VOLUME 5 **ASSESSMENT AND PREPARATION OF ROAD SCHEMES**

SECTION 1 **ASSESSMENT OF ROAD SCHEMES**

PART 3

TA 46/97

TRAFFIC FLOW RANGES FOR USE IN THE ASSESSMENT OF NEW RURAL ROADS

SUMMARY

This Advice Note sets out carriageway standard options for use as starting points in the assessment of new rural trunk roads. The Advice supersedes that in Section 4 of TD 20/85 and TA 46/85.

INSTRUCTIONS FOR USE

1. Insert TA 46/97 into Volume 5, Section 1, after Part 2.

2. Remove TA 46/85 from DMRB 5.1 and archive as appropriate.

3. Annotate TD 20/85 (DMRB 5.1) to show that Section 4 'Recommended Flow Levels for New Rural Links' is superseded by this Advice Note.

4. Archive this sheet as appropriate.

Note: A quarterly index with a full set of Volume Contents Pages is available separately from the Stationery Office Ltd.

THE HIGHWAYS AGENCY

THE SCOTTISH OFFICE DEVELOPMENT DEPARTMENT

THE WELSH OFFICE
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THE DEPARTMENT OF THE ENVIRONMENT FOR
NORTHERN IRELAND

Traffic Flow Ranges for Use in the Assessment of New Rural Roads

Summary: This Advice Note sets out carriageway standard options for use as starting points in the assessment of new rural trunk roads. The Advice supersedes that in Section 4 of TD 20/85 and TA 46/85.

REGISTRATION OF AMENDMENTS

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SECTION 1 ASSESSMENT OF ROAD SCHEMES

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TA 46/97

TRAFFIC FLOW RANGES FOR USE IN THE ASSESSMENT OF NEW RURAL ROADS

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1. INTRODUCTION

General

1.1 The recommended flow levels to be used as a starting point for the assessment of rural trunk road links contained in TD 20/85 and TA 46/85 'Traffic Flows and Carriageway Width Assessment for Rural Roads' (DMRB 5.1) have been reviewed and updated.

1.2 Since the publication of TD 20/85 and TA 46/85 there have been a number of changes in the traffic and economic parameters recommended for use in cost-benefit analysis techniques. As a result, updated estimates have been made of the economic benefits of providing different carriageway standards on new rural roads to obtain an indication of the range of traffic flows over which each carriageway standard is likely to be economically justified.

1.3 Arising from this work, the following documents are hereby withdrawn:

- Section 4 of Departmental Standard TD 20/85 (DMRB 5.1);
- Departmental Advice Note TA 46/85 (DMRB 5.1).

1.4 The general guide to the layout features appropriate for various types of roads that was given in Table 2 in Section 4 of TD 20/85 can be found in Table 4 of TD 9/93 (DMRB 6.1).

Scope

1.5 This Advice Note sets out carriageway standard options related to opening year flow ranges **for use as starting points in the design and economic assessment of new rural trunk road links.** Opening year flows are now used as a reference in preference to design year flows. The flow ranges aim to ensure that those carriageway standards that are most likely to be economically and operationally acceptable are assessed locally. **The ranges do not provide any indication of the ultimate flow which a road can carry.** An indication of the maximum flow that a road can carry is discussed in Chapter 3 of this Advice Note. The flow ranges **should not be used** for the choice and assessment of carriageway standards for improved (widened) motorway or all-purpose dual carriageway trunk road links. In these cases each increase in standard should be considered incrementally.

1.6 Annexes A, B and C give a brief description of the economic assessment undertaken to produce the flow ranges including the assumed maintenance profiles and construction costs. Annex D describes the Congestion Reference Flow (CRF) which is an estimate of the total Annual Average Daily Traffic (AADT) flow at which the carriageway is likely to be ‘congested’ in the peak periods.

Implementation

1.7 This Advice Note should be used forthwith for the assessment of all motorway and trunk road schemes currently being prepared, provided that, in the opinion of the Overseeing Organisation, this would not result in significant additional expense or delay progress. Design Organisations should confirm its application to particular schemes with the Overseeing Organisation.

Definitions

1.8 The following terms and definitions shall have the meanings ascribed below:

Rural Roads. All-purpose roads and motorways that are generally not subject to a local speed limit.

