Post Opening Project Evaluation

M1 Junction 25 to 28 Widening - Five Years After Opening Evaluation

May 2017

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Executive summary

Scheme Description

The M1 Junction 25 to 28 widening scheme is a Highways England major scheme situated between Derbyshire and Nottinghamshire, which opened in May 2010. The purpose of the scheme was to widen a 14 mile (23km) section of carriageway on the M1 motorway between junction 25 at Sandiacre, Derbyshire and junction 28 at Pinxton, Derbyshire. The road was widened from 3 to 4 lanes in each direction. Soon afterwards a controlled motorway technology scheme was implemented on the same scheme section.

Scheme Objectives

Widening Scheme Objectives *Source: Scheme Brief (June 2005)*	**Objective Achieved?**
Reduce congestion and improve journey time reliability	✓
Improve road safety	✓
Respect the environment	✓
Controlled Motorway Scheme Objectives *Source: Impact Assessment of M1 Junctions 25 to 28 Controlled Motorway Scheme*	**Objective Achieved?**
Reduce congestion and improve journey time reliability	✓
Improve road safety	✓
Achieve best use of existing road space	✓
Allow faster response times to incidents and reduce clear-up times	✓

Summary of Scheme Impacts

Key Findings

- Average journey times across the scheme have reduced by around 1 minute.
- Average weekday traffic flows are lower than forecast, showing a negligible change since pre scheme traffic flows.
- There has been decrease in the number of personal injury collisions since the scheme opened, with an average annual saving of 26 collisions and 50 casualties on the scheme itself.
- The majority of environmental impacts are as expected.
- The scheme delivers a Benefit Cost Ratio of 1.7, lower than expected due to the lower traffic levels giving lower benefits.

Traffic

- Overall, traffic flows across the scheme extent have shown a negligible change. Average weekday traffic travelling northbound has seen an average of 1% change from pre scheme to five years after the scheme was implemented. Southbound has seen no change on average in traffic flow.
- Greater variation can be seen in the peak hours which suggests the scheme section could now be a more attractive option to commuter/ business travellers due to the increase of capacity.
- Observed traffic flows are 17% lower than forecast across the entire scheme section

- The average journey time benefit of the scheme is 1 minute and 25 seconds compared to a saving of 1 minute and 11 seconds at the one year after evaluation stage.

Safety

- The number of injury collisions on the key links of the M1 and A38 has reduced from an annual average of 178 to 133, a saving of 45 collisions (26%).
- On the scheme section J25 to J28 excluding the junctions, the number of collisions reduced from an annual average of 63 down to 37, an annual saving of 26 (41%).
- The scheme was forecast to reduce collisions by 14% in the opening year. Post opening a saving of 25% (45 collisions) is seen.
- Personal security has improved through the increased provision of CCTV, improved lighting across many sections of the scheme and a new hard shoulder which has been designed to ensure that there were no discontinuities close to the junctions.

Environment

- Traffic speeds are as predicted and flows are largely within predicted thresholds. Therefore noise generated by traffic along the scheme and on adjacent links is likely to be generally as expected overall. However, lower than forecast traffic flows suggest there are likely to be better than expected noise impacts for sections of the scheme between J25 and J26 in both directions and between J26 and J27 northbound. Some Part 1 Claims have been successful indicating that the impacts associated with vibration in some locations were underestimated in the scheme's Environmental Statement (ES), and that noise has been an issue in some locations.
- Air Quality monitoring (for Nitrogen Dioxide) for 2010 to 2015 shows that the estimated concentrations given in the environmental statement have been underestimated.
- Landscape and townscape impacts are considered to be as expected, slight adverse. Mitigation has generally been implemented as expected and scheme planting is considered to be establishing satisfactorily thus in time it is anticipated to provide the expected screening. Part 1 Claims information indicates that the impacts of lighting may have been underestimated in locations near to Stanton Gate and Trowell.
- Biodiversity mitigation has generally been implemented as expected. Vegetation is maturing satisfactorily and it is expected to provide its expected ecological function. Mitigation such as bird boxes, bat boxes, hibernacula and log piles have been installed across the scheme although there are some issues with vandalism and poorly constructed structures. In general, benefits are largely being realised, as expected.
- The impact of the scheme on water quality and drainage is considered to be neutral, as expected as pollution control measures were implemented.
- The overall impacts on journey ambience are considered to be beneficial as expected.

Accessibility and Integration

- The impact of the scheme on accessibility and integration sub objectives are neutral, as expected.

Summary of Scheme Economic Performance

All monetary figures in 2002 Prices and values		Forecast	Reforecast
Investment and operating cost in present value (PVC)		£314.4 m	£270.2 m
Journey Time Benefits		£521.3 m	£345.7 m
Vehicle Operating Costs		-£47.0 m	-£19.1 m
Safety Benefits		£86.9 m	£122.6 m
Construction Delay		-£12.7 m	-£12.7 m
Journey Time Reliability		£12.8 m	£12.8 m
Total Present Value Benefits		£561.3 m	£449.3 m
Indirect Tax		£41.3 m	£16.8 m
Benefit Cost Ratio (BCR)	**Indirect Tax impact treated as a cost**	2.1	1.8
Benefit Cost Ratio (BCR)	**Indirect Tax impact treated as a benefit**	1.9	1.7

- The reforecast assessment of the scheme's benefits indicate that it will provide £450m (£466m with indirect tax) in present value benefits in 2002 values over 60 years.
- The reduction in journey times, provides the majority of the total benefits but are lower than expected due to lower than forecast traffic flows.
- Safety benefits are higher than expected due to a better than expected reduction in the number of collisions on the M1 and the level of disbenefit for users' Vehicle Operating Costs being also better than expected.
- The investment cost to build the scheme (widening and installation of the controlled motorway) was £261.7 million (in 2002 prices, not discounted), which is 12% lower than forecast.
- Outturn Benefit Cost Ratio represents over £1.70 of benefits for every £1 spent which represents medium for money.

1. Introduction

1.1. This report is a Five Years After (FYA) opening evaluation study of the M1 Junction 25 to 28 widening scheme which opened in May 2010. The evaluation has been prepared as part of Highways England's Post Opening Project Evaluation (POPE) programme. This report builds upon the findings of the One Year After (OYA) POPE study.

Scheme Context

1.2. The M1 J25 to J28 widening scheme is a 14 mile (22.5km) stretch of motorway situated between Derbyshire and Nottinghamshire (As shown in **Figure 1.1**). The scheme runs between Sandiacre (J25) and Pinxton (J28). The M1 is a key strategic link between London, the Midlands and the North while providing access to the cities of Derby and Nottingham.

1.3. Before the scheme opened, this section of the M1 experienced high volumes of traffic, from both long distance travellers as well as local traffic around the East Midlands. The M1 was originally expected to carry up to 67,000 vehicles per day, however has been exceeding this volume for many years.

1.4. The M1 J25 to J28 widening scheme was part of a larger programme of schemes after the need was raised to provide extra capacity on the M1 through Yorkshire and the East Midlands. This led to the East Midlands Multi-Modal Study in 2002, which considered a 50 mile long scheme between Leicester (J21) and Chesterfield (J30).

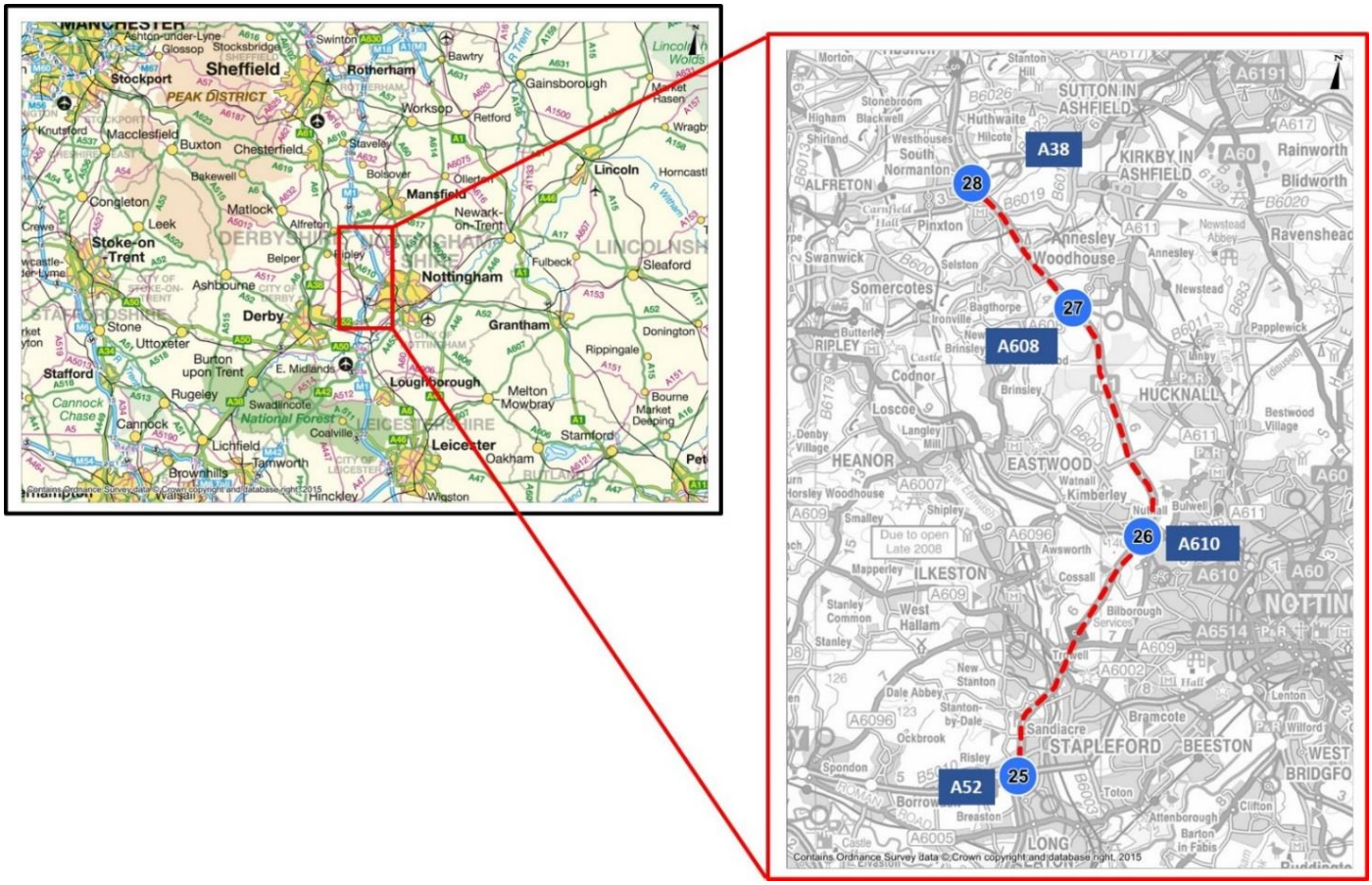
1.5. This scheme aimed to increase capacity along the M1 through widening from 3 to 4 lanes in each direction. Subsequent to the widening scheme, a controlled motorway technology scheme was implemented on the same scheme section. It should be noted that any impacts assessed in this report are the combined effects of both the schemes implemented.

1.6. A Controlled Motorway is a system of traffic management that applies variable speed limits to traffic at busy times or when incidents occur. By using overhead gantries spaced at regular intervals, variable message signs (VMS) instruct drivers which lanes can be used and the speed limit that applies. When congestion builds up lower speed limits are applied in order to smooth the flow of traffic. The system also provides information to drivers (via VMS) and the Traffic Officer Service about incidents and lane closures. The M1 J25 to J28 widening scheme resulted in the motorway having 4 lanes of carriageway permanently open for traffic in each direction, therefore the controlled motorway system could be added without the need to use the hard shoulder.

1.7. East Midlands Airport lies within close proximity to the scheme. The airport is the second largest freight terminal and 11th largest passenger terminal in the UK[1]. This gateway creates a large volume of traffic for the M1 and other surrounding roads in the area from both passengers, imports and exports as well as employment.

[1] Civil Aviation Authority, UK Airport Statistics: 2015 – Annual. Available at online: https://www.caa.co.uk/Data-and-analysis/UK-aviation-market/Airports/Datasets/UK-Airport-data/Airport-data-2016-05/

Figure 1-1 Location of M1 J25 to J28 widening scheme



Scheme Description

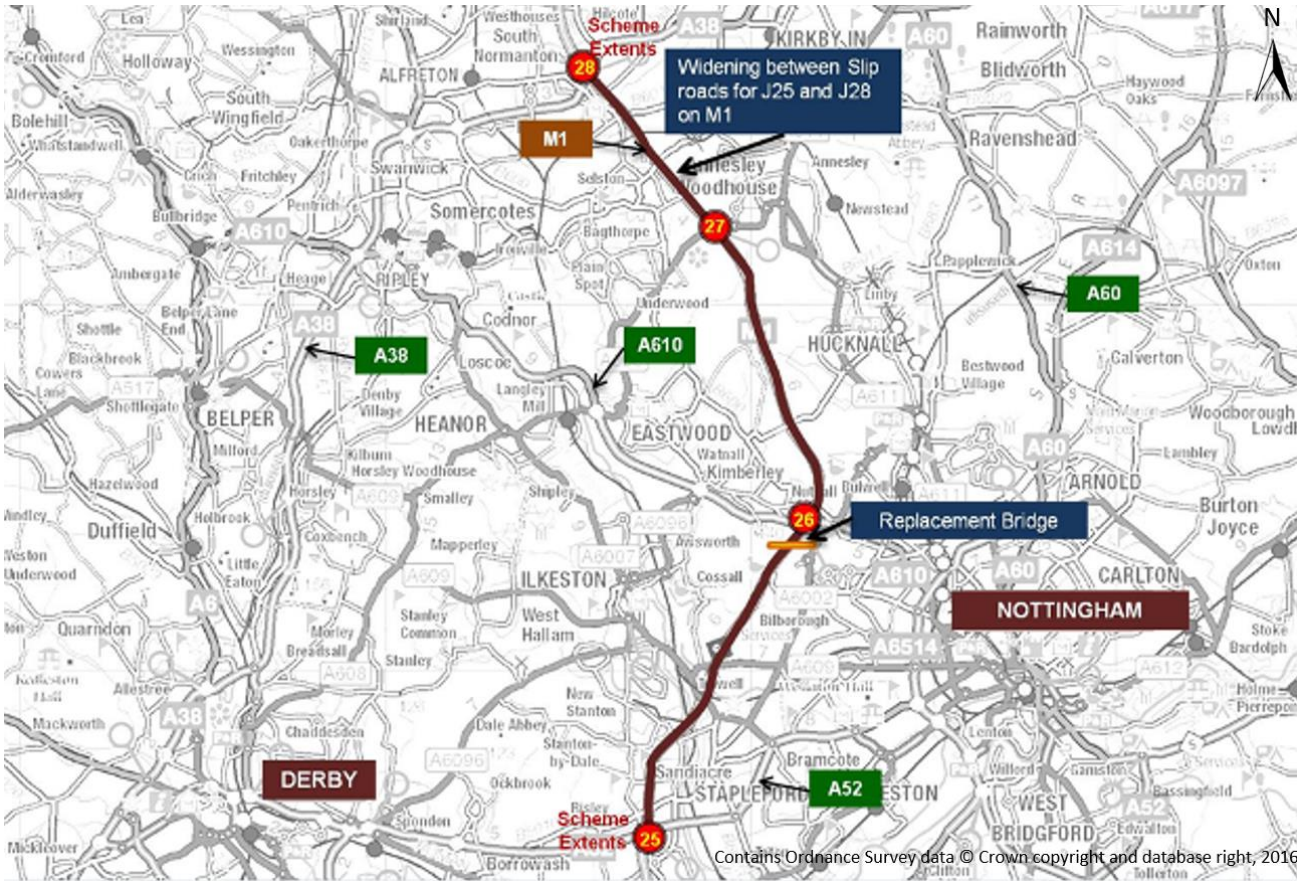
1.8. The scheme under evaluation in this POPE report formed Stage 1 of the proposed M1 widening improvement scheme between J21 and 30. Stage 1 of the scheme was to widen 14 miles of the M1 between J25 and J28 to provide relief from the effects of congestion caused by high volumes of traffic. The key features of the works consisted of:

- Widening from 3 to 4 lanes in each direction between J25 and J28 by converting the hard shoulders into permanent running lanes and providing new, discontinuous hard shoulders and emergency strips of at least 2.0m width that run for the whole length of the scheme;
- Extra lane added to the main carriageway through J26 and J27 and minor changes to the slip roads at each of the four affected junctions, but the motorway junctions themselves are unchanged;
- Earthworks and retaining walls for the widened carriageway;
- Resurfacing with low noise materials (routine maintenance works brought forward);
- Replacement or upgrading of some bridges;
- Noise barriers and other environmental mitigation measures; and
- Controlled Motorway between J25 and J28, including new sign and signal gantries.

1.9. The Controlled Motorway element of the scheme was added after the original widening scheme was given approval and it had a separate business case and approval process but it has been included as part of the J25 to J28 scheme in this evaluation as it is not possible to disaggregate the impacts of the widening and controlled motorway elements.

1.10. Construction of the scheme began in October 2007 and was completed in May 2010. The key features of the scheme are shown in **Figure 1-2.**

Figure 1-2 Key Features of the Scheme



Scheme History

1.11. A summary of the key events involved in the development of the scheme is provided in **Table 1-1.**

Table 1-1 Scheme History

Date	Event
1993- 1994	Options for widening of M1 prepared by Highways Agency (now Highways England)
December 2002	Secretary of State announces support for the scheme
July 2003	The scheme is split into 2 separate phases
March 2006	Environmental Statement published
March- June 2006	Public Consultation
January 2007	Contract awarded
October 2007	Construction commences
May 2010	M1 J25 to J28 4 lanes opened to traffic with Variable Advisory Speed Limits introduced
May 2011	Variable Mandatory Speed Limits introduced

Scheme Objectives

1.12. The M1 J25 to J28 scheme contained both a widening element and the implementation of a Controlled Motorway.

1.13. The overall objectives of the M1 J25 to J28 Widening scheme were defined in the Scheme Brief and they were to:

- Reduce congestion and improve journey time reliability;
- Improve road safety; and
- Respect the environment.

1.14. The Controlled Motorway scheme element set separate objectives. These were defined in the Impact Assessment of M1 J25 to J28 Controlled Motorway Scheme and were to:

- Reduce congestion and improve journey time reliability;
- Improve road safety;
- Achieve best use of existing road space; and
- Allow faster response times to incidents and reduce clear-up times.

Post Opening Project Evaluation

Highways England's Appraisal Process

1.15. 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 project's continued development. When submitting a proposal for a major transport scheme, the Department for Transport (DfT) specifies that an Appraisal Summary Table (AST) is produced which records the degree to which five objectives[2] have been achieved. The AST for this scheme is presented in Appendix B of this report.

Post Opening Project Evaluation

1.16. POPE studies are undertaken at two stages after all Major Schemes have opened: one year after scheme opening and five years after scheme opening. The purpose of POPE studies is to document outturn impacts, evaluate the strengths and weaknesses of the techniques used for appraising schemes so that informed improvements can be made to the appraisal process in the future. This is achieved by comparing information collected before and after the opening of the scheme to traffic, against predictions made during the planning process. The outturn impacts of a scheme are summarised in an Evaluation Summary Table (EST) which summarises the extent to which the objectives of a scheme have been achieved. The EST for this scheme can be found in Appendix C of this report.

Summary of M1 J25 to J28 OYA Opening Study

1.17. The purpose of the FYA study is to verify and undertake a more in-depth analysis of the emerging trends and conclusions from the OYA study. The main conclusions reported at in the M1 J25 to J28 OYA evaluation study were as follows:

- Average journey times were reduced by approximately 1.2 minutes but average peak hour journey times were cut by up to 11 minutes. The evening peak saw the largest savings in journey time. These impacts were in line with the forecasts that were made for journey times.

[2] In recent years these have changed, but the evaluation of this scheme in this study will use those defined at the time of its appraisal, namely Environment, Safety, Economy, Accessibility and Integration.

- There were 26% fewer collisions per year on this section of the M1 since the scheme was constructed than in the five years prior to opening and a 38% decrease in the number of casualties. The average severity of collisions increased slightly due to the reduction in the number of slight collisions rather than an increase in the number of serious and fatal collisions.

Report Structure

1.18. The structure of this report is as follows:

- **Chapter 2** - Traffic Impact Evaluation
- **Chapter 3** - Safety
- **Chapter 4** - Economy
- **Chapter 5** - Environment
- **Chapter 6** – Accessibility and Integration
- **Chapter 7** – Conclusions
- **Appendix A** – Glossary
- **Appendix B** – Appraisal Summary Table
- **Appendix C** - Evaluation Summary Table
- **Appendix D** – Environment Sources
- **Appendix E** – Air Quality Data
- **Appendix F** – Detailed Ecology Evaluation
- **Appendix G** – Tables And Figures Listed in this report

2. Traffic Analysis

Introduction

2.1. This section examines traffic data from a number of sources to provide a before and five year after scheme opening comparison of traffic flows and journey times along the M1 J25 to J28. The purpose of this evaluation is to understand whether changes in traffic flows and journey times may be attributable to the scheme.

2.2. This chapter comprises:

- An overview of national, regional and local background traffic trends.
- A detailed comparison of pre scheme, OYA and FYA traffic flows on key routes on and around the M1 area likely to be affected by the scheme.
- A comparison of journey times for before scheme opening and FYA stages.
- An evaluation of key differences between forecast and outturn impacts of the scheme in terms of traffic flows and journey times.

Background Traffic Trends

2.3. Historically in POPE scheme evaluations, the 'before' counts have often been factored to take account of background traffic growth so that they are directly comparable with the 'after' counts. This usually involves the use of National Road Traffic Forecasts (NRTF), with local adjustments made using Local Growth Factors if applicable.

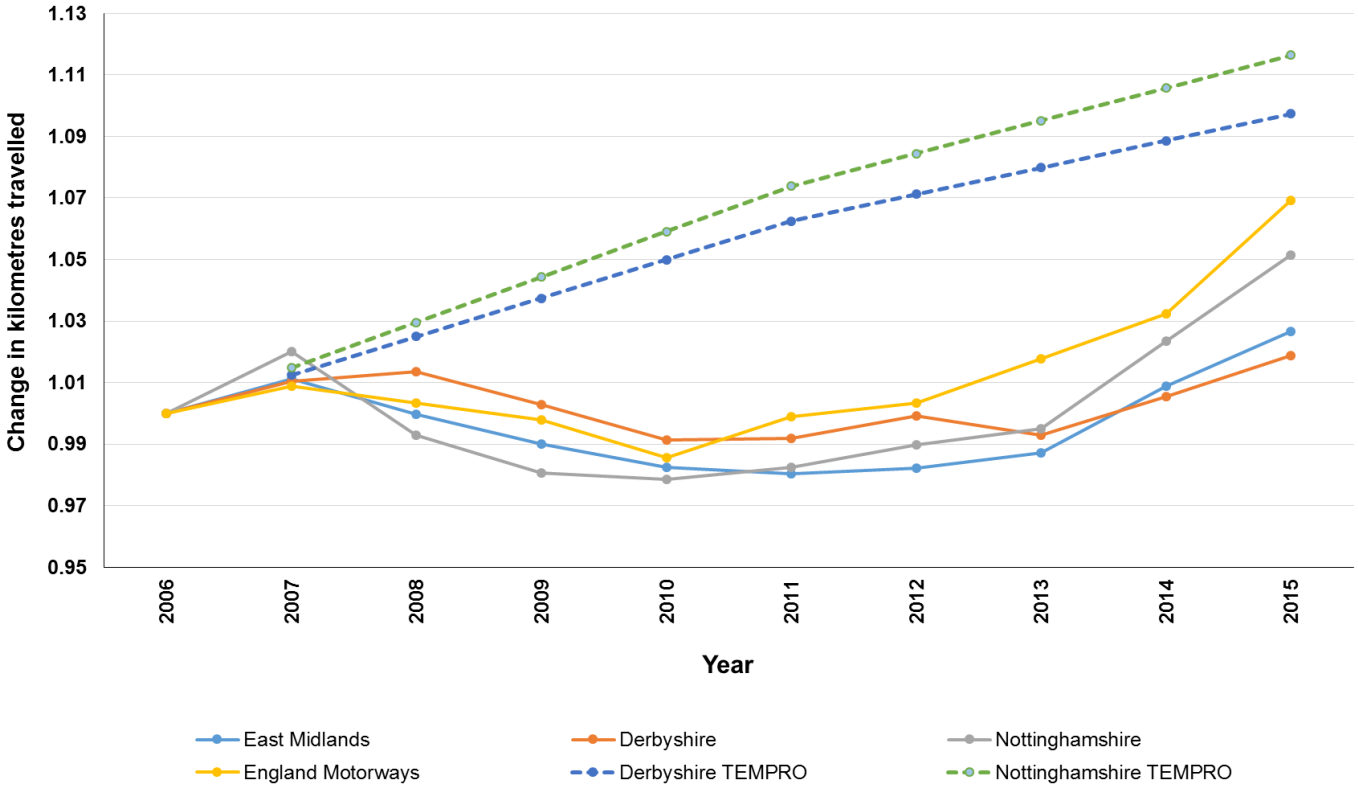
2.4. However, over the evaluation timescales used for this report, there has been a widespread reduction in vehicle travel in the UK as a whole in the period from 2008, it is no longer deemed appropriate to use this method of factoring 'before' counts to reflect background changes in traffic. As an alternative, recent POPE studies have taken a more considered approach in order to assess changes in the vicinity of the scheme, within the context of national, regional and locally observed background changes in traffic.

Local, Regional and National Trends

2.5. The best measure of the wider trends in overall traffic levels both regionally and nationally is shown in DfT annual statistics for total distance travelled (million vehicle kilometres)[3]. **Figure 2-1** shows the observed changes by year in the period from 2006 (when traffic forecasting for this scheme was done) and 2015 (the latest available) for the regions in which it lies, and for motorways managed by Highways England. In addition, predicted traffic trends are presented, obtained from NTEM (National Trip End Model) 5.2, forecasted from the TEMPRO (Trip End Model Presentation Program) software. The traffic forecast for the scheme used NTEM 4.0 however this version is no longer available and therefore the successive version has been used. This will not make a notable difference to the results.

[3] Graph based on data in DfT tables TRA8904 and TRA4112.

Figure 2-1 Local, Regional and National Traffic Trends



2.6. National trends indicate an overall increase in vehicle kilometres travelled between 2006 and 2015. Vehicle kilometres do see an average decrease of 2% between 2007 and 2010 which coincides with the economic recession. In 2015 national vehicle kilometres travelled were 7% higher than in 2007 and 8% higher than in 2010.

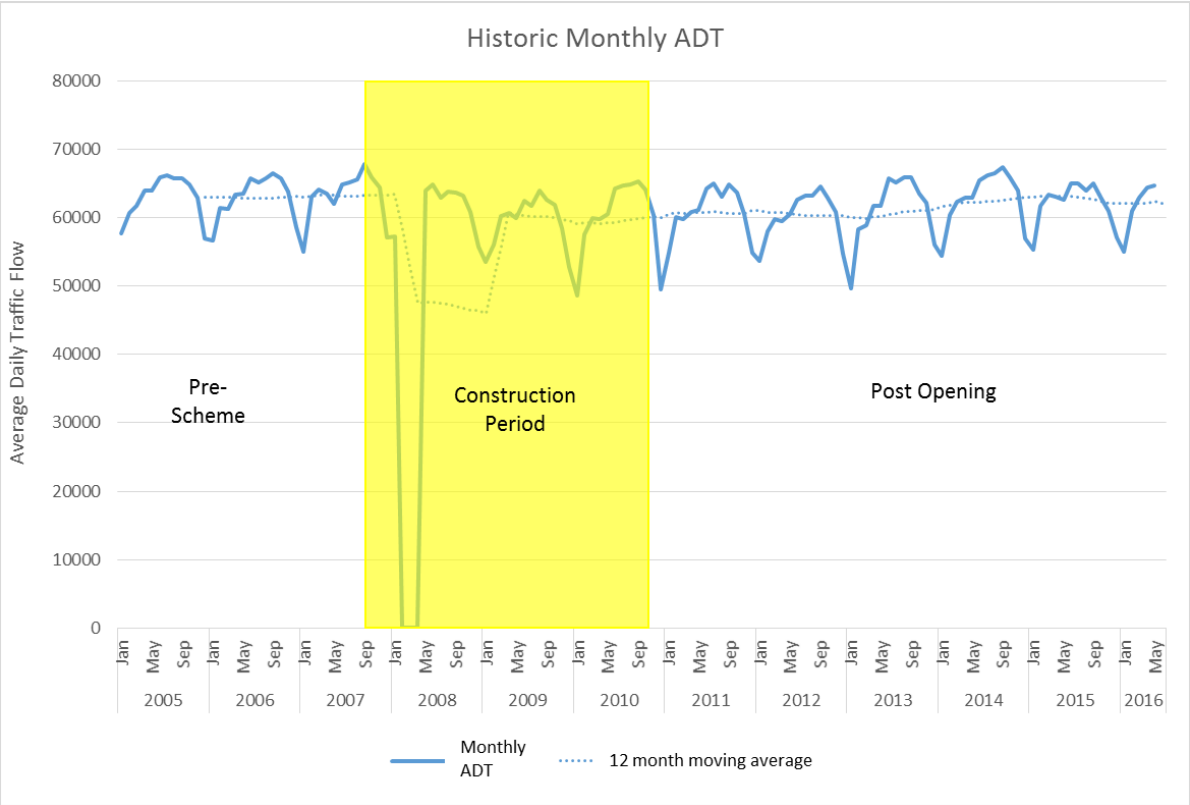
2.7. In addition to this, TEMPRO forecasts for both Nottinghamshire and Derbyshire overestimated future traffic growth showing predicted forecasts to be significantly higher than observed traffic growth figures, both locally and nationally. As the scheme appraisal used the NTEM to produce specific forecast traffic flows on the scheme itself, forecasting figures presented later on in the report will be significantly greater than the observed traffic flow figures.

2.8. Vehicle kilometres travelled across the East Midlands indicate a slight decrease in vehicle kilometres travelled between 2007 and 2010, however vehicle kilometres travelled have been rising since 2010. A similar trend can be seen for motorways.

Long Term Traffic Trends on the M1

2.9. In order to determine a greater understanding of the historical fluctuations in yearly traffic flows along the M1, **Figure 2-2** presents annual average daily traffic (AADT) flow data collected from the TRADS (Traffic Database System) database. The data presents traffic flows for a section of the M1 just south of the scheme, between J24a and 25.

Figure 2-2 Historic Monthly ADT, J24a-25 (Combined Directional Average)



2.10. The historic monthly average displays the monthly changes in traffic flow from 2005 to 2016. Although daily traffic flows fluctuate by month through the year, only a small overall change in traffic flow can be seen over the 10 year period.

2.11. It should be noted that the 0 flow between January and May 2008 were during the construction period of the scheme. This means that the traffic count systems were temporarily turned off or removed in this period and therefore no data was available however traffic still used this section of motorway during this time.

Conclusions on Background Changes in Traffic

2.12. From the analysis of background traffic changes, the DfT distance travelled data shows that there has been between a 2-5% increase nationally, regionally and locally over the time period covered in this between 2006 and 2016. Observed long term data for the M1 shows that traffic volumes have experienced a negligible change in traffic flow between 2007 and 2016. When reading this report it is therefore important to keep in mind that any change in vehicle flows (over 2%) are more ikely to be attributed to the scheme itself rather than background change in traffic flow.

Scheme Background

2.13. The modelled area for traffic covered the proposed widening of the M1 between J21 and J30. At the time of the Traffic Forecasting Report it was planned that the widening would be conducted under two contracts. Contract 1, the scheme evaluated here, and Contract 2 would include the remaining junctions. After Contract 1 was completed, Highways England introduced Smart Motorways which uses active traffic management (ATM) techniques to increase capacity by use of variable speed limits and hard shoulder running, therefore Contract 2 became a Smart Motorway scheme as an alternative to widening. The additional schemes have been undertaken in two sections, the M1 J28 to 31 smart motorway scheme that opened in March 2016 and the M1 J24 to J25 which has joined with the M1 J23a to J24 scheme and is set to begin construction in early 2017. Table 2.1 highlights the location of other upgrading work in the area.

Table 2-1 Additional Improvement Schemes Located on M1

M1 Section	Scheme	Status
M1 J32 to J35a	SMART Motorway	Under Construction (to be completed March 2017)
M1 J28 to J31	SMART Motorway	Scheme Opened March 2016
M1 J25 to J28	**Widening (with Controlled Motorway)**	**Scheme Opened May 2010**
M1 J24/ A50 Approach	Junction Improvement, Pinch Point	Scheme Opened March 2015
A453 –Between M1 J24 and Nottingham	Dualling	Scheme Opened July 2015
M1 J23a to J25	SMART Motorway	Construction set to begin 2017
M1 J19	Junction Improvement	Under Construction (to be completed December 2016)
M1 J16-19	SMART Motorway	Under Construction (to be completed March 2017)

Traffic Volume Analysis

Data Sources

2.14. This section uses a variety of data sources to inform the before and after analysis of changes in traffic volumes for the scheme. To complete this evaluation, data from before construction (June 2007), OYA opening (June 2011) and FYA opening (May 2016) is compared.

Traffic Count Data Sources

2.15. For the purpose of this evaluation study, the following sources of traffic data have been used:

- Permanent traffic count data obtained from the Highways England TRADS/WebTRIS database for count locations on the strategic network for before construction (June 2007) and OYA counts (May 2010) and FYA (May 2016).

- Permanent traffic count data was provided by Nottinghamshire County Council for locations on the wider surrounding network for before construction (June 2007), OYA (May 2011) and FYA (May 2016).

2.16. **Table 2-2** details the traffic count sites used in the FYA evaluation and the locations of these sites are shown in **Figure 2-3** and **Figure 2-6** along with observed average weekday traffic flows (AWT).

Table 2-2 Count Site Locations

Source	Site Ref	Location
Nottinghamshire County Council	A	A60 Nottingham Road, Ravenshead
	B	A614 Old Rufford Road, Bilsthorpe
	C	A60 Ruddington, north of crossroads
TRADS	1	M1 J24a-J25
	2	M1 J25-J26
	3	M1 J26-J27
	4	M1 J27-J28
	5	M1 J28-J29
	6	A38 N of A609
	7	A50 Derby Spur/ A6 Alvaston Bypass

Observed Traffic Flows

2.17. A comparison of pre-scheme and post-opening 24-hour Average Weekday Traffic (AWT) flows along the scheme section is presented in **Figure 2-3**, while **Figure 2-4** and **Figure 2-5** show the total traffic flows in the AM (7am-8am) and PM (5pm-6pm) peak periods. The percentage change in flow at OYA and FYA are compared to the period before the scheme began construction and are indicated by colour code.

Figure 2-3 Before and After Traffic Volumes on scheme section (AWT)

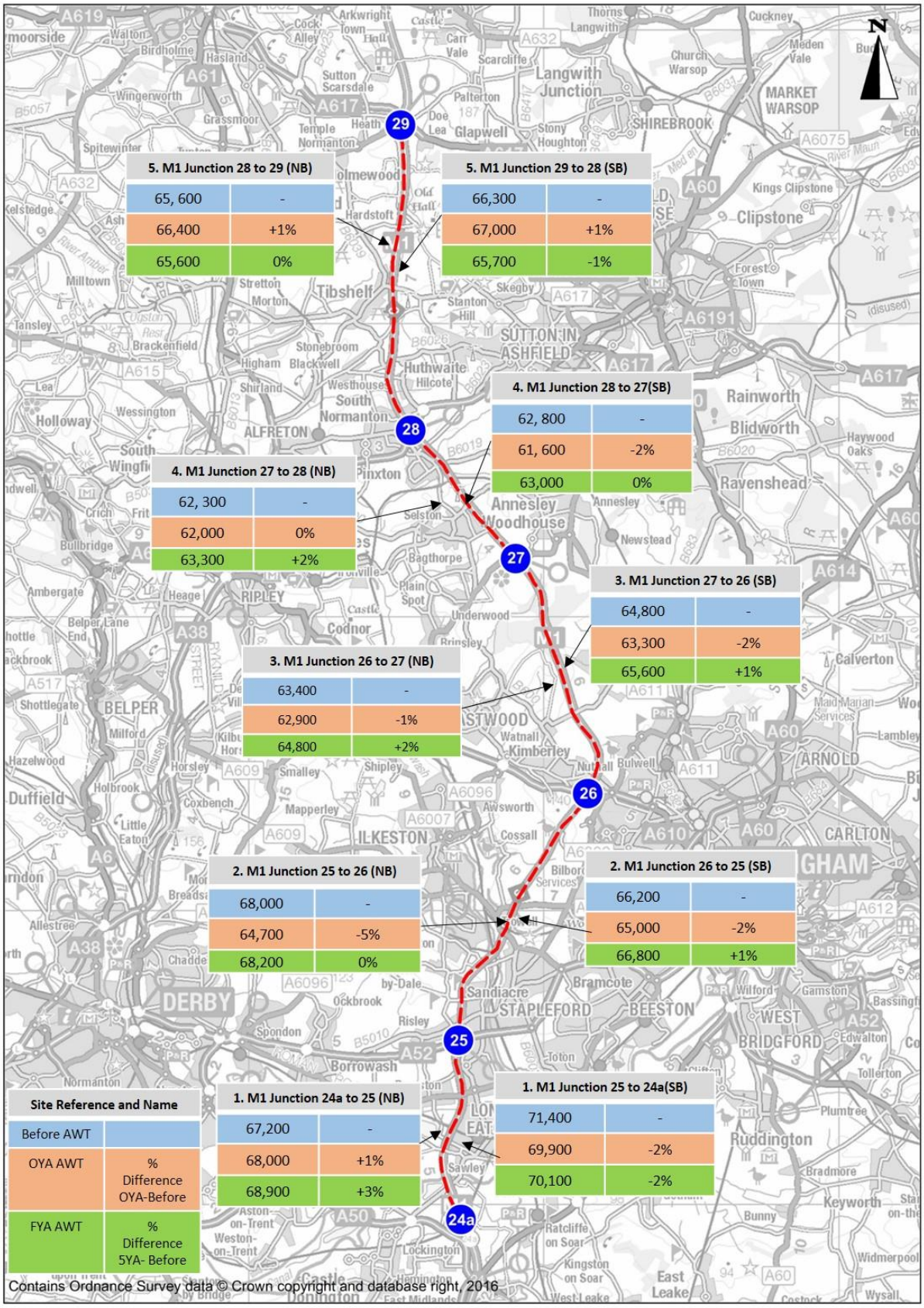


Figure 2-4 Before and After Traffic Volumes on scheme section (AM Peak)

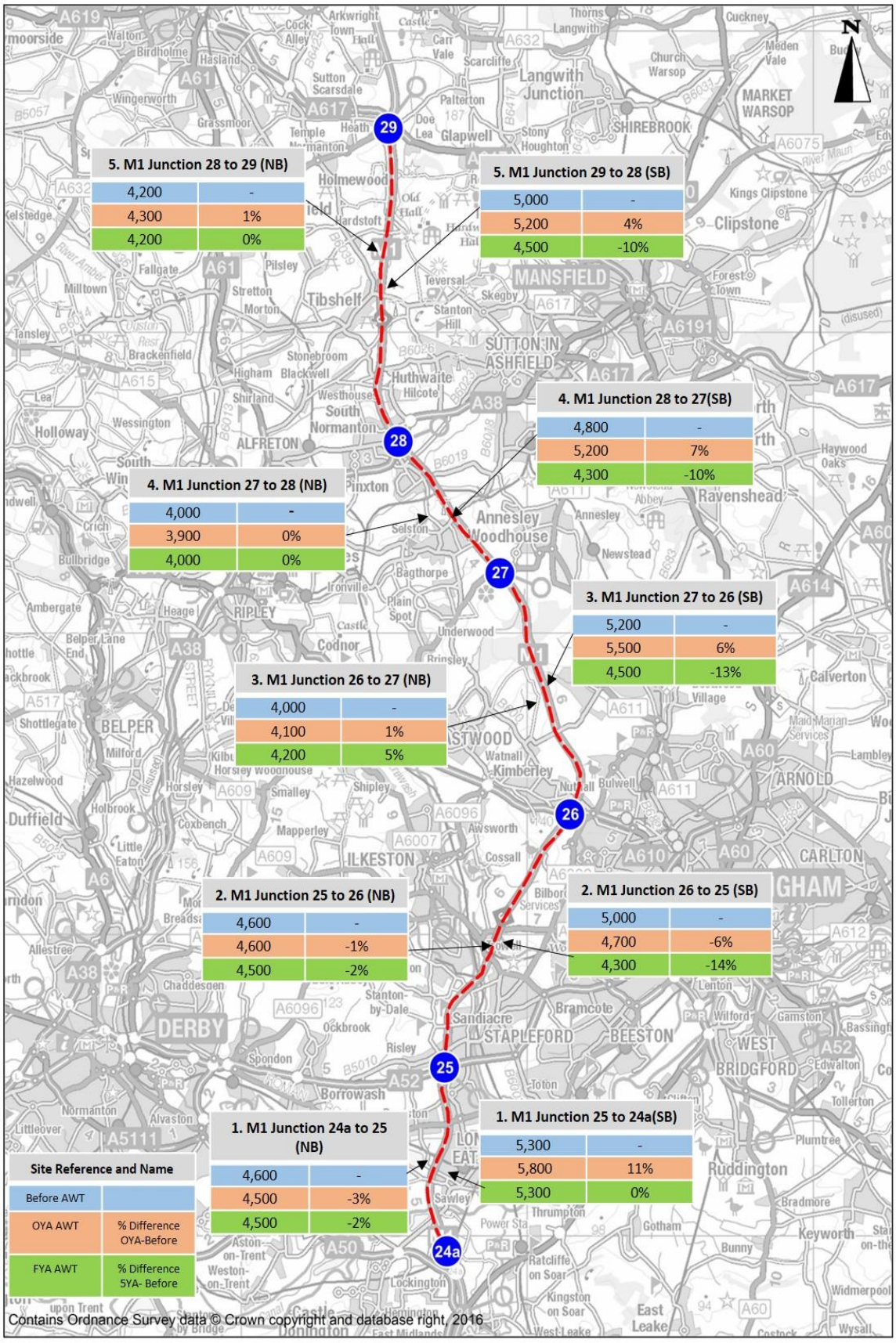
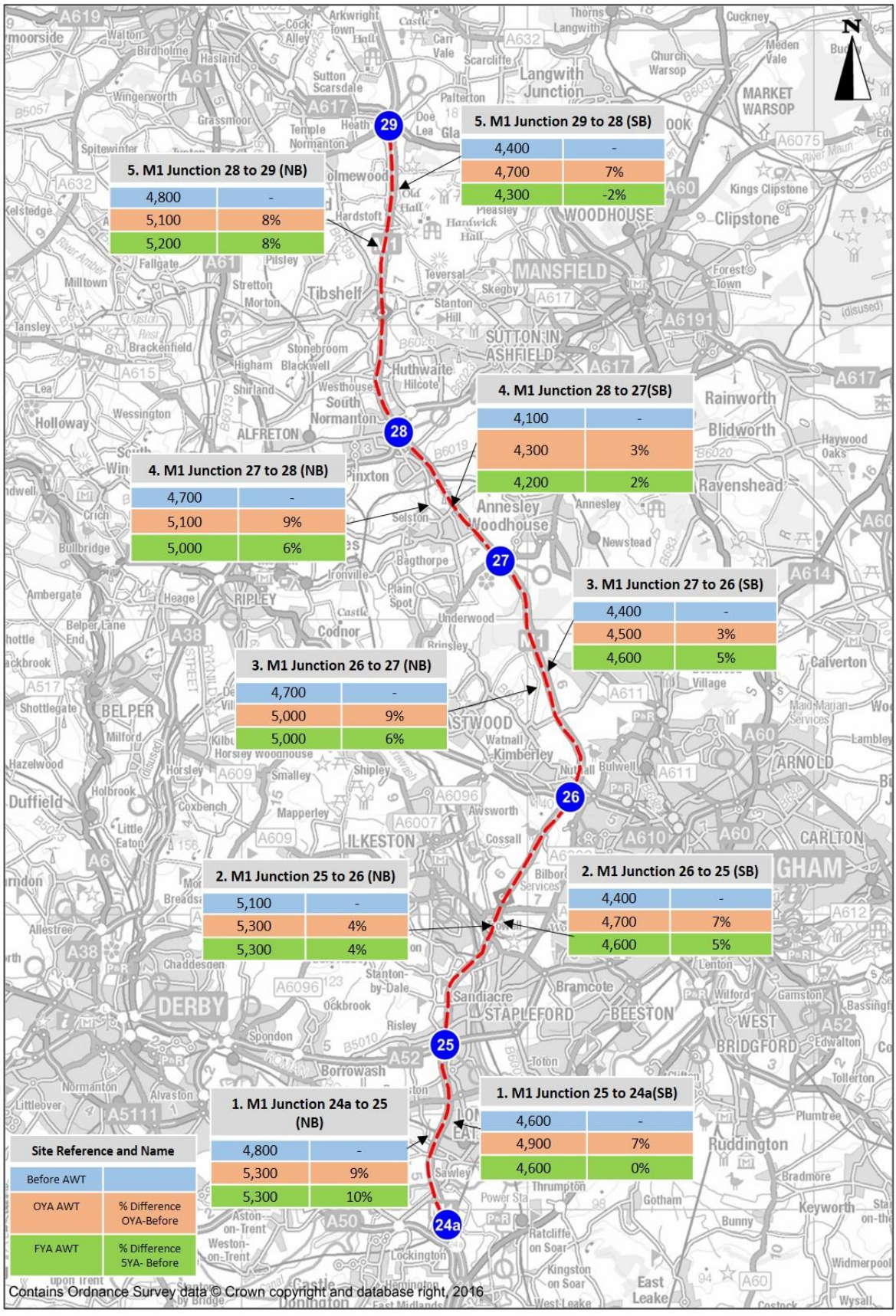


Figure 2-5 Before and After Traffic Volumes on scheme section (PM Peak)



2.18. The following observations regarding changes in Average Weekday Traffic (AWT) along the scheme section at AM peak, PM peak and 24- hours can be made:

24 hour

- On average, 24 hour weekday traffic has seen very little change in comparison to pre scheme traffic.

- AWT travelling northbound has seen an average of 1% change from pre scheme to five years after the scheme was implemented. On average, SB has seen no change in traffic flow.

2.19. More significant changes in traffic flow can be seen in the peak periods:

AM Peak

- The AM Peak covers a time period between 7am and 8am. The data shows that traffic volumes travelling northbound has experienced no change since before the scheme was implemented whereas traffic flows travelling southbound have experienced an average of a 10% decrease.

- J26 to 25 (SB) has experienced the large reduction in traffic flows in the AM peak at 14% while flow of vehicles travelling northbound have decreased by only 2%.

PM Peak

- The PM period for this scheme is 17:00-18:00. Average PM peak traffic flows have increased in the PM peak travelling both northbound and southbound with the exception of J29-J28 southbound. On average northbound traffic has increased by an average of 7% while traffic travelling southbound has increased by 2%.

- Greater differences in traffic flow can be seen outside of the scheme extent however as noted earlier, a different data source was used for these traffic counts and therefore a proportion of the differences could be a product of this.

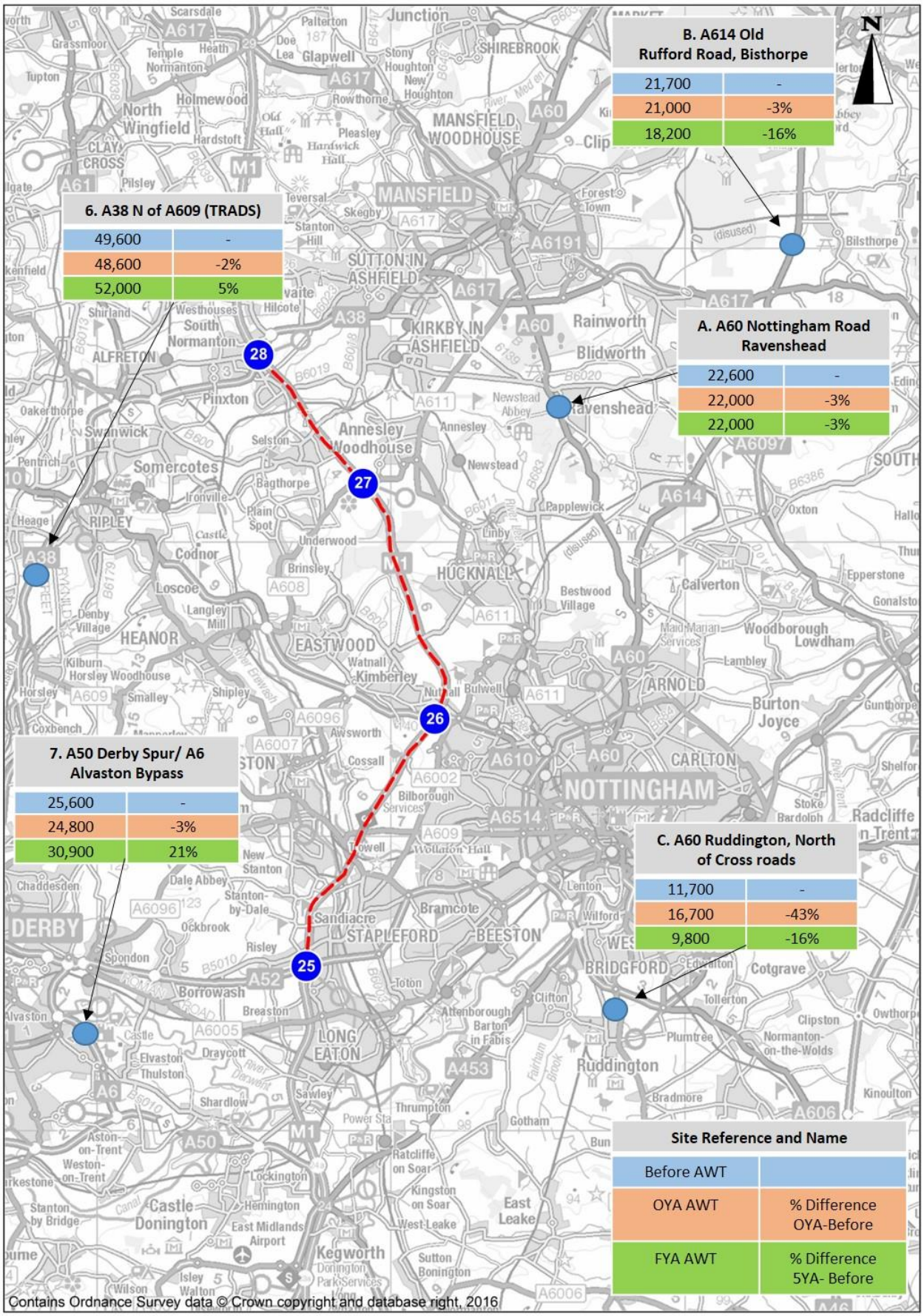
2.20. The data suggests that overall traffic flows on the M1 have not changed a significant amount. Background traffic on the M1 has mirrored this pattern showing a negligible change from the pre scheme to five year after opening period. This is significantly lower than the NTEM forecasts shown in the Derbyshire and Nottinghamshire TEMPRO models. Overall traffic flows on the M1 have shown very little change over time, however, greater increases can be seen in the PM peak periods which suggests that the scheme section could now be a more attractive option to commuter/ business travellers due to the increase of capacity the scheme has created.

2.21. The roadworks on the adjacent scheme M1 J28 to 31 (a 20 mile section) between summer 2014 and early 2016 included a maximum speed limit of 50mph. This is likely to have had an impact on adjacent sections. Flows here are from May 2016, a few months after the M1 J28 to 31 scheme opened to traffic, but the reduction seen here, particularly southbound in the AM peak may be a residual effect of the roadworks, with users having adjusted the time they travel.

Local Highway Network Flow Changes

2.22. An analysis of the local network has been undertaken to investigate any potential rerouting as a result of the scheme, as shown in **Figure 2-6**.Traffic flows on alternative routes represent vehicle movements across a wider corridor and can therefore a better understanding of the scheme impacts can be found.

Figure 2-6 Traffic Volumes across the local road network surrounding the scheme (AWT)



2.23. As shown in **Figure 2-6** changes in traffic flows within the wider area vary:

- Overall traffic on local roads has seen decreased to the east of the scheme by up to 16% however increased to the west of the scheme by up to 21%.
- The A38 has seen a 5% increase in traffic which is a common alternative route to the M1 when traveling north or south for long distance journeys. An increase in traffic flow on this part of the network would suggests that the increase of capacity created by the scheme has not encouraged a change in route for many drivers.
- The A6 Alvaston Bypass has seen a significant increase in traffic flows which is likely to be related to developments in Derby and recent junction improvements in the vicinity to facilitate growth.
- The A60 has experienced a decrease in traffic flow which could be a result of long distance travellers whom before the scheme was implemented may have avoided the M1, now finding the M1 a more attractive option due to an increase of capacity. It is more likely that this route has been affected by the improvements to the A453.

HGV Traffic Flows

2.24. An analysis of Heavy Good Vehicles (HGVs) flows on the M1 before and five years after scheme opening has been carried out to assess whether the implementation of the scheme has had an impact goods vehicles. Due to the large volume of HGV vehicles travelling along the M1, it is defined as a route of key importance to both the national and regional economies.

2.25. **Table 2-3** illustrates how HGV flows have changed on the M1 before and five year after scheme opening. The classification of HGV's used in the data available at the time of the OYA was over 5.2m, therefore the same measure has been used in the FYA evaluation to ensure a like-for-like comparison. Forecast information for HGV's isn't directly comparable and therefore not included here.

Table 2-3 HGV ADT Flows (>5.2m)

Site		2007 (Pre-scheme)		2011 (OYA)		2016 (FYA)	
		HGV ADT	**% of total**	**HGV ADT**	**% of total**	**HGV ADT**	**% of total**
J25 – J26	Northbound	16,300	26%	10,900	18%	12,200	19%
	Southbound	16,700	27%	13,900	23%	16,300	25%
J26 - J27	Northbound	14,700	25%	18,400	32%	19,000	31%
	Southbound	13,800	23%	14,300	24%	15,100	27%
J27 - J28	Northbound	12,700	22%	19,500	34%	15,600	26%
	Southbound	11,900	20%	12,400	22%	13,800	23%
Average			**24%**		**26%**		**25%**

2.26. **Table 2-3** shows that the proportion of HGV flows on the scheme's section of the M1 has increased slightly since before the construction of the scheme. The average proportion of vehicles over 5.2m is now 25% across the sections within the scheme. J26-J27 northbound continues to have the highest level of HGV traffic. Overall, there is an increase of 7% in the HGV flows, although this masks a fall on J25-J26 NB, first observed at OYA and continuing at FYA.

2.27. From the data presented it suggests that the scheme has encouraged HGVs to use the route. It is however noted that development at J29a is very much focussed on logistics and distribution warehouses which is likely to have contributed to the growth of HGVs along the route, in addition to further freight growth at East Midlands Airport.

Forecast and Observed Traffic Impacts

Traffic Forecasting Approach

2.28. The East Midlands M1 Traffic Assessment Model (EMM1TAM) was based on the Multi-Modal Study for North/South Movements on the M1 corridor in the East Midlands (M1MMS) created in 2000. This model was then calibrated and developed to produce the EMM1TAM to replicate existing traffic conditions by assigning a matrix of trips, derived from survey information, to a defined highway network.

2.29. The appraisal used a base year of 2003 to predict traffic flows in an assumed opening year of 2010 and design year of 2023 for three traffic growth scenarios, 'pessimistic', 'most likely' and 'optimistic'. This was achieved through the use of SATURN modelling software, TEMPRO (Trip End Model Programme) version 4.0 to produce growth factors for car trip demand and NRTF (National Road Traffic Forecasts) to produce growth factors for trips made by goods vehicles.

2.30. The modelled area covered the proposed widening of the M1 between Junctions 21 and 30. At the time of the Traffic Forecasting Report it was planned that the widening would be conducted under two contracts. As discussed earlier in the chapter (Section 2.13), the schemes have been implemented at different stages.

2.31. The Forecasting Report stated that growth factors for the future year demand were derived giving special consideration to Nottingham East Midlands Airport (NEMA)[4] and Markham Employment Growth Zone (MEGZ) which included significant development of distribution land use. Included in the Do-Minimum Network is the new J29A – this forms part of the MEGZ development and was not part of the M1 widening scheme.

Forecast vs. Observed DM and DS Traffic Flows

2.32. Predicted central (most likely) growth flows have been taken from Traffic Forecasting Report: M1 Widening Contract 1 (J25 to J28) Draft 2 (June 2006) in addition to supporting information provided by the traffic forecasting consultant. The report provides peak hour traffic volume forecasts for 2010 do minimum (DM) and do something (DS) scenarios and future year 2023. This section will compare this data with observed flow data collected for both the DM and DS scenarios. It should be noted that these traffic flow forecasts are different to those reported in the Environment chapter, which are high growth forecasts.

2.33. Where possible, Annual Average Daily Traffic (AADT) observed flows have been used in order to make a direct comparison with the AADT Forecasts. The figures presented in both tables therefore do not match the observed flows presented earlier in this chapter, which were average weekday traffic (AWT) flows. The methodology to factor the predicted peak hour flows up to AADT was also provided in the Traffic Forecasting Report. Detailed HGV forecasts are not available in the forecasting report to enable comparison with observed at the FYA stage.

[4] Now renamed 'East Midlands Airport'

Do Something Scenario

2.34. A comparison of the DS (with scheme) forecast traffic flows (for 2016 estimated using straight line interpolation between forecasts for 2010 and 2023) and those observed on the M1 J24a to J29 are provided in **Table 2-4.**

Table 2-4 Forecast and Observed Flows for the Do Something Scenario

Site Ref	Description	ADT/AADT Flow			
		Forecast (2016)	Observed (2016)	Difference	Percentage Difference
J24a – J25	Northbound	74,100	63,500	-10,600	-14%
	Southbound	75,000	64,900	-10,100	-14%
J25 – J26	Northbound	77,800	63,000	-14,800	-23%
	Southbound	77,400	62,100	-15,300	-25%
J26 – J27	Northbound	74,200	60,000	-14,200	-24%
	Southbound	70,200	60,700	-9,500	-16%
J27 – J28	Northbound	69,000	58,700	-10,300	-18%
	Southbound	67,600	58,700	-8,900	-15%
J28 – J29	Northbound	68,900	60,300	-8,600	-13%
	Southbound	66,200	60,500	-5,700	-9%
Average (J25-J28)				-11,600	-20%
Average (J24a-J29)				**-10,800**	**-17%**

2.35. It can be seen from **Table 2-4** that forecast traffic flows are higher than the observed traffic flows across the entire scheme section. The greatest difference is observed traffic flow at J25 to J26 southbound whereas the smallest changes can be seen at J29 to J28 southbound where the difference is 25% and 9% respectively.

