

LNMS EVALUATION REPORT

M62 Junction 10 Westbound Diverge



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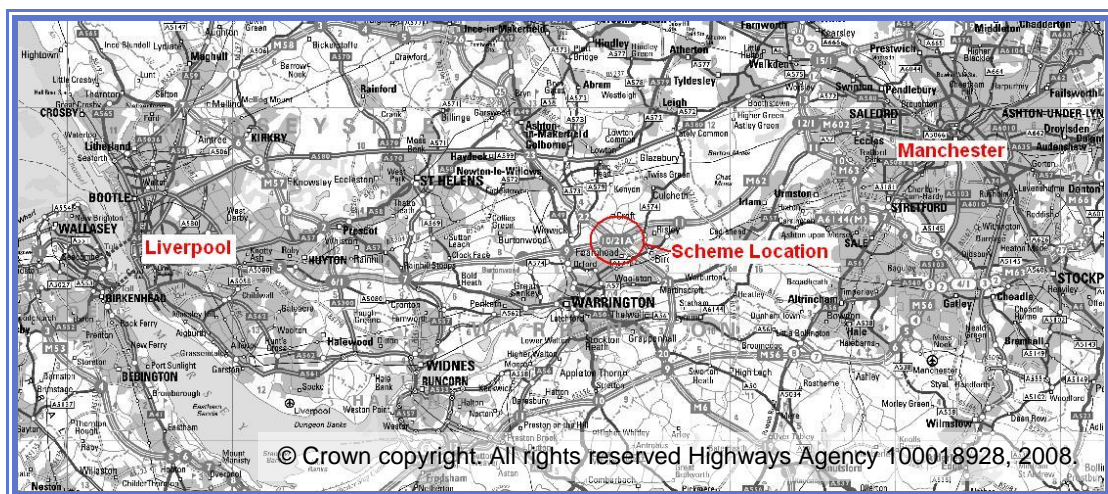
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1. Introduction

SCHEME BACKGROUND

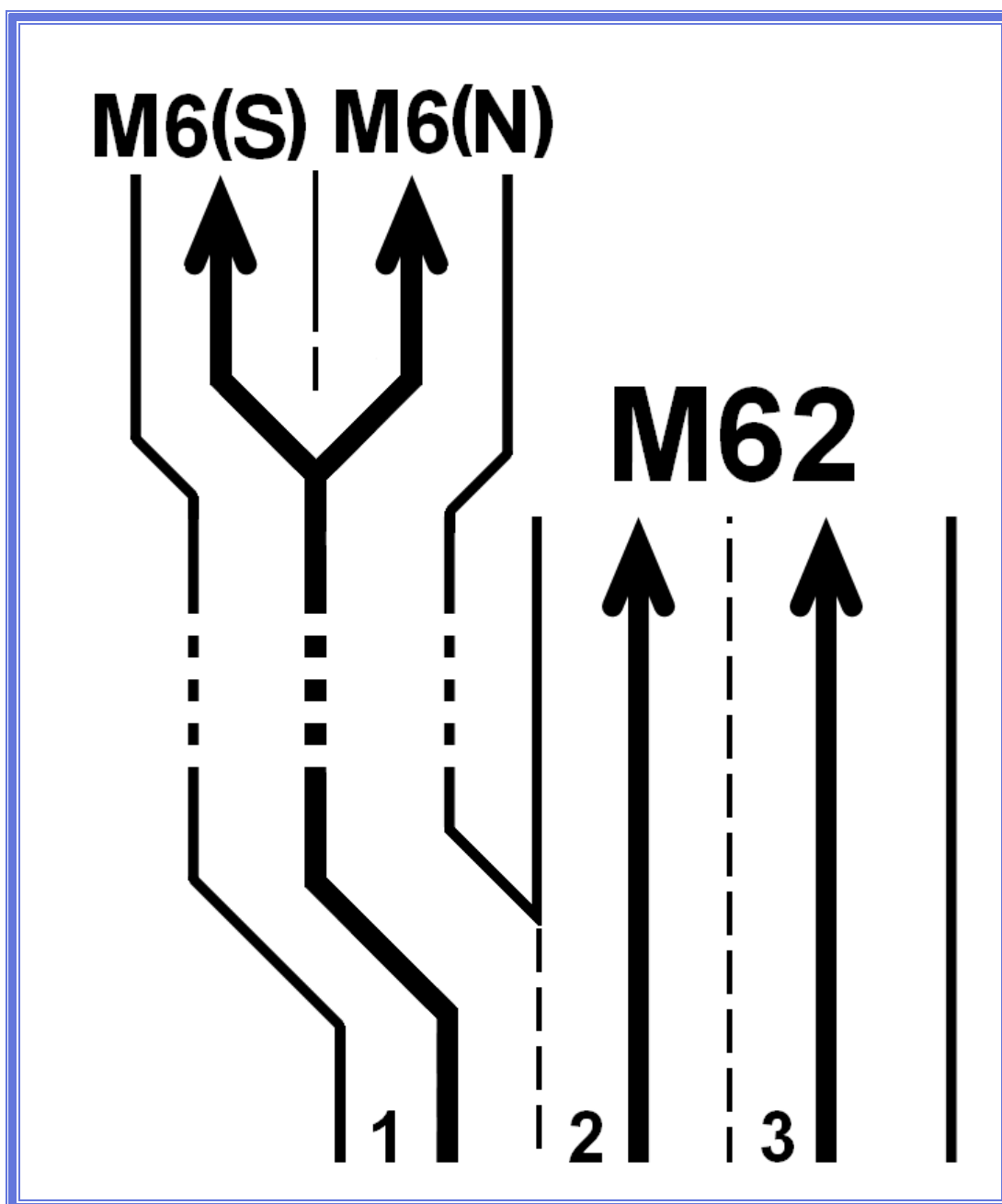
- 1.1 The Croft Interchange is located between Manchester and Liverpool (**Figure 1.1**) at the interchange between M62 (junction 10) and M6 (junction 21a). The M62 forms the main route from Manchester to Liverpool and the M6 North serves as a route to the north and the Lake District.

Figure 1.1 – Scheme Location



- 1.2 The westbound diverge of the M62 at this junction consists of two separate diverges. Prior to the scheme, the first stage of the diverge removed M6 traffic from the M62 and the second stage of the diverge split the M6 north and M6 south traffic. The pre-scheme layout of the diverge is illustrated in **Figure 1.2**.
- 1.3 Furthermore, prior to the scheme implementation there was a problem with stationary queuing traffic in lane 1 of the westbound M62. This was due to the restriction of diverging traffic to one lane. Furthermore, driver confusion and excessive lane changing was also regarded as a contributory factor to congestion upon the approach to second stage of the diverge.
- 1.4 The project inception date was April 2004, with construction beginning in February 2006. The scheme was fully operational by April 2006.

Figure 1.2 – Interchange Layout (Pre-Scheme)



The Preferred Scheme

- 1.5 The scheme involved the provision of a 'tiger tail' ghost island to increase the capacity of the diverging traffic from one lane to two lanes. The revised layout is shown in **Figure 1.3**. M6 southbound traffic continues to diverge in lane 1 but M6 northbound traffic now diverges from lane 2 after the ghost island. Additionally, the new layout of the westbound diverge encourages traffic to enter the correct lane before diverging, thus reducing the excessive weaving manoeuvres along the length of the diverge. **Figure 1.4** illustrates the new 'tiger tail' chevron markings.

- 1.6 Improved layout and signing at the second stage of the diverge was also implemented as part of the scheme (**Figures 1.5 and 1.6**). Roadside lighting along the stretch of the scheme was also upgraded. This was to aid a reduction in driver confusion and prevent excessive lane changing.