Opening Year AADT Flow. Scheme opening year forecast traffic flow expressed as 24 hour Annual Average Daily Traffic (AADT), that is, forecast total annual traffic divided by 365.

2. ECONOMIC ASSESSMENT AND RECOMMENDED FLOW RANGES FOR NEW RURAL ROAD LINKS

Economic Assessment

2.1 Extensive estimates were made of the economic benefits of providing different carriageway standards on new rural roads. Time, vehicle operating and accident costs were estimated using the cost-benefit analysis program COBA (DMRB 13.1). Estimates of total maintenance costs were obtained by assuming typical maintenance works profiles, costs and durations in the maintenance assessment program QUADRO (DMRB 14.1). The costs of delays during construction are extremely variable and were not considered in this assessment. Also, the costs of traffic delays resulting from everyday incidents (accidents and breakdowns) are not included.

2.2 Pairs of road standards were assessed at various levels of traffic flow. For each pair the extra construction cost of the higher standard was set against the extra benefits predicted by COBA and QUADRO. This information was used to obtain an indication of the range of traffic flows over which each carriageway standard is likely to be economically justified. Additional work was carried out to assess the effects of local variations, such as seasonality, percentage of heavy vehicles, road geometry and opening years, etc on flow ranges. See Annex A for a more detailed description of the economic assessment.

Recommended Flow Ranges For New Rural Road Links

2.3 The recommended opening year economic flow ranges are given in Table 2.1. See Annex A for definitions of carriageway standard. The ranges are also shown graphically in Figure 2.1.

2.4 When the opening year flows are predicted to be above the maximum values shown in Table 2.1 for D3AP and D4M, alternative methods of providing additional capacity should be considered.

Carriageway Standard	Opening Year AADT	
	Minimum	Maximum
S2	Up to 13,000	
WS2	6,000	21,000
D2AP	11,000	39,000
D3AP	23,000	54,000
D2M	Up to 41,000	
D3M	25,000	67,000
D4M	52,000	90,000

Table 2.1 Opening Year Economic Flow Ranges

2.5 The opening year AADT Economic Flow Ranges given in Table 2.1 are very different to the ranges given in previous editions of this Advice Note, even after allowing for the change from Design Year (15th year) to Opening Year. These differences are due to a combination of effects reflecting changes in traffic characteristics and economic costs. For example, revised accident rates and costs (especially for single carriageways), updated speed/flow relationships and capacities, changes in the hourly flow distribution and improved roadworks site layouts and capacities. These factors are all recognised in the latest versions of COBA and QUADRO (see Annex A). However, it must always be remembered that these opening year flow ranges should only be used as starting points for the economic assessment of new roads.

Widening of Existing Motorways and All-Purpose Dual Carriageway Links

2.6 The flow ranges given in Table 2.1 and Figure 2.1 should not be used for the appraisal of on-line widening of existing motorways and all-purpose dual carriageway links. When widening an existing dual carriageway, each extra lane (including Collector Distributor roads if appropriate) to be added to the existing dual carriageway should be justified incrementally.