2.36. The average difference between forecast and observed traffic flow through the scheme sections is 20% lower. As presented earlier on in the chapter, the NTEM forecasts overestimated traffic growth assuming a consistent increase in background traffic between the base year and opening year, whereas the observed trend shows a negligible change in traffic flow between 2007 and 2015 across the region. This suggests that the forecasts overestimated the traffic using the corridor. This lack of background traffic growth can explain the significant differences between the forecast and observed traffic flows above.

Journey Time Analysis

Scheme Objective: Reduce Congestion and Improve Journey Time Reliability

2.37. This section of the report will consider the impact on journey times following the implementation of the scheme. One of the schemes main objectives is to *'Reduce Congestion and Improve Journey Time Reliability'*. Pre-scheme journey times along the M1 between J24a to J29 are compared with post-opening journey times for both directions.

2.38. The section of motorway immediately north and south of the scheme was included in the OYA analysis to determine if the scheme has reduced congestion in areas close to the scheme. Therefore, the analysis covers the sections of the M1 from junctions 24a to J29 for consistency. However, it should be noted that even though it is likely that the scheme has had an impact on the sections to the north and south, other schemes within close proximity to the scheme have taken place since the OYA evaluation stage and therefore we do not want to capture the benefits of other schemes. For a more conservative assessment, a narrower area of the scheme itself (J25 to J28) has also been considered.

Journey Time Sources

2.39. Observed journey times have been taken from the Highways England Journey Time Database (JTDB). The data used in the analysis is along the M1 J24a to J29, taken from the centre of each junction both NB and SB. Data has been obtained from a neutral week in May 2016. The use of a single source of data for the before and after opening comparisons ensures that a 'like for like' comparison is possible.

Journey Time Results - Wider Area

2.40. **Table 2-5** compares the average journey times for the scheme by direction for pre scheme, OYA and FYA scheme opening covering the wider area of the M1 J24a to J29.

Table 2-5 Average Journey Times between J24A and J29

Direction	Before 2007 (mm:ss)	OYA 2011 (mm:ss)	FYA 2016 (mm:ss)	Saving between before and FYA (mm:ss)
Northbound	25:01	23:48	24:44	00:17
Southbound	24:56	23:48	22:24	02:32
Combined Average				**01:24**

2.41. **Table 2-5** shows that the average journey time benefit of the scheme is 1 minute and 24 seconds compared to a saving of 1 minute and 11 seconds at the OYA evaluation stage. This benefit varies depending of the time of day and day of the week. These variations are discussed below.

Journey Time Results- Scheme Section

2.42. The journey time results reported for the wider assessment area show a further improvement in journey times since the OYA evaluation. Therefore the following section will address the saving that have occurred on the scheme section only. As explained earlier in the chapter, due to other improvement schemes under construction a short distance from the scheme in hand it is important to look at the journey time results for the scheme section itself. This is to ensure that the evaluation does not capture the benefits of these other schemes and allows for a more conservative assessment.

Table 2-6 Average Daily Journey Times between J25 and J28

Direction	Before 2007 (mm:ss)	OYA 2011 (mm:ss)	FYA 2016 (mm:ss)	Difference Before and FYA (mm:ss)
Northbound	14:38	13:48	13:44	00:54
Southbound	14:50	13:38	13:43	01:07
Combined Average				**01:00**

2.43. **Table 2-6** shows an average journey time benefit of 1 minute when compared to pre-scheme journey times. Between OYA and FYA there was a slight worsening southbound but slight improvement northbound. The northbound improvement may be linked to the newly opened smart motorway between J28 to 31.

Forecast vs. Observed Journey Times

2.44. Forecast journey times have been provided for J25 to J28 for the opening year 2010 and future year 2023 in the 'Forecasting Report- Contract 1 (2006)'.

2.45. The forecast journey times, alongside observed journey times are presented in **Table 2-7**.

Table 2-7 Forecast vs. Observed Change in Journey Times

		Journey Time (mins)
Forecast Change	2003 -2010 DM	+ 1 to 2 mins
	2003 -2010 DS	- 0.5 to -2 mins
Observed Change *(J24a to J29)*	2007- 2016	Saving 1 minute 24 seconds
Observed Change *(J25 to J28)*	2007- 2016	Saving 1 minute 0 seconds

2.46. The following observations from **Table 2-7** can be made:

- The observed journey time savings are within the forecast range of saving for the Do Something scenario with a saving of 1 minute and 24 seconds and therefore it can be concluded that the scheme is meeting one of its objectives. Results from the scheme section only show a lower saving than the change over a wider area, however it is still within forecast. J28 to J29 have shown the largest journey time savings which could be an impact of the scheme in hand or other schemes that have taken place within close proximity. The observed change seen on the scheme itself can be attributed to the improvement scheme and therefore the scheme is meeting its objectives at FYA.

- Overall the scheme has been successful in creating a journey time saving for vehicles, a key objective of the scheme when it was appraised. It should be noted that the forecasts assumed an increase in traffic volume. As flows have been observed to have shown a negligible change, it can be concluded large proportion of the benefits found are a direct impact of the scheme.

Journey Time Reliability

Scheme Objective: Improve Journey Time reliability

2.47. One of the schemes key objectives was to improve journey time reliability on the M1 J25 to J28. As the OYA evaluation reports, journey time reliability calculations were only conducted to calculate the benefit of the Controlled Motorway system of the scheme and not the widening.

2.48. An INCA (Incident Cost Benefit Assessment) model was used for this assessment which highlighted benefits of £17.6m in market prices over the 30 year Controlled Motorway appraisal period, made up of Travel Time Variability Benefit (£12.8m) and Delay Benefit (£4.8m). The monetisation of reliability is considered further in the Economy chapter of this report.

2.49. Journey time reliability calculates the variability in journey times within the same time periods on different days. Therefore, a proxy for reliability can be determined by examining the variation of journey times using the data extracted from the JTDB, as used earlier in this report.

2.50. The metric used in the analysis is the standard deviation of mean journey times for each time period for the pre-scheme and OYA opening and FYA opening. Data is presented for a twelve hour period across 7 days (07:00-19:00). **Figure 2-7** presents the journey time reliability for the scheme section travelling northbound, and **Figure 2-8** presents journey time reliability for vehicles travelling southbound.

Figure 2-7 Standard Deviation of M1 Northbound Journey Times (J24A-J29)

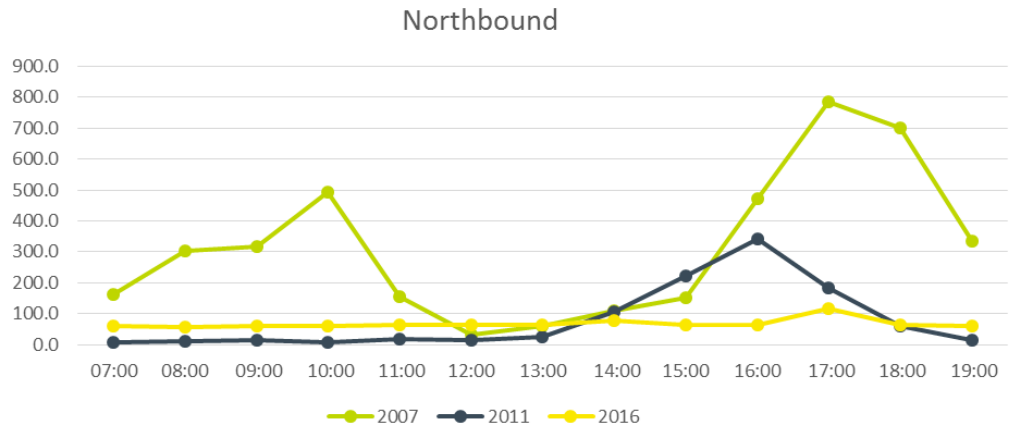
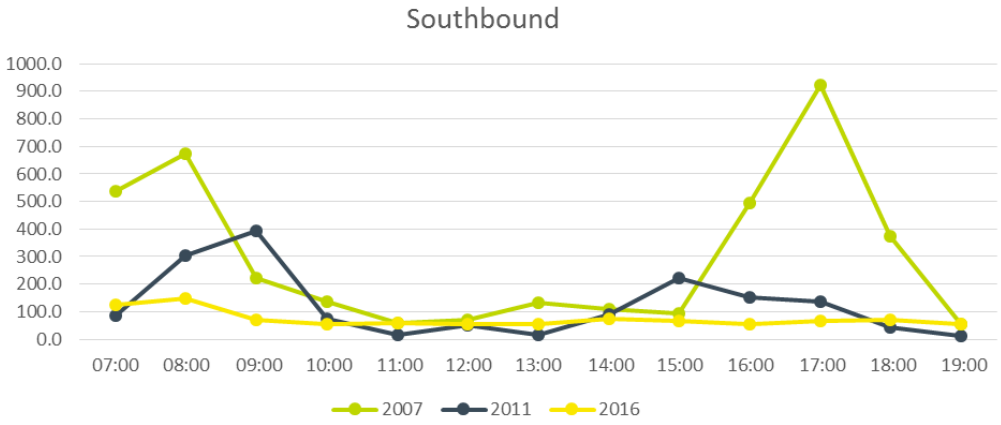


Figure 2-8 Standard Deviation of M1 Southbound Journey Times (J24A-J29)



2.51. Both **Figure 2-7**and **Figure 2-8** and show that journey times are now more consistent throughout day and the standard deviation of journey times on the improved section of the M1 has reduced since the scheme opened.

2.52. Before the scheme was implemented, journey times were significantly more inconsistent in the AM and, in particular, the PM peaks (up to 900 seconds, 15 minutes). As shown in the figures above, the scheme has improved journey time reliability five years after opening with the largest variability of 146 seconds (2 minute and 26 seconds).

Key Points - Traffic

Traffic Flows

- Overall, traffic flows across the scheme have shown a negligible change. Average weekday traffic flows have seen an average change of 1% in the northbound direction, with southbound seeing no discernible change post opening.
- Greater variation can be seen in the AM and PM peaks where increases are more noticeable. This suggests that the additional capacity offered by the scheme has made the route more attractive at peak times.

HGV flows

- HGV's have increased post opening with vehicles >5.2m in length now making up 25% of total daily flows across the scheme, compared to 24% pre scheme.

Traffic Forecasts

- Observed daily traffic flows are on average 20% lower than forecast for the M1 between J25-J28 indicating that flows were overestimated for the route.

Journey Times

- Overall journey times have improved post opening for traffic travelling in both direction. Southbound traffic has seen an average saving of 1 minute 7 seconds, whilst northbound traffic sees a slightly lower average saving of 54 seconds.

Journey Time Reliability

- Journey time reliability for vehicles using the scheme has improved compared to pre scheme with more consistent journey times seen throughout the day indicating that the increased capacity and controlled motorway technology have had a positive impact for users.

Journey Time Forecasts

- The savings seen for the scheme section are in line with the lower estimated forecasts.

3. Safety Evaluation

Introduction

Scheme Objective: Improve road safety

3.1. This chapter examines the impact of the scheme on safety. The DfT's objectives for transport set out the principal objectives to reduce collisions and improve security. This includes reducing the loss of life, injuries and damage resulting from transport collisions and crime.

3.2. In order to assess the scheme's impact on collisions, this chapter of the report analyses changes in Personal Injury Collisions (PICs) occurring in the five year period before and after scheme opening. Evaluation of the scheme's impact on personal security has also been undertaken through comments received during the environmental consultation.

Data Sources

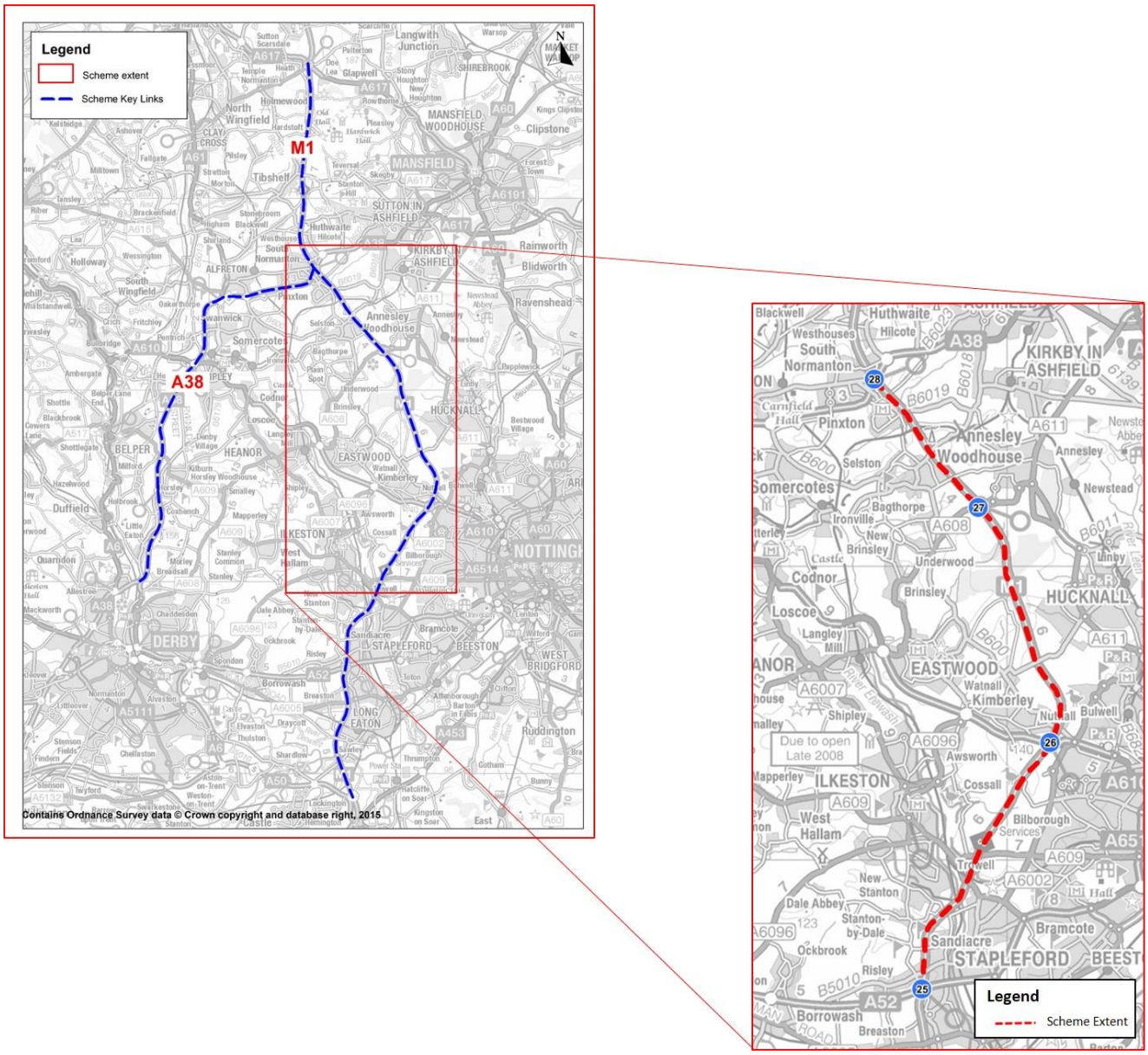
Forecast Data

3.3. Forecast safety benefits for the M1 J25 to J28 widening scheme were derived from a spreadsheet analysis tool based on the COBA (Cost Benefit Analysis) methodology, calculating personal injury collision (PIC) numbers and costs using combined link and junction collision rates. Predicted PIC savings were provided for the opening year and for the 60 year appraisal period.

3.4. At the One Year After POPE a geographical area was chosen to focus on those collisions occurring along the M1 between J24a to J29, and on the A38 between the A61 in Derby and M1 J28 to see if a transfer of traffic had affected collision numbers on this route.

3.5. The FYA evaluation will evaluate both the larger geographical area used in the OYA evaluation for a like for like comparison in addition to collision and casualty data on the scheme section only (M1 J25 to J28) to ensure benefits from other schemes are not captured, allowing for a conservative assessment of the scheme itself. The two areas evaluated are highlighted in **Figure 3-1**.

Figure 3-1 Collision Analysis Area



Observed Data

3.6. Collision data has been obtained from a variety of sources including:

- The Area 7 Managing Agent Contractor (MAC);
- Derbyshire Police;
- Nottinghamshire Police;
- Leicestershire Police; and
- DfT

3.7. The data is based on records of PICs (Personal Injury Collisions) within the STATS19 data that has been collected. PICs are defined as collisions that involve one or more persons and severity is defined by the most serious injury incurred. This data is collected by the Police when attending a collision. Collisions that do not result in injury are not included in this dataset and are thus not considered in this evaluation.

3.8. It should be noted that at this stage, not all the collision data has been validated by the Department for Transport (DfT). The data is judged to be sufficiently robust for use in this study, but it may be subject to change. However, it is not anticipated that this would be significant in terms of the analysis of collision numbers presented in this report.

Background Changes in Collision Reduction

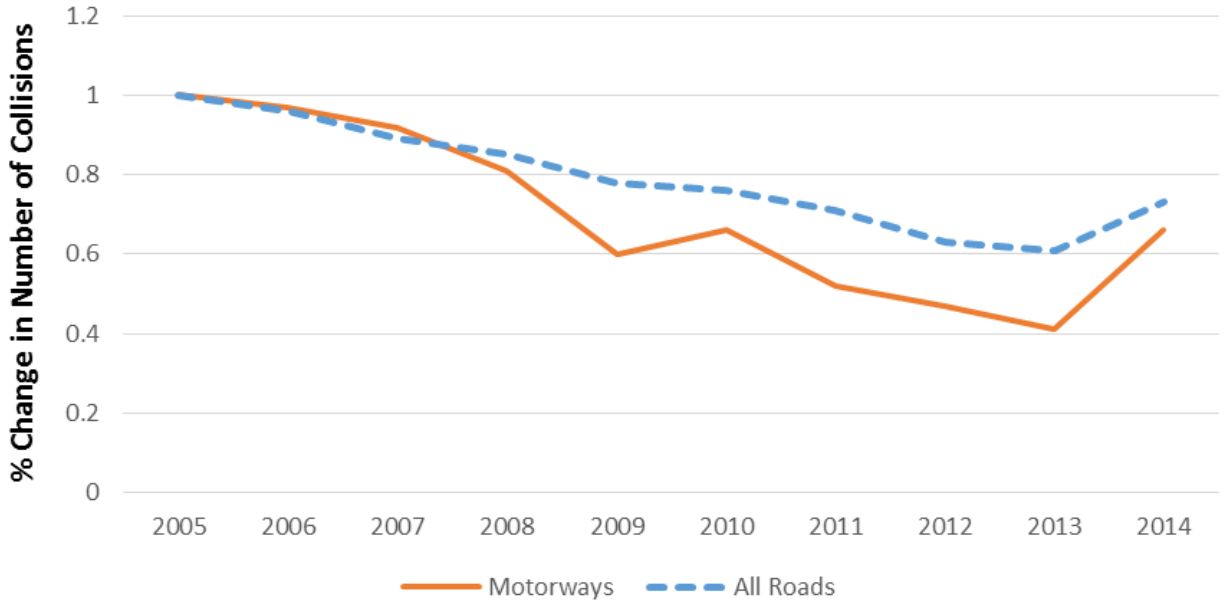
3.9. It is widely recognised that for over a decade there has been a year-on-year reduction in the numbers of personal injury collisions on roads, even against a trend of increasing traffic volumes during much of the same period. The reasons for the reduction are considered to be multi-factorial and include improved safety measures in vehicles and reduced numbers of younger drivers. This background trend needs to be considered when examining the changes in collision numbers. If the scheme had not been built, collision numbers in the area may still have been influenced by wider trends and reduced.

3.10. When comparing the numbers of collisions and casualties in this area before and after the scheme was built and associated net change with the scheme, the background reduction needs to be taken account of. The best way to do this is to assume that, if the scheme had not been built, the number of collisions and resulting casualties on the roads in the COBA area for the scheme would have dropped at the same rate as they did nationally during the same period. This gives a counterfactual 'without scheme' scenario on a like for like basis with the observed post opening data, which is the 'with scheme' scenario.

3.11. The difference between the numbers of collisions in these two scenarios can then be attributed to the scheme rather than the wider national trends. This result will inform the calculation of monetised safety benefits achieved by the scheme as discussed in the economy chapter of this report.

3.12. The change in the number of collisions over this period for motorways is calculated from the national collision data. **Figure 3-2** illustrates the change in collision numbers by road type between 2005 and 2014.

Figure 3-2 Trends in Injury Collision Numbers



3.13. The reduction in national collision numbers presented above is used in the development of the counterfactual scenario for the post-construction collision data.

Observed PICs

3.14. This section analyses observed changes in the number of PICs following the implementation of the scheme. This includes investigating the changes in the number of collisions and associated

casualties (further detail later in this report) as well as if there has been a reduction in the relative severity of collisions.

Key links

3.15. The key links for this scheme include the M1 mainline between J24a to J29 excluding junctions and slip roads, in addition to the A38 between the A61 in Derby and M1 J28. This area has been used to understand whether a transfer of traffic on to the A38 has affected collisions on this route. The junctions directly north and south of the scheme are included as it is possible the scheme could also affect these junctions.

Collision Numbers – Scheme Key Links

3.16. **Table 3-1** compares the observed of collisions (without scheme counterfactual) before the scheme was implemented with observed number of collisions during and after scheme construction. The latter figures are based on a counterfactual scenario to ensure background changes in the number of PICs are taken into account.

Table 3-1 Comparison of Observed Collisions Before Scheme Opening with During and After Scheme Construction

Time Period	Date		Number of Collisions				Annual Average				Severity Index
	From	To	Fatal	Serious	Slight	Total	Fatal	Serious	Slight	All	
Before Scheme Opening	Oct 2002	Sep 2003	1	25	241	267	2.8	24.2	237.5	264.4	10%
	Oct 2003	Sep 2004	5	33	243	281					
	Oct 2004	Sep 2005	1	27	243	271					
	Oct 2005	Sep 2006	2	17	257	276					
	Oct 2006	Sep 2007	5	19	203	227					
Without scheme counterfactual										**177.8**	
Construction Period	Oct 2007	Sep 2008	3	23	203	229	2.6	19.9	177.0	199.5	11%
	Oct 2008	Sep 2008	3	20	163	186					
	Oct 2009	May 2009	1	10	106	117					
After Scheme Opening	Jun 2010	May 2011	4	13	144	161	1.8	12.0	119.1	132.8	11%
	Jun 2011	May 2012	2	13	104	119					
	Jun 2012	May 2013	2	12	129	143					
	Jun 2013	May 2014	1	12	96	109					
	Jun 2014	May 2015	0	10	122	132					
Annual Collision Saving										**45.0**	

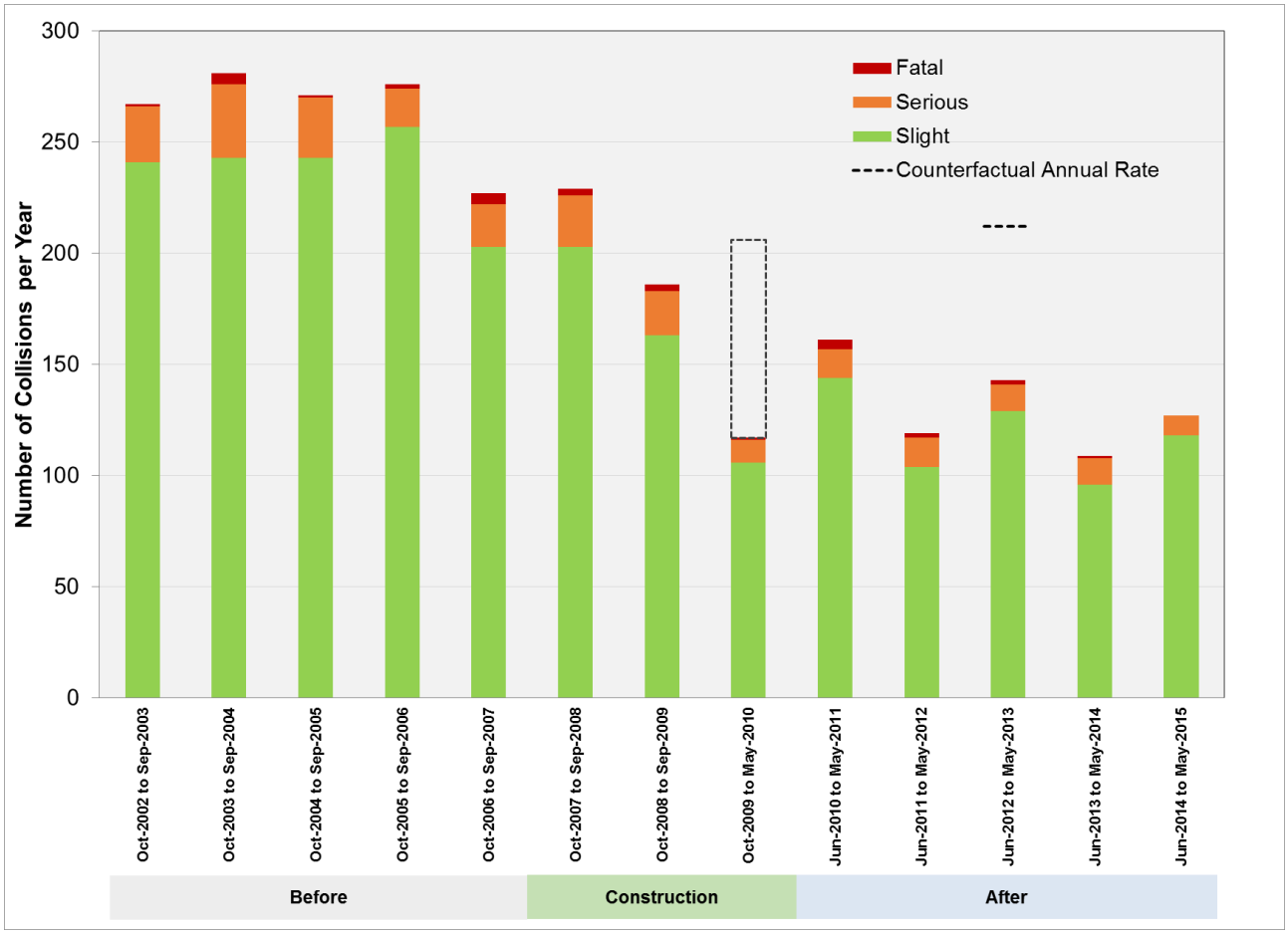
3.17. The results presented in **Table 3-1** show:

- When compared to the post scheme opening, the total collision saving (based on the counterfactual) equates to 45 (25.3%) collisions per annum. Statistical Significance testing (section 3.26) shows that these savings are most likely a direct impact of the implementation of the scheme.

- The severity index has slightly increased from 10% to 11% post opening. It can be seen that the annual average number of fatal and serous collisions has actually reduced post opening, but slight collisions have reduced to a greater extent, giving a slightly misleading increase in severity index.

- **Figure 3-3** displays the breakdown of the collisions numbers by severity and the year they occurred. The graphs shows that there has been a significant decrease in collision numbers when compared to pre scheme collision figure even when the counterfactual number of collisions is applied.

Figure 3-3 Number of Collisions per Year



Casualty Numbers – Scheme Key Links

3.18. The number of people injured in collisions on the key scheme links are shown in **Table 3-2.** The annual average number of casualties is shown for the before and after scheme opening periods in **Table 3-2**.

Table 3-2 Comparison of Casualties Before Scheme Opening with During and After Scheme Construction

Time Period	Date		Number of Casualties				Annual Average				Severity Index
	From	To	Fatal	Serious	Slight	Total	Fatal	Serious	Slight	All	
Before Scheme Opening	Oct 2002	Sep 2003	1	30	408	439	3.0	28.4	413.6	445.0	7%
	Oct 2003	Sep 2004	5	43	427	475					
	Oct 2004	Sep 2005	1	31	405	437					
	Oct 2005	Sep 2006	2	17	476	495					
	Oct 2006	Sep 2007	6	21	352	379					
Without scheme counterfactual										**307.6**	
Construction Period	Oct 2007	Sep 2008	3	29	338	370	3.4	23.6	282.4	309.4	9%
	Oct 2008	Sep 2008	5	22	250	277					
	Oct 2009	May 2009	1	12	165	178					
After Scheme Opening	Jun 2010	May 2011	4	18	218	240	1.8	14.0	186.9	202.6	8%
	Jun 2011	May 2012	2	15	188	205					
	Jun 2012	May 2013	2	13	200	215					
	Jun 2013	May 2014	1	14	144	159					
	Jun 2014	May 2015	0	10	184	194					
Annual Casualty Saving										**105**	

3.19. The results presented in **Table 3-2** show:

- The without scheme counterfactual casualty rate (accounting for the background reduction in collisions over time) is calculated as 307.6 casualties per annum, displaying a decrease in casualties when compared to 201.2 casualties after the scheme was implemented. This equates to an annual casualty saving of 105 casualties as a result of the scheme. Statistical Significance testing (section 3.26) show that these savings are most likely a direct impact of the implementation of the scheme.

- The severity index has slightly increased from 7% to 8% post opening. It can be seen that the annual average number of fatal and serous casualties has actually reduced post opening, but slight casualties have reduced to a greater extent, giving a slightly misleading increase in severity index.

Scheme Section

3.20. Collision and casualty numbers have also been evaluated on the scheme section (J25 to J28) to understand the direct impacts of the scheme improvements.

Collision Numbers – Scheme Section

3.21. **Table 3-3** compares the observed of collisions (without scheme counterfactual) before the scheme was implemented with observed collisions during and after scheme construction. The latter figures are based on a counterfactual scenario to ensure background changes of PIC's taken into account.

Table 3-3 Comparison of Observed Collisions J25-J28 before scheme implementation with observed collisions during and after scheme construction

Time Period	Date		Number of Collisions				Annual Average				Severity Index
	From	To	Fatal	Serious	Slight	Total	Fatal	Serious	Slight	All	
Before Scheme Opening	Oct 2002	Sep 2003	0	11	83	94	0.8	11.0	81.4	93.3	13%
	Oct 2003	Sep 2004	1	9	68	78					
	Oct 2004	Sep 2005	0	15	83	98					
	Oct 2005	Sep 2006	1	7	92	100					
	Oct 2006	Sep 2007	2	13	81	96					
Without scheme counterfactual										**62.7**	
Construction Period	Oct 2007	Sep 2008	2	9	72	83	1.5	9.8	66.8	78.0	14%
	Oct 2008	Sep 2008	2	13	65	80					
	Oct 2009	May 2009	0	4	41	45					
After Scheme Opening	Jun 2010	May 2011	0	4	49	53	0.4	4.2	32.2	36.8	10%
	Jun 2011	May 2012	2	5	24	31					
	Jun 2012	May 2013	0	5	36	41					
	Jun 2013	May 2014	0	3	21	24					
	Jun 2014	May 2015	0	4	31	35					
Total Collision Saving										**25.9**	

3.22. Key findings from **Table 3-3** are:

- The counterfactual collision rate (which accounts for the background reduction in collisions over time) has been calculated as 62.7 collisions per annum between J25 and J28. When compared to the post scheme opening rate, the total collision saving equates to 25.9 collisions per annum.

- The severity index has decreased from 13% pre scheme to 10% post scheme implementation. This indicates that for the scheme section there has been a reduction in the number of fatal and serious collisions post opening.

Casualty Numbers – Scheme Section

3.23. **Table 3-4** presents the casualty numbers observed before, and after the scheme was implemented.

Table 3-4 Comparison of Casualties Before Scheme Opening with During and After Scheme Construction

Time Period	Date		Number of Casualties				Annual Average				Severity Index
	From	To	Fatal	Serious	Slight	Total	Fatal	Serious	Slight	All	
Before Scheme Opening	Oct 2002	Sept 2003	0	12	140	152	1.0	12.4	140.5	153.9	9%
	Oct 2003	Sept 2004	1	12	100	113					
	Oct 2004	Sept 2005	0	16	142	158					
	Oct 2005	Sept 2006	1	7	171	179					
	Oct 2006	Sept 2007	3	15	149	167					
Without scheme counterfactual										**106.3**	
Construction Period	Oct 2007	Sep 2008	2	11	112	125	1.9	11.3	101.6	114.8	11%
	Oct 2008	Sep 2008	3	15	98	116					
	Oct 2009	May 2009	0	4	61	65					
After Scheme Opening	Jun 2010	May 2011	0	5	77	82	0.4	5.4	50.6	56.4	10%
	June 2011	May 2012	2	7	49	58					
	June 2012	May 2013	0	6	56	62					
	June 2013	May 2014	0	5	27	32					
	June 2014	May 2015	0	4	44	48					
Total Casualty Saving										**49.9**	

3.24. **Table 3-4** presents the following:

- The without scheme counterfactual casualty rate (accounting for the background reduction in collisions over time) is calculated as 106.3 casualties per annum on the scheme extent. When comparing this to the average annual casualties five years after the scheme opened, there has been an average decrease of 49.9 casualties per annum.

- The severity index has slightly increased from 9% to 10% post opening. It can be seen that the annual average number of fatal and serous casualties has actually reduced post opening, but slight casualties have reduced to a greater extent, giving a slightly misleading increase in severity index.

Statistical Significance

3.25. In order to determine whether the changes in collision numbers observed before and after the scheme opened are statistically significant, a Chi-square test has been undertaken for the COBA modelled area. This test uses the without scheme counterfactual and post-opening number of collisions and casualties to establish whether the changes in collision numbers are significant and hence likely to be related to the scheme, or are likely to have occurred by chance.

3.26. A similar test was undertaken with the collision rates on the scheme using the mvkm.

3.27. For both the COBA area we can be confident that the change in collision numbers and casualty numbers in addition to the collision rate for the scheme extent are not a result of chance alone and therefore we can infer that the scheme has had a direct impact on safety.

Fatalities & Weighted Injuries

3.28. A fatalities and weighted injuries metric (FWI) has also been calculated which combines measures of casualties based on the number of fatal, serious and slight casualties. The FWI three years before construction and five years after opening are shown in **Table 3-5**. To ensure the increase of traffic on the M1 is taken into account Billion Vehicle Kilometres (bvkm) are also presented. However, it should be noted that these figures do not take account for background reductions in casualty or collision numbers.

Table 3-5 FWI on M1 J25 to J28

	FWI/collision	FWI/year	FWI/bvkm
Pre Scheme	0.042	4.14	1.8
Post Opening	0.039	1.45	0.7

3.29. **Table 3-5** shows that the FWI/ bvkm has decreased post scheme opening. This indicted that the severity of injures incurred on the scheme section has reduced by a significant amount. Data shows that fatal, serious and slight injuries have all reduced since the scheme was implemented.

Forecast vs. Observed Collision Savings

3.30. This section compares the number of observed collisions, as discussed earlier, with the forecast collisions for the scheme opening year. These forecasts have been obtained from the COBA-based spreadsheet analysis tool of the scheme. This approach allows collisions to be calculated directly on the basis of output from the scheme's highway SATURN models.

3.31. Input data is provided on traffic volumes, distance and road type by each link from SATURN. This information then defines each link's collision casualty rates, monetary values and change rates according to the COBA manual before the inputs are combined to provide an estimate of collisions on the study network in the Do Minimum and Do Something scenarios in each forecast year.

3.32. The forecast equated to a saving of 846 collisions across the network as a whole over 60 years.

Collision Forecasts

3.33. A comparison of the forecast vs observed collisions along the length of the COBA modelled area is shown in **Table 3-6.**

Table 3-6 Comparison between Forecast and Observed Collision numbers (J24a to J29 and A38)

Forecast (opening year)	Do-Minimum (without scheme)	153
	Do-Something (with scheme)	155
	Do Something (15% reduction due to Controlled Motorway)	132
	Forecast Saving	**21 (14%)**
Observed (Pre-scheme vs. Post-opening collision numbers)	Observed before opening	264.4
	Without scheme (counterfactual)[5]	177.8
	Observed after opening	131.7
	Observed Saving	**45.0 (25%)**

3.34. The COBA forecast predicted a saving of 21 PICs in the opening year, a reduction of 14% from the DM scenario. **Table 3-6** shows that the observed saving was more than double with a post opening collision saving of 45 (25%) collisions per annum.

Collision Rates

3.35. The number of collisions along a length of road together with its AADT can be used to calculate a collision rate (calculated as number of collisions per million vehicle kilometres). This allows comparisons to be made which take into account traffic growth and can be compared to the national average using default collision rates which are calculated using the COBA Manual.

[5] Counterfactual is the average observed rate in the before period multiplied by the national reduction in collisions rate per mvkm during the comparable period. The reduction factor in the collision rate was 0.672

3.36. **Table** 3-7 shows the collision rates calculated for the scheme section between J25 and J28 of the M1 and compares this to the national average for motorways.

Table 3-7 Collision Rates M1 J25 to J28 (PICs/mvkm)

Time Period	Road Type	Annual average collisions	Collision Rate (PICs/mvkm)
Before	D3M	93	0.041
After	D4M	58	0.028

3.37. **Table** 3-7 shows that before the scheme was implemented the collision rate was lower than the national average by over half. After the scheme opened the collision rate decreased by a further 0.018 PICs/ mvkm).

3.38. It is suggested that this decrease in collision rate can be attributed to the widening scheme and the implementation of controlled motorway system.

Personal Security

3.39. The aim of this sub-objective is to consider both the changes in security and the likely number of users affected by the changes. For highway schemes, security includes the perception of risk from damage to or theft from vehicles, personal injury or theft of property from individuals or from vehicles. Security issues may arise from the following:

- On the road itself (e.g. being attacked whilst broken down).
- In service areas/car parks/lay-bys (e.g. vehicle damage while parked at a service station, attached whilst walking to a parked car).
- At junctions (e.g. smash and grab incidents while queuing at traffic lights.

3.40. The primary indicators for personal security on roads include:

- Surveillance;
- Landscaping;
- Lighting and visibility;
- Emergency call facilities; and
- Cyclists and pedestrian facilities.

Forecast

3.41. The scheme appraisal scored personal security as ‘neutral’, stating that there would be no significant overall impact, while the Controlled Motorway appraisal did not mention Personal security.

FYA Evaluation

3.42. The OYA evaluation concluded that Personal Security has been more beneficial than expected and this conclusion is still relevant at the FYA evaluation stage. This evaluation has been made from:

- Management and enforcement of the scheme section has improved through the increased provision of CCTV and enforcement cameras mostly located on the CM gantries and adjacent

to the hard shoulder. This means that vehicle speed enforcement should be better and the management of traffic during incidents, collisions and queuing will be improved.

- Lighting has been improved along many sections of the scheme.

- A new hard shoulder has been constructed, but it does have some narrow sections at bridges that have not been widened. Research at the appraisal stage suggested that hard shoulder discontinuities on dual 4-lane motorways showed that there was little evidence to suggest that they would increase the collision rate but there was a caveat about the small sample size available. The design ensured that there were no discontinuities close to the junctions.

3.43. At FYA, there has been no change to any of the above, therefore the FYA assessment is unchanged.

Key Points - Safety

Collisions Key Links

- The annual average number of PICs has reduced from 177.8 to 132.8, a saving of 25.3%. This equates to average decrease 45 collisions per annum.
- The average annual number of casualties has reduced from 307.6 to 202.6 following scheme opening, equating to an average decrease of 105 casualties per annum equating to a 34.1% casualty reduction.

Collisions- Scheme Extent

- The annual average number of PICs has reduced from 62.7 to 36.8, a saving of 41.3%. This equates to average decrease 25.9 collisions per annum.
- The average annual number of casualties has reduced from 106.3 to 56.4 following scheme opening, equating to an average decrease of 46.9%, equating to 49.9 casualties per annum.

Forecast vs. Observed Collision Savings

- The COBA spreadsheet model forecast predicted a saving of 21 PICs in the opening year, a reduction of 14% more than in the Do Minimum scenario. Observed saving were more than double with a post opening collision saving of 45 PIC per annum.
- The national average collision rate for a 3 or 4 lane motorway in England was predicted to increase by 0.002 PICs/mvkm however, the collision rate for this scheme area decreased from 0.041 to 0.028 PICs/ mvkm).

Personal Security

- Management and enforcement of the scheme section has improved through the increased provision of CCTV and enforcement cameras located mostly on the Controlled Motorway gantries and adjacent to the hard shoulder.
- Lighting has been improved along many sections of the scheme.
- A new hard shoulder has been designed and constructed to ensure that there were no discontinuities close to the junctions.

4. Economy Evaluation

Introduction

4.1. The following chapter will evaluate how the scheme is performing against its economic objective. The following sub-objectives will be considered.

- Achieve good value for money in relation to impacts on public accounts.
- Improve Transport Economic Efficiency (TEE) for business users, transport provide and consumer users.
- Improve journey reliability (which has been considered in Chapter 2).
- Provide beneficial wider economic impacts.

4.2. This section provides a comparison between the outturn costs and benefits and the forecast economic impacts, as well as considering the wider economic impacts of the scheme. Outturn journey time and safety economic impacts are based upon the observed results reported in Chapters 2 and 3.

4.3. As noted in the report introduction, the scheme was carried out in two stages, the first was for the physical widening of the motorway and the second was for the addition of the Controlled Motorway element. Due to this, the two elements have different business cases and approval processes, therefore the following economic chapter will combine the two appraisals where possible which in turn will allow forecasts to be made directly to the actual observed impacts of the two stages combined.

4.4. The remainder of this section is structured as follows:

- Forecast Benefits
- Outturn Benefits
- Scheme Costs
- Indirect Tax
- Benefit Cost Ratio
- Wider Economic Impacts

Sources

4.5. The following documents have been utilised to inform the post opening evaluation of the scheme benefits:

- Economic Assessment Report (June 2006)
- Traffic Forecasting Report - Contract 1 (June 2006)
- East Midlands M1 Traffic Assessment Model (EMM1TAM) (2000)
- Outturn Costs from Regional Finance Manager (RFM)

4.6. The reports provide an original appraisal forecast for a 60 year appraisal period based on a 2010 opening year. All costs presented are for the most likely scenario and in 2002 values discounted to 2002 in market prices unless otherwise stated.

Forecast Benefits

4.7. **Table 4-1** summarises the predicted monetised impacts of the scheme over a 60 year appraisal period and the approach to their evaluation in this study. This shows that over the 60 year appraisal period the widening scheme was predicted to generate in excess of £510m benefits (in 2002 values) with the vast majority arising from reduced journey times. The Controlled Motorway element was forecast to deliver an additional benefit of £50.8m over a 30 year appraisal period.

4.8. A tick indicates that the element of benefits is considered as part of this evaluation. A cross indicates that the forecast impact from the appraisal will be used in place of a full evaluation.

Table 4-1 Forecast Monetised Impacts of Scheme over 60 year appraisal period

Benefit Stream	Forecast Benefits		Evaluation	
	£	%	Evaluate?	Approach
M1 Widening Scheme (60 year appraisal)				
Journey Times	£516.5m	86%	✓	Based on changes to observed flows and journey times.
Safety	£53.9m	9%	✓	Based on recorded collision numbers
Vehicle Operating Costs (VOC's)	-£47.2m	-8%	✓	Net change in fuel consumption monetised to calculate a proxy outturn reforecast value of VOC.
Construction Delay	-£12.7m	-2%	✗	Not within the remit of POPE to evaluate.
Total	**£510.5m**	**91%**	-	
M1 Controlled Motorway Scheme (30 year appraisal)				
Safety	£33.0m	6%	✓	Evaluated in combination with widening scheme. Based on recorded collision numbers
Journey Time	£4.8m	1%	✓	Evaluated in combination with widening scheme. Based on changes to observed flows and journey times.
Journey Time Reliability	£12.8m	2%	✗	Not evaluated as INCA model not obtained and forecast value is only 2% of overall benefits.
Vehicle Operating Costs (VOC's)	£0.2m	0%	✓	Evaluated in combination with widening scheme. Net change in fuel consumption monetised to calculate a proxy outturn reforecast value of VOC.
Total	**£50.8m**	**9%**	-	
Combined total (excluding tax)	**£561.3m**	**100%**		
Indirect Tax	£41.3m	-	✓	Net outturn change in fuel consumption calculated reforecast 60 year benefit from ratio with forecast.

Outturn Benefits

4.9. The following section will consider the main impacts that were predicted to arise from the scheme in the appraisal and will use observed data to re-forecast the monetary benefits.

Journey Time Savings

4.10. Due to the forecast reduction in congestion the scheme was predicted to generate considerable time savings, estimated to be in excess of £520million over the 60 year appraisal period.

Evaluation Methodology

4.11. The basis of the POPE methodology (in terms of vehicle hour savings) is a comparison of changes in predicted vehicle hours (using journey times and traffic flows) and the post opening change in vehicle hours using observed journey times and traffic flows, where both use the same set of road links. The vehicle hour savings for the M1 J25 to J28 widening scheme were appraised using TUBA software which is matrix based rather than link by link, not allowing POPE to isolate forecasts for links for comparison to observed.

4.12. As an alternative approach, the journey time benefits for this scheme have been evaluated using a Project Appraisal Report (PAR) approach, typically adopted by Highways England for the appraisal of smaller schemes[6]. This evaluation is therefore subject to a number of caveats and assumptions as listed below:

- The evaluation only includes journey time savings on the M1, and not the wider network. However, for a widening scheme with limited traffic reassignment (as shown earlier in Section 3) it is anticipated that the vast majority of the benefits should occur on the M1. It is therefore considered that this approach will provide a slightly conservative estimate of benefits.

- The PAR method provides capitalisation factors which depend only on the road type and forecast growth rate whereas modelling tools used for the appraisal consider the complexity of how traffic growth would affect future traffic behaviour in detail. For this scheme, future forecasts will be influenced by timing and severity of forecast congestion with or without the scheme

- The impact of the Controlled Motorway on the M1 is included in the outturn evaluation. As the Controlled Motorway was completed in parallel to the widening scheme it is not possible to separate out the impacts of each element.

4.13. The PAR method of calculating the TEE journey time benefits is based on the vehicle hours saved in the post opening period, monetised by using a Value of Time (VOT) then converted to a forecast for the whole appraisal period using capitalisation based on traffic growth. Values for the VOT for an average vehicle per hour and capitalisation factors are specified in the PAR guidance.

4.14. Vehicle hours saved in the FYA year were calculated using the observed traffic flows and journey times described in the traffic section extrapolated to a full year using the AM, IP and PM weekday time periods as used in the appraisal and including weekends. The vehicle hour calculation was carried out just on the M1 between J25 to J28 to ensure a conservative assessment. It is recognised that the widening scheme is likely to have had an impact on journey times on un-widened sections to the north and south of the scheme and other schemes close to the location have taken place in recent years and therefore we do not want to capture the benefits of other schemes by including these.

4.15. Journey time savings and the associated monetary benefit are presented in **Table 4-2** based on traffic growth for 60 years. NRTF97 growth assumptions have been used in this evaluation in line with guidance in place at the appraisal stage to achieve a level of consistency.

[6] PAR Guidance Project Appraisal Report Guidance Notes Version 5.0

Table 4-2 Journey Time Saving and Monetary Benefit (2002 Market Prices, Discounted)

	Outturn
Vehicle Hours Saved in Opening Year	701,286
Value Of Time per hour at 2002 market prices[7]	£13.02
Annual Time Saving at 2002 prices	£9.13m
60-Year Capitalisation Factor[8]	49.9
60-Year Time Saving	£455.5m
Discount factor	0.759
60-Year Time Saving discounted to 2002	**£345.7m**

4.16. **Table 4-2** displays the 60 year monetary benefit in market prices that has been re-forecast based on observed traffic conditions five years after opening. The results show a saving of £345.7m for the scheme's improved section, which is 33% lower than the forecast journey time benefit of £521.3m (£516.5m for the widening and £4.8m for the controlled motorway).

4.17. It is important to note that:

- The journey time benefit calculated above is based on the M1 J25 to J28 only whilst the appraisal of the scheme covered a number of other roads in the wider area.
- This benefit includes the combined impacts of both the widening and the controlled motorway part of the scheme.
- The traffic flows presented earlier in the report concluded there had been a negligible observed change in traffic flow since the scheme opened. A greater increase in traffic volume was forecast in the scheme appraisal.
- The lack of traffic growth could be linked to the effects of the recession. This would not be have been considered in the forecasting figures. However, the appraisal period for this scheme is 60 years and therefore the effects of the recession should decrease over time.

Vehicle Operating Costs (VOC)

4.18. According to WebTAG guidance, the use of the road system by private cars and lorries gives rise to operating costs for the user. These are fuel and non-fuel costs, where fuel is the majority net cost impact of conventional highways schemes. In the case of this scheme, the forecast changes in Vehicle Operating Costs (VOC) are a not insignificant disbenefit of around -9% of all benefits, and therefore it is necessary to evaluate the impact of the scheme on VOC.

4.19. Similar to the journey time benefits, VOC has been forecast using TUBA. As this model cannot be re-run to evaluate the actual impact of the scheme five years after opening, an alternative approach has been adopted.

4.20. The approach uses observed changes in traffic combined with the guidance in webTAG and PAR to calculate a reforecast the 60 year impact. This takes the following steps:

- Estimating changes in fuel consumption in the opening year on the key links using observed data for flows and speeds by time period and based on VOC guidance on calculations given in webTAG[9].

[7] Table C.6, PAR Guidance Project Appraisal Report Guidance Notes Version 5.0

[8] Table C.8, PAR Guidance Project Appraisal Report Guidance Notes Version 5.0

[9] Function to calculate fuel consumption and fuel costs given in WebTAG unit 3.5.6 (April 2011) section 1.3.

- Applying the ratio of forecast and observed fuel consumption to the VOC forecasts that were made; and.

- Capitalising the opening year monetary impact to 60 years using the PAR approach for VOC.

4.21. This is based on the assumptions:

- Fuel consumption is the majority of the VOC impact; and

- Changes on the key links are indicative of the changes overall.

4.22. The scheme forecasts obtained from the TUBA model calculated a large disbenefit to VOC as a result of the scheme. Over a 60 year appraisal period a £47.2m disbenefit was forecast over 60 years, £31m of which came from freight usage. The VOC disbenefits calculated were forecast to be an impact from the scheme widening with only a small percentage as a result from the controlled motorway element of the scheme.

4.23. The disbenefits were calculated for the Do Something scenario with the assumption that an increase in speeds and volume of traffic over time would equate to a greater fuel consumption for road users.

4.24. **Table 4-3** shows the calculation of the re-forecast change in Vehicle Operation Costs over a 60 year appraisal period using observed five year after opening traffic data.

Table 4-3 Economic Evaluation of Vehicle Operating Costs (VOC)

Forecast change in VOC (60 year disbenefit) 2002 prices discounted	- £47.0m
Forecast additional fuel consumption (litres per day)	23,744
Observed FYA (calculated) additional fuel consumption (litres per day)	9,658
Ratio between Forecast and Observed fuel consumption	2.46: 1
POPE 60 year re-forecast VOC 2002 prices discounted	- £19.1m

4.25. **Table 4-3** displays a reduction in the level of disbenefit from £19.1m forecast when the scheme was appraised to a £47.0m reforecast based on observed changes post opening.

4.26. The reason for the reduced level of disbenefit in fuel costs to road users than forecast is that traffic flows on the motorway are lower than the traffic model forecast and the level of increase in flows that was expected to result from the increase in capacity has not materialised. This lack of traffic growth is due to the background reduction in traffic flows on the network as a whole as a result of the economic recession and the lack of additional traffic volumes as a result of the scheme.

4.27. It is important to note that his approach only gives a very broad indication of the relative change in VOC but it is a useful indicator of the impact on these road user costs.

Collision Savings

4.28. In the scheme appraisal the economic changes in safety are calculated by assigning monetary benefits to the reduction in the number and severity of Personal Injury Collisions over a 60 year appraisal period.

Forecast methodology

4.29. The forecast collision savings for this scheme were derived using the methodology and collision rates contained in the COBA manual (DMRB Volume 13, Section 1) although a spreadsheet

method was used to produce the forecasts instead of the COBA program, due to the size of the traffic model study area.

4.30. Collision rates for the different types of road in the study network were taken from the COBA manual, using both link and junction collision rates to produce a combined rate. These rates were then adjusted to take account of COBA guidance that the trend in collisions and severities will reduce over time. The proposed collision rates were validated against actual collisions and traffic volumes on the M1 and were found to be well correlated.

4.31. The forecast saving of PICs was converted into a monetary value using link and junction combined average costs per collision.

Forecast results

4.32. The motorway widening scheme was expected to provide a saving of 848 collisions over the 60 year appraisal period. When these forecast collision savings were monetised to a 2002 base, they added up to a saving (or a positive benefit) of £53.9m over the study area.

4.33. The forecast collisions are not presented by road type in the Economic Assessment Report so it is not possible to determine whether the collision savings are expected to be on the motorway or on the other road types within the study area. However, we do know that COBA collision rates are identical on D2M, D3M and D4M so the only change that was included between the Do Minimum and Do Something in the pre-scheme appraisal was the volume of traffic travelling on the motorway.

4.34. Traffic volumes were forecast to increase on the motorway due to the scheme so we can assume that collisions were also expected to increase on the motorway but this increase was counter-balanced by a larger forecast decrease in collisions on the non-motorway roads.

4.35. The later addition of the Controlled Motorway element of the scheme meant that further road safety benefits were forecast, in addition to those saved by the widening scheme. The Controlled Motorway scheme was forecast to cut collisions by 15% to provide an additional saving of 649 collisions over the 30 year appraisal period.

4.36. The combination of the widening and Controlled Motorway safety benefits equated to a saving of 1,497 collisions over 60 years, giving an economic saving of £86.9m over the study area.

Collision Benefit Evaluation

4.37. The POPE method of evaluating the economic value of benefits arising from safety improvements is based upon comparing the observed and forecast collision saving in the opening year combined with the assumption that the observed safety impact in the opening year can be taken to be indicative of the trend for the whole appraisal period.

4.38. The POPE methodology for evaluating safety benefit is based on the combination of:

- The difference between the forecast and observed number of collisions;
- The PAR method for monetising injury collisions; and
- The forecast 60 year monetary savings for the wider study area.

4.39. In the case of this scheme the wider study area was modelled for the widening part and that included the beneficial impacts of traffic rerouting onto the widened motorway from other roads with higher collision rates and that exceeded the net increase in collision numbers on the motorway itself due to the extra traffic. This prediction of more collisions due to extra traffic and the fact that extra traffic has not been observed (as noted in the traffic chapter) means that we cannot look at the forecast impact of the widening in collision numbers in isolation. The evaluation is based on the safety impact in the wider area being in line with forecast. The Controlled motorway part of the scheme had a forecast reduction in collisions of 15% on the motorway. Thus we have created a proxy for the forecast of the savings just on the scheme section based on a 15% saving of collision numbers and the proxy Do Minimum of the observed counterfactual of 62.7, giving 9.4.

4.40. How these combine to produce the outturn monetary benefit is set out in **Table 4-4**.

Table 4-4 Predicted vs. Outturn Safety Benefits

Forecast		Outturn	
Forecast opening year collision saving on key links J25-J28 based on 15% reduction	9.4	Observed annual average saving in first year on key links J25 – J28	25.9
		Net difference from forecast	16.5
		PAR based monetisation of net difference in first 5 years	£1.381m
Forecast Monetary benefit for whole area (60 years)	£86.9m	60 monetisation of net difference in collision numbers on the J25 – J28 key links from forecast	£35.7m
		Total safety PVB whole area (60 years)	£122.6m

4.41. **Table 4-4** displays the reforecast 60 year safety benefit to be £122.6m and this is due to the reduction in collisions on the M1 being greater than the forecast 15%.

Summary of Forecast and Outturn monetised Benefits

4.42. **Table 4-5** summarises the forecast scheme benefits in addition to the 60 year re-forecast using five year after observed data. As noted earlier construction delay and reliability benefits have not been evaluated and are assumed as forecast.

Table 4-5 Summary of Monetised Benefits

Present Value Benefits (prices in 2002 prices and values)	Forecast	Outturn (reforecast 60 years)
		NRTF Growth
Journey Time Benefits - Widening	£516.5m	£345.7m
Journey Time Benefits - CM	£4.8m	
VOC	£-47.0m	£-19.1m
Total TEE	**£474.3m**	**£326.6m**
Safety – Widening	£53.9m	**£122.6m**
Safety – CM	£33.0m	
Total Safety	**£86.9m**	
Construction Delay	- £12.7m	*- £12.7m*
Journey Time Reliability	£12.8m	*£12.8m*
Total PVB	**£561.3m**	**£466.0m**

4.43. **Table 4-5** shows that although they make up the largest part of the forecast monetised benefits (77%) of the scheme, journey time benefits are significantly less than forecast due to the lack in traffic growth while Vehicle Operating Costs created a much lower disbenefit than forecast results. In turn this has created a lower total Transport Economic Efficiency (TEE) impact than what was predicted for the scheme. Overall when the TEE benefits are combined with the higher than expected level of safety benefits of the scheme, the total PVB (total benefits of the scheme) is lower than forecast. It must be noted that safety benefits are calculated from the scheme section of the M1 alone and therefore the wider network is likely to have experienced additional benefits due to the implementation of the scheme.

Scheme Costs

4.44. Costs of the scheme are also considered for the full appraisal period of 60 years such that they can be compared with the benefits over the same period. Investment costs are considered in terms of a common price base of 2010 for comparison with forecast. For comparison with the benefits, overall costs are expressed in terms of present value, termed Present Value Cost (PVC).

Present Value Costs (PVC)

4.45. 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.

4.46. Following Treasury Green Book guidance, calculation of the present value entails the conversion to market prices, then discounting by year. This uses a rate of 3.5% for the first 30 years and 3% thereafter. Note that the base year used in the appraisals is 2010.

4.47. Appraisal of this scheme included the following types of cost:

- Investment costs: before and during construction;
- Indirect Tax impact over the whole appraisal period; and

- Operational costs of the controlled motorway.

Investment Costs

4.48. **Table 4-6** compares the forecast cost of the scheme with the outturn cost as of 2017. The investment cost is the cost to Highways England of the following:

- Costs of construction;
- Land and property costs;
- Preparation and supervision costs; and
- Allowance for risk and optimism bias.