Figure 1.3 – Interchange Layout (Post Scheme)

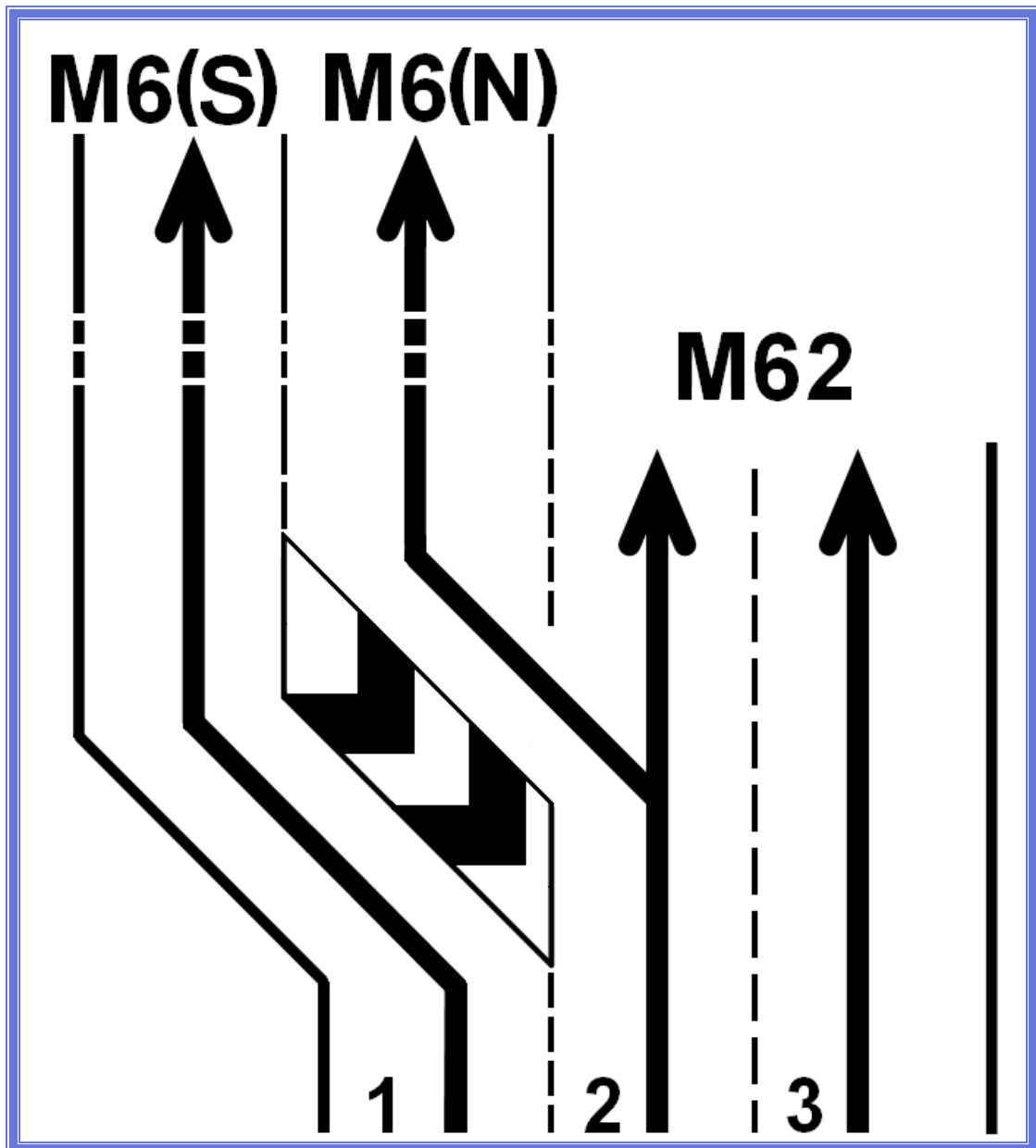


Figure 1.4 – Tiger Tail Diverge: M62 J10 Westbound



Figure 1.5 – New signs on M62 westbound approach to J10



Figure 1.6 – Lane Markings on Approach to Diverge



Alternative Options

- 1.7 The original PAR, Atkins (November 2005), states that other options were also considered including: Reducing the hard shoulder width and the installation and associated traffic management of a new gantry. The existing gantry can be seen in **Figure 1.4**. No further specific details were discussed in the PAR.

SCHEME OBJECTIVES AND CATEGORISATION

- 1.8 Local Network Management schemes are categorised according to which of the five assessment objectives of Safety, Economy, Environment, Accessibility and Integration is primarily addressed by the scheme.
- 1.9 As detailed in the PAR document, the scheme objective was to improve journey times in peak hours for M62 Westbound traffic. As such the scheme was categorised as an **economy scheme**.
- 1.10 The scheme objectives were:
- ◆ To improve journey times by reducing the congestion at and on the approach to the diverge; and
 - ◆ To improve safety by reducing weaving manoeuvres in the diverge area.

PURPOSE OF THIS REPORT

- 1.11 As part of an ongoing requirement of the Highways Agency to re-evaluate the impacts of new trunk road schemes, Atkins Consultants Ltd has been commissioned by the Highways Agency to undertake post-opening evaluations of large Local Network Management Schemes (LNMS) with an implementation cost of between £1m and £5m. The aim of this process is to assist the Highways Agency (HA) and their managing agents to:
- ◆ Quantify the outturn benefits and disbenefits accruing from new schemes and to ascertain which schemes offer the greatest value for money;
 - ◆ Develop the pre scheme appraisal processes (PAR Guidance) and ensure that accurate predictions are made about the possible impacts of highway schemes on safety, congestion, environment, accessibility and integration in the future; and
 - ◆ Ensure that the HA continues to deliver schemes that offer the greatest value for money and that are most effective solutions to problems on the core network.
- 1.12 This report will initially undertake an assessment of the 'physical' impact of the scheme, namely:
- ◆ A comparison of 'Before' and 'After' levels of Personal Injury Accidents (PIAs);
 - ◆ The impact of the scheme on journey times on this section of the M62 Westbound;
 - ◆ A comparison of pre-opening and post-opening MIDAS data to ascertain the level of time savings resulting from the scheme.
- 1.13 This is followed by an assessment of the scheme in accordance with the Post Opening Project Evaluation (POPE) methodology. This methodology aims to provide a method by which the forecast and outturn effects of a scheme can be evaluated on a common basis. This process ultimately presents two appraisals:
- ◆ Appraisal 1: The Original PAR assessment (including the original AST). This is a forecast of the cost / benefits of the scheme, usually calculated in accordance with PAR 3.3 (2002 prices discounted at 3.5%). We will also provide economic cost / benefits of the scheme in the currently used 2002 present year value.
 - ◆ Appraisal 2: An Evaluation Summary Table (EST) based on outturn effects, but evaluated on precisely the same terms (version of the PAR document, present value year and discount rate) of the original assessment. The calculation is usually a simple pro-rate of the original assessment based on the outturn impact with regard to user benefits and scheme costs. The advantage of this assessment is that it is an outturn assessment that is directly comparable with the original PAR AST.
- 1.14 The remainder of this report has been divided into six further sections as follows:
- ◆ **Section 2 – Data Collection.** Includes a description of available 'before' data together with any new data collected as part of the POPE process;
 - ◆ **Section 3 – Scheme Impact.** Addresses the 'physical' impact of the scheme, comparing before and after data for accidents and traffic flow;
 - ◆ **Section 4 – POPE Evaluation.** Addresses the safety and economy aspects of the scheme. It takes values from the physical impacts of the scheme and translates them to appropriate monetised benefits;

- ◆ **Section 5 – Assessment of Environment, Accessibility and Integration.** These three objectives were previously included in the comparison of the AST and EST. The emphasis on this aspect of LNMS now means that this assessment requires a standalone section in the report;
- ◆ **Section 6 – Summary of all conclusions.**

1.15 It is intended that the findings of this report will ultimately feed into a wider summary of the outcomes of the POPE process in Summer 2008.

2. Data Collection

2.1 The following data was utilised to support this scheme evaluation.

Accident Data

2.2 Accident data was obtained from the Area Service Provider from January 2001 – June 2007. **Figure 2.1** shows the study area for the accident data. The original PAR did not specify the study area used, as such this report outlines its own study area for use in the analysis of safety benefits.

Journey Time Database

2.3 Data from the Journey Time Database was collected for the M62 junction 12 to junction 10 links (westbound direction) for June 2005 and June 2007.

