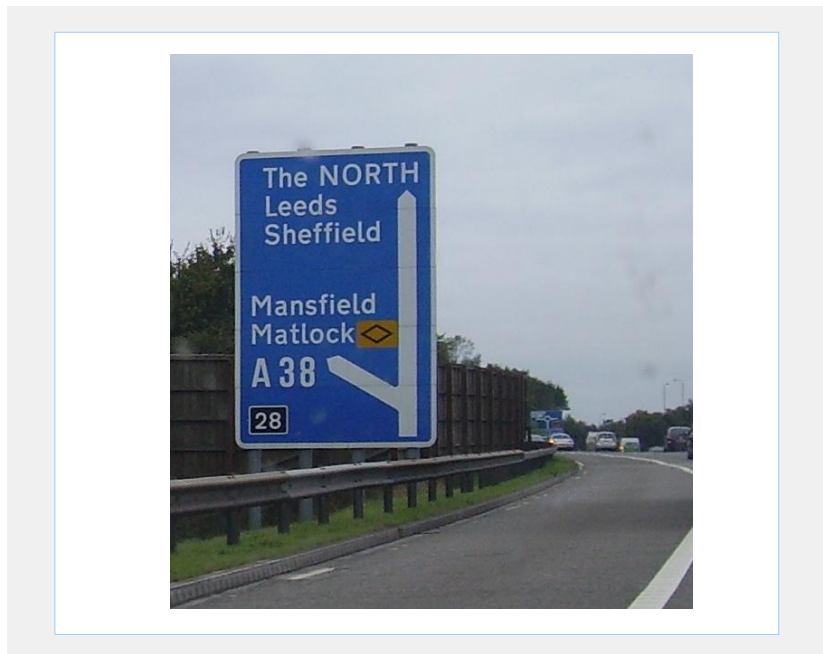


LNMS EVALUATION REPORT

M1 Junction 28 Capacity Improvement Scheme



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1. Introduction

PURPOSE OF THIS REPORT

- 1.1 As part of an ongoing requirement of the Highways Agency to evaluate the impacts of new trunk road schemes, Atkins has been commissioned to undertake post-opening evaluations of 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 dis-benefits accruing from new schemes and to ascertain which schemes offer the greatest value for money;
 - ◆ Develop the pre-scheme appraisal processes (PAR Guidance) to assist in providing accurate predictions about the possible impacts of highway schemes on safety, economy, environment, accessibility and integration in the future; and
- 1.2 This document specifically sets out the results of the Post-opening Project Evaluation (POPE) of the M1 Junction 28 Improvements Scheme as implemented in March 2006. The report examines the economic, safety, environmental, accessibility, and integration impacts resulting from the installation of the junction improvement. The final outcomes will inform the POPE of local Network Management Schemes (LNMS) Fifth Annual Report in June 2008

BACKGROUND

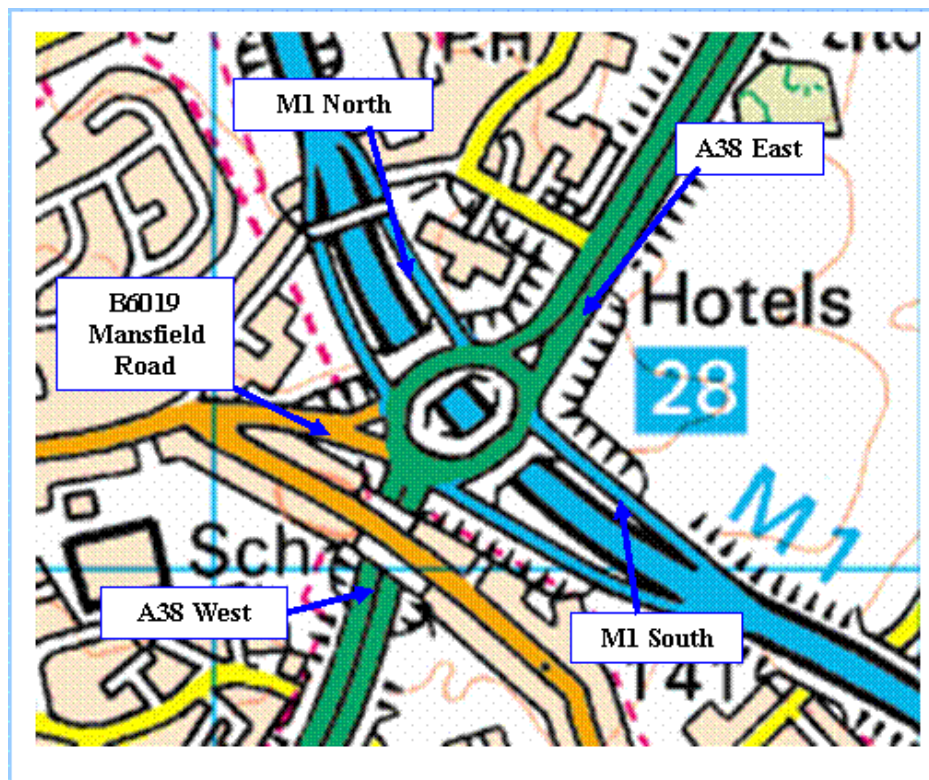
- 1.3 M1 Junction 28 is located 10km to the south-west of Mansfield (Figure 1.1) and forms the intersection between the M1, A38 and B6019 Mansfield Road. The junction is located on a key corridor for HGV and commuter traffic between Derbyshire and Nottinghamshire.

Figure 1.1 – M1 Junction 28 Location



- 1.4 Prior to the junction improvements long peak hour queues formed on both A38 approaches to the roundabout (particularly in the AM peak period). Queues on the western approach extended to nearly 2 kilometres, and frequently reached more than 600m back eastern approach. Such conditions were paralleled with a high accident rate, particularly on the A38 Western approach, where the two entry lanes to the roundabout were of a substandard width. Figure 1.2 displays the layout of the M1 J28 in more detail.

Figure 1.2 – M1 J28 Junction Detail



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SCHEME DESCRIPTION

- 1.5 Improvements to the junction were identified in the M1 Multi-Modal Study (MMS) published in April 2002. The study recommended short-term improvements for junctions on the M1 from Junction 21, Leicester to Junction 30, Chesterfield.
- 1.6 The Project Appraisal Report was produced by AMScott and was issued in August 2005. Construction for the scheme began in October 2005 and was fully operational by March 2006. The specific improvements implemented for M1 J28 included:
 - ◆ Increasing the number of entry lanes on the A38 West approach to the roundabout from two to three, adjusting lane destination markings to suit the new layout;
 - ◆ Providing a segregated left turn lane from the A38 East to the M1 South; and
 - ◆ Providing high friction surfacing on both of the A38 approaches to the roundabout.

The scheme also saw the installation of MOVA at the existing signalised junction and aimed to improve pedestrian access through and around the junction. This included new footpaths which ensure pedestrians cross in advance of the signals. These elements were not specified in the PAR, but information has since been provided by the Managing Agent and is shown below in Figure 1.3

Figure 1.3 - Scheme Drawing



Source: AMScott

SCHEME CATEGORISATION AND OBJECTIVES

- 1.7 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.
- 1.8 As detailed in the original PAR document, the primary purpose of the project was to reduce the peak time congestion on the two approaches of the A38, hence reducing average delay times. Therefore the scheme has been categorised as an **economy scheme** with some supplementary safety objectives.

POPE METHODOLOGY OVERVIEW

- 1.9 This report initially presents a comparison of the predicted and outturn impacts of the scheme based upon the five assessment objectives above, specifically:
 - ◆ A comparison of the 'before' and 'after' traffic volumes at the junction to illustrate how overall traffic conditions have changed following scheme opening, and an evaluation of journey time savings
 - ◆ An outline of changes in accident rates at the junction following scheme opening.
 - ◆ A comparison of predicted and outturn impacts on; the environment, accessibility and integration.
- 1.10 This is then followed by an assessment of the scheme in accordance with the POPE methodology. This methodology aims to provide a method by which forecast and outturn effects of a scheme can be evaluated on a common basis. This process ultimately derives the following:
 - ◆ The original PAR assessment (completed by AMScott in August 2005). This represents the forecast benefits of the scheme. Where necessary values are updated to 2002 discounting and price bases; and
 - ◆ An Evaluation Summary Table based on the outturn effects of the scheme using a methodology consistent with the original PAR assessment undertaken prior to scheme opening.

REPORT STRUCTURE

- 1.11 Following this introduction, the report has been divided into 5 further sections as follows:
 - ◆ **Chapter 2:** Data Collection and Stakeholder Feedback;
 - ◆ **Chapter 3:** Traffic and Economic Impacts;
 - ◆ **Chapter 4:** Safety Impacts;
 - ◆ **Chapter 5:** Environmental, Accessibility and Integration Impacts; and
 - ◆ **Chapter 6:** Summary of Findings and Recommendations.

2. Data Collection and Stakeholder Feedback

INTRODUCTION

- 2.1 This chapter sets out the data collection process used to support this scheme evaluation. More specifically this chapter:
- ◆ Lists the datasets used to undertake the scheme POPE assessment;
 - ◆ Summarises the outcomes of a site visit undertaken by Atkins in November 2007; and
 - ◆ Provides a summary of the feedback from the consultation regarding the overall effectiveness of the scheme in achieving the intended objectives.

DATASETS USED TO SUPPORT THE POPE EVALUATION

- 2.2 A number of data sets were used to inform this POPE study, these are listed as follows:

Pre-Scheme Opening Data

- ◆ Personal Injuries Accident data (5 years from 1st January 2000 to 31st December 2004)
- ◆ Highways Agency TRADS 2 Database ATC data. (One site available on A38(T) western approach, approximately 1.5 miles from the junction).
- ◆ Classified demand count for all approaches. (15 minute intervals for the classification categories Car, LGV, OGV1, OGV2 and PSV, Feb 2005, Count on Us, 07:00 – 19:00)
- ◆ Queue delay survey for all approaches (Feb 2005, Count on Us, 07:00 – 19:00). Conducted by picking sampled (black and white) vehicles and taking the delay as the difference between the times they reach the back of the queue to when they pass the stop line.
- ◆ JUICE files containing TRANSYT delay calculations.
- ◆ Turning count surveys for each arm (Paul Castle) May 2004. (07:00 – 19:00)

Post-Scheme Opening Data

- ◆ Personal Injuries Accident data (18 months following implementation April 2006 to September 2007)
- ◆ Classified Count Survey and Queue Delay Survey, conducted on 30th April 2008.
- ◆ Highways Agency TRADS 2 Database ATC data. (One site available on A38(T) western approach, approximately 1.5 miles from the junction).

SUMMARY OF SITE OBSERVATIONS

- 2.3 A site visit was conducted in November 2007 to observe post-opening traffic conditions. Key observations of relevance are summarised as follows:

Weekday Morning Peak Period:

- ◆ On the M1 off-slips (southbound and northbound) and the B6019 approaches to the roundabout, queues were observed with delays of up to 3 minutes from joining the back of the queue;
- ◆ 2 minute delays were observed on the A38 eastern approach;
- ◆ The A38 Western approach suffered delays of approximately 4 minutes and queues extended 400m back from the approach stopline. Delays were worst between 07:45 and 08:45; and
- ◆ The two overhead vehicle messaging signs on this approach were flashing 'Queue Ahead' and 'Queue Caution'.

Weekday Evening Peak Period:

- ◆ On the M1 Southbound and Northbound off-slips and the B6019 approaches to the roundabout, small queues were observed at around 17:00 although queuing was less than in the morning peak.
 - ◆ At 17:00 queues were observed on the A38 Eastern approach with vehicles queuing for less than 1 minute.
 - ◆ A38 Western approach suffered delays of up to 5 minutes, with queues peaking from 17:00 to 17:15 when queues were up to 1 mile long. The two overhead vehicle messaging signs on this approach were flashing 'Queue Ahead' and 'Queue Caution'.
- 2.4 Environmental mitigation measures, including the replanting of vegetation following the re-grading of the embankment, as described in Section 5 'Environmental, Accessibility and Integration Impacts' were observed to have been implemented on site. Figure 2.1 below shows replanting on the A38 Western Approach.

Figure 2.1 – Replanting on A38 Western Approach



STAKEHOLDER FEEDBACK

- 2.5 As part of the POPE process, feedback on the success of the scheme was invited from the Project Sponsor, the Managing Agent and Derbyshire County Council. The following feedback has been received.

Project Sponsor Feedback

- 2.6 The Highways Agency responded to the consultation request and noted that a majority of the scheme benefits appear to have materialised from the dedicated westbound on-slip to the M1 and the installation of MOVA. The representative was not aware of any weaknesses of the scheme, although it was felt that with a larger budget and additional land, it would have been beneficial to have built a standard dual lane entry slip

Managing Agent Feedback

- 2.7 The Managing Agent felt that the scheme had been successful as it has improved the efficiency of the Junction and has reduced congestion at peak times. The MAC noted that the design and build of the scheme was scaled down after the main developer withdrew funding.

Feedback from Derbyshire County Council

- 2.8 No response was provided by Derbyshire County Council.

SECTION SUMMARY

- ◆ A site visit undertaken in November 2007 revealed that the scheme was implemented in accordance with the PAR, and that environmental mitigation measures had also been implemented as in the PAR.
- ◆ Post opening site-visits showed that queues were still developing at the junction even following scheme opening.
- ◆ During the morning peak queues of vehicles were experiencing delays of up to 2 minutes on the A38 East and delays of approximately 4 minutes on the A38 West.
- ◆ Queues were shorter on the A38 East in the PM peak with delays of approximately 1 minute.
- ◆ Queues of extended back to a mile beyond the junction the A38 West during the PM Peak hour this is close to the queue lengths of 2 kilometres observed prior to the junction improvements.
- ◆ Consultation with a representative from the managing agent believed that the scheme had been successful in reducing congestion at the junction at peak times.

3. Traffic and Economic Impacts

INTRODUCTION

- 3.1 The primary objective of the M1 Junction 28 improvements was to improve economic efficiency at the junction by reducing peak time queuing delays on the A38 approaches. This chapter sets out the evaluation of the economic impacts derived from the scheme. Specifically this chapter will:
- ◆ Provide an appreciation of recent changes in traffic volume at the junction;
 - ◆ Provide an analysis of the outturn costs and compare them with those predicted in the original PAR assessment; and
 - ◆ Use post-opening journey time surveys to provide an outturn re-forecast of the economic benefits of the scheme.

TRAFFIC VOLUME CHANGES

- 3.2 A key aspect of scheme evaluation is to understand the extent to which traffic volumes have changed following the scheme's implementation. Such an analysis serves two main purposes:
- ◆ To ascertain whether any additional traffic has been attracted to the junction as a result of the scheme; and
 - ◆ To ensure that the benefits for additional/new users of the junction are considered in the estimation of outturn economic benefits.

Average Annual Daily Traffic (AADT)

- 3.3 Although there are a number of TRADS sites close to the junction, data was only available for the A38 (T) Western approach. The site is approximately 1.5 miles from the junction and although there is a minor side road between the site and the junction it is considered that the majority of the traffic is bound for the M1 Junction 28.
- 3.4 Table 3.1 illustrates the changes in 24 hour AADT on the Western approach for traffic entering and exiting the junction. A comparison with national road traffic forecast (NRTF) growth rates is also provided.

Table 3.1 – ATC data for A38(T) (Annual Average Daily Traffic)

Year	A38(T) Southbound			A38(T) Northbound		
	AADT	Index	NRTF (Central)	AADT	Index	NRTF (Central)
2002	22259	1.000	1.000	22349	1.000	1.000
2003	23108	1.038	1.017	22884	1.024	1.017
2004	22376	1.005	1.034	20950	0.937	1.034
2005	22307	1.002	1.052	21818	0.976	1.052
2006	22748	1.022	1.069	21782	0.975	1.069
2007	24429	1.098	1.086	24172	1.082	1.086

3.5 Key points from AADT data for the A38 Western Approach are:

- ◆ AADT growth at the site has increased in line with national growth trends between 2002 and 2007 however, as can be seen in Table 3.1 the annual growth varies;
- ◆ Flows fell in both directions during 2004, although it should be noted that the TRADS database shows that road works were in place for much of 2004 on this section of the A38;
- ◆ AADT flows in 2004 and 2005 were also below 2003 levels, there were periods in both years when the construction of the scheme improvements reduced flows through the junction.
- ◆ In the first full year following the scheme opening, flows have increased by 5.7% when compared to 2003 flows. NRTF growth over the same period was 6.8%.
- ◆ For months not affected by roadwork’s or scheme construction ADT levels were fairly constant between 2003 and 2005. Following the scheme construction traffic increased by approximately 3% in 2006 and again by 5% in 2007, suggesting that the increase in traffic is due to the junction improvements.

Peak Flows

- 3.6 To look in more detail at the impact of the scheme on the junction, the ATC data for the A38(T) Western Approach was used to look at the hourly flows during the peak period before and after the scheme implementation. Comparisons have been made between the average weekday flows for June 2005 and June 2007.
- 3.7 Figure 3.1 shows that during this period flows approaching the junction from the A38(T) West had increased by approximately 7% during the AM Peak the Inter-Peak and the PM Peak. This trend is marginally less than the observed AADT growth over the same period set out in Table 3.1. In the off-peak periods, flows were generally lower following the scheme opening.
- 3.8 Figure 3.2 shows that the largest increases to traffic flow exiting the junction on the A38 West following the scheme implementation occurred between 06:00 and 09:00 with increases of 11.1% on June 2005 traffic levels. Traffic levels increased in all

peak and inter-peak hours with flows increasing by approximately 7% between June 2005 and June 2007.

Figure 3.1 – Junction Entry Flows from A38 (June 2005 and June 2007)

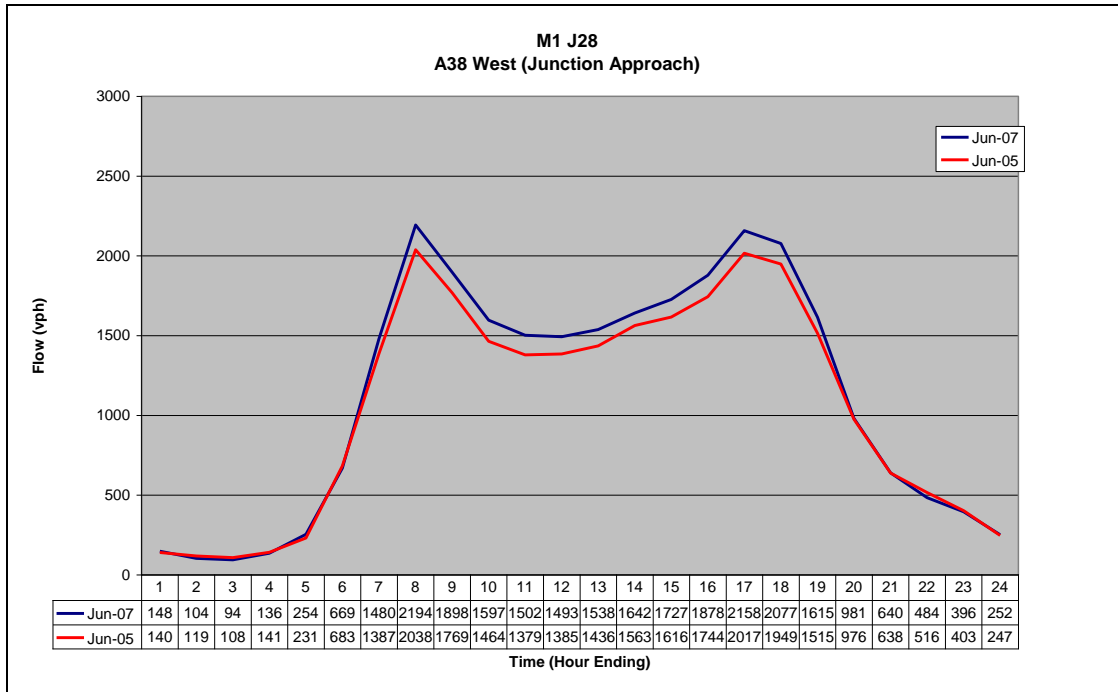
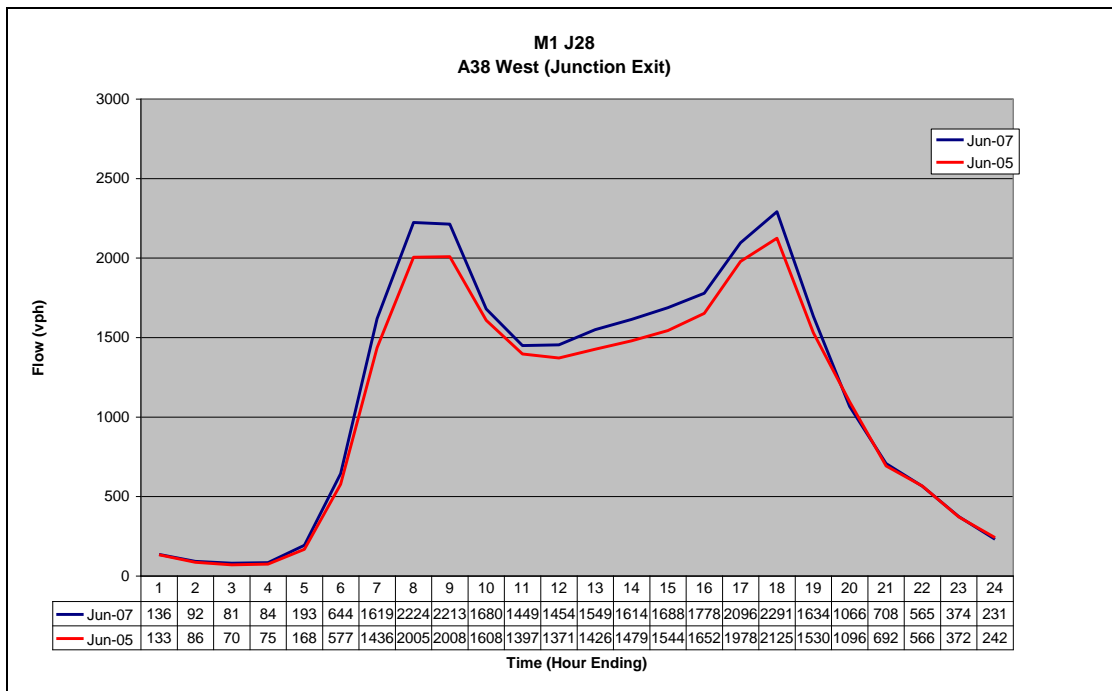


Figure 3.2 – Junction Exit Flows on to A38 (June 2005 and June 2007)



MANUAL CLASSIFIED COUNT DATA

- 3.9 In addition to the ATC data available on the A38W, two classified passing counts have been undertaken at the Junction. Counts were undertaken in February 2005, as part of the original PAR assessment, and in April 2008 as part of the POPE evaluation. Comparable surveys are available for the AM Peak (07:00 – 10:00) and the PM Peak (16:00 – 17:00).
- 3.10 Table 3.2 below displays the AM Peak (07:00 – 10:00) average hourly flows both before and after the scheme opened. Flows are shown for all junction approach arms. Table 3.3 shows equivalent data for the PM peak period (16:00 – 18:00).

Table 3.2 – AM Peak Hour Traffic Flows

Arm	Before (Feb 2005)	After (April 2008)	% Difference
M1 J28 Southbound Off-slip	1042	1337	28.3%
A38 Westbound	1469	1620	10.3%
M1 J28 Northbound Off-slip	914	1002	9.6%
A38 Northbound	1666	1766	6.0%
Mansfield Road Eastbound	613	505	-17.6%
Total	5703	6230	9.2%

Table 3.3 – PM Peak Traffic Flows

Arm	Before data (Feb 2005)	After data (April 2008)	% Difference
M1 J28 Southbound Offslip	1036	1262	21.8%
A38 Westbound	1378	1643	19.3%
M1 J28 Northbound Offslip	903	946	4.8%
A38 Northbound	1560	2032	30.3%
Mansfield Road Eastbound	543	470	-13.3%
Total	5418	6354	17.3%

- 3.11 The key points emerging from the traffic surveys with relation to changes in traffic volumes following the scheme opening are:
- ◆ Overall between the surveys AM peak flows increased by 9.2%, and PM Peak flows increased by 17.3% through the junction. This accounts for an additional 527 vehicles for the average AM Peak hour and an additional 936 vehicles for the average PM Peak hour.
 - ◆ Traffic approaching the junction from Mansfield Road has reduced in both time periods following the scheme implementation with 17.6% less traffic in the AM Peak and 13.3% less traffic in the PM Peak;

- ◆ A screenline across the A38W and Mansfield Road for the AM peak suggests that there has been some transfer of eastbound traffic from the latter to the former;
- ◆ In the PM peak, traffic from the A38 westbound has also increased by almost 20% (double the observed increase in the AM peak), this could partially be attributable to develop on the eastside of the junction;
- ◆ Traffic approaching the junction had increased from all other roads in both time periods;
- ◆ The largest increase in the AM Peak came from the M1 Southbound Offslip with traffic volumes increasing by 28.3%, accounting for an additional 300 vehicles per hour.
- ◆ In the AM peak, traffic entering the junction from the A38 East rose by 10.3% and by 6.0% from the A38 West.
- ◆ In the PM peak period, the largest increase came from the A38 approaches. An additional 427 vehicles per hour in the northbound direction gave an increase of 30.3% on the 2005 counts. Traffic entering from the east rose by 266 vehicles per hour, an increase of 19.3%.
- ◆ As in the AM peak there was a large increase in the number of vehicles entering the junction from the M1 Southbound Offslip, with flows increasing by 21.8% between 2005 and 2008.
- ◆ Analysis of HGV flows shows an increase of 5.4% in the average AM-Peak hour and almost constant levels in the average PM-Peak hour.

NEARBY DEVELOPMENTS

- 3.12 With relation to changes in traffic volumes it should be noted that the first phase of a new office development 'The Village' was completed in June 2005 with 80% of this development being let by February 2006. This provided 35,000 sq.ft. of office space, with 4 car parking spaces per 1000 sq. ft. (140 spaces). The development is located 500 yards from M1 Junction 28 along the A38 East. This development could have contributed to increased flow through the junction.
- 3.13 In addition AMScott also implemented three junction improvement schemes on the A38 Junctions at Derby during 2004 and 2005. These were located at Kingsway, Markeaton and Little Eaton.

POPE ASSESSMENT

The PAR Appraisal

- 3.14 The original PAR assessment for M1 junction 28 was undertaken by AMScott. The scheme intended to provide interim capacity improvements on the A38 approaches to the roundabout in advance of the M1 motorway-widening scheduled to start in 2010. In the longer term it was proposed that a third bridge would be added to the junction for the East/West traffic, crossing the motorway between the present two bridges as part of the M1 widening. In line with these proposals, an assessment period of 3 years was selected in the initial PAR.

- 3.15 Queue delay surveys were used to obtain do-minimum delays in the opening year, following this TRANSYT modelling was used to project future year's monetary impacts. The following assumptions were made as part of the PAR appraisal:
- ◆ AM and PM Peak periods were modelled in TRANSYT for the years 2006 and 2015 based on peak hour turning counts from 12th May 2004 and NRTF growth forecasts, interpolation was used for the years between 2006 and 2015.
 - ◆ Inter-peak, off-peak and weekend delays were assumed to be equal to 2006 delays for the DS Scenario (zero growth) and increased in the DM Scenario;
 - ◆ Journey time benefits were calculated for 3 year assessment period in the AM Peak (07:00-10:00), PM peak (16:00-19:00), Inter-Peak (10:00-16:00), Off-peak and Weekend periods;
 - ◆ Traffic was assumed to grow in accordance to the NRTF. (15% growth between 2006 and 2015);
 - ◆ Construction delays were modelled in TRANSYT with the A38 approach arms reduced to a single lane; and
- 3.16 The outcome of the original PAR appraisal is summarised in Table 3.4. All values are discounted to 2002 and given in 2002 prices.

Table 3.4 –PAR predicted economic benefits

Vehicle Hours Saved in Opening Year	Central Growth
Peak Hours Benefit (Total Opening Year Hours)	263,681
Opening Year Monetary Benefit	£2.776m
Scheme Life Monetary Benefit (3 years)	£8.793m (Excluding £5.786m Construction Disbenefit)

- 3.17 In summary the PAR predicted opening year benefits of £2.776m. This translated into journey time savings of £8.793m over the assessment period, although this was offset with a forecast £5.786m dis-benefit during the construction period. Consequently the scheme was forecast to have net economy benefit of £3.007m. Approximately 60% of the economy benefits were expected to be derived from the AM-Peak.

PAR Predicted Corrected Appraisal

- 3.18 In order to ensure that a like-for-like comparison of the predicted and outturn economic impact can be made, a PAR 'predicted corrected' appraisal of the scheme economic benefits has been undertaken. More specifically the purpose of the PAR predicted corrected appraisal is to:
- ◆ Ensure that the predicted and outturn scheme impacts can be compared on a like-for-like basis; and
 - ◆ Account for any obvious errors in the original PAR calculations.
- 3.19 The predicted-corrected assessment for this scheme has been conducted for the following reasons:

- ◆ Of the M1 widening proposals between Junctions 21 and 30, only Phase 1 between junctions 25 and 28 are proceeding at the present time. The strategy for delivering improvements on the M1 from Junctions 21 to 30 is currently under review, to allow the viability of an alternative hard shoulder running scheme to be assessed. In light of this, and as the original widening schemes were programmed to start in February 2012, an extended 5 year appraisal has been used;
- ◆ To include benefits for the AM and PM peak periods only as TRANSYT models were not available for the other periods. Furthermore it is assumed that the impact in the off peak is neutral as there were no observed delays prior or subsequent to opening during this time period;
- ◆ To remove the element of construction delay from the assessment as no means were available to assess the actual outturn impacts of the construction periods as part of the scheme evaluation. It is also assumed that an element of rerouting will have occurred during the scheme construction. The effects of this have not been considered in this evaluation as there is insufficient post opening data to make such an assessment.

3.20 The following assumptions were made in forecasting the predicted corrected PAR appraisal:

- ◆ The appraisal period is extended to 5-years (to provide an actual measure of the schemes out-turn impacts).
- ◆ Benefits are derived for the AM and PM peak periods only.
- ◆ DM Delays are derived from pre-scheme implementation delay surveys.
- ◆ DS Delays are taken from the opening year TRANSYT results files
- ◆ Calculations were made in accordance with the 'worksheet for economy – journey times' from PAR 3.3. Guidance Notes.

3.21 Table 3.5 below summarises the key results of the predicted-corrected economic assessment.

Table 3.5 – Summary of predicted-corrected economic benefits

Journey Time Benefits/Dis-benefits			Central Growth
Vehicle Hours Saved in Opening Year		(a)	180697
Value of Time (VOT) per average vehicle in Opening Year (p/hour)		(b)	1194
VOT Savings in Opening Year	(a) x (b) = (c)	(c)	£2.158m
Capitalisation Factor			5.1
VOT Benefits	(c) x Capitalisation Factor	(d)	£11.003m
Opening Year discount factor		(e)	0.87
VOT Savings in Opening Year discounted to 2002	(c) x (e)	(f)	£1.877m

Five Year VOT Benefits discounted to 2002	(d) x (e)	(g)	£9.573m
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3.22 Key points to note from the PAR predicted corrected appraisal with respect to the original PAR appraisal is:

- ◆ First year monetary benefits of £1.877m are reduced from the original assessment of £2.776m due to the omission of any potential benefits emerging from the inter-peak, off-peak and weekend periods from the predicted-corrected appraisal.
- ◆ The predicted corrected scheme-life monetary benefit of £9.573m is much larger than the original value of £3.007m due to the omission of construction delays and the increased appraisal period from 3-years to 5-years.

Outturn Appraisal of Economic Benefits

3.23 Queue delay surveys were available pre-scheme. Delays were recorded from when a vehicle reached the back of the queue to when it crossed the stop line. These were used in the original PAR to calculate the DM-Delay. In order to establish a comparable measure for outturn delays, surveys were conducted using the same methodology.

3.24 Journey time benefits were then calculated using the Full PAR – Worksheet for Economy: Transport Economic Efficiency – Journey Time Benefits/Dis-benefits. The following assumptions were made:

- ◆ The appraisal period is over 5-years;
- ◆ Benefits are derived for the AM and PM peak periods only;
- ◆ DM Delays are derived from pre-scheme implementation delay surveys;
- ◆ DS Delays are derived from post-scheme implementation delay surveys;
- ◆ The ‘rule of half’ has been applied to new traffic on approaches where traffic had increased by more than 10%. Full benefits have been assigned to existing traffic and half benefits have been assigned to additional traffic.

3.25 Table 3.6 displays the journey time benefits of the scheme over the 5-year assessment period.

Table 3.6 – Summary of POPE Economic Benefits

Journey Time Benefits/Dis-benefits			Central Growth
Vehicle Hours Saved in Opening Year		(a)	75,520
Value of Time (VOT) per average vehicle in Opening Year (p/hour)		(b)	1194
VOT Savings in Opening Year	(a) x (b) = (c)	(c)	£0.902m
Capitalisation Factor			5.1
VOT Benefits	(c) x Capitalisation Factor	(d)	£4.599
Opening Year discount factor		(e)	0.87
VOT Savings in Opening Year discounted to 2002	(c) x (e)	(f)	£0.784m
VOT Benefits discounted to 2002	(d) x (e)	(g)	£4.001m

3.26 Key points to note from the outturn economic impacts when compared to the predicted corrected PAR appraisal are:

- ◆ Whilst the scheme has delivered an outturn delay saving of 75,520 hours in the opening year, it has only been approximately 42% of the predicted corrected delay saving;
- ◆ Opening year and scheme-life economic benefits are equivalent to £0.784m and £4.001m respectively; predicted-corrected benefits were £1.877m and £9.573m;

3.27 A more in-depth analysis the delay surveys with relation to each arm reveals that the project has had some success in achieving its primary aim of reducing peak-time congestion on the two approaches of the A38. With relation to journey times on individual approach arms the delay surveys reveal the following:

- ◆ Delays from the A38 East reduced from an average of 2.7minutes per vehicle to an average of 1.1 minutes-per-vehicle in the AM peak, this was the largest journey time saving per vehicle on any arm as a result of the scheme.
- ◆ Small savings were also realised in the PM peak on the A38 East, although initial delays were only 0.4 minutes per vehicle during this period.
- ◆ The A38 West had the largest delays on any arm both before and after the schemes implementation. Despite average savings of 0.8 minutes-per-vehicle in the AM peak and 0.5 minutes-per-vehicle in the PM Peak delays still averaged 4.3 minutes and 2.5 minutes-per-vehicle respectively following the junction improvements.
- ◆ The largest overall savings from the scheme came from improvements on the A38 East with 34700 vehicle hours saved in the opening year from this arm. Savings from the A38 West totalled 24700 vehicle hours during the same period.

- ◆ Overall journey time improvements were observed on each approach arm with the exception of the Mansfield Road Eastbound. This arm saw an increase in delays of 3 minutes-per-vehicle in the AM Peak and 1 minute-per-vehicle in the PM Peak. Mansfield Road was also the only approach arm to see a reduction in traffic following the scheme implementation.

INTERPRETING THE POPE CONCLUSIONS

- 3.28 The POPE evaluation has illustrated that the improvements at M1 J28 have produced some healthy economic benefits over the 5-year appraisal period. However, the outturn benefits are only just over third of those predicted in the PAR. With regards to the outturn assessment of the scheme, the following points should be taken into consideration:
- 3.29 The appraisal is based on delay surveys from one weekday before and after the scheme implementation. Therefore results should only be indicative of daily conditions experienced at the junction and will not be as comprehensive as if large quantities of data were available.
- 3.30 Consultation with the Managing Agent following the outturn evaluation revealed that they felt the journey time surveys underplayed the true delay savings, particularly on the A38 West. Comments from a member of the signals design team and a frequent user of the junction revealed that:
- ◆ Pre-Scheme the conditions at the junction were unpredictable, often even outside peak hours. The scheme is considered to largely have overcome this perception.
 - ◆ Post scheme AM queues are typically experienced between 07:30 and 09:00 hours. Pre-Scheme queues would often persist throughout the whole 07:00 to 10:00 period.
 - ◆ Post scheme PM queues are normally confined to the worst hour of the PM Peak, whereas previously it was not uncommon to join a long queue at 15:00 or well after 18:00. The average delay saving per vehicle is considered to be greater than the surveyed 0.5 minutes.
- 3.31 A number of measurable outturn effects of the junction support anecdotal feedback that conditions on the A38 West have improved significantly following the schemes implementation:
- ◆ Accidents on the A38 West approach arm have decreased from an average of 5.0 per annum to an average of 1.3 per annum. Suggesting that there have been significant improvements to traffic flow on the arm.
 - ◆ Following the scheme opening traffic flows on the A38 West increased by 6% in the AM Peak and by 30% in the PM Peak. Flows on other approach arms also increased dramatically. Additional traffic at the junction is an indicator of better operational efficiency and additional traffic being attracted to the junction.
- 3.32 With consideration to the above it may be considered that the outturn assessment based on journey time surveys can be considered to represent a conservative assessment of journey time savings.

