

The Impact of Road Projects in England



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EXECUTIVE SUMMARY

This study examines the impacts of road schemes on traffic, the environment (focussing in particular on landscape, biodiversity and carbon emissions), the economy, road safety and land use.

It draws upon evidence of short-term impacts (between one and five years after scheme completion) from over 80 road schemes, published by Highways England¹ through its Post-Opening Project Evaluation (POPE) process. This is supplemented by long-term evidence from four road schemes that were completed between 13 and 20 years ago: the A34 Newbury Bypass, M65 Blackburn Southern Bypass, A46 Newark – Lincoln dualling and A120 Stansted to Braintree dualling.

The impacts of road building

Generated traffic

Evidence from 13 road schemes (nine randomly selected from all available POPEs, across all English regions, and the four case study schemes) is consistent with the conclusion that road schemes generate traffic. Average increases over the short run (3-7 years; seven schemes) were +7%. Average increases over the long run (8-20 years; six schemes) were +47%. These were increases over-and-above background traffic growth (measured by county and regional trends), and in most cases were across a screenline, to rule out reassignment effects. Exclusion of schemes where screenline data was unavailable reduced these averages, but the difference was small.

Environmental impacts

More than half of road schemes for which a POPE is available (49 out of 86) affected an area that had a local or national designation for its landscape, biodiversity or heritage. Many schemes had multiple impacts.

Evidence from the four case study schemes suggests that the impacts of road schemes on landscape and biodiversity are long-lasting.

The effect of road schemes in generating traffic means that they also cause substantial increases in carbon emissions, probably systematically and significantly underestimated by the POPE process because of its failure to recognise generated traffic.

Economic impacts

Of 25 road schemes justified on the basis that they would benefit the local economy, only five had any evidence of any economic effects. Even for these five, the economic effects may have arisen from changes incidental to the road scheme, or involved development in an inappropriate location, or involved changes that were as likely to suck money out of the local area as to bring it in.

Where a road scheme was justified on the basis that it would support regeneration of an area with a struggling economy, it was common for economic development following completion of the road scheme to be slower than expected, or not to materialise at all, or to be of a type which offered little benefit to the area concerned.

Where a road scheme was justified on the basis that it was needed to cater for current and future traffic in a 'pressure cooker' area with a buoyant economy, it was common for the scheme to be followed by much development in car-dependent locations, causing rapid traffic growth and congestion on both the road scheme and the pre-existing road network.

Some road schemes were justified on the basis that by reducing journey times, they would increase the number of jobs that were accessible to local people, or increase the potential workforce able to access major employment sites, or create thousands of new jobs. There was no evidence of measurable economic benefit from these schemes.

Road safety

Effects on safety were examined in a methodologically robust way (i.e. relative to what would have happened otherwise) by 15 POPEs. These suggested, at best, a mixed effect of the roads programme on road safety: eight schemes showed a reduction in collisions relative to the counterfactual, and seven showed an increase in collisions, over the short time period of (at most) five years following scheme completion.

The POPE process offers no evidence regarding long-term impacts of road schemes on safety. If road building generates traffic, it might be expected that the long-term effects would be worse than short-term effects. This appears to be the case for the Newbury Bypass, where our analysis suggests the long-term effect is significantly worse than the national trend, with almost three times as many collisions resulting in death or serious injury per year in the four-year period 2011-2015 as would have been expected if the A34 had followed the national downward trend in collisions.

Land use change

In all four case study schemes, road building was associated with a highly car-dependent pattern of land development. Increased road capacity was 'consumed' in the form of housing developments in the countryside, from which the vast majority of trips were by car. Road schemes were also associated with development of business parks and retail parks, generating large numbers of vehicle movements, and causing serious congestion. These sites included businesses and retailers that would be better located in a town centre, where they would be more accessible by public transport, cycling and walking.

This pattern of road building and associated land development is leading to a semi-industrial / urban landscape in the countryside, and the erosion of Green Belt that was originally designated to prevent sprawl. It is a major cause of the high levels of traffic growth associated with road schemes in the long term.

Alternatives to road building

The roads that were the subject of the case studies were not 'the answer' to the problems that they were supposed to solve. The local authority, national government and business community were together locked into a highly car-dependent development model, in which road building and the associated development generated more traffic, which in turn created pressure for more road building. The case for more road building was (and is) partly justified on the basis that existing roads cannot take the strain any longer, and partly on the basis that increased road capacity will magically unlock the economic potential of the area. However, provision of more road capacity does not deliver a stable situation – the more capacity is increased, the more capacity increases are 'needed'. In all four case studies, there

were plans to enlarge junctions, or widen the road, or create a new off-line dual carriageway at one end.

The **roads → car-based development → traffic growth → roads** model of economic development had not delivered even on its own terms. It has not solved Blackburn's economic problems: unemployment is high and wage levels are low. It did not bring more jobs to the Stansted to Braintree A120 corridor. The ribbon-development of homes and businesses along supposedly 'strategic' corridors is self-strangling: any respite from congestion provided by a new or widened road is temporary.

More environmentally and economically effective strategies would include:

- Models of economic development in which housing and employment are focussed in towns and around existing and new rail stations, designed to densities and of an urban form which make walking and cycling the modes of travel of choice.
- Strategic investment in new high quality rail (and light rail) corridors, in locations that will unlock land for housing and employment, built to densities and form that enable rail + bus and rail + walk / cycle for the majority of trips; and investment in rail infrastructure to support modal shift from road to rail for freight.
- Measures to take traffic off existing roads or to manage demand at peak times, including road pricing, levies on workplace car parking, and support for businesses to reduce car use for commuting and business travel with the money raised from road pricing and workplace parking levies being invested in frequent high-quality public transport along the same corridor.
- Broader assessment of the underlying reasons that local economies are not thriving (spanning across poor health, low educational attainment, mismatch of skills etc. as well as transport), and implementation of transport and non-transport schemes that directly address these factors.
- Far-reaching reform of the way in which road schemes are appraised, including examination of opportunity costs and how else objectives could be achieved; a complete re-think of the excessive weighting given to aggregated (but individually small) drivers' time savings in WebTAG; and recognition in modelling and appraisal of the likely effects of road schemes on land use.

1. Introduction

Does increased road capacity deliver the congestion relief that its proponents often promise? Does it help boost the local economy of areas that are struggling, and provide a means for prosperous areas to be even more successful?

Or does it actually make the problem worse, encouraging new journeys and traffic; opening up new areas for car-dependent development; and stimulating less sustainable forms of economic activity at the expense of more sustainable forms?

Do road schemes cause long term and irreversible damage to the landscape through which they pass, or do time and mitigation measures enable new and bigger roads to be accommodated without long-term impact on the countryside?

Ten years ago, CPRE and the Countryside Agency commissioned us, with our colleagues Lilli Matson and John Elliott, to try to answer these questions, drawing on the evidence that was starting to emerge from the Highways Agency's new Post-Opening Project Evaluations (POPEs) of major road schemes². From three in-depth case studies (A34 Newbury Bypass, M65 Blackburn Southern Bypass and A27 Polegate Bypass) and a review of 10 of the 12 POPE 'One Year After' (OYA) studies that had at that point been published, we reached some dismaying conclusions:

- Traffic growth on these road schemes was higher than forecast, and sometimes dramatically so.
- All the in-depth case studies included elements which were damaging to the landscape and represented a permanent deterioration of its quality.
- Development was often used as a justification for road building, and vice versa.
- There was initial evidence that the roads had resulted in negative economic impacts.

Since 2006, a great deal more evidence has emerged. Over 80 road schemes have been evaluated through the POPE process. Highways Englandⁱ commissions two POPEs for every road in its Major Schemes programme, reviewing data at one and five years after (OYA and FYA) scheme completion. The individual POPEs examine the outturn impacts of each road scheme, and compare these with the forecast impacts. They cover a range of issues, including pre- and post-scheme traffic flows; safety; economic impact; and environmental impact. Every two years, Highways England publishes a meta-analysis, aggregating the evidence from all available POPEs. The most recent (2015) meta-analysis was published in January 2016.

With such a large body of evidence now available, this study provides an opportunity to assess whether (or not) the conclusions reached in 2006 still hold good. It re-visits two of the 2006 case studies, the A34 Newbury Bypass and M65 Blackburn Southern Bypass, to understand what the long-term impacts of these roads have been – on traffic, land use, landscape and the local economy – nearly twenty years after they were built. It examines evidence from two more recent road schemes: the A46 Newark – Lincoln and A120 Stansted to Braintree, both built somewhat over ten years ago, to see whether they show similar or

ⁱ Highways England was known as the Highways Agency until April 2015.

different impacts. It also looks at the evidence presented in OYA and FYA POPEs for a sample of other road schemes. We have attempted to answer the following four questions:

- Looking at a sample of road schemes, what has been the actual change in traffic volume pre- and post-scheme completion, and to what extent does this provide evidence of induced traffic?
- What have been the cumulative consequences of the roads programme in terms of its impact on landscape quality?
- How strong is the evidence in the meta-analysis, and in individual POPEs, that road building has stimulated economic development, and is it the right sort of economic development?
- What other conclusions can be drawn from the evidence in the POPE meta-analyses?

The report is structured as follows:

PART I: Evidence from POPEs and meta-analyses

Chapter 2 examines evidence from a sample of road schemes on the effects of road schemes on traffic volume.

Chapter 3 examines evidence on the landscape impacts of all roads for which a POPE (either OYA, or FYA) is available.

Chapter 4 examines evidence on the economic impact of all roads for which a POPE is available.

Chapter 5 explores some other issues on which evidence is available from the POPE meta-analyses: effects on congestion and reliability; effects on road safety; and effects on carbon emissions.

PART II: Case study evidence

Chapter 6 provides a summary of findings from the in-depth case studies.

Chapters 7 – 10 are the in-depth case studies in full: the A34 Newbury Bypass, M65 Blackburn Southern Bypass, A46 Newark – Lincoln and A120 Stansted to Braintree schemes. Each case study examines evidence on traffic growth, landscape impact, economic impact, and effect on land use.

PART III: Evidence synthesis and recommendations

Chapter 11 sets out our findings on the effects of the roads programme, and our recommendations and conclusions.

PART I: Evidence from POPEs and Meta-analyses

2. Effects of Road Schemes on Traffic Volume

2.1 Introduction

For over 90 years, the argument about whether road building generates traffic has swung to and fro. Goodwin (2006)³ documents the evidence, which first emerged in 1925 in relation to the Great West Road in west London; then again in a series of empirical studies and official reports in 1937, 1958, 1963, 1968, 1985, 1987, 1988, 1994, 1996 and 2006, each of which demonstrated that more road capacity leads to more traffic. As he put it:

“For 80 years, every eight years on average, there has been the same experience, the same conclusions – even, for goodness sake, more or less the same figures. The evidence has been consistent, recurrent, unchallenged by serious countervailing evidence but repeatedly forgotten.”

The 1994 SACTRA report on trunk roads and the generation of traffic examined a very large body of empirical evidence, including 151 ‘improved’ roads and 12 more detailed case studies over the short and long term. Based both on this empirical evidence and on economic theory, SACTRA concluded that what it termed ‘induced’ traffic:

“...can and does occur, probably quite extensively, although its size and significance is likely to vary widely in different circumstances.”⁴

Phil Goodwin’s synthesis of the empirical evidence that had been examined by SACTRA (of which he had been a member) was that:

“An average road improvement, for which traffic growth due to all other factors is forecast correctly, will see an additional [i.e. induced] 10% of base traffic in the short term and 20% in the long term.”⁵

But despite the large and consistent body of evidenceⁱⁱ, governments, and the bodies that advise them, have repeatedly found it convenient to forget or deny that road schemes generate more traffic, independently of changes arising from growth in population or the economy.

The Highways England POPE meta-analyses are no exception in this regard. The 2015 meta-analysis⁶ concluded that there was little evidence of induced traffic, with only eight schemes out of 65 showing evidence of traffic growth that could be due to induced traffic. Looking at the different types of scheme, evidence of induced traffic was recognised in:

- Six of 23 bypasses
- One of 19 widening schemes
- None of 20 junction schemes

ii Very much more extensive than quoted here. For recent discussion, see for example: Naess P et al. (2015) *Forecasting inaccuracies: a result of unexpected events, optimism bias, technical problems or strategic misrepresentation?* Journal of Transport and Land Use 8(3) pp39-55; and Antoniou C et al. (2011) *Induced traffic prediction inaccuracies as a source of traffic forecasting failure*, Transportation Letters 3(4) pp253-264.

- Neither of two motorway upgrade schemes
- One (of one) 'smart motorway' scheme.

Although contrary to the evidence and experience of the last 90 years, the finding that induced traffic is no longer happening to any significant degree *could* be correct. In recent years, evidence has begun to grow for a phenomenon described as 'peak car'. National datasets show that car mileage per capita stopped rising in the mid-1990s in Britain, and since then has been in decline; a trend also seen in many other countries at around the same time. We were therefore interested to examine the evidence behind the POPE meta-analysis conclusion, and to test whether it might be correct.

Why road schemes generate traffic

There are many reasons why a new road, or an increase in capacity on an existing road, might lead to more traffic overall.

Short term:

- *Mode shift*: improved traffic flow makes driving relatively more attractive than bus / train etc., so some people switch mode.
- *Destination change*: higher road speeds allow drivers to choose more distant destinations than before.
- *More trips*: higher road speeds mean drivers make additional trips (that they would not otherwise have bothered to make).

Long-term:

- *Mode shift*: Less demand for public transport (because more people are driving) leads to service cutbacks, so public transport users have to switch to driving.
- *Mode shift*: more traffic makes conditions worse / more dangerous for cycling, so people drive instead.
- *Destination change and mode shift*: sites close to the road become quick to reach by car, so are developed for housing, business, retail or industry that over time replaces housing, business, retail or industry in more public transport-accessible locations (e.g. town centres).

2.2 Our methodology to assess existence of induced traffic

The 2015 POPE meta-analysis did not name the road schemes that showed evidence of induced traffic, and so it is not possible to go back to the relevant POPEs and assess what evidence was used to draw the conclusion that these eight road schemes had led to induced traffic. No information is given in the meta-analysis on the magnitude of induced traffic identified in the eight schemesⁱⁱⁱ.

iii There also appears to be some inconsistency between the findings of the 2011, 2013 and 2015 meta-analyses. The 2013 POPE meta-analysis identified a total of nine schemes out of 63 showing evidence of induced traffic. The 2011 POPE meta-analysis identified a total of 13 schemes out of 47 showing evidence of induced traffic; for three of these, induced traffic was considered to probably be due solely to the road scheme (A419 Commonhead Junction, A1033 Hedon Road Improvement and A63 Selby bypass), while for 10 schemes (un-named), it was concluded that induced traffic might have been caused by the scheme, but other factors (new developments and other highway schemes) could also have contributed. The authors commented that 'there is the argument that some of the new developments may have only been possible because of the Major Scheme, and therefore as such, the induced traffic could be considered as an indirect result of the scheme.' It thus appears that as successive meta-analyses have been published, the number of road schemes considered to show some evidence of induced traffic has progressively fallen from 13 out of 47; to 9 out of 63; and then to 8 out of 65. Each meta-

The 2015 POPE meta-analysis points out that changes in traffic flows on a road after the implementation of a scheme may be for a range of reasons, including:

- General background traffic growth (that would have happened with or without the scheme)
- Reassigned traffic (people changing their route)
- Mode change (switching to or from public transport)
- Destination change
- Time of travel change
- Trip frequency increase
- Generated or new trips (e.g. from different land use patterns).

Changes as a result of *background traffic growth* can be identified by comparing traffic counts at or near the scheme with data from comparator locations where there was no road scheme. In our analysis, we used the local authority and the region within which each road is sited as the comparators (an approach also used in some, but not all, individual POPEs). *Reassigned traffic* can be identified by looking at traffic flows across a screenline, including the new or widened road and any other roads that a driver might have previously used to make the same trip (for example, a bypass and the 'old' road which it replaces). Most POPEs identify a screenline and report changes in traffic across it before and after scheme completion, and we used the relevant screenline data as reported in the POPEs.

Additional traffic due to changes in *mode, destination, time of travel* and *trip frequency*, as well as *new trips*, are all treated by the POPE meta-analysis as induced traffic (and are in practice indistinguishable from one another).

In order to test the conclusion in the latest Highways England meta-analysis, we examined pre- and post-scheme traffic flow data from a sample of POPEs. We selected POPEs so as to give a broad geographical coverage, with at least one road scheme drawn from each of the Highways England geographical regions. We aimed for a range of scheme types (bypasses, widening, motorway upgrades, but not junction schemes) and a range of completion dates. Table 2.1 summarises the selected schemes.

For each scheme, we reviewed the POPE (OYA or FYA, or if necessary both). We looked for data showing traffic flows across a screenline before and after scheme completion. Where results were reported for several screenlines, we used those screenlines that were most relevant for assessment of the possibility of induced traffic as a result of the scheme^{iv}. In some cases, traffic flow data was only reported for the road scheme itself, rather than across a screenline, generally where there was no expectation of trip reassignment, and where this was the case, we used the traffic data reported for the scheme.

We compared pre- and post-scheme traffic flows across the screenline (typically reported as average weekday traffic, or sometimes average daily traffic) with 'background' changes in traffic volume (vehicle kilometres) over the same time period in both the region and the local authority area(s) in which the scheme was sited. This traffic volume data at the regional and local authority level is published by DfT⁷, and is available annually from 1993.

analysis is stated to include evidence from all published POPEs to date, and no explanation is given for this reduction in the number of schemes recognised as demonstrating evidence of induced traffic.

iv Some POPEs also reported data for screenlines that did not cross the road scheme.

Comparison of pre- and post-scheme screenline traffic flows with regional and local traffic volumes enabled us to exclude any changes due to reassigned traffic (people changing their route) or background traffic growth (that would have happened with or without the scheme). This approach was also used in some of the POPEs^v, and we believe it provides a robust method for assessing whether or not there may be induced traffic.

Table 2.1: Road schemes for which evidence of induced traffic was assessed

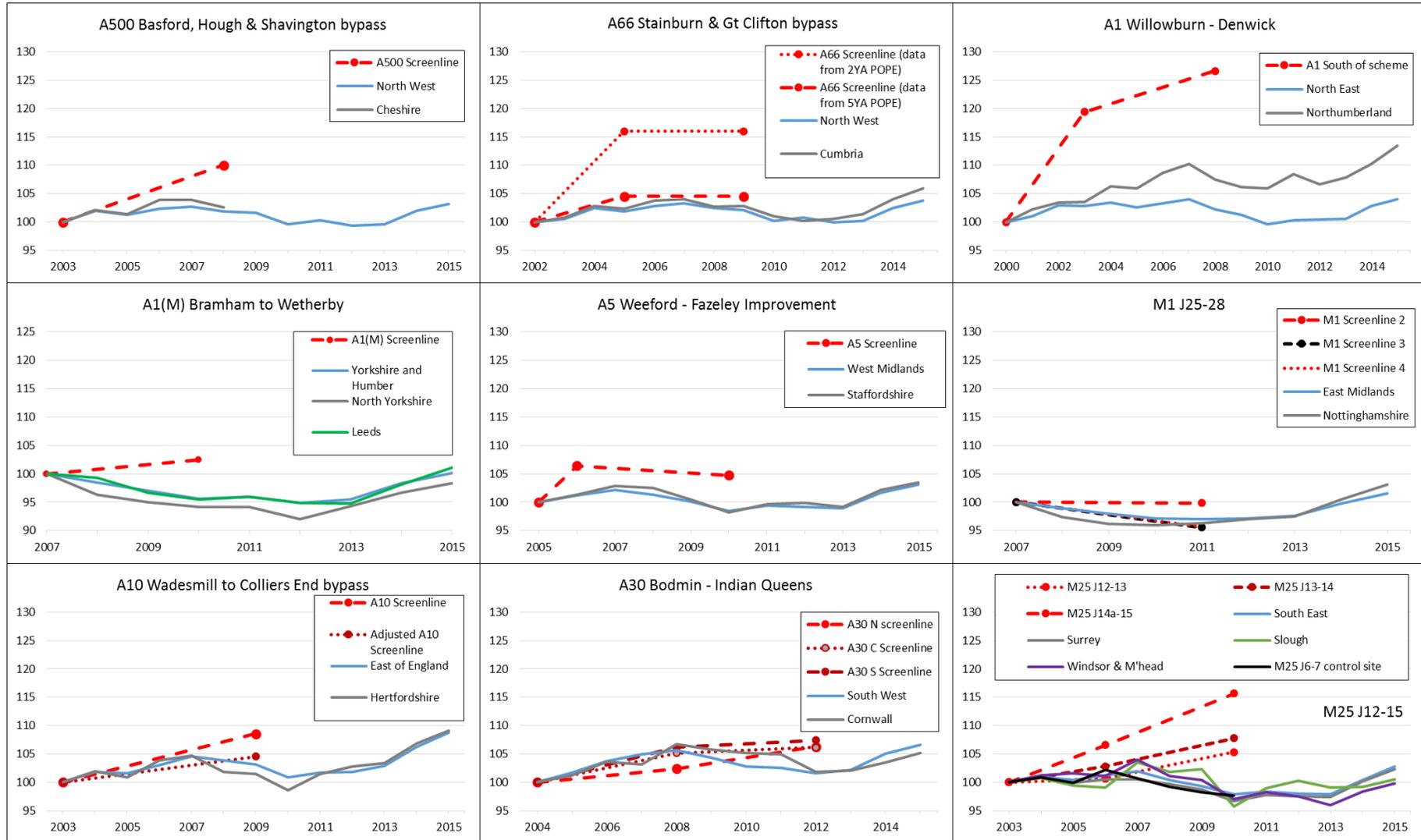
Road / Scheme name	Region	Opening date	Scheme description
A500 Basford, Hough, Shavington bypass	NW	2003	7km new dual carriageway, bypassing villages on E-W route between Nantwich and M6
A66 Stainburn & Great Clifton bypass	NW	2002	4km new single carriageway bypass of villages of Stainburn and Great Clifton
A1 Willowburn – Denwick Improvement	NE	2003	4km of single carriageway converted to dual carriageway on section of A1 bypassing Alnwick
A1(M) Bramham - Wetherby	Y&H	2009	Conversion of 10km of existing 2 and 3 lane A1 to dual 3 lane motorway by on-line carriageway widening. Construction of parallel local access road, completing an inner bypass of Wetherby
A5 Weeford – Fazeley Improvement	WM	2005	5km new two-lane dual carriageway between existing A5 south of Tamworth and the junction with the A5 and A38, plus grade separation of the A38/A5 junction
M1 J25-28 widening	EM	2010	Widening of 22km of motorway in Derbyshire and Nottinghamshire from 3 lanes to 4 by conversion of hard shoulder into permanent running lane; installation of 'controlled motorway' system (variable speed limits + driver information)
A10 Wadesmill to Colliers End bypass	E	2004	7km of off-line dualling, bypassing several villages; the dualling starts north of Hertford and the new dual carriageway re-joins the old A10 at Standon
A30 Bodmin Indian Queens Improvement	SW	2007	12km of A30 was converted to dual carriageway, and much of the route was re-aligned. Since scheme completion, the former A30 has been converted in places to a shared multi-use trail
M25 J12-15 widening	SE	2005	11km section of the M25 between the M3 and M4 was widened from 3 or 4 lanes in each direction to 4-6 lanes in each direction

2.3 Evidence of induced traffic

Table 2.2 at the end of this section presents our findings for each of the schemes; results are presented graphically in Figure 2.1.

^v Some POPEs did not identify a regional or local comparator. Others compared observed post-scheme traffic flow with the pre-scheme forecast of future flows, which is problematic because national traffic forecasts have significantly over-estimated the rate of traffic growth over the time period in question.

Figure 2.1: Indexed change in traffic across screenline or on road scheme, relative to regional and local comparators



The key points from this analysis are as follows:

- In eight out of nine road schemes, traffic growth on a screenline (or on the scheme itself, where no screenline data was reported) was higher than background regional and local traffic growth, by a non-trivial amount. In one scheme, growth was essentially the same as the background trend.
- Growth was typically in excess of background growth by about 5-10%-points over time periods of about 3 – 8 years.
- However, there are some examples where traffic growth exceeded background trends by more than this; notably, the widening of the M25 (J14a-15), which created Britain's first six-lane motorway, resulted in traffic growth almost 20%-points higher than the background trend, over seven years (Figure 2.2).

Figure 2.2: The M25 between J14a and J15: Britain's first six-lane motorway, where traffic growth exceeded background trends by 20%-points over seven years



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As will be seen in Part II, our case study schemes also show growth that is substantially in excess of background traffic growth, over a longer time period.

If examining a single road scheme, it would be difficult to be certain that any growth above background trends was due to induced traffic^{vi}. However, because most of the schemes examined here show the same pattern, there is a greater likelihood that this is attributable to induced traffic. That is, *without* induced traffic, we would expect roughly half of the traffic growth trends shown by road schemes to be *above* regional / local growth trends, and half to be *below* regional / local growth trends. Examination of Figure 2.2 (and of the equivalent graphs in Chapters 7 – 10) suggests that this is not the case: the red dashed or dotted line showing the indexed change in traffic for the road scheme is almost always above the blue solid line showing the regional comparator, and the grey, green and purple solid lines showing the local comparators.

^{vi} This is for two reasons. First, count data reported in POPEs is sometimes based on specially-commissioned temporary traffic counts, if there is no permanent traffic counter in a suitable location. These temporary traffic counts would be expected to show some random variability. Second, the 'background' traffic growth rate within any region or local authority will not be uniform: different individual roads will have different traffic growth rates, spread above and below the mean.

One alternative explanation that should be considered is that road schemes might be more likely to be implemented in locations with high traffic growth rates – that is, the high growth is the cause of the road scheme, rather than the other way around. None of the nine road schemes for which we reviewed the POPE included any evidence of pre-scheme traffic growth rates (for example, for the five years prior to the start of construction) that enabled this to be assessed. However, this seems on the face of it unlikely to be a general explanation, given that many road schemes are justified on the basis of congestion, which itself might be expected to suppress the pre-scheme traffic growth rate.

Another possible explanation of the pattern seen in Figure 2.1 might be that traffic growth might be systematically higher on roads managed by Highways England. We checked this by examining the growth rate on the trunk road network in each region in the period in question. While the trunk road traffic growth rate was sometimes different to the traffic growth rate for ‘all roads’, the differences were small and there was no systematic tendency for the regional trunk road traffic growth rate to be higher than the regional ‘all roads’ traffic growth rate – in fact, the regional trunk road growth rate was *lower* than, or the same as, the regional ‘all roads’ growth rate for seven out of the nine road schemes we examined^{vii}.

vii We used ‘all roads’ for our comparators, rather than solely trunk roads, because a de-trunking programme from 1999 resulted in stretches of road that were previously the responsibility of Highways England being transferred to local authorities. This meant that we could not be certain that the group of roads used to calculate ‘trunk road’ traffic would be the same in different years. Calculation of regional trunk road traffic growth rates uses road traffic statistics TRA8904 and TRA8906 (subtracting one from the other). The two road schemes for which the regional trunk road traffic growth rate was higher than the regional ‘all roads’ traffic growth rate were M1 J25-28 (which is the road scheme where there was no evidence of induced traffic) and A1 Willowburn – Denwick, where the change in traffic for the road scheme was +27%, the change on ‘all roads’ in the NE Region was +2%, and the change in trunk roads in the NE region was +7%.

Table 2.2: Summary of evidence of induced traffic

Road / Scheme Name	Traffic evidence (from POPE)	Growth in excess of average background growth*	Likelihood of induced traffic?
A500 Basford, Hough, Shavington bypass	<p>The 5YA POPE reports that traffic flows across a N-S screenline including the old road, the new bypass and the A534 through Crewe increased from 47,000 (AWT) in 2003 to 51,700 in 2008: a change of +10.0%. Over the same period, data from DfT traffic statistics TRA8904 shows that traffic increased by +1.9% in the NW, and by +2.6% in Cheshire.</p> <p>The POPE rather misleadingly focusses on the fact that the increase in traffic is 'marginally higher than expected' i.e. it is marginally higher than the pre-construction forecast.</p>	+7.7% in 5 years	Yes
A66 Stainburn & Great Clifton bypass	<p>There is an unexplained discrepancy between the 2YA and 5YA POPEs in the figure reported for 'before' traffic on the old road. If the figure reported in the 2YA POPE is correct, traffic flows across a N-S screenline including the old road and the new bypass increased from 10,000 (AWT) in 2002 to 11,600 in 2009: a change of +16.0%. If the figure reported in the 5YA POPE is correct, traffic flows increased from 11,100 in 2002 to 11,600 in 2009: a change of +4.5%. Over the same period, data from DfT traffic statistics TRA8904 shows that traffic increased by +2.1% in the NW, and by +2.8% in Cumbria.</p> <p>No comparator figures are quoted in either POPE (instead, it is asserted that growth is in line with predictions).</p>	+2.1% or +13.6% in 7 years	Yes
A1 Willowburn – Denwick Improvement	<p>No screenline data are reported. The 5YA POPE reports traffic flows at a site immediately to the south of the scheme (close enough that it is probably representative of flows on the scheme itself), and at three other sites on the A1 (about 5km and 8km to the north of the scheme and 13km to the south of the scheme).</p> <p>Traffic flows at the site closest to the scheme increased from 13,900 (AADT) in 2000 to 17,600 in 2008: a change of +26.6%. Over the same period, data from DfT statistics TRA8904 shows that traffic grew by +2.2% in the NE, and by +7.5% in Northumberland.</p> <p>Most of the growth at the site closest to the scheme (+19.4%) was in the period immediately after opening (i.e. comparing flows in 2000 with flows in 2003). During this period, the count sites on the A1 further away from the scheme also show increases in traffic that are bigger than the NE and Northumberland trends, but less than the growth at the site closest to the scheme. In the period between 2003 and 2008, the three count sites further away from the scheme show a higher rate of growth than observed at the site closest to the scheme; there is no information in the POPE to enable an assessment of possible reasons for this.</p>	+21.8% in 8 years	Yes

Road / Scheme Name	Traffic evidence (from POPE)	Growth in excess of average background growth*	Likelihood of induced traffic?
A1 Bramham – Wetherby	The 1YA POPE reports that traffic flows across an E-W central screenline including the A1(M) and parallel roads increased from 115,400 AADT in 2007 to 118,300 AADT in 2010: a change of +2.5%. Over the same period, data from DfT statistics TRA8904 shows that traffic fell by -4.4% in Y&H region, by -5.8% in North Yorkshire, and by -4.5% in Leeds (the local comparator areas for the scheme, as selected in the 1YA POPE).	+7.4% in 3 years	Yes
A5 Weeford – Fazeley Improvement	The 5YA POPE reports that traffic flows across a screenline including the new A5 and old A5 increased from 54,600 AWT in 2005 to 57,200 AWT in 2010: a change of +4.8%. Over the same period, data from DfT traffic statistics TRA8904 shows that traffic fell by -1.5% in the WM region, and by -1.8% in Staffordshire. The 5YA POPE points out that traffic growth exceeded the background trend at locations on the A5 to the east and west of the road scheme, and suggests that this is a corridor experiencing higher levels of growth overall (i.e. atypical of regional trends). However, it also identifies a number of new developments that could have affected traffic flows at these locations (particularly the location to the west of the scheme). Analysis of traffic patterns for this scheme is also complicated by the existence of the M6 Toll Road nearby.	+6.4% in 5 years	Probably
M1 J25-28 widening	The 1YA POPE reports traffic flows across five E-W screenlines including the M1 and parallel A roads. Traffic flows are given in 2007 (pre-construction) and 2011. For the three screenlines that lie between J25 and J28 (which are the most relevant), traffic flows fell from an average of 213,632 AWT in 2007 to 206,178 in 2011: a fall of -3.5%. Over the same period, data from DfT traffic statistics TRA8904 shows that traffic fell by -3.0% in the EM region, and by -3.7% in Nottinghamshire.	+0.1% in 4 years	No
A10 Wades-mill to Colliers End bypass	The 5YA POPE reports traffic flows across several screenlines, of which the most relevant is the 'central wider' screenline. This includes the new A10, the old A10, two other 'A' roads and one 'B' road. Traffic flows across this screenline are reported for 2002 / 2003 (pre-construction) and 2009. Traffic rose from 70,350 AWT to 76,350 AWT over this period, a change of +8.5%. However, a footnote in the POPE indicates that the pre-construction figure for the old A10 may have been affected by roadworks. If so, there is an alternative count site on the old A10, and if this is substituted, the change in traffic flow across the screenline is from 74,750 AWT to 78,150 AWT, a change of +4.5%. Over the same period, data from DfT traffic statistics TRA8904 shows that traffic increased by +3.1% in the East of England, and by +1.4% in Hertfordshire. The POPE suggests that above-background traffic growth on the new A10 (and/or on the screenline) may be due to the growth of nearby Stansted Airport, but for the survey dates in question, the evidence on changes in car trips to Stansted Airport does not support this conclusion.	+2.3% or +6.3% in 6 years	Yes

Road / Scheme Name	Traffic evidence (from POPE)	Growth in excess of average background growth*	Likelihood of induced traffic?
A30 Bodmin Indian Queens Improvement	The 5YA POPE reports traffic flows across 3 screenlines, including the A30 and other sub-parallel A roads (notably the A39 and the A390). Average weekday traffic counts are reported for 2004 (pre-construction), 2008 (one year after opening) and 2012 (five years after opening). The average change in AWT flows across all three screenlines is +4.6% between 2004 and 2008, and +6.7% between 2004 and 2012. Data from DfT traffic statistics TRA8904 shows that between 2004 and 2008, traffic increased by +5.7% in the SW and by +6.8% in Cornwall. However, traffic levels then fell between 2008 and 2012 in the SW and Cornwall, such that the total change in traffic between 2004 and 2012 was only +1.6% in the SW and +1.9% in Cornwall. There is thus no evidence of growth in excess of background trends in the year after the scheme opened, but there <i>does</i> appear to have been growth in excess of background trends over the longer five-year period. The POPE suggests the growth in traffic across the screenline is in line with the Cornwall trend – but this is based on comparison of traffic figures for the A30 in 2012 with figures for Cornwall for 2011. The traffic figure for Cornwall fell significantly in 2012, and if comparison is with the correct year, the POPE's conclusion does not appear valid.	+5.0% in 8 years	Probably
M25 J12-15 widening	No screenline data are reported. The 5YA POPE reports 2-way traffic volumes on the widened M25 in 2003 (pre-widening); 2006 (one year after widening) and 2010 (five years after widening). Between 2003 and 2010, the increase in traffic was +5.3% for J12-13 (widened from 4 to 5 lanes); +7.8% for J13-14 (widened from 4 to 5 lanes); and +15.7% for J14a-15 (widened from 4 to 6 lanes - the first 6 lane motorway in Britain). The 5YA POPE identifies a comparator section of the M25 where no widening took place, between J6 and J7. The 'comparator' section of the M25 showed a fall in traffic of -2.4% between 2003 and 2010. Over the same period, data from DfT traffic statistics TRA8904 shows that traffic fell by -2.1% in the SE, and by -3.3% in Surrey; traffic also fell in Slough (-4.3%) and Windsor & Maidenhead (-2.9%). The 5YA POPE suggests that part of the reason for the increase in traffic on the M25 J12-15 may be the opening of Heathrow Terminal 5 in 2008, and the construction of a new Spur Road from the M25 to T5. However, the increase in traffic on the relevant sections of the M25 is substantially larger than the increase in traffic flows on the two roads between the M25 and Heathrow, so that even if the effect of Heathrow expansion is netted out, the traffic growth on the widened sections of the M25 is still very much in excess of background trends.	+8.5% (J12-13); +10.9% (J13-14); +18.8% (J14a-15) in 7 years	Yes

*Growth in excess of background growth is in percentage-points i.e. equal to (average % growth across all screenlines crossing road scheme) – (average % growth for relevant regional and local comparators). AWT = average weekday traffic; ADT = average daily traffic; AAWT = annual average weekday traffic; AADT = annual average daily traffic.

2.4 Variance of conclusions to those in the POPE meta-analysis

This analysis examined nine road schemes, selected to be representative of the geographical regions of England, and found eight where the change in traffic pre- and post-scheme was in excess of regional and local growth rates. The frequency with which this pattern was seen lends strength to the conclusion that it is at least in part attributable to induced traffic.

Why might our conclusions differ from those drawn by Atkins, who used the same data for their meta-analysis for Highways England? The POPE meta-analysis does not explain the methodology used to judge whether a particular road scheme had caused induced traffic^{viii}, and so we cannot be certain why our conclusions differ. However, some possibilities are:

- The POPE meta-analysis took statements in individual POPEs that traffic growth was ‘in line with forecasts’ at face value (as suggesting that there was no induced traffic), without checking whether the forecast for the background trend had been accurate.
- If traffic growth at the site of a road scheme was similar to growth on the same road at points either side of the scheme, the POPE meta-analysis assumed that the road in question was an anomalously ‘high growth’ road – but without considering whether other non-highway interventions, such as new business parks or residential developments, could have affected the growth rates at these other locations.
- Some individual POPEs suggested that growth in excess of background trends could be attributable to other causes – for example, opening of major visitor attractions, new housing or business parks, or airport expansion. The POPE meta-analysis may have taken this as a total explanation for the excess growth, without considering whether traffic flows to the destination were large enough for this to be plausible, or whether the changes in land use would have happened in the absence of the road scheme.

For future POPEs, and POPE meta-analyses, it would be desirable for a consistent approach to be used to assess the possibility of induced traffic, including:

- Identification of a suitable screenline in all cases.
- Comparison with the regional growth trend and the growth trend in the relevant local authority area (*not* with the pre-scheme forecast; and *not* with the growth trend at some other single location on the same road)^{ix}.
- Comparison of *pre-construction* traffic growth rates (for a period of at least five years prior to the start of construction) with regional and local comparators, so as to test the possibility that high growth rates are the ‘cause’ of the road schemes, rather than the other way around. This in turn implies the need for a monitoring strategy which defines suitable screenlines and begins data collection well in advance of the start of construction.

viii And nor does Highways England (2016) *Post Opening Project Evaluation (POPE) of Major Schemes Methodology Note*.

ix Highways England (2016) *Post Opening Project Evaluation (POPE) of Major Schemes Methodology Note* suggests that the ‘preferred option’ for a comparator should be local observed traffic flow data from a nearby road of similar type unaffected by the scheme and other network changes. We think this is problematic because of the risk of bias in selection of the comparator, and that use of regional and local authority trends is therefore preferable.

3. Effects of Road Schemes on Landscape, Biodiversity and Heritage

3.1 Landscape impact: evidence from POPE

The executive summary of the most recent Highways England POPE meta-analysis focuses on describing the landscape impact of road schemes *relative to the original expectation*, stating that:

'80% of the schemes assessed show that the overall landscape objectives are set to be achieved'^{8 x}.

This sounds on the face of it like a positive outcome. However, the full report makes clear that prior to construction, 76% of schemes had been predicted to have an adverse effect on the landscape – thus, a scheme 'achieving its landscape objectives' simply means that it has had the (generally adverse) effect that was predicted.

We therefore reviewed all available POPEs to assess what the actual landscape impact of these road schemes had been, based on both the *predicted* impact at scheme appraisal stage, and the *outcome relative to this prediction* at either one or five years after the scheme was completed. We also reviewed the evidence contained in individual POPEs as to the impact of the road schemes on designated landscapes.

Adverse landscape impacts

Including 86 schemes for which a POPE reporting a landscape impact was available, we identified 69 schemes, or 80%, that had an adverse impact on the landscape at one or five years after completion. Twelve schemes (14%) were found to have had a neutral effect, and four (5%) were found to have had a slight beneficial effect. Figure 3.1 illustrates the distribution.

Where there was a difference between the assessment of landscape impact before and after scheme construction, the post-scheme assessment was generally worse than had been predicted: nine schemes were assessed as having an impact that was 'worse than expected', and only one scheme had an impact that was 'better than expected'.

A number of the schemes that were defined as having had a 'slight adverse' or even a 'neutral' effect at one or five years' after scheme completion seemed, from a careful reading of the POPE, likely to have had an impact that was more serious than this implies. Such schemes frequently affected areas that were designated locally or nationally for their landscape value. For example:

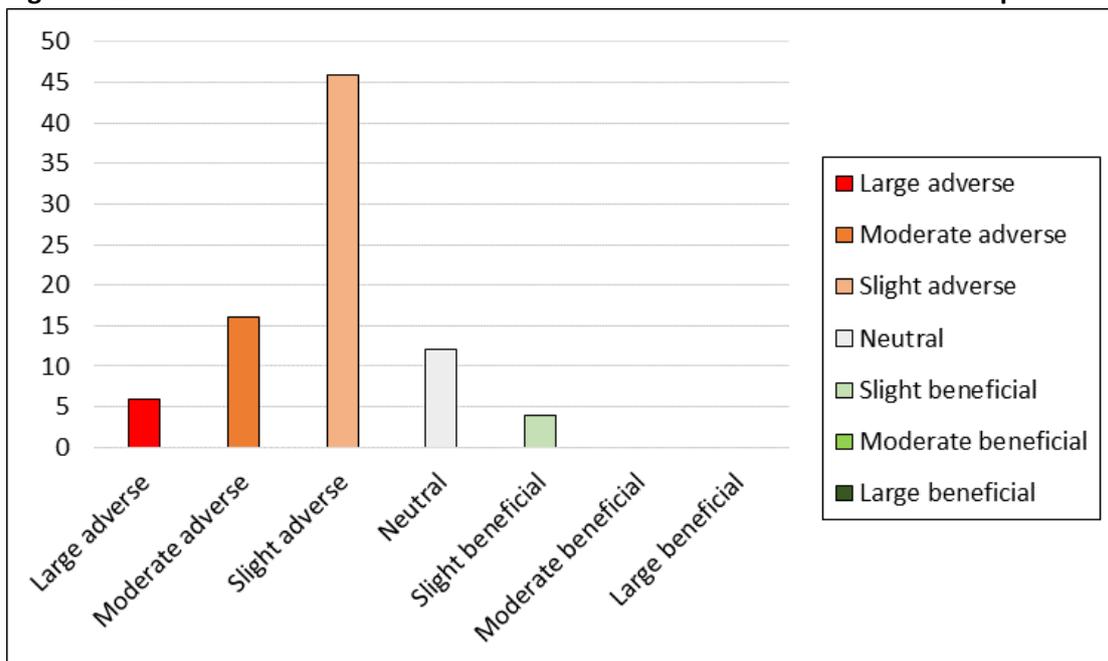
- The A34 Chieveley / M4 J13 improvement (SE) was assessed as having a neutral effect on the landscape five years after completion, but is in an area of attractive countryside on

x It is worth noting that even within the narrow terms of the POPE meta-analyses, there is some indication that pre-scheme appraisal of landscape impact may be becoming less accurate over time: Table 7-7 of the 2015 meta-analysis shows that only 7% of schemes had a 'worse than expected' landscape impact in 2010, compared to 20% in 2015. It is suggested that this may be due to the 2010 meta-analysis including a higher proportion of OYA schemes, but the 2015 meta-analysis recommends further investigation of the trend.

the edge of North Wessex Downs Area of Outstanding Natural Beauty. Southern marsh orchids in an area destroyed by the road scheme were translocated but did not survive.

- The A30 / A382 Whiddon Down Junction (SW) was assessed as having a neutral effect on the landscape five years after completion, despite encroaching into an Area of Great Landscape Value and being on the boundary of Dartmoor National Park.
- The A46 Newark – Lincoln Improvement (EM) had been predicted to have a neutral impact on the landscape, despite adversely affecting an Area of Great Landscape Value. Five years after completion the landscape effects were assessed as worse than expected, primarily due to significant visual intrusion of lighting and vertical structures.

Figure 3.1: Number of road schemes with adverse or beneficial effects on landscape



Roads are categorised according to the landscape effect reported in the most recent POPE (OYA or FYA). For one scheme, the Newbury Bypass, the impact was simply recorded as 'adverse'; from our knowledge of the effects of this scheme it has been categorised here as 'large adverse'.

Of the 86 schemes reviewed, 13 (or 15%) affected an area that had a national landscape designation, and 33 (or 38%) affected an area that had either a national or local landscape designation.

Schemes affecting nationally designated landscapes

Three schemes affected a **National Park**. Of these, two cut through a National Park: the A590 High and Low Newton Bypass (NW) in the **Lake District National Park** and A27 Southerham to Beddingham Improvement (SE) in the **South Downs National Park**. One was on the boundary of a National Park: the A30/A382 Whiddon Down Junction (SW) on the edge of **Dartmoor National Park**.

Ten schemes affected an **Area of Outstanding Natural Beauty (AONB)**. Of these, seven cut through an AONB, and three were adjacent to an AONB such that they affected the view from it or caused light pollution within it. The seven schemes cutting through an AONB were the M4 J18 Eastbound Diverge (SW) in the **Cotswolds AONB**; A21 Lamberhurst Bypass (SE) in

the **High Weald AONB**; A3 Hindhead Improvement (SE) in the **Surrey Hills AONB**; A34 Newbury Bypass (SE) in **North Wessex Downs AONB**; and three schemes, A41 Aston Clinton Bypass (SE), M25 J16-23 Widening (SE) and M40/A404 Handy Cross Junction Improvement (SE) in the **Chilterns AONB**. The three schemes adjacent to an AONB were the A419 Commonhead Junction (SW) and A34 Chieveley / M4 J13 Improvement (SE) on opposite edges of the **North Wessex Downs AONB**; and M25 J1b-3 (SE) close to the **Kent Downs AONB**.

Schemes affecting locally designated landscapes

Twenty-five schemes (five already listed above for their impact on nationally-designated areas, plus a further 20 schemes) affected an area which had been designated by the local authority for its landscape significance, for example as a Special Landscape Area, or Area of High Landscape Value^{xi}. These schemes were as follows:

- NW Region: A66 Stainburn and Great Clifton Bypass;
- NE Region: A1 Willowburn – Denwick Improvement; A66 Greta Bridge to Stephen Bank;
- Y&H Region: A1 Bramham – Wetherby; A63 Melton Grade Separated Junction; A650 Bingley Relief Road;
- WM Region: M40 J15 Longbridge Roundabout;
- EM Region: Colsterworth and Carpenters Lodge Grade Separated Junctions (both part of the A1 Peterborough – Blyth Grade Separated Junctions scheme); A46 Newark – Lincoln Improvement; A6 Rothwell – Desborough Bypass;
- E Region: A10 Wadesmill to Colliers End Bypass; A14 Haughley New Street – Stowmarket Improvement; A421 Bedford to M1 J13; A428 Caxton Common to Hardwick Improvement; A43 M40 – B4031 Dualling; A43 Silverstone Bypass; A43 Whitfield Turn – Brackley Hatch Improvement; A6 Clapham Bypass;
- SW Region: A30/A382 Whiddon Down Junction; A419 Commonhead Junction;
- SE Region: A21 Lamberhurst Bypass; A27 Polegate Bypass; A34 Newbury Bypass; M25 J1b-3 Widening.

Other affected landscapes

For a further ten schemes not listed above, there were no effects on designated landscapes, but the POPE noted some other particularly adverse impact on the local landscape. For example, the A66 Temple Sowerby Bypass (NW) adversely affected the scenic River Eden where it crossed it, leading to loss of tranquillity along public rights of way close to the river; the A63 Selby Bypass (Y&H) rose on an embankment to cross the River Ouse, canal and railway, creating a negative impact in a flat agricultural landscape; the A5 Nesscliffe Bypass (WM) spoiled views from Nesscliffe Hill Country Park; and the A38 Dobwalls Bypass (SW)

xi Different terms are used by different local authorities to designate areas that have a special landscape which, although not of national significance, is nevertheless important at the local level. Other terms used are Area of Great Landscape Value, Area of Best Landscape Value, Landscape Conservation Area and Area of Local Landscape Importance.

created ‘*prominent and incongruent features*’ in the landscape as a result of embankments and a steep cutting through the Blackwater Valley.

Effects on tranquillity and the night sky

POPEs include a detailed evaluation of the noise impacts of road schemes on occupied buildings (mostly residential, but also occasionally sites such as schools, commercial properties, churches etc.). However, only occasionally is the effect on tranquillity of the surrounding countryside noted. For example the FYA POPE for the A10 Wadesmill, High Cross and Colliers End Bypass (E) notes that:

‘...the bypass had introduced a source of noise into the rural landscape impacting on the tranquillity of the countryside and the public footpath network as had been expected’.

There were few examples of even this level of basic commentary in individual POPEs. This is despite DfT guidance that:

‘...tranquillity is one of the features defining landscape, and changes in tranquillity will be taken into account in the assessment of landscape impacts’⁹.

Given the lack of attention paid to tranquillity in individual POPEs, it is unsurprising that the overall effect of the roads programme on loss of tranquillity is not even mentioned in the latest meta-analysis. This represents a neglect of an important aspect of landscape. Our previous research on the noise impact of road schemes¹⁰ has demonstrated that noise has a significant effect on people’s quiet enjoyment of the countryside, and leads to people avoiding footpaths near the road, and not visiting otherwise attractive and scenic countryside over a large area (1-2 miles from the road or more) because it is polluted by noise.

Finally, lighting from some schemes may have an adverse impact on the countryside. For example, the negative effect of lighting was noted for the A21 Lamberhurst Bypass (SE), where the FYA POPE records that:

‘...the impact of night time lighting, particularly from the northern roundabout, extended over a wider area than was predicted – being visible from Goudhurst (a village several km to the east’.

Again, such comments are rare, and it is thus impossible to assess the cumulative impact of the roads programme on light pollution.

3.2 Biodiversity impacts: evidence from POPE

The 2015 meta-analysis notes a large number of examples of road schemes causing an adverse effect on biodiversity, both in areas designated for wildlife and elsewhere. Sometimes this was an inevitable consequence of the choice of scheme route; sometimes it was because measures to offset the damage caused by the road (so-called mitigation measures) had not been identified; sometimes because these measures had been identified but not implemented, or had been implemented ineffectively; and sometimes because necessary ongoing maintenance had not taken place, or new structures had been vandalised. In other cases, there was no information about whether the mitigation measures had been effective, because no ongoing monitoring was undertaken by Highways England (what might be termed an ‘out of sight, out of mind’ approach to biodiversity).

Some of the examples documented in the 2015 meta-analysis or elsewhere include^{xii}:

- M40 J15 Longbridge Roundabout (WM): large flocks of **lapwings** previously overwintered in an area that was destroyed by the scheme. No mitigation measures were planned and *'it was hoped that they would not be affected by the works'*. The county council asked for the road scheme to contribute to the cost of a local Biodiversity Action Plan habitat to compensate for the loss, but this did not happen. Lapwing are now lost to the area as a result of the scheme.
- A6 Alvaston Improvement (EM): The **great crested newt** population was underestimated, and as a result the mitigation ponds were too small to accommodate the number of newts that had to be moved once works started. The ponds were also unsuitably designed (with the wrong bank profiles, depths and planting); failed to hold water and consequently dried out several times until they were eventually re-lined; and became choked with vegetation due to lack of maintenance. As a result, the population of great crested newts fell from about 300 before the road scheme, to less than 10 after the second attempt at pond re-lining.
- A34 Newbury Bypass (SE): Rack Marsh was the centre of concern for its nationally significant population of a rare snail, **Desmoulin's whorl snail**. The snail population in the area of habitat due to be destroyed was relocated to another location (Bagnor Island) where work was undertaken to create the necessary environment. However, pipes feeding water to the site silted up and surveys in 2006 and 2011 concluded that the snail had died out in the relocation area¹¹.
- A120 Stansted to Braintree (E): The road severed a calcareous grassland site of local conservation importance; **Bee orchids** were found in pre-construction ecological studies and in mitigation it was proposed that turves containing Bee orchids should be re-located, but this was not done. The evaluation noted that the contractor *'has confirmed that the relocation of turves was constrained by the stage of the works. There was nowhere to put the turves at the time of the clearance and the benefit would have been slight.'*

Schemes affecting areas designated for biodiversity

Twenty schemes adversely affected areas that were nationally or locally designated for their wildlife importance^{xiii}.

For example, the M62 J6 (NW) cut through Windy Arbor Wood, a bluebell wood with local Biodiversity Action Plan status; the A1(M) Ferrybridge – Hook Moor (Y&H) abutted the RSPB reserve and Site of Special Scientific Interest (SSSI) at Fairburn Ings; the A650 Bingley Relief Road (Y&H) destroyed part of Bingley South Bog which is a mire / peatland SSSI; and the A249 Iwade – Queenborough Improvement (SE) involved loss of grazing marsh within the Medway Estuary and Marshes Special Protection Area and Ramsar Site. The A27 Southerham

xii Additional details have been included from the original POPEs.

xiii That is, affecting one or more of the following: Ramsar site; candidate Special Area of Conservation; Special Protection Area; National Nature Reserve; SSSI; Site of Importance for Nature Conservation; ancient woodland; or having local Biodiversity Action Plan status. In addition, one scheme was adjacent to a local wildlife trust reserve.

to Beddingham Improvement (SE) passed close to three SSSIs, one candidate SAC, one National Nature Reserve and two Sites of Nature Conservation Interest. The Newbury Bypass (SE) cut across three separate SSSIs / Special Areas of Conservation (Snelsmore Common, River Lambourn and River Kennet) and built over half of Rack Marsh Nature Reserve.

Fourteen schemes adversely affected ancient woodland areas^{xiv}. For example, the A66 Stainburn and Great Clifton Bypass (NW) resulted in the loss of the majority of an ancient woodland bank adjacent to the A66 near Stainburn School and ancient woodland at Scale Beck; Haydon Bridge Bypass (NE) led to the loss of ancient woodland at Gees Wood; the A46 Newark to Widmerpool Improvement (EM) led to the removal of woodland edge from a broad-leaved plantation on an ancient woodland site that retains some indicator species, equivalent to 10% of the woodland; the A43 Silverstone Bypass (E) resulted in loss of 3.6ha from Hazelborough Wood, an ancient replanted woodland, the loss of which was viewed as significant; and the M25 J16-23 widening (SE) resulted in some loss of ancient woodland (including that within County Wildlife Sites), at Junction 16, Berry Lane viaduct near Rickmansworth, and Long Wood north of Abbots Langley. A further four schemes affected ancient hedgerows.

3.3 Heritage impacts: evidence from POPE

At least 11 schemes affected places with a heritage designation (a number of which also affected sites listed for landscape or wildlife). For example, the A66 Stainburn and Great Clifton Bypass (NW) cut off almost a sixth of Grade II Curwen Park from the rest; the A1 Willowburn – Denwick Improvement (NE) affected the historic setting of Alnwick Castle and its 18th century parkland designed by Capability Brown; the A6 Alvaston Improvement (EM) caused visual intrusion for Elvaston Castle and Historic Park; the M1 J25-28 widening (EM) affected views from Strelley Hall across Strelley Conservation Area and historic parkland, including a listed Grade II historic farm; the A46 Newark – Lincoln Improvement (EM) severely affected the setting of a Grade II listed building; the A11 Attleborough Bypass (E) took land from the avenue to Attleborough Hall (Grade II*), adversely affecting its setting; the A10 Wadesmill to Colliers End Bypass (E) affected the setting of Grade II* Youngsbury Park, designed by Capability Brown; and the M5 J19-20 climbing lane (SW) had an adverse impact on Clevedon Court, a Grade I listed building, and its Registered Park and Garden.

xiv Ancient woodland is woodland that is known to have existed continuously since at least 1600. According to the Woodland Trust, this means it has developed an ecosystem that is rich, complex and irreplaceable. Replanting can never replace it, because the soils on which woodland is planted today have been modified by modern agriculture, and because habitat fragmentation makes it difficult for many species characteristic of ancient woodland to colonise new areas <https://www.woodlandtrust.org.uk/visiting-woods/trees-woods-and-wildlife/woodland-habitats/ancient-woodland/>. The current ancient woodland inventory held by Natural England only includes woodland areas over 2 ha. Parts of south-east England have been re-surveyed with an inclusion threshold of 0.25 hectares and it is likely that the inventory will be updated across England (see http://www.gis.naturalengland.org.uk/pubs/gis/tech_aw.htm). It is therefore likely that many more areas of ancient woodland will have been affected by major road schemes.

3.4 Highways England's responsibility for landscape and biodiversity

The evidence presented in the POPEs, and summarised here, suggests that the roads programme as a whole is having a damaging effect on the countryside.

Of the 86 schemes reviewed, more than half (49 schemes, or 57% of the total) affected an area that had a national or local designation for landscape, biodiversity or heritage. A number of schemes had multiple impacts.

Past road schemes fall far short of the ambition set out by Roads Minister John Hayes in 2015, when Highways England was established as a new company, that:

'...every road scheme should be rooted in its locality and actually enhance the natural landscape'¹².

It remains to be seen whether Highways England can rise to the challenge of designing every future road scheme so that it is rooted in its locality and enhances the landscape. The change that will be required in order to achieve this ambition is profound. It surely implies that future road schemes must be on a scale that is consistent with the grain of the landscape through which they pass: for example, small single-carriageway bypasses rather than multi-lane highways that bear no relation to the pattern of fields, hedgerows and woodlands. It also implies that road schemes in areas of tranquillity should be designed for lower speeds so as to help protect these areas from road noise as well as improving road safety. To 'enhance the natural landscape' requires far more than the addition of cosmetic measures such as stone facing of structures. It suggests the need for bespoke assessment of landscape at the design stage, so as to ensure that scheme design is appropriate to, and an enhancement of, the specific local landscape.

From review of individual POPEs, it is also clear that there are problems beyond the design and construction of road schemes, in relation to monitoring, management and maintenance. The POPEs record frequent examples of planting being inadequately maintained; of populations of plants and animals that have been re-located (e.g. orchid meadows, water voles) not surviving; or of dead or vandalised trees not being replaced (sometimes because *'the aftercare period has ended'*). It should be the job of Highways England to ensure proper care of the countryside through which its road schemes are built. The evidence presented in the POPEs suggests that this responsibility has not in the past been given sufficient weight, and this raises questions about how Highways England proposes to improve monitoring, management and maintenance in the future.

3.5 POPE approach to assessment of environmental impact

In order for Highways England to rise to the challenge that has been posed by the Roads Minister, the approach to evaluation of landscape impact will also need to change.

At present, the impact of a road scheme on landscape is interpreted narrowly and mechanistically. POPEs report at length on whether planting schemes are 'neat and tidy in appearance'; whether tree guards need to be adjusted; whether plant replacement has been

undertaken where required; and whether planting is showing acceptable growth so that it will achieve screening of traffic by the 'design year'^{xv}. More attention should be paid to:

- Large-scale factors that determine the overall impact of the scheme: the scale of the road in relation to the grain of the landscape through which it passes; the size of the area over which the road is visible and traffic audible.
- Consequential factors: whether the road scheme has facilitated inappropriate development such as industrial or retail outlet 'tin sheds' in the countryside, or has led to in-fill of former greenbelt.
- Design factors: whether the design of the scheme has created what John Hayes terms '*a destructive sense of alienation from the built environment*'¹³, evidenced by repeated problems of vandalism, graffiti or fly-tipping in particular areas, such as beneath overpasses.
- Enhancement: how the road scheme has improved the natural landscape compared to what was there previously: for example, by putting the road into a tunnel, or by enabling closure of a previous road that bisected an important landscape area.

This in turn implies wholesale revision of the guidance set out in Highways England's Landscape and Visual Effects Assessment policy, as well as in the Department for Transport's WebTAG guidance on appraisal of landscape impacts. It also implies the need for a more transparent process of making judgements about what is important, in the specific local context of a particular road scheme, as opposed to a tick-box approach that simply considers whether appropriate mitigation measures have been implemented.

The current POPE Methodology Note¹⁴ states that '*no new environmental surveys are specifically undertaken for the POPE, which is why it is important that the scheme survey and monitoring information is made available*'. And yet scheme survey and monitoring information is frequently *not* available as part of the POPE process: the 2015 meta-analysis noted that 72 (89%) of POPEs had succeeded in obtaining *less than half* of the information that they had requested. Even when this historic information is available, it is not adequate for assessing the long-term environmental impacts of schemes. The POPE process commonly seek views from statutory bodies such as Natural England about the post-construction effects of schemes, but it is impossible for these organisations to comment in the absence of survey data – and there is a risk that 'no evidence of an adverse impact' is taken to mean 'no adverse impact'. The POPE process should be modified so that it includes post-scheme environmental surveys for all schemes that affect any locality with a national or local designation for landscape, biodiversity or heritage, undertaken by impartial and appropriately qualified professionals.

xv The 'design year' is 15 years after scheme opening.

4. Effects of Road Schemes on the Local Economy

4.1 Economic development impact: evidence from POPE

There is a strong belief amongst politicians, at both national and local level, that road building is beneficial to the economy. For example, the Chancellor of the Exchequer (and former Secretary of State for Transport) Philip Hammond was recently quoted as saying that road schemes are a rapid means of stimulating economic growth:

*'I think there is a role for big strategic projects, but they are unlikely ever to be able to contribute to fiscal stimulus because of the timelines involved...often it is modest, rapidly deliverable investments that can have the most immediate impact, particularly on the road network but also, in some places, on the rail network.'*¹⁵

The most recent Highways England POPE meta-analysis quotes the Government's Road Investment Strategy (2014):

"There is strong evidence that transport investment, including in roads, can improve productivity and GDP. The strategic road network is a major facilitator of economic growth and having roads that meet the needs of all users, especially the freight and logistics sector, is vital for economic prosperity."

If indeed the evidence of the link between road building and economic growth were strong and immediate, we might expect the POPE meta-analyses to be packed with examples where a causal link could be demonstrated between a road scheme and economic uplift.

However, the POPE meta-analysis¹⁶ is rather more circumspect. It states that:

'There is anecdotal evidence to show that Major Schemes have assisted local and regional economic development through congestion reduction and improved journey time reliability which provides improved access to employment centres.' [Our emphasis]

Nevertheless, it suggests that 22 of the road schemes included in the meta-analysis had a specific objective relating to 'stimulating the economy' and that 21 of these achieved their objective, with one scheme having inconclusive evidence. It then provides a series of short case studies of schemes where it claims the POPE had been able to identify a beneficial economic impact from the road scheme.

So how strong and clear is the empirical evidence about the link between road building and economic development? In order to test this, we reviewed all available POPEs and identified 25 schemes that had an objective relating to stimulus of the local or regional economy^{xvi}. We reviewed the evidence presented in the POPE (OYA, FYA, or in a few cases both) for each scheme. The schemes are described in Table 4.1 and the evidence on their effect in stimulating the economy is summarised in Table 4.2. Our conclusions are in section 4.2.

xvi It is not clear why the 2015 meta-analysis only identified 22 (rather than 25) road schemes with an objective of stimulating the economy, as the meta-analysis does not list the schemes it so identified.

Table 4.1: Road schemes with an objective to boost the local / regional economy

Road / Scheme name	Region	Opening date	Scheme description
A5117/A550 Deeside Park Junctions	NW	2009	Grade separation at 2 junctions; extension of M56 motorway to bypass a third junction
A590 High and Low Newton Bypass	NW	2008	4km dual two-lane carriageway
A595 Parton to Lillyhall Improvement	NW	2009	5km converted from single to dual carriageway plus new bypass around Distington
M60 J5-8 Widening	NW	2006	One of the largest HA schemes; widened from 3 to 4 lanes between J5 and J6; new parallel distributor roads between J6 and J7; widened from 2 to 3 lanes between J7 and J8
M62 J6	NW	2008	Two new link roads between M62 and M57
A1033 Hedon Road Improvement	Y&H	2003	New 7km 2-lane dual carriageway east of Hull city centre (in place of 4-lane single carriageway)
A63 Melton Grade Separated Junctions	Y&H	2006	Grade-separated junction and 1.5km of new dual carriageway west of Hull city centre
A63 Selby Bypass	Y&H	2004	6km single carriageway bypass of Selby
A650 Bingley Relief Road	Y&H	2003	5km new dual carriageway through Bingley
A5 Weeford – Fazeley Improvement	WM	2005	5km new two-lane dual carriageway between existing A5 south of Tamworth and junction with A5 and A38; grade separation of A38/A5 junction
A500 City Rd and Stoke Rd Junction Improvement	WM	2006	New 2-lane dual carriageway in an underpass; widening of existing road either side of the underpass from dual-2 to dual-3 lane
M6 J8-10a Smart Motorway	WM	2011	Variable mandatory speed limits, hard shoulder running and through junction running
A46 Newark – Lincoln Improvement	EM	2003	Widening 13km to two-lane dual carriageway between Newark and Lincoln; mostly online apart from 2km bypassing Brough
A46 Newark to Widmerpool Improvement	EM	2012	New 28km dual carriageway (about half off-line) with grade-separated junctions replacing single carriageway road
A6 Alvaston Improvement	EM	2003	Dual carriageway bypass around district centre of Alvaston in Derby
M1 J25-28 Widening	EM	2010	Widening 22km of motorway from 3 lanes to 4 by conversion of hard shoulder into permanent running lane; installation of 'controlled motorway' system (variable speed limits + driver information)
A120 Stansted to Braintree	E	2004	New 19km dual carriageway bypass and dualling of existing 4km single carriageway road; two new link roads between the A120 and the M11, including one that also links to Stansted Airport.
A14 Haughley New Street – Stowmarket	E	2008	4km new dual carriageway between Haughley New Street and Stowmarket
A428 Caxton Common to Hardwick Improvement	E	2007	8km dual carriageway near new settlement of Cambourne, west of Cambridge

Road / Scheme name	Region	Opening date	Scheme description
A2 / A282 Dartford Improvement	SE	2007	2km section of A2 widened from 3 to 4 lanes (from Bean to M25/A282 junction); slip-roads / viaducts between A2 and M25/A282
A2 Bean – Cobham Phase 1 (Bean – Pepperhill)	SE	2004	Online widening of 4km section of A2
A2 Bean – Cobham Phase 2 (Pepperhill – Cobham)	SE	2009	Half online and half offline widening of 7km section of the A2, to 4 lanes in each direction
M25 J1b-3	SE	2008	Widening of M25 from 3 to 4 lanes between J2 and J3; widening from 2 to 3 lanes between J1b and J2 in southbound direction
A21 Lamberhurst Bypass	SE	2005	3km dual carriageway bypass of Lamberhurst
A249 Iwade – Queenborough Improvement	SE	2006	5km dual carriageway between end of Iwade bypass and Queenborough; high-level bridge over the Swale onto Isle of Sheppey

Table 4.2: Strength of evidence that road schemes with ‘economic stimulus’ objectives have achieved a boost to the local / regional economy

Scheme / Economic stimulus objective	Evidence of achievement of the economic stimulus objective, as presented in POPE	Evidence strength
<p>A5117/A550 Deeside Park Junctions Improvement</p> <p><i>Benefit economy by reducing congestion and improving journey time reliability</i></p>	<p>Appraisal Summary Table predicts scheme will result in an ‘increase in jobs accessible in Regeneration Area, based on changes in accessibility’. OYA POPE reports that ‘the AST stated that as a result of the scheme, up to 25,719 more jobs would be made accessible in a regeneration area, and that employment in deprived wards would increase in the range of 141 to 703 new jobs.’</p> <p>OYA evaluation considers that it is too soon to identify any impact on jobs.</p>	None
<p>A590 High and Low Newton Bypass</p> <p><i>Improve accessibility of Barrow peninsula, which has Assisted Area status (OYA POPE)</i></p> <p><i>Provide good accessibility to existing communities and areas of industrial, commercial and tourist development (FYA POPE)</i></p>	<p>OYA POPE notes that the scheme should assist in achievement of local policies in relation to the Cumbrian economy. It cites the Cumbria Local Transport Plan (2006-11), which notes that ‘the A590 between the Furness peninsula and the M6 motorway has several constrictions, including passing through High and Low Newton, and long single carriageway sections with unimproved alignments. This causes unreliable and extended journey times between Furness and the rest of the region and UK, impeding economic development.’ The OYA POPE also cites the North West Regional Transport Strategy objective to ‘support economic development and regeneration of Furness and West Cumbria through securing reliable and effective links to the M6 and West Coast Main Line’.</p> <p>Neither OYA nor FYA POPE present any evidence at all to test whether the scheme has led to any beneficial economic development in Furness and West Cumbria.</p> <p>FYA POPE reports some local economic <i>disbenefit</i>: ‘one local concern has been that the lack of signage directing traffic to the local amenities in High and Low Newton has had negative consequences for local businesses within the villages.’</p>	None
<p>A595 Parton to Lillyhall Improvement</p> <p><i>Promote more efficient transport system in the area; improve access to other regional centres in Cumbria and the wider NW region</i></p>	<p>FYA POPE notes the scheme lies within the Priority Regeneration Area of West Cumbria. According to the Economic Impact Report ‘the scheme would improve the catchment of all of the key employment locations and the accessibility to jobs for the workforce including the unemployed, providing additional job opportunities...there is some potential for businesses to expand due to improved access to business and markets’.</p> <p>FYA POPE says scheme has reduced journey times along A595 between Whitehaven and Workington, and that this is ‘likely to have helped promote a more efficient transport system in the area, improving N-S access to regional centres in West Cumbria and aiding a large proportion of the population in terms of access to job opportunities and regional businesses’.</p> <p>However, no evidence presented to show whether there were more jobs or businesses following completion of the scheme.</p>	Weak indirect

Scheme / Economic stimulus objective	Evidence of achievement of the economic stimulus objective, as presented in POPE	Evidence strength
<p>M60 J5-8 Widening <i>Cater for traffic generated by Trafford Park development and the opening of Manchester Airport's second runway</i></p>	<p>According to the OYA POPE, the scheme's Appraisal Summary Table stated that problems would 'worsen when development at Trafford Park opens in 1998 and Runway 2 at Manchester Airport opens in 2000'.</p> <p>No evidence is presented as to whether the road scheme has benefitted Trafford Park or Manchester Airport, or whether expansion of Trafford Park and Manchester Airport has benefitted the regional economy.</p>	None
<p>M62 J6 <i>Be a positive influence with respect to the regeneration policies of the Merseyside Strategic Investment Area, in particular Huyton Strategic Investment Area</i></p>	<p>OYA POPE notes that the Appraisal Summary Table predicted beneficial wider economic impacts, stating that the scheme would have a positive effect on regional regeneration strategies, and would generate between 731 and 914 jobs.</p> <p>No evidence is presented on whether there have in fact been any beneficial effects on the local economy in the Strategic Investment Areas.</p>	None
<p>A1033 Hedon Rd Improvement <i>Assist economic growth and the efficiency of the network by providing additional capacity to meet predicted growth</i></p>	<p>FYA POPE notes that the Appraisal Summary Table stated that the scheme would serve Hull and East Yorkshire Assisted Area, Yorkshire and Humberside Objective 2 Area, and Hull SRB; it also stated that development at Hull ports was likely to depend on the scheme proceeding.</p> <p>FYA evaluation notes the following evidence:</p> <ul style="list-style-type: none"> • Humber Economic Partnership opinion that the scheme helped facilitate development at Hull ports and in the East Hull Employment Corridor. However, 'continuing congestion was noted in the corridor west of the present scheme, which was felt to be restricting further development'. • During site visit, new commercial developments were noted, but also some vacated premises and empty parcels of land. 	Weak

Scheme / Economic stimulus objective	Evidence of achievement of the economic stimulus objective, as presented in POPE	Evidence strength
A63 Melton Grade Separated Junction <i>Facilitate new development</i>	<p>FYA states that prior to the scheme, development of land between the scheme and the River Humber was restricted because of planning conditions limiting the number of vehicles accessing the A63. The opening of the road scheme removed the planning restriction. The resulting development sites (Melton Park and Melton West) were predicted to have the potential to generate more than 3,000 jobs once fully developed.</p> <p>FYA evaluation notes the following evidence:</p> <ul style="list-style-type: none"> • Site visit in 2011 confirmed development had occurred at both sites, but that they were 'by no means fully occupied'. • The developer responsible for Melton Park was planning to use part of the site for residential development instead of employment uses. <p>FYA evaluation concludes that 'it is clear that the [road] scheme has been crucial in facilitating development of the land between the A63 and the River Humber, but this development occurred at a slower rate than expected.'</p>	Weak
A63 Selby Bypass <i>Assist economic growth and the efficiency of the network</i>	<p>FYA POPE states that one of the objectives of the scheme was to improve the economic vitality of the area, and that as part of the road scheme, an additional roundabout was built on the bypass to open up access to a development site.</p> <p>FYA evaluation notes the following evidence:</p> <ul style="list-style-type: none"> • It reports that 'to date, no development has taken place at this site, however the land is designated for development'. • Nevertheless, there has been significant development of <i>other</i> land between the bypass and the town (not accessed directly from the bypass), including residential development (Staynor Hall), a retail park (Three Lakes), and Selby Business Park and a hotel and restaurant. 	Weak and negative
A650 Bingley Relief Road <i>Spark rebirth of Bingley town centre making it a more pleasant place to live and shop</i>	<p>FYA POPE states scheme was expected to 'assist regeneration, [as] planned development in the Keighley Single Regeneration Budget area depended on the scheme being built' and 'to spark the rebirth of Bingley town centre'.</p> <p>FYA evaluation notes the following evidence:</p> <ul style="list-style-type: none"> • Both the Chamber of Trade and the Town Centre Manager consider business in town has improved following on-street car parking and new town square that holds markets three days a week; these changes were funded from sale of land to the Highways Agency (£1.1m). <p>There is no information in the FYA POPE on the effect of the road scheme on the Keighley SRB area.</p>	Moderate – probably due to payment for land purchase by HA, rather than due to road scheme <i>per se</i>

Scheme / Economic stimulus objective	Evidence of achievement of the economic stimulus objective, as presented in POPE	Evidence strength
<p>A5 Weeford – Fazeley Improvement</p> <p><i>Assist regeneration, as the scheme is within the West Midlands Assisted Area and European Regional Development Fund Area</i></p>	<p>FYA POPE states that 'The scheme was within the West Midlands Assisted Area during construction and continues to be so. It is reasonable to assume that the improvements in journey times and reliability brought about by the scheme will have facilitated access to employment and services, although clearly this is impossible to quantify. The improvements had no link to specific development.'</p> <p>Solely on the basis of this assertion, the FYA evaluation concludes that the scheme was successful in meeting its objective of assisting regeneration.</p>	None
<p>A500 City Road and Stoke Road Junction Improvement</p> <p><i>Support...regeneration and employment; facilitate development of sites adjacent to the A500; promote the economy of the North Staffordshire conurbation generally</i></p>	<p>FYA POPE notes that the scheme Appraisal Summary Table stated that four development sites were dependent on the scheme (but does not state what these sites were).</p> <p>Evaluation Summary Table comments that 'Some development near the scheme has been completed or is underway although much less than expected by this time'.</p> <p>FYA POPE includes a table listing planned and proposed developments in Stoke that were expected to have been complete by 2012, and that were used in the pre-construction Traffic Forecasting Report to model future traffic flows. The three developments noted here as being 'dependent on the A500 scheme' are listed as having 'no development' at the end of 2011. The only developments to have progressed are the ones that are listed as 'not dependent on A500 scheme'.</p>	Weak and negative
<p>M6 J8-10a Smart Motorway</p> <p><i>Support agglomeration of business activity; support mobility and flexibility of labour market; increase accessibility to a larger pool of workers.</i></p>	<p>OYA POPE states that 'a large proportion of the wider benefits come from the agglomeration and imperfect condition components (whereby changes to the transport system allow improved access to higher productivity areas for employment). These components are largely driven by the travel time and accessibility benefits of the scheme....The weekday travel time benefits were slightly lower than forecast. The scheme, however, is utilised far more than forecast including in the inter peak and weekend hours. The increased capacity and accessibility from the scheme during these hours will facilitate the wider economic benefits of the scheme.'</p> <p>It thus seems that higher-than-forecast traffic levels by <i>non-employment</i> traffic are being claimed as evidence of an agglomeration benefit.</p>	Weak indirect

Scheme / Economic stimulus objective	Evidence of achievement of the economic stimulus objective, as presented in POPE	Evidence strength
<p>A46 Newark – Lincoln Improvement</p> <p><i>Contribute to the economic prosperity of the region</i></p>	<p>FYA POPE states that the scheme serves Lincolnshire Objective 5b area and that development depended on the scheme. However, it goes on to note that 'The whole of rural Lincolnshire is so designated, with funds going to agricultural diversification and development, tourism, training and guidance. The projects funded are relatively small, and there is no information that the A46 Newark – Lincoln Improvement has directly affected any of them'.</p> <p>Appraisal Summary Table states that 400 homes and over 70ha of employment land at RAF Swinderby site 'are likely to be dependent on the scheme'. FYA POPE notes that a 1000-home development known as Witham St Hughs has been built at the airfield, and that this is a dormitory settlement reliant on commuting probably mostly to Lincoln.</p>	Weak
<p>A46 Newark to Widmerpool Improvement</p> <p><i>Relieve significant development pressures in Bingham</i></p>	<p>OYA POPE states that it is too early to quantify whether this objective has been achieved, but also comments that improved access arrangements for the former RAF Newton site (on opposite side of A46 to Bingham) 'may result in an increase in the rate of development of the site'.</p> <p>Web search suggests RAF Newton site has now been granted outline planning permission for residential development. Property consultant Innes England note on their website that 'Strategically this is a hugely important site due to its location close to both the A46 and A52, meaning excellent road links around the country....In addition to the delivery of up to 500 new low density homes, planning permission outlines the provision of a new foot/cycle bridge over the A46 to give direct access to Bingham'. (http://www.innes-england.com/news/whole-new-community-destined-for-raf-newton-site, accessed 14.9.2016).</p>	Moderate – but related to residential development rather than commercial development
<p>A6 Alvaston Improvement</p> <p><i>Encourage regeneration of the area by enhancing road access to the south of Derby from the A50 and A52</i></p>	<p>FYA POPE states that 'The scheme appears to have encouraged regeneration and development of the area as there is a major development currently under construction to the east of the bypass and plans to develop a large area of land to the south of Alvaston for housing.' No further details are given.</p> <p>The Appraisal Summary Table says that the scheme will provide access to the Courtaulds development site, and that this development depends on the scheme. Again, no further details are provided.</p>	Weak

Scheme / Economic stimulus objective	Evidence of achievement of the economic stimulus objective, as presented in POPE	Evidence strength
<p>M1 J25-28 Widening</p> <p><i>Supporting policies and proposals for the regeneration and economic development of those areas through which the route passes</i></p>	<p>Appraisal Summary Table stated 'Improvements to the M1 may aid regeneration of North Derbyshire and North Nottinghamshire coalfields'.</p> <p>OYA POPE claims that '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.'</p> <p>OYA POPE then states that '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...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.'</p>	Weak negative
<p>A120 Stansted to Braintree Improvement</p> <p><i>Provide new employment and regeneration opportunities</i></p>	<p>Appraisal Summary Table stated that there was a 'need to improve access in the area to facilitate development, in particular housing for employees, associated with expansion of Stansted Airport.' AST also stated that the scheme would serve Harwich / Clacton Assisted Area and Braintree Investment Area.</p> <p>FYA evaluation notes the following evidence:</p> <ul style="list-style-type: none"> • 'Several new housing developments have been built since the scheme opened', but no details are given about their location or relationship to the A120 scheme. • 'The scheme has ... [attracted] new developments and hence local jobs to the area such as a business park in Great Notley'. No further details are given about location or relationship to the A120 scheme. • The scheme 'has improved access to important local developments such as Stansted Airport'. However, evidence in the FYA POPE shows that passenger and employment growth at Stansted Airport has <i>not</i> resulted in more cars accessing the airport (due to improved public transport), raising the question of whether an increase in road capacity was necessary. • There is no information as to whether the scheme resulted in any changes in the Harwich / Clacton Assisted Area or the Braintree Investment Area. 	Weak

Scheme / Economic stimulus objective	Evidence of achievement of the economic stimulus objective, as presented in POPE	Evidence strength
<p>A14 Haughley New Street – Stowmarket Improvement</p> <p><i>Support objectives for regeneration and employment in the Suffolk Structure Plan</i></p>	<p>FYA POPE states that 'At this stage there is no evidence to suggest that the scheme has increased enablement of employment or housebuilding, although the new development in Cedars Park (to the north of Stowmarket) is being built at a faster rate than anticipated in the original modelling but is not directly linked to the A14 improvement scheme.'</p> <p>Evaluation Summary Table states that 'Improvements in journey times for strategic traffic is likely to have improved access to the east, particularly to the port of Felixstowe. The improvement in journey times also reduces the time to travel to other urban areas, aiding access to job opportunities for local communities, but does not directly affect any development.'</p>	Weak indirect
<p>A428 Caxton Common to Hardwick Improvement</p> <p><i>To be compatible with proposals along the route for access to new housing and commercial developments (in Cambourne) funded by S278 agreements</i></p>	<p>FYA POPE states that 'Completion of the scheme is consistent with regional policies concerning new housing and a commercial development at the new settlement of Cambourne. This is now home to over 7,000 people and there is commercial space with the potential for 5,000 jobs.'</p> <p>It explains that Cambourne is a new community 14km west of Cambridge, lying south of the A428. Construction started in 1998. Traffic generated by the development was expected to result in severe congestion if the capacity of the A428 was not increased; planning permission therefore required the developers to fund a new grade separated junction with the A428 and 2km of dual carriageway. The Caxton Common to Hardwick Improvement is in two sections to the east and west of the developer-funded scheme.</p> <p>FYA POPE states that 'The scheme has accommodated the traffic growth associated with the Cambourne development' and that the 'Importance of the improvements to the A428 to new developments is shown by the fact that 18,600vpd travel on weekdays between Cambourne and the Cambourne interchange of the A428.'</p>	Moderate – but Cambourne development preceded the HA road scheme
<p>A2 / A282 Dartford Improvement</p> <p><i>Provide enhanced access to major regeneration area of Kent Thameside and other regeneration areas in north and east Kent</i></p>	<p>Appraisal Summary Table describes the scheme as improving access from M25 and A2 to regeneration areas in Kent, and states that it is vital for the future development of Kent Thameside.</p> <p>OYA POPE concludes that the scheme has fulfilled the objective of putting in place the infrastructure to improve road access to the regeneration areas of northern Kent and the Thames Gateway area. However, it finds that at this stage of the post opening period and during a recession it is too early to identify job creation in this area as a result of the highways scheme.</p>	None

Scheme / Economic stimulus objective	Evidence of achievement of the economic stimulus objective, as presented in POPE	Evidence strength
<p>A2 Bean – Cobham, Phases 1 and 2</p> <p><i>Provide enhanced access to major regeneration area of Kent Thameside and other regeneration areas in north and east Kent</i></p>	<p>The scheme was described as necessary because 'Forecast increases in traffic flows ... and major new developments planned in the region would further worsen the congestion on the A2.'</p> <p>The Phase 1 Appraisal Summary Table states that: 'Widening would be likely to bring forward development in the Thameside area. No development at Ebbsfleet above 75,000m² (<10% of total development) can be started until the scheme is complete.' The Phase 2 Appraisal Summary Table states that 'scheme will assist policies for regenerating Gravesham'. The Economic Impact Report for Phase 2 predicted its economic impacts would be to increase the number of jobs accessible to the workforce in the regeneration area by in the order of 55,124 to 85,150 jobs (based on changes in accessibility); and to increase the number of employed residents in deprived wards by 84 - 376 jobs.'</p> <p>OYA/FYA evaluation notes the following evidence:</p> <ul style="list-style-type: none"> • 'Phase 1 and Phase 2 contribute toward providing access from the trunk road network to the new Ebbsfleet international railway station on HS1'. • According to the Evaluation Summary Table 'Some developments of Ebbsfleet valley dependent on the scheme have been completed. Further development of disused chalk pit area (Eastern Quarry) has been facilitated.' <p>No evidence is provided on the change in the number of jobs accessible to the workforce in the regeneration area, or on the number of employed residents in deprived wards. In practice, development at Ebbsfleet has been slow: a report in 2014¹⁷ commented that despite Ebbsfleet being designated in 2003 as the location for 10,000 homes and 5.5m square feet of commercial space, 'slow progress was made in developing the sites'. This led the government to establish a new Development Corporation in 2014. It therefore appears that the road scheme was ineffective in bringing forward economic development in the area.</p>	Weak

Scheme / Economic stimulus objective	Evidence of achievement of the economic stimulus objective, as presented in POPE	Evidence strength
<p>M25 J1b-3 Widening</p> <p><i>Create jobs in Kent Thameside regeneration area through increased labour pool and impacts on companies relying on distribution of goods</i></p>	<p>OYA POPE notes that improved road access would not improve access to jobs for residents of the deprived wards in northern Dartford that were most in need of regeneration. This was because residents were resistant to travelling long distances and did not have the means to acquire a car. Improved public transport and additional job opportunities close to their homes would be more beneficial.</p> <p>However, the Economic Impact Report claimed that by increasing the catchment area for employment sites in the deprived wards, the road scheme would make these sites more attractive locations for prospective businesses. It estimated up to 64 jobs could result from the scheme in 2008, rising to a maximum of 303 jobs by 2018 (with 99 of these jobs being taken by local people from wards in northern Dartford most in need of regeneration).</p> <p>OYA POPE stated that ‘details of the local developments upon which the forecasts for the scheme were based were not available at the time of this study’ and that the recession meant that it was ‘too early to identify the job creation impact.’</p>	None
<p>A21 Lamberhurst Bypass</p> <p><i>Improve access to the Assisted Area of Hastings</i></p>	<p>Evaluation Summary Table states that 'Route stress which is a proxy for reliability has reduced significantly as a result of the bypass...However, as route stress was not high in the ‘before’ situation...the scheme has only had a slight positive impact’ and finds that 'The scheme will have played a part in assisting the regeneration of Hastings and Bexhill area by improving the A21 route between Hastings and London.’</p> <p>FYA POPE concludes that the scheme achieved the objective of improving access to the Assisted Area of Hastings (but does not address whether slightly more reliable access has had any impact on regeneration in Hastings, which is over 30km away).</p>	None

Scheme / Economic stimulus objective	Evidence of achievement of the economic stimulus objective, as presented in POPE	Evidence strength
<p>A249 Iwade – Queenborough Improvement</p> <p><i>Promote regeneration and development</i></p>	<p>AST states scheme ‘serves Swale/Sittingbourne and Sheerness Assisted Areas. Development at Neatscourt Minster, Ridham and Leppel could not go ahead without the scheme’. Environmental Statement states that: ‘the development strategies for both Sheppey and Sittingbourne are heavily dependent on the provision of new and improved road infrastructure’. The Thames Gateway Kent Partnership identified this section of the A249 as having huge regeneration and growth potential. FYA evaluation notes the following evidence:</p> <ul style="list-style-type: none"> • Development has been slower than expected. 'Traffic numbers accessing the Isle of Sheppey have increased by around 6% since before the scheme opened...much lower than forecast because the assumed level of development traffic has not materialised, primarily due to overoptimistic forecasting and the impact of the economic downturn'. • Number of HGVs using Sheppey Crossing (part of the scheme) fell between 2008 and 2011, both in absolute terms and as a proportion of total traffic; 'this provides evidence to suggest that economic activity on the Isle of Sheppey may have decreased over recent years'. • Five years after the scheme was completed, Swale Borough Council reported that development had 'only just started to take place in Queenborough and Rushenden' (at Neatscourt Retail Park, a site opened up by the scheme). • A large Morrisons distribution facility opened in 2010, accessed by a junction to the south of the scheme. Although not accessed by the scheme itself, Swale Borough Council reported that development at this site could not take place until the road scheme was completed (though the reason for this dependency is unclear). • Overall, prosperity on the Isle of Sheppey did not appear to have improved. Of 25 LSOAs (lower super-output areas) on the Isle, four were in the 10% most-deprived in the country in 2004; increasing to seven in 2010; 'this shows that despite the improved accessibility onto the Isle, indices of deprivation [have] worsened.' <p>Despite this evidence, FYA POPE concludes that 'The scheme has been crucial in stimulating economic development in the North Kent area. Although much of this development has been delayed by the recession, the scheme has still been successful in promoting North Kent and the Isle of Sheppey in particular as a place for businesses to invest. It is currently not possible to monetise this extremely positive impact.' This seems to rather overstate the outcome.</p>	Moderate

4.2 Our assessment of economic evidence in the POPEs

Across all 25 schemes examined, we found the following:

- **Eight** where **no evidence was presented** to enable a judgement to be made about the economic impact of the scheme.
- **Three** schemes had **weak negative** evidence (i.e. suggesting that the scheme had actually resulted in a disbenefit to the local economy).
- **Three** schemes relied on **weak indirect** evidence of a decrease in journey times to argue that an economic benefit could be inferred.
- **Six** schemes had **weak evidence** that the scheme might have benefitted the local economy, typically anecdotal.
- **Five** with **moderate evidence** of a relationship between economic development and the scheme. However, in most cases this statement needs to be qualified, because the economic improvement was probably the result of changes incidental to the road scheme; or because the resulting development was housing rather than an employment site; or because the resulting economic development was in an inappropriate location or was as likely to suck money out of the local area as to bring it in.

Despite the relative paucity of evidence, ranging for individual schemes from thin and circumstantial, to non-existent, it was not uncommon for POPEs to over-claim. Schemes were described as having been ‘successful’ and ‘extremely positive’ in their effects on the economy when this was not justified by the evidence.

The schemes fell into three broad types (although the distinction was not always clear-cut):

- Schemes in a location with a struggling economy. These tended to be justified on the basis that they were essential to boost the amount or speed of regeneration. The pre-scheme case for these schemes typically claimed that they would open up land for commercial development, or make existing development sites more attractive to prospective employers, or reduce the disadvantage suffered by peripheral areas.
- Schemes in ‘pressure cooker’ areas where the economy was already buoyant. These tended to be justified on the basis that new development (including business parks, airport expansion and residential development) was coming anyway and would generate large volumes of traffic, such that the existing road network would be unable to cope unless its capacity was increased.
- Schemes in ‘neutral’ areas that were neither ‘pressure cookers’ nor ‘struggling economies’. These schemes were generally justified on the basis that they would reduce journey times, thus increasing the catchment from which employers could draw their employees and, conversely, providing employees with more job opportunities; this, it was argued, would boost the economy over a wide area. (This rationale was also sometimes used for schemes in ‘pressure cooker’ areas and in ‘struggling economies’).

‘Struggling economy’ areas

For road schemes in areas with a struggling economy, the following themes emerge:

- Regeneration following completion of the road scheme was generally **slower than expected**, or had not yet started. This pattern was not confined to schemes that were completed at the time of the economic downturn. In one case (A63 Melton Grade Separated Junction, completed in

2006) the developer was planning to use part of the site for residential development rather than for employment, presumably because of difficulties attracting business occupation of the site. Another scheme (A590 High and Low Newton Bypass) was intended to stimulate the economy of the Furness peninsula, but does not appear to have achieved this objective, as Barrow-in-Furness showed the largest decline in population of any local authority in England and Wales between the 2001 and 2011 Census, and is also forecast to show the largest population fall between 2014 and 2024¹⁸. The main reason for Barrow's declining population is people leaving the area for other parts of the UK, presumably because of the lack of job opportunities in the Furness peninsula; unfortunately, there is no evidence that the road scheme has slowed this decline, even some time after the economic downturn. In two cases (A63 Selby Bypass, completed in 2004, and A500 City Road and Stoke Road Junction Improvement, completed in 2006), development of sites accessed from the road scheme had not occurred, whereas development of other sites nearby, *not* accessed from the road scheme, had taken place. Other sites where economic development had been slower than expected, or had not happened at all, were the A1033 Hedon Road Improvement to the east of Hull (completed 2003); M1 J25-28 Widening (completed 2010); and A249 Iwade – Queenborough Improvement (completed 2006).

- Where development has occurred, it is **not necessarily the type of development that the area needs**. The A249 Iwade – Queenborough Improvement was described as *'fundamental to the economic development strategy for the Isle of Sheppey and Swale in general'*. Data in the FYA POPE suggested that in 2001 almost 80% of Isle of Sheppey residents who were in employment worked locally: either on the island, or elsewhere in the local authority area of Swale. But the businesses that moved to the new Retail Park following the road scheme are not likely to provide well-paid secure jobs for local people: they include Sports Direct, Poundland, Kentucky Fried Chicken and B&M Bargains¹⁹. The G-Park logistics and distribution site just to the south of the road scheme (marketed as 'Kent's premier logistics location') was successful in attracting a Morrisons distribution centre in 2010, four years after the road scheme was completed, but to date no more companies are listed on the G-Park website as having taken up premises there, and the website promotes the fact that the area has 'lower labour earnings for all employee levels compared with the south-east region and the UK as a whole'²⁰: that is, the development resulting from the road scheme is part of a 'race to the bottom' in terms of employee conditions and wages.

'Pressure cooker' areas

For the roads in 'pressure cooker' areas where the economy was already buoyant, the key issue is that:

- The development associated with these road schemes is **highly car-dependent**, and potentially undermines the viability of development in more sustainable locations such as town centres, but this effect is never considered in the POPEs. For example, the M60 J5-8 Widening was justified on the basis that it was needed to cater for traffic to the out-of-town Trafford Centre, but the effect of the Trafford Centre on the prosperity of Manchester city centre, and on nearby town centres such as Altrincham, was not considered. The A46 Newark to Widmerpool Improvement had an objective of relieving development pressures on nearby Bingham, but the residential development that is now planned is being promoted for its 'excellent road links' and its 'low density homes'.

‘Neutral’ areas, and schemes justified on travel time savings

For schemes that were justified on the basis that the reduction in journey times would boost the economy over a wide area, the key issue is one of **lack of credibility**. For example:

- The A5117 / A550 Deeside Park Junctions were predicted to make almost 26,000 more jobs accessible in a regeneration area as a result of improvements in congestion and more reliable journey times. However, in a journey time survey carried out pre- and post-scheme, only one of four routes through the scheme showed a time saving (of about 4 minutes in peak periods); the other three routes showed a very small saving (0.5-1 minute), no consistent pattern, or increased journey times.
- A2 Bean to Cobham Phase 2 was predicted to make an extra 55-85,000 jobs accessible to the workforce in a regeneration area. But the journey time survey carried out pre- and post-scheme showed that peak period journey times only went down by 2 minutes.

In neither of these cases does it seem plausible that the observed small journey time savings would result in people looking significantly further afield for employment, and nor does it seem plausible that these journey time savings would be sufficient to tip the balance when a business was considering where to locate. None of the POPEs reporting pre-scheme predictions of increased job accessibility were able to provide any post-scheme empirical evidence of actual changes in employment rates, or any examples of businesses locating at sites accessed from the road scheme.

4.3 Other evidence on the economic impact of road schemes

Notwithstanding the weakness of the empirical evidence from the POPE process, it is worth noting that there *is* evidence from other sources that road schemes in the UK may have had an economic impact. An important study by the Spatial Economics Research Centre (SERC) at London School of Economics examined how changes in ‘employment accessibility’ along the road network as a result of 31 road construction schemes between 1998 and 2007 affected employment levels and labour productivity²¹. The study concluded that accessibility changes as a result of these road schemes resulted in increased employment of 0.012% for each year’s investment in the major road network. This was equivalent to about 3600 jobs per year of major road scheme expenditure. The change was mainly due to firm entry in areas with increased accessibility, and there was little effect on existing firms’ decisions to expand or contract employment. The study noted that it was impossible to determine whether the jobs were truly ‘additional’, or whether they were simply a result of firm re-location. There was evidence that increased accessibility also had a positive effect on labour productivity.

Aside from this study, there is very little robust evidence on economic effects of road schemes. The What Works Centre for Local Economic Growth reviewed around 2,300 evaluations of the local economic impact of transport projects from the UK and other OECD countries, and found only 17 robust studies of the effect of road schemes on the local economy²². There was only one study from the UK (the SERC study summarised above), with 11 from the USA and the remainder evaluating programmes in Spain, Portugal, Hungary and EU-wide. It is not possible to generalise the findings of these studies to the UK context. However, the main findings of the review were that:

- **Roads can positively impact local employment. But effects are not always positive and a majority of evaluations show no (or mixed) effects on employment.** Of six studies that reported employment effects, two found a positive impact, three found no impact, and one found mixed results. One of the studies finding a positive impact concluded that this might be due to

‘negative spill-overs’ i.e. positive effects along the highway corridor accompanied by losses in other areas.

- **Road schemes may increase firm entry, although not necessarily the overall number of businesses (as new entrants may displace existing firms).** Three studies examined this: two found a positive outcome, and one found no effect.

The sparsity of robust evidence on the economic effects of road schemes (and transport schemes more generally) was noted in a recent report for the National Infrastructure Commission²³, which commented:

‘...there is very little existing evidence on the economic impact of specific transport interventions. In part, this results from a lack of rigour in transport evaluations, particularly in defining what would have happened in the absence of the transport scheme.’

The general weakness of the evidence, especially when coupled with our findings in section 4.2, raises the following questions:

- Would the same level of investment in other forms of transport (e.g. rail), or in education, training or research and development, yield the same increase in jobs and productivity (or more, or less) for the local community in the area of each road scheme?
- How long-lived are any economic effects of road construction, especially if road schemes lead to additional traffic?
- To what extent are the economic impacts of road schemes ‘displacement effects’, simply transferring economic activity from one location (possibly a more environmentally sustainable one, such as a town centre) to another?
- If road schemes do deliver a net increase in local employment, to what extent do they support sectors of the economy that offer ‘good jobs’ as opposed to sectors of the economy that offer insecure or poorly paid jobs?
- To what extent is any increase in local employment appropriate to, and accessible to, those people most in need of work in the local area?

4.4 Comments on the POPE approach to the assessment of economic impact

Our review of POPEs led us to three main conclusions about the way in which the economic impact of road schemes is evaluated.

First, **post-scheme evaluation appears to start from the premise that ‘any development is good development’.** A more nuanced approach is needed, considering a wider range of impacts. These include:

- How well development following a road scheme matches local community need (e.g. providing an increase in permanent jobs on good salaries, as opposed to attracting employers offering insecure employment on zero-hours contracts).
- Whether a road scheme has had the effect of stimulating car-dependent development while undermining the viability of more sustainable development (e.g. in town centres).
- How accessible any new employment sites are to job-seekers.
- How appropriate any new employment sites are to the needs of the local job-market.

This suggests the need for a different evaluation approach, with more use of qualitative social research methods alongside quantitative methods. This is also recommended in a recent document from the Department for Transport on strengthening the links between appraisal and evaluation²⁴.

Second, **while pre-scheme forecasts are often very precise about the (large) number of jobs that are predicted to be created in regeneration areas, or to become accessible to residents in those areas, there is no attempt in the post-opening evaluation to assess the credibility of these predictions.** A common-sense assessment of the evidence that *is* presented suggests that these predictions cannot be credible, and yet the POPEs are silent on this point. An analysis of changes in employment density proximal to the road scheme, compared to changes in employment density in a 'control' area, is required.

Third, **the headline claims of economic benefit made in individual POPEs and in POPE meta-analyses cannot be substantiated.** The evidence is considerably weaker than it is made to appear, and the most plausible meta-level conclusion would be that the economic impacts of road building are uncertain, and may be either positive or negative. That is, from the empirical evidence gathered by the POPE process over the last 15 years, it is far from proven that road schemes have an immediate impact in stimulating the local economy^{xvii}.

xvii As claimed by Philip Hammond – see section 4.1.

5. Other Effects of Road Schemes

5.1 Introduction

This section briefly reviews the evidence from the meta-analysis and individual POPEs for four other topics: the effects of road schemes on congestion and reliability; on journey times; on road safety; and on carbon emissions.

5.2 Congestion and reliability

The headline conclusion in the 2015 meta-analysis with regard to reliability is that:

‘New bypasses, widening schemes and schemes upgrading A-roads to motorways significantly improve journey time reliability, with bypass schemes showing the greatest improvements’.

This conclusion relies heavily on an evaluation method that was used in most POPEs until fairly recently, known as the ‘Route Stress’ approach. The 2015 meta-analysis states that POPE has tended to rely on the Route Stress approach because *‘this has been the predominant approach used in the appraisal of the schemes’* and because *‘it is also relatively simple to calculate’*. However, the latest methodology note from Highways England acknowledges the limitations of this approach²⁵.

The 2015 meta-analysis presents a graph which shows that the change in Route Stress ‘before’ and ‘after’ scheme opening is:

- From 91.5% to 44% for bypasses (using data from 26 schemes);
- From 86.4% to 49.4% for widening schemes (using data from 19 schemes);
- From 82.5% to 51% for ‘upgrade to motorway’ schemes (using data from four schemes).

On the face of it, these sound like major improvements, and the fact that they can be so precisely calculated to one decimal point makes them seem all the more trustworthy.

However, while it may be simple to calculate, Route Stress is not a transparent and readily understood measure of congestion, and it is questionable whether the way it is used in the POPE reports and meta-analyses is meaningful. Route Stress is defined as the ratio of Annual Average Daily Traffic (AADT) flow to the Congestion Reference Flow. The latter is a complex measure based on the proportion of heavy vehicles during peak hours; type of road (single or dual carriageway or motorway); number of lanes; lane width; proportion of daily flow that occurs during the peak hour; directional split of the peak hour flow; the Annual Average Daily Traffic and the Annual Average Weekday Traffic^{xviii 26}. Following construction of a road scheme, the biggest factor affecting the Congestion Reference Flow will be the number of lanes: if this doubles, the CRF also doubles and Route Stress is therefore halved.

xviii The Congestion Reference Flow is given by the following formula: $CRF = [A - B * Pk\%H] * NL * Wf * 100/PkF * 100/ PkD * AADT / AAWT$, where: A and B are constants that depend on the type of road (single or dual carriageway or motorway); Pk%H = percentage of heavy vehicles in the peak hour; NL = number of lanes in each direction; Wf = the ‘width factor’, which is an adjustment factor for carriageways with non-standard lane widths; PkF = proportion of total daily 2-way flow that occurs in the peak hour; PkD = the directional split of the peak hour flow; AADT = Annual Average Daily Traffic flow; AAWT = Annual Average Weekday Traffic flow.

Department for Transport guidance on appraisal states that the Route Stress approach *'is only appropriate when...other approaches...are not feasible. The change in stress is essentially a proxy for change in reliability. The approach does not provide a direct quantification of changes in reliability or reliability benefits. In addition, it is not a precise or comprehensive method and can only provide a very broad indication of the impact of a proposal on reliability.'*²⁷

DfT guidance also states that values of Route Stress that are lower than 75% should be treated as 75% (and values that are higher than 125% should be treated as 125%) – in other words, numbers outside this range are meaningless. While it is unclear from the 2015 meta-analysis how the reported changes in Route Stress by scheme type have been calculated^{xix}, the claim that Route Stress has fallen to around 45-50% is meaningless, and tells us nothing useful at all about congestion and reliability.

Although the Route Stress approach was the main method used to evaluate reliability in the past, more recent POPEs have moved away from this method towards other approaches that are more defensible:

- For 13 (unnamed) schemes, the 2015 meta-analysis states that pre- and post-scheme reliability was compared, using change in **journey time standard deviations** within specific time periods (e.g. AM peak, inter-peak, PM peak). Data were drawn from Highways England's Journey Time Database^{xx}. For 10 of these schemes, the meta-analysis states that there is a *'clear improvement in journey time reliability'* since the scheme opened. For three schemes there is no clear evidence of improved journey time reliability.
- For three named schemes, the meta-analysis also reports journey time variability based on in-vehicle GPS data for a probably large (but unspecified) number of trips, showing the change in the **ratio of the 95th percentile of journey time: 25th percentile of journey time**, pre- and post-scheme completion. For all three schemes (one smart motorway, one new dual carriageway, and one motorway junction scheme), there are improvements in AM peak period journey time variability; two schemes show a non-trivial improvement in PM peak period journey time variability while one shows little change.

Our own scrutiny of a random sample of more recent POPEs suggests that effects of road schemes on journey time reliability are mixed. Table 5.1 summarises our own judgments for 10 schemes for which methodologically robust analysis is reported in the respective POPE. For seven schemes, there *is* evidence of a positive effect on reliability, while for the other three schemes the evidence is ambiguous. This is broadly consistent with the finding in the 2015 meta-analysis that 10 out of 13 schemes showed reliability improvements.

However, all the road schemes for which we were able to find methodologically robust analysis were built during a period when background traffic levels were stable or falling, and the comparison of pre- and post-scheme data may appear 'positive' partly or wholly because of this underlying trend. For most of the schemes, only 'one-year after' data are as yet available. One of the two schemes with 'five year after' data (M27 J11-12) shows initial reductions in journey time variability at one year after, but very considerable erosion of this effect at five years. There is also evidence of land

xix It seems most likely that Route Stress has been calculated for each road before and after scheme opening, and that the reported figures are the 'before' and 'after' means.

xx No explanation is given of the methods used to collect this data, but we assume that it is primarily from inductive loops in the road, Automatic Number Plate Recognition Cameras and (possibly) in-vehicle GPS.

use change associated with one scheme (M40 J15 Longbridge Bypass) which makes it highly likely that short term increases in reliability after one year will be very rapidly eroded.

Our overall conclusion is therefore that road schemes *may* deliver more reliable journey times in the short term (i.e. one year), on the road scheme itself. But there is as yet no compelling evidence that they deliver more reliable journey times on the road scheme in the longer term (five years or more), and if road schemes are associated with more car-based development and consequent traffic generation, there is a risk that these benefits will be rapidly eroded. In addition, traffic generation associated with road schemes may lead to *less* reliable journeys on the wider road network, as the additional traffic arising from car-dependent development associated with the road scheme will cause traffic levels on nearby roads to increase.

5.3 Journey time savings in cost-benefit analysis of road schemes

Of all the ‘benefits’ of road schemes that are monetised during cost-benefit analysis, journey time savings for drivers are by far the biggest. According to the 2015 POPE meta-analysis, this accounted for 85% of average scheme benefits in ex-ante cost-benefit analysis, with the remaining 15% resulting from predicted reductions in collisions. For ex-post cost-benefit analysis, journey time savings accounted for 79% of average scheme benefits; reductions in collisions accounted for 20%; and all other factors combined contributed only 1%^{xxi}.

There is an extensive literature critiquing the way in which conventional appraisal methodology places too much emphasis on small notional time savings, which, when multiplied by a large number of vehicles, yield apparent large aggregate time savings which are supposed to allow more productive work to be carried out and more valuable leisure to be had (but in practice probably have little if any effect for each individual)²⁸. Data presented in the 2015 meta-analysis suggests that median journey time savings arising from road schemes are of the order of 1.5 minutes during peak periods (based on 40 road schemes for which pre- and post-completion data are available), and 1 minute during the inter-peak / off-peak (based on 30 schemes)^{xxii}. These time savings are trivial, and it is highly problematic that cost-benefit analysis places such weight on journey time savings, while giving very little weight, or in some cases, no weight at all, to important environmental and social factors (including carbon emissions, air quality, noise, landscape impacts, severance, effects on the viability of public transport, accessibility etc.).

Concerns about this issue have been raised over very many years. SACTRA (1999) recognised that the full economic costs, particularly environmental externalities, were not accounted for in conventional appraisal, and noted *‘environmental costs represent real economic resources even when their money values are not calculated...the description of physical impacts in a conventional environmental appraisal carries the implication of economic impacts.’*²⁹

xxi It is worth noting in passing that the ex-post road safety benefits reported in most POPEs to date do not take account of the background trend of declining injury collisions, and so almost all POPEs (apart from the most recent ones) misreport road safety benefits as larger than they actually are. Even for recent POPEs which have taken account of the background trend of declining injury collisions in calculating scheme benefits, it is possible that long-term safety benefits will still be overestimated in cases where there is substantial induced traffic.

xxii Our estimates, based on Figures 4-18 and 4-19 of 2015 meta-analysis. A previous meta-analysis in 2011 quotes ‘average’ journey time savings of 3 minutes in peak periods and 2.5 minutes in inter-peak periods, based on a smaller sample of schemes than in 2015. ‘Average’ (presumably mean) figures are misleading, because they are distorted by the small number of road schemes that show very large time savings.

Table 5.1: Evidence on journey time variability for sample of 10 road schemes

Scheme (<i>OPENING DATE</i> / <i>POPE</i>)	Method*	Overview of results	Evidence summary
A2 Bean – Cobham (2004 & 2009 / OYA & FYA)	B	In 2002 (pre-scheme) mean journey time was higher during AM peak period westbound, and during PM peak period east-bound, than at other times. By 2006 (first phase of scheme complete), mean journey times in AM peak westbound and PM peak eastbound had fallen. By 2010 (second phase of scheme complete), mean journey times in AM peak westbound and PM peak eastbound showed further fall.	Positive
A2 / A282 Dartford (2007, OYA)	A	Clear improvement in both peak time / peak flow periods (westbound in AM peak and eastbound in PM peak) after one year.	Positive
M6 J8-10a Managed Motorway (2011, OYA)	C	Clear improvement in AM and PM peak periods in both directions.	Positive
M25 J1b-3 (2008, OYA)	A	AM peak period: northbound flows show clear improvement (reduction) in variability comparing one year pre/post scheme completion; however variability is worse (higher) for southbound flows. PM peak period: northbound flows show high and erratic variability one year after scheme completion (data errors?); southbound flows show less variability post-scheme compared to pre-scheme.	Ambiguous
M25 J16-23 (2012, OYA)	A	Clear improvement in all 4 peak time periods after one year	Positive
M25 J27-30 (2012, OYA)	A	Clear improvement in 3 out of 4 peak time periods (AM and PM clockwise; PM peak anticlockwise) after one year; but variability is worse in the AM peak anticlockwise after one year.	Ambiguous
M27 J3-4 (2009, OYA)	B	Before scheme completion, mean journey time was somewhat higher during AM and PM peaks than during rest of the day. One year after completion, mean journey time during AM and PM peaks is similar to mean journey time in the inter-peak.	Positive

Scheme (<i>OPENING DATE / POPE</i>)	Method*	Overview of results	Evidence summary
M27 J11-12 (<i>2008 / OYA & FYA</i>)	B	Before scheme completion, mean journey time was higher during AM and PM peaks than at other times. One year after completion, mean journey times during AM and PM peaks have fallen somewhat. However, 'after' analysis was in 2008-09, and POPE notes that journey time savings should be considered in context of traffic reductions caused by the recession.	Ambiguous
	A	Initial improvement in 3 out of 4 peak time periods (east and westbound, AM and PM peak), but considerable erosion of the improvement after five years.	
M40 J15 Longbridge Bypass (<i>2010 / OYA</i>)	C	Clear improvement in all four peak time periods for A46 traffic bypassing J15 roundabout after one year. However, major development has taken place adjacent to the junction (Tournament Fields Business Park and 1,250 homes) since the completion of the scheme, and so it is likely that the improvements in journey time variability will have been eroded since completion of the OYA POPE in 2012.	Positive
M62 J25-30 Smart Motorway (<i>2013 / OYA</i>)	C	Clear improvement in all four peak time periods, particularly marked in PM peaks	Positive

* Analytical methods used in POPEs varied as follows:

A = comparison of standard deviation of journey times, pre- and post-scheme

B = comparison of mean journey times at peak periods relative to off-peak, pre- and post-scheme

C = comparison of 95th, 75th, 25th and 5th percentile journey times, pre- and post-scheme

Note: in all, POPEs for 19 road schemes completed since 2007 were checked for useable evidence on journey time variability. POPEs for ten of the 19 schemes included useable evidence, based on one or more of the analytical methods listed above. Not all schemes completed since 2007 were checked.

5.4 Road safety

The most recent POPE meta-analysis reports that 71 road schemes amongst those included in the analysis had an objective to improve safety. Of these, it states that 61 had achieved this objective, four had not achieved it, two had partially achieved it and inconclusive evidence was available for four.

However, as the POPE meta-analysis itself later acknowledges, this is a problematically misleading summary statement, since it takes no account of the strong downward trend in road collisions resulting in injury, which was -40% between 2000 and 2015^{xxiii}. Most individual POPEs assumed that the counterfactual case (what would have happened if the road scheme had not been built) was no change in personal injury collisions. It would be more meaningful to define a counterfactual for each scheme in which personal injury collisions fell at the same rate as nationally or regionally, and compare pre- and post-scheme collision trends to this.

Further, for some schemes where there has been a very substantial long-term increase in traffic following construction (e.g. our in-depth case studies, in Chapters 6-10), it might be expected that any reduction in personal injury collisions immediately after scheme completion (e.g. where a bypass removes traffic from a village or town centre) would be followed by a levelling out or even an increase, as the impact of rising traffic volumes starts to be felt. This potentially important relationship between generated traffic and the trend in collisions would only become evident if data were examined over a period of at least 10-15 years after scheme completion.

We requested personal injury collision data for one road scheme, the Newbury Bypass, from Highways England in order to examine the long-run effects. In the four years prior to construction of the bypass (1994 – 1997), there were 16 collisions leading to a death or serious injury on the A34, an average of four per year. In the four years after construction of the bypass (1999 – 2002), there were 32 collisions leading to a death or serious injury, an average of eight per year^{xxiv}. Over the long term, in the four four-year periods between 1999 and 2015, the average annual number of KSI collisions were 8.0 (1999 – 2002); 5.3 (2003 – 2006); 4.0 (2007 – 2010); and 5.8 (2011 – 2015). The picture therefore seems to be of a sudden *increase* in KSI collisions immediately after the bypass opened, then a decline, and then another increase. This is very significantly worse than the national trend. If KSI collisions on the A34 had followed the trend for Britain, there would only have been about two KSI collisions per year on this stretch of the A34 by 2011 – 2015.

The 2015 meta-analysis considers data from 15 POPEs where adjustment *has* been made for the background downward trend in personal injury collisions. It finds that of these 15 schemes, eight showed a reduction in collisions relative to the counterfactual, and seven showed an increase in collisions relative to the counterfactual. Taking this at face value, it suggests, at best, a mixed effect of the roads programme on road safety – we could conclude

xxiii The trend is similar for all injury collisions and for collisions involving death or serious injury (Department for Transport road safety statistics RAS10013).

xxiv Figures are for the A34 between Didcot (north of Newbury) and a junction near Basingstoke (south of Newbury). The 'after' figures do not include personal injury collisions on the 'old' A34 and hence understate the total for the corridor.

either that ‘some road schemes improve road safety and some worsen road safety’, or alternatively, that ‘there is a random variation in casualty numbers, and the overall effect of the roads programme is neutral in the short term’. But because the data for these 15 schemes is only for a short time period following scheme completion (at best five years and in some cases just one year), it gives no insights at all on the potential longer-term road safety impacts of the schemes.

In future meta-analyses, it would be desirable to undertake a re-analysis of primary datasets for a sample of road schemes for which there is both pre-scheme collision data and a long-run data series of at least 10-15 years following scheme completion. Pre- and post-scheme collision trends should be compared to national or regional collision trends (i.e. change-on-change analysis). Some of the road schemes included in the sample should be ones where the corridor in question has seen substantial traffic growth, above the regional growth trend, so that the long-run effects of above-trend traffic growth on road casualties can be understood.

5.5 Greenhouse gas emissions

The 2015 POPE meta-analysis presents estimated change in greenhouse gas emissions in the opening year for around 66 schemes. The reported figures compare emissions ‘with’ the scheme to those that would have been expected ‘without’ the scheme.

For most schemes, the method used to estimate changes in emissions is a simple spreadsheet model, which takes account of the following factors^{xxv}: traffic flows (AADT) ‘with’ the scheme compared to those predicted ‘without’ the scheme; link length (i.e. the length of each section of road being considered); average annual speeds ‘with’ versus ‘without’ the scheme; and traffic composition, based on averages for different road types.

Based on summary material presented in the 2015 meta-analysis, the changes in emissions are reported to be as follows:

- Half of the road schemes show an estimated net increase in annual emissions of 0 - 1000 tonnes carbon^{xxvi};
- A third of schemes show a larger increase in annual emissions, ranging between 1,000 and ‘above 5,000’ tonnes carbon;
- A sixth of the schemes show a reduction in annual carbon emissions.

There are two issues with the methodology used to derive these estimates:

- Use of pre-scheme traffic forecasts to define the counterfactual (i.e. what would have happened to traffic levels ‘without’ the scheme) is problematic, because traffic forecasts have historically been very much higher than observed traffic growth. This means that the magnitude of emissions due to increased traffic is substantially underestimated. It would be more appropriate to assume that traffic growth in the corridor in the absence of the road scheme would be the same as the county or regional trend. In order to address this issue, emissions for each scheme would need to be re-calculated,

xxv Carbon emissions for most schemes were assessed using the DMRB Screening Method (Design Manual for Roads and Bridges Volume 11 Section 3 Part 1 HA207/07).

xxvi The 2015 meta-analysis reports figures for ‘carbon’. Later in this section, we convert carbon to CO₂.

comparing changes between pre-scheme and post-scheme FYA traffic counts, with changes in traffic mileage at the county and regional level, over the same time period.

- Clearly, the excess carbon emissions resulting from a road scheme are not confined to its opening year, and there will also be excess carbon emissions in future years. If higher emissions in the opening year are due to higher volumes of traffic (i.e. induced traffic), it is likely that annual emissions will grow in future years, at least until the new or widened road fills up with traffic to the point where growth reverts to the average for the area. If higher emissions in the opening year are due to increased speeds (e.g. where a high speed dual carriageway bypass replaces a previous single carriageway road), annual emissions in future years are likely to be similar to those in the opening year.

We did not have sufficient information to estimate how use of a regional / county comparator for the counterfactual (as opposed to traffic forecasts) would have affected the estimate of annual carbon emissions.

However, we were able to estimate the cumulative impact of the reported annual carbon emissions from multiple schemes, over multiple future years. We used the same source of information as that used in the 2015 meta-analysis³⁰. Our estimate should be considered as indicative^{xxvii}.

We concluded that:

- For the 54 road schemes that opened in the eight year period between 2002 and 2010, and had non-trivial changes in carbon emissions, **cumulative emissions over the period 2002 to 2015** were of the order of 2.2 Mt carbon, or **8 Mt CO₂**.
- **In 2014**, the emissions resulting directly from these 54 road schemes were of the order of 320 kT carbon, or **1.2 Mt CO₂**. We estimate that **this increase is very approximately 3% of the annual emissions of CO₂ from all motorway and trunk road traffic in England**^{xxviii}. Another way of putting this is that it is the equivalent of putting an extra 590,000 cars with average mileage and average emissions onto the road^{xxix}.

This is a minimum estimate, and if a more robust counterfactual were used to estimate traffic flows 'with' these schemes compared to those 'without' the schemes, the carbon emissions would be higher, and probably substantially so.

xxvii For each scheme for which non-trivial changes in carbon emissions were estimated by Highways England (increases or decreases of more than 100 tonnes C), we noted the reported change in emissions. For those schemes with the largest change in emissions (generally >1000 tonnes C), we checked in the OYA or FYA POPE whether the main reason for this change was traffic volume changes or speed changes, or a combination. For schemes where the main reason for changed emissions was related to vehicle speeds, we assumed that the increase (or decrease) in annual emissions would remain constant in future years. For schemes where the main reason for changed emissions was related to traffic levels, we assumed the reported increase in annual emissions was the result of one year's 'above-forecast' traffic growth, and that the growth rate would be the same in the future. For schemes where the changed emissions were attributed in the POPE to a mixture of traffic effects and speed effects, we assumed these two factors each made an equal contribution. We also assumed that these two factors made an equal contribution for schemes where the change in carbon emissions was <1000 tonnes C.

xxviii CO₂ emissions for England for road transport (motorways and 'A' roads) = 67Mt in 2013, according to *2005 to 2013 UK local and regional CO₂ emissions, full dataset*: <https://www.gov.uk/government/statistics/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics-2005-2013>; 51% of motorway and 'A' road traffic is Highways England roads i.e. motorways and trunk 'A' roads (from DfT statistics TRA0103 for 2013).

xxix Assuming average CO₂ emissions of 156.6g/km, and average annual car mileage of 7,900 miles (12,640 km).

PART II: Case Study Evidence

6. Overview of the Case Studies

In order to gain a more detailed understanding of the effects of road schemes on traffic growth, landscape, the local economy, and land use, we undertook four in-depth case studies.

Two of our case studies were road schemes that had been examined in detail in our study for CPRE and the Countryside Agency a decade ago: the A34 Newbury Bypass and the M65 Blackburn Southern Bypass. We were interested in these road schemes because of their potential to provide a 'long view' of what happens when road capacity is increased: most especially with regard to changes in land use, but also with regard to changes in traffic volume and economic impact. The other two case studies were more recent schemes, to provide insights on whether the nature or effect of the roads programme has changed over time.

Our selection criteria for the two more recent road schemes were:

- The schemes should preferably have been completed between 2005 and 2011, and have a FYA POPE already available (although in the event, we chose case studies that were completed earlier than 2005, as these provided the best match to our other criteria).
- They should be bypasses, road widening schemes or conversion from 'A' road to motorway standard (not junction schemes or 'smart' motorway schemes).
- They should be in locations with time-series traffic count data available from the Highways England webTRIS on-line database, to enable assessment of changes in traffic volume.
- They should be in locations with active local CPRE groups, or similar, as a source of information and contacts.
- Ideally, at least one case study should be of a scheme on a corridor which has had multiple interventions at different locations.

In addition, taking all four case studies together:

- Some should have evidence about economic effects.
- Some should be in locations with a national or local designation for landscape value, and some should be in locations with no such designation.
- The four case studies should have good geographical coverage.

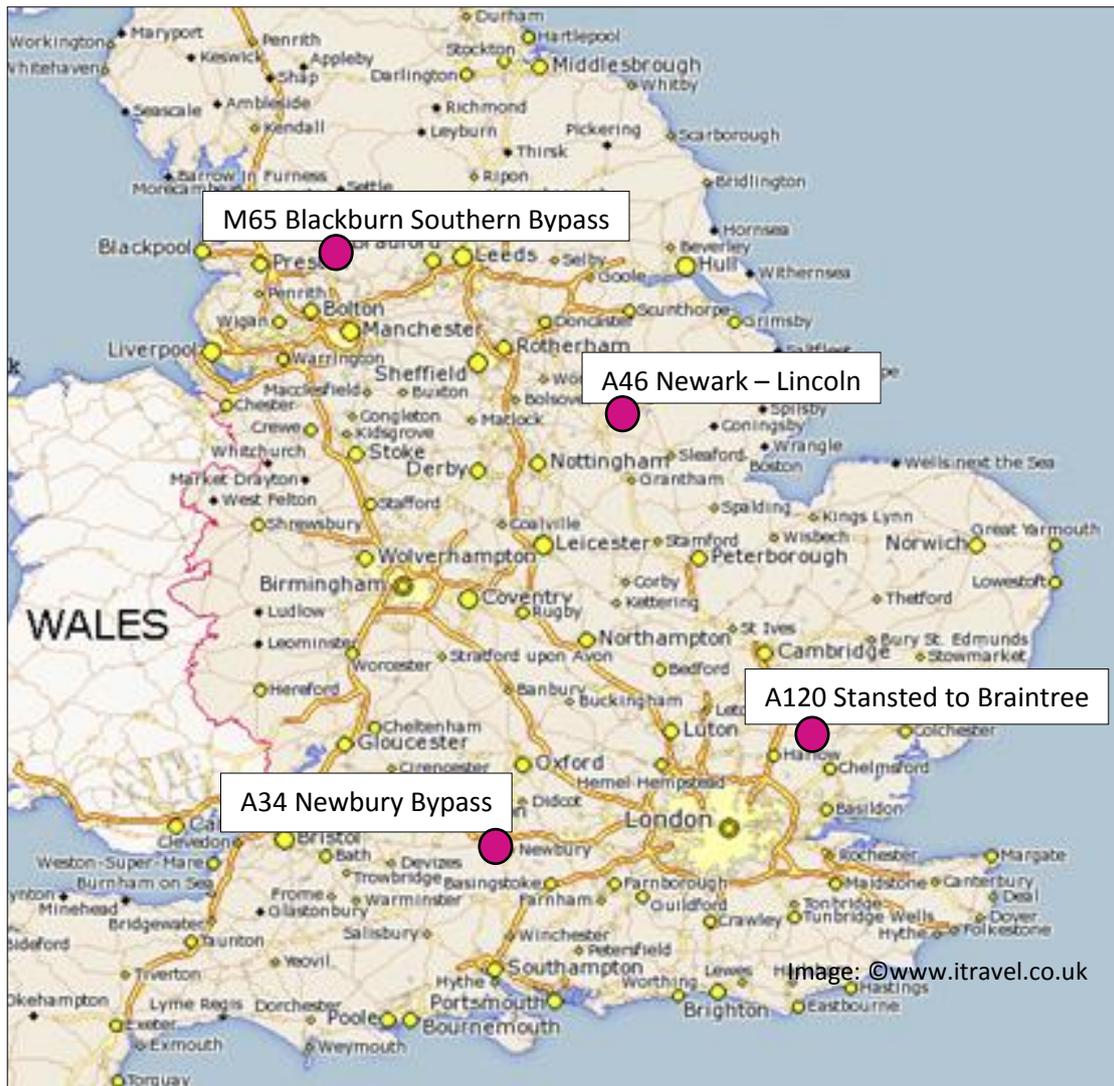
Having agreed selection criteria, we identified seven possible schemes, and following discussion with CPRE, narrowed this down on the basis of the best balance to meet our criteria to the final two: A46 Newark – Lincoln and A120 Stansted to Braintree.

Key features of the four schemes are summarised in Table 6.1, and their location is shown in Figure 6.1.

Table 6.1: Overview of the case study schemes

	A34 Newbury Bypass	M65 Blackburn Southern Bypass	A46 Newark – Lincoln	A120 Stansted to Braintree
Date of opening	1998	1997	2003	2004
Region	SE	NW	EM	E
Length	13.5km	21km	13km	23km
Nature of scheme	New dual carriageway	New motorway, mostly two lanes	On-line widening to dual-2 and off-line bypass	New dual carriageway
Cost	£100m (1998 prices)	£147 million (1990 prices)	£41m (2002 prices)	£101m (2002 prices)
Main case study findings	Traffic +77% across screenline	Traffic +119% on some sections	Traffic +33% across screenline in northern section	Traffic +84% across screenline
	Nature reserve halved in size and SSSIs severed	Stanworth Valley severely damaged: ancient woodland destroyed. Green Belt cut back	10km of hedgerows (Area of Great Landscape Value) & three woodland Sites of Nature Conservation Importance partly destroyed	Crossing of River Chelmer severely degraded
	Stimulated large amount of car-dependent development, so 'relieved' former A34 now heavily congested again	Led to many new 'tin sheds' in former countryside, causing peak-time congestion at junctions and on some links	Facilitated new car-dependent housing (2,500 units built / planned)	Facilitated new car-dependent housing (13,000 units anticipated)
Future	Pressure for enlargements of junctions and sections of 'relieved' former A34	Pressure to widen motorway and extend eastwards	Lincoln Eastern Bypass recently approved; southern bypass linking to A46 anticipated	Pressure to dual A120 east of Braintree

Figure 6.1: Locations of the case study schemes



7. A34 Newbury Bypass Case Study

7.1 Introduction

The A34 runs from the Midlands to the south coast. Prior to construction of the bypass, sections of the A34 passing east of Newbury were the only remaining single carriageway.

Figure 1.1: Route of A34 Newbury Bypass

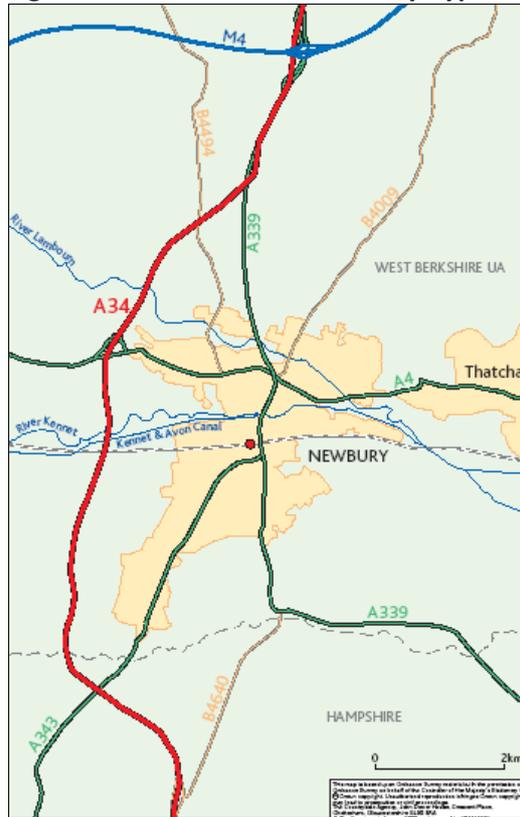


Image: Countryside Agency

Figure 1.2: Newbury Bypass construction



Image: Historic England

Table 7.1: A34 Newbury Bypass overview

Region	Southeast
Opening date	1998
Scheme length	13.5km
Scheme description	Dual carriageway on new alignment
Scheme cost	£100 million (1998 prices) ³¹
Available evaluation reports	'Five Years After' POPE

The Newbury area is economically buoyant. West Berkshire has a jobs density in the UK top decile³² and is classified as 'Prosperous Country' in the Office for National Statistics 2011 Area Classification for local authorities. The scheme could therefore be categorised as a road scheme in a 'pressure cooker' area.

The scheme was justified on the basis that it would remove traffic from the old road (the ‘inner relief road’, itself a previous bypass constructed in 1963, passing east of the centre of Newbury) and would complete the A34 as dual carriageway between the Midlands and the south coast ports³³.

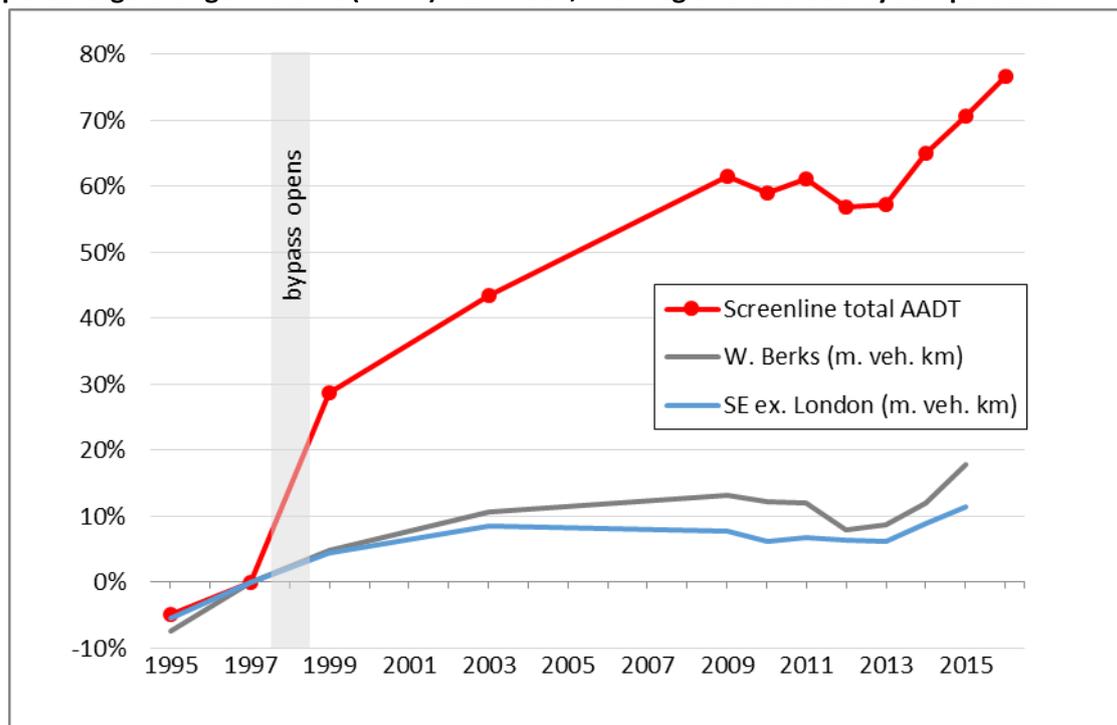
The A34 passes from chalk downland in the north to the smaller scale fields and woods of the Kennet Valley further south, within which the town of Newbury lies. A landscape assessment in 1993, prior to the construction of the bypass, described Newbury district as having ‘a high quality, diverse landscape character which includes a significant portion of the North Wessex Downs Area of Outstanding Natural Beauty’³⁴.

When construction of the road started in 1996, the site was occupied by one of the largest anti-road direct action campaigns ever seen in Britain, seeking to defend this countryside and a number of sites of archaeological and ecological importance.

7.2 Traffic impact

Total traffic along the A34 corridor (i.e. the A34 bypass plus the bypassed old road, now the A339) has risen steeply from its level before the bypass was built, as shown in Figure 7.3.

Figure 7.3: Screenline across A34 Newbury Bypass and A339 bypassed old road showing percentage change in traffic (AADT) from 1997, with regional and county comparators



Source: Highways England automatic traffic counter sites reported on WebTRIS provide a single screenline just south of the split between the northern end of the A34 Newbury Bypass and the old road, now the A339. Screenline figures for 1995, 1997, 1999 and 2003 are from the ‘Five Years After’ POPE; for 2009 onwards are from WebTRIS traffic count sites 5616/1 and /2 northbound and 5617/1 and /2 southbound. Screenline traffic volumes in 2016 involve extrapolation of data for October – December.

Note: The West Berkshire traffic trend may be influenced by the A34, as one of the county’s major roads.

Since 1997, the year before the bypass opened, total traffic on the corridor formed by the bypass and the old road has grown 77%. Over the same time period, traffic volumes in West Berkshire grew 18%, and traffic volumes in Southeast England outside London grew 12%^{xxx}. The graph shows that traffic growth on the A34 corridor was almost identical to the regional rate of traffic growth prior to the bypass, but rose much faster once the bypass was built. Between 2009 and 2013, when there was an economic downturn, traffic on the corridor stopped growing. However, as the economy began to recover from 2014, traffic growth resumed, at a rate that outstripped both the county and the regional growth trend.

Table 7.2: Changes in traffic on a screenline across A34 Newbury Bypass and former A34 compared with traffic predictions

	1997 AADT	bypass opens	1999 AADT	2010 AADT	2016 AADT	Change in AADT to 2016 from pre-bypass level
Actual	41,900		53,900	66,600	74,000	+32,100 (+77%)
Predicted	n/a		n/a	57,000 - 68,000	n/a	

Source of predictions: Highways Agency 1995 *Newbury Bypass Study Report*. However, these predictions for 2010 are for a more southerly screenline, so the above figures apply a correction factor. For the old road, the correction uses Department of Transport predictions for 1999 that distinguished between sections of the old road. For the bypass, in the absence of any DoT predictions that distinguish particular sections, the correction uses actual observed traffic on different sections in 1999. Data sources for observed values as per graph.

The high rate of traffic growth on the A34 corridor was predicted prior to the construction of the new road, as shown in Table 7.2, although not, as it transpired, for the right reason. Earlier forecasts had been lower, but were increased in 1995, in light of a higher National Road Traffic Forecast (NRTF 1989)³⁵. However, this national forecast turned out to far exceed actual national traffic growth, representing 300-400% national traffic growth for the period in question^{xxxi}.

The forecasting assumption that the A34 corridor would follow national traffic growth was incorrect. The road attracted much more traffic growth than the national average.

The assumption that growth would be linear to 2010 also proved erroneous. The added road capacity quickly attracted new traffic. One year after the bypass opened, traffic on the A34 corridor had even outstripped the forecasts predicated on meteoric national traffic growth.

For the old, bypassed road, a local traffic study noted resurgent congestion issues by 2003³⁶:

‘Traffic levels on the A339 corridor immediately reduced following the opening of the Newbury Bypass in 1998 but have since increased again. It is thought that a significant proportion of this increase may be local traffic, including traffic generated by recent developments. It is apparent that increasing traffic levels of the A339 corridor have resulted in junctions along the A339 corridor operating close to or at

xxx Using DfT statistics table TRA8904 of million vehicle km per year for local authorities and regions.

xxxi The National Road Traffic Forecast in use at the time would have been the 1989 NRTF, which predicted national (GB) traffic volumes would grow by 82-142% between 1988 and 2025. By interpolation, the implied national growth between 1997 and 2010 would have been 24-37%. Actual GB traffic growth in this time period was just 8% (from DfT statistics TRA8904).

capacity as well as acting as a barrier and reducing accessibility into Newbury Town Centre for all road users including cyclists and pedestrians.'

A further analysis³⁷ of traffic data revealed that peak hour traffic on the section of the old road closest to Newbury had nearly returned to its pre-bypass levels by 2003, although AADT traffic averaged over the whole day remained about one quarter below pre-bypass levels. The available traffic figures for 2015, although not precisely comparable, indicate that on this central section of road the very steep initial resurgence in traffic levelled off and slightly reversed so that traffic levels are now about 33% below pre-bypass levels. However, further north along the old road, growth has continued. Many of the junctions along the old route are locally notorious for their congestion (Figure 7.4).

Figure 7.4: Heavy traffic on the A339 'old road' (photographed 3pm, between peak hours)



Prior to the construction of the bypass, the Highways Agency noted³⁸ that *'The growth of induced traffic could be restricted or prevented. For example, some of the existing road space released by the bypass could be allocated to public transport'*. The opportunity to constrain traffic growth and make road space for public transport, pedestrians and cyclists was not taken. On the contrary, the planning policies executed appear to have encouraged further traffic growth along the A339. Relationships between congestion on the old road and new developments are considered further in section 7.5.

7.3 Landscape and other environmental impacts

No Environmental Impact Assessment was undertaken for the Newbury Bypass because the decision processes preceded the legislation that later required such assessments. However, many landscape, ecological, archaeological and other environmental issues arose, leading to a protracted process and many objections from the public and from official bodies^{xxxii}. The decision to go ahead with the road was taken in 1988, at the first of two Public Inquiries, but there was a decade of further argument before it was finally built.

Figure 7.5 illustrates the visual impact of the road on the Kennet Valley, which the bypass crosses on an extended embankment, shown at the crossing of the hitherto tranquil Kennet

xxxii Berks, Bucks and Oxon Naturalists Trust (1996) *Wildlife News* Issue 17 noted that the Nature Conservancy Council opposed the bypass at the 1988 Public Inquiry and that the National Rivers Authority, established after the Inquiry, opposed the construction of an embankment across the Kennet and Lambourn river valleys. The Advisory Committee on the Landscape Treatment of Trunk Roads opposed all routes proposed west of Newbury.

and Avon canal. This degree of disturbance was predicted and strongly criticised by the Advisory Committee on the Landscape Treatment of Trunk Roads³⁹, who advised that the crossing of the Kennet Valley's *'intimate rural landscape'* would *'create an enormous visual barrier right across the whole valley'*. The committee had, in two previous reports, already recommended against the whole bypass route as *'unacceptable on landscape grounds'*. It was ordered to re-inspect the route, and its third report, issued under protest, requested that if the road did go ahead then there should be a visually more transparent viaduct rather than an embankment. This official advice was ignored. The 'Five Years After' POPE⁴⁰ reports the follow-up landscape assessment by West Berkshire as finding the embankment *'visually intrusive and out of keeping with the local landscape character – as expected. It has resulted in severance of the landscape and visual continuity.'*

Figure 7.5: A34 at Kennet and Avon Canal



The Advisory Committee was also very concerned about the impact on the landscape further north, where it considered that *'the damage by these routes to the Lambourn Valley and Snelsmore Common would be quite unacceptable'*. Snelsmore Common is part of the North Wessex Downs Area of Outstanding Natural Beauty, an area of rolling chalk downland landscapes. Figure 7.6 shows the nature of the chalkland landscape in an unaffected location, for comparison with Figure 7.7, which shows similar terrain, during excavation of a deep cutting for the bypass near where it enters the AONB, and from a bridge offering a similar vantage point in 2016.

These images give a view from the north of the section of road where the 1988 Appraisal Framework⁴¹ considered *'more severe intrusion would result from the route through the rising open valley from Bagnor towards Snelsmore Common, which would be visible for a considerable distance from the south'*. Although some revegetation has occurred since the road was built, this does not compensate for the loss of mature woodland and cannot disguise the deep gouge in the hillside. West Berkshire assessed⁴² the impact on the AONB to be *'worse than expected'*.

Figure 7.6: Downland view away from A34



Figure 7.7: Excavation of cuttings for Newbury Bypass and a close-by vantage point in 2016



Image: Chris Gomersall rspb-images.com

Noise impacts of the bypass were also presumed to be *'worse than expected'* by the FYA POPE on the grounds that there had been faster growth in traffic than expected. It reported *'constant background noise from traffic using the bypass'* on the public footpaths assessed, including those near the village of Bagnor and along the towpath of the Kennet and Avon Canal. *'Background traffic noise was noticeable'* at Donnington Castle English Heritage site. Another study at the same date⁴³ noted a Newbury resident's complaint that traffic noise at The Chase National Trust site had stopped him going for walks there. A landscape assessment for West Berkshire in 2009⁴⁴ noted that the A34 had caused loss of tranquillity across many areas. In the Speen Valley, for example, which includes the River Kennet and the Kennet and Avon Canal, it reported that:

'Noise from, and views of, traffic on the A34 extend deep into the area... [the] A34 on embankment [is] very intrusive visually and aurally in west of area'.

The village of Bagnor was mentioned in the 1988 Appraisal Framework⁴⁵ as an area officially recognised for its *'special architectural, historic, or townscape character to be safeguarded and enhanced'* (although the Framework failed to consider noise as an issue for the village). Bagnor village green was described by the Advisory Committee on the Landscape Treatment of Trunk Roads as having *'a quiet and isolated situation alongside the river Lambourn'*⁴⁶. The bypass resulted in constant background noise at this location⁴⁷.

The Appraisal Framework anticipated that the alignment of the bypass along an old railway line would destroy about 2km of footpath and that footpaths would be severed and diverted

at 13 locations^{xxxiii}. This degree of severance was described as 'slight' in the FYA POPE, despite recording West Berkshire Council's assessment that:

'The way that public rights of way were dealt with meant that many routes were severed ... A lot of work was created for the Authority to get the network back to a satisfactory standard...Overall, the Bypass has not been good for the rights of way network and circular walks that were attractive from the town centre are now less so.'

Neither the 1988 Appraisal Framework nor the FYA POPE considered the issue of light pollution, even though the Advisory Committee on the Landscape Treatment of Trunk Roads⁴⁸ had pointed out in 1985 that '*visual intrusions in such an area as this will be enormously increased unless lighting is kept to an absolute minimum*'. Although the bypass is not lit, there is lighting at roundabouts and Tot Hill service area. The A4 junction is a particularly conspicuous source of light pollution due to lighting of two roundabouts and the high-level bridge connecting them over the motorway.

The bypass route passed through many sites of historical and archaeological value, including prehistoric and roman settlement sites and a historic civil war battlefield site. West Berkshire Council reported that:

'The most significant impacts are on the sites of the two battles of Newbury. First battle site – reduced ability to understand the landscape of the battle, also area [now coming] under pressure for residential development between town and the bypass. Second battle site – lost under the A4 Speen junction.'

A number of sites designated for their ecological value were affected by the bypass⁴⁹:

- Snelsmore Common SSSI (and Wildlife Trust nature reserve): bypass cut across south corner of the designated area
- River Lambourn SSSI & SAC^{xxxiv}: bypass cut right across the designated area
- River Kennet SSSI & SAC: bypass cut right across the designated area
- Rack Marsh Nature Reserve (Wildlife Trust): bypass built over half of the reserve

Rack Marsh was the centre of concern for its nationally significant population of a rare snail, Desmoulin's whorl snail. The snail population in the area of habitat due to be destroyed was relocated to another location (Bagnor Island) where work was undertaken to create the necessary environment. However, pipes feeding water to the site silted up and surveys in 2006 and 2011 concluded that the snail had died out in the relocation area⁵⁰.

xxxiii Inspection of maps in 2016 identified the following apparent diversions: Enborne Row (two footpaths diverted sideways by 200m and 150m parallel to bypass); Lambourn Rd (two footpaths cut short by 200m and diverted parallel to bypass to join a road passing underneath); Skinner's Green (new bridge provided but one footpath diverted sideways 200m parallel to bypass to use it); south of Bath Rd (path diverted 300m parallel to bypass to pass underneath); NE of Bagnor (path diverted 200m parallel to the bypass to cross on a bridge); south of Mary Hare School (where a path appears to have been diverted 200m parallel to the bypass to pass under it at a road).

xxxiv Designation by English Nature of the Lambourn and Kennet rivers as SSSIs in 1995 post-dated the 1988 Inquiry that gave the go-ahead to the Newbury Bypass, but pre-dated its construction. European level designation of the rivers as Special Areas of Conservation under the Habitats Directive was in process at the time of construction of the bypass but not completed until after construction.

The 1988 Appraisal Framework⁵¹ noted that the route crossed ‘possible ancient woodlands’ at four places: Balls Plantation (Burghclere), Whittle Copse (Belmont), Hill’s Pightle (Snelsmore) and Packers Copse (Snelsmore). 10,000 mature trees are estimated to have been felled to construct the bypass^{xxxv}. Although saplings were planted alongside parts of the route these will take many decades to mature and even after that time period the landscape, amenity and habitat they offer will still fall far short of the previous ancient woodland in an undisturbed location^{xxxvi}.

7.4 Economic impact

Newbury Bypass was not primarily justified for reasons of local economic development: Newbury was an economically buoyant area prior to the bypass and remains so.

The FYA POPE calculated a monetary benefit for drivers’ time savings^{xxxvii} but did not undertake research into wider economic impacts. It took it to be a self-evident fact that:

‘The bypass appears to have contributed towards making Newbury a more attractive centre for investment, by reducing traffic congestion and diverting much HGV traffic’.

In support of this assertion, the POPE listed every development that had been built in the whole Newbury and Thatcham area since the bypass. Much more development has taken place in the succeeding decade. Although it is not possible to say how much of the development in the Newbury area might have taken place without the bypass, it is now possible to see a clear pattern to the changes in land use, the types of development to date and the proposals for future developments. The pattern shows that the local authority has taken the ‘relief’ of the old road as an opportunity to permit a series of vehicle-dependent developments around the old road that would otherwise probably not have been allowed on traffic grounds.

This drive for development around the old road appears to have been given priority over the environmental benefit from traffic reduction to Newbury residents that was used to justify construction of the bypass, and appears to have over-ridden the idea mooted before the bypass of managing space on the old road to help constrain traffic growth and provide better provision for public transport, walking and cycling. The bypass could have facilitated a development model that located and designed developments so that Newbury functions as a compact town on a walking and cycling scale, serviceable by public transport. Instead, the released capacity on the old road has facilitated an expanded development model reliant on vehicle access.

The next section considers the recent developments in detail and in particular their relationships with the A34 Newbury Bypass and with the old roads it bypassed. It considers

xxxv No official assessment of the number of trees felled appears to be available. An estimate of 10,000 mature trees is widely cited, e.g. BBC 2016 Newbury Bypass 20 years on <http://www.bbc.co.uk/news/uk-england-berkshire-35132816> accessed 03.12.2016

xxxvi WoodlandTrust (undated) *HS2 Factsheet: Compensation and Mitigation for Biodiversity Loss* states that ‘Ancient woodland (land continuously wooded since at least 1600) is our richest land-based habitat, home to rare and vulnerable species, many of which do not colonise new areas easily...Every ancient wood is a unique product of its location and its history...The communities of animals and plants that have developed there over centuries cannot be recreated instantly in new woods. Ancient woods are irreplaceable.’

xxxvii FYA POPE reported that observed journey time savings for through-traffic in 2003 were four minutes off-peak and 11 minutes at peak times.

the development trajectory which has been set and assesses whether it appears on course to provide sustainable growth in the Newbury area.

7.5 Land development impact

Table 7.3 summarises types of impact associated with recent developments in the Newbury area relevant to the A34 bypass.

All the sites in Table 7.3 are either close to the 'old road' (now bypassed and renumbered the A339), or they are close to the bypass, in a setting that was physically altered by its construction so that it became more acceptable to build there.

Developments adding traffic to the 'old road'

The first column in Table 7.3 shows that ten developments are adding (or will add) traffic to the A339. The scale of all of these sites is such that traffic generation is significant. The Vodafone site alone is base for approximately 4000 staff and all the business parks and industrial estates are large. The two largest housing developments at Newbury Racecourse and Sandleford Park are set to add 3500 dwellings between them. Newbury Retail Park and the amenity (waste/recycling) site are smaller in areal extent but are major generators of traffic because of the numbers of people that use them. Five of these sites have dedicated junctions onto the A339. In addition Newbury Retail Park and Hambridge Road Business Park draw considerable traffic through already busy nearby roundabouts on the A339. Newbury Retail Park creates traffic queues along the A339 north of the nearest roundabout and the amenity site sometimes creates traffic queues along the A339 south from its entrance junction as far as the roundabout 0.7 kilometres to the south.

At the time of the initial planning application for the 60 hectare Greenham Business Park in 1995, it was predicted to create 13,000 daily vehicle movements, which appears to have been exceeded even though the site is not yet fully built out and operational^{xxxviii}. West Berkshire Council's concerns about the impact on the A339 led them to stipulate that the site should not fully open until the Newbury Bypass was built. After the bypass was built, however, by 2007 traffic levels on the A339 were such that the council refused an application to build more units on the site due to concerns that the *'road network is already considered to be congested at peak periods, especially along the A339 corridor'*^{xxxix}. Sixty per cent of traffic from the business park heads north along the A339 past Newbury, double the level predicted^{xl}.

xxxviii This information and some other local planning and historical details in this section provided by Tony Forward, Greenham Parish Council Councillor 2001-2014 (Council Chairman 2007-2014).

xxxix Council officers' evidence to the planning committee calculated that with this single application the business park would increase the overload on the southern arm of the A339 roundabout at Pinkington Lane from 102% to 104% (Documentation to West Berkshire Council Western Area Planning Committee 16.05.2007).

xl Discrepancy partly due to weight restrictions preventing HGVs taking another route to join the A4 at Thattham.

Table 7.3: Summary of issues for developments in Newbury area since construction of the bypass (including key developments in the pipeline)

	Adds traffic to A339 old road	Bypass altered setting	Creates congestion	Greenfield site	Car-dependent site	Displaces town centre shops/firms	Light pollution to dark area	Noise pollution to quiet area
Residential								
Market street ‘urban village’: 230 units; 2 ha town centre site by station, close to A339; planning permission 2016. Not car-dependent location but includes 500 space multi-storey car park (whilst just 6% affordable homes). Displaces bus station from its rail-integrated location by the station to far side of the town centre.	✓				(✓)	(✓)		
Racecourse: 1500 units; partly constructed and occupied as at December 2016. Newbury Town Council predicted impact on local roads will be ‘horrendous’. Clearly a green and open site but West Berkshire Council argued it was brownfield due to previous quarry pits. Particularly car-dependent at the eastern end of the development.	✓		(✓)	✓	✓			
Sandleford Park: 2000 units; awaiting planning permission as at December 2016. Includes new junction onto A339. Will put traffic onto A343, one of the roads relieved by A34. This is the site that inspired the novel <i>Watership Down</i> .	✓			✓	✓		✓	✓
Deadmans Lane: 8 ha recent housing development close to A339 but with only indirect access via Pinchington Lane roundabout.	✓			✓	✓		✓	✓
Enborne Row Washwater: 2 ha development of large detached houses abutting the bypass and post-dating its construction.		✓		✓	✓			
Lamborne/Bath Rd: 4 ha site abutting A34. West Berkshire Council proposed allocation for 100 dwellings with landscape assessment to allow housing.		✓		✓	✓		✓	
Mixed residential/business								
London Rd Industrial Estate: declining industrial site that pre-dates the bypass; now being redeveloped with mixed commercial and residential units. A flagship redevelopment for Newbury. Main access to be from A339. New link road from Faraday Rd to a new junction on A339 (according to Newbury 2026 ‘vision’ document).	✓				✓	✓		

	Adds traffic to A339 old road	Bypass altered setting	Creates congestion	Greenfield site	Car-dependent site	Displaces town centre shops/firms	Light pollution to dark area	Noise pollution to quiet area
Business/retail/other								
Hambridge Rd Business Park: very large site; not a new site but considerable redevelopment since the bypass. Creates congestion on King's Road link to A339. Includes a steadily increasing number of retail businesses e.g. hair salons.	✓		✓		✓	✓		
Newbury Retail Park: present before bypass but has grown subsequently. Further building works on site as at December 2016. Creates queues along A339, particularly at weekends.	✓		✓	✓	✓	✓	✓	✓
Greenham Business Park: site opened prior to the bypass but has much expanded since the bypass was constructed. Accessed from A339. Due to traffic concerns, the site was not permitted to fully open until bypass opened. Predicted to generate 13,000 vehicle movements daily; a local source says traffic has exceeded predictions. Mainly storage and transport firms but also firms and retail services that could otherwise be in town centre.	✓		✓	✓	✓	✓	✓	✓
Vodafone site: 'campus' of seven 3-4 storey office blocks over 12 ha employing 4000 people. Accessed from A339. Highways Agency refused expansion of the site unless the bypass went ahead and the A339 was de-trunked. Vodafone previously occupied several office buildings in the town centre.	✓			✓	✓	✓		
Tothill Services on bypass: site built with the bypass (within the AONB) in 1996 to provide services (fuel, food, accommodation).		✓		✓	✓		✓	
Amenity Site: recycling/waste disposal site that post-dates the bypass. Accessed from A339 at a dedicated junction. Cars sometimes queuing on the A339 back to Swan roundabout. Was a farm, but West Berkshire Council argued it was brownfield because the barns had been used for storage. Noise affects residents on the far side of the A339.	✓		✓	✓	✓		✓	✓

With further investigation other sites could probably be added to this table. Newbury College has built on a site near the A339 since the bypass. A major site spanning the A339 adjacent to the Vodafone site was assessed by West Berkshire Council as capable of development for 550 dwellings and shortlisted as a preferred site in 2014. The council no longer appears to be treating this as a strategic priority site, but the developer has challenged the council's re-designation, claiming its strategy is not compliant with the National Planning Policy Framework.

Car-dependent location and design

Table 7.3 shows that a large majority of the developments took place on out-of-town sites and that all but one are in locations where the only realistic expectation is that a majority of users will rely on private vehicles for transport. Figure 7.8 shows the car-oriented design of Newbury Retail Park, which was built on what, at the time, was the outermost edge of the built up area of Newbury. Figure 7.9 shows new development close by that has subsequently expanded the built up area southeast of Deadmans Lane. This urban form, of large detached houses spread out over a large area, encourages car use and is insufficiently dense to support provision of either public transport or shops within walking distance^{xli}.

Figure 7.8 Newbury Retail Park



Figure 7.9 New housing off Deadmans Lane



Image: © 2016 Google

Some of the new housing developments are built to a higher density, but are laid out in ways or in locations that make high car use inevitable. The Racecourse development includes six storey flats (Figure 7.10) but these will be strung out in a line along the whole northern side of the racecourse so that the effective design is a ribbon development that creates long distances to the town centre and its facilities, particularly from the east end. The eastern end of the development will be about 2.4 km from the town centre. Even the western end, 0.8 km from the town centre, does not appear to have pedestrian and cycling links to the town centre and elsewhere that are sufficiently attractive to result in a high proportion of trips being made by these modes. The A339 dual carriageway (the 'inner relief road' – the first bypass) severs this area from the town centre and has to be crossed via an unappealing subway. The developer's marketing of the flats (*'Direct commuter links to London...The best of town and country'*⁵²) primarily appears to be marketing these flats as dormitory homes for people to commute out of Newbury, or as country retreats, rather than as homes for people to live and work locally.



Figure 7.10 Development of flats along north side of Newbury Racecourse

xli In this case, Newbury Retail Park and a large supermarket are close by, but the access to these sites via major roads and large car parks is such that local residents will tend to drive to them anyway.

Site visits to the housing developments listed in Table 7.3 lead to the impression that nearly all are either built in a form or are situated in a location that will lead to high car use, or both. The planned Market Street development appears set to be an exception so far as its residents are concerned, but it will be accompanied by a 500 space car park that will encourage others to make trips into the town centre by car.

Development undermining town centre viability

This sprawling style of development also has other consequences. Not all the firms moving to these sites undertake activities that need to be out-of-town, or would be inappropriate to a town centre location. QTR Transport's warehousing and distribution business at Greenham Business Park really does require large amounts of space and HGV access (although in this case, the firm is also not appropriate to this location on the A339, a road that was supposed to be relieved of HGV movements by the construction of the Newbury Bypass). However, many of the companies situated on business park sites are firms whose activities could otherwise be contributing to a thriving town centre. Figure 7.11 shows a hairdressing business on Hambridge Road Business Park, a business that has no requirement for an out of town site, except in so far as that provides cheap accommodation that will enable it to undercut town centre providers of the same service. Its advertising criticises the town centre in a bid to win business from town centre salons *"We are easily accessed on the outskirts of Newbury town and we have plenty of free parking, so you won't have to traipse around town looking for a free slot"*. This is in conflict with West Berkshire's vision document for Newbury⁵³ which states that *"One of our ambitions is to create a more vibrant town centre"*.

Figure 7.11 Hairdressing salon on Hambridge Road Business Park



Image: © 2016 Google

Similarly, Vodafone's head office site does not require HGV movements, or noisy polluting processes. It does need to draw many skilled specialist staff from a wide catchment area, for which a location close to a public transport hub is ideal. However, it moved from its town centre offices within walking distance of the station to a location far out of town, where much of the site is taken up with a ring of seven double-deck car parks to accommodate all the staff who can only reach the site by car (Figure 7.12).

Figure 7.12 Vodafone site car park management display and double-deck car parking



Poor matches to local employment needs

Vodafone is probably the sort of high-skill high-wage employer all towns want to have. However, it is questionable whether much of the employment at the business park sites is of a kind that Newbury would ideally want. For example, Provender's food processing operation at Greenham Business Park requires large numbers of low-skill low-wage employees. When it set up in the Newbury area, which has very low unemployment, it found it necessary to bus in its workers from as far afield as Portsmouth^{xlii}.

Greenfield development

A further consequence of this sprawling type of development is the amount of countryside consumed. This issue is at the forefront of the campaign against the Sandleford Park housing development, which makes the point that it will build over land featured in the beginning of the Richard Adams novel *Watership Down*. Figure 7.13 shows some of the designated land (the orange signs are the planning notices at the edge of the site). This site is central to West Berkshire's housing development strategy⁵⁴ despite being beyond the built up area, distant from the town centre and reliant on the A339, the 'relief' of which was a prime justification for construction of the Newbury Bypass.

xlii Information from Tony Forward, Greenham Parish Council Councillor 2001-2014 (Council Chairman 2007-2014).

Figure 7.13 Sandleford Park land earmarked for development



Failure to plan around public transport and create a pleasant town for walking and cycling

The overall pattern of development around Newbury is one of dispersed developments at highly car-dependent locations that are already bringing increased traffic pressure onto the old bypassed road and are set to add to that pressure until the congestion on the old road reaches or exceeds its pre-bypass levels. These types of development cannot viably be served by high frequency public transport and are unpleasant and distant for access by walking or by cycling. The A339 corridor is an obstacle to cyclists rather than the strategic cycling corridor it might have become.

This loading of development and associated traffic onto the old road undermines the Newbury Bypass Inspector's original reason to allow the bypass to be built despite the large amount of environmental damage it would cause:⁵⁵

'I consider that the PR [preferred route] does pass the environmental test, for, whilst I accept in landscape terms on the west of Newbury the PR would be very damaging in places, it would provide considerable relief to the people of Newbury who live along the present route'.

Thirty years later, it is clear that the approach to development has not given that 'relief' any of the weight accorded to it in the Inquiry, and instead has chosen to concentrate development on the old road despite knowing that the traffic impacts would be considerable. The council's priority now is to enlarge junctions and parts of the road to reduce the resulting congestion:

'Reduced journey times and greater reliability for road users will be sought through ongoing improvements to the road network including the A339 corridor'⁵⁶.

This does not give the impression of being the type of approach to local development that could benefit Newbury most, or being a development strategy that will be economically (or environmentally) sustainable.

7.6 Conclusions

Traffic impacts

The A34 Newbury Bypass has resulted in a 77% increase in traffic on the corridor between 1997 and 2015. This is over four times the rate of traffic growth in the county and over six times the rate of traffic growth in the region.

Environmental impacts

Landscape and other environmental impacts of the bypass were anticipated to be severe and have proved to be. The bypass has caused considerable detrimental impacts on scenery, amenity value, tranquillity, historical/archaeological sites and ecology. A nature reserve was halved in size, SSSIs were severed, and a wide area of formerly fine countryside that used to offer a pleasant tranquil environment has lost a great deal of what made it attractive and useful to the local population and visitors. Trees planted alongside the bypass are now two decades old but will only ever provide a poor substitute for the irreplaceable ancient woodlands that were felled.

Land use impacts

The A339 corridor along the 'old road' has been the focus for much new development. It is not clear how much of this development might have taken place somewhere in the Newbury area even without the bypass. However, it is evident that development policy for the bypassed A339, rather than seeking to lock in the traffic 'relief', has instead used the road as an opportunity to build new traffic-generating developments, with the result that local policy is now to enlarge the road to reduce congestion and lessen greater delays likely to occur with further planned developments.

Economic impacts

Developments are generally in designs or locations that are liable to be car-dependent, or both. Many of the businesses located on edge-of-town or out-of-town developments would be suited to a town centre location, but in their present situations tend to displace economic activity from the town centre, in contradiction to the council's intended town centre rejuvenation objectives.

One of the largest housing developments presently being built is being marketed as dormitory accommodation for its residents to commute out to London. Meanwhile, at least one of the businesses on Newbury's development sites has found it necessary to bus in cheap labour from far afield because it could not source this locally. This situation does not appear sensible from either a transport perspective or an economic perspective, and raises questions about the sustainability of the local economic and development strategy.

8. M65 Blackburn Southern Bypass Case Study

8.1 Introduction

The M65 in Lancashire runs from just south of Preston through to Colne. It was built in sections and was originally planned to go via Blackburn town centre but this was opposed by the local council and a bypass route south of the town was selected. The M65 Blackburn Southern Bypass, which opened in 1997, runs from Bamber Bridge, south of Preston (Junction 1A), where it connects with the M6 and M61, to east of Blackburn at Whitebirk (Junction 6) (Figure 8.1). It is mostly two lanes from Junctions 2 to 6 (although there are a number of 3-lane sections for climbing), but was built with overwide structures to allow for possible future widening^{xliii}.

Figure 8.1: Route of M65 Blackburn Southern Bypass Junctions 1A to 6



© Streetmap

Table 8.1: M65 Blackburn Southern Bypass overview

Region	North West
Opening date	1997
Scheme length	21km
Scheme description	New motorway section, mostly two lanes, south of Blackburn
Available evaluation reports	Predates POPE studies
Scheme cost	£147 million (1990 prices)

xliii Most of the M65 is two lanes with three-lane sections at the western end between the M6 and M61 junctions and on the eastern section from Junctions 6 to 9 between Blackburn and Burnley.

A public inquiry into the M65 Blackburn Southern Bypass was held in 1990. The case for the motorway presented by the Department of Transport included reducing transport costs; removing traffic from unsuitable roads in towns and villages; and improving road safety⁵⁷. Construction of the motorway generated considerable opposition with road protests centred on Cuerdon Valley Park, at the western end of the scheme, and Stanworth Valley Woodlands, an area of ancient and semi-natural woodland near Tockholes. Stanworth Valley became a cause célèbre due to the ‘village in the sky’ of around 40 tree houses occupied by road protestors and connected by 4km of aerial walkways, leading to a protracted eviction process⁵⁸.

The scheme predates the inception of post-opening project evaluation (POPE) studies and there does not appear to have been any Post Implementation Evaluation Study (PIES), the precursor of POPE. There have been a number of traffic studies since opening to address persistent traffic growth and junction capacity problems, and a number of changes made to junctions south of Blackburn. There are currently studies into further widening of the M65 between Junctions 2 and 6, and extension of the M65 eastwards⁵⁹.

The route of the motorway was originally mainly through open countryside. Although the landscape around the western end at Junction 1 and between Junctions 4 and 5 is now semi-urban, the road passes through open farmland from Junctions 2 to 3, and through the West Pennine Moors^{xliv 60} between Junctions 3 and 4 which form a dramatic backdrop to the south of Blackburn. East of Junctions 5 and 6 is also open countryside^{xlv 61}. Most of the countryside surrounding Blackburn and Darwen urban areas is Green Belt.

Blackburn with Darwen Borough Council, a unitary authority, is part of Pennine Lancashire, a strategic group of five East Lancashire local authorities which form an economic and ‘travel to work’ area within Lancashire. Pennine Lancashire has reportedly struggled to keep up with neighbouring areas in terms of economic activity for a number of years⁶². Blackburn with Darwen is relatively economically deprived. It is classed as a manufacturing centre in the ONS 2011 Area Classification, and manufacturing is still the main employment, though unemployment levels are high relative to neighbouring areas and the region as a whole^{xlvi 63}. The motorway may therefore be categorised as in a location with a ‘struggling economy’.

8.2 Traffic impact

Traffic on the M65

At the Inquiry the Inspector stated that *‘it was not expected that the road would need to be widened during its design life’*^{xlvii 64}. However, by 2010, traffic flows between Junctions 3 and 4 were 35% higher than the high growth forecasts for that year (even though actual growth

xliv The West Pennine Moors is a locally designated area ‘of open countryside, a patchwork of moorland, reservoirs, wooded cloughs and historic villages and cities’ managed by seven local authorities to conserve and enhance its natural and cultural heritage. Natural England has recently notified a large area of upland moorland habitat in the West Pennine Moors, south west of Darwen, as an SSSI.

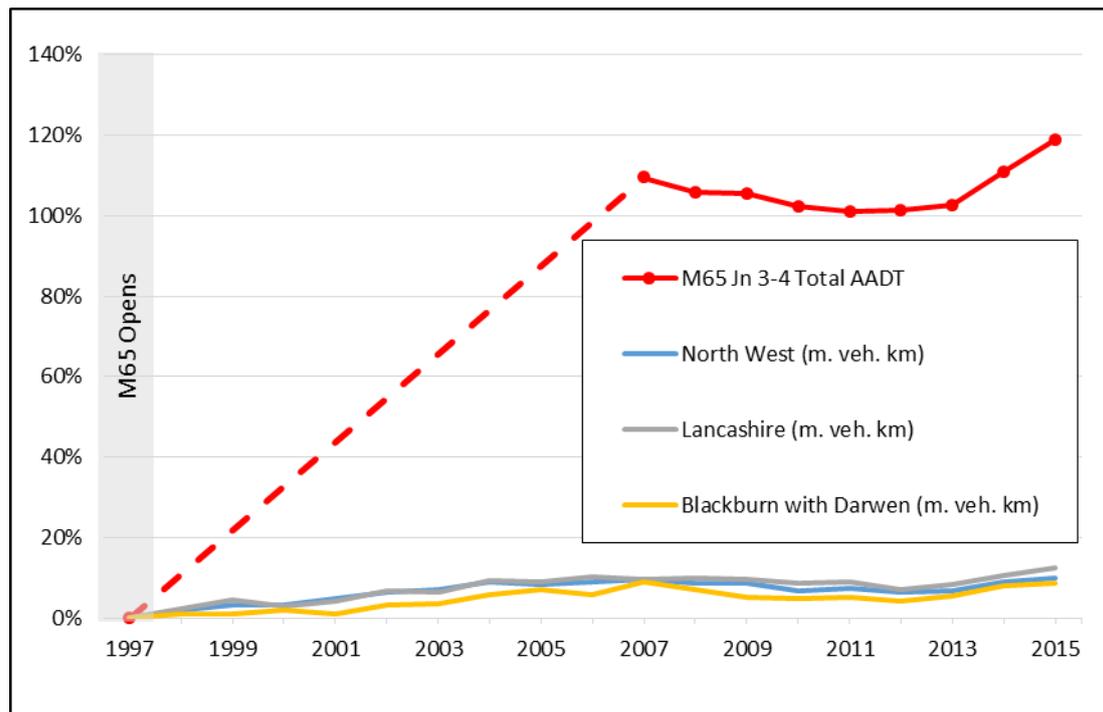
xlv The M65 Blackburn Southern Bypass cuts through several landscape character types and areas including Undulating lowland farmland, Moorland Hills, Moorland Fringe and Industrial foothills and valleys.

xlvi In 2015, unemployment rates in Blackburn with Darwen were 7.4% compared to 5.7% in Burnley and Preston, 5.8% in Hyndburn and 5.3% for the North West region.

xlvii The Design Year is defined as 15 years after opening, i.e. 2010 based on a predicted opening in 1995.

nationally turned out to be much lower than the national traffic growth forecasts on which this was based) (Table 8.2). Traffic has grown by around 4% per annum since the motorway's opening. In 2015, traffic flows between Junctions 3 and 4^{xlviii} were more than 100% higher than the forecasts on opening (Table 8.2), and have completely outstripped traffic growth in Blackburn (9%), Lancashire (12%) and the North West region (10%) over the same period (Figure 8.2)^{xlix}.

Figure 8.2: Increase in traffic (AADT) on M65 Junctions 3-4, compared to regional and local growth



See notes to Table 8.2 for source of data.

Table 8.2: Changes in traffic flows (AADT) on the M65 between Junctions 3 and 4

	1995 AADT	Scheme opens	2010 AADT	2015 AADT	Change in AADT 1995-2015
Actual flows ^a	25,250 ^b		51,113	55,238	+29,988 (119%)
Predicted flows	24,100- 26,400 ^c		30,600- 38,000 ^d	n/a	

a: Highways Agency WebTRIS data from TMU 9021/1 eastbound and TMU 9022/1 westbound.

b: In the absence of any data the average of the low growth and high growth forecast on opening have been used to estimate the actual traffic flows on opening.

c: Department of Transport forecasts on opening. Figures from the Public Inquiry.

d: Department of Transport forecasts for design year. Figures from the Public Inquiry.

xlviii Traffic growth between 1997 and 2015 was 53% between Junctions 5-6. No recent traffic count data is available between Junctions 2-3 and Junctions 4-5. Given the large amount of development between Junctions 4-5, and the fact that traffic flows in 2004 were already 80% higher than those forecast on opening, it is likely that traffic growth between Junctions 4-5 may have been even higher than between Junctions 3-4.

xlix Data for traffic growth in Blackburn with Darwen, Lancashire and North West from DfT statistics TRA8904.

There is no reliable data for other roads to generate a screenline across a wider corridor. Although it is likely that traffic flows will have fallen on the original trunk roads through Blackburn with Darwen, traffic across a wider corridor is still likely to have increased by a significant amount, and higher than forecast.

Although we have no data for traffic flows between 1997 and 2007, it is likely that the growth over this period (shown by a dashed line in Figure 8.2) was non-linear, increasing rapidly after the motorway was opened. Between 2008 and 2014, coinciding with the economic downturn, traffic stopped growing on the motorway. However, from 2014 onwards, the growth in traffic resumed, and exceeded that at the borough, county and regional levels.

Peak flow congestion at some junctions has been a problem since at least 2005¹. In 2015 the M65 was operating at near capacity at peak times on certain links, particularly westbound between Junctions 5 and 4 (PM peak) and between Junctions 2 and 3 (AM peak)⁶⁵. Many of the eastbound links also showed signs of stress. It is predicted by 2026 capacity will be exceeded at the majority of junctions at both the morning and evening peak hours⁶⁶.

The build out of local employment sites and housing sites in proximity to the corridor, and upward trends in car ownership and usage, are contributing to the traffic growth⁶⁷. Local transport experts also consider that some of the growth is due to drivers using the M65 to avoid other saturated motorways such as the M62 and M60⁶⁸. There has been particularly high growth in HGVs, attributed to the growth in warehousing and pallet-type businesses attracted by the relatively cheaper cost of units in East Lancashire⁶⁹.

As a result of the continued growth and congestion there is pressure to widen the road and there are studies to investigate extension of the M65 eastwards and widening the M65 between Junctions 2 and 6 respectively⁷⁰.

Traffic on other roads

One of the original justifications for the motorway was removal of through-traffic from existing roads, with a key benefit that it:

*'Relieves the existing sub standard route north of Blackburn and provides relief to existing east west routes between Blackburn-Preston and Blackburn-Chorley'*⁷¹.

Government predicted major flow reductions on the existing trunk road A6119/A677/A59 (see Figure 8.1) *'which will improve the environment for the communities which border the route'*⁷². It also predicted that roads in South Blackburn and Lower Darwen which acted as a southern ring road would see a large reduction in traffic including the removal of many commercial vehicles which serviced the existing industrial areas.

The original A677 trunk road through Blackburn was monitored between 1997 and 1998, before the construction of the motorway and for one year afterwards. Over this time traffic fell from 29,917 to 16,995 vehicles per day (AADT), a 43% drop⁷³. This is in line with predictions that traffic would be reduced by 30-50%.

¹ For example, traffic queueing at Junction 6 during the morning peak, according to Matson et al. (2006).

Many of the traffic monitoring sites used originally for the Inquiry are no longer active, so it is not possible to make any direct comparisons with recent traffic levels, while published DfT traffic data for Blackburn with Darwen is only for 2000 onwards and not directly comparable. However it is likely that traffic on some other local roads would have fallen after the motorway opened.

The 2011 Local Transport Plan for Blackburn with Darwen notes that congestion levels in the borough are 'high' despite low car ownership levels, and air quality 'poor' particularly at locations associated with corridors into the two town centres and into major employment sites⁷⁴. Some of this congestion will be associated with population growth^{li} and local traffic changes. It is notable however that congestion hotspots⁷⁵ within the borough include a number of approach roads or alternative routes to the M65^{lii}. Capacity issues on the M65 have led to some local roads, such as the A6119/A677 route to the north of Blackburn, being described as 'crucial links' to the M6⁷⁶.

Traffic on the A6077 (the approach to Junction 5) in 2015 is double what it was predicted to be on the opening of the motorway^{liii}. This has caused significant congestion around the approach to Junction 5 at Guide and Shadsworth, which contrasts with the predictions in the Environmental Statement that *'The communities of Lower Darwen, Guide, Shadsworth and Intack will all experience environmental improvements as the existing roads return to their original function as local distributor roads.'*⁷⁷

The congestion around Junction 5 has led to numerous traffic schemes over the years such as full signalisation in the last 12 months. However as soon as works were completed there was a 7% increase in traffic at the junction⁷⁸. There is a limit to what further works can be done on Haslingden Road to increase traffic capacity, and it is unclear what the impacts of further motorway widening will be on this particular, already congested, corridor^{liv}.

Car ownership in Blackburn with Darwen has increased significantly in the last 20 years^{lv79}, and there is great reliance on the private car for travel to the town centre and major employment destinations, with 77% of those in employment at non-home locations using a car or taxi to get to work⁸⁰. Tellingly, in 2011 more residents of Blackburn with Darwen travelled to work by taxi than by train⁸¹.

'...it's so easy to jump in your car and go down the motorway than go up and down the high street. I know people who go to Sainsbury's three times in a day because they've forgotten something. I think the growth in out of town shopping areas have killed a lot of local businesses' Darwen local resident, Sarah Arnold.

li Blackburn with Darwen population increased from 137,470 at the 2001 Census to 147,489 at the 2011 Census, a growth of 7%.

lii Blackburn to Darwen (A666); Blackburn to Whitebirk (A677/A679); Preston Old Road (A674); Whitebirk Drive (A6119); Haslingden Rd Corridor (A6077).

liii Traffic flows for 1995 (predicted opening of the M65) were 15,000-16,400 without the motorway and 10,000-10,900 with the motorway. In 2015 traffic flows were 22,231 (DfT figures for monitoring site 99558 between M65 and Bennington St.)

liv Part of the growth on Haslingden Road is due to the Royal Blackburn Hospital, a large and busy regional unit. This opened in 2006 and consolidated a number of local facilities which closed down elsewhere. The good access to the M65 was a factor in its location to this site.

lv 59% of Blackburn households owned cars in 1991, and 69% in 2011: an increase of 10%-points, compared to a national increase of 3%-points.

Blackburn with Darwen Council has implemented a number of sustainable transport measures as a result of its LSTF-funded BwD Connect project 2012-2016⁸². This has supported capital investment in the local bus and cycling networks (complementing the Pennine Reach rapid bus transit and Weavers Wheel cycling network major schemes) and is working with businesses across the borough (including on the Haslingden Road corridor) to encourage more sustainable modes of transport for the commute to work. There has also been investment in the local rail network at Darwen to provide the necessary infrastructure required to deliver a half hourly timetable along the corridor⁸³. However, Council officers note that:

'...the desire for growth in the UK economy will ultimately lead to greater demand for travel and the potential for more car trips'⁸⁴.

For example, there are plans for further large developments at Junctions 1 and 6 (discussed in section 8.4) which will generate considerable additional traffic. The application for a strategic employment site at Whitebirk Drive, Junction 6, was opposed by the county highways authority which predicted traffic queueing and rat-running within Blackburn, and was concerned that the development *'has the potential to lead to high car dependency'* and *'generate higher levels of car use on surrounding road network'⁸⁵*. There was also concern it would exacerbate air quality for local residents^{lvi} ⁸⁶. Planning permission was conditional on further works to the Junction 6 roundabout, measures to control traffic and a 'Green Travel Plan' though the application indicates this aims for a relatively unambitious 10% modal shift over five years^{lvii}. While this site is described as being *'reasonably well served by public transport'* councils are facing profound cuts to public finances which impacts non-commercial bus services and other sustainable transport solutions.

8.3 Landscape and other environmental impacts

There are no nationally designated landscape or nature conservation sites in the vicinity of the M65 Blackburn Southern Bypass but it impacted a number of areas sensitive for their landscape or wildlife value including a number of informal sites of scientific interest. This included⁸⁷:

- Effects on Cuerdon Valley Park – loss of 21 ha of land including some ancient woodland of high ecological value, wetland habitat and severance of the Park.
- Effect on woodland at Stanworth Valley, Sheep Bridge Brook and Stockclough Brook – areas identified as rich in bird and plant life and woodland classified as ancient.
- Impact on trees covered by Tree Preservation Orders at several sites including Cuerdon Valley.
- Extensive destruction of woodland and hedgerows.
- Loss of 200 ha of agricultural land including pasture, grassland and marsh.

lvi Blackburn with Darwen has a number of Air Quality Management Areas (AQMA), hotspots which are close to an exceedance of national air quality objectives, including one at Intack (Accrington Rd/Whitebirk Rd).

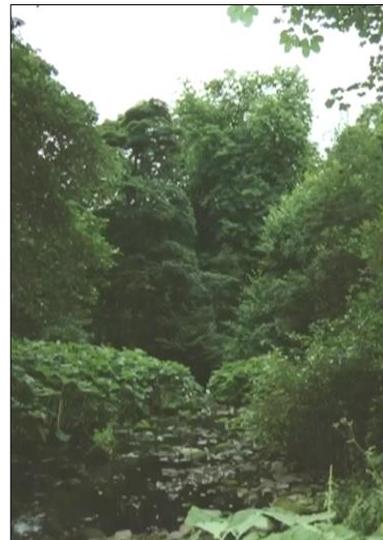
lvii DfT guidance from 2009 is that a reduction of between 10-20% in car use over three years is reasonable. DfT (2009) *Good Practice Guidelines: Delivering Travel Plans through the Planning Process*.

- Impact on approximately 11km of a then locally-designated Area of Special Landscape Value, which was dismissed by the Inspector because *'in my opinion ... much of the area is a good deal affected by the sight and sound of traffic on these [existing] roads'*⁸⁸.
- Impact on approximately 14km of Green Belt.
- High visual intrusion at Cuerden Valley Park, crossings of Leeds Liverpool canal, Stanworth Valley; A666 and the cutting through the ridge at Guide. Moderate intrusion was predicted to result from the alignment through open countryside.

In Cuerden Valley Park, the Highways Agency paid for the Cuerden Valley Park Trust to plant 30,000 trees and to move bluebells, with some follow-up monies for care and maintenance to get the plants established. These measures were reportedly relatively successful⁸⁹ and this impact is not addressed further here.

The M65 route crosses the narrow steep-sided Stanworth Valley (east of Junction 3) which was described in the Environmental Statement as an *'area extremely rich in bird and plant life with many rare species particularly in the marsh area adjacent to the stream in Stanworth Valley Woodland classified as ancient'*. This area was subject to sustained environmental protests which lasted for over a year with non-violent direct action and an extensive village of tree houses connected by rope walkways.

Figures 8.3 and 8.4: M65 under construction; undamaged woodland in Cuerdon Valley before the road was built



Images: M65 Link Road Protest Group

In mitigation the Appraisal Framework noted *'The effect on the valleys is reduced by using viaducts as opposed to embankments. Ground cover would re-establish itself beneath the viaducts'*, while the Environmental Statement noted that *'Planting along the side slopes of the route will eventually help to ameliorate the loss of habitat in this area'*. Photos taken in 2016, some 20 years after the road was built, suggest that ground cover under the viaducts is poor and of low ecological value, while tree cover in the immediate vicinity of the viaducts remains relatively sparse, compared to the dense vegetation in other parts of the woodland.

Figures 8.5 and 8.6: Sparse tree growth and poor ground cover around and under the viaducts at Stanworth Valley woodlands



The route also destroyed 1.2 ha of woodland and severed woodland stream corridors at Sheep Bridge Brook, east of Stanworth Valley, another area classified as ancient woodland and extremely rich in bird and plant life⁹⁰.

There were no details of any ecological surveys taken before the M65 was constructed, so the long term impacts are hard to assess. However aside from the direct loss of habitat, there will be long term impacts of noise and lighting on birds, bats and other mammals, as well as direct severance impacts from the road.

In addition to landscape and ecological impacts the new road was predicted to result in noise impacts on approximately 1,000 houses within 300m of the centre line⁹¹. However a 2008 study for the Noise Association reported that even households one mile (1.6km) from the road experienced significant noise disturbance at home and that the traffic noise had worsened considerably over time⁹²:

'In the summer when the weather's hot, if you leave the bedroom window open you get woken up at half past six because it's very noisy in those weather conditions. The traffic starts to get heavy at that time'⁹³.

The M65 has also negatively impacted on amenity, and areas previously enjoyed for recreation:

'I used to go walking in the Stanworth woods a lot, with the dog. It's a lovely walk, especially when the bluebells are out, but we don't very often do it because it is really bad, noisy. I wouldn't take people down there now. We always tend to go towards the moors and round Roddlesworth'⁹⁴.

The motorway construction involved relocation of several footpaths, particularly in the area between Junctions 3 and 4. Several of the footpaths run directly adjacent to the road for several hundred metres, and are subject to high noise and visual intrusion (Figure 8.7).

Fig 8.7 Relocated footpath immediately adjacent to the M65, part of the regional walk the Witton Weavers Way



Image: © Martin Porter

A published route of a five-hour walk through Lancashire countryside included this description:

Follow the path alongside the motorway, taking care to observe the interesting debris on its verges. When I was there these included plastic bags, fast food containers, a ring-binder file and what looked like a pair of trousers... Mercifully, you are soon on a quiet country road again^{lviii}.

8.4 Economic impact

There have been reports since the 1960s which concluded that the future growth and prosperity of the Calder Valley (from West Yorkshire to south of Blackburn) depended upon a fast route through it⁹⁵. The predicted benefits of the Blackburn Southern Bypass section were listed in promotional material⁹⁶ at the time as:

- *'Promotes the economic regeneration of the Calder Valley towns'*
- *'Serves the key industrial areas to the south of Blackburn thereby helping to stimulate industrial development'*
- *'...considerably enhance[s] the opportunities for developing several major industrial sites now available on the southern periphery of Blackburn and in Darwen.'*

In his conclusions at the public inquiry the Inspector noted that *'much of the development achieved recently has been in the expectation of the Blackburn Southern Bypass being built as planned'*⁹⁷.

lviii The Greenman (2013) Blog 18 May 2013. <http://thesnufkin.blogspot.co.uk/2013/05/protest-walks-2-bluebells-in-stanworth.html>. Ugly fly-tipping from the hard shoulder off the Stanworth Valley viaduct into the woodland below was also documented in the 2006 CPRE study, and observed on a site visit in late 2016.

There is still a widely held perception that the M65 has contributed to economic growth and is of strategic importance to the regional economy⁹⁸. In a 2015 study for Blackburn with Darwen Borough Council to identify sites for future development for employment use, many of the identified sites were at or near to M65 junctions^{lix}. These include the large Whitebirk Strategic Employment Site near J6 (in Hyndburn but adjacent to Blackburn's urban area). Another study suggested that current demand for employment land in Pennine Lancashire is being driven by distribution / logistics uses close to the M65 motorway junctions⁹⁹. Sites along the M65 are identified as key logistics locations¹⁰⁰.

However the M65 is also a victim of its own success. The continued traffic growth and congestion is limiting further development of employment sites. According to Lancashire Enterprise Partnership:

*'The predominantly two lane section between the M61 (Junction 2) and Whitebirk (Junction 6) is increasingly becoming a bottleneck, reducing the ability of the M65 to function as a key gateway for East Lancashire'*¹⁰¹.

A planning document for Pennine Lancashire noted that *'the potential for conflict between economic growth and sustainable travel objectives is particularly evident with regards to the M65'*¹⁰². Highways England has already expressed concern about the capacity of the M65 to accommodate additional large-scale sites close to junctions. It is also acknowledged that better economic conditions create more traffic: the East Lancashire Highways and Transport Masterplan notes that *'...too much congestion hampers business and makes travel difficult for everyone'*¹⁰³. Hence the calls for further widening, in the belief this will improve inward investment.

While the M65 has created a number of jobs at sites near to junctions, unemployment in the Blackburn with Darwen area is higher than in neighbouring authorities and the Lancashire and regional averages. Wage levels also lag behind regional and national levels, with a productivity gap of over £1bn with the rest of the North West; median weekly earnings in Blackburn with Darwen were £388 in 2015, compared to £489 in the North West¹⁰⁴. Blackburn is a net importer of workers (net inflow of 5,460 people each day) *'many of whom use the M65 corridor to access the borough which is now at capacity at peak times of the day'*¹⁰⁵.

Blackburn with Darwen suffers from severe levels of deprivation, and in 2015 was ranked the 12th most deprived local authority in England, with nearly one third of its neighbourhoods in the most deprived 10% of neighbourhoods nationally¹⁰⁶. Compared to the five most similar local authorities in England in 2015, Blackburn with Darwen has the second highest level of deprivation and unemployment rate (after Bradford)^{lxi}. It does however have the highest level of job density (number of jobs as a percentage of population)^{lxii}.

lix Whitebirk industrial estate (6.1ha adjacent to J6); Furthergate Phase 1 (4.2ha in vicinity of J6); Plot C Shadsworth (1.9ha adjacent to J5); Waterside Employment Site Haslingden Rd (6.3ha J5); Premier Way Walker Park (2.6ha J5); Commercial Way (3.4ha J4); Whitebirk Strategic Site (12.8ha, J6). BE Group (2015) *Commercial Property Market Study*.

lx In 2015 Blackburn with Darwen had an unemployment rate of 7.4% and a job density of 0.78.

lxi The five most similar local authorities are Oldham, Bradford, Rochdale, Kirklees and Bolton, from ONS 2011 Area Classification for Local Authorities. Deprivation rates from DCLG English Indices of Deprivation 2015.

A 2011 sustainable transport funding bid acknowledged that accessibility in the borough was poor and a barrier to development, with travel cost and journey times still significant barriers to those seeking employment¹⁰⁷. Especially given the low levels of car ownership in the Borough, employment opportunities need to be highly accessible by public transport or walking and cycling. Yet many of the key employment sites are located in areas that are much more accessible by car than other modes.

Despite improvements to the rail network in East Lancashire it still suffers from numerous deficiencies^{lxii} and there is a strong perception locally that East Lancashire is poorly connected in terms of both road and rail, which is having a negative impact on economic development¹⁰⁸. Despite recommendations for electrification of the lines between Preston and Colne/Leeds and Clitheroe and Bolton, these have not been included in the latest government plans¹⁰⁹. A local campaign group is working on a new 12 mile missing section of rail between Skipton and Colne¹¹⁰. This would connect to the existing rail network and thus form a modern line from Leeds to Burnley, serving major towns in East Lancashire with a total population of over a quarter of a million people. This has an estimated cost of £100 million which campaigners hope will be included in the Transport for the North's list of rail priority projects. The reinstatement of the Skipton-Colne railway, with its associated improvements in connectivity, could improve travel to work opportunities¹¹¹.

While the M65 has undoubtedly facilitated the creation of jobs at the sites near to junctions it is highly likely this is pulling in workers from other areas and undermining regeneration of the central urban areas. For example, relaxation of trading restrictions at a large 'bulky goods' retail centre at Junction 6 in the neighbouring borough of Hyndburn was opposed by Blackburn with Darwen Borough Council due to the effect on the vitality and viability of the town centre. The Planning Inspector who upheld Blackburn with Darwen Council's appeal acknowledged that the costs and risks of town centre sites were higher but *'the contribution made by private sector town centre schemes is particularly important in towns which suffer from various forms of socio-economic disadvantage'*. The Inspector concluded that the threats to vitality of the town centre significantly outweighed the benefits in terms of jobs created at the retail site¹¹². In 2016, planning permission was controversially granted by Hyndburn Council for a new discount food store at the site, a decision described as 'disappointing' by the head of regeneration at Blackburn with Darwen Council, who has asked the Secretary of State to call in the decision¹¹³. There are already two similar stores in Blackburn.

Similarly to the impacts of out-of-town retail, it is also likely that the large number of office units located at Junction 4 is depressing the market for office space in the town centres.

Unemployment rates and job density from ONS (2016) *LI01 Regional labour market: Local indicators for counties, local and unitary authorities*.

lxii Low service frequency, slow journey times, poor service reliability and passenger facilities and low rail usage.

Figures 8.8 and 8.9: Office-style units at Junction 4 compete with office space in Blackburn and Darwen town centres



The plans for a 35ha mixed employment site near Junction 6 have changed over the years. A development brief from 2001 had the objective of facilitating high quality employment (mainly light industrial and research and development) and limiting the amount of warehousing, storage and distribution. However, the proposal granted planning permission in 2015 was largely warehousing. This was partly justified on the basis of research that showed warehousing provided better pay and GVA than manufacturing¹¹⁴. However the study indicated that most of the jobs will be ‘manual picking’ which on recruitment websites typically tend to be hourly rate jobs. The economic study in support of the planning application estimated the site would create 1,742 net jobs and assumed the majority of these would be taken up by the residents of Blackburn with Darwen¹¹⁵. The study suggested that the site ‘can provide the local economy with a step change in its economic fortunes’. Yet, 20 years after the bypass was built, other similar sites provided have not so far resulted in any transformation in Blackburn’s fortunes or levels of employment.

8.5 Land development impact

Although at the time the motorway was built there was a considerable amount of established industrial development to the south of Blackburn^{lxiii}, the route of the road was through mainly open countryside. Since 1997 there has been expansion of the existing industrial areas as well as development of a number of new sites, particularly around Junctions 4 to 6. These include motorway services, light industrial areas, storage and distribution sites, car showrooms and business parks.

The combined impact of these has been to create a semi-industrial/urban landscape south of Blackburn, particularly between Junctions 4 and 5, and around Junction 6. Around Junction 5 there is no longer open countryside between the motorway and the town.

lxiii There were three major industrial estates located at Whitebirk, Shadsworth and Roman Road, which included the large firm of Walker Steel. The motorway was intended to service these existing industrial sites and provide relief to local roads. Environmental Statement, 1992.

Figure 8.10: View over industrial development between Junctions 4 and 5



Before the motorway was built, Blackburn with Darwen was encircled by Green Belt to contain development and prevent sprawl from the main urban areas into the surrounding countryside. The potential erosion of Green Belt was raised by objectors at the inquiry but the Department of Transport responded *'there was no reason to expect significant development along the axis of the motorway'*¹¹⁶. However the construction of the motorway caused modification to the Green Belt boundary, which was cut back to the line of the motorway north of Junction 5 at Guide; the section between the motorway and Blackburn is now business and industrial development and housing¹¹⁷. Between Junctions 3 and 4 Green Belt land to the south of the M65 has been identified as contributing significantly to the unique setting and distinctive character of both Blackburn and Darwen, while north of the motorway *'there is a sense of deep rural character extending beyond the M65'*¹¹⁸. However there has been pressure to release further Green Belt for development since the road was built¹¹⁹.

Local CPRE campaigners are working to ensure the Green Belt serves its purpose to prevent urban sprawl. Development is creeping south of Blackburn towards the M65. According to the Chair of Blackburn with Darwen CPRE:

'The motorway went through countryside and it should have been left as countryside. We don't want to see development jumping the motorway; that should be a barrier and shouldn't define Green Belt in any case' Tony Duckworth, Chair of Blackburn with Darwen CPRE.

In 2015 outline planning permission was granted for a strategic 35ha employment site 'Lantern Park' south of Junction 6 within Hyndburn. The land, which is largely agricultural and formerly Green Belt will be largely industrial and logistics (warehousing) with a drive-through takeaway, pub, hotel and petrol filling station¹²⁰. As well as causing further urbanisation of the countryside and generating more traffic on the motorway, it is also predicted to create rat-running in residential areas and exacerbate local air pollution problems.

More recently, plans have been announced for a 65 ha Cuerdon strategic development site at the end of the M65 (where it meets the A6) comprising a mix of commercial, industrial and leisure use including Ikea¹²¹. This includes housing, a new IKEA and five large format retail units, car showrooms, restaurants, hotel, and a food store, though the majority of the site is (at this stage) intended for employment uses – offices, logistics and manufacturing¹²².

A planning application will be submitted at the end of 2016. This greenfield development, immediately adjacent to Cuerdon Valley Country Park, will not only represent a significant change in land use, but will undoubtedly generate considerable additional traffic on the M65.

These sites, often with minimal conditions for sustainable transport imposed on them, will continue to lock-in a culture of car-dependency. They will generate further traffic on the M65 and local roads in an unsustainable and never-ending cycle that will swiftly fