POPE of LNMS

A303 Countess Roundabout LNMS Evaluation Report

Highways Agency

November 2014

HIGHWAYS AGENCY

Safe roads, reliable journeys, informed travellers

An executive agency of the Department for Transport

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Glossary

Term	a.k.a.	Definition
Accessibility	**-**	Accessibility can be defined as 'ease of reaching'. The accessibility objective is concerned with increasing the ability with which people in different locations, and with differing availability of transport, can reach different types of facility.
Annual Average Daily Traffic	**AADT**	The 24 hour total traffic flow for the average day of the year
Automatic Number Plate Recognition	**ANPR**	A mass surveillance method using optical character recognition on images to read vehicle registration plates.
Appraisal Summary Table	**AST**	This records the impacts of the scheme according to the Government's five key objects for transport, as defined in **DfT** guidance contained on its **Transport Analysis Guidance** web pages, **WebTAG**
Automatic Traffic Count	**ATC**	An automated method of recording the volume (and sometimes classification) of vehicles passing a particular point on a road.
Average Daily Traffic	**ADT**	The 24 hour total traffic flow on an average day over a certain time period (Monday – Sunday)
Average Weekday Traffic	**AWT**	The 24 hour total traffic flow on an average weekday over a certain time period (Monday – Friday)
Benefit Cost Ratio	**BCR**	Benefit Cost Ratio is a ratio identifying the relationship between cost and benefits of a proposed project
Cost Benefit Analysis	**COBA**	A **HA** sponsored computer program. Estimates the effects of highway improvements, in terms of time, vehicle operating and accident costs on the users of the road system.
Department for Transport	**DfT**	A Government department whose objective is to oversee the delivery of a reliable, safe and secure transport system that responds efficiently to the needs of individuals and business whilst safeguarding our environment. The **HA** is an executive of the **DfT**
Discounting	**-**	A technique used to compare costs and benefits that occur in different time periods and is the process of adjusting future cash flows to their present values to reflect the time value of money, e.g. £1 worth of benefits now is worth more than £1 in the future. A standard base year needs to be used which is 2002 for the appraisal used in this report
Dis-benefit	**-**	A negative benefit or something that detracts from the performance.
Evaluation Summary Table	**EST**	In **POPE** studies, this is a summary of the evaluations of the **TAG** objectives using a similar format to the

		forecasts in the **AST**
First Year Rate of Return	**FYRR**	First Year Rate of Return is the ratio of money gained on an investment relative to the amount of money invested.
Highways Agency	**HA**	An Executive Agency of the **DfT,** responsible for operating, maintaining and improving the strategic road network in England
Killed or Seriously Injured	**KSI**	A term used to describe the number of people killed or seriously injured as a result of **PICs.**
Local Network Management Scheme	**LNMS**	**LNMS** are improvement schemes where total overall estimated cost (including design, land, works, supervision, risk and VAT) is less than £10 million. They are categorised by the Government under Safety, Economy, Accessibility, Integration and Environment
Managing Agent Contractor	**MAC**	Responsible for the operation, maintenance, and improvement of the motorway and trunk road network of a **HA** area
New Approach to Appraisal	**NATA**	Used for transport scheme appraisal since 1998
Non Motorised User	**NMU**	Includes pedestrians, cyclists, horse riders and disabled people, whose needs must be addressed. An **NMU** audit considers the specific needs of these vulnerable road users
Project Appraisal Report	**PAR**	A key document summarising the need for a project, plus its costs and benefits (including those that cannot be quantified in monetary terms)
Personal Injury Collision	**PIC**	A term commonly used to refer to road accidents
Post-Opening Project Evaluation	**POPE**	Before and after monitoring of all highway schemes in England
Present Value of Costs	**PVC**	Present Value of Costs is a term used in cost-benefit analysis and project appraisal that refers to the discounted sum, or Present Value, of a stream of costs associated with a project or proposal
Risk Allowance	**-**	Risk refers to identifiable future situations that could result in an over spend or under spend occurring. The base cost estimate is adjusted to account for risk in order to obtain more accurate cost estimates
Severance	**-**	Community severance is the separation of adjacent areas by road or heavy traffic, causing negative impact on non-motorised users, particularly pedestrians
-	**STATS 19**	A database of injury accident statistics recorded by police officers attending accidents
Traffic Database System	**TRADS**	Traffic count database developed by the **HA**, to hold data from traffic monitoring sites on the strategic network

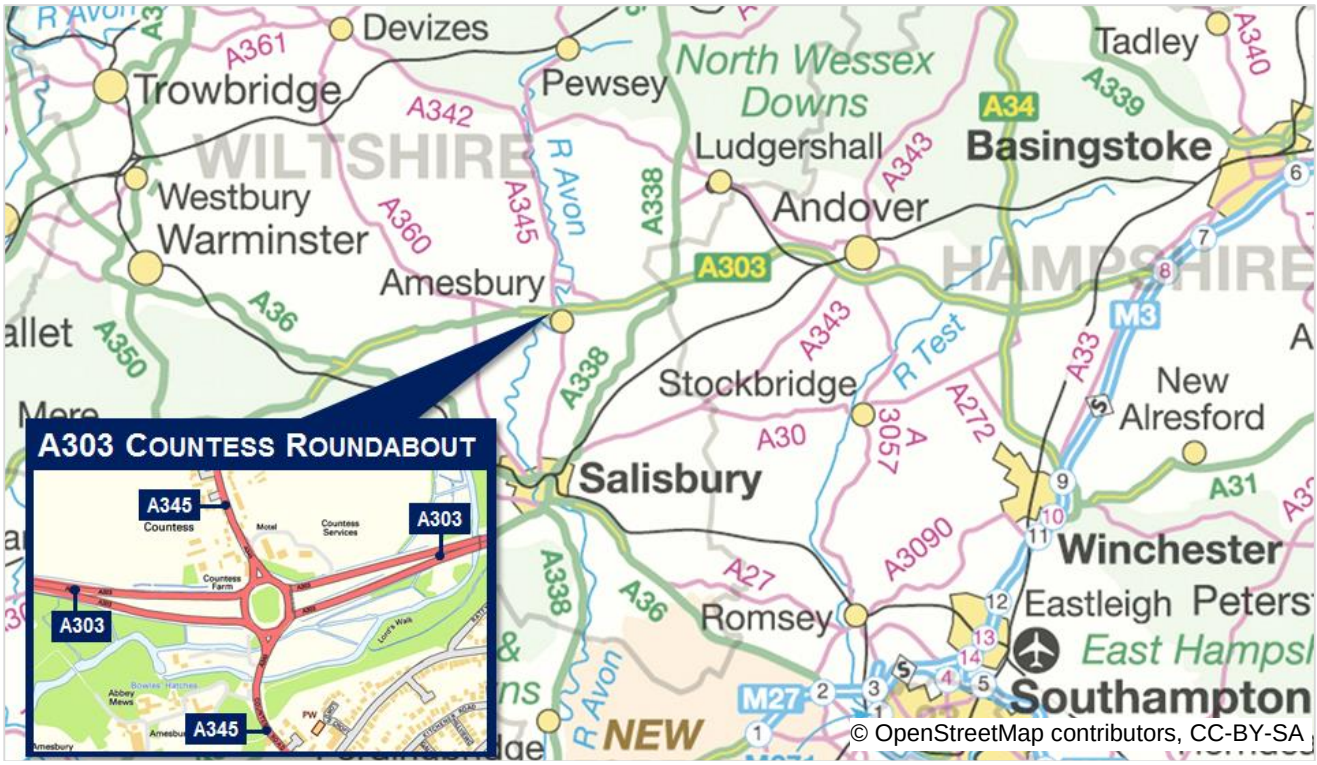
1. Introduction

Background

1.1. This report is the Post-Opening Project Evaluation (POPE) of the **A303 Countess Roundabout** Local Network Management Scheme (LNMS).

1.2. The A303 Countess Roundabout is located within Wiltshire, adjacent to the town of Amesbury. The roundabout connects the A303 with the A345 Countess Road, and is the first interruption to A303 westbound traffic on the route from London to the West Country. The location of the scheme is shown in **Figure 1-1**.

Figure 1-1 Location Plan



1.3. The roundabout experienced significant congestion, particularly at weekends and during school holidays. This congestion restricted traffic flow along the A303, and had an impact on the operation of the A345. The roundabout was also subjected to high approach and circulatory speeds through the junction. There was a consequent high rate of 'shunt-type' accidents and other speed related accidents.

1.4. Opening in May 2011, the A303 Countess Roundabout LNMS aimed to address these issues through the implementation of traffic signals on all approaches and the circulatory carriageway. In addition, the A303 approaches and the north / south sides of the circulatory carriageway were widened to provide three lanes.

1.5. The scheme also involved the introduction of a unified speed restriction on approach to and throughout the roundabout. More specifically, this involved a speed limit reduction on the A303 approaches from 70mph to 40mph, to be in line with the A345 approaches. Other measures included replacement of signage, safety barriers and improvements to the exit geometry.

Purpose of this report

1.6. As part of an ongoing programme, whereby the Highways Agency (HA) evaluates the impacts of trunk road schemes, Atkins is commissioned to undertake post-opening evaluations of LNMS with an implementation cost of between £25k and £10m.

1.7. This report specifically sets out the results of the POPE of the A303 Countess Roundabout LNMS. More specifically, this report examines the economic and safety impacts resulting from the improvements, with consideration also given to the main environmental, accessibility and integration impacts.

1.8. It is intended that the findings from this report will feed into a wider summary of the outcomes of POPE. This is a document (namely the LNMS Annual Evaluation Report) produced in the 4th quarter of each year outlining the key messages from the entire POPE of LNMS process.

2. Scheme Detail

Introduction

2.1. This section of the report outlines the pre-scheme and post-scheme layout of the roundabout, using photos, diagrams and site observations to illustrate the changes made to the highway network. In addition, this section contains the views and feedback on the scheme from key stakeholders.

Background

2.2. The A303 Countess Roundabout LNMS introduced signals on all four approaches and circulatory carriageway. Other improvements included a 40mph speed limit on A303 approaches, lane widening and replacement of signage / safety barriers. **Table 2-1** summarises the scheme details.

Table 2.1 – Summary of A303 Countess Roundabout LNMS

Scheme name	A303 Countess Roundabout LNMS
Area	2
Opening date	13th May 2011 (construction began 17th January 2011)
Category	Safety
Reason for scheme	The scheme was introduced to address delay and congestion through the roundabout, particularly at weekends and during holiday periods. Furthermore, the scheme aimed to improve the safety and capacity at the junction and to ease traffic movements along the A303 and A345.
Objectives	Reduce the severity and number of accidents
History	A303 Podimore Roundabout, approximately 70km west on the A303, is of a similar layout to A303 Countess Roundabout. Until recently, this was the worst accident cluster site on the A303. In 2005/06, the roundabout was signalised and since then there has been a dramatic decrease in the number of accidents. This is believed to be due to the reduction in circulatory speeds resulting from the signals. Therefore, it was considered that implementing a scheme of similar nature at the A303 Countess Roundabout may also lead to beneficial impacts.

Location

2.3. Countess Roundabout in Wiltshire connects the A303 with the A345 Countess Road.

2.4. The A303 is a 92-mile long trunk road, running from M3 J8 (south of Basingstoke) in the east, to Exeter in the west. The route is a major link to the West Country, popular with both holidaymakers from London and the Home Counties, and a high proportion of HGV traffic.

2.5. The A303 begins in the east as a dual carriageway, with Countess Roundabout located after almost 30 miles. The roundabout is the first interruption to westbound traffic flow on the route.

2.6. At Countess Roundabout, the A303 connects with the A345. The A345 is a frequently used, single carriageway A road that runs in a north – south direction through Countess Roundabout. The road runs from Marlborough and the A4 in the north, to Salisbury in the south.

2.7. Past Countess Roundabout, the A303 continues as a dual carriageway for a further mile to the west of the roundabout before reducing to a single carriageway section. Approximately two miles to the west of Countess Roundabout, is Stonehenge World Heritage site. This section of the A303 often experiences congestion due to the combination of tourist traffic for Stonehenge and this being a single carriageway stretch.

2.8. As such, this section of the A303 has been subject to several upgrade proposals over the years. This has included previous designs such as widening both carriageways or providing a two-mile tunnel under Stonehenge – both very expensive options. More recently, the Government has given permission to proceed to a A303 Stonehenge feasibility study to discover solutions to the congestion issues.

2.9. The A303 Countess Roundabout lies next to the town of Amesbury, and nine miles north of Salisbury. **Figure 2-1** indicates the general context of the junction in relation to the surrounding towns, villages and cities.

Figure 2-1 Junction Location Context Plan

Imagery ©2014 DigitalGlobe, Getmapping plc, Infoterra Ltd & Bluesky, The GeoInformation Group, Mapdata ©2014 Google.

Pre Scheme Opening

2.10. All arms of the A303 Countess Roundabout prior to the opening of the scheme were priority controlled. All roundabout approaches were also two lanes in width, with the exception of the A345 southbound approach, which had three lanes. The circulatory carriageway was two lanes in width.

2.11. Before the scheme was introduced, the A303 approaches were subject to the national speed limit (70mph), while the A345 northbound approach was 30mph and the southbound approach was 40mph. **Figure 2-2** shows an aerial view of the roundabout layout from 2009, two years prior to the opening of the scheme.

Figure 2-2 Pre-scheme Junction Layout (Google Maps)

Imagery ©2014 DigitalGlobe, Getmapping plc, Infoterra Ltd & Bluesky, The GeoInformation Group, Mapdata ©2014 Google.

2.12. Some of the issues occurring prior to the opening of the scheme include:

1) **Poor geometry / high approach and circulatory speeds**
   The Roundabout was constructed in the 1960's and was designed to allow for grade separation at a later date. As a result, its geometry has an elongated central section, which contributed to high circulatory traffic speeds. It also created difficulties for drivers entering the roundabout who were unable to assess the speed of traffic already circulating the roundabout. This results in hesitation and a high proportion of shunt accidents.

2) **Congestion**
   Approximately one mile to the west of the roundabout, the A303 westbound decreases to single carriageway, which frequently causes a bottleneck. This traffic often stretches right back to Countess Roundabout, and because the roundabout was priority controlled, there was no influence over traffic entering the roundabout. Therefore, westbound traffic continued to enter the roundabout, blocking the cross traffic movement on the A345 Countess

Road. As a result, the roundabout frequently became gridlocked, causing severe delays to the surrounding road network and in Amesbury. This typically occurs in the weekday peaks, Saturdays, school holidays and bank holiday periods.

3) **High number of accidents**
The Roundabout has one of the highest accident rates on the A303, with a notable number resulting from shunt accidents at the A303 approaches. The A303 Roundabouts Review - Countess Roundabout (InterRoute Area 2, 2008) concluded that these accidents result from excessive approach speeds to the roundabout and the poor geometry of the roundabout entries and exits.

4) **Inadequate signage**
Aspects of the existing signage did not comply with the current Traffic Signs Regulations and General Directions (TSRGD), and it was considered that this may cause confusion and contribute to the number of accidents.

