Post Opening Project Evaluation

A46 Newark to Widmerpool Improvement Scheme - Five Years After Opening

August 2017

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Executive summary

Scheme Description

The A46 Newark to Widmerpool Improvement Scheme was a major Highways England scheme that opened to traffic in April 2012. The scheme provided 17.5 miles (28 km) of dual carriageway, replacing a substandard section of single carriageway. Multiple existing junctions were replaced with grade separated junctions, facilitating the free-flow of traffic on the A46 mainline. The scheme also included the retention of some sections of the existing alignment for cycle/pedestrian/equestrian routes.

Scheme Objectives

The Statement of Case (2007) set out the following objectives:

Objective	Has the scheme objective been 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.	✓

Key Findings

This report has found the following key findings:

- On the A46 mainline, average weekday traffic flows have increased by 27-51%, with reduced traffic along minor alternative routes.
- The traffic forecasts compiled at the appraisal stage have generally overestimated traffic volumes on the A46 and some surrounding roads, mainly due to overestimation of traffic growth, progress of local development and not modelling re-routeing from the wider study area.
- Average journey times along the A46 between Newark and Widmerpool have reduced, along with an improvement in journey time reliability due to reduced congestion. This has not been to the level forecast.
- Analysis of collision data indicates that the scheme has saved 11.6 personal injury collisions per year for the appraisal area, and 10.5 for the key links (A46 main carriageway, on/off slips, old alignment of the A46) of the scheme. This indicates that the scheme has had a beneficial impact on safety whilst taking into account the background reduction in collisions over the appraisal period.
- Monetary benefits are lower than expected, with outturn present value benefits of £731.6m, compared to a forecast of £996.22m. This is primarily due to the journey times 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-scheme with an increase of 34% (9,700 vehicles per day) observed on the A46 between the junction with A52 and A6097. On the northern section of the scheme, a 47% increase (11,400 vehicles per day) has been observed. The highest percentage increase was observed on the southern section of the scheme, of 51% which equates to an additional 9,700 vehicles per day.
- Traffic has reduced on a number of alternative routes to the east of the scheme, which indicates that traffic has transferred onto the improved A46 scheme section. To the west, there is a more mixed picture with some sites experiencing an increase in traffic flow and others decreasing. As the increase in flows on the A46 is above the level of transference and background growth, this suggests that the scheme has also reduced rat-running through local villages.
- Traffic forecasts were generally higher than observed, both with and without the scheme. On the scheme section, observed traffic volumes were lower than forecast which is likely to be due to re-routeing onto the A46 being lower than forecast, progress of developments near to the scheme to date and background traffic growth being lower than expected.
- For vehicles travelling between Newark and Widmerpool, average journey times have reduced considerably between pre- and post-scheme opening. The greatest benefit was observed during the PM peak for vehicles travelling southbound (saving of approximately 16 minutes). The observed journey time savings are lower than those forecast.
- Journey time reliability has improved as a result of the scheme, which is due to a reduction in congestion and collisions along the length of the scheme.

Safety

- Analysis of observed safety data for the modelled area shows an annual collision saving of 11.6 collisions per year. On the key links of the scheme, an annual collision saving of 10.5 collisions per year is observed, which is statistically significant. This clearly indicates that the scheme has had a beneficial impact on safety.
- The severity of the collisions on the key links has reduced, with the rate of fatal and serious injuries per billion vehicle kilometres (bvkm) reducing by 34% compared to pre-scheme.
- The scheme was forecast to reduce the annual number of collisions on the key links by 30%. Observed data shows that the scheme has reduced the annual number of collisions on the key links by 21%. The observed collision savings are lower than those forecast (30% reduction in annual collisions over the key links), with a reduction of 21% observed.

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 pre- and post-scheme is less than forecast. Observed total carbon 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 planting for visual screening is serving to reduce the immediate impacts of the scheme.
- Biodiversity mitigation measures have been installed as expected, and based on the site visit conducted at FYA, they have been deemed to be successful. Confirmation of use has not been received by the POPE team. Therefore, based on the findings of a site visit alone, it is considered that the impact is as expected.
- The impact on heritage is mostly as expected (moderate adverse).
- The water environment and drainage features are performing as expected.
- Physical fitness benefits are also largely as expected. Journey ambience has improved due to the removal of congestion along the route and conflict with non-motorised users. The large beneficial impact predicted in the forecast is apparent.

Accessibility and Integration

- The removal of traffic on the existing alignment of the A46 and improvements at junctions along the length of the scheme has improved journey time reliability for local bus services using the A46 mainline, and it is also likely that it will be safer for them to pull into, and out of, bus stops. Although some services have been re-routed, the quality of the waiting environment has been improved. The reduction in congestion and journey times will improve links to local transport interchanges for all users. Local communities have also benefitted from the conversion of some sections into routes for pedestrians, cyclists and horse riders. These facilities include several overbridges, reducing severance for local communities.
- The scheme is well aligned with a range of local, regional and national policies relating to land use and development. The reduction of traffic through local villages and towns has decreased, which has indirectly facilitated public transport interchange improvements in terms of noise, air quality and safety.

Summary of Scheme Economic Performance

	All monetary figures in 2002 prices and values	Forecast	Outturn Reforecast
Costs	**PVC**	**£274.5m**	**£273.9m**
Benefits	Journey time benefits	£1,157.3m	£928.1m
	Safety Benefits	£114.0m	£62.95m
	Construction Delay	-£9.9m	-£9.9m
	Vehicle Operating Costs	-£239.8m	-£228.9m
	Carbon benefits	-£35.28m	-£30.55m
	Noise Benefits	£1.957m	£1.957m
	PVB subtotal	**£998.28m**	**£723.66m**
	Indirect Tax	£196.4m	£187.5m
	BCR (with indirect tax in PVC)	**12.7**	**8.4**
	BCR (with indirect tax in PVB)	**4.3**	**3.3**

- Journey time benefits are below that forecast, mainly due to lower traffic levels observed on the scheme section than what was forecast.
- Outturn safety benefits were also lower than forecast, at £62.95m, due to observed collisions saving at FYA being lower than forecast.
- The outturn PVB of £723.66m is 27% lower than forecast.
- Outturn investment costs are very slightly higher than forecast by 0.5%.
- The outturn BCR indicates that the scheme is still considered to deliver high value for money.
- There has been a considerable improvement in journey times, additional capacity and improved safety is considered to support future growth and development in local area. It is important to note that this study has not identified any firm evidence to suggest that the scheme has stimulated economic activity at this stage.

1. Introduction

Background

1.1. This report presents the Five Years After (FYA) opening evaluation of the A46 Newark to Widmerpool Improvement scheme (hereafter referred to as 'the scheme') which opened to traffic in April 2012.

1.2. The evaluation has been prepared as part of Highways England's Post Opening Project Evaluation (POPE) programme. The purpose of this report is to build upon the initial findings presented in the One Year After (OYA) report published in August 2014.

Scheme Location

1.3. The A46 between Newark and Widmerpool is part of the strategic route between Leicester, Newark and Lincoln. This section of the A46 is approximately 17.5 miles (28km) long.

1.4. The scheme is located approximately 9 miles (14km) east of Nottingham, and is within the county of Nottinghamshire. To the north, it provides access to Newark-on-Trent and Lincoln, and to the south, it provides access to Leicester, Loughborough and M1 Junction 21 and 21a.

1.5. The geographical location of the scheme in relation to the region and the surrounding highway network is shown in **Figure 1-1**.

Figure 1-1 Scheme Location

Problems Prior to the Scheme

1.6. Prior to scheme implementation, the A46 between Newark and Widmerpool was the only single carriageway section of the route between Leicester and Newark. The existing layout of the route was straight, following the line of the old Roman Road (Fosse Way)), however the multiple junctions and accesses to the surrounding fields, farms and residential properties made overtaking difficult. It is understood from the Statement of Case (March 2007) that the route carried over 25,000 vehicles per day, of which up to 15% were heavy goods vehicles (HGVs). These high levels of traffic, in conjunction with the physical layout of this section of the A46, is understood to have resulted in frequent congestion and delays.

1.7. The Statement of Case for this scheme (March 2007) also provides details of the safety record of the route prior to scheme implementation and identifies that the route had a poor safety records, with accident numbers higher than the national average for a modern single carriageway road.

1.8. There were also many bridleways and footpaths that joined and crossed this section of the A46. It is understood from the Statement of Case (March 2007) that walkers, cyclists and horse riders found the A46 difficult to cross due to the high traffic flows.

Objectives

1.9. The objectives of the scheme, as set out in the Statement of Case (March 2007) are as follows:

- **To reduce the number of accidents;**
- **To reduce congestion along the route;**
- **To improve links from Nottingham and Leicester to Newark, the A1 and Lincoln;**
- **To provide an improved strategic link between the M1 and A1; and**
- **To relieve significant development pressures in Bingham.**

Scheme Description

1.10. The scheme provided 17.5 miles (28km) of new dual carriageway, 9 miles (15km) of which was constructed off-line. The southern end of the scheme connects with the existing grade separated junction with the A606 at Widmerpool. At the northern end of the scheme, an enlarged roundabout was provided to link into the Newark Bypass at Farndon. In addition, the scheme involved the construction of 8 full, or compact, grade separated junctions, as well as 13 bridges and underpasses. The scheme has bypassed the villages of East Stoke and Farndon.

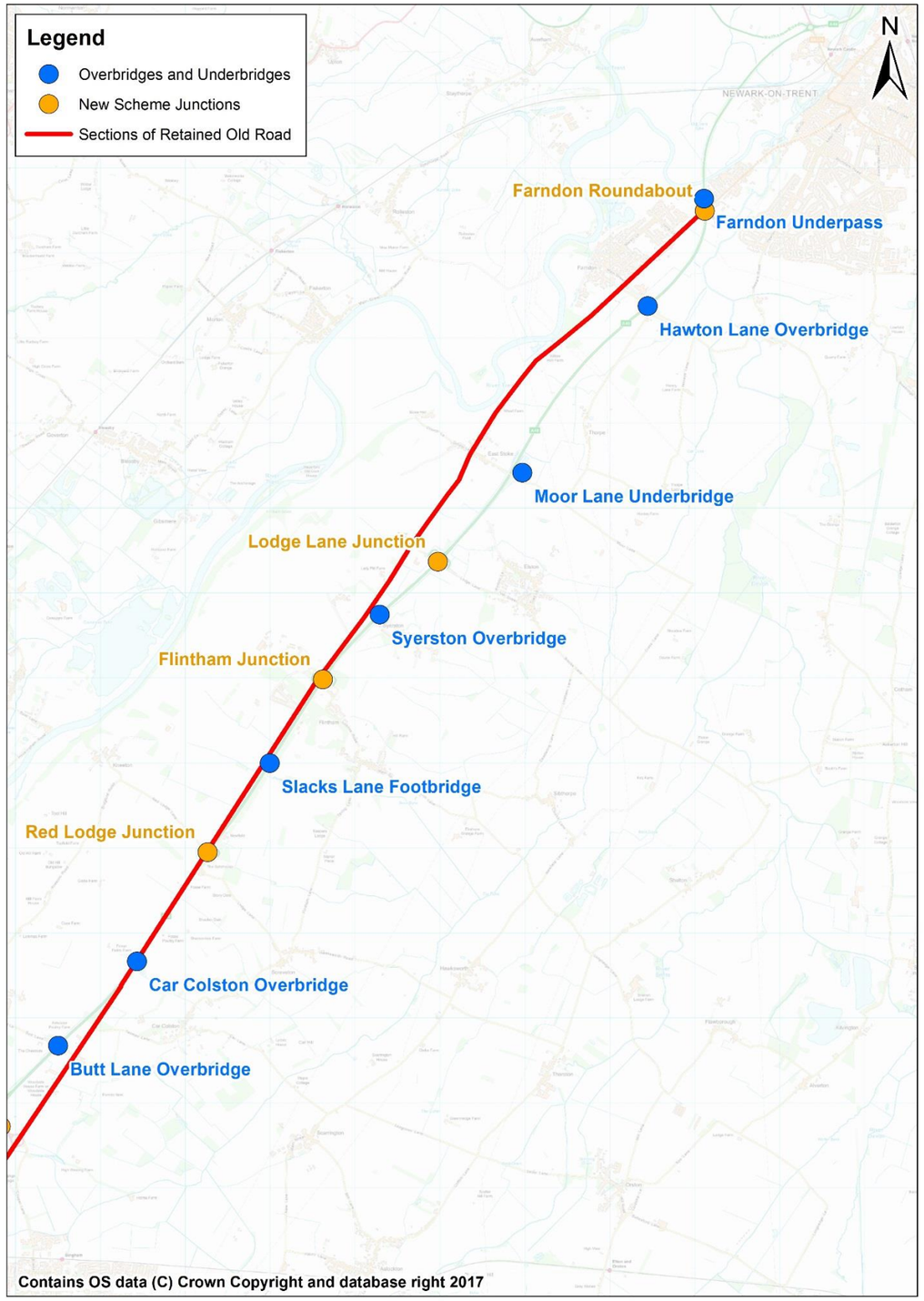
1.11. The scheme severed a number of accesses to properties, farms and businesses, and so these have been replaced with indirect accesses. The original alignment of the A46 has mostly been retained for use as local access roads, with some converted into cycle/equestrian routes.

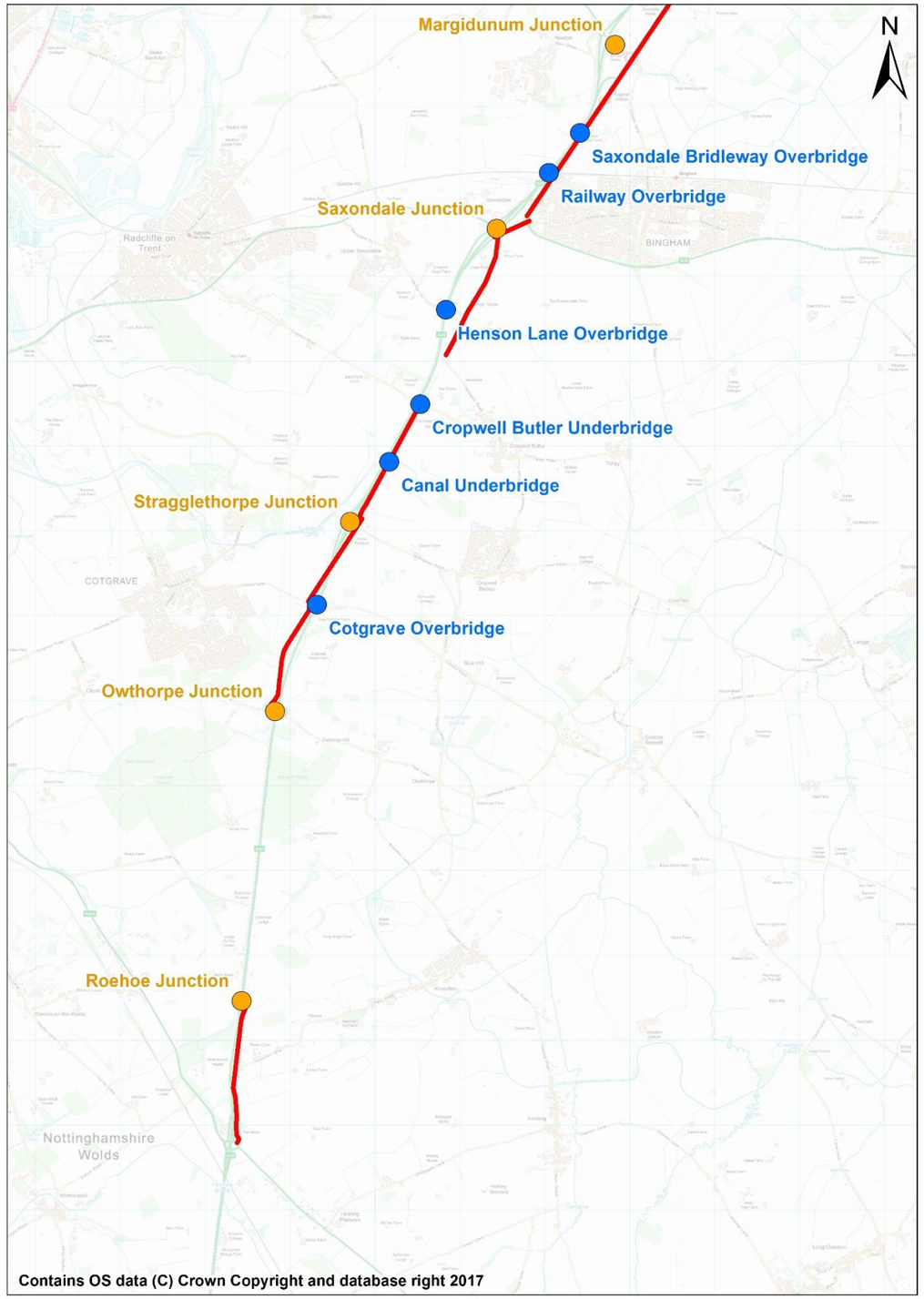
1.12. The main dual carriageway has no lighting provision. However, the junctions at Stragglethorpe, Saxondale, Margidinum and Farndon have been lit.

1.13. Prior to the scheme the railway bridge crossing the A46 at Bingham had substandard headroom. This resulted in vehicles over 4 metres in height being diverted through Bingham. The Bingham railway line now crosses the new dual carriageway just north of the Saxondale roundabout, with additional headroom. This has allowed an existing environmental weight limit to be fully enforced in Bingham.

1.14. A summary of the key features of the scheme is provided in **Figure 1-2,** with retained sections of old road shown in red.

Figure 1-2 Key Features of the Scheme





Scheme History

1.15. A brief history of the key events involved in the development of the scheme is provided in **Table 1-1.** Initially, the scheme was forecast to open in 2016, but the scheme opened earlier than expected, in 2012, as construction also started earlier than expected.

Table 1-1 A46 Newark to Widmerpool Scheme History

Date	Event
May 1989	Scheme first considered
April 1991	First public consultation – online widening to dual carriageway
March 1992	Preferred Route Announcement
December 1993	Second public consultation
July 1995	Preferred Route Announcement - revised
1997	Scheme withdrawn from Roads Programme
2001	Scheme enters Targeted Programme of Improvements
March to 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 to April 2010	Public Inquiry 2 into Supplementary Orders
November 2011	Public Inquiry 3 intro de-trunking, stopping up existing means of access to premises along the scheme length and the various compulsory purchases[1].
April 2012	**Scheme Opened to Traffic**
15 June 2012	Formal Road Opening Ceremony
August 2014	One Year After Opening (OYA) POPE report published

Nearby Schemes

A52 Nottingham Junctions (Highways England scheme)

1.16. There are currently ongoing works on the A52 on the outskirts of Nottingham. This scheme was announced in 2014 as part of the government's Road Investment Strategy, as a two-phase package of measures (signalisation and junction reconstruction) to improve the junctions along the length of the A52 in Nottingham. Traffic management has been in place since January 2017 around Nottingham Road and Cropwell Road. It is expected that these works will be completed in June and August 2017, respectively. The overall completion date

[1] A46 Newark to Widmerpool Improvement - Public Inquiry 2011

of this scheme is not currently available. Where possible, counts from October 2016 have been used in this study for this locality to avoid the traffic management affecting the results of these surveys. It is not understood that these works would affect traffic flows along the mainline of the A46.

M1 Junction 23a to 25 Smart Motorway (Highways England scheme)

1.17. Construction on the M1 Junction 23a to 25 Smart Motorway scheme began on the 30 March 2017. This scheme proposes to provide three lanes open to traffic in each direction during peak periods between the junction with the A42 adjacent to East Midlands Airport and A52 to the west of Nottingham. This scheme is expected to be complete in late 2018. This information has been provided for context, to understand improvements to the strategic road network in the vicinity of the scheme.

A453 M1 Junction 24 to A52 Improvements (Highways England scheme)

1.18. In July 2015, a scheme which widened the A453 between M1 Junction 24 and the Farnborough Road on the outskirts of Nottingham was completed. The scheme was designed to improve multi-modal access, with links to East Midlands Parkway Railway Station and NET 2 (electric tram) park and ride facilities. The A453 provides a key route into Nottingham, and surrounding areas via the A52. Construction works for this scheme may have influenced long distance routeing along the A46.

Overview of POPE

1.19. Highways England is responsible for improving the strategic highway network (motorways and trunk roads) through 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 scheme's continued development.

1.20. 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 Government objectives for Transport have been achieved. These objectives are Economy, Environmental, Safety, Accessibility and Integration). The contents of the AST allow judgements to be made about the overall value for money of the scheme. The AST for this scheme is presented in **Section 7** of this report.

1.21. POPE studies are carried out for all Major Schemes to evaluate the strengths and weaknesses in the techniques used for appraising schemes, to allow for improvements to be made in the future. This evaluation compares information collected before and after the opening of the scheme to traffic, against predictions made during the planning process. The outturn impacts of the scheme are summarised in an Evaluation Summary Table (EST). The contents of the EST summarise the extent to which the objectives of a scheme have been achieved. The EST for this scheme can be found in **Section 7** of this report.

1.22. A OYA report was produced in August 2014, the key findings of which are summarised below:

- In the first year of opening, the average journey times along the A46 corridor reduced, although not to the level forecast, and as a result of reduced congestion, an improvement of journey time reliability was also found.
- Average weekday traffic flows had increased by 14-22% along the scheme section, with evidence of reduced traffic on minor alternative routes.
- It was found that traffic forecasting at the appraisal stage generally overestimated traffic volumes on the A46 and some of the surrounding roads.
- Collision data indicated a saving of 7.8 personal injury collisions per year for the appraisal area, lower than the number forecast. For the key links of the scheme, a saving of 14.7 collisions per year was achieved, indicating that in the first year of opening 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 were found to be lower than expected, with outturn present value benefits of £502.35m compared to a forecast of £996.3m. This was primarily due to the journey time and collision savings being lower than forecast.

Contents of this Report

1.23. Following this introduction, the report is divided into eight further chapters as follows:

- **Chapter 2** – Traffic Impact Evaluation;
- **Chapter 3** – Safety Evaluation;
- **Chapter 4** – Economic Evaluation;
- **Chapter 5** – Environmental Evaluation;
- **Chapter 6** – Accessibility and Integration Evaluation;
- **Chapter 7** – AST and EST; and
- **Chapter 8** – Conclusions.

2. Traffic Analysis

Introduction

2.1. This section examines traffic data from a range of sources to provide a before and FYA opening comparison of traffic flows and journey times along the length of the scheme and the surrounding local roads. The purpose of this evaluation is to understand whether changes in traffic flows and journey times are attributable to the scheme and consider the impact on the objectives of the scheme.

2.2. This chapter includes the following:

- A summary of the sources used to complete this evaluation.
- An overview of national, regional and local background traffic trends
- A detailed comparison of before and FYA 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 FYA 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.

Data Sources

Traffic Count Data

2.3. Traffic count data has been extracted for the A46 (scheme section and wider links), A1 and A52 from the Highways England webTRIS database for a period before construction (May 2009) and FYA opening (March 2017). These dates have been chosen as they avoid construction of neighbouring schemes and have been carried out during months which are typically considered as 'neutral'.

2.4. To understand the impact of the scheme on the surrounding road network, traffic count data supplied by Nottinghamshire County Council (NCC) has been used for the before and after periods. The data from NCC was for March 2017, October 2016 and July 2016. Where suitable data was not available from existing sources, additional counts were commissioned between 7th and 21st March 2017. These counts were placed in the same location as those commissioned at the OYA evaluation stage to allow for direct comparison.

2.5. Due to the length of the scheme, the results are split over two sections to allow for clearer presentation. The locations of the traffic count data sites from the different sources are shown in **Figure 2-1** and **Figure 2-2.**

Journey Time Data

2.6. At the OYA evaluation stage, journey time data was extracted from the Highways England Journey Time Database (JTDB) for pre-scheme and one year after scheme opening. At the FYA stage, observed journey times along the A46 between Newark and Widmerpool have been extracted from Trafficmaster. This records the average vehicle journey time for sections of the UK road network. The analysis uses data for March 2017 to understand journey times at this five-year post-opening analysis stage.

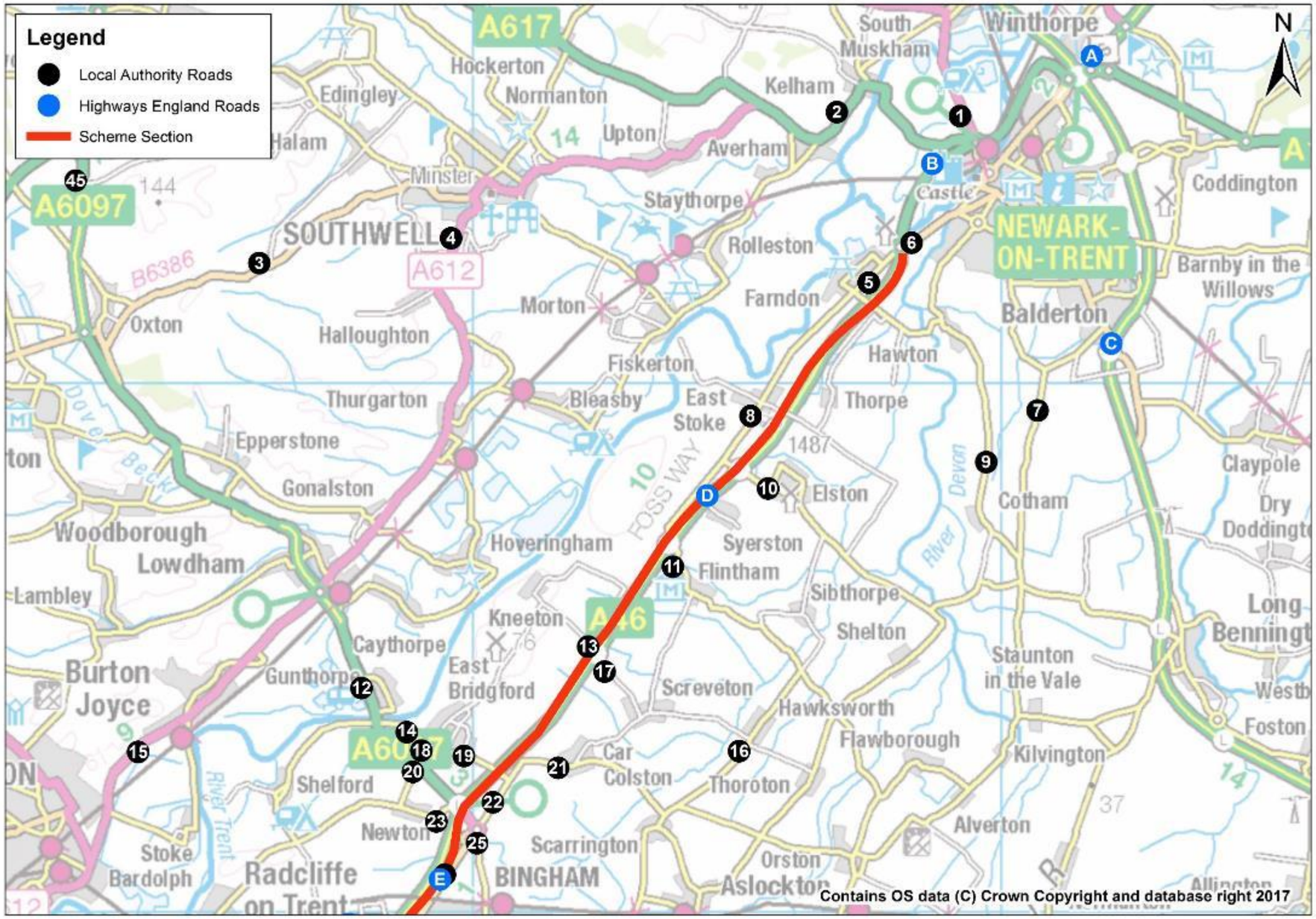
2.7. The forecasts provide journey times for the A46 between Widmerpool (junction with A606) and Newark (Farndon roundabout, B6166).

2.8. At OYA, the pre- and post-scheme data from the JTDB extended beyond the scheme section, part way round the Newark Bypass (approximately an additional 1.6 miles). It is recognised that this short section to the roundabout north east of Newark with the A6017 was not changed as part of the scheme. It has not been possible to extract the pre-scheme data from either data source (Trafficmaster/JTDB) for the scheme section in isolation due to available link

lengths and there not being data currently available for the required time period. Therefore, at FYA, data from Trafficmaster has been used for the same route length as at OYA (A46 junction with A606 to partway round the Newark Bypass) to ensure the impact of the scheme is still represented and results for pre- and post-scheme are comparable.

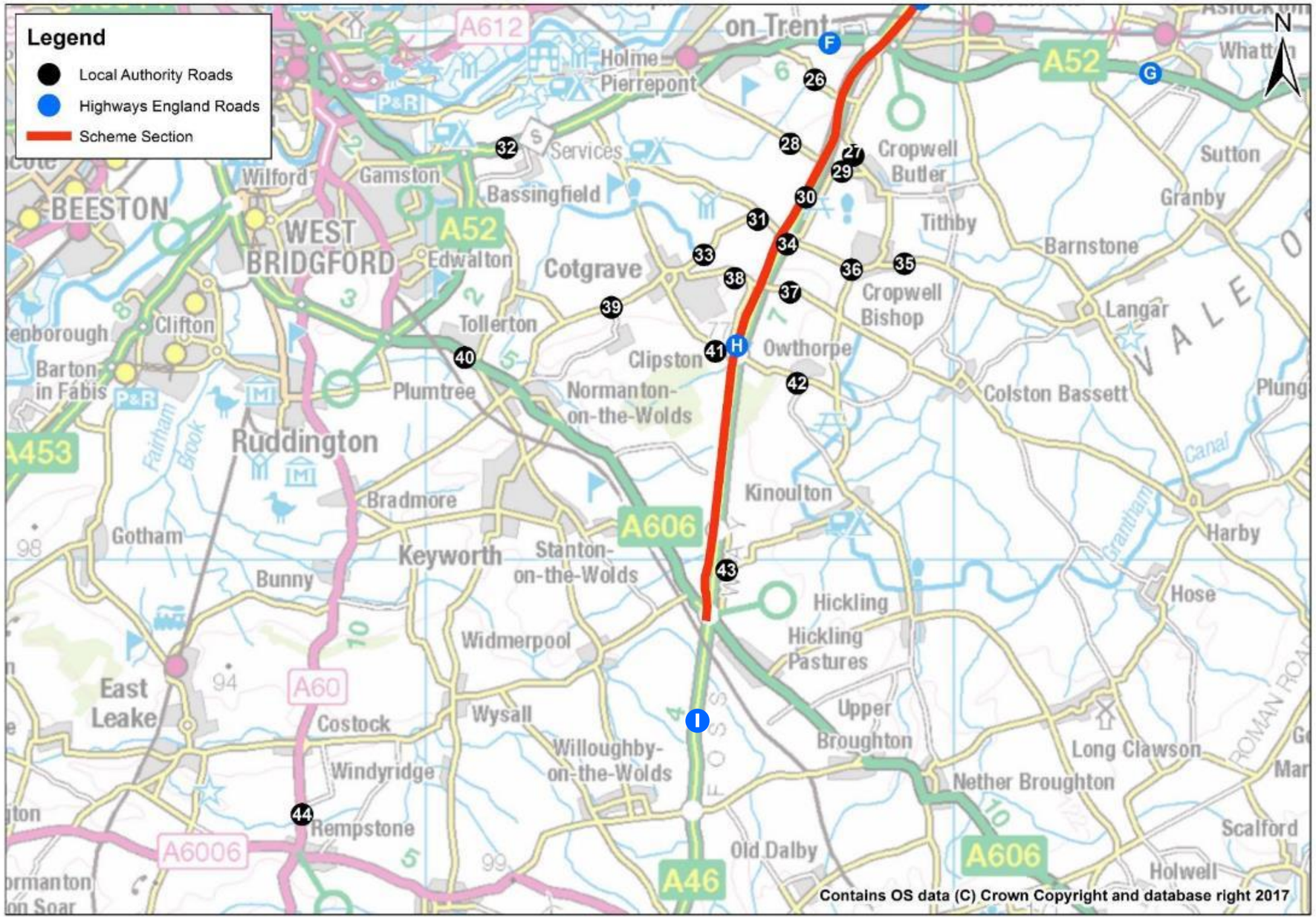
2.9. As the forecasts are only provided for the A46 between Widmerpool (junction with A606) and Newark (Farndon roundabout) we are unable to provide a directly like-for-like comparison. In order to compare observed to forecast journey times, the impact of this additional link length at FYA has been taken into consideration in the commentary presented in this section.

