

LNMS Evaluation Report

A14 Spittals Interchange – Provision of Traffic Signals




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LNMS Evaluation Report

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September 2008

JOB NUMBER: 5064711.822			DOCUMENT REF: POPE of LNMS - A14 Spittals Interchange_FINAL.doc			
A	Draft Evaluation Report	EH	JA	NDM	NDM	28/05/08
B	Draft Evaluation Report	JA	LT	NDM	NDM	22/07/08
C	Final Report	JA	JA	NDM	NDM	18/09/08
		Originated	Checked	Reviewed	Authorised	Date
Revision	Purpose Description					

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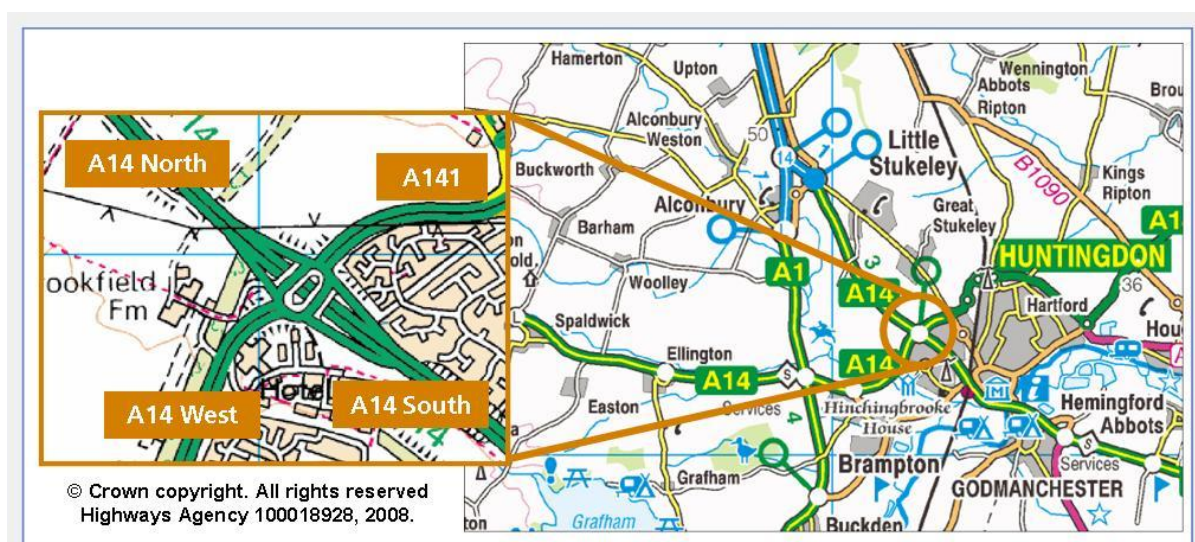
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1. Introduction

BACKGROUND

- 1.1 The A14 Spittals Interchange is a grade-separated junction located to the west of Huntingdon in Cambridgeshire where three sections of the A14 adjoin with the A141. The junction falls to the north-east extremity of Highways Agency (HA) Area 8 forming an important east-west link for traffic movements from Northamptonshire to Cambridgeshire, and a north-south link for traffic travelling from North Cambridgeshire to South Cambridgeshire (**Figure 1.1**).

Figure 1.1 – Location of Scheme



- 1.2 Prior to signalisation the junction had been identified as being close to capacity, with queuing problematic on approaches from Cambridge and Huntingdon directions. Pre-scheme observations suggests that vehicles were finding it difficult to enter the roundabout due to high volumes and the speed of traffic on the circulatory carriageway. The interchange also had a high accident frequency on the approach road from Cambridge, where there were heavy traffic flows, and on the radius section of the circulatory due to high vehicle speeds following the straight section.
- 1.3 Signalisation of the interchange was identified as being better able to cope with future traffic growth than the existing layout. The PAR notes that ‘traffic signals will provide the opportunity for queuing traffic to get onto the roundabout with greater efficiency, improving the safety of the roundabout’.

REPORT PURPOSE

- 1.4 As part of an ongoing requirement of the Highways Agency to evaluate the impacts of new trunk road schemes, Atkins Consultants Ltd has been commissioned by the Highways Agency 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 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) and ensure that accurate predictions are made about the possible impacts of highway schemes on safety, economy, environment, accessibility and integration in the future; and
- 1.5 This document sets out the findings of the Post Opening Project Evaluation (POPE) of the A14 Spittals Interchange Improvements as implemented in January 2006. The report specifically examines the economic, safety, environment, integration and accessibility impacts of the junction improvements and its outcomes will inform the POPE of Local Network Management Schemes (LNMS) Fifth Annual Report in June 2008.

SCHEME DESCRIPTION

- 1.6 The scheme was identified as the preferred solution from an Options Report carried out by Carillion URS in November 2001. The Project Appraisal Report (PAR), also produced by consultant Carillion URS, was issued in July 2005.
- 1.7 Construction work for the scheme commenced in October 2005 and was completed on the 22nd January 2006. The scheme (**Figure 1.2**) consisted of the following:
- ◆ Provision of signals on each entry arm and on the circulatory carriageway with high friction surfacing on all signal approaches;
 - ◆ Strip widening to the A14 eastbound and westbound approaches and to sections of the circulatory carriageway;
 - ◆ Realignment of the A141 exit;
 - ◆ Changes to lighting columns and safety fencing; and
 - ◆ Introduction of a 40mph speed limit at the junction.
 - ◆ Although not highlighted in the PAR, information from the Highways Agency and from Carillion URS states that the signal timings are controlled by MOVA.
- 1.8 Furthermore the scheme follows two earlier small LNMs safety schemes implemented at the junction prior to the large LNMs scheme at a value of £0.010m and £0.110m (2002 prices discounted to 2002) respectively. Key features of these schemes are described below:

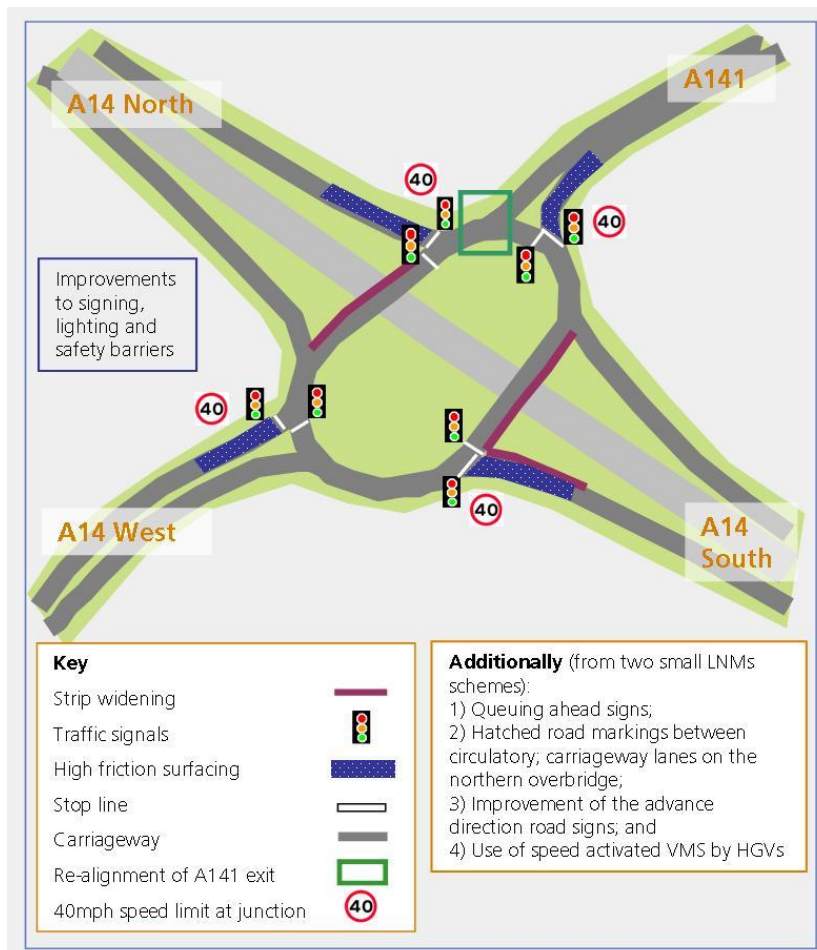
Scheme 1 (Opening date 25th February 2005)

- ◆ 'Queuing Ahead' signs erected on the Eastbound and Westbound A14 approaches.