MIDAS Data

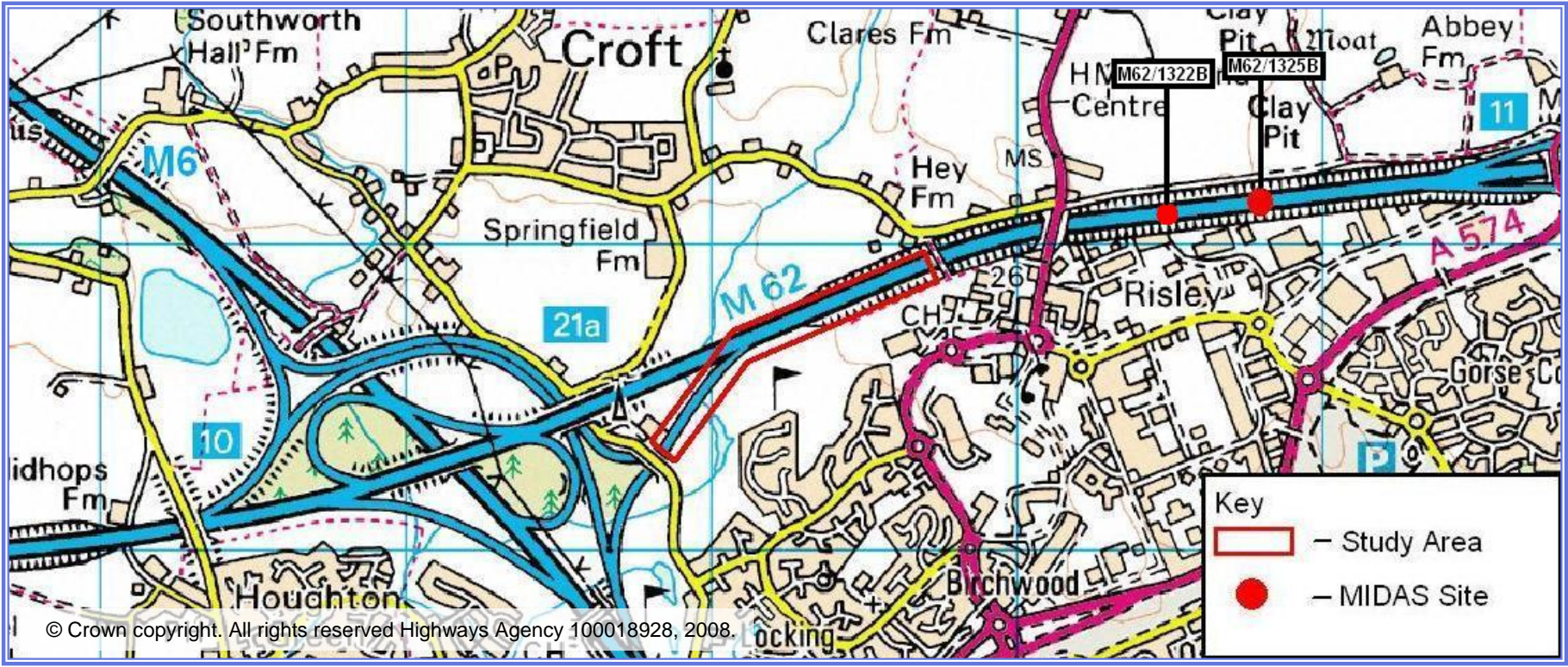
2.4 Traffic count data was obtained from a MIDAS site situated before the diverge. The details of the count site are given below. MIDAS data consists of speed and flow information by lane. The location of this MIDAS site can be seen in **Figure 2.1**.

- ◆ M62/1325B: situated around 2km prior to the diverge;
- ◆ M62/1322B (2005 data only): situated 1.5km prior to the diverge.

Feedback and Consultation

2.5 Feedback was requested from the Managing Area Contractor (MAC) and the Project Sponsor. As yet, not comments have been received.

Figure 2.1 – Scheme Location



3. Scheme Impact

OVERVIEW

- 3.1 This section addresses the physical impact of the scheme by comparing before and after opening accident and traffic flow data.

ACCIDENTS

PAR Document

- 3.2 As stated in **Section 2**, the PAR used accident data for 1998 – 2002. **Table 3.1** summarises these Personal Injury Accidents (PIAs). No specific date or locations were given for these incidents. Causation factors were not considered.

Table 3.1 - Number of Personal Injury Accidents (PAR)

Year	Number of Personal Injury Accidents (NOT casualties)*			
	Slight	Serious	Fatal	Total
1998	1	0	0	1
1999	0	0	0	0
2000	2	0	0	2
2001	1	0	0	1
2002	0	0	0	0
TOTAL	4	0	0	4
Severity Index (Fatal + Serious /All Accidents as percentage)				0%
Provide observed accident rate, and state units				0.8 PIAs/yr
Provide the comparable national average accident rate (as detailed in the COBA manual, DMRB 13.1.2)				2.08 PIAs/yr

- 3.3 Though no causation was given for the PIAs listed above, the PAR stated that:
‘Clarifying the signing and lining will improve the safety of the junction by reducing the incidence of lane changing hence bringing about accident benefits.’
- 3.4 The original assessment predicted an accident saving of 10% in the Opening Year; amounting to a forecast accident benefit of 6.79 accidents (central case) over the 60 year assessment period. This accident rate was calculated via the PAR worksheet for accidents. No accident rate for the two month construction period was calculated.
- 3.5 **Table 3.2** provides a summary of the original PAR prediction of accidents savings at the junction. Low growth was set at 30% and high growth was set at 57%, as detailed by the original PAR and which are broadly in accordance with the forecast growth rates in NRTF97.

Table 3.2 – Original PAR: Analysis of Accident Savings

	Low	Central	High
PIAs Saved in Opening Year	0.08	0.08	0.08
60 Year Assessment Period	6.18	6.79	7.40
Accidents During Construction	Not Calculated	<i>Not Calculated</i>	Not Calculated
Total Impact	Not Calculated	Not Calculated	Not Calculated

Accidents: Outturn*Pre-opening Accidents*

- 3.6 The evaluation of the observed accident impact of the scheme was assessed using available data covering the period January 2001 to May 2007. This provided a total of 61 months pre-opening data, the 2 month construction period and 14 months post-opening accident data. For consistency the same table is used as in the original PAR. The geographical area of analysis is illustrated in **Figure 2.1**.
- 3.7 **Table 3.3** provides a summary of the pre-opening accident data (2001 – 2006).

Table 3.3 - Number of Personal Injury Accidents POPE Analysis

Year	Number of Personal Injury Accidents (NOT casualties)			
	Slight	Serious	Fatal	Total
2001	0	0	0	0
2002	2	0	0	2
2003	0	1	0	1
2004	1	1	0	2
2005	3	0	0	3
2006(January)	0	0	0	0
TOTAL	6	2	0	8
Severity Index (Fatal + Serious /All Accidents as percentage)				25%
Provide observed accident rate, and state units				1.57 PIAs/yr
Provide the comparable national average accident rate (as detailed in the COBA manual, DMRB 13.1.2)				2.54 PIAs/yr

- 3.8 The length of road used for selecting the appropriate PIAs is 1.3 km in length, starting up stream from the westbound diverge and ending in the second stage of the diverge as seen in **Figure 2.1**. Reliable traffic data is only available for the M62 westbound. Details of the accident rate calculation are given in Annex A.

Construction-period Accidents

- 3.9 No safety impacts were considered in the original PAR for the construction period. The data collected in the outturn assessment shows that there were two PIAs during

the two month construction period. These accidents will be deducted from the outturn 60 year accident benefits to derive a net accident benefit/disbenefit.

Post-opening Accidents

- 3.10 During the 14 months post-opening accident data there was one recorded PIA. The pre-opening Annual Average PIA was 1.57 and the post-opening was 0.86. **Table 3.4** summarises the results of outturn assessment accident data.

Table 3.4 – Personal Injury Accidents at Westbound Diverge

Sector	No of months	Slight	Severe	Fatal	Totals	Average Annual Accidents	KSI%
Pre-opening	61	6	2	0	8	1.57	25%
Construction	2	2	0	0	2	-	0%
Post-opening	14	1	0	0	1	0.86	0%

Note: The average annual number of accidents has not been traffic flow weighted.

- 3.11 The number of accidents resulting in fatality or serious injury has reduced, with the KSI index decreasing from 25% to 0%.
- 3.12 The reforecast of the 60 year assessment period accident benefits are given in **Table 3.5**. For consistency low growth is set at 30% and high growth is set at 57% as in the original PAR.

Table 3.3.5- Outturn re-assessment of accident savings

	Low	Central	High
PIAs Saved in Opening Year	0.717	0.717	0.717
60 Year Assessment Period	55.4	73.95	92.5
Accidents During Construction	2	2	2
Total Impact	53.4	71.95	90.5

Predicted-Corrected Assessment

- 3.13 To allow a valid comparison between accident benefits predicted in the original PAR appraisal and the outturn accident benefits it is necessary to calculate a predicted-corrected value for accident savings. The methodology for the predicted-corrected is in line with the assumptions and predicted savings of the original PAR.
- 3.14 A 10% reduction is applied to the data from the new study area set out in this report, see **Paragraph 3.4**. As can be seen below this puts the predicted level of accident benefits as being higher than that calculated in the original PAR. The predicted level of savings remains lower than the outturn assessment of accident savings.
- 3.15 **Table 3.6** shows a comparison of the original PAR predictions, the predicted corrected and the outturn re-assessment of accident benefits.

Table 3.3.6- Comparison of accident savings

Central Case	Original PAR Assessment	Predicted-Corrected	Outturn Assessment
PIAs Saved in Opening Year	0.08	0.157	0.717
60 Year Assessment Period	6.79	13.3	73.95
Accidents During Construction	-	-	2
Total Impact	-	-	71.95

- 3.16 On the basis of the post-opening data it can be concluded that there is evidence of an accident benefit. However, to say this with statistical confidence it is necessary to have a minimum of three years post-opening data. This positive scheme impact is an indication only.

TRAFFIC FLOW IMPACTS

- 3.17 **Table 3.7** gives a two way AADT for the M62 between junctions 10 and 11.

Table 3.7 – Analysis of Traffic Flow Data

Year	AADT (%HGV)	Index	Index (Central National Road Traffic Forecast 97 All Roads)
2001	100000 (18%)	1.000	1.000
2002	100600 (21%)	1.006	1.017
2003	99800 (19%)	0.998	1.034
2004	100700 (19%)	1.007	1.052
2005	106000 (16%)	1.06	1.069
2006	109100 (16%)	1.091	1.087
2007 (*Forecast)	110400*	1.110*	1.104
Annual Growth Rate		1.76%	1.5%

Note: Data from MIDAS site M62/1325B

- 3.18 This section of the M62 has experienced a steady rate of growth in accordance with growth within the all roads category for central NRTF97. Until data for the entirety of 2007 becomes available it is not possible to say conclusively whether the opening of the scheme in April 2006 resulted in any significant change to the background rate of traffic growth at the junction.

TRAVEL TIME IMPACTS

PAR Document

- 3.19 A time saving of 30 seconds per vehicle was predicted for each vehicle travelling through the junction during 6 peak hours. This amounted to a total of 48,958 vehicle hours saved in the opening year. The original PAR did not define which five hours were chosen as being peak hours. The original journey time savings are given in Annex C. The Value of Time monetised benefits are discussed in Section 4.

- 3.20 Travel time benefits or disbenefits were not considered for the construction period. Furthermore there was no supporting evidence to suggest how the 30 second per vehicle time saving was calculated.

Outturn Assessment

- 3.21 Data from the Journey Time Database was used to ascertain the change in speed of vehicles travelling on the M62 westbound. MIDAS (Motorway Incident Detection and Signing) data was used to allow analysis of speeds and flows to be undertaken on a lane by lane basis.
- 3.22 The PAR did not specify what time periods were identified as being peak periods, as such the peak periods in the following assessment are 7am-10am and 4pm-7pm. This is a total of six peak hours, allowing any possible benefits to peak period traffic to be identified.

Journey Time Database

PAR Document

- 3.23 No journey time data was utilised in the original PAR, however, journey times and reliability were considered in the project description of the original PAR:

'By easing the flow of traffic through the junction the congestion will be reduced which in turn will improve the journey times and reliability of the junction.'

Observed impact

- 3.24 Journey time data was extracted from the Journey Time Database (JTDB) for M62 J11 to J10 westbound and also for J12 to J10. The purpose of collecting journey time data for J12 to J10 was to ensure that any previous tailback past J11 were not overlooked.
- 3.25 The results from the Journey Time Database were not as expected. Journey time for both J11 to J10 and J12 to J10 increased and speeds reduced. **Table 3.8** shows a summary of the results for J11 to J10. The JTDB does not provide data by lane; hence it is not possible to comment on where any observed journey time differences are a direct impact of the scheme.

Table 3.3.8 - J11 to J10 Journey Time Data

	Average	AM Peak	PM Peak	Average
June 2005	Travel Time (seconds)	126.9	133.2	130.1
	Travel Speed (km/h)	106.7	101.6	103.8
	Total Flow (vehicles)	3848	5001	4425
June 2007	Travel Time (seconds)	133.1	150.1	141.6
	Travel Speed (km/h)	101.7	90.5	95.5
	Total Flow (vehicles)	4146	5085	4616
Differences (%)	Travel Time (seconds)	+6.2 (+5%)	+16.9 (+13%)	+11.5(+9%)
	Travel Speed (km/h)	-5 (-5%)	-11.1 (-11%)	-8.3(-8%)
	Total Flow (vehicles)	+298 (+8%)	+84 (+2%)	+191(+4%)

3.26 Key scheme impacts to note from **Table 3.8**:

- ◆ The flow travelling from junction 11 to junction 10 westbound has increased, on average, by 4% in the peak hours. This is not considered to be a direct impact of the scheme itself, and is inline with background traffic growth trends. Additionally, it is possible that any journey time benefits accrued from the scheme were absorbed by the increase in flow;
- ◆ There has been an average reduction in speed of 8.3 km per hour (8% reduction). In part, this can be explained by drivers slowing down in response to the additional signs introduced as part of the scheme;
- ◆ The travel time has increased by an average of 11.5 seconds, or 9%. This is in line with the reduction in speed.

MIDAS Data

3.27 The advantages of using MIDAS data, with respect to this evaluation, are as follows:

- ◆ Data is available minute by minute: this will enable data to be collated into peak and off-peak hours. Time savings were only calculated for peak hours in the PAR;
- ◆ Data is available lane by lane: it is possible to see speed and flow changes in each lane. This is particularly important for this scheme as the intention was to reduce the overload occurring in lane 1.

3.28 For each lane on the approach to the junction, the anticipated results from the MIDAS travel time data were as follows:

- ◆ Lane 1: A decrease in flow would be expected as the lane is now only for the use of M6 south traffic, where as previously it was being used by all diverging traffic for the M6. As a results of reduction in flow a slight increase in speed would also be expected;
- ◆ Lane 2: An increase in flow would be expected as lane two now accommodates diverging traffic for the M6 north and a portion of the M62 westbound flow. It could be inferred that this increase in flow would in turn result in a slight decrease in speed;

- ◆ **Lane 3:** A slight increase in flow would be expected as vehicles continuing on the M62 move into lane three which is only for the use of westbound traffic. Again, this increase in flow could result in a slight decrease in speed.

3.29 By considering the expected changes in flow on the approach to the junction in the above it can be noted that the estimation of a 30 second time saving per vehicle in each peak hour is unlikely to be realised by all users of the junction. Due to the increase in lanes for diverging traffic, it is likely that any time saving that occurs will mainly be accrued by those vehicles joining the M6.

Outturn Assessment

3.30 MIDAS data 2km upstream from the westbound diverge was used. This MIDAS count site is situated slightly downstream from the first set of lane markings and signs. Data was compared for the first 9 months 2005 and 2007 as data was only available for January to September of 2007.

Table 3.3.9 – Average Count (per hour)

Time Period	Day	Lane 1		Lane 2		Lane 3		Total	
		2005	2007	2005	2007	2005	2007	2005	2007
7am – 10am	Monday	967	943	1320	1387	1310	1377	3598	3706
	Tuesday – Thursday	1010	1036	1413	1570	1462	1623	3885	4230
	Friday	989	992	1371	1506	1363	1531	3722	4029
	Average	997	1009	1386	1521	1412	1555	3795	4085
4pm – 7pm	Monday	1309	1152	1713	1839	1680	1668	4702	4660
	Tuesday – Thursday	1405	1284	1799	1980	1872	1897	5077	5161
	Friday	1269	1173	1710	1871	1712	1760	4691	4804
	Average	1359	1235	1764	1930	1802	1824	4925	4989
Peak Hours	Average	1178	1122	1575	1726	1607	1690	4360	4537

3.31 **Table 3.9** shows the flow across each lane for both 2005 and 2007. The flow in lane 1 has decreased, whilst the flow in lane 2 has increased. This was to be expected as the diverging traffic is now accommodated by lanes 1 and 2 instead of just lane 1. Additionally there has been an increase in flow for lane 3. This could possibly be accounted to the fact that lane 3 is an M62 westbound dedicated lane, where as lane 2 is for both M62 westbound and diverging traffic for M6 northbound.

3.32 Though the scheme has had the desired effect of reducing flow in lane 1, this pattern is not consistent across the AM and PM peak periods.

3.33 Key points to note from **Table 3.9** are:

- ◆ The average flow has decreased in lane 1 from 1178 to 1122 vehicles, this is a reduction of 5%;
- ◆ The average flow has increased in lane 2 from 1575 to 1726 vehicles, this is an increase of 10%;
- ◆ The average flow has increased in lane 3 from 1607 to 1690 vehicles, this is an increase of 5%;

- ◆ The overall increase in flow from 2005 to 2007 during the peak hours is from 4360 to 4537 (values are vehicles per hour across all three lanes), this is an increase of 4%. This value supports the increase in flow calculated from the JTDB data as shown in **Table 3.8**.
- 3.34 The increase in flow is not considered to be a result of the scheme itself. The increase in flow is in line with the level of growth shown in **Table 3.7**, and is regarded as the result of background growth trends.
- 3.35 **Table 3.10** shows the average speed (in km/hr) over the defined peak hours for both 2005 and 2007.

Table 3.3.10 - Average Speed (km/hr)

Time Period	Day	Lane 1		Lane 2		Lane 3		Average	
		2005	2007	2005	2007	2005	2007	2005	2007
7am – 10am	Monday	91.8	91.2	107.5	101.4	115.4	107.5	106.2	101.1
	Tuesday – Thursday	90.4	89.8	105.6	100.2	116.8	112.8	105.8	102.5
	Friday	90.8	90.2	107.3	101.3	119.7	114.2	107.4	103.5
	Average	90.8	90.2	106.3	100.7	117.1	112.0	106.2	102.4
4pm – 7pm	Monday	89.4	83.2	101.6	89.0	111.5	98.8	101.8	91.2
	Tuesday – Thursday	83.4	79.8	93.8	83.7	102.4	92.9	94.1	86.1
	Friday	88.3	84.8	100.3	91.0	110.2	101.4	100.7	93.3
	Average	85.6	81.5	96.7	86.2	105.8	95.8	97.0	88.6
Peak Hours	Average	88.2	85.9	101.5	93.5	111.5	103.9	101.6	95.5

- 3.36 Key points to note from **Table 3.10** are:
- ◆ The average speed of vehicles travelling in lane 1 has decreased from 88.2 km/hr to 85.9 km/hr, this is a decrease of 3%;
 - ◆ The average speed of vehicles travelling in lane 2 has decreased from 101.5 km/hr to 93.5 km/hr, this is a decrease of 8%;
 - ◆ The average speed of vehicles travelling in lane 3 has decreased from 111.5 km/hr to 103.9 km/hr, this is a decrease of 7 %;
 - ◆ The average speed across all three lanes has decreased from 101.6 km/hr to 95.5 km/hr; this is reduction in speed of 6%, comparable to the reduction in speed calculated from the JTDB data in **Table 3.8** (8.3%);
 - ◆ Overall there has been a decrease in speeds. This is more apparent in the PM peak period.
- 3.37 The results stated above are generally in agreement with those expected in this report except for the decrease in speed observed in lane 1. This decrease in speed is a surprising result; one feasible explanation for this decrease in speed is that people are slowing down in response to the improved signing and lane markings and to move into the correct lane sooner.
- 3.38 To conclude, there is no evidence to support the original PAR's prediction of a 30 second time saving per vehicle over peak hours. Additionally, the outturn data shows

that there has been a slight decrease in speed and an increase in flow. As such, the outturn assessment of the scheme's impact on travel time is **neutral**.

SUMMARY- SCHEME IMPACT

- ◆ The original assessment predicted an accident saving of 10% in the opening year; this is a predicted opening year accident saving of 0.08 PIAs culminating in a 60-year accident benefit of **6.79 PIAs** (central case).
- ◆ In comparison to the predicted-corrected saving of 0.157 PIAs in the opening year, the actual observed accident reduction was 0.717 PIAs in the opening year.
- ◆ The KSI index was 25% in the outturn pre-opening accident data. The only observed accident in 14 months post-opening data had a slight severity index, giving a post-opening KSI of 0% (compared to 25% prior to scheme opening).
- ◆ Analysis of the post-opening data indicated that the Annual Average PIA was 1.57 prior to the scheme and 0.86 after the scheme's implementation. Taking the two accidents during the construction period, this amounts to a re-forecast net accident saving of 71.95 PIAs (central case) over 60 years.
- ◆ A time saving of 30 seconds per vehicles travelling through the junction during peak hours was predicted in the original PAR.
- ◆ The outturn assessment of travel time benefits showed the following trends:
 - No improvements were made to journey times from junction 11 to junction 10;
 - No evidence was given to support the saving of 30 seconds per vehicle in the peak hours predicted by the original PAR;
 - A slight decrease in speeds is shown in the MIDAS data. The average speed across all three lanes has reduced from 101.6 km/hr to 95.5 km/hr, this is a decrease of 6%.
- ◆ There is no significant evidence to support either an improvement or deterioration in travel times. As such, the outturn assessment is neutral.
- ◆ Though the predicted Journey Time benefits did not materialise it is still important to note from an observed operational perspective that the westbound diverge is functioning well.

4. Summary of Monetary Impacts

INTRODUCTION

- 4.1 This section assesses the predicted level of safety and economic benefits for the scheme and then compares this prediction against actual benefits accrued when considering observed traffic volume changes. The re-evaluation, termed the Post Opening Project Evaluation (POPE) methodology, uses observed accident and link transit savings to provide a monetised assessment of the performance of the scheme. It should also be noted that all PARs after PAR3.0 (including PAR3.1) account for costs and benefits in terms of market prices as opposed to resource costs.
- 4.2 It is also important to emphasise that the outturn assessment is in essence a 're-forecast' of the benefit over the entire evaluation period (usually 30 or 60 years) based solely on data collected during the first year after opening. As a consequence it is not able to account for other areas of potential under-estimation or over-estimation of benefits such as future traffic growth.

FORECAST AND ACTUAL OPENING YEAR

- 4.3 The forecast opening date of the project was 2005 (no specific month given in the PAR), with an actual opening date of April 2006.

EVALUATION PERIOD

- 4.4 The evaluation in the PAR document was based on PAR3.3. This version of PAR had a 2002 present value year, a discount rate of 3.5% and an assessment period of 60 years. As such it has been decided that the outturn assessment will be conducted as for PAR3.3 so as to allow direct comparison with the original PAR.

SAFETY

Predicted Accident Benefits

- 4.5 As detailed in **Section 3**, the original PAR predicted an accident saving of 6.79 PIAs over the 60-year evaluation period, and that the scheme itself was forecast to provide only a slight accident benefit. The monetised accident benefit of the scheme was £0.33m (low growth) and £0.39m (high growth), producing a **central growth safety benefit of £0.36m**.

Predicted-Corrected Accident Benefits

- 4.6 The study area was not clearly defined in the original PAR, as such a predicted-corrected accident saving was calculated using the level of safety benefit predicted in the original PAR, but applied to the before data in the outturn assessment. This allows a valid comparison of the outturn data with the original predicted safety benefit.

- 4.7 The predicted-corrected scenario gives an accident saving of 13.3 PIAs (central case) over the 60-year evaluation period, this is assuming the 10% PIA saving set out in the original PAR. The monetised predicted-corrected safety benefit is £0.58m (low growth) and £0.69m (high growth), producing a **central growth safety benefit of £0.63m**.
- 4.8 This is an increase from the original PAR safety benefit of 75%.