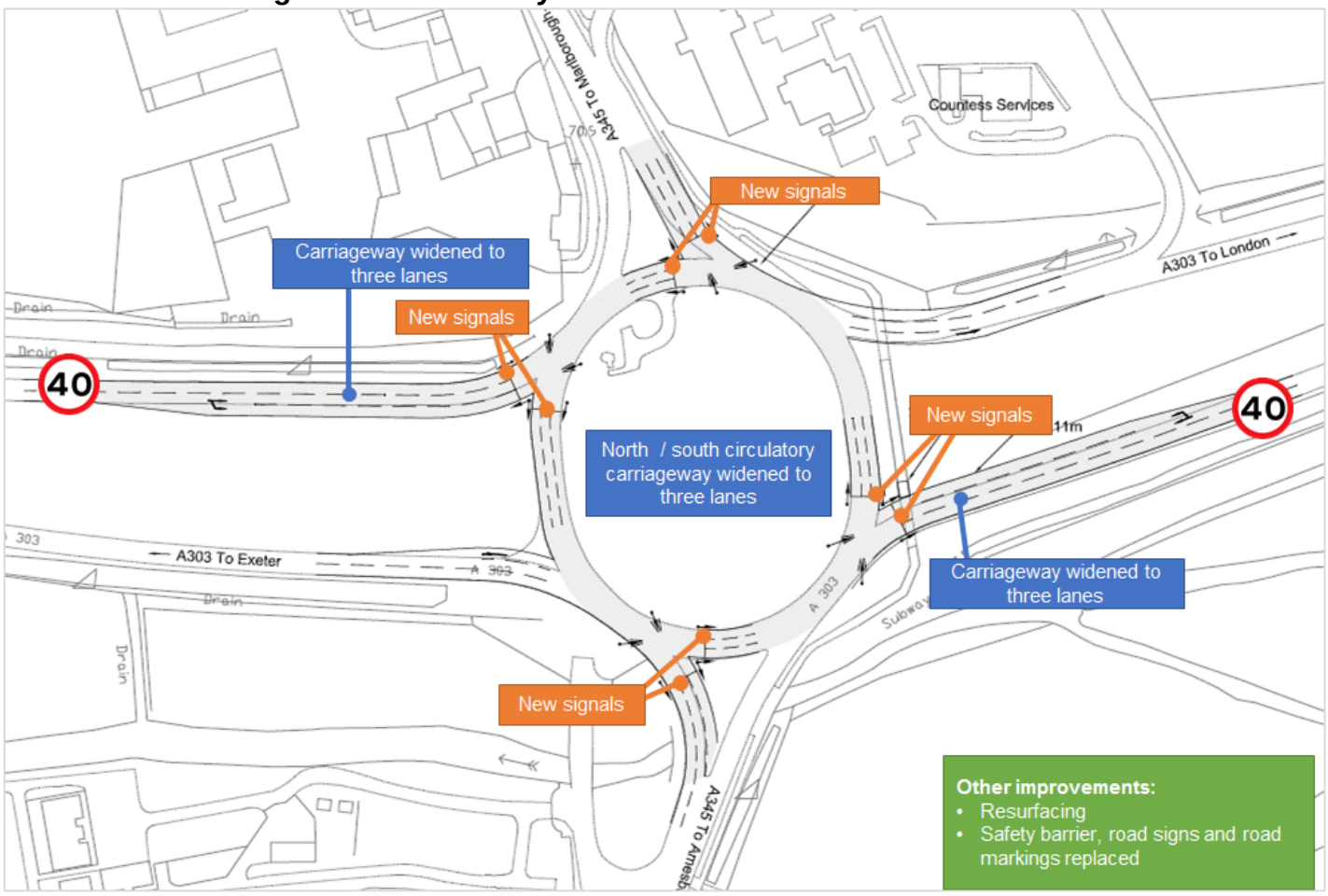
2.13. The A303 Countess Roundabout LNMS was introduced to resolve these issues. The design was based on that introduced at the A303 Podimore Roundabout, further west on the A303. This roundabout is of a similar layout to Countess and had one of the worst accident rates on the A303. The A303 Podimore Roundabout LNMS involved signalisation of all arms, and post-scheme analysis found that there had been a dramatic decrease in the number of accidents – believed to be due to the reduction in circulatory speeds resulting from the signals.

2.14. The scheme was expected to have a beneficial impact on safety and reduce the severity and number of accidents. The PAR noted that the scheme would not have any monetary impact for journey times across the roundabout. This was because the dis-benefits of a speed limit reduction on the A303 were anticipated to cancel out any benefits from reduced congestion from the new signals.

Post Scheme Opening

2.15. The A303 Countess Roundabout opened to schedule, on the 13th May 2011. A summary of the works carried out is illustrated in **Figure 2-3**. It is important to note that this is an earlier drawing and as such, some minor details were changed for the final scheme. For example, the A345 approach to the roundabout from the south shows three lanes when in reality, the scheme kept this approach at two lanes.

Figure 2-3 Summary of A303 Countess Roundabout Works



Installation of traffic signals

2.16. The main feature of the scheme was the installation of MOVA traffic signals on all four approaches to the roundabout and the circulatory carriageway. **Figure 2-4** shows the A345 northbound roundabout approach pre and post scheme opening, and **Figure 2-5** displays the signals post scheme opening on the A303 eastbound approach.

Figure 2-4 A345 Northbound Roundabout Approach

Pre-scheme layout (2008)

Post-scheme layout (2011)

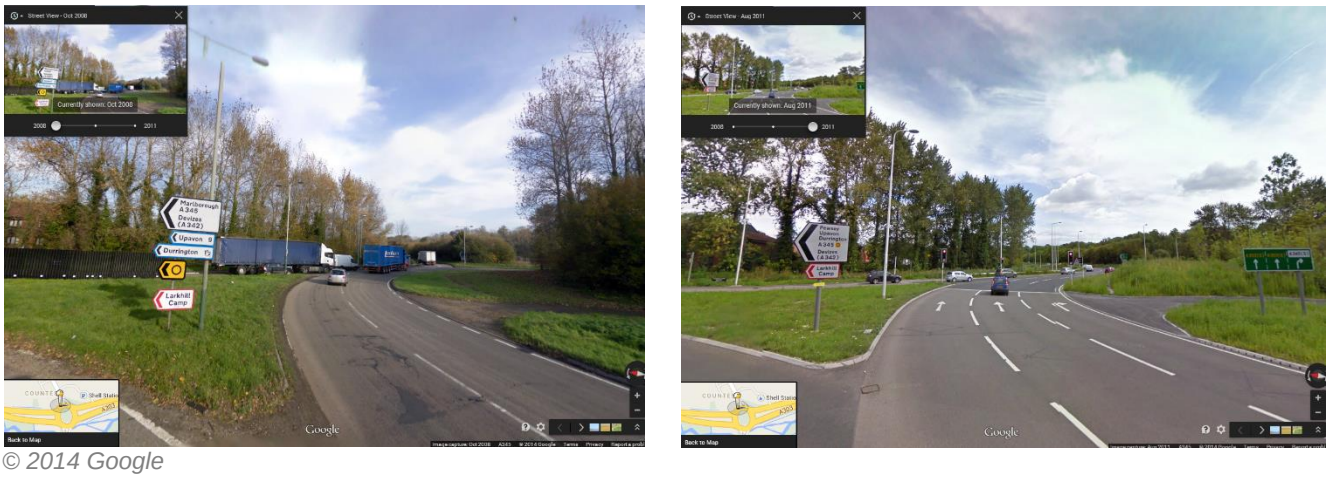
Figure 2-5 A303 Eastbound Roundabout Approach

Carriageway widening

2.17. The carriageway has been widened from two to three lanes on the A303 approaches to the roundabout. The north and south side of the circulatory carriageway have also been widened to three lanes. Whilst the east and west sides of the roundabout have been widened, they remain as two lanes. **Figure 2-6** compares the north side of the circulatory carriageway, pre and post scheme opening.

Figure 2-6 Countess Roundabout Circulatory Carriageway (north side)

Pre-scheme layout (2008) *Post-scheme layout (2011)*



Unified speed restriction

2.18. To curtail high approach and circulatory speeds, a unified speed restriction of 40mph has been applied throughout the roundabout. This primarily affects the A303, where the speed limit was previously 70mph. The purpose of this measure was to ensure that there was a consistent speed limit across the roundabout.

Other improvements

2.19. As part of the works, the road has been resurfaced across the roundabout and new lane markings / lining have been introduced. In addition, there is new directional signing and 40mph speed limit signs.

Figure 2-7 New signage (post-scheme opening)

Above: Left image shows new directional signing and warning of the signals / 40mph speed limit. Middle image shows new lane signage. Right image shows 40mph speed limit roundels.

2.20. Minor works involving the renewal of lighting columns, lanterns and installation of associated cables were also carried out as part of a separate maintenance scheme. These works were carried out at the same time, and also involved the replacement and refurbishment of certain sections of the existing drainage system. Due to the nature of the works, it is not expected that this will have had an impact on the A303 Countess Roundabout LNMS of which this report refers to.

Site Observations

2.21. A site visit was undertaken during the PM peak (16:00 – 18:00) on Thursday 3rd July and the AM peak (07:30 – 09:30) on Friday 4th July. At the beginning of the PM peak on the Thursday, there was a broken down vehicle on exit from the roundabout onto the A303 eastbound. However, this did not appear to be causing any major traffic issues and the incident was quickly resolved.

2.22. The scheme appeared to have been implemented as described in the PAR. In both the AM and PM peaks, the roundabout appeared to be operating very well with very little instances of queuing.

2.23. To the west of the roundabout on the A303 westbound, there were long tailbacks in the PM peak where the A303 decreases from two lanes to one. However, this is not as a result of the scheme.

Stakeholder Feedback

2.24. While the analysis in this report can consider the quantifiable impact of this scheme based on empirical data, it is also worth considering the opinions of

major stakeholders of the scheme. For example, a scheme may save journey times in practice, but if this saving is not perceived, the scheme may not be as successful as first thought.

2.25. The major stakeholders contacted for feedback on the A303 Countess Roundabout were:

- Highways Agency Project Sponsor;
- Stonehenge Visitor Centre (English Heritage);
- Amesbury Town Council; and
- Salisbury Reds (bus company).

2.26. No response was received from Amesbury Town Council or Salisbury Reds, but the Highways Agency and Stonehenge Visitor Centre have provided comments. The remainder of this section outlines the responses received.

Highways Agency

2.27. Mark Arberry, Project Sponsor at the Highways Agency provided brief feedback on the scheme:

"My personal view is that the installation of signals on Countess along with the extra capacity that was created at the roundabout has **improved safety**. Some **issues still remain when the traffic backs up along the A303** but this is largely due to the carriageway reducing from dual to single lane to the west of the junction which causes traffic to tail back to the roundabout and beyond."

Stonehenge Visitor Centre

2.28. Kate Davies, General Manager of Stonehenge Visitor Centre responded with feedback from the scheme, but noted that she was not in post in 2011 when the scheme opened. However, her general observations are as follows:

"The roundabout **seems to work better with lights**. However it seems that the congestion on the A303 is increasing, so through that observation, it leads me to believe that the works have not improved the experience for visitors – that doesn't mean the roundabout isn't easier to navigate."

"I have spoken to a colleague who has been in post for many years they say that they use the roundabout from time to time and don't have any problems with it. However, problems with Countess Roundabout were always relatively insignificant compared with the **bottleneck where the two lanes merge into one**."

2.29. Overall, the feedback seems to suggest that A303 Countess Roundabout is operating well. However, there are notable issues to the west of the roundabout where congestion occurs as the A303 becomes single carriageway.

3. Traffic Volumes

Introduction

3.1. This section of the report considers the impact that the A303 Countess Roundabout LNMS has had on traffic volumes.

Data Sources

3.2. As scheme planning and construction is a process that takes a number of years, it is important to understand how traffic volumes have changed over time and whether this will impact the way the scheme performs. To understand this, the following traffic data has been assessed:

- Department for Transport (DfT) National Road Statistics;
- Highways Agency (HA) Traffic Database System (TRADS) for the A303 eastbound and westbound;
- DfT Annual Average Daily Flow (AADT) data for the A345 SB; and
- Classified Turning Count at the roundabout (July 2014).

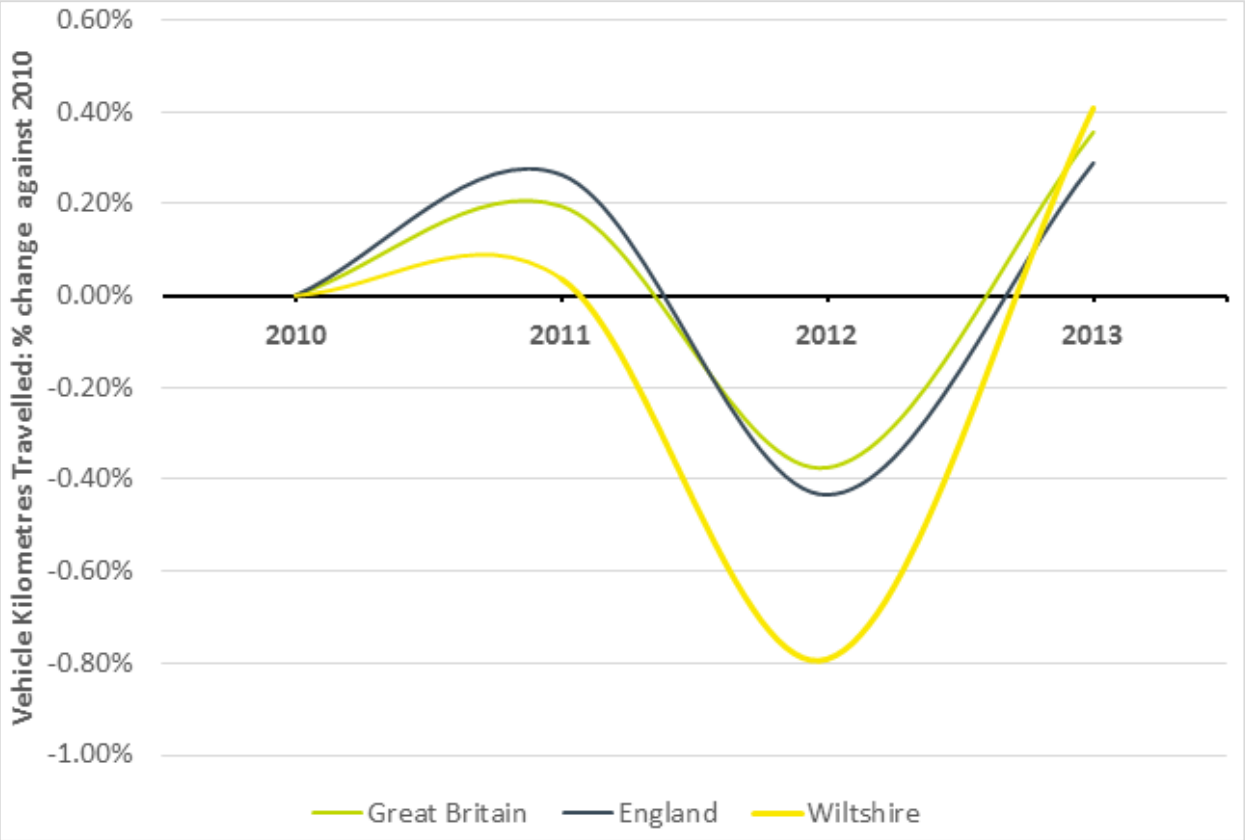
Vehicle-Kilometres

National Trends

3.3. The development and implementation of the scheme needs to be considered in the context of national, regional and local trends. DfT statistics on vehicle-kilometres travelled by road traffic provides this, and the data is available to 2013[1]. **Figure 3-1** presents the percentage change in vehicle kilometres travelled from 2010, the year that the scheme's Project Appraisal Report (PAR) was produced.