Figure 2-1 Traffic Count Locations (Northern Section)



Highways England Roads	A	A46 , North of A1 Newark
	B	A46 Newark Bypass
	C	A1, South of Newark
	D	A46 between A6097 and Newark
	E	A46 between A52 and A6097
Local Authority Roads	1	A616 Great North Rd
	2	A617 Kelham
	3	B6386 Oxton Road
	4	A612 Nottingham Road
	5	Fosse Road
	6	B6166 Farndon Road
	7	Grange Lane
	8	Fosse Road
	9	Hawton Road
	10	Lodge Lane
	11	Inholms Lane
	12	A6097 Gunthorpe
	13	Red Lodge Lane
	14	Trent Lane
	15	A612 Nottingham Road
	16	Hawksworth Road
	17	Lodge Lane
	18	Kirk Hill
	19	Butt Lane
	20	East Bridgford Lane
	21	Tenman Lane
	22	Fosse Way
	23	Main Road, Newton
	24	Fosse Road

Figure 2-2 Traffic Count Locations (Southern Section)



Highways England Roads	F	A52 West of A46
	G	A52 East of A46
	H	A46 between A606 and A52
	I	A46 South of A606
Local Authority Roads	25	Chapel Lane
	26	Henson Lane
	27	Hardigate Lane
	28	Cropwell Road
	29	Cropwell Road
	30	Fosse Road
	31	Stragglethorpe Road
	32	A52 Radcliffe Road
	33	Hollygate Lane
	34	Nottingham Road
	35	Fern Road
	36	Nottingham Road
	37	Colston East
	38	Colston Gate
	39	Cotgrave Road
	40	A606 Melton Road
	41	Owthorpe Road
	42	Park Lane
	43	Kinoulton Lane
	44	A60 Rempstone
	45	A6097 Warren Hill

Background Changes in Traffic

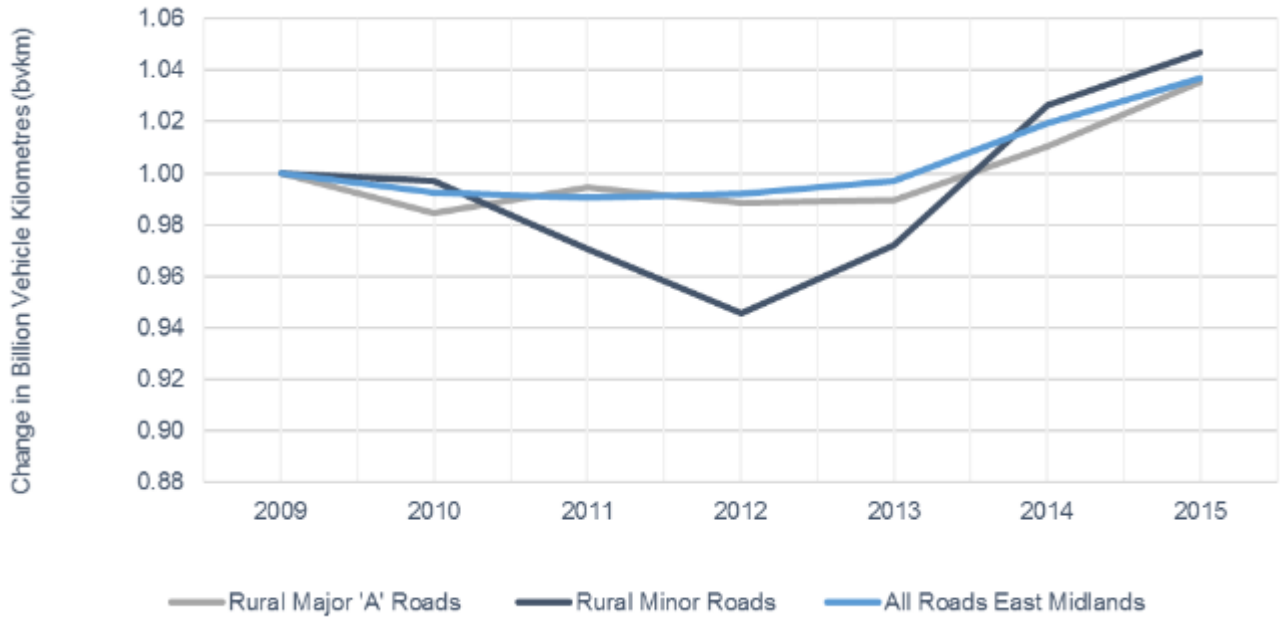
2.10. In previous POPE reports, evaluations have taken into account background traffic growth so that the traffic flows are directly comparable with the post opening counts. However, in light of the recent economic climate which has seen widespread reductions in motor vehicle travel in the United Kingdom (UK) as a whole since 2008, it is no longer deemed appropriate to use this method of factoring. More recently, POPE studies have taken a more considered approach to assess changes in the vicinity of the scheme, within the context of national, regional and locally observed background changes in traffic. This is an agreed POPE methodology.

2.11. This section will examine and discuss the national, regional and local trends in traffic flows.

National and Regional Trends

2.12. The DfT produces observed annual statistics for all motor vehicles by road type[2]. Data between 2009 (construction) and 2015 (latest available) has been used to understand changes in traffic volumes compared to a base year of 2009. **Figure 2-3** shows the nationally observed trends for all rural major 'A' roads (UK), rural minor roads (UK) and All Roads (East Midlands).

Figure 2-3 Nationally and Locally Observed Trends by Road Type



2.13. **Figure 2-3** shows that traffic levels on rural minor roads dropped between 2009 and 2012 (construction period of scheme) by approximately 5%. Since 2012, traffic levels on rural minor roads have increased rapidly. Traffic levels in 2015 on rural minor roads are higher than those experienced in the base year of 2009 by approximately 4.5%. In comparison, traffic levels on rural 'A' roads and all roads in the East Midlands have remained relatively constant compared to the base year, with fluctuations of up to 1.5% up until 2013. Since 2013, traffic levels have increased by approximately 3%.

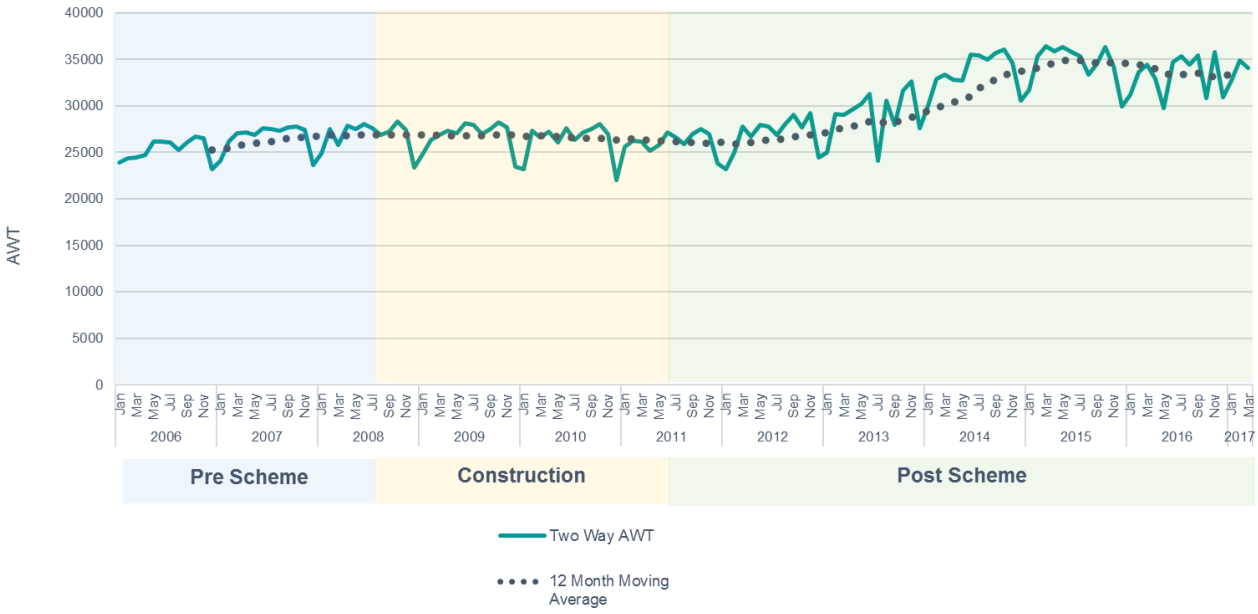
[2] Traffic Volume – kilometres (Table TRA0202): https://www.gov.uk/government/statistical-data-sets/tra02-traffic-by-road-class-and-region-kms

Traffic by local authority - vehicle kilometres (Table TRA8904): https://www.gov.uk/government/statistical-data-sets/tra89-traffic-by-local-authority

Local Trends

2.14. This scheme involved a major upgrade of a strategic route. Therefore, the long-term average weekday traffic (AWT) from a site on the A46 directly south of the scheme section which remained operational during scheme construction (Site I), has been looked at between January 2007 and March 2017. **Figure 2-4** shows the long-term traffic trends at this location and a 12-month moving average.

Figure 2-4 A46 South of Widmerpool - Long Term Trends



2.15. Based on the 12-month moving average, **Figure 2-4** shows that prior to scheme construction, traffic levels on the A46 remained relatively consistent. During construction, there was a very slight reduction in traffic, which is likely to be due to the speed and lane restrictions in force and vehicles using alternative routes. Post-scheme opening traffic levels on the A46 have continued to increase year on year, recently levelling out from mid-2016 onwards. This suggests that that more traffic has been drawn onto the A46 following implementation of the scheme.

2.16. Taking into account the information presented in **Figure 2-3** and **Figure 2-4,** no adjustment for background growth has been made in the analysis presented in this report. However, the trends in traffic volumes at a national and local level should be considered when evaluating changes in traffic volumes in the vicinity of the scheme, as up to 4.5% of changes in traffic at this level may be due to growth in background traffic at a national and regional level.

Observed Traffic Flows

2.17. A comparison of pre- and five years post-opening 24-hour AWT flows has been conducted. The geographical location of these count locations is shown overleaf in **Figure 2-5** and **Figure 2-6** for the northern section of the scheme, and **Figure 2-7** and **Figure 2-8** for the southern section of the scheme. The boxes shaded in red show those located on the scheme section of the A46, whereas those in grey are those outside of scheme section of the A46. The values presented in these figures have been rounded. A full table comparing pre-scheme, one year post-opening and five years post-opening is presented in **Appendix A.**

Figure 2-5 Average Weekday Traffic (AWT) Northern Scheme Section

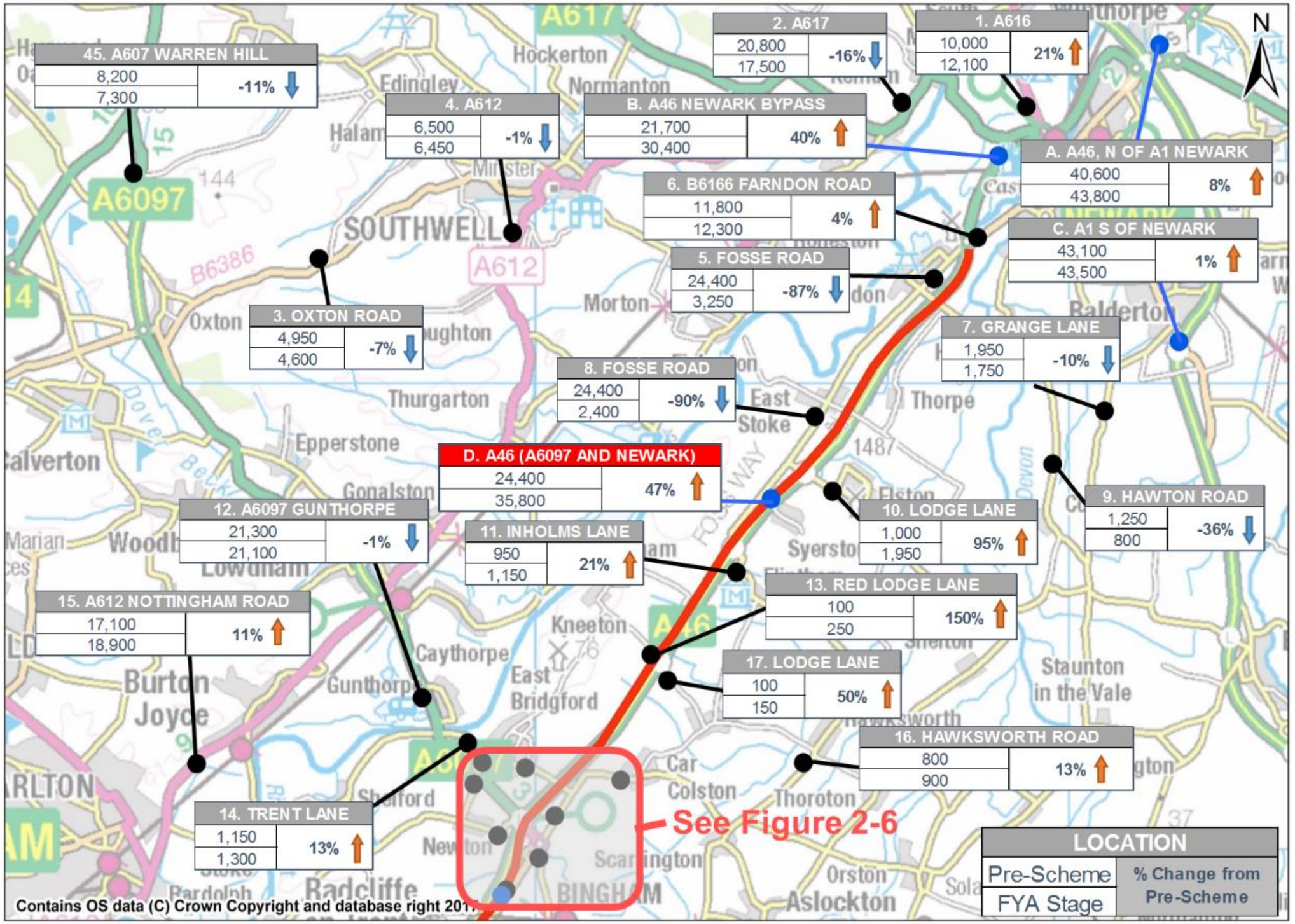


Figure 2-6 Average Weekday Traffic (AWT) Northern Zoom Section

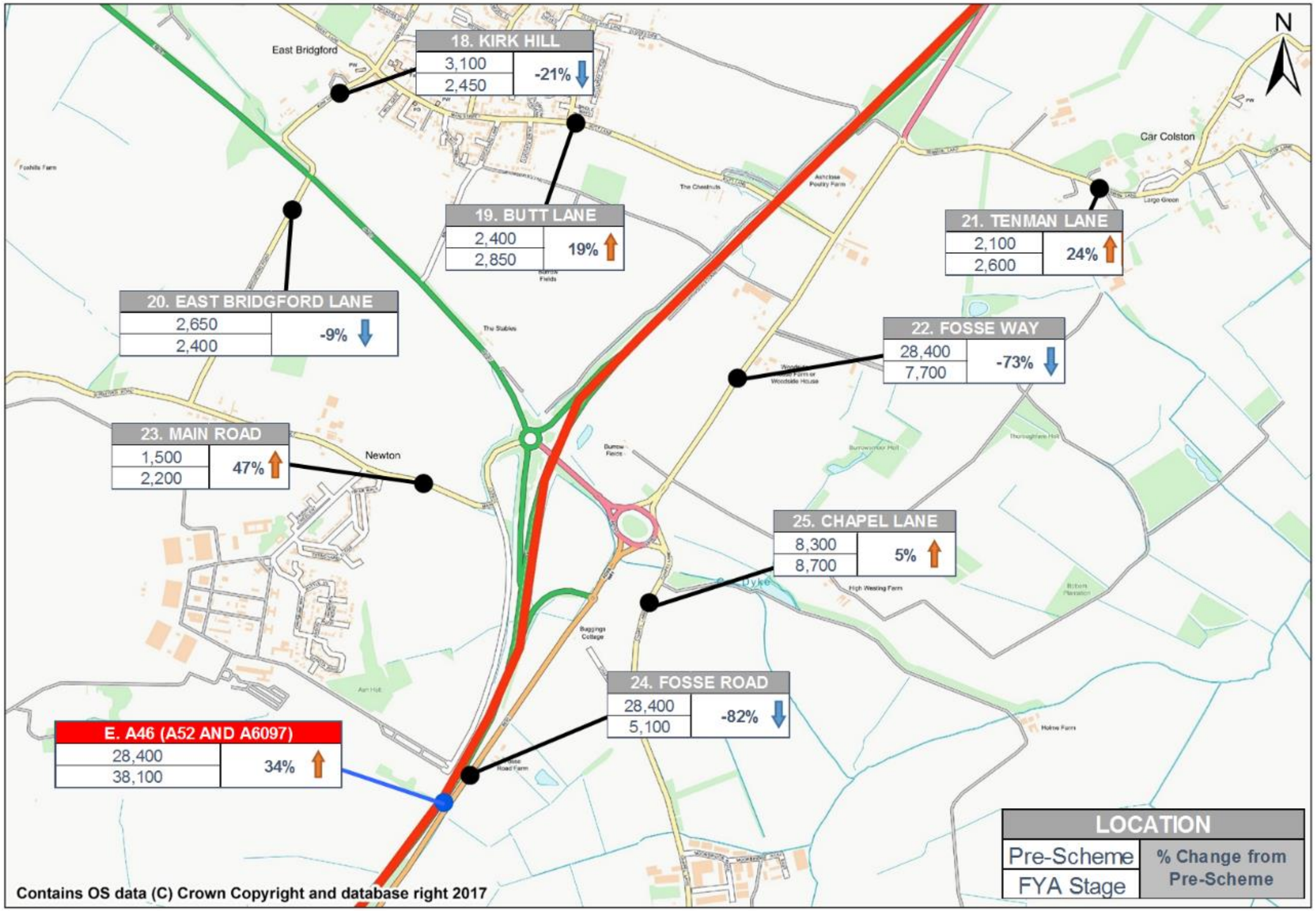


Figure 2-7 Average Weekday Traffic (AWT) Southern Scheme Section

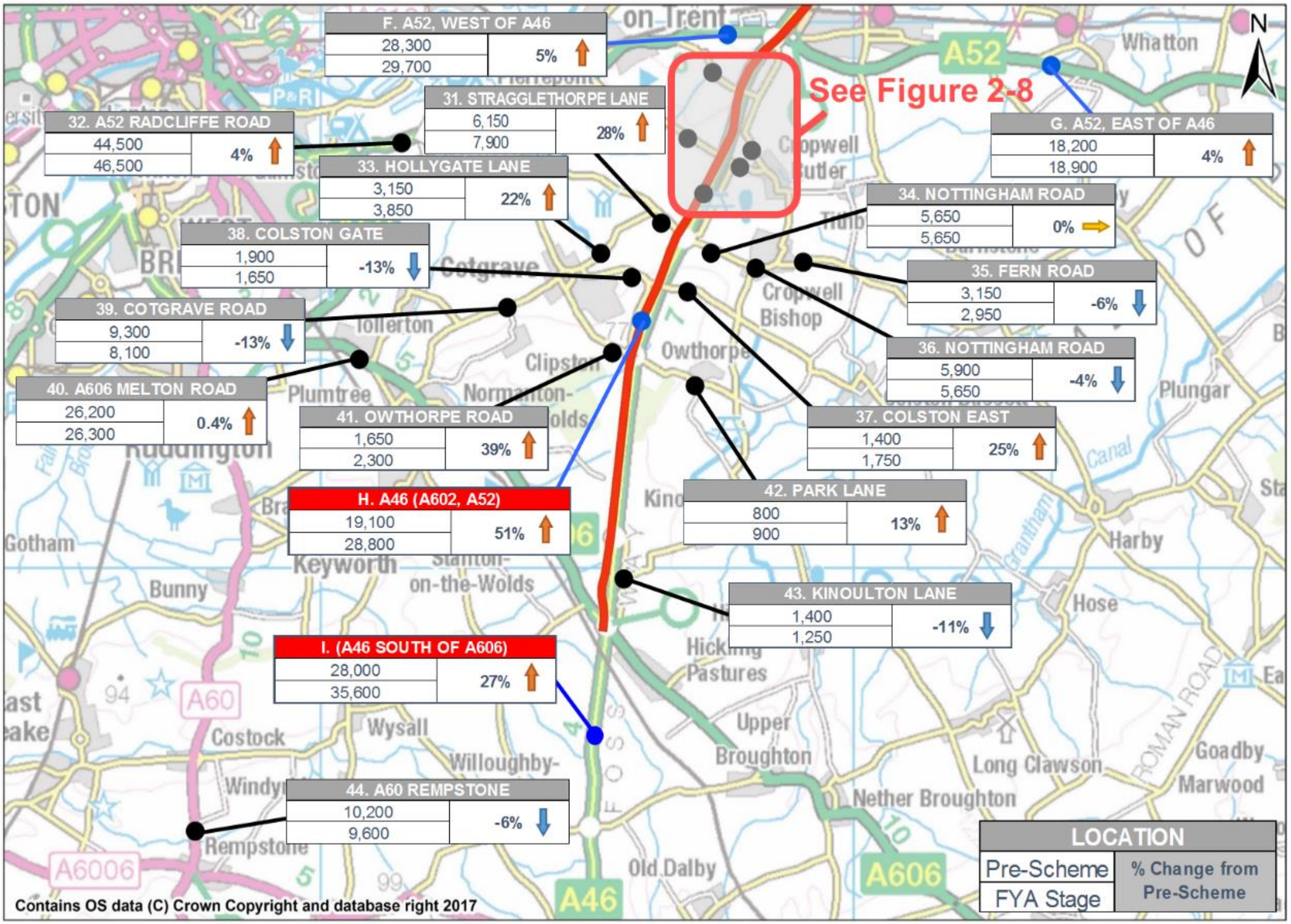
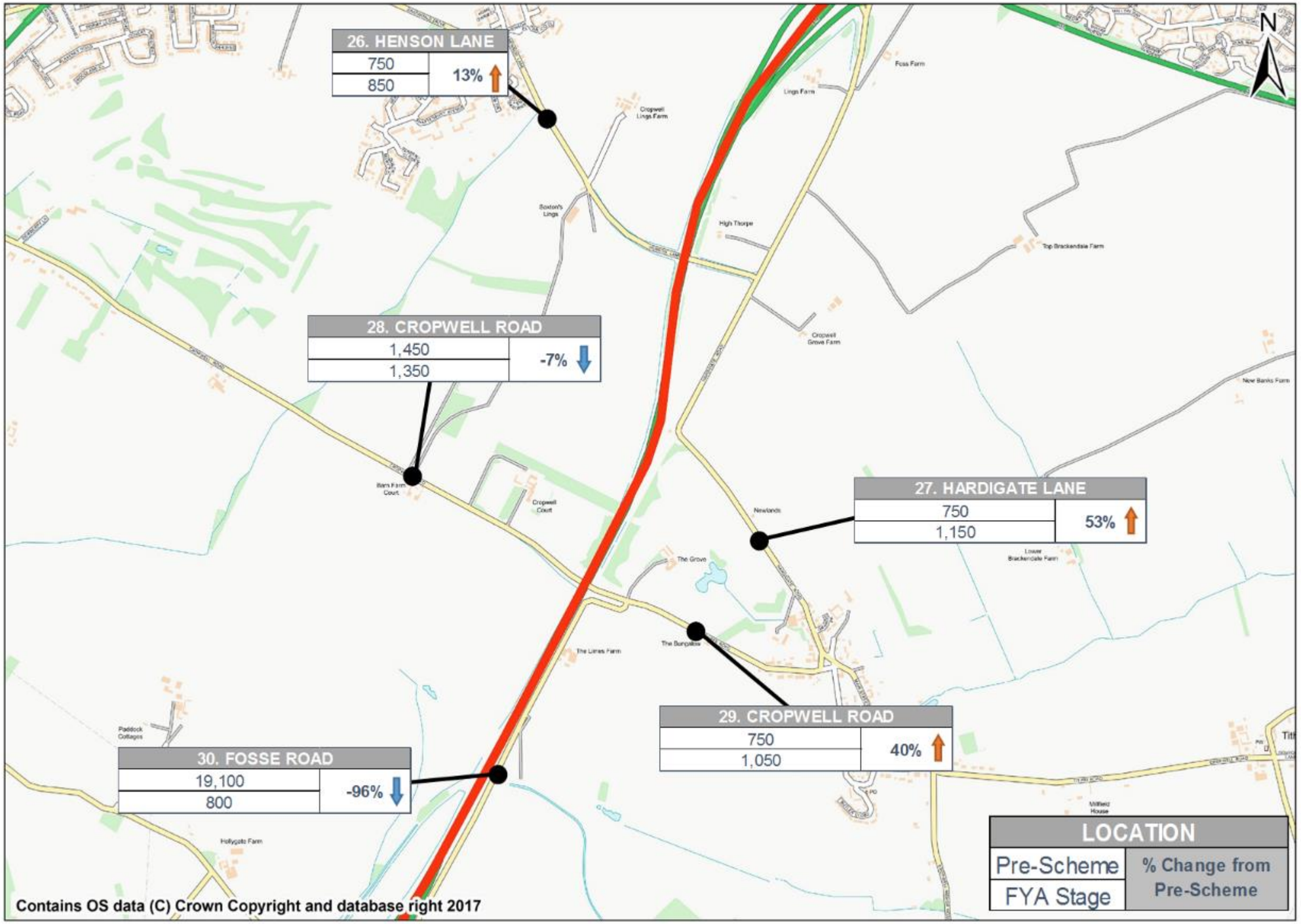


Figure 2-8 Average Weekday Traffic (AWT) Southern Zoom Section



Northern Section

2.18. The key observations to note from **Figure 2-5** to **Figure 2-6** are described within this section. As noted earlier in this section, it should be taken into consideration that up to 4.5% of traffic growth between pre- and post-scheme may be as attributed to background growth.

A46 and Major Roads

- The volume of traffic using the improved A46 dual carriageway between Newark and Widmerpool has increased along the length of the scheme. At the northern extent of the scheme between the A6097 and Newark, traffic volumes have increased by 47% (Site D) compared to pre-scheme, an increase of 11,400 vehicles per day (vpd).
- There has been a considerable reduction in the volume of traffic using the old alignment of the A46 at sites 5, 8, 22 and 24. These sites have experienced a reduction in traffic of between 20,700 to 23,000 vpd which equates to a reduction of between 73% to 90%. This would indicate that vehicles use the A46 for longer distance trips and have transferred to the upgraded dual carriageway. This is in line with findings at the OYA post-opening evaluation.
- There has also been an increase in traffic on the A46 Newark Bypass, to the north of the scheme of 40% (8,700 vpd). This is in line with increases on the scheme section and can therefore be attributed to the improvements implemented. Again, this is consistent with findings at the OYA post-opening evaluation.
- The A1 (Site C) has experienced a small decrease in traffic of 1%. **Figure 2-3** shows that major rural A roads have experienced an increase of between 3% and 4%. Therefore, this would suggest that there has been a small amount of re-assignment from the A1 onto the A46 as a result of the scheme.

Other Local Roads

- There has been a small increase of 4% in traffic on the B6166 Farndon Road (Site 6), from which vehicles travelling along the A46 can access Newark. Taking into consideration the growth and traffic volumes on the A46 Newark Bypass (Site B), this suggests that vehicles travelling along the A46 mostly route onwards along the Newark Bypass rather than travelling along the B6166. This is in line with findings at the OYA opening evaluation.
- Site 7 and 9, minor rural roads to the east of the scheme, have experienced a decrease in traffic volumes of 10% and 36%, respectively. This indicates that the scheme has successfully reduced the number of vehicles using this route to rat-run into Newark, avoiding congestion on the A46. This is in line with findings at the one-year post-opening evaluation.
- The minor rural roads to the north of Bingham have experienced proportionally large increases in traffic volumes, between Red Lodge and Lodge Lane Junctions sites 10 and 13). This may be due to the changes in access arrangements at these junctions. Although the percentage increases may be proportionately large, the changes in terms of vehicle numbers are relatively small. This is in line with findings at the one-year post-opening evaluation.
- Surrounding Bingham, there has been a considerable increase in traffic on Main Road (Site 23) which may be due to the continued construction of the RAF housing development, which has progressed since the publishing of the one-year post-opening report for this scheme. This site has experienced an increase in traffic whilst East Bridgford Lane (Site 20) has experienced a decrease, which may be due to the new direct access onto the A6097 at Saxondale junction providing a more attractive route that via signalised junction at the East Bridgford Lane/A6097 junction.
- Of the two sites in East Bridgford, one has experienced reduction in traffic (Kirk Hill – Site 18) and the other has experienced an increase in traffic (Butt Lane – Site 19). This is likely to be due to local traffic travelling into Bingham from areas to the west of the A46 along the A6097, routeing via Butt Lane to avoid navigating two roundabouts and the signalised

junction between A6097 and Kirk Hill. This is in line with findings at the one-year post-opening evaluation.

Southern Section

2.19. The key observations to note from **Figure 2-7** and **Figure 2-8** are as follows:

A46 and Major Roads

- The volume of traffic using the improved A46 dual carriageway between Newark and Widmerpool has increased along the length of the scheme. At the southern extent of the scheme between the A602 and A52, traffic volumes have increased by 51% (Site H) compared to pre-scheme, an increase of 9,700 vpd. This is in line with findings at the one-year post-opening evaluation. This is greater than any observed background growth between pre- and post-scheme.
- The sites on the A52 to the east, and west of the A46 have experienced a small increase in traffic of 4% and 5%, respectively. Taking into account background growth, this would suggest that the scheme has not contributed to changes in traffic along these routes.
- To the south of the junction with the A606, the volume of traffic has increased by 27% (Site I), equating to an increase of 7,600 vehicles. This suggests that the scheme may have drawn traffic onto the A46 for longer distance journeys through the East Midlands and beyond. As the increase between pre- and post-scheme is larger at Site I, than H, this suggests that the scheme may also have increased traffic on the A606.