4.49. The forecast is the cost estimate that was approved by the Minister prior to start of construction and the outturn cost is the most up to date cost as determined from the spend profile provided for the purpose of this study from the Highways England Regional Finance Manager.

Table 4-6 Forecast vs. Outturn Scheme Cost

Costs in £million 2002 prices (not discounted)	Ministerially Approved Budget	Outturn
Widening scheme: Construction, preparation, supervision, risk, optimism bias	£281.4m	£261.7m
Controlled Motorway construction	£13.8m	
Land	£1.7m	
TOTAL	**£296.9m**	**£261.7m**

4.50. The key point from **Table 4-6** is that outturn scheme costs are lower than the forecast estimate. This is due to the redesign of the scheme that took place once the contractor, was appointed. The scheme was redesigned using a Compact Motorway Design with a variable width verge which removed or reduced in scale a number of scheme elements. For instance the scheme originally included four new bridges over the motorway but after the redesign process this was reduced to one.

Indirect Tax

Forecast Indirect Tax

4.51. In addition to the scheme costs, the total forecast PVC (Present Value Costs) includes an amount of indirect tax which relates to the value of VAT and fuel duty that the Government was expected to gain as a result of the scheme due to higher speeds on the motorway than before the widening.

4.52. The scheme's forecast impact on Indirect Tax is presented in the Economic Assessment Report and this figure is -£41.3m in 2002 prices, discounted to 2002, i.e. the cost side was reduced by this forecast additional income to the government.

Outturn Indirect Tax impact

4.53. The scheme was evaluated using TUBA so it is not possible to re-run the indirect tax calculation using the COBA files. To give a broad indication of the scale of observed impact of this scheme on indirect tax, this POPE evaluation has calculated the estimated change in fuel consumption (based on traffic volumes, proportions and speeds at OYA and FYA compared to before construction) for an average day, and applied a value using figures provided in WebTAG.

4.54. The calculation of the impact on fuel consumption mirrors that used for VOC previously, and likewise, the 60 year reforecast of the monetary impact is calculated using the ratio between the forecast and outturn fuel consumption impacts.

4.55. The re-evaluated indirect tax calculation suggests that the actual income to the government was significantly less than forecast however has increased since the OYA evaluation, £16.8m compared with £12.1m at OYA and a forecast of £41.3m. The reason for this shortfall in forecast income is that traffic flows on the motorway are lower than the traffic model forecast and the increase in flows that was expected to result from the increase in capacity has not materialised. As discussed in the Traffic section, this lack of traffic growth related to the background reduction in traffic flows on the network as a whole as a result of the economic recession.

Present Value Costs (PVC)

4.56. Any major scheme requires a cost benefit analysis across the entire appraisal period. This needs to be expressed on a like- for –like basis with the benefits, termed at Present Value. The 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.

4.57. **Table 4-7** presents Forecast PVC which can be compared to total PVC for the scheme based on observed data at the Five Years After (FYA) stage in addition to Indirect Tax and scheme costs.

4.58. This total PVC includes the physical widening and the installation of Controlled Motorway. These costs have been extracted from the appraisal for each element, the Economic Assessment Report (2006) for the widening and the Impact Assessment (2010) for the Controlled Motorway scheme. These figures are in 2002 prices, discounted to 2002 at 3.5% and converted to market prices.

Table 4-7 PVC for M1 Widening and Controlled Motorway J25-J28 (2002 prices) discounted to 2002[10] and converted to market prices

	Latest Forecast	Outturn Costs
Investment: Works, Prep, Supervision, Risk, Optimism Bias	£286.4m	£253.3m
Controlled Motorway investment	£9.5m	
Land	£1.7m	
Controlled Motorway operation	£16.8m	£16.8m*
Indirect Tax	-£41.3m	-£16.8m
Total PVC	**£273.1m**	**£253.4m****

*Operating costs assumed as forecast
**Costs do not total due to rounding

4.59. It can be seen from **Table 4-7** that the scheme's outturn PVC is £19.7m less than forecast and that this is due to the large savings made in the works costs between funding approval and construction. The indirect tax value, based on observed traffic data in the opening year, is much lower than forecast because traffic volumes have been lower than expected. As indirect tax is included as a negative cost within the PVC, this has increased the outturn PVC.

Benefit Cost Ratio (BCR)

4.60. The benefit-cost ratio (BCR) is an indicator used in the cost-benefit analysis of a road scheme that attempts to summarize the overall value for money of a project or proposal. The BCR is the ratio of the benefits of a project or proposal, expressed in monetary terms, relative to its costs, also expressed in monetary terms. All benefits and costs are expressed in present values as detailed in the above sub-sections. For this scheme we use present value of 2002 prices discounted to 2002 in line with the approach taken when it was appraised.

[10] Converted to market prices

4.61. Using the using the economic present value benefits (PVB) and costs (PVC) from the appraisal and the outturn re-forecast as detailed earlier in this chapter, the BCRs can be calculated as shown in **Table 4-8**.

4.62. When this scheme was appraised the indirect tax impact was included as part of the costs which in the case of this scheme resulted in lowering the overall cost to the Treasury over the appraisal period. In more recent guidance, the costs in the BCR assessment are for the Broad Transport budget and the indirect tax impact is treated as part of the benefit, which here increases the benefits.

Table 4-8 Forecast vs. Outturn Re-forecast Benefit Cost Ratio

2002 prices and values	Indirect Tax treated as a negative cost		Indirect Tax as a positive benefit	
	2007 Forecast	Outturn	2007 Forecast	Outturn
Present Value of Benefits (PVB)	£561.3m	£449.2m	£602.6m	£466.0m
Present Value of Costs (PVC)	£273.1m	£253.4m	£314.4m	£270.2m
BCR	2.1	1.8	1.9	1.7

4.63. The key points regarding the evaluated BCRs in **Table 4-8** are:

- Outturn BCR of 1.7 is lower than the forecast is due to the benefits being lower than expected despite the lower costs.
- The outturn BCR represents medium for money in accord with DfT guidance (i.e. between 1.5 and 2) rather than high value for money (above 2) as forecast.

4.64. It should be noted that the BCR presented in this section does not consider non-monetised impacts. In the assessment used at the time this scheme was appraised, and its current replacement, the Transport Business Case, the impacts on wider objectives must be assessed but are not monetised. The evaluation of the environmental, accessibility and integration objectives of each junction improvement are covered in the following sections.

Wider Economic Impact

Forecast

4.65. The AST states:

'Improvements to the M1 may aid regeneration of North Derbyshire and North Nottinghamshire coalfields, however, such benefits would need to be fully assessed as part of an EIR' (Economic Impact Report). Score: Slight Beneficial

4.66. The Highways England website expands on this with the following statement:

'The widening scheme will primarily benefit the economy as a result of reduced congestion and improved accessibility to the region.

4.67. In particular, the scheme was expected to assist in supporting policies and proposals for the regeneration and economic development of those areas through which the route passes, or which had good access to the widened motorway.

4.68. Nottingham and Derby were both expected to benefit from this improved accessibility, in underpinning their roles as regional and sub regional centres.

4.69. The importance of the M1 was apparent in the development of the Markham Employment Growth Zone (MEGZ) which is a large regeneration area in north Derbyshire that has constructed a new

junction (29A) on the M1. Special consideration was given to the traffic that was expected to be generated by this development in the traffic model forecasts that were made.

Evaluation

4.70. The M1 motorway has a key function in providing strategic connectivity between London and the Midlands and the North for passengers and freight. This report has already shown that the scheme has increased capacity, improved journey times and reliability and improved road safety.

4.71. Wider economic impacts were not considered in detail as part of the appraisal and an EIR was not produced, however the scheme appraisal did assume that high levels of traffic growth would occur, stimulated by expected economic growth. Since the original scheme appraisal assessment the impact of the recession and hence the economic and traffic growth that was forecast in the pre-scheme appraisal has not materialised. However, despite this it is clear that the scheme has the potential to have a beneficial impact on the local, regional and even national economy by delivering the journey time savings and perhaps more importantly, journey time reliability to large numbers of business journeys and delivery vehicles. These benefits are likely to have had a positive impact on the economy, against the background of reduced economic growth.

4.72. Actual development and traffic growth at MEGZ has been slower than expected, due to the economic downturn rather than the introduction of the road widening scheme. This has contributed to the lower than expected levels of traffic on the M1. However, the potential remains for this site to generate large volumes of traffic in the future so the widening of the motorway has ensured that the capacity is in place for when this potential development traffic materialises. The scheme has contributed to the promotion of the MEGZ development, but other factors have slowed down the actual rate of development on the site.

4.73. The wider economic impacts cannot be quantified and there have been much larger economic factors in action over recent years. It can still be inferred that the scheme has had a positive impact on facilitating wider economic benefits so an EST score of Slight Beneficial has been given, as forecast.

Key Points – Economy

Present Value Benefits

- The outturn assessment of the scheme's benefits show that it will provide £466m in present value benefits over 60 years, the vast majority of which come from journey time savings.
- Benefits from the saving in journey times are lower than forecast due to lower than expected traffic flows.
- Outturn safety benefits were calculated to be £127m over the scheme life, higher than expected.

Costs

- Outturn investment costs were lower than forecast at £261.7m.

Benefit Cost Ratio

- Taking indirect tax as a benefit, the scheme achieves a BCR of 1.7, lower than forecast due to lower than expected journey time benefits.
- The outturn BCR represents medium for money in accordance with DfT guidance (i.e. between 1.5 and 2).

Wider Economic Impacts

- Although the wider economic impacts cannot be quantified and there have been much larger economic factors in action over recent years, it can still be inferred that the scheme has had a positive impact on facilitating wider economic benefits so an EST score of Slight Beneficial has been given, as expected.

5. Environment Evaluation

Introduction

5.1. This section documents the evaluation of the impacts of the scheme on the environmental sub-objectives.

5.2. The Environmental Statement (ES, March 2006) stated that the key objectives pertinent to the environment were:

- Works being capable of completion within the existing highway boundary.
- The widening should be designed to minimise any additional land-take in order to limit the environmental impact of the widened motorway. This should not however, override the need for additional land-take that may be necessary to ensure adequate environmental mitigation and landscape design to current standards.

5.3. This section only focuses on the environmental aspects of the scheme that were not fully evaluated at OYA, or where at OYA, suggestions were made for further study. Any issues that have arisen since the OYA evaluation are also discussed.

5.4. Although the detail of the OYA evaluation is not repeated here, reference is made to the OYA evaluation where required and key points are incorporated into this FYA report to provide contextual understanding where appropriate.

5.5. No new modelling or survey work has been undertaken for this FYA environmental evaluation.

Data Sources

5.6. No new surveys are undertaken as part of the Environment Evaluation. The following documents have been used in the environmental evaluation part of this study:

- Archaeological Geological and Cultural Heritage Plan, 2009;
- Appraisal Summary Table (AST), July 2007;
- As Built drawings, 2010;
- As Built AST, June 2010;
- Animal Mortality data, 2009 – 2016;
- Air Quality Data (provisional) provided by Bolsover District Council, 2015.
- Assessment of Species Rich Grassland, 2011; 2012; 2013 and 2014;
- Environmental Statement (ES) Volumes 1 (main text), 2a (detailed assessment), 2b (annexes) and 3 (figures), 2006;
- Ecological Report, Inspections on bird boxes/bat boxes, hibernacula and log piles Year 1, March 2011;
- Ecological Watching Briefs, 2007, 2008 and 2009;
- Handover Environmental Management Plan (HEMP) Draft for year 5 to year 25 management, 2009;
- HEMP Final for year 5 to year 25 management, 2015;

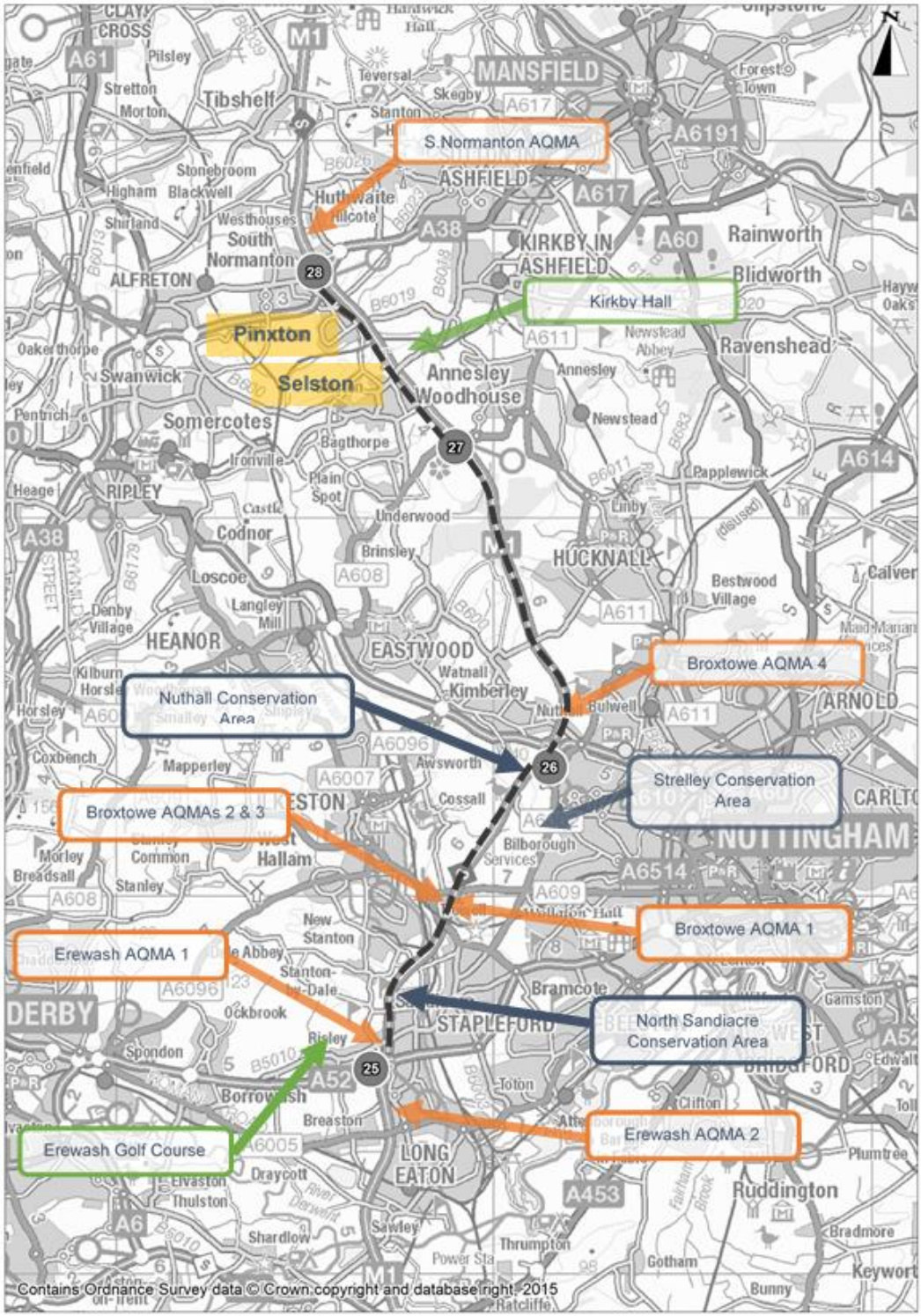
- Landscape and Ecology Specification for Planting, Seeding, Maintenance and Five Year Management, July 2010; and

- Part 1 Claims information, July 2016;

Site Inspections

5.7. A site visit was undertaken in August 2015. Photographs taken during this visit are included within this chapter. Within the ES Viewpoint photographs were limited and photomontages were not included. Locations, including photograph locations, visited at OYA were re-visited at FYA. Key locations referred to in this report are shown in **Figure 5-1** below.

Figure 5-1 Key Environmental Locations Map



Consultations

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

Table 5-1 Summary of Environmental Consultation Responses

Organisation	Field of Interest	Comments OYA	Comments FYA
Derbyshire County Council	General	Responses received with regard to rights of way. No further responses received.	Responded. No additional comments to make.
Nottinghamshire County Council	General	Responses received for rights of way, noise, landscape and heritage. With regard to ecology, NCC was unable to provide specific scheme information.	Responded. County Archaeologist and Nature Conservation Officer had no comments to make. Comments in respect of Heritage and Landscape received.
Environment Agency	Water	Response received regarding construction and operational impacts.	Responded. No additional comments to make.
Natural England	Landscape and Ecology	Commented that they were not aware of any scheme impacts to SSSIs in the area.	No response received.
Historic England	Heritage	English Heritage stated that they were unable to comment on the scheme and that the county councils should be contacted with regard to heritage issues	Responded. Unable to make any comment.
Erewash Borough Council	Emissions	No response received.	No response received.
Sandiacre Parish Council	General	Response received. Little detrimental effect to properties in Sandiacre or on the surrounding countryside and councillors were largely content with the widening scheme. Some detrimental noise impacts highlighted.	No response received.
Stanton by Dale Parish Council	General	General response received	No response received.
Trowell Parish Council	General	No response received	Response received. No negative impacts encountered. But comment made in respect of the extent of the noise fencing.
Broxtowe Borough Council	Emissions and General	No response received	Response received. Parks manager made comment in respect of plant establishment. Environmental Health Officer had no comments to make.
Nuthall Parish Council	General	Nuthall commented that the scheme ran smoothly, and despite the delays they were kept well informed throughout.	No response received.

Greasley Parish Council	General	Greasley declined to comment. They should be contacted again at FYA	No response received.
Annesley and Felley Parish Council	General	Response received; Annesley and Felley had no comments to make on the scheme.	No response received.
Selston Parish Council	General	No response received.	Response received No feedback to give.
Pinxton Parish Council	General	Response received; Pinxton had no comments to make on the scheme.	No response received.
Bolsover District Council	Emissions	Response received with regard to air quality.	Response received. Comments in respect of Air Quality.

5.9. At OYA the Highways England Part 1 Team were contacted regarding Part 1 claims however it was too early in the claims process to say how many of the 1169 received would be successful. The Part 1 Team have be re-contacted as part of the FYA and POPE was informed that as of the 12th May 2016 a total of 201 claims had been successful. It should be noted that the final claim date for this Scheme is the 2nd May 2017, therefore subsequent claims may be made and more claims may be successful, however, the information provided gives a good indication of the sources associated with claims. This information is considered as part of the evaluations of the Noise and Landscape sub-objectives.

5.10. Both pre and post scheme Animal Mortality data has been provided by the Managing Agent Contractor (MAC) for the period from July 2009 to March 2012 (as part of the OYA Evaluation) and from April 2012 to March 2016 (FYA Evaluation). Consideration of the information is given in the Biodiversity Section.

Scheme Amendments

5.11. It is understood that since the ES was prepared (2006) the scheme design was reviewed and subsequently altered. A subsequent review of the AST was undertaken to provide confidence that the design developments and working practices were in line with the original ES appraisal. The design review was undertaken in order to achieve a more compact motorway design with a variable width verge. With regard to the environment sub-objectives the key changes in scheme design, as stated by the As Built AST (June 2010), since the ES are:

- Reduced motorway cross section;
- Overall reduced land clearance of 113,600m^2;
- Additional / replacement, longer or higher noise barriers;
- Reduction in retaining structures facing away from the motorway;
- Additional screen planting at some locations;
- Only 4 underbridges widened compared to 13 proposed in the ES (parapet works undertaken on the other 9 structures); and
- Only 1 bridge replaced compared to 4 proposed in the ES (parapet works undertaken on the other 3 structures).

5.12. The above amendments are considered further within the individual evaluations for each of the environmental sub-objectives were appropriate.

5.13. It should also be noted that the scheme assessed in the ES did not include a variable speed limit. The as built scheme is a Controlled Motorway, with variable mandatory speed limits. With regard to infrastructure, the only change to the scheme assessed in the ES is the installation of variable speed signals. This is considered a very minor change, not noticeably impacting on the environment, as the signals were mounted to gantries already assessed by the ES. Explanatory Memorandum to the M1 Motorway (J25 to J28) (Variable Speed Limits) Regulations 2011 No. 909 stated that there may be a benefit with regard to emissions (which would be due to lowering of traffic speeds and reducing congestion), but there would be no other change to the impacts reported in the ES.

Traffic Forecasts and Evaluation

5.14. Three of the environmental sub-objectives (noise, local air quality and greenhouse gases) are directly related to traffic flows. The evaluation of sub-objective Journey Ambience also considers traffic data. No new environmental surveys are undertaken for POPE and 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 are as expected.

5.15. The traffic forecasts used in the noise and local air quality evaluation are summarised in **Table 5-2**.

5.16. Observed FYA traffic flow (ADT) has been compared to the straight line forecast traffic growth for the same year to ensure a like for like comparison. Detailed HGV forecasts were not provided in the ES for future years to enable a comparison with observed at the FYA stage.

5.17. The average observed traffic flows are lower than predicted across all links with the greatest differences recorded between J25 and J26 (in both directions), and J26 and J27 (northbound).

5.18. As discussed in the Traffic chapter of this report observed traffic flow changes have been largely flat on the M1 compared to small increases seen over the same period at a regional level. Forecast figures used here are slightly different from that used in the traffic chapter as here flows are compared against high growth forecasts.

Table 5-2 Forecast (2016 adjusted) ADT vs. Observed (2016 FYA) ADT

Location/ Link	Total ADT				
	Observed ADT Before *(June 2007)*	Observed *(FYA 2016)*	Forecast High Growth 2016	Difference *(Observed 2016 and Forecast 2016)*	Percentage Difference (%)
J24A to J25 Northbound	63,000	63,500	75,600	-12,100	16%
J25 to J24A Southbound	66,900	64,900	76,500	-11,600	15%
J25 to J26 Northbound	63,700	63,000	79,400	-17,600	21%
J26 to J25 Southbound	62,000	62,100	78,900	-22,600	22%
J26 to J27 Northbound	59,200	60,000	75,700	-15,800	21%
J27 to J26 Southbound	60,500	60,700	71,600	-10,900	16%
J27 to J28 Northbound	58,200	58,700	70,300	-12,200	17%
J28 to J27 Southbound	58,900	58,700	68,900	-10,900	15%
J28 to J29 Northbound	61,400	60,300	70,300	-10,000	15%
J29 to J28 Southbound	62,300	60,500	67,600	-7,000	11%

5.19. **Table 5-2** illustrates the traffic speeds. In the absence of complete traffic speed forecasts for the design year, a comparison of the 2016 observed and forecast journey time figures has been undertaken and is presented in in the traffic chapter. These figures show that journey times are largely in line with those predicted.

Five Years After Environmental Assessment

5.20. This section summarises the OYA evaluations (including close out/ key issues identified for further reporting at the FYA stage), which have been included to provide the context for the FYA evaluation. A copy of the AST for this scheme has been replicated in Appendix B of this report.

Noise

OYA Summary

5.21. The OYA noise evaluation summary confirmed that in general traffic speeds were largely as predicted. The observed traffic flows differed from those predicted in the ES for the Do Something scenario, but are generally within 20% of predictions, with the exception of between J25 and J26 in both directions where it is more than 20% lower than expected, including HGVs. Generally HGV numbers were in line with expectations with regard to noise thresholds.

5.22. It was confirmed that a low noise surface was used throughout the schemes as expected.

5.23. It was also confirmed that noise barriers had been installed across the scheme in the locations and heights proposed and are generally uniform in appearance. However, a detailed review of the as-built environmental barrier drawings against the proposals in the ES showed that at two areas there were differences between ES proposals and the as-built drawings.

5.24. A new 3.5m high environmental barrier was provided close to properties at Stapleford, 2.3m closer to the carriageway than proposed. The ES proposed a 3m high barrier in this area; and

5.25. At Nuthall, the as-built environmental barrier did not extend as far south toward J26 (Home Farm) as proposed in the ES.

5.26. At OYA it was evaluated that the mitigation measures were generally in place as described in the ES with the exception for Nuthall and based on traffic flows, the impact of the scheme on the local noise climate is assumed to be as expected, except between J25 and J26 where it is likely to be better than expected.

FYA Consultation

5.27. At FYA, Trowell Parish Council commented that "*whilst they have not noticed any negative issues resulting from the widening, they would have wished for the sound barrier to have continued further on so that the whole of Roehampton Drive would have had the full benefit."* Noise barrier (fencing) has been provided adjacent to the southbound carriageway at this location but does stop near to where the motorway passes over the River Erewash as expected in the ES. According to the ES, no new noise fencing was planned at this location as part of the mitigation (ES Volume 3 Figures). POPE cannot confirm whether the decision made at the ES stage was connected with the forecast noise changes or the distance of the receptors from the motorway.

5.28. Both Bolsover District Council and Broxtowe Borough Council responded stating that they were unable to make any comments in respect of the noise environment. No response has been received from Erewash Borough Council.

FYA Evaluation

5.29. POPE methodology assumes that if traffic flows vary by 25% more or 20% less when compared with what was originally forecast in a particular year, then it would be assumed that the local noise impact is likely to be respectively 'worse than' or 'better than' expected respectively.

5.30. Comparisons of both the predicted and observed AADT flows for all the junctions are presented in **Table 5-2**. This shows that the observed traffic flows differ from those predicted in the ES for the Do Something scenario, but are generally within 20% of predictions and are therefore considered to be as expected.

5.31. However, between J25 and J26 in both directions, and J26-J27 northbound the observed flows are more than 20% lower[11] than expected. The ES identified settlements that were potentially sensitive to changes in the noise environment, five of these (Risley, Trowell, Sandiacre, Strelley and Nuthall) are located along the links mentioned above. This may indicate that at some properties located within these settlements the noise environment could be 'better than expected', but as mentioned earlier this may not be able to be attributed to the Scheme, but rather general background reductions experienced on the M1.

5.32. Based on information in the traffic chapter, changes in observed speeds are also lower than expected, but these differences are considered marginal (of up to -3.8mph) but are within POPE methodology tolerances and are therefore considered to be as expected.

5.33. Observed FYA traffic flow (ADT) has been compared to the straight line forecast traffic growth for the same year to ensure a like for like comparison. Detailed HGV forecasts were not provided in the ES for future years to enable a comparison with observed at the FYA stage.

5.34. The Part 1 Claims Team were re-contacted as part of the FYA and POPE was informed that, as of May 2016, a total of 201 claims had been successful. It is understood that claims have generally been associated with six stretches of the Scheme, at locations; Sandiacre to Stanton Gate; Trowell; Nuthall; Selston and Pinxton. Noise was considered the main physical factor of concern, particularly where the motorway has moved closer to properties. This could indicate that whilst the noise environment at locations near Trowell, Nuthall and Sandiacre may be better than expected

[11] Extract from POPE Methodology: If traffic conditions vary by the following amounts when compared with what was originally forecast in a particular year, then it would be assumed that the local noise impact is likely to be either 'worse than' or 'better than' expected;

- Traffic flows 25% more or 20% less; or
- Average speed is different by at least 10kph; or
- % HDV is different by at least 20%.

due to the lower than predicted traffic flows, that adverse impacts upon some properties has occurred due to increases in noise.

5.35. A number of Part 1 Claims were unsuccessful at Selston, due to the acknowledged benefit of noise mitigation (noise barrier) as part of the Scheme. Near Selston the observed traffic flows are lower than forecast within the ES (link J27 – J28 northbound, shows a 17% reduction in observed traffic flows than that forecast). It is considered likely that the noise environment around Selston is likely to be 'better than expected'.

5.36. The ES stated that no properties were close enough to the Scheme to be impacted by ground-borne vibration. However, it would appear from the Part 1 Claims information that vibration has been an issue in some locations at Trowell (in approximately 16 Part 1 Claims, vibration was reflected in the settlement). Traffic flows are 22% lower than expected at the link near to Trowell (J25-J26 northbound) and therefore it would appear that the impacts of ground-borne vibrations were likely to be under estimated by the ES.

5.37. The AST stated that it was expected that 21 dwellings could qualify for noise insulation as a result of the Scheme. No information in respect of Noise Insulation was available for this study.

5.38. At OYA it was reported that the barrier at Nuthall was not implemented as proposed, past Home Farm. A review of the ES figures at FYA has confirmed that the new absorptive barrier was not expected to extend this far and that an existing barrier was to be retained. It was confirmed during the FYA site visit that an absorptive barrier has been erected in line with the ES figure in this location and the existing barrier has been retained.

5.39. As noted above, mitigation measures are generally in place as described in the ES and the changes in traffic flows do not exceed the POPE methodology thresholds, therefore the impact of the scheme on the local noise climate is generally assumed to be as expected, except between J25 and J26, and along the northbound side of J26-J27 where, based on traffic flows, it could be better than expected. However taking into consideration the Part 1 Claims information, including the claims in association with vibration, on balance it is considered that overall the impact on the noise environment is 'as expected'.

Table 5-3 Summary of Noise Evaluation

Origin of Assessment	Summary of Predicted Effects	Assessment
AST	The increase in the Estimated People Annoyed (EPA) within the study area will be approximately 6%. As a result of the scheme 21 dwellings could qualify for noise insulation.	126 more people highly annoyed with the scheme.
EST	Traffic speeds are as predicted and flows are largely within predicted thresholds and noise generated by traffic along the scheme and on adjacent links is likely to be generally as expected. However, there are likely to be better than expected noise impacts between J25 and J26 in both directions and between J26 and J27 (northbound), as along these links observed traffic flows are more than 20% less than expected. Part 1 Claims may indicate noise has been an issue in some locations and that the impacts associated with vibration were under estimated in the ES. They also indicate that in some locations mitigation has been highly effective.	Overall likely to be as expected.