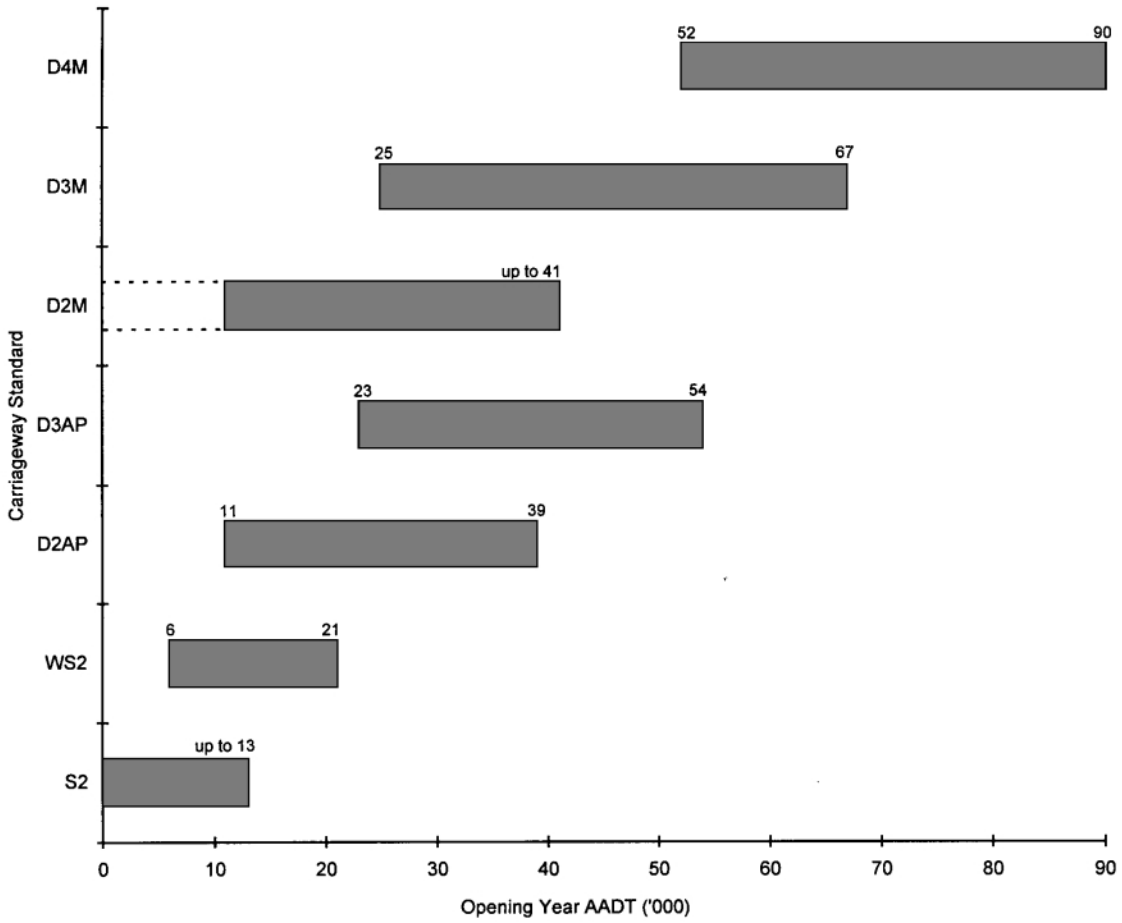

Figure 2.1 Opening Year Economic Flow Ranges

3. USE OF FLOW RANGES IN SCHEME ASSESSMENT

Need for Local Assessment

3.1 To ensure that value for money is obtained from the Roads Programme, each scheme should be justified separately and the major components of cost, including carriageway provision, should be incrementally justified.

Reference Year for Flow Ranges

3.2 The flow ranges given in Table 2.1 above have been referenced to the scheme opening year and expressed in terms of Annual Average Daily Traffic (AADT). The opening year has been chosen as the reference year because it is felt that this is a more reliable indicator of flow than the design year (15th year after opening), used in earlier editions of this Advice Note.

Role of the Flow Ranges

3.3 The flow ranges given in Table 2.1 provide a starting point for scheme assessment. They should help designers to decide which carriageway standards are most likely to be economically and operationally acceptable in normal circumstances for any given traffic flow. These standards will then need to be assessed locally.

3.4 The flow ranges should be used flexibly. Where, for example, construction costs are unusually high, it may be necessary to assess a lower standard than is indicated by the flow ranges. Conversely, where costs are relatively low (for example, where an acceptable dual carriageway layout can be formed by adding a second carriageway alongside an existing single carriageway road), higher standards than those indicated by the flow ranges may be economically justified. Also, where traffic growth is expected to be outside the NRTF high and low growth range, alternative standards may be applicable.

Procedure for the Assessment of Carriageway Standards

3.5 The recommended procedure for the assessment of carriageway standard is as follows:

Step 1. Determine the high and low growth AADT flows forecast for the scheme's expected opening year. These estimates should take account of any induced traffic.

Step 2. Select for local assessment those carriageway standards that fall within the flow range for either or both of these traffic forecasts. For example, for a forecast flow range of 16,000 to 17,000 AADT, Table 2.1 shows that WS2 and D2AP standards are suitable for assessment.

Step 3. Consider whether there are any local circumstances (for example, unusually high or low construction costs, environmental constraints, operational considerations, major network changes in the evaluation period, etc) which suggest that different standards other than those recommended in Table 2.1 should be assessed.