- 3.33 The original PAR assessment did not consider the possibility of induced or redistributed traffic (although it is appreciated that this is difficult to predict). It is possible that the inclusion of extra traffic in the post opening analysis has contributed towards the erosion of some of the benefits of the scheme.
- 3.34 It is recommended that, where data is available that future scheme appraisal should consider the possibility of induced and development traffic.

SCHEME COSTS

- 3.35 Predicted and outturn costs for the scheme are shown below in Table 3.7, outturn costs were £3.571m compared to forecast costs of £3.239m, an increase of 10.2%. With relation to the impact upon public accounts a developer contribution of £0.450m is included in both the predicted and outturn assessment.

Table 3.7 – Comparison of predicted and outturn scheme costs

Type of cost (all at 2002 pricing)	Predicted	Outturn
Work Costs	£2.354m	£3.048m
Land Costs	£0.00	£0.00
Site preparation and Supervision costs	£0.047m	£0.233m
Other Costs	£0.00	£0.00
Risk Allowance	£0.488m	£0.00
Optimism Bias Adjustment	£0.087m	£0.00
Total Project Cost (2002 Prices)	£2.977m	£3.282m
Total PVC (2002 market prices, discounted to 2002)	£3.239m	£3.571m
Developer Contributions	£-0.450m	£-0.450m
NET IMPACT PVC	£2.789m	£3.121m

SECTION SUMMARY

- ◆ The AADT on the A38 West (the only site with data available) remained close to 2002 levels until 2006, although this may be in part to traffic flows not recovering from long-term roadwork's in 2004. Flows increased dramatically in the first year following the scheme implementation (9.5% on the junction approach and 10.8% on the junction exit, NRTF forecasts of for the same period were 3.2%)
- ◆ Manual classified traffic counts from 2005 and 2008 show that in this period peak hour usage of the junction increased by 9.2% in the AM Peak and by 17.3% in the PM Peak. Traffic flows increased on all roads except the B6019 during peak-periods. Large increases were seen on both A38 approaches and on the M1 Southbound off-slip
- ◆ An analysis of before and after HGV flows revealed that despite large changes in the overall volume of traffic HGV flows only increased by 3.1%.
- ◆ Outturn opening year and scheme life economic benefits are equivalent to £0.784m and £4.001m respectively. This is only equivalent to 42% of the predicted scheme life benefits of £9.573m
- ◆ The scheme appears to have played an effective role in absorbing the effects of additional traffic at the junction (possibly generated by local development);
- ◆ There appears to have been some observed transfer of traffic from Mansfield Road on to the A38W – this could be a result of worsening delays on the former approach to the junction;
- ◆ The outturn cost for the scheme was 10% more than predicted due to overrunning on works costs and site supervision.

4. Safety Impacts

INTRODUCTION

- 4.1 This section examines the changes in 'before' and 'after' accident data to quantify the scheme safety benefit. The objectives of this section are to:
- ◆ Provide an appreciation of the changes in the number, distribution and causation of accidents emerging as a result of this scheme; and
 - ◆ Ascertain the overall monetary safety benefit derived from improvements at the M1 junction 28.
- 4.2 The scheme took approximately 6 months to construct (October 2005 – March 2006). Accidents occurring during this period will be excluded from this accident analysis. The outturn evaluation is based on the 18 months (April 2006 – September 2007) of post opening accident data and hence is only intended to provide an indication of out-turn safety impacts.

PAR ASSESSMENT

- 4.3 The PAR used accident data for the period 1st January 2000 to 31 December 2004. Key pre-scheme accident trends that can be identified from the PAR include:
- ◆ Accident severity was 16%;and
 - ◆ There were an average of 5 accidents per year before the scheme
- 4.4 The PAR predicted that the scheme would result in an opening year accident saving of 0.6 PIA's (a 12% accident saving). This is equivalent to a monetised opening year benefit of £0.047m (2002 prices, discounted to 2002) equivalent to £0.121m over 3 years.
- 4.5 It was stated in the PAR that 'The accidents are mainly front-to-rear collisions resulting from long queues and inadequate stopping sight distance.' An objective of the scheme was to facilitate a 'reduction in accident rates due to improvements in roundabout capacity, signage and stopping sight distance'.

PAR PREDICTED CORRECTED ASSESSMENT

- 4.6 The PAR appraisal only included accidents occurring on the two A38 approaches to the roundabout and on the circulatory carriageway, with omissions to the other arms of the roundabout. It is considered that, although improvements have only been made to these approaches, the scheme may impact upon the rest of the junction. Therefore in the POPE assessment considers accidents on all five arms and on the circulatory carriageway. Accidents are considered to a distance of 700m from the stop line on the A38 as in the PAR assessment and for the same distance along the B6019. Accidents on the M1 are considered for the off-slips only.
- 4.7 To enable a like-for-like comparison of predicted and outturn accident impacts the PAR prediction was re-calculated to:

- ◆ Include an analysis of all accidents on all approaches to the junction occurring prior to scheme opening;
- ◆ Exclude any accidents not of direct relevance to the scheme (for example tyre blow outs, Police pursuits);
- ◆ To update the period of pre-scheme accident analysis (October 2002-September 2005); and
- ◆ To account for the extended appraisal period of 5-years.

4.8 Table 4.1 below provides a summary of the pre-opening predicted corrected accident data.

Table 4.1 - Number of Personal Injury Accidents, Predicted Corrected Analysis

Year	Number of Personal Injury Accidents (NOT casualties)			
	Slight	Serious	Fatal	Total
	All 5 approaches			
Oct 2002 – Sept 2003	14	1	0	15
Oct 2003 – Sept 2004	16	2	1	19
Oct 2004 – Sept 2005	19	1	0	20
TOTAL	49	4	1	54
Severity Index (Fatal + Serious /All Accidents as percentage)				10.20%
Provide observed accident rate, and state units				18.0 PIA/year

- 4.9 Key accident trends identified as part of the predicted corrected appraisal include:
- ◆ In the 3 year pre-scheme period (October 2002 – September 2005) there were a total of 54 accidents (an average of 18.0 per year); and
 - ◆ A pre-scheme KSI rate of 10.2%.
- 4.10 Upon re-calculating the PAR predicted safety benefit using the updated accident data set, the first year accident saving is predicted to be 1.0. The revised opening year safety benefits therefore equates to £0.078m, giving benefits of £0.356m over the 5-year appraisal period.

OUTTURN IMPACTS

- 4.11 Only 18 months (April 2006 – September 2007) of post opening data were available at the time of assessment, which is used to provide a preliminary indication of the scheme’s safety impact. During this period there were a total of 23 accidents at the junction, an average of 15.3 per year.
- 4.12 Table 4.2 summarises the outturn assessment of the scheme safety impacts.

Table 4.2 - Number of Personal Injury Accidents, POPE Analysis

Year	Number of Personal Injury Accidents (NOT casualties)			
	Slight	Serious	Fatal	Total
	All 5 approaches			
April 2006 – Sept 2006	6	0	0	6
Oct 2006 – Sept 2007	15	2	0	17
TOTAL	21	2	0	23
Severity Index (Fatal + Serious /All Accidents as percentage)				9.52%
Provide observed accident rate, and state units				15.3 PIA/year

4.13 Key trends emerging from the post-opening accident analysis include:

- ◆ The annual accident rate has fallen from an average of 18.0 to 15.3 representing a first year accident saving of 2.7.
- ◆ The accident severity has fallen from 10.2% to 9.5% with only two serious accidents in the 18 months following the scheme implementation.

4.14 A summary of the accident locations (by arm) in the periods before and after scheme opening is shown below in Table 4.3.

Table 4.3 – Accident Locations

Accident Location	Corrected Before Accidents		After Accidents	
	Appraisal Period	Per Annum	Appraisal Period	Per Annum
A38 Eastern	7	2.3	2	1.3
A38 Western	19	6.3	2	1.3
B6019	2	0.7	1	0.7
M1 NB	6	2.0	4	2.7
M1 SB	6	2.0	3	2.0
Roundabout	14	4.7	11	7.3
TOTAL	54.0	18.0	23.0	15.3

4.15 Key points to note from the trends emerging from the pre and post-scheme accident locations are:

- ◆ The three approach arms which are not directly part of the scheme appear to have minimal changes to accident rates following the scheme implementation. Accident rates on the B6019 and the M1 Southbound remain unchanged. The

accident rate on the M1 NB has increased from 2.0 accidents per year to 2.7 accidents per year.

- ◆ The scheme appears to have had a small beneficial impact upon the number of accidents occurring on the A38 East. There were averages of 2.3 accidents per year before the scheme, and 1.3 accidents per year following the schemes opening.
- ◆ Before the scheme implementation there was an average of 6.3 accidents per annum on the A38 West which accounted for nearly 35% of the accidents at the junction. In the 18 months following the scheme implementation there have been an average of 1.3 accidents per year suggesting the scheme has successfully reduced the number of accidents on this approach to the junction.
- ◆ In the three years before the schemes implementation an average of 4.7 accidents occurred each year on the circulatory carriageway. This had risen to 7.3 following the scheme opening. An increased number of accidents on the roundabout following the scheme opening is probably due to an increased flow of traffic through the junction following the schemes implementation.

Monetised Accident Savings-

4.16 Table 4.4 provides a summary of the predicted, predicted corrected and outturn safety impacts.

Table 4.4- Predicted and outturn monetary safety benefits

	PAR Predicted	PAR Predicted-Corrected	Outturn
Evaluation Period	3-years	5-years	5-years
Number of Personal Injury Accidents saved in opening year	0.6	1.0	2.7
Number of accidents saved in assessment period	1.8	4.9	13.2
Average cost of accident in the opening year (at 2002 market prices)	£0.090m	£0.090m	£0.090m
Annual accident benefit in opening year (2002 prices)	£0.054m	£0.090m	£0.243m
Annual accident benefit in opening year (discounted to 2002)	£0.047m	£0.078m	£0.211m
Accident benefits over assessment period, (discounted to 2002)	£0.121m	£0.356m	£0.961m

*£0.124 scheme life benefits - -£0.003m construction dis-benefits

4.17 The PAR predicted that 0.6 accidents would be saved in the opening year. However this figure was corrected to 1.0 based upon updated accident data. The outturn safety impact was a saving of 2.7 accidents in the opening year, almost three times

that predicted. This is equivalent to £0.211m for first year, and £0.961m, for the five year appraisal period following the scheme opening.

- 4.18 On the basis of the post-opening data it can be concluded that there is evidence of accident benefit. However, to say this conclusively it is necessary to have a minimum of three years post-opening data. The positive impact is an indication only.

SECTION SUMMARY

- ◆ The original PAR assessment did not assess accident benefits across the whole junction, only the A38 approaches were considered, a predicted corrected PAR assessment and the outturn assessment have included all approaches to the junction.
- ◆ The annual number of accidents has fallen from 18.0 to 15.3 and hence the scheme has resulted in a first year accident saving of 2.7.
- ◆ Accident savings of 2.7 accidents per year are almost three times the predicted corrected saving of 1.0.
- ◆ In monetary terms the opening year accident benefit is equivalent to £0.211, compared to a predicted corrected figure of £0.078m.
- ◆ The accident severity index has fallen from 10.2% to 9.5%.
- ◆ Outturn Accident savings are based on 18 months of post-opening data, three years data are required to make a conclusive scheme evaluation.

5. Environment, Accessibility and Integration Impacts

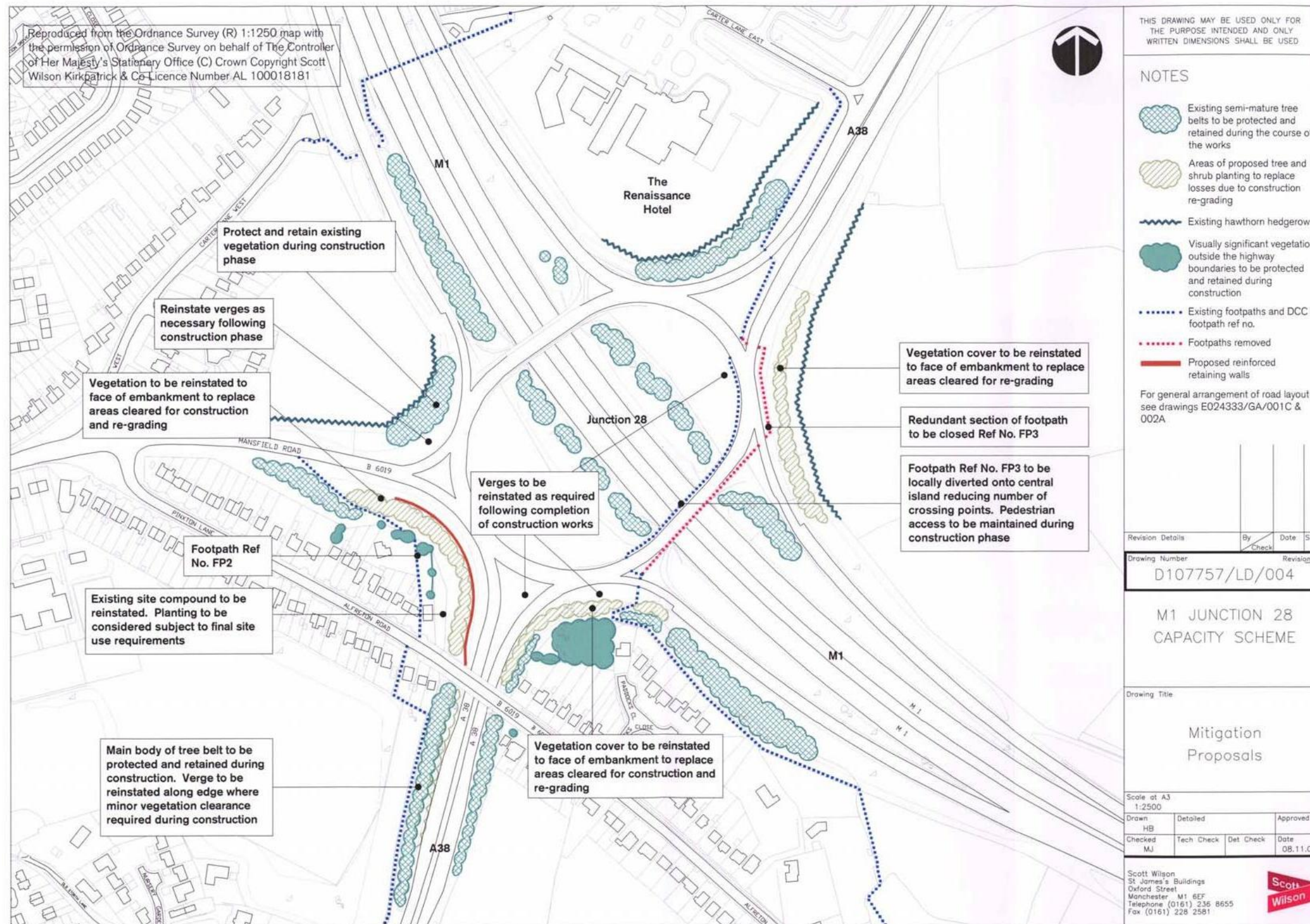
Introduction

- 5.1 This section reviews the impact of the safety improvement scheme on the local environment, accessibility and integration. With the exception of Landscape, Journey Ambiance and Biodiversity the PAR predicted neutral impacts on all other sub-objectives.

ENVIRONMENTAL IMPACTS

- 5.2 The following data was collected to support calculations and assumptions in the PAR and POPE Analysis.
- ◆ **PAR** – Preliminary Environmental Assessment, AMScott, May 2004; Phase 1 Habitat Survey, AMScott, May 2004; Landscape and Visual Impact Assessment, Scott Wilson Kirkpatrick, November 2004; and Record of Determination undertaken in accordance with the requirements of EC Directive 97/11, 30 Nov 2004.
 - ◆ **POPE Analysis** – Site visit to determine environmental, accessibility and integration impacts (November 2007)
- 5.3 Following the environmental assessment it was considered that the scheme would not have a significant adverse impact on the environment in the long term, provided that the recommended mitigation measures were adapted. These included planting on site and reguarding of cut faces to improve the screening function once planting was re-established. Mitigation proposals are shown below in Figure 5.1.
- 5.4 A site visit on in November 2007 observed that mitigation measures had been implemented on site.

Figure 5.1 – Mitigation Proposals



Source: M1 Junction 28 Capacity Scheme Landscape & Visual Impact Assessment

Table 5.1 contains forecast and outturn assessments for each of the environmental sub-objectives.

Table 5.1 – Summary of predicted and outturn environmental impacts

Environmental Sub-Objective	PAR Predicted Impact	Outturn Impact	Qualitative/Quantitative Evidence for Outturn Assessment
Noise	Neutral	Neutral	Traffic flows have increased by less than 25% (13.1% Peak Periods) and HGV flows have increased by less than 20% (3.1% Peak Periods).
Air Quality	Neutral	Slightly-Adverse	There are a number of properties within 50m of the edge of the carriageway and AADT has risen by more than 700 vehicles. However the majority of properties within 50m are located on the B6019 where traffic flows have reduced.
Greenhouse Gases	Neutral	Neutral	Although manual classified traffic counts reveal an increase in traffic flow of 13.1% in peak periods, the change in vehicle kilometres travelled on roads affected by the project is considered to be less than 10% given that a relatively small proportion of this increase will be from generated trips.
Landscape	Initially Adverse (Mitigated within 15 Years)	Neutral	PAR stated initial impact would be adverse but would be mitigated within 15 years. Mitigation measures have been observed on site.
Townscape	Neutral	Neutral	The scheme is not located in a built-up area.
Heritage of Resources	Neutral	Neutral	No impact or archaeological or noteworthy built heritage sites.
Biodiversity	Initially Adverse (Mitigated within 15 Years)	Neutral	This project was not within a 'sensitive site'. Mitigation measures implemented as per the PAR assessment.
Water Environment	Neutral	Neutral	Negligible changes to the volume and quality of water discharged.
Physical Fitness	Neutral	Slightly Beneficial	No data relating to pedestrian and cycle use before the scheme. Improvements made to footpaths as part of the scheme to make them safer, should promote their use.
Journey Ambience	Large Beneficial	Large Beneficial	Improvements to journey times and reduced accidents as a result of junction improvements.

ACCESSIBILITY IMPACTS

Option Values

PAR

- 5.5 The PAR forecast that the scheme would have no impact upon option values

Outturn Assessment

- 5.6 The scheme provides no new public transport services. The outturn assessment was in agreement that there would be **no impact** on option values.

Severance

PAR

- 5.7 The PAR predicted that the scheme would have no impact on severance.

Outturn Assessment

- 5.8 The scheme has resulted in improvements to the footpaths at the junction has improved the quality and standards of routes for pedestrians and cyclists. The outturn assessment is that the scheme has had a **beneficial** impact on severance. No data was collected to measure whether the enhancements had resulted in increased usage of the junction by cyclists and pedestrians.

Access to the Transport System

PAR

- 5.9 The PAR predicted that the scheme would have no impact on access to the transport system.

Outturn Assessment

- 5.10 The scheme had no impact upon the public transport system, therefore the scheme has had **no impact** upon access to the transport system, no public transport routes pass through the junction.

INTEGRATION ASSESSMENT

Transport Interchange

PAR

- 5.11 The PAR stated that the scheme would have no impact on Transport Interchange.

Outturn Assessment

- 5.12 The scheme did not make any changes to interchange facilities in connection with the transport system, and there were no Park and Ride sites or rail stations in the vicinity of the junction. Therefore the outturn assessment is that the scheme had **no impact** on transport interchange.

Land-Use Policy

PAR

- 5.13 The PAR predicted that there would be no impact on Land-Use Policy.

Outturn Assessment

- 5.14 The scheme is not mentioned in either the Local Transport Plans or the Regional Transport Strategies for Nottinghamshire or Derbyshire from 2001 onwards. The scheme did not have any implications for local transport or planning policies and is considered to have had **no impact** upon land use policy.

Other Government Policies

PAR

- 5.15 The PAR predicted that there would be no impact on other government policies.

Outturn Assessment

- 5.16 The outturn assessment is in agreement that the scheme does not have any recognisable effects on other government policies.

SECTION SUMMARY

Environment

- ◆ Impacts upon the environment are generally as forecast in the PAR with the scheme resulting in no impact to; noise, greenhouse gases, landscape, townscape, heritage of historic resources, biodiversity or water environment as forecast.
- ◆ The outturn assessment was that the scheme had had a beneficial impact upon journey ambience as forecast in the PAR due to a reduced accident rate.
- ◆ The PAR predicted no impact on local air quality although the outturn assessment is slightly adverse as the AADT has increased by more than 700 vehicles at the junction.
- ◆ The PAR predicted that there would be no impact to physical fitness as a result of the scheme although there is no record regarding pedestrian and cycle use at the junction it is considered that improvements made to footpaths should promote their use bringing a beneficial impact to physical fitness.

Accessibility

- ◆ Option values and Access to Transport Systems impacts have remained neutral for predicted and outturn assessments
- ◆ The outturn assessment for severance is considered to be beneficial due to improved standard and quality of routes for pedestrians, no impact was forecast in the PAR.

Integration

- ◆ Transport Interchange, Land Use Policy and Other Government Policy impacts have all remained neutral for predicted and actual.

6. Summary and Conclusions

INTRODUCTION

- 6.1 The capacity improvement scheme at M1 Junction 28 had the primary purpose of reducing peak hour congestion in order to reduce delays and the number of injury accidents along the two A38 approaches to the roundabout.
- 6.2 The improvements included increasing the number of entry lanes on the A38(T) Western approach to the roundabout from two to three lanes and providing a free flowing segregated left turn lane from the A38 Eastern approach to the M1 Southbound exit.
- 6.3 The POPE assessment of M1 Junction 28 has utilised the data available to examine the outturn impacts of the scheme compared to those forecast in the PAR. The purpose of this section is to:
- ◆ 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 the junction.

SUMMARY OF KEY IMPACTS

- 6.4 Table 6.1 provides a summary of the monetised benefits of the improvements at M1 Junction 28 based on a comparison of a 5 year appraisal period. The AST and EST are included in Appendix A and B respectively.
- 6.5 Key points to note include:
- ◆ The total first year benefits of the scheme were £0.995m, 51% of those predicted;
 - ◆ The total benefits accrued from the scheme will cover total costs in just over 3-years(out-turn FYRR of 31.9%);
 - ◆ The outturn BCR of the scheme over 5-years is 1.59 compared to a predicted BCR of 3.56;
 - ◆ Accident savings are nearly three times the predicted levels although economic benefits are only a 42% of the forecast amount;
 - ◆ The scheme was delivered at 11.9% over the predicted corrected cost of £2.789m;.
 - ◆ An evaluation over the original 3-year appraisal period would have resulted in an outturn BCR of close to one (0.95) compared to a predicted corrected BCR of just over 2;
 - ◆ An evaluation of the standard 60 year would have delivered an outturn BCR of 20:1. In the event that additional improvements are not implemented at the junction, the scheme will continue to deliver benefits in relation to the pre-scheme conditions.

Table 6.1 – Summary Economic Evaluation

	PAR Predicted	PAR Predicted-Corrected	Outturn
PAR Version	PAR 3.3	PAR 3.3	PAR 3.3
Method of Calculation	Economy: Juice Accidents: Manual Calculation	Economy: Juice Accidents: Manual Calculation	Economy: Juice Accidents: Manual Calculation
Present Value Year	2002	2002	2002
Discount Rate	3.50%	3.50%	3.50%
Scheme Opening Year	2006	2006	2006
Evaluation Period	3 Years	5 Years	5 Years
Economy Benefits	£3.007m	£9.573m	£4.001m
Accident Benefits	£0.122m	£0.356m	£0.961m
Total Scheme Life Benefits (PVB)	£3.129m¹	£9,929m²	£4,962m²
Total Cost (PVC)	£2.789m³	£2.789m³	£3.121m³
Benefit Cost Ratio (BCR)	0.96	3.56	1.59
First Year Economy Benefits	£2.776m	£1.877m	£0.784m
First Year Accident Benefits	£0.047m	£0.078m	£0.211m
First Year Total Benefits (PVB)	£2.823m	£1.955m	£0.995m
First Year Rate of Return (FYRR)	101.2%	70.1%	31.9%

¹ Includes construction Dis benefits spread over scheme life

² Excludes construction disbenefits

³ Cost to the Highways Agency

6.6 Appendix D contains an Economic Evaluation Summary based on the original 3 year appraisal period. In summary, had the scheme life been equivalent to the forecast of 3 years then:

- ◆ The first year impacts would be unaffected and equivalent to those specified above (the FYRR would be slightly less than the average for all LNMS of 39%);
- ◆ The BCR would be reduced to 0.95, comparable to half the original prediction, but substantially less than the predicted corrected estimate (2.13);
- ◆ Overall the scheme would have performed as expected.

6.7 The main outturn economy, safety, environment, accessibility and integration impacts of the scheme are listed below:

Economy Impacts

- 6.8 Analysis of the ATC site on the A38 West revealed that there had been little traffic growth between 2002 and the scheme implementation in 2006. However, in the first full year following the improvements (2007), flows increased by an average of 10%.
- 6.9 Overall between 2005 and 2008, traffic through the junction increased by 9.2% in the AM Peak and by 17.3% in the PM Peak. Traffic flows increased in both peak periods on all roads except the B6019. Increases in traffic were also observed on both approaches of the A38 and on the M1 Southbound off-slip.
- 6.10 In contrast to the increase in flows on the A38W approach to the junction, traffic flows on the Mansfield Road have fallen by 13 to 17% suggesting that the scheme may be resulting in some re-routing effects.
- 6.11 An analysis of before and after HGV flows reveal that despite large changes in the overall volume of traffic, HGV flows only increased by 3.1% between 2005 and 2008, which is considerably less than the proportional increase in all traffic.
- 6.12 Outturn opening year and scheme life economic benefits are equivalent to £0.784m and £4.001m respectively. This is equivalent to 42% of the predicted scheme life benefits of £9.573m
- 6.13 The primary aim of the scheme, to reduce peak hour delays on the A38 approaches to the junction has seen some success. During the AM Peak delays on the A38 East were reduced by 1.7 minutes-per-vehicle in the AM Peak, while delays on the A38 West fell by 0.8 minutes-per-vehicle.
- 6.14 Outturn economic benefits may be lower than predicted due to additional traffic as a result of the scheme adding to congestion on the network and eroding some of the scheme benefits.

Safety Impacts

- 6.15 The original PAR assessment did not assess accident benefits across the whole junction, only the A38 approaches were considered. The predicted corrected PAR assessment and the outturn assessment have included all approaches to the junction.
- 6.16 The annual number of accidents has fallen from 18.0 to 15.3 and hence the scheme has resulted in a first year accident saving of 2.7. The accident severity index has fallen from 10.2% to 9.5%.
- 6.17 Accident savings of 2.7 accidents per year are almost three times the predicted corrected saving of 1.0. In monetary terms the forecast opening year accident benefit was £0.078m while the outturn value was £0.211m (2002 values, discounted to 2002).

Environmental, Accessibility and Integration Impacts

6.18 As predicted in the PAR the scheme has had little impact upon environmental, accessibility and integration sub objectives. Impacts which are non neutral and which are different to forecast in the PAR are:

- ◆ Slightly adverse impacts upon local air quality due to increased traffic levels.
- ◆ Beneficial impacts to physical fitness and severance due to improvements made to footpaths as part of the scheme.

KEY LESSONS LEARNT

- ◆ The scheme has offered value for money and looks set to recover its costs within its 5 year life span;
- ◆ Anecdotal evidence provided by route stakeholders and managers can help to validate technical elements of appraisal;
- ◆ Based on the technical and anecdotal evidence collected as part of this evaluation process it is evident that this scheme will recover its costs in the original 3 year appraisal period;
- ◆ As with many other Large LNM schemes, the impact of junction improvements can be variable by arm;
- ◆ An observed increase in traffic at the junction is likely to be a result of enhanced operational efficiency and additional traffic attracted to the junction from elsewhere on the network (hence where possible the effects of re-assigned traffic need to be considered as part of scheme appraisal);
- ◆ There was limited evidence from this evaluation about the schemes positive effects on accessibility, integration and environment benefits; and
- ◆ The area of analysis for accidents was too narrow and did not fully consider additional accidents impacts that may occur on other arms. Overall this scheme has delivered substantial safety benefits in its opening year, over and above those expected.