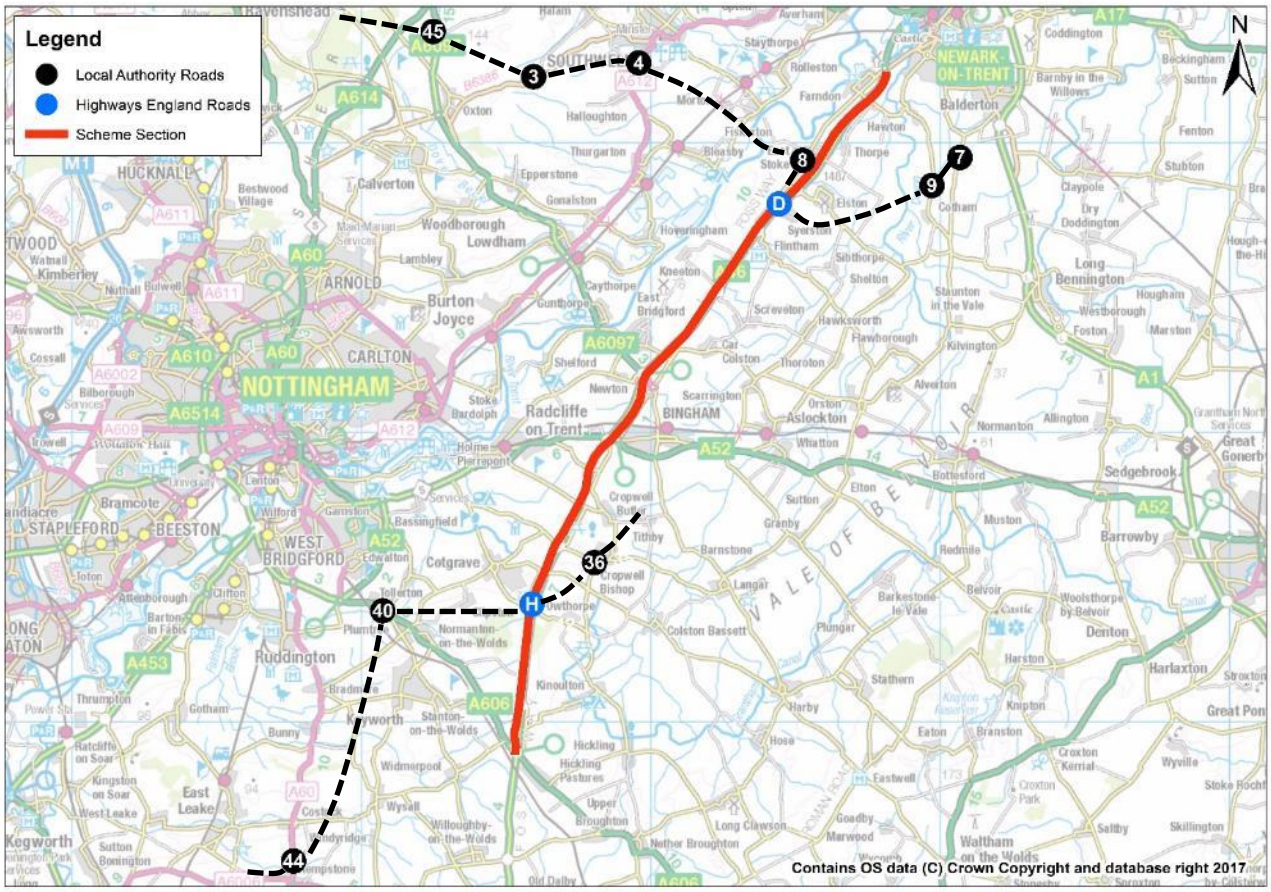
Other Local Roads

- Taking into consideration the role of background growth, the A606 Melton Road (Site 40) has not experienced any change in traffic volume. This is to be expected, as the scheme did not alter the layout of the junction between A606 and A46. If this junction had been altered, this may have affected the attractiveness of this route for traffic.
- Through the consultation process, Cropwell Bishop Parish Council expressed that the '*general view is that traffic through the village has increased in the last couple of years'.* Based on the traffic count data available at sites 35 and 36, this would suggest that traffic through the village of Cropwell Bishop has decreased (between 4% and 6%) between pre- and post-scheme.
- Sites 41 (Owthorpe Road) and 42 (Park Lane) have experienced increases in traffic, which is likely to be because of vehicles no longer being able to access the A46 to the north, at Colston Gate, and therefore accessing and egressing the A46 at Owthorpe junction.
- The increases in traffic at Site 31 (Stragglethorpe Lane) and at other sites (33, 41) to the west of the A46 coupled with small decreases at sites to the east of the A46 (35, 36), and a decrease at sites south of Owthorpe Road (38, 39) suggest that vehicles may be exiting the A46 at junctions south of that at Saxondale to avoid congestion on the A52 into Nottingham.

Screenlines

2.20. To understand the impact of any potential reassignment as a result of the scheme, a screenline analysis has been undertaken for the screenlines identified in **Figure 2-9.** This allows for a better analysis of total vehicle movements across a wider corridor. The intention is to count vehicles in only one location for each journey they make.

Figure 2-9 Screenline Locations



2.21. The results of the screenline analysis are shown in

2.22.

2.23. **Table 2-1** and **Table 2-2** for the northern and southern sections, respectively. As noted previously, it is important to take into consideration that up to 4.5% of growth can be accounted for by background growth.

Table 2-1 Northern Screenline Analysis*

Site	Description	Average Weekday Traffic (AWT)		Pre-Scheme to FYA Change	% Change
		Pre-Scheme (2009)	FYA (2017)		
45	A6097 Warren Hill	8,200	7,300	-900	-11%
3	B6386 Oxton Road	4,950	4,600	-350	-7%
4	A612 Nottingham Road	6,500	6,450	-50	-1%
8	Fosse Rd - south west of East Stoke (former A46 route)		2,400	2,400	
D	A46 between A6097 and B6166 (2009 - former route)	24,400	35,800	11,400	47%
7	Grange Lane, south of Balderton Grange	1,950	1,750	-200	-10%
9	Hawton Road, Cotham	1,250	800	-450	-36%
	Screenline Total	**47,250**	**59,100**	**11,850**	**25%**

*Values in table have been rounded

2.24. The data presented in **Table 2-1** shows that across the northern section of the scheme, AWT flows have increased by 11,850 equating to a 25% increase in traffic flows across the wider area. A proportion of this can be attributed to an increase in traffic on the mainline of the A46, which is predominantly as a result of re-assignment of traffic from other local roads, primarily at site 7 and 9. This may suggest that there is reduced rat-running along these local roads compared to pre-scheme. The increase experienced on the A46 mainline is greater than the decrease on other local routes which suggests that more traffic is using the A46.

Table 2-2 Southern Screenline Analysis*

Site	Description	Average Weekday Traffic (AWT)		Pre-Scheme to FYA Change	% Change
		Pre-Scheme (2009)	FYA (2017)		
44	A60 Rempstone	10,200	9,600	-600	-6%
40	A606 Tollerton	26,200	26,300	100	0%
H	A46 Northbound between A606 and A52	19,100	28,800	9,700	51%
36	Nottingham Road, Cropwell Bishop	5,900	5,650	-250	-4%
	Screenline Total	**61,400**	**70,350**	**8,950**	**15%**

*Values in table have been rounded

2.25. The data presented in **Table 2-2** shows that across the southern section of the scheme, AWT flows have increased by 2,250, equating to a 15% increase in traffic flows. The major change on this screenline is on the A46 mainline, where an increase of 51% has been observed.

2.26. **Figure 2-4** shows that to the south of the scheme section, there has also been a growth in traffic levels between pre-scheme and FYA opening evaluation. This suggests that as well as local traffic, longer distance traffic has also been drawn to the improved route.

Heavy Goods Vehicles (HGVs)

2.27. **Table 2-3,** overleaf, presents a comparison of HGV flows on the A46 for pre- and post-scheme periods.

Table 2-3 HGV* Flows on A46

Site	Location	Before (May 2009)			FYA (March 2017)		
		AWT	HGV	HGV%	AWT	HGV	HGV%
H	A46 between A606 and A52	19,100	4,300	23%	28,800	6,200	22%
E	A46 between A52 and A6097	28,400	5,950	21%	38,100	7,900	21%
D	A46 between A6097 and B6166	24,400	4,950	20%	35,800	7,300	20%

* Vehicles longer than 5.2m

2.28. **Table 2-3** shows that post-scheme the number of HGVs using the A46 mainline has increased, but the proportion for which they account for has remained the same at approximately 20 – 22% across the scheme section. This suggests that the majority of HGVs are using the scheme for long distance trips along the A46 rather than local trips.

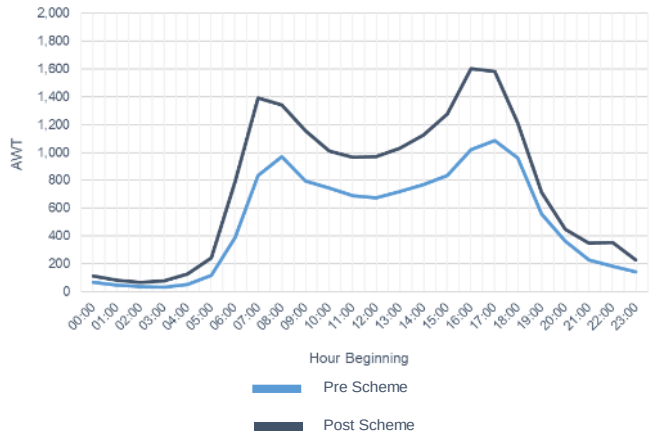
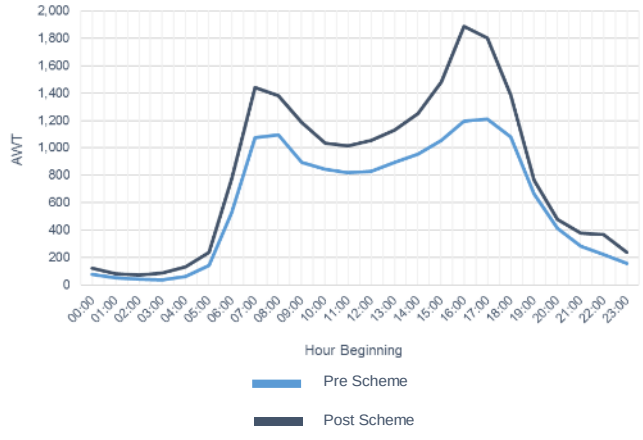
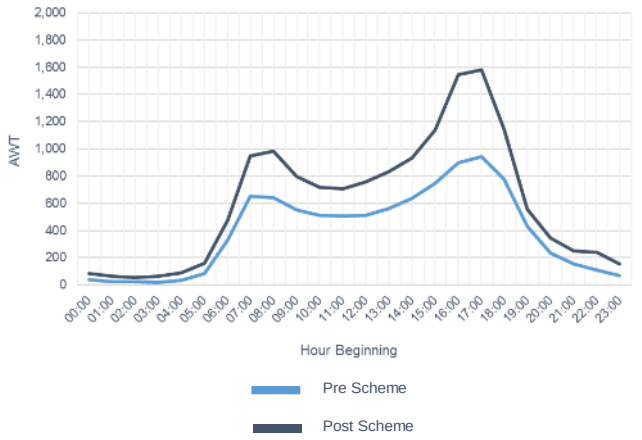
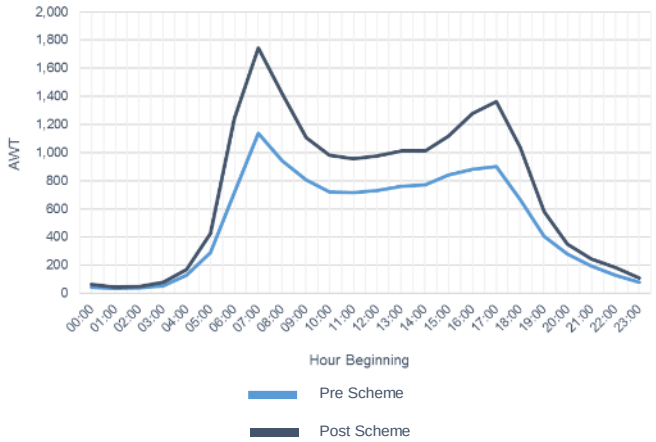
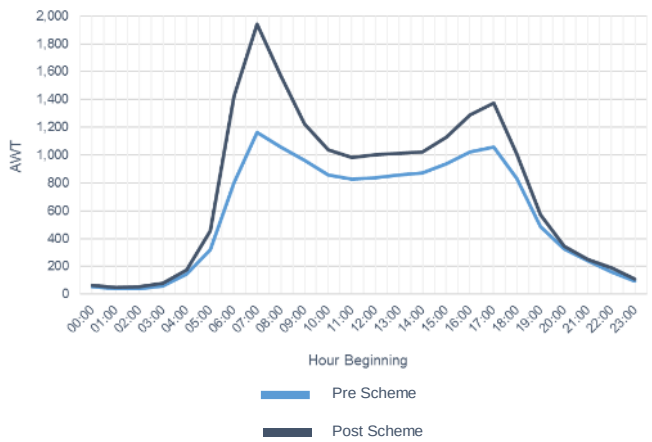
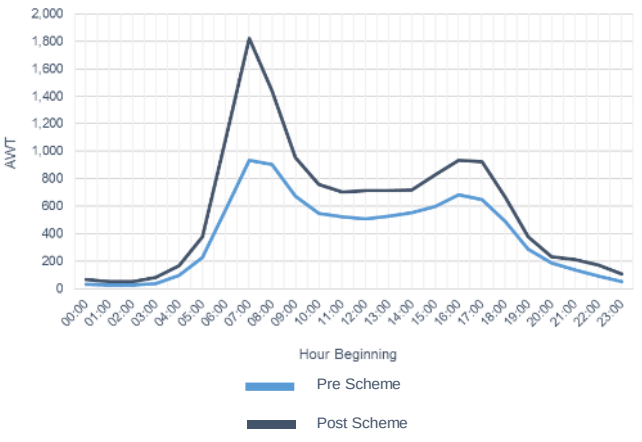
Hourly Flows on A46

2.29. The previous section of this report has demonstrated that the A46 has experienced a considerable increase in traffic flows since the dual carriageway opened, over what can be attributed to background growth. To understand and analyse daily change in more detail, traffic flows for March 2017 have been assessed by time of day for each of the main scheme sections, as shown in **Table 2-4,** overleaf.

2.30. **Table 2-4** shows that the majority of traffic growth along the scheme can be attributed to peak periods, with these time periods showing the largest difference between pre- and post-scheme traffic flows. The graphs also illustrate that traffic flows along the length of the scheme are tidal – with more traffic travelling northbound towards Newark in the AM peak, and southbound towards Leicester in the PM peak. This tidality is more pronounced post-scheme, compared to pre-scheme, across all three sections of the scheme.

2.31. These changes in daily traffic flow suggest that there was trip suppression during the pre-scheme period, especially during peak periods. Post-opening, the increased capacity of the route has allowed traffic that previously assigned to other local roads to use the A46 mainline. Across an average day, traffic flows on a number of local roads which may have been used as an alternative to the A46, have experienced a decrease in traffic flows. This is the case for longer and shorter distance trips as these observations are made throughout the three sections of the scheme, as well as in each individual section.

Table 2-4 Hourly Flows on the A46

	A6097 – Newark (Northern Section, Site D)	A6097 – A52 (Central Section, Site E)	A606 – A52 (Southern Section, Site H)
Northbound			
Southbound			

Forecast Traffic Flows

2.32. To ascertain the accuracy of predictions made during the pre-scheme appraisal process, modelled forecast flows from the pre-scheme appraisal, will be compared with observed flows. As part of the pre-scheme appraisal process, traffic flows for the Do Minimum (DM) and Do Something (DS) scenarios were calculated. The DM scenario accounts for traffic flows had the scheme not been implemented, conversely, the DS scenario reflects traffic flows following scheme implementation.

2.33. The forecast traffic flows have been reproduced from the Environment Statement Addendum (March 2007) and the information regarding the assumptions of the forecasting has been taken from the Traffic Forecasting Report Volume 1 (March 2007). The Environment Statement Addendum (March 2007) provides 24-hour AADT flows for the modelled area, whereas the Traffic Forecasting Report (March 2007) only provides 12-hour and 18-hour AADT for the A46.

Forecasting Assumptions

2.34. In order to understand and explain any potential differences between observed and forecast flows, it is key to develop an understanding of any assumptions made in the appraisal process.

2.35. All forecasting for the A46 Newark to Widmerpool Scheme was undertaken using a combination of SATURN (v.10.6.17) and DIADEM (v.2.1) traffic models. Traffic growth was forecast using NRTF 97 and TEMPro v5.3.

2.36. The geographical extent of the model used in the traffic forecasting is as shown in **Figure 3-1**, which included the A46 between Newark and Widmerpool, a short section of the A52 between Garnston and Bingham and the A606 to Tollerton (junction with A52). Minor routes through a number of the surrounding towns and villages were also included, for example East Bridgford, Bingham, Radcliffe on Trent, Cotgrave and Cropwell Bishop. Some of the sites included in this analysis which may form alternative routes to the A46, are outside of the modelled area for example, site 7 (Grange Lane) and 9 (Hawton Road). The model does not take into account re-assignment to/from the A46 at these sites.

2.37. 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 to allow for a direct comparison in this POPE evaluation, a proxy pre-scheme year forecast has been calculated using growth factors to enable comparison with the observed.

Network Improvement Assumptions

2.38. The base model was used a starting point for developing the future year network. The Traffic Forecasting Report considered a number of improvements to the road network would take place, as follows:

- M1 Widening (Junctions 21 to 30)
- A52 Improvements (preferred scheme including improvements along the A52 from Gamston to Saxondale, including a new off-line stretch to the south of the alignment at Radcliffe-on-Trent)
- A453 (M1 Junction 24 to A52) Improvements

The Traffic Forecasting Report concluded that these network improvements would have a minimal impact on flows on the A46 Newark to Widmerpool section.

Network Improvement Progress

2.39. The A453 widening scheme (M1 Junction 24 and A52 Nottingham) was completed in July 2015. Construction on this scheme, which involved widening the 7.5-mile (11.5km) section of

the scheme, started in January 2013. The one-year after opening report for the A453 widening scheme was published in Summer 2017.

2.40. At the time the appraisal for the A46 Newark to Widmerpool scheme was written, the A52 improvement had not been announced and therefore, did not constitute a committed scheme. Therefore, forecasts were made for both the A46 improvements without the A52 scheme, and also the A46 improvements and A52 improvements. At the time of writing this evaluation report, the first phase of the A52 scheme is currently in the construction phase (started in January 2017) for the Cropwell Road and Nottingham Road junctions[3]. Therefore, the forecast flows in this section refer to the scenario without the A52 improvements. It is understood that temporary diversion routes have been put in place at certain times, which may have an impact on local traffic movements in this area. The second phase of this improvement has not yet started.

Development Assumptions

2.41. The Traffic Forecasting Report for this scheme stated that no committed developments were found from Newark and Sherwood District Council outside the bounds of Newark, and within the study area. Initial plans to develop an area south of Newark for up to 5,000 houses over 20 years (starting in 2008) was highlighted. The Forecasting Report stated that this level of housing growth was within the bounds used in TEMPro for the Newark and Sherwood District, and that therefore, it was sufficient for TEMPro to be used to understand growth in the northern section of the scheme.

2.42. The Traffic Forecasting Report for this scheme identified two major developments within the Rushcliffe Borough, as follows:

- RAF Newton – redevelopment within the existing footprint for short-term industrial use (B2 and B8), to be fully completed by 2016; and
- Cotgrave Colliery – provision of 600 houses and 25 hectares of employment (B2 and B8), estimated to start construction in 2009 and be fully developed by 2016.

2.43. TEMPro was used to assess overall traffic growth within the southern area of the scheme, adjusted to take into account the RAF Newton and Cotgrave Colliery developments.

Development Progress To-Date

2.44. **Table 2-5** provides details of the progress to date at the development sites in the vicinity of the scheme. **Figure 2-10**, overleaf, shows the location of the development in relation to the scheme, shown by the red line.

[3] Highways England – A52 Nottingham Junctions, http://roads.highways.gov.uk/projects/a52-nottingham-junctions/ (Accessed: 21st March 2017)

Table 2-5 Development Progress To-Date

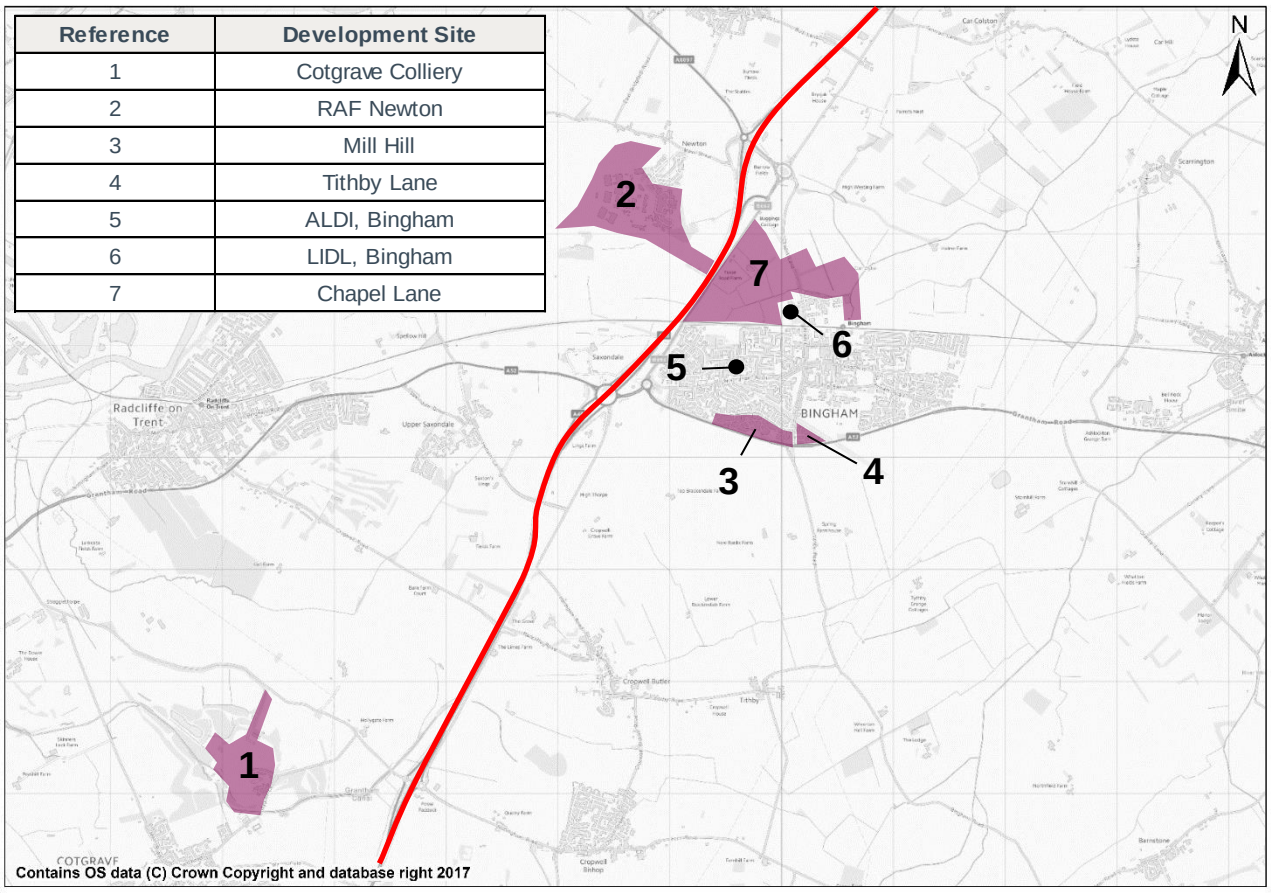
Site	Description	Development Progress (as of April 2017)
Newark Southern Link Road	The Southern Link Road (SLR) links the A46 to the west with A1 to the east, and is proposed to offer a relief road for the town centre and enable an urban extension. Planning permission was granted in 2011 to create a new access onto the A46 to link to the SLR [4]. Identified in the forecasting, but there was 'no certainty attached to the proposals' to was not included in the model.	Part of the SLR was completed in September 2016. This work included a new roundabout, street lights, pedestrian crossing, footpath and cycleway being provided on Bowbridge Lane, and a new junction with Hawton Lane[5].
Cotgrave Colliery (1)	This site has been allocated for 470 houses and approximately 4.5 hectares of employment use in the Local Plan Part 1: Core Strategy (adopted December 2014). Outline planning permission for both elements was granted in March 2011. The reserved matters application (13/01973/REM) for 450 dwellings with associated infrastructure, public open space and access in January 2014[6]. Development included in the model.	120 dwellings have been provided at the development, with a further 344 to be provided. The construction of the employment element has not yet started.
RAF Newton (2)	This site is allocated for 550 houses, approximately 6.5 hectares of employment development, a primary school, community centre and other facilities in the Local Plan Part 1: Core Strategy (adopted December 2014). Outline planning permission for 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) was granted in January 2014 (10/02105/OUT). Development included in the model.	Approximately 150 houses have been built at this development site.
Mill Hill (Bingham) (3)	This site was been granted planning permission for 224 dwellings.	All 224 dwellings have been built at this site.
Tithby Road (Bingham) (4)	This site was granted planning permission for 89 dwellings. Was considered to have 0% certainty at scheme appraisal, therefore was excluded from the model.	All 89 dwellings have been built at this site.
Chapel Lane (7)	This site was identified as a Strategic Allocation site in the Local Plan Part 1: Core Strategy (adopted December 2014). Outline planning permission for up to 1,000 houses, 15.6 ha of employment land, 1.6 ha mixed use site, neighbourhood centre (retail, community centre, etc.), amenity open space and community park (10/01962/OUT) was granted in December 2013. Included in the forecasting model.	Construction has not yet started at this site.
Retail Development in Bingham (5,6)	Two large supermarkets have been constructed in Bingham, one on Chapel Lane (2,160m^2 floorspace) and on Nottingham Road (1,254 m^2 floorspace). Not included in forecasting model or mentioned in the scheme appraisal.	Both sites opened in 2016.

[4] http://www.newarkfuture.net/ , Accessed 5th May 2017

[5] http://www.d2n2lep.org/news/first-preview-of-newark-southern-link-road-as-bowbridge-lane-reopens-to-the-public - Accessed 5th June 2017

[6] Rushcliffe Borough Council – Potential Large Developments, http://www.rushcliffe.gov.uk/developmentcontrol/potentiallargedevelopments/, Accessed 5th May 2017

Figure 2-10 Location of Development Sites



2.45. Since the A46 scheme has opened, a number of environmental weight limits have been imposed on the minor roads surrounding the scheme, some of which were in force at the one-year after evaluation stage and others which have been implemented since that report was published. These were not included in the appraisal of this scheme, and hence may have a small impact on HGV routeing in the vicinity of the scheme. It is likely that a number of these HGVs would have already re-routed into the A46 as a result of the scheme improvements, and so it is not anticipated that the implementation of these environmental weight limits will impact traffic flows considerably.

Forecast vs. Outturn Traffic Flows

2.46. As detailed previously, the accelerated nature of this scheme (opening year 2012, rather than 2016 as originally forecast) meant that forecast traffic flows used in this report have been factored using TEMPro to present equivalent forecast pre-scheme flows as follows to allow a direct comparison:

- 2009 – Pre-scheme
- DM and DS scenarios

2.47. A full summary of pre-scheme forecast and observed traffic flows pre-scheme at all comparable sites are shown in **Table 2-6.** Sites with a difference of +/- 15% have been highlighted.

Table 2-6 Traffic Flow Forecast vs. Observed ADT Without Scheme

Map Reference (Figure 2-1 and Figure 2-2)	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 section)**	25,900	23,000	-11%
E	A46 between A52 and A6097 **(scheme section)**	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 section)**	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%
8	Fosse Road, south west of East Stoke	24,800	23,000	-7%
10	Lodge Lane, Elston	980	910	-7%
11	Inholms Road, Flintham	650	880	36%
12	A6097, Gunthorpe	26,000	19,100	-27%
13	Red Lodge Lane	170	120	-30%
14	Trent Lane, East Bridgford	3,550	1,100	-69%
17	Lodge Lane, Screveton	80	100	16%
18	Kirk Hill, East Bridgford	1,850	2,750	52%
19	Butt Lane, East Bridgford	1,600	2,100	32%
20	East Bridgford Road, Newton	6,500	2,350	-64%
21	Tenman Lane	1,950	1,900	-1%
22	Fosse Way, south west of Butt Lane	27,600	23,000	-17%
25	Chapel Lane, Bingham	4,200	7,500	77%
26	Henson Lane, Radcliffe on Trent	1,650	670	-59%
27	Hardigate Road, Cropwell Butler	710	680	-4%
28	Cropwell Road, west of A46	1,750	1,350	-25%
29	Cropwell Road, east of A46	1,350	720	-47%
31	Stragglethorpe Lane, Cotgrave	5,800	5,400	-7%
33	Hollygate Lane, Stragglethorpe	3,900	2,900	-25%
39	Cotgrave Road, Cotgrave	7,100	8,600	22%
41	Owthorpe Road, Cotgrave	1,700	1,500	-11%
42	Park Lane, Owthorpe	840	740	-11%
43	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 14 (Trent Lane) were 69% lower than modelled, whilst site 18 (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 19 (Butt Lane) out of East Bridgford to the south also shows an observed flow 32% above the forecast.

- Site 25 (Chapel Lane, Bingham) shows observed flows in 2009 were 77% above that which was forecast.
- Most sites where traffic was considerably 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. Forecast flows for 2016 have been compared to observed post-opening flows for March 2017 for the DM and DS scenario. A full summary of forecast and observed traffic flows post-scheme at all comparable sites are shown in **Table 2-7.** Sites with a difference of +/- 15% have been highlighted.

Table 2-7 Traffic Flow Forecast vs. Observed ADT With Scheme

Map Reference	Location			
		Do Something Forecast AADT (2016)	FYA Observed ADT (2017)	% difference
B	A46 Newark Bypass	27,000	29,100	8%
D	A46 between A6097 and B6166 **(scheme section)**	34,900	33,400	-4%
E	A46 between A52 and A6097 **(scheme section)**	45,200	35,300	-22%
F	A52 West of A46	33,300	28,500	-14%
G	A52 East of A46	25,200	17,900	-29%
H	A46 between A606 and A52 **(scheme section)**	25,000	26,000	4%
I	A46 South of A606	29,400	35,600	21%
5	Fosse Road, Farndon	900	3,050	239%
6	B6166 Farndon Road, Newark (NE of A46)	13,600	11,400	-16%
8	Fosse Road, south west of East Stoke	2,200	2,150	-2%
10	Lodge Lane, Elston	2,100	1,750	-17%
11	Inholms Road, Flintham	820	1,050	28%
12	A6097, Gunthorpe	27,100	19,500	-28%
13	Red Lodge Lane	190	230	21%
14	Trent Lane, East Bridgford	1,900	1,200	-37%
17	Lodge Lane, Screveton	20	150	650%
18	Kirk Hill, East Bridgford	1,750	2,200	26%
19	Butt Lane, East Bridgford	2,450	2,550	4%
20	East Bridgford Road, Newton	4,600	2,150	-53%
21	Tenman Lane	2,050	2,400	17%
22	Fosse Way, south west of Butt Lane	6,300	7,200	14%
25	Chapel Lane, Bingham	2,850	8,000	181%
26	Henson Lane, Radcliffe on Trent	2,700	860	-68%
27	Hardigate Road, Cropwell Butler	570	1,150	102%
28	Cropwell Road, west of A46	1,400	1,350	-4%
29	Cropwell Road, east of A46	1,550	1,000	-35%
31	Stragglethorpe Lane, Cotgrave	10,800	7,700	-29%
33	Hollygate Lane, Stragglethorpe	8,900	3,500	-61%
39	Cotgrave Road, Cotgrave	9,400	8,500	-10%
41	Owthorpe Road, Cotgrave	1,550	2,400	55%

42	Park Lane, Owthorpe	2,350	840	-64%
43	Kinoulton Lane, Kinoulton	900	1,150	28%

2.50. The key points to note between the forecast and the observed traffic as shown in **Table 2-7** are as follows:

- On the scheme sections D and E, observed traffic flows were between 4 and 22% lower than forecast. At H, also in the scheme section, observed traffic flows were 4% higher than forecast.
- To the north of the scheme section, at site B, the observed traffic flows were 8% higher than those forecast. To the south of the scheme section, at site I, the observed traffic flows were 21% higher than forecast.
- At Site 25 (Chapel Lane) observed traffic flows were 181% higher than observed. The pre-scheme flows were also higher than forecast (77%). This suggests that outturn there is little evidence of considerable changes in traffic flow at this site.
- The observed traffic at sites near to the Cotgrave Colliery development site (31, 22, 39) are all lower than forecast, which is likely to be due to the majority of the development not yet being fully completed development as forecast.
- Site 5, part of the old route of the A46, appears to have inaccurate traffic forecasts. This is likely to be due to the local inaccuracies in forecasts due to routeing of traffic and access to the new A46.

2.51. **Table 2-8** shows the forecast impact for each site in terms of a percentage compared to the observed change.

Table 2-8 Forecast Impact vs. Observed Change

Map Reference	Location	Forecast Impact			Observed Change		
		DM AADT 2009	DS AADT 2016	% Difference	Pre-Scheme ADT 2009	Post-Scheme ADT 2017	% Difference
B	A46 Newark Bypass	21,800	27,000	24%	20,500	29,100	42%
D	A46 between A6097 and B6166 **(scheme)**	25,900	34,900	35%	23,000	33,400	45%
E	A46 between A52 and A6097 **(scheme)**	35,400	45,200	28%	26,700	35,300	32%
F	A52 West of A46	29,500	33,300	13%	26,900	28,500	6%
G	A52 East of A46	25,000	25,200	1%	17,200	17,900	4%
H	A46 between A606 and A52 **(scheme)**	19,600	25,000	28%	17,200	26,000	51%
I	A46 South of A46	26,500	29,400	11%	24,900	35,600	32%
5	Fosse Road (West of A46 RBT)	24,800	900	-96%	23,000	3,050	-87%
6	B6166 Farndon Rd	11,700	13,600	16%	11,100	11,400	3%
8	Fosse Road (South of Moor Lane)	24,800	2,200	-91%	23,000	2,150	-91%
10	Lodge Lane, Elston	980	2,100	114%	910	1,750	92%
11	Inholms Lane	650	820	26%	880	1,050	19%
12	A6097 Gunthorpe	26,000	27,100	4%	19,100	19,500	2%
13	Red Lodge Lane	170	190	12%	120	230	92%
14	Trent Lane	3,550	1,900	-46%	1,100	1,200	9%

Map Reference	Location	Forecast Impact			Observed Change		
		DM AADT 2009	DS AADT 2016	% Difference	Pre-Scheme ADT 2009	Post-Scheme ADT 2017	% Difference
17	Lodge Lane, Screveton	80	20	-75%	100	150	50%
18	Kirk Hill, East Bridgford	1,850	1,750	-5%	2,750	2,200	-20%
19	Butt Lane, East Bridgford	1,600	2,450	53%	2,100	2,550	21%
20	East Bridgford Lane, Newton	6,500	4,600	-29%	2,350	2,150	-9%
21	Tenman Lane	1,950	2,050	5%	1,900	2,400	26%
22	Fosse Way, south west of Butt Lane	27,600	6,300	-77%	23,000	7,200	-69%
25	Chapel Lane, Bingham	4,200	2,850	-32%	7,500	8,000	7%
26	Henson Lane, Radcliffe on Trent	1,650	2,700	64%	670	860	28%
27	Hardigate Lane, Cropwell Butler	710	570	-20%	680	1,150	69%
28	Cropwell Road, east of A46	1,750	1,400	-20%	1,350	1,350	0%
29	Cropwell Road, west of A46	1,350	1,550	15%	720	1,000	39%
31	Stragglethorpe Lane, Cotgrave	5,800	10,800	86%	5,400	7,700	43%
33	Hollygate Lane, Stragglethorpe	3,900	8,900	128%	2,900	3,500	21%
39	Cotgrave Road, Cotgrave	7,100	9,400	32%	8,600	8,500	-1%
41	Owthorpe Road, Cotgrave	1,700	1,550	-9%	1,500	2,400	60%
42	Park Lane, Cotgrave	840	2,350	180%	740	840	14%

2.52. The key points to note from **Table 2-8** are as follows:

- At site E (scheme central section), the scale of the forecast impact on the A46 was accurate to within 4%. However, at site D (northern section of scheme) and site H (southern section of scheme) the impact was underestimated by 10 and 31%, respectively.
- At some sites, an accurate forecast of change has been modelled, for example site G, 12 and 6.
- On the A52, to the west of the scheme, the forecasts were quite accurate (within 3%), but to the east, the forecasting is less accurate (within 7%)
- On the smaller local roads, the majority of forecasts have not materialised and in some cases an increase has been observed where a decrease has been forecast for example at Hardigate Lane (Site 27), Chapel Lane (site 25) and Lodge Lane (site 17).

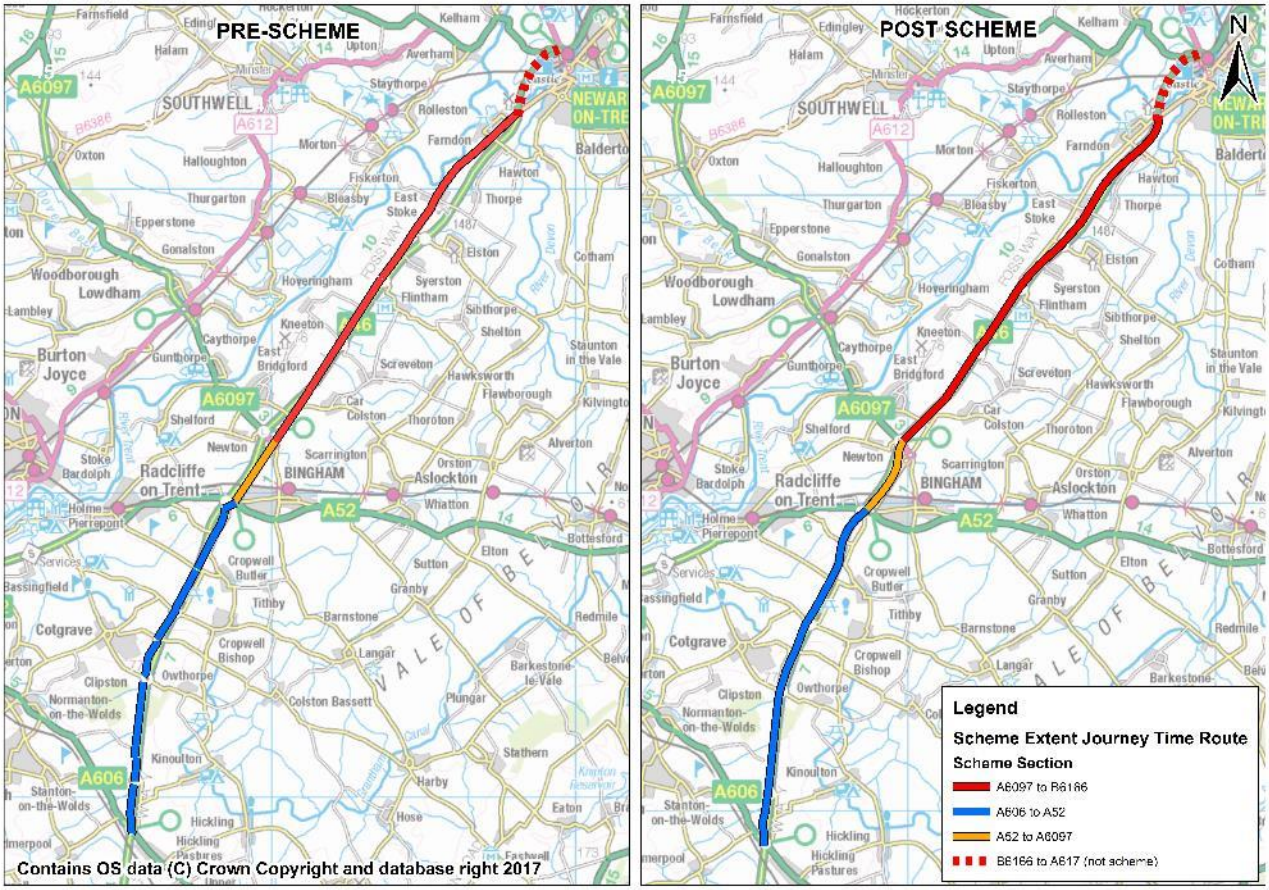
2.53. In summary, the larger differences in forecast and observed traffic flows are caused by growth assumptions which have not yet materialised to the scale forecast. This means that in many cases, the DM flows were higher than those observed pre-scheme, that is then maintained in the DS scenario. In addition, there appears to have been a reduced reassignment onto the A46 than forecast in the traffic model.

Journey Time Analysis

2.54. This section of the report considers the impact of the scheme on journey times along the length of the scheme. The analysis will compare the journey time differences between Newark and Widmerpool pre- and post-scheme on the two different routes as shown in **Figure 2-11,** and

compare these to forecast journey times. The data which was available for pre-scheme extends beyond the scheme section, hence, post-scheme the route has been extended to cover the same route to ensure consistency. Therefore, the results still represent that impact of the scheme on journey times between Newark and Widmerpool. The short section between the Farndon roundabout and the junction with the A617 was not changed as part of this scheme.

Figure 2-11 Journey Time Analysis Routes



2.55. Journey times have been collected for the following time periods to ensure comparison with forecast impacts:

- Weekday AM Peak (07:00 – 09:00)
- Weekday IP Peak (10:00 – 15:00)
- Weekday PM Peak (16:00 – 18:00)

Journey Time Results

2.56. This section compares the observed journey time results along the new dualled A46 scheme section with the pre-scheme results for the old route, between Widmerpool and the junction between A46 and A617 to the north of Farndon Roundabout.

2.57. Pre- and post-opening journey times are presented in **Table 2-9**, overleaf, for northbound and southbound for the three key time periods.

Table 2-9 Observed Journey Times (mm:ss)

Direction	Time Period	Observed Pre-Scheme (2009)	Observed FYA (2017)	Change	% Change
Northbound	AM Peak	29:54	16:44	**-13:10**	**-44%**
	Interpeak	27:36	16:10	**-11:26**	**-41%**
	PM Peak	31:06	19:13	**-11:53**	**-38%**
Southbound	AM Peak	28:18	17:00	**-11:18**	**-40%**
	Interpeak	26:54	15:54	**-11:00**	**-41%**
	PM Peak	31:12	15:05	**-16:07**	**-52%**

2.58. The results presented in **Table 2-9** show that journey times have decreased by over 11 minutes in all directions and time periods. This equates to a change of over 38%, which is a large journey time saving between pre- and post-scheme opening. The key points to note from **Table 2-9** are as follows:

- In a northbound direction, the largest decrease in journey times was observed in the AM (approximately 13 minutes), which suggests that the scheme has increased capacity and effectively reduced congestion during the time periods with the highest traffic flow.
- In the southbound direction, the largest decrease in journey times was observed in the PM Peak, which also experienced the highest journey time pre-scheme. A change of approximately 16 minutes was observed, which indicates that the scheme has effectively reduced congestion for vehicles travelling this route in the PM Peak.
- In the southbound direction, pre-scheme journey times varied by approximately 4 minutes, whereas, post-scheme, variability has been reduced to approximately 2 minutes, suggesting that journeys along this route are more predictable as a result of the scheme.
- In the northbound direction, observed journey times varied by approximately 3.5 minutes, whereas, post-scheme, **Table 2-9** demonstrates that this variability has been reduced to approximately 3 minutes, suggesting that journeys along this route are slightly more predictable as a result of the scheme.

2.59. The journey times presented in this section of the report show that there is evidence suggesting that traffic on the scheme section is free-flowing in both directions, and all time periods.

2.60. **Table 2-10** presents the observed post-scheme journey time for the Newark Bypass section. This information has been presented to understand the proportion of the overall journey times presented in **Table 2-11** which this section accounts for as it is not part of the scheme. This information cannot be provided for the pre-scheme journey times, due to the format of the data preventing it from being split up into smaller sections. Based on the posted speed limit and link length it is expected that during free-flow conditions that this section can be travelled in approximately 2 minutes, which shows this section is operating in free-flow during all time periods apart from for vehicles travelling northbound during the PM Peak. **Table 2-9** shows that the highest journey for the full route in 2017 was observed for vehicles travelling northbound during the PM Peak, at approximately 19 minutes, compared to 15-16 minutes in all other time periods. The increased journey time for this time period can mostly be attributed to the Newark Bypass, as shown in **Table 2-10,** which has an observed journey time of 4 minutes. It is likely that the increased traffic on the scheme section to the south of this section has had an impact on levels of congestion along the Newark Bypass, which only has one lane in each direction. This cannot be quantified due to the lack of pre-scheme data for the Newark Bypass in isolation

Table 2-10 Observed Journey Time on Newark Bypass (post-opening)

Direction	Time Period	Journey Time FYA observed journey times (mm:ss)
Northbound	AM Peak	02:12
	Interpeak	02:17
	PM Peak	04:05
Southbound	AM Peak	01:58
	Interpeak	01:56
	PM Peak	01:54

2.61. A consultation response from Cropwell Bishop Parish Council expressed concern regarding '*serious delays at A46/A617 and A46/A1/A17 junctions at Newark'*. Although these junctions are not within the key links of this scheme, congestion at these locations may have impacted journey times on the additional section on the A46 between B6166 and A617 used in this analysis.

2.62. Cropwell Bishop Parish Council also stated that the scheme has '*failed to reduce delays on the A52 at Saxondale'*. Whilst this section has demonstrated that the scheme has improved journey times through the scheme section, no analysis has been carried out about the impact of the scheme on journey times on other routes. It was also not an objective of the scheme to improve journey times through other strategic routes other than the M1 and A1. There is currently a major improvement scheme in the early stages of construction on the A52, which may reduce delays along this route.

Comparison to Forecast

2.63. The Traffic Forecasting Report Volume 1 (March 2007) presents journey time forecasts for DM and DS in 2016 (opening year). These are presented for each time-period, by direction in **Table 2-11.** Further breakdown of these journey times is not available.

2.64. The forecast journey times are for the scheme section between the A606 at Widmerpool and the junction with the B6166 at Farndon Roundabout. The observed journey times (both pre- and post-scheme) extend beyond the scheme itself at the northern end, part way around the Newark Bypass to the junction with the A617.

Table 2-11 Forecasts vs. Observed Journey Times on A46 (mm:ss)

Direction	Time Period	Forecast DM (2016)	Observed Pre-Scheme (2009)	Forecast DS (2016)	Observed FYA (2017)
Northbound	AM Peak	32:53	29:54	15:39	16:44
	Interpeak	26:10	27:36	15:07	16:10
	PM Peak	36:04	31:06	15:43	19:13
Southbound	AM Peak	32:25	28:18	15:21	17:00
	Interpeak	26:45	26:54	15:07	15:54
	PM Peak	29:50	31:12	15:12	15:05

2.65. The key points to note from the data presented in **Table 2-11** are as follows:

- Without the scheme, it was forecast that vehicles travelling northbound on the A46 during the PM Peak would have the longest journey time, in excess of 36 minutes. It was forecast that post-scheme; this would reduce to approximately 15 minutes.

- Post-opening observed journey times on the A46 are all between 15 and 19 minutes, all of which are higher than those forecast apart from for vehicles travelling in the southbound direction during the PM peak. However, this does reflect the slightly longer route used for the observed journey times and when this is taken into account, post-opening observed flows are below those forecast.
- In general, the forecast DM journey times are higher than those observed pre-scheme, which is likely to be due to the forecast traffic flows being higher than observed as shown in **Table 2-6**. In some time periods, the observed pre-scheme journey times are higher than those forecast in the DM scenario, however, taking into consideration the impact of the additional link length, the observed flows for the scheme section would be below those forecast.

2.66. In summary, the observed post-scheme opening journey times are all higher (i.e. longer journey time) than DS forecast journey times and forecast DM journey times are higher than those observed pre-scheme, which is mainly due to two reasons:

- The inclusion of the Newark Bypass in the observed journey times, but not in forecast journey times; and
- Observed traffic flows were lower than the forecast DM traffic flows, which means that forecast journey times will be higher than those observed.

Journey Time Reliability

2.67. Reliability is a sub-objective of the Economy objective, as set out in WebTAG, and refers to the impact of the scheme on improving journey time reliability. This section assesses the impact of the scheme on reliability, based on availability of existing data and guidance.

Appraisal

2.68. One of the objectives of the scheme was to improve journey time reliability for traffic using the A46 between Newark and Widmerpool. The AST states that the section to the south of the A52 at Saxondale would have a slightly beneficial improvement in 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-objectives as Moderate Beneficial.

2.69. Congestion Reference Flow (CRF) indicates the level at which the carriageway is likely to be congested in peak periods on an average day. The Business Case (2008)[7] for this scheme states that CRF was exceeded 94% of the time. This would lead to low levels of journey time reliability.

Evaluation - Route Stress Approach

2.70. A route stress based approach has been used to assess the reliability impacts of the scheme at the FYA opening evaluation stage, against forecasts. This method has been used as the detailed information in relation to changes in speed percentiles from satellite navigation data was not available for this scheme.

2.71. The Stress Factor for a specific link is defined as the ratio of the Annual Average Daily Traffic (AADT) flow to the 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 guidance 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%.

2.72. **Table 2-12** shows the route stress calculation using observed traffic data. The figures in brackets showed the adjusted stress figures in line with DfT guidance[8]. Observed traffic data for the central section of the scheme (A46 between A52 and A6097) has been used as a proxy

[7] A46 Newark to Widmerpool Improvement Business Case Version 3.2 (February 2012), Highways England

[8] http://www.dft.gov.uk/pgr/economics/rdg/multimodal/anewdealfortrunkroadsinengla5491?page=7

for calculating route stress for the whole length of the scheme. 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.

Table 2-12 Observed Changes in Route Stress

	Observed Before (2009)	Observed FYA (2017)
A46 scheme section (based onA52 to A6097)	96%	47% (75%)

2.73. **Table 2-12** shows that route stress has reduced from 96% to an adjusted 75% on the busiest scheme section. This indicates that the scheme has reduced the levels of congestion.

Key Points – Traffic

Traffic Flow Impacts

- The scheme has increased traffic on the new sections of the A46, with an increase of 34% (approximately 9,700 vpd) on an average weekday between the junction with the A52 and the A6097. On the northern section, traffic has increased by 47% (approximately 11,400 vpd) on an average weekday. On the southern section of the scheme, traffic has increased by 51% (approximately 9,700 vpd). This represents the highest percentage increase across the key links of the scheme. The majority of this increase occurs in the AM and PM peak periods.
- There has been a considerable reduction in the volume of traffic using the existing alignment of the A46, of between 20,700 and 23,000 vpd, equating to a reduction of between 73 and 90% of traffic through East Stoke and Farndon.
- There has also been a reduction on local roads which no longer directly provide access to the A46, and an increase on local roads which now provide direct access, due to local re-routeing. There is also evidence to suggest that rat-running through local roads has also been reduced.
- Screenline analysis for the northern and southern section, shows that there has been increase on both sections, suggesting that the increase observed on the scheme section is mostly due to reassignment of traffic from other local routes. On the northern section, traffic has increased by approximately 25% and 15% on the southern section.

Traffic Forecasting

- The traffic modelling used variable demand over a compact area, with much of the traffic growth dependent on urban growth in the surrounding local area for example at RAF Newton and the former Cotgrave Colliery.
- For the DM scenario, the traffic forecasting overestimated traffic flows on the major roads, including the scheme section. These sites are all between 6 and 31% lower than the central growth forecast.
- In the DS scenario, the traffic flows on the scheme section were also overestimated. On local roads, there also appears to be some inaccuracies, which is likely to be due to local development progress, local access to the A46 and errors in the DM forecasting.
- The main reason why the forecasts are higher than observed is due to there being less local growth than initially forecast.

Journey Times

- Vehicles using the A46 Newark to Widmerpool in both directions have experienced a considerable journey time saving in all time periods as a result of the scheme being implemented.
- During the AM Peak, savings of 13 minutes northbound and 11 minutes southbound were achieved. In the Interpeak, approximately 11 minutes of saving were achieved in both directions. The largest saving was found for vehicles travelling southbound during the PM peak, with 16 minutes of saving achieved.
- Route Stress analysis (a proxy for journey time reliability) has demonstrated that the scheme has successfully reduced the congestion on the busiest scheme section, and by implication on the rest of the scheme links.

Journey Time Forecasting

- The pre-scheme observed journey times (over a slightly longer route) are generally lower than forecast, apart from for the Interpeak in both directions. It is noted that pre-scheme observed traffic flows were generally lower than forecast.
- For the DS scenario, observed journey times are higher than forecast in all scenarios apart from in a southbound direction in the PM peak, which is likely to be due to the additional link length.
- In summary, the journey times through the scheme have improved considerably, but not to the level initially forecast.

3. Safety Evaluation

Introduction

3.1. This section of the report considers the impact of the scheme in terms of its success in addressing the objective of reducing collisions. The Environmental Statement (2007)[9] states that the existing alignment of the A46 showed '*high percentage of 'killed' and 'serious injury' accident types…which is contrary to that for a similar rural (i.e. 50 mph or more) single carriageway A and trunk roads in Nottinghamshire (including injury accidents at roundabout and junctions along their length)'* which further highlights the need for the scheme to address collisions. In addition, the Outline Statement of Case (2007) states '*the road also has a poor safety record – in the five years between 2001 and 2005 there have been 13 fatal, 56 serious and 222 slight accident. The existing A46 is generally straight, following the line of the old Road road, the Fosse Way. Overtaking is difficult, however, because of the undulating alignment and the many junctions and accesses to fields, farms and houses. Bridleways and footpaths also join and cross this section of the A46. Walkers, cyclists and horse riders find it difficult to cross because of the heavy traffic'*

3.2. In order to assess the impact of the scheme on collisions, this section analyses change in personal injury collisions (PICs) occurring in the five-year pre-construction period, and the FYA post-opening period. Evaluation of the scheme's impact on personal security has been undertaken through observations made whilst on a site visit and desktop analysis.

Data Sources

Forecast Safety Data

3.3. For the purposes of assessing the collision impact of the scheme, forecasts were produced for the number of collisions the scheme was forecast to save, together with the associated number of casualties and the monetary benefit of the savings. Forecasts of the impact of the 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 evaluation considers collision numbers; the economic impact of the change in collisions is evaluated in the 'Economy' section of this report.

Observed Safety Data

3.4. Collisions by their very nature include a random element and are somewhat unpredictable events. To ensure that this evaluation captures a time period where the scheme is the only known change, data has been obtained for the most recent five years prior to construction and four years nine months of post opening data. Due to timescale constraints, five years of post-opening data was unavailable at the time of writing this report, however, it is considered that four years, nine months of data is a sufficient timescale to analyse trends and measures the schemes success against objectives. Collision data was obtained from Nottinghamshire County Council (NCC) to cover the time periods shown in **Table 3-1.** This data has all been validated by the DfT[10].

[9] A46 Newark to Widmerpool Improvement, Environmental Statement (ES) – Volume 1, Scheme Information and Summary of Assessment (January 2007) prepared for Highways Agency by Balfour Beatty.

[10] The collision numbers may vary slightly from those presented in the OYA report due to data being obtained from different sources, and due to some of the data presented in the OYA report being un-validated at the time for analysis.

Table 3-1 Collision Study Periods

Study Period	Dates
Pre-Scheme	1st July 2004 to 30 June 2009 (5 years)
Scheme Construction	1st July 2009 to 31 March 2012 (2 years, 10 months)
Post-Scheme	1st April 2012 to 31st December 2016 (4 years, 9 months)

3.5. The collision data is based on the records of PICs (i.e. 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.

Personal Security

3.6. The assessment of personal security has been undertaken based on a site visit conducted on Wednesday 31st May 2017.

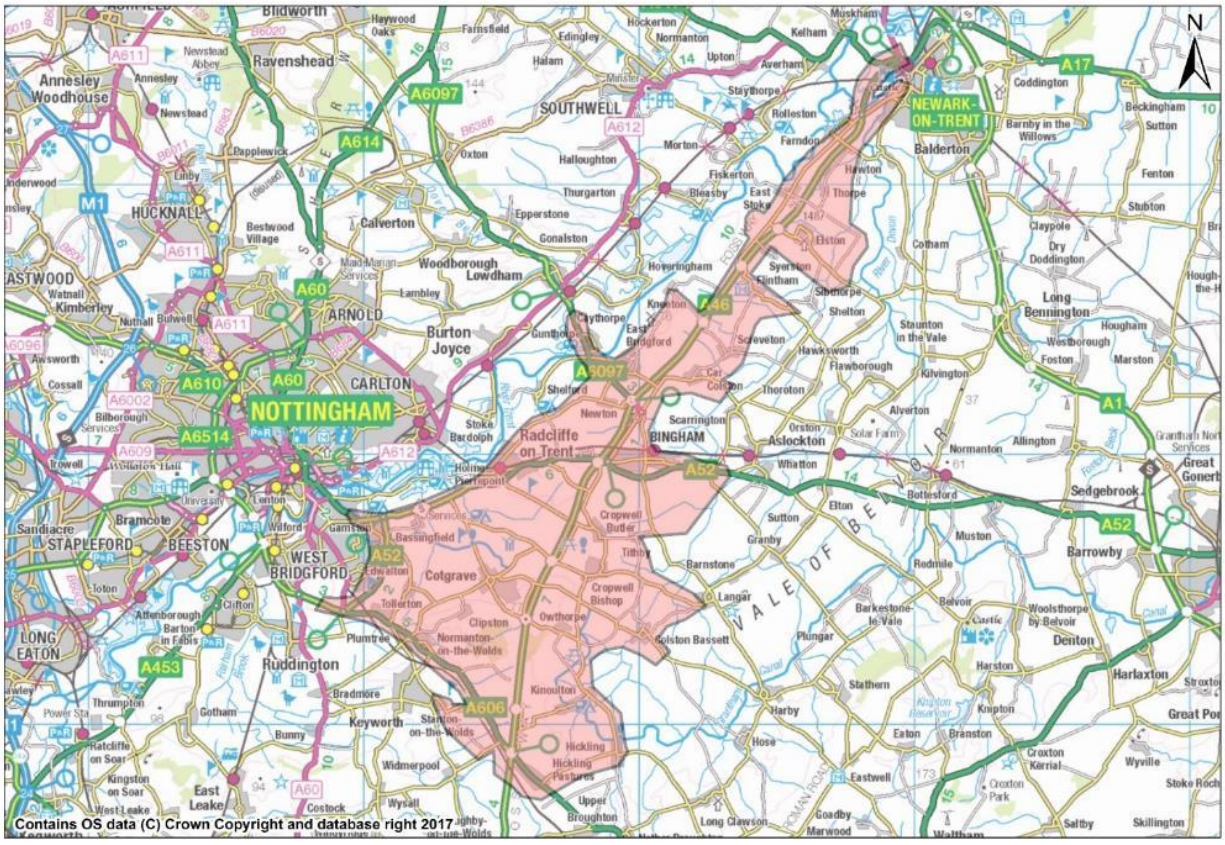
Collisions

Study Areas

3.7. For the purposes of this assessment, the geographical extent of the COBA model 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. To ensure a like-for-like comparison between the predicted and observed collision changes, the overall geographical area of analysis used for this study only includes links shown in the COBA modelled area[11]

[11] Economics Assessment Report (EAR) March 2007, prepared for the Highways Agency by Balfour Beatty.

Figure 3-1 COBA Modelled Area (shown in red)



3.8. Consideration has also been given to the impact of the scheme on safety on the A46 key link sections (main carriageway of the A46, slip roads and the old alignment of the A46). The scheme appraisal did not specifically consider the impact on the A46 key links (COBA output provides saving broken down by link), but has been considered in this report as it this is where the main changes in traffic are expected, and therefore safety.

Collision and Casualty Numbers

3.9. 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. Included in this section is an analysis of the changes in the number of collisions and associated casualties, as well as whether there has been any change in the relative severity.

3.10. The severity of a collision is determined by the highest severity of resulting casualties.

Background Collision Reduction

3.11. It is widely recognised over the course of the last decade, that there has been a year-on-year reduction in the number of personal injury collisions on the roads. This trend continues against a trend of increasing traffic volumes during much of that period. The reasons for this are wide ranging and include improved safety measures in vehicles and reduced numbers of younger drivers. Consideration of the background trends in collisions is required to understand the changes in collision numbers in the scheme area, pre-and post-scheme. If the scheme had not been built, collision numbers in the area are still likely to have reduced, in line with wider trends.

3.12. In this analysis, the number of collisions in the study area before and after the scheme was built have been compared. Although the net change is primarily associated with the scheme, this background reduction has been considered. It is considered that the best way to do this

is to assume that if the scheme had not been built, the number of collisions on roads in the study area would have dropped at the same rate as they did nationally during the same period[12]. This creates what is known as the 'counterfactual' scenario. This allows the counterfactual 'without-scheme' scenario to be compared on a like for like basis with the observed post-opening data which is the 'with scheme' scenario. The difference between the number of collisions in these two scenarios can then be attributed to the scheme, rather than national trends. This result will inform the calculation of monetised safety benefits by the scheme as discussed in the economy section of this report.

COBA Modelled Area

Evaluation of Collision Numbers and Severity

3.13. An evaluation of the pre- and post-scheme collision numbers by year for the whole of the COBA modelled area is shown in **Figure 3-1**, **Table 3-2** and **Figure 3-2.** The severity of a collision is defined by the most serious injury incurred. **Table 3-2** also includes the counterfactual without scheme collision values, which is comparable to the after data. It should be noted that where periods of less than one year have been 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 the grey stacked columns in **Figure 3-2.**

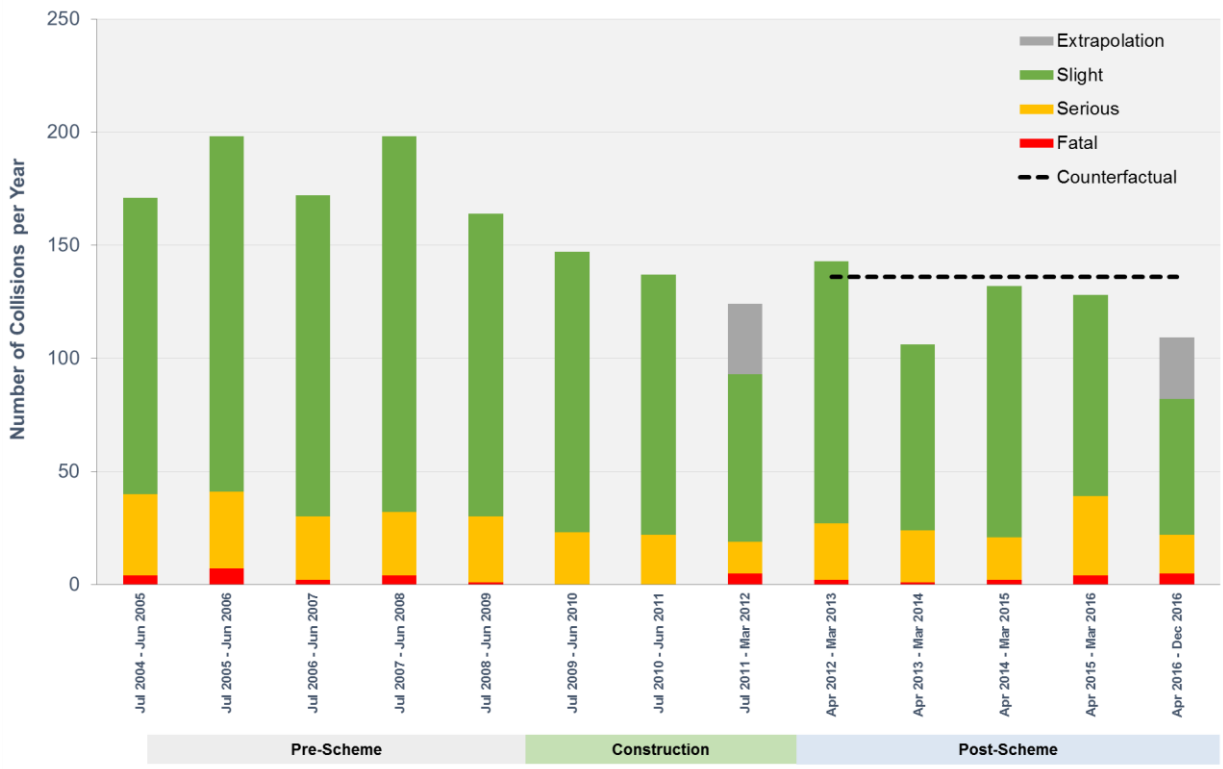
Table 3-2 Number of Observed Collisions by Severity for COBA Modelled Area

Study Period	From	To	Fatal	Serious	Slight	Total	Annual Average
Pre-Scheme	July 2004	June 2005	4	36	131	171	180.7
	July 2005	June 2006	7	34	157	198	
	July 2006	June 2007	2	28	142	172	
	July 2007	June 2008	4	28	166	198	
	July 2008	June 2009	1	29	134	164	
Without Scheme Counterfactual (adjusted for background reduction)[13]							136.0
Construction	July 2009	June 2010	0	23	124	147	137.1
	July 2010	June 2011	0	22	115	137	
	July 2011	March 2012	5	14	74	93	
Post-Scheme	April 2012	March 2013	2	25	116	143	124.4
	April 2013	March 2014	1	23	82	106	
	April 2014	March 2015	2	19	111	132	
	April 2015	March 2016	4	35	89	128	
	April 2016	December 2016	5	17	60	82	
Percentage change in average number of collisions per year			-18%	-19%	-34%	-	-

[12] National trends in collisions is sourced from DfT Table RAS100002

[13] Background (counterfactual) factor in collision numbers for all roads 2004 to 2015 was 0.752

Figure 3-2 Number of Observed Collisions by Severity for COBA Modelled Area



3.14. From **Table 3-2** and **Figure 3-2,** the following can be observed:

- The average number of collisions post-opening was 124.4 per annum and that this represents an 8.5% decrease (11.6 collisions) when compared to the without scheme counterfactual, in which an average of 136.0 collisions were recorded per annum. This is not a statistically significant result; and
- Post-scheme there was a reduction in the average number of fatal collisions per annum by 18%, and a reduction in the average number of serious collisions per annum by 19%.

