Traffic and Economic Proof of Evidence for the Chideock and Morcombelake Bypass PE002

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HIGHLIGHTED PARAGRAPHS

Document PE 2

DEPARMENT OF TRANSPORT

THE A31/A35 TRUNK ROAD

CHIDEOCK & MORCOMBELAKE BYPASS

PUBLIC LOCAL INQUIRY

TRAFFIC AND ECONOMICS STATEMENT APRIL 1994

PROOF OF EVIDENCE GIVEN BY

T P LACEY BSc CEng MICE FIHT DipTE

MRM

PARTNERSHIP

Calyx House

South Road

TAUNTON

TA1 3DU

Tel. 0823253291

Fax. 0823 259554

1 INTRODUCTION

1 .1 Personal Particulars and Experience

1.1.1 Paul Lacey, Transportation Planning Regional Associate employed by MRM Partnership, Calyx

House, South Road, Taunton, will say:

1.1.2 I am a Chartered Engineer holding a Bachelor of Science Degree in Civil Engineering and a Diploma in Transportation Engineering from the Institution of Highways and Transportation. I a member of the Institution of Civil Engineers and a Fellow of the Institution of Highways and Transportation.

1.1.3 I have twenty years experience in highway, traffic and transportation engineering and have worked for Local Government, a Development Corporation and Consulting Engineers. Experien has been gained in organising and supervising traffic surveys, preparing and presenting eviden at Public Inquiries and assessing and designing numerous road schemes in both urban and rur locations.

1 .2 Details of Brief

1.2.1 MRM Partnership was appointed by the Department of Transport in December 1985 to develop proposals that would:

a) Remove Trunk Road traffic from the villages of Chideock and Morcombelake on the existing A3

b) Improve the free flow and safety of Trunk Road traffic.

1 .3 Studies Undertaken

1.3.1 In order to assess the existing traffic flows and to determine how much traffic will use the bypa several surveys were undertaken between 1986 and 1993. Prior to 1978 schemes were assessed the basis of August traffic flows but since the publication of the Department of Transport Traffi Appraisal Manual (Deposited Document No 38) it is now considered that a Spring or Autumn month is a more representative and stable time of the year. To conform with the latest requirements surveys were carried out on a Tuesday and Thursday in May 1986 and also on an August Tuesday and Saturday to determine seasonal variation. To ensure up-to-date informatio additional surveys were carried out on a Tuesday and Thursday in September 1991 and on an August Tuesday and Saturday in 1991.

1.4 Brief Description of Evidence

1.4.1 In the following evidence I will describe the surveys carried out, explain the traffic modelling a prediction of future traffic flows, and give details of accidents, I will then summarise the traffic problems and provide information relating to the economic viability of the scheme. In conclusio will detail the major benefits of the project to both the travelling and resident population.

2. TRAFFIC SURVEYS

2.1 Surveys in 1986

2.1 .1 Figure 1 shows the study area and the nearby coastal region to the south. This coast attracts ma holiday makers, which greatly increases the summer population, and adds to the traffic flows. Particular problems occur at the junction with Duck Street which provides the only access to Seatown. The traffic surveys in 1986 were carried out over a 12 hour period and consisted of th following:

a) A registration number origin and destination survey carried out at three points along the main road and at all the side roads in Chideock and Morcombelake on Thursday 8 May.

b) Classified counts at two main road sites on Thursday 8 May over a 12 hour period.

c) An origin and destination roadside interview survey on Tuesday 1 3 May at one westbound site together with two-way classified counts at the same site.

d) Automatic traffic counts at Miles Cross for the whole of 1986.

e) Journey time measurements carried out on a number of weekdays in May and August.

2.1.2 In the high season month of August three additional surveys were carried out:

a) Registration number survey on Tuesday 12 August on the A35.

c) Turning counts at the Duck Street junction on Tuesday 12 and Saturday 16 August.

2.2 Surveys in 1991

2.2.1 It is a requirement of the Traffic Appraisal Manual that data should be as accurate and up-to-d as possible to ensure that schemes are assessed in a consistent manner. As the data collected in 1986 would be at least six years old by the date of the Inquiry it was considered that more curre information would be required. The following data collection took place.

a) Origin and destination roadside interviews at two sites close to Charmouth and at an additional two sites close to Bridport. These were undertaken on Tuesday 17 and Thursday 19 September.

b) Two-way classified counts at the interview sites on 17 and 19 September.

c) Turning counts at a number of the major side roads through Chideock and Morcombelake.

d) Automatic traffic counts from the permanent site at Miles Cross and from a temporary site at t western end of the scheme.

e) A limited number of turning counts were also undertaken on Tuesday 20 August.