SUMMARY OF RECOMMENDATIONS

- ◆ This evaluation has illustrated that there is value in the HA considering temporary schemes where major schemes may be planned in the short to medium term;
- ◆ Where necessary PAR forms should be updated to include re-forecast benefits should a change in circumstances under which the scheme be introduced change (change to appraisal period);
- ◆ Where feasible, the PAR process should consider the implications of induced/reassigned traffic when forecasting post-scheme journey time savings;
- ◆ Where feasible, the PAR should consider the effects of future developments when forecasting post-scheme journey time savings;
- ◆ The MAC should consider the effects of development, other network schemes or road works on the driver routing behaviour and hence the influence this can have on scheme appraisal; and

- ◆ The MAC should ensure that they have taken appropriate consideration of the scheme impacts on an arm by arm basis (not necessarily assume an average benefit across all arms).

CONCLUDING REMARKS

- 6.19 To summarise, this POPE evaluation has largely demonstrated that the scheme has delivered outturn benefits below those forecast in the original PAR assessment. This evaluation report has illustrated that whilst the scheme has not delivered the expected level of journey time benefits it offers good value for money (even within a 3 year appraisal period) with a BCR of 0.95. Opening year accident benefits three times greater than those originally predicted further demonstrates the value for money offered by the scheme.
- 6.20 This evaluation only presents a snapshot of the scheme's out-turn benefits, it is suggested that the HA uses this to be used as an indicator of the scheme's performance relative to that predicted. It is recommended that the results within this report should really be treated as a cautious view of the real benefits accrued in the opening year due to:
- ◆ The inclusion of induced/re-assigned traffic in the do-something scenario (the scheme has helped the junction to accommodate traffic growth not originally considered in the PAR);
 - ◆ The dependency of the results on both snapshot traffic flow and journey time surveys; and
 - ◆ The lack of data to quantify any potential off peak impacts.

Appendix A – Original Scheme AST

Pre-Implementation Predicted Impacts: **APPRAISAL SUMMARY TABLE (AST) 2004**

OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE	ASSESSMENT
ENVIRONMENT	Noise	No Impact	-	-
	Local Air Quality	No Impact	-	-
	Greenhouse Gases	No Impact	-	-
	Landscape	Initial adverse impact will be fully mitigated by the end of the 15 year assessment period	-	-
	Townscape	No Impact	-	-
	Heritage of Historic Resources	No Impact	-	-
	Biodiversity	Initial adverse impact will be fully mitigated by the end of the 15 year assessment period	-	-
	Water Environment	No Impact	-	-
	Physical Fitness	No Impact	-	-
	Journey Ambience	The predicted reduction in the accident rate will have a beneficial impact for road users	-	Large Beneficial
SAFETY	Accidents	-	Low Growth = 1.74 High Growth = 1.74	Low Growth PVB £0.122 m High Growth PVB £0.122 m
	Security	No Impact	-	-
ECONOMY	Public Accounts	-	-	£2.789 m (PVC)
	Business Users & Providers	Not calculated (PAR Guidance C.37)	Not calculated (PAR Guidance C.37)	£0.267 m
	Consumer Users	-	-	£2.290 m
	Reliability	No Impact	-	-
	Wider Economic Impacts	No Impact	-	-
ACCESSIBILITY	Option values	No Impact	-	-
	Severance	No Impact	-	-
	Access to the Transport System	No Impact	-	-
INTEGRATION	Transport Interchange	No Impact	-	-
	Land-Use Policy	No Impact	-	-
	Other Government Policies	No Impact	-	-

Appendix B – Outturn EST

Post-Implementation Actual Impacts: EVALUATION SUMMARY TABLE (EST) 2007

Objectives	Sub-Groups	QUALITATIVE IMPACTS	QUANTITATIVE MEASURE	ASSESSMENT
ENVIRONMENT	Noise	Outturn changes in AADT < 25%. Change in HGV flows <20%	Not applicable	Neutral
	Local Air Quality	Properties within 50m and AADT increases of over 700 vehicles	Not applicable	Slightly Adverse
	Greenhouse Gases	Outturn change in total distance travelled less than 10%	Not applicable	Neutral
	Landscape	Mitigation measures abided by	Not applicable	Neutral
	Townscape	Located away from urban\built up area	Not applicable	Neutral
	Heritage of Historic Resources	No impact on archaeological or noteworthy built heritage sites	Not applicable	Neutral
	Biodiversity	The scheme is not located in a sensitive site	Not applicable	Neutral
	Water Environment	Negligible change to the volume and quality of water discharge.	Not applicable	Neutral
	Physical Fitness	Improvements made to pedestrian access through and around the junction	Not applicable	Slightly Beneficial
	Journey Ambience	Reduced accident rates as a result of scheme implementation	Not applicable	Beneficial
SAFETY	Accidents	The 18 months of accident data indicates that the scheme has had a positive impact on reducing accident levels	13.2 PIAs saved (central case)	£0.961m
	Security	The scheme has no impact	-	Neutral
ECONOMY	Public Accounts		-	PVC to HA is £3.121m
	Business Users & Providers	No Impact	Not applicable	Neutral
	Consumer Users	User benefit from reduced delays	75520 hours saved in opening year	£4.001m
	Reliability	Improved reliability in peak hours	Not applicable	Slightly Beneficial
	Wider Economic Impacts	No Impact	Not applicable	Neutral
ACCESSIBILITY	Option Values	No new public transport services	Not applicable	Neutral
	Severance	Improvements made to pedestrian access through and around the junction	Not applicable	Slightly Beneficial
	Access to the Transport System	No changes to the public transport system	Not applicable	Neutral
INTEGRATION	Transport Interchange	No changes to the public transport system	Not applicable	Neutral
	Land-Use Policy	No mention in Local Transport Plans or Regional Transport Strategy	Not applicable	Neutral
	Other Government Policies	No Impact	Not applicable	Neutral

Appendix C – Glossary

The following table details the acronyms and specialist terms used within the context of this report.

Term	Definition
AADT	Annual Average Daily Traffic. Average of 24 hour flows, seven days a week, for all days within the year.
AST	Appraisal Summary Table. This records the impacts of the scheme according to the Government's five key objectives for transport, as defined in DfT guidance contained on its Transport Analysis Guidance web pages, WebTAG
ATC	Automatic Traffic Count
BCR	Benefit Cost Ratio A ratio identifying the relationship between cost and benefits of a proposed project.
DM	'Do Minimum'
DS	'Do Something'
EST	Evaluation Summary Table. In POPE studies, this is a summary of the evaluations of the TAG objectives using a similar format to the forecasts in the AST.
FYRR	First Year Rate of Return
HA	Highways Agency. An Executive Agency of the Department for Transport, responsible for operating, maintaining and improving the strategic road network in England.
HGV	Heavy Goods Vehicle
LNMS	Local Network Management Scheme A contribution to bringing about the changes required by the integrated transport white paper and 10 year plan.
MAC	A Managing Agent Contractor is responsible for the operation, maintenance, and improvement of the motorway and trunk road network of a Highways Agency area.
NRTF	National Road Traffic Forecast. This document defines the latest forecasts produced by the Department of the Environment, Transport and the Regions of the growth in the volume of motor traffic. The most recent one is NRTF97 and the one previous was NRTF89.
PAR	Project Appraisal Report
POPE	Post Opening Project Evaluation, before & after monitoring of all major highway schemes in England.
VOT	Value of Time

Appendix D – Comparison of Scheme Impacts (3 and 5 Year Appraisals)

	PAR Predicted	PAR Predicted-Corrected	PAR Predicted-Corrected	Outturn	Outturn
PAR Version	PAR 3.3	PAR 3.3	PAR 3.3	PAR 3.3	PAR 3.3
Method of Calculation	Economy: Juice Accidents: Manual Calculation	Economy: Juice Accidents: Manual Calculation	Economy: Juice Accidents: Manual Calculation	Economy: Juice Accidents: Manual Calculation	Economy: Juice Accidents: Manual Calculation
Present Value Year	2002	2002	2002	2002	2002
Discount Rate	3.50%	3.50%	3.50%	3.50%	3.50%
Scheme Opening Year	2006	2006	2006	2006	2006
Evaluation Period	3 Years	3 Years	5 Years	3 Years	5 Years
Economy Benefits	£3.007m	£5.744	£9.573m	£2.401	£4.001m
Accident Benefits	£0.122m	£0.208	£0.356m	£0.561	£0.961m
Total Scheme Life Benefits (PVB)	£3.129m¹	£5.952 m²	£9,929m²	£2.962 m²	£4,962m²
Total Cost (PVC)	£2.789m³	£2.789 m³	£2.789m³	£3.121 m³	£3.121m³
Benefit Cost Ratio (BCR)	0.96	2.13	3.56	0.95	1.59
First Year Economy Benefits	£2.776m	£1.877m	£1.877m	£0.784m	£0.784m
First Year Accident Benefits	£0.047m	£0.078m	£0.078m	£0.211m	£0.211m
First Year Total Benefits (PVB)	£2.823m	£1.955m	£1.955m	£0.995m	£0.995m
First Year Rate of Return (FYRR)	101.2%	70.1%	70.1%	31.9%	31.9%