Local Air Quality

OYA Summary

5.40. At OYA monitored concentrations of NO_2 (for 2010) showed that the calculated concentrations at receptors given in the ES for the scheme opening year have generally been underestimated. This was considered to be due to the concentrations not falling in future years in line with expectations.

5.41. Concentrations at properties within the AQMAs were generally still exceeding the air quality criteria, with an exception in Broxtowe where two of the four AQMAs near the M1 are expected to be revoked. However, the impact of the scheme was evaluated as likely being better than expected, due to generally lower observed traffic flows and HGVs.

5.42. Although observed concentrations had not decreased in line with expectations at OYA, it was considered that the change with the scheme was likely to be better than expected as observed traffic flows are lower than forecast.

FYA Consultation

5.43. At OYA Bolsover District Council responded that air quality associated with the scheme is worse than expected they "*have evidence of a slight increase in the annual mean for nitrogen dioxide in 2010 compared to the previous two years at 2 monitoring sites (sites 6 and 8)". There is also a worse than expected impact realised due to a "significant increase in the nitrogen dioxide levels in 2010 within the AQMA which is situated north of junction 28".* At FYA they commented that the area north of J28 has been subject to major works between 2014 and 2016 which has included a 50 mph speed limit, so these are likely to have influenced air quality over this time period.

5.44. At the time of writing this report, no comments had been received from either Broxtowe Borough Council or Erewash Borough Council.

FYA Evaluation

5.45. POPE methodology outlines that if observed after opening traffic flows identified by POPE vary by more than +/- 10% AADT, it would be assumed that local air quality is likely to be either 'worse than' or 'better than' expected.

5.46. Comparisons of both the predicted and observed AADT flows for all the junctions are presented in **Table 5-2** . The average traffic flows with the scheme are lower than predicted across all links, which would suggest that air quality is better than expected across the scheme.

5.47. However, as shown in Appendix E, monitoring in the AQMAs along the M1 corridor between J24a to J29 (i.e. including the area south and north of the scheme) has shown that over the period 2008 - 2015, there have continued to be exceedances of the NO_2 annual mean objective in one or more years in all AQMAs with the exception of Broxtowe AQMA No.4.

5.48. At the monitoring sites which are not in AQMAs, there have been no exceedances of the annual mean NO_2 objective since 2011 and only at one site prior to opening (EBC11 Bronte Close, Long Eaton).

5.49. At the majority of sites south of J27, there is no clear trend in monitoring data, although three sites do show a statistically significant downward trend (EBC6 Guinea Close, Long Eaton, EBC11 Bronte Close, Long Eaton, and EBC18 Richmond Avenue, Sandiacre). At sites north of J27, NO_2 concentrations have decreased since 2008, and since 2012, there have been no exceedances of the NO_2 annual mean objective at the sites in Bolsover District Council's South Normanton AQMA12. The majority of sites show a statistically significant downward trend since 2008, all sites with the exception of the Bolsover sites 6 (Brookhill Lane, Pinxton) and 10 (57 Lane W, South Normanton).

[12] Bolsover District Council note in their draft LAQM 2016 report that a speed limit of 50 mph throughout part of 2014 and 2015 due to the roadworks on the M1 may be responsible for the lower concentrations

5.50. Broxtowe Borough Council has revoked two of their AQMAs since 2010 (AQMAs Nos. 2 and 3) and their latest air quality review and assessment report[13] noted that monitoring data within AQMA No.4 would be reviewed to identify whether this AQMA could also be revoked.

5.51. In summary, in the area south of J26, NO_2 concentrations are still exceeding the annual mean objective in the AQMAs with the majority of sites showing no clear trend. Between J26 and J27 there has been little change in concentrations, although the objective has been met at all sites. Between J27 and J28 there has been a clear downward trend at the majority of sites, with concentrations meeting the objective, while north of J28 there has also been a downward trend, with concentrations only exceeding the objective within the South Normanton AQMA until 2012. The reason for any spatial differences along the length of the scheme is not known at this time.

5.52. Given that the air quality assessment estimated that pollutant concentrations would be below the AQS objectives, it is clear that the assessment underestimated the concentrations reported, in the ES, as the objectives are still being exceeded. This is as a result of concentrations not decreasing as fast in future years as was expected at the time of undertaking the assessment.

5.53. On balance, it can be considered that the change with the scheme is as expected as the effect of the lower observed traffic flows will have outweighed any expected increase in concentrations with the scheme.

Table 5-4 Summary of Local Air Quality Evaluation

Origin of Assessment	Summary of Local Air Quality Impacts	Assessment
AST (forecast)	The AST stated that the worsening in local air quality due to increased exposure to both NO_2 and PM_{10} at the properties within 200m of the M1 (J25-J28) is predicted to have an adverse impact along the route including upon the AQMAs declared for NO_2 in Erewash and Broxtowe (Erewash AQMA 1 and Broxtowe AQMAs 1, 2, 3 and 4). However, the predicted increase in annual mean NO_2 and PM_{10} will not result in exceedances of the Air Quality Strategy Objectives in 2010, including within the 5 adjacent AQMAs.	Weighted property concentrations (opening year): PM_{10} =+325.18_g/m^3 NO_2 = +476.16_g/m^3
EST (FYA evaluation)	Monitored concentrations of NO_2 for 2010 to 2015 show that there are still exceedances of the annual mean AQS objective in the AQMAs, hence as reported at OYA it is likely that the estimated concentrations at receptors given in the ES for the scheme opening year were underestimated, as a result of concentrations not decreasing in future years in line with expectations. Despite this underestimate, it is likely that the change with the scheme is likely to be as expected, as the effect of the lower observed traffic flows can be considered to have outweighed the expected increase with the Scheme.	As expected.

[13] Broxtowe Borough Council, 2015 Air Quality Updating and Screening Assessment for Broxtowe Borough Council, July 2015

Greenhouse Gases

5.54. WebTAG notes that Carbon Dioxide (CO_2) is considered the most important greenhouse gas therefore has been used as the key indicator for the purposes of assessing the impacts of transport options on climate change. Changes in CO_2 levels are considered in terms of equivalent tonnes of carbon released as a result of the scheme. Carbon emissions should therefore be estimated for the Do-Something (with scheme) and Do-Minimum (without scheme) scenarios.

Forecast

5.55. The ES stated that *'there would be 21.5% more CO_2 emissions as a result of the proposed works (2010). This will have no impact at a local level'*. The figures in the ES show an increase of 39,318 tonnes/year of CO_2 as a result of the scheme, which is over 10 times more than the figure presented in the AST

5.56. The AST presented significantly different figures to those presented in the ES. The AST published on the HA website was produced in 2007, and it states that '*The scheme will result in a small increase in CO2 emissions from the traffic network assessed'*. The quantitative assessment given is 'CO_2 Emissions: Opening year (2010): +3,148 tonnes/year CO_2 compared with future Do minimum in year of opening. CO_2 Emissions over whole appraisal period: +158,195 tonnes/year CO_2'. These CO2 figures are equivalent to 858 tonnes of Carbon in the opening year and 43,122 tonnes of Carbon over the 60 year appraisal period.

5.57. The methodology used in the ES did not use an actual representation of the links on the network (as described in more detail below) so it should not be interpreted as an absolute forecast of tonnes of CO_2 emitted, but it does represent a proportional change in emissions. It is not clear how the AST figure was calculated. For the purposes of the POPE study we have used the figures that were presented in the ES as the definitive forecast of Greenhouse Gas emissions because the derivation of the forecasts is clearly presented.

5.58. The ES suggests that these increased emissions are likely to be due to the increased number of vehicles on the motorway (9% more vehicle kilometres) but the ES makes no reference to the effect of the forecast increase in the annual average vehicle speeds (16% increase) even though they are included in the calculation input tables. In reality, the increase is likely to be a result of the combination of these two factors.

Changes since ES

5.59. The as-built AST for greenhouse gases had no further changes to make to the assessment because it assumed that the final scheme would have the same impact on vehicle link speeds as the original design in the ES.

FYA Evaluation of Greenhouse Gases

5.60. The methodology used in appraisal cannot be recreated in the post-scheme evaluation because we do not have observed traffic volumes on every link, and most of those links have experienced change due to other factors than the M1 widening scheme. Therefore, we have produced a more appropriate evaluation that compares 'Before' and 'Five Years After' emissions on the M1 links between J25 and J28 only. The surrounding network has been excluded from the evaluation, in a similar way to the road safety and economy evaluations.

5.61. In order to provide a comparison of the forecast and outturn changes in Carbon due to the scheme, it has been necessary to use current DMRB guidance to estimate the observed change over the first year since opening based on changes in traffic volumes, speeds and HGVs.

5.62. The results of this exercise are presented in **Table 5-5**.

Table 5-5 Outturn change in Carbon emissions

Scenario	Outturn Tonnes of Carbon/year
'Without scheme'	111,052
'With scheme'	125,238
Difference	**+14,186 (12.7%)**

5.63. It can be seen from the table above that the scheme has resulted in a greater increase in Carbon than forecast, and this is primarily because:

- The total study area that was used in the appraisal was much larger than the study area we have used in the evaluation, therefore it is not a strict like with like comparison.
- The number and percentage of HGVs has increased slightly, generating some additional Carbon emissions (see **Table 2-3**)

5.64. The combination of these factors has resulted in the small increase in Carbon emissions. The approach taken in the appraisal used a very large study area and assessed the impact on every link on the traffic model network. This approach was not compliant with DMRB. The approach to evaluation assumes that the impact is more limited in scope and has evaluated the M1 links only.

5.65. In other POPE studies where this situation has arisen a proxy 'forecast' has been produced using the same, smaller study area that was used in the evaluation. However, the required journey speed forecasts by link and by vehicle type are not available so it has not been possible to produce a proxy 'forecast' in this case.

5.66. A summary of the evaluation compared to the forecast is shown in **Table 5-6.**

Table 5-6 Summary of Greenhouse Gas Impacts

Origin of Assessment	Summary of Greenhouse Gas Impacts	Assessment
ES (Forecast)	Emissions of CO_2 are estimated to increase with the scheme in place by 21.5% in the opening year (2010). Increases are due to the forecast increase in traffic volume and speed.	Total change in CO_2 emissions due to proposed scheme in the opening year is an increase of 21.5%.
EST (FYA evaluation)	Increased emissions due to increased journey times and number of HGVs but no traffic growth.	Increase of 12% in CO_2 Greater than expected

Landscape and Townscape

OYA Summary

5.67. Overall it was considered at OYA that the impacts were as expected for Landscape and Townscape.

Retained Vegetation and Planting Establishment

5.68. At OYA the site visit confirmed that mitigation had largely been implemented as expected within the highway boundary, although no off-site planting has been undertaken as suggested by the ES.

5.69. A review of the as built landscape drawings and the site visit at OYA confirmed that more existing vegetation had been retained by the scheme than expected in the ES.

5.70. It was also confirmed that extensive new planting had been undertaken within the highway boundary as expected. Planting viewed during the OYA site visit was reported as being individually guarded and generally in a healthy and well maintained condition.

5.71. At OYA the site visit identified that one area of grass seeding, near Selston, which had received remedial works.

Landscape and Townscape Impacts

5.72. The AST entry for townscape predicts that six distinct areas of residential townscape would be adversely affected by the scheme. POPE understands that these areas are Sandiacre, Stapleford, Trowell, Nuthall (historically important townscape), Selston and Pinxton. Whilst no impacts on the layout of the settlements were expected, an increase in the urbanised character of these settlements was expected in the connection of highway widening, siting of gantries and relocation of lighting from the central reserve. The motorway is on embankment next to four of these settlements.

5.73. It was stated that where noise barriers have been installed, planting has been provided to soften their appearance from nearby visual receptors. Although the planting was not established at OYA, it is considered that once mature, it would help to screen the noise barriers.

5.74. At the time of writing the ES, it was thought that no retaining walls, facing inward toward the motorway, would be required. During the OYA site visit it was noted that a large number of small retaining walls have been installed next to motorway furniture such as lighting columns, drainage covers and cabinets. Gabion baskets have been used throughout the scheme corridor for longer sections of retaining wall. Retaining walls of block-construction were considered to add to the cluttered appearance of the motorway where they have been installed. It was commented that these retaining walls are generally only visible from the motorway itself and public rights of way, but this effect was considered to be worse than expected.

5.75. It was confirmed at OYA that the number of retaining walls proposed facing outwards from the scheme had been reduced compared to the ES predictions. This has had a better than expected effect on the surrounding landscape and visual receptors.

5.76. At OYA it was confirmed that, as set out in the ES, the finish of the widened structures has been considered and they have been clad in grey brick. The work to overbridges has not been as extensive as predicted in the ES. Only one overbridge has been replaced, rather than the four predicted. The appearance and finish of this structure is considered an improvement on those existing along the scheme corridor.

5.77. The significant landscape character impacts predicted by the ES were largely due to urbanising nature of the addition motorway furniture, including lighting columns and gantries, and due to the removal of screening vegetation. The largest landscape character impacts were predicted in the region of the Erewash floodplain, where the landscape is generally open and much of the scheme is on embankment. The impact at OYA was evaluated as major/moderate as expected.

Visual Impacts

5.78. Although there is a lack of viewpoint photographs in the ES there are cross sections, which show proposed planting throughout the scheme. At OYA it was reported that a review of these cross

section could be considered at FYA to understand the expected and actual planting presence and establishment.

5.79. Pinxton, close to J28 was predicted in the ES to experience, at worst, major/moderate impacts. It is considered that the impact on Pinxton was as expected at OYA. It was reported that the M1 was very visible from a number of properties and rights of way in the town and the new lighting columns and gantries may have had a major impact on some properties.

5.80. At OYA it was reported that major and moderate adverse visual impacts to properties at Nuthall were predicted in the ES, with impacts being associated with the erection of a large environmental barrier, taller lighting columns and gantries being visible from the Conservation Area. At OYA it was evaluated that screening planting in this area would not completely mitigate the significant visual impacts of the Scheme and it is considered that the longer term predicted moderate adverse impact as being likely to be accurate.

FYA Consultation

5.81. Broxtowe Borough Council Parks Manager commented that *"whilst they could not provide specific confirmation, the tree planting undertaken as part of the scheme is generally establishing well*." An evaluation of planting establishment has been undertaken as part of this FYA evaluation and is discussed below.

5.82. Nottinghamshire County Council's (NCC) Landscape and Reclamation Team commented: "*from a landscape and visual impact perspective, the Landscape and Reclamation Team consider that the Scheme has generally met or exceeded expectations and mitigation measures have been successfully implemented. This has been possible in part due to advance involvement of landscape professionals with the project. The only features where we have commented that the scheme is worse than expected is for impacts on Strelley Conservation Area and Registered Historic Park, and Nuthall Conservation Area and Registered Historic Park, however screening of these features would also have prevented views of them from the Motorway."*

5.83. NCC also stated that; "*New planting in association with the existing retained planting has been effective in screening views of the motorway, particularly from Public Rights of Way. The Motorway passes through 8 Landscape Policy Zones (Nottinghamshire Coalfield 01, NC02, NC04, and NC05; Sherwood16; Magnesian Limestone 15, ML16, and ML19 defined in the Nottinghamshire Landscape Character Assessment). Several of these policy zones contain landscape actions to enhance the screening of the M1 by planting woodland to reduce views of the motorway, therefore the successful implementation of the scheme has helped to achieve these objectives*."

5.84. In respect of Nuthall Conservation Area and Registered Historic Park, "*there are views of the M1, including the widened section, from the motorway embankment travelling north. Views will be obtained of the elevated Motorway on embankment, particularly from the areas surrounding Temple Lake and Home Farm and the associated Registered Historic Park.*"

5.85. No further comments were received in respect of Landscape and Townscape. Some of the comments above are also considered in the Cultural Heritage Section.

FYA Evaluation

Vegetation Removal and Planting Establishment

5.86. At OYA it was noted that the extent of vegetation removal had be lower than expected. The final HEMP (2015), provided during the FYA, states that the Scheme's footprint had been reduced by the steepening of the slopes and inclusion of retaining walls and the reduction in the requirement for the regrading of slopes. Thus the reducing of the requirement for vegetation removal has occurred.

5.87. A review of the Final HEMP identified that following the initial two years of planting maintenance of the soft estate, the HE required a reduced level of maintenance, which is reported as in broad terms requiring the; removal of grass cutting in general areas; reduced levels of weeding control in grass and planting plots; and the removal for the requirement to thin out planting. The HEMP reports that this reduced level of maintenance specification may result in some of the Scheme Environment Objectives taking longer to achieve or not being achieved. POPE confirms that over a longer period the impacts of a reduced maintenance specification may become apparent.

5.88. POPE has not been made aware as to the reason for such decision and without in depth and on-going survey work is not able to establish whether this has had / or will have any adverse impact on the achieving of Scheme Objectives. However, during the FYA site visit, the same locations were visited as during the OYA and whilst weed presence was noted throughout the planting plots, the growth and health of the planting is considered largely to be as expected at this stage of its establishment.

5.89. A location near to Erewash Golf Course was visited at OYA to view the extent of the scheme planting, and this location was re-visited at FYA. Figure 5-2 shows planting viewed during the OYA and FYA site visits. The planting is generally in a healthy and establishing, some weed growth was noted.

Figure 5-2 Extensive planting of embankment adjacent to Erewash Golf Course (OYA left), showing good signs of healthy establishment at FYA (right)

Landscape and Townscape Impacts

5.90. It was confirmed at the OYA stage that planting adjacent to noise barriers had taken place. The successful establishment of this planting was confirmed during the FYA site visit and is considered that as it continues to mature it will further screen the noise barriers. An example of such planting is shown in Figures 5-3 and 5-4, taken adjacent to the M1, at the edge of Sandiacre.

Figure 5-3 Planting showing signs of presence at OYA (left) and successful establishment (FYA) and future ability to screen environmental barrier at Sandiacre (right)

Figure 5-4 Planting showing signs of successful establishment and future ability to screen environmental barrier at Sandiacre (FYA)

5.91. The FYA site visit confirmed that the seeded embankments and cutting slopes continue to remain in a satisfactory condition, and are generally free of noxious weeds and litter, although there are isolated areas where litter is scattered along motorway cuttings and embankments, generally close to the urban areas adjacent to the scheme.

5.92. The location of remedial seeding work, near Selston, was re-visited as part of the FYA site visit and whilst there has been some greening, it is not as well established as other grassed areas (shown in Figure 5-5). Further monitoring of this location would be required to confirm as to whether this area will successfully establish.

Figure 5-5 Areas of poor establishment of grass seeding near Selston recorded at OYA (left), showing signs of establishment at FYA (right)

5.93. As stated in the OYA report, the largest landscape character impacts were predicted in the region of the Erewash floodplain, where the landscape is generally open and much of the scheme is on embankment, as illustrated in Figure 5-6. The impact at OYA was considered to be major/moderate as expected, with a reduction in adverse impact expected upon establishment of the Scheme planting. Cross section 3 (Erewash Valley) indicated that new planting was not expected along the entire length of this stretch of Scheme, however the Landscape As-built drawings include shrub planting at this location. This location was re-visited as part of the FYA evaluation and it is considered that the Scheme planting is largely establishing satisfactorily within the floodplain area, see Figure 5.1 earlier. It is expected that subject to ongoing maintenance and management, as planting establishes to maturity, the Scheme impacts should be reduced to minor, as expected.

Figure 5-6 View of the scheme from the edge of Stapleford in the Erewash floodplain, OYA (left) and FYA (right)

Visual Impacts

5.94. It should be noted that there were no viewpoint photographs contained within the ES. To evaluate the establishment of Scheme planting and screening effectiveness appropriate photograph viewpoints identified in the OYA have been re-visited as part of the FYA evaluation. A review of the cross sections showing proposed planting included in the ES has also been reviewed to compare expected and actual vegetation presence and establishment at FYA. Information relating to this review is contained where applicable.

5.95. No night-time viewpoints were included in the ES for comparison therefore no comparison to a forecast impact could be made. The presence of, and type of, lighting column was reviewed as part of the day-time visit. A review of the as built information and information from the FYA site visit confirmed that the lighting columns were located to the verges of the motorway and are fully – cut off lanterns, of 15m in height as expected in the ES. In total there have been approximately 20 successful Part 1 claims, in which lighting was reflected in the final settlement. These properties were located at Stanton Gate and Trowell. The motorway near these locations was already lit but existing lighting columns have been replaced (in line with the ES expectations) with an increased height column (from 12m to 15m), and are more numerous due to the relocation of central reserve lighting to the highway verge. The replacement lighting has full cut-off luminaries to limit light-spill

as expected. Information in respect of the Part 1 Claims would indicate that the situation may be worse than the slight adverse expected at locations in close proximity to the motorway around the settlements of Stanton Gate and Trowell.

5.96. A review of the ES cross sections illustrated that new planting expected at a location to the north of J25, did not occur as illustrated on Cross Section 1 (south of Derby Road, Sandiacre). Planting is shown on the southbound carriageway on this cross section. POPE confirms that no new planting has occurred in this location, however it is not considered to have resulted in any additional impacts as the retained vegetation is mature and provide screening during the summer months. The Visual Impact Report (ES Vol 2b, Annex 5B) also confirms that increased planting was considered a requirement in this location, however it does confirm that the level of increased visual intrusion would be Low without mitigation in this location.

5.97. Short term major and moderate adverse visual impacts were predicted at properties at Nuthall, due to a large noise barrier being installed and taller lighting columns and gantries all being visible from Nuthall. It was expected in the ES (Vol 2b, Annex 5b) that with the minimisation of vegetation loss and the inclusion of additional screen planting that the impacts could reduce to moderate adverse in the longer term (15 years). Whilst planting has been implemented and is establishing as expected, POPE considers that it will not completely mitigate the significant visual impacts in the longer term. It is considered that the ES's predicted longer term moderate adverse impact would seem appropriate.

5.98. The ES stated that special consideration would be given to the barrier at Nuthall (Conservation Area). It can be seen from **Figure 5-7** taken from within the Conservation Area, that a visually enhanced noise barrier has been erected as part of the Scheme. There are no supports showing on the 'property side' of the fence with overlapping boards used to minimise the visual intrusion of this feature. **Figure 5-7** also illustrates that planting has also been undertaken against the noise barrier in this location and is establishing satisfactorily. The review of ES Cross Section 7 (south of Nottingham Road, Nuthall) indicates that the Scheme has been constructed and proposed planting is present as expected. Visual impacts in Nuthall were expected to range from minor to major adverse in the short term and it is considered that these have been realised as expected.

Figure 5-7 Noise barrier and establishing screen planting adjacent to Nuthall, OYA (left) and FYA (right)

5.99. The ES predicted a Year 1 major adverse visual impact at Erewash Golf Course clubhouse, due to almost complete loss of screening vegetation from the M1 corridor. Reducing to moderate adverse in the longer term (15 year) as the result of the inclusion of mitigation planting to the highway embankment. At FYA this location was re-visited as shown in **Figure 5-8**, and whilst the gantry and HGV traffic are still visible, the Scheme planting is establishing satisfactorily and is expected to fulfil the screening potential anticipated in the ES, resulting in a long term minor adverse visual impact on the Golf Course clubhouse location.

Figure 5-8 View of the scheme from a location near to the Erewash Golf Course clubhouse, OYA (left) and FYA (right)

5.100. At Pinxton, close to J28, it was predicted that an overall moderate adverse visual impacts would occur in the short term, reducing to minor in the longer term (Year 15) within the inclusion of new planting along the highway corridor. It was considered that the impact on Pinxton was as expected at OYA. The M1 is very visible from a number of properties and rights of way in the town and the new lighting columns and gantries may have had a major impact on some individual properties' views. **Figure 5-9** shows the long views of the Scheme from Pinxton, while **Figure 5-10** shows the close-up views that some properties experience. These locations were re-visited as part of the FYA evaluation and it is considered that the scheme planting is establishing satisfactorily and beginning to provide some screening, in line with the expectations of the ES.

5.101. **Figure 5-9** illustrates that the planting provides almost total screening during the summer months. Over time, as the planting matures further, the blending and screening of the Scheme into the landscape from these longer distance views is expected to increase.

Figure 5-9 Long view of the scheme from Pinxton, with the scheme visible in the background, OYA (left) and FYA (right)

Figure 5-10 View of the scheme from back of property on Woodfield Road in Pinxton, with the scheme located immediately adjacent, OYA (left) and FYA (right)

5.102. A review of the Final HEMP identified that there had been historic issues of roots from the highway planting encroaching beyond the highways boundary at locations adjacent to Iona Drive, Stapleford. The HEMP confirmed that the solution to this was to remove some of the existing vegetation and to provide a route barrier at this location. It is also understand that no new woody vegetation was planted within the highway boundary at this location.

5.103. POPE FYA has reviewed the implications of this in terms of visual impacts in this location. The ES (Volume 3, Section 5.1) reported that the existing level of visual intrusion at this location was low to moderate, with the existing highway planting having a general motorway function and not a screening function. It was expected that the impacts of the Scheme at this location would result in minor adverse effects, in both the short and long term and that mitigation planting should be provided. The ES (Volume 2b Annex 5B) reported that views before the Scheme were gained from 2nd storey windows and that the resultant increase in visual intrusion as a result of the Scheme would be low. It was expected that the existing planting would be strengthen in this location. Cross Section 4 (south of Stapleford Road) illustrates the retention of existing vegetation with reinforcement with new planting. Due to the issue identified with the roots, in addition to the removal of additional trees, no new woody or 'climax' tree vegetation has been planted within the vicinity and therefore no screening will be achieved. From the site visit it is confirmed that views from some residential properties on Iona Drive are still gained from 2nd storey windows.

5.104. Overall POPE considers that the visual impacts are likely to worse than expected to a small number of properties in this location as the combined result of unexpected vegetation removal and the lack of ability to increase planting and provide visual screening in this location.

Table 5-7 Summary of Landscape and Townscape Evaluation

Origin of Assessment	Summary of Predicted Effects	Assessment
AST	The scheme area is mainly rural but there is much settlement close to the corridor. Significant landscape issues include the impact on adjacent residential settlements, properties, and on historic landscapes and floodplains. There would be adverse impact from new urbanising elements including new lighting, gantries, signs and central concrete barriers. There are six distinct residential townscape areas adjacent to the scheme that would experience an adverse impact, reinforcing the urban characteristics, although no direct effects on layout of settlements are anticipated. The motorway is on embankment next to four of these settlements, one of which is a historically important townscape.	Slight adverse
EST	Mitigation has generally been implemented as expected and Scheme planting is considered to be establishing satisfactorily and in time, subject to ongoing maintenance and management it is anticipated will provide the expected screening. In one location, mitigation planting did not occur, this was in connection with the resolution of another issue identified in this location that resulted in the removal of existing vegetation and none planting of larger tree species, which has potentially resulted in visual impacts being worse than expected to a small number of residential properties. Part 1 Claims information indicates that the impacts of lighting may have been underestimated in locations near to Stanton Gate and Trowell.	As expected

Biodiversity

OYA Summary

5.105. Overall it was considered at OYA that the impacts were as expected for Biodiversity.

5.106. Mitigation measures for reptiles, amphibians, birds and bats have been implemented, with bat and bird boxes, log piles and hibernacula installed and new habitats including areas of trees and shrubs, species rich grassland and hedgerows being planted and managed.

5.107. It was considered that the mitigation planting has generally been implemented as expected, but the scheme impacts realised are not as large as expected in the ES due to reduced land-take of the as-built scheme and more than expected retained planting. At OYA the planted vegetation was considered to still be immature, but this is to be expected at this stage.

5.108. Species rich grass were reported as being seeded and showing signs of becoming established.

5.109. It was confirmed that mitigation such as bird boxes, bat boxes, hibernacula and log piles had been installed across the Scheme. Although some issues with vandalism and poorly constructed structures were reported. It was considered that as long as maintenance continues, benefits are likely to be realised, as expected.

5.110. It was reported at OYA that the impacts of the scheme are generally as expected, with no material damage to any habitats, designated or otherwise, outside of the highway boundary. Mitigation measures described by the ES are discussed are evaluated further in Appendix F.

FYA Consultation

5.111. At FYA the Nottinghamshire County Council ecologist responded that they were unable to provide any detail as they were unfamiliar with the scheme area.

5.112. No further consultation comments have been received with regard to biodiversity.

FYA Evaluation

5.113. As reported at OYA, due of the lack of off-site planting, an opportunity has been missed to enhance biodiversity in the area. However, other mitigation has generally been undertaken as expected and a programme of monitoring of biodiversity mitigation has been undertaken since construction of the Scheme. This monitoring was not a recommendation of the ES and is considered a benefit that should ensure that biodiversity mitigation successfully establishes over the coming years.

5.114. The impacts expected in the ES, together with the evaluations at OYA and FYA are contained within Appendix F. The key issues are summarised in the text below.

5.115. At OYA it was confirmed that the planting had been generally implemented within the highway boundary as expected and during the FYA site visit it was confirmed that the scheme planting is generally establishing satisfactorily, as illustrated in the figures provided in the Landscape Section.

5.116. A monitoring report of Species Rich Grassland was made available at OYA and showed that in general, the grassland is establishing and is of good species diversity. This monitoring was expected to continue in subsequent years. Subsequent reports for 2012, 2013 and 2014 were provided to POPE FYA. In general there has been a pattern of improving establishment in terms of numbers and diversity of grassland species over the years and that the areas of species rich grasslands is highly likely to be fulfilling their ecological function. Further details in terms of species rich grassland is provided in Appendix F.