3. TRAFFIC MODELLING

3.1 Trip Patterns

3.1.1 By using a variety of computer programs, traffic models for Chideock and Morcombelake were derived which satisfy two objectives:

a) to enable the forecasting of future levels of traffic flows in the year 2011 for the design of the scheme; and

b) to enable traffic flows through Chideock and Morcombelake to be calculated and input to the Department's cost benefit analysis computer program known as COBA.

3.1.2 Many schemes in the roads programme, such as by-passes, have limited effects on the pattern o movements on the surrounding road system. As Chideock and Morcombelake fall into this categ the estimation of future traffic levels has been undertaken using a 'simple' model restricted to t highway network in the locality of the scheme. The form of model used is in accordance with th Traffic Appraisal Manual, is uncomplicated and produces robust forecasts of future traffic flows The predictions of future Annual Average Daily traffic flows are based on the 1 991 data while t 1986 data has been used for the prediction of flows in August.

3.1.3 The data was analysed in the following way:

a) September 1991 Origin and Destination Survey.

The journeys identified from the September Tuesday and Thursday roadside interviews were allocated to zones representing the start and finish points of each trip. These zones are shown i Figure 2A and Figure 2B and divide the country into 17 areas; at Chideock and Morcombelake the are relatively small but with increasing distance from the study area become much larger. The sample of interviewed trips was then expanded to the total traffic movements by the use of the hour classified counts. For the purpose of predicting movements on individual sections of road t data was further analysed to produce a trip pattern of movements between each individual entr road into the area surrounding the scheme. A 'desire line' diagram is shown in Figure 3 which shows all the major movements through the area over a 24 hour Average Annual Day in 1991. the purpose of the study goods vehicles include all vehicles over 30 cwt un-laden weight togethe with buses and coaches. The average percentage of goods vehicles throughout the year was 5%. Further details of the analysis are provided in the Local Model Validation Report (LMVR Docu DT1)

b) August 1986 Registration Number Survey

By matching registration numbers of vehicles entering and leaving Chideock and Morcombelak was possible to derive the pattern of traffic movements on an August Tuesday and Saturday ov 12 hour period. For compatibility with the 1991 data the traffic flows have been factored to 199 levels using the growth recorded at the Automatic Traffic Count site at Miles Cross and are sho in Figure 3.

3.2 The importance of the A35 trunk route in Dorset is illustrated in Figure 3A, 3B & 3C which show graphically the traffic movements into, out of and through both Chideock and Morcombelake. It be clearly seen that the largest movement is through traffic on the A35 with the next highest movement being local traffic between Chideock and the east. The importance of Chideock as a holiday centre is shown in Table 1 by the 74% increase in traffic to and from Chideock that occu on an August weekday compared with the Average Annual Day.

Table 1 1991 24 Hour two-way vehicle movements

	Through Traffic	Traffic to/from Morcombelake	Traffic to/from Chideock
Annual Average Day	9400	1000	1750
August Tuesday	12800	1450	3050
August Saturday	17050	1050	2750

3.3 It can be seen from Figure 3A, 3B & 3C that the maximum amounts of traffic that could be rem by a bypass are:

Table 2 Percentage Traffic Relief with Bypass

	Western end of scheme	Eastern end of scheme
AADT	90%	84%
August Tuesday	88%	82%
August Saturday	93%	87%

As mentioned earlier the proportion of goods vehicles is approximately 5% most of which will be through vehicle movements. On the Average Daily basis approximately 500 goods vehicles woul therefore be removed by construction of the bypass. The removal of goods vehicles and other through traffic movements will provide a substantial improvement in the

3.4 Seasonal Variation

3.4.1 From the flows of through and stopping traffic for the three survey days the seasonal variation caused by holiday traffic is clearly seen. During August the through traffic increases by a factor 36% on a Tuesday and 81 % on a Saturday when compared to the Average Annual Day (AADT). Another indication of seasonal variation is shown in Figure 4 which indicates the weekly traffic flows throughout the year recorded at Miles Cross, just to the east of the scheme. The traffic flo at this site vary between 6,000 and 17,000 vehicles over an average 24 hour period and the flow during August are approximately 40% greater than the average for the whole year.