Scheme 2 (Opening date 28th March 2005)

- ◆ Improved hatched road markings in the centre of the northern over-bridge;
- ◆ Improved warning/advanced direction road signing; and
- ◆ Introduction of speed activated variable message sign for heavy goods vehicles.

Figure 1.2 - Spittals Interchange Provision of Traffic Signals



SCHEME OBJECTIVES AND CATEGORISATION

- 1.9 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. As detailed in the PAR document, the schemes main objective was to 'reduce accidents and improve the efficiency of the roundabout'. The scheme has therefore been categorised as a **safety scheme**, although some economy benefits were also predicted due to capacity improvements.

POPE METHODOLOGY OVERVIEW

- 1.10 This report presents the forecast and outturn effects of the scheme on a common basis. This process ultimately presents two assessments of the scheme:
- ◆ **Assessment 1:** The original Full PAR Assessment (using version 3.3). This represents the forecast benefits of the scheme; and
 - ◆ **Assessment 2:** An Evaluation Summary Table based on the out-turn effects of the scheme using a methodology consistent with the original PAR assessment undertaken prior to scheme opening.

- 1.11 All costs are presented in 2002 prices, discounted to 2002.
- 1.12 POPE is based on an evaluation of the schemes out-turn impacts against the five core NATA objectives as listed below:
- ◆ **Economy** - concerned with improving the economic efficiency of transport for example journey time savings and reliability;
 - ◆ **Safety** - concerned with reducing the loss of life, injuries and damage to property resulting from transport incidents and crime;
 - ◆ **Environment** - reducing the direct and indirect impacts of transport facilities on the physical and social environment of both users and non-users;
 - ◆ **Accessibility** - concerned with the ability with which people can reach different locations and facilities by different modes; and
 - ◆ **Integration** - aims to ensure that all decisions are taken in the context of the Government's integrated transport policy.

REPORT STRUCTURE

- 1.13 Following this introduction, the report has been divided into five further sections as follows;
- ◆ **Section 2** - Data Collection and Stakeholder Feedback;
 - ◆ **Section 3** - Traffic and Economic Impacts;
 - ◆ **Section 4** - Safety Impacts;
 - ◆ **Section 5** - Environmental, Accessibility and Integration Impacts; and
 - ◆ **Section 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 POPE assessment;
 - ◆ Summarises the outcomes of a site visit undertaken by Atkins in November 2007; and
 - ◆ Provides a summary of the feedback from various stakeholders 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

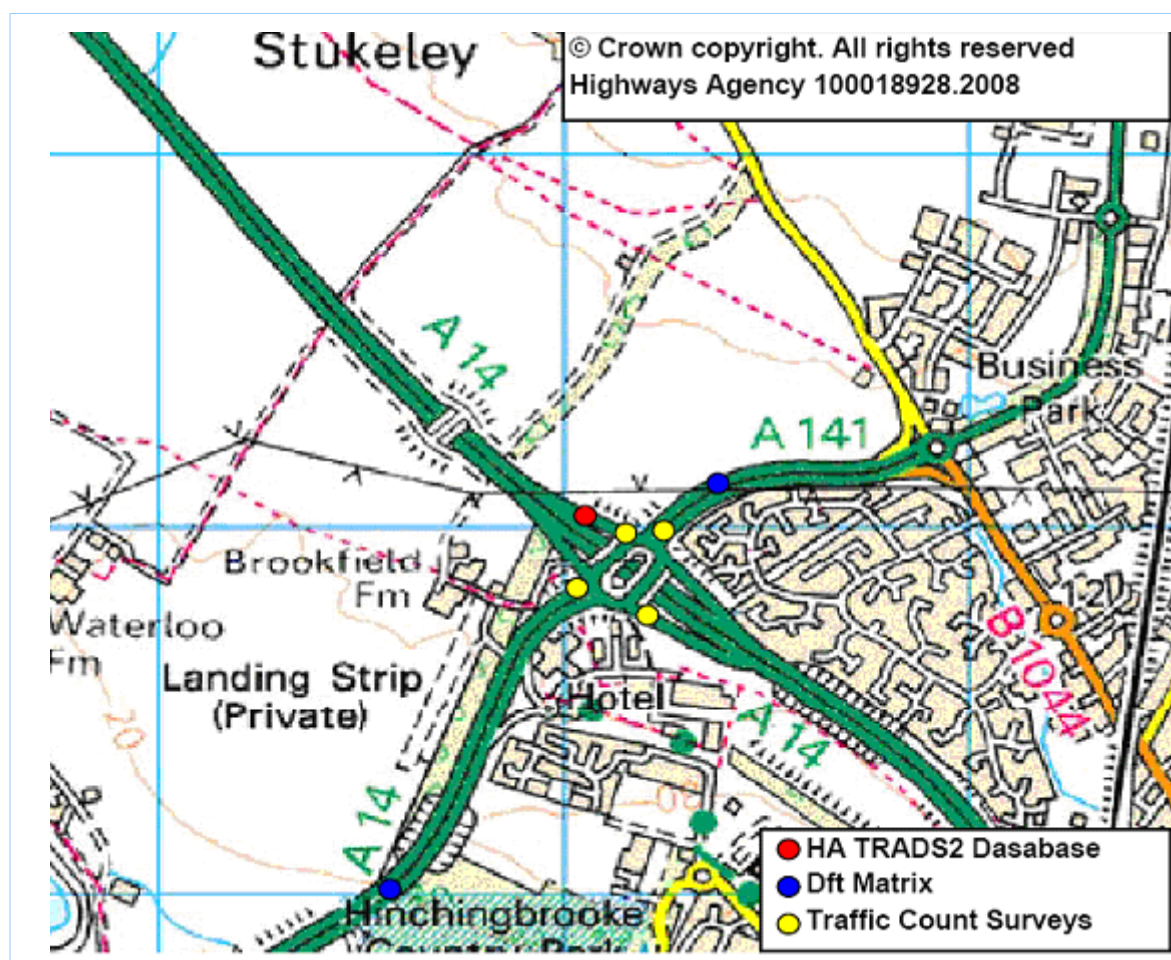
- ◆ Personal Injury Accident (PIA) data for the period April 2000 – March 2005;
- ◆ Manual Traffic Count Data (October 1999, November 2004);
- ◆ Pedestrian survey (November 2004); and
- ◆ Queue length survey data (March 2003).

Post Opening Data

- ◆ Personal Injury Accident (PIA) data for the 2 year period January 2006 – January 2008.
- ◆ Traffic Count and Journey Time surveys (8th April 2008);
- ◆ Full turning count survey for A14 Spittals Interchange (26th June 2007); and
- ◆ Highways Agency TRADS 2 Database ATC data.

- 2.3 **Figure 2.1** summarises the location of the count sites used in this study.

Figure 2.1 – Count Site Locations



Other Data

- ◆ Modelling data files used to support the original PAR appraisal economic benefit calculations;
- ◆ Site visit observations; and
- ◆ Stakeholder feedback.

POST OPENING JUNCTION CONDITIONS – SUMMARY OF SITE OBSERVATIONS

2.4 A site visit was conducted in November 2007 to observe post-opening traffic conditions at the junction. The objectives of the site visit were as follows:

- ◆ To ensure that the scheme was implemented as per the original PAR and scheme drawings provided by the MAC; and
- ◆ To observe the post opening junction operating conditions with regard to traffic flows and safety.
- ◆ To check that the scheme had not adversely impacted on the environment.

2.5 The following general observations were made during the site visit:

- ◆ The scheme had been implemented as stated in the PAR;
- ◆ Compared to the before photos the junction had improved signing and lining that made the junction more ‘readable’;
- ◆ The post-opening conditions appeared to show that the junction was operating well, though it was observed that traffic seemed to be unusually light for the A14;
- ◆ There was no obvious evidence of safety issues observed such as skid marks or near misses; and
- ◆ Additional footways were also observed to have been implemented as proposed in the PAR appraisal.
- ◆ No adverse environmental impacts were observed as a result of the scheme.

STAKEHOLDER FEEDBACK

Original PAR

2.6 As part of the PAR appraisal, consultation for the A14 Spittals Interchange Provision of Traffic Signals was undertaken.

2.7 The consultation was carried out in regard to the proposed scheme, traffic management and safety issues with the following stakeholders;

- ◆ Cambridgeshire County Council
- ◆ Cambridgeshire Police

2.8 No specific details of the consultation process of feedback were available, but the PAR states that both parties supported the scheme.

Post Opening Consultation

2.9 As part of the POPE process, consultation was again undertaken with Cambridgeshire County Council, Cambridgeshire Police and the Project Sponsor. The consultation took the form of a letter; the following feedback has been received:

Cambridgeshire County Council (CCC)

2.10 A representative at CCC believed that the scheme had brought journey time reliability improvements for the A14 approach from the south and reduced queue lengths on this approach in the AM and PM peak. From other approaches there had been little observable benefits, with more extensive queues on non-trunk roads and anecdotal evidence of rat-running through local villages to avoid continuing congestion at the junction. It was further perceived that long queues on A141 are due instances where the 7 second minimum green phase is being applied in the morning peak, and hence not providing sufficient green time to clear queues.

Cambridgeshire Police

- 2.11 A response from a representative of Cambridgeshire Police produced similar feedback stating that since the implementation of the scheme journey times had improved on the A14(N) and the A14(S), although had not improved on the other two approach arms. The representative believed that PM Queues had reduced on all arms excluding the A141 and that overall the junction was operating better than before the traffic signals were installed.

Summary – Section 2:

- ◆ A site visit was undertaken in November 2007 during the morning peak which revealed that the out-turn scheme was implemented as per the PAR and that the junction appeared to be operating well following scheme opening.
- ◆ Consultation with a representative from Cambridgeshire County Council believed that the scheme has brought journey time reliability improvements for the A14 south and reduction in queue lengths in the AM and PM on this arm, however this was believed to be at the detriment of the non-trunk roads which have experienced more extensive queues due to disproportionate cycle times.
- ◆ Consultation with a representative from Cambridgeshire Police believed that the scheme had brought journey time improvements for those approaching the junction from the North and South of the junction. It was believed that on a whole the junction was operating better than before the scheme was implemented.

3. Traffic and Economic Impacts

INTRODUCTION

3.1 This chapter sets out the evaluation of the economic impacts derived from the scheme. More specifically this chapter will:

- ◆ Provide an appreciation of recent changes in traffic volume at the junction;
- ◆ Quantify the outturn impacts of the scheme upon journey times through the junction in order to provide an assessment of the economic benefits of the scheme; and
- ◆ Provide an analysis of the outturn costs and compare them with those predicted in the original PAR;

TRAFFIC GROWTH TRENDS

Daily Traffic

3.2 A number of sources of traffic data were used to provide an appreciation in traffic flow changes emerging as a result of improvements to the junction; these are listed in **Section 2**. Automatic traffic count (ATC) data available on approaches to this junction is partial in nature and hence the information presented in this section should be treated as indicative only. **Table 3.1** summarises annual average daily traffic (AADT) flows into the junction for the period 2004 – 2007.

Table 3.1 – AADT Data

Count Location	Source	AADT				Change in vehicles (2004 - 2007)	Observed Change (2004-2007)	NRTF97 Growth Forecast
		2004	2005	2006	2007			
A14 North	HA TRADS	3017	3090	3444	3486	469	15.55%	5.00%
A14 West	DfT	48402	42318	43067	46496	-1906	-3.94%	5.00%
A141	DfT	26737	26736	27318	27600	863	3.23%	5.00%

3.3 The following points can be noted from **Table 3.1**.

- ◆ A comparison of 2004 and 2007 traffic flows illustrate that average daily traffic on the A14 approach from the north has increased by 15.5% compared to NRTF97 forecasts of 5.0% over the same period. This represents a marginal increase of 20 vehicles per hour approaching the junction from this arm;
- ◆ Traffic approaching the junction from the A141 has increased by 3.2% (less than predicted by NRTF growth factors); and
- ◆ Traffic has fallen by 4% on the A14W arm; this is contradictory to the growth estimates forecast by NRTF. The reason for the reduction in traffic is not apparent.

Peak Hour Traffic

- 3.4 Peak hour turning count surveys undertaken in 2004 and 2007 provide a further appreciation of traffic flow changes at Spittals Interchange. **Table 3.2** summarises AM and PM peak hour traffic flows for 2004 and 2007.

Table 3.2 - Summary of Peak Hour Traffic Flow Changes (2004 vs 2007)

Approach	AM (08:00-09:00)			PM (16:00-17:00)		
	2004	2007	% Change	2004	2007	% Change
A141	1069	948	-11.3%	866	928	7.16%
A14 (from South)	1397	1936	38.6%	1365	1620	18.68%
A14 (from West)	1794	1660	-7.5%	2184	1922	-12.00%
A14 (from North)	320	459	43.4%	218	225	3.21%
TOTAL	4580	5003	9.2%	4633	4695	1.34%

- 3.5 Total traffic entering the junction in the AM peak has increased by around 9% compared with 1.3% in the PM peak suggesting that the junction has been able to accommodate traffic more efficiently. More specific points to note from **Table 3.2** are listed below:
- ◆ The scale of traffic volume changes (by arm) have been variable;
 - ◆ The approach from the A14S is carrying approximately 39% more traffic than in 2004 suggesting that the operational efficiency of the junction has improved as this approach was previously operating under congested conditions. Such a trend substantiates comments provided by Cambridgeshire County Council that there had been some improvement to journey time reliability following the junction improvements;
 - ◆ Traffic approaching the junction from the A14W has fallen by an average of 9.8% in peak periods with the more pronounced change taking place in the AM peak. This compares with a 4% decrease in AADT (**Table 3.1**) between 2004 and 2007;
 - ◆ In the AM peak, traffic approaching from the A141 appears to have fallen by around 11%, this compares to an observed increase of 7% in the PM peak;
 - ◆ There has been a dramatic increase in AM peak hour traffic approaching from the A14 North (43%). This parallels with an observed 15.5% increase in AADT from the same direction between 2004 and 2006;
 - ◆ An analysis of peak hour traffic flows at a permanent count site close to the junction show that traffic from the north A14 approach (June 2004 and 2007) has increased by 52% and 8% in the AM and PM peak periods respectively thus confirming general trends identifiable from the manual traffic counts undertaken in 2004 and 2008; and
- 3.6 An analysis of the HGV flows in the 'before' and 'after' turning count data revealed that peak hour HGV flows increased by 5.8% in the AM Peak and by 16.6% in the PM Peak.

POPE ASSESSMENT

3.7 The remainder of this section sets out the out-turn assessment of journey time benefits emerging from enhancements implemented at the Spittals Interchange. Such an approach effectively represents a re-forecast of scheme benefits based on opening trends in journey times and traffic flows.

The PAR Appraisal

3.8 The original PAR assessment for Spittals Interchange was undertaken by Carillion-URS. As the A14 Ellington to Fen Ditton scheme was timetabled for late 2010 an assessment period of 5 years was selected, rather than the standard 60 year appraisal period. The proposed scheme, to include the introduction of a new three lane dual carriageway south of Huntingdon between Ellington and Fen Drayton, is expected to reduce flows on the present A14 west of Fen Drayton by up to 40% of their present-day levels. Although progress will depend on the number and nature of objections to the proposals draft orders, and the start of building work will be subject to the availability of funding, the Highways Agency presently timetable construction work to begin in late 2010. Therefore the 5 year appraisal period has been maintained for the outturn appraisal.

3.9 The PAR made the following assumptions in forecasting the economic impacts of the scheme:

- ◆ ARCADY, TRANSYT and JUICE software were used to estimate scheme journey time benefits;
- ◆ Journey time benefits were calculated for 5 year assessment period in the AM (08:00-09:00) and PM peak (17:00-18:00) – inter-peak impacts were not forecast;
- ◆ Journey times are modelled for 2005 and 2010, with traffic assumed to grow according to NRTF between these years; and
- ◆ A 13% reduction in demand flows for the DS scenario was used within TRANSYT to proxy MOVA conditions.

3.10 The outcome of the original PAR appraisal is summarised in **Table 3.3**. All values are discounted to 2002 and given in 2002 prices. Values shown are for the ‘Central Growth’ scenario representing the average of the high and low growth scenario as calculated in the PAR.

Table 3.3 – Summary of Predicted Economic Benefits (as per the PAR)

Vehicle Hours Saved in Opening Year	Central Growth
Peak Hours Benefit (Total Opening Year Hours)	-17334
Opening Year Monetary Benefit	-£169,000
Scheme Life Monetary Benefit	£737,000

3.11 In summary the PAR concluded that the scheme would result in a first year dis-benefit of -£169,000. However, the signalised roundabout was forecast to bring

journey time savings in future years when traffic volumes are higher resulting in a 5-year saving of £737,000.

The PAR Predicted Corrected Appraisal

- 3.12 In order for a like-for-like comparison of the predicted and outturn economic impact to be made, a PAR 'predicted corrected' appraisal of the scheme economic benefits has been undertaken. The purpose of the PAR predicted corrected appraisal is to:
- ◆ Ensure that the predicted and outturn scheme impacts are considered using a like-for-like approach;
 - ◆ Account for differences in the scheme appraised in the PAR and the scheme implemented; and
 - ◆ Account for any obvious errors in the original PAR calculations.
- 3.13 The predicted corrected assessment has been conducted specifically for this scheme for the following reasons:
- ◆ To ensure that the modelled journey times correspond with the surveyed journey routes as undertaken as part of the POPE process;
 - ◆ To recalculate delays from TRANSYT which were extracted incorrectly in the original PAR; and
 - ◆ To reassess modelled journey times from ARCADY in the do-minimum scenario which were inconsistent with the queue rates and anecdotal journey times observed prior to scheme opening.

Re-examination of ARCADY Journey Times

- 3.14 An examination of 2003 (pre-scheme) queue length surveys, anecdotal evidence from stakeholders and modelled delays from the DM ARCADY model revealed the following:
- ◆ Queues of over 200m were observed on all arms in the AM peak hour. Queues were consistently over 200m on the arms from Huntingdon and Cambridge for the AM peak hour;
 - ◆ Queues were not as extensive in the PM peak hour, but were over 200m long from along the A141 by 17:10 and did not recover until 18:25; and
 - ◆ The PAR states that *'Prior to signalisation the junction had been identified as being close to capacity, with queuing being identified from both the Cambridge and Huntingdon directions'*.
- 3.15 Average modelled delays from the DM ARCADY model accompanying the PAR were 0.41 minutes per vehicle from the A14 (South) in the AM Peak and 0.49 minutes per vehicle along the A14 (West) in the PM peak. Due to the evidence presented above these were not felt to accurately represent 'base year' delays at the junction. As site specific flow data was available for the junction, the capacity correction facility in ARCADY has been used to carry out the measurement needed for an 'intercept correction', the results from these runs are felt to better represent the 'pre opening' conditions at the junction following comparisons with the above.

3.16 Pre opening delays for each arm of the junction taken from the PAR the PAR predicted corrected scenarios are presented in Table 3.4 and

3.17 Table 3.5, all delays are shown in minutes.

Table 3.4 – Modelled Pre Opening AM Peak Delays (Minutes per Vehicle)

Approach Arm	Average Vehicle Delay (Minutes per Vehicle)	
	Pre Opening Delays (PAR)	Pre Opening Delays (PAR Corrected)
A141	0.1	1.45
A14 (S)	0.41	2.26
A14 (W)	0.21	0.96
A14 (N)	0.25	0.88

Table 3.5 – Modelled Pre Opening PM Peak Delays (Minutes per Vehicle)

Approach Arm	Average Vehicle Delay (Minutes per Vehicle)	
	Pre Opening Delays (PAR)	Pre Opening Delays (PAR Corrected)
A141	0.24	0.96
A14 (S)	0.1	0.30
A14 (W)	0.49	1.60
A14 (N)	0.18	1.86

3.18 The following assumptions were made in forecasting the PAR predicted corrected appraisal of journey time benefits:

- ◆ Journey time benefits were calculated for 5 year assessment period in the AM (08:00-09:00) and PM peak (17:00-18:00);
- ◆ No traffic growth was forecast in the as the junction was already saturated;
- ◆ The recognised standard of 13% was taken off delays for MOVA in the DS scenarios as TRANSYT can not specifically model MOVA technology;
- ◆ Delays are calculated over the routes specified in the POPE assessment, using point-to-point journey time times taken from ARCADY and TRANSYT; and
- ◆ Calculations were made in accordance with the ‘worksheet for economy – journey times’ from PAR 3.3. Guidance Notes.

3.19 Opening year benefits are re-forecast over the appraisal period to match data availability for the outturn assessment.

3.20 **Table 3.6** summarises the results of the predicted corrected PAR appraisal.

Table 3.6 – Summary of Predicted-Corrected Economic Benefits

Journey Time Benefits/Dis-benefits			Central Growth
Vehicle Hours Saved in Opening Year		(a)	1406
Value of time (VOT) per average vehicle in Opening Year (p/hour)		(b)	1194
VOT Savings in Opening Year	(a) x (b) = (c)	(c)	£16,789
Capitalisation Factor			5.1
VOT Benefits	(c) x Capitalisation Factor	(d)	£85,626
Opening Year discount factor		(e)	0.87
VOT Savings in Opening Year discounted to 2002	(c) x (e)	(f)	£14,607
5 year VOT Benefits discounted to 2002	(d) x (e)	(g)	£74,494

3.21 Key points to note with reference to the PAR predicted appraisal include:

- ◆ A small net peak hour saving of 1,406 vehicle hours in the opening year compared to an extra delay of 17,334 forecast in the PAR; and
- ◆ The predicted-corrected PAR gives journey time benefits of £15,000 in the opening year, translating to £74,000 for the 5-year appraisal period.

Outturn Appraisal of Economic Benefits

3.22 To gain a robust appreciation of post-implementation journey times through the junction for all movements, Automated Number Plate Recognition cameras were used (April 2008). The location of the ANPR cameras on each approach arm are summarised in **Table 3.7** below:

Table 3.7 – Location of Survey ANPR Cameras

Road	Approach (meters)	Downstream of Junction (meters)
A141	200	250
A14 (S)	450	450
A14 (W)	250	250
A14 (N)	547	547

Note: Distances relate to the location of cameras upstream and downstream of the junction.

3.23 Due to the absence of pre-opening journey time data, ARCADY was used to estimate point-to-point journey times for the opening year do minimum (DM) scenario.

3.24 The following assumptions were made as part of the post-opening evaluation:

- ◆ Do Something (DS) journey times are taken from the surveys undertaken on 8 April 2008. Journey times were recorded over a set distance using ANPR (**Table 3.5**);
- ◆ DM journey times are modelled using ARCADY 6 which produces point to point journey times. No growth in traffic was forecast at the junction given it was already saturated.
- ◆ Journey time benefits were calculated for the 5 year assessment period in the AM (08:00-09:00) and PM peak (17:00-18:00);
- ◆ Average delay savings per vehicle are calculated for each arm by deducting the average DS journey time from the average DM journey time.
- ◆ The ‘rule of half’ has been applied. This is standard practice whereby full benefits have been assigned to existing traffic and half the benefits have been assigned to new traffic at the junction; and
- ◆ Outturn assessment of benefits comparing the scheme before and after represent a ‘re-forecast’ of the benefit over the entire evaluation period (5 years) based solely on data collected during the first year after opening.

3.25 Comparisons of the predicted corrected and out-turn journey time/delay savings for the opening year are provided in **Table 3.8**.

Table 3.8 – Summary of Estimated Journey Time Savings

Approach	AM Peak Hour			PM Peak Hour		
	Predicted Corrected Delay Saving in Vehicle Hours (Modelled Delay)	Outturn Delay Saving in Vehicle Hours (Observed Delay)	After Delay-Average per Vehicle (mins)	Predicted Corrected Delay Saving in Vehicle Hours (Modelled Delay)	Outturn Delay Saving in Vehicle Hours (Observed Delay)	After Delay-Average per Vehicle (mins)
A141	3894	-4964	2.00	-29519	-18540	3.19
A14 (S)	18860	19342	0.85	-4064	-3616	0.60
A14 (W)	794	-1357	1.06	8682	13344	0.80
A14 (N)	574	1235	0.53	2185	2745	0.42

3.26 Analysis of the results shows that:

- ◆ Journey time impacts were variable by approach and time period;
- ◆ The scheme has produced overall opening year net journey time savings of 14,255 vehicle hours in the AM Peak compared to a 6,068 vehicle hour dis-benefit in the PM peak;
- ◆ During the AM Peak there are journey time dis-benefits on two of the four approaches, although these have been outweighed by large journey time savings on the A14(S). Such changes to delays are consistent with statements from Cambridge County Council and Cambridgeshire Police;
- ◆ During the PM peak the largest delay savings were observed on the A14 (W) approach, whilst increases in delay on the A141 were higher than expected;
- ◆ Increases in delays on the A141 in both peak periods following the scheme implementation are consistent with the anecdotal evidence provided by both Cambridge County Council and the Cambridgeshire Police in consultation feedback; and
- ◆ Across both time periods there is a total net opening year journey time saving of 8,188 hours.

3.27 The outcome of the original POPE appraisal is summarised in **Table 3.9**. All monetised values are discounted to 2002 and given in 2002 prices.

Table 3.9 – Summary of POPE Economic Benefits

Journey Time Benefits/Dis-benefits			Central Growth
Vehicle Hours Saved in Opening Year		(a)	8188
Value of time (VOT) per average vehicle in Opening Year (p/hour)		(b)	1194
VOT Savings in Opening Year	(a) x (b) = (c)	(c)	£97,763
Capitalisation Factor			5.1
VOT Benefits	(c) x Capitalisation Factor	(d)	£498,591
Opening Year discount factor		(e)	0.87
VOT Savings in Opening Year discounted to 2002	(c) x (e)	(f)	£85,054
5 Year VOT Benefits discounted to 2002	(d) x (e)	(g)	£433,774

3.28 A number of trends can be extracted from the POPE evaluation of the outturn economic impacts of the A14 Spittals Interchange scheme. These are listed as follows.

- ◆ The outturn benefits of the scheme over the 5 year assessment period are equivalent to £434,000 compared to £74,000 forecast in the predicted corrected PAR;

- ◆ The scheme has delivered outturn journey time savings of 8,188 hours in the opening year which equates to an opening year monetary value of £85,000, in comparison to the predicted value of 15,000;
- ◆ Benefits have been greater than expected due to an apparent underestimation of the delays before the scheme was in place; and
- ◆ The benefits emerging on the A14S approach have done so at the detriment to other approaches (particularly the A141).

Summary of Costs

3.29 **Table 3.10** illustrates the predicted and outturn works costs for the scheme. The PAR predicted and PAR predicted corrected costs are inclusive of 3% optimism bias. As previously stated this evaluation has been affected by two preceding small LNM schemes implemented at the junction. In order to ensure that all costs and benefits from all three schemes have been considered, the predicted costs have been updated to include the previous two schemes. The table illustrates that the outturn cost of £1,962,423 was just under 2% more than the PAR predicted-corrected.

Table 3.10 – The Predicted, Predicted Corrected and Outturn Costs for the Scheme

Scenario	Total PVC at 2002 pricing, discounted to 2002
PAR Predicted	£1,742,530
PAR Predicted - Corrected	£1,927,742
Outturn	£1,962,423

3.30 When viewed in isolation the large LNMS scheme was delivered at a cost of £1,843,423 compared to a predicted corrected cost of £1,802,617 – a difference of just over 2%.

INTERPRETING THE POPE CONCLUSIONS

3.31 Whilst it appears that the improvements at A14 Spittals Interchange have produced a small reduction to average peak hour delay, the following caveats must be considered:

- ◆ Due to the absence of ‘observed pre-opening journey time data’ available for this scheme evaluation, an ARCADY model has been used to ‘estimate’ pre-opening journey times against which observed post opening journey times have been compared. This methodology introduces a margin of error that must be considered when using these results; and
- ◆ The predicted and outturn journey time benefits are based upon peak hour assessments only due to pre-scheme opening data availability. Consequently changes in delays during other time periods have not been considered. It is likely that the addition of signals and speed limit reductions will have resulted in increased journey times in inter-peak and off-peak periods.