[1] DfT Road Statistics for Local Authorities 1993-2013 (www.gov.uk/government/organisations/department-for-transport/series/road-traffic-statistics)

Figure 3-1 Annual national, regional and district trends: million vehicle kilometres travelled, % change against 2010 (PAR year)



3.4. The data provided shows the following changes in vehicle kilometres travelled compared to 2010:

- **Great Britain / England:** there have been fluctuations in distance travelled since 2010; from 2010 to 2011 there was an increase, a decrease between 2011-2012 and a return to 2011 levels in 2013
- **Wiltshire:** the data follows a similar pattern to that in Great Britain and England, with an increase in 2010-2011, and then a sharp decrease in 2011-2012. In 2012-2013, distance travel began to increase again before increasing further in 2013.

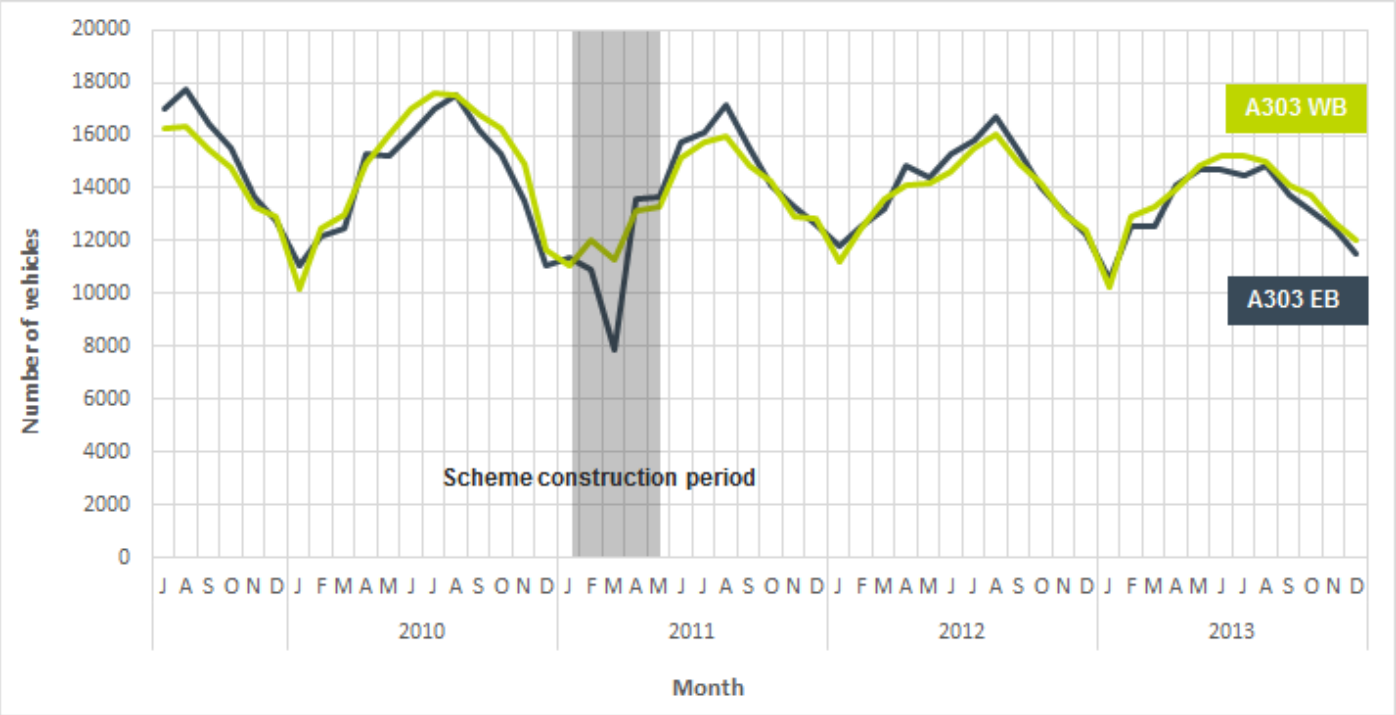
3.5. The data provided in Figure 3-1 illustrates that in Wiltshire, there has been overall increase in distance travelled since 2010. This is broadly in line with the trends experienced across England and Great Britain.

Traffic Volumes

A303 eastbound and westbound

3.6. Data obtained from TRADS count sites on the A303 eastbound and westbound approaches to the Roundabout have been evaluated. The Average Weekday Traffic (AWT) on a monthly basis is shown in **Table 3-2**.

Figure 3-2 Monthly AWT on the A303 EB and WB Approaches



3.7. The data shows clearly that there are substantial variations in traffic flow based on the time of year. In some years, traffic flow in the summer months is over 50% greater compared to the winter months. It can be seen that traffic flows usually reach their peak in August, with the overall peak period being between June and September of each year.

3.8. The large variations in traffic flows across the year are likely due to a combination of seasonal variations and tourist traffic on top of this. As such, it is likely that the scheme may perform differently depending on the time of year. Therefore, the analysis of journey times in Section 4 is carried out over two separate periods - high tourism (June – September) and low tourism (October – May).

3.9. In addition, Figure 3-1 shows that traffic flow patterns have remained relatively consistent before and after implementation of the scheme. However, there appears to have been a steady decline in traffic over time.

A345 southbound

3.10. AADT data is available for the A345 southbound from the DfT website. It is only available in annual format, and is shown in **Table 3.1**. This demonstrates that the change in yearly traffic flows is relatively small at this location. A345 northbound flows are unavailable for this time period, but it is expected that these would remain consistent with the flows on the A345 southbound, at approximately 12,000 vehicles per year.

Table 3.1 – A345 Southbound Count Data

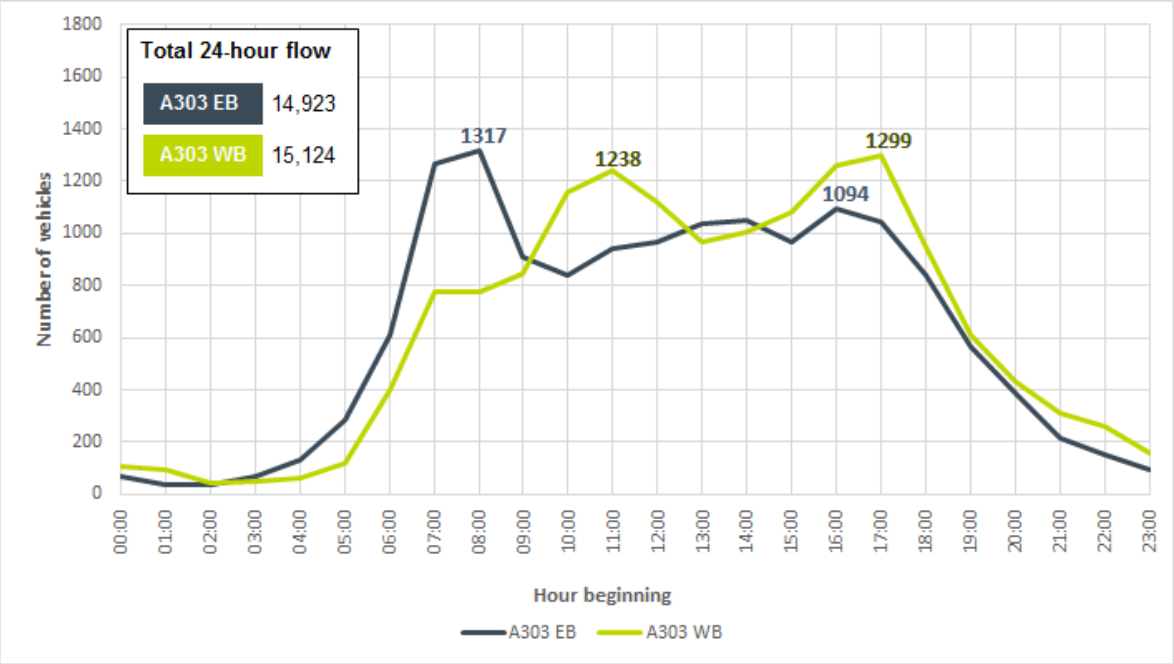
Year	Yearly Flow
2009	12,185
2010	12,028
2011	12,179
2012	11,980
2013	12,067

Traffic Volume – Daily Traffic Patterns

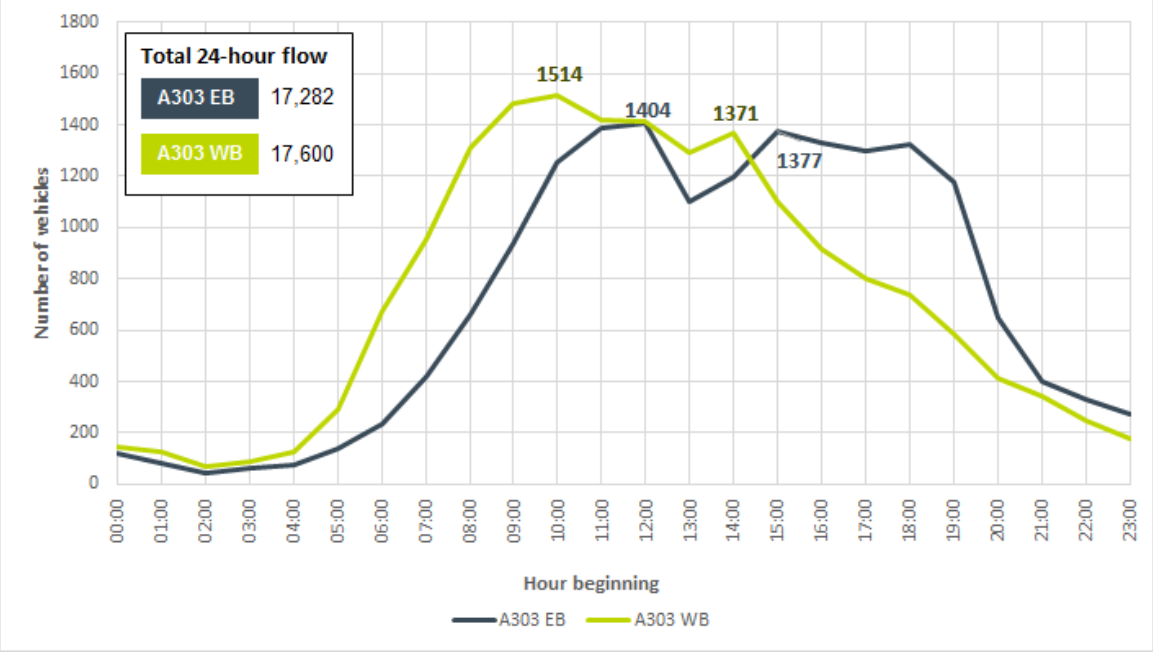
3.11. HA TRADS daily traffic flow data from count sites located on the A303 eastbound and westbound roundabout approaches have been assessed. This is to identify the peak periods throughout the day where traffic through the junction is at its greatest.

3.12. The data has been viewed on a typical high tourism week in August (w/c 6th August 2012). **Figure 3-2** compares the average hourly traffic on a weekday, Saturday and Sunday.

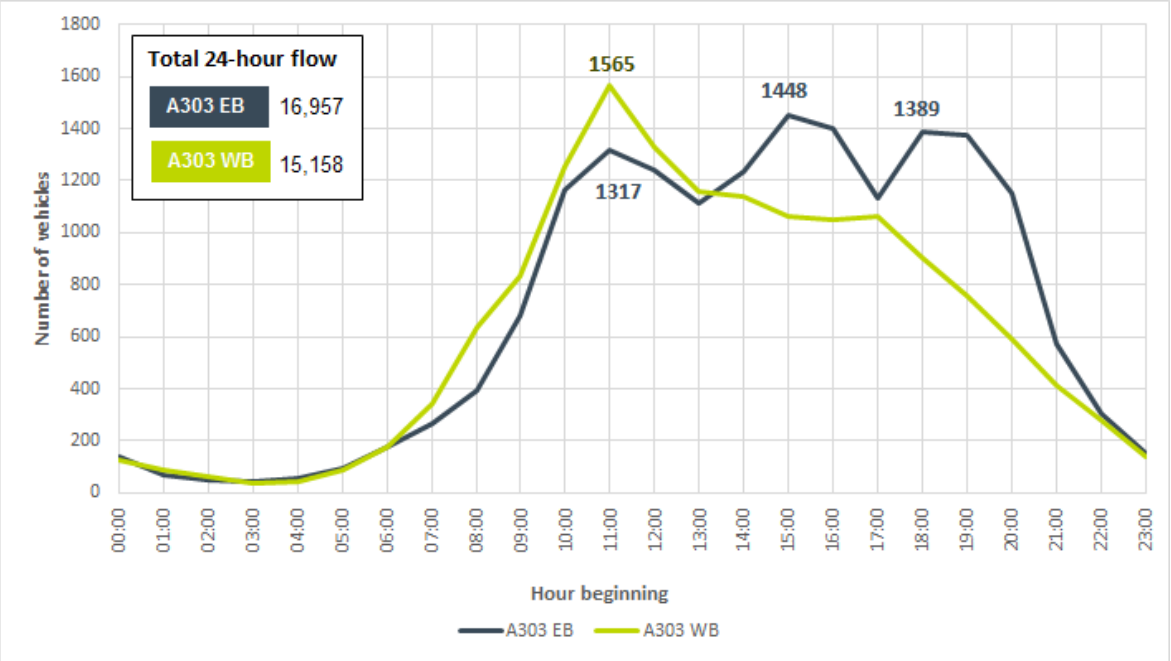
Figure 3-3 Average Hourly Traffic on the A303 EB and WB approaches



Mon-Fri



Saturday



Sunday

3.13. Overall, it can be seen that flows are higher on Saturdays and Sundays than during the week. Across a 24-hour period, the total EB and WB combined flow on a weekday is 30,047. On a Saturday this is 17% higher at 34,882 and 32,095 on a Sunday.

3.14. This is not traffic flow behaviour that one would expect. As mentioned in the PAR, Countess Roundabout is known to experience increased congestion on weekends and holiday periods, with this being a main route popular with holidaymakers, and being located close to Stonehenge.

3.15. On a weekday, the peak periods differ between the A303 eastbound and westbound. On the A303 eastbound, traffic is at its peak at 08:00 and 16:00, whilst in the westbound direction the peaks are later at 11:00 and 17:00.

3.16. On Saturday, traffic peaks between 11:00 and 12:00 and rises again at 15:00 in the eastbound. Flows in the westbound direction reach their peak at 9:00 – 10:00 before steadily declining during the PM.

3.17. Sunday has a similar pattern to Saturday in that traffic flows tend to be higher in the afternoon. The peak flows in the westbound are highest between 09:00 – 10:00 and remain high until 14:00 until decreasing. In the opposite direction, the eastbound flows are highest at midday before decreasing slightly and rising again to remain high between 15:00 and 18:00.

3.18. Separate analysis of the 'low tourism' months (October – May) has been undertaken and this shows more typical flow behaviour due to much reduced tourism. We can therefore conclude that the traffic flow behaviour for these months is notably different to the 'high tourism' months of June to September, and therefore our journey time analysis will be conducted separately.