Outturn Accident Benefits

- 4.9 Section 3 compared the accident data for the area of the scheme in the westbound direction for the pre-opening, construction, and post-opening period. This assessment showed:
- ◆ During the construction period there were two Personal Injury Accidents (PIAs);
 - ◆ Following the completion of the scheme there was a one PIA in a period of 14 months. This is a reduction from an Annual Average of 1.57 PIAs to 0.86 PIAs.
 - ◆ The re-forecast of the 60 year accident benefit gives a low growth estimate of 55.4 PIAs and high growth estimate of 92.5 PIAs. This gives a central growth accident benefit of 71.95 PIAs.
 - ◆ Though 3 years accident data is not yet available, based on the 14 months post-opening accident data there is enough evidence to make a preliminary conclusion that there has been an observed reduction in PIAs at the junction.
- 4.10 This gives a monetised accident benefit for the scheme of £2.57m (low growth) and £3.05m (high growth), giving a **central growth safety benefit of £2.81m**. As in the original PAR low growth and high growth are set at 30% and 57% respectively. Details of these calculations are given in Annex B.

ECONOMY

Predicted

- 4.11 The original PAR predicted a time saving of 30 seconds per vehicle in the 5 Monday to Friday peak hours. This amounted to a Value of Time benefit (discounted to 2002) of £25.7m (low growth) and £30.4m (high growth). This produces a **central growth figure of £28.1m**. Low growth and high growth are set at 30% and 57% respectively.

Transport Economic Efficiency: Outturn

- 4.12 As detailed in **Section 3** there was no conclusive evidence that there had been any time saving benefits for westbound traffic. As such there are no Journey Time Benefits to take into consideration when calculating the outturn economic benefits of the scheme.

SCHEME COST

PAR/AST Cost

- 4.13 The scheme cost estimate presented in the PAR document was £1.475m in Q1 2002 prices. This was converted to a 2002 present value of cost (PVC) of £1.605m assuming a year of construction of 2005.

Outturn Cost

- 4.14 No outturn costs were made available: In the absence of outturn values the scheme costs from the original PAR document was used for the analysis of monetised costs and benefits. The PVC was recalculated, however, with the actual construction year of 2006 used for discounting.

SUMMARY

- 4.15 **Table 4.1** gives a summary of the central growth economic evaluation for the original PAR, the predicted-corrected PAR and the outturn assessment.
- 4.16 Key points to note from **Table 4.1** are:
- ◆ The outturn Benefit Cost Ratio (BCR), 1.81, is much lower than the predicted BCR of 17.7. As discussed previously, this is accounted to the lack of evidence to support any journey time benefits. Though the outturn value is much lower it is important to note that it is still greater than 1, due to the scheme giving greater safety benefits than expected;
 - ◆ The outturn first year benefits are £0.052m and are much lower than the predicted value of £0.516m. The outturn first year rate of return (FYRR) of 3.35% is also much lower than the predicted value of 32.1%. These differences can again be attributed to the non-emergence of economy benefits predicted in the original PAR (see previous section).
 - ◆ Costs are marginally lower than expected due to differences in the predicted and outturn construction years.

Table 4.4.1 – Summary Economic Evaluation

	Predicted Original	Predicted Corrected	Outturn
PAR Version	PAR 3.3	PAR 3.3	PAR 3.3
Method of Calculation	Economy: Manual Calculation Accidents: Manual Calculation	Economy: Original PAR Accidents: Manual Calculation, predicted-corrected	Economy: Manual Calculation Accidents: Manual POPE Calculation
Present Value Year	2002	2002	2002
Discount Rate	3.5%	3.5%	3.5%
Scheme Opening Year	2005	2005	2006
Evaluation Period	60 Years	60 years	60 Years
Economy Benefits	£28.075m	£28.075	-
Accident Benefits	£0.322m	£0.632m	£2.812m
Total Benefits (PVB)	£28.397m	£28.707m	£2.812m
Total Cost (PVC)	£1.605m	£1.605	£1.552m
Net Present Value (NPV)	£26.79m	£27.102	£1.26m
Benefit Cost Ratio (BCR)	17.7	17.9	1.81
<i>First Year Economy Benefits</i>	<i>£0.510m</i>	<i>£0.510</i>	<i>£0m</i>
<i>First Year Accident Benefits</i>	<i>£0.006m</i>	<i>£0.012m</i>	<i>£0.0523m</i>
First Year Total Benefits (PVB)	£0.516m	£0.522m	£0.0523m
First Year Rate of Return (FYRR)	32.1%	32.5%	3.35%

OTHER SAFETY AND ECONOMY SUB-OBJECTIVES

Security

- 4.17 An assessment of the impact of the scheme on security was not applicable for this scheme. The PAR and the POPE assessment are in agreement that the forecast impact for security is **no impact**.

Reliability

- 4.18 The original PAR stated that:

'By easing the flow of traffic through the junction the congestion will be reduced which in turn will improve the journey times and reliability of the junction.'

- 4.19 However the forecast given in the PAR was **no impact** and no worksheet was completed.
- 4.20 The POPE assessment considered the relevance of reliability with respect to the journey time data and decided that the impact was **neutral**.

Wider Economic Impacts

- 4.21 An assessment of the impact of the scheme was presented in the relevant PAR worksheet. In accordance with the worksheet the scheme was deemed to have no forecast benefit with regard to regeneration and have no impact with regard to developments dependent on the outcome of the scheme. The resultant forecast impact was **no impact**.
- 4.22 The POPE assessment agreed with the PAR score of **no impact**.

SUMMARY- POPE, SAFETY AND ECONOMY OBJECTIVES

- ◆ The predicted central growth safety benefit was **£0.36m**, compared to an outturn central growth safety benefit is **£2.81m**. The outturn value is much higher than the predicted safety benefit.
- ◆ The predicted central growth Value of Time benefit was **£28.1m**. As the outturn impact on journey times was classified as neutral, there was **no outturn Value of Time benefit**. This resulted in a significant reduction of Present Value of Benefits (PVB) for the scheme.
- ◆ No outturn scheme cost was forthcoming from the Project Sponsor; as such the predicted scheme costs from the original PAR were used in the outturn economic assessment. Outturn costs were marginally lower than expected due to the delay in opening of the scheme.
- ◆ The original PAR predicted a **BCR of 17.7** and a **First Year Rate of Return of 32.1%**.
- ◆ The outturn **BCR was 1.81** and the **First Year Rate of Return was 3.35%**.
- ◆ Security, Reliability and Wider Economic Impact objectives were not found to be affected by the scheme.

5. Assessment of Environment, Accessibility & Integration Impacts

INTRODUCTION

- 5.1 This section examines the environment, integration, accessibility and integration objectives of the scheme by presenting the forecast impacts of the scheme as contained in the PAR and AST, and comparing these to outturn values.
- 5.2 The forecast impacts of the scheme have been derived from the main body of the PAR document and the completed AST (see Annex D). The main source of information for the outturn assessments was a site visit undertaken by members of Atkins POPE evaluation team.
- 5.3 A summary of the PAR and outturn impacts on the Environmental, Accessibility and Integration objectives is summarised in **Table 5.1**.

Table 5.5.1 – Assessment of Environment, Accessibility and Integration

	Objective	Original PAR Assessment	Outturn Assessment
Environment	Noise	Not applicable – no impact	Neutral
	Local Air Quality	Not applicable – no impact	Neutral
	Greenhouse Gases	Not applicable – no impact	Neutral
	Landscape	Not applicable – no impact	No impact
	Townscape	Not applicable – no impact	No impact
	Heritage of Historic Resources	Not applicable – no impact	No impact
	Biodiversity	Not applicable – no impact	No impact
	Water Environment	Not applicable – no impact	Neutral
	Physical Fitness	Not applicable – no impact	No impact
	Journey Ambience	Not applicable – no impact	Slight beneficial
Accessibility	Option Values	Not applicable – no impact	No impact
	Severance	Not applicable – no impact	No impact
	Access to the Transport System	Not applicable – no impact	No impact
Integration	Transport Interchange	Not applicable – no impact	No impact
	Land-Use Policy	Not applicable – no impact	No impact
	Other Government Policies	Not applicable – no impact	No impact

- 5.4 An outturn assessment of 'neutral' indicates that the scheme's impact on the objective has been considered. An assessment of 'no impact' indicates that the scheme will not impact on the objective in any way so has not been given the same level of consideration. All objectives with an assessment other than 'no impact' are discussed in further detail below.

ENVIRONMENT

Overview

- 5.5 The PAR stated that an Environmental Assessment was undertaken to determine the impact of the scheme and this work has concluded that there would be no significant environmental impact. All assessment work took place in accordance with the Design Manual for Roads and Bridges (DMRB). No environmental impacts were predicted and no mitigation measures were implemented. No post opening maintenance issues have been reported and no obvious issues presented themselves on the site visit.

Noise

PAR & AST

- 5.6 The effect of noise was limited to the short construction period and did not consider the post opening period; therefore no PAR worksheet was required. The AST stated that there were no anticipated changes in traffic flows or percentage HGVs and change in speed was anticipated to be less than 10%. The original assessment was therefore **not applicable – no impact**.

Outturn Assessment

- 5.7 The outturn assessment of traffic for the scheme shows that there has been a 4% increase in traffic during peak periods from 2005 (see **Table 3.8**). This increase in traffic may have resulted in an increase in the traffic noise heard at properties located near the scheme.
- 5.8 Appendix B.4 PAR3.3 states that if the change in traffic is greater than 25% then the impact in terms of traffic noise is not neutral.
- 5.9 However, as there was no significant speed change, and the change in traffic flow was less than 25%, it can be concluded that the impact of the scheme is '**neutral**'. Additionally, the change in flow is largely accountable to traffic growth.

Local Air Quality

PAR & AST

- 5.10 The effect on local air quality was limited to the short construction period; therefore no PAR worksheet was completed. The AST stated that no properties were located within 50 metres of the proposed carriageway edge and no change in overall traffic flows or speeds was predicted.
- 5.11 The original assessment was therefore **not applicable – no impact**.

Outturn Assessment

- 5.12 There are no properties within 50 metres of the junction and there is no evidence of a significant increase in vehicle speeds. To determine whether or not this impact can be regarded as non-neutral there is a need to consult the PAR guidance. Appendix B.5 PAR3.3 states that if the increase in traffic must be greater than 700 vehicles for

the impact to be regarded as non-neutral, therefore the outturn assessment is **neutral**.

Greenhouse Gases

PAR & AST

5.13 It was determined in the PAR that an assessment of the schemes impact on greenhouse gases was unnecessary.

5.14 The original assessment was therefore **not applicable – no impact**.

Outturn Assessment

5.15 The PAR stated that 30 seconds would be saved per vehicle in the peak hour. It is inferred that this time saving would be produced through increased speed when travelling through the westbound diverge. The effects of this change in speed were not considered in the AST but would have provided an increase in overall carbon emissions.

5.16 However, the outturn assessment shows that there is no evidence of an increase in speed for vehicles travelling through the westbound diverge. As such the outturn assessment for greenhouse gases was **neutral**.

Journey Ambience

PAR & AST

5.17 The PAR and AST forecast that the scheme would have **no impact** on physical fitness.

5.18 The PAR stated that:

‘The reduction in the number of accidents will improve the journey ambience’

Outturn Assessment

5.19 There has been no change in the roadside facilities and the journey times during peak hours have not been effected, but the personal injury accident rate has been reduced. Also, improved signage and the introduction of the ‘tiger tail’ road markings have reduced driver confusion. The outturn assessment of the schemes impact on journey ambience is therefore considered to be **slight beneficial**.

5.20 Additionally, it should be noted that the impact of the scheme on journey ambience should have been considered in the original PAR as time savings and a reduction in driver confusion were predicted.

SUMMARY- ENVIRONMENT, ACCESSIBILITY AND INTEGRATION

In summary, the majority of elements are considered to be as the PAR predicted.

- ◆ Environment- Noise, Local Air Quality and Greenhouse Gases: **neutral**
- ◆ Environment- Journey Ambience: **slight beneficial**
- ◆ Environment- all other objectives: **no impact**
- ◆ Accessibility- all objectives: **no impact**
- ◆ Integration- all objectives: **no impact**

The outturn Evaluation Summary Table for the scheme can be seen in Annex E.

6. Conclusions and Recommendations

INTRODUCTION

- 6.1 This report has presented the post opening evaluation of the M62 Junction 10 Westbound Diverge which opened in April 2006. This scheme involved increasing the number of diverging lanes from one to two and improving signage and lane markings for the length of the scheme.
- 6.2 The POPE assessment of M62 Junction 10 junction improvements has utilised a range of observed and modelled data available to examine the outturn impacts of the scheme compared to those forecast in the original PAR. The purpose of this section is to:
- ◆ Draw together the key impacts emerging from the POPE evaluation;
 - ◆ Summarise the key lessons emerging from this evaluation; and
 - ◆ Suggest recommendations that will facilitate and increase the accuracy of future PAR appraisals for schemes similar to that implemented at M62 Junction 10.

SUMMARY OF KEY IMPACTS

Economy

- ◆ The scheme has not resulted in any change to traffic growth trends which has largely been in line with NRTF growth projections;
- ◆ A comparison of before and after traffic flows indicates a 4% increase in traffic between 2005 and 2007 (estimated average);
- ◆ POPE did not reveal any conclusive evidence of journey time savings at the interchange;
- ◆ Data from MIDAS suggests there has been a decrease in average vehicle speeds between Junctions 10 and 11 of around 6% (101kph to 95kph). Speed reductions demonstrated in the JTDB are in the region of 8%;
- ◆ Reductions in average vehicle speeds as projected using MIDAS data equates to an average time disbenefit of 11 seconds per vehicle;
- ◆ The marginal change in average journey times points towards a neutral journey time impact; and
- ◆ Whilst journey times did not reduce by the magnitude forecast in the PAR, site observations undertaken in the peak hours suggest that the scheme is operating well.

Safety

- ◆ Opening year PIA data clearly indicates that there has been a reduction in the number of personal injury accidents in the vicinity of the junction;
- ◆ There have been no serious or fatal PIA's at the interchange subsequent to scheme opening;
- ◆ Accident benefits were greater than expected. There was a reduction in the Annual Average PIA from 1.57 to 0.86 in the opening year (compared to a predicted opening year saving of 0.08);

- ◆ 60 year safety benefits equated to £2.8m and therefore were substantially higher than the predicted-corrected value of £0.63m;
- ◆ Opening Year safety benefits were equivalent to £0.0523m; and
- ◆ The observed reduction in vehicle speeds may be a contributing factor to the safety benefits accrued at the junction.

Value for Money

- 6.3 Table 6.1 summarises the overall value for money performance of the M62 J10 scheme.

Table 6.1 –Value for Money Summary

	Predicted	Predicted Corrected	Actual
First Year Benefit*	£0.5m	£0.5m	£0.05m
60 Year Benefit*	£28.4m	£28.7m	£2.8m
Cost*	£1.605m	£1.605m	£1.522m
Benefit Cost Ratio (BCR)	17.7	17.9	1.81
% FYRR	32.1	32.5	3.4

- 6.4
- 6.5 The predicted benefit cost ratio was 17.7 and the outturn value 1.81 (this has been derived solely from safety benefits alone). The first year rate of return was 3.35% compared to a predicted value of 32.1% (10% of that predicted). Overall, it appears that the scheme has added substantial value in terms of the outturn accident savings it has delivered, yet its impact on journey times has been limited.
- 6.6 No outturn scheme costs were available; as such the costs from the original PAR were amended to account for changes in the actual opening year.
- 6.7 The lower than expected BCR and FYRR can largely be attributed to the lack of clear cut economy benefits emerging from the scheme.

Environment, Accessibility and Integration

- 6.8 With regards to the environmental, accessibility and integration sub-objectives the predicted an outturn sub-objectives were in agreement with the following exceptions:
- ◆ The scheme generally had a minimal impact upon the environment as all the work was carried out within the highway boundary. The impact on air quality and greenhouse gases is neutral as there is no significant indication that there has been any increase in speeds or flow.
 - ◆ After conducting a detailed site visit and review of existing PAR documentation and PAR guidance was undertaken, our evaluation of the scheme's impact on accessibility and integration is neutral.