Step 4. Carry out the economic assessment to determine Net Present Values for each standard.

Step 5. Enter Net Present Values and/or benefit-cost ratios, and all other relevant factors into the impacts tables used in the assessment reports (see TD 37/93, DMRB 5.1.2) to inform the selection of the optimal standard.

3.6 All decisions on choice of carriageway standard should be based on the combined results of economic, operational and environmental assessments. The flow ranges given in Table 2.1 are determined only from the economic assessments using COBA and QUADRO. They indicate the lowest flow at which a given standard is likely to be economically preferred to a lesser standard and the highest flow at which a given standard is likely to be economically preferred to a greater standard. An operational assessment should also be carried out to indicate the maximum flow which a given road standard can accommodate in the future under some stated conditions.

3.7 The operational assessment for each standard being locally assessed should include reference to Congestion Threshold (and hence Congestion Reference Flow) and Maintenance Considerations.

Congestion Threshold and Congestion Reference Flow

3.8 The congestion threshold is a measure of the maximum achievable hourly throughput of a link which should be considered as part of the scheme operational appraisal.

Any increase in demand above this threshold can lead to flow breakdown, queueing and reduced throughput. It depends on many physical characteristics, for example, the proportions of different vehicle types, driver behaviour, distance between junctions, etc. It is not appropriate to define a fixed threshold value for any particular road standard. However, it is possible to estimate the maximum hourly throughput and it may be desirable to relate this to a daily flow. The threshold may be expressed in terms of annual average daily traffic (AADT) by identifying the likely ratio of peak to daily flow and applying this to the threshold hourly value. The resulting AADT is known as the Congestion Reference Flow (CRF).

3.9 The derivation of CRF is given in Annex D. Further advice on the application of the CRF should be sought from the Overseeing Organisation.

Maintenance Considerations

3.10 The effect of maintenance on the maximum hourly throughput and the resulting operation of the road (and diversion routes) being considered should be included in the operational assessment of carriageway standards. Due consideration should be given to the likely nature, frequency and duration of future works on the different road standards being assessed. QUADRO can give an indication of the different volumes of traffic diverting for each standard being considered, and where high standard diversion routes are not available, the delays during future maintenance may indicate that a higher road standard is beneficial.

Changes in Carriageway Standard

3.11 Sustaining a particular carriageway standard along an entire route is not normally acceptable if this is at the expense of foregone economic or environmental benefits.

4. REFERENCES

1. Design Manual for Roads and Bridges: (Stationery Office Ltd)

Volume 5: Assessment and Preparation of Road Schemes

Section 1: Assessment of Road Schemes

TD 37 Scheme Assessment Reporting, (DMRB 5.1.2)

Volume 6: Road Geometry

Section 1: Links.

TD 9 Highway Link Design, (DMRB 6.1.1)

TD 27 Cross Sections and Headrooms, (DMRB 6.1.2)

Volume 13: Economic Assessment of Road Schemes

Section 1: The COBA Manual, (DMRB 13.1)

Section 2: Highways Economics Note No.2, HEN2, (DMRB 13.2)

Volume 14: Economic Assessment of Road Maintenance

Section 1: The QUADRO Manual, (DMRB 14.1)

2. HEN1: Highways Economics Note No.1 (September 1995) - 1994 Valuation of Road Accidents, Road Safety Division, Department of Transport.

5. ENQUIRIES

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ANNEX A

DESCRIPTION OF ECONOMIC ASSESSMENT

A.1 This Annex contains a more detailed description of the economic assessment used to produce the opening year flow ranges shown in Table 2.1 and Figure 2.1.

COBA Analysis

A.2 COBA was used to compare the user benefits of one carriageway standard with another. Each comparison was based on a 1 kilometre length of road with varying values of flow. Hilliness, bendiness and visibility were typical for the carriageway standard being considered. Traffic growth was based on the 1989 National Road Traffic Forecasts with an evaluation period of 30 years. Values of time and vehicle operating costs were taken from Highways Economics Note No.2 dated September 1996, accident rates and costs were consistent with Highways Economics Note No.1 dated September 1995. This information can be found in the COBA10 program and users' manual. Various opening years, seasonalities and vehicle category proportions were also considered.

A.3 The following pairs of carriageway standards were compared:

Single 7.3m* (S2)	with	wide single 10m* (WS2)
Wide single 10m* (WS2)	with	dual 2 lane all purpose* (D2AP)
Dual 2 lane all purpose* (D2AP)	with	dual 3 lane all purpose* (D3AP)
Dual 3 lane all purpose* (D3AP)	with	dual 3 lane motorway (D3M)
Dual 2 lane all purpose* (D2AP)	with	dual 2 lane motorway (D2M)
Dual 2 lane motorway (D2M)	with	dual 3 lane motorway (D3M)
Dual 3 lane motorway (D3M)	with	dual 4 lane motorway (D4M)

* each with 1 metre hard strips.

(Dimensions and other details for these carriageway standards were taken from TD 27 Cross Sections and Headrooms, (DMRB 6.1.2).)

A.4 The comparisons were made for a range of traffic flows sufficiently wide to include those flows at which the change from one standard to another would probably be economically justified.

QUADRO Analysis

A.5 The latest version of the QUADRO program (QUADRO3) was used to calculate the total costs of major road maintenance works. The same traffic and economics data was used as in the COBA analysis. Typical characteristics of the main route and the assumed diversion route were used according to the carriageway standard being considered.

A.6 Traffic management arrangements were intended to minimise delay costs while being consistent with safe and efficient working practice. For single 7.3m roads it was assumed that all works are carried out under shuttle working conditions. A single lane closure was assumed for wide single 10m roads. For all-purpose dual and motorway standards, all works resulted in the complete closure of one of the carriageways. Narrow lanes and tidal layouts were used where appropriate.

A.7 The assumed maintenance works profiles, costs and durations are shown in Annex B.

Construction Costs

A.8 The assumed construction costs are shown in Annex C. These were taken from a study of out-turn costs from 100 recently constructed schemes. These costs include construction of links and junctions, land, and preparation and supervision costs split over three years.

A.9 Incremental scheme costs for each of the eight carriageway standard comparisons were calculated and then varied by ± 30% to produce a range of costs.

A.10 Graphs representing high, average and low scheme costs were plotted with the maximum and minimum COBA and QUADRO benefit lines to produce the flow ranges given in Table 2.1 and Figure 2.1.

Summary of Findings

A.11 From the analysis of the results, it was found that:

(i) Higher values of seasonality produced slightly higher benefits for all cases.

(ii) Effects due to percentage of heavy vehicles were variable. It was not possible to accurately predict how higher or lower (than the national) percentages will affect scheme comparisons.

(iii) The improvement of roads with poor geometry generally gave higher benefits for all flow levels.

(iv) Varying economic/traffic growth rates greatly affected the resulting scheme benefits.

(v) The scale of effects due to seasonality, percentage heavy vehicles and road geometry are of a lower order to those of variations in scheme costs and economic/traffic growth.

(vi) The scheme opening year did not significantly affect the overall results when costs had been discounted.

(vii) Construction costs vary greatly between individual schemes of the same standard.

ANNEX B

MAINTENANCE WORKS PROFILES, DURATIONS AND COSTS

B.1 The assumed maintenance works profiles, durations and costs are shown in Table B.1.

C'Way Std.	Flow '000s	Job 1			Job 2			Job 3		
		Type Yr	Cost	Days	Type Yr	Cost	Days	Type Yr	Cost	Days
S2	5-15	SD 11	40	4	SD 19	40	4	Ov 24	190	16
S2	20	SD 9	40	4	Re 17	120	8	Ov 24	190	16
WS2	10-15	SD 11	50	4	SD 19	50	4	Ov 24	290	19
WS2	20-25	SD 9	50	4	Re 17	180	10	Ov 24	290	19
D2AP	10-20	SD 11	80	5	SD 19	80	5	Ov 24	490	23
D2AP	30	SD 10	80	5	SD 18	80	5	Ov 22	490	23
D2AP	40	SD 9	80	5	Re 17	330	14	Ov 24	490	23
D3AP	20-30	SD 11	100	6	SD 19	100	6	Ov 24	690	30
D3AP	40	SD 9	100	6	Re 17	460	18	Ov 24	690	30
D3AP	50-60	Re 12	460	18	Ov 24	690	30	--	--	--
D2M	20	SD 11	80	5	SD 19	80	5	Ov 24	610	27
D2M	30	SD 10	80	5	SD 18	80	5	Ov 22	610	27
D2M	40	SD 9	80	5	Re 17	410	16	Ov 24	610	27
D2M	50	Re 12	410	16	Ov 24	610	27	--	--	--
D2M	60	Re 10	410	16	Re 17	410	16	Ov 24	610	27
D3M	20-30	SD 11	100	6	SD 19	100	6	Ov 24	810	33
D3M	40	SD 10	100	6	SD 18	100	6	Ov 22	810	33
D3M	50-60	Re 12	540	20	Ov 24	810	33	--	--	--
D3M	70-80	Re 10	540	20	Re 17	540	20	Ov 24	810	33
D4M	50-70	Re 12	600	25	Ov 24	900	41	--	--	--
D4M	80-100	Re 10	600	25	Re 17	600	25	Ov 24	900	41