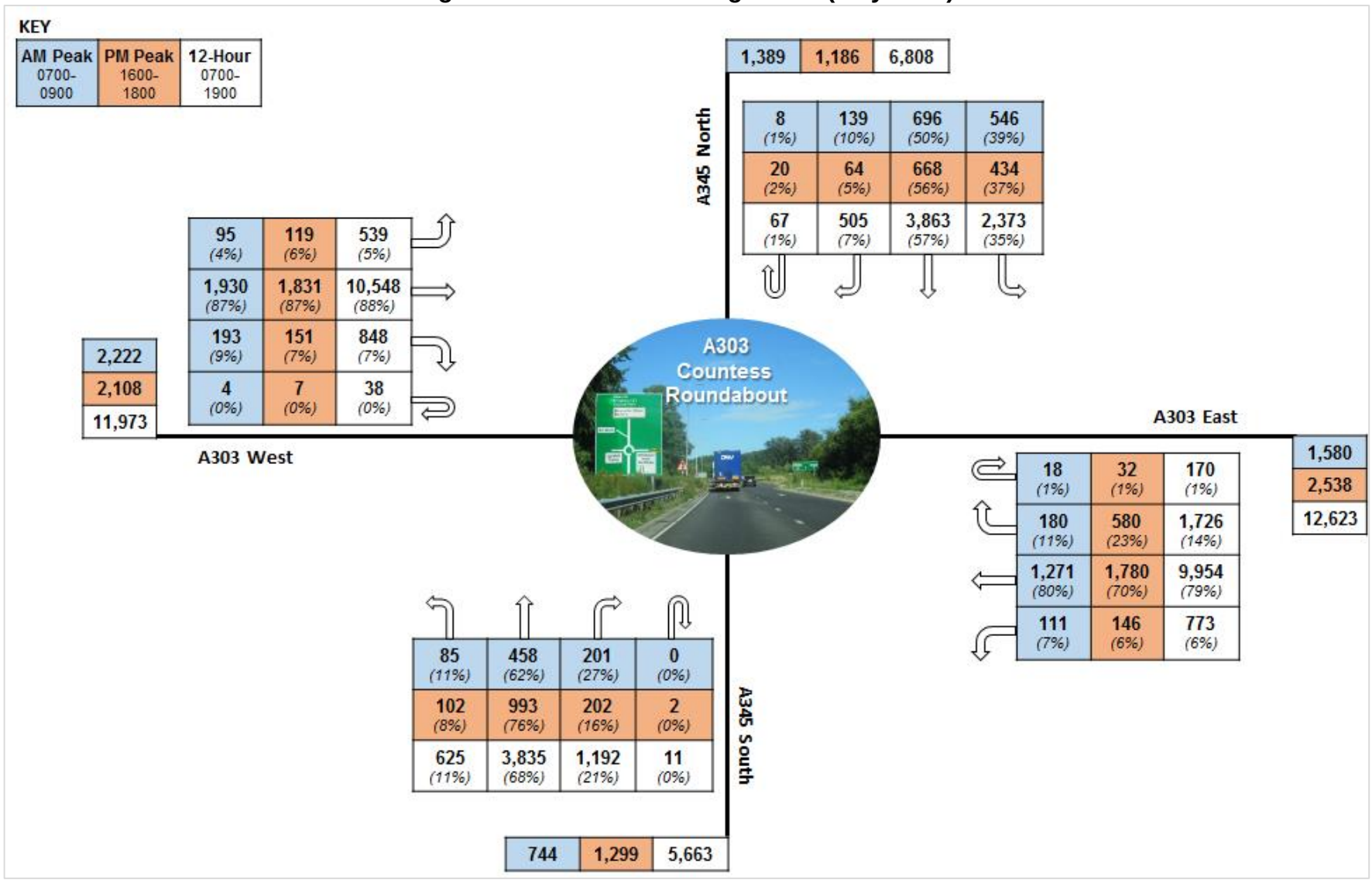
Traffic Turning Movements

3.19. Vehicle turning movements over 12 hours (0700-1900) have been analysed based on a turning count carried out on the 31st July 2014. Data for the AM Peak (0700-0900) and PM Peak (1600-1800) hours have also been assessed. This is presented in **Figure 3-4**.

3.20. The following observations can be made from the turning count data shown:

- In the **AM peak, the A303 eastbound carries the highest amount of traffic** (2,222 vehicles). In the **PM peak, it is the A303 westbound**, which has the highest flows (2,538 vehicles). The A303 eastbound is not far behind this, with 2,108 vehicles;
- Across a 12-hour period, the **A303 carries approximately double the amount of traffic of the A345**. This is not unexpected given that the A303 is a major route across the country and would be expected to carry a higher proportion of traffic;
- On both A303 approach arms, the dominant movement is straight ahead;
- On the A345 northbound approach, the dominant movement is also straight ahead, although to a lesser extent than with the A303;
- On the A345 southbound, just over half of all vehicles continue straight ahead. However, 35% of vehicles were observed to turn left onto the A303 over a 12-hour period. It is possible that a proportion of these manoeuvres were made by drivers who were exiting the service station and continuing eastwards on their journey.

Figure 3-4 Vehicle Turning Flows (July 2014)



Summary

3.21. Analysis of traffic flows at the scheme location shows that traffic flows pre and post scheme opening are of a similar volume. This signifies that the implementation of the scheme does not appear to have had an impact on traffic flows through the roundabout.

3.22. Analysis of AWT data by month for the A303 shows that there are clear differences in traffic flow between the low tourism and high tourism months. In some cases, traffic flow in the high tourism period is over 50% larger compared to the low tourism months. It can be seen that traffic flows usually reach their peak in August, with the overall peak period being between June and September of each year. This backs up the information provided in the PAR that congestion is worse throughout the summer months. This leads us to conclude that separate analyses of journey times are necessary as the scheme is likely to have had a different impact depending on the time of year.

3.23. Traffic flows are also higher on a weekend compared to a weekday, showing that the roundabout carries a notable amount of leisure traffic.

3.24. Turning count data indicates that the A303 carries double the amount of traffic that is carried by the A345. The dominant movements across the roundabout appear to be straight on, although to a lesser extent with the A345 approaches.

4. Journey Time Analysis

Introduction

4.1. The A303 Countess Roundabout LNMS is classified as a safety scheme with no predicted journey time benefits. The PAR noted that the scheme would not have any monetary impact for journey times across the roundabout. This was because the dis-benefits of a speed limit reduction on the A303 were anticipated to cancel out any benefits resulting from reduced congestion from the new signals

4.2. However, it is possible that the signalisation of the junction, increased lane capacity and uniform speed limit through the junction could have had an economic impact for road users, and therefore this section aims to test this.

4.3. To assess the potential economy impact, this report considers pre and post scheme evidence to ascertain whether there has been a journey time benefit experienced due to the scheme.

Data Source

4.4. For the journey time analysis, Satellite Navigation (Sat Nav) data has been used to inform pre and post scheme journey times. This data is available from some motorists who use satellite navigation devices and allow their data to be used anonymously for generating travel statistics. This data can provide crucial intelligence on the operation of the highway network. The data also has the benefit of being historic, so that it is possible to retrieve pre-scheme journey time data after the scheme has opened.

4.5. To assist the analysis, seven time periods have been defined using the diurnal flow profiles presented in chapter 3 as a guide. The time periods have been defined to combine similar hours in terms of flow levels and trip purposes (commuting/leisure etc). The seven time periods used are listed in **Table 4.1**.The first column shows the seven time periods, and each of these time periods consists of the hours shown in the next two columns.

Table 4.1 – Journey Time Analysis: Time Period Splits

24 Hour Flow	Mon-Thur	Fri-Sun
Weekday AM Peak	0700 – 0900	
Weekday Inter Peak	0900 – 1600	
Weekday PM Peak	1600 – 1800	
7-Day Ramp Up and Down	1800 – 2100	0700 – 1000 & 1700 – 2100
7-Day Overnight	2100 – 0700	2100 – 0700
Weekend AM		1000 – 1200
Weekend PM		1200 – 1700

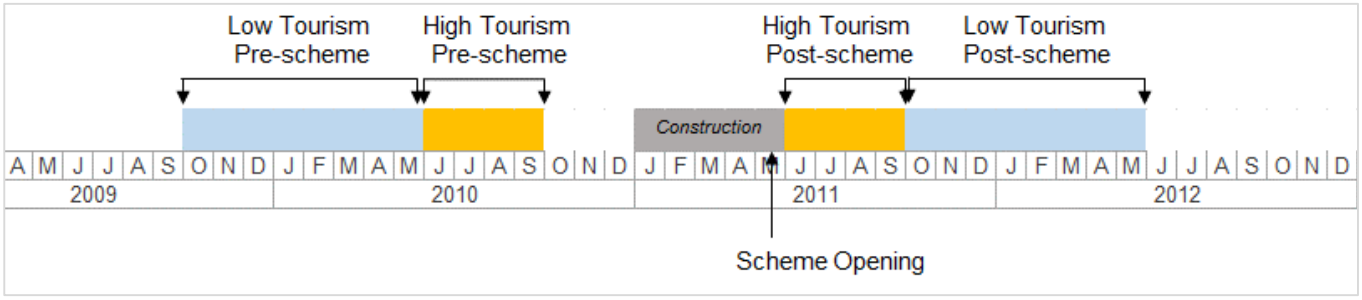
4.6. Sat Nav data has been acquired for these time periods for dates pre and post scheme opening.

4.7. Monthly traffic flow data for the A303 (Section 3) showed that there were notable differences in flows between the summer and winter months. This is likely to be due to additional tourist traffic in the summer months, as well as natural seasonality. Consequently, it is likely that the impact on journey times may vary depending on the time of year. Therefore, data has been assessed across two separate periods; the high tourism months (June – September) and low tourism months (October – May).

4.8. A summary of the periods evaluated is as follows:

- Pre-scheme 'low tourism': October 2009 – May 2010;
- Pre-scheme 'high tourism': June 2010 – September 2010;
- Post-scheme 'high tourism': June 2011 – September 2011; and
- Post-scheme 'low tourism': October 2011 – May 2012.

4.9. These periods are illustrated in the following timeline:



High Tourism (June – September)

Journey Time Comparison

4.10. The impact of the scheme during each of these seven time periods has been considered separately for the high tourism months.

4.11. **Table 4.2** presents the change in journey time between the pre-scheme and post-scheme periods for each movement. Negative values indicate a journey time saving and hence a benefit.

4.12. In reality, some of the small journey time differences shown in this table may be due to sampling errors or if true, may be unperceivable. As a result, only journey time changes in excess of ten seconds (positive or negative) are considered when calculating the annual vehicle hours saved.

Table 4.2 – Difference in Pre and Post Scheme Journey Times (High Tourism)

Arm From	Arm To	Weekday AM Peak	Weekday Inter Peak	Weekday PM Peak	7-Day Ramp Up / Down	7-Day Overnight	Weekend AM	Weekend PM
A303 West	A345 N	-31	-3	-31	-10	1	-3	-28
	A303 E	-33	-3	-35	-9	4	-3	-31
	A345 S	-27	6	-27	-1	10	6	-26
A345 North	A303 E	-13	0	4	5	5	4	5
	A345 S	-8	8	12	13	15	14	12
	A303 W	-9	9	13	13	21	7	-6
A303 East	A345 S	-4	1	-11	-2	2	-8	-21
	A303 W	-7	-3	-7	-10	3	-41	-102
	A345 N	9	10	0	7	9	-3	-21
A345 South	A303 W	2	-0	-12	0	9	-7	-39
	A345 N	14	9	-3	8	14	1	-31
	A303 E	14	9	-2	9	15	2	-31

Negative values indicate a journey time saving and hence a benefit. Savings > 10 secs are highlighted in Green. Positive values indicate an increase in journey time and hence a dis-benefit. Increases of > 10 seconds are highlighted in Red.

All seconds displayed are an average per vehicle.

4.13. One of the key points to note from Table 4.2 is that the **A303 west has experienced journey time benefits in the high tourism months of June to September**. This is most evident in the weekday AM and PM peaks and in the afternoons of the weekends. In these periods, journey times through the roundabout are up to 35 seconds quicker. There are however some dis-benefits for those travelling through the junction overnight from the A303 west, with a ten second increase for vehicles turning right. This is likely to be from vehicles now having to stop at the traffic signals where the route was likely to be almost free-flowing prior to the opening of the scheme.

4.14. There are also **journey time benefits for drivers travelling from the A303 east**, particularly in the **weekend PM period**. For instance, vehicles continuing through the roundabout from the A303 east to the west have seen a reduction in journey time of 102 seconds (01:42). It is interesting that the A303 has experienced such benefits particularly as there has been a speed limit reduction as part of the scheme to 40mph.

4.15. The scheme has had a **negative impact on the A345 north for vehicles continuing south on the A345 and those turning right onto the A303**. In the weekday PM peaks, 7-day ramps, overnight and weekend periods, journey times have increased from between 12 and 21 seconds.

4.16. There appears to be **little change for vehicles travelling north through the roundabout on the A345**, although journey times have increased in the AM peak and overnight for vehicles continuing north and turning right. That said, in

the weekday PM periods, there are journey time benefits in excess of 30 seconds.

4.17. In summary, the majority of vehicles are experiencing journey time benefits in the high tourism period. However, there are some dis-benefits, particularly for drivers on the A345.

Journey Time Reliability

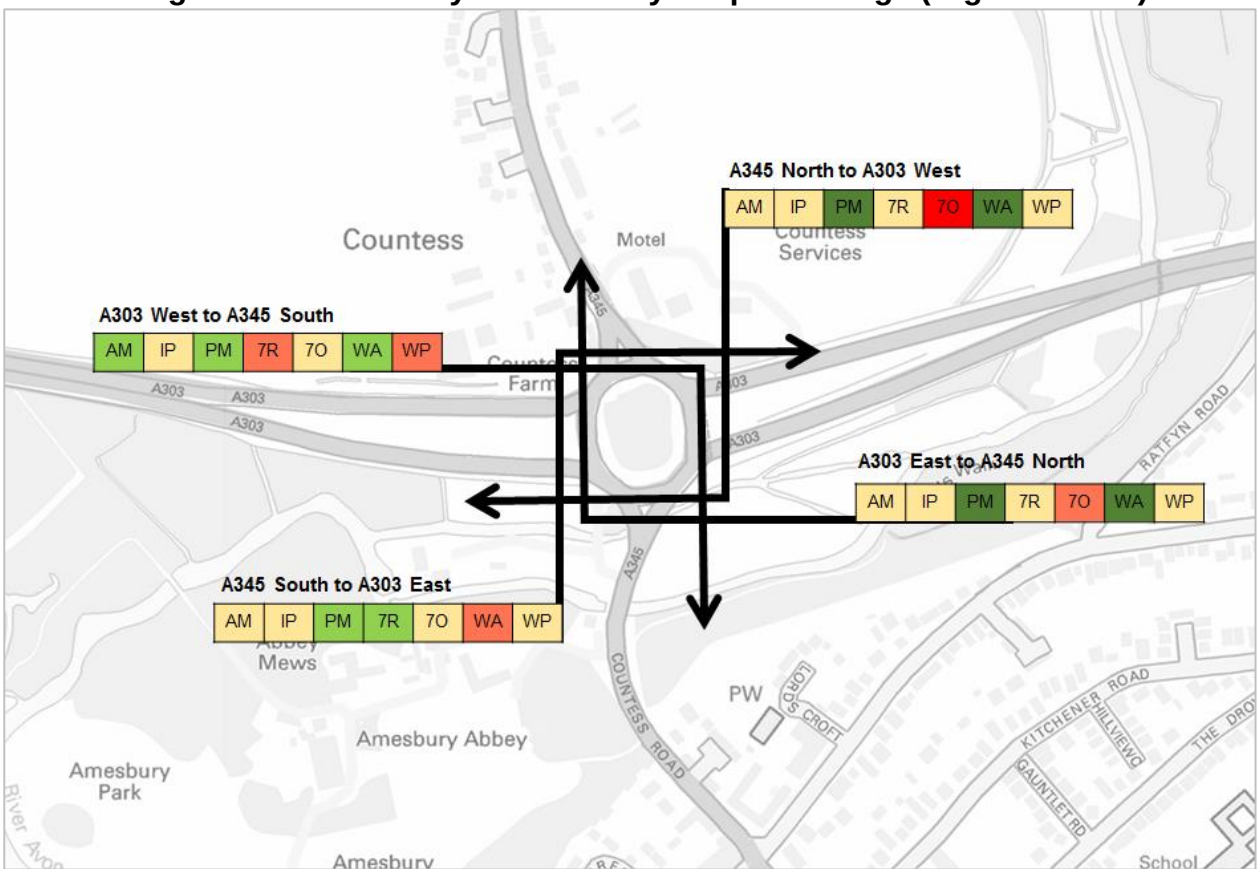
4.18. The journey time data can also be used to quantify changes in journey time reliability as a result of the scheme. The journey time data for right-turning movements on the junction have been extracted, this accounts for the majority of key movements using the circulatory carriageway.

