

Post Opening Project Evaluation

A46 Newark to Widmerpool Improvement One Year After Study

August 2014



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Executive Summary

Scheme Description

The A46 Newark to Widmerpool Improvement scheme was a major Highway's Agency project in Nottinghamshire which opened to traffic in April 2012. The purpose of the scheme was to provide a 17.5 mile (28km) section of dual carriageway to replace a substandard section of single carriageway trunk road. Numerous low quality junctions were replaced by grade separated junctions, allowing the A46 to have no junctions for through traffic to stop at. The scheme also included retaining sections of the former A46 route as local access roads to settlements and downgrading other sections to be cycle/pedestrian and equestrian routes.

This document summarises the findings of the one year after (OYA) post opening evaluation study completed in 2014.

Scheme Objectives

Objectives (Statement of Case 2007)	Objective Achieved?
To reduce the number of accidents.	✓
To reduce congestion along the route.	✓
To improve links between Nottingham and Leicester to Newark, the A1 and Lincoln.	✓
To provide an improved strategic link between the M1 and A1.	✓
To relieve significant development pressures in Bingham.	Too early to quantify

Key Findings

- Average journey times along the A46 corridor have reduced (although not to the level forecast), and an improvement in journey time reliability is seen as a result of reduced congestion.
- Post opening, average weekday traffic flows have increased by between 14-22% along the scheme section, with evidence of reduced traffic on more minor alternative routes.
- Traffic forecasting at the appraisal stage generally overestimated traffic volumes on the A46 and some surrounding roads. This is partly due to an overestimation of traffic growth in the area, as well as the modelled area not allowing for rerouting from a wider area.
- Collision data indicates a saving of 7.8 personal injury collisions per year for the appraisal area, lower than the number forecast. A saving of 14.7 collisions per year is seen for the scheme key links, indicating that the scheme has had a beneficial impact on safety, even taking into account the background national reduction in collisions over the appraisal period.
- Monetary benefits are lower than expected, with outturn present value benefits of £502.35m compared to a forecast of £996.3m. This is primarily due to the journey time and collision savings being lower than forecast.

Summary of Scheme Impacts

Traffic

- Average weekday traffic flows on the A46 scheme key links have increased post opening with an increase of 14% (4,500 vehicles per day (vpd)) seen on the A46 between the A52 and A6097

junctions and an increase of 18% (5,500 vpd) seen on the northern section of the scheme. Proportionally, the highest increase is seen on the southern part of the scheme south of the A52 junction where an increase of 22% is seen, although this equates to a slightly lower 4,200 vpd.

- Traffic has reduced on alternative routes (the A612 and B6386) to the west of the scheme, with reductions also seen on minor roads to the east of the northern section of the scheme. This indicates that traffic has transferred onto the more suitable A46 route. An increase in flows on the A46 above the level of transference indicates that the scheme has also reduced ratrunning on smaller roads where counts were not available.
- Forecast traffic volumes were generally lower than observed, both with and without the scheme. However, the overall forecast impact of the scheme on traffic flows on the A46 was slightly underestimated, suggesting that rerouting was not as great as forecast, and that forecast housing development in the area has not progressed to the level expected for the original opening year of 2016.
- Along the A46 scheme section, average journey times have reduced significantly during all time periods, with greatest savings seen in the peak periods.
- Journey time reliability on the A46 has improved as a result of the scheme opening. This is a result of reduced congestion and reduced collisions along the route.

Safety

- Safety data for the modelled area indicates an annual collision saving of 7.8 collisions per year.
- When only the A46 scheme key links are considered, an annual collision saving of 14.7 collisions per year is seen (above that observed for the wider study area), therefore strongly indicating that the scheme has had a direct beneficial impact on safety on the A46 improved section.
- The savings observed on the scheme section are in line with the forecasts (around 30% reduction in annual collisions), but the forecast saving of 16% of annual collisions over the study area has not been met, with an observed reduction of 6% seen (when the national collision background decline over time is accounted for), although firm conclusions cannot be drawn from one year of data.
- Severity of collisions has reduced slightly, with a larger change seen post opening for the scheme key links than the wider study area.

Environment

- Based on traffic flows, the noise and local air quality impacts of the scheme are generally as expected, with some local variations.
- The observed increase in carbon emissions between the pre and post scheme periods is less than forecast. Observed total emissions are lower than forecast as the without scheme scenario forecast overestimated carbon emissions in the pre scheme period.
- The landscape measures are generally as expected (slight adverse). The effectiveness of planting for visual screening cannot be fully determined at the OYA stage due to the immaturity of the vegetation, however the planting is considered to be growing as expected of one year old planting.
- Biodiversity mitigation measures have been implemented as expected. The effectiveness of these measures cannot be fully evaluated at OYA, however monitoring reports should be available to inform future evaluation.
- The impacts on heritage are largely as expected at the OYA stage. Additional archaeological reports should be published by the five years after (FYA) stage, allowing for a full assessment of the scheme. Visual screening of affected heritage buildings/ sites, where applicable, should be maturing by FYA allowing for an assessment of the effectiveness of mitigation.
- No visible issues with water and drainage were found during the OYA site visit, although an issue remains unresolved with regard to drainage. This was raised by the Environment Agency and local parish councils.

- Physical fitness benefits have been largely as expected. There is an outstanding issue regarding reinstatement of certain footpaths that is the local authority responsibility. Overall the impact of the scheme is considered to be as expected.
- Journey ambience has improved as expected due to the removal of congestion along the route. The route is generally well sign-posted, aiding drivers, and grade separated junctions remove opposing movements across the carriageway reducing driver stress.

Accessibility and Integration

- The removal of traffic from the local settlements of East Stoke and Farndon has benefited these local communities by reducing severance and improving the quality of the environment in the local area. Local communities are further benefited by the conversion of some sections of the former A46 route to cycle and bridleways.
- As a result of the removal of traffic from villages, public transport interchange improvements are indirectly improved through an improvement to the waiting environment, although some services have been rerouted post opening.

Summary of Scheme Economic Performance

All monetary figures in 2002 prices and values		Forecast	Outturn Re-forecast
Journey Time Benefits		£1,157.3m	£601.3m
Safety Benefits		£114.0m	£49.7m
Vehicle Operating Costs		-£239.8m	-£131.4m
Carbon benefits		-£35.2m	-£17.25m
Present Value Benefits (PVB)		£996.3m	£502.35m
Indirect Tax		£196.4m	£108.6m
Present Value Costs (PVC)		£274.5m	£265.3m
Benefit Cost Ratio (BCR)	Indirect Tax as a cost	12.8	3.2
	Indirect Tax as a benefit	4.3	2.3

- Journey time benefits are below that forecast, mainly due to lower traffic levels and speed changes.
- Outturn safety benefits of £49.7m are lower than that forecast as the number of observed collisions in the OYA period within the appraisal area are higher than forecast, particularly when the national background decline in the number of collisions is accounted for.
- Overall the outturn PVB of £502.35m is 49% lower than the forecast.
- The outturn investment costs are 3.5% lower than forecast.
- The outturn BCR indicates that the scheme is still considered to deliver value for money.
- The study has not identified any firm evidence to suggest that the scheme has had a discernible impact in terms of stimulating economic activity at this stage. However the reduced journey times and additional capacity are considered to support future growth around Bingham and Newark.

1. Introduction

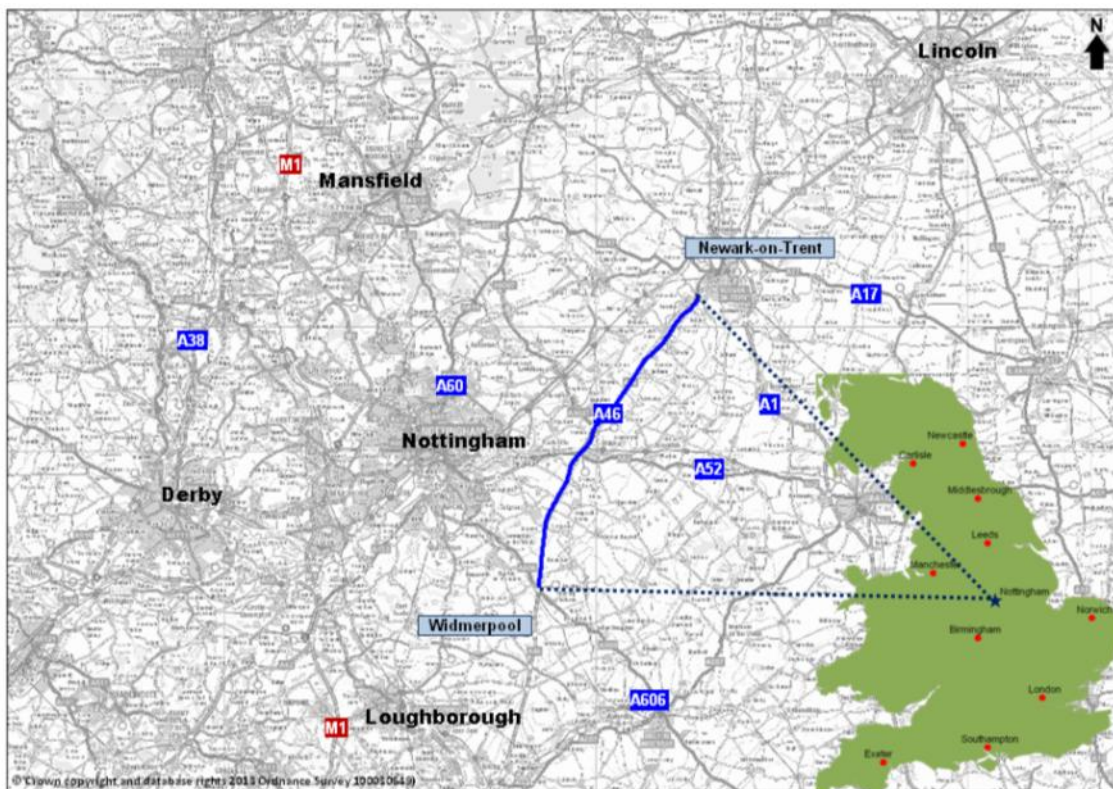
Background

- 1.1 This report presents a One Year After (OYA) opening evaluation of the A46 Newark to Widmerpool Improvement scheme (hereafter known as 'the scheme') which opened to traffic at the beginning of April 2012. The formal road opening ceremony was conducted on 15th June 2012. The evaluation has been prepared as part of the Highway Agency's (HA's) Post Opening Project Evaluation (POPE) programme. The purpose of this report is to present the initial impacts of the scheme.

Scheme Context

- 1.2 The A46 between Newark to Widmerpool is part of a strategic route, linking the M1 at Leicester through to the A1 at Newark, running to the south of Nottingham. The location of the scheme is illustrated in Figure 1-1.

Figure 1-1 – Scheme Location



- 1.3 This section of the A46 was the only remaining single carriageway section between Leicester and Newark. The Statement of Case (March 2007) for this scheme indicates that the A46 at this location carried over 25,000 vehicles per day (vpd). This level of traffic gave rise to frequent congestion and delays. The road also had a poor safety record.
- 1.4 The A46 generally followed the line of the old Roman Road, Fosse Way and the straight yet undulating nature of the original road and the many junctions and accesses to fields, farms and houses made safe overtaking difficult. Bridleways and footpaths joined and crossed this section of the A46 but walkers, cyclists and horse-riders found it difficult to cross because of the high traffic flows

Scheme Description

- 1.5 The A46 Newark to Widmerpool Improvement scheme is a major HA project which provided 17.5 miles (28km) of new dual carriageway, 15km of which was constructed off line. The

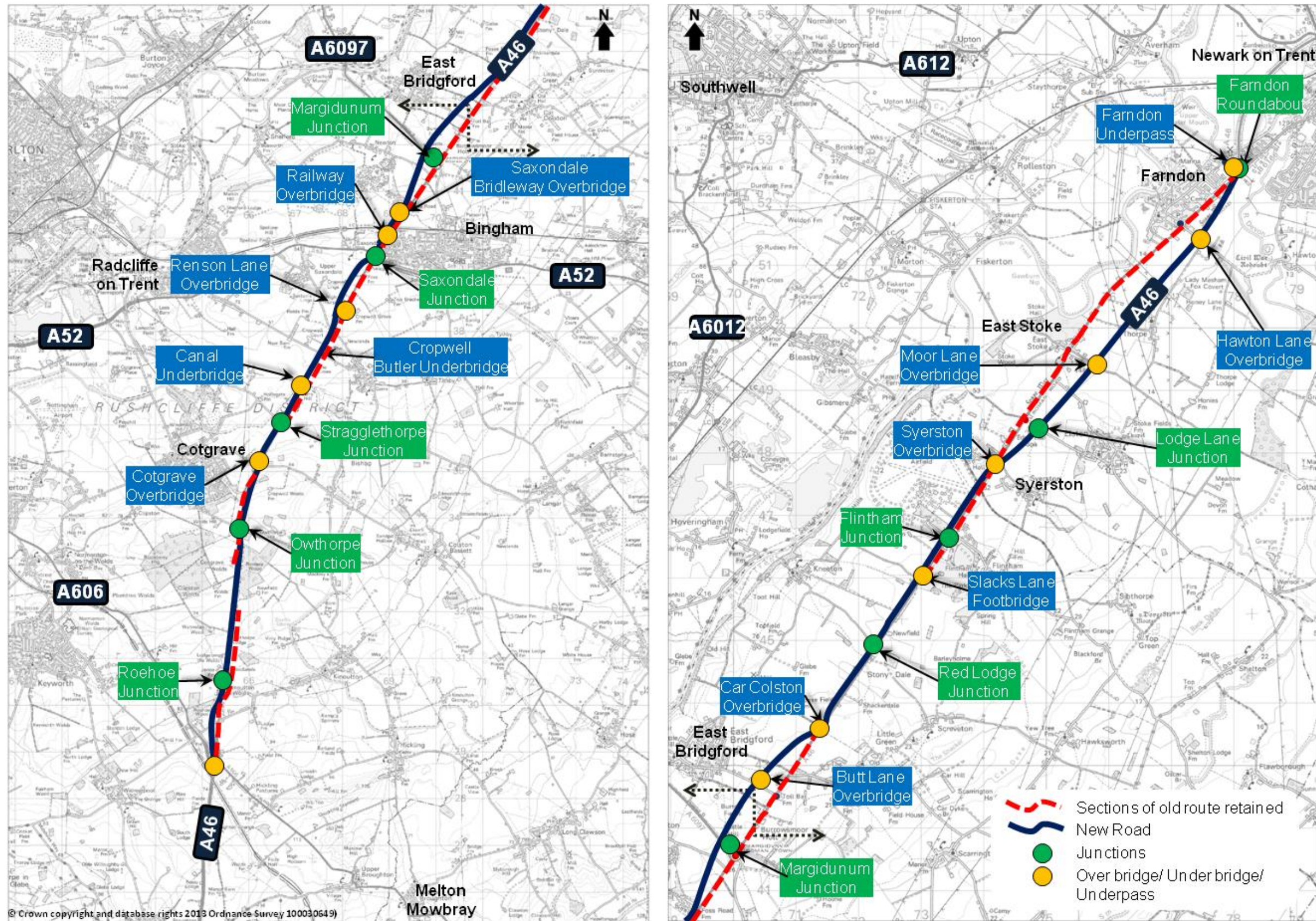
route connects with the existing grade separated junction with the A606 at Widmerpool to the south. The northern end connects with the Newark bypass with an enlarged roundabout at Farndon. The scheme involved the construction of 8 full or compact grade separated junctions, as well as 13 bridges and underpasses. The villages of East Stoke and Farndon have been bypassed. Further details are shown in Figure 1-2.

- 1.6 Throughout the length of the scheme, new indirect accesses have been provided to properties, farms and businesses where the original access was severed by the scheme. Much of the old alignment is retained as local access roads, with some converted to cycle/equestrian routes.
- 1.7 The main dual carriageway has no lighting provision, however the junctions at Stragglethorpe, Saxondale, Margidunum and Farndon along the route have been lit.
- 1.8 Prior to the scheme, the railway bridge crossing the A46 at Bingham had substandard headroom resulting in vehicles over 4 metres in height being diverted through Bingham to avoid it. The Bingham railway line now crosses the new dual carriageway just north of Saxondale roundabout with more headroom. This removes the requirement for high vehicle diversions, and allowing an existing environmental weight limit to be fully enforced in Bingham.

Scheme Objectives

- 1.9 The objectives of the scheme, as set out in the HA's Statement of Case (March 2007) were:
 - **To reduce the number of accidents.**
 - **To reduce congestion along the route.**
 - **To improve links between Nottingham and Leicester to Newark, the A1 and Lincoln.**
 - **To provide an improved strategic link between the M1 and A1.**
 - **To relieve significant development pressures in Bingham.**

Figure 1-2 – Key Features of the Scheme



Scheme History

- 1.10 A brief history of the key events involved in the development of the scheme is provided in Table 1–1.

Table 1–1 Chronology of the A46 Newark to Widmerpool Improvement Scheme

Date	Event
May 1989	Scheme first considered
April 1991	First public consultation – online widening to dual carriageway
March 1992	Preferred Route Announcement
December 1993	2nd Public Consultation
July 1995	Preferred Route Announcement – revised
1997	Scheme withdrawn from Roads Programme
2001	Scheme enters Targeted Programme of Improvements
March - April 2003	Public Consultation and Exhibitions
July 2005	Preferred Route Announcement
December 2005	Environmental Statement and Draft Orders Published (withdrawn)
January 2006	Public Exhibitions
January 2007	Environmental Statement and Draft Orders republished
September 2007	Public Inquiry
February 2008	Inspectors Report
January 2009	Made Orders Published
June/July 2009	Start of Works Ceremony and Exhibitions
January/February/April 2010	Public Inquiry 2 into Supplementary Orders
Nov 2011	Public Inquiry 3
April 2012	Scheme Opened to traffic
15 June 2012	Formal Road Opening Ceremony

Overview of POPE

- 1.11 The HA is responsible for improving the strategic highway network (motorways and trunk roads) by delivering the Major Schemes programme. At each key decision stage through the planning process, schemes are subject to a rigorous appraisal process to provide a justification for the project's continued development. When submitting a proposal for a major transport scheme, the Department for Transport (DfT) specifies that an Appraisal Summary Table (AST) is produced which records the degree to which the five Central Government objectives for Transport¹ (Environment, Safety, Economy, Accessibility and Integration) have been achieved. The AST for this scheme is presented in Table 7–1 on page 99.
- 1.12 POPE studies are carried out for all Major Schemes to evaluate the strengths and weaknesses in the techniques used for appraising schemes. This is so that improvements can be made in the future. For POPE, this is achieved by comparing information collected before and after the opening of the scheme to traffic, against predictions made during the planning process. The outturn impacts of a scheme are summarised in an Evaluation Summary Table (EST) which summarises the extent to which the objectives of a scheme have been achieved. The EST for this scheme can be found in Table 7–2 on page 101.
- 1.13 POPE of Major Schemes goes beyond monitoring progress against targets set beforehand. Instead, it provides the opportunity to study which aspects of the intervention and appraisal tools used to evaluate it are performing better or worse than expected, and how they can be made more effective. More specifically the objectives of POPE evaluation reports are to:
- Provide a quantitative and qualitative analysis of scheme impacts consistent with national transport appraisal guidance (WebTAG) and scheme specific objectives.
 - Identify discrepancies between forecast and outturn impacts.
 - Explain differences between forecast and outturn impacts.

¹ As of August 2011, this approach has been revised. However, POPE is concerned with evaluation against the appraisal and as such follows the objectives used at that time.

- Identify key issues relating to appraisal methods that will assist the HA in ongoing improvement of appraisal approaches and tools used for major schemes.

Contents of this Report

1.14 The remainder of this report is structured as follows:

- **Section 2 – Traffic Impact Evaluation.** This section looks what impacts the scheme had on traffic volumes and journey times on the A66 and surrounding roads;
- **Section 3 – Safety Evaluation.** This section compares the pre and post opening collision numbers and looks at collision rates;
- **Section 4 – Economy Evaluation.** This section compares the monetary value of any changes in journey times and collisions and compares these benefits with the cost.
- **Section 5 – Environment Evaluation.** This section looks at the environmental impacts of the scheme and the success of any mitigation;
- **Section 6 – Accessibility and Integration Evaluation.** This section contains a review of the scheme impacts on accessibility for pedestrians and cyclists and considers the impact of the scheme on local land use and Government Policies;
- **Section 7 – Appraisal Summary Table (AST) and Evaluation Summary Table (EST).** This section contains an overview of the actual scheme impacts compared to those predicted in the original AST; and
- **Section 8 – Conclusions.** This section summarises the main findings of this study against the key objectives.

1.15 There are also a number of appendices listed below as follows:

- Appendix A – List of Tables and Figures presented in this report
- Appendix B – Glossary
- Appendix C – Information requested for Environmental section
- Appendix D - Photographic record of scheme
- Appendix E - Environmental Awards
- Appendix F – Visual Impacts
- Appendix G – Ecological Impacts

2. Traffic Impact Evaluation

Introduction

- 2.1 This section examines traffic data from a number of sources to provide a before and after opening comparison of traffic flows and journey times along the A46 Newark to Widmerpool route and the surrounding road network. The purpose of this evaluation is to understand whether changes in traffic flows and journey times may be attributable to the scheme.
- 2.2 This chapter comprises:
- An overview of national, regional and local background traffic trends.
 - A summary of the sources used to compile data for this evaluation.
 - A detailed comparison of before and one year after (OYA) traffic flows on key routes including the A46 and other routes in the study area likely to be affected by the scheme.
 - A comparison of before and OYA journey times along the A46.
 - An evaluation of the key differences between forecast and outturn impacts of the scheme on traffic flows and journey times.

Background Changes in Traffic

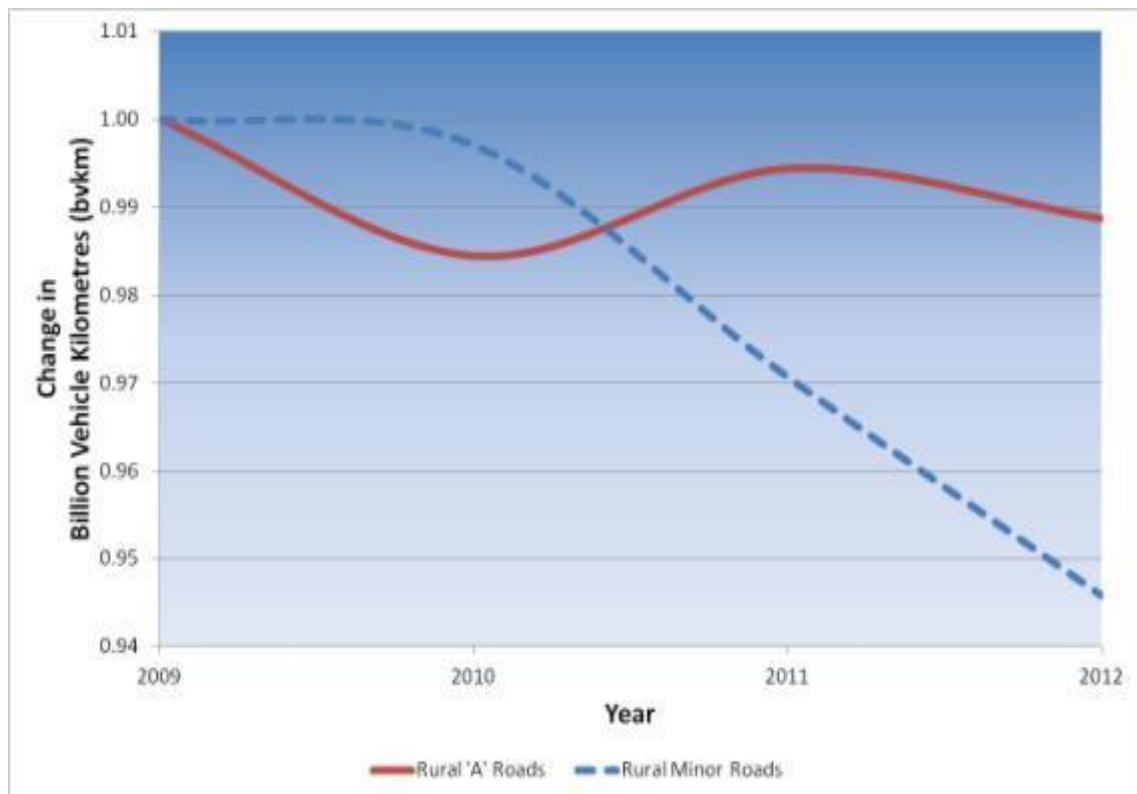
- 2.3 Historically in POPE evaluations, the before counts have often been factored to take account of background traffic growth so that they are directly comparable with the after counts. However, in light of the recent economic climate, which has coincided with a widespread reductions in motor vehicle travel in the United Kingdom (UK) as a whole since 2008, it is no longer deemed appropriate to use this method of factoring to reflect background changes in traffic. Rather, recent POPE studies have taken a more considered approach in order to assess changes in the vicinity of the scheme, within the context of national, regional and locally observed background changes in traffic.
- 2.4 As such, this section will examine and discuss the national, regional and local trends in traffic flows.

National Trends

- 2.5 The Department for Transport (DfT) produces observed annual statistics for all motor vehicles in billion vehicle kilometres (bvkm) by road type². Data between 2009 (construction) and 2012 (latest available) has been used to calculate the factor of change compared to a base year of 2009 on a yearly basis, and is shown in Figure 2-1 for all rural 'A' roads and all rural minor roads in Great Britain.

² Road Traffic and Speeds (<http://www.dft.gov.uk/pgr/statistics/datatablespublications/roads/traffic>). Table TRA0202b. Motor vehicle traffic (vehicle kilometres) by road class in Great Britain, annual from 1993 to 2012.

Figure 2-1 – Nationally Observed Trends by Road Type



2.6 It can be seen from Figure 2-1 that:

- Traffic levels nationally on rural A roads dropped by around 1.5% during the construction period with a slight increase seen again in 2011. Post opening, traffic flows are around 1% less than seen prior to construction.
- Traffic levels in 2012 on rural minor roads nationally were over 5% lower than the base year of 2009.

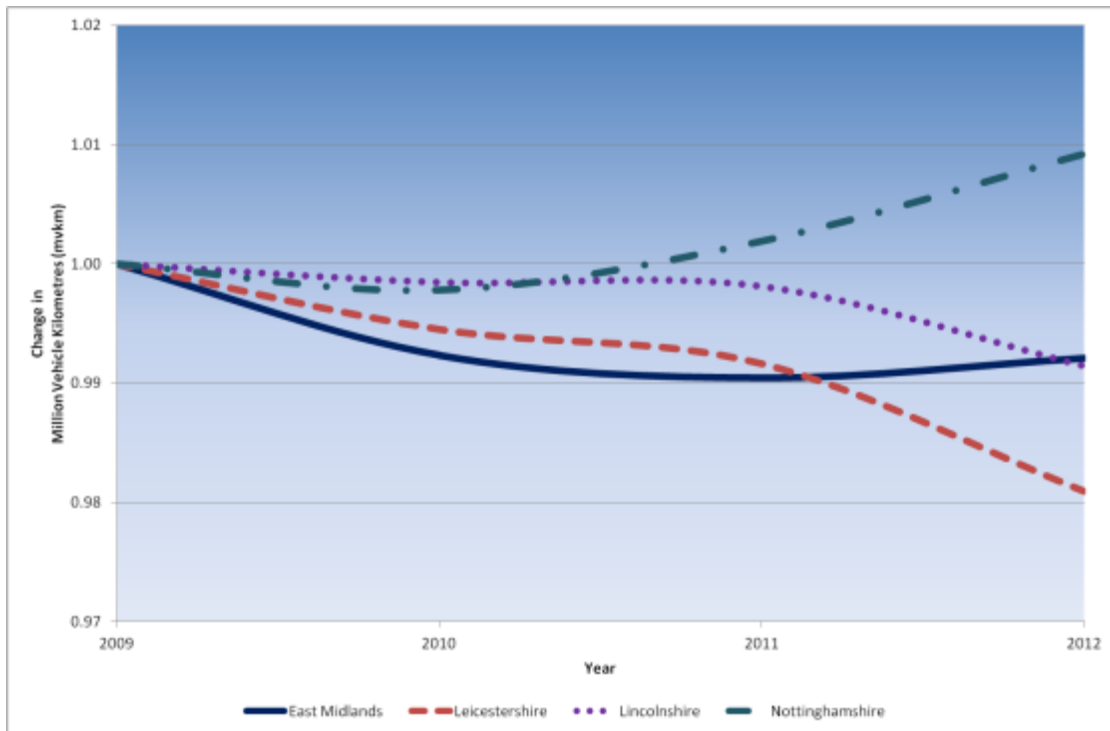
2.7 This should be borne in mind when assessing the changes in traffic volumes around the A46 later in this section, as it is important to determine whether changes have occurred due to the scheme or they are merely indicative of national trends.

Regional and Local Trends

2.8 Regionally and locally observed changes in traffic levels are also provided by DfT Statistics in the form of million vehicle kilometres (mvkm)³, and these have been used to calculate the factor of change by year compared to 2009, for all roads in the East Midlands region, and for the counties of Nottinghamshire, Leicestershire and Lincolnshire. This is shown in Figure 2-2.

³ Road Traffic and Speeds (<http://www.dft.gov.uk/pgr/statistics/datatablespublications/roads/traffic>) Table TRA8904f. Motor vehicle traffic (vehicle kilometres) by local authority in the East Midlands, annual from 1993 to 2012

Figure 2-2 – Regional and Local Trends



2.9 It can be seen from Figure 2-2 that:

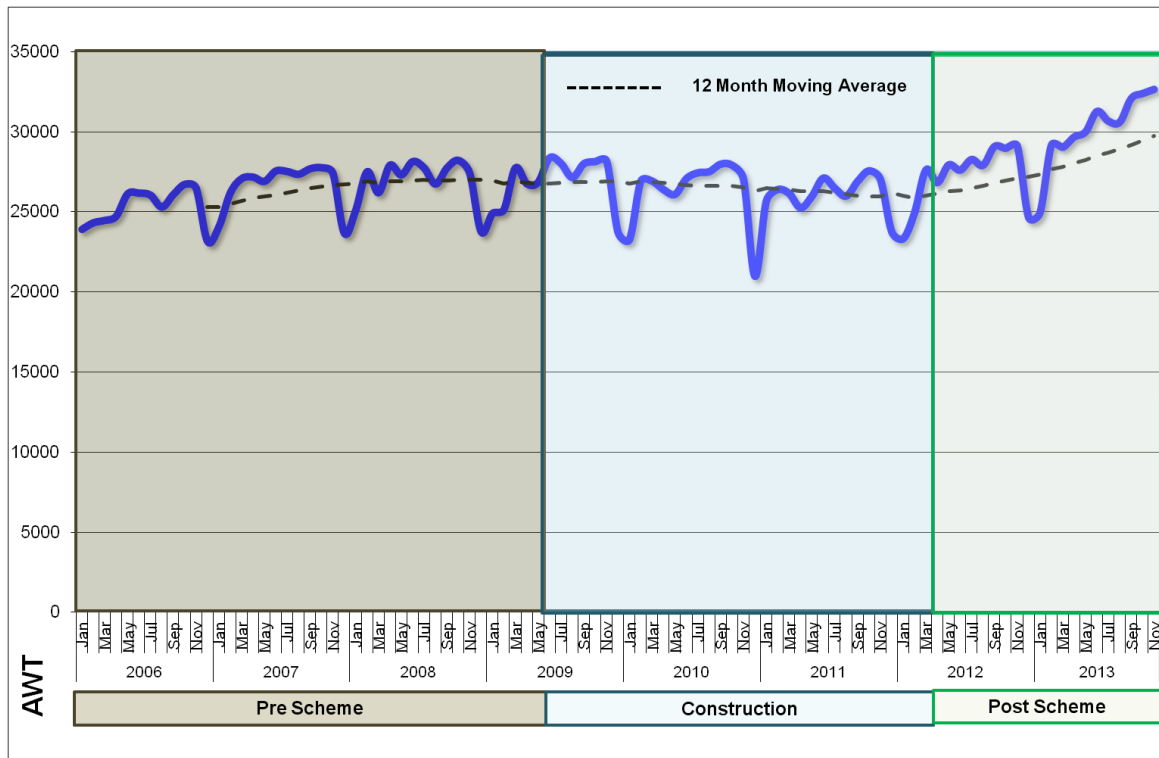
- Traffic levels in the East Midlands show a gradual decrease of around 1% from 2009 to 2011, however, 2012 figures indicate a slight increase, although traffic levels remain around 0.8% lower than the base year of 2009.
- There is a gradual decrease in vehicle kilometres driven in Leicestershire, with 2012 levels being around 2% less than in 2009.
- Lincolnshire traffic levels have been fairly steady, only showing a decrease in 2012, however overall levels are less than 1% lower than they were in 2009.
- Nottinghamshire seems to buck the trend, showing a slight decrease into 2010, but then showing an increase, resulting in 2012 levels being around 1% higher than those seen in 2009.

2.10 **Overall based on the trend shown in these figures, no factors have been applied to observed traffic flows to account for an annual change.** The scheme is wholly located in Nottinghamshire, however as a strategic route, trends in Lincolnshire and Leicestershire may also influence observed flows.

2.11 As the scheme was a major upgrade of a strategic route, the long term average weekday traffic (AWT) trends on a site on the A46 just south of the scheme section (which remained operational during scheme construction) has been looked at. It can be seen from Figure 2-3 that:

- Traffic was increasing slowly prior to construction, however the construction period demonstrates a reduction in traffic, which is likely to be due to the speed and lane restrictions that were in force.
- Post opening, traffic increases steadily towards the end of 2012. Following a seasonal drop at the end of 2012, traffic continues to increase. This supports the notion that the scheme has resulted in more traffic being drawn to the route.

Figure 2-3 – A46 South of Widmerpool - Trend over Time



Traffic Volume Analysis

Data Sources

- 2.12 For the purposes of this evaluation, the main sources of traffic data (ATC) include:
- Permanent traffic count data for the HA network from the TRADS database for the periods before construction and one year after opening.
 - Traffic count data supplied by Nottinghamshire County Council and Lincolnshire County Council for the before and after periods.
 - Where existing traffic data was not available pre scheme, additional counts were commissioned, and repeated at the OYA stage.
- 2.13 Due to the length of the scheme, the results are split over two sections, the northern and southern areas to enable clear presentation. The locations of the traffic count data sites used in this evaluation are shown in Figure 2-4 and Figure 2-5.

Observed Flows

- 2.14 A comparison of pre and post opening 24 hour average weekday traffic (AWT) flows is shown geographically in Figure 2-6 and Figure 2-7 for the northern section of the scheme, and Figure 2-8 and Figure 2-9 for the southern section of the scheme.