5.117. The Ecological Report, Inspections on bird/bat boxes, hibernacula and log piles, Year 1, March 2011 records the audit of mitigation measures (bat boxes, hibernacula, log piles or bird boxes) undertaken as part of the scheme monitoring. It was reported at OYA that theft and vandalism had occurred to some of the bird and bat boxes. Confirmation has been sought to establish whether the recommendations in the 2011 inspection report were carried out, but to date no confirmation has been received.

5.118. It was not known at OYA whether a great crested newt licence (GCN) was required or obtained for construction of the scheme. It was established at OYA, that a licence was gained for works to a bat roost. However, the relevant documents were not made available to POPE. A list of licences is included in the Draft Handover Environmental Management Plan (HEMP) 2009, which does not include any reference to GCN or Bat licences. No list of licences is included within the Scheme's Final HEMP. The Final HEMP (which covers the period of 6 – 25 years post construction) states that whilst there is no requirement to monitor the bat boxes in the longer term, they must be inspected for damage and repaired accordingly in line with Record of Environmental Actions and Commitments (REAC). If these inspections are undertaken, this will ensure that the continuation of this mitigation provision.

5.119. It is understood from correspondence provided for this study that a Badger Licence was required as part of the scheme, but this was only for the disturbance to badgers and not for the destroying of setts. Again this appears to be backed up by information within the Draft HEMP list of licences (2009), which is described as a licence to 'disturb badger setts, exclude badgers and destroy setts'. No badger tunnels or fencing were proposed by the scheme and the full extent of mitigation in relation to badgers is not known to POPE. The badger report has not been made available to POPE.

5.120. The Final HEMP states that in respect of environmental monitoring, desirable but not essential monitoring in years 6 – 25, could include bird boxes and the checking of hibernacula to ensure that the state of these does not decline and result in the non-compliance with the requirement to deliver HABAP targets. Longer term impacts may be greater than expected if these actions are not carried.

Animal Mortality Figures

5.121. The Managing Agent Contractor (MAC) has been consulted with regard to animal mortality due to motorway traffic between J25 and J28 and have provided the records shown in **Table 5-8** below. Data from before the scheme opening (but during construction) only covers an eight month period, whereas post opening data is available for the full five years (split between the periods of scheme opening to OYA and from OYA to FYA) and therefore an average number of incidents per month has been calculated.

5.122. The scheme includes areas of deer fencing in key areas, but no other mammal fencing was provided; this is in line with the expectations of the ES. Based on the available animal mortality data it appears as those the level of animal mortality is likely to have increased in the 12 months following the Scheme opening and then lowered in the period up to the FYA study, on a month on month basis. POPE concludes that there are likely to be no unexpected impacts associated with direct highway related animal mortality. However without more detail, POPE cannot confirm whether this has resulted in the deer being diverted to crossing different sections of the motorway.

Table 5-8 Animal Mortality Figures provided by the Managing Agent Contractor (MAC)

	Total number of Incidents per month (average)	Number of Incidents by Species						
		Swan	Dog	Deer	Hare	Fox	Badger	Unidentified
During Construction Jul 2009 – Apr 2010 (8 months)	1.2	0	0	1	2	6	0	0
Post Scheme Opening (OYA) May 2010 – March 2012 (22 months)	1.4	0	0	5	1	21	3	0
Post Scheme April 2012 – May 2016 (4 years)	0.2	1	4	6	0	1	3	3

Table 5-9 Summary of Effects

Origin of Assessment	Summary of Effects on Biodiversity	Assessment
AST	Slight adverse impacts as a result of permanent loss and disturbance to habitats and species: neutral grassland, broad-leaved woodland, scrub, mixed woodland, seven badger setts and a common pipistrelle bat roost. The approximate areas of habitat loss are: 14 ha (23%) of broad-leaved and mixed plantation woodland; 12ha (33%) of scrub; and, 9ha (31%) of neutral grassland. To mitigate loss of habitats new habitats would be created within the highway boundary and retained habitats enhanced.	Slight adverse
EST	Mitigation planting has generally been implemented as expected, but the scheme impacts realised are not as large as expected in the ES due to reduced land-take of the as-built scheme and more than expected retained planting. Vegetation is maturing satisfactorily and the areas of species rich grass that have been seeded (and re-seeded) is showing a general pattern of improving establishment, in terms of number and diversity. It is expected that the plots are likely to provide their expected ecological function. Commitments within the HEMP are to be carried out to ensure the longevity of successful mitigation.	As expected (slight adverse)

Cultural Heritage and Archaeology

OYA Summary

5.123. Overall it was considered at OYA that the impacts described in the ES and AST are generally realised; however, the OYA assessment considers that a score of neutral underestimated the overall scheme impacts.

5.124. It was reported at OYA that no meaningful assessment as to whether the longer term impacts are as predicted is achievable by POPE, due to the confusing use of significance criteria scores used in the ES.

Cultural Heritage

5.125. The OYA report reported that Scheme modifications had occurred, which have resulted in a change to the appearance of the Scheme through fewer outward facing retaining walls and more retained vegetation. It was considered that this would have slightly altered the impacts of the Scheme. For example, the ES cites that retaining walls would have an impact at the North Sandiacre Conservation Area, but these were not installed and therefore this impact was not realised.

5.126. At OYA, from a location from within the North Sandiacre Conservation Area it was confirmed that no retaining walls were incorporated in the scheme and therefore impacts associated with these structures were deemed to not have been realised. It was commented that, as expected, the gantries do add a new element, which is visible from the Conservation Area. It was considered that the short term minor impact predicted by the ES on this Conservation Area, and the nearby Catstone Conservation Area, are minor as expected. However, planting was unlikely to screen gantries even once mature and therefore it is not considered that the future impact will be neutral, especially considering the scattered nature of the planting.

5.127. At OYA the predicted impacts at Nuthall Conservation Area and associated listed buildings, Strelley Conservation Area and Catstone Conservation Area, were considered to be as expected.

5.128. Between J27 and J28 the ES predicted minor/slight impacts to historic assets to the east of the scheme (Cuttail Brook Scheduled Monument, and Langton Hall, Kirkby Hall and Brookhill Hall Historic Parks and Gardens). It was not possible to access Cuttail Brook during the OYA site visit, as it lies within private property. However, it was reported that based on views from adjacent roads it is considered that the impacts are likely to be as expected, with the widened motorway visible on a ridge approximately 1km from the monument.

Archaeology

5.129. At OYA communication with the Employer's Agent indicated that a watching brief was undertaken during construction. However, archaeological reporting was not been made available to POPE to confirm the scheme's archaeological impacts at FYA.

FYA Consultation

5.130. Historic England were contacted at FYA, but were unable to provide any comments.

5.131. As mentioned in the Landscape and Townscape topic above, Nottinghamshire County Council's Landscape and Reclamation Team made comments in respect of Strelley and Nuthall Conservation Areas and Registered Historic Parks.

5.132. In respect of Strelley Conservation Area and Registered Historic Park, they consider the situation to be 'worse than expected' as "*there are views of the M1 including the widened section, from elevated areas around the historic buildings within the Strelley Conservation Area, such as the Grade I Listed All Saints' Church, and Grade II listed Strelley Hall. The Motorway then passes into cutting and becomes screened from view. Because the south western edge of the Conservation Area is elevated this is visible from the Motorway, but this also allows views of the area from the motorway travelling north. The registered Historic Park to the north east of the Conservation Area is screened from view due to landform sloping away to the north east.*"

5.133. Likewise in respect of Nuthall Conservation Area and Registered Historic Park, *"there are views of the M1, including the widened section, from the motorway embankment travelling north. Views will*

be obtained of the elevated Motorway on embankment, particularly from the areas surrounding Temple Lake and Home Farm and the associated Registered Historic Park."

5.134. Further comments were also received from Nottinghamshire County Council Historic Buildings department. "*Wider views from within Strelley conservation area have been affected to a minor level. Some harmful impacts arising from increased noise and the intrusion of the road within the rural setting of the village cannot be mitigated."*

5.135. In respect of Nuthall Conservation Area they commented: "*The proximity of the M1 has been a major negative issue for Nuthall conservation area and the widening of the bridge/flyover immediately north of J26 has increased the harmful impact. Within the conservation area there are several key listed buildings that have been impacted upon by the road widening. In particular Home Farm, grade II listed, continues to be blighted by the M1 and its condition has deteriorated in the past 5 years, during which time it has been marketed but not purchased. This issue was raised at the time of the road widening but no mitigation was offered by the HA despite there being a clear connection between the condition to the designated heritage asset and the proximity of the M1."*

FYA Evaluation

Cultural Heritage

5.136. The location from within North Sandiacre Conservation Area was re-visited during the FYA site visit, **Figure 5-11**. Scheme planting is establishing but as was stated in the OYA, its scattered nature is not considered sufficient to result in a reduction in longer term adverse impacts. Therefore POPE considers that the longer term impacts on the Conservation Area is likely to be slightly worse than expected (minor adverse rather than neutral).

Figure 5-11 View from the edge of North Sandiacre Conservation Area

5.137. The ES assessed that impacts on Nuthall Conservation Area, Registered Historic Park and Historic Settlement Core would be minor adverse, reducing to slight adverse as planting matures. The impacts were reported as being associated with an increase in lighting columns and the erection of new noise barriers, which would result in an increased level of visual intrusion. More significant impacts were not considered likely as the motorway was already a major feature before this Scheme.

5.138. As discussed in the Landscape Section of this report, Mitigation planting (which is reported as establishing satisfactorily at FYA) and the erection of noise fencing is as expected in the vicinity of the Conservation Area. A location, near to the edge of the Conservation Areas was visited at OYA, and was revisited as part of the FYA site visit. Whilst POPE considers that the planting would not entirely screen the M1 from locations within the Conservation Area, it would provide some screening, which is expected to result in a reduction on the visual intrusion of the motorway in the longer term (as described in the landscape section).

5.139. Concerns were raised during both the OYA and FYA consultations by NCC Historic Building Department, about the adverse impacts of the scheme on the Conservation Area and its listed buildings including Home Farm (grade II listed). It is understood that mitigation proposals were put forward by the Statutory Consultee but it would appear that an opportunity to provide this mitigation

was not taken and may have impacted on this Cultural Heritage asset to a greater degree than anticipated by the ES.

5.140. Strelley Conservation Area rises from the motorway and **Figure 5-12** illustrates an example of the longer, unscreened view of the scheme from the Conservation Area. The ES considered that minor adverse impacts would occur on the Conservation Area and its Historic Settlement Core through an increased visual intrusion due to the engineer works and enhanced lighting where the motorway is at grade or on embankment. Cross Section 6 (north of Strelley) illustrates that the ES expected the regrading of the southbound slope to result in vegetation clearance in this location. From the site visit it was confirmed that the extent of site clearance and embankment regrading (within the cutting) was not as extensive as expected in the ES, see **Figure 5-13** with a small retaining wall being constructed. Impacts at Strelley are considered to be 'minor' as expected in the ES, which is also in line with comments received from NCC Historic Buildings Department. However, given the comments from NCC Landscape Team, there is potential for the impacts associated with visual impacts presented in the ES to have been underestimated or the effects of mitigation have been over estimated.

Figure 5-12 View from the centre of Strelley Conservation Area towards the south, with the M1 in the distance

Figure 5-13 View towards the western edge of Strelley Conservation Area and Registered Historic Park and Garden

5.141. As reported at OYA, of the three historic parks and gardens, Kirkby Hall lies closest to the Scheme and is therefore considered the most sensitive. **Figure 5-14** illustrates the view from the most easterly edge of the garden, this location was visited as part of both the OYA and FYA site visits. New lighting columns and noise barriers are visible from the garden, as well as the Scheme mitigation planting. It was noted during the FYA visit that the planting is establishing, but as the planting is located at a lower level than the fencing and motorway (M1 on embankment) it will take more establishment to begin to provide any screening. In the longer term (15 years), it is considered that some screening of the fencing would be achieved. Screening of the lighting columns is considered, by POPE, to be unlikely, even in the longer term. The ES considered that the short term impact would be minor adverse. Due to the confused terminology used in the ES Cultural Heritage assessment, it is not clear whether the impacts were expected to reduce in the longer term. POPE FYA considers that due to the implementation of new lighting in this area, and the fact that the mitigation planting is unlikely to provide substantial screening the impact of the scheme will not reduce further and would remain as minor adverse.

5.142. It was noted during the FYA site visit that a gantry was being constructed at this location, which has resulted in the removal of noise fencing and potentially some planting. It is expected that the removal of these would be a short term impact and would be replaced by the Scheme currently being constructed.

Figure 5-14 View from the edge of Kirkby Hall Historic Park and Garden towards the M1, OYA (left) and FYA (right)

5.143. Listed buildings were not specifically referred to in the ES and therefore the individual impact assessment on these is hard to decipher from the generic assessment undertaken. POPE considers that there is evidence that in some instances the ES impacts to have been underestimated, notably at Home Farm, and therefore opportunities for the provision of mitigation measures were not deemed necessary and could have resulted in greater than expected impacts.

5.144. POPE considers that a score of neutral is not representative of the overall Scheme impacts and this may be due to an underestimation of the Scheme's impacts within the ES, and therefore an overall score of slight adverse is more appropriate in terms of built heritage.

Archaeology

5.145. It has been confirmed as part of the FYA evaluation that an Archaeological, Geological and Cultural Heritage Management Plan (2009) was produced for the Scheme. It is also understood that an Archaeological Watching Brief was undertaken in early 2009 at a location near to an over bridge to the north of Strelley (on the southeast side of the motorway). This was reportedly in connection with earthwork activities, for which there was a potential presence of an ancient parish boundary at this location. It is understood from correspondence on the matter, that no evidence was found during the watching brief, however, no report containing the post fieldwork analysis was available for consideration by POPE to further confirm this matter.

5.146. The impacts described in the ES and AST for Archaeology were expected to be limited on the basis that any archaeological resources would have been destroyed during the construction of the M1. Based on the information available to POPE this is likely to be the case, although the post fieldwork analysis reporting would be required to confirm this.

Table 5-10 Summary of Cultural Heritage Evaluation

Origin of Assessment	Summary of Predicted Effects	Assessment
AST	Proposals are confined to existing motorway boundaries and the original M1 construction is likely to have destroyed near surface archaeological artefacts. The scheme would cause slight adverse impacts to the setting of the historic features along the M1 corridor including three Grade II Listed Buildings, one Scheduled Monument, four Conservation Areas and five registered Parks & Gardens, however this would reduce to neutral as landscape planting matures.	Neutral
EST	The FYA assessment considers that a score of neutral is not representative of the overall Scheme impacts. Although the built heritage assets affected by the scheme were already located close/adjacent to the existing M1, the increase in urbanisation of the scheme as a whole and both the high number and close proximity of the asset is considered to have resulted in a slight adverse impact on the heritage environment as a whole. POPE considers that a score of neutral is not representative of the overall Scheme and this may be due to an underestimation of the Scheme's impacts within the ES. It Is likely that the impacts associated with below ground assets are minimal as expected but without post fieldwork analysis reporting a definitive conclusion cannot be made by this study.	Slightly worse than expected overall (slight adverse).

Water Quality and Drainage

OYA Summary

5.147. Overall it was considered at OYA that the impacts described in the ES and AST for Water Quality and Drainage were generally neutral as expected.

5.148. Based on the As-built drawings it would appear that the Scheme drainage has been constructed as expected; new lined or piped drainage has been provided and attenuation and spill control chambers have been constructed. Due to the Scheme being constructed within the highway boundary, this limited opportunities for providing off-site attenuation features. As the drainage system is constructed underground, only the man-hole covers and drainage gullies were visible during the site visit.

5.149. Mitigation measures have been provided and no information was made available for this study that would indicate that it is performing other than as expected. From consultation comments provided from the Environment Agency, POPE OYA was not aware that there have been any pollution incidents, except minor incidents at construction stage. The Environment Agency also stated that provision of interceptors within the Scheme are expected to have a positive impact on the water environment and reduce the amount of pollution entering local watercourses.

5.150. At OYA the Environment Agency commented that "*It [was] not really possible to comment on the impact of the works that have been installed, as [there have not been] any rainfall events of sufficient intensity to significantly test the capability of the installed system.*"

FYA Consultation

5.151. The Environment Agency were contacted again at FYA and confirmed that they had nothing further to add to their comments at OYA. They did confirm that they had not received any correspondence or complaints.

FYA Evaluation

5.152. At OYA it was suggested that if water quality monitoring data became available then it should be considered by the FYA. No such data has been made available and therefore POPE can add no further information to the OYA in this respect.

5.153. Mitigation measures have been provided and no information has been provided for this study that would indicate that it is performing other than as expected and the predicted overall neutral impact of the scheme is considered to be as expected.

Table 5-11 Summary of Water Evaluation

Origin of Assessment	Summary of Water Impacts	Assessment
AST (forecast)	The spillage containment and pollution control measures incorporated into the scheme were expected to reduce pollution impacts from road run-off. As a result there would be a slight decrease in overall pollutants entering into the River Erewash catchment, Golden Brook, the Erewash Canal and Moorgreen Reservoir. The scheme would not encroach onto the floodplain.	Neutral
EST (FYA evaluation)	No further information received at FYA would indicate that the OYA evaluation was not relevant. The Environment Agency is not aware that the water quality in any of the local watercourses has changed significantly since the scheme. The risk of spillage to local watercourses in the Erewash catchment since scheme opening has reduced. Scheme drainage, attenuation and spill containment has been installed as expected and based on the information available to POPE it would appear that mitigation is performing as intended although further information would be required to confirm.	As expected

Physical Fitness

OYA Summary

5.154. Overall it was considered at OYA that the impacts described in the ES and AST for Physical Fitness were generally considered to be neutral as expected.

5.155. At OYA it was reported that although construction was likely to have had a lower than expected impact than expected, due to fewer works being undertaken on bridges, NCC did report an unexpected closure, which led to complaints. Measures should have been put in place to communicate planned closures with all relevant county councils ahead of planned closures. Ultimately the scheme has had no operational impacts with regard to physical fitness and the predicted score of neutral is considered accurate. It is not proposed that any further assessment of this sub-objective is undertaken at FYA.

FYA Consultation

5.156. At OYA Derbyshire County Council Rights of Way (RoW) Officer commented that the impact of the scheme on RoW was "*minimal*". The County Council were contacted again at FYA and they stated that they had nothing further to add to their OYA comments.

5.157. No further comments have been received from the PRoW officers at FYA. However a relevant comment was made by the Nottinghamshire County Council's Landscape Officer, *"PROWs have previously been retained by diverting footpaths so that they cross the road corridor by means of footbridges or road bridges. Existing planting has been retained or new treatment developed to screen PROWs from the widened motorway corridor. In terms of visual impacts on PRoW the County Landscape Officer considers these to be "as expected".*

FYA Evaluation

5.158. At OYA comments were made with regards to problems experienced during the construction phase connected with closures. No additional comments have been made by the Consultees at FYA, on this matter and therefore the comments made at OYA are still considered relevant.

5.159. Nottinghamshire County Council's Landscape Officer commented that, in visual terms, impacts on the amenity of users is considered to be as expected due to the planned inclusion of scheme planting, which is providing screening of the motorway. The general success of the Scheme's planting establishment is also described in the Landscape and Townscape sub-topic of this Chapter. Ultimately the scheme has had no operational impacts with regard to physical fitness and the predicted score of neutral is considered accurate.

Table 5-12 Summary of Physical Fitness Evaluation

Origin of Assessment	Summary of Physical Impacts	Assessment
AST (forecast)	It is considered unlikely that the scheme would result in increased physical activity through cycling or walking, or influence the travel time of the existing users to exceed 30 minutes.	Neutral
EST (FYA evaluation)	The scheme has had no operational impacts to physical fitness.	As expected

Journey Ambience

OYA Summary

5.160. Overall it was considered at OYA that the impacts described in the ES and AST for Journey Ambience were generally considered to be large beneficial as expected.

5.161. The reduction in congestion and improved traffic flows were considered to have reduced driver stress and improved journey times as expected. Collisions numbers have reduced on the scheme.

5.162. Removal of vegetation has opened up views at OYA, as expected. Lighting, signage and gantries have been introduced as expected but traveller care has generally not altered as a result of the scheme.

Consultation

5.163. No comments have been received to date with regards to Journey Ambience.

Evaluation

5.164. The evaluation for Journey Ambience considers the sub objectives; Traveller Views, Traveller Stress, and Traveller Care, separately in **Table 5-13**. Some further explanation of the evaluation of Traveller Views is also included below.

5.165. In terms of Traveller Views, longer distance views have remained open as expected, as illustrated in **Figure 5-15** below. The presence of additional motorway infrastructure furniture and associated retaining walls has increased visual clutter within views and in some locations has intermittently and temporarily foreshortened views along the Highway corridor but based on the FYA site visit, POPE considers these to be minimal and barely perceived changes to the views attained by travellers. The extent of vegetation removal, throughout the scheme, has not been as extensive as expected and therefore the opening up of views is unlikely to be as extensive as expected in the ES. It was expected that impacts on traveller views would be neutral. POPE FYA considers that this is likely to be appropriate, even once Scheme vegetation has fully established.

Figure 5-15 Longer distance views beyond the Highway Corridor retained as expected (FYA)

Table 5-13 Journey Ambience Evaluation by Traveller Factor

Traveller Factor		Score	FYA evaluation
Traveller Views		Neutral	Traveller views are generally as expected at FYA. As described above, longer distance views have been retained. Vegetation removal has meant views have also been opened up at some locations even though more vegetation was retained than expected POPE does not consider that this affects the expected ES impact of neutral. Locations of new planting are considered not led to a perceived restriction on visibility along the stretch of motorway corridor for travellers. The introduction of additional motorway furniture has urbanised the route corridor as expected and although there are more retaining walls visible from the road than predicted in the ES it is not considered that this has had a substantial impact on traveller views.
Traveller Stress	Stress – frustration	Beneficial	Driver stress should have generally reduced due to the reduction in congestion and thus reduced frustration. There is less congestion and journey times between J25 and J28 have improved by around 4 minutes in both northbound and southbound directions (an improvement on the 2 minutes observed at OYA), as a result of the scheme.
	Stress – fear of potential collisions	Beneficial	New lighting should have reduced the fear of collisions between J27 and J28.
	Stress – route uncertainty	Beneficial	Gantries and signage have been implemented as expected, improving route certainty.
Traveller care		Beneficial	New gantries have provided additional traveller information.
Summary Score		**Beneficial**	**As expected**

Table 5-14 Summary of Journey Ambience Evaluation

Origin of Assessment	Summary of Journey Ambience Impacts	Assessment
AST (forecast)	Reduced traveller stress due to improvements in traffic speeds, information (e.g. gantries and signage) and lighting. Improved traveller care due to improvements in travel information. Travellers views will change as a result of new features introduced by the scheme, including: gantries and signage; noise barriers; taller, more numerous or new lighting columns; a rigid central concrete safety barrier; new retaining structures; and changes in existing roadside vegetation.	Large beneficial
EST (OYA evaluation)	The reduction in congestion and improved traffic flows have reduced driver stress and improved journey times as expected. Collisions numbers have reduced on the scheme. Removal of vegetation has not been as extensive as expected but has opened up views, as expected. Lighting, signage and gantries have been introduced as expected. As expected traveller care has generally not altered as a result of the scheme.	As expected

Key Points – Environment

Noise

- Lower than forecast traffic flows suggest there are likely to be better than expected noise impacts between J25 and J26 in both directions and between J26 and J27 northbound. Between J26 and J28 impacts are likely to be as expected. Part 1 Claims information indicates that the impacts associated with vibration were under estimated in the ES, and that noise has been an issue in some locations. The Claims information also indicate that mitigation has been effective in one location (Selston).

Local Air Quality

- Monitored concentrations of NO2 for 2010 to 2015 show that there are still exceedances of the annual mean AQS objective in the AQMAs, hence it is likely that the estimated concentrations given in the ES were underestimated. Despite this underestimation, it is likely that this is outweighed by the effect of the lower than forecast observed traffic flows and local air quality can be considered to be as expected.

Greenhouse Gases

- Carbon was forecast to increase by just over 10,000 tonnes. The five year after evaluation shows that there has been a greater increase in carbon emissions of 14,186 tonnes. This is due to the fact that the total study area that was used in the appraisal was much larger than the study area we have used in the evaluation, therefore it is not a strict like with like comparison. In addition to this the number and percentage of HGVs has increased slightly, generating some additional Carbon emissions.

Landscape and Townscape

- Overall, landscape and townscape impacts are considered to be as expected, slight adverse. Mitigation has generally been implemented as expected and Scheme planting is considered to be establishing satisfactorily and in time it is anticipated to provide the expected screening. In one location (Stapleford), planting has not been implemented due to other reasons and visual intrusion is likely to have increased as a result. Part 1 Claims information indicates that the impacts of lighting may have been underestimated in locations near to Stanton Gate and Trowell.

Biodiversity

- Mitigation has generally been implemented as expected, but the scheme impacts are not as substantial as expected in the ES due to reduced land-take and more than expected retained planting. Vegetation is maturing satisfactorily and it is expected to provide its expected ecological function. Mitigation such as bird boxes, bat boxes, hibernacula and log piles have been installed across the scheme although there are some issues with vandalism and poorly constructed structures. Confirmation has been sought, but not received, as to whether recommendations contained within the 2011 report have been carried out. In general benefits are largely being realised, as expected.

Cultural Heritage

- The predicted score of neutral is not considered, by POPE, to be representative of the overall Scheme impacts. Although the heritage assets affected by the scheme were already located close/adjacent to the existing M1, the increase in urbanisation of the scheme as a whole and both the high number and close proximity of affected assets is considered to have resulted in a slight adverse impact on the heritage environment as a whole. It is likely that the impacts associated with below ground assets are minimal as expected but without post fieldwork analysis reporting a definitive conclusion cannot be made.

Water

- Due to the inclusion of pollution control measures, the impacts associated with road run-off were expected to reduce and an overall neutral impact was expected. Scheme drainage, attenuation and spill containment has been installed as expected and it would appear, based on the information available to POPE that mitigation is performing as expected.

Physical Fitness

- The scheme has had no operational impacts to physical fitness as expected.

Journey Ambience

- Reduction in congestion and improved traffic flows will have reduced driver stress, and driver information has also been improved. Overall, impacts on journey ambience, are considered to be beneficial as expected.

6. Accessibility and Integration Evaluation

Introduction

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

Accessibility

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

- Option Values
- Access to the transport system
- Severance

Option Values

Forecast

6.3. Option values, as defined in webTAG, relate to the availability of different transport modes within the study area, even if they are not used. For example, a car user may value a bus service along their route even if they never used it because they have the option of another mode should their car become unavailable.

6.4. The AST stated that the scheme would have no impact on option values and therefore the assessment was scored as ‘neutral’.

Evaluation

6.5. The scheme evaluation area is limited to the M1 J25-J28 which does not accommodate many short distance public transport modes however does accommodate long distance journeys for coach services for whom the reliability improvements are likely to have benefited their timetabling. As such, the AST forecast of ‘neutral’ is considered valid.

Access to the Transport System

Forecast

6.6. The AST forecast that the scheme would not alter access to the transport system. Given this, the assessment was scored as ‘neutral’.

Evaluation

6.7. The scheme did not result in any improvement in access to the transport system, given that the objective of the programme was to widen the motorway rather than improve access. The outturn evaluation for this objective is the same as forecast i.e. neutral.

Severance

6.8. Community severance refers to the degree to which movement and activities within the community are affected by the presence of a major road or other transport link, and particularly the degree of separation of residents from the facilities and services they use within their community.

Forecast

6.9. The scheme appraisal stated that this was ‘no significant overall impact on severance’, therefore the forecast impact for this sub objective was ‘neutral’.

Evaluation

6.10. It is considered that the AST forecast is valid. Past evaluation of traffic on local roads within the vicinity of the scheme showed very insignificant changes as result of the scheme and therefore the widening of the M1 does not create any further severance.

Integration

6.11. The integration objective consists of two main elements:

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

Transport Interchange

Forecast

6.12. The transport interchange objective relates to the extent to which the scheme contributes towards the Government objective of improving transport interchange for passengers and freight. Regarding this, the AST forecast states:

'Proposal is concerned with motorway improvements and is unlikely to affect passenger/ freight interchange'.

6.13. As such the AST forecast a neutral impact for the transport interchange objective.

Evaluation

6.14. It is considered that the AST forecast is valid. This sub-objective will only be applicable in certain cases where an interchange between different modes forms part of the scheme, such as a park and ride facility; as the scheme does not include these measures, it will have no impact on transport interchange

Land Use Policy and Other Government Policies

Forecast

6.15. The AST scored the impact of the scheme on land use policy as neutral reasoning that:

'There may be benefits at regional and local levels through improved accessibility, and there will be adverse impacts on the environment which primarily will be localised on land in closer proximity to the route. The scheme may be slightly beneficial achieving the objectives of the four Local Transport Plans, when viewed as part of an integrated package of transport improvements: the delivery of the various LTP measures is unaffected by the M1 widening proposals.'

6.16. The AST also scored other Government policies as neutral and states:

'*The scheme will have a neutral impact on the delivery of government policy, however it may result in benefits to the local, regional and national economies as a result of the improved accessibility, journey times and reliability on a key transport corridor.'*

Evaluation

6.17. It is considered that the AST forecast is valid. The scheme aligns with national, regional and local policies (detailed in full in the OYA evaluation report[14], Table 7.1), improving journey times and reliability as well as improving safety.