Notes.
1. Flows are opening year AADT.
2. Costs and days are for 1km of road, that is, both carriageways.
3. Costs are £'000s expressed in average 1994 prices.
4. Job Types, SD = Surface Dressing, Re = Resurfacing, Ov = Overlay.
5. Job Yr = Year after opening.

Table B.1 Assumed Maintenance Works Profiles, Durations and Costs

ANNEX C

CONSTRUCTION COSTS

C.1 The assumed construction costs are shown in Table C.1

Carriageway Standard	Construction Cost Range *	Total Cost Range **
S2	0.9 - 1.7	1.1 - 2.0
WS2	1.3 - 2.3	1.5 - 2.7
D2AP	1.8 - 3.4	2.2 - 4.1
D3AP	2.6 - 4.8	3.1 - 5.8
D2M	2.5 - 4.5	2.9 - 5.4
D3M	3.2 - 6.0	3.9 - 7.2
D4M* **	4.0 - 7.4	4.8 - 8.8

* £ millions per km of road (average 1994 prices).
** Including allowances for land, preparation and supervision costs.
*** Extrapolated from D2M and D3M data on a per lane km basis.

ANNEX D

CONGESTION REFERENCE FLOWS

D.1 The Congestion Reference Flow (CRF) of a link is an estimate of the Annual Average Daily Traffic (AADT) flow at which the carriageway is likely to be 'congested' in the peak periods on an average day. For the purposes of calculating the CRF, 'congestion' is defined as the situation when the hourly traffic demand exceeds the maximum sustainable hourly throughput of the link. At this point the effect on traffic is likely to be one or more of the following: flow breaks down with speeds varying considerably, average speeds drop significantly, the sustainable throughput is reduced and queues are likely to form. This critical flow level can vary significantly from day to day and from site to site and must be considered as an average. **The CRF is a measure of the performance of a road link between junctions. The effect of junctions must be considered separately.**

D.2 Links of the same standard will have different CRF values determined by the proportion of heavy vehicles, the peak to daily ratio, the peak hour directional split and the weekday/weekly flow ratio. The variation of the local daily/peak hour flow profile over the year indicates when the peak hours/periods occur. Thus a link which experiences the traditional morning and evening commuter peaks, and has AADT traffic levels equal to the CRF, is likely to be 'congested' for approximately 250 hours per year in the weekday peaks in the peak direction. (There being approximately 500 weekday peak hours in the year, half of which will have a higher than average demand flow). In the case of links in recreational areas, peak period congestion is likely to be concentrated in the summer months.

D.3 The CRF of a link is given by the formula:

CRF = CAPACITY * NL * Wf * 100/PkF * 100/PkD * AADT/AAWT

where, CAPACITY is the maximum hourly lane throughput (see note 1);

NL is the Number of Lanes per direction;

Wf is a Width Factor (see note 2);

PkF is the proportion (percentage) of the total daily flow (2-way) that occurs in the peak hour;

PkD is the directional split (percentage) of the peak hour flow;

AADT is the Annual Average Daily Traffic flow on the link;

AAWT is the Annual Average Weekday Traffic flow on the link.

Notes on Congestion Reference Flow (CRF) calculations

Note 1. CAPACITY - the maximum sustainable hourly lane throughput.