Figure 2-4 – Traffic Count Locations - North

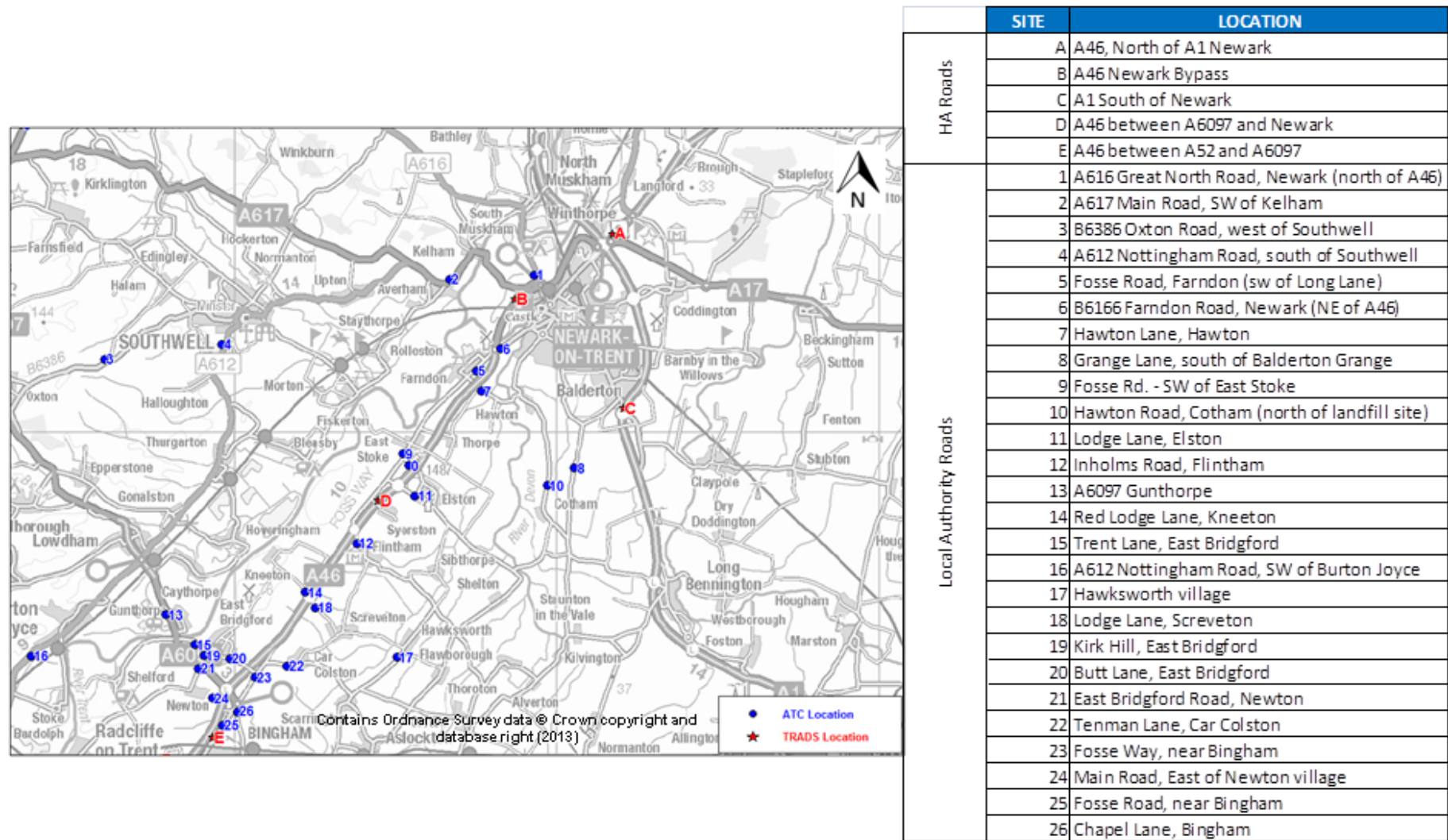


Figure 2-5 – Traffic Count Locations - South

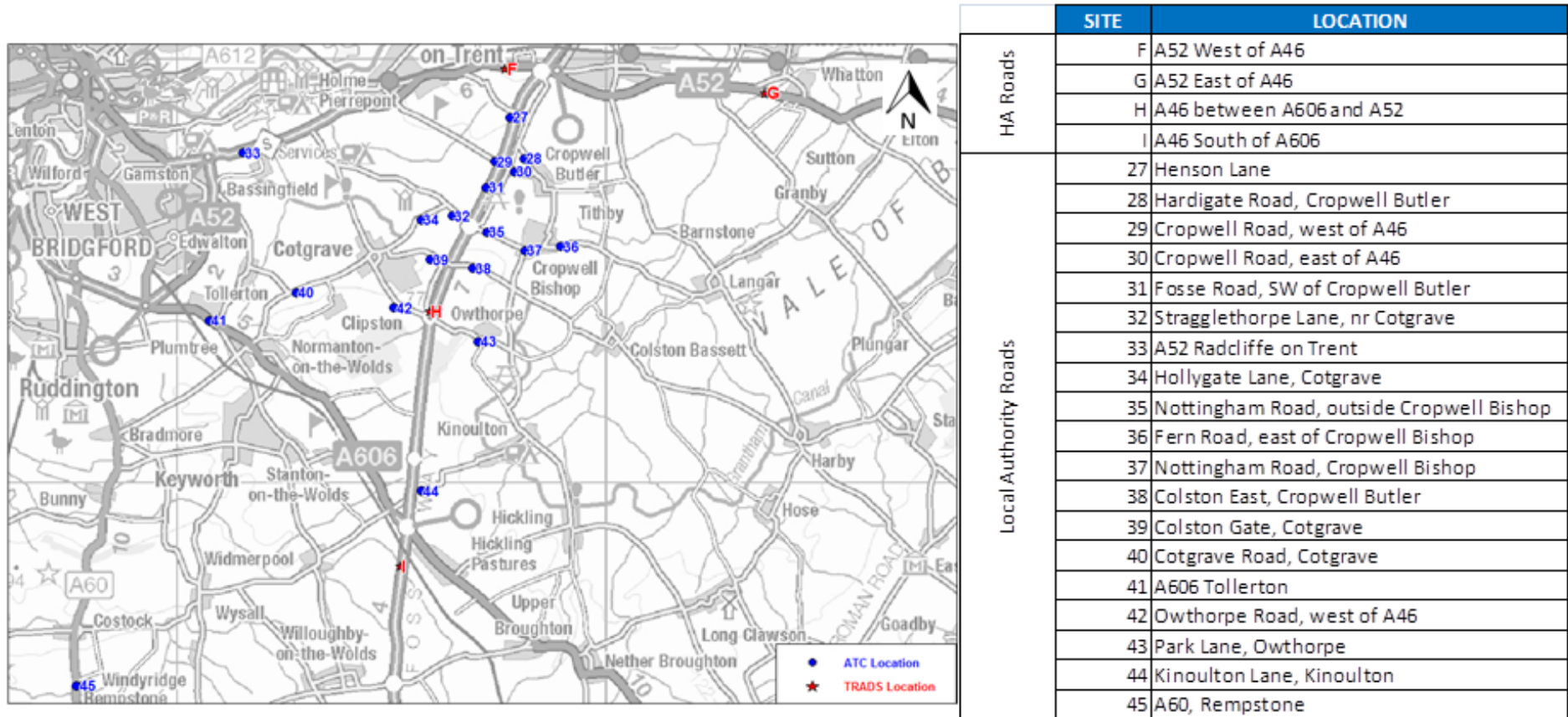


Figure 2-6 – Average Weekday Traffic (AWT)- Northern Section of scheme

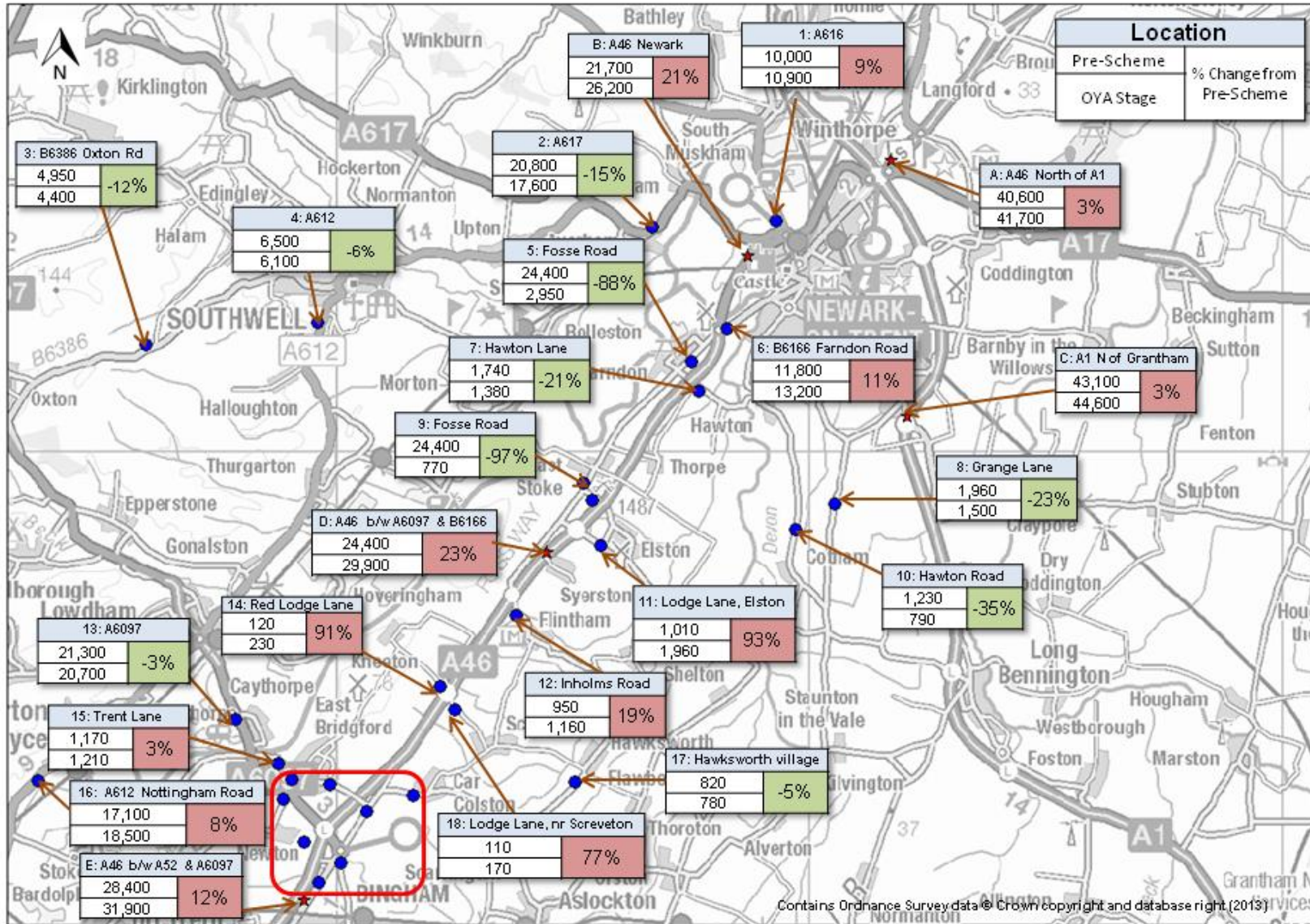


Figure 2-7 – Average Weekday Traffic (AWT)- Northern Zoom section

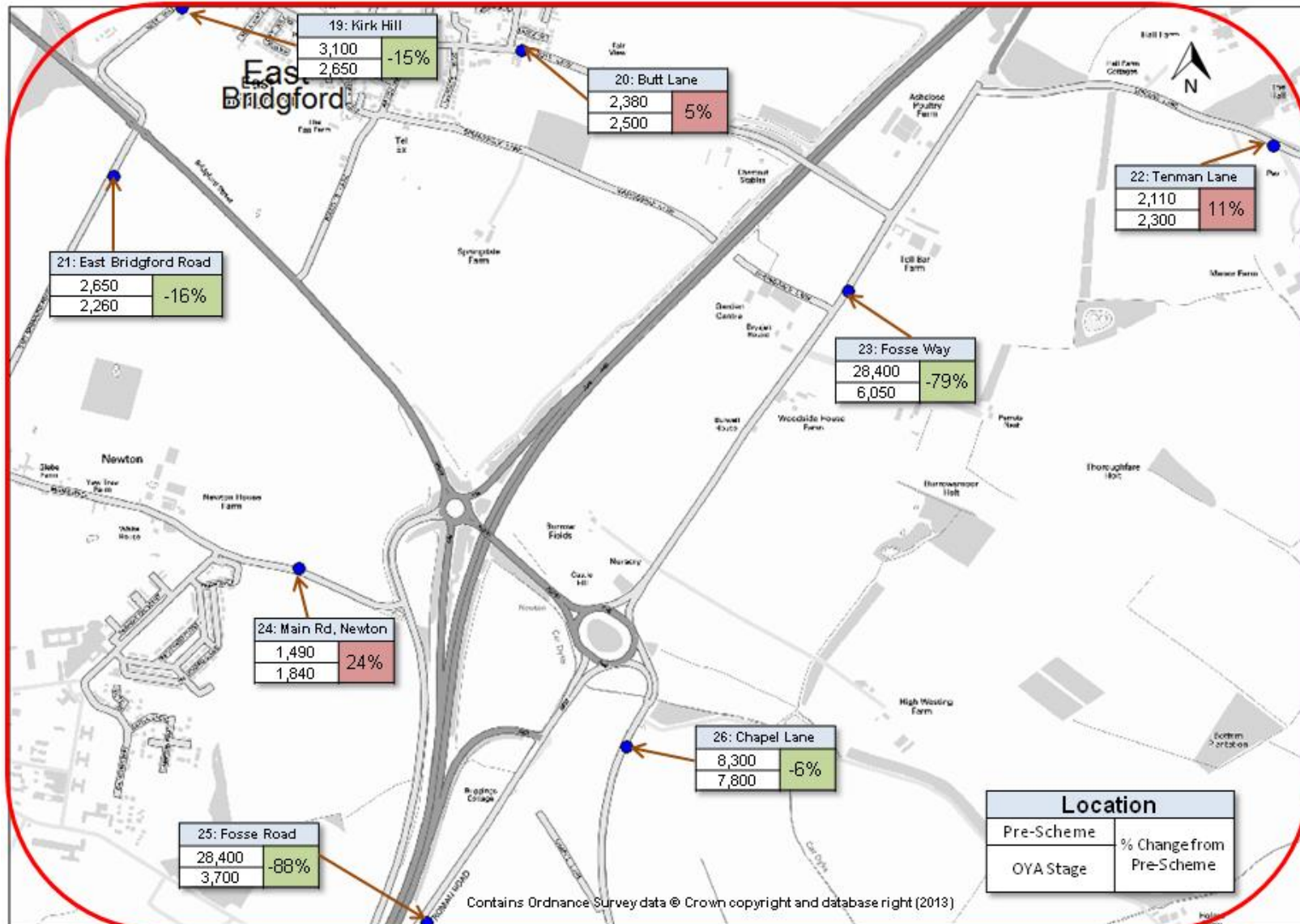


Figure 2-8 – Average Weekday Traffic (AWT)- Southern Section of scheme

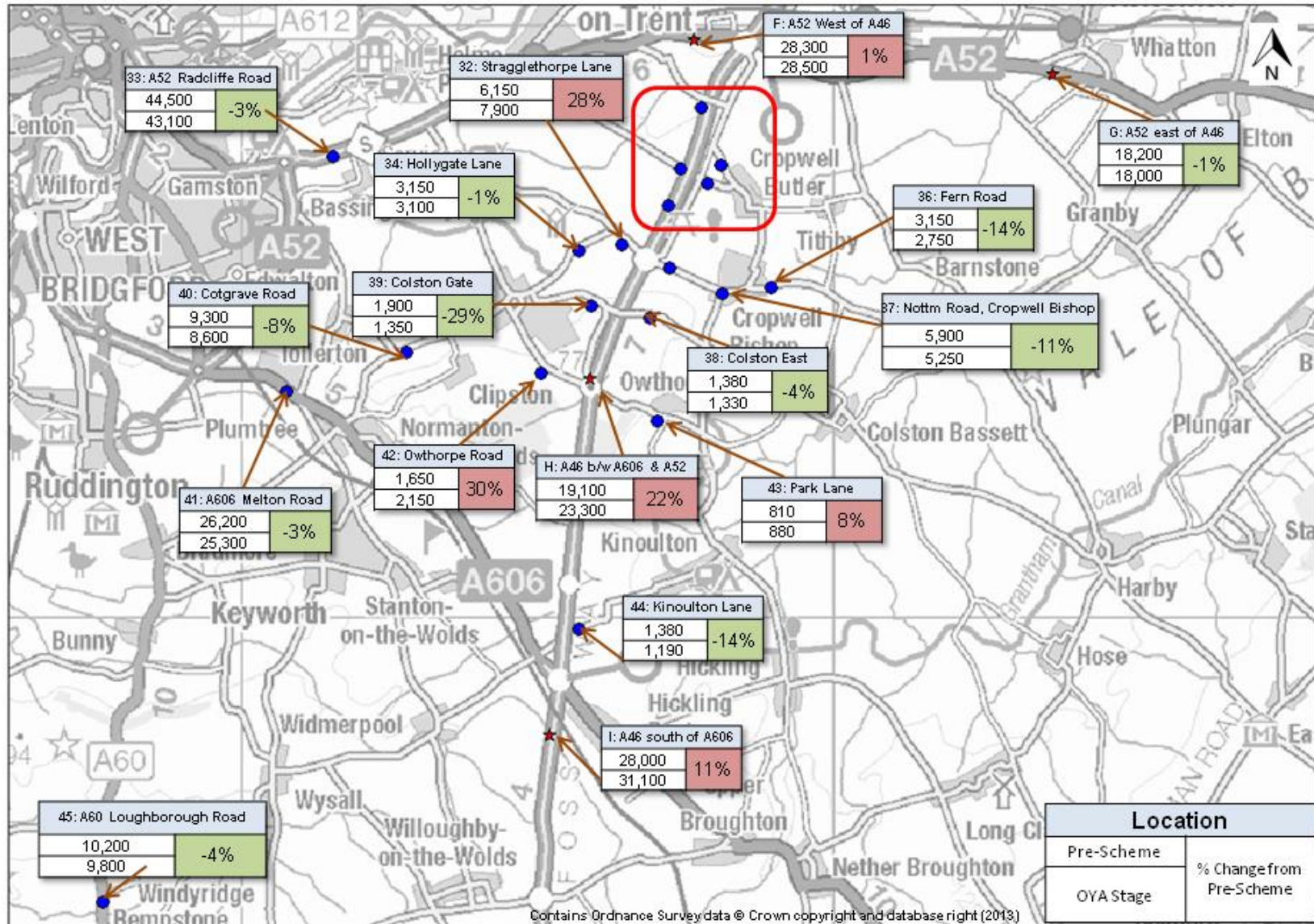
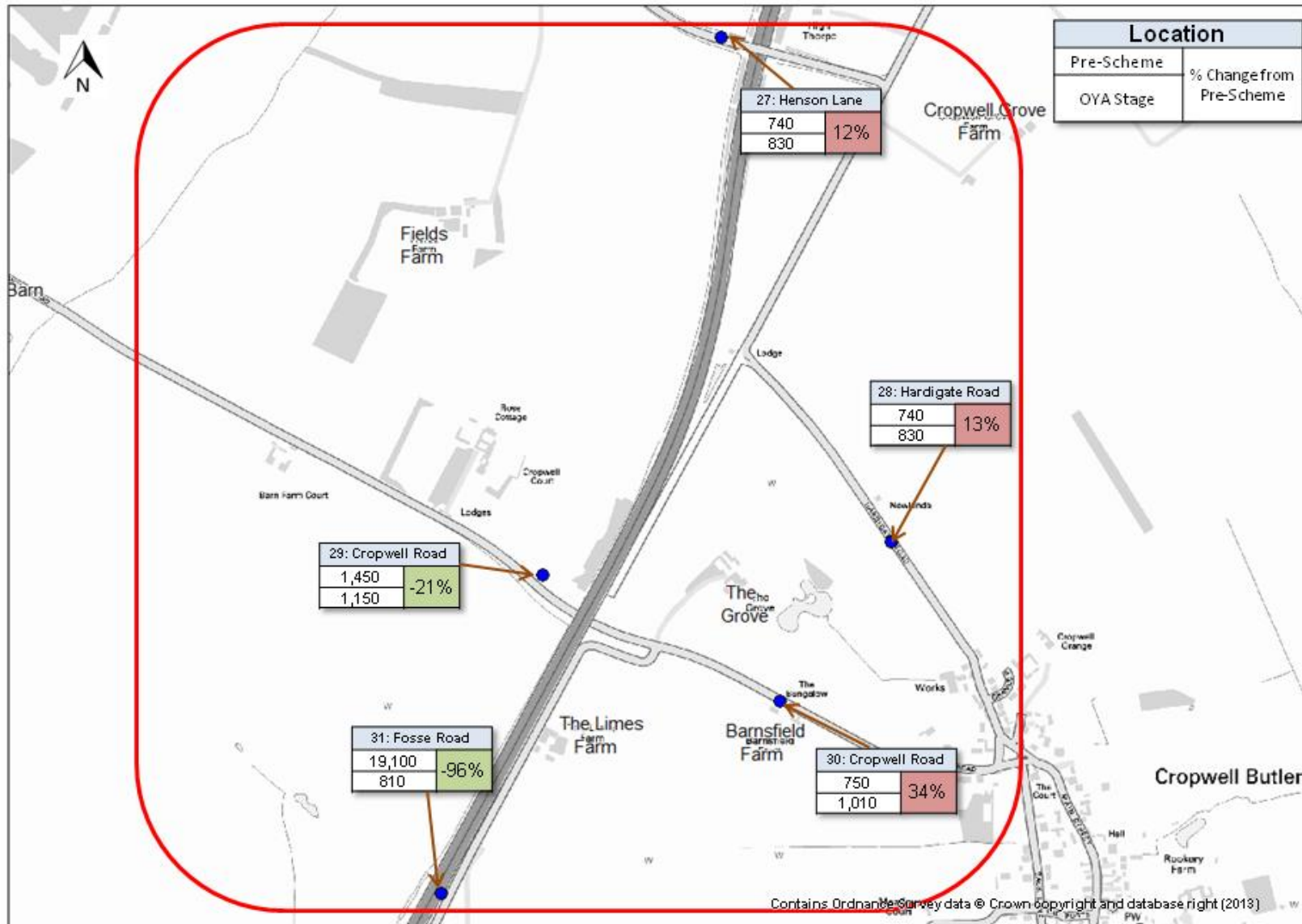


Figure 2-9 – Average Weekday Traffic (AWT)- Southern Zoom section



Northern Section

2.15 Key observations to note from Figure 2-6 and Figure 2-7

A46 and Major Roads

- Traffic using the improved A46 dual carriageway between the A6097 and Newark (site D) has increased by 23% compared to the pre scheme situation, an increase of 5,500 vehicles per day (vpd).
- Significant changes are seen for sites 5 and 9 on the bypassed section of the old A46 route through East Stoke and Farndon. These sites have seen a decrease of between 88-97% equating to a decrease of between 21,450 and 23,630 vpd. Longer distance through traffic has transferred to the dual carriageway as would be expected for a scheme of this type.
- An increase of 4,500 vpd (21%) is seen on the Newark bypass just north of the scheme. This is as a result of the increase on the improved section of the A46.
- Traffic using the A46 on the central scheme section between the A52 and A6097 (site E) has seen an increase of 11%, 3,500 vpd.
- The A1 (site C) (an alternative strategic route to the east of the scheme) has seen a small increase in traffic of 3%.

Other Roads

- The road accessing Newark from A46 roundabout shows an increase of around 11% which equates to 1,400 vehicles.
- Sites 8 and 10 (parallel minor north south routes accessing Newark from the south) show a decrease in traffic of between 23% and 35% (equating to a total decrease of approximately 900 vpd). This shows that the scheme has successfully reassigned traffic using these roads as a ratrun to access Newark from the south.
- The proportionally large increases seen on minor roads close to the Red Lodge and Elston junctions (sites 14, 18 and 11) are due to the access arrangements to the A46 diverting traffic. These are all relatively small numbers of vehicles.
- Flows around East Bridgford have altered slightly, with traffic accessing onto the A6097 via Kirk Hill (site 19) reducing by 15%, whilst Butt Lane (site 20) has seen an increase to the east of the village. It is likely that local traffic accessing Bingham will use Butt Lane as a preference to traversing 2 roundabouts. The reduction seen at Kirk Hill may also be partly due to a reduction of traffic using East Bridgford to avoid the congestion at the Saxondale and Mardigunum roundabouts pre scheme.
- Traffic from Newton using East Bridgford Road (site 21) has reduced by 16%, whilst there has been an increase in traffic (24%) on Main Road, Newton (site 24). This is likely to be due to the new direct access (via Main Road) to the roundabout being a more attractive option than a signalised junction (via East Bridgford Road) to access the A6097, as well increased demand due to the initial housing development at the former RAF site (See para 2.42 for details).

Southern Section

2.16 Key observations to note from Figure 2-8 and Figure 2-9 are:

A46 and Major Roads

- Traffic using the southern section of the improved route (A52 to A606) has seen an increase of 22%, an increase of 4,200 vehicles.
- The A606 between the A46 and Nottingham (site 41) has not seen a significant change in traffic post opening, perhaps to be expected given that the A46/A606 junction has not been altered as part of the scheme.
- The A52 east and west of the scheme has seen negligible changes of between 1% (west site F) and -1% (east site G).

- The A46 south of the scheme at Widmerpool shows an increase of 11%, equating to an increase of 3,100 vehicles, suggesting that the scheme has drawn traffic onto the A46 from further afield.

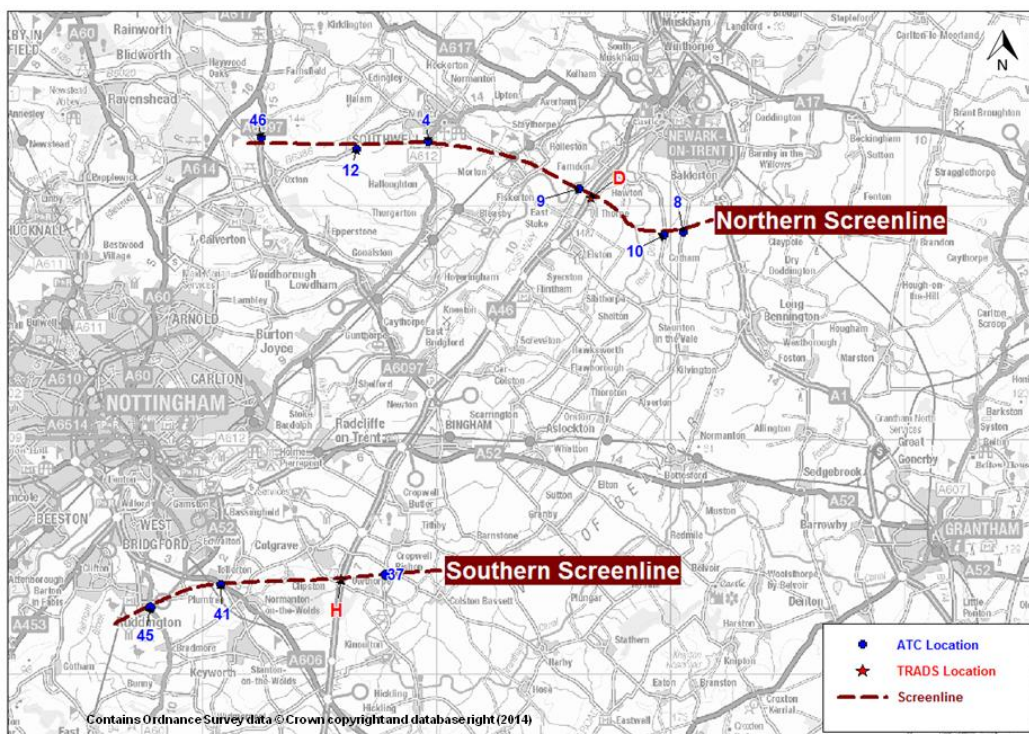
Other Roads

- Site 43 at Owthorpe has seen an increase of 8% but this only equates to around 70 vehicles. This increase is likely to be due to rerouting to access the A46 at Owthorpe junction.
- Traffic has increased by 30% on Owthorpe Road (site 42), however this is balanced by the equivalent reduction at site 39 (Colston Gate) as traffic can no longer access the A46 at Colston Gate (site 39) and have to travel via Owthorpe Road from Cotgrave to access the A46.
- The slight reduction seen at site 34 (Hollygate Lane, Cotgrave) also reflects the change in access options to the A46 post opening.
- There has been a 28% increase seen at Site 32 (Stragglethorpe Lane). Feedback from Nottingham County Council indicates that traffic has been attracted to this route since the A46 scheme opened, possibly to avoid delays on the A52 at Radcliffe and/or the A606 into Nottingham, particularly towards Nottingham in the AM peak.

Screenlines

- 2.17 In order to further investigate any wider potential reassignment as a result of the scheme, a screenline analysis has been undertaken for the screenlines identified in Figure 2-10. Screenline analysis allows a better understanding of total vehicle movements across a wider corridor. The intention is to count vehicles at only one location for each journey they make.
- 2.18 Two screenlines have been identified for this scheme, one running across the southern section of the scheme, and the other across the northern section of the scheme. This analysis enables a comparison of how north-south movements on the major roads have been affected by the scheme. These include some additional wider count sites as well as some detailed in the previous section. Locations are noted in Table 2–2 and Table 2–1.

Figure 2-10 – Screenline locations



- 2.19 The results of the screenline analysis are shown in Table 2–1 for the northern screenline and Table 2–2 for the southern screenline of the scheme

Table 2–1 – Northern Screenline Analysis

	Site	Description (west to east)	Average Weekday Traffic		Pre Scheme to OYA Change	Pre Scheme to OYA %Change	
			Pre-Scheme (2009)	OYA (2013)			
Northern Screenline	Two way flows	46	A6097, Warren Hill	8,200	6,700	-1,500	-18%
		3	B6386, west of Southwell	5,000	4,400	-600	-12%
		4	A612, south of Southwell	6,500	6,100	-400	-6%
		9	Fosse Rd. - SW of East Stoke (former A46 route)		770	770	
		D	A46 between A6097 and B6166 (2009 – former route, 2013 new route)	24,400	29,900	5,500	23%
		10	Hawton Road, Cotham	1,230	790	-440	-36%
		8	Grange Lane, south of Balderton Grange	2,870	2,240	-630	-22%
		Screenline Total			48,200	50,900	2,700

2.20 Using the data presented in Table 2–1 it can be seen that:

- Across the northern part of the scheme, AWT flows increased by 2,700 vehicles equating to a 6% increase in traffic flow over the wider area.
- Most of this increase can be attributed to the increase in traffic on the A46 improved route, which has seen an increase of 5,500 vehicles (23% increase) which is predominantly traffic reassigning from other roads. Based on the reduction in other routes accessing from the south, it is likely that this increase in traffic is partly drawn from sites 8 and 10. This indicates that perhaps more traffic is now accessing Newark, as it is more accessible for local villages than travelling to Nottingham.
- Other roads have seen a decrease in traffic to the east and west suggesting that there has been some rerouting away from parallel (in some cases ratrunning) routes onto the improved A46.

Table 2–2– Southern Screenline Analysis

	Site	Description (west to east)	Average Weekday Traffic		Pre Scheme to OYA Change	Pre Scheme to OYA %Change	
			Pre-Scheme (2009)	OYA (2013)			
Southern Screenline	Two Way Flows	45	A60 Rempstone	10,200	9,800	-400	-4%
		41	A606 Tollerton	26,600	25,500	-1,100	-4%
		H	A46 northbound between A606 and A52	19,100	23,300	4,200	22%
		37	Nottingham Road, Cropwell Bishop	5,900	5,250	-650	-11%
		Screenline Total			61,800	63,850	2,050

2.21 Key points that can be drawn from Table 2–2 are:

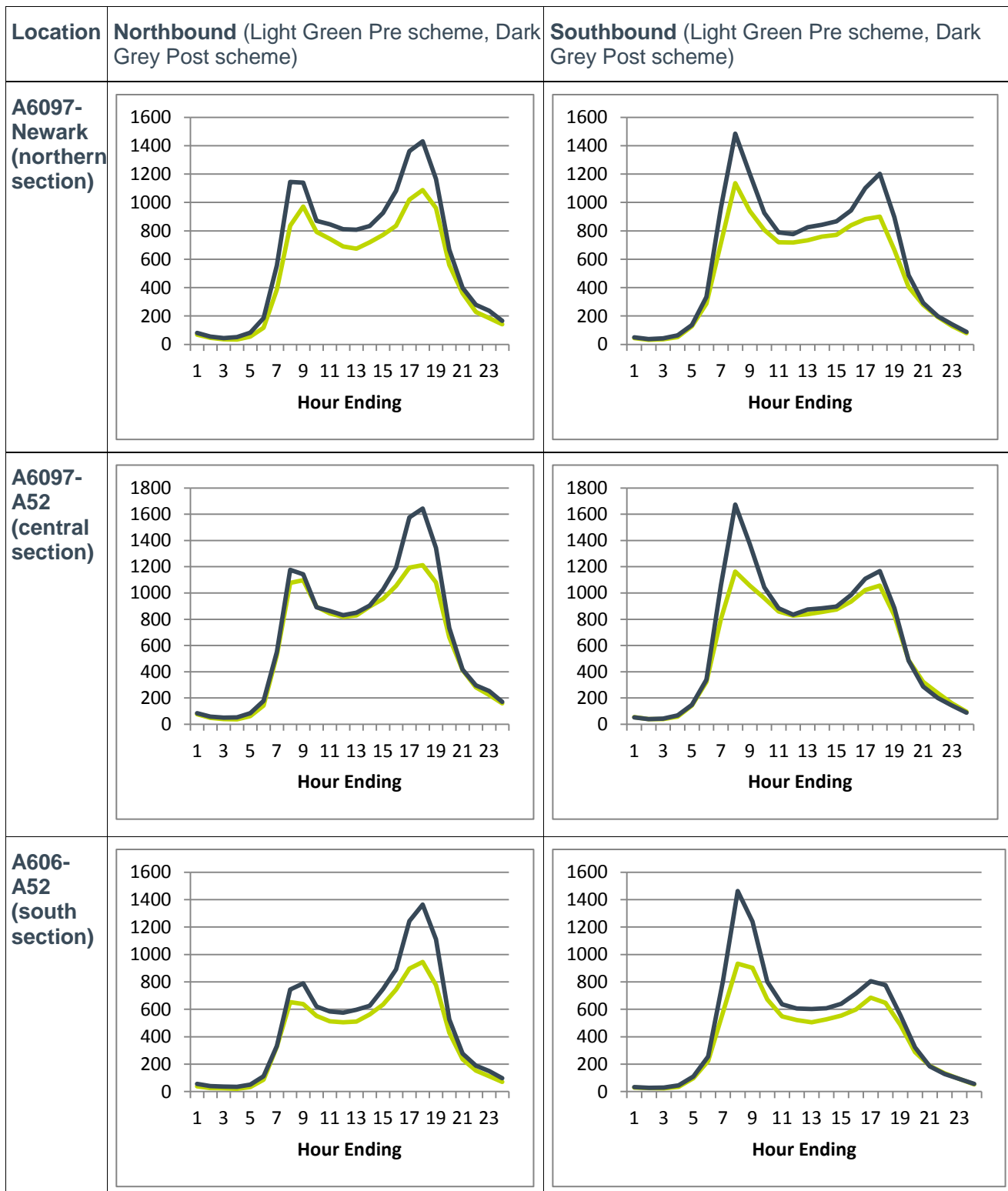
- Overall there has been an increase of 3% over the screenline, with the major change being seen on the A46 southern scheme section where an increase of 22% is seen.
- A decrease can be seen on the A606 which may be due to traffic travelling to the north east of Nottingham remaining on the A46 for a longer distance rather than diverting off to avoid queuing at the former A46 route at Saxondale and/or Mardigunum roundabouts.
- A 4% decrease in traffic is seen on the A60 although this only equates to 400 vehicles. This traffic change may be influenced by roadworks in Nottingham for the extension of the tram network.

- There is evidence of reassignment onto the A46, with an increase of 22% (4,200 vehicles) post opening.

Hourly flows on A46

2.22 The previous section notes that there has been a large increase in traffic on the A46 post opening. To try to analyse the daily change in more detail, traffic flows have been assessed by time of day for each of the main scheme sections.

Figure 2-11 – A46 weekday average hourly flow comparison



- 2.23 Figure 2-11 demonstrates that the traffic growth on the central section of the A46 is strongly weighted towards the peak periods, particularly in the PM peak northbound and in the AM peak southbound. There is very little traffic growth change outside of the peak periods.
- 2.24 For the northern and southern sections of the scheme, again the traffic growth is centred on the peak periods, however some growth is also seen for the interpeak periods.
- 2.25 The increase in the peak periods accentuates the tidal flow of the A46 route, showing that the highest demand is to travel southbound away from Newark in the AM peak, and travelling towards Newark in the PM peak.
- 2.26 The changes in the flow profile across the day show that in the pre scheme period there was trip suppression, particularly in the peak periods. Post opening the increased capacity and journey time savings has enabled the suppressed traffic to use the route, and encouraging reassignment from less suitable roads. This increase also suggests that the dualling of the final section of the A46 between the M1 and Newark Bypass increases the attractiveness of the route for longer distance travel. The impact of the scheme on the wider area is considered in the next section.

Heavy Goods Vehicles (HGV)

- 2.27 Table 2–3 shows a comparison of HGV (vehicles longer than 5.2m) usage for the pre and post scheme periods.