4.19. Changes in journey time reliability is quantified by using the inter-quartile range and the 5th to 95th percentile journey time pre and post-scheme. The movements which have been analysed are:

- A303 West to A345 South;
- A345 North to A303 West;
- A303 East to A345 North; and
- A345 South to A303 East.

4.20. These are displayed in **Appendix A**, however a summary of the reliability graph findings is shown in **Figure 4-1**. It should be noted that the colour scheme shown illustrates whether reliability for those within the 75th percentile has improved or worsened. For instance, a dark green box reflects a marked improvement to reliability in that time period, whilst red shows that reliability has become worse since the opening of the scheme. A yellow box shows a time period where there has been little or no change to journey reliability.

Figure 4-1 Summary of Reliability Graph Findings (High Tourism)



Key: AM = Weekday AM Peak, IP = Weekday Interpeak, PM = Weekday PM Peak, 7R = 7-day Ramp Up/Down, 7O = 7-day Overnight, WA = Weekend AM, WP = Weekend PM

4.21. Figure 4-1 shows the following:

- Reliability has improved for drivers travelling right from the A303 West in the AM, PM and weekend AM peaks, however there are reliability dis-benefits in the ramping periods and weekend PM peak;
- In the opposite direction from the A303 East, there are considerable benefits for drivers reliability in the weekday PM and weekend AM peaks;
- A similar pattern can be seen from the A345 north turning right, with considerable benefits in the weekday PM and weekend AM peaks. There is a dis-benefit for vehicles overnight however;
- From the A345 south to A303 east, reliability has improved for drivers in the weekday PM and 7-day ramping periods.

4.22. In summary, reliability has improved for the majority of time periods / movements, with the few exceptions noted above.

Calculation of High Tourism Vehicle Hour Benefits

4.23. Table 4.2 demonstrated the difference in pre and post scheme journey times over the high tourism months of June to September. It is assumed that these changes are because of the scheme measures, and therefore it is necessary to calculate the number of vehicle hours saved in the year. This allows the quantification of the overall economic evaluation for this LNMS.

4.24. The July 2014 turning count (displayed in the previous chapter) gives a good representation of traffic flow movements throughout the junction. This has been

used to give the number of vehicles making each arm-to-arm movement. These flows have been used to determine the total flow for each movement in the seven time periods outlined previously. As the flows are for the month of July only, this has been factored to represent typical flows across the entire high tourism months.

4.25. The arm-to-arm vehicle movements have been multiplied by the differences in journey times outlined in **Table 4.3** to identify the total weekly vehicle hour savings. As outlined above, only changes in journey time that are greater than 10 seconds are included in the calculation to isolate only the changes, which are perceivable and therefore tangible.

4.26. Weekly vehicle hour savings are multiplied by 17: this is the total number of weeks within the high tourism period that has been analysed. The total resulting vehicle hour savings are summarised, by turning movement, in **Table 4.3**.

Table 4.3 – Annual Vehicle Hour Savings, by Turning Movement (High Tourism)

Arm	A303 West	A303 East	A345 South	A345 North	TOTAL
A303 West	0	-4,629	-272	-219	**-5,120**
A303 East	-9,847	0	-142	6	**-9,982**
A345 South	-186	-129	0	-428	**-743**
A345 North	103	-84	1,282	0	**1,301**
Total Annual Vehicle Hour Saving (High Tourism)					**-14,544**

4.27. The key points to note from Table 4.3 are:

- The **largest annual vehicle hour savings are experienced on the A303 eastbound and westbound routes**, with a saving of -9,982 hours for vehicles travelling on the A303 from the east, and -5,120 hours for vehicles travelling in the opposite direction;
- These vehicle hour savings predominantly arise from vehicles travelling straight ahead and continuing on the A303;
- There are considerably **smaller annual vehicle hour savings from vehicles travelling from the A345 south**;
- The **A345 from the north produces 1,301 vehicle hours of journey time dis-benefits** in the opening year;
- Overall, **the scheme produces -14,544 vehicle hours of journey time benefits in the opening year during the high tourism months** (June to September). This is largely due to vehicle hour savings on the A303 travelling straight ahead in both directions.

4.28. The evidence presented shows that the scheme has had a beneficial impact on journey times across the roundabout in the high tourism period. This conclusion is drawn from considering all time periods throughout the week as the implementation of new signals has affected traffic movements throughout all hours of each day. These benefits largely arise from vehicles travelling straight ahead on the A303 in both directions. There are also small benefits for drivers on the A345 northbound and a dis-benefit for drivers in the opposite direction.

Low Tourism (October – May)

Journey Time Comparison

4.29. The impact of the scheme on journey times has now been assessed for the same seven time periods, but this time for the low tourism months (October – May). **Table 4.4** presents the change in journey time between the pre-scheme and post-scheme periods for each movement. Negative values indicate a journey time saving and hence a benefit.

4.30. As before, only journey time changes in excess of 10 seconds (positive or negative) are considered when calculating the annual vehicle hours saved.

Table 4.4 – Difference in Pre and Post Scheme Journey Times (Low Tourism)

Arm From	Arm To	Weekday AM Peak	Weekday Inter Peak	Weekday PM Peak	7-Day Ramp Up / Down	7-Day Overnight	Weekend AM	Weekend PM
A303 West	A345 N	-6	-2	-4	-1	1	0	-3
	A303 E	-4	1	-3	2	4	3	-1
	A345 S	2	9	5	10	10	15	8
A345 North	A303 E	2	5	4	5	4	6	6
	A345 S	9	13	12	13	10	16	14
	A303 W	10	14	12	14	11	18	14
A303 East	A345 S	3	3	-1	3	3	2	-3
	A303 W	4	3	-4	2	3	2	-17
	A345 N	16	14	8	14	10	14	7
A345 South	A303 W	1	3	-3	3	8	4	1
	A345 N	12	12	6	12	14	13	11
	A303 E	12	13	7	13	16	14	12

Negative values indicate a journey time saving and hence a benefit. Savings > 10 secs are highlighted in Green. Positive values indicate an increase in journey time and hence a dis-benefit. Increases of > 10 seconds are highlighted in Red.

All seconds displayed are an average per vehicle.

4.31. Table 4.4 shows a contrasting image of journey times in the low tourism months compared to that in the high tourism months. It is clear that there are **journey time dis-benefits for drivers approaching the roundabout from the A345 south**. There are dis-benefits for vehicles travelling straight on and turning right in all time periods.

4.32. There are also **dis-benefits for vehicles travelling on the A345 approaching from the north**. These drivers have seen an increase in journey times, again in all time periods.

4.33. On the **A303, most of the journey time differences are within +/- 10 seconds**, and are therefore considered to be minimal. The exception to this is for vehicles travelling from the A303 west and turning right in the 7-day ramps and the

weekend AM peak, where there has been a journey time increase of more than ten seconds. In the opposite direction, there are journey time dis-benefits for vehicles travelling right in all time periods.

4.34. The one winner in the low tourism months is vehicles travelling from the A303 east approach and continuing on the A303. These vehicles have seen a journey time decrease of over 17 seconds in the weekend PM period.

Journey Time Reliability

4.35. As with the high tourism months, graphs have been produced to show journey time reliability on the four right turning arm-to-arm vehicle movements. These are for the same movements analysed previously for the high tourism months.

4.36. These graphs are displayed in **Appendix B**, and show that overall journey time reliability is worse in all directions in the majority of periods. However, it is worth noting that the change in reliability is to a lesser extent to that experienced in the high tourism months. The differences in reliability are most noticeable on the A345 approach from the south and turning right (see Appendix B.4).

Calculation of Low Tourism Vehicle Hour Benefits

4.37. The annual vehicle hour benefits for the low tourism months has been calculated in the same way as for the high tourism period. Once again, the July 2014 turning count has been used but flows have been factored to be in line with flows expected during these low tourism months.

4.38. As outlined above, only changes in journey times that are greater than ten seconds are included in the calculation to isolate only the changes, which are perceivable and therefore tangible.

4.39. Weekly vehicle hour savings are multiplied by 35: this is the total number of weeks within the low tourism period that has been analysed. The resulting vehicle hour savings are summarised, by turning movement, in **Table 4.5**.

Table 4.5 – Annual Vehicle Hour Savings, by Turning Movement (Low Tourism)

Arm	A303 West	A303 East	A345 South	A345 North	TOTAL
A303 West	0	0	165	0	**165**
A303 East	-2,301	0	0	971	**-1,330**
A345 South	0	981	0	2,655	**3,636**
A345 North	423	0	2,934	0	**3,357**
Total Annual Vehicle Hour Saving (Low Tourism)					**5,827**

4.40. The key points to note from Table 4.5 are:

- Overall, **the scheme produces 5,827 vehicle hours of journey time dis-benefits in the opening year during the low tourism months** (October to May).
- The **largest annual vehicle hour dis-benefits are experienced on the A345 northbound and southbound routes**, with a dis-benefit of 3,636 and 3,357 respectively;
- These vehicle hour dis-benefits predominantly arise from vehicles travelling straight ahead and continuing on the A345; and
- There is however, an annual vehicle hour saving of -2,301 for vehicles approaching the roundabout from the A303 east and continuing straight ahead.

4.41. The evidence shows that the scheme has had a negative impact on journey times across the roundabout in the low tourism period. Although this is to a lesser extent than the benefits experienced in the high tourism months. It is likely that due to traffic flows being lower in the low tourism months, traffic may have previously been free flowing in certain periods, yet now it may have to stop at the signals.

Combined High Tourism and Low Tourism Journey Times

Annual Vehicle Hour Benefits

4.42. The annual vehicle hour benefits will now be calculated to show the economic benefit or dis-benefit for vehicles across the entire year. **Table 4.6** shows the combined annual vehicle hour savings, by turning movement, taking into account the figures for all months.

Table 4.6 – Annual Vehicle Hour Savings, by Turning Movement

Arm	A303 West	A303 East	A345 South	A345 North	TOTAL
A303 West	0	-4,629	-107	-219	**-4,955**
A303 East	-12,148	0	-142	977	**-11,313**
A345 South	-186	852	0	2,227	**2,893**
A345 North	526	-84	4,216	0	**4,658**
Total Annual Vehicle Hour Saving					**-8,717**

4.43. The key points to note from Table 4.6 are:

- Overall, **the scheme produces -8,717 vehicle hours of journey time benefits** in the opening year.
- These benefits come from **annual vehicle hour savings on the A303** approaching from the west (-4,955) and the east (-11,313). As with the high tourism months, this is mostly from vehicles travelling straight ahead; and
- However, there are annual vehicle hour dis-benefits for vehicles on the A345 north and south, largely for vehicles travelling straight ahead. Nonetheless, these dis-benefits were not large enough to outweigh the journey time benefits experienced on the A303.

4.44. The PAR noted that the scheme would not have any monetary impact for journey times across the roundabout. This was because the dis-benefits of a speed limit reduction on the A303 were anticipated to cancel out any benefits from reduced congestion from the new signals. However, it can be seen that there has been an overall annual vehicle hour saving of -8,717, resulting in a beneficial impact on journey times. Therefore, Transport Economic Efficiency (TEE) has been scored as **beneficial** in the Evaluation Summary Table (EST).

4.45. The Appraisal Summary Table (AST) in the PAR also stated that the scheme would have a **beneficial** impact on journey reliability. Whilst reliability is worse in some of the movements in the low tourism period, reliability has largely improved in the high tourism period where the roundabout carries a higher amount of traffic. Therefore, the reliability benefits in the high tourism period are deemed to outweigh the dis-benefits in the low tourism months.

4.46. Taking this into account, the evidence of the scheme's impact on reliability is positive, and hence is scored as **slight beneficial** in the EST.

Summary

4.47. Satellite Navigation (Sat Nav) data has been used to inform pre and post scheme journey times across seven time periods. Due to the seasonality of traffic flows, it was expected that the scheme would affect journey times differently depending on the time of year, and therefore the analysis has been conducted for the high tourism months (June – September) and the low tourism months (October – May).

4.48. In the high tourism period, there are large journey time benefits for drivers on the A303. There are however, some dis-benefits for drivers travelling in some directions on the A345. The overall vehicle hour saving for the high tourism months is -14,544.

4.49. In the low tourism period, there are mostly dis-benefits for drivers, particularly on the A345. This resulted in an overall vehicle hour dis-benefit of 5,827.

4.50. Combining the journey time data to assess the difference over the entire year shows that there has been an overall annual vehicle hour saving of **-8,717**. Drivers on the A303 mostly experience the benefits; however, there are some dis-benefits for vehicles on the A345.

4.51. In addition, journey time reliability overall has improved, and has been scored as slight beneficial in the scheme's EST.

5. Safety Impacts

Introduction

5.1. As a safety scheme, the key justification for this LNMS is a reduction in the severity and number of accidents. This section examines the safety impacts associated with the scheme, and compares the pre and post scheme opening accident rates to determine whether the scheme has resulted in a post opening safety benefit or dis-benefit.

5.2. More specifically, this chapter:

- Observes any changes to the number, location and causation of Personal Injury Collisions (PICs);
- Establishes whether the scheme has achieved the safety objectives set out in **Table 2.1** of this report; and
- Determines whether the scheme has resulted in an overall safety benefit or dis-benefit.

Data Source

5.3. The PAR used accident data[2] for a five year period (1st January 2005 to 31st December 2009) as evidence for the pre-scheme conditions at the scheme site. The area used was a 200m radius of the roundabout.

5.4. Accident data was requested from the Managing Agent Contractor (MAC) for the same area from the 1st January 2005 to as recent a date as possible. The accident data received from the MAC matched the data included within the PAR.

5.5. The PAR covers the evidence used to support the decision to proceed with the scheme, effectively outlining the business case. However, once a PAR has been completed and agreed, there can be a time delay before the start of scheme construction.

5.6. In this case, the accident data in the PAR covered a date range up to 31st December 2009, meaning there was a gap in accident data between this date and the beginning of scheme construction in January 2011, during which time the accident rate could have changed.

5.7. As such, to understand just the impact of the scheme, accident data has been analysed for the same location for a period of five years directly before construction began (1st January 2006 – 31st December 2010) and two years and seven months after opening (1st June 2011 – 31st December 2013).

[2] All references to accidents in this report refer to Personal Injury Collisions (PICs).
The accident data referred to in this report has not necessarily been derived from the national validated accident statistics produced by Department for Transport (DfT). As such, the data may subsequently be found to be incomplete or contain inaccuracies. The requirement for up-to date information and site specific data was a consideration in the decision to use non-validated data and, as it is sourced from Local Processing Units through the Managing Agent Contractors or Asset Support Contractors, it is sufficiently robust for use in this context.

5.8. The scheme took approximately five months to construct (January – May 2011). When evaluating LNMS, accidents within the construction period are omitted. In this case, there were no accidents occurring within the construction period.

Analysis

Comparison of pre and post scheme opening data

5.9. **Table 5.1** provides a summary of the number of pre and post scheme accidents, along with a comparison of accident rates and severity index.