Summary – Section 3:

- ◆ Changes in traffic flow following the opening of the scheme have been variable by time of day and approach. Manual turning counts show a 12% reduction in flows on the A14W during the PM peak, whilst flows on the A14N had increased by 43.4% in the AM peak;
- ◆ Post opening traffic levels at the junction (2007) now exceed pre-opening levels at 2 of the 3 automatic count sites. Traffic flows on the A14W were 11% lower than in 2004;
- ◆ Overall, between 2004 and 2007, peak hour usage of the junction increased by 9% (423 vehicles) in the AM Peak and 1% (62 vehicles) in the PM Peak. This suggests that the junction has become more heavily utilised following the scheme opening, particularly in the AM Peak Period.
- ◆ Analysis of the HGV content in the 'before' and 'after' turning count data revealed that peak hour HGV flows increased by 5.8% in the AM Peak and by 16.6% in the PM Peak.
- ◆ In contrast to PAR forecasts, the scheme has resulted in a small overall reduction in delays at the junction, although again impacts have been variable by arm;
- ◆ The most substantial reduction in delays were observed on the A14S in the AM peak period (19,342 vehicle hours saved in opening year), whilst an additional 23,500 hours of vehicle delay was introduced to the A141 during peak periods;
- ◆ Outturn opening year and scheme life (5 years) economic benefits are equivalent to £85,000 and £434,000 respectively. This is substantially greater than the predicted savings of £15,000 and £74,000 respectively.
- ◆ The scheme's outturn cost was underestimated by 2% (£1,962,423 compared to a predicted corrected cost of £1,921,617).
- ◆ Overall the scheme appears to have delivered small economic benefits in the peak hours. Whilst modelling can provide an appreciation of likely delays and journey time benefits, the availability of pre-scheme opening observed journey time data would have provided a more accurate appreciation of outturn journey time benefits.

4. Safety Impacts

INTRODUCTION

- 4.1 This section examines the changes in 'before' and 'after' accident events 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 A14 Spittals Interchange.

PAR ASSESSMENT

- 4.2 The PAR appraisal was based on Personal Injury Accident (PIA) data for the period April 2000 to March 2005. Key pre-scheme accident trends identified in the PAR include:
- ◆ There were an average of 26.0 PIA's per year prior to scheme opening;
 - ◆ The accident severity was 9.2% (ratio of killed and serious PIAs to total accidents); and
 - ◆ The PAR predicted that the scheme would result in an opening year accident saving of between 7.9 (low growth) and 8.1 (high growth) PIAs. This is equivalent to a monetised central growth opening year benefit of £2,870,000.

PAR PREDICTED CORRECTED ASSESSMENT

- 4.3 It was apparent that the PAR appraisal only included accidents occurring on the circulating area of the roundabout and along a 1km stretch of the A14 (S) approach from Cambridge. The PAR appraisal had therefore omitted accidents occurring on the remaining arms of the roundabout despite scheme proposals affecting all approaches.
- 4.4 For the purpose of this evaluation, it is has been assumed that the implemented scheme has impacted upon each approach arm due to the addition of traffic signals on all approaches. To enable a like-for-like comparison of predicted and outturn accident impacts, the original PAR prediction was adjusted to include an analysis of accidents on all approaches to the junction prior to scheme opening. As in the PAR all accidents within the selected area were included. The rate of accident saving calculated for the A14S (as assumed in the PAR), was therefore applied to the three additional arms included in the POPE evaluation.
- 4.5 Key accident trends for the predicted corrected appraisal include the following:

- ◆ In the 5 year pre-scheme period (April 2000 – March 2005) there were a total of 171 accidents (an average of 34.2 per year - higher than stated in the PAR);
- ◆ The accident severity (ratio of KSI's to all accidents) for this period was 9.4% (relatively unchanged from that presented in the PAR appraisal);
- ◆ Upon re-calculating the PAR predicted safety benefit using the updated accident data set, the first year accident saving is predicted to be 8.5 (marginally greater than predicted in the original PAR assessment – 8 PIAs); and
- ◆ The revised predicted opening year and scheme life safety benefits therefore equate to £665,000 and £3,473,000 respectively (around 600,000 more than originally predicted).

OUTTURN IMPACTS

- 4.6 Although only 24 months of accident data was available for use in the post opening evaluation, such a time period will provide a useful indication of the possible safety benefits emerging from changes implemented at the junction. In the two years following the scheme opening (January 2006 – December 2007) there was a total of 49 accidents at the junction (an average of 24 PIAs per annum).
- 4.7 **Table 4.1** provides a comparison of annual before and after accident rates at the junction

Table 4.1 – Accident Locations at A14 Spittals Interchange

Accident Location	Annual Average Number of PIA's	
	Before Scheme	After Scheme
Circulatory Carriageway	18.2	5.0
A14(N)	3.2	4.5
A141	3.2	0.5
A14(S)	6.6	11.5
A14(W)	2.0	2.5
Through Movements	1.0	0.5
TOTAL	34.2	24.5

- 4.8 Key points to note from the trends emerging from analysis of accident trends are:
- ◆ An overall accident saving of 9.7 PIA's per annum has materialised following scheme opening;
 - ◆ This saving is more favourable than the forecast accident reduction in the PAR saving an additional 1.2 accidents in the opening year;
 - ◆ The accident severity index has risen from 9.4% to 10.4% (due to the reduction in the overall number of accidents). The annual number of

severe accidents has reduced marginally from 2.8 per year to 2.5 per year. In the 5 years before the scheme there were an average of 0.4 fatal accidents per year, no fatal accidents occurred in the two years following the scheme opening.

- ◆ There has been a large reduction in the number of accidents occurring on the circulatory carriageway - from 18.2 per annum pre-scheme opening to 5.0 per annum post scheme opening. This represents a saving of 13.2 accidents per annum; and
- ◆ Overall the number of accidents occurring on the first kilometre of each approach arm has risen from 15.0 to 19.0 accidents per annum. The main changes on the approach arms are:
 - An increase of 6.6 accidents a year to 11.5 accidents per annum on the A14(S) – this could be attributed to the peak hour increase in traffic flows and vehicle speeds at the junction from this approach; and
 - A decrease of 2.7 accidents a year giving only 0.5 accidents per annum along the A141 – possibly attributed to the reduction speed of traffic passing through this junction in the peak hours from this approach.

MONETISED ACCIDENT SAVINGS

4.9 **Table 4.2** provides a summary of the predicted, predicted corrected and outturn safety impacts in monetary terms.

Table 4.2 – Predicted, Predicted Corrected and Outturn Monetary Benefits

	PAR Predicted	PAR Predicted-Corrected	Outturn
PVC	£1,742,530	£1,921,617	£1,962,423
Number of accidents saved in opening year (central growth)	8	8.5	9.7
Number of accidents saved over 5 year assessment period (central growth)	39.2	41.5	47.4
Average cost of accident in the opening year	£89,960	£89,960	£89,960
Annual accident benefit in opening year (2002 prices)	£721,000	£765,000	£873,000
Annual accident benefit in opening year discounted to 2002	£627,000	£665,000	£759,000
Accident benefits over 5 year assessment period discounted to 2002	£2,870,000	£3,044,000	£3,473,000
FYRR	36.0%	34.6%	38.7%

4.10 The key points to note from **Table 4.2** include:

- ◆ The outturn safety benefit is equivalent to a monetary saving of £759,000 in the first year and £3,473,000 for the five year appraisal period following scheme opening (2002 prices, discounted to 2002);

- ◆ The scheme's first year accident benefit (in monetary terms) is 21% greater than the original PAR estimate and 14% higher than the amended forecast;
- ◆ The scheme is forecast to save a total of 47 accidents over 5 years - this is 8 more than predicted; and
- ◆ The First Year Rate of Return (FYRR) for accident savings is 38.7% compared to 34.6% for the PAR, this suggests that the scheme will pay for itself within 3 years through the emergence of safety impacts alone.