Table 2–3 – HGV flows on A46

Location	Before			OYA		
	AWT	HGV		AWT	HGV	
A46 between A606 and A52	19,100	4,300	23%	23,300	4,800	20%
A46 between A52 and A6097	28,500	5,900	21%	31,900	6,800	20%
A46 between A6097 and B6166	24,400	4,900	20%	29,900	5,600	19%

- 2.28 The key points to note from Table 2–3 are:
 - Prior to the scheme there were 5,900 HGVs using this section of the A46 on an average weekday, accounting for 21% of the total traffic. Post scheme, the total number of HGVs using the route has increased slightly, but they represent slightly less of the total traffic at 20%.
 - The largest increase is seen in the central section (A52-A6097) which may be linked to high vehicles no longer needing to travel through Bingham to avoid the low railway bridge.

Forecast Traffic Flows

- 2.29 The pre-scheme appraisal process for the A46 Newark to Widmerpool scheme involved the forecasting of traffic flows for Do Minimum (DM) and Do Something (DS) scenarios. The DS scenario includes the scheme, whilst the DM scenario does not. As part of POPE methodology, these modelled forecast flows are compared with observed flows to ascertain the accuracy of the original predictions.

Sources

- 2.30 Information on forecast traffic flows have been taken the Environmental Statement (March 2007 Addendum (final), including Figures). Other information regarding the assumptions has been taken from the Traffic Forecasting Report (March 2007).

Forecasting Assumptions

- 2.31 In order to understand the differences between the forecast and actual traffic impacts, it is first necessary to develop an understanding of how the scheme was appraised and the key assumptions used. This then may assist in explaining any differences observed.

- 2.32 All forecasting for the A46 Newark to Widmerpool scheme was undertaken using SATURN and DIADEM modelling software for variable demand modelling, with traffic growth using NRTF and TEMPRO.
- 2.33 The forecast flows area was fairly compact (see Figure 3-1 for modelled area/COBA area) and included the A46 from Newark through to Widmerpool, including a short section of the A6097 and the A52, as well as the A606 at Widmerpool. Minor roads through the villages along the route that would be affected by the route were also included, although no forecasts were provided for parallel routes such as Hawton Road (site 39), Grange Lane (site 42) or A612 (Site 4) which were outside of the model area. As a result no account of reassignment from these routes has been included in any of the assumptions.
- 2.34 The base year used in the model was 2004 with an opening year forecast of 2016 and a design year forecast of 2031 (15 years after opening). No detailed revised opening year (2012) traffic forecasts were available therefore for the POPE purposes a proxy opening forecast has been calculated using growth factors to enable comparison with observed.

Network Improvement Assumptions

- 2.35 The base model was the starting point for developing the future year network. The forecasting report for this scheme considered a number of improvements to the road network including the M1 at Nottingham and the A453 improvements south west of Nottingham and concluded that they would have a minimal impact on flows on the A46. The local authority proposed improvements of the A52 between Nottingham and the A46 scheme section was expected to impact on flows, however as this was not a committed scheme at the time of scheme appraisal, forecasts were made for both the A46 improvements (without the A52 scheme), and the A46 and A52 improvements scenario. The A52 scheme has not been progressed therefore the forecast flows referred to in this section include the A46 improvements scenario only.
- 2.36 Throughout 2012 and 2013 there has been disruption for traffic accessing Nottingham City urban area, particularly from the west and southwest due to roadworks for the city's tram network extension and the A453 construction works. This was not accounted for in the modelling. This should be completed by winter 2014, however in the meantime, construction work may have an impact on localised traffic movements.

Development Assumptions

- 2.37 The Traffic Forecasting Report for this scheme stated that no committed developments were noted from the Newark and Sherwood District Council area which were within the bounds of Newark and within the study area. An initial plan to develop an area of housing to the south of Newark in association with the envisaged Newark Southern Bypass was highlighted. This potential development would consist of up to 5,000 houses, built over a period of 20 years starting in 2008. This level of house-building was stated in the forecasting report to be within the bounds used in TEMPRO for the Newark and Sherwood district. Therefore TEMPRO was used to consider growth for the northern section of the scheme.
- 2.38 The report details that Rushcliffe Borough Council had two major developments identified in its revised Local Plan (2005):
- Redevelopment within the existing footprint at RAF Newton (industrial uses, expected to be fully completed by 2016).
 - 600 houses and 25 hectares of employment at Cotgrave Colliery. (Estimated start in 2009, completed by 2016 – original opening year).
- 2.39 No other specific committed developments were noted within the study area (including Bingham) therefore TEMPRO was used, with adjustment to take the Newton and Cotgrave developments into account, to assess overall traffic growth for the southern area of the scheme.

Progress to date (developments)

- 2.40 Newark's status as a new Growth Point⁴ suggests that the level of development identified in the appraisal documents is still required, with up to 7,000 dwellings to the south/south east of Newark, however no large scale developments have yet started. Planning permission was granted in 2011 to create a roundabout with the A46 dual carriageway south of the Farndon junction to facilitate a southern bypass to support the planned development to the south of Newark. To date there has been no further progression of this.
- 2.41 As of January 2014, no development has taken place at the former Cotgrave Colliery site however there is an application pending for a residential development of 450 dwellings with associated infrastructure, public open space and access.
- 2.42 An outline planning application has been received (2013) on land at RAF Newton for a development consisting of up to 500 dwellings, up to 50 live/ work units, 5.22 ha of new employment land (including provision for light industry (Class B1), general industry (Class B2) and storage or distribution (Class B8). Around 150 houses have been built at the time of this report (Winter 2013/4).
- 2.43 At the time of writing, some development in Bingham had taken place, with 185 dwellings built in the Mill Hill development, with a further 268 to be built. The Bingham Parish Profile⁵ states that 305 dwellings were completed within the parish boundary between 2001 and 2010.
- 2.44 A number of planning permissions are currently pending for the area to the north of Bingham, around Chapel Lane. This includes housing, office use and a supermarket. No work is currently underway.
- 2.45 Since the A46 scheme opened, Nottinghamshire County Council has implemented a number of environmental weight limits on minor roads around the scheme. This was not known at the time of the appraisal and may have had a small impact on traffic (particularly HGVs) using the minor roads. It is likely however that due to the improvements, HGVs would already have transferred to the A46 and not the minor roads (as perhaps they may have done previously to avoid traffic congestion), therefore it is not anticipated that this will have a great effect on the flows.

Forecast vs. Outturn Traffic Flows

- 2.46 As detailed previously, the accelerated nature of this scheme meant that forecast traffic flows used in this report have been derived from the A46 Newark to Widmerpool Traffic Forecasting Report (March 2007), and factored using TEMPRO to present equivalent forecast pre and post opening flows for the actual opening year and corresponding design year as follows to allow a direct comparison:
- 2012 – the first scheme year
 - DM and DS scenarios
- 2.47 A full summary of forecast and observed traffic flows pre scheme at all comparable sites are shown in Table 2–4. Sites which show a difference in excess of +/- 15% have been highlighted.

⁴ <http://www.newark-sherwooddc.gov.uk/business/newarkgrowthpoint/> accessed January 2014

⁵ http://www.rushcliffe.gov.uk/media/rushcliffe/media/documents/pdf/planningandbuilding/bingham_parish_profile.pdf accessed January 2014

Table 2-4 – Traffic Flow forecast vs observed ADT Without Scheme

Map Reference	Location	2009		
		Do Minimum Forecast AADT	Before Observed ADT	% difference
B	A46 Newark Bypass	21,800	20,500	-6%
D	A46 between A6097 and B6166 (scheme)	25,900	23,000	-11%
E	A46 between A52 and A6097 (scheme)	35,400	26,700	-25%
F	A52 West of A46	29,500	26,900	-9%
G	A52 East of A46	25,000	17,200	-31%
H	A46 between A606 and A52 (scheme)	19,600	17,200	-12%
I	A46 South of A606	26,500	24,900	-6%
5	Fosse Road, Farndon	24,800	23,000	-7%
6	B6166 Farndon Road, Newark (NE of A46)	11,700	11,100	-6%
7	Hawton Lane, Hawton	1,500	1,550	3%
9	Fosse Road, south west of East Stoke	24,800	23,000	-7%
11	Lodge Lane, Elston	980	910	-7%
12	Inholms Road, Flintham	650	880	36%
13	A6097, Gunthorpe	26,000	19,100	-27%
14	Red Lodge Lane	170	120	-30%
15	Trent Lane, East Bridgford	3,550	1,100	-69%
18	Lodge Lane, Screveton	80	100	16%
19	Kirk Hill, East Bridgford	1,850	2,750	52%
20	Butt Lane, East Bridgford	1,600	2,100	32%
21	East Bridgford Road, Newton	6,500	2,350	-64%
22	Tenman Lane	1,950	1,900	-1%
23	Fosse Way, south west of Butt Lane	27,600	23,000	-17%
26	Chapel Lane, Bingham	4,200	7,500	77%
27	Henson Lane, Radcliffe on Trent	1,650	670	-59%
28	Hardigate Road, Cropwell Butler	710	680	-4%
29	Cropwell Road, west of A46	1,750	1,350	-25%
30	Cropwell Road, east of A46	1,350	720	-47%
32	Stragglethorpe Lane, Cotgrave	5,800	5,400	-7%
34	Hollygate Lane, Stragglethorpe	3,900	2,900	-25%
40	Cotgrave Road, Cotgrave	7,100	8,600	22%
42	Owthorpe Road, Cotgrave	1,700	1,500	-11%
43	Park Lane, Owthorpe	840	740	-11%
44	Kinoulton Lane, Kinoulton	1,400	1,250	-12%

2.48 The key points to note from this comparison between the forecast and observed traffic without the scheme are:

- Observed flows pre scheme on the northern and southern scheme sections of the A46 (sites D and H) are below the forecast DM by between 11% and 12%;
- Flows on the middle section (Site E) between the A52 and the A6097 are below the forecast DM by 25%;
- Observed flows at site 15 (Trent Lane) were 69% lower than modelled, whilst site 19 (Kirk Hill) was 52% above the forecast. This may be due to the ease of access to the A6097, as Kirk Hill junction is signalised, whilst Trent Lane is a give way access to the A6097. Site 20 (Butt Lane) out of East Bridgford to the south also shows an observed flow 32% above the forecast.
- Site 26 (Chapel Lane, Bingham) shows observed flows in 2009 were 77% above that which was forecast.

- The majority of those sites where traffic was significantly over estimated are close to East Bridgford, Newton and Bingham. This is likely to be due to the expectation of more development focused here.

2.49 A full summary of forecast and observed traffic flows pre scheme at all comparable sites are shown in Table 2–5. Sites where a difference of +/- 15% have been highlighted.

Table 2–5 – Traffic Flow forecast vs observed ADT: With Scheme

Map Reference	Location	Opening Year		
		Do Something Forecast AADT	OYA Observed ADT	% difference
B	A46 Newark Bypass	26,200	24,600	-6%
D	A46 between A6097 and B6166 (scheme)	33,900	27,800	-18%
E	A46 between A52 and A6097 (scheme)	43,900	29,500	-33%
F	A52 West of A46	32,300	26,900	-17%
G	A52 east of A46	24,500	16,900	-31%
H	A46 between A606 and A52 (scheme)	24,200	21,200	-13%
I	A46 south of A606	28,600	27,800	-3%
5	Fosse Road, Farndon	880	2,750	214%
6	B6166 Farndon Road, Newark (NE of A46)	13,300	12,100	-9%
7	Hawton Lane, Hawton	1,750	1,250	-27%
9	Fosse Road, south west of East Stoke	2,150	690	-67%
11	Lodge Lane, Elston	2,000	1,750	-12%
12	Inholms Road, Flintham	800	1,050	33%
13	A6097, Gunthorpe	26,300	18,700	-29%
14	Red Lodge Lane	180	220	20%
15	Trent Lane, East Bridgford	1,850	1,100	-40%
18	Lodge Lane, Screveton	20	170	772%
19	Kirk Hill, East Bridgford	1,700	2,400	41%
20	Butt Lane, East Bridgford	2,400	2,300	-4%
21	East Bridgford Road, Newton	4,400	2,050	-54%
22	Tenman Lane	2,000	2,150	6%
23	Fosse Way, south west of Butt Lane	6,200	5,600	-9%
26	Chapel Lane, Bingham	2,750	7,200	161%
27	Henson Lane, Radcliffe on Trent	2,650	770	-71%
28	Hardigate Road, Cropwell Butler	550	770	39%
29	Cropwell Road, west of A46	1,350	1,150	-15%
30	Cropwell Road, east of A46	1,550	1,000	-34%
32	Stragglethorpe Lane, Cotgrave	10,500	7,000	-33%
34	Hollygate Lane, Stragglethorpe	8,700	2,850	-67%
40	Cotgrave Road, Cotgrave	9,100	7,900	-13%
42	Owthorpe Road, Cotgrave	1,500	2,000	31%
43	Park Lane, Owthorpe	2,250	820	-64%
44	Kinoulton Lane, Kinoulton	870	1,100	25%

2.50 The key points to note from this comparison between the forecast and observed traffic with the improvements are:

- Observed traffic on the A46 scheme sections is below that forecast by between 13% and 33%.
- Observed traffic flows on the A46 both north and south of the scheme sections are below that forecast by between 3% and 6%. This is less than the difference observed on the scheme section, perhaps suggesting that the level of induced traffic on the improved section of the A46 was overestimated.
- As with the DM, sites 15 and 19 close to East Bridgford are inaccurate, however this is likely to have been carried through from the inaccuracy of the DM forecast.
- The overestimated flows at sites 32 and 34 to the north west of Cotgrave may be due to Cotgrave Colliery development not yet being started, as was anticipated in the forecast;
- The large underestimate seen at Chapel Lane, Bingham (site 26) is due to the overestimate made for the DM scenario. As reported previously in this section, observed pre and post scheme flows show a slight decrease in traffic of 6%.
- Traffic forecast to travel along the detrunked A46 route through East Stoke and Farndon appears to be inaccurate, however this is likely to be local forecasting inaccuracies of preference to access the A46 and the villages as well as possible errors in forecasts, as East Stoke would likely always carry more traffic than at Farndon given the size of settlements.

2.51 The previous tables indicate that there were some large differences in the baseline flows for many sites. Table 2-6 shows the forecast impact for each site in terms of a percentage, compared to the observed change.

Table 2-6 – Forecast Impact vs Observed Change

Map Reference	Location	Forecast Impact			Observed Change		
		DM AADT 2009	DS AADT 2012	% Difference	Pre Scheme ADT 2009	Post Scheme ADT 2012/3	% Difference
B	A46 Newark Bypass	21,800	26,200	20%	20,500	24,600	20%
D	A46 between A6097 and B6166 (scheme)	25,900	33,900	31%	23,000	27,800	21%
E	A46 between A52 and A6097 (scheme)	35,400	43,900	24%	26,700	29,500	11%
F	A52 West of A46	29,500	32,300	10%	26,900	26,900	0%
G	A52 east of A46	25,000	24,500	-2%	17,200	16,900	-2%
H	A46 between A606 and A52 (scheme)	19,600	24,200	23%	17,200	21,200	23%
I	A46 south of A606 (south of scheme)	26,500	28,600	8%	24,900	27,800	12%
5	Fosse Road, Farndon	24,800	880	-96%	23,000	2,750	-88%
6	B6166 Farndon Road, Newark (NE of A46)	11,700	13,300	13%	11,100	12,100	9%
7	Hawton Lane, Hawton	1,500	1,750	15%	1,550	1,250	-18%
9	Fosse Road, south west of East Stoke	24,800	2,150	-91%	23,000	690	-97%
11	Lodge Lane, Elston	980	2,000	106%	910	1,750	95%
12	Inholms Road, Flintham	650	800	22%	880	1,050	19%
13	A6097, Gunthorpe	26,000	26,300	1%	19,100	18,700	-2%
14	Red Lodge Lane	170	180	11%	120	220	91%
15	Trent Lane, East Bridgford	3,550	1,850	-47%	1,100	1,150	2%
18	Lodge Lane, Screveton	80	20	-76%	100	170	77%

Map Reference	Location	Forecast Impact			Observed Change		
		DM AADT 2009	DS AADT 2012	% Difference	Pre Scheme ADT 2009	Post Scheme ADT 2012/3	% Difference
19	Kirk Hill, East Bridgford	1,850	1,700	-7%	2,750	2,400	-13%
20	Butt Lane, East Bridgford	1,600	2,400	51%	2,100	2,300	9%
21	East Bridgford Road, Newton	6,500	4,400	-32%	2,350	2,050	-13%
22	Tenman Lane	1,950	2,000	4%	1,900	2,150	11%
23	Fosse Way, south west of Butt Lane	27,600	6,200	-78%	23,000	5,600	-76%
26	Chapel Lane, Bingham	4,200	2,750	-35%	7,500	7,200	-5%
27	Henson Lane, Radcliffe on Trent	1,650	2,650	62%	670	770	14%
28	Hardigate Road, Cropwell Butler	710	550	-22%	680	770	14%
29	Cropwell Road, west of A46	1,750	1,350	-23%	1,350	1,150	-13%
30	Cropwell Road, east of A46	1,350	1,550	13%	720	1,000	40%
32	Stragglethorpe Lane, Cotgrave	5,800	10,500	80%	5,400	7,000	29%
34	Hollygate Lane, Stragglethorpe	3,900	8,700	123%	2,900	2,850	-2%
40	Cotgrave Road, Cotgrave	7,100	9,100	29%	8,600	7,900	-8%
42	Owthorpe Road, Cotgrave	1,700	1,500	-10%	1,500	2,000	32%
43	Park Lane, Owthorpe	840	2,250	171%	740	820	11%
44	Kinoulton Lane, Kinoulton	1,400	870	-38%	1,250	1,100	-12%

2.52 Whilst the forecast DM and DS flows are quite different to the observed flows pre and post scheme, Table 2–6 shows the comparison between the forecast impact of the scheme on flows and the observed change in flows, based on percentage change. The key points to note are:

- The scale of the forecast impact on the A46 to the north and south of the scheme (site B and I) was accurate to within 4%.
- The change for the southern section was accurate at 23%, but the forecast change for the middle and northern section of the scheme was overestimated compared to the observed change.
- Flows on the A52 were accurately forecast to the east of the scheme, however the 10% forecast increase in traffic on the A52 towards Nottingham has not yet materialised.
- Large percentage changes are seen on a number of the smaller roads, and in a number of cases an increase has been seen rather than the forecast decrease. These include Trent Lane East Bridgford and Owthorpe Road, Corgrave.

2.53 In summary, the bigger differences between forecast and actual traffic volumes are caused by growth assumptions, which have not been to the scale forecast. This results in DM flows being larger than observed in many cases, which is maintained when the scheme is included in the DS scenario. The traffic model has accurately modelled the main changes due to the scheme but this has resulted from two competing issues. I.e there is more development and growth in the forecasts than has occurred, but there has been more reassignment into the corridor observed than modelled. The combination of these issues has resulted in an accurate forecast of change on many routes.

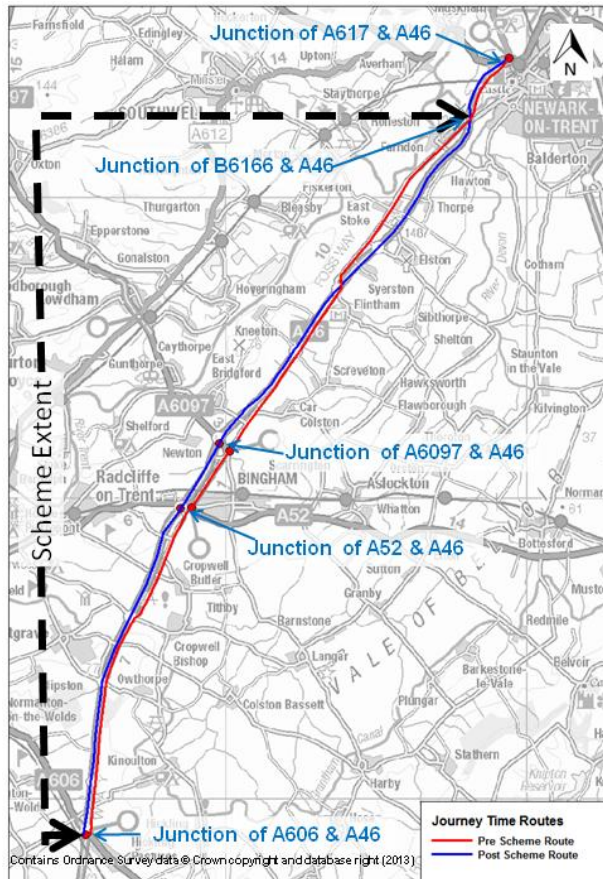
Journey Time Analysis

- 2.54 One of the main objectives of the scheme was to improve journey times along this section of the A46. Therefore this section considers the impact of the scheme on journey times. Journey time analysis will focus on:
- Analysis of journey time differences between Newark and Widmerpool using the old A46 route and the new A46 dual carriageway.
 - A comparison of forecast and observed journey times for the A46 Newark to Widmerpool route.
- 2.55 Forecast journey times for the scheme have been taken from the A46 Newark to Widmerpool Improvement Traffic Forecasting Report Volume 1 (2007).
- 2.56 Observed journey times along the A46 between Widmerpool and Newark have been extracted from the HA's Journey Time Database (JTDB). The JTDB records average vehicle journey times between sections of trunk roads in England.
- 2.57 Journey times were collected for the following time periods to enable comparison with forecast impacts later in this chapter:
- Weekdays AM peak (07:00 – 09:00)
 - Weekdays IP peak (10:00 – 15:00)
 - Weekdays PM peak (16:00 – 18:00)

A46 Newark to Widmerpool Journey Time Results

- 2.58 This section considered the observed journey time results along the A46 scheme section, comparing the old route with the new dual carriageway section between Newark and Widmerpool.
- 2.59 Data was extracted for observed pre- and post- scheme journey times and used to analyse the impact of the scheme on journey times. Figure 2-12 shows the JTDB links for which journey times were extracted. It is noted that the section between the A6097 and A617 at the northern end of the scheme extends beyond the scheme section, part way around the Newark bypass (additional 1.6 miles), however the pre and post routes are the same length so still represent the impact of the scheme. This short section between the roundabout at Farndon and the roundabout north east of Newark with the A6017 was not changed as part of this scheme.

Figure 2-12 – Journey Time Routes



2.60 Pre and post scheme journey times are presented in Table 2-7 for north and southbound directions for the three main time periods.

Table 2-7 – Observed Journey Times (mm:ss)

Direction	Time Period	Observed Pre Scheme (2009)	Observed OYA	Change	% Change
Northbound	AM Peak	29:54	19:06	-10:48	-36%
	Interpeak	27:36	19:12	-8:24	-31%
	PM Peak	31:06	19:12	-12:54	-38%
Southbound	AM Peak	28:18	18:30	-9:48	-38%
	Interpeak	26:54	18:54	-8:00	-30%
	PM Peak	31:12	18:48	-12:24	-40%

2.61 The results presented here show that the journey times have fallen in all time periods by a minimum of 30%. The Key points to note from this journey time data are:

- The largest decrease in journey times are seen in the PM peak in both directions. These were the longest journey times pre scheme, indicating congestion therefore allowing for the most improvement.
- The AM peak has also seen an improvement by almost 11 minutes in the northbound direction, and almost 10 minutes travelling southbound.
- Pre scheme journey times varied by almost 4 minutes depending on time period, whereas post scheme there is variability of less than 40 seconds between time periods suggesting that journeys are more predictable.

Forecast vs. Observed Journey Time Savings

- 2.62 The A46 Newark to Widmerpool Improvement Traffic Forecasting Report Volume 1 (2007) included journey time forecasts for DM in 2016 and the DS in 2016 scenarios. These forecasts were not revised for the change in opening year to 2012. We consider it appropriate to assume the times to be valid for 2012 as the opening year as the forecasts for DS are based on traffic being free flowing in all time periods. The forecasts for the do minimum scenario are based on traffic flows in 2016 if the scheme had not been built. The forecast flows for 2016 are higher than those observed in 2009, therefore the observed pre scheme times may be below those predicted for DM 2016. No breakdown of journey time forecasts was available beyond that presented in Table 2–8.
- 2.63 The forecast journey times are for the scheme section between the A606 at Widmerpool and the at-grade junction north of Farndon. The observed journey times (both pre and post scheme) extend beyond the scheme itself at the northern end, part way around the Newark bypass.
- 2.64 Table 2–5 demonstrates that traffic on the Newark bypass has increased post opening. It is therefore likely that there has been a small detrimental impact on the journey times for traffic using this section, however this is masked by the aggregated journey time length from the JTDB. In free flow conditions this additional length would add around 2 minutes to a journey time (compared to the forecast time and lengths). However it is likely that, particularly in peak periods, the journey time for this section has increased post opening, perhaps accounting for the slightly longer journey times, particularly in the northbound direction.

Table 2–8 - Forecast vs Observed Journey Times on A46 (mm:ss)

Direction	Time Period	Forecast Do Minimum 2016	Observed Pre Scheme (2009)	Forecast Do Something 2016	Observed OYA 2013
Northbound	AM Peak	32.53	29.54	15.39	19.06
	Interpeak	26.10	27.36	15.07	19.12
	PM Peak	36.04	31.12	15.43	19.12
Southbound	AM Peak	32.25	28.18	15.21	18.30
	Interpeak	26.45	26.54	15.07	18.54
	PM Peak	29.50	31.06	15.12	18.48

- 2.65 The key points to note from the data presented in Table 2–8 are (noting slightly longer journey length for observed):
- Without the scheme, the longest journey times were forecast to be in excess of 36 minutes in 2016, whilst when the scheme was built, these were forecast to reduce to between 15-16 minutes.
 - The forecast DM times are higher than observed pre scheme in the northbound AM and PM peaks, and in the southbound AM peak period. This is likely to be due to the expected higher traffic flows in 2016, than observed pre scheme.
 - Forecast DM times in the PM peak southbound are marginally lower than observed although when the additional observed length is considered, the DM times in the PM peak southbound would be as forecast.
 - Post opening journey times on the A46 are all in the region of 18-19 minutes. This is above that forecast, although does reflect the slightly longer route used for the observed times.
- 2.66 In summary, the forecast changes in journey times are all higher than observed, which is due to two reasons
- The inclusion of the Newark bypass in the observed journey times, but not in the forecast.
 - Higher DM flows forecast than were observed, which means that the forecast DM journey times are higher than observed.

Journey Time Reliability

- 2.67 WebTAG states that reliability is a sub-objective of the economic assessment of a scheme, and refers to the impact of the scheme on improving journey time reliability.
- 2.68 The assessment of reliability made in this section is within the context of what is achievable using the existing guidance and data.

Appraisal

- 2.69 One of the scheme’s key objectives was to improve journey time reliability for traffic using the A46 route. The scheme AST states that the section to the south of the A52 at Saxondale would have a slight beneficial improvement for reliability, whilst sections to the north of the A52 at Saxondale would have a moderate beneficial impact on reliability. Overall the AST scored the reliability sub objective as Moderate Beneficial.
- 2.70 The Business Case for this scheme, first published in 2008 states that the congestion reference flow (CRF), which indicates the level at which the carriageway is likely to be congested in the peak periods on an average day was exceeded 94% of the time.

Evaluation

Route Stress Approach

- 2.71 A stress based approach has been used to assess the reliability impacts of this scheme OYA after its opening in order to make a comparison with the forecast, as the detailed information from sat nav data was not available for this scheme to consider changes in speed percentiles.
- 2.72 The Stress Factor for a particular link is defined as the ratio of the Annual Average Daily Traffic (AADT) flow to the Congestion Reference Flow (CRF). The CRF is expressed as an AADT flow estimate at which a road is likely to be congested in the peak periods on an average day. DfT Guidance⁶ states that only values between 75% and 125% should be considered and anything outside this range should be adjusted up or down to 75% or 125%. As a result, the adjusted stress figures are included in brackets where applicable.
- 2.73 The route stress calculation using observed traffic data is shown in Table 2–9. The busiest section between the A52 and A6097 has been used. It can be assumed that the northern and southern sections of the scheme will have a lower route stress percentage as there are currently lower levels of traffic. It can be seen that route stress has reduced from 96% to an adjusted 75% on the busiest section indicating that the scheme has reduced the level of congestion.

Table 2–9 – Observed Changes in Route Stress

	Observed	
	Before (2009)	OYA (2013)
A46 scheme section A52-A6097	96%	47%(75%)

⁶ <http://www.dft.gov.uk/pgr/economics/rdg/multimodal/anewdealfortrunkroadsinengla5491?page=7>

Key Points – Traffic Impacts

Traffic Flow impacts

- The scheme has led to extra traffic on the new sections of the A46, with an increase of 14% (4,500 vpd) on an average weekday between the A52 junction and the A6097 junction. Increases of 18% are seen at the northern section of the A46 where an additional 5,500 vehicles are seen on an average weekday. The highest percentage increase on the A46 scheme section is the southern section between A606 and A52, where an increase of 22% is seen, although this equates to 4,200 vehicles.
- The increase in traffic is most noticeable in the AM peak travelling southbound, and in the PM peak travelling northbound.
- There has been a reduction in traffic on some local roads which no longer have direct access to the A46, which has also led to an increase in traffic on local roads where direct access to the A46 is provided, due to local rerouting.
- There has been a reduction in traffic on routes to the east of the scheme approaching Newark. These routes were formerly used as rat runs to avoid the delays on the A46 through the villages of East Stoke and Farndon.
- Up to 97% of traffic has been removed from the villages of East Stoke and Farndon as a result of the scheme.
- Screenlines show that there has been an increase in traffic across the Northern section of the scheme, suggesting that the increase seen on the A46 dual carriageway is mostly due to traffic rerouting from other local routes, as well as some induced traffic.
- Overall, traffic has increased over the southern screenline by around 3%, and the northern screenline around 6%.

Traffic Forecasting

- The traffic modelling used variable demand over a compact area, with much of the traffic growth dependent on urban growth.
- For the DM scenario, the traffic forecasting scenario overestimated traffic volumes on the major roads (A46, A52, A6097 and A606) with observed flows seen to be between 6 and 31% lower than the central growth forecast along the route.
- The DS central growth scenario for the A46 along the scheme section is similarly overestimated. The DS forecasts for the local roads show some inaccuracies, likely to be a combination of errors at the DM forecast stage, and problems with local traffic movement forecasts.
- The forecast increase on the major routes was generally in line with forecasts.
- The key reason for forecasts being high is that the economic downturn has resulted in less growth than forecast.

Journey Times

- Vehicles using the A46 route between Newark and Widmerpool have seen a significant reduction in journey times in all time periods. In the PM peak, savings of almost 12 minutes are seen in the northbound direction, with a 11.5 minute saving seen southbound.
- Smaller savings are seen in the AM peak of almost 11 minutes northbound and almost 10 minutes southbound. Savings in the region of 8-8.5 minutes are seen in the interpeak.
- Journey time reliability has improved as a result of the scheme opening.

Journey Time Forecasting

- The pre scheme observed journey times (over a slightly longer route) are generally lower than the forecast, although it is noted that traffic flows were not as high as forecast for the opening year.
- For the DS scenario, observed journey times are longer than forecast in every time period.
- Overall, journey times have improved significantly for all time periods, however not to the level forecast.

3. Safety Evaluation

Introduction

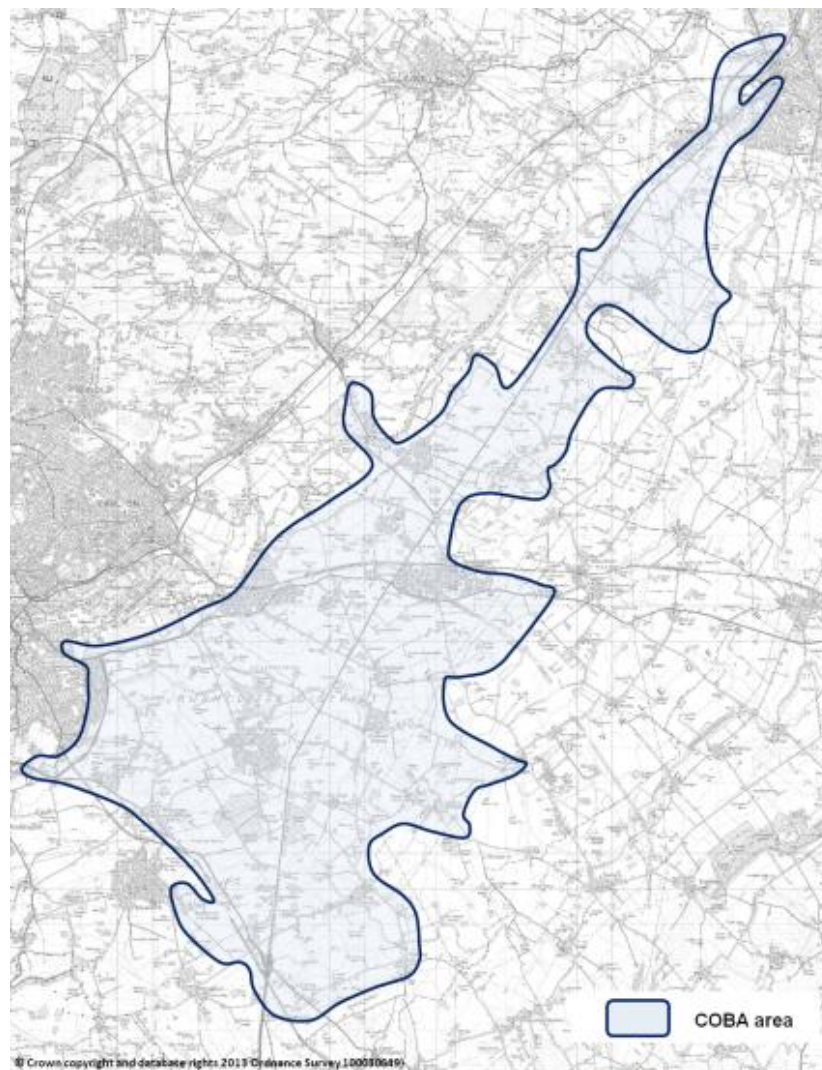
- 3.1 This section considers the impact of the scheme in terms of the level of success in addressing the objective of reducing collisions.
- 3.2 The Environmental Statement (2007) for this scheme stated that '*the trend in all accidents and 'killed and serious injury' accidents is towards an increase, which is contrary to that for similar rural (i.e. 50 mph or more) single carriageway A and trunk roads in Nottinghamshire (including injury accidents at roundabouts and junctions along their length)*' further highlighting the need for the scheme to address accidents.
- 3.3 In order to assess the impact of the scheme on collisions, this section of the report analyses change in personal injury collisions (PICs) occurring in the five year pre construction period, and the 15 month post-opening period. Evaluation of the scheme's impact on personal security has been undertaken through the use of observations made during a site visit.

Data Collection

Forecast

- 3.4 For the purposes of assessing the collision impacts of the scheme, forecasts were produced for the number of collisions the scheme is expected to save, together with the associated numbers of casualties and the monetary benefit of the savings. Forecasts of the impact of the A46 Newark to Widmerpool scheme on safety have been obtained from the scheme's Cost Benefit Analysis model (COBA). The forecast saving is calculated for the opening year, and over the scheme appraisal period of 60 years. This section of the study concerns collision numbers; the economic impact of the change in collisions is evaluated later in the Economy section of this report.
- 3.5 The extent of the COBA model area is shown in Figure 3-1. This covers the network, and covers all the main routes in the immediate and wider vicinity of the scheme where changes in traffic were anticipated, and hence changes in collisions may occur. In order to ensure a like-for-like comparison between the predicted and observed collision changes, the overall geographical area of analysis used for this study is the same area covered by the COBA model.