In reality this value varies day to day due to the prevailing conditions (for example, day/night, wet/dry, percentage heavy vehicles, regular/holiday traffic) and values used must be an average. For **new links** and **existing links not currently experiencing congestion** this can be estimated from the following relationship:

CAPACITY = [A - B * Pk%H]

where, Pk%H is the percentage of 'Heavy Vehicles' in the peak hour. The term 'Heavy Vehicles'

always includes the vehicle categories OGV1, OGV2 and PSV's according to the COBA definition;

A and B are parameters dependant on road standard;

	A	B
Single Carriageway	1380	15.0
Dual Carriageway	2100	20.0
Motorway	2300	25.0

For **existing links already experiencing congestion** the maximum hourly throughput should ideally be an observed, robust estimate. This can be determined from observations on a minimum of ten days in fine, dry, daylight conditions. When observing the maximum hourly throughput the major problem is to determine when the link is actually operating at "capacity" (paragraph D.1 describes the likely traffic conditions at "capacity").

Note 2. Carriageway Width Factor (Wf)

This factor is designed to adjust the CRF for all-purpose links, generally single carriageways, with non-standard lane widths. Carriageway width is defined as the total paved width of the carriageway less the width of ghost islands and hard strips.

Motorways - the width factor Wf should always be unity for motorways as there is no evidence to suggest that the maximum hourly throughput of motorway links is affected by minor changes in lane width.

All-purpose dual carriageways - to reflect the different standards of some dual carriageways. The width factor is given by:

Wf = Carriageway Width / (Number of Lanes * 3.65).

The majority of dual carriageways will have lane widths of 3.65 metres and hence a width factor of unity. Some will have reduced lane widths, generally those built to older design standards, and in these cases the width factor can be less than unity. Should the lane width be greater than 3.65 metres the width factor should be restricted to a maximum value of unity.

Single carriageways (2-lane) - the main purpose of the width factor is to differentiate between the different carriageway width standards of single carriageways. The width factor is given by:

Wf = (0.171 * Carriageway Width) - 0.25

Roads built to modern designs usually have 7.3 metre of 10 metre carriageways, that is, a width factor of unity or 1.46. The width of older roads can vary significantly but the width factor relationship is not valid for road widths less than 5.5 metres or greater than 11 metres. For roads with widths outside these limits the traffic analyst must use judgement to decide on the relevant value.

D.4 Table D/1 gives observed 1995 traffic characteristics which should be used as a guide to the selection of the appropriate parameter values for use in the CRF calculations when reliable local data is not available.

Traffic Characteristic		Motorway	Trunk Road	Principal Road
AADT % Heavy Vehicles (Typical Range)		15.5 (6-26)	12.1 (4-26)	7.5 (2-20)
Peak Hour Flow / AADT % (Typical Range)	(PkF)	10.0 (7-12)	9.4 (7-12)	9.6 (7-12)
Peak Hour Directional Split % (Typical Range)	(PkD)	56.3 (50-70)	57.4 (50-70)	58.4 (50-70)
Peak Hour % Heavy (Typical Range)	(Pk%H)	13.5 (5-25)	10.4 (3-20)	5.6 (2-12)
Peak Hour %Heavy / AADT %Heavy (Typical Range)		0.87 (0.50-1.00)	0.86 (0.50-1.00)	0.75 (0.50-1.00)
AADT / AAWT (Typical Range)		0.93 (0.89-1.00)	0.97 (0.90-1.00)	0.98 (0.90-1.02)

Table D/1: Observed 1995 Values

D.5 Substituting the average values given in Table D/1 produces the Congestion Reference Flows (CRFs) given in Table D/2. These values have been given for illustrative purposes only, **local values should always be used**. The differences between the Trunk and Principal road values for the same standard are due mainly to the different proportions of heavy vehicles in the peak hour.

Carriageway Standard		Trunk Road	Principal Road
Single 7.3m	(S2)	22,000	23,000
Wide Single 10m	(WS2)	32,000	33,000
Dual 2 lane all purpose	(D2AP)	68,000	70,000
Dual 3 lane all purpose	(D3AP)	103,000	104,000
		Motorway	
Dual 2 lane motorway	(D2M)	65,000	
Dual 3 lane motorway	(D3M)	97,000	
Dual 4 lane motorway	(D4M)	130,000	

Table D/2: Example CRFs Using 1995 Traffic Characteristics