3.5 Assignment to existing roads

3.5.1 For the purpose of analysis by computer the road network was represented as a series of numbe links representing the roads, and numbered nodes representing road junctions. The characteris of each link and node have been accurately measured. This network is known as the Do Minim network. The trips from the September survey were then allocated or assigned to individual roa of the Do Minimum network using an All or Nothing SATURN minimum cost traffic model. Thi method selects the optimum route between two points based on both journey distance and time. Comparisons were then made of assigned flows against observed counts to ensure that the meth produced realistic flows. For the assessment of design standards and environmental effects the hour flows observed in September were converted to AADT 24 hour flows using a locally derive factor of 1 .049. Figure 5 shows the low and high growth predicted AADT flows for the opening y of 1996 and the 'design year' of 2011. Assignments were not carried using the August data.

3.6 Assignment to Bypass

3.6.1 After validation of the Do Minimum assignments it was possible to assign the September weekd matrix to the Do Something network. Figure 6 shows the results, converted to AADT levels, for t low and high growth predictions in 1996 and 2011 and confirms the very substantial relief mentioned in paragraph 3.3. Table 3 below has been prepared to show the distribution of traffic r along the 'old' road.

Table 3 Percentage Relief along the 'old' A35

	%
West of Tizards Knapp	97
Ship Knapp to Shedbush Lane	93
Shedbush Lane to Ryall	92
Chideock Hill	89
North Road to Duck Street	87
Duck Street to Link Road	85

3.6.2 This table confirms the very considerable relief that will result from the construction of the byp

4. FORECASTING

4.1 Over the past 10 years there has been a steady growth in traffic as recorded at the Miles Cross automatic traffic count site. Between 1981 and 1991 AADT flows have grown by 51 %. In order assess the appropriate standard of the new road, and its economic viability, it is necessary to predict by how much 1991 traffic flows will increase with time. In the past few years the rate of growth has been less than experienced during the 1980s', due to the recession. Traffic growth largely mirrors economic activity, however, and will undoubtedly rise again in the future.

4.2 The apparent short term variations in growth are not a good guide to long term trends in traffic flow. Uncertainty in the future is taken account of by using a range of traffic growth which refl the lowest and highest levels of National economic activity. These low and high growth factors set out in the Department of Transport's National Road Traffic Forecasts 1989 (NRTF) Deposite Document No 12. Traffic growth, in this document, is based on assumptions made about car ownership, car usage, population projections, motoring costs and economic activity.

4.3 The traffic forecasting procedure also took account of the local variation in trip growth in the So West. The factors used for assessment based on 1991 levels were:

Table 4 Local Growth Traffic Forecasts 1991

	1991-1996 (year of opening)	1991 –2011 (design year)
Low Growth	1.133	1.512
High Growth	1.195	1.794

The 2011 factors represent an increase of between 51 % and 79% over that observed in 1 991. T range of flows predicted in 2011 for the situation without the bypass are shown in Figure 5 and with the bypass in Figure 6 for the 24 hour AADT situation. Tables 5A and 5B have also been produced to show the 1996 (first year of opening) and 2011 flows on the bypass and the 'old' roa both with and without the bypass.

Table 5A Predicted 24 hour AADT flows in 1996 and 2011

Without Bypass	Morcombelake		Chideock	
	Bypass	Old Road	Bypass	Old Road
1996 Low Growth	N/A	11900	N/A	12400
1996 High Growth	N/A	12600	N/A	13100
2011 Low Growth	N/A	15900	N/A	16600
2011 High Growth	N/A	18900	N/A	19700

With Bypass	Morcombelake		Chideock	
	Bypass	Old Road	Bypass	Old Road
1996 Low Growth	11200	900	10800	1600
1996 High Growth	11900	950	11400	1700
2011 Low Growth	15000	1200	14500	2100
2011 High Growth	17800	1400	17200	2500

Note: Due to U-turning traffic within Morcombelake, resulting from the proposed junction arrangements, the totals of the bypass and 'old road' flows are slightly greater than the flow through Morcombelake without the bypass.