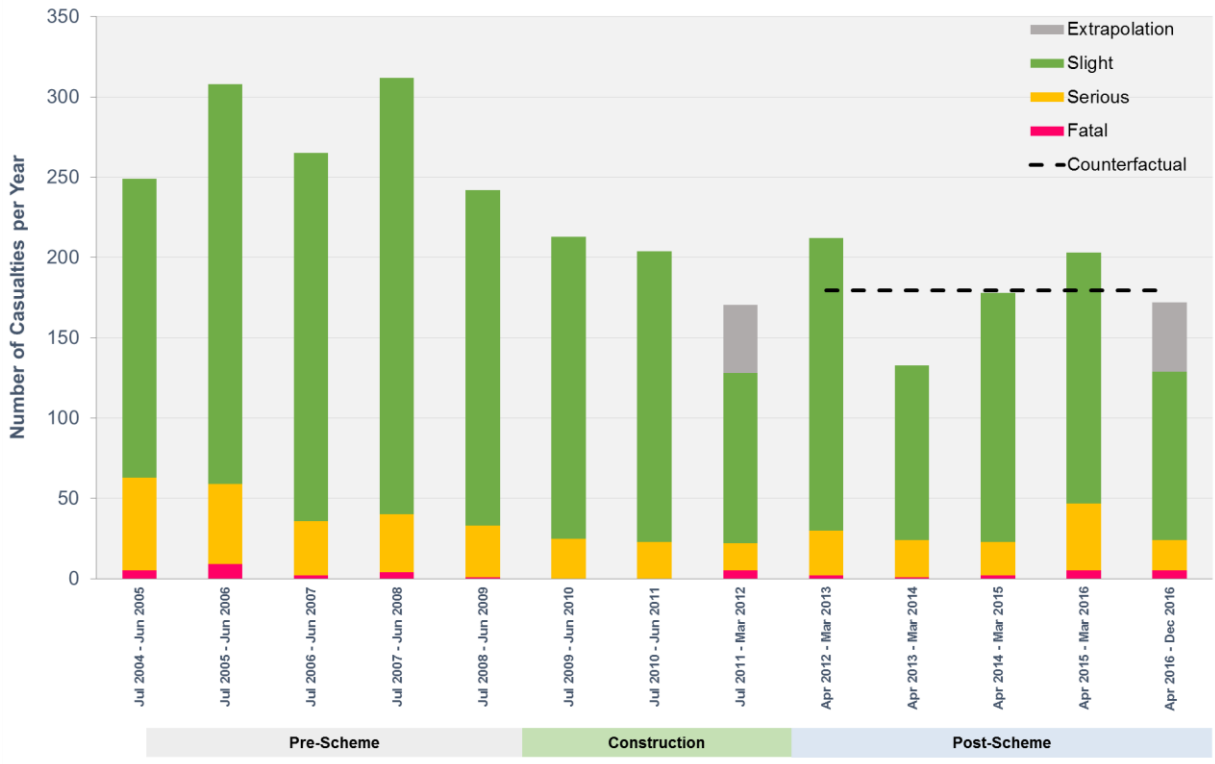
Evaluation of Casualty Numbers and Severity

3.15. An evaluation of the pre- and post-scheme casualty numbers by year for the whole of the COBA modelled area**,** is shown in **Figure 3-3** and **Table 3-3. Table 3-3** includes the counterfactual without scheme casualty values, which is comparable to the after data. It should be noted that where periods of less than one year have been displayed, the number of casualties for the period has been extrapolated to provide an equivalent number of casualties per year, the number of casualties added as a result of the extrapolation is shown as the grey stacked columns in **Figure 3-3.**

Table 3-3 Number of Observed Casualties by Severity for COBA Modelled Area

Study Period	From	To	Fatal	Serious	Slight	Total	Annual Average
Pre-Scheme	July 2004	June 2005	5	58	186	249	275.4
	July 2005	June 2006	9	50	249	308	
	July 2006	June 2007	2	34	229	265	
	July 2007	June 2008	4	36	272	312	
	July 2008	June 2009	1	32	209	242	
Without Scheme Counterfactual (adjusted for background reduction)[14]							179.2
Construction	July 2009	June 2010	0	25	188	213	198.2
	July 2010	June 2011	0	23	181	204	
	July 2011	March 2012	5	17	106	128	
Post-Scheme	April 2012	March 2013	2	28	182	212	180.0
	April 2013	March 2014	1	23	109	133	
	April 2014	March 2015	2	21	155	178	
	April 2015	March 2016	5	42	156	203	
	April 2016	December 2016	5	19	105	129	
Percentage change in average number of collisions per year			-25%	-33%	-35%	-	-

Figure 3-3 Number of Observed Casualties by Severity for COBA Modelled Area



[14] Background (counterfactual) factor number of casualties for all roads 2004 to 2015 was 0.653

3.16. From **Figure 3-3** and **Table 3-3,** we can conclude the following:

- The average number of casualties post-opening was 180.0 per annum and that this represents a slight increase when compared to the without scheme counterfactual in which an average of 179.2 casualties were recorded per annum.
- Post-scheme there was a reduction in the average number of fatal casualties per annum by 25%, and a reduction in the average number of serious collisions per annum by 33%.

Key Links

3.17. An analysis of the collision record for the A46 key links (A46 main carriageway and junctions, on/off slips, existing alignment of A46) 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 pre- and post-scheme collision numbers by year for key links on the A46, is shown in **Figure 3-4** and **Table 3-4.**

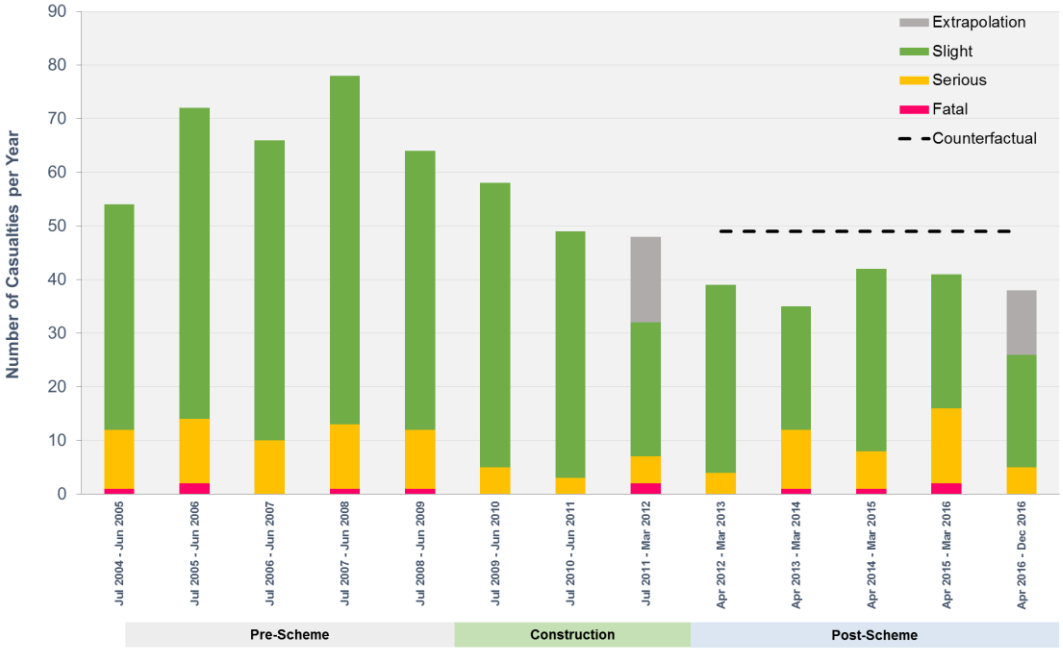
3.19. **Table 3-4** also includes the counterfactual without scheme collision values, which is comparable to the after data. It should be noted that where periods of less than one year have been displayed, the number of collisions for the period has been extrapolated to provide an equivalent number of collisions per year, the number of collisions added as a result of the extrapolation is shown as the grey stacked columns in **Figure 3-4.**

Table 3-4 Number of Observed Collisions by Severity for A46 Key Links

Study Period	From	To	Fatal	Serious	Slight	Total	Annual Average
Pre-Scheme	July 2004	June 2005	1	11	42	54	66.8
	July 2005	June 2006	2	12	58	72	
	July 2006	June 2007	0	10	56	66	
	July 2007	June 2008	1	12	65	78	
	July 2008	June 2009	1	11	52	64	
Without Scheme Counterfactual (adjusted for background reduction)[15]							49.0
Construction	July 2009	June 2010	0	5	53	58	50.5
	July 2010	June 2011	0	3	46	49	
	July 2011	March 2012	2	5	25	32	
Post-Scheme	April 2012	March 2013	0	4	35	39	38.5
	April 2013	March 2014	1	11	23	35	
	April 2014	March 2015	1	7	34	42	
	April 2015	March 2016	2	14	25	41	
	April 2016	December 2016	0	5	21	26	
Percentage change in average number of collisions per year			-16%	-23%	-47%	-	-

[15] Background factor in collision numbers for rural roads (excluding motorways) 2004 to 2015 was 0.733

Figure 3-4 Number of observed collisions on a yearly basis for A46 Key Links



3.20. From **Figure 3-4** and **Table 3-4,** the following can be observed:

- The average number of collisions post-opening was 38.5 per annum and that this represents a 21% decrease (10.5 collisions) when compared to the without scheme counterfactual scenario, in which an average of 49.0collisions were recorded per annum. This is a significant change.
- Post-scheme there was a reduction in the average number of fatal collisions per annum by 16%, and a reduction in the average number of serious collisions per annum by 23%.

Evaluation of Casualty Numbers and Severity

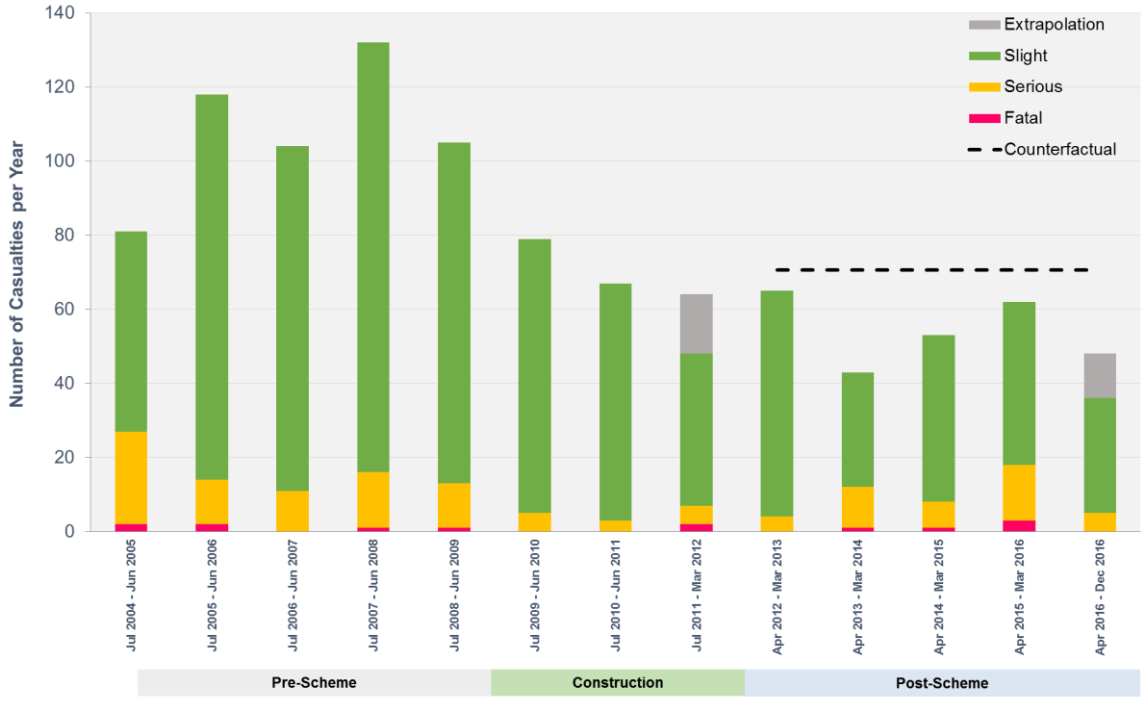
3.21. An evaluation of the pre- and post-scheme casualty numbers by year for the key links (A46 main carriageway and junctions, on/off slips and existing alignment of A46)**,** is shown in **Figure 3-5** and **Table 3-5**.

3.22. **Table 3-5** includes the counterfactual without scheme casualty values, which is comparable to the after data. It should be noted that where periods of less than one year have been displayed, the number of casualties for the period has been extrapolated to provide an equivalent number of casualties per year, the number of casualties added as a result of the extrapolation is shown as the grey stacked columns in **Figure 3-5.**

Table 3-5 Number of Observed Casualties by Severity for Key Links

Study Period	From	To	Fatal	Serious	Slight	Total	Annual Average
Pre-Scheme	July 2004	June 2005	2	25	54	81	108.1
	July 2005	June 2006	2	12	104	118	
	July 2006	June 2007	0	11	93	104	
	July 2007	June 2008	1	15	116	132	
	July 2008	June 2009	1	12	92	105	
Without Scheme Counterfactual (adjusted for background reduction)[16]							70.5
Construction	July 2009	June 2010	0	5	74	79	70.5
	July 2010	June 2011	0	3	64	67	
	July 2011	March 2012	2	5	41	48	
Post-Scheme	April 2012	March 2013	0	4	61	65	54.5
	April 2013	March 2014	1	11	31	43	
	April 2014	March 2015	1	7	45	53	
	April 2015	March 2016	3	15	44	62	
	April 2016	December 2016	0	5	31	36	
Percentage change in average number of collisions per year			-12%	-41%	-51%	-	-

Figure 3-5 Number of Casualties by Severity for Key Links



3.23. From **Figure 3-3** and **Table 3-3,** we can conclude the following:

- The average number of casualties post-opening was 54.5 per annum and that this represents a 23% decrease (16.0 casualties) when compared to the without scheme

[16] Background (counterfactual) factor number of casualties for all roads 2004 to 2015 was 0.653

counterfactual scenario, in which an average of 70.5 casualties were recorded per annum.

- Post-scheme there was a reduction in the average number of fatal casualties per annum by 12%, and a reduction in the average number of serious collisions per annum by 51%.

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.

3.25. **Table 3-6** provides a summary of the before and after opening collision severity indices by period (pre-scheme, construction, post-scheme) for the whole of the COBA modelled area, and key links.

Table 3-6 Collision Severity Index

Period	COBA Area	Key Links
	Average Collision Severity Index	Average Collision Severity Index
Pre-Scheme	19%	18%
Construction	17%	11%
Post-Scheme	23%	25%

3.26. **Table 3-6** shows that the collision severity index has increased in both the COBA modelled area and on the key links. Although, previous tables have shown that the number of total collisions on the scheme section and modelled COBA area has decreased, a corresponding decrease in severity has not been observed. This may be due to the increased speed limit along the route as a result of the scheme, and also the provision of an additional lane in comparison to the single lane provided pre-scheme implementation.

Further Collision Analysis

3.27. This section conducts a more detailed analysis of the collisions on the key links, in terms of weather, lighting conditions, location and involvement of non-motorised users (NMUs). Maps showing the location of these collisions are provided in **Figure 3-6** and **Figure 3-7**. This analysis does not consider causation factors as the data did not consistently include causation factors.

3.28. The proportion of collisions which occurred during darkness, with no lighting has increased between pre- and post-scheme, but the difference in the number of collisions is negligible with 18 and 20 occurring, respectively. Pre-scheme, some sections were unlit and others were lit at regular intervals. This suggests from the data available that although the A46 main carriageway is unlit, this has not had a detrimental impact on safety.

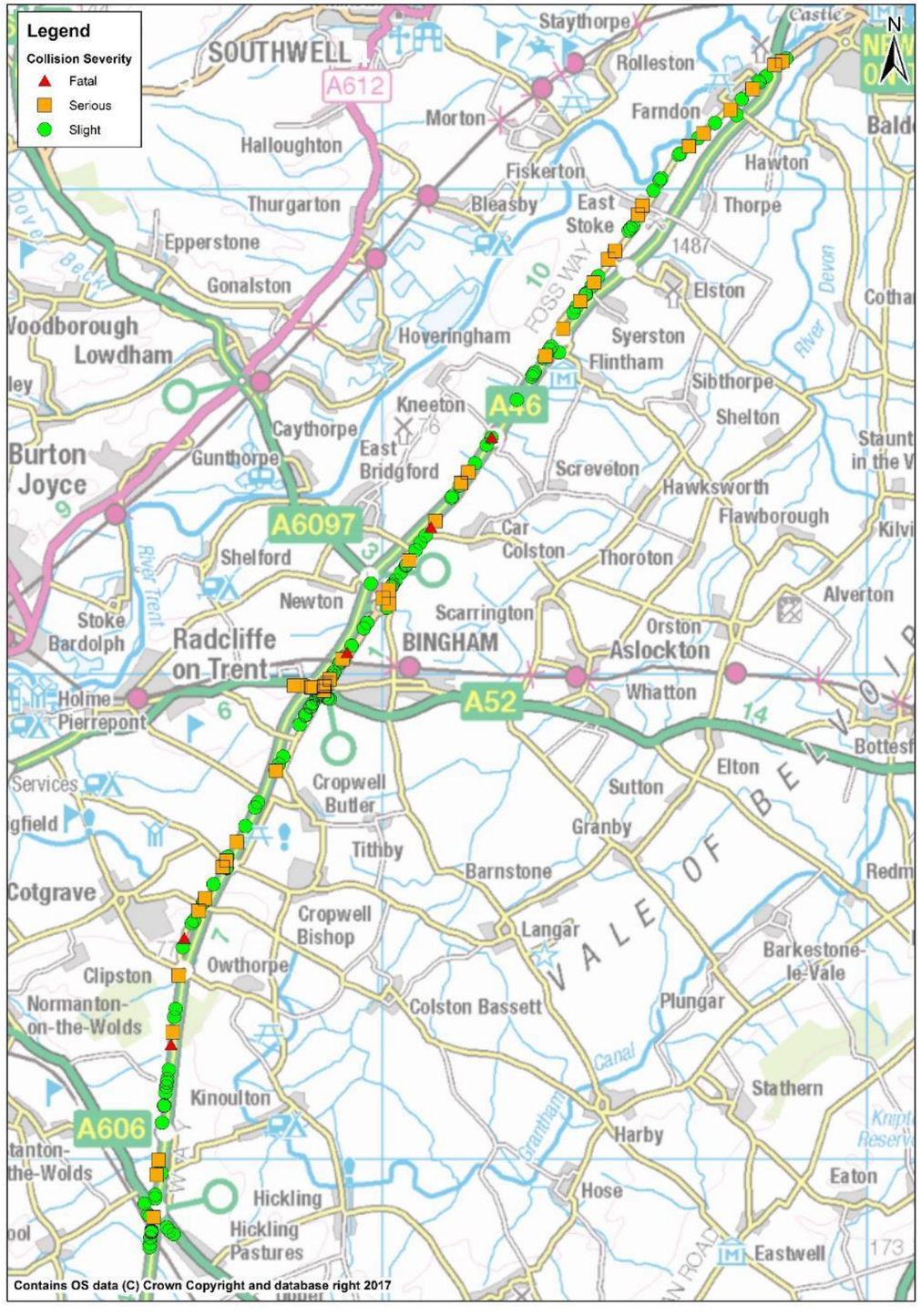
3.29. In terms of weather conditions, a comparison between collisions reported pre- and post-scheme has been carried out which provides no indication that the scheme has impacted the occurrence of collisions during certain weather conditions.

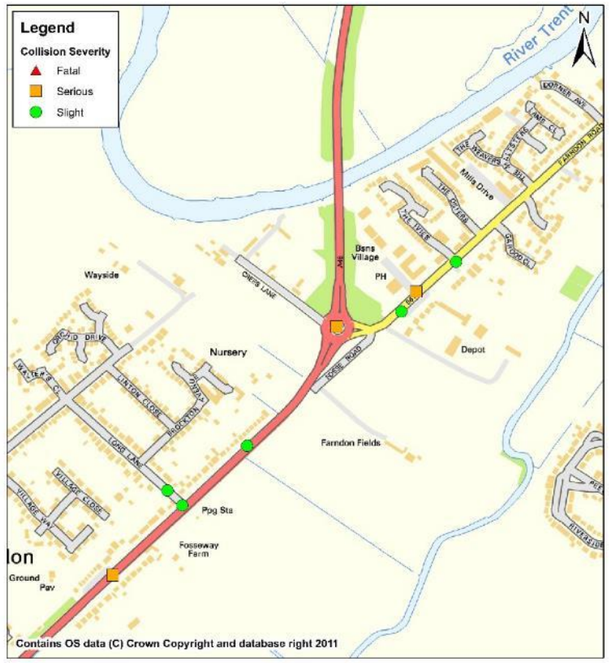
3.30. In the pre-scheme study period there were two serious collisions and one slight collision reported along the key links of the scheme involving non-motorised users (pedestrians and cyclists), whilst post-scheme there were four serious and one fatal collision. Of those reported post-scheme, only one of the collisions occurred on the old alignment of the A46, which suggests that the scheme has improved road safety for non-motorised users on the old alignment of the A46. It is noted that the fatal collision which occurred post-scheme on the A46 mainline is reported to have occurred during poor weather conditions. However, based on the information available, no further conclusions can be drawn.

3.31. Consultation responses from Kinoulton Parish Council have expressed concerns over the length of the slip roads at Kinoulton. Based on the post-opening safety data used in this report, there is no evidence to suggest that there are any road safety concerns at this location, given the absence of reported collisions on the slip roads. Similarly, concerns were also expressed for the length of the slip roads at Cotgrave. In the post-opening period, two collisions have been reported at the junctions with the A46 on/off slips and Owthorpe Road, both of which were classified as slight. Taking into account that these occurred over a period of 4 years 9 months, it is considered that the length of the slip roads has not compromised road safety at this location. Both of these junctions have been constructed as per the designs for the scheme. Concerns have also been raised about the speed of vehicles on the old A46 from the junction with Kinoulton Lane and the roundabout at Widmerpool and Roehoe. Traffic data for this stretch of road has not been collected, so cannot be validated in terms of the speed. No collisions have been reported at this location in the post-scheme study period, which would suggest that there are no known safety concerns at this location.

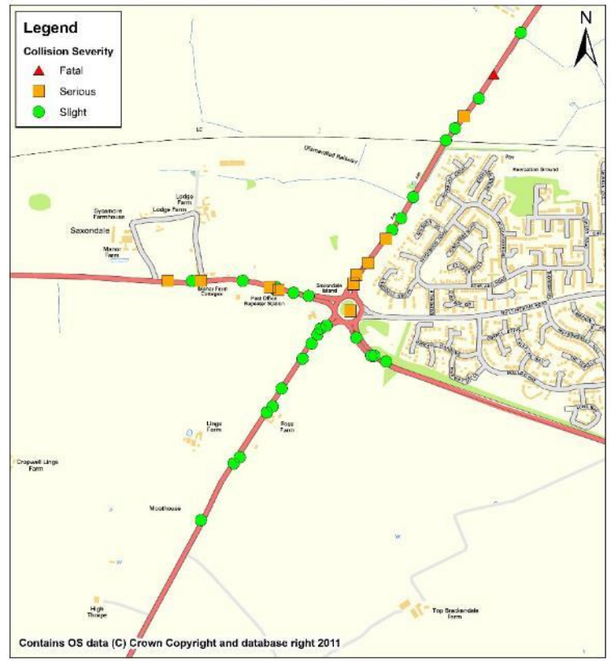
3.32. Consultation responses from Cropwell Bishop Parish Council have expressed concern over the safety record at Saxondale roundabout, due to '*inadequate vision from northbound A46 and old A46 off slips joining the roundabout'*. **Figure 3-7** shows that the majority of collisions at this roundabout did not occur at these locations, but rather are rather clustered at the A52 entries/exits. Further information regarding movement and causation factors was not made available in the data, and so further analysis cannot be carried out.

Figure 3-6 Pre-Scheme Collision Maps

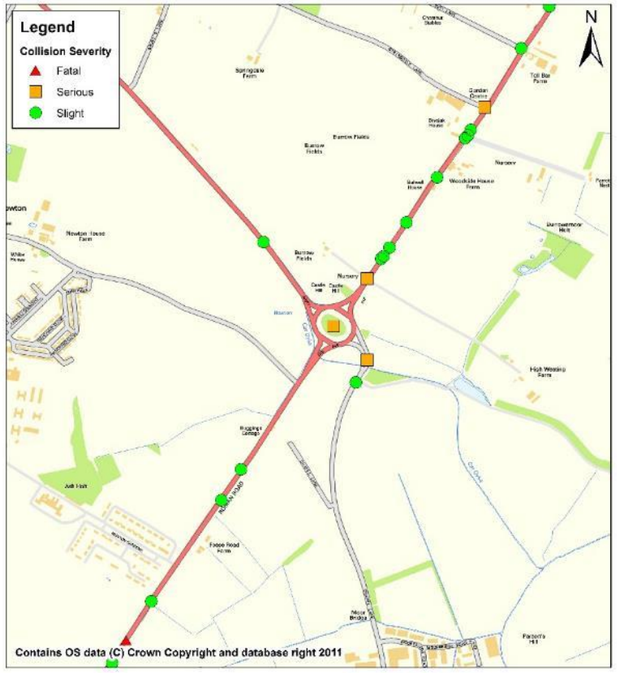




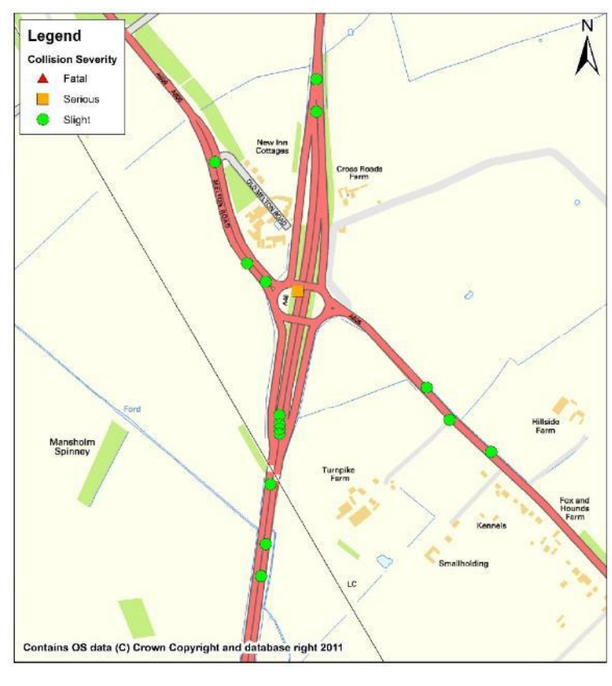
Farndon Roundabout



A46 Junction with A52

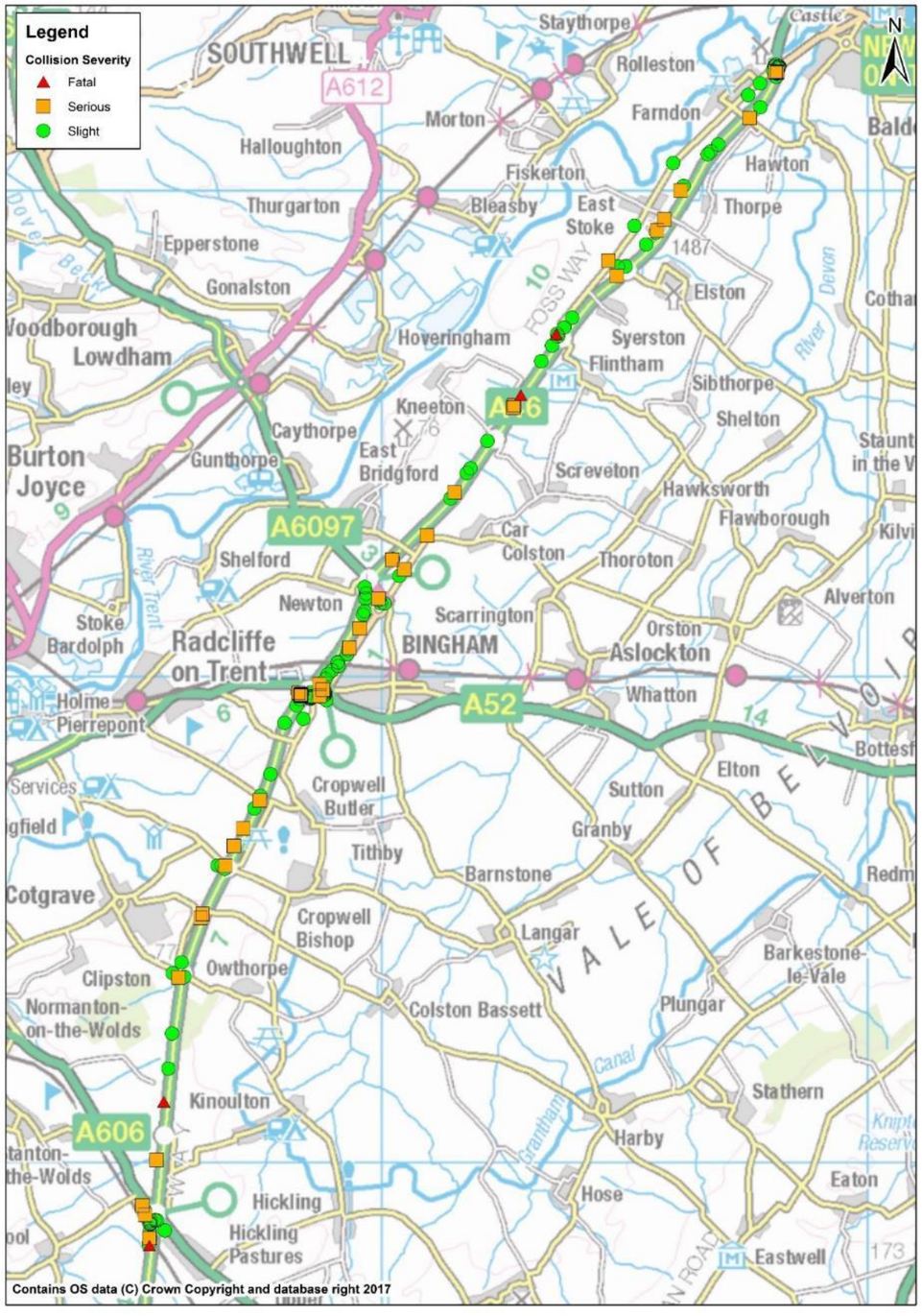


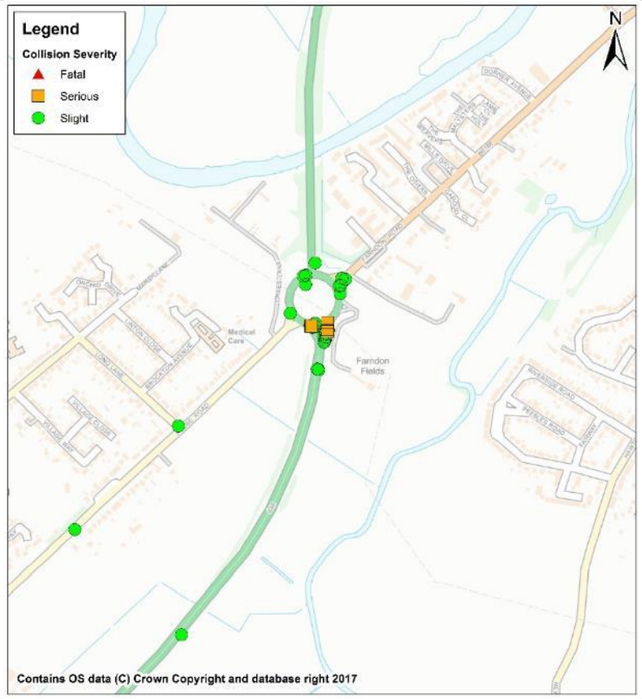
A46 Junction with A6097



A46 Widmerpool

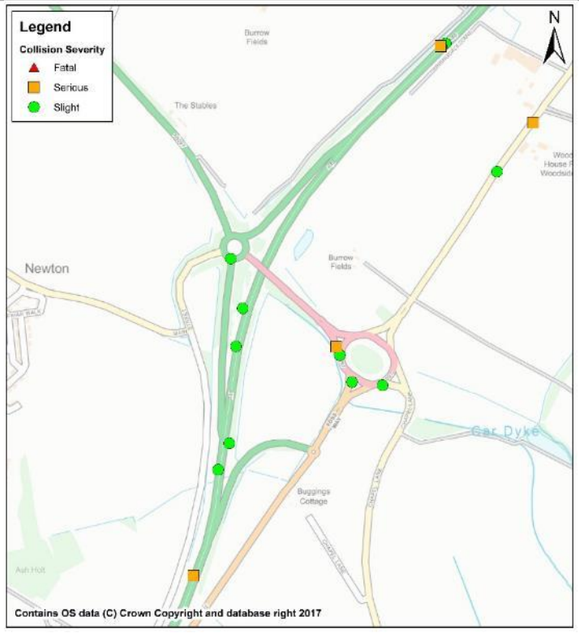
Figure 3-7 Post-Scheme Collision Maps



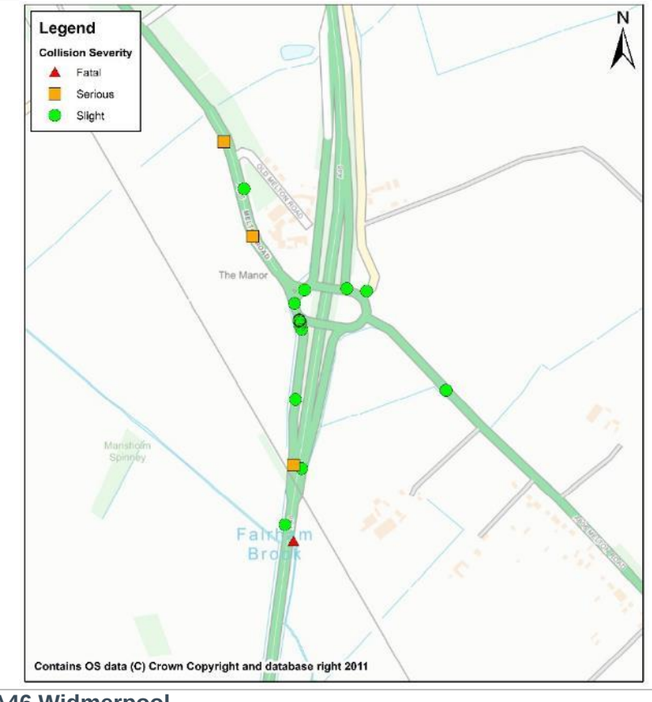


Farndon Roundabout

A46 Junction with A52



A46 Junction with A6097



A46 Widmerpool

Fatalities and Weighted Injuries

3.33. The Fatalities and Weighted Injuries (FWI) metric is a combined measure of casualties based on the numbers of fatal, serious and slight casualties. The FWI for the key links, for the three years before and the available post-opening period, are shown in **Table 3-7.** To take into account the increased traffic flow on the A46 post-opening, **Table 3-7** also presents the FWI rate per billion vehicle kilometres (bvkm). It is important to note that these figures do not take into consideration any background reduction in casualties.