Table 5.1 – Summary of Pre and Post Scheme Accidents

Period	Date Range	Calculation	Slight	Serious	Fatal	TOTAL	Severity Index
Pre Scheme Opening	Jan 2006 – Dec 2010	No. of accidents	21	4	0	25	**16.0%**
		Accident rate per year	4.2	0.8	0	**5.0**	
Post Scheme Opening	June 2011 – Dec 2013	No. of accidents	7	0	0	7	**0%**
		Accident rate per year	2.71	0	0	**2.71**	

5.10. The key points to note from Table 5.1 are:

- The pre-scheme annual average accident rate was 5.0, which has decreased to 2.71 in the post opening period. This creates a post opening **accident saving of 2.29 accidents**. Whilst this is a positive message, this is lower than the PAR predicted accident saving of 4.86 accidents;
- Prior to scheme opening, there had been four serious accidents, which gave a severity index of 16%. Three of these accidents occurred when vehicles had entered the roundabout into the path of an oncoming vehicle and were struck sideways on; and
- In the post-opening period there have been no serious or fatal accidents, resulting in a **severity index of 0%.**

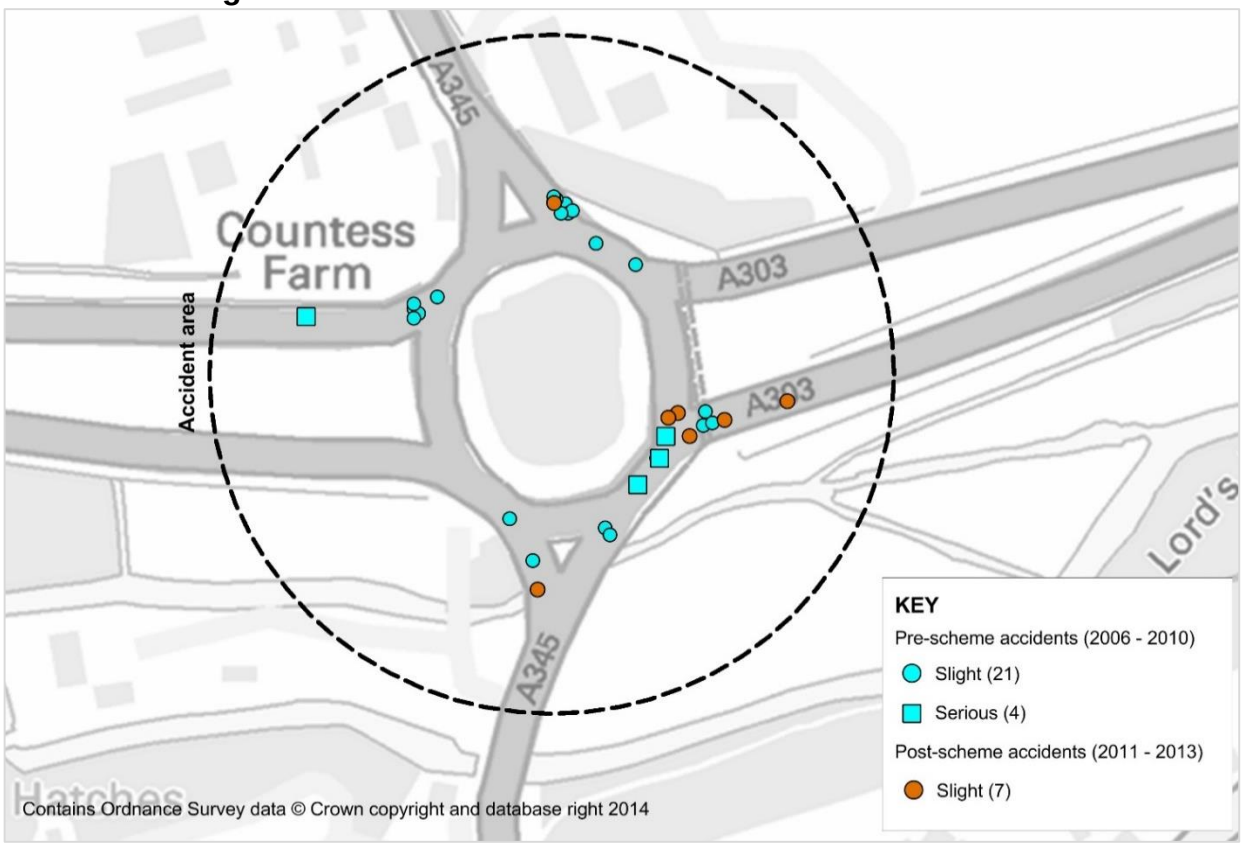
5.11. The first objective of the scheme was to reduce the number of accidents. As shown above, the scheme has met this objective. However, the predicted accident saving was lower than expected. The PAR predicted that the scheme would save 4.86 accidents – practically all of the accidents given that the pre-scheme rate was 5.0. Reducing the accident rate from five to 0.14 per annum is an ambitious target for a scheme.

5.12. Along with reducing the number of accidents, the second objective of the scheme was to reduce the severity of accidents. As there were no serious or fatal accidents occurring post-opening, it can be concluded that the scheme has achieved this objective also.

Location of Accidents

5.13. Accident location analysis has been conducted for the pre and post scheme opening period. The location of the accidents is illustrated in **Figure 5-1**.

Figure 5-1 Location of Pre and Post Scheme Accidents



5.14. It can be seen from this map that a cluster of pre-scheme accidents occurred on the circulatory carriageway where the A303 WB enters the roundabout. Assessment of the accident descriptions shows that a large proportion of these accidents were where vehicles entered the roundabout into the path of vehicles already on the roundabout.

5.15. Four of the seven post-scheme accidents also occurred at this location. Almost all of the post-scheme accidents resulted from vehicle shunts at the traffic lights.

Causation of Accidents

5.16. The PAR noted that the roundabout experienced a high rate of 'shunt' and speed related accidents prior to the opening of the scheme. Many of these occurred on the approach to the roundabout when the layout was priority controlled.

5.17. Of the seven accidents that occurred post-scheme opening, it is apparent that four of these were shunt related. These accidents occurred when vehicles were on the approach to the new signals. The other three accidents occurred due to inappropriate lane changing, whilst two were loss of control due to the driver being impaired by alcohol. None of the post-opening accidents were speed related.

Summary

5.18. This POPE of LNMS has analysed accident data for a period of five years pre-scheme opening and two years and seven months post-scheme opening. This has shown that there has been an accident saving of 2.29 in the opening year – slightly lower than the predicted 4.86 saving. The severity of accidents has decreased from 16% to 0%.

5.19. The scheme has also been successful in reducing speed related accidents, but although shunts still occur (albeit fewer) these are occurring at the signals instead. However, overall the scheme has been successful in reducing the number of these accidents.

6. Economy

Introduction

6.1. This section of the report takes the journey time and safety impacts reported in sections 4 and 5, and considers the monetary value of these impacts. These monetised benefits are then compared to the cost of scheme construction to inform two measures of value for money: the First Year Rate of Return (FYRR) and the Benefit Cost Ratio (BCR).

6.2. All monetised figures in this section are quoted in 2002 prices, discounted to opening year, unless otherwise specified.

PAR and Outturn Comparison

6.3. The evidence provided in this report has been provided to consider the scheme costs and economic benefits of the scheme provided in the PAR (2011) and to calculate the outturn costs and scheme benefits based on empirical evidence from a year after opening.

6.4. **Table 6.1** provides this comparison between the PAR and Outturn costs and benefits of the scheme. It also includes the opening year and scheme life costs and benefits of the scheme. The journey time and accident benefits of the scheme discussed earlier in the report have been monetised using standard value of time and accident values from WebTAG. This is undertaken to understand whether the monetised scheme benefits offset the cost of scheme implementation and assess the overall value for money of the scheme.

Table 6.1 – PAR and Outturn Economy Comparison

		PAR	Outturn
Opening Year (2012)	Total Cost	£1.514m	£1.464m
	Opening Year Accident Saving (number)	4.86	2.29
	Opening Year Accident Saving (£)	£0.443m	£0.209m
	Opening Year Vehicle Hours Saving (number)	0	-8,717
	Opening Year Journey Time Benefits (£)	£0	£0.115m
	FYRR	29%	22%
Scheme Life (60 years)	Costs	£1.514m	£1.464m
	Safety Benefits	£23.223m	£12.813m
	Journey Time Benefits	£0	£5.630m
	BCR	15.3	12.6

Summary

6.5. The scheme is shown to have been less successful than was predicted, however it has still resulted in an overall beneficial impact and therefore provides good value for money.

6.6. It was anticipated that the scheme would deliver large safety benefits, which was based on an opening year accident saving of 4.86 accidents. Given that the pre-scheme rate was 5.00, this seems an ambitious target. As a result of the lower opening year accident saving of 2.29, the opening year accident saving is lower than expected at £0.209m.

6.7. There were no predicted economy benefits in the PAR, however it was deemed that the scheme could have an impact on journey times due to the speed limit reduction on the A303 and the signalisation of the roundabout, and therefore this has been tested to see whether there has been an impact. The Sat Nav data has provided evidence that journey times through the junction have in fact decreased for many movements and in many time periods since the opening of the scheme, particularly on the A303 in the high tourism months. Whilst the A345 does experience dis-benefits, there is an overall journey time economic benefit of £0.115m per annum, once these impacts are annualised.

6.8. The outturn scheme costs were slightly lower than those predicted in the PAR evaluation: £1.464m outturn cost compared to the £1.514m cost that was predicted.

6.9. All of the above points contribute to an outturn FYRR of 22%, which is slightly lower than the predicted figure of 29%. The 60-year BCR of 12.6 is slightly lower than the typical BCR of a Large LNMS, which is 15.7[3]. However, DfT guidance[4] notes that a BCR greater than 4.0 can be considered to offer 'very high VfM'.

[3] POPE of LNMS 10th Annual Evaluation Report (December 2013)

[4] Department for Transport Value for Money Assessment

7. Environment, Accessibility and Integration

Introduction

7.1. This section of the report presents information relating to the WebTAG objectives of environment, accessibility and integration. This information will be compared to the forecasts made in the PAR's Appraisal Summary Table (AST) (provided in **Appendix C**). These comparisons are used to score the scheme against the WebTAG objectives based on first year observed findings, and are recorded in the Evaluation Summary Table (EST). This can be found in **Appendix D**.

Environmental Impacts

Landscape

7.2. The PAR predicted that there would be a **slight adverse** impact on Landscape. This was due to the surrounding landscape containing features of national importance (Stonehenge World Heritage Site). The PAR noted that the scheme would increase urbanisation of the area from the addition of new lighting. However, this lighting was introduced as part of a separate scheme to renew existing lighting columns and replace certain sections of the existing drainage system. Therefore, it is not considered that this would have a significant impact on Landscape as a result of this scheme.

7.3. That said, this LNMS did involve the implementation of new signage and signalisation of the roundabout. The new signage is in keeping with existing signs and are hidden well from any nearby properties by the tall vegetation that surrounds the roundabout and parts of the roundabout approaches.

7.4. However, as shown in **Figure 7-1**, the new signals on the A345 arms are located adjacent to the existing subway, which is frequently used by Non-Motorised Users (NMUs), and consequently could be deemed to have had an adverse impact on their view of the landscape.

Figure 7-1 New Signals on the A345 North (Adjacent to the Subway)

7.5. Therefore, due to the implementation of the new signals, the impact on Landscape is deemed to be **'slight adverse'**.

Heritage and Historical Resources

7.6. As with the Landscape sub-objective, the PAR also predicted a **slight adverse** impact on Heritage and Historical Resources. The reason being because built heritage is in close proximity to the construction of lighting columns that may be in visual range. As before, new lighting columns were introduced as part of a separate scheme and therefore the impact of the lighting columns on Heritage and Historical Resources is not applicable.

7.7. Although the scheme did involve the installation of traffic signals, the roundabout is approximately two miles from Stonehenge and is not considered to have had an impact. Therefore, the overall impact on Heritage and Historical Resources is classed as **'neutral'**.

Journey Ambience

7.8. The PAR predicted a reduction in the number of accidents as a result of the scheme. This in turn was expected to reduce traveller stress / frustration and fear of potential accidents. In addition, the PAR claimed that route certainty was expected to improve due to the anticipated reduction in delay caused by incidents at this location. All resulted in a predicted impact of **large beneficial**.

7.9. The post opening evaluation discovered a reduction in the accident rate from 5.00 to 2.71, which is likely to have a beneficial impact on journey ambience as the junction will now 'feel' safer to users. Driver stress is also expected to have decreased due to the new traffic signals. The fear of potential accidents is expected to have decreased as drivers now do not need to rely on their own judgement when to access a busy junction. Therefore, that decision is taken away by obeying the signals, effectively reducing any potential driver stress. Another element of driver stress is linked to frustration. It is expected that this would decrease as the results show that generally, journey times have improved resulting in reduced congestion. However, it is acknowledged that frustration may increase for drivers at night who may be stopped at the signals when previously they could have pulled straight out into the roundabout.

7.10. Taking all of the above into account, the outturn assessment has established a **'large beneficial'** impact on journey ambience, as expected.

Other

7.11. The scheme has demonstrably not changed traffic flows or traffic routes, and so no noise, air quality, greenhouse gas, townscape, biodiversity, water environment or physical fitness evaluation is required.

Accessibility Impacts

7.12. The PAR predicted that the scheme would have no impact on accessibility. Following a site visit and desk-top analysis, we are confident that this assessment is correct, and all impacts have been classed as **'not applicable'**.

Integration Impacts

7.13. The scheme makes no reference to wider policies nor does it link with transport interchange facilities, so all impacts are **'not applicable'**.

8. Conclusions and Lessons Learned

Introduction

8.1. This report presents the POPE of the A303 Countess Roundabout LNMS, implemented by the Area 2 MAC in 2011. The scheme evaluation has considered all elements of the WebTAG criteria. The evaluation team have worked closely with the MAC to ensure the best data possible was used and the scheme thoroughly understood.

8.2. The purpose of this section is to:

- Summarise the key impacts of the scheme and how these compare to forecasts; and
- Consider the lessons learnt and make recommendations to improve future LNMS.

Summary of Scheme Impacts

8.3. The A303 Countess Roundabout LNMS opened in May 2011. The scheme introduced new traffic signals on all approaches of the roundabout, creating a completely signalised junction. The signals were integrated with MOVA and additional improvements to road markings and surfacing were made to improve driver conditions. In addition, the A303 approaches and the north / south sides of the circulatory carriageway were widened to provide three lanes. The scheme also involved a speed limit reduction for drivers on the A303, from 70mph to 40mph.

8.4. The scheme was introduced to improve safety and reduce the high rate of shunt-type accidents and other speed related incidents. Congestion was also an issue, particularly at weekends and during school holidays.

8.5. Although no journey time saving was predicted in the PAR, the journey time analysis identified that overall the scheme has reduced journey times. The A303 in both directions saw the majority of these benefits, particularly in the high tourism months where flows on the A303 are almost 50% higher than the low tourism months. When traffic flows are lower in the low tourism period, it was found that there were journey time dis-benefits, chiefly on the A345. However, these dis-benefits were outweighed by the beneficial impacts experienced on the A303 in the high tourism months.

8.6. This was a safety scheme, aimed at reducing the number of accidents, which the scheme has done successfully. The accident rate has decreased from 5.00 to 2.71 – an opening year accident saving of 2.29. Although this is a beneficial safety impact, the accident saving is lower than the PAR predicted figure of 4.86.

8.7. Overall, the scheme can be considered a success. The benefits are perhaps not quite as high as predicted, however the combination of modest safety and economic benefits contribute to an outturn FYRR of 22%. The 60-year BCR of 12.6 can be considered to offer ‘very high VfM’ (DfT guidance rates a BCR greater than 4.0 offering very high VfM).

Scheme Specific Objectives

8.8. Drawing on information presented in this report, a summary of the scheme's success against the scheme specific objectives, listed in the introduction to this report, is provided in **Table 8.1**.

Table 8.1 – Scheme Specific Objectives

Objective	Success	
Safety: To **reduce the severity** and **number accidents**	The annual accident rate has fallen from 5.00 in the 5 year pre-construction period to 2.71 after the introduction of the scheme. The severity of accidents has also decreased from 16% to 0%,	✓

Lessons Learned

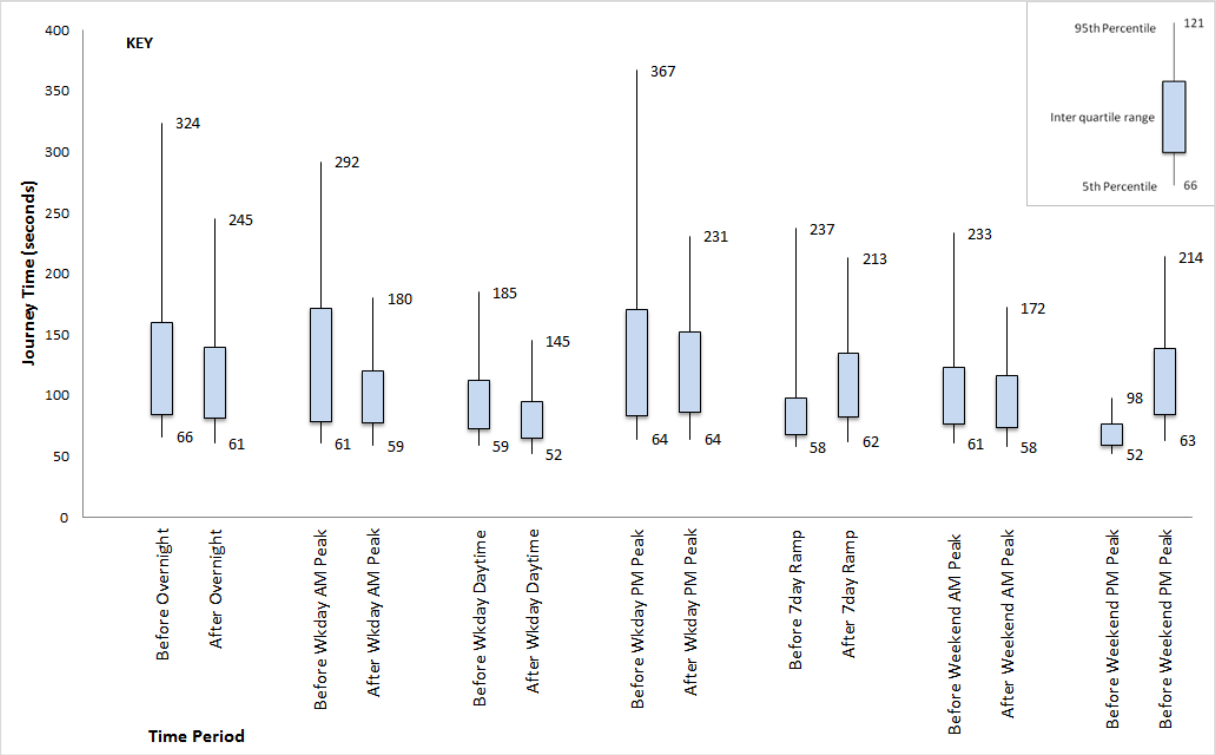
8.9. During the course of this evaluation, a number of findings have revealed ways in which the LNMS appraisal process could be improved. These are summarised as the following lessons learned:

- The journey time dis-benefits identified in the low tourism periods and in some of the high tourism time periods could be mitigated by considering 'part time' operation of signal controls. This would mean during periods of low flow, traffic would not be held up by traffic signals if there was a suitable gap in the circulatory traffic flow; and
- The PAR predicted an opening year accident saving of 4.86. Reducing the accident rate from five to 0.14 per annum is an ambitious target for a scheme, which was unlikely to ever be met. One potential way of predicting a more realistic target would be to look at COBA targets at similar junctions as a guide. The POPE findings for similar schemes could also be used to benchmark predictions.

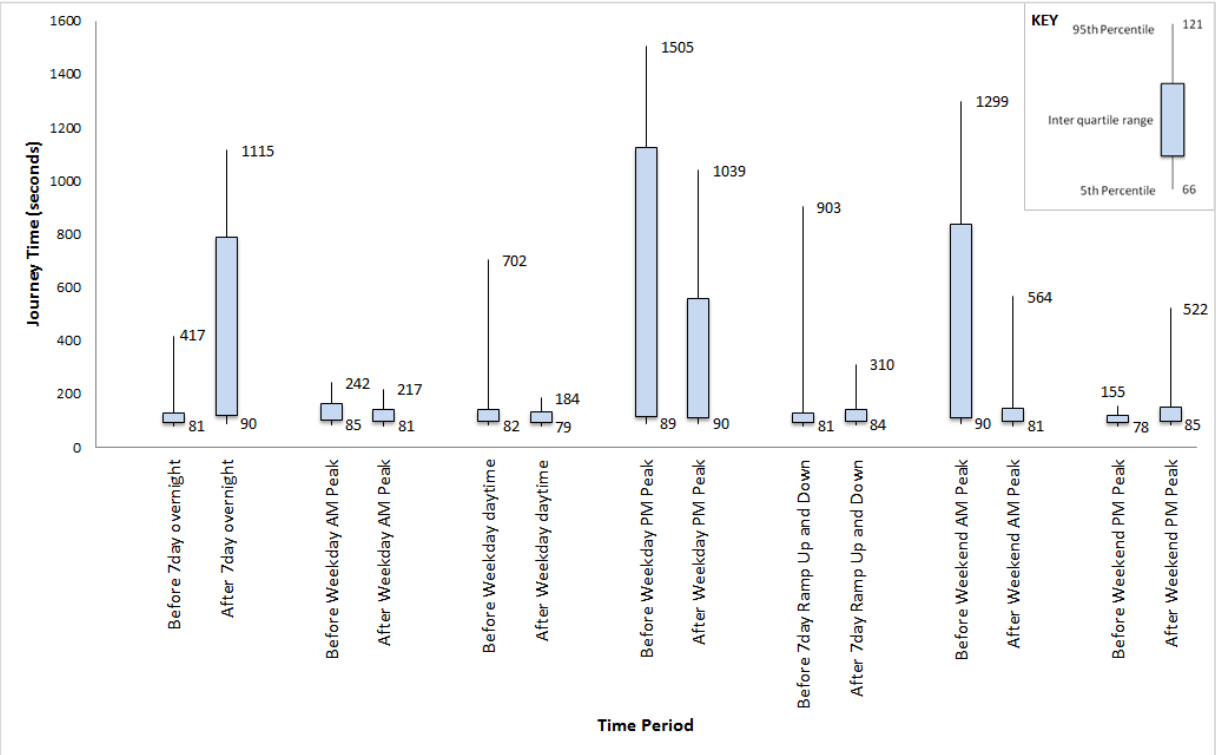
Appendices

Appendix A. Reliability Graphs (High Tourism)