Figure 3-1 – COBA Modelled Area



Observed Data

- 3.6 Collisions by their nature include a random element and are somewhat unpredictable events. To ensure that the scheme is the only known change, pre scheme collision data has been obtained for the most recent 5 years prior to construction rather than using the more outdated data used in the EAR (2001-2005). Collision data has been obtained from Nottinghamshire County Council (NCC) covering the following time periods:
- Pre scheme – 1 July 2004 – 30 June 2009 (5 years)
 - Construction – 1 July 2009 – 31 March 2012 (2 years, 10 months)
 - Post scheme - 1 April 2012 – 30 June 2013 (1 year, 3 months)
- 3.7 All available data was requested from five years prior to scheme construction through to as recent as available post opening. At the time of request, post opening data was available up to the end of June 2013. A five year period of data is preferred in order to draw robust conclusions, therefore conclusions drawn from the 15 months of post opening data should be viewed with this in mind.
- 3.8 The collision data is based on the records of PICs (ie collisions that may involve injuries to one or more persons) recorded in the STATS19 data collected by the police when attending collisions. Collisions that do not result in injury are not included in this dataset and are therefore not considered in this evaluation.
- 3.9 It should also be noted that at this stage the collision data may not yet have been validated by the DfT. The requirement for up-to-date and site specific information necessitated the use of unvalidated data sourced from the local authority. Thus the data is judged to be sufficiently

robust for use in this study but it may be subject to change. However it is not anticipated that this would be significant in terms of the analysis of collision numbers presented in this report.

Collision Numbers

- 3.10 This section analyses the observed changes in PICs following the implementation of the scheme. One of the stated objectives of this scheme was to reduce the number of collisions along the route. This section includes an investigation into the changes in the number of collisions and associated casualties as well as whether there has been any change in the relative severity. This section first considers the impact on the whole modelled (COBA) area, and then further detail is provided regarding the impacts just on the key links of the scheme section.

Background Collision Reduction

- 3.11 It is widely recognised that, for over a decade, there has been a year-on-year reduction in the number of personal injury collisions on the roads, even against a trend of increasing traffic volumes during much of that period. The reasons for the reduction are considered to be wide ranging and include improved safety measures in vehicles and reduced numbers of younger drivers. Consideration of this background trend is needed when considering the changes in collision numbers in the scheme area in the before and after periods. If the scheme had not been built, collision numbers in the area are still likely to have been influenced by wider trends and reduced.
- 3.12 The numbers of collisions in this area in the years before and after the scheme was built are compared. Although the net change is primarily associated with the scheme, this background reduction is taken into account. The best way to do this is to assume that, if the scheme had not been built, the number of collisions on the roads in the study area here would have dropped at the same rate as they did nationally during the same time period⁷. This gives what is known as a counterfactual scenario. A comparison can then be made between this data for the counterfactual 'without scheme' scenario on a like-for-like basis and the observed post opening data which is the 'with scheme' scenario.
- 3.13 The difference between the numbers of collisions in these two scenarios can then be attributed to the scheme rather than the wider national trends. This result will inform the calculation of monetised safety benefits achieved by the scheme as discussed in the economy chapter of this report.

COBA Modelled Area

Evaluation of Collision Numbers and Severity

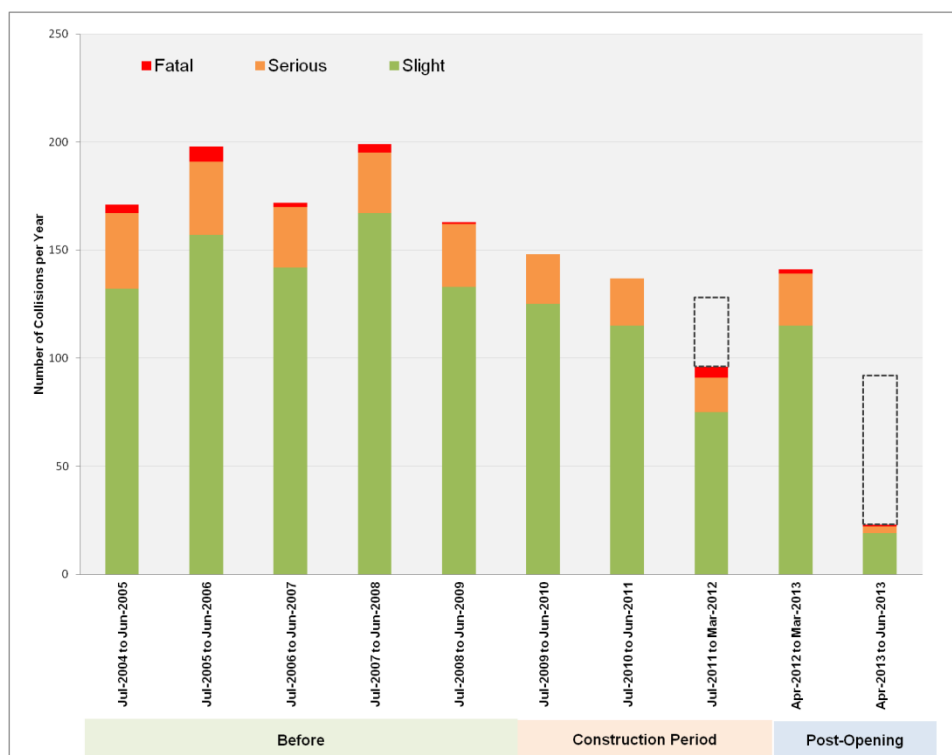
- 3.14 An evaluation of the before and after collision numbers by year for the whole of the COBA modelled area is shown in Table 3-1 and Figure 3-2. This enables a direct comparison with forecast collision savings derived from COBA. The severity of a collision is defined by the most serious injury incurred.
- 3.15 The table also includes the counterfactual without scheme which is comparable to the after data. It should be noted that where periods of less than one year are displayed, the number of collisions for the period has been extrapolated to provide an equivalent number of collisions per year; the number of collisions added as a result of the extrapolation is shown as a dotted bar.

⁷ National trend data is sourced from DfT table RAS10002

Table 3–1 – Number of Collisions by Severity in the COBA Area

Period	Time Period		Collision Severity			Total	Annual Average
	From	To	Fatal	Serious	Slight		
Pre Scheme	July 2004	June 2005	4	35	132	171	180.6
	July 2005	June 2006	7	34	157	198	
	July 2006	June 2007	2	28	142	172	
	July 2007	June 2008	4	28	167	199	
	July 2008	June 2009	1	29	133	163	
Construction	July 2009	June 2010	0	23	125	148	138.5
	July 2010	June 2011	0	22	115	137	
	July 2011	March 2012	5	16	75	96	
Without Scheme Counterfactual (adjusted for background reduction)⁸							139.0
Post Opening	April 2012	March 2013	2	24	115	141	131.2
	April 2013	June 2013	1	3	19	23	

Figure 3-2 – Number of Collisions on Year by Year Basis for COBA Modelled Area



3.16 From Table 3–1 and Figure 3-2 it can be seen that:

- The average number of collisions recorded post opening was 131.2 per year, which is a 28% decrease when compared to the before period in which an average of 181 collisions were recorded per year.
- The ‘without scheme’ counterfactual collision rate (accounting for the background reduction in collisions over time) is calculated as 139 collisions per year. Compared to the post opening period collision rate this represents an annual collision saving of 7.8 collisions a year, suggesting that the scheme has had a clear beneficial effect on the frequency of collisions along the A46 and surrounding roads.
- The annual average number of fatal collisions in the study area reduced by 33% post scheme.
- The annual average number of serious collisions has reduced by 30% post opening.

⁸ Background factor in collision numbers for all roads 2006-2012 was 0.770

A46 Newark to Widmerpool Key Links Section

3.17 An analysis of collisions records for the A46 key links has also been undertaken to investigate the impact of the scheme on collisions on the directly improved A46 section between Newark and Widmerpool.

Evaluation of Collision Numbers and Severity

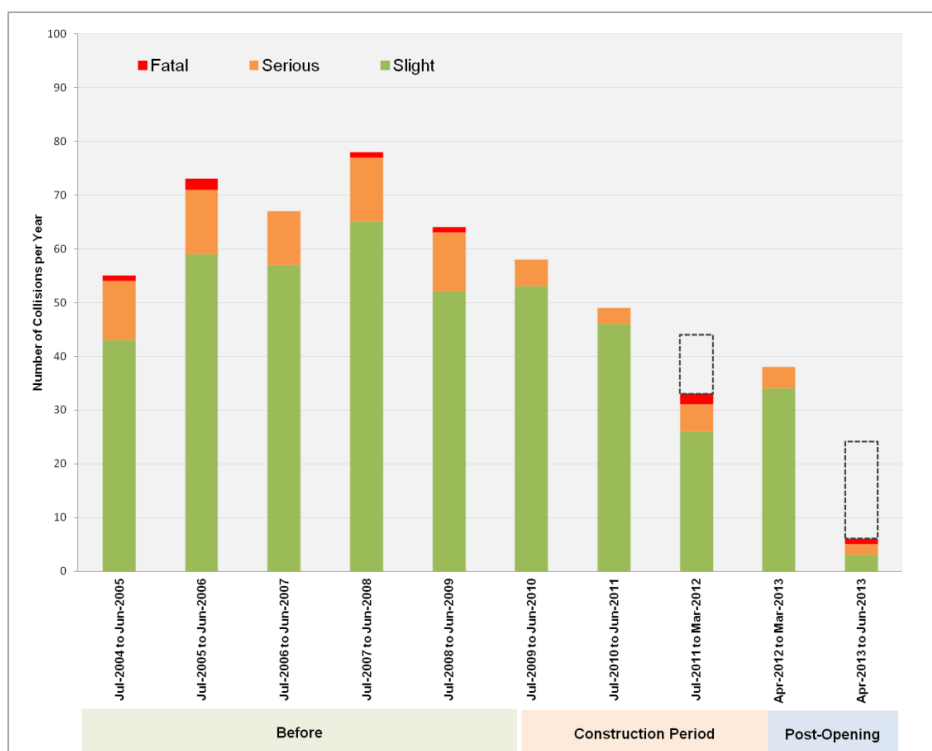
3.18 An evaluation of the before and after collision numbers by year for the scheme key links is shown in Table 3–2 and Figure 3-3. The severity of a collision is defined by the most serious injury incurred.

3.19 It should be noted that where periods of less than one year are displayed, the number of collisions for the period has been extrapolated to provide an equivalent number of collisions per year; the number of collisions added as a result of the extrapolation is shown as a dotted bar.

Table 3–2 – Number of Collisions by Severity Scheme Key Links

Period	Time Period		Collision Severity			Total	Annual Average
	From	To	Fatal	Serious	Slight		
Pre Scheme	July 2004	June 2005	1	11	43	55	67.4
	July 2005	June 2006	2	12	59	73	
	July 2006	June 2007	0	10	57	67	
	July 2007	June 2008	1	12	65	78	
	July 2008	June 2009	1	11	52	64	
Construction	July 2009	June 2010	0	5	53	58	50.9
	July 2010	June 2011	0	3	46	49	
	July 2011	March 2012	2	5	26	33	
Without scheme Counterfactual (adjusted for background reduction) ⁹							49.9
Post Opening	April 2012	March 2013	0	4	34	38	35.2
	April 2013	June 2013	1	2	3	6	

Figure 3-3 – Number of Collisions on Year by Year Basis for Scheme Key Links



⁹ Background reduction in accident numbers for rural A roads 2006-2012 was 0.740

3.20 From Table 3–2 and Figure 3-3 it can be seen that:

- The total number of collisions recorded over the post opening period was 44, an average of 35 per year, which is a 48% decrease when compared to the before period when an average of 67 collisions were recorded per year.
- The ‘without scheme’ counterfactual collision rate (accounting for the background reduction in collisions over time) is calculated as 49.9 collisions per year. Compared with the post opening collision rate of 35.2 per year, this represents an annual collision saving of 14.7 collisions. This saving exceeds that seen over the wider COBA area, suggesting that the scheme has had a direct beneficial impact on the frequency of collisions along the improved link.
- The annual average number of fatal collisions reduced by 20% post opening, to less than 1 fatal collision on average a year.
- The annual average number of serious collisions has reduced by 57% post opening.

Consultation response

3.21 With regard to safety, Cropwell Bishop Parish Council noted that they ‘hoped that there have been fewer serious injury accidents’, but queried whether ‘the layout of certain junctions causing driver confusion’ could have increased the number of minor collisions. Here they do not give the opinion that they believe this to be the case, but state that they await the release of statistics to see whether this has occurred.

3.22 A comment from East Bridgford Parish Council related to a potential safety problem with the new junction of Butt Lane with the old A46 (now detrunked) being perceived as hard to see at night with poor road markings. The response indicated a desire for the provision of give way signs on Butt Lane as well as a ‘finger sign’ to East Bridgford as it is ‘very easy to miss the turn off to the old A46’.

3.23 The information shown in Table 3–2 shows that overall collisions have reduced. The limited information available at this evaluation stage does not highlight a particular problem, however this should be looked into again at the FYA evaluation stage when a larger data data set is available to identify trends.

Evaluation of Collision Severity Index

3.24 The collision severity index is the ratio of the number of collisions classed as serious or fatal compared to the total number of collisions. At the time of the scheme appraisal, this was noted to be 24 per cent¹⁰ (based on 2001-2005 data, just using scheme area). A summary of the before and after opening collision severity indices by year for the whole of the COBA modelled area, and the A46 scheme section is shown in Table 3–3.

Table 3–3 – Collision and Casualty Severity Index

	COBA Area	Key Links
Period	Average Collision Severity Index	Average Collision Severity Index
Pre Scheme	19%	18%
Construction	17%	11%
Post Opening	18%	16%

3.25 The collision severity index for the COBA modelled area has fallen slightly post opening.

3.26 A similar pattern is seen for the scheme section, with collision severity indices showing a decrease post opening. The decrease in total collisions along the scheme is not fully matched here with the reduction in severity, however this may be due to the increase in speed for traffic using the new dual carriageway resulting in a greater potential for a higher severity collision

¹⁰ A46 Newark to Widmerpool Environmental Statement Vol 1, January 2007

than previously seen on the lower speed single carriageway. Limited evaluation can be undertaken given the differences in lengths of time covered by the pre and post scheme period; however initial findings indicate that the scheme has had a beneficial impact.

- 3.27 The removal of high volumes of traffic from routes passing through local communities such as Farnon and East Stoke is likely to have reduced the number of non motorised user (NMFU) collisions and casualties. This will be considered in more detail at the Five Year After POPE reporting stage when a larger sample size will be available to identify the impact on pedestrian, cycle and equestrian users.

Fatalities & Weighted Injuries

- 3.28 The collision rate discussed previously and shown in Table 3–1 does not take into account the severity of collisions. To analyse this we now present the Fatalities and Weighted Injuries metric which is a combined measure of casualties based on the numbers of fatal, serious and slight casualties. The FWI for the five years before and the available after period are shown in Table 3–4. To take into account the increased traffic on the A46 and for comparison with other schemes, we also present the FWI rate per billion vehicle kilometres (bvkm). It should be noted that these figures do not account for changes in the background reduction in casualties.

Table 3–4– FWI on the A46 trunk road

Period	FWI/collision	FWI/year	FWI/bvkm
Before	0.054	3.63	15.2
After	0.050	1.78	6.9

- 3.29 Table 3–4 shows that the seriousness of collisions has changed little post opening, whilst the number of fatal and serious injuries per bvkm is reduced by 55%.

Statistical Significance of Outturn Collision Impacts

- 3.30 In order to determine whether the changes in collision numbers observed before and after the scheme opened are statistically significant, Chi-Square tests have been undertaken. This test uses the before (counterfactual) and after numbers of collisions and traffic flows to establish whether the changes are significant or likely to have occurred by chance.
- 3.31 For the COBA appraisal area, the changes seen are not statistically significant, due to the wider area covered which was not directly impacted by the scheme.
- 3.32 However, for the smaller area, the test showed that we can be 98% confident that the reduction in the number of collisions on the key links would not have occurred by chance. It is therefore concluded that the observed collision changes seen on the scheme key links can be directly linked to the scheme, and not likely to be just due to chance.

Forecast vs. Outturn Collision Numbers

- 3.33 This section compares the number of observed collisions discussed earlier with those predicted to occur. The predictions have been obtained from the COBA model for this scheme and cover the whole of the modelled area (shown previously in Figure 3-1). For the outturn collisions the annual average before and after the scheme opened are used for the same area as used in the COBA appraisal.

Table 3–5– Comparison of Forecast and Outturn Collisions across the COBA Area

Annual Collisions		Central Growth
Forecast Opening Year	Do Minimum (without scheme)	167.9
	Do Something (with scheme)	141.9
	Saving	26
	% Change	15.5%
Outturn Annual Average	Before Opening	180.6
	Without scheme (counterfactual for same period)	139.0
	After Opening	131.2
	Saving	7.8
	% Change	6%

3.34 Table 3–5 shows:

- The COBA model of the scheme predicted the average number of collisions in the do minimum scenario to be 168 (central growth = average of low and high growth scenarios) which is less than the observed pre scheme collisions.
- The model predicted a saving of 26 collisions (15.5%) in the opening year. Based on the scheme improvements it was predicted that there would be a reduction in the number of collisions occurring at junctions, but a slight increase in the number of collisions occurring on links.
- Post opening, the number of collisions over the same area has decreased by an average of 7.8 collisions a year (6%) in the opening year, below that predicted for the same area. The size of the appraisal area means that changes in the wider area, not influenced by the scheme, may have masked the overall impact of the scheme. Therefore the scheme key links are considered in more detail here.

Table 3–6– Comparison of Forecast and Outturn Collisions for the Key Links

Annual Collisions		Central Growth
Forecast Opening Year	Do Minimum (without scheme)	58.6
	Do Something (with scheme)	41.1
	Saving	17.5
	% Change	30%
Outturn Annual Average	Before Opening	67.4
	Without scheme (counterfactual for same period)	49.9
	After Opening	35.2
	Saving	14.7
	% Change	29%

3.35 This table shows that the observed collision reduction of 14.7 (based on comparison with the counterfactual value) is slightly below the forecast 17.5 saving, however as the counterfactual value is lower than the DM forecast, the percentage change is very similar (30% forecast, 29% observed).

3.36 This indicates that the scheme has had an impact as expected in terms of reducing the number of collisions. However this comparison should be treated with caution given that the observed saving is only based on 15 months of post opening data.

Collision Rates

3.37 The number of collisions along a length of road used together with the AADT for the same section can be used to calculate an collision rate, known as PIC/mvkm. This allows comparisons to be made which take into account traffic growth.

3.38 In this section, combined observed collision rates during the pre and post scheme periods for the key links improved by the scheme (the new dual carriageway, junctions and remaining

bypassed sections of the old A46) are compared with the forecasts (from COBA) for the same links and junctions.

- 3.39 Table 3–7 shows the collision rate calculated for the A46 Newark to Widmerpool key links forecast vs observed pre and post opening.

Table 3–7 – Forecast vs. Observed Collision Rates (PIC/mvkm) for Key Links of Scheme

Predicted (2012 Opening Year)	Do-Minimum (without scheme)	0.243
	Do-Something (with scheme)	0.126
	Forecast Saving	0.116 (48%)
Observed (Pre-scheme vs. Post-opening collision rates)	Before Opening Observed	0.283
	Without scheme (Counterfactual for same period as After opening data) ¹¹	0.214
	After Opening Observed	0.136
	Observed Saving	0.078 (36%)

- 3.40 Table 3–7 shows that the observed reduction in collision rate across the scheme key links is lower than expected, with a saving of 0.078 PIC/mvkm compared to a forecast of 0.116 PIC/mvkm. This is mainly due to the background reduction in the model being lower than the observed reduction, meaning that the counterfactual value of 0.214 PIC/mvkm is lower than the DM collision value and the observed rate is higher than forecast. A saving is still observed; hence it can be considered that the scheme has successfully reduced the rate of collisions for the key links affected by the scheme.

Security

- 3.41 The aim of this sub-objective is to consider both the changes in security and the likely number of users affected by the changes. For highway schemes, security includes the perception of risk from damage to or theft from vehicles, personal injury or theft of property from individuals or from vehicles. Security issues may arise from the following:
- On the road itself (e.g. being attacked whilst broken down).
 - In service areas/car parks/lay-bys (e.g. vehicle damage while parked at a service station, attached whilst walking to a parked car).
 - At junctions (e.g. smash and grab incidents while queuing at traffic lights).

- 3.42 The primary indicators for roads include surveillance, landscaping, lighting and visibility, emergency call facilities and pedestrian and cycling facilities.

Forecast

- 3.43 The scheme appraisal stated that a 'neutral' impact was expected for Security. The AST noted that the lay-bys on the Scheme would be unlit although the landscaping design would ensure that sight lines were clear and that the lay-bys were visible at all times. No additional security improvements were proposed by the Scheme.

Evaluation

- 3.44 The new route follows much of the alignment of the original road with plenty of lay-by provision with emergency phones. No lighting or traffic lights were included in the scheme other than at the main junctions. Overall it is considered that the overall impact of the scheme is Neutral, as expected for Security.

¹¹ Counterfactual without scheme is the observed rate in the before period multiplied by the national reduction in collisions rate per mvkm during the comparable period, for the middle year of the data collection periods, in this case 2006 for before the period and 2012 for the after period. The reduction factor in the collision rate for all road types was 0.757.

Key Points - Safety

Collisions

- The overall reduction in collision rate in terms of observed PIC/mvkm for key links affected by the scheme is lower than forecast, with a reduction of 0.078 PIC/mvkm (after background collision decline considered) compared to a forecast reduction of 0.116. The observed saving can be directly attributed to the scheme following the calculation of a counterfactual pre scheme collision rate which considers the background decline in collisions.
- Analysis of observed collision data for the whole study area shows a reduction (when compared to the counterfactual) of 7.8 collisions per year, suggesting that the scheme has had a beneficial impact on the A46 and surrounding roads.
- Analysis of the observed collision data for the scheme key links which were directly affected by the scheme shows a reduction (when compared to the counterfactual) of 14.7 collisions a year. This is higher than the wider study area, strongly suggesting that the scheme has had a direct beneficial impact for safety on the A46 improved section.

Forecast vs. Outturn Collision Savings

- The scheme was forecast to have a saving of 26 collisions (16%) in the opening year for the whole COBA area. When the observed data is considered (compared to the counterfactual before), a smaller saving of 7.8 collisions (6%) is seen, suggesting that the benefit for the wider area has not been as great as forecast.
- When the key links of the scheme are considered, a reduction of 17.5 collisions (30%) was forecast, and an observed counterfactual reduction of 14.7 (29%) is seen. The forecasts for the scheme key links were accurate, and highlights that most of the savings seen are focused on the scheme section.
- The changes in collisions seen for the scheme key links are considered statistically significant, and therefore it is considered that the scheme has had a direct impact on safety.

Security

- Layby facilities with emergency phones have been installed on the new dual carriageway replacing the previous access to local facilities such as garages on the old alignment. Lighting has only be provided at the main junctions and the overall assessment of the scheme on security is neutral, as expected.

4. Economy

Introduction

- 4.1 The purpose of this chapter is to evaluate how the scheme is performing against the economy objective, which consists of the following sub-objectives:
- Achieve good value for money in relation to impacts on public accounts.
 - Improve Transport Economic Efficiency (TEE) for business users, transport providers and consumer users.
 - Improve journey reliability.
 - Provide beneficial wider economic impacts.
- 4.2 The study area for the scheme assessment consisted of the A46 between Newark and Widmerpool as well as small sections of the A606, A52 and A6097 along with the minor roads accessing the A46 along this stretch. The full COBA appraisal area is shown previously in Figure 3-1.
- 4.3 TUBA (Transport Users Benefit Appraisal) was used to forecast the economic benefits of the scheme although TUBA is unable to directly analyse collision benefits or user delays. A COBA model was therefore used to appraise the safety benefits of the scheme and added manually to the analysis. The benefits were appraised over a 60 year period in line with current guidance.
- 4.4 This section provides a comparison between the outturn costs and benefits and the forecast economic impacts. Consideration is also given to the scheme's wider economic impact. Outturn journey time and safety economic impacts are based on the observed results at OYA reported in previous chapters of this report, and reforecast to a 60 year period.

Sources

- 4.5 The economic forecasts of the scheme have been taken from the Post Public Inquiry Economic Appraisal Report (PI EAR) undertaken in 2009. This report was an update of the EAR dated March 2007. The key changes between these two documents are:
- Revised costs.
 - Inclusion of the Kinoulton Alternative link.
 - Earlier opening date of the scheme of 2012.
- 4.6 The COBA model dated April 2009 has been also been used.
- 4.7 The outturn spend profile for this scheme was obtained from the Highways Agency Regional Finance Manager in November 2013. All costs presented in this report are in 2002 prices.

Evaluation of Journey Time Benefits

- 4.8 The change in annual vehicle hours over a wide network (including the A46 key links) was used to derive economic benefits, as these links are the key elements of economic benefit for the whole scheme. It is not possible to use TUBA outputs to create a comparable forecast based on the impacts on this route only as TUBA is matrix based and its output does not give any breakdown of the impacts by link or area.
- 4.9 TUBA modelling was based on the benefits in a wider area, but for this evaluation, we focus on the route where changes for users can be most clearly identified as being linked to the scheme. In this case it is vehicles using the A46 improved section.
- 4.10 For these users, vehicle hours savings have been calculated for the vehicles using the A46 between Newark (Farndon roundabout) and Widmerpool (where the A46 meets the A606).
- 4.11 Savings were considered for the weekday peak periods, interpeak, overnights and weekends.

- 4.12 Additional traffic in the corridor, which is the traffic attracted by the improved A46, was attributed with half the benefits using the economic principle of rule-of-half in line with WebTAG guidance.
- 4.13 Information used in the Traffic Forecasting Report for this scheme has been used to create a proxy forecast vehicle hours saving on the A46 key links. The observed vehicle hour savings have been calculated from the traffic counts and journey time surveys, discussed in Chapter 2 of this report. This method uses the differences between the do minimum and do something values for the following variables:
- Link Distance
 - Journey Times
 - Traffic Flow
- 4.14 The opening year savings were as shown in Table 4–1 by scheme section. The largest saving is seen for the northern section, as this is the longest of the sections.

Table 4–1 – Vehicle hour savings

Route section	Opening Year Vehicle Hour Saving (hours)
Northern (A6097-Newark)	553,166
Central (A52-A6097)	120,352
Southern (A606-A52)	334,651
Total Saving	1,008,168

Monetised Journey Time Benefits

- 4.15 The evaluation focuses on key links on the A46 between Newark and Widmerpool. The methodology detailed below was applied to obtain a POPE re-forecast for the 60 year journey time benefits as shown in Table 4–2 and Table 4–3 below.
- The total predicted vehicle hours saved in the opening year on the key links was calculated using forecast flows, speeds and journey times from the traffic forecasting report.
 - The predicted monetary vehicle hour benefit was taken from the EAR for the whole appraisal area.
 - The actual vehicle hour saving was calculated using observed before and after flows and journey time data.
 - The ratio between predicted vehicle savings and actual savings for the key links was applied to the total monetised benefit from the full TUBA appraisal. This is based on the assumption that the savings for key links are representative for all links.

Table 4–2 Comparison of Predicted and Observed Vehicle Hours

Opening year Vehicle Hours Saving	
Reforecast scheme key links	2,109,609
Observed (OYA)	1,008,168
% difference	-48%

- 4.16 The table shows an observed saving in vehicle hours for the A46 Newark to Widmerpool scheme of 1.01m hours per year compares to the reforecast for the same key links of 2.11m

hours per year (48% lower than forecast). Therefore, the observed saving is around 52% of that predicted. This is due to journey time savings in all time periods being lower than forecast, and traffic flows substantially less than forecast for the opening year.

- 4.17 The full TUBA assessment showed that the forecast time saving benefits for the scheme were £1,157m (2002 prices and values). Using the ratio between the reforecast model of the hours saved on the A46 key links in the opening year and the observed hours saving and the economic benefit over the whole 60 year appraisal period, gives an outturn benefit of £601.8m, as shown in Table 4–3.
- 4.18 This lower than forecast benefit is mainly due to the lower than expected traffic growth anticipated in the original forecasts, as well as the lower observed journey times.

Table 4–3 Time Benefits comparison

Difference in Vehicle Hours in Opening year		Predicted Benefit over 60 years	
Key Links reforecast	2,109,609	TUBA	£1,157.3m
Observed	1,008,168	Outturn	£601.8m

Evaluation of Safety Benefits

Forecast Safety Benefits

- 4.19 The forecast safety benefits for this scheme were derived from COBA (which also monetises the benefits), with the findings detailed in the Post PI EAR. An opening year saving of 26 collisions was forecast, with a 60 year monetary benefit equating to £114m (2002 prices discounted to 2002). These figures are based on a central growth forecast which was considered at the time of the report (2009) as the most likely growth scenario.
- 4.20 The forecast savings were due to be as a result of removing substandard accesses and upgrading the remaining junctions to grade-separated standards. The upgrading to dual carriageway standard was forecast to have a slight increase in collisions occurring on the mainline sections.

Evaluation of Safety Benefits

- 4.21 The POPE methodology for the evaluation of the outturn of the economic value of benefits arising from safety improvements is based on the comparison of observed and forecast collision changes at the POPE evaluation stage (in this case one year after opening, and using the pre scheme counterfactual scenario to take background decline in collisions into account). This is then combined with the assumption that the observed safety impact at this stage can be taken as indicative of that over the whole 60 year appraisal period.
- 4.22 The methodology for calculating benefits is based on the presumption that the forecast ratio of the number of collisions saved in the first year to the forecast 60 year benefits can be used to generate a reforecast economic benefit based on the observed saving in collisions reported in Chapter 3 of this report.
- 4.23 Monetisation of these savings is calculated by:
 - Calculating the net difference between the forecast opening year saving and the opening year observed collision savings in the COBA area.
 - Monetising the net difference using the PAR method which values collisions by road type and enables capitalisation over 60 years based on expected traffic growth.
 - Calculating the 60 year outturn benefits for the whole area by combining the forecast from COBA (for the whole study area) with the outturn assessment of the net difference.
- 4.24 The evaluation of the monetary safety benefits is shown in Table 4–4. All values in 2002 prices discounted to 2002.

Table 4–4 – Comparison of Forecast and Re-forecast Collision benefits

Central Growth Forecast (COBA area)	Forecast Collision Saving (Opening Year)	(a)	26
	Central growth forecast (60 years)	(b)	£114.0m
Observed COBA area	Average Annual Collision Saving in Post-Opening Period (based on adjusted counterfactual) (see Table 3–1)	(c)	7.8
	Net difference between forecast and observed	(d) = (c) – (a)	-18.2
	Monetisation of net difference for opening year	(e)	-£1.69m
	Monetisation of (d) into 60 year impact of net difference between forecast and observed (using PAR 5 guidance)	(f)	-£64.29m
	Outturn 60-year benefit	(b) + (f)	£49.69m

4.25 Table 4–4 demonstrates that the re-forecast 60 year monetary safety benefits for the appraisal area are substantially lower (over 50%) than originally forecast.

Indirect tax - present value cost

4.26 Indirect tax revenue is the expected change in indirect tax revenue to the Government due to changes in the transport sector as a result of the scheme over the appraisal period. For the highways scheme in this study, the tax impact is derived primarily from the monetisation of forecast of the changes in fuel consumption over the 60 years period. A scheme may result in changed fuel consumption due to:

- Changes in speeds resulting in greater or lesser fuel efficiency for the same trips
- Changes in distance travelled
- Increased road use through induced traffic or the reduction of trip suppression

4.27 Note that at the time this scheme was originally appraised, costs were initially taken for the wider costs to public accounts and thus the impact of the scheme on indirect tax was considered within these wider costs. The current guidance¹² (AMCB, Analysis of Monetised Costs and Benefits) considers the costs in terms of the 'broad transport budget' i.e. costs and revenues which directly affect the public budget available for transport and therefore the indirect tax impact is covered within the benefits. Part way through construction, a revised Business Case included an updated TEE for this scheme to allow for indirect tax as part of the benefits rather than the costs.

4.28 Forecasting of the impact of the scheme on indirect tax was done within the TUBA modelling and was based on the whole study area. This showed that the scheme was expected to increase tax revenue over the 60 years appraisal period. To assess the outturn impact we have calculated the impact on the A46 corridor compared with the forecast and then used the ratio method between forecast and outturn to extrapolate the impact over the wide area.

4.29 The outturn impact is only based on the changes on the A46, but as shown in the screenline analysis in chapter 2 of this report, some of the additional traffic is reassigned traffic, therefore the outturn impact may be a slight overestimate.

¹² TAG UNIT A1.1 Cost-Benefit Analysis, October 2013

Table 4–5 – Indirect tax as present value

Costs in 2002 market prices, discounted	Forecast (COBA area)	Outturn (A46 only)
Impact on Indirect tax raised	£196.4m	£108.6m

- 4.30 This evaluation shows that the scheme will result in a large increase in indirect tax, at a level lower than expected. The reduced tax revenue is due to a lower than expected increase in traffic and speed on the A46 improved route. If this impact included within the assessment of the cost to the Treasury, this would reduce the cost of the scheme significantly.

Vehicle Operating Costs (VOC)

- 4.31 For most highway schemes including this one, the VOC and indirect tax impacts are both very closely linked to changes in fuel consumption (eg changes in speeds) which has similar magnitude of impacts, but from opposite sides of the benefits balance. That is, if there is increased fuel consumption, VOC will increase due to users paying more for fuel (i.e. a disbenefit) and thus more indirect tax will be collected by the Treasury which is considered to be a benefit according to current guidance. For this scheme the ratio used for the reforecast indirect tax calculation has been applied to the monetary value for VOC.

Table 4–6 – Vehicle Operating costs (present value)

Costs in 2002 market prices, discounted	Forecast (Study area)	Outturn (A46 only)
Impact on vehicle operating costs	-£239.8m	-£131.4m

- 4.32 This evaluation shows that the scheme will result in a large increase in vehicle operating costs, however, at a level lower than expected. The reduced costs are due to a lower than expected increase in traffic and speed on the A46 improved route.

Carbon Impact

- 4.1 The impact of the scheme on greenhouse gases (change in carbon outputs) is considered in detail in the next chapter of this report. At the time this scheme was appraised, an output from the TUBA model was a monetary value for the change in carbon emissions, based on a price per tonne.
- 4.2 As this scheme was appraised using TUBA, this calculation has already be made to estimate that the scheme would result in an increase in carbon, at a cost of -£35.2m over the 60 year appraisal period.
- 4.3 A proxy change in carbon emissions has been calculated using the forecast and observed journey times and traffic flows along the A46 scheme key links (see Chapter 5). This indicates that an increase of 41% (8,145 tonnes of carbon) is observed and this is 49% of the reforecast equivalent. We have then used the ratio method to extrapolate the change seen on the key links to the wider area, which results in an outturn reforecast carbon disbenefit of -£17.25m over 60 years.

Scheme Costs

- 4.4 This section compares the forecast costs of the scheme as of the start of the construction period with the actual spend at the time of this study.
- 4.5 Costs of the scheme are also considered for the full appraisal period of 60 years so they can be compared with the benefits over the same period. The full costs examined are made up of the following:

- Investment costs: before and during construction
- Operating costs; over the 60 years after opening

4.6 Investment costs are considered in terms of a common price base of 2002 for comparison with forecast. For comparison with the benefits overall costs are expressed in terms of present value.

Investment Costs

4.7 The investment cost is the cost to the HA of the following:

- costs of construction
- land and property costs
- preparation and supervision costs
- allowance for risk and optimism bias

4.8 The last pre-construction forecast of the investment costs was in May 2009 at the Highway Investment Board when the scheme was given the final go-ahead. This was a slight revision to the forecast costs contained in the Post PI EAR in April 2009 and the AST.

4.9 The scheme budget included in the Post PI EAR was based on the November 2008 scheme budget presented to the HA and was expected to be £365m at 2006 Q2 prices. The final cost estimate in May 2009 revised this to £382.9m and this figure is used in this evaluation as the final pre-construction forecast cost.

4.10 The outturn spend profile for this scheme has been obtained for the purpose of this study and covers the period 2002 – 2013 (spend to date). For the purpose of comparison between forecast and actual, and with other major schemes, prices have been converted to 2002 prices. This figure can then be compared with the forecast cost on a comparable basis.

4.11 Comparison between the forecast and outturn is presented in Table 4–7.

Table 4–7 – Scheme Investment Costs (£m)

Forecast Cost (May 2009)		Outturn Cost (as of October 2013)		% difference
Highway Investment Board submission	£382.9m	As spent costs in 2002-2013 years and prices	£369.7m	
Cost in £million 2002 prices, undiscounted	£297.9m	Cost in £million 2002 prices, undiscounted	£287.4m	-3.5%

4.12 The key point to note as shown in the table is that the outturn cost was 3.5% below that forecast.

Present Value Costs (PVC)

4.13 Cost benefit analysis of a major scheme requires all the costs to be considered for the whole of the appraisal period and they need to be expressed on a like-for-like basis with the benefits. This basis is termed Present Value. Present Value is the value today of an amount of money in the future. In cost-benefit analysis, values in differing years are converted to a standard base year by the process of discounting giving a present value.

