme.

2.1 DATA COLLECTION

2.1.1 Three accident rates have been calculated for S4 roads operating under a 30mph speed limit, those operating under a 40mph speed limit and a combined accident rate for a 30/40mph speed limit (which was done in order to make a comparison with urban roads in the COBA manual). All accident rates are in the "link and junction combined" form as given for other carriageway types in DMRB Vol.13 Sec.1 Part 2 Table 4/1.

2.1.2 White Young Green contacted a total of 24 Highway Authorities, and requested the following information:

- Plans showing locations and lengths of 4 lane single carriageway (S4) roads within their boundaries
- The most recent 5 years of accident data for (S4) roads

2.1.3 The following Highway Authorities provided the requested information:

- Birmingham City Council
- Bristol City Council
- City of Edinburgh Council
- Hampshire County Council
- Northamptonshire County Council
- Nottingham City Council
- Nottinghamshire County Council
- Transport for London

2.1.3 Accident rates are measured in Personal Injury Accidents per million vehicle kilometres (PIA/mvkm). To calculate the accident rates, Annual Average Daily Flow (AADF) values were obtained for each of the S4 sites from the Department for Transport (DfT) website <http://www.dft-matrix.net/>. All traffic data obtained from the website was dated 2005.

2.2 ANALYSIS

2.2.1 Accident data was obtained for a total of 37 sections of S4 road. The data was subsequently divided into two groups: those sections of S4 operating under a 30mph speed limit and those operating under a 40mph speed limit. There were 24 sections of carriageway in the 30mph group and 13 sections in the 40mph group.

2.2.2 The amount of traffic data available from the Department for Transport website varied depending on the particular S4 site. Some sites had traffic data for one or more locations along their length, whilst other sites had no traffic data. Where no data was available for a site, traffic flows were estimated based on the best available data.

2.2.3 The degree of confidence in traffic data for each site was rated excellent, good or poor. Sites rated poor were excluded from the study. This left 18 sections in the 30mph group (total length 15.3km) and 10 sections in the 40mph group (total length 17.0km), giving 28 sections with a total carriageway length of 32.3 kilometres.

2.2.4 The majority of accident records obtained for these sections of carriageway covered the five-year period 2002-2006. The accident data from the middle year of 2004 was chosen for analysis purposes as being representative for the accident rates. This is important when comparing the accident rates and severity splits calculated with those presented in the COBA manual.

2.2.5 Traffic data available from the Department for Transport website was for 2005. To calculate predicted accident rates for 2004, the 2005 traffic data was factored from 2005 to 2004 using National Road Traffic Forecasts (Great Britain) 1997 (NRTF 1997).

2.2.6 The two speed limit groups were analysed separately, then aggregated and analysed together. The analysis procedure for each S4 site was as follows:

- (i) The length of S4 carriageway was measured.
- (ii) The 2004 traffic flow was calculated in million vehicle kilometres (million veh km).
- (iii) The number of accidents on the S4 section was determined.
- (iv) The predicted accident rate was calculated in PIA/million veh km.
- (v) The numbers of slight, serious and fatal accidents was determined.
- (vi) The numbers of slight, serious and fatal casualties was determined.

2.2.7 Predicted accident rates for each site are presented in **Appendix A**. Accident rates varied considerably from site to site, from a low of 0.069 PIA/million veh km on Bedford Road, Northampton to a high of 4.298 PIA/million veh km on Great Hampton Street, Birmingham.

2.2.8 The overall accident rate (A) for each group was calculated using the following formula:

$$A = \frac{\sum PIA}{\sum YTF},$$

Where $\sum PIA$ is the sum of the average number of Personal Injury Accidents in a year for each S4 site and $\sum YTF$ is the sum of the Yearly Traffic Flow for each S4 site, measured in million vehicle kilometres.

2.2.9 The overall accident rates and accident and casualty severity splits for the 30mph group, the 40mph group and the 30/40mph combined group are presented in **Table 1** below. For comparison purposes the table also includes accident rates and severity splits for S2 'A' roads and dual carriageways subject to a 30/40mph speed limit calculated using the COBA manual.

Road	Accident Rate	PIA Proportions			Casualties per PIA		
Type	(PIA/million	Fatal	Serious	Slight	Fatal	Serious	Slight
S4 30mph	1.136	0.013	0.125	0.862	0.0145	0.1384	1.2009
S4 40mph	0.488	0.007	0.128	0.866	0.0029	0.1520	1.1637
S4 30/40mph combined	0.769	0.011	0.126	0.863	0.0113	0.1422	1.1906
COBA S2 A- roads 30/40mph	0.791	0.008	0.118	0.873	0.0076	0.1202	1.2040
COBA Dual Carriageways 30/40mph	0.941	0.008	0.106	0.886	0.0078	0.1055	1.2817

Table 1 - 2004 Accident Rates and Severity Splits

2.3 CONCLUSIONS

- 2.3.1 It can be seen from **Table 1** that there is a large difference in the accident rate between the 30mph and 40mph speed limit groups, with the 40mph accident rate being lower than the 30mph rate on S4 roads. The combined S4 30/40mph accident rate of 0.769 PIA/million veh km compares favourably with the COBA S2 'A' roads 30/40mph accident rate of 0.791 PIA/million veh km and is lower than the COBA dual carriageway 30/40 mph rate.
- 2.3.2 The combined S4 30/40mph accident rate of 0.769 PIA/million veh km also compares favourably with the average rate for urban A class roads of 0.79/0.76/0.70 per million veh km for the 3 years 2002 to 2004 respectively taken from the DfT Transport Statistics Bulletin – Road Casualties in Great Britain:2004.
- 2.3.3 The accident and casualty severity splits are similar across all the single-carriageway road types although there is some variation for the proportion of fatal accidents and casualties per PIA which is to be expected since the low number of fatalities makes this group sensitive to random fluctuations.
- 2.3.4 It is considered that the observed accident rate and severity splits for S4 40 mph roads are appropriate to use in the safety economic assessment for the scheme.

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Appendix A – Accident Analysis