5. CARRIAGEWAY STANDARD

5.1 When the scheme re-entered the roads programme in 1985 the traffic predictions suggested tha single carriageway road would probably be adequate to cater for forecast traffic flows. The Preferred Route was announced in February 1989 with the route standard recommended as sin carriageway with extensive climbing lane sections. Junctions would be located to the west of Morcombelake and east of Chideock and be at-grade priority layouts.

5.2 In the traffic studies carried out prior to Public Consultation the following traffic growth factors were used:

	1991-1996 (year of opening)	1991 - 2011 (design year)
Low Growth	1.056	1.183
High Growth	1.103	1.339

These factors were based on the NRTF predictions published in 1984 and were applied to the tr survey data collected in 1986.

5.3 In 1989 the Department of Transport published revised predictions of national traffic growth w took account of the higher economic growth that occurred in the 1980s'. As already shown these revised rates are considerably higher and for comparison are quoted again below:

	1991-1996 (year of opening)	1991 – 2011 (design year)
Low Growth	1.133	1.512
High Growth	1.195	1.794

5.4 At the Public Consultation stage the traffic predicted on the bypass in the design year of 2009 w 10,500 to 12,600 vehicles AADT for low and high growth respectively. Departmental Standard TD2O/85 'Traffic Flows and Carriageway Width Requirements' sets out carriageway width opti related to forecast flow ranges for use as a starting point in the design and assessment of new schemes. Table 2 in TD 20/85 shows a maximum recommended design year AADT flow of 13,00 vehicles for a normal single carriageway. As the predicted high growth flow was just below this value the scheme was originally envisaged as a single carriageway improvement.

5.5 With the revised predictions of traffic growth applied to the latest 1991 survey data the bypass flows in the design year of 2011 have now increased to 14,500 to 17,800 vehicles AADT as show Figure 6. Both the low and high growth predictions are now in excess of the 13,000 vehicle maximum for a single carriageway. Due to the increased flows consideration was then given to alternative carriageway standards; a wide single carriageway and a dual carriageway. Table 2 i TD 20/85 shows flow ranges of 10,000 to 18,000 vehicles for a wide single carriageway and 11,0 TO 46,000 for a dual carriageway.

5.6 If a wide single carriageway were chosen on a basically level alignment TD 20/85 suggests a maximum design flow of 18,000 vehicles. In the case of Chideock and Morcombelake the topography dictates that the majority of the scheme length would be marked out as climbing la in an almost identical layout to the normal single carriageway with climbing lanes. The actual capacity of a single carriageway with climbing lanes is therefore likely to be slightly above that standard 7.3m wide road but not as great as predicted for a 10m wide road. The capacity of a wi single layout could possibly be improved by reducing the gradients and enlarging the radius of t bends but it is clear that this is not an option for this scheme. For this reason alone the wide sin carriageway is not a practical option.

5.7 Further tests were then undertaken using COBA to determine whether a single carriageway wi climbing lanes or dual carriageway produced the highest economic return. Although a single carriageway has lower construction costs this is more than off-set by the loss in overall benefits. dual carriageway will provide a much safer environment for overtaking, through this very stee section of the Dorset coast, and in economic terms is beneficial both in reducing journey times a also in saving accidents.

5.8 A further important consideration is the ease with which future maintenance can be carried out With a single carriageway major maintenance of the western section of the road could involve closure and diversion of through traffic via Chard and the A30. With a dual carriageway it is lik that all maintenance can be undertaken by the use of contra-flow systems utilising either the eastbound or westbound carriageways for two-way traffic. The QUADRO program has been use assess the delay and diversion costs of this form of maintenance and confirms the substantial increased benefits of a dual carriageway.

5.9 Two other factors are relevant to the decision to choose a dual carriageway. The first concerns t lack of any alternative parallel route and the second relates to the 'cost of being wrong'. For the majority of the A35 route through Dorset there is an alternative parallel County road which ten to reduce the flows of traffic on the A35. Between Charmouth and Bridport only one road exists which accounts for the high flows of traffic on this section compared with the remainder of the west of Dorchester. The next higher flow of traffic is on the Yellowham Hill section of the A35 t the east of Dorchester.