Summary – Section 4:

- ◆ Out-turn accident savings of 9.7 accidents in the first year were larger than those predicted (8.5).
- ◆ The scheme has been successful in reducing accidents on the circulatory carriageway; the impact upon accidents occurring on the approach arms has been mixed.
- ◆ The accident severity index has risen from 9.4% to 10.4% (due to the reduction in the overall number of accidents). The annual number of severe accidents has reduced marginally from 2.8 per year to 2.5 per year. In the 5 years before the scheme there were an average of 0.4 fatal accidents per year, no fatal accidents occurred in the two years following the scheme opening.
- ◆ Based on the post opening data available to date the scheme is forecast to save approximately 8 more accidents over 5 years than predicted;
- ◆ In the opening year there has been an accident benefit of £744,000 (discounted to 2002), compared to the predicted figure of £627,000. This gives a FYRR of 38.7%.
- ◆ Overall, the scheme appears to have been successful in delivering its safety objective.

5. Environmental, Accessibility and Integration Impacts

INTRODUCTION

- 5.1 This section sets out the impacts of the providing traffic lights and the other scheme measures on the environmental, accessibility and integration sub objectives.
- 5.2 The forecast impacts of the scheme have been derived from the main body of the PAR document and completed AST. The outturn assessments have been completed through information gathered from site visits by members of the Atkins POPE evaluation team and as a desk-top research exercise in line with POPE guidance.

IMPACTS ON THE ENVIRONMENT

- 5.3 The installation of traffic signals was not expected to involve any significant impacts to the local environment. As a result the Environmental Impact Survey was not carried out by The Landscape Partnership as stated in the Implementation PAR, but was undertaken by Carillion-URS using an environmental checklist methodology. A copy of the environmental checklist has not been provided although no negative environmental impact has been identified on site as was stated in the PAR.
- 5.4 The majority of outturn environmental impacts of the scheme were as predicted in the PAR. A summary of the predicted and outturn impacts is summarised in Table 5.1.

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	No Impact	Neutral	The overall outturn change in AADT is less than 25% and the change in HGV flows is less than 20%
Local Air Quality	No Impact	Slightly Adverse	Under the PAR guidance the scheme has had an adverse impact on local air quality as there are properties within 50m of the carriageway and AADT has increased by over 700 vehicles.
Greenhouse Gases	No Impact	Neutral	Outturn change in total distance travelled was less than 10% (as inferred by available AADT data).
Landscape	No Impact	Neutral	The project involved the installation of traffic signals, although the environmental checklist from the PAR indicated that this was not expected to result in a significant impact on the surrounding landscape.
Townscape	No Impact	Neutral	Located away from urban/built up area.
Heritage of Resources	No Impact	Neutral	No impact on archaeological or noteworthy built heritage sites
Biodiversity	No Impact	Neutral	The project is not within or adjacent to a sensitive site, and does not conflict with any local HA biodiversity action plan objectives.
Water Environment	No Impact	Neutral	Negligible change to the volume and quality of water discharge.
Physical Fitness	No Impact	Neutral	Nominal cyclist/pedestrian activity before and after scheme implementation. No cycle/pedestrian facilities on site.
Journey Ambience	No Impact	Beneficial	There is a significant reduction to the accident rate at the junction, and some benefits due to reduced delays.

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ACCESSIBILITY AND INTEGRATION IMPACTS

5.5 The remainder of this section describes the forecast and out-turn implications of the A14 Spittals interchange improvements on the accessibility and integration sub-objectives.

Option values

PAR

- 5.6 Option values relate to improved public transport services they are the value put on a service by those who are not regular users but benefit from the increased number of options for travel. The PAR forecast that the scheme would have **no impact** on option values.

Outturn Assessment

- 5.7 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

- 5.8 The PAR forecast that the scheme would have **no impact** on severance.

Outturn Assessment

- 5.9 Site visits observed that improvements to the footway on the northern overbridge and footways either side of it (resurfacing in some areas and dropped kerbs) had been implemented. Therefore the outturn assessment was the scheme had had a **slightly-beneficial** impact upon severance. There was no evidence provided from site visits or other sources to suggest that such improvements at the junction had resulted in any increases in pedestrian or cyclist activity.

Access to the Transport System

PAR

- 5.10 The PAR forecast that the scheme would have **no impact** upon access to the transport system.

Outturn Assessment

- 5.11 Presently there are no bus services which use the A14 Spittals Interchange therefore the outturn assessment has concluded that the scheme has had **no impact** on access to the transport system.

INTEGRATION

Transport Interchange

PAR

- 5.12 The PAR forecast that the scheme would have **no impact** upon transport interchange

Outturn Assessment

- 5.13 There is no change in access to park and ride, bus or rail stations due to the scheme, and no creation or modification to the interchange facilities, therefore the outturn assessment on transport interchange is **no impact**

Land use policy

PAR

- 5.14 The PAR forecast that the scheme would have **no impact** upon land use policy.

Outturn

- 5.15 The scheme is consistent with the Cambridgeshire Local Transport Plan, Appendix 8 of Cambridgeshire's LTP2 notes *"It would be extremely advantageous if the Highways Agency were to implement a signalisation scheme for Spittals Interchange, which is currently a significant congestion and accident hotspot"*. Therefore the outturn assessment on Land use policy has been classified as **slightly beneficial**.

Other government policies

PAR

- 5.16 The PAR forecast that the scheme would have no impact upon land use policy.

Outturn Assessment

- 5.17 The scheme has no recognisable effect on Government policies, and is in agreement that there would be **no impact** on any Government policies.

Summary – Section 5:

- ◆ The scheme has generally had little impact upon the Environmental, Accessibility and Integration objectives; this is in agreement with the PAR.
- ◆ The scheme delivered slightly adverse impacts upon local air quality due to an observed increase in AADT.
- ◆ The scheme delivered journey ambience benefits through a reduction in the number of accidents at the interchange, and the improved 'readability' of the junction.
- ◆ The future implementation of the signalisation scheme was regarded as 'extremely advantageous' in the Cambridgeshire LTP2, therefore the scheme has had a beneficial impact on land use policy.

6. Summary of Findings and Recommendations

INTRODUCTION

6.1 The POPE assessment of the A14 Spittals Interchange improvements has utilised the post opening data available to examine the outturn impacts of the scheme compared to those forecast in the 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 the A14 Spittals Interchange.

6.2 For reference, copies of the original AST and EST are included in Appendix A and B respectively.

SUMMARY OF KEY IMPACTS

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	Economy: Juice	Economy: Juice
Present Value Year	2002	2002	2002
Discount Rate	3.50%	3.50%	3.50%
Scheme Opening Year	2006	2006	2006
Evaluation Period	5 Years	5 Years	5 Years
Economy Benefits	£737,000	£74,000	£434,000
Accident Benefits	£2,870,000	£3,044,000	£3,473,000
Total Benefits (PVB)	£3,607,000	£3,118,000	£3,907,000
Total Cost (PVC)	£1,742,530	£1,927,742	£1,962,423
Net Present Value (NPV)	£1,864,470	£1,190,258	£1,944,577
Benefit Cost Ratio (BCR)	2.07	1.62	1.99
First Year Economy Benefits	-£169,000	£15,000	£85,000
First Year Accident Benefits	£627,000	£665,000	£759,000
First Year Total Benefits (PVB)	£458,000	£680,000	£844,000
First Year Rate of Return (FYRR)	26.3%	35.3%	43.0%

6.3 Key points to note from the summary of results presented in Table 6.1 include:

- ◆ The total first year benefits of the scheme were £844,000 - 24% greater than predicted. Both the safety and economic benefits were underestimated;
- ◆ The scheme was delivered at 2% over the predicted corrected cost of £1,921,617; and
- ◆ The BCR of the scheme over the appraisal period of 5 years is 1.99 compared to a predicted BCR of 1.62.