SUMMARY OF LESSONS LEARNT

- 6.9 The key points to note regarding the M62 junction 10 westbound diverge scheme are:
- ◆ The available evidence did not demonstrate that the scheme had met its objectives of reducing journey times;

- ◆ The PAR assessment provided an over-estimate of economic benefits as the scheme's impact on journey times was not considered on a lane by lane basis.;
- ◆ No study area was defined in the original PAR and as such a full comparison between the PAR and out-turn appraisal could not be made (hence there is a dependency on the consultant to make high level assumptions as part of the POPE process);
- ◆ The 14 months post-opening data indicates that the scheme has exceeded its objective of improving safety at the junction and hence suggests that signing and lining schemes can have a significant effect on road safety; and
- ◆ Junction layout improvements when paired with improvements to road markings and signing can aid the safety objective by reducing excessive weaving manoeuvres resulting from driver confusion;
- ◆ The PAR was not thorough when applying the time saving benefits, as the redistribution of flow would be unlikely to benefit all vehicles on the approach to the diverge; and
- ◆ The transition between MAC agents has made retrieving historical PAR information problematic.

SUMMARY OF RECOMMENDATIONS

- 6.10 In order to for the HA to progress in light of the lessons learnt described above, it is recommended that where possible the following is considered:
- ◆ Greater evidence of observed journey times prior to scheme opening would help to verify the extent of congestion/journey time problems at the junction;
 - ◆ PAR submissions supported with a clear audit trail and supporting calculations would help to facilitate the POPE process and provide a solid evidence base for scheme proposals. Such a process will help to improve the robustness of comparisons made as part of POPE;
 - ◆ Early consideration should be given to the chosen study area (zone of influence) as this can significantly impact on the benefits/disbenefits emerging from the scheme; and
 - ◆ In cases where new diverge arrangements are being implemented, consideration should be given to how such proposals will affect traffic distribution across lanes i.e. a uniform journey time saving should not necessarily be assumed.

Annex A – Accident Rate Calculation

COBA Default Accident Rate Calculation

Link/Junction Combined

Table 4/1

D4 Motorway

$$A_0 = 0.098 \text{ PIA/mvkm}$$

$$\beta = 1.001$$

$$A_N = A_0 \times \beta^N$$

Base Year = 2000

N = number of years after base year (middle year of current accident data)

N = 3 (2003)

$$A_N = 0.09829 \text{ PIA/mvkm}$$

2 Way AADT = 109100 (year 2006)

1 Way AADT = 54550

The 2 way AADT value is from a MIDAS site east of M62 J10

The study area for accident data is 1.3km

$$\text{PIA/year} = 0.09829 \times 54,550 \times 365 \times 1.3/1,000,000$$

$$\text{PIA/year} = 2.54$$

Annex B - Accident Economic Evaluation

	Traffic Growth Forecast		
	Low	Central	High
Number of Personal Injury Accidents saved in Opening Year	0.717	0.717	0.717
Average Cost of Accident in Opening Year (£)	£82,970	£82,970	£82,970
Annual Accident Benefit in Opening Year (£/year)	59489	59489	59489
60 Year Accident Benefit in 2002 prices, discounted to 2002	£2,571,230	£2,811,792	£3,052,353
Number of accidents saved over 60 years	77.3	84.9	92.5

Annex C – Original PAR's Journey Time Saving Calculation

Vehicle Hours Saved in Opening Year

48,958 hours saved/year

Peak Hour Flow (ave) = 4700

Approximately 250 weekdays per year

Minutes saved per vehicle in peak hour = 30 seconds per vehicle

Number of peak hours per day in which savings could occur = 5 peak hours

Total time saved in opening year

$$=(4700)(0.5)(5) * 250/60$$

$$=48,958 \text{ hours saved/year}$$

Annex D – Original Scheme AST

Option: M62 Junction 10 Westbound Diverge		Description:		Present Value Cost: £1.398m
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE	ASSESSMENT
ENVIRONMENT	Noise	No impact		Estimated Population Annoyed by Noise
	Local Air Quality	No impact		Concentrations weighted for exposure
	Greenhouse Gases	No impact		Tonnes of CO ₂
	Landscape	No impact		Score
	Townscape	No impact		Score
	Heritage of Historic Resources	No impact		Score
	Biodiversity	No impact		Score
	Water Environment	No impact		Score
	Physical Fitness	No impact		Score
Journey Ambience	No impact		Score	
SAFETY	Accidents	Reduced accident rate due to the reduced amount of queuing and lane changing traffic	3.02 accidents saved	PVB £0.12m
	Security			Score
ECONOMY	Public Accounts	No local government contribution		PVC £1.398m
	Business Users & Providers	No impact	N/A	
	Consumer Users	User benefits from optimising the use of the two lane diverge and improved signage	Users PVB £14.1m	PVB £14.1m
	Reliability			Score
	Wider Economic Impacts			Score
ACCESSIBILITY	Option values			Score
	Severance			Score
	Access to the Transport System			Score
INTEGRATION	Transport Interchange			Score
	Land-Use Policy			Score
	Other Government Policies			Score

Note: Original AST only partially complete.

Annex E – Outturn EST

Option: M62 Junction 10 Westbound Diverge		Description:		Present Value Cost: £M
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE	ASSESSMENT
ENVIRONMENT	Noise	There is no property within 300m of the scheme.	Not applicable	Neutral
	Local Air Quality	There are no properties within 50 metres of the junction and there is no evidence of an increase in vehicle speeds.	Not applicable	Neutral
	Greenhouse Gases	There was no evidence to indicate that there had been a significant change in speed. Greenhouse Gases are not affected by this scheme.	Not applicable	Neutral
	Landscape	Scheme is wholly within the existing highway boundary,	Not applicable	Not applicable – no impact
	Townscape	Scheme is wholly within the existing highway boundary. No townscape is affected by this scheme. Only applies to built-up areas.	Not applicable	Not applicable – no impact
	Heritage of Historic Resources	The scheme was confined to the existing highway boundary so no mitigation works were required.	Not applicable	Not applicable – no impact
	Biodiversity	The scheme is not located on a sensitive site, no protected species are affected and the scheme does not conflict with any local HA biodiversity action plans.	Not applicable	Not applicable – no impact
	Water Environment	There were no changes to the volume and water quality.	Not applicable	Not applicable – no impact
	Physical Fitness	No change to length or number of walking or cycling trips made. Physical fitness not affected by this scheme.	Not applicable	Not applicable – no impact
	Journey Ambience	No change to roadside facilities or to the views from the road. However, the increased capacity for the diverging traffic, the improvements to signage and the reduction in accidents reduce driver confusion and stress.	Not applicable	Slight beneficial
SAFETY	Accidents	The 14 months post-opening data available indicates that the scheme has had a positive impact on reducing accident levels.	71.95 PIAs saved (central case), major positive.	PVB: 60-year benefit of £2.812m
	Security	The scheme has no impact	Not applicable	Not applicable – no impact

ECONOMY	Public Accounts	No local government contribution		PVC £1.552m
	Transport Economic Efficiency	The aim of the scheme was to reduce delay during peak times and to increase vehicle speeds through the junction. No evidence was found to indicate that the aims of the scheme had been realised.	Not applicable	Neutral
	Reliability	No significant evidence in the journey time data that queue lengths have changed.	Not applicable	Neutral
	Wider Economic Impacts	The scheme has no impact.	Not applicable	Not applicable – no impact
ACCESSIBILITY	Option values	The scheme does not result in new public transport services. Therefore it does not impact upon option values.	Not applicable	Not applicable – no impact
	Severance	There is no change to pedestrian, equestrian or cycle routes. Therefore, severance is not affected by this scheme.	Not applicable	Not applicable – no impact
	Access to the Transport System	The scheme does not affect access to the transport system.	Not applicable	Not applicable – no impact
INTEGRATION	Transport Interchange	The scheme does not change access to park and ride, bus or rail stations and no interchange facilities are created or modified.	Not applicable	Not applicable – no impact
	Land-Use Policy	No land use policy is affected by this scheme.	-	Not applicable – no impact
	Other Government Policies	The scheme has no recognisable effect on other government policies.	Not applicable	Not applicable - no impact