5.10 The Department of Transport recognises that the accuracy of traffic forecasts for new schemes cannot be guaranteed. In the case of Chideock and Morcombelake it is clear that the majority of traffic will by-pass the two villages but it is more difficult to predict the actual traffic growth th will occur in the future. If the predictions were found to be an underestimate and a decision we made to construct a single carriageway the disruption and cost would be considerable. Such a situation occurred with the Ilminster Bypass which was constructed as a wide single carriagew and has now re-entered the roads programme for widening to dual carriageway. In the case of Ilminster Bypass widening is a comparatively simple engineering process but this would certai not be the case for Chideock and Morcombelake.

5.11 The adoption of a dual carriageway caused the terminal points of the scheme to be re-appraised from the original single carriageway planning brief. This extended the scheme both to the east west and had the benefit of upgrading two quite short sections of sub-standard single carriagew Greater detail of the relative merits of a single or dual carriageway are detailed in the Scheme Development Report (Deposited Document No 22).

6. ACCIDENTS

6.1 Figure 7 has been prepared which shows the location and severity of all the injury accidents on A35 through Morcombelake and Chideock between January 1989 and December 1993. An analy has been undertaken to compare accident rates on the A35 with average National rates for this type of road. This indicates that the overall rate of 0.46 per million vehicle kilometres, over the year period, is above the National average rate of 0.29. A particular accident problem in Chideo is caused by the very steep gradient of Chideock Hill. On the data shown in Figure 7 it can be s that a fatal accident occurred at the bottom of this hill in 1991 when a lorry went out of control with brake failure. Arrester beds (escape roads) have now been constructed at two locations to t and avoid similar accidents in the future.

16.2 A detailed analysis has been undertaken of the accident rate and severity of the accidents for fi separate sections of the road between Charmouth and Bridport Link Road. This data is shown i the table below and is compared with both national rates and other rates on the A35 through Dorset.

Table 6 Accident Rates and Severity

Section	Accident Rate (PIA per m.veh .kms)	Casualties per Accident Fatal	Serious	Slig
Morcombelake Hill	0.30	0.143	0.143	1.07
Morcombelake (40 mph limit)	0.86	0.063	0.375	1.00
Chideock Hill	0.18	0.200	0.400	3.00
Chideock (30 mph limit)	0.23	0.000	0.250	0.75
Quarr Hill	0.78	0.000	0.281	1.46
Total	0.46	0.056	0.282	1.35

6.3 The accident rate obtained from Dorset County Council for various lengths of the A35 to the eas Bridport over the past 3 years is 0.20 which with the exception of Chideock Hill is lower than al the sections quoted above. The overall rate of 0.46 is therefore 59% above the national average 0.29 and 2.3 times the rate of 0.20 on other lengths of the A35. In Morcombelake it can be seen the rate is 3 times the national average. Excess speed could be a contributory factor in this case even with the recent introduction of a speed limit. Figure 8 and 9 show the results of a radar sp measurement, at the Post Office in Morcombelake, and indicates that at times of free flow 62% eastbound and 72% of westbound traffic is exceeding the speed limit of 40 mph. Just over 10% o drivers in each direction were observed at speeds in excess of 50 mph.

6.4 In terms of the severity of the accidents national data for 'A' roads in rural areas suggests that accident has the following number of casualties:

	Fatal	Serious	Slight
Casualties per Accident	0.060	0.439	1 .136

The overall figures for Chideock and Morcombelake conform closely with the national data with slightly fewer serious injuries and more slight injuries per accident. A notable exception is Chideock Hill where only 5 accidents resulted in 18 injuries.

6.5 The COBA analysis indicates that when the bypass is constructed there should be a considerabl reduction in accidents due to the lower accident rates that occur on dual carriageway roads. It i predicted that over a 30 year period some 600 - 700 accidents could occur on the existing A35 compared to 230 - 250 on the new and 'old' road if the bypass is constructed. This represents a 6 reduction and is a major benefit of the bypass.