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

Economy Impacts

- ◆ Overall, between 2004 and 2007, peak hour usage of the junction increased by 9% in the AM peak and 1% in the PM peak. There are an additional 423 vehicles in the AM peak hour and 62 more vehicles in the PM peak hour suggesting that the junction has become more heavily used in the peak periods following the scheme opening.
- ◆ Traffic flows increased on the A14 North and A14 South during both peak periods, although flows increased on the A141 only in the PM Peak and fell on the A14 West during both peak periods. This supports the consultation feedback from Cambridge County Council that traffic flows have not been improved on these arms.
- ◆ Outturn opening year and scheme economic benefits are £85,000 and £434,000 respectively.
- ◆ Predicted economic impacts were underestimated. Monetary impacts were forecast to be £15,000 in the opening year and £74,000 over the 5-year appraisal period.
- ◆ The scheme's outturn cost was underestimated by 2% (£1,962,423 compared to a predicted corrected cost of £1,927,742).
- ◆ Only peak hour impacts have been considered in the evaluation of this scheme (due to limited data being available for time periods outside of the AM and PM peaks) however, the scheme may have impacted inter-peak and off-peak journey times.

Safety Impacts

- ◆ The scheme saved 9.7 accidents in the opening year (47.4 accidents over the 5-year scheme life);
- ◆ Opening year safety benefits are equivalent to £759,000 compared to a predicted corrected benefit of £665,000;
- ◆ The total outturn safety benefit over 5 years of £3,473,000 was 14% higher than predicted;
- ◆ The accident severity index has increased from 9.4% to 10.4%, although this could be due to a reduction in the total number of accidents, and the overall number of severe and fatal accidents reduced.
- ◆ The scheme was successful in reducing the number of accidents occurring on the circulatory carriageway, although results on the approach arms were mixed.

Environmental, Accessibility and Integration Impacts

6.5 As predicted in the PAR, the scheme has had little impact upon environmental, accessibility and integration 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 ambiance due to a reduced number of accidents and improved 'readability' of the roundabout; and
- ◆ Beneficial impacts on land use policy due to consistency with the Cambridgeshire LTP2.

KEY LESSONS LEARNT

6.6 A number of general lessons can be learnt from this evaluation;

- ◆ The scheme was implemented in accordance with the latest PAR provided to Atkins;
- ◆ Despite offering only a temporary solution, the scheme has provided good value for money as illustrated by a BCR of 2;
- ◆ Technical data can help to support issues identified by stakeholders and vice versa, illustrating the value of anecdotal evidence in scheme appraisal;
- ◆ As with many other large LNMS schemes the impact of junction improvements can be variable by arm;
- ◆ Given that prior to opening the junction was operating at capacity, the observed 1-9% increase in traffic volumes at the junction can be attributable to enhanced capacity;
- ◆ The availability of pre-opening journey time/delay data can help verify both the extent of an issue being addressed and the modelling outputs used to inform scheme appraisal;
- ◆ It appears that the value of this scheme (as per the PAR) was misjudged due to the original delays estimated from ARCADY being underestimated;
- ◆ Journey time benefits can be focused on a single approach at the expense of movements from other approaches;
- ◆ Marginal journey time savings can be observed even where the scheme is predominantly lead by safety objectives;
- ◆ More observed data is required to update our understanding of potential MOVA benefits;
- ◆ The area of analysis for accidents was too narrow and did not fully consider the wider changes in the occurrence/distribution of accidents that may emerge as a result of changing queue lengths on other arms.

RECOMMENDATIONS

6.7 In the light of this study, the following recommendations are made to the HA:

- ◆ This evaluation has illustrated that there is value in the HA considering temporary schemes where major schemes may be planned in the medium term;
- ◆ Where feasible, the PAR appraisal process should include some observed journey time/delay data to verify journey time outputs from the model. This will help to verify the extent of the original problem addressed by the scheme;
- ◆ Collection of pre and post-opening journey time data will enable the POPE and pre-scheme appraisal processes to derive a more accurate appreciation of outturn journey time benefits;
- ◆ MACs should use their own and stakeholders anecdotal evidence to support technical analysis undertaken as part of the PAR process;
- ◆ For schemes involving the introduction of signals on roundabouts, the PAR should take into account journey time delay which may occur in the inter-peak periods;
- ◆ The PAR evaluation did not include any consideration of the ‘increased’ accident risk on roads associated with delays and tailbacks;
- ◆ Consideration should be given to how the impact of HA schemes on local authority routes can be minimised and where required mitigated; and

CONCLUDING REMARKS

- 6.8 To summarise, this POPE evaluation has demonstrated that the scheme has delivered good value for money. Overall, the outturn journey time benefits were larger than forecast in the POPE assessment. The majority of the scheme benefits come from accident savings which were 14% lower than in the PAR assessment. The scheme has delivered small user journey time benefits in contrast to dis-benefits forecast in the PAR appraisal. It is important to note that whilst modelling can provide an appreciation of likely delays or journey time benefits emerging from a scheme. It would have been preferable to have observed data to use alongside the model. Therefore the journey time benefits calculated in this report should only be used to provide the Highways Agency and other readers with an indication of the overall scheme benefits.

Appendix A – Original Scheme AST

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

Objectives	Sub-Groups	Qualitative Impacts	Quantitative Measure	Assessment
ENVIRONMENT	Noise	No Impact	-	-
	Local Air Quality	No Impact	-	-
	Greenhouse Gases	No Impact	-	-
	Landscape	No Impact	-	-
	Townscape	No Impact	-	-
	Heritage of Historic Resources	No Impact	-	-
	Biodiversity	No Impact	-	-
	Water Environment	No Impact	-	-
	Physical Fitness	No Impact	-	-
	Journey Ambience	No Impact	-	-
SAFETY	Accidents	Substantial accident reduction – accident saved in 5 years	PIA Savings 41.5 (central case)	£3.044m
	Security	No Impact		
ECONOMY	Public Accounts		Central Govt PVC £1927.742	PVC £1.927m
	Business Users & Providers			PVB £0.074m
	Consumer Users	Journey times – positive impact	Users PVB £74,000	
	Reliability	Improved efficiency of roundabout	Slight Beneficial	200,000
	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	Traffic signals not expected to have a significant impact on Landscape.	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	Nominal cyclist/pedestrian activity	Not applicable	Neutral
	Journey Ambience	Significant reduction in accident rates and improved 'readability' of the junction.	Not applicable	Beneficial
SAFETY	Accidents	The 24 months of accident data indicates that the scheme has had a positive impact on reducing accident levels	47.4 PIAs saved (central case)	£3,473,000
	Security	The scheme has no impact	-	Neutral
ECONOMY	Public Accounts		-	PVC £1,962,423
	Business Users & Providers	No Impact	Not applicable	Neutral
	Consumer Users	User benefit from reduced delays	4304 hours saved in opening year	£32,000
	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 to the footway on the northern overbridge and on either side of it	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	Scheme supported in the Cambridgeshire LTP2	Not applicable	Slightly Beneficial
	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.
COBA	Cost Benefit Analysis – a computer program which compares the costs of providing road schemes with the benefits derived by road users (in terms of time, vehicle operating costs and accidents), and expresses the results in terms of a monetary valuation. The COBA model uses the fixed trip matrix.
DM	'Do Minimum'
DMRB	Design Manual for Roads and Bridges
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.
RMS	Route Management Strategy
VOT	Value of Time