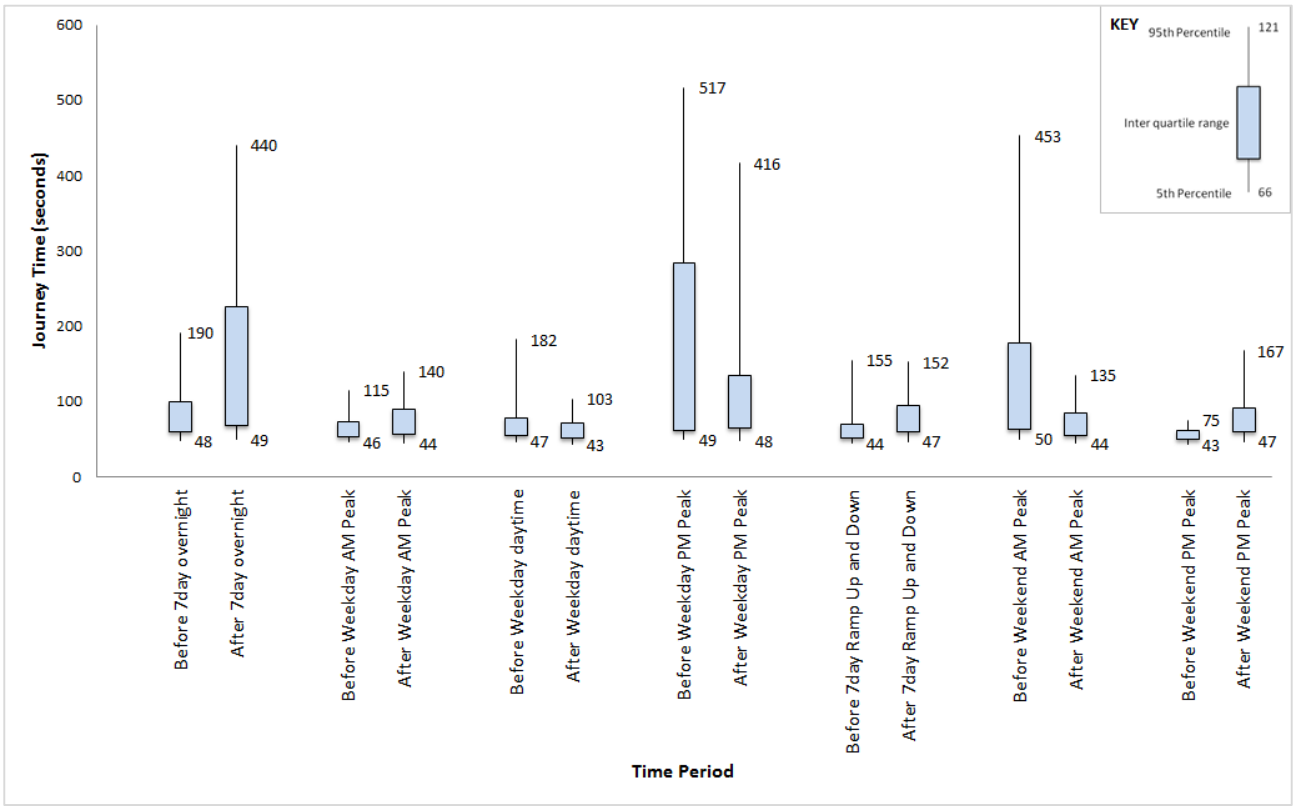
A.1. A303 West to A345 South



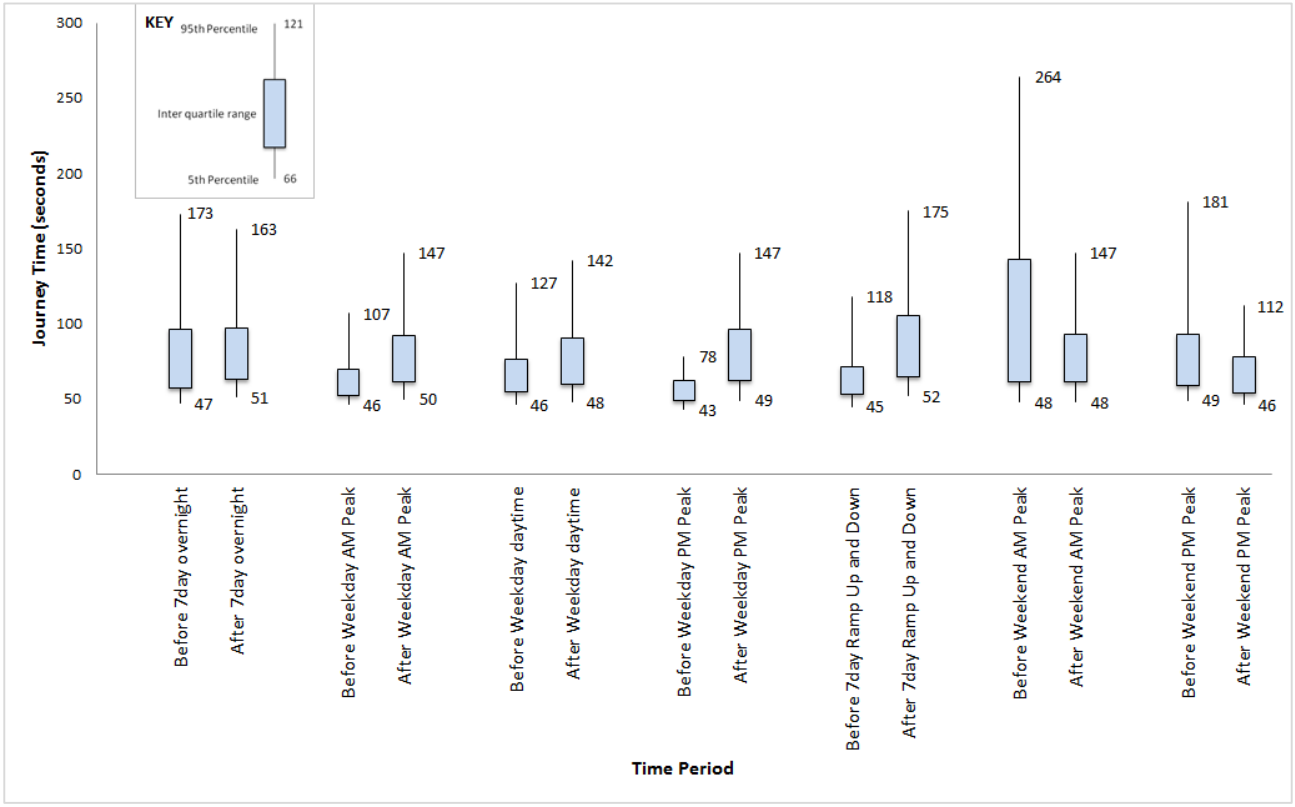
A.2. A345 North to A303 West



A.3. A303 East to A345 North

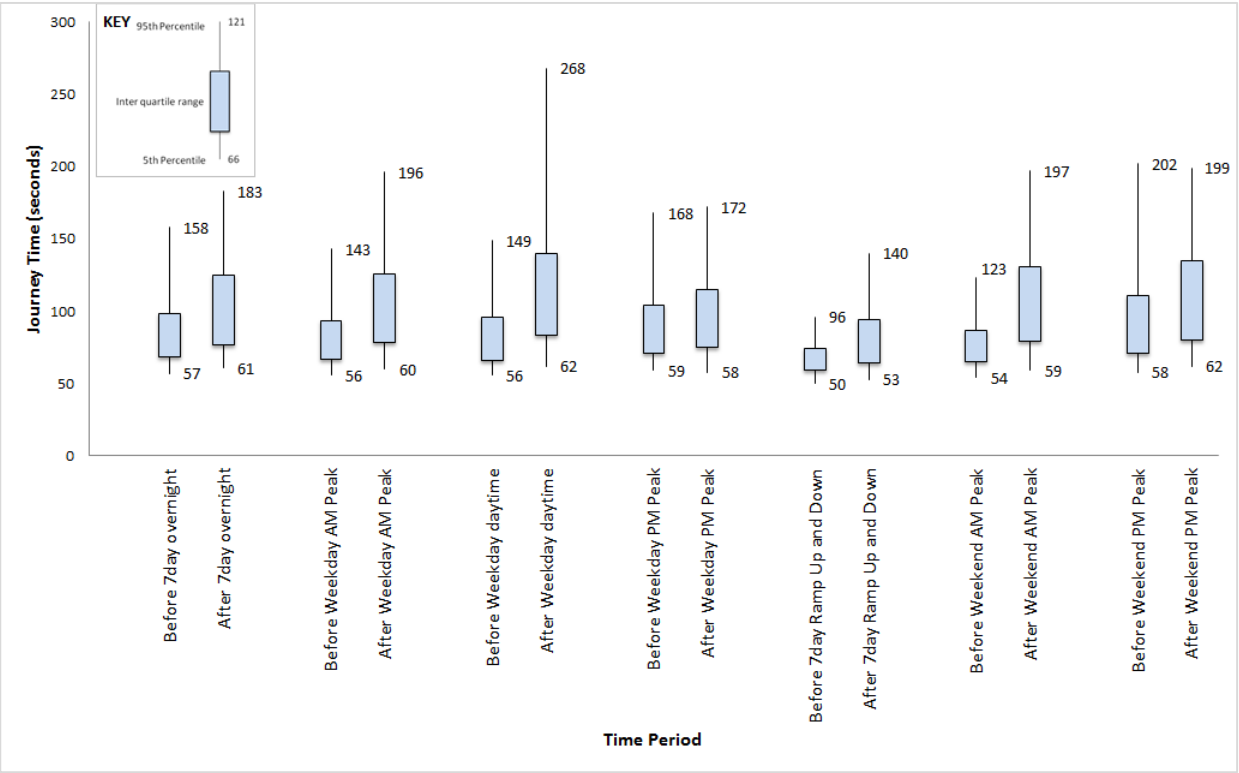


A.4. A345 South to A303 East

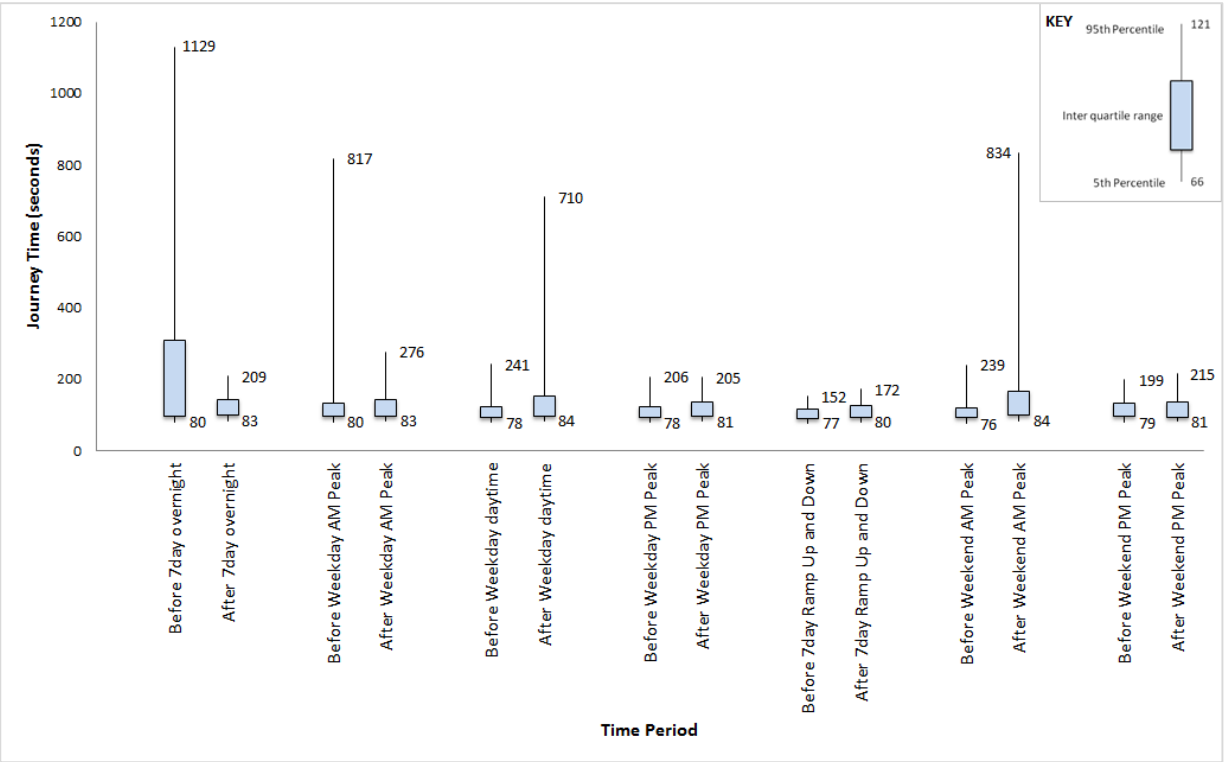


Appendix B. Reliability Graphs (Low Tourism)

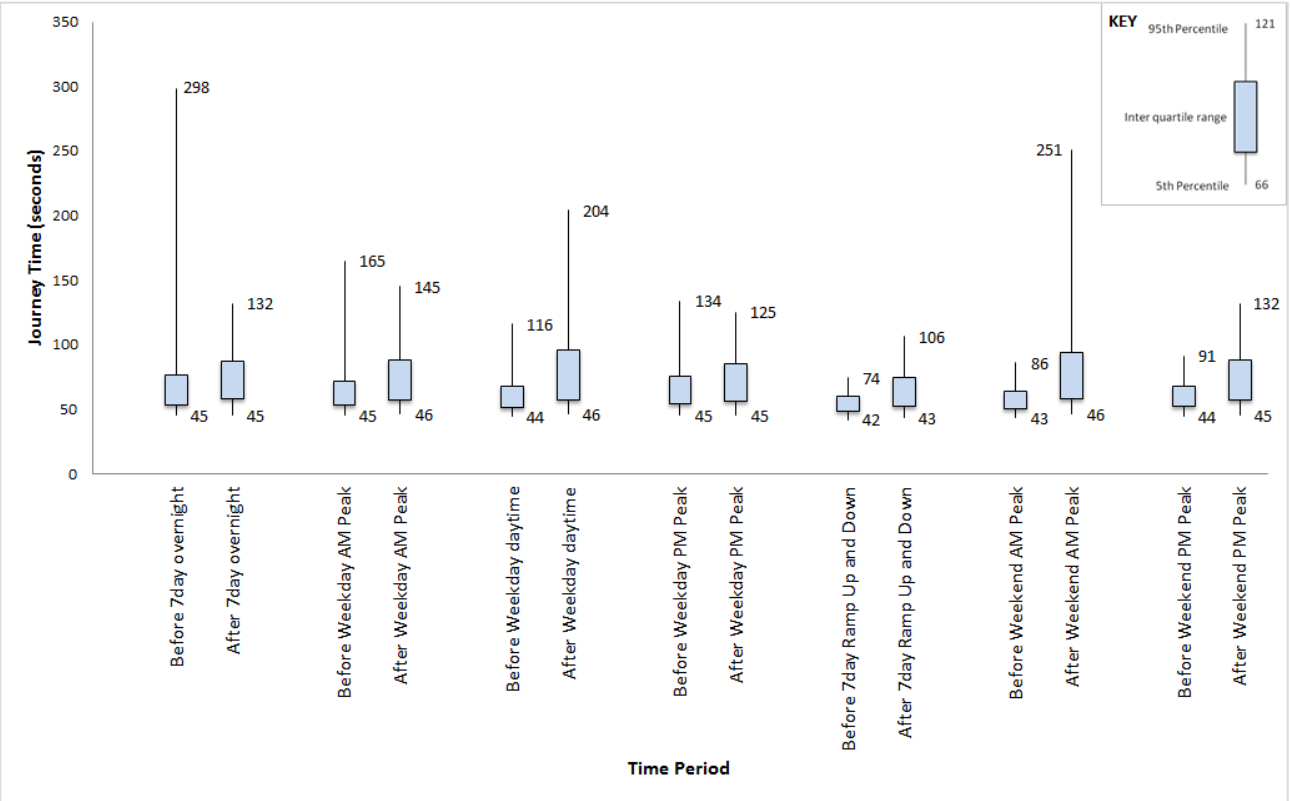
B.1. A303 West to A345 South



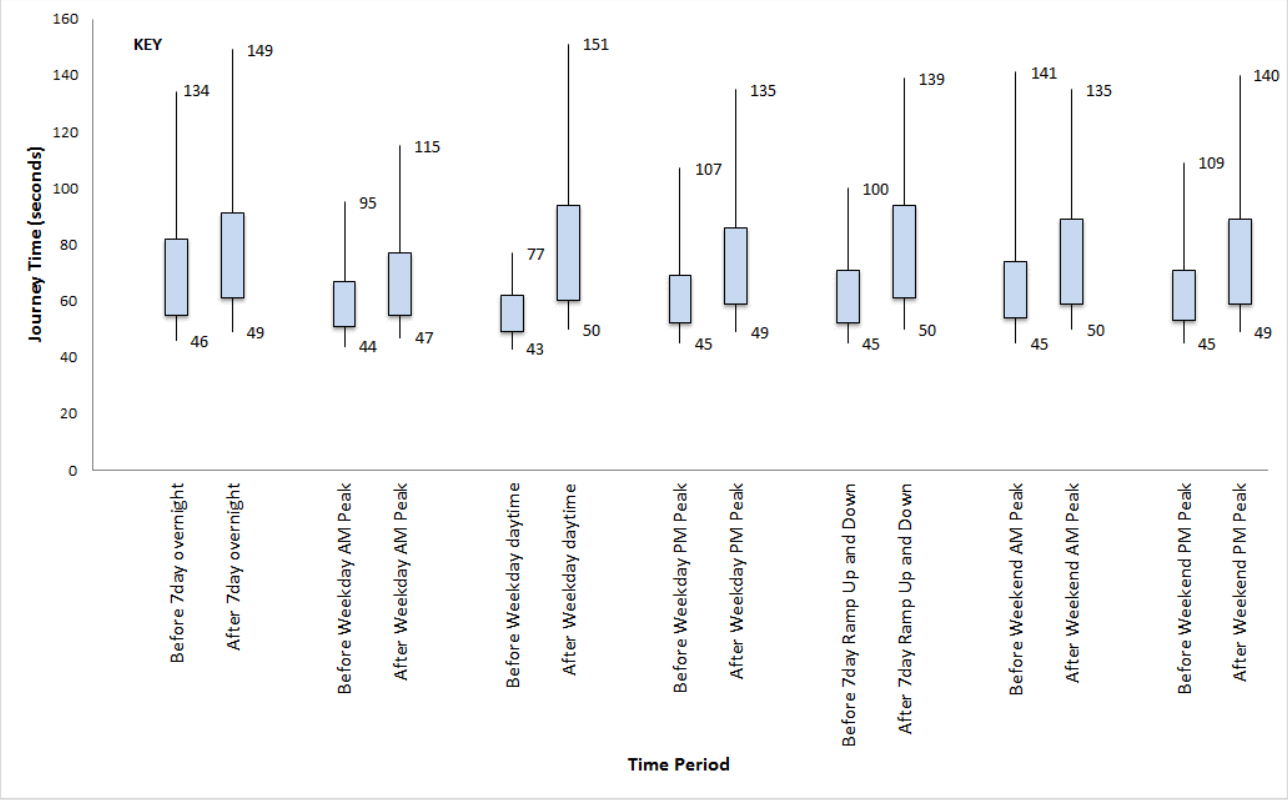
B.2. A345 North to A303 West



B.3. A303 East to A345 North



B.4. A345 South to A303 East



Appendix C. Scheme AST

	Sub-Objective	Qualitative Impact	Quantitative Measures	Assessment
ENVIRONMENT	Noise	Predicted construction noise increases of up to 14.1 dBA at 2 adjacent properties, although this will occur for less than 1 week	No change	Neutral
	Local Air Quality	Not applicable	N/A	N/A
	Greenhouse Gases	Not applicable	N/A	N/A
	Landscape	The surrounding landscape contains features of national importance (Stonehenge World Heritage Site), however works are confined to the HA estate and will not impact these features. The extent of vegetation clearance during works will be largely substituted by vegetation that will remain, however works will increase urbanisation of the area from addition of new lighting (completed as part of renewals scheme).	-	Slight adverse
	Townscape	Not applicable	-	-
	Heritage and Historical Resources	There shall be no impacts on archaeology because works are confined to ground previously disturbed by the construction of the A303. Negligible Adverse impacts are anticipated for built heritage in close proximity due to construction of additional road structures (lighting columns) that may be in visual range.	-	Slight adverse
	Biodiversity	Not applicable	-	-
	Water Environment	Potential pollution impacts on both surface and ground water are limited to construction activities, there are no operational impacts anticipated. The installation of drainage design features (i.e. storage pipes) will mitigate risk of additional runoff caused by a small increase of hardstanding.	-	-
	Physical Fitness	Not applicable	N/A	N/A
	Journey Ambience	Reduced traveller stress/frustration and fear of potential accidents due to the predicted reduction in the number accidents as a result of the scheme. Also improved route certainty due to the anticipated reduction in delay caused by incidents at this location.	-	Large Beneficial
SAFETY	Accidents	Estimated PIA saving of 4.86 in opening year	296 accidents saved	£17.039 Accident PVB
	Security	Not applicable	N/A	N/A
ECONOMY	Public Accounts	Scheme costs met by DfT funding	Scheme costs met by DfT funding	£1.15m
	All Users	Not applicable	N/A	N/A
	Reliability	Scheme anticipates improved journey reliability due to the reduction in accidents and associated delay	N/A	Moderate beneficial
	Wide Economic Impacts	Not applicable	N/A	N/A
ACCESS-IBILITY	Option values	Not applicable	-	N/A
	Severance	Not applicable	N/A	N/A
	Access to Transport System	Not applicable	-	N/A
INTEG-RATION	Transport Interchange	Not applicable	N/A	N/A
	Land Use Policy	Not applicable	-	N/A
	Other Government Policies	Not applicable	-	N/A

Appendix D. EST

	Sub-Objective	Qualitative Impact	Quantitative Measures	Assessment
ENVIRONMENT	Noise	Neutral	No change	Neutral
	Local Air Quality	Not applicable	N/A	N/A
	Greenhouse Gases	Not applicable	N/A	N/A
	Landscape	New lighting was introduced as part of a separate scheme and is not considered to have had an adverse impact. However, as new signals and signs were implemented, these are deemed to have had an adverse impact	-	Slight adverse
	Townscape	Not applicable	-	-
	Heritage and Historical Resources	New lighting columns were introduced as part of a separate scheme. Signals and signage were also implemented but are considered to have a neutral impact	-	Neutral
	Biodiversity	Not applicable	-	-
	Water Environment	Neutral	-	-
	Physical Fitness	Not applicable	N/A	N/A
	Journey Ambience	There has been a decrease in the number of accidents, and the new signals are also expected to have decreased driver stress.		Large Beneficial
SAFETY	Accidents	Post opening PIC saving of 2.29 in opening year	137 accidents saved	£12.813m Accident PVB
	Security	Not applicable	N/A	N/A
ECONOMY	Public Accounts	Scheme costs met by DfT funding	Scheme costs met by DfT funding	£1.46m
	All Users / TEE	There has been a decrease in journey times in the high tourism period and a slight increase to some journey times in the low period. Overall, journey times have decreased and a beneficial impact has been achieved.	N/A	£5.630m
	Reliability	Improved journey reliability	N/A	Slight beneficial
	Wide Economic Impacts	Not applicable	N/A	N/A
ACCESS-IBILITY	Option values	Not applicable	-	N/A
	Severance	Not applicable	N/A	N/A
	Access to Transport System	Not applicable	-	N/A
INTEG-RATION	Transport Interchange	Not applicable	N/A	N/A
	Land Use Policy	Not applicable	-	N/A
	Other Government Policies	Not applicable	-	N/A