Table 3-7 Fatalities and Weighted Injuries on A46 Key Links (A46 main carriageway and junctions, on/off slips, existing alignment of A46)

Period	FWI/collision	FWI/year	FWI/bvkm
Pre-scheme	0.042	2.94	12.5
Post-scheme	0.062	2.36	8.2

3.34. Per collision, **Table 3-7** shows that the severity of collisions has increased post-opening by 46% (from 0.042 to 0.062 FWI/collision), whilst the number of fatal and serious injuries per year, and per bvkm, has reduced by approximately 20% and 34% respectively.

Statistical Significance of Outturn Collision Impacts

3.35. To determine whether the changes in collision numbers pre- and post-scheme are statistically significant, chi-squared tests have been carried out. These tests use the numbers of collisions and traffic flows for five years' pre-scheme, and all available data post-scheme to establish if the changes are significant, or are likely to have occurred by chance.

3.36. For the COBA modelled area, the changes which have been observed are not statistically significant, as the modelled area included a lot of links which were unlikely to have been directly impacted by the scheme.

3.37. For the key scheme links, the chi-squared test shows that we can be 95% 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 changes in the number of collisions can be directly linked to the scheme, and not likely to be due to chance.

Forecast Collision Numbers and Rates

3.38. This section of the report compares the number of observed collisions and collision rates with those predicted to occur.

Collision Numbers

3.39. The forecasts for the impact of the scheme on collision numbers have been obtained from the COBA model for this scheme, and cover the whole of the modelled area shown in **Figure 3-1.** For the outturn collisions, the average annual number of collisions pre- and post-scheme opening have been used for the COBA modelled area. **Table 3-8** provides a comparison of the forecast and outturn collisions across the COBA area based on the central growth scenario (average of low and high growth scenarios).

Table 3-8 Comparison of Forecast and Outturn Collisions across the COBA Area

		Average Annual Collisions
Forecast Opening Year (Central Growth)	Do Minimum (without scheme)	167.9
	Do Something (with scheme)	141.9
	Saving	26
	% Change	**15.5%**
Outturn Annual Average	Pre-Scheme	180.7
	Without Scheme (counterfactual for the same period)	136.0
	Post-Scheme	124.4
	Saving	11.6
	% Change	**8.5%**

3.40. **Table 3-8** shows the following:

- The COBA model for the scheme predicted that the average number of collisions in the do minimum scenario to be 167.9, which is lower than the observed pre-scheme values (180.7).
- The model predicted that the scheme would save 26 collisions in the opening year, a reduction of 15.5%. Based on the reduction in the number of junctions and the replacement of existing priority junctions with grade separated junctions, it was predicted that there would be a reduction the number of collisions occurring at junctions but a slight increase in the number of collisions occurring on links.
- Post-scheme opening, the number of collisions over the COBA modelled area has reduced by 11.6 a year (over five years), a reduction of 8.5%. This is lower than what has been predicted. Given the size of the area which has been modelled, the changes in the wider area may have masked the overall impact of the scheme. Therefore, the scheme key links are considered in more detail in **Table 3-9**

3.41. **Table 3-9** shows the same results but for the key links only. It shows that:

- The observed collision reduction for the key links of the A46 is 10.5, this is below the forecast 17.5 saving.
- The COBA model for the scheme predicted that the average number of collisions in the do minimum scenario for the key links to be 58.9, which is higher than the without scheme at outturn.
- The scheme was forecast to reduce collisions by 30%, and at outturn, based on observed data the scheme has reduced the annual number of collisions by 21%. This suggests that the scheme has had a positive impact on reducing collisions, but not to the extent forecast.

Table 3-9 Comparison of Forecast and Outturn Collisions on Key Links (A46 main carriageway and junctions, on/off slips, existing alignment of A46)

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	Pre-Scheme	66.8
	Without Scheme (counterfactual for the same period)	49
	Post-Scheme	38.5
	Saving	10.5
	% Change	**21%**

Collision Rates

3.42. The collision rate is calculated using the length of a road and the AADT for the same section, and is known as Personal Injury Collision per million vehicle kilometres (PIC/mvkm). The use of collision rate allows comparisons to be made that take background traffic growth into account.

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 A46 are compared with forecasts (from COBA) for the same links and junctions. **Table 3-10** showed the collision rate for the scheme section, forecast vs. observed, pre- and post-scheme scheme opening. The observed data has been compared to the values for the opening year (2012). AADT for a counting site just south of Widmerpool has been used.

Table 3-10 Comparison of Forecast and Outturn Collisions on Key Links

Annual Collisions		Central Growth
Predicted (2012 Opening Year)	Do Minimum (without scheme)	0.243
	Do Something (with scheme)	0.126
	Saving	0.116
	% Change	**48%**
Observed (Pre-Scheme vs. Post-Scheme Collision Rates)	Pre-Scheme	0.284
	Without Scheme (counterfactual for the same period)[17]	0.203
	Post-Scheme	0.133

[17] Counterfactual without scheme is the observed rate in the pre-scheme period, multiplied by the national reduction in collisions rate per mvkm during the comparable period. The reduction factor in the collision rate for all road types was 0.72.

Annual Collisions		Central Growth
	Saving	0.069
	% Change	**34%**

3.43. **Table 3-10** shows that the observed reduction in collision rate across the scheme key links is lower than expected, with a saving of 0.069 PIC/mvkm compared to a forecast of 0.116 PIC/mvkm. The counterfactual value (0.203 PIC/mvkm) is lower than the do minimum collision value (0.243 PIC/mvkm). The observed rate (0.133 PIC/mvkm) is also higher than forecast (0.126 PIC/mvkm). This suggests that the background reduction in the model is lower than the observed reduction. Nevertheless, a saving has still been observed and so it is considered that the scheme has successfully reduced the rate of collisions for the key links affected by the scheme.

Security

3.44. The aim of this sub-objective is to consider any changes in security and the likely number of users affected by the changes. For highway schemes, 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 whilst parked at a service station, being attacked whilst walking to a parked car); and
- At signals or junctions (e.g. smash and grab incident whilst queuing at lights).

3.45. The primary indicators for highway schemes include surveillance, landscaping, lighting and visibility, emergency call facilities and cyclist facilities.

Forecast

3.46. The scheme appraisal stated that the scheme would have a ‘Neutral’ impact on Security. The AST notes that the lay-bys on the scheme would be un-lit, although landscaping design would ensure that the lay-bys are visible at all times. The scheme did not propose any additional security improvements.

Evaluation

3.47. The new road follows much of the same alignment as the existing, which means that security issues arising on the road itself would not have changed as a result of implementation of the scheme. A number of lay-bys have been provided with emergency phones, in both directions along the length of the scheme. The landscaping design and surrounding vegetation has allowed lay-bys to remain visible at all times from the main carriageway, as shown in **Figure 3-8.** No lighting or traffic lights were included in the scheme, other than at the main junctions. The main junctions, for example, Saxondale Junction and Margidunum Junction are well lit. The main junctions of the pre-scheme alignment were also lit.

3.48. Overall, it is considered that the scheme has had a **neutral** impact on Security. This is in line with forecast.

Figure 3-8 Photograph of Lay-By Provision (North East of Car Colston)

Key Points – Safety

Collisions

- Analysis of the observed collision data for the whole COBA modelled study area shows a reduction of 11.6 collisions per year, compared to the counterfactual scenario, which suggests that implementation of the scheme has had a beneficial impact on the A46 and surrounding roads. Analysis of the observed collision data for the scheme links shows a reduction, compared to the counterfactual, of 10.5 collisions a year. This shows that the scheme has had a beneficial impact on the scheme section in addition to the wider study area.
- The changes in collisions for the scheme key links are considered statistically significant, and therefore it is considered that the scheme has had a direct impact on safety.

Severity

- The collision severity index has increased for the COBA modelled area and key links. This may be due to the increased speed limit and provision of an additional lane in comparison to the single lane provided pre-scheme.

Fatalities and Weighted Injuries

- On the scheme key links, the rate of fatal and serious injuries per bvkm has reduced by 34%.

Forecast Collision Numbers and Rates

- The scheme was forecast to have a saving of 26 collisions (15.5% saving) in the opening year for the whole COBA area. The observed data has produced a smaller saving of 11.6 collisions (8.5%), suggesting that the benefit for the wider study area has not been as large as forecast.
- For the key links, a reduction of 30% was forecast, however a counterfactual reduction of 10.5 (21%) was observed. This shows that the majority of the savings seen are focussed on the scheme section.

Security

- Layby facilities with emergency phones have been provided along the new alignment of the road, in both directions. Lighting has only been provided at the main junctions along the scheme, with laybys remaining visible from the main carriageway. Therefore, the overall outturn assessment of the impact of the scheme on security, has been scored as **neutral.**

4. Economy

Introduction

4.1. This section evaluates how the scheme is performing against the economy objective, which consists of the following sub-objectives:

- Achieve good value for money in relation to impact on public accounts.
- Improve Transport Economic Efficiency (TEE) for business users, transport providers and consumer users.
- Improve journey time 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 smaller sections of the A606, A52 and A6097, with a number of the minor roads accessing the A46. The full appraisal area (also used with the COBA) is shown earlier in this report in **Figure 3-1.**

4.3. TUBA (Transport User Benefits Appraisal) was used to forecast the economic benefits of the scheme. As TUBA is unable to directly analyse collision benefits or user delays, a COBA model was used to appraise the safety benefits of the schemes and added manually to the analysis. The benefits were appraised for a 60-year period in line with guidance.

4.4. This section provides a comparison between outturn costs and benefits and the economic impacts. Consideration has also been given to the scheme's wider economic impact. Outturn journey times and safety economic impacts are based on the observed results presented in previous sections of this report, and re-forecast to a 60-year period.

Data 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 are as follows:

- Revised forecast costs.
- Inclusion of the Kinoulton alternative link.
- Earlier opening date of the scheme of 2012.

4.6. The COBA model dated April 2009 has also been used.

4.7. The outturn spend profile for this scheme has been obtained from the Highways England Regional Finance Manager for the purposes of the FYA evaluation. All costs presented in this report are in 2002 prices and values in line with those in the EAR, unless otherwise stated.

4.8. **Table 4-1** outlines the evaluation approach undertaken in this report. A 'yes' indicates that a certain element has been considered in this evaluation. A 'no' indicates that the forecast impact has been used in place of a full evaluation at this stage.

Table 4-1 Economic Benefits of Scheme (2002 prices and values)

Benefits in £m 2002 market prices, discounted	Forecast £m (EAR)	Evaluate?	Evaluation Approach/Comments
Journey Time (TEE business and consumer users)	£1,157.3m	Yes	Outturn journey time impacts on opening year can be calculated from observed data.
Vehicle Operating Costs (VOC)	-£239.8m	Yes	Net change in fuel consumption in operating year has been monetised to calculate a proxy outturn reforecast value of VOC.
Delay during Construction	-£9.9m	No	Not within the remit of POPE to evaluate. Included in PVB calculations and forecast cost assumed at outturn.
Future maintenance costs	-	No	EAR states '*maintenance expenditure is included manually within the overall economic assessment results'* therefore is not included.
Safety Benefits	£114.0m	Yes	Based on observed reduction in collision numbers, if this is statistically significant.
Carbon Benefits	-£35.284m	Yes	Ratio between forecast and outturn opening year carbon impact used to calculate 60-year re-forecast.
Noise Benefits	£1.957m	No	Only accounts for a small proportion of overall scheme impacts
Indirect Tax Impact	£196.4m	Yes	Calculate outturn change in fuel consumption in the opening year and use ratio against forecast change to reforecast 60-year benefit.
Total PVB	**£1,184.673m**		

Evaluation of Journey Time Benefits

4.9. The change in annual vehicle hours over the wide network (including the A46 key links) has been used to derive economic benefits, as these links form the key elements of the economic benefits for the whole scheme.

4.10. The TUBA model for this scheme forecast the benefits for the wider area, but for the purposes of this evaluation we are focussing on the route for where changes for users are most clearly linked to the scheme i.e. the improved A46 scheme section. It is not possible to use the TUBA outputs to create a comparable forecast based on the impacts on this route alone, as its output does not give any breakdown of the impacts by link or area. The outputs from the central growth scenario (used in the modelling) has been used in this evaluation, which conforms to TEMPRO and central NRTF growth rates, as at the post PI appraisal stage this is regarded

as the traffic and economic growth scenario which was in line with government aspirations along which the economy would be guided.

4.11. The vehicle hour savings for those travelling along the A46 improved scheme section (A46 between Newark (junction with A617) and Widmerpool (junction with A606)) have been calculated. Savings have been considered for the weekday peak periods and interpeak. Information used in the Traffic Forecasting Report for this scheme has been used to create a proxy forecast vehicle hours' savings on the A46 key links. The observed vehicle hours' savings have been calculated from the traffic counts and journey time savings, discussed earlier in this report. This method uses differences between the DM and DS values for link distance, journey times and traffic flow.

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 the WebTAG guidance.

Table 4-2 Annual Observed Vehicle Hour Savings between 2008 (pre-scheme) and 2017 (post-scheme)

Route Section	Annual Vehicle Hour Saving (hours)
Northern (A6097 – Newark)	801,067
Central (A52 to A6097)	159,171
Southern (A606 to A52)	429,555
Total Saving	**1,389,793**

4.13. **Table 4-2** shows the annual vehicle hour savings between pre- and post-scheme by scheme section. The largest saving has been observed for the northern section, which is the longest section of the scheme.

Monetised Journey Time Benefits

4.14. This evaluation focusses on key links on the A46 between Newark and Widmerpool. The methodology detailed below (profile approach) was applied to obtain a POPE re-forecast for the 60-year journey time benefits as shown in **Table 4-3** and **Table 4-4**.

- The total forecast vehicle hours saved in the five years' post opening on the key links was calculated using forecast flows, speeds and journey times from the traffic forecasting report.
- The observed vehicle hours saved over the scheme section, was calculated using observed traffic flows and observed journey times from the opening year and five years after opening (2017).
- The predicted monetary vehicle hour benefit was taken from the Post Public Enquiry (PI) EAR for the whole appraisal area.
- The actual vehicle hour saving was calculated using observed pre- and post-scheme flows and observed journey time data.
- The ratio between the forecast opening year vehicle saving and observed opening year vehicle saving along the A46 scheme section was applied to the forecast opening year monetised benefit from the TUBA appraisal. This assumes that the accuracy of journey time savings over the scheme section are representative of the wider modelled area.
- The profile method has been used to factor the observed opening year benefits to the full 60-year appraisal period, splitting into the first five years, and the following 55. This method applies the absolute difference between the forecast and observed benefits in the five years' post opening to the TUBA benefits profile for the remaining years of the appraisal period. It considers the difference between the observed and modelled benefits as an absolute difference rather than proportionally.

Table 4-3 Comparison of Predicted (EAR) and Observed (FYA) Vehicle Hours

Annual Vehicle Hour Saving (hours)	
Re-forecast scheme key links	2,109,544
Observed (FYA)	1,389,793
% difference	**-34%**

4.15. **Table 4-3** shows the observed saving in vehicle hours for the A46 Newark to Widmerpool is 34% lower than forecast. Therefore, the observed saving is around 66% of that predicted. This is due to the journey time savings and traffic flows both being less than forecast.

4.16. The full TUBA assessment for the study area shows that the forecast time saving benefits for the scheme were £1,157m (2002 prices and values). Applying the profile approach detailed above, an outturn value of £928.1m is achieved, as shown in **Table 4-4**.

Table 4-4 Time Benefits Comparison

Annual Vehicle Hour Saving (hours)		Predicted Benefit over 60 years	
Key Links Re-forecast	2,109,544	TUBA forecast	£1,157.3m
Observed (Saving between 2008 and 2017)	1,389,793	Outturn (first 5 years)	£54.1m
		Outturn re-forecast (subsequent 55 years)	£874.0m
		Outturn (Total)	**£928.1m**

4.17. **Table 4-4** shows that the outturn value is lower than forecast, which is mainly due to traffic growth being lower than expected, as well as lower than forecast observed journey times.

Evaluation of Safety Benefits

Forecast Safety Benefits

4.18. The forecast safety benefits for this scheme were derived from a COBA model, with the findings detailed in the Post PI EAR[18]. The figures presented in this section of the report are based on the Central Growth scenario, and this is considered to be the most likely growth scenario. For the COBA modelled area **(Figure 3-1**), an opening year saving of 26 collisions was forecast, with a 60-year monetary benefit of £114m (2002 prices discounted to 2002).

4.19. These savings were forecast to be achieved by the removal of priority junctions, and replacement with grade separated roundabouts. The upgrade of the A46 to dual carriageway, was forecast to increase the number of collisions on the mainline for the following reasons[18]:

- The A46 would carry larger traffic flows with the scheme than without it.

[18] A46 Newark to Widmerpool Improvement: Post PI Economics Appraisal Report (April 2013) (Report Number: PD0285/4/001) C Status, Issue 3

- Speeds on the links of the new dual carriageway would be greater than those on the existing single carriageway.
- The collision records on the base network are attributed to junctions where collisions occurred within 20 metres of junctions, and the majority of links have a safer record than would be expected for a single carriageway road.

Evaluation of Safety Benefits

4.20. The methodology for evaluating the outturn of economic value of benefits arising from safety benefits is based on a comparison of observed and forecast changes to the number of collisions over the five-year post opening period, considering the counterfactual scenario for pre-scheme data. It is assumed that the observed safety impact for the last five years post-opening is indicative of what will be achieved over the remainder of the 60-year appraisal period. The ratio between the number of collisions saved in the first five years to the forecast 60 year benefits is then used to generate a re-forecast economic benefits.

4.21. To monetise the savings, the following methodology has been followed:

- Calculating the net difference between the forecast opening year saving and the annual average observed collision savings in the COBA area, allowing for the counterfactual scenario.
- Monetising the net difference using the PAR method, which values collisions saved 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.

4.22. **Table 4-5** shows the evaluation of monetary benefits, with all values shown in 2002 prices discounted to 2002. It demonstrates that the re-forecast 60-year monetary safety benefits for the appraisal area are approximately 55% lower than originally forecast.

Table 4-5 Comparison of Forecast and Re-forecast collision benefits

Central Growth Forecast (COBA Area)	Forecast Collision Saving in opening year	(a)	26
	Forecast value of saving (60 years, central traffic growth)	(b)	£114.0m
Observed COBA Area	Annual Average Collision Pre-Scheme	(c)	180.70
	Annual Average Collision Post-Scheme	(d)	124.42
	National Index of Change on collision numbers (Counterfactual)	(e)	0.752
	Average Annual Collision Saving (based on adjusted counterfactual)	(f) = (c*e) - (d)	11.53
	Net Difference between forecast and observed	(f) – (a)	-14.47
	Monetisation of net difference for opening year	(h)	-£1.34m
	Monetisation of (f) into 60-year impact of net difference between forecast and observed (using PAR 5 guidance)	(i)	-£51.05m
	Outturn 60-year benefit	**(b) + (i)**	**£62.95m**

Indirect Tax

4.23. Indirect Tax revenue is the expected change in the 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 primarily derived from the monetisation of forecast of the changes in fuel consumption over the 60-year period. A scheme may result in changes in fuel consumption due to:

- Changes in speed 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.

4.24. Forecasting the impact of the scheme on indirect tax was done in TUBA and modelled was based on the whole study area for a 60-year period. This evaluation has used the ratio approach to assess the outturn impact, by calculating the impact on the A46 corridor compared with forecast, and then extrapolated over the wider study area. The outturn impact is only based on changes along the A46. Screenline analysis conducted earlier in this report demonstrated that some of the additional traffic between pre- and post-scheme on the A46 is due to reassignment from other local routes. Therefore, the outturn impact may be a slight overestimate.

4.25. Initially, at the time of appraisal, this scheme considered indirect tax within wider costs. Current guidance (AMCB, Analysis of Monetised Costs and Benefits) from WebTAG considered costs in terms of the 'broad transport budget', i.e. costs directly affect the budget available for transport. Therefore, this guidance would consider indirect tax as a benefit, rather than a cost. Part way through scheme construction, a revised business case for this scheme was produced with an updated TEE, to allow for indirect tax to be included as a benefit rather than a cost.

Table 4-6 Indirect Tax Revenue Impact as a present value

Costs in 2002 market prices, discounted	Forecast (TUBA Area)	Outturn (A46 only)
Impact on indirect tax revenue raised	£196.4m	£187.5m

4.26. **Table 4-6** shows that the scheme will result in a large increase in indirect tax (£187.5m), slightly lower than forecast. The reduced revenue raised from indirect tax is mainly due to the lower than expected increase in traffic on the A46 mainline. If included in the assessment of the cost to the Treasury, this would reduce the cost of the scheme considerably.

4.27. Vehicle Operating Costs and indirect tax impacts are very closely linked to changes in fuel consumption, which can be affected by factors such as changes in speed. They are both linked to the same magnitude of impacts, but from opposite sides of the benefit balance. If there is increased fuel consumption, VOC will increase as drivers pay more for fuel (i.e. a dis-benefit to the driver), but this would result in increased indirect tax being collected by the Treasury (i.e. a benefit to the Treasury).

4.28. To evaluate the impact of the scheme on VOC, the ratio used to re-forecast indirect tax has been applied to the monetary value for VOC from the TUBA.

Table 4-7 VOC as a present value

Costs in 2002 market prices, discounted	Forecast (COBA Area)	Outturn (A46 only)
VOC	-£239.8m	-£228.9m

4.29. **Table 4-7** shows that the scheme will result in a large decrease in vehicle operating costs, but at a slightly lower level than forecast. This is due to the observed traffic flows and speeds being lower than forecast.

Carbon Impact

4.30. The impact of the scheme on greenhouse gases (change in carbon outputs) is considered in detail in the chapter 5 of this report.

4.31. At appraisal, the TUBA model was used to calculate the monetary value for change in carbon emissions, based on a price per tonne. Over the 60-year appraisal period, the scheme was forecast to result in an increase in carbon at a cost of -£35.284m.

4.32. A proxy change in carbon emissions has been calculated using the forecast and observed journey times and traffic flows along the scheme section presented earlier in this report. This indicates that an increase of 72% (14,404 tonnes of carbon) is observed between pre- and post-scheme and this is 82% of the reforecast equivalent.

4.33. The ratio method has then been used to extrapolate the change seen on the key links in the wider area, which results in an outturn re-forecast carbon dis-benefit of -£30.55m over 60 years.

Scheme Costs

4.34. This section compares the forecast costs of the scheme at the start of the construction period, with the actual spend at the time of writing this report.

4.35. Costs have been considered for the full appraisal period of 60 years so that they can be compared with benefits over the same period. The full scheme costs are made up of the following two aspects:

- Investment Costs – before and during construction
- Operating Costs – over the 60 years after opening

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

Investment Costs

4.37. The investment cost is the cost to the Highways England of the following:

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

4.38. 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.

4.39. 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.

4.40. The outturn spend profile for this scheme has been obtained for the purpose of this study and covers the period 2002 – 2017 (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. Comparison between the forecast and outturn is presented in **Table 4–8.**

Table 4–8 – Scheme Investment Costs (£m)

Forecast Cost (May 2009)		Outturn Cost (as of July 2017)		% difference
Highway Investment Board submission	£382.9m			
Cost in £million 2002 prices, undiscounted	£297.9m	Cost in £million 2002 prices, undiscounted	£299.5m	0.5%

4.41. The key point to note as shown in the table is that the outturn cost was 0.5% higher than forecast.

Present Value Costs (PVC)

4.42. 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.

4.43. 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.

4.44. The full PVC at the time of appraisal was made up of the following costs converted to present value:

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

4.45. 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 4–8** for the final forecast. Therefore, the revised value presented in **Table 4–9** includes only the investment costs, not the indirect tax revenues. This is the 2002 costs, expressed in market prices discounted at the annual rate of 3.5%. The outturn costs are presented likewise.

Table 4–9 – Investment Costs as Present Value (£m)

Present Value £m (costs in 2002 market prices, discounted)	Forecast	Outturn
Investment Costs	£274.5m	£273.9m

Benefit Cost Ratio (BCR)

4.46. 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.

4.47. 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.

4.48. **Table 4–10** compares the predicted and outturn costs and benefits.

Table 4–10 – 60 Year BCR summary

		Forecast	Outturn Reforecast
Costs	**PVC**	**£274.5m**	**£273.9m**
Benefits	Journey time benefits	£1,157.3m	£928.1m
	Safety Benefits	£114.0m	£62.95m
	Construction Delay	-£9.9m	-£9.9m
	Vehicle Operating Costs	-£239.8m	-£228.9m
	Carbon benefits	-£35.28m	-£30.55m
	Noise Benefits	£1.957m	£1.957m
	PVB subtotal	**£998.28m**	**£723.66m**
	Indirect Tax	£196.4m	£187.5m
	BCR (with indirect tax in PVC)	**12.7**	**8.4**
	BCR (with indirect tax in PVB)	**4.3**	**3.3**

4.49. It can be seen from **Table 4–10** that the BCR is lower than forecast due to lower than expected journey time benefits and safety benefits. A BCR of 3.3 represents high value for money, which is considered a conservative estimate based on the reforecast benefits calculated as part of this report.

4.50. 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

4.51. It is difficult to isolate wider economic impacts which could be attributed to a highway scheme. However, it is important to understand the socio-economic context in which the scheme opened, and how the scheme has assisted in local and regional socio-economic aspirations.

Forecast

4.52. The AST for this scheme forecast that the scheme would have a **neutral** impact on the wider economy, with a comment stating that '*no assessment required'*.

Five Years After Opening Evaluation

4.53. One of the key objectives for this scheme was to provide an improved link between the M1 and A1. Analysis presented in this report has demonstrated that the scheme has improved journey times, journey time reliability and safety for vehicles using the scheme section. This is beneficial to both freight and business users who may have improved productivity, as a result of spending less time on the road.

4.54. Improved journey times between Newark and Widmerpool as a result of the scheme implementation have opened up opportunities for development, both residential and employment, in the local area for example in Bingham and Newark. There are a number of large mixed use developments in construction within the vicinity of the scheme, for example RAF Newton and Cotgrave Colliery, which will further benefit from the scheme. The RAF Newton site (former RAF base) has planning permission for residential and employment development – to date, 150 houses (of 550) have been completed). Cotgrave Colliery site, has planning permission for both employment and residential elements. To date, 120 dwellings have been provided (of 470) and the employment element has not yet begun construction. Since the OYA stage of analysis there has been additional progress at these sites, although many have not been fully completed. The employment elements of these developments, once complete, will become more attractive for potential businesses given the improvement in journey times and reduction in congestion on the A46 scheme section.

4.55. At the OYA stage of analysis, it was assessed that the scheme had had a neutral effect on this sub-objective. There is no direct evidence to suggest that there is a direct link between increased enablement of development or employment of nearby development sites. Therefore, based on the information presented above, at this stage of analysis this has been rated as **neutral.**

Key Points – Economy

Present Value Benefits

- The outturn journey time benefits of £928.1m are below those forecast. This is mainly due to the traffic growth being lower than expected.
- Outturn safety benefits were calculated to be £62.95m, compared to a forecast of £114.0m. This difference is partly due to taking into account the national collision background decline seen between the appraisal and pre-scheme period.
- The dis-benefit from vehicle operating costs were £10m lower than forecast, mainly due to the traffic flows on the scheme section being lower than forecast. The dis-benefit from carbon was also lower than forecast for the same reasons.
- Overall the outturn PVB is 27% lower than forecast.

Costs

- Outturn investment costs were very slightly higher (0.5%) than forecast at £299.5m.
- The outturn impacts on indirect taxation of £187.5m is approximately 4.5% lower than forecast due to the lower overall traffic levels compared to forecast.

Benefit Cost Ratio

- Taking indirect tax as a benefit, the scheme achieves a BCR of 3.3 which shows the scheme has delivered value for money.

Wider Economic Impacts

- The increased capacity that the scheme provides is likely to support development along the route. No direct evidence to suggest there is a direct link between increased enablement of development or employment of nearby development sites. Therefore, based on the information presented above, at this stage of analysis this has been rated as **neutral.**

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 AST is set out below:

- No change in the number of people annoyed by traffic noise, whilst there would be a 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:

- AST (June 2009).
- ES (December 2005).
- ES Vol 1, Vol 2 and Vol 3 (January 2007)
- ES Addendum (Final), including figures (March 2007).
- ES Non-Technical Summary (January 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).
- 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).

5.4. A full list of the background information requested and received to help with the compilation of this report is included in **Appendix B** at the end of this document.

Site Visit

5.5. A site visit was undertaken on the 31st of May 2017 and photos were taken of features relevant to this evaluation.

Consultations

5.6. **Table 5–1** provides a list of stakeholders contacted so to understand 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	OYA Comments	FYA Comments
Environment Agency (EA)	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.	Response received and included in the water quality sub section.
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.	Natural England responded that it has no comments to make on the post opening project evaluation.
English Heritage	Heritage	No response received as of August 2014.	No response received as of June 2017
Nottingham City Council	General	No response received as of August 2014.	No response received as of June 2017
Nottinghamshire County Council (NCC)	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.	Built heritage services response received
Rushcliffe Borough Council	General	No response received as of August 2014.	No response (beyond initial response to communication) received as of June 2017.
Newark and Sherwood District Council	General	No response received as of August 2014.	No response received as of June 2017

Organisation	Field of interest	OYA Comments	FYA Comments
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.	No response received as of June 2017.
Nottinghamshire Geological and Biological Records Centre	Biodiversity	No response received as of August 2014.	No consultation undertaken
Nottinghamshire Wildlife Trust	Biodiversity	No response received as of August 2014.	No consultation undertaken
Widmerpool Parish Council	General	No response received as of August 2014.	No consultation undertaken
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.	No response received as of June 2017
Kinoulton Parish Council	General	No response received as of August 2014.	Response received for various topics.
Cotgrave Town Council	General	No response received as of August 2014.	No response received as of June 2017.
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.	Updated responses received which have been included with this chapter.
Bingham Town Council	General	No response received as of August 2014.	No consultation undertaken.
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.	No consultation undertaken.
Car Colston Parish Meeting	General	No response received as of August 2014.	No consultation undertaken.
Screveton Parish Meeting	General	No response received as of August 2014.	No consultation undertaken.
Kneeton Parish Council	General	No response received as of August 2014.	No consultation undertaken.
Flintham Parish Council	General	No response received as of August 2014.	No consultation undertaken.

Organisation	Field of interest	OYA Comments	FYA Comments
Syerston Parish Meeting	General	No response received as of August 2014.	No consultation undertaken
Elston Parish Council	General	No response received as of August 2014.	No consultation undertaken
East Stoke with Thorpe Parish Council	General	No response received as of August 2014.	No consultation undertaken
Farndon Parish Council	General	No response received as of August 2014.	No consultation undertaken

Animal mortality

5.7. The Managing Agent Contractor (MAC) stated at OYA that they had minimal animal mortality data as they only responded to immediate hazards. As such no further contact has been made at FYA.

Traffic Forecasts and Evaluation

5.8. 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.

5.9. 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).

5.10. 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.

5.11. Under the DS 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 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/under bridges.

5.12. 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).

5.13. No percentage HGV forecasts were included in the ES for comparison. However, **Table 2-3** shows observed changes for HGV usage on the A46.

5.14. A full analysis of the traffic changes is discussed in **Chapter** 3 of this report. The traffic forecasts from the ES (interpolated to 2016) used in the noise and local air quality appraisals and the observed flows (2016) are shown in **Table 2-7.**

5.15. Observed traffic levels on the unclassified roads in parts of Bingham, Farndon, Screveton, Cropwell Butler, Cotgrave and East Bridgford exceed the forecast substantially in these locations. Overall, observed traffic was more than forecast (25% or greater) in 8 of 31 locations, less than forecast (20% or less) in 10 locations and the same as forecast (within the range plus 25% or minus 20%) in 13 locations.

Noise

Forecast

AST

5.16. 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.

5.17. With the scheme, it was predicted that 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 Laeq19 by year 15.

Environmental Statement

5.18. 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.

5.19. 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.

5.20. 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.

5.21. The ES assessment of noise and vibration was considered to be conservative in line with 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.

5.22. 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 insulation regulations.

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

Consultation

5.23. Cropwell Bishop Parish Council confirmed their OYA comments still apply which "indicates that operational noise from the new A46 is generally as expected, with 'traffic drone that can be worse with northerly or westerly winds".

5.24. Kinoulton Parish Council stated that:

- The new road produces a much higher level of noise particularly when traffic is heavy in the mornings.
- Concerns were expressed that the road surface has been repaired with "strips" (near the Widmerpool bridges) that create a percussive sound particularly with heavier, or longer, vehicles.

Evaluation

5.25. Noise from a flow of road traffic is generated by both vehicles' engines and the interaction of tyres with the road surface. The traffic noise level at a receptor, such as an observer at the roadside or residents within a property, is influenced by a number of factors including traffic flow, speed, composition (% HGV), gradient, type of road surface, distance from the road and the presence of any obstructions between the road and the receptor. An assumption is made by POPE methodology that noise levels will be as expected if observed traffic flows are within 25% more or 20% less than predicted; average speed is different by at least 10kph; or % HDV is different by at least 20%.

OYA evaluation summary

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

5.27. Traffic flow forecast and observed figures for all routes were reviewed as a part of the assessment. It was noted that observed traffic flows within the scheme were less than forecast, with the southern part of the scheme having 33% less traffic than forecast. In 13 locations, traffic flows were in line with forecasts and noise was 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 were more than 25% above the forecast traffic flows, indicating that noise was likely to be worse than predicted in the ES for some areas, although these routes had relatively low traffic flows.

5.28. It was confirmed that one property, near Cropwell Butler, qualified for noise insulation which included secondary glazing which had been agreed with the resident. This insulation has been provided.

5.29. Overall, it is considered that the impact of the scheme on noise was overall as expected.

FYA evaluation

5.30. Based on the observed traffic flows shown in **Table 2-8**, scheme impacts due to traffic flows has been underestimated in some areas and overestimated in others. Generally, the A46 shows traffic flows within predicted ranges, however, the local road network has shown a considerable change to those predicted. Although some of the percentages shown in **Table 2-8** appear high, the total vehicle numbers should be considered when assessing their influence i.e. vehicle differences less than 1,000 per day have minimal influence.

5.31. Observed traffic levels on the unclassified roads in parts of Bingham, Farndon, Screveton, Cropwell Butler, Cotgrave and East Bridgford exceed the forecast substantially (as shown in **Table 2-6** and **Table 2-7**). Overall, observed traffic was more than forecast (±25% or greater) in 8 of 31 locations, less than forecast (20% or less) in 10 locations and the same as forecast (within the range plus 25% or minus 20%) in 13 locations.

Table 5–2 – Summary of Noise assessment

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 ≥ 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	Change in Population Annoyed (Year 15) = -1
EST	Based on the traffic survey results, noise levels near the scheme are on balance as expected.	As expected for A46

Local Air Quality

Forecast

AST

5.32. The AST states that there would be a net beneficial impact regarding air quality due to 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 Coneygrey Spinney.

5.33. Regarding 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).

5.34. 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

5.35. 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.

5.36. 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.

5.37. 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.

5.38. No specific air quality mitigation was proposed for this scheme.

Consultation

5.39. Cropwell Bishop Parish Council have confirmed that their OYA comments still apply at FYA which *"indicated that local air quality is considered to be 'as expected' with no significant change on opening of the scheme".*

5.40. Kinoulton Parish Council stated that it was felt that there is a smell of carbon monoxide around the properties on the old A46 and a lot more dust cloaks the properties than it did prior to the changes.

Evaluation

5.41. An assumption is made by POPE methodology that if traffic flows vary by more than +/- 10% AADT; or by +/- 200HDV AADT; or daily speed by 10kph; or peak hour speeds by 20kph from those predicted in the ES, it is assumed that local air quality is likely to be either 'worse than' or 'better than' expected.

OYA evaluation summary

5.42. The OYA report stated that the Rushcliffe Borough Council had 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 was within the air quality study area for the scheme ES, but it was not known whether it was within the affected road network, as the ES did not identify this area. In addition, this AQMA related to specific properties only. As such, this AQMA was not considered further at OYA.

5.43. The observed traffic flows were more than 10% below the forecast traffic flows in 19 out of 34 locations and thus, air quality was likely to be better than forecast in these locations.

5.44. Observed traffic flows on routes off the A46 reviewed as a part of the scheme were more than 10% above the forecast in 9 locations and as a result air quality was considered worse than predicted in the ES in these locations.

5.45. Overall it is considered that most locations were experiencing improved air quality, as expected.

FYA evaluation

5.46. The consultation response received from Kinoulton Parish Council for increases in carbon monoxide is not supported by traffic flows recorded. Although there is a local increase in traffic flows, flows less than 1,000 cars per day will not signify a worsening of air quality.

5.47. The observed traffic flows were more than 10% below the forecast traffic flows in 14 out of 31 locations (refer to Table 2-7) and thus, air quality was likely to be better than forecast in these locations.

5.48. Observed traffic flows on routes off the A46, but reviewed as a part of the scheme were more than 10% above the forecast (**Table 2-7**) in 12 locations. Thus, air quality was considered worse than predicted in the ES in these locations.

5.49. Overall it is expected that air quality will be as expected along the A46 with local elements showing increases and decreases in local traffic flows.

Table 5–3 – Summary of Air Quality

Origin of Assessment	Summary of Effects on Air Quality	Assessment
AST	A total of 6,603 properties are located within 200m of the existing A46 and/or the scheme and/or surrounding affected roads. Three properties would be demolished due to the scheme, 5677 (86%) would experience an improvement in local air quality and 926 (14%) a worsening. The scheme 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 Coneygrey 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.	Properties with improved air quality 2016 with scheme = 5,677, worse = 926
EST	Based on the traffic survey results, air quality in the vicinity of the scheme is likely to be as expected. Local roads have variances in their observed flows which indicate some areas are worse than expected or better than expected for air quality	As expected

Greenhouse Gases

5.50. 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 (CO_2) is considered the most important greenhouse gas for transport, which is therefore used as the key indicator for the purposes of assessing the impacts of transport options on climate change. Changes in CO_2 levels are expressed in terms of equivalent tonnes of carbon released as a result of the scheme.

Forecast

5.51. The ES[20] 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 CO_2. Since the time of the appraisal, guidance now states that the impact should be expressed in terms of Carbon which is 6,194 tonnes.

Evaluation

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

[20] A46 Newark to Widmerpool Improvement: Environmental Statement Addendum (March 2007)

Table 5–4 – Change in Greenhouse Gases (tonnes of carbon/year) (2013)[21]

	Forecast		Observed
Do Minimum	23,948	Pre-Scheme	20,100
Do Something	40,584	Post-Scheme	34,504
Difference	16,635 (69%)	Difference	14,404 (72%)
% Difference between Observed and Forecast			87%

5.53. **Table 5–4** shows that the scheme was forecast to increase carbon emissions on the A46 corridor. The outturn assessment shows that the scheme has increased carbon emissions on the A46, accounting for approximately 87% of that which was forecast. The scheme has increased emissions due to the increases in traffic volumes and speeds. Although the observed flows and speeds are lower than forecast, the overall increase is less. Pre-scheme, low speeds in congested periods would have resulted in inefficient fuel consumption, but the significantly higher speeds and extra traffic negate this beneficial impact in terms of carbon, hence the net worsening. If carbon was assessed over the wider study area, it is likely that there would be a lower increase in percentage terms as some of the additional traffic on the A46 has re-routed from other local roads.

Table 5–5 – Summary of Greenhouse Gases

Sub-Objective	AST Score	FYA Evaluation
Greenhouse Gases	Increase in CO_2 due to scheme: +28,938t; PVB = -£35.2M	+14,404t, Better than expected

Landscape and Townscape

Forecast

AST

5.54. 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.

5.55. The AST scored a **slight adverse** effect for landscape.

5.56. 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.

[21] Calculated using the DMRB Regional Impact Assessment Spreadsheet, assuming a year of 2013 to create a ‘counter-factual’ scenario to ensure a like-for-like comparison between pre- and post-scheme, without taking into account background traffic growth.

5.57. Overall, the AST scored a **slight beneficial** effect for townscape.

Environmental Statement

Landscape

5.58. 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.

5.59. Retention of existing vegetation was a priority, and therefore, where on-line widening was proposed, the scheme would aim to retain the vegetated boundary to the east. Planting would be used to fulfil a number of requirements which included screening of receptors and the reflection and enhancement of the local landscape and the promotion of 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 rich grassland were expected to contribute to the enhancement of the character of the local landscape and integrate the scheme into the landscape.

5.60. The ES noted that of the 22 Landscape Character Areas (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 character.

Visual

5.61. 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 7 and 15 receptors would experience slight and moderate beneficial effects respectively.

5.62. The ES also predicted that receptors in East Stoke and Farndon that 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.

5.63. 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.

5.64. 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.

Effects of lighting

5.65. The ES stated that the extent of existing lighting was to be significantly reduced under the scheme, bring 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.

Townscape

5.66. Townscape impacts were not specifically addressed in the ES.

Consultation

5.67. Cropwell Bishop Parish Council confirmed that they consider plants to be growing well and that their OYA comments still apply at FYA – impacts are 'as expected given the scheme design'. They noted that the landscape at Stragglethorpe was now dominated by moving traffic on a one mile long 9.5m high embankment. The scheme planting was 'growing well after a good summer season, but was unlikely to ever disguise traffic on the high embankment'. The response also noted that the Parish Council believed this section of the scheme should have been built at ground level, which would have reduced maintenance and earthwork costs.

Evaluation

OYA Evaluation Summary

Landscape

5.68. The OYA evaluation noted that the use of earthworks (in the form of landscape bunds) could be seen within the scheme around some of the junctions, including Saxondale Junction and the mainline. The vertical alignment 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.

5.69. The as built drawings for the scheme and the OYA site visit confirmed that planting had been generally implemented as set out in the ES and the Environmental Masterplan. In some areas, planting appeared to have failed, with examples being the south-eastern embankment of the Syerston overbridge 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 including north of Slacks Lane was noted. The HEMP for the project covered five years of landscape maintenance. It was assumed that under this maintenance, failed planting would be replaced which should be confirmed as part of the FYA evaluation.

5.70. It was apparent that planting had been undertaken in phases during the scheme construction, as there were areas where planting showed 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.

5.71. In addition, it was also apparent that the establishment and successful growth of planting was being monitored, with individual dead plants marked for replacement/removal, for example in the new hedgerow alongside Slacks Lane footbridge.

5.72. The HEMP also set out the strategy for future longer term maintenance and management of the soft estate by the MAC. At OYA the scheme generally appeared to be well maintained in relation to the implemented landscape mitigation, with little visible litter and low levels of weed invasion.

5.73. 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 appeared to have established successfully. It was recommended that this site should be revisited at FYA to confirm continued growth and establishment of this hedgerow. Another translocated hedgerow was 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.

Visual

5.74. Visual impacts relate to changes arising from the scheme to individual receptor's views of the landscape.

5.75. For visual receptors with a view to the scheme, impacts were considered to be generally adverse, as expected. The completed scheme included a number of highly visible new features, including junctions and bridges. Although the landscape mitigation was in place, it was immature and not yet effective as a visual screen. This was 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 had benefitted from the removal of traffic, which had improved their visual amenity as expected.

5.76. New overbridges, including Saxondale bridleway overbridge and Butt Lane overbridge would remain visible in the landscape until the planting scheme around them matured.

5.77. Visual screening in the form of close board fencing was 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.

5.78. Offsite planting was 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 (operating as Eden Hall Day Spa at OYA) and near Henson Lane. The planting adjacent to Elston Towers comprised of open grassland, linear belts of shrub and tree planting and woodland edge planting. The establishment of the offsite planting plots would be considered further at FYA.

FYA evaluation

5.79. Further to the OYA evaluation summarised above, only those aspects requiring closing out or updating are included as a part of the FYA evaluation. The photographic record of planting progress within the scheme is provided **Appendix B. Figure 5-1** shows a typical example of vegetation growth within the scheme.

Figure 5-1 Planting north of Widmerpool junction, northbound

5.80. Generally, plant growth is good, plant maintenance is being undertaken as required and plant stock failures are being replaced. These replacements are easily identified due to their size differences to original stock.

5.81. Planting on landscape mounds installed for visual screening is progressing well and set to achieve its screening function by the design year. Hedgerows are growing well with localised failures being replaced. Screening fences have been installed for individual landowners, with an example showing in **Figure 5-2** below.

Figure 5-2 Screening Fence

5.82. Woodland translocation is growing well and being maintained as required, as shown in **Figure 5-3** and **Figure 5-4.**

Figure 5-3 Woodland re-planting/translocation for loss of planting in Roehoe Woodland (1)

Figure 5-4 Woodland re-planting/translocation for loss of planting in Roehoe Woodland (2)

5.83. Confirming the issue raised by Cropwell Bishop Parish Council, lighting provided as a part of the scheme will not be screened by the design year on embankments. **Figure 5-5** demonstrates this point clearly.

Figure 5-5 Lighting within Stragglethorpe junction

Table 5–6 – Summary of Landscape

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 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
EST	Progress of planting functioning as visual screening and integration is serving to reduce the immediate impacts of the scheme. It is expected that current progress of planting and good maintenance practices will ensure that the screening requirements by the design year except for lighting on embankments which is expected.	As expected

OYA evaluation summary

Townscape

5.84. It was considered that the setting of the conservation area at East Stoke had benefitted from the removal of through traffic, which in turn improved the local townscape character and visual

amenity. The reduction in traffic volumes 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 OYA site visit, which would have been very unlikely pre-scheme due to the high levels of traffic that this road previously carried.

5.85. 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 were much reduced with the scheme. This should be revisited at FYA.

5.86. Overall, it was concluded that the AST score of a **slight beneficial** effect for townscape was apparent post-scheme.

Lighting

5.87. New lighting within the scheme was implemented as expected. The site visit confirmed that, as stated in the ES, lighting had been provided at Saxondale, Stragglethorpe, Margidunum and Farndon junctions. In addition, there was no lighting on the mainline, with sections of the former A46 now incorporated into the new dual carriageway having had lighting removed. This 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.

FYA evaluation

5.88. Traffic levels along the old A46 have reduced due to the scheme. Local traffic was observed using the road throughout the day during the site visit confirming the AST prediction that there would be ease of movement locally. Townscape is therefore considered to **be as expected.**

Table 5–7 – Summary of Townscape

Origin of Assessment	Summary of Effects on Townscape	Assessment
AST	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.	As expected

Cultural Heritage and Archaeology

Forecast

AST

5.89. 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.

5.90. The AST scored a **moderate adverse effect** for heritage.

Environmental Statement

Built environment

5.91. 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 would 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.

5.92. 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

5.93. 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.

5.94. With regard to archaeology, the ES predicted the following residual effects on archaeological sites:

- A sight 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.

5.95. 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.

5.96. 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

5.97. 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.

5.98. 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.

5.99. 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.

5.100. 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.

5.101. 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 was not known at OYA whether any restoration or enhancement had been undertaken and it was suggested that this aspect should be considered at FYA.

Consultation

5.102. Cropwell Bishop Parish Council stated their comment from the OYA stage still stands - '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'.

5.103. Nottinghamshire County Council responded on the built heritage as follows:

- Flintham Hall parkland, the impacts are as predicted. Some positive impacts, include an improvement to the perceived noise levels and tranquillity due to the road now being located in part through a cutting for part of the section close to the registered parkland.
- Hawton church, the impacts are as predicted and predominantly negative, although the view of the west elevation and tower is now closer and can be better appreciated by passengers using the A46.
- East Stoke Conservation area, the impact of detrunking the old A46 road has improved the tranquillity of the village, however the asked for reversals of highway signage and road markings was not delivered and remains a major negative intrusion on the rural character of the conservation area. One unpredicted negative outcome has been the redundancy of the pub/restaurant in the village.
- Elston Towers (Eden Hall Spa), the predicted benefits to the setting have materialised (much improved sense of tranquillity arising from relocating the road in a cutting to the rear of the site). Alongside this, the predicted negative impact on setting resulting from the bridge flyover (to access Elston village and the spa), has occurred but to only a negligible level.
- Effects of the repair and relocating of the wind pump at Fosse Farm (non-designated Heritage Asset (HA)), has proved successful.
- The impact on the setting and long term strategic aim of reopening the Grantham canal (non-designated HA) has been wholly negative. It appears as though little or no attempts were made to mitigate these issues.

Evaluation

OYA evaluation summary

5.104. The OYA report concluded that the impacts on the built heritage items visited appeared similar to those predicted in the ES/AST; however, it was noted that this assumption was based on an objective assessment.

5.105. The archaeological works undertaken for the scheme, as reported in the draft Archaeological Report (May 2011) had 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.

5.106. 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 OYA site visit and as built drawings, the landscape design had been implemented largely as set out in the ES; however, the planting had not reached maturity. As such, it was predicted that the adverse impacts on historic landscape features identified were as predicted.

FYA evaluation

5.107. As stated in the OYA report, in response to the Cropwell Bishop Parish Council consultation it is confirmed that there was no agreement from the then Highways Agency to provide a bridge over the Grantham canal.

5.108. The consultation responses received from the Nottinghamshire County Council are mostly positive although they also are concerned over the lack of mitigation of the impact of the scheme on the Grantham Canal.

5.109. Confirmation of the archiving of finds and reports has not yet been undertaken. It is understood that they will be archived at the Nottingham University Museum.

5.110. The archaeological results have been published and disseminated as a hardback Cotswold Wessex Archaeology (CWA) monograph.

5.111. A publication of summarised results from the internationally important LUP remains at Farndon Fields has been presented through a more specialised focused period-specific journal[22]

5.112. The Highways England website link contains the pamphlet “Following the Fosse Way Through Nottinghamshire”[23].

5.113. Overall, the progress of planting at FYA has further mitigated the effects of the scheme on the built heritage and it is expected that at design year, the scheme impacts will be as predicted although this may be better than predicted in some areas.

Table 5–8 – Summary of Heritage

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	Impacts appear largely as described in the AST/ES.	As expected

[22] https://www.researchgate.net/publication/263511073_Late_Upper_Palaeolithic_Farndon_Fields

[23] http://assets.highways.gov.uk/roads/road-projects/a46-newark-to-widmerpool-improvement/m120008_Following_the_Fosse_Way_through_Nottinghamshire_Archaeology_and_the_A46_proof_low.pdf

Biodiversity

Forecast

AST

5.114. 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.

5.115. The AST scored a **moderate adverse effect** for biodiversity.

Environmental Statement

5.116. The ES considered the ecology and biodiversity impacts to be of low significance in terms of nature conservation. In addition, the ES stated 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.

Consultation

5.117. Cropwell Bishop Parish Council stated that they are concerned that the concrete central reserve acts as a total barrier to wildlife movements. Whilst the amount of 'roadkill' observed seems to have decreased there is no way that hedgehogs, rabbits, frogs, toads, mice etc. can cross the road. They enquired as to whether this is contributing to the national reduction in Hedgehogs. They noted that the one year after report inspection failed to find the badger tunnels which were reported to have been installed and would like confirmation that these tunnels were "helping the wildlife".

5.118. Kinoulton Parish Council stated that:

- The solid central barrier is regarded as an issue for wildlife. The solid barrier between carriage ways prevents wildlife from crossing the barrier. Residents have stated that they have witnessed deer, badgers, hares, rabbits, a dog, and cats being hit by traffic after having to turn around upon reaching the central barrier and being unable to pass it.
- It was also raised that fences alongside woodland do not promote high flying that would reduce bird strikes with traffic. This is not only detrimental to the bird population but hazardous to drivers.

Evaluation

OYA evaluation summary

5.119. The key issues were summarised as follows:

Habitat / vegetation removal

5.120. Removal of vegetation / habitat was identified as an impact in multiple locations across the scheme although appropriate mitigation was proposed. 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 appeared to have predominantly successfully established, however, their value as habitat was limited at OYA. It was stated that the success of habitat establishment should be reviewed at FYA.

Hedgerows

5.121. 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 appeared to have established successfully. This site should be revisited at FYA to confirm continued growth and establishment of this hedgerow. Another translocated hedgerow located opposite Elston Towers (across Moor Lane) was not known about at the time of the OYA site visit.

Badger

5.122. Based on the as built drawings and the site visit, permanent badger fencing (with buried mesh and mesh on lower part of fence) was installed in numerous locations across the scheme, in association with badger tunnel locations.

5.123. 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 did not assess their effectiveness post construction.

5.124. Badgers would need to learn the new safe passage places across the road which might take time for routes to be established. The detailed Badger Mitigation Strategy 2010 recommended enticing badgers to the new tunnels using bait, which might 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 was not known at OYA whether this had been undertaken.

5.125. 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 was understood that post construction monitoring was underway and the result of this should be made available for the FYA evaluation report.

Bats

5.126. 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, standing deadwood and log piles were provided. Bat roosts were provided in the new Grantham Canal under bridge as confirmed during the site visit.

Amphibians

5.127. A total of 13 wildlife ponds with surrounding grassland/ scrub habitat were provided as a part of the scheme (in addition to balancing ponds). No reference to amphibian hibernacula was found in the HEMP or Environmental Masterplan as built drawings.

5.128. 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 was specified in the HEMP at Roehoe (ponds NP1, 2 and 3) as being undertaken up to 2014.

5.129. 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 was specified in the HEMP as ongoing.

5.130. The OYA report stated that the outcome of all GCN monitoring should be reviewed at FYA including other ongoing management activities for GCN comprise annual grass cutting in Autumn for habitat maintenance.

Ponds and water courses

5.131. Provision of ponds and watercourses included 13 wildlife ponds, 14 balancing ponds and 5 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

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

Breeding birds

5.133. Increased habitat was provided, but the new vegetation was mostly not sufficiently mature to provide nesting sites at OYA. Bird boxes were indicated on as built drawings as having been provided at Kinoulton Shelter Belt.

Barn owl

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

Reptiles

5.135. 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 was also indicated on as built drawings. Reptile hibernacula are indicated as having been provided associated with one balancing pond (pond 6), located adjacent to the Grantham Canal underbridge.

Macroinvertebrates (terrestrial and aquatic)

5.136. As part of mitigation for bats, standing deadwood and log piles were provided. In addition to providing mitigation for bats, these features also offer habitat for terrestrial macroinvertebrates.

5.137. Aquatic macroinvertebrate mitigation was provided in the form of 13 wildlife ponds, five ecology ditches and grassland and wetland habitat at the Moor Lane surface water balancing area.

OYA summary

5.138. Mitigation had 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 was likely that the impacts of the scheme on biodiversity were 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 provided a detailed outline of the post-scheme opening monitoring to be undertaken including location, timing and duration. Monitoring to be undertaken included bats, great-crested newts, badger, grizzled skipper butterfly translocated woodland, retained trees, ecology ponds, and new ecology/ habitat planting areas.[24]

FYA evaluation

5.139. No further monitoring reports were received at FYA although they were referenced as required in the OYA evaluation. Based on this, success of ecological mitigation can only be evaluated based on findings during the site visit.

5.140. Consultation responses received from Cropwell Bishop and Kinoulton Parish Councils indicate a concern with the central reserve concrete barrier for animals attempting to cross the A46. The construction of the scheme included the installation of mammal tunnels along the route, providing safe passage under the road. These tunnels were not reported on the OYA report. As monitoring reports were not received by POPE for this FYA evaluation, confirmation of the Parish Council's concern cannot be evaluated. During the site visit, no dead animals were

[24] No additional monitoring reports provided at FYA

noted which does not indicate that crossing is not an issue. **Figure 5-6** shows a typical badger fencing location adjacent to a mammal tunnel.

Figure 5-6 Badger Fencing

5.141. During the site visit, most mammal tunnels, GCN habitat creation areas (ponds, swale and ditches), SINC replacement habitat creation areas, translocated woodland plots and bat boxes were located. Photographic records of these areas can be found within this section and in **Appendix B**. Figure 5-8 Pond 1 GCN Ditchshows an area of habitat creation for the loss of habitat in a SINC. **Figure 5-8** shows GCN ditch and pond 1.

Figure 5-7Species rich grassland area created as mitigation

Figure 5-8 Pond 1 GCN Ditch

5.142. **Figure 5-9** shows a bat box as installed in Roehoe Woodland. No monitoring records have been made available to POPE to determine if mitigation for loss of habitat for bats has been successful.

Figure 5-9 Bat Box in Roehoe Woodland

5.143. **Figure 5-10** shows one of 13 GCN ponds included as mitigation / habitat creation for the scheme. Ecology pond NP06/NP07 is a typical view of GCN ponds throughout the scheme showing good maintenance practices.

Figure 5-10 Ecology pond NP06 and NP07

Figure 5-11 Translocated woodland species near Roehoe woodland

5.144. **Figure 5-11** shows translocated woodland establishing. Growth is acceptable at this stage.

5.145. Most mammal tunnels were showing active signs of use, one showing signs of flooding due to incorrect levels and overflow from pond 4. Two mammal tunnels were completely overgrown with no active signs of use. **Figure 5-12** below shows active signs of use and appears to be well maintained. **Figure 5-13** shows flooding and overgrowth with the concrete channel on the left of the view the overflow from pond 4. **Figure 5-14** shows an overgrown mammal tunnel with no use. It is recommended that overgrown mammal tunnels receive regular maintenance to confirm their availability for crossing to mammals.

Figure 5-12 Mammal Tunnel BT02

Figure 5-13 Mammal tunnel BT04 (wet from overflow from pond 4)

Figure 5-14 Mammal Tunnel BT07

5.146. **Figure 5-15** shows the success of mammal crossing where access has been provided over a ditch. First view shows the approach to the crossing with two regular paths in use, the second view shows the ditch crossing and the third, the successful approach to the actual mammal tunnel.

Figure 5-15 Mammal Tunnel BT11

5.147. In summary, new habitats, including woodland, hedgerows and species rich grassland have been created as part of the works and are progressing well at FYA. These have increased 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 not been confirmed via detailed monitoring reports to POPE. As such, these new habitats and features have been assessed on face value. Based on the findings of the site visit alone, it is concluded that the effect on biodiversity at FYA is as expected.

Table 5–9 – Summary of Biodiversity

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	Habitat creation and mitigation features have been installed as required in the ES and are deemed to be successful based solely on the site visit, without the provision of any monitoring reports beyond what was provided at OYA. Confirmation of use has not been received by POPE.	As expected

Water Quality and Drainage

Forecast

AST

5.148. 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 a better drainage design. Minor aquifers used for agricultural supply were noted as not being affected by the scheme.

5.149. The AST scored a **neutral** effect for water.

Environmental Statement

5.150. Several 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 was 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.

5.151. 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.

5.152. Regarding 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.

5.153. 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.

5.154. Mitigation measures in the scheme design as set out in the ES, include:

- Attenuation ponds to limit peak discharge rates.
- Scheme 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 proposed to ensure that there would be no net loss of land available for flooding.
- Oil interceptors 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 would be 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 would 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

5.155. A response on water quality and drainage from Cropwell Bishop Parish Council confirmed that the drainage issues noted at OYA appear to have been resolved. They do question however, whether the effectiveness of the ponds provided is as expected.