7. SUMMARY OF TRAFFIC PROBLEMS

7.1 The traffic surveys have provided information which enables the traffic problems to be assessed These problems can be summarised as follows:

i) Conflict occurs between through traffic and local traffic movements particularly in the summer months.

ii) Heavy goods vehicles have to negotiate a number of steep gradients and narrow twisting sectio road. In the past a number of these vehicles have suffered brake failure.

iii) The large seasonal variation in traffic flows causes traffic congestion in July and August.

iv) The poor alignment of the road results in driver frustration due to the low speeds and lack of overtaking opportunities.

v) Accidents problems have occurred throughout the route with particularly serious accidents at t bottom of Chideock Hill.

The Department's proposal to bypass Morcombelake and Chideock should alleviate these proble and return the villages to the residents and visitors.

8. ECONOMICS

8.1 The COBA (cost benefit analysis) program was developed as a technique for assessing value for money from investment in road schemes. While its coverage is only partial, it provides an important element in the total assessment of any scheme. Cost benefit analysis in its most gene form was developed to measure all the costs and all the benefits which accrue to society at large a result of public investment. Experience has shown, however, that such a complete analysis is feasible. As monetary values cannot be put on all the costs and benefits of a scheme COBA is limited to those factors which are relatively easy to value, which essentially confines its coverag the benefits to those gained by road users. In addition to COBA the QUADRO (queues and dela at roadworks) program was developed to calculate the delays to road users due to roadworks, ei road maintenance or road construction, and also expresses the results in monetary terms.

8.2 The user benefits are defined as the difference between the costs incurred by users of the 'Do Minimum' and 'Do Something' road networks (ie, the road system with or without the scheme), where user costs cover:

a) journey time on roads and at junctions

b) accidents costs

c) vehicle operating costs

d) maintenance delay costs

On the expenditure side COBA takes account only of those elements which fall directly on the financing authority. These costs are:

e) capital costs, including construction, land and compensation, preparation and supervision costs; and

f) maintenance costs.

	£ 1000's	
	Low	High
Scheme Costs		
Construction and Land	15.181	15.181
Total (PVC)	15.181	15.181
Scheme Benefits:		
Link Transit Savings	13.738	22.847
Junction Delay Savings	-1.358	-1.735
Accident Savings	4.557	6.780
Total (PVB)	16.937	27.892
Net Present Value (PVB - PVC)	1.756	12.711

Thus construction of the proposed bypass would produce a net benefit of between £1.8m and £12.7m at 1988 prices.

8.6 The benefits do not include the assessment of maintenance delays which have been undertaken using the QUADRO program. As mentioned previously the costs of maintaining the existing roa are considerable and could result in the complete closure of the road while the western section i re-constructed. If this is taken into account additional benefits of £5.01 to £8.23m result from construction of the dual carriageway bypass.

9. CONCLUSION

9.1 The existing A35 between Charmouth Bypass and the Bridport Link Road is a poorly aligned si carriageway road passing through the villages of Morcombelake and Chideock. Severe gradient cause slow speeds for heavy goods vehicles and result in delays to following traffic. In the summ months traffic flows increase substantially.

9.2 A traffic model was developed to predict future traffic movements both with and without the proposed bypass. This indicates flows of up to 20.000 vehicles per 24 hour day in 2011 which wo be totally unacceptable on the existing substandard road. With the proposed bypass the maxim flows on the 'old road' would be 2,500 vehicles per day representing a substantial benefit both to motorists and residents.

9.3 The estimated Net Present Value of the scheme is positive with benefits in the range of £2 to £1 million at 1988 prices discounted to 1988. Additional benefits will also be gained due to the redu delay during periods of maintenance. The scheme therefore represents good value for money.

MAPS AND DIAGRAMS

Figure 1 Location of Traffic Survey Sites

Figure 2A 17 Sector System Map South of England

Figure 2B 17 Sector System Map Dorset

Figure 3A 24 Hour 2 Way Flow Link Diagram, Average Annual Day

Figure 3B 24 Hour 2 Way Flow Link Diagram, August Tuesday 1991

Figure 3C 24 Hour 2 Way Flow Link Diagram, August Saturday 1991

Figure 4 Chart of Miles Cross 24Hr Weekly Average Flows 1991

Figure 5 Map of Forecast Flows Without Bypass

Figure 6 Map of Forecast Flows – With Bypass

Figure 7 Map of Personal Injury accidents 1989 – 1993

Figure 8 Chart of Morcombelake Eastbound Speeds 08/03/94

Figure 9 Chart of Morcombelake Westbound Speeds 08/03/94