[14] http://assets.highways.gov.uk/our-road-network/pope/major-schemes/M1_J25_28_Widening/POPE_M1_J25_28_Widening_OYA_Final_Report.pdf (accessed January 2017)

7. Conclusions

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

Scheme Specific Objectives

7.2. **Table 7-1** presents an evaluation of the scheme's objectives using the evidence presented in this study.

Table 7-1 Success against Scheme Objectives

Objective		Has the scheme objective been achieved?	
Widening	Reduce congestion and improve journey time reliability	The scheme has successfully increased capacity by adding a fourth lane to M1 J25 to J28. In turn creating an average journey time across the scheme of 1 minute (J25-J28) and 1 minute 25 seconds (J24a to J29)	✓
	Improve road safety	There have been decrease in number of collisions since the scheme opened, with a saving of 25.9 collisions and 49.9 casualties per annum on the scheme itself. The collision rate for this scheme area decreased from 0.041 to 0.028 PICs/ mvkm (National average predicted to increase by 0.002 PICs/mvkm).	✓
	Respect the environment	Mitigation has generally been implemented as expected and the scheme impacts are not as substantial as expected in some cases.	✓
Controlled Motorway	Achieve best use of existing road space.	The addition of controlled motorway technology increases capacity without any further additional lanes to be built.	✓
	Allow faster response times to incidents and reduce clear-up times	Increased technology and monitoring allows a quicker response time for incidents. The increased number of lanes should reduce the delay for traffic in the event of an incident (increased likelihood that a lane can be kept open for traffic).	✓

Appendices

Appendix A: 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.
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.
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.
CEMP	**Construction Environment Management Plan**
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 collisions), and expresses the results in terms of a monetary valuation. The COBA model uses the fixed trip matrix unless it is being used in Collision-only mode.
DfT	**Department for Transport**
Discount Rate	The percentage rate applied to cash flows to enable comparisons to be made between payments made at different times. The rate quantifies the extent to which a sum of money is worth more to the Government today than the same amount in a year's time.
Discounting	Discounting is a technique used to compare costs and benefits that occur in different time periods and is the process of adjusting future cash flows to their present values to reflect the time value of money, e.g. £1 worth of benefits now is worth more than £1 in the future. A standard base year needs to be used which is 2002 for the appraisal used in this report.
DM	**Do Minimum**. In scheme modelling, this is the scenario which comprises the existing road network plus improvement schemes that have already been committed.
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	**Economic Assessment Report**
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**
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.
LEAP	**Landscape and Ecology Aftercare Plan**
MAC	**Managing Area Contractor** Organisation normally contracted in 5-year terms for undertaking the management of the road network within a Highways England area.
MVKM	**Million Vehicle Kilometres**
NCC	**Nottinghamshire County Council**

Terms	Definition
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.
NTM	**National Transport Model**
OYA	**One Year After**
PC	**Parish Council**
PIC	**Personal Injury Collisions**
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
QUADRO	**Queues and Delays at Roadworks**. A software program for calculating the monetary impacts of delays at roadworks.
REAC	**Record of Environmental Actions and Commitments**
SSSI	**Site of Special Scientific Interest**
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.
TRADS/ WebTRIS	**Traffic Flow Data System**. Database holding information on traffic flows at sites on the strategic network.
VDM	**Variable Demand Modelling**
WebTAG	DfT's website for guidance on the conduct of transport studies at http://www.webtag.org.uk/

Appendix B: Appraisal Summary Table (AST)

Scheme Name: M1 Widening J21-J30: Contract 1 Works J25 – J28		**Description:** Contract 1 will involve symmetrically widening the existing M1 motorway between Sandiacre (Junction 25) and Pinxton (Junction 28), a distance of approximately 24km, from dual 3-lane to dual 4-lane. This first phase comprises only of works within the highway boundary to enable early congestion relief.	**Problems: There is a high level of congestion and accidents on the M1**	**Present Value of Costs to Public Accounts £250.5m**
OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE ASSESSMENT	ASSESSMENT
ENVIRONMENT	Noise	**The increase in the Estimated People Annoyed (EPA) within the study area will be approximately 6%. As a result of the scheme 21 dwellings could qualify for noise insulation.**	**DM 2006 Estimated People Annoyed (EPA)** **DS 2132 Estimated People Annoyed (EPA)**	**Estimated increase in people annoyed =126**
	Local Air Quality	The worsening in local air quality due to increased exposure to both NO_2 and PM_{10} at the properties within 200m of the M1 (J25-28) is predicted to have an adverse impact along the route including upon the AQMA's declared for NO_2 in Erewash and Broxtowe (Erewash AQMA 1 and Broxtowe AQMA's 1, 2, 3 and 4). However, the predicted increase in annual mean NO_2 and PM_{10} will not result in exceedences of the Air Quality Strategy Objectives in 2010 including within the 5 adjacent AQMAs.	No. of properties where air quality has improved in 2010 due to the scheme = 0 No. of properties where air quality has worsened in 2010 due to the scheme = 2229	Assessment Values: PM_{10}=+325.18; NO_2= +476.16
	Greenhouse Gases	**The existing motorway and the surrounding local road network will result in emissions of CO_2 in 2010. The Scheme will result in a small increase in CO_2 emissions from the traffic network assessed. Monetised PVB carbon costs were assessed with the TUBA traffic Model.**	**CO_2 Emissions: Opening year (2010): +3,148 tonnes/yr CO_2 compared with future Do minimum in year of opening.** **CO_2 Emissions over whole appraisal period: +158,195 tonnes/yr CO_2**	**Net present value of change in CO_2 emissions over whole assessment period: PVB -£5.59m**
	Landscape	This section of the M1 is mainly rural but there is much settlement close to the corridor; significant landscape issues include the impact on adjacent residential settlements and properties, and the impact on historic landscapes and river floodplains. There would be adverse impact from new 'urbanising' elements including new lighting, gantries, signs and central concrete barriers.	-	Slight Adverse
	Townscape	There are six distinct residential townscape areas adjacent to this section of the M1, which would experience an adverse impact, reinforcing the urban characteristics although no direct effects on the layout of settlements is anticipated The motorway is on embankment next to four of these settlements, one of which is an historically important townscape.	-	Slight Adverse
	Heritage of Historic Resources	Proposals are confined to existing motorway boundaries and the original M1 construction is likely to have destroyed of near surface archaeological artefacts. The scheme would cause slight adverse impacts to the setting of the historic features along the M1 corridor including three Grade II Listed Buildings, one Scheduled Monument, four Conservation Areas and five registered Parks & Gardens, however this would reduce to neutral as landscape planting matures.	-	Neutral
	Biodiversity	Slight adverse impacts as a result of permanent loss and disturbance to habitats and species: neutral grassland, broad-leaved woodland, scrub, mixed woodland, seven badger setts and a common pipistrelle bat roost. The approximate areas of habitat loss are: 14 ha (23%) of broad-leaved and mixed plantation woodland; 12ha (33%) of scrub; and, 9ha (31%) of neutral grassland. To mitigate loss of habitats new habitats would be created within the highway boundary and retained habitats enhanced.		Slight Adverse
	Water Environment	The spillage containment and pollution control measures incorporated into the scheme are expected to reduce pollution impacts from road run-off. As a result there would be a slight decrease in overall pollutants entering into the River Erewash catchment, Golden Brook, the Erewash Canal and Moorgreen Reservoir. The scheme would not encroach onto the floodplain.		Neutral
	Physical Fitness	It is considered unlikely that the scheme would result in increased physical activity through cycling or walking, or influence the travel time of the existing users to exceed 30 minutes.	Change in the number of cyclists / pedestrians making journeys exceeding 30 minutes = 0	Neutral
	Journey Ambience	Reduced traveller stress due to improvements in traffic speeds, information (e.g. gantries and signage) and lighting. Improved traveller care due to improvements in travel information. Travellers views will change as a result of new features introduced by the scheme, including: gantries and signage; noise barriers; taller, more numerous or new lighting columns; a rigid central concrete safety barrier; new retaining structures; and changes in existing roadside vegetation.		Large Beneficial
SAFETY	Accidents	The scheme will have a positive effect on accidents, with accident savings over the 60 year period of 848 personal injury accidents. A total of 8 fatal casualties, 113 serious casualties and 699 slight casualties will be saved over this time period resulting in benefits of £53.9 million. During construction there will be 25 additional personal injury accidents resulting in an additional 3 serious casualties and 32 slight casualties. These additional accidents cost £1.9 million	Accident savings: Total Personal Injury Accidents = 823 Fatal casualties = 8 Serious casualties = 110 Slight casualties = 667	PVB £52.0m
	Security	No significant overall impact on security	N/A	Neutral
ECONOMY	Public Accounts	The total costs to Government are £250.5 million, discounted to 2002 prices. This comprises £4.8 million for maintenance costs, £286.9 million investment costs and £41.3 million extra income received in indirect taxes.	Central Govt PVC £250.461m, Local Govt PVC £0.0m	PVC £250.5m
	Transport Economic Efficiency: Business Users & Transport Providers	Over the 60 year period, the benefits are accrued of travel time benefits of £248.5 million for Personal Business users and £125.0 million for Freight users. Changes in vehicle operating costs result in a benefit of £1.9 million for Personal Business users but a disbenefit of £31.4 million for Freight users. During construction there are disbenefits of £5.8 million for Personal Business users and £1.0 million for Freight users. The total vehicle hours saved in the opening year are annualised to all 8760 hours of the year and based on the network consistent with that used in the economics.	Users PVB £337.2m, Transport Providers PVB £0.0m, Other PVB £0.0m Total vehicle hours saved 2010 = 263,296	PVB £337.2m
	Transport Economic Efficiency: Consumers	The benefits to consumers as a result of the scheme break down as £143.0 million travel time benefits, £17.8 million vehicle operating costs disbenefits and £4.1 million construction disbenefits. Journey time savings shown are based on all users of the motorway and are the time savings in the do-something scenario compared with the do-minimum scenario between Junctions 25 and 28 of the M1. The total vehicle hours saved in the opening year are annualised to all 8760 hours of the year and based on the network consistent with that used in the economics.	Users PVB £121.2m Total vehicle hours saved 2010 = 228,210 Journey time savings J25-28 3 minutes peak, 2 minutes inter-peak	PVB £121.2m
	Reliability	Not assessed		Not assessed
	Wider Economic Impacts	Improvements to the M1 may aid regeneration of North Derbs & North Notts coalfields, however such benefits would need to be fully assessed as part of an EIR.		Slight Beneficial
ACCESSIBILITY	Option values	Proposal is concerned with motorway improvements and is unlikely to affect transport options.		PVB £m
	Severance	No significant overall impact on severance.		Neutral
	Access to the Transport System	Proposal is concerned with motorway improvements and is unlikely to affect access to the transport system.		Neutral
INTEGRATION	Transport Interchange	Proposal is concerned with motorway improvements and is unlikely to affect passenger/freight interchange.		Neutral
	Land-Use Policy	There may be benefits at regional and local levels through improved accessibility, and there will be adverse impacts in terms of the environment which primarily will be localised on land in closer proximity to the route. The scheme may be slightly beneficial in achieving the objectives of the four Local Transport Plans, when viewed as part of an integrated package of transport improvements: the delivery of the various LTP measures is unaffected by the M1 widening proposals		Neutral
	Other Government Policies	The scheme will have a neutral impact on the delivery of Government policy, however it may result in benefits to the local, regional and national economies as a result of the improved accessibility, journey times and reliability on a key transport corridor.		Neutral

Appendix C: Evaluation Summary Table (EST)

OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE IMPACT	ASSESSMENT
Environment	**Noise**	Lower than forecast traffic flows suggest there are likely to be better than expected noise impacts between J25 and J26 in both directions and between J26 and J27 northbound. Between J26 and J28 impacts are likely to be as expected. Part 1 Claims information indicates that the impacts associated with vibration were under estimated in the ES, and that noise has been an issue in some locations. The Claims information also indicate that mitigation has been effective in one location (Selston).	Not applicable	Better than expected
	Local Air Quality	Monitored concentrations of NO_2 for 2010 to 2015 show that there are still exceedances of the annual mean AQS objective in the AQMAs, hence it is likely that the estimated concentrations given in the ES were underestimated. Despite this underestimation, it is likely that this is outweighed by the effect of the lower than forecast observed traffic flows and local air quality can be considered to be as expected.	Not applicable	As expected
	Greenhouse Gases	Carbon was forecast to increase by just over 10000 tonnes. The five year after evaluation shows that there has been a greater increase in carbon of 14, 186 tonnes. This is due to the fact that the total study area that was used in the appraisal was much larger than the study area we have used in the evaluation, therefore it is not a strict like with like comparison. In addition to this the number and percentage of HGVs has increased slightly, generating some additional Carbon emissions.	Increase of 14,186 tonnes of carbon (12.7% increase)	Worse than expected
	Landscape	Overall, landscape and townscape impacts are considered to be as expected, slight adverse. Mitigation has generally been implemented as expected and Scheme planting is considered to be establishing satisfactorily and in time it is anticipated to provide the expected screening. In one location (Stapleford), planting has not been implemented due to other reasons and visual intrusion is likely to have increased as a result. Part 1 Claims information indicates that the impacts of lighting may have been underestimated in locations near to Stanton Gate and Trowell.	Not applicable	As expected
	Townscape	Rural scheme – not applicable	Not applicable	Not applicable
	Heritage of Historic Resources	The predicted score of neutral is not considered, by POPE, to be representative of the overall Scheme impacts. Although the heritage assets affected by the scheme were already located close/adjacent to the existing M1, the increase in urbanisation of the scheme as a whole and both the high number and close proximity of affected assets is considered to have resulted in a slight adverse impact on the heritage environment as a whole. It is likely that the impacts associated with below ground assets are minimal as expected but without post fieldwork analysis reporting a definitive conclusion cannot be made.	Not applicable	Definitive conclusion cannot be made
	Biodiversity	Mitigation has generally been implemented as expected, but the scheme impacts are not as substantial as expected in the ES due to reduced land-take and more than expected retained planting. Vegetation is maturing satisfactorily and it is expected to provide its expected ecological function. Mitigation such as bird boxes, bat boxes, hibernacula and log piles have been installed across the scheme although there are some issues with vandalism and poorly constructed structures. Confirmation has been sought, but not received, as to whether recommendations contained within the 2011 report have been carried out. In general benefits are largely being realised, as expected, but commitments in the HEMP and REAC are to be undertaken to ensure longevity of successful mitigation.	Not applicable	As expected
	Water Environment	Due to the inclusion of pollution control measures, the impacts associated with road run-off were expected to reduce and an overall neutral impact was expected. Scheme drainage, attenuation and spill containment has been installed as expected and it would appear, based on the information available to POPE that mitigation is performing as expected.	Not applicable	As expected
	Physical Fitness	The scheme has had no operational impacts to physical fitness as expected.	Not applicable	As expected
	Journey Ambience	Reduction in congestion and improved traffic flows will have reduced driver stress, collision numbers have fallen and driver information has also been improved. Overall, impacts on journey ambience, are considered to be beneficial as expected.	Not applicable	As expected

OBJECTIVE	SUB-OBJECTIVE	QUALITATIVE IMPACTS	QUANTITATIVE IMPACT	ASSESSMENT
Safety	**Accidents**	The number of collisions has reduced on the scheme itself as well as over the wider study area considered in the appraisal. The results of a statistical significance test found that we can be confident that the change in collision numbers and casualty numbers for the COBA area in addition to the collision rate are not a result of chance alone and therefore we can infer that the scheme has had a direct impact on safety.	Outturn annual average number of collisions saved five years after opening: 26 Re-forecast 60 year safety benefit: £122.6m	Better than expected
	Security	Management and enforcement of the scheme section has improved through the increased provision of CCTV and enforcement cameras mostly located on the CM gantries and adjacent to the hard shoulder. Lighting has been improved along many sections of the scheme. In addition a new hard shoulder has been designed and constructed to ensure that there were no discontinuities close to the junctions.	Not applicable	Better than expected
Economy	**Public Accounts**	Cost to Government (discounted) £270.2m including operating costs of the controlled motorway.	PVC £270.2m including operating costs of controlled motorway.	-
	Transport Economic Efficiency	Scheme achieves considerable journey time benefits with an average saving of 1 minutes and 24 seconds over the wider area and 1 minute is present on the scheme section itself. Average journey time increases in the AM and PM peak periods by approximately 2 minutes when compared to the 24 hour journey time average.	Journey time benefit NRTF Traffic Growth: £345.7m	Worse than expected
	Reliability	Considerable improvements to journey time reliability have been demonstrated for M1 Traffic. There has been a large reduction in the standard deviation of journey times in the peak periods, providing a much more consistent journey time across the entire day. This indicates that journey time reliability has improved as a result of the increased capacity and the Controlled Motorway system provided by the scheme.	No quantitative assessment of reliability benefits has been made.	As expected
	Wider Economic Impacts	Although the wider economic impacts cannot be quantified and there have been much larger economic factors in action over recent years, it can still be inferred that the scheme has had a positive impact on facilitating wider economic benefits so an EST score of Slight Beneficial has been given.	Not applicable	As expected
Accessibility	**Option Values**	The scheme evaluation area is limited to the M1 J25-J28 which does not accommodate many short distance public transport modes however does accommodate long distance journeys for coach services. As such, the AST forecast of 'neutral' is considered valid.	Not applicable	As expected
	Severance	It is considered that the AST forecast is valid. Past evaluation of traffic on local roads within the vicinity of the scheme showed very insignificant changes as result of the scheme and therefore the widening of the M1 does not create any further severance.	Not applicable	As expected
	Access to the Transport System	Not applicable	Not applicable	Not applicable
Integration	**Transport Interchange**	It is considered that the AST forecast is valid. This sub-objective will only be applicable in certain cases where an interchange between different modes forms part of the scheme, such as a park and ride facility; as the scheme does not include these measures, it will have no impact on transport interchange.	Not applicable	As expected
	Land-Use Policy and Other Government Policies	The scheme aligns with national, regional and local policies, improving journey times and reliability as well as improving safety.	Not applicable	As expected

Appendix D: Environment Sources

Table D.1 Environment Information Requested

Environment Specific Requirements	Response OYA	Response FYA
Environment Statement (ES) or if not a scheme requirement the latest Scheme Assessment Report (SAR).	Environment Statement and Appendices March 2006 Volumes 1 (main text), 2a (detailed assessment), 2b (annexes) and 3 (figures).	-
AST	AST (July 2007)	-
Any amendments, updates or addendums to the ES/SAR or any relevant further studies or reports. Any significant changes to the scheme since the ES.	As-built AST Review (June 2010) identifies the main changes	-
As built drawings for landscape/biodiversity/environmental mitigation measures/drainage/ fencing/ earthworks etc.	Complete as-built drawings provided (2010)	-
Construction Environment Management Plan (CEMP)	Not available	-
Landscape and Ecology Aftercare Plan (LEAP).	Landscape and Ecology Specification for Planting, Seeding, Maintenance and Five Year Management (July 2010).	-
H& S File – environment information	Not provided	Not provided
Handover Environmental Management Plan (HEMP).	Draft Handover Environmental Management Plan (for 5 to 20 years after scheme opening (October 2009)	Final Handover Environmental Management Plan (for 5 to 20 years after scheme opening (2015)
Relevant Contact Names for: the Statutory Consultees (EA, HE and NE); the local authorities (at county and district level); the Parish / Town Councils; Employer's Agent and Designers or environmental coordinators for scheme; The MAC; and Other relevant specialist consultees.	Some information provided from construction but mainly out of date.	-
Archaeological Reports (popular and academic).	Not available – may not be produced as scheme within HA boundary of existing M1.	Archaeological geological and cultural heritage plan 2009 prepared and POPE received. Copy of Archaeological Watching Brief (2009) received.
List of properties eligible for noise insulation.	Provided in ES.	No further information provided
List of Part 1 Claims regarding noise/air quality/lighting	Numbers provided but details not provided. To be confirmed at FYA	Details up to April 2016 provided.
Reports for any pre/post opening survey and monitoring work e.g. for noise, biodiversity, water quality).	Assessment of Species Rich Grassland (June 2011) Ecological Report, Inspections on bird boxes/bat boxes, hibernacula and log piles Year 1 (March 2011)	Assessment of Species Rich Grassland (June 2012, 2013, 2014, 2015) Ecological watching briefs 2007, 2008 and 2009 provided
Animal mortality data	Supplied by the MAC for July 2009 to 2012.	Supplied by the MAC for July 2012 to 2016.
Post opening Non-motorised User (NMU) Audit or Vulnerable User Survey	Not required for this scheme as there have been no changes to NMU routes.	-
Any information regarding environmental enhancements to streetscape/townscape for bypassed settlements.	Not applicable as scheme undertaken within existing highway boundary. No enhancements undertaken outside of boundary as agreement with landowners could not be reached.	-
Employers Requirements Works Information – environment section	Not made available.	-
Scheme Newsletters /publicity material/Award information for the scheme.	Newsletters obtained from the HA website. Not aware of any awards	-

Appendix E: Air Quality Data

Concentrations measured at NO_2 Diffusion Tube Sites near the M1 J25-J28, µg/m^3

DT Site ID	Location	In AQMA?	OS Grid Ref	2008	2009	2010	2011	2012	2013	2014	2015
South of J25											
Erewash Borough Council											
EBC2	Cairnsmore Close, Long Eaton	Erewash AQMA No.2	447296, 334180	**44**	38	**44**	**43**	36	**40**	38	**40**
EBC4	Copeside Close, Long Eaton	Erewash AQMA No.2	447348, 333589	**46**	38	**43**	**44**	**42**	39	39	**40**
EBC5	Brendon Way, Long Eaton	Erewash AQMA No.2	447209, 334545	**47**	38	**46**	**40**	**41**	**40**	39	**41**
EBC6	Guinea Close, Long Eaton	N	447359, 333404	38	35	38	35	33	30	31	32
EBC11	Bronte Close, Long Eaton	N	447281, 333156	**40**	36	**40**	38	37	34	33	35
EBC22	Borrowdale Drive	N	447192, 332847	n/a	n/a	n/a	37	36	32	32	34
J25-J26											
Erewash Borough Council											
EBC1	Derby Road Sandiacre	Erewash AQMA No.1	447172, 336102	**64**	**53**	**63**	n/a	**57**	**59**	**57**	**58**
EBC18	Richmond Avenue, Sandiacre	Erewash AQMA No.1	447301, 335804	37	33	n/a	36	35	33	33	32
Broxtowe Borough Council*											
BX11	34/15 Iona Drive, Trowell Park	Broxtowe AQMA No.1	448550, 339050	38	36	35	39	**42**	39	38	**42**
BX12	71 Nottingham Road, Trowell	N	448850, 340150	28	28	27	26	26	27	33	25
BX16	18 Roehampton Drive, Trowell Park	N	448650, 338650	26	21	27	25	24	25	22	23
BX32	30 Derbyshire Ave, Trowell	N	448750, 339750	33	31	30	30	29	33	30	26
BX33	81 Nottingham Road, Trowell	N	448850, 340150	31	30	27	31	27	30	30	26
J26-J27											
Broxtowe Borough Council*											
BX01 (co-located with BX05)	19 Nottm Rd, Nuthall	Broxtowe AQMA No.4	451650, 344550	32	35	33	32	31	33	31	28
BX05 (co-located with BX01)	19 Nottm Rd, Nuthall	Broxtowe AQMA No.4	451650, 344550	34	33	31	29	31	32	32	29

DT Site ID	Location	In AQMA?	OS Grid Ref	2008	2009	2010	2011	2012	2013	2014	2015
BX09	Methodist Church, Nottingham Road, Nuthall	N	445850, 344350	28	30	29	28	26	27	27	27
BX13	20 Nottm Rd, Nuthall	Broxtowe AQMA No.4	451750, 344450	36	35	36	36	35	33	34	34
J27-J28											
Ashfield District Council											
16	Forest Close M1	N	447968, 353086	32	29	29	24	27	28	23	discontinued
14	M1 Pinxton	N	446492, 355266	36	36	31	30	33	28	29	28
Bolsover District Council											
6	Brookhill Lane, Pinxton	N	445811, 355815	35	35	36	31	32	34	33	28**
8	Paddocks Close, Pinxton	N	445384, 356063	36	33	37	27	32	31	29	26**
North of J28											
Bolsover District Council											
5, 26, 27	1 Carter Lane E, South Normanton	South Normanton AQMA	445241, 356536	**49**	**46**	**42**	**41**	**41**	39	38	37**
10	57 Lane W, South Normanton	N	445140, 356458	n/a	n/a	n/a	28	31	32	31	26**
15	3 Carter Lane E, South Normanton	South Normanton AQMA	445245, 356539	**46**	**45**	**42**	**41**	**41**	39	37	38**
20	17 Carter Lane E, South Normanton	South Normanton AQMA	445278, 356540	**51**	**41**	**40**	**42**	**41**	36	36	36**
21	31 Carter Lane E, South Normanton	N	445321, 356567	36	36	35	31	33	30	30	26**

*Grid references only given to the nearest 100m

** Provisional data

Exceedances of the NO_2 annual mean criterion of 40 µg/m^3 are shown in bold

Appendix F: Detailed Ecology Evaluation

Ecology potential impacts, mitigation and evaluation of impacts

Aspect	Predicted Impact	Mitigation Measures	Evaluation
Habitats	Loss of broad-leaved woodland within the highway boundary Loss of grassland within the highway boundary Loss of other habitats within the highway boundary	BAP habitat planting within the highway boundary where appropriate. Management of woodland areas to create canopy, shrub layer and ground layer. Management of scrub vegetation to provide thick cover. Cutting of hedgerows to create thick, 'A' shaped and diverse hedge, some with standard trees. Provision of species rich grassland. Mowing of grassland and as necessary the removal of clippings to create species diverse grassland. Promotion of thick vegetated fringes to ponds and water-courses.	Areas of species rich grassland were identified on the ES figures. These areas have been provided as expected and monitoring and management is in place. In June 2011 a report was produced; Assessment of Species Rich Grassland Establishment. This concluded that the species rich grassland plots on the scheme were generally showing a good level of species diversity. However, in many cases the species which were establishing are not those which were seeded. The report does state that the species rich objective of the grasslands is being met, but not necessarily with those seeds which were planted. Subsequent reports for 2012, 2013 and 2014 were provided to POPE FYA. The 2014 report concludes that in general there has been a pattern of improving establishment in terms of number and diversity over time. However there are signs of this slowing down in recent years. These reports confirm that the re-seeding of plots had occurred with appropriate species and is establishing. Some seeds have not been successful in any of the plots, the reports state that this could be due to seed viability, lack of growing conditions or local conditions. These species include agrimony, Wild Carrot, Meadow Cranebill and Great Mullien. Slow establishment within some plots was attributed to the slopes being re-worked with stone and no sub soil. Injurious weeds have not become frequent due to the absence of fertile topsoil. In 2014 the occurrence of woody species had increased, a sign of natural succession, which may indicate an absence of appropriate management. It concluded that it is highly likely that the ecological function of the plots is being fulfilled. No enhancement planting has been undertaken off-site, but the effects on habitats are generally as expected in the ES. During the FYA site visit, areas of planting were visited and reported as generally establishing satisfactorily. It is expected that the scheme planting will continue to establish and reach maturity to provide habitats as expected.
Aquatic habitats	Risk to aquatic habitats from spillages during operation and construction	Water attenuation and pollution control features would provide protection to the water environment and also provide amphibian habitat, although there are no ecologically enhanced features proposed as much of the attenuation is provided sub-surface.	The as-built drawings illustrate that water attenuation and spill control measures have been installed as expected. However, with the exception of some surface level drainage ditches, most of the measures have been installed below ground and are therefore of no ecological value. The ES did not include detailed mitigation for any aquatic habitats and so it was considered, at OYA, that mitigation has been installed as expected. Although not clearly marked on the as-built drawings, an ecological mitigation survey reports (March 2011) highlighted that wet hollows had been installed on the scheme, but require periodic maintenance.

Reptiles and amphibians	Reptiles and amphibians potentially present at areas required for construction and areas of potential reptile habitat lost at operation of each scheme.	Great crested newt survey work to be undertaken and possibly apply for a licence to undertake works. Provision of hibernacula.	New reptile and amphibian hibernacula have been provided within the highway boundary as part of the scheme and are shown on the ecological and landscaping as-built drawings. These hibernacula were surveyed and reported in the ecological mitigation survey report (March 2011). A total of 35 log-pile sites were inspected. Of these, 28 were undamaged, two were damaged (i.e. they were not considered to be suitable for use by their target species) and five were missing, presumed stolen. A total of 34 hibernaculum sites were inspected. Of these, 19 were undamaged, eight were slightly damaged (i.e. could be used by their target species in spite of the damage) and seven were damaged (i.e. they were not considered to be suitable for use by their target species). The report also highlighted that log piles had not been construction to current standards. Other areas of tussocky grassland were shown to be managed well for reptiles. It is considered, based on this reporting that reptile mitigation has been implemented as expected, although there are recommendations for improvements to be made that could be investigated at FYA. Ecological watching briefs undertaken in 2007, 2008 and 2009 suggest that great crested newts were eventually not found to be present on the scheme and therefore a licence and clearance works may not have been required. A list of licences is included in the Draft Handover Environmental Management Plan (HEMP), dated 2009, and this did not include any reference to GCN licence. No list of licences was included in the Final HEMP (2015).

Appendix G: Tables and Figures Listed in this report