4.14 Following current Treasury Green Book guidance, calculation of the present value entails the conversion to market prices, then discounting by year. This using a rate of 3.5% for the first 30 years and 3% thereafter.

4.15 The full PVC is made up of the following costs converted to present value:

- Investment costs, as above
- Indirect Tax Revenues during the lifetime of the scheme

The final TUBA model (2005) and the AST both present the PVC as £239m, but this is based on older version of the cost forecast, so we have revaluated the present value of the investment cost shown in Table 4–7 for the final forecast. This revised value presented in Table 4–8. This is the 2002 costs, expressed in market prices discounted at the annual rate of 3.5%. The outturn costs are presented likewise.

Table 4–8 – Investment Costs as Present Value (£m)

Present Value £m (costs in 2002 market prices, discounted)	Forecast	Outturn
Investment Costs	£274.5m	£265.3m

Benefit Cost Ratio

- 4.16 The Benefit Cost Ratio (BCR) is used as an indicator of the overall value for money of the scheme. It is the comparison of the benefits (PVB) and costs (PVC) expressed in terms of present value.
- 4.17 Projects with a BCR greater than 1 have greater benefits than costs; hence they have positive net benefits. The higher the ratio, the greater the benefits relative to the costs. It is to be noted that the BCR is insensitive to the magnitude of net benefits and therefore may favour projects with small costs and benefits over those with higher net benefits.
- 4.18 Table 4–9 compares the predicted and outturn costs and benefits. A column has been included to indicate whether the outturn reforecasts are likely to be a conservative estimate (due to the small appraisal area, but wide observed effect), or optimistic (due to the impact of reassigned traffic).

Table 4–9 – 60 Year BCR Evaluation

		Forecast	Outturn Reforecast	Estimate
Costs	PVC	£274.5m	£265.3m	-
Benefits	Journey time benefits	£1,157.3m	£601.3m	Conservative
	Safety Benefits	£114.0m	£49.7m	Conservative
	Vehicle Operating Costs	-£239.8m	-£131.4m	Optimistic
	Carbon benefits	-£35.2m	-£17.25m	Conservative
	PVB subtotal	£996.3m	£502.35m	-
	Indirect Tax	£196.4m	£108.6m	Optimistic
	BCR (with indirect tax in PVC)	12.8	3.2	Conservative
	BCR (with indirect tax in PVB)	4.3	2.3	Conservative

- 4.19 It can be seen from Table 4–9 that the BCR is lower than forecast due to lower than expected journey time benefits and safety benefits. A BCR of 2.3 represents high value for money, which is considered a conservative estimate based on the reforecast benefits calculated as part of this report.
- 4.20 It should be noted that the BCR ignores non-monetised impacts. In the former NATA framework and its replacement, the Transport Business Case, the impacts on wider objectives must be assessed but are not monetised. The evaluations of the wider economic impacts, environmental, accessibility and integration objectives are covered in the following sections of the report.

Wider Economic Impacts

- 4.21 It is inherently difficult to isolate wider economic impacts which could be attributed to the scheme. However, it is important to understand the socio-economic context in which the scheme opened and how the upgrading of the A46 route between Newark and Widmerpool may have assisted local and regional socio-economic aspirations.

Forecast

- 4.22 The AST for this scheme forecast that the scheme would have a neutral impact, with a comment stating 'no assessment required'.

Evaluation

- 4.23 The A46 is a strategically important route for the East Midlands, and one of the key objectives of this scheme was to 'provide an improved strategic link between the M1 and the A1. Evidence presented in this report demonstrates that journey times along the A46 for the scheme section have reduced significantly, with journey time reliability also improving. This will have benefits for freight and business users who may have improved productivity due to reduced time spent on the road.
- 4.24 The scheme can therefore be linked to improving the wider transport network, which in turn will have opened up the opportunities for Bingham, Newark and beyond to Lincoln and the wider East Midlands for development and employment by reducing the time to reach other key urban areas. The improved access arrangements for the former RAF Newton site may result in an increase in the rate of development of the site.
- 4.25 At this stage there is no evidence regarding the direct link between increased enablement of development or employment to support this claim, however improved access to the east of the East Midlands will have improved the attractiveness of Newark and beyond to businesses. This will have opened up opportunities for a wider area of employment opportunities for residents of the East Midlands.
- 4.26 The overall assessment of the impact on of the scheme on the wider economy is neutral at this stage. Further assessment of the longer term impact of the scheme on the wider economy will be considered at the Five Years After POPE stage.

Key Points - Economy

Present Value Benefits

- The outturn journey time benefits of £601.3m are approximately half of the forecasts. This is mainly due to the observed speeds and traffic flows being below that forecast due to lower traffic growth observed than forecast.
- Outturn safety benefits were calculated to be £49.7m compared to a forecast of £114m. This difference is partly due to taking account of the national collision background decline seen between the appraisal period and the post opening period.
- The disbenefit from vehicle operating costs is less than forecast, due to the observed speeds and traffic flows being lower than forecast. The disbenefit from carbon is also less than forecast for similar reasons.
- Overall the outturn PVB is 49% lower than forecast.

Costs

- Outturn investment costs were 3.5% lower than forecast at £287.5m.
- The outturn impact on indirect taxation of £108.6m is lower than forecast due to lower overall traffic levels (compared to forecast), and lower average speeds on the A46.

Benefit Cost Ratio

- Taking indirect tax as a benefit, the scheme achieves a BCR of 2.3 which show the scheme has delivered value for money.

Wider Economic Impacts

- Due to the inherent difficulty in isolating the wider economic impacts of the scheme, it has not been possible to conclude whether the scheme has had a direct impact on stimulating local economic activity. However, the increased capacity provided by the scheme is likely support development along the route.

5. Environment

Introduction

- 5.1 This section documents the evaluation of the impacts of the scheme on the environmental sub-objectives. The overall environmental aim for the scheme, as stated in the 2007 Environmental Statement (ES) was ‘to protect the natural and built environment’ and ‘to undertake a programme of archaeological, environmental and historical investigations prior to and during construction’.
- 5.2 A summary of how the scheme was considered to perform in the Appraisal Summary Table is set out below:
- No change in the number of people annoyed by traffic noise, whilst there would be **net improvement** in terms of air quality.
 - The scheme would have a **slight adverse** impact on the area landscape/townscape due to the presence of grade-separated junctions and offline sections of road.
 - Due to potential effect on archaeological resources, the scheme was considered to have a **moderate adverse** impact on heritage of historic resources.
 - A **moderate adverse** impact was also predicted on biodiversity due to the scheme’s potential, direct effect on eight sites of nature conservation interest (SINCs), an indirect effect on a further four SINCs, and effects on ponds, wetlands, ditches, hedgerows and other ecological habitats.
 - The scheme was predicted to have a **moderate adverse** impact on the water environment due to potentially significant effects on floodplain storage capacity on the River Trent/Devon floodplain, as well as effects on local watercourses and aquifers.
 - The scheme was predicted to have **moderate beneficial** impacts on physical fitness and journey ambience.

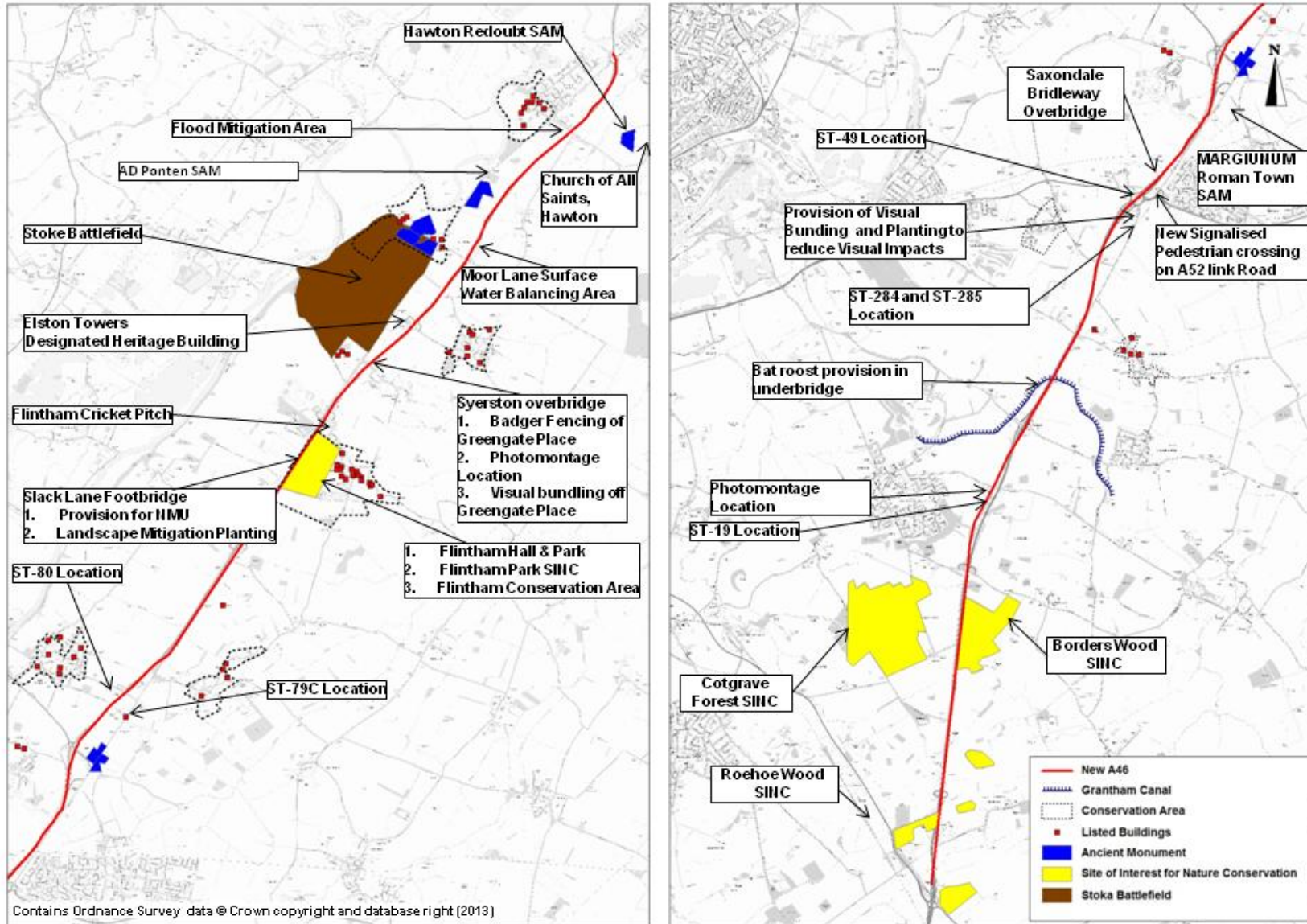
Data collection

- 5.3 The following documents have been used in the environmental evaluation part of this study:
- Appraisal Summary Table (AST) June 2009.
 - December 2005 ES (scheme information and summary of assessment only).
 - January 2007 Environmental Statement (ES) (Vol 1, Vol 2 and Vol 3).
 - March 2007 ES Addendum (Final), including figures.
 - ES Non Technical Summary (January 2007).
 - A46 Photomontages (Public Inquiry 2007).
 - Environmental Masterplan as built drawings (November 2013).
 - Detailed Landscape Design as built drawings (July 2013).
 - Detailed Design Balancing Ponds as built drawings (June 2013).
 - Grantham Canal Underbridge General Arrangement as built drawing (June 2013).
 - Grantham Canal Underbridge Miscellaneous Details as built drawing (June 2013).
 - Environmental Masterplan drawings (2007).
 - Landscape Management and Maintenance Plan September 2010.
 - Archaeological Assessment Report (draft) May 2011.
 - ‘Following the Fosse Way through Nottinghamshire: Archaeology and the A46’ HA 2012
 - Badger Activity 2009-2012: Summary Report September 2012.
 - Handover Environmental Management Plan (July 2012 and November 2013 versions).
 - A46 Awards summary (2013).
- 5.4 A full list of the background information requested and received to help with the compilation of this report is included in Appendix C at the end of this document.

Site inspections

- 5.5 A site visit was undertaken on the 20th October 2013. No photo comparison views were included in the ES, however, photomontages from locations along the scheme were produced for the Public Inquiry in 2007. For each of these locations, a photo of the existing view was included as well as photomontages showing predicted views for scheme years 1 and 15. These were replicated (as close as possible given access restrictions in some locations) during the OYA site visit and are included in Appendix D.
- 5.6 Figure 5-1 shows the key environmental features that are discussed in this chapter.

Figure 5-1 – Key Environmental Features



Consultations

- 5.7 Table 5–1 lists the organisations contacted regarding their views on the impacts that they perceive the road scheme has had on the environment, and whether they feel that the mitigation measures implemented have been effective.

Table 5–1 – Summary of environmental consultation responses

Organisation	Field of interest	Comments
Environment Agency	Water	The EA indicated that in their opinion the scheme has performed 'worse than expected'. They stated that the EA has not been invited to comment on the scheme since 2007, prior to detailed design and that they are aware of flooding in the area in 2012 potentially associated with the scheme as well as ongoing drainage issues that remain outstanding.
Natural England	Landscape and biodiversity	Advised that as the scheme does not affect any statutory designated sites or protected landscapes NE is unable to make specific comment. As mitigation/compensation was required, they advised that the consultation request had been forwarded to NE's wildlife licensing team who may be able to provide some information. No further response received as of August 2014.
English Heritage	Heritage	No response received as of August 2014.
Nottingham City Council	General	No response received as of August 2014.
Nottinghamshire County Council	General	Response received on landscape and visual impacts only, indicating impacts are generally as expected or better than expected. Responses on other issues were to be provided by others in NCC. Response received in July 2014 on rights of way highlighting some handover and maintenance issues.
Rushcliffe Borough Council	General	No response received as of August 2014.
Newark and Sherwood District Council	General	No response received as of August 2014.
British Waterways (Canal River Trust)	Waterways	Partial response received covering issues related mostly to the Grantham Canal Towpath, specifically conflict between walkers and equestrians on this path related to problems with segregation of bridleway and towpath.
Nottinghamshire Geological and Biological Records Centre	Biodiversity	No response received as of August 2014.
Nottinghamshire Wildlife Trust	Biodiversity	No response received as of August 2014.
Widmerpool Parish Council	General	No response received as of August 2014.
Stanton on the Wolds Parish/Shelford and Newton Parish Council	General	Generally positive feedback. Negative comments related to vehicular and pedestrian disruption during the construction period.

Organisation	Field of interest	Comments
Kinoulton Parish Council	General	No response received as of August 2014.
Cotgrave Town Council	General	No response received as of August 2014.
Cropwell Bishop Parish Council	General	Provided comprehensive feedback on environmental and traffic issues as well as raising issues of previous concern related to the design and construction of the scheme and lessons learnt for future schemes. Some of this feedback related to issues raised at the pre-construction public inquiry. Concerns related to scheme drainage were also raised.
Cropwell Butler Parish Council	General	No response received as of August 2014.
Bingham Town Council	General	No response received as of August 2014.
East Bridgford Parish Council	General	Limited response received covering traffic in East Bridgford, some perceived safety issues with use of the scheme, drainage at Margidunum and general comment that the connection to Newark has been improved.
Car Colston Parish Meeting	General	No response received as of August 2014.
Screveton Parish Meeting	General	No response received as of August 2014.
Kneeton Parish Council	General	No response received as of August 2014.
Flintham Parish Council	General	No response received as of August 2014.
Syerston Parish Meeting	General	No response received as of August 2014.
Elston Parish Council	General	No response received as of August 2014.
East Stoke with Thorpe Parish Council	General	No response received as of August 2014.
Farndon Parish Council	General	No response received as of August 2014.

Animal mortality

- 5.8 The Managing Agent Contractor (MAC) was contacted with regard to animal mortality figures. The MAC indicated that they have little animal mortality data, as they no longer record all instances of dead animals. Their contract now only requires attendance if the animal is causing an immediate hazard or potential distress to the road users, therefore, if a dead animal is on the verge, they no longer normally record or respond. As such, the mortality data supplied is partial, only showing instances where the MAC attended. The categories of mortality data supplied for this assessment were not relevant to biodiversity.

Environmental awards

- 5.9 The scheme has received a number of awards for construction, sustainability, environment and safety (see Appendix E).

Traffic forecasts and evaluation

- 5.10 Three of the environmental sub-objectives (noise, local air quality and greenhouse gases) are directly related to traffic flows. For POPE an assumption is made that if the observed level of traffic is in line with forecasts, then it is likely that local noise and air quality impacts are as expected.
- 5.11 The ES noted that flows along the existing A46 in 2004 were at their lowest in the section between Widmerpool and Owthorpe (in the region of 16,000 vehicles AADT), with higher flows occurring north of the A6097 at Margidunum (AADT in excess of 25,000).
- 5.12 The ES stated that the existing A46 (without the scheme) was predicted to have 24-hour traffic flows (AADT) of between 18,000 and 27,000 in 2016, with flows potentially increasing to between 19,000 and 29,000 by 2031. With the scheme, traffic would be attracted to the A46 corridor, resulting in traffic flows on the new road of between 25,000 and 36,000 vehicles in 2031. These figures have been interpolated to reflect the actual opening year and are shown in Table 2–5.
- 5.13 Under the ‘do-something’ scenario, flows on the former A46, which would be de-trunked, would fall substantially. For example, flows on the existing A46 between Flintham and Farndon would be reduced by approximately 92% through East Stoke, and by 98% at Syerston, in 2016 (the expected scheme opening year in the ES). Discussion in Chapter 2 of this report shows that observed pre and post opening traffic flows along this section have reduced by 89% at East Stoke and 97% at Farndon. The general effect of the scheme on the county road network was predicted to be a reduction in traffic flows, although localised increases were predicted where traffic would be directed to new junctions and to over/underbridges.
- 5.14 The peak-hour, average speed of cars using the A46 was predicted to increase from the observed 20-30mph to just below 70mph for the proposed scheme. Inter-peak speeds were predicted to increase from nearly 40mph to nearly 70mph. The predicted speed differences were attributed to the scheme resulting in an improvement from a single carriageway road with junctions along its length (and subject to some 40mph speed limits), to a dual carriageway with no at-grade junctions, subject to a 70mph limit along its length. In addition, it was predicted that the new road would operate below the capacity of a dual carriageway in 2031; therefore, the traffic would not be slowed down by congested flow conditions. Speed limits were not predicted to change on the old road, so free flow conditions would occur (that is a slight speed increase in peak hours, but not much change interpeak/off peak).
- 5.15 No percentage HGV forecasts were included in the ES for comparison at OYA, however Table 2.3 in chapter 2 of this report shows observed changes for HGV usage on the A46.
- 5.16 A full analysis of the traffic changes is discussed in Chapter 2 of this report. The traffic forecasts from the ES (interpolated to 2012) used in the noise and local air quality appraisals and the observed flows (2012/2013) are shown in Table 2–5 in the traffic chapter of this report.
- 5.17 Observed traffic levels on the unclassified roads in parts of Bingham and East Bridgford exceed the forecast substantially in these locations. The observed flows at sites 26 and 19 pre scheme were substantially above the forecast opening year levels and although traffic flows are greater than expected in the ES there has actually been an observed slight reduction in traffic at site 26 and site 19 post opening as discussed in Chapter 2 of this report. Overall, observed traffic was more than forecast (25% or greater more) in 7 of 34 locations, less than forecast (20% or greater less) in 14 locations and the same as forecast (with plus 25% or minus 20%) in 13 locations.

Noise

Forecast

AST

- 5.18 Areas noted in the 2009 AST expected to experience an overall improvement in noise climate included Newark, Kinoulton, East Stoke, Farndon and parts of Bingham. Areas predicted to experience slight increases in traffic noise levels were noted as Cropwell Bishop, Cropwell Butler and Elston.
- 5.19 With the scheme it was predicted that the overall number of people annoyed in year 15 would decrease by one and there would be 141 fewer properties experiencing noise levels greater than 66dB L_{aeq} ¹³ by year 15.

Environmental Statement

- 5.20 Areas identified in the ES as likely to experience an overall improvement in noise climate as a result of the scheme included Radcliffe on Trent, Kinoulton, parts of Cropwell Butler, East Stoke and Farndon. Elsewhere, the settlements of Cotgrave, Cropwell Bishop, Bingham, East Bridgford, Elston and Syerston were predicted as likely to experience increased traffic noise levels. However, it was generally concluded that noise levels post-scheme would be relatively low for large parts of these settlements. No areas were predicted to experience noise levels greater than 55 dB LA10,18h. The ES concluded that such noise levels were considered likely to result in very low levels of long-term noise annoyance.
- 5.21 In the long term, the ES addendum (March 2007) predicted that there would be no change in the number of people annoyed by traffic noise, considered to be a negligible impact.
- 5.22 It was calculated that the percentage of people in the area annoyed by traffic vibration would decrease in the long term with the scheme from 2.7% to 2.3%, considered to be a negligible impact.
- 5.23 The ES assessment of noise and vibration was considered to be conservative as based on DMRB guidance. In particular the assessment assumed a low noise road surface for the old A46 in the future 2031 baseline. Noise and vibration impacts associated with the proposed scheme would be lower than presented in the ES if this were not the case.
- 5.24 Where possible, the scheme vertical and horizontal alignments were configured in a manner that would reduce the scheme's potential noise impact. For example, where possible, the Scheme design keeps the mainline close to existing ground levels, and uses cuttings and false cuttings that are able to act as noise barriers, whilst landscape bunds were also identified as having the potential to provide some noise mitigation, although this was not designed as their primary function. The only specific noise mitigation identified in the ES for inclusion as part of the scheme was a low road noise surface. No purpose-built noise barriers were proposed. The ES addendum does note however, that one property (The Lodge, Cropwell Butler) may be eligible for treatment under noise mitigation regulations.

Consultation

- 5.25 The response on noise impacts received from Cropwell Bishop Parish Council indicates that operational noise from the new A46 is generally as expected, with 'traffic drone that can be worse with northerly or westerly winds'.

Evaluation

- 5.26 Low road noise surfacing has been provided along the entire length of the dual carriageway scheme. No information on road surface influence has been provided. As indicated on the as built drawings, no additional noise mitigation measures were considered necessary in the ES and none were indicated as provided on the as built drawings.

¹³ L_{aeq} is the equivalent continuous noise level, defined as "when a noise varies over time, the L_{eq} is the equivalent continuous sound that would contain the same sound energy as the time varying sound".

- 5.27 Table 2.5 in Chapter 2 details the traffic flow forecast and observed figures for all routes reviewed as a part of this assessment. Based on this table, it is noted that observed traffic flows within the scheme are less than forecast, with the southern part of the scheme having 33% less traffic than forecast. In 13 locations, traffic flows are in line with forecasts (as shown in Table 2–5) and noise is likely to be as predicted in the ES at these locations. Observed traffic flows off the A46, but reviewed as a part of the scheme in 14 locations are more than 25% above the forecast traffic flows, indicating that noise is likely to be worse than predicted in the ES for some areas, although are routes with relatively low traffic flows.
- 5.28 It should be noted however, as detailed in Chapter 2, that observed traffic flows for Chapel Lane and Kirk Hill in 2009 (pre scheme), were above the forecast opening year flows.
- 5.29 It is noted that the HEMP identifies one property, near Cropwell Butler, as qualifying for noise treatment under the Noise Insulation Regulations, which is that identified in the ES addendum. The HEMP notes with regard to this property that the close boarded fence at this property is not a noise barrier. The HA have confirmed that a compensation package has been agreed with the resident, which includes secondary glazing.
- 5.30 Overall, it is considered that the impact of the scheme on noise is as expected as whilst the scheme itself has lower than expected flows.

Origin of Assessment	Summary of Effects on Noise	Assessment
AST	The study area consisted of all properties within 600 metres either side of the Scheme and 600 metres either side of all road links which experience a change in traffic flow greater than +25% / -20% as a result of the Scheme. There would be areas that would experience an overall improvement in noise climate (including Newark, Kinoulton, parts of Bingham, East Stoke and Farndon). Elsewhere, the settlements of Cropwell Bishop, Cropwell Butler and Elston would experience slight increases in traffic noise levels. Number of properties experiencing noise levels \geq 66 dB LAeq (Year 0) Do Minimum 496, Published Scheme 371. Number of properties experiencing noise levels \geq 66 dB LAeq (Year 15) Do Minimum 578, Published Scheme 434. 3 residential properties demolished as part of the Scheme	Change in Population Annoyed (Year 15) = -1
EST	Based on the traffic survey results, noise levels in the vicinity of the scheme are on balance as expected. One property post-opening is eligible for noise mitigation treatment and a compensation package has been agreed.	As expected

Local air quality

Forecast

AST

- 5.31 The AST states that there would be a net beneficial impact with regard to air quality as a result of the scheme. A total of 6,603 properties were located within 200m of the existing A46 and/or scheme and/or surrounding affected roads. Overall, the AST predicted that 5,677 properties (86%) would experience an improvement in local air quality, while 926 (14%) would experience worsening air quality. Three properties to be demolished as part of the scheme. The AST stated that air quality improvements were expected in East Stoke and Farndon, with worsening expected on the western edge of Syerston and Coneygreys Spinney.
- 5.32 With regard to nitrogen dioxide levels, the AST predicted 1,837 properties would experience reduced levels, while 555 properties were expected to experience reduced levels of particulate matter (PM₁₀).

- 5.33 No exceedances of the 2009 air quality objectives were predicted at any affected property with or without the scheme. There were no declared air quality management areas (AQMAs) in the vicinity of the scheme at the time of the AST preparation.

Environmental Statement

- 5.34 The ES addendum predicted that overall, the scheme would have a moderate beneficial impact on community exposure to road traffic pollution. It was predicted that in 2016 of 6,210 properties, 4,698 (76%) would experience improved air quality and 1,509 (24%) worsened air quality.
- 5.35 The ES included an assessment of road traffic emission impacts affecting the Kinoulton Marsh and Canal site of special scientific interest (SSSI), as the SSSI is located within 200m of a minor side road that was predicted to undergo an increase in traffic flow of more than 10% in 2016. The ES found that due to traffic flows on the minor road being very low operation of the scheme in 2016 would have no significant effect on nature conservation sites (including the SSSI) due to changes to road traffic emissions.
- 5.36 The ES concluded that the scheme would not result in any significant air quality problems as a result of changes in road traffic emissions. Further, the ES noted that these findings were further emphasised by the fact that the DMRB procedures used in the air quality assessment are designed to over-predict traffic emissions. On this basis, the ES stated that it could be assumed with confidence that no significant air quality problems would occur in 2016 as a result of the operation of the scheme.
- 5.37 No specific air quality mitigation was proposed for this scheme.

Consultation

- 5.38 The response on air quality impacts received from Cropwell Bishop Parish Council indicated that local air quality is considered to be 'as expected' with no significant change on opening of the scheme.

Evaluation

- 5.39 Rushcliffe Borough Council declared a nitrogen dioxide AQMA in 2011 (after publication of the ES) 'covering several properties along the A52 and Stragglethorpe Road at the junction of the A52 and the Stragglethorpe Road', Radcliffe-on-Trent. This area is within the air quality study area for the scheme ES, but it is unknown whether it is within the affected road network, as the ES does not identify this area. In addition this AQMA relates to specific properties only. As such, this AQMA is not considered further here.
- 5.40 The observed traffic flows are more than 10% below the forecast traffic flows in 19 out of 34 locations (refer to Table 2–5) and as a result, air quality is likely to be better than forecast in these locations.
- 5.41 Observed traffic flows on routes off the A46, but reviewed as a part of the scheme are more than 10% above the forecast (Table 2–5) in 9 locations. As a result, air quality is considered worse than predicted in the ES in these locations.
- 5.42 The above indicates that, overall most locations are experiencing improved air quality, **as expected**.

Origin of Assessment	Summary of Effects on Air Quality	Assessment
AST	A total of 6603 properties are located within 200m of the existing A46 and/or the Scheme and/or surrounding affected roads, 3 properties would be demolished due to the Scheme, 5677 (86%) would experience an improvement in local air quality and 926 (14%) a worsening. Will give improvements to air quality at East Stoke and Farndon, although there will be a slight worsening in air quality at the west edge of Syerston and Coneygre Spinney. No exceedances of the current air quality objectives	Properties with improved air quality 2016 with scheme = 5,677, worse = 926

	are predicted at any affected property with or without the Scheme; the Local Authorities have not declared any AQMAs in the vicinity of the Scheme.	
EST	Based on the traffic survey results, air quality in the vicinity of the scheme is as expected.	As expected

Greenhouse gases

- 5.43 The assessment of the impacts of transport schemes on emissions of greenhouse gases is one of the environment sub-objectives. WebTAG notes that carbon dioxide (CO₂) is considered the most important greenhouse gas which is therefore used as the key indicator for the purposes of assessing the impacts of transport options on climate change. Changes in CO₂ levels are expressed in terms of equivalent tonnes of carbon released as a result of the scheme.

Forecast

- 5.44 The ES states that the scheme would increase emissions in the study area by 21% in 2016 (the opening year in earlier modelling) which was 22,733 tonnes CO₂. Since the time of the appraisal, guidance now states that the impact should be expressed in terms of Carbon which is 6,194 tonnes. This would have been calculated using the DMRB air quality assessment spreadsheet and monetised using TUBA.

Outturn

- 5.45 To facilitate a like for like comparison of forecast and outturn carbon impacts, an evaluation method consistent with that in the forecast is used. In the case of this scheme, there was no detailed breakdown of the traffic data used to calculate the forecast figure above over the wider area. Therefore to create a like-for-like, we have use the forecast figures for traffic and journey times as set out in Chapter 2 to create forecasts along the A46 route improved by the scheme which we can compare with observed data for the same links. To capture the varying impact level during the differing periods we have assessed the emissions by time periods during the day. This results in very different figures to the forecast in the ES, as it doesn't take any reduction in carbon calculated for routes where a decrease in traffic was forecast/observed.

Table 5–2 – Change in Greenhouse Gases

Tonnes of Carbon	Do Minimum/Pre Scheme	Do Something/Post Scheme	Difference
Forecast	23,948	40,568	16,620 (69%)
Observed	20,100	28,245	8,145 (41%)

- 5.46 Table 5–2 shows that the scheme was forecast to increase carbon emissions on the A46 corridor and the outturn assessment has shown that there has been a significant increase in the opening year, but that this increase has been 8,475 tonnes less than expected (51%). The additional emissions arise from the increase in traffic in the corridor and the increased speeds as a result of the dual carriageway, although as the observed flows and speeds are lower than forecast, the overall increase is less. Although the low speeds in the congested peak periods before the scheme was built meant that the traffic experienced inefficient fuel consumption, in general the higher speeds and extra traffic negate this beneficial effect in terms of carbon, hence the net worsening. However it must be noted that some of the additional traffic on the A46 has rerouted from other roads, so an assessment of the carbon impact over the roads in the wide area would show a much lower increase overall in percentage terms.

Sub-objective	AST score	OYA evaluation
Greenhouse gases	Increase in CO ₂ due to scheme: +28,938t; PVB = -£35.2M	Better than expected

Landscape and townscape

Forecast

AST

- 5.47 In relation to landscape, the 2009 AST stated the scheme would follow the alignment of the existing A46 along a former Roman Road through a gently rolling and agricultural landscape for the majority of the route, retaining vegetation to the east where possible. Planting to be lost to the west of the scheme would be replaced, with hedgerows translocated where practicable. The AST stated that on the offline section, planting would be provided to reconnect severed hedgerows. Significantly more vegetation would be provided by the scheme than would be removed. The roundabouts at Stragglethorpe, Saxondale, Margidunum and Farndon would be lit as would the new roundabout at Lodge Lane and the existing A46. The mainline carriageway would not be lit.
- 5.48 The AST scored a **slight adverse** effect for landscape.
- 5.49 With regard to townscape, the AST stated that the scheme would improve the setting of the conservation areas at East Stoke and Farndon. It also noted that human interaction would be improved as a result of ease of movement within and between local settlements and isolated properties.
- 5.50 Overall, the AST scored a **slight beneficial** effect for townscape.

Environmental Statement

Landscape

- 5.51 The ES stated that the existing A46 between Widmerpool and Newark ran along the route of the Roman Road known as the Fosse Way. The A46 had an existing impact on adjoining property and landscape and crossed three landscape character areas (LCAs), further divisible in 22 sub-areas.
- 5.52 Retention of existing vegetation was a priority, and therefore, where on-line widening was proposed, the scheme proposed to retain the vegetated boundary to the east. Planting was proposed to be used to fulfil a number of requirements (namely, screening of receptors) and to reflect and enhance the local landscape and promote wildlife habitats. Significant lengths of earthworks mounds were to be used to create false cuttings to screen views of the scheme from receptors. Mounds were also to be used to act as visual barriers between the scheme and the existing A46. These mounds were to be graded out where possible to integrate the scheme into the local landscape. Significant areas of planting in the form of woodland, trees and shrubs, hedgerow with trees and areas of species with grassland were to contribute to the enhancement of the character of the local landscape and integrate the scheme into the landscape.
- 5.53 The ES noted that of the 22 LCA sub-areas that comprise the scheme corridor, five were expected to be unaffected by the development. Landscape mitigation (in the form of the landscape design proposals) would alleviate effects, such that by the year of opening 14 sub-areas would be subject to moderate adverse effects and three slight adverse effects. Further, with maturing of planting, by year 15 this would be reduced to slight adverse effects for 12 of the sub-areas, with the remaining 10 experiencing a neutral effect. Overall, the ES predicted that the scheme would have a slight adverse effect on the prevailing landscape.

Visual

- 5.54 The effect of the scheme on visual receptors was predicted to reduce over time. After 15 years of establishment of planting, it was predicted that there would be two residential receptors experiencing a substantial adverse effect, 11 experiencing a moderate adverse effect and 67 experiencing a slight adverse effect. In addition, at this time, the ES predicted that seven and 15 receptors would experience slight and moderate beneficial effects respectively.

- 5.55 The ES also predicted that receptors in East Stoke and Farndon that would directly face the de-trunked A46 would experience substantial beneficial effects associated with reduced numbers of passing vehicles. Those with views to the rear of their properties would, also experience disruption to these views as the scheme crosses open countryside, however, these effects were predicted to reduce to slight adverse by year 15.
- 5.56 The ES identified that should residual effects become apparent, there would be potential for mitigation of these through off-site planting. However, it was clearly stated that this would need to be undertaken in agreement with the landowner.
- 5.57 Overall, the ES found that the scheme was likely to bring instant benefits to many receptors, and that many more receptors would benefit over time as the landscape mitigation established and matures. Similarly, the ES predicted that the local character of the area would be enhanced with the introduction of significant areas of planting and lengths of hedgerows, bringing both visual benefits and ecological mitigation.

Townscape

- 5.58 Townscape impacts were not specifically addressed in the ES.

Effects of lighting

- 5.59 The ES stated that the extent of existing lighting was to be significantly reduced under the scheme, bringing benefits in terms of reducing sky glow in rural areas. The proposed lighting identified in the ES would be concentrated around interchanges (Stragglethorpe, Saxondale, Margidunum and Farndon), with lighting to be removed on sections of the existing A46 to become part of the new road such that no lighting would be provided along the mainline.

Consultation

- 5.60 Response on landscape and townscape impacts received from Cropwell Bishop Parish Council stated that these impacts are 'as expected given the scheme design'. They note that the landscape at Stragglethorpe is now dominated by moving traffic on a one mile long 9.5m high embankment. The scheme planting is considered to be 'growing well after a good summer season, but is unlikely to ever disguise traffic on the high embankment'. The response also noted that the Parish Council believe this section of the scheme should have been built at ground level, which would have reduced maintenance and earthwork costs.
- 5.61 Response on landscape impacts received from NCC indicated that early consultation (2006 onwards) enabled the scheme to be designed incorporating species lists from the Nottinghamshire Landscape Character Assessment, resulting in better than expected impact on landscape character. Early consultation was also reported as allowing discussion about the impact of the scheme on existing landscape features, resulting in impacts on these being as expected. NCC also indicated that views to and from the scheme are as expected, as early visualisation modelling allowed the degree of impact to be accurately predicted. The County Council also stated that the surrounding landscape character areas have been tied into the scheme through the use of recommended species, resulting in a better than expected result.
- 5.62 With regard to mitigation of visual impacts, NCC reported that mitigation measures have been effective in reducing visual impacts as expected and that careful site supervision has ensured that mitigation has been implemented as agreed, including off site planting.

Evaluation - Landscape

- 5.63 As set out in the ES, the landscape design mitigation for the scheme aimed to integrate the scheme into the landscape through appropriate use and grading of earthworks and planting. The aim of the landscape proposals was not only to replace the landscape features lost to the scheme, but also to increase planting, as well as conserve, restore and diversify the LCAs in line with the objectives of the local plans and Nottinghamshire Landscape Guidelines. They also aimed to reduce visual effects on people and properties.
- 5.64 The use of earthworks (in the form of landscape bunds) can be seen on the scheme around some of the junctions, including Saxondale Junction as well as along the mainline, as shown in Figure 5-2. The vertical alignment of the scheme and the use of large earthworks and

embankments for the scheme were considered in detail during scheme development, as documented in the ES. These considerations included landscape and visual impacts, the historic environment, water resources, noise impacts, land-take and access issues, ecology considerations and property as well as engineering requirements and cut and fill balance.

Figure 5-2 – Visual bunding at Saxondale (left) and view towards Syerston overbridge from Greengate Place (right)



5.65 The as built drawings for the scheme and the site visit confirmed that planting has been generally implemented as set out in the ES and the Environmental Masterplan. In some areas, planting appears to have failed, such as on the south-eastern embankment of the Syerston overbridge (Figure 5-3) and on the western side of the scheme north of Slacks Lane overbridge. For comparison, well established landscape planting on the opposite side of the scheme also north of Slacks Lane is also shown (Figure 5-4). The HEMP for the project covers five years of landscape maintenance. It is assumed that under this maintenance, failed planting will be replaced and this should be confirmed as part of the FYA evaluation.

Figure 5-3 – Poorly established landscape planting

Dead landscape planting on the south-east embankment of Syerston overbridge



Poorly growing landscape planting on west side of the scheme north of Slacks Lane footbridge



Figure 5-4 – Well growing landscape planting on the east side of the scheme north of Slacks Lane footbridge



- 5.66 It is apparent that planting has been undertaken in phases during the scheme construction, as there are areas where planting shows signs of growth greater than would be expected at 12 months after completion of the scheme, while other areas still appeared to be within the six month to one year growth phase. For example the planting in the foreground of Figure 5-5 appears more mature than the planting in the middle ground of this photo. Plant growth generally should be reconsidered for the FYA report.

Figure 5-5 – Looking north from Cotgrave overbridge, with more established landscape planting in the foreground and less established in the middleground



- 5.67 In addition, it is also apparent that the establishment and successful growth of planting is being monitored, with individual dead plants marked for replacement/removal, for example in the new hedgerow alongside Slacks Lane footbridge (Figure 5-6).

Figure 5-6 – Dead hedgerow plants alongside Slacks Lane footbridge marked for presumed removal/replacement



- 5.68 The HEMP also sets out the strategy for future longer term maintenance and management of the soft estate by the Highway Agency's MAC. At OYA the scheme generally appears to be well maintained in relation to the implemented landscape mitigation, with little visible litter and low levels of weed invasion.
- 5.69 Translocated hedgerows were only found in the vicinity of the Moor Lane surface water balancing area (Figure 5-7), along the western edge of the grassy/marshy area provided to the west of the mainline. The translocated hedgerow in this location appears to have established successfully. This site should be revisited at FYA to confirm continued growth and establishment of this hedgerow. Another translocated hedgerow is located opposite Eden Hall Day Spa (across Moor Lane), but as this was not known at the time of the site visit, the successful translocation and establishment of this hedgerow cannot be verified. This should be revisited at FYA.

Figure 5-7 – Translocated hedgerow north of Moor Lane



Visual

- 5.70 Visual impacts relate to changes arising from the scheme to individual receptor's views of the landscape.
- 5.71 For visual receptors with a view to the scheme, impacts are considered to be generally adverse, as expected. The completed scheme includes a number of highly visible new features, including junctions and bridges. Although the landscape mitigation is in place, it is immature and is not effective as a visual screen. This is as expected at OYA. The establishment of landscape mitigation planting should be revisited at FYA. Properties facing the old A46 in East Stoke and Farndon have benefitted from the removal of traffic, which has improved their visual amenity as expected.
- 5.72 New overbridges, including Saxondale bridleway overbridge (Figure 5-8) and Butt Lane overbridge will remain visible in the landscape until the planting scheme around them matures.

Figure 5-8 – Overbridges – Saxondale Bridleway viewed from the old A46 (left) and Slacks Lane footbridge viewed from Flintham Junction (right)



- 5.73 Visual screening in the form of close board fencing has been provided in various locations along the scheme in consultation with land owners on their property to provide immediate screening benefits. The provision of such visual screening was not specifically identified in the ES, although private mitigation arrangements were mentioned as a possibility, if warranted. An example of this is shown in Figure 5-9.

Figure 5-9 – Visual screen fencing on private land



- 5.74 Off site planting has been undertaken in consultation with adjacent landowners in various locations, including between the Moor Lane over-bridge and the attenuation pond to the north, at Elston Towers (currently operating as Eden Hall Day Spa) and near Henson Lane. The planting adjacent to Elston Towers, which comprises of open grassland, linear belts of shrub and tree planting and woodland edge planting, is shown in Figure 5-10. The establishment of the offsite planting plots will be considered further at FYA.

Figure 5-10 – Off site planting at Elston Towers



- 5.75 Examples of the visual impact of the scheme on various receptors are illustrated and discussed in Appendix F.
- 5.76 The photomontages included for the Public Inquiry have been recreated (as far as possible given accessibility and lack of clarity on locations), these are reproduced alongside the original photomontages in Appendix D.

Origin of Assessment	Summary of Effects on Landscape	Assessment
AST	Scheme would follow alignment of existing A46 along former Roman Road through a gently rolling and agricultural landscape for the majority of its route, retaining vegetation to the east where possible. Planting lost to the west would be replaced and hedgerows translocated where practicable. On the off line section, planting to reconnect severed hedgerows would be provided. The roundabouts at Stragglethorpe, Saxondale, Margidunum and Fardon would be lit. Lighting on the new roundabout at Lodge Lane and the existing A46 would also be provided. The mainline would not be lit. Significantly more vegetation would be provided by the Scheme than lost.	Slight adverse
EST	The components of the scheme with the most significant landscape impacts are the sections of the scheme on embankment as well as the new overbridges, all of which will remain dominant in the landscape at least until the new planting around them matures. Planting within the scheme has been implemented as set out in the ES/Environmental Masterplan. Screen planting is in place and should meet its targets by design year, subject to continued successful growth and ongoing maintenance.	As expected

Evaluation - Townscape

- 5.77 With regard to townscape, it is considered that the setting of the conservation area at East Stoke has benefitted from the removal of through traffic, which in turn has improved the local townscape character and visual amenity (Figure 5-11). The reduction in traffic volumes will also have facilitated ease of movement within and between local settlements and isolated properties. Use of the old A46 in East Stoke by a horse rider was noted during the site visit, which would have been very unlikely pre-scheme due to the high levels of traffic that this road previously carried.

Figure 5-11 – East Stoke, showing low traffic levels post-scheme



- 5.78 During the site visit, a drive through of Farndon was undertaken. Farndon was observed to have higher levels of traffic than East Stoke, which would be expected given the larger size of this town. Overall traffic levels on the former A46 are much reduced with the scheme. This should be revisited at FYA.
- 5.79 Overall, it is concluded that the AST score of a **slight beneficial** effect for townscape is apparent post-scheme in East Stoke.

Lighting

- 5.80 New lighting within the scheme has been implemented as expected. The site visit confirmed that, as stated in the ES, lighting has been provided at Saxondale, Stragglethorpe, Margidunum and Farndon junctions. The lighting at the Saxondale Junction is shown in Figure 5-2 (left). In addition, there is no lighting on the mainline, with sections of the former A46 now incorporated into the new dual carriageway having had lighting removed (as shown on Figure 5-5 and Figure 5-8 (right)). This has resulted in reduced lighting compared to the pre-scheme situation for receptors in some locations, with a likely increase in lighting affecting receptors located near to the new junctions. A night time evaluation of lighting has not been undertaken at OYA and could be considered at FYA.

Conclusion

- 5.81 Overall, based on the site visit and consultation responses received, it is considered at OYA that landscape, townscape and visual impacts are largely as expected. Landscape planting has been undertaken in accordance with the ES, and subject to effective aftercare, it is considered likely that the vegetation will continue to grow, providing increasing levels of visual screening and landscape integration as planting matures. At FYA, the visual and landscape evaluation should consider whether the mitigation planting is maturing and reducing impacts and integrating the scheme into the local landscape as predicted.

Origin of Assessment	Summary of Effects on Townscape	Assessment
AST	Scheme would improve the setting of the conservation areas at East Stoke and Farndon. Similarly, human interaction would be improved as a result of ease of movement within and between local settlements and isolated properties.	Slight beneficial
EST	The impacts described in the ES and AST are generally considered to be as expected, although the scheme did not include any streetscape works through the villages of Farndon/East Stoke. The route is now detrunked and the local authority has no plans to implement any changes.	As expected

Cultural heritage and archaeology

Forecast

AST

- 5.82 In relation to heritage, the 2009 AST stated that the scheme would cause changes to the setting of 20 listed buildings, nine locally listed buildings and four conservation areas, although reduced traffic on the existing A46 would benefit other heritage features. The AST also noted that the scheme would affect nine scheduled ancient monuments (SAMs), one English Heritage registered battlefield and a number of archaeological sites. The AST noted that a programme of detailed archaeological investigation and research, building recording and investigation of historic landscape features would be undertaken prior to construction.
- 5.83 The AST scored a **moderate adverse** effect for heritage.

Environmental Statement

Built environment

- 5.84 The greatest impact on built heritage resources was predicted in the ES as likely to occur along the northern off-line section of the scheme. Along this section, some new impacts were predicted to be introduced to previously unaffected heritage assets, in addition to the reduction of adverse impacts from heritage assets already affected by the old A46. The southern, mostly on-line section was predicted to increase impacts from the existing road on some historic buildings and their settings.
- 5.85 With regard to built heritage, the ES predicted that, after mitigation, residual effects on built heritage would comprise:
- A slight adverse effect on 27 properties, including The Grove, Elston Conservation Area and the Church of All Saints at Hawton.
 - A moderate adverse effect on four properties: Flintham Hall and Park, the West Lodge of Flintham Park, Flintham Conservation Area and Elston Towers.
 - A slight beneficial effect on 16 properties, including Syerston Hall, Elston Lodge and Farndon Conservation Area.
 - A moderate beneficial effect on the East Stoke Conservation Area.

Archaeology

- 5.86 The ES noted that the scheme would be diverted around and away from nationally important designated archaeological sites at Margidunum, Ad Pontem and the East Stoke Battlefield in order to avoid large adverse effects.
- 5.87 With regard to archaeology, the ES predicted the following residual effects on archaeological sites:
- A slight adverse effect on 13 sites, including Moot House Pit and an Early Medieval Tumulus, Palaeo-environmental deposits at Bingham Basin, Moor Lane and Hawton Lane and the SAM Hawton Redoubt.
 - A moderate adverse effect on 15 sites, including the Fosse Way historic road, the Neolithic and Bronze Age flint scatter at Saxondale roundabout and the English Civil War features at Farndon.
 - A slight beneficial effect on three sites, namely offline sections of the Fosse Way and the scheduled Roman towns of Ad Pontem and Margidunum.
 - An uncertain effect on Owthorpe Early Medieval Cemetery.
- 5.88 The ES committed to a detailed programme of archaeological works, which were to be carried out in advance of the main construction phase. These works would provide a permanent record of the archaeological features uncovered by the scheme. The ES stated that archaeological mitigation would be used to minimise the effects of scheme construction and operation.

- 5.89 The ES indicated that measures to achieve preservation in situ of archaeological deposits would be adopted, where appropriate. The results of such measures were expected to add significantly to regional and national archaeological research archives, particularly in relation to Late Upper Palaeolithic artefact studies and later prehistoric site types and distributions. The results of the analyses of the archaeological finds were to be made available to a wide audience and were expected to potentially contribute to local historic environment education projects.

Historic landscape

- 5.90 The ES stated that the scheme would avoid severe impacts on the most sensitive historic landscape character areas. This was partially achieved through the objective of limiting effects on associated heritage resources, such as important listed buildings and SAMs.
- 5.91 With regard to historic landscape, the ES predicted that, following mitigation, there would be a slight adverse effect on nine areas, including East Stoke SAM and Battlefield, Hawton and Flintham. A slight beneficial effect was predicted for the Farndon Conservation Area associated with removal of traffic from the existing A46 to the new A46, which is located further from this conservation area.
- 5.92 The ES suggested that the use of appropriate tree and new hedgerow planting and earthworks within the landscaping design would minimise the visual impact of new structures and integrate the scheme with the surrounding landscape, minimising the adverse impacts of the scheme on the historic landscape.
- 5.93 Archaeological recording was proposed for key historic landscape features that would be affected by the scheme, which would provide permanent records of the features and contribute to the regional historic landscape research archive.
- 5.94 The ES concluded that overall, taking into account the proposed mitigation and residual effects, the scheme would have a moderate adverse effect on the area's cultural heritage and archaeological resources. The ES further concluded, however, that the scheme would also have a slight beneficial effect on the immediate setting of the SAM at Margidunum and Ad Pontem, and also on parts of the Fosse Way where detrunking of the existing A46 would provide future opportunity for restoration or enhancement of historic character. It is not known at OYA whether any restoration or enhancement has been undertaken. This should be considered at FYA.

Consultation

- 5.95 Response on heritage impacts received from Cropwell Bishop Parish Council stated '*Grantham canal bridge at Stragglethorpe should have been built within the scheme works. Failure by HA and Contractor to provide this bridge was a big disappointment*'. It is apparent that this relates to the bridge over the canal at Stragglethorpe Road that was requested by some stakeholders, but not agreed to be provided by the HA at the design stage and not included in the ES.

Evaluation

Built environment

- 5.96 As part of the OYA site visit, only some of the listed heritage items identified in the ES were able to be visited due to time constraints and access restrictions. One location that was visited was the Church of All Saints at Hawton. Photos of the scheme taken from this site, and photos to the church (Figure 5-12) from the scheme suggest that impacts on this heritage feature are minimal, as the scheme is barely visible from the cemetery attached to the church, and may have been overstated in the ES.

Figure 5-12 – Heritage impact on Church of All Saints, Hawton. Right - view from cemetery (scheme is in background in front of chimney stacks in the centre of photo), Left – view of church (church just visible in the background in the centre left of the photo)



- 5.97 It was not possible to gain access to other affected sites of built heritage value; however, views of the listed Elston Towers across the scheme from the eastern side (refer Figure 5-13) show that mitigation planting is not yet mature enough to screen this listed building from the scheme. As such, the moderate adverse effect on this building predicted in the ES is likely to be accurate in relation to effects on the setting of the heritage listed building.

Figure 5-13 – View of Elston Towers, across the scheme from near the Lodge Lane overbridge



- 5.98 With regard to the comment on the Grantham Canal bridge received from Cropwell Bishop Parish Council, it is understood that there was no agreement from the HA to provide a bridge over the canal in this location at any stage of the project.

Archaeology

- 5.99 Extensive archaeological works were undertaken to mitigate the effects of construction. The bulk of the fieldwork was carried out between March and November 2009, although a number of watching briefs were stated as being on-going during construction in the draft Archaeological Assessment Report in May 2011. No update on the May 2011 report has been provided to POPE.
- 5.100 According to the draft Archaeological Assessment Report, the archaeological works yielded a substantial body of recorded archaeological site data and material remains (both artefactual

and environmental), ranging in date from the Late Upper Palaeolithic period to the post-medieval period.

- 5.101 The Archaeological Assessment Report states that it is intended that the entire Scheme archive, including project records and records generated through the assessment and analysis process (i.e. research), be retained together, ultimately to be deposited with Newark Museum. This report also identifies that a project digital archive will be made freely available and accessible online. Whether this has been undertaken should be verified at FYA.
- 5.102 The results of the archaeological works will be published, including summarised results from the internationally important LUP remains at Farndon Fields in the form of a more specialised focused period-specific journal (such as Proceedings of the Prehistoric Society). The undertaking of this should also be verified at FYA.

Historic landscape

- 5.103 It was not possible to visit all of the identified affected historic landscapes during the site visit due to time and access constraints. Although, as discussed above, the impact of the scheme on the Hawton area is judged, based on the site visit, to be minimal.
- 5.104 The view of the scheme from the vicinity of the East Stoke Battlefield SAM area is shown in Figure 5-14. The ES identified a slight adverse effect on this site. It is considered that the effect of the scheme on this site at OYA is minimal from the far side of the site, as the scheme is barely visible. However, the impact is likely to be slightly greater from the scheme side of the site and overall the slight adverse effect concluded in the ES is considered a fair assessment.

Figure 5-14 – View of the scheme from the vicinity of the East Stoke Battlefield SAM towards Butt Lane overbridge (just seen in the background centre left of the photo)



- 5.105 Mitigation for historic landscape impacts related primarily to the scheme design by avoiding the most sensitive sites. Other mitigation related to the landscape planting, which has been undertaken largely as specified. The third type of mitigation related to recording and reporting of earthworks and industrial heritage. The former have been covered in considerable detail in the Archaeology Assessment Report referred to in the above section. It is unknown whether any archaeological survey and photographing of industrial heritage was undertaken, as specified in the ES.

Conclusion

- 5.106 The impacts on the built heritage items visited appear similar those predicted in the ES/AST; however, it should be noted that this is based on an objective assessment. However, as it was not possible to fully evaluate with regard to all affected built heritage aspects at OYA, these should be revisited at FYA.
- 5.107 The archaeological works undertaken to date for the scheme, as reported in the draft Archaeological Report (May 2011) have yielded a substantial body of recorded archaeological site data and material remains ranging in date from the Late Upper Palaeolithic period to the

post-medieval period. The proposed archive and reporting out of the archaeological work should be verified at FYA.

- 5.108 The ES stated that sensitive landscape design would be used to mitigate the effects of the scheme on the historic landscape, where possible. Based on the site visit and as built drawings, the landscape design has been implemented largely as set out in the ES; however, the planting has not reached maturity. As such, it is predicted that the adverse impacts on historic landscape features identified above are as predicted.

Origin of Assessment	Summary of Effects on Heritage	Assessment
AST	Scheme causes changes to the setting of 20 listed buildings, 9 locally listed buildings and 4 conservation areas although reduced traffic on existing A46 would benefit other heritage features. Scheme will affect 9 SAMs, 1 English Heritage registered battlefield and a number of archaeological sites. A programme of detailed archaeological investigation and research, building recording and investigation of historic landscape features would be undertaken prior to construction.	Moderate adverse
EST	Reporting on archaeological investigation is ongoing. Impacts appear largely as described in the AST/ES.	As expected

Biodiversity

Forecast

AST

- 5.109 The 2009 AST stated that the scheme would have a direct impact on 10 sites of importance for nature conservation (SINCs) and result in the loss of one field pond supporting Great Crested Newts (GCNs). Some mature trees, woodland, hedgerows and ditch habitats would be lost, which would affect birds, invertebrates and mammals (including bats and badgers). The AST also noted that there would be a significant amount of habitat created by the scheme providing a net increase in trees, woodland, hedgerows and scrub, as well as providing ecology ponds and ditches.
- 5.110 The AST scored a **moderate adverse** effect for biodiversity.

Environmental Statement

- 5.111 According to the ES the ecology and biodiversity impacts were considered to be of low significance in terms of nature conservation. In addition, the ES states that with the provision of mitigation, the overall impact of the Scheme (15 years after construction) would be slight adverse, with this residual effect due to the loss of mature trees during construction.
- 5.112 The identified ecological impacts of the scheme and the proposed mitigation are detailed in Appendix G.

Consultation

- 5.113 Response on biodiversity impacts received from Cropwell Bishop Parish Council indicated that they had no particular comments or observations with regard to this topic. This response also stated that it is likely to take five years to stabilise.

Evaluation

- 5.114 The impacts of the scheme on biodiversity are evaluated in Appendix G. The key issues are summarised below.

Habitat / vegetation removal

- 5.115 Removal of vegetation / habitat was identified as an impact in multiple locations across the scheme and appropriate mitigation proposed (as discussed in detail in Appendix G). Based on

as built plans planting of new vegetation and habitats would appear to have been undertaken in line with the ecological mitigation detailed in the ES. Areas viewed during the OYA site visit appeared to have predominantly successfully established, however, their value as habitat is limited at this early stage. The success of habitat establishment should be reviewed at FYA.

Hedgerows

- 5.116 Translocated hedgerows were only found in the vicinity of the Moor Lane surface water balancing area, along the western edge of the grassy/marshy area provided to the west of the mainline. The translocated hedgerow in this location appears to have established successfully. This site should be revisited at FYA to confirm continued growth and establishment of this hedgerow. Another translocated hedgerow is located opposite Elston Towers (across Moor Lane), but as this was not known at the time of the site visit, the successful translocation and establishment of this hedgerow, or otherwise, was not verified. This should be revisited at FYA.

Badger

- 5.117 Based on the as built drawings and the site visit, permanent badger fencing (with buried mesh and mesh on lower part of fence) has been installed in numerous locations across the scheme, in association with badger tunnel locations. Badger fencing on the east side of the scheme south of Syerston overbridge is shown in Figure 5-15.

Figure 5-15 –Example of badger fencing south of Syerston overbridge



- 5.118 A Badger Activity Summary Report was prepared in 2012 covering badger activity between 2009 and 2012. This report was prepared as part of commitments made relating to mitigation measures to protect and / or enhance nature conservation value as part of the ES. These included pre, during and post construction surveys to assess the efficacy of badger tunnels and fencing. As the tunnels and fencing were not completed until the end of construction, the 2012 report does not assess their effectiveness post construction.
- 5.119 Badgers will need to learn the new safe passage places across the road, and it may take time for routes to be established. The detailed Badger Mitigation Strategy 2010 recommended enticing badgers to the new tunnels using bait, which may help to establish the new routes. The Badger Activity Summary Report proposed that this would form part of the essential mitigation and should be undertaken once fencing and tunnels were complete. It is not known at OYA whether this has been undertaken.
- 5.120 Badger fencing appeared to be intact at OYA. No badger tunnels were viewed during the site visit, as at that time their locations were unknown. It is understood that post construction monitoring is underway and the result of this should be made available for the FYA evaluation report.

Bats

- 5.121 Mitigation for bat roost potential was provided in multiple locations within retained vegetation across the scheme, as shown on the as built drawings. In addition, in various locations (as set

out in the HEMP, Table 2), standing deadwood and log piles have also been provided. Bat roosts have been provided in the new Grantham Canal under bridge as confirmed during the site visit (see Appendix G).

Amphibians

- 5.122 A total of 13 wildlife ponds with surrounding grassland/ scrub habitat have been provided (in addition to balancing ponds). No reference to amphibian hibernacula was found in the HEMP or Environmental Masterplan as built drawings.
- 5.123 European Protected Species licences were granted to allow works affecting GCN to proceed. The granting of some of these licences was tied to conditional mitigation measures and monitoring to be approved by Natural England. No response was received from Natural England with regard to protected species licences, but ongoing monitoring of GCN is specified in the HEMP at Roehoe (ponds NP1, 2 and 3) as being undertaken up to 2014.
- 5.124 Other mitigation relating to GCN included relocation, which was undertaken using pitfall trapping under licence in Spring 2011. Monitoring of GCN in relation to this is specified in the HEMP as ongoing.
- 5.125 The outcomes of all GCN monitoring should be reviewed at FYA. Other ongoing management activities for GCN comprise annual grass cutting in Autumn for habitat maintenance.

Ponds and water courses

- 5.126 Provision of ponds and watercourses includes 13 wildlife ponds, 14 balancing ponds, five ecology ditches. An existing pond (Pond 11), which was removed to enable the scheme to be constructed was replaced by three of the 13 new wildlife ponds early in the scheme construction (in 2009) as mentioned under GCN above.

Brown hare

- 5.127 Provision of new habitat as part of the scheme is potentially of relevance to this species. No further mitigation was proposed.

Breeding birds

- 5.128 Increased habitat has been provided, but the new vegetation is mostly not sufficiently mature to provide nesting sites at OYA. Bird boxes are indicated on as built drawings as having been provided at Kinoulton Shelter Belt.

Barn owl

- 5.129 Provision of new habitat as part of the scheme is potentially of relevance to this species. No further mitigation was proposed.

Reptiles

- 5.130 Post-construction mitigation associated with general provision of balancing ponds, rough grassland and hedges is indicated as present on as built drawings. Over-deepening of some balancing ponds is also indicated on as built drawings. Reptile hibernacula is indicated as having been provided associated with one balancing pond, located adjacent to the Grantham Canal underbridge.

Macroinvertebrates (terrestrial and aquatic)

- 5.131 As part of mitigation for bats, standing deadwood and log piles have been provided (as set out in Table 2 of the HEMP). In addition to providing mitigation for bats, these features also offer habitat for terrestrial macroinvertebrates.
- 5.132 Aquatic macroinvertebrate mitigation has been provided in the form of 13 wildlife ponds, five ecology ditches and grassland and wetland habitat at the Moor Lane surface water balancing area.

Summary

- 5.133 The mitigation has been largely provided as specified in the ES. The mitigation viewed during the site visit appeared to be in place and in good working order. Based on this, it is likely that the impacts of the scheme on biodiversity are as expected in the ES and AST, however, further survey and monitoring information would be required to confirm this and biodiversity should be reconsidered at FYA. The scheme HEMP provides a detailed outline of the post-scheme opening monitoring to be undertaken including location, timing and duration. Monitoring to be undertaken includes bats, great-crested newts, badger, grizzled skipper butterfly translocated woodland, retained trees, ecology ponds, and new ecology/ habitat planting areas.

Origin of Assessment	Summary of Effects on Biodiversity	Assessment
AST	Scheme would have a direct impact on 10 SINCs and result in the loss of one field pond supporting Great Crested Newts. Some mature trees, woodland, hedgerows and ditch habitats would be lost, which would affect birds, invertebrates and mammals (including bats and badger). There would be a significant amount of habitat created by the Scheme providing a net increase of trees, woodland, hedgerows and scrub as well as provide ecology ponds and ditches.	Moderate adverse
EST	New habitats, including woodland, hedgerow and grassland have been created as part of the works and have been planted in accordance with the Environmental Masterplan. These will in time increase the biodiversity value of the corridor, as will the habitat created via construction of ponds and ditches for ecology mitigation and provision of ecological mitigation features as part of attenuation ponds and landscape planting. Mitigation has been created for species including breeding birds, bats, great-crested newts, reptiles and badgers. The effectiveness of these measures has yet to be reported on at this stage.	As expected

Water quality and drainage

Forecast

AST

- 5.134 The AST stated that the scheme would maintain the existing storage capacity for the rivers Trent and Devon. The AST also stated that the water quality in receiving ditches and streams along the existing A46 would be slightly improved with the scheme as a result of better drainage design. Minor aquifers used for agricultural supply were noted as not being affected by the scheme.
- 5.135 The AST scored a **neutral** effect for water.

Environmental Statement

- 5.136 A number of potential effects associated with the scheme on surface water and groundwater resources were identified in terms of flows and water quality. The magnitude of potential effects were to be reduced or removed through the implementation of mitigation measures incorporated into the scheme design, as well as actions that were to be undertaken during the construction phase. The identified residual effects were deemed to be mostly of slight or neutral significance.
- 5.137 The ES identified that the design of the scheme included measures to compensate for the loss of flood storage space on the floodplain of the rivers Trent and Devon, as well as provisions for managing surface water flows through the use of culverts. The provision of these features was predicted to result in an overall negligible effect on flood depth and a relatively minor impact on flood duration in agricultural areas.
- 5.138 With regard to routine surface water discharges, scheme runoff was to be generally collected and transferred to attenuation ponds, where collected water was to be discharged to existing

watercourses at a controlled rate. For catchments within the floodplains of the rivers Devon and Trent, road drainage was proposed to be collected by the highway drainage system and directed to discharge points without passage through attenuation features. Oil interceptors were to be provided at the scheme junctions, as well as in areas of particular sensitivity. The assessment in the ES indicated that the routine operation of the proposed drainage system was expected to have, at worst, a minor effect on water quality in receiving ditches and watercourses. Given the defined medium sensitivity of these receiving watercourses, the effects were considered overall to be neutral.

- 5.139 In addition to the above, the ES stated that given that the existing drainage system would not be altered as part of the scheme and that traffic flows along the old A46 would be significantly reduced, pollutant loads to watercourses that were receiving road drainage from the existing A46 at the time of assessment, without attenuation or treatment, would be reduced. This was predicted to result in a localised benefit to water quality in the watercourses / ditches affected at the time of the ES assessment. In addition, it was considered that the scheme would improve road safety, thus reducing environmental risks associated with spillages resulting from road collisions.
- 5.140 Mitigation measures in the scheme design are set out in the ES, including:
- Attenuation ponds to limit peak discharge rates.
 - The scheme was designed to sit above the 1-in-100 year flood levels, and flood-relief culverts were to be provided beneath the highway in order to ensure connection of floodwaters.
 - Two floodplain compensation areas were proposed to ensure that there would be no net loss of land available for flooding.
 - Oil interceptors were to be provided upstream of attenuation ponds receiving drainage from major junctions (i.e. Stragglethorpe, Saxondale and Margidunum) and at Flintham to reduce the risk of pollution by petrol and oils.
 - Best practice (in terms of spillage risk and pollution control) was to be adopted to minimise the number of proposed discharges.
 - The proposed drainage solutions were designed to minimise interference with the existing drainage patterns, sustainable drainage solutions were used where appropriate.
 - Highway drainage was to be designed to avoid transfer of water from one catchment to another irrespective of vertical alignment, except where unavoidable.
 - With the exception of some stretches of existing roadside ditches, there was to generally be no diversion of surface watercourses to accommodate the new road.
 - Where the road would interrupt surface watercourses, culverts were to be provided to maintain flows.

Consultation

- 5.141 Response on water quality and drainage impacts received from Cropwell Bishop Parish Council indicated that it considers that impacts are '*far worse than expected*'. The Parish Council reported that drainage on the scheme has been 'a disaster', with excessive land take for balancing ponds. Further, they noted that the drainage ponds tend to be either full all of the time or empty all of the time. Cropwell Bishop Parish Council also indicated that traffic was disrupted for one year after opening for reconstruction of drainage runs, and that Severn Trent installed deep tunnelled drainage under Cropwell Road to take water away from Cropwell Butler underpass after flooding in Cropwell Butler.
- 5.142 The Environment Agency indicated that with regard to scheme drainage, pollution control measures and flow attenuation measures, the scheme has performed much worse than expected. EA indicated that consultation with them on this scheme effectively ceased in 2007, prior to detailed design and that much has occurred with regard to the scheme since this time that they were not invited to comment on. EA responded that flooding incidents in 2012 in the area may be related to the scheme and that they are aware of ongoing drainage issues that remain outstanding. Minimal consultation has been undertaken with EA with regard to these ongoing issues.

- 5.143 In addition to the above, the consultation response received from East Bridgford Parish Council mentioned ‘*difficult drainage at Margidunum*’ and queried whether this had been resolved.

Evaluation

- 5.144 The ES specified that highway drainage from the scheme would generally consist of surface water channels on embankments and combinations of kerbs, gullies, surface water channels, combined kerbs and drainage blocks, with combined surface water and groundwater filter drains in cuttings. The scheme would also include a surface water storage area north-west of the Moor Lane over-bridge.
- 5.145 The drainage and water quality mitigation features built as part of the scheme are shown on the as built drawings. It appears from these drawings and from the drainage and water features noted during the OYA site visit, that the scheme has included the drainage and water mitigation features identified in the ES.
- 5.146 Surface water attenuation features include 14 surface water attenuation ponds along the scheme and one surface water runoff storage area north of the Moor Lane over-bridge (Figure 5-16), comprising ridge and furrow marsh / grassland / pasture. Culverts to maintain surface water flow have also been provided.
- 5.147 Flood mitigation provided as part of the scheme comprises two flood relief culverts located south of Hawton Lane overbridge and two flood compensation areas, one west of the mainline, east of the existing A46 (Figure 5-17) and another located further away from the scheme to the east, south of the River Devon, south-east of Farndon roundabout.
- 5.148 Oil separators were specified in the ES to be located upstream of ponds at the major junctions. Oil separators have been provided as part of the attenuation ponds (ponds 5, 7, 10 and 12) which are located close to these major junctions.

Figure 5-16 – Water management area north of Moor Lane overbridge



Figure 5-17 – Flood compensation area south of Hawton Lane overbridge with the scheme in the background



- 5.149 As described above, a total of 14 attenuation ponds have been constructed as part of the scheme, plus a surface runoff storage area. Access to these generally appears to have been provided via the local road network. The attenuation ponds are spread along the length of the scheme, and in time, are expected to blend in with their surrounds. The fencing used around the ponds is wooden post and rail type, which fits the agricultural nature of the prevailing landscape within which these features have been built. The 14 attenuation ponds are wet ponds, and several are described in the as built drawings as being subject to over-deepening for amenity / ecological purposes. An additional surface water runoff storage area has been constructed to the north of the Moor Lane overbridge, this is a dry feature comprising ridge and furrow marsh / grassland / pasture.
- 5.150 Mitigation measures have been implemented and based on the site visit no obvious issues with drainage were apparent. However, consultation responses received from Cropwell Bishop Parish Council and the Environment Agency indicates that this may not be the case, with issues with drainage and potentially flooding raised. No direct link with the scheme has been verified, although independent investigations are provisionally planned and any results will be included in the FYA report on this scheme.

Origin of Assessment	Summary of Effects on Water Environment	Assessment
AST	Existing floodplain storage capacity for the Rivers Trent and Devon would be maintained by Scheme. The water quality of receiving ditches, and streams along the existing A46 would be slightly improved with the Scheme due to better drainage design. Minor aquifers used for agricultural supply would not be affected by the Scheme.	Neutral
EST	No issues with drainage were noted during the site visit; however, several consultation responses raised scheme drainage as an issue and suggested that inadequate drainage was responsible for flooding in 2012. This has not been visually verified.	Potentially worse than expected (reported as much worse than expected by the Environment Agency and others)

Physical fitness

Forecast

AST

- 5.151 The 2009 AST noted that it was unlikely that the scheme would change existing pedestrian travel in terms of journeys greater than 30 minutes. It also noted a potential for new leisure journeys between villages as a result of the provision of bridged crossing points and the creation of new off-road cycleways.
- 5.152 The AST scored a **neutral** effect for physical fitness.

Environmental Statement

- 5.153 The ES stated that the operation of the scheme would sever several local footpaths; however, it also noted that the scheme design would retain the existing footpath network through the provision of safe crossing points over the A46 via over-bridges and footpath diversions. As part of the scheme, two low use footpaths were to be permanently closed. The ES found that the scheme would create an improved amenity for east-west movements by non-motorised users (NMU) and concluded that as the majority of the existing routes were used for leisure and recreational purposes, the diversions would contribute to a safer improved public rights of way (PROW) network.

- 5.154 The ES stated that a major beneficial effect of the scheme would be the downgrading of the existing sections of the A46 at Kinoulton, Owthorpe to Cotgrave, Cropwell Butler to Stragglethorpe, Hardigate Road to Car Colston and Longhedge Lane to Farndon. The A46 in these locations would provide access to existing properties as well as becoming an extension of the pedestrian, equestrian and cycle network within the scheme corridor. The treatment to be applied to the downgraded sections was to be subject to detailed design and agreement with NCC.
- 5.155 It was considered that the scheme would have a major beneficial effect for recreational users through the provision of increased amenity and safe crossing points across the A46. The ES also concluded that the scheme would substantially reduce community severance in East Stoke and Farndon, improving safety for pedestrians and cyclists. Severance was also anticipated to be reduced in Bingham, Saxondale and Flintham.

Consultation

- 5.156 Response on physical fitness received from Cropwell Bishop Parish Council indicated that impacts on physical fitness are '*as expected from poor HA design provision*' and noted that it is not easy for cyclists or walkers to cross over the two roundabouts at Stragglethorpe.
- 5.157 Further comment from the Parish Council indicated that a footpath/cycleway link is required from the A46 to Cropwell Bishop alongside Nottingham Road, although they do note that this is a County Council responsibility. Further comment related to footpaths CBP-13 and CBP-14 being cut during construction and that reinstatement of these, as at November 2013, was not yet complete, although county council staff '*are working on them*'.
- 5.158 The Canal and Rivers Trust raised an issue relating specifically to conflict between walkers and equestrians on the Grantham Canal towpath associated with problems in the segregation of bridleway and towpath.
- 5.159 A consultation response received from NCC's Countryside Access Team noted that footpath FP2 (marked on ES plans as footpath O-2) through Herrywell Wood "has not been implemented on the ground by the contractor". Problems with farmers cultivating field edge paths from diverted footpaths were also noted.

Evaluation

- 5.160 With regard to specific impacts identified in consultation responses above, during construction, footpath CBP-13 was to be stopped up with a new diversion being provided that was to connect to Colston Gate and CBP-14 was to be stopped up and diverted during the works in order to connect with Colston Gate east of the earthworks. Following completion of construction, footpath CBP-14 was to be diverted to Colston Gate (380m) from where access to Cotgrave Overbridge and footpath CBP-13 430m via a diversion adjacent to the A46, would be available. These footpaths were not visited during the site visit, however the HA project manager for this scheme has confirmed that these diversions are now complete (April 2014).
- 5.161 With regard to the diversion of footpath O-2 at Owthorpe, the HA confirmed in August 2014 that this has yet to be resolved and remains incomplete, as indicated in feedback received from NCC Countryside Access Team (refer above).
- 5.162 Off-line dualling has reduced traffic levels and improved access along the old A46. The ES indicated that the speed limits on the de-trunked sections of the A46 would be reduced, it appeared during the site visit that the speed limits have not yet been changed, as signage had not been amended. During the site visit, use of the old A46 in East Stoke by a horse rider, was noted. Some sections of the old A46 have also been converted to cycleway / bridleway / footpath as specified in the ES.
- 5.163 In addition, new NMU over-bridges have improved access between the east and west side of the A46, for example Slacks Lane footbridge and Saxondale bridleway over-bridge (shown in Figure 5-8). The approaches to these over-bridges are zig-zag format, allowing easy approach. The structures appear well maintained and include high friction surfacing (Figure 5-18) for equestrian users.

Figure 5-18 – Looking across Slacks Lane footbridge, showing high friction surfacing



5.164 As part of the scheme, signalised pedestrian crossing points were to be provided on the A6097 near Newton and on the A52 link road near Bingham. The new pedestrian crossing near Bingham is shown in Figure 5-19.

Figure 5-19 – New signalised pedestrian crossing on the A52 link road near Bingham



5.165 The Grantham Canal PRow passes beneath and partially alongside the scheme. This PRow was observed (during the site visit in October 2013) to be fairly well used and well maintained. The point where this PRow passes across the scheme via a new underbridge is shown in Figure 5-20.

Figure 5-20 – Looking north-east towards Grantham Canal underbridge and PRow



5.166 In general, PRow, bridleway and other NMU provision appeared to be clearly signposted, well maintained and clean and free of litter. An example of the NMU signage provided is shown in Figure 5-21. There is no NMU post opening audit report which would provide information relating to NMU usage and POPE has not undertaken any specific NMU surveys.

Figure 5-21 – NMU signposting near Slacks Lane footbridge



5.167 It is concluded that the scheme has largely had a neutral impact on overall physical fitness, as expected, with regard to impacts / issues that were HA responsibilities.

Origin of Assessment	Summary of Effects on Physical Fitness	Assessment
AST	Unlikely that the Scheme would change the existing pedestrians travel in terms of journeys greater than 30 min. There is however, a potential for new leisure journeys between villages with the provision of bridged crossing points and the creation of new off-road cycle ways.	Neutral
EST	The impacts described in the ES and AST are generally considered to be as expected.	As expected

Journey ambience

5.168 The journey ambience sub-objective considers traveller care (facilities and information), traveller views and traveller stress (frustration, fear of potential collisions and route uncertainty).

Forecast

AST

5.169 The 2009 AST stated reduced driver stress, enhanced highway design and carrying capacity, separation of NMU facilities and uninterrupted travel along the new A46 would provide improved journey ambience.

5.170 The AST scored a **large beneficial** effect for journey ambience.

Environmental Statement

5.171 The ES stated that traveller's views from the existing A46 were contained by existing roadside vegetation along the majority of its length, except in East Stoke and Farndon, where buildings screened views. Where views were afforded, these were a result of undulating topography. The ES stated that the existing route was considered to result in high levels of driver stress due to its sub-standard nature. Traveller care was not considered in the ES.

- 5.172 The ES concluded that during operation, the overall effect of the scheme on travellers' views would be neutral (compared to the pre-scheme situation) given that views would generally remain restricted. The ES also concluded that scheme operation would have a beneficial effect on driver stress due to the increased carrying capacity of the carriageway, provision of lay-bys, enhanced highway design, safer driving conditions and the separation of NMU facilities from motorists, which was expected to result in a reduced number of vehicle/NMU movements crossing the roads. Overall, the ES concluded that driver stress on the new A46 would be low due to reduced frustration, fear of potential collisions and route uncertainty.

Consultation

- 5.173 Response on journey ambience received from Cropwell Bishop Parish Council indicated that impacts are *'as expected'*. The Parish Council note that travelling on the new A46 is *'relaxing'* and that the central concrete barriers give a feeling of security to the driver. They also note, however, that the southbound turn off for Stragglethorpe has a *'surprisingly short run off after the countdown warnings'* and the Saxondale roundabout is not *'comfortable'* to use, as the A52 westbound exit from the second roundabout is a very tight turn. In addition, the Parish Council report that it is not easy to enter the roundabout from the northbound A46 slip road because of the speed of the traffic on the roundabout.
- 5.174 With regard to journey times and destinations, Cropwell Bishop Parish Council responded that *'journey time from Cropwell Bishop to Newark has been reduced by 8 or 9 minutes, making it an attractive route to the A1 and the North (as an alternative to the A6097 and A614). The reduced journey times to Newark and to Leicester have encouraged local residents to use these centres more, rather than Nottingham, which is no easier to get to than it was pre A46 improvement.'* They also noted that *'the A46 with its fast traffic merging manoeuvres and many roundabouts is not attractive for local journeys to Bingham'* and that *'many residents prefer the route via Tythby'*.
- 5.175 With regard to signage, Cropwell Bishop Parish Council responded that *'it was a difficult challenge to have helpful signs located in the right place when the scheme itself has many complicated junctions each spread over a large area of land. Liaison with the County Council during scheme construction helped with installation of local village signs and HGV restriction signs where necessary'*.
- 5.176 With regard to safety, Cropwell Bishop Parish Council indicated that they *'hoped that there have been fewer serious injury accidents'*, but queried whether *'the layout of certain junctions causing driver confusion'* could have increased the number of minor collisions. Here they do not give the opinion that they believe this to be the case, but state that they await the release of accident statistics to see whether this has occurred.
- 5.177 A limited consultation response has been received from East Bridgford Parish Council covering traffic in East Bridgford. This indicated some perceived safety issues with use of the scheme and a general comment that the connection to Newark has been improved. The safety issues related to the new junction of Butt Lane with old A46 being perceived as hard to see at night with poor road markings. The response indicated a desire for the provision of give way signs on Butt Lane as well as a *'finger sign'* to East Bridgford as it is *'very easy to miss the turn off to the old A46'*.

Evaluation

- 5.178 Lay-bys are located along the route; both north and southbound, providing a good separation from the main trunk road as shown in Figure 5-22. This separation allows for safe access to and from the road. At the time of the OYA site visit, all lay-bys along the scheme appeared to be in use, generally tidy with little visible litter.

Figure 5-22 – Southbound lay-by north of Moor Lane over bridge



- 5.179 The safety issues raised by East Bridgford Parish Council appear to relate partially to traffic in East Bridgford and on the old A46, which would now be a County Council responsibility. The safety chapter shows that collisions on the scheme, compared to the A46 pre-scheme, have reduced significantly.
- 5.180 Table 5–3 summarises the evaluation of the various elements of journey ambience and the scheme's impact on this sub-objective.

Table 5–3 – Summary of journey ambience evaluation

Sub-objective	AST score	OYA evaluation
Views	Neutral	Views to the open countryside are largely limited by topography and landscape bunding, as expected. Some views to the open landscape are available along flatter sections of the route.
Stress	Large beneficial	On the new A46, the traffic is free flowing with no congestion, which will have reduced driver frustration. Clear signage is provided (as confirmed by Cropwell Bishop Parish Council), reducing route uncertainty, although one consultation response indicated more signage would be beneficial at the turn off to East Bridgford. Conflicts with NMUs have been removed through the provision of dedicated shared and NMU-specific crossing points (e.g. over-bridges). Overall, driver stress appears to have benefited as a result of the scheme, as expected. Consultation responses and opinions received during the site visit indicate that the driver experience and journey time along the scheme are much improved compared to pre-scheme.
Care	Large beneficial	The route has numerous laybys, which have been designed for ease of access to and from the A46. Offsite care facilities are available at junctions along the route and appear to be adequately signposted on the A46.

Origin of Assessment	Summary of Effects on Journey Ambience	Assessment
AST	Reduced driver stress, enhanced highway design and carrying capacity, separation of NMU facilities and uninterrupted travel along the new A46 would provide improved journey ambience.	Large beneficial
EST	Journey ambience has been improved as expected in the ES, with reduced driver stress associated with improved conditions and reduced congestion and conflict with NMU. The large beneficial impact predicted in the ES is apparent.	As expected

Key Points – Environment

Noise

- Low noise surface has been provided along the entire scheme length, no other noise mitigation measures were identified in the ES/AST. One property is identified in the HEMP (Nov 2013) as qualifying for noise mitigation treatment, with compensation now agreed (possibility also noted in the ES addendum). Based on the traffic survey results, noise levels in the vicinity of the scheme are as expected.

Local air quality

- No issues with air quality were raised in any consultation response received. Based on the traffic survey results, air quality in the vicinity of the scheme is considered to be as expected with the scheme.

Greenhouse gases

- A 41% net increase in carbon emissions for traffic on the A46 has been observed on the scheme section, lower than the re-forecast 69% increase. The observed net increase in emissions is lower than the reforecast increase due to the observed pre scheme traffic flows being below the DM forecast, and the overall increase in traffic and speeds using the route were not as high as expected.

Landscape

- Overall, landscape impacts are considered to be slight adverse as expected. Landscape earthworks have been provided around junctions as specified, for example at Saxondale Junction. Mitigation planting has been largely implemented as set out in the ES. It is too soon to evaluate the success of new landscape planting in terms of its effectiveness in visual screening and integrating the scheme into the local landscape, which should be considered further at FYA.

Townscape

- The setting of the conservation area at East Stoke has benefitted from the removal of through traffic, which in turn has improved the local townscape character and visual amenity. Reduced traffic volumes has facilitated ease of movement within and between local settlements and isolated properties.

Biodiversity

- New habitats, including woodland, hedgerow, grassland and ditches and ponds have been created as part of the works in accordance with the mitigation proposals in the ES. These will in time increase the biodiversity value of the corridor. Specific mitigation has been created for breeding birds, bats, great-crested newts, reptiles and badgers, while habitat creation is also expected to benefit other identified species in the longer term. The effectiveness of these measures cannot be fully evaluated at OYA and should be reconsidered at FYA when it is expected that ongoing scheme monitoring information would be available.

Heritage

- It was not possible to fully evaluate the impacts on built heritage and historic landscape at OYA and these should be considered further at FYA, Impacts on heritage sites that were visited were found to be largely as described.
- The archaeological works undertaken to date for the scheme, as reported in the draft Archaeological Report (May 2011) have yielded a substantial body of recorded archaeological site data and material remains ranging in date from the Late Upper Palaeolithic period to the post-medieval period. The impacts on heritage items visited are largely similar, or less than, those predicted in the ES/AST.

Key Points – Environment cont.

Heritage (cont)

- It is reported that the entire Scheme findings will be archived at Newark Museum as well as digitally archived, which will be made freely available and accessible online. The archaeological results will also be published and disseminated as a hardback Cotswold Wessex Archaeology (CWA) monograph. Additionally, a publication of summarised results from the internationally important LUP remains at Farndon Fields will also be presented through a more specialised focused period-specific journal. The undertaking of the above should be verified at FYA.

Water

- The scheme includes the provision of 14 attenuation ponds and a surface water balancing area near Moor Lane. These appeared during the site visit to be functioning as expected, and no visible issues with drainage were noted at the time. However, several consultation responses raised scheme drainage as an issue and suggested that inadequate drainage was responsible for flooding in 2012. This has not been verified although investigations are planned therefore should be reconsidered at FYA in order to ascertain any drainage problems or flooding issues resulting from the scheme.

Physical Fitness

- No post opening survey information is available to confirm NMU usage. NMU provision has been incorporated into the scheme and downgrading of sections of the old A46 has improved access although lower speed limits may not yet be in place. Some consultation responses indicated potential issues with items of County Council responsibility, such as reinstatement of footpaths and these aspects should be reconsidered at FYA. The impacts described in the ES and AST are generally considered to be as expected, such as provision of new cycleway, bridleway and pedestrian paths and potential for new leisure journeys between bypassed villages.

Journey Ambience

- Impacts on journey ambience are largely beneficial, as expected. Reduction in congestion and improved journey times has reduced driver stress, as has removal of conflict between motorists and NMUs. Driver information has been improved through clear signage, as expected. Safety has been improved, as shown by a significant reduction in road traffic accidents since the scheme opened compared to pre-scheme.
- Views for travellers on the scheme are fairly enclosed in most cases, as expected. Provision of driver care facilities comprises off-site care facilities, such as restaurants, petrol stations and toilets, as well as laybys located in numerous locations along the length of the scheme.

6. Accessibility and Integration

- 6.1 This chapter evaluates the impact of the scheme in terms of the accessibility and integration objectives; comparing qualitative forecast assessments from the scheme AST with post-opening findings and analysis of policy objectives.

Accessibility

- 6.2 The accessibility objective is concerned with how the scheme has affected the ability of people in different locations to reach different types of facility, using any mode of transport. The accessibility objective consists of three sub-objectives. These are:
- Option Values
 - Access to the Transport System
 - Severance

Option Values

Forecast

- 6.3 Option Values, as defined in webTAG relate to the availability of different transport modes within the study area, even if they are not used. For example, a car user may value a bus service along their route even if they never use it, because they have the option of another mode should their car become unavailable.
- 6.4 The AST for this scheme states that there would be *'no substantial change to transport services'*. As such, the AST forecast a score of **neutral** for this objective.

Evaluation

- 6.5 The length of the scheme is covered by a number of commercial and council provided bus services. The main services on the northern section of the scheme linking Bingham and Newark and utilising some of the A46 are:
- Service 91/54 between Bingham and Newark, serving villages such as East Bridgford, Flintham, up to 8 times a day, and Elston and Farndon up to 15 times a day Monday to Friday. The service also routes through Screveton and Car Colston. A Saturday service runs 7 times a day, with no Sunday service provided.
 - Service 90- the Fosseyway Flyer between Newark and Nottingham, calling at Farndon and East Stoke before travelling on the A52 towards Radcliffe and Nottingham. This service runs twice an hour with a lower frequency in the evenings Monday to Friday. An hourly service is provided on a Saturday, with a 2 hourly daytime service on a Sunday.
- 6.6 Marshalls Coaches who operate services 90 and 91 had the following comments to make regarding the impact of the A46 scheme improvements on their services:
- 'The improvements do offer a far more reliable journey time with fewer accidents and hold ups due to slow traffic, and crucially the chance to turn right out of Farndon village onto the old road with minimal delays'.*
- 6.7 It was noted that only a small portion of their services use the new A46, therefore they have not been able to offer faster journeys or increased frequency. Additionally it was perceived that the scheme had resulted in the loss of passengers at a bus stop in Coneygre, *'it would now appear that perhaps the majority of passengers from the old Coneygre stop must have walked from Flintham and now that walk to the bus stop is circa 0.5 miles further, I assume most of these people must have made other arrangements'.*
- 6.8 Nottingham County Council commented to say that there had been limited impact on the service provided, although service 90 no longer serves Red Lodge due to the new road layout.

'On the whole, journey times are now quicker and more direct and apart from Red Lodge the same villages are still served'.

- 6.9 The main services on the southern section of scheme generally cross the A46 linking settlements such as Bingham and Cropwell Bishop with the suburbs of Nottingham. The ease of crossing the A46 at the new junctions is likely to have assisted with increased bus reliability, although there is no indication that the scheme has resulted in any additional services or route frequencies.
- 6.10 As there is no evidence to suggest that the A46 Newark to Widmerpool scheme has led to any changes in option values, this sub-objective has been assessed as **neutral**, as forecast in the AST.

Access to the Transport System

Forecast

- 6.11 For this objective, the AST forecast impact states *'with the exception of the relocation of bus stops at Saxondale Village and Butt Lane, access to the public transport system would remain unchanged in the Do Something scenario'.*
- 6.12 Given the anticipated impact, the AST forecast a score of **Neutral** for this objective.

Evaluation

- 6.13 The reduction in traffic and congestion through the villages which were situated on the old road is likely to have improved bus reliability. It is also reasonable to assume that stopping in the carriageway/laybys is easier and safer with the reduction in traffic.
- 6.14 The improved journey times for traffic will also allow improved access to the transport interchanges in Bingham, Newark and into Nottingham.
- 6.15 However, as no physical changes were made to improve access to the transport system, the AST score of **Neutral** is upheld.

Severance

Forecast

- 6.16 For this objective the AST forecast that the 'scheme provides new safe crossing points at Saxondale and Farndon, which greatly improves non-motorised user provision along the Scheme and reduces existing severance. Bridges at Owthorpe, Roehoe, Stragglethorpe, and Flintham provide safe crossing points, improvements to severance and counteract some increases to footpath lengths. Significant sections of old A46 contribute to increased non-motorised user provision and provide a new north-south cycleway facility'.
- 6.17 Given the forecast impact, the AST forecast a score of **Slight Positive** for this objective.

Evaluation

- 6.18 No post opening NMU surveys were available for this scheme, therefore the evaluation of this objective will focus on the qualitative impacts.
- 6.19 The downgrading of parts of the former A46 route to a bridleway, cycle way and pedestrian route have provided a number of traffic free alternatives adding to a reduction in severance for users. The reduction in traffic through the villages of Farndon and East Stoke has significantly reduced severance for these residents. A post opening site visit provided evidence of an equestrian user on the old A46 route in Farndon, and numerous pedestrians using the footpaths.
- 6.20 Comments received from Cropwell Bishop Parish Council noted that there were perceived problems from pedestrians negotiating the Saxondale roundabout.

- 6.21 Given the detail above, the assessment score of **Slight Positive** has been upheld for the scheme overall.

Integration

- 6.22 The integration objective consists of two main elements:
- Interchange with other transport modes: how the scheme assists different modes of transport in working together and the ease of people moving between them to choose sustainable transport choices.
 - Land Use Policy and Other Government Policies: how the scheme integrates with local land use and wider government objectives.

Transport Interchange

Forecast

- 6.23 The transport interchange objective relates to the extent to which the scheme contributes towards the Government objective of improving transport interchange for passengers and freight. The AST forecast for this scheme was '*no inter-modal interchanges would be provided*'. As such, the AST forecast a **neutral** impact for transport interchange.

Evaluation

- 6.24 No freight or passenger transport interchanges were included in within the scope of the scheme, however it is noted that the reduction in traffic volumes through the villages on the old A46 route has indirectly facilitated improvements for public transport interchange by:
- The reduction in traffic flows has allowed buses to stop and pull out with minimal disruption to the flow of traffic.
 - Reduced traffic has created a more pleasant environment for local bus users by improving air quality and reducing noise.
 - A reduction in traffic has resulted in an improvement in the accessibility of bus stops for users (including school children) and in the safety of users along the former A46 route.

Land Use Policy

- 6.25 This section looks at the scheme in relation to national, regional and local level land use and development policies.

Forecast

- 6.26 For the land use policy objective, the AST stated that the '*scheme would support some land use policies (e.g. recreation, employment allocations, habitat creation and non-motorised user provision), but hinder other policies (e.g. loss of best and most versatile agricultural soils, effects on Green Belt and policies to protect heritage, landscape and ecology)*'.
- 6.27 Overall, the AST judged the scheme to have a **Neutral** impact in respect of national, regional and local planning policies.

Evaluation

- 6.28 An evaluation of the scheme in relation to policy has been undertaken and summarised in Table 6–1 on the following page. Given the findings presented, it is considered that the overall impact of the scheme on land use policy integration is **neutral**, as forecast in the AST.

Table 6-1 – Scheme Alignment with National, Regional and Local Policy

	Policy/Document	Relevant Policy Objective/Reference	Relevant Scheme Impacts	Alignment
Local and Sub-Regional Policies	Rushcliffe Borough Local Plan 1996	This plan states that the Borough Council is committed to the principal of ensuring that development takes place in a sensitive and sustainable way. The document details several other targets including: <ul style="list-style-type: none"> • There are a number of proposals for major new road schemes within the Rushcliffe Area and the Borough Council will seek to ensure that no development takes place which would inhibit the implementation of schemes like A46 Newark to Widmerpool improvement. • Developers will be required to make provisions for facilities for Cyclists, pedestrians and horse riders in major development proposals. • The borough council will support the provision of separate footpaths linking residential, employment and commercial land uses. • Planning permission for development which would adversely affect recognised sites of ecological or geological significance will not be granted. • Planning permission will be granted for small scale commercial and industrial developments subject to the provisions of policy Env1. 	<ul style="list-style-type: none"> • A number of measures were included as part of the scheme in order to mitigate access issues for NMUs along the length of the scheme. Reductions in traffic along the remaining sections of the old route are also likely to have improved accessibility along this route. • The scheme has improved the trunk road network linking Newark and the wider Lincolnshire area with the wider East Midlands region. 	✓
	Nottinghamshire Structure Plan 1996	During the plan period 1991-2011, provision will be made for a scale of Economic Development necessary to meet the needs of the county's population and that respects and enables the protection and enhancement of the environment. The various policies stated in the structure plan include: <ul style="list-style-type: none"> • Provision will be made for about 1,770 hectares of land to be protected for employment development, as well as highway schemes such as A46 Newark • Areas of poor environmental quality will be improved, particularly in town and village centres and residential areas • Provision will be made for new transport infrastructure to improve accessibility between employment areas, major development sites, areas of high unemployment and the strategic transport network • Traffic Management measures will be taken to improve conditions in residential and other sensitive areas adversely affected by through traffic or non-residential parking. 	<ul style="list-style-type: none"> • The scheme has improved reliability for traffic using the A46, and improved journey times. • The scheme has removed traffic from residential areas such as Farndon and East Stoke, facilitating an improvement in environmental conditions. • The removal of traffic from village centres has improved the environment in these areas, however has introduced 	✓ Partial
	Newark and Sherwood District Local Plan 1999	The main objectives of the Newark and Sherwood district local plan are: <ul style="list-style-type: none"> • The promotion of development which will bring benefits to the area, particularly jobs and the protection of the environment in all its aspects. In order to achieve the aims of the Local Plan, the District Council will seek to secure implementation of the following objectives: <ul style="list-style-type: none"> • Early implementation of the dualling of the A46, including by-passes for Farndon, East Stoke and Brough and early implementation of by-passes for Rainworth, Southwell, Collingham and Kelham; • Highway improvements in the western part of the District - to facilitate improved access to employment sites • To encourage a comprehensive public transport system and easily accessible terminals • To identify sufficient employment land to meet Structure Plan requirements; • To identify high quality employment sites in Newark and the Western part of the District; • To protect and enhance sites of nature conservation interest and ecological or geological significance 	<ul style="list-style-type: none"> • The scheme has helped to improve the A46 trunk road, helping to support the local economies of both Bingham and Newark and providing improved connectivity with the rest of the UK via the A1 and M1. • The scheme has included several measures to try and protect habitats, air and water quality, although does affect landscape and heritage features • The removal of traffic from villages such as East Stoke and Farndon has improved the quality of life and environment in these areas. 	✓ Partial
Reg Policy	Regional Spatial Strategy (RSS) for the East Midlands (2005)	The key policies outlined in the RSS for East Midlands(2005) state that local planning authorities and individual transport authorities should ensure that any additional trunk road schemes are consistent with RTS objectives and ensure that highway capacity is managed effectively to reduce congestion and improve safety. The document also details several other targets including: <ul style="list-style-type: none"> • Policy 44: Progressive reduction in the rate of traffic growth over time and reduction in congestion in urban areas and on inter regional routes. • Policy 50: Regional priorities for bus and light rail services should increase at the regional level towards the national target of 12% by 2010. • Policy 52: A decrease in accidents at the regional level towards the national target of 40% by 2010 	<ul style="list-style-type: none"> • The scheme has achieved a considerable reduction in the number of collisions across the area; and • The scheme has considerably improved journey times for trunk road traffic and relieved pressure on other roads, removing congestion hotspots. 	✓
National Policy	A New Deal for Trunk Roads in England (1998)	The Government's overarching objectives for transport at the time of the appraisals were set out in this document: <ul style="list-style-type: none"> • To protect and enhance the built and natural environment. • To improve safety for all travellers • To contribute to an efficient economy, and to support sustainable economic growth in appropriate locations. • To promote accessibility to everyday facilities for all, especially those without a car. • To promote the integration of all forms of transport and land use planning, leading to a better, more efficient transport system 	<ul style="list-style-type: none"> • The scheme has delivered major journey time benefits, improving the efficiency of the trunk road network, with potential for wider economic benefits. • The scheme has considerably improved journey times for trunk road traffic and relieved pressure on other roads. 	✓
	Transport 2010: The Ten Year Plan (2000)	The strategy for transport aims to tackle congestion and pollution by improving all types of transport -rail and road, public and private - in ways that increase choice. It is a strategy for investment in the future to create prosperity and a better environment.	<ul style="list-style-type: none"> • The scheme has delivered major journey time benefits, improving the efficiency of the trunk road network, with potential for wider economic benefits. • The impact on the environment has been minimised through mitigation, but the scheme builds on fields and other previously non built up land. 	✓ Partial
	The Future of Transport: A Network for 2030 (2004)	The Strategy builds on the progress that had already been made since the implementation of the 10 year plan for transport. This plan extended out to 2014-2015 but strategy also looks even further ahead, at the challenges faced over the next 20-30years. The Strategy is build around three themes , Sustained investment, Improvements in transport management and Planning ahead	<ul style="list-style-type: none"> • The scheme has delivered journey time benefits and improved capacity of the route for future traffic growth. The improved junctions also allow for capacity for further developments in places such as Bingham and Newark. 	✓

Key Points – Accessibility and Integration

Accessibility

- The removal of traffic through the villages on the former A46 route has reduced severance and improved the quality of the environment for residents. The conversion of the former A46 to NMU routes in some sections has as positive effect on local users.
- The scheme has had no discernible impact on option values or access to the transport system

Integration

- The reduction of traffic on the former A46 has indirectly facilitated public transport interchange improvements in terms of noise, air quality and safety.
- The scheme is aligned with local, regional and national policies related to land use and development.

7. Appraisal Summary Table & Evaluation Summary Table

Appraisal Summary Table

- 7.1 The AST is a brief summary of the main economic, safety, environmental and social impacts of a highway scheme. Table 7–1 presents the AST for the A46 Newark to Widmerpool Scheme.
- 7.2 The AST presents a brief description of the scheme, a statement detailing the problems that the scheme planned to address, and makes an assessment of the scheme's predicted qualitative and quantitative impacts against the following objectives:
- **Environment** – an estimate of the impact of the scheme on factors such as noise, local air quality, landscape, biodiversity, and water.
 - **Safety** – measured reduction in the number and severity of collisions and qualitative assessment of impacts on security.
 - **Economy** – Estimated impact of the scheme upon journey times, vehicle operating costs, scheme costs, journey time reliability and wider economic impact.
 - **Accessibility** – A review of scheme impact upon access to the public transport network, community severance, and non-motorised user impact.
 - **Integration** – A description of how a scheme is integrated with wider local planning, regional and national policy objectives.

Evaluation Summary Table

- 7.3 The EST was devised for the POPE process to record a summary of the outturn impacts against the objectives, compared to the predictions in the AST.
- 7.4 Drawing on the results presented in this report, Table 7–2 presents the EST for the scheme. An assessment of each of the objectives at the FYA stage is given. Where possible, the format of the EST mirrors the appearance and process of the AST to enable direct comparison between the two.

Table 7-1 Appraisal Summary Table (AST)

OBJ	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE IMPACT	ASSESSMENT
Environment	Noise	The study area consisted of all properties within 600 metres either side of the Scheme and 600 metres either side of all road links which experience a change in traffic flow greater than +25% / -20% as a result of the Scheme. There would be areas that would experience an overall improvement in noise climate (including Newark, Kinoulton, parts of Bingham, East Stoke and Farndon). Elsewhere, the settlements of Cropwell Bishop, Cropwell Butler and Elston would experience slight increases in traffic noise levels. Number of properties experiencing noise levels ≥ 66 dB LAeq (Year 0) Do Minimum 496, Published Scheme 371. Number of properties experiencing noise levels ≥ 66 dB LAeq (Year 15) Do Minimum 578, Published Scheme 434. 3 residential properties demolished as part of the Scheme	People annoyed by noise – Published Scheme vs Do Minimum 2027. Total Population in Assessment: 34,041, Do Minimum: 2,464 annoyed, Published Scheme: 2,463 annoyed	Change in Population Annoyed (Year 15) = -1 PVB (Residential) = +£1,957,298
	Local Air Quality	A total of 6603 properties are located within 200m of the existing A46 and/or the Scheme and/or surrounding affected roads, 3 properties would be demolished due to the Scheme, 5677 (86%) would experience an improvement in local air quality and 926 (14%) a worsening. Will give improvements to air quality at East Stoke and Farndon, although there will be a slight worsening in air quality at the west edge of Syerston and Coneygreys Spinney. No exceedances of the current air quality objectives are predicted at any affected property with or without the Scheme; the Local Authorities have not declared any AQMAs in the vicinity of the Scheme.	No. of properties with an improvement in air quality in 2016 due to the Scheme: 5677 No. of properties with worsening of air quality in 2016 due to the Scheme: 926	NO2: -1837 PM10: -555
	Greenhouse Gases	Total road traffic CO2 emissions in the Traffic Model Study Area increase by 21% in 2012 and 22% in 2027. This is due to the increase in the vehicle kilometres travelled in the Traffic Model Study Area of 12-14% and the increase in average speed on the A46 of around 40 km/hr due to the operation of the Scheme	Total emission of CO2 (tonnes/yr): DM 2012: 138,160 DS 2012: 167,098	Increase in emissions of CO2 due to the Scheme: +28,938 tonnes PVB -£35.2M
	Landscape	Scheme would follow alignment of existing A46 along former Roman Road through a gently rolling and agricultural landscape for the majority of its route, retaining vegetation to the east where possible. Planting lost to the west would be replaced and hedgerows translocated where practicable. On the off line section, planting to reconnect severed hedgerows would be provided. The roundabouts at Stragglethorpe, Saxondale, Margidunum and Farndon would be lit. Lighting on the new roundabout at Lodge Lane and the existing A46 would also be provided. The mainline would not be lit. Significantly more vegetation would be provided by the Scheme than lost.		Slight Adverse
	Townscape	Scheme would improve the setting of the conservation areas at East Stoke and Farndon. Similarly, human interaction would be improved as a result of ease of movement within and between local settlements and isolated properties.		Slight Beneficial
	Heritage of Historic Resources	Scheme causes changes to the setting of 20 listed buildings, 9 locally listed buildings and 4 conservation areas although reduced traffic on existing A46 would benefit other heritage features. Scheme will affect 9 SAMs, 1 English Heritage registered battlefield and a number of archaeological sites. A programme of detailed archaeological investigation and research, building recording and investigation of historic landscape features would be undertaken prior to construction.		Moderate Adverse
	Biodiversity	Scheme would have a direct impact on 10 SINCs and result in the loss of one field pond supporting Great Crested Newts. Some mature trees, woodland, hedgerows and ditch habitats would be lost, which would affect birds, invertebrates and mammals (including bats and badger). There would be a significant amount of habitat created by the Scheme providing a net increase of trees, woodland, hedgerows and scrub as well as provide ecology ponds and ditches.		Moderate Adverse
	Water Environment	Existing floodplain storage capacity for the Rivers Trent and Devon would be maintained by Scheme. The water quality of receiving ditches, and streams along the existing A46 would be slightly improved with the Scheme due to better drainage design. Minor aquifers used for agricultural supply would not be affected by the Scheme.		Neutral
	Physical Fitness	Unlikely that the Scheme would change the existing pedestrians travel in terms of journeys greater than 30 min. There is however, a potential for new leisure journeys between villages with the provision of bridged crossing points and the creation of new off-road cycle ways.	Change in number of cyclists/pedestrians making journeys of > 30 minutes = 0	Neutral
	Journey Ambience	Reduced driver stress, enhanced highway design and carrying capacity, separation of NMU facilities and uninterrupted travel along the new A46 would provide improved journey ambience.		Large Beneficial
Safety	Accidents	Accident assessment over 60 years and for all roads local to the Scheme based upon Central growth forecasts.	Number Personal Injury Accidents: 1,671. Casualties: Deaths: 64 Serious: 395 Slight: 2,299	PVB £114.0 M
	Security	Lay-bys on the Scheme will be unlit although the landscaping design will ensure that sight lines are clear and that the lay-bys are visible at all times. No additional security improvements are proposed by the Scheme.		Neutral

OBJ	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE IMPACT	ASSESSMENT
Economy	Public Accounts	Scheme cost estimate on 'Green Form' October 2007. Assessment based on the Central scenario over a 60 year appraisal period and are present values discounted to 2002, in 2002 prices, £Millions	Investment costs: £261.1 M Indirect Tax Revenue: -£195.8 M	PVC £65.3 M
	TEE	Assessment based on the Central Growth scenario over a 60 year appraisal period and are present values discounted to 2002, in 2002 prices, £Millions.		PVB £ 668.2 M
	TEE	Assessment based on the Central Growth scenario over a 60 year appraisal period and are present values discounted to 2002, in 2002 prices, £Millions.		PVB £239.4 M
	Reliability	Reliability in two sections to the south of Saxondale assessed as slight beneficial. Three sections assessed to the north of Saxondale show a moderate beneficial impact in terms of reliability based on an assessment of links using 2016 Central growth forecasts.	Route Stress (Opening year 2016):	Moderate Beneficial
	Wider Economic Impacts	No assessment required.		Neutral
Accessibility	Option Values	No substantial change to transport services created by this Scheme.		Neutral
	Severance	Scheme provides new safe crossing points at Saxondale and Farndon, which greatly improves non-motorised user provision along the Scheme and reduces existing severance. Bridges at Owthorpe, Roehoe, Stragglethorpe, and Flintham provide safe crossing points, improvements to severance and counteract some increases to footpath lengths. Significant sections of old A46 contribute to increased non-motorised user provision and provide a new north-south cycleway facility.		Slight Positive
	Access to the Transport System	With the exception of the relocation of bus stops at Saxondale Village and Butt Lane, the access to the public transport system would remain unchanged in the Do Something scenario.		Neutral
Integration	Transport Interchange	No inter-modal interchanges would be provided as part of this Scheme.		Neutral
	Land Use Policy & Other Gov't Policies	Scheme would support some land use policies (e.g. recreation, employment allocations, habitat creation and non-motorised user provision), but hinder other policies (e.g. loss of best and most versatile agricultural soils, effects on Green Belt and policies to protect heritage, landscape and ecology). Overall, Scheme judged to be Neutral in respect of national, regional and local planning policies. Scheme would have a Neutral effect in terms of other Government policies relating health, social inclusion, education etc.		Neutral

Table 7-2 Evaluation Summary Table (EST)

OBJ	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE IMPACT	ASSESSMENT
Environment	Noise	Based on the traffic survey results, noise levels in the vicinity of the scheme are as expected. One property has been identified post-opening as eligible for noise mitigation treatment, at present negotiation with the property owner on the form of this mitigation are ongoing.		As expected
	Local Air Quality	Based on the traffic survey results, air quality in the vicinity of the scheme is as expected.		As expected
	Greenhouse Gases	Carbon output from vehicles using the A46 scheme section has increased post scheme opening. However this increase is not as large as expected.	Reforecast carbon emissions predicted an increase to 40,568 tonnes (69% increase in emissions). Observed increase is lower at 23,948 tonnes 41%	-£17.25m, better than expected
	Landscape	The components of the scheme with the most significant landscape impacts are the sections of the scheme on embankment as well as the new overbridges, all of which will remain dominant in the landscape at least until the new planting around them matures. Planting within the scheme has been implemented as set out in the ES/Environmental Masterplan. Screen planting is in place and should meet its targets by design year, subject to continued successful growth and ongoing maintenance.		As expected (slight adverse)
	Townscape	The impacts described in the ES and AST are generally considered to be as expected, although the scheme did not include any streetscape works through the villages of Farndon/East Stoke. The route is now detrunked and the local authority has no plans to implement any changes.		As expected (slight beneficial)
	Heritage of Historic Resources	Reporting on archaeological investigation is ongoing. Impacts appear largely as described in the AST/ES.		As expected (moderate adverse)
	Biodiversity	New habitats, including woodland, hedgerow and grassland have been created as part of the works and have been planted in accordance with the Environmental Masterplan. These will in time increase the biodiversity value of the corridor, as will the habitat created via construction of ponds and ditches for ecology mitigation and provision of ecological mitigation features as part of attenuation ponds and landscape planting. Mitigation has been created for species including breeding birds, bats, great-crested newts, reptiles and badgers. The effectiveness of these measures has yet to be reported on at this stage.		As expected (moderate adverse)
	Water Environment	No issues with drainage were noted during the site visit; however, several consultation responses raised scheme drainage as an issue and suggested that inadequate drainage was responsible for flooding in 2012. This has not been visually verified.		Potentially worse than expected (reported as much worse than expected by the Environment Agency and others) (neutral)
	Physical Fitness	The impacts described in the ES and AST are generally considered to be as expected.		As expected (neutral)
	Journey Ambience	Journey ambience has been improved as expected in the ES, with reduced driver stress associated with improved conditions and reduced congestion and conflict with NMU. The large beneficial impact predicted in the ES is apparent.		As expected (large beneficial)
Safety	Accidents	The collision rate across the wider COBA modelled area has decreased post-opening. A larger decrease in collisions occurring on the improved A46 scheme key links is also seen, suggesting that the scheme has had a direct beneficial impact on collisions.	COBA modelled area savings in no. collisions per annum: 7.8 during post-opening period (includes national background reduction in collisions)	PVB = £49.69m (lower than expected)
	Security	Despite the implementation of secure layby facilities on the bypass and modern lighting columns at the major junctions, the scheme's overall impact on security has been scored as 'neutral' as although emergency call facilities have been provided in laybys, the opportunity to seek help from urban areas has been removed.		As expected (neutral)
Economy	Public Accounts		Forecast PVC: £274.5m Reforecast PVC based on OYA impact: £265.3m	As expected
	TEE	Travel times using the A46 between Newark and Widmerpool have reduced considerably at the OYA stage when compared to those seen pre scheme. Times in all periods have reduced by a minimum of 30%, with larger saving seen in the peak periods. Overall journey times have not reduced quite to the level forecast.	Journey time benefits £601.3m (52% of forecast) VOC -£131.4m Indirect Tax £108.6m	Lower than expected, but beneficial
	Reliability	Post-opening travel times along the new A46 route are consistent throughout the day whereas previously, travel times were considerably higher during peak periods. Suggests improvements in journey reliability.	Route stress 75% (adjusted) post opening	As expected (moderate beneficial)

OBJ	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE IMPACT	ASSESSMENT
	Wider Economic Impacts	Improvements in journey times combined with increased road capacity are likely to have helped promote a more efficient transport system, improving northeast-southwest access to regional centres in the East Midlands and aiding access to job opportunities and regional businesses.		As expected (neutral)
Accessibility	Option Values	No impact on option values	Not applicable	As expected (neutral)
	Severance	All scheme measures were implemented as expected. Overbridges and underpasses have helped to mitigate the impact of the new route whilst diversions to PROWs do not appear to have caused any major inconvenience. Removal of traffic from the old A46 route (particularly through East Stoke and Farndon) has reduced severance in these settlements by making it easier to cross the highway.	Not quantified	As expected (slight positive)
	Access to the Transport System	No impact on access to the transport system.	Not applicable	As expected (neutral)
Integ	Transport Interchange	No impact on transport interchange	Not applicable	As expected (neutral)
	Land Use Policy & Other Gov't Policies	The scheme aligns with national, regional and local policies, improving journey times and increasing the regions connectivity as well as reducing the number of road collisions and removing large volumes of traffic away from local communities.	Not applicable	As expected (neutral)

8. Conclusions

8.1 To conclude this report, this section summarises how the scheme is meeting its specified objectives.

Scheme Specific Objectives

8.2 Table 8–1 presents an evaluation of the scheme’s objectives using the evidence presented in this study.

Table 8–1 Success against Scheme Objectives

Objective	Has the scheme objective been achieved?	
To reduce the number of accidents.	Since scheme opening there has been an annual average reduction of 7.8 collisions a year over the wider COBA area, and an average reduction of 14.7 collisions over the A46 scheme key links. This shows that there has clearly been an improvement in safety as a result of the scheme.	✓
To reduce congestion along the route.	Journey time reliability on the scheme section has improved in both directions. This is as a result of increased capacity and reduced collisions reducing congestion.	✓
To improve links between Nottingham and Leicester to Newark, the A1 and Lincoln.	The scheme has resulted in a reduction in journey times along the A46 between the Newark and Widmerpool, which combined with an improvement in journey time reliability has made the route more attractive to users.	✓
To provide an improved strategic link between the M1 and A1.	The dualling of the last section of the A46 between the M1 and Newark bypass has improved the strategic route, providing reduced and more reliable journey times. The single carriageway Newark bypass is now the only remaining single carriageway to the A1.	✓
To relieve significant development pressures in Bingham.	Additional capacity has been provided through the upgrade of the A46, of which Bingham has direct access to at Saxondale roundabout.	Too early to assess

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Appendix B. Glossary

Terms	Definition
AADT	Annual Average Daily Traffic. Average of 24 hour flows, seven days a week, for all days within a year.
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.
ADT	Average Daily Traffic. Average daily flows across a given period.
AQMQ	Air Quality Management Area.
AST	Appraisal Summary Table. 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.
ATC	Automatic Traffic Count
AAWT	Annual Average Weekday Traffic. As AADT but for five days (Monday to Friday) only.
AWT	Average Weekday Traffic. As ADT but for five days (Monday to Friday) only.
BBMCE	Balfour Beatty Major Civil Engineering
BCR	Benefit Cost Ratio. This is the ratio of benefits to costs when both are expressed in terms of present value i.e. PVB divided by PVC.
BS EN 1794-2	British Standard – Road Traffic Noise Reducing Devices
Bvkm	Billion Vehicle Kilometres
CCS	Considerate constructors scheme
CEEQUAL	The evidence based sustainability assessment and awards scheme for civil engineering.
CEMP	Construction environmental management plan
CO ₂	Carbon dioxide
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 unless it is being used in Accident-only mode.
CRF	Congestion Reference Flow
DfT	Department for Transport
Discount Rate	The percentage rate applied to cash flows to enable comparisons to be made between payments made at different times. The rate quantifies the extent to which a sum of money is worth more to the Government today than the same amount in a year's time.
Discounting	Discounting is 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.
DM	Do Minimum. In scheme modelling, this is the scenario which comprises the existing road network plus improvement schemes that have already been committed.
DMRB	Design Manual for Roads and Bridges
DS	Do Something. In scheme modelling, this is the scenario detailing the planned scheme plus improvement schemes that have already been committed.
EA	Environment Agency
EH	English Heritage
ES	Environmental Statement
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.

Terms	Definition
FYA	Five Years After
GCN	Great crested newt
HA	Highways Agency. An Executive Agency of the DfT, responsible for operating, maintaining and improving the strategic road network in England.
ha	Hectare
HEMP	Handover environmental management plan
HGV	Heavy Goods Vehicle
KSI	Killed or Seriously Injured. KSI is the proportion of casualties who are killed or seriously injured and is used as a measure of collision severity.
L _{a10 18h}	Noise level exceeded 10% of the time, over an 18 hour measurement period.
L _{aeq}	Equivalent continuous noise level
LCA	Landscape character area
LEAP	Landscape Environmental Management Plan
LNS	Low Noise Surfacing
MAC	Managing Area Contractor Organisation normally contracted in 5-year terms for undertaking the management of the road network within a HA area.
Mph	Miles per hour
MVKM	Million Vehicle Kilometres
NATA	New Approach to Appraisal. The basis of the standard DfT appraisal approach when this scheme was appraised.
NCC	Nottinghamshire County Council
NE	Natural England
NMU	Non-Motorised User. A generic term covering pedestrians, cyclists and equestrians.
NRTF	National Road Traffic Forecasts. 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. At the time this scheme was appraised, the most recent one was NRTF97, i.e. dating from 1997.
ONS	Office for National Statistics
OYA	One Year After
PIC	Personal Injury Collisions
PM ₁₀	Particulate matter less than 10 micrometres in size
POPE	Post Opening Project Evaluation. The before and after monitoring of all major highway schemes in England.
Present Value	Present Value. The value today of an amount of money in the future. In cost benefit analysis, values in differing years are converted to a standard base year by the process of discounting giving a present value.
PROW	Public right of way
PVB	Present Value Benefits. Value of a stream of benefits accruing over the appraisal period of a scheme expressed in the value of a present value.
PVC	Present Value Costs. As for PVB but for a stream of costs associated with a project
RoSPA	Royal Society for the Prevention of Accidents
RSI	Road Surface Influence
SAM	Scheduled Ancient Monument
SINC	Site of Importance for Nature Conservation
SSSI	Site of Special Scientific Interest
STATS19	A database of injury collision statistics recorded by police officers attending collisions.

Terms	Definition
TAR	Transport Appraisal Report
TEE	Transport Economic Efficiency
TEMPRO	Trip End Model Program. This program provides access to the DfT's national Trip End Model projections of growth in travel demand, and the underlying car ownership and planning data projections.
TIS	Traffic Impact Study
TRADS	Traffic Flow Data System. Database holding information on traffic flows at sites on the strategic network.
UK	United Kingdom
webTAG	DfT's website for guidance on the conduct of transport studies at http://www.webtag.org.uk/

Appendix C. Information requested for Environmental section

Environment specific requirements	Provided for OYA
Environment Statement (ES), or if not a scheme requirement, the latest Scheme Assessment Report (SAR).	ES Volume 1 (2005); ES volumes 1, 2 and 3 and non-technical summary (dated January 2007).
Assessment Summary Table (AST).	AST (dated June 2009).
Any amendments, updates to addendums to the ES/ASR or any relevant further studies or reports. Any significant changes to the scheme since the ES.	Public Inquiry photomontages (dated July 2007) and ES addenda (dated March 2007).
As built drawings for landscape/ biodiversity/ environmental mitigation measures/ drainage/ fencing/ earthworks etc.	<p>Environmental Masterplan as built drawings AB/PD0285/ENV/2500/014 to AB/PD0285/ENV/2500/032, excluding drawing 30 (November 2013).</p> <p>Detailed Landscape Design as built drawings AB/PD0285/LD/1000/001 to AB/PD0285/LD/1000/070 and AB/PD0285/LD/1000/074 to AB/PD0285/LD/1000/078 (July 2013).</p> <p>Detailed Design Balancing Ponds as built drawings AB/PD0285/DR500/601 to AB/PD0285/DR500/616 (June 2013).</p> <p>Grantham Canal Underbridge General Arrangement as built drawing AB/PD0285/BD/08/01 (June 2013).</p> <p>Grantham Canal Underbridge Miscellaneous Details as built drawing AB/PD0285/BD/08/14 (June 2013).</p>
Construction Environmental Management Plan (CEMP).	Not provided.
Landscape and Ecology Aftercare Plan (LEAP).	Landscape Management Maintenance Plan (dated 2010) provided.
H&S file – environment information.	Not provided.
Handover Environmental Management Plan (HEMP).	A46 Newark to Widmerpool Improvement Phase 2 Detailed Design and Construction Handover Environmental Management Plan (November 2013) provided.

<p>Relevant contact names for: statutory consultees (EA, EH and NE); local authorities (county and district level); parish/ town councils; employer's agent and designers or environmental coordinators for the scheme; the MAC; and other relevant specialist consultees.</p>	<p>Contacts provided for designer.</p>
<p>Archaeological reports (popular and academic).</p>	<p>Draft Archaeological Assessment Report (dated 27 May 2011) and 'Following the Fosse Way through Nottinghamshire: Archaeology and the A46' (dated 2012) provided.</p>
<p>The road surface influence (RSI) value of any low noise surface installed.</p>	<p>Not received.</p>
<p>The insulation performance properties of any noise barriers installed (the BS EN 1794-2 result provided by the noise barrier manufacturer).</p>	<p>Not applicable</p>
<p>List of properties eligible for noise insulation.</p>	<p>Information included in Nov 2013 HEMP.</p>
<p>Reports for any pre/ post opening survey and monitoring work (e.g. for noise, biodiversity, water quality).</p>	<p>A46 Newark to Widmerpool Improvement Phase 2 Detailed Design & Construction Badger Activity 2009-2012: Summary Report (September 2012)</p>
<p>Animal mortality data.</p>	<p>Received from MAC.</p>
<p>Post opening non-motorised user (NMU) audit or vulnerable user survey.</p>	<p>None received.</p>
<p>Any information regarding environmental enhancements to streetscape/ townscape for bypassed settlements.</p>	<p>None received.</p>
<p>Employers Requirements Works Information – environment section.</p>	<p>Not received.</p>
<p>Scheme newsletters/ publicity material/ awards information.</p>	<p>Awards information provided.</p>

Appendix D. Photographic Record of Scheme

Public Inquiry 2007 Photomontage 1



OYA site visit October 2013



The view at OYA assessment from this photomontage location appears to be very similar to the view predicted in the photomontage. The scheme on embankment is clearly visible and the former A46 in the foreground appears to be well established as a grassland area. Badger fencing has been provided here, which was not shown in the photomontage.

Public Inquiry 2007 Photomontage 2

THE SCHEME YR.1



OYA site visit October 2013



The view at OYA is very similar to the photomontage prepared predicting the view of the scheme from this location in Year 1. The scheme on embankment predictably dominates, blocking the wider views.

Public Inquiry 2007 Photomontage 3

THE SCHEME YR. 1



OYA site visit October 2013 (taken from vicinity of photomontage location as exact location could not be found)



The photo from this approximate photomontage location at OYA shows that, as predicted in the Year 1 photomontage, the scheme is barely visible, screened by intervening hedgerows and trees.

Public Inquiry 2007 Photomontage 4



OYA site visit October 2013 (taken from a slightly different angle as original location no longer publically accessible)



Although taken from a different angle, the replicated photomontage at OYA is very similar to the photomontage prepared predicting the view of the scheme from this location in Year 1. The only part of the scheme visible in both the Year 1 photomontage and the OYA photo is the Syerston overbridge. Even with the scheme landscape planting still immature at OYA, this element does not form a dominant feature within the view.

Appendix E. Awards

E.1. A46 Awards

Issue Date	Awards	Category	Outcome
2009	Balfour Beatty Major Civil Engineering (BBMCE) Environment Award		Won
2010	BBMCE Zero Harm Awards	Project Safety Performance	Won
2011	Royal Society for the Prevention of Accidents (RoSPA) Awards		Gold
2011	BBMCE Safety Awards		Won
2011	Highways Magazine Excellence Awards	Environment and Sustainability in Highways Sector	Won
2012	RoSPA		Gold
2012	Construction News	Major Project	Highly Commended
2012	Green Apple	Built Environment	Bronze
2012	Brownfield Briefing Awards	Most Sustainable and Low Carbon Remediation Project	Joint Highly Commended
2012	HA Supplier Award	Delivering Sustainable Values and Solutions	Won
2013	The Civil Engineering Environmental Quality and Assessment Scheme (CEEQUAL) – Outstanding Achievement	Project / Contract Management	Highly Commended
2013	CEEQUAL – Outstanding Achievement	Waste Management	Won
2013	Considerate Constructors Scheme (CCS) Awards	Gold Award	Won
2013	CCS – National Awards	Runner Up	Won

Appendix F. Visual Impacts

- F.1. Given the extent of the scheme, the very large number of visual receptors identified in the ES and limited time available during the site visit, along with the lack of photographs indicating the pre-scheme views from any identified visual receptors in the ES against which to take comparison photos, a handful of receptors across the scheme were selected to be visited during the site visit. The views from these receptors at OYA are shown and discussed below. The locations of these receptors are shown on Figure 5-1 in the main report.
- F.2. Figure F-1 shows the view towards the scheme from near 10 Brunts Lane, East Bridgford (ST-71), which was assessed as likely to experience a slight adverse impact in Year 1. The scheme is barely discernible in the view at OYA.

Figure F-1- Looking towards scheme from 10 Brunts Lane, East Bridgford (ST-71)



- F.3. Figure F-2, shows the view towards the scheme from outside the front gate of the Chestnuts Riding School (ST-80), the view from this property was assessed in the ES to be substantially adversely affected at Year 1. The view to the Butt Lane overbridge at OYA shown in Figure F-2 is largely obscured by mature vegetation; although the road climbing onto the over bridge does form a major element in the view. In addition, the view from the side of the property facing the scheme is expected to have changed substantially for the worse, with the scheme a dominant feature; however, this could not be verified without accessing the property.

Figure F-2- Looking towards Butt Lane overbridge from Chestnuts Riding School (ST-80) on Butt Lane



- F.4. Figure F-3 shows the view towards the scheme (Butt Lane overbridge) from Springdale Farm (ST-81) off Springdale Lane, East Bridgford. The ES estimated that the impact on this property in Year 1 would be slight adverse. As shown in Figure 3, the scheme is only just discernible from this receptor at OYA.

Figure F-3- Looking towards Butt Lane overbridge from Springdale Farm (ST-81)



- F.5. Figure F-4 shows the view of the scheme (Butt Lane overbridge and surrounds) seen by visitors to the Bridgford Garden Centre (from the car park). The impacts of the scheme on views from this property were not assessed in the ES as it was considered that there would be no views. However, the new Butt Lane overbridge is clearly visible from this location, as are large vehicles travelling on the mainline. Although, it is considered that these elements do not intrude on this landscape to a large extent as the views in the area are dominated by the garden centre, which is not visible in Figure F-4.

Figure F-4- Looking towards Butt Lane overbridge from car park of Bridgford Garden Centre (ST-79C)



- F.6. Figure F-5 shows a view seen by vehicle travellers on Greengate Place. The ES estimated that users on this road would be subject to slight adverse visual impacts in Year 1. The scheme is fairly noticeable in this view at OYA, as Syerston overbridge is a dominant feature, however, this angle of view would be fleeting from a moving vehicle.

Figure F-5- View of the scheme seen by vehicle travellers on Greengate Place



F.7. Figure F-6 and Figure F-7 show views of the scheme (including Saxondale Junction) from near receptors Foss Farm and an unnamed farm (ST-284 and ST-285). The ES estimated that the impact of the scheme on these receptors at Year 1 would be slight and substantially adverse respectively, and noted views would include Saxondale Junction. Figure F-6 and Figure F-7 confirm that the scheme, particularly Saxondale Junction, at OYA is highly visible from these properties.

Figure F-6- View of scheme from near Foss Farm (ST-284)



Figure F-7- View of scheme from unnamed farm near Foss Farm (ST285)



- F.8. Figure F-8 shows the view of the scheme from next to Danewood House (ST-251), located east of the scheme off Inholms Road, north of Flintham Junction. The ES predicted that the impact of the scheme on this receptor in Year 1 would be moderate adverse. Figure F-8 shows that the scheme is a dominant feature in views from this property at OYA.

Figure F-8- View of the scheme from Danewood House (ST-251)



- F.9. Figure F-9 shows the view of the scheme from Fosse Cottage Farm (ST-19), located west of the scheme south of Cotgrave overbridge. The ES estimated that the impact of the scheme from this receptor at Year 1 would be substantially adverse. Figure F-9 shows the scheme on embankment forming a dominant feature in the view from this property, blocking wider views of the surrounding countryside.

Figure F-9- View of the scheme from Fosse Cottage Farm (ST-19)



- 8.3 Figure F-10 shows the view of the scheme from The Laurels (ST-49) on Main Street near Saxondale Junction. The ES estimated that the impact of the scheme from this receptor at Year 1 would be substantially adverse. Figure F-10 shows that the scheme on embankment and lighting infrastructure form major components of the view from this property. It is expected that this property may also be affected by the lighting at this junction at night.

Figure F-10- View of the scheme from The Laurels (ST-49)



- F.10. It is expected that by the FYA the landscape planting will have matured somewhat providing greater screening of the scheme than that shown at OYA, thereby reducing the visual impacts experienced by receptors in many locations, including those mentioned above. These sites should be revisited at FYA to confirm.

Appendix G. Ecological Impacts

Aspect	Predicted impact	Mitigation measures	Evaluation
Roadside shelterbelt, Kinoulton	Removal of approximately 0.31ha of mature trees, including habitat for bats, birds and invertebrates along the woodland edge, equivalent to 45% of the total area of this site.	0.72ha of landscaping and planting of hedgerow and scrub to be provided.	Linear belts of shrub and tree planting are indicated on both sides of new A46 on as built drawings and were noted on site. The extent of the area of planting provided compared to that stated in the ES was not verified.
Roehoe Wood SINC	Removal of approximately 1.58ha woodland edge from a broad-leaved plantation on an ancient woodland site that retains some indicator species and woodland habitat for birds, mammals and invertebrates. Equivalent to 9.5% of the woodland.	Planting of 0.7ha of new woodland, translocation of woodland soils and selected shrubs. Retained woodland would be further from road than existing. Additional 2.0ha new woodland east of A46 at Roehoe Junction.	Woodland planting to replace lost woodland habitat from Roehoe Woodland, including translocation of soil and trees, indicated on as built drawings. The extent of the area of planting was not verified.
Roundhill Spinney	Removal of approximately 0.96ha of plantation woodland with a high proportion of dead wood and habitat for birds, mammals and invertebrates. Equivalent to 60% of this site.	Planting of 0.6ha of new woodland, with linear belts of scrub and trees along the new woodland edge.	Planting of woodland and linear scrub and tree belts to replace lost plantation woodland from Roundhill Spinney indicated on as built drawings. The extent of the area of planting was not verified.
Borders Wood SINC	Removal of approximately 600m ² of edge of broad-leaved and mixed woodland, equating to 0.1% of total SINC area.	Planting of new grass verge and hedgerow with trees along woodland edge and approximately 2ha new woodland on east side of Owthorpe Junction.	Open grassland and hedgerow indicated along edge of Borders Wood SINC as well as replacement woodland east of Owthorpe Junction. The extent of the area of planting was not verified.
Honeybutts Plantation	Removal of approximately 0.44ha of woodland edge from mixed plantation with habitat for birds, mammals and invertebrates. Equivalent to 17.2% of this site.	Areas to be replanted behind retained woodland edge on completion of construction. Redundant Owthorpe Road hedgerows to be retained and seeded with species rich grassland. Planting of 2.2ha of woodland to the north.	As built drawings indicate provision of woodland planting behind retained woodland edge and to the north of the plantation and species rich grassland planting along retained hedgerows. The extent of the area of planting was not verified.
Long plantation	Removal of approximately 0.45ha and severance of semi-natural mixed broadleaved plantation, equivalent to 18% of the site.	Provision of 4.7ha of semi-natural habitat of rough grassland, scrub and trees.	Woodland planting to replace plantation woodland lost in cutting, along with planting of open grassland indicated on as built drawings.

			Scrub planting not indicated on as built drawings in this location. The extent of the area of planting was not verified.
Scrub at Colston Gate	Removal of approximately 0.72ha of scrub woodland edges with medium bat roost potential, equivalent to 49% of this woodland site.	Landscaping to create a large area of grassland, tall herb and scrub. Area of semi-natural habitat (1.9ha) would be greatly increased overall.	Grassland, woodland edge, woodland and linear belts of shrub and tree planting indicated on as built drawings. The extent of the area of planting was not verified.
Shelterbelt at Flintham Park SINC	Removal of approximately 400m ² of the edge of a shelterbelt with mature oaks with high bat roost potential, equivalent to 3% of the woodland.	Linear belts of scrub and trees were to be planted along the new woodland edge. 1.0ha of woodland planting at Red Lodge Junction.	New woodland planting indicated on as built drawings at Red Lodge Junction. The extent of the area of planting was not verified. Linear belts of scrub and trees along new woodland edge at Flintham Park SINC not indicated on as built drawings.
Coneygrey Wood	Removal of approximately 1.24ha of woodland edge of Beech Plantation, including a row of mature oaks with high potential for bats. Equivalent to 20.5% of the site.	Supplementary planting along the new woodland edge and 1.7ha of new woodland planting within the junction.	New woodland planting indicated on as built drawings along new woodland edge and within junction. The extent of the area of planting was not verified.
Hedgerows	A total of 214 hedges would be affected by the scheme, ranging from minor effects to complete removal of hedgerow, including trees, which would affect 3.1km of hedgerow.	Planting of 3.3km of new hedges. Translocation of up to 9% of hedges to be removed and reconnection of severed hedgerows and provision of links to other new habitats.	New and translocated hedgerows were observed in various locations along the scheme during the site visit and are also indicated on as built drawings, including links to new habitats. The extent (length) of new hedges planted was not verified. One translocated hedgerow north of Moor Lane was visited during the site assessment, this appeared to have established successfully.
Melton Road verge SINC	Removal of approximately 290m ² of unimproved grassland, which is a scarce and declining habitat in this district/county. This is equivalent to 2.4% of this site.	Loss of verge to scheme offset by creation of 0.5ha grassland in cutting.	Provision of grassland in cutting indicated on as built drawings. The extent of the area of planting was not verified.
Unimproved/ semi-improved grassland south of Roehoe Wood	Removal of approximately 3.42ha of unmanaged grassland, which is a limited resource in the district. Equivalent to 565% of the site (two fields).	New pond for newts. Reinstated grassland to provide for foraging. Includes 0.7ha of translocated woodland. Rough grassland and scrub is expected to develop in the cutting in 5-15 years.	Newt pond, reinstated grassland and translocated woodland soils all indicated on as built drawings. The extent of the area of planting was not verified. With regard to the rough grassland and scrub, this was indicated in the ES as expected to be established at 5-15 years after planting, as such, OYA is too early for this

			habitat to have fully established. To be revisited at FYA.
Semi-improved grassland at Jerico Farm	Removal of approximately 4.67ha pasture, limited permanent grassland of potential habitat value for great crested newt, equivalent to 38% of the total area of the two affected fields.	Provision of terrestrial foraging habitat, including rough grassland on embankments and in balancing pond; scrub; two new ponds; ecology ditch.	Provision of rough grassland on embankments and balancing pond as well as scrub, two new ecology ponds and ecology ditch indicated on as built drawings.
Laming Gap Lane SINC	Removal of approximately 0.038ha of neutral / calcareous unimproved grassland, equivalent to 28% of total area.	Landscaping would provide 0.1ha of species rich grassland.	Planting of species rich grassland at Laming Gap Lane indicated on as built drawings. The extent of the area of planting was not verified.
Groundswell verge SINC	Removal of approximately 0.31ha of relict unimproved grassland, a scarce and declining habitat in the district/county. Equivalent to 40% of the total area.	Net gain of semi-natural habitat, scrub in the long term. 0.31ha of grassland to be provided along diverted footpath.	Planting of grassland and linear belts of shrubs and trees along diverted footpath and roadside noted during site visit (refer Figure G-1) and indicated on as built drawings. The extent of the area of planting was not verified.
Foss House verge SINC	Removal of approximately 0.13ha of unimproved grassland, equivalent to 28% of the total area.	Existing A46 would be removed and seeded with a species rich grassland mix. An area of scrub and woodland of 0.46ha would be planted.	Planting undertaken as per mitigation proposal, verified on site (refer Figure G-2) and on as built drawings. The extent of the area of planting was not verified.
Nottinghamshire road verges, Cropwell Bishop SINC	Removal of approximately 0.32ha of unimproved grassland, equivalent to 66% of the total area.	Increase in area for managed unimproved grassland.	Areas of new grassland planting indicated on as built drawings.
Grantham Canal SINC	Removal of approximately 0.33ha of linear corridor, containing a range of semi-natural habitats, including bat roosts in bridge and habitat for grass snake. Additionally shading from the new bridge.	Landscaping would replace vegetation removed during construction. Conversion of arable to scrub on embankments from Stragglethorpe Junction to canal. Provision of new bat roost in bridge.	The proposed landscaping planting has been undertaken, including on embankments (Figure G- 3). The immaturity of the planting makes it difficult to tell if the embankments are planted to scrub, although as built drawings indicate that linear belts of shrub and tree planting and grassland areas have been provided. To be revisited at FYA. Bat boxes have been installed in the new Grantham Canal overbridge, these were noted on site and have been confirmed by reference to as built drawings (refer Figure G-4).
Saxondale Railway SINC	Removal of approximately 0.22ha of scrub from site containing calcareous flora that supports a population of the grizzled skipper butterfly. This	Embankments to Saxondale roundabout to be planted as scrub, with grassland along bridleway and around balancing ponds.	Species rich grassland has been seeded around ponds, open grassland along bridleways and scrub on Saxondale roundabout embankments,

	equates to 8.7% of the total site area.		as noted on site and also indicated on as built drawings (Figure G-5 and Figure G-6).
Pond 11	Removal of historic pond that supports great crested newts and diverse macroinvertebrate and plants, including removal of surrounding grassland.	Two new ponds, plus two more new at construction, were to be provided, one on each side of A46. Translocation of newts and also flora/other fauna. Loss of surrounding grassland mitigated by new rough grassland, ditch, scrub, amphibian hibernacula.	A total of 13 ecology ponds have been provided, with new rough grassland, ditch and scrub, including the three identified as replacements for Pond 11 (NP1, NP2 and NP3, completed in 2009). The Handover Environmental Management Plan (November 2013) notes that pond flora and fauna was fully established by Spring 2010, it is assumed that this covers the GCN population, which are not specifically mentioned in the HEMP. No provision of amphibian hibernacula appears to have been undertaken. The ES mitigation does not refer to monitoring of GCN following translocation, although the HEMP states that this is ongoing.
Various watercourses	Land take for culverts and variation in flow affecting 21 small watercourses (mostly seasonal), comprising about 800, additional length of culvert, reduced flow in two ditches and more stable flow in East Stoke Sewer.	In all, 14 balancing ponds to be provided to reduce run off to greenfield rate. Five 'ecology ditches', vegetated ditches to provide wet / damp conditions, total area approximately 550m. Oil interceptors and balancing ponds would reduce pollution risk.	Provision of ponds and watercourses includes 13 wildlife ponds, 14 balancing ponds, 5 ecology ditches. Pond 11, which was removed for the scheme, was replaced by three of the 13 new ecology ponds early in the scheme construction (2009).
Badgers	Removal of three outlier setts and disturbance of five additional setts. Severance of one territory and edge effects on others.	Badger tunnels along scheme and fencing in locations with the most badgers. Habitat creation to increase the area of rough grassland, scrub and woodland.	Badger tunnels and fencing have been provided in multiple locations across the scheme (refer Figure G-7). Habitat creation of rough grassland, scrub and woodland has also been undertaken scheme-wide. The use of badger tunnels was not able to be verified at the time of the site visit, as badger tunnel locations were unknown at that time. This should be considered at FYA, at which time the results of ongoing badger monitoring are also likely to be available.
Bats	Removal of trees with bat roost potential in hedgerows and woodland. Removal of hedgerows that provide flight lines / foraging areas at side roads along scheme and in parts along the A46.	Planting of new hedges, scrub with trees and woodland to restore connectivity north-south and to provide foraging areas. Bat boxes provided in retained woodland. Bat box provision in canal under bridge.	Planting of new hedges, scrub with trees and woodland has been undertaken. Bat roosts/boxes have been provided in the new Grantham Canal underbridge (refer Figure G-4) and in various locations across the scheme, as

			indicated on the as built drawings, as has dead wood and log piles.
Brown hare	Severance of a scattered population of this species.	Some habitat provision from new rough grassland and hedges. No mitigation proposed for severance.	Habitat provision through the planting of new rough grassland and hedges has been undertaken across the scheme area. No further mitigation was proposed for this species.
Birds	Loss of nest sites and foraging areas for breeding birds in hedges, mature trees and woodland.	Increased areas of new habitat initially limited, but improving over time. Provision of bird boxes.	Increased habitat provided, but vegetation mostly not sufficiently mature at OYA to provide nesting sites. Bird boxes indicated on as built drawings as provided at Kinoulton Shelter Belt.
Barn owl	Removal or severance of hedgerows used as foraging routes.	Increased areas of habitat, more rough grassland along cuttings, around balancing ponds and woodland edges. Planting of trees at severed ends of existing good hedgerows.	Habitat provision through the planting of new rough grassland along cuttings, around balancing ponds and woodland edges and planting of trees at severed ends of hedgerows has been undertaken in various locations across the scheme area. No further mitigation was proposed for this species.
Reptiles	Possible minor impact on grass snake identified during construction only.	Post-construction: new balancing pond and associated rough grassland and hedge adjacent to canal. Over-deepening of balancing pond to develop wetland vegetation. Hibernacula would be created within balancing pond site.	Impacts were during the construction phase, so largely not relevant to OYA. Post-construction mitigation associated with general provision of balancing ponds, rough grassland and hedges indicated as present on as built drawings. Over-deepening of some balancing ponds indicated on as built drawings. However, ES does not specify which ponds these mitigation measures were to apply to, and over-deepening and associated grassland and hedge provision is not indicated for all attenuation ponds along the scheme. Reptile hibernacula is indicated as provided associated with one balancing pond, located adjacent to the Grantham Canal underbridge.
Amphibians	Removal of existing field ponds and habitat.	Provision of a total of 14 ponds for wildlife (in addition to the balancing ponds that have a primary function of drainage). Ponds would have associated semi-natural habitat; rough	The November 2013 Handover Environmental Management Plan indicates that 13 ponds for wildlife were provided (in addition to balancing ponds). These are indicated on as built drawings

		grassland, scrub and hibernacula.	as surrounded by grassland/ scrub habitats. No reference to amphibian hibernacula was found in the Handover Environmental Management Plan or Environmental Masterplan as built drawings.
Aquatic macro-invertebrate	Loss of 800m of land to culverts, loss of pond 11 and variation in flow in East Stoke Sewer.	Provision of 14 new wildlife ponds, including 2.8ha of grassland and wetland habitat at Moor Lane surface water balancing area; and five ecology ditches.	The November 2013 Handover Environmental Management Plan indicates that 13 wildlife ponds and 5 ecology ditches were provided (in addition to balancing ponds). Grassland and wetland habitat has been provided at the Moor Lane surface water balancing area (refer Figure G-8).
Terrestrial invertebrates	Removal of old trees along the scheme that provide habitat for invertebrates.	Selected large and small dead wood would be moved into new areas for woodland creation. Standing dead wood would be provided where feasible.	As part of mitigation for bats, standing deadwood and log piles have been provided (as set out in Table 2 of the Handover Environmental Management Plan). In addition to providing mitigation for bats, these features also offer habitat for terrestrial macroinvertebrates, as discussed in the ES.

Figure G.1 – New grassland and linear shrub and tree planting associated with north of Groundswell Verge SINC



Figure G.2 – Retained SINC vegetation and seeded former A46 Cotgrave overbridge



Figure G.3 – New planting alongside A46 associated with Grantham Canal SINC



Figure G.4 – Bat roosts provided in new Grantham Canal bridge



Figure G.5 – View of Saxondale roundabout embankments with new planting **Figure G.6 – New grassland and scrub north of Saxondale roundabout**



Figure G.7 – Badger fencing near Greengate Place



Figure G.8 – Grass and wetland, Moor Lane surface water balancing area