5.156. The Environment Agency response is as follows:

- Local water quality – as expected. Whilst we do not have any specific monitoring data confirming this, it is likely that mitigation measures will have been effective in reducing/avoiding impacts from highway drainage on local water quality, in particular where mitigation measures were installed where none previously existed. Similarly, it is likely that mitigation measures will have resulted in localised improvements in water quality, e.g. reducing levels of suspended solids, metals and oils, again particularly where highway drainage discharged directly to minor watercourses and ditches where no mitigation measures previously existed.
- Scheme drainage, pollution control measures and flow attenuation measures – as expected. We are not aware of any pollution incidents relating to highway runoff since completion of the scheme, so assume that the scheme drainage and pollution attenuation measures are operating as designed.
- Since the construction of the scheme the introduction of a Lead Local Flood Authority (LLFA) has taken on the responsibilities of dealing with surface water issues. They may have records of the performance / impacts of the drainage from the road scheme.

5.157. No response has been received from the Nottinghamshire County Council (designated LLFA) for flooding.

5.158. Kinoulton Parish Council stated that the water table has been changed along the route, especially through the cutting between Roehoe Junction and the A606.

Evaluation

OYA evaluation summary

5.159. 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.

5.160. The drainage and water quality mitigation features built as part of the scheme were shown on the as built drawings. It appeared from these drawings and from the drainage and water features noted during the OYA site visit, that the scheme had included the drainage and water mitigation features identified in the ES.

5.161. Surface water attenuation features included 14 surface water attenuation ponds along the scheme and one surface water runoff storage area north of the Moor Lane over-bridge, comprising ridge and furrow marsh / grassland / pasture. In addition culverts to maintain surface water flow were provided.

5.162. Flood mitigation provided as part of the scheme comprised 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 and another located further away from the scheme to the east, south of the River Devon, south-east of Farndon roundabout.

5.163. Oil separators specified in the ES (to be located upstream of ponds at the major junctions) were provided as part of the attenuation ponds (ponds 5, 7, 10 and 12) which are located close to these major junctions.

5.164. Based on the OYA site visit no obvious issues with drainage were apparent. However, consultation responses received from Cropwell Bishop Parish Council and the Environment Agency indicated that this may not be the case, with issues with drainage and potential flooding raised.

FYA evaluation

5.165. Consultation responses received were mostly positive, however Kinoulton Parish Council felt that the scheme had in some way, raised the water table causing issues with septic tanks. This will be raised with Highways England outside of this report.

5.166. All drainage ponds accessed as a part of the POPE site visit were showing good levels of maintenance with no overgrowth or invasive plant species noted. Pond views are included below and in **Appendix B**. **Figure 5-16** below demonstrates the high level of maintenance around and within the pond.

Figure 5-16 Pond 1

5.167. **Figure 5-17** and **Figure 5-18** show good maintenance practices within drainage channels along the scheme and leading to drainage ponds.

Figure 5-17 Drainage ditch north of Roehoe junction

Figure 5-18 Ditch leading to pond 8 and 9

5.168. **Figure 5-19** and **Figure 5-20** below show well maintained flood compensation areas situated south of Hawton Lane overbridge.

Figure 5-19 Flood compensation area east of Hawton Lane overbridge

Figure 5-20 Flood compensation area west of Hawton Lane overbridge

5.169. In summary and based on the information available to POPE at FYA, the effect on drainage and water quality appears to be as expected with a good level of maintenance being undertaken resulting in well-functioning drainage features.

Table 5–10 – Summary of Water Environment

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	Water quality and drainage in the form of features installed are performing as expected.	As expected

Physical Fitness

Forecast

AST

5.170. 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.

5.171. The AST scored a **neutral** effect for physical fitness.

Environmental Statement

5.172. 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.

5.173. 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.

5.174. 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

5.175. Cropwell Bishop Parish Council confirmed that their statement at OYA remained at FYA – "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."

5.176. Kinoulton Parish Council stated that public rights of way were generally much better than prior to changes although it was felt that there was a piece missing near Roehoe Junction, south.

Evaluation

OYA evaluation summary

5.177. The OYA report confirmed that the off-line dualling had 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 had 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.

5.178. In addition, new NMU over-bridges had improved access between the east and west side of the A46, for example Slacks Lane footbridge and Saxondale bridleway over-bridge. The approaches to these over-bridges are zig-zag format, allowing easy approach. The structures appeared well maintained and included high friction surfacing for equestrian users.

5.179. 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.

5.180. The Grantham Canal PRoW passed 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.

5.181. In general, PRoW, bridleway and other NMU provision appeared to be clearly signposted, well maintained and clean and free of litter. There was no NMU post opening audit report which would provide information relating to NMU usage and POPE had not undertaken any specific NMU surveys.

5.182. The OYA report concluded that the scheme largely had a neutral impact on overall physical fitness, as expected, with regard to impacts / issues that were Highways England responsibilities.

FYA evaluation

5.183. Cropwell Bishop Parish Council confirmed that an issue over the crossing at Stragglethorpe roundabouts raised at OYA remained at FYA. During the POPE site visit, an issue was not noted, although the site was accessed outside of peak hour traffic times.

5.184. Bridleways and footpaths were accessed during the POPE site visit. All were found to be well maintained and functioning as expected

5.185. **Figure 5-21** and **Figure 5-22** are a selection of PROWs, including use by recreational walkers and cyclists.

Figure 5-21 Bridleway north of Roehoe Junction

Figure 5-22 Saxondale Bridleway Overbridge

Figure 5-23 Cyclist using bridleway north-east of Red Lodge Junction

Figure 5-24 Walker using bridleway north east of Red Lodge Junction

Figure 5-25 Cycleway Bridleway at Flintham Junction

5.186. In summary, all PROWs accessed were functioning as expected and in a good state of repair. At FYA it is determined that the scheme effect on physical fitness is as expected.

Table 5–11 – Summary of Physical Fitness

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 considered to be as expected.	As expected

Journey Ambience

5.187. 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

5.188. 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.

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

Environmental Statement

5.190. 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.

5.191. 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

5.192. Comments received from Cropwell Bishop Parish Council have been forwarded to the POPE transport planner for use in the safety and traffic sections of this report.

Evaluation

OYA evaluation summary

5.193. The OYA report confirmed that lay-bys were located along the route; both north and southbound, providing a good separation from the main trunk road. This separation allowed 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.

FYA evaluation

5.194. **Table 5–12** and **Table 5–13** summarise the evaluation of the various elements of journey ambience and the scheme's impact on this sub-objective.

Table 5–12 – Summary of Journey Ambience

Sub-objective	AST score	OYA evaluation	FYA 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.	No change noted at FYA

Sub-objective	AST score	OYA evaluation	FYA evaluation
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 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.	The journey time analysis section of this report shows that there has been a considerable improvement in journey times along the new A46 although overall this is slightly less than predicted. Traffic flows show large increases than those predicted for roads outside of the key links of the scheme which may increase driver stress on some minor routes.
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.	No change noted at FYA

Figure 5-26 Lay-By north east of Car Colston Overbridge

Table 5–13 – Summary of Journey Ambience

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. Based on the traffic survey results, noise levels near the scheme are on balance as expected. Substantial increases and decreases in local roads suggest better than expected and worse than expected effects on residents.

Local air quality

- One issue of concern for air quality was raised in consultation responses received. The localised increase in traffic in the area of concern is, however, below 1,000 vehicles per day and therefore not sufficient to impact on air quality.
- Based on the traffic survey results, air quality near the scheme is considered to be as expected with local roads showing variances in their observed flow, indicating a worse than expected or better than expected evaluation for air quality.

Greenhouse gases

- A 72% net increase in carbon emissions for traffic on the A46 has been observed on the scheme section, higher than the re-forecast 69% increase. Despite the observed pre-scheme traffic being below the DM forecast, the speeds are higher than forecast, which explains the increase.

Landscape

- Overall, landscape impacts are as expected. Establishment of planting throughout the scheme is progressing well, with planting replacements showing early signs of growth. Planting success at FYA is set to ensure that visual screening and integrating of the scheme into the local landscape will occur by the design year.

Townscape

- Reduced traffic volumes has facilitated ease of movement within and between local settlements and isolated properties. Traffic on former A46 observed throughout the day during the site visit was continuous but appeared local.

Biodiversity

- New habitats, including woodland, hedgerow, grassland and ditches and ponds created as part of the works are progressing well. No monitoring reports were received by POPE at FYA, however, based on the findings of the site visit it is considered to be as expected.

Heritage

- Screening of heritage features are set to reach their design year targets. Archiving of the scheme data and finds has not been undertaken yet, but it is understood that these will be lodged at the Nottinghamshire University museum.

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.
- Views for travellers on the scheme are fairly enclosed in most cases, as expected. Provision of driver care facilities comprises existing off-site care facilities, such are restaurants, petrol stations and toilets, as well as laybys located in numerous locations along the length of the scheme.

Water

- The scheme includes the provision of 14 attenuation ponds and a surface water balancing area. These appeared during the site visit to be functioning as expected, and no visible issues with drainage were noted at the time.

Physical Fitness

- PROWs are functioning as intended with use noted during the POPE site visit. No NMU audit has been made available to confirm any issues that may have arisen due to their design.

6. Accessibility and Integration

Introduction

6.1. This section of the report evaluates the impact of the scheme in terms of accessibility and integration. It compares qualitative forecast assessments from the scheme AST with post-opening findings and analysis of policy objectives.

6.2. Accessibility refers to how the scheme has affected the ability of people to move between places, and to different types of facility, using any mode of transport. It takes into consideration the range of opportunities and choices an individual has to access these locations and services. This objective is made up of three sub-objectives:

- **Option Values**;
- **Access to the Transport System**; and
- **Severance**.

6.3. Intervention consists of two main objectives, as follows:

- **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; and
- **Land Use Policy and Other Government Policies** – how the scheme integrates with local land use and wider government objectives.

6.4. This section of the report is based on the findings of a site visit conducted on Wednesday 31st May and a desktop based study.

Accessibility

Option Values

6.5. Option Values, according to WebTAG guidance, refers 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, as the user would have the option of another mode should their preferred mode be unavailable.

Forecast

6.6. The AST for the A46 Newark to Widmerpool scheme forecast there to be '*no substantial change to transport services'*, and therefore forecast a score of **neutral** for this scheme.

Five Year After Opening Evaluation

6.7. The length of the scheme, and junctions which have been improved as part of the scheme are used by a number of bus services[25]. The main services using the northern section of the scheme are as follows:

- **Service 90A/90 (Marshalls Coaches)[26]** runs between Newark and Nottingham ('Fosseway Flyer'), calling at Farndon, East Stoke, Coneygrey Spinney and Radcliffe on Trent. It operates on an hourly basis throughout the day, Monday to Saturday. A two-hourly service is provided on a Sunday. This services utilises the improved A46

[25] http://www.nottinghamshire.gov.uk/media/109174/nottinghamshirecountybusmap.pdf

[26] http://www.marshallscoaches.co.uk/services.html

between East Bridgford and Coneygrey Spinney, and the old route of the A46 (Fosse Road) to the north of Coney Grey Spinney.

- **Service 91/354** (**Marshalls Coaches)**[26] runs between Newark and Bingham, serving Farndon, Elston, Sibthorpe, Flintham, Screveton, Car Colston and East Bridgford. It operates on a two-hourly basis, with hourly services in the morning and evening, Monday to Saturday. No Sunday service is provided.

6.8. At the OYA evaluation stage, Marshalls Coaches commented that:

'*The improvements offer a far more reliable journey time with fewer accidents and hold up due to slow traffic, and crucially the change the turn right out of Farndon village onto the old road with minimal delays'*

6.9. Only a small proportion of bus routes managed by Marshalls use the new A46, so they have not been able to offer faster journeys or increased frequency. However, the improvements have clearly had a positive impact on journey time reliability, re-enforced by results presented earlier in this report.

6.10. On the southern section of the scheme, the majority of services cross the A46, linking settlements such as Cropwell Bishop, Owthorpe and Cropwell Butler with the suburbs of Nottingham. The layout of these new junctions, with minimal congestion, is likely to assisted with increasing bus reliability, although there is currently no indication that any additional services or routes have been provided.

6.11. Based on this information, as the scheme has not led to any changes in option values, the sub-objective has been assessed as **neutral,** in line with forecast.

Access to the Transport System

Forecast

6.12. The AST for the A46 Newark to Widmerpool scheme forecast there to be '*no substantial change to transport services'***,** and therefore forecast a score of **neutral** for this scheme. The only changes to transport services were a relocation of a bus stop at Saxondale Village and Butt Lane.

Five Year After Opening Evaluation

6.13. Earlier sections of this report, have demonstrated that traffic and congestion through the villages situated along the alignment of the old A46 has reduced. This is likely to have improved bus reliability. Based on the evidence that traffic along these routes has reduced, it is also reasonable to assume that it is easier and safer for buses to pull into bus stops and laybys than pre-scheme.

6.14. Evidence has also been presented that indicates that journey times along the length of the A46 have improved. The improved journey times and congestion along the A46 mainline are likely to improve access to transport interchanges in Bingham, Newark and Nottingham.

6.15. Given that no physical changes were made to improve access to the transport system, this sub-objective has been assessed as **neutral,** in line with forecast.

Severance

Forecast

6.16. The AST for the A46 Newark to Widmerpool scheme states that '*scheme provides new safe crossing points at Saxondale and Farndon, which greatly improved non-motorised user provision along the scheme and reduced 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 the old A46 contribute*

to increased non-motorised user provision and provide a new north-south cycleway facility'. Therefore, the AST forecast a score of **Slight Positive** for this objective.

Five Year After Opening Evaluation

6.17. No post-opening NMU surveys were available for this scheme, and so this evaluation focusses on the qualitative impacts. **Table 6-1** shows a selection of photographs from the site visit which will be drawn on in this evaluation.

Table 6-1 Selection of photographs from site visit

	
Bridleway north of Roehoe Junction	**Shared cycleway/footway at Roehoe Junction**
	
Cycleway/Bridleway at Flintham Junction	**Overbridge at Saxondale**

6.18. Parts of the former A46 route have been downgraded to a bridleway/cycleway/pedestrian route, which provide a number of traffic free alternatives. This reduces severance for all non-motorised modes. This is particularly the case for locations where the scheme has provided an overbridge, for example at Saxondale. The provision of shared footway/cycleways at key junctions, for example Roehoe Junction, further reduces severance for non-motorised users. The post-opening site visit provided evidence of both pedestrian and cyclist activity on the routes along the length of the scheme.

6.19. Comments received from Kinoulton Parish Council noted that it was perceived that the footpaths are generally much better than pre-scheme, but that there is a section of footpath missing near to the south of Roehoe junction.

6.20. Given the factors considered above, this sub-objective has been assessed as **slight positive,** in line with forecast.

Integration

Transport Interchange

6.21. This objective aims to understand the extent to which the scheme has contributed to the Government objective of improving transport interchange for both passengers and freight.

Forecast

6.22. The AST states that '*no inter-modal interchanges would be provided'.* Therefore, the AST has forecast a **neutral** impact for transport interchange.

Five Year After Opening Evaluation

6.23. Although no freight or passenger interchanges have been provided as part of this scheme, it is likely that the decrease in traffic through villages and towns along the old alignment of the A46 will result in improvements for public transport. The reduction in traffic flows through these villages and towns, will improve the ease with which buses can stop and pull out into the main carriageway. Reduced traffic flows will also improve air quality and reduce noise in these locations, making the environment more pleasant for local bus users. Safety analysis has demonstrated that post-scheme, there are fewer collisions involving pedestrians along the old alignment of the A46 than pre-scheme. This therefore improves the safety of those travelling to bus stops along the existing alignment of the A46. Pedestrians may also make use of the footpaths which have been created to access bus stops, rather than walking alongside the carriageway.

6.24. Based on the evidence presented above, the forecast impact of **neutral** has been upheld at outturn.

Land Use Policy

6.25. This section examines the relation of the scheme to national, regional and local level land use and development policies.

Forecast

6.26. The AST states that '*scheme would support some land use policies, but hinder other policies'*. Based on this, the AST forecast the scheme to have a **neutral** impact on land use policy.

Five Year After Opening Evaluation

6.27. An evaluation of the scheme in relation to various relevant policies has been undertaken and summarised in **Table 6-2,** overleaf. Given the evidence presented, it is considered that the overall impact on the scheme at this FYA stage is **neutral**, as forecast in the AST.

Table 6-2 Land Use Policy Summary

	Policy/Document	Relevant Policy Objective/Reference	Relevant Scheme Impacts	
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: • 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.	• This scheme has included a number of measures and facilities for cyclists, pedestrians and horse riders, to link to a number of different land uses along the length of the scheme. This mitigates the impact of the scheme on non-motorised users. • Traffic volumes have decreased on a number of local roads, including old sections of the A46, improving safety and accessibility. • The scheme has improved the strategic road network between Newark and the wider area of Lincolnshire, Nottinghamshire and the East Midlands.	✓
	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: • 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.	• The scheme has considerably improved reliability for traffic using the A46 (between Newark and Widmerpool), and improved journey times, which will be of benefit to employment development in the local area. • The scheme has removed traffic from residential areas such as Farndon and East Stoke, facilitating an improvement in environmental conditions and removing through traffic. • Environmental Weight Limits have been introduced which prevents HGVs from routeing through small villages which were affected by through traffic and rat-running pre-scheme.	✓
	Newark and Sherwood District Local Plan 1999	The main aim of the Newark and Sherwood District Local Plan is to promote development that will bring benefits to the area, in particular, jobs and protection of the environment in all aspects. To achieve the aims of the Local Plan, the District Council will seek to secure implementation of the following objectives: • Early implementation of the dualling of the A46, including by-passes for Farndon and East, and 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	• 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.	✓
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: • 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.	• The scheme has reduced the number of collisions, both on key links and across the wider modelled area. • The scheme has considerably improved journey times for trunk road traffic and relieved pressure on other roads, removing potential congestion hotspots along the route. • There is evidence of increased traffic on the scheme section, over what can be accounted for by background growth. The improved scheme section, specifically in terms of improved journey times, may increase the attractiveness of this route, drawing extra traffic to the route. This may hinder policy 44, which aims to reduce the rate of traffic growth.	✓
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: • 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	• The scheme has delivered considerable journey time benefits, improving the efficiency of the trunk road network, with potential for wider economic benefits. This has also relieved pressure on other surrounding roads. • The scheme has reduced traffic volumes through a number of smaller settlements which were on the existing alignment of the A46. This has enhanced the built and natural environment in these locations. New habitats which were created as mitigation of the scheme are progressing well, which has also has benefits for the natural environment.	✓
	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.	• The scheme has delivered considerable 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 has built on fields and other previously non-built up land.	✓
	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 built around three themes, Sustained investment, Improvements in transport management and Planning ahead	• 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 local developments.	✓

✓ **Partial Alignment** ✓ **Full Alignment**

Key Points – Accessibility and Integration

Accessibility

- The removal of traffic on the existing alignment of the A46 and improvements at junctions along the scheme length, has improved journey time reliability for a number of local bus services. It is also likely that it is safer and easier for buses to pull into, and out of bus stops.
- Improved journey times and reduction of congestion along the A46 mainline will also improve links to transport interchanges in surrounding areas, as well as the quality of the environment for residents.
- Along the length of the scheme, facilities have been provided for use by pedestrians, cyclists and horse riders which were observed to be in use from a post-opening site visit. These facilities include overbridges, which reduce severance for non-motorised users.
- In summary, the sub-objectives which make up accessibility at outturn have been scored in line with forecasts, as follows:
    - Option Values – **Neutral**
    - Access to Transport System – **Neutral**
    - Severance – **Slight Positive**

Integration

- The reduction of traffic through a local villages and towns has decreased, which have indirectly facilitated public transport interchange improvements in terms of noise, air quality and safety.
- The scheme is aligned well with a range of local, regional and national policy documents related to land use and development.
- In summary, the sub-objectives which make up accessibility at outturn have been scored in line with forecasts, as follows:
    - Transport Interchange – **Neutral**
    - Land Use Policy - **Neutral**

7. Appraisal Summary Table and Evaluation Summary Table

Appraisal Summary Table (AST)

7.1. The AST is a summary of the main economic, safety, environmental and social impacts of a highway scheme. **Table 7-1** presents the AST for this scheme.

7.2. In particular, 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 schemes 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 (EST)

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 Coneygrey 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
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

OBJ	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE IMPACT	ASSESSMENT
	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 near the scheme are on balance as expected. Substantial increases and decreases in local roads suggests that better than expected and worse than expected effects on local residents' applies		As expected
	Local Air Quality	Based on the traffic survey results, air quality in the vicinity of the scheme is likely to be as expected. Local roads have variances in their observed flows which indicate some areas are worse than expected or better than expected for air quality.		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 34,504 tonnes (72% increase in emissions)	-£30.55, better than expected
	Landscape	Progress of planting functioning as visual screening and integration is serving to reduce the immediate impacts of the scheme. It is expected that current progress of planting and good maintenance practices will ensure that the screening requirements by the design year.		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	Impacts appear largely as described in the AST/ES.		As expected (moderate adverse)
	Biodiversity	Habitat creation and mitigation features have been installed as required in the ES and are deemed to be successful based solely on the site visit. Confirmation of use has not been received by POPE team.		As expected (moderate adverse)
	Water Environment	Water quality and drainage in the form of features installed are performing as expected.		As expected
	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 and key links has decreased post-opening. This suggests that the scheme has had a direct beneficial impact on collisions.	COBA modelled area savings in no. collisions per annum: 11.6 during post-opening period (includes national background reduction in collisions)	PVB = £62.95 (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**	PVC based on OYA costs – to be updated after first draft when updated costs are provided.	Forecast PVC: £274.5m Reforecast PVC: £273.9m	As expected
	TEE	Travel times using the A46 between Newark and Widmerpool have reduced considerably at the FYA stage when compared to those seen pre scheme. Times in all periods have reduced by with larger saving seen in the peak periods. Overall journey times have not reduced quite to the level forecast.	Journey time benefits £928.1m VOC -£228.9m Indirect Tax £187.5m	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)
	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)
Ac ce	**Option Values**	No impact on option values	Not applicable	As expected (neutral)

OBJ	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE IMPACT	ASSESSMENT
	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

Introduction

8.1. This section of the report concludes the report and summarises how the scheme is meeting scheme specific objectives.

Scheme Specific Objectives

8.2. **Table 8-1** presents an evaluation of the scheme's objective using the evidence presented in this report.

Table 8-1 Appraisal against Scheme Objectives

Objective	Has the scheme objective been achieved?	
To reduce the number of accidents.	Since the scheme opened, approximately five years ago, there has been an annual average reduction of 11.6 collisions across the COBA study area and 10.5 across the key links of the scheme. These values are considered statistically significant across the scheme links, but not the COBA modelled area. This shows that there has clearly been an improvement in safety as a result of the scheme.	✓
To reduce congestion along the route.	Journey times and journey time reliability on the scheme section has improved for vehicles travelling in both directions. This is due to the increased capacity on the road as a result of the scheme.	✓
To improve links between Nottingham and Leicester to Newark, the A1 and Lincoln.	The A46 scheme section forms a key section of these routes, so it is considered the improvements in journey times and safety along the scheme section will improve strategic links to these destinations via the M1 and A1.	✓
To provide an improved strategic link between the M1 and A1.		✓
To relieve significant development pressures in Bingham.	The upgrade of the A46 has increased the capacity of the A46 between Newark and Widmerpool. Bingham has direct access to this section of the A46 via Saxondale Roundabout. The development which has currently been completed in Bingham, for example at the site of RAF Newton, has not had a visible detrimental impact on congestion on the A46 mainline. Chapel Lane, a major residential development in Bingham, has not yet started construction, which may affect traffic flows in the future but cannot be considered at this stage. The additional capacity on the A46 is likely to be able to relieve future development pressure in Bingham.	✓

8.3. **Table 8-1** shows that the scheme has successfully achieved all of the objectives.

Appendices

Appendix A. OYA and FYA Traffic Flow Comparison (AWT)

			Pre-Scheme AWT	OYA AWT	FYA AWT
Highways England Roads	A	A46, North of A1 Newark	40,600	41,700	43,800
	B	A46 Newark Bypass	21,700	26,200	30,400
	C	A1, South of Newark	43,100	44,600	43,500
	D	A46 between A6097 and Newark	24,400	29,900	35,800
	E	A46 between A52 and A6097	28,400	31,900	38,100
	F	A52 West of A46	28,300	28,500	29,700
	G	A52 East of A46	18,200	18,000	18,900
	H	A46 between A606 and A52	19,100	23,300	28,800
	I	A46 South of A606	28,000	31,100	35,600
Local Authority Roads	1	A616 Great North Rd	10,000	10,500	12,100
	2	A617 Kelham	20,800	17,600	17,500
	3	B6386 Oxton Road	4,950	4,400	4,600
	4	A612 Nottingham Road	6,500	6,100	6,450
	5	Fosse Road	24,400	2,950	3,250
	6	B6166 Farndon Road	11,800	13,200	12,300
	7	Grange Lane	1,950	1,500	1,750
	8	Fosse Road	24,400	750	2,400
	9	Hawton Road	1,250	800	800
	10	Lodge Lane	1,000	1,950	1,950
	11	Inholms Lane	950	1,150	1,150
	12	A6097 Gunthorpe	21,300	20,700	21,100
	13	Red Lodge Lane	100	250	250
	14	Trent Lane	1,150	1,200	1,300
	15	A612 Nottingham Road	17,100	18,500	18,900
	16	Hawksworth Road	800	800	900
	17	Lodge Lane	100	150	150
	18	Kirk Hill	3,100	2,650	2,450
	19	Butt Lane	2,400	2,500	2,850
	20	East Bridgford Lane	2,650	2,250	2,400
	21	Tenman Lane	2,100	2,300	2,600
	22	Fosse Way	28,400	6,050	7,700
	23	Main Road, Newton	1,500	1,850	2,200
	24	Fosse Road	28,400	3,700	5,100
	25	Chapel Lane	8,300	7,800	8,700
	26	Henson Lane	750	850	850
	27	Hardigate Lane	750	850	1,150
	28	Cropwell Road	1,450	1,100	1,350
	29	Cropwell Road	750	950	1,050
	30	Fosse Road	19,100	800	850
	31	Stragglethorpe Road	6,150	7,900	7,900
	32	A52 Radcliffe Road	44,500	43,100	46,500
	33	Hollygate Lane	3,150	3,100	3,850
	34	Nottingham Road	5,650	4,200	5,650

	35	Fern Road	3,150	2,750	2,950
	36	Nottingham Road	5,900	5,250	5,650
	37	Colston East	1,400	1,350	1,750
	38	Colston Gate	1,900	1,350	1,650
	39	Cotgrave Road	9,300	8,600	8,100
	40	A606 Melton Road	26,200	25,300	26,300
	41	Owthorpe Road	1,650	2,150	2,300
	42	Park Lane	800	900	900
	43	Kinoulton Lane	1,400	1,200	1,250
	44	A60 Rempstone	10,200	9,800	9,600
	45	A6097 Warren Hill	8,200	6,700	7,300

*Values in table have been rounded

Appendix B. Environment

B.1. Sources

Table 1. Standard list of information required to evaluate the environmental sub-objective.

Requested Information	Response
Environmental Statement	Received ES, figures and technical reports
AST	Received
Any amendments/ updates/addendums etc. to the ES or any further studies or reports relevant to environmental issues. Have there been any significant changes to the scheme since the ES.	ES addendum (March 2007)
'As Built' drawings for landscape, ecological mitigation measures, drainage, fencing, earthworks etc. Preferably electronically or on CD.	Received
Copies of the Landscape/Ecology Management Plan or Handover Environmental Management Plans	Updated versions not received
Contact names for consultation	None received
Archaeology - were there any finds etc. Have any Archaeological reports been written either popular or academic and if so are these available?	Data and finds yet to be lodged with Nottingham University Museum.
Have any properties been eligible for noise insulation?	None received
Has any post opening survey or monitoring been carried out e.g. for ecology/biodiversity or water quality and if so would copies of the reports be available?	Monitoring reports are due but have not been made available
Animal Mortality Data	No request undertaken
Pre scheme Non Motorised User (NMU) Audit or Vulnerable User Survey	None received
Copy of NMU post opening survey	None received,
Employers Requirements Works Information - Environment sections	None received
Health and Safety File – Environment sections	None received
Construction Environment Management Plan (CEMP)	Not received
Landscape and Ecology Aftercare Plan (LEAP) and / or Landscape and Ecology Management Plan (LEMP)	2010 version received at OYA
Handover Environmental Management Plan (HEMP)	2013 version received at OYA – no updated version received

The Road Surface Influence (RSI) value of any low noise surface installed	None received

B.2. Photographic Record of Scheme

Landscape planting record at FYA

Butt Lane overbridge planting

Hedgerow – an example recent planting

Roehoe Junction planting

Landscape bund for visual screening north east of Henson land overbridge

Planting west of Saxondale overbridge

Planting north east of Hawton Lane overbridge – minimal growth with suspected compaction as an issue

Planting undertaken towards the end of the construction period

Biodiversity record at FYA

Ecology pond NP01

Ecology ditch/swale near pond 4

Ecology pond 5

Ecology pond NP08

Ecology pond 9

Ecology pond NP10

Ecology pond NP12

Ecology pond NP13

Mammal tunnel BT01

Mammal tunnel BT03

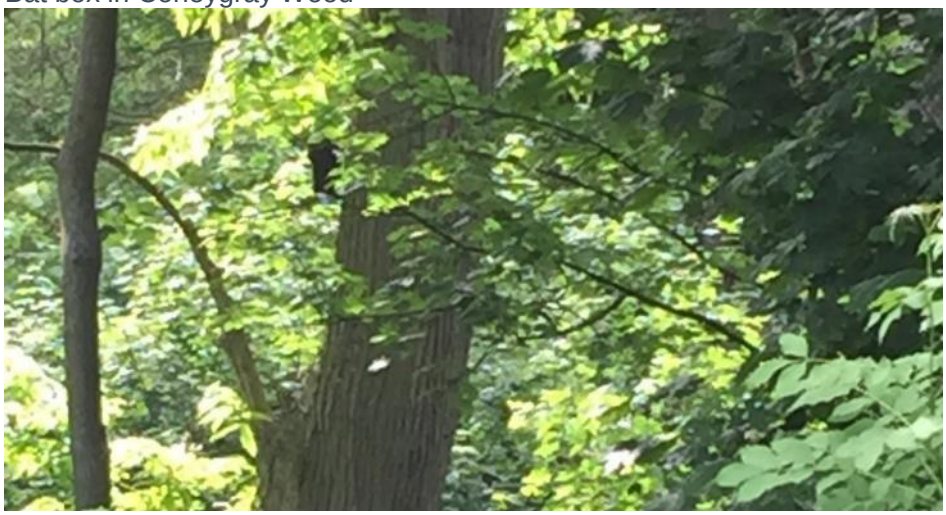
Mammal tunnel BT05

Mammal tunnel BT07

Mammal tunnel BT09

Mammal tunnel BT14

Bat box in Coneygray Wood



Drainage pond record at FYA

Pond 2

Pond 4a

Pond 4

Pond 5

Pond 6

Pond 7

Pond 8 and 9

Pond 10

Pond 11

Pond 12

Appendix C. 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.
AQMA	**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**
DIADEM	**Dynamic Integrated Assignment and Demand Modelling**. A piece of modelled software which allows users to set up variable demand models in accordance with advice provided in WebTAG.
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**
EAR	**Environmental Assessment Report** or, **Economic Assessment Report**

Terms	Definition
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.
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.
Laeq	Equivalent continuous noise level
LCA	**Landscape character area**
LEAP	**Landscape Environmental Management Plan**
LLFA	**Lead Local Flood Authority**
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**
PAR	**Project Appraisal Report**
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**

Terms	Definition
RSI	**Road Surface Influence**
SAM	**Scheduled Ancient Monument**
SATURN	**SATURN.** A piece of modelling software used for highway assignment to create strategic and local traffic models.
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.
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**
UK	**United Kingdom**
vpd	**Vehicles per day**
VOC	**Vehicle Operating Costs** are the costs that vary with vehicle use, for example fuel, tyres, maintenance costs, vehicle depreciation etc.
WebTAG	DfT's website for guidance on the conduct of transport studies at http://www.webtag.org.uk/
webTRIS	**webTRIS** Database holding information on traffic flows at sites on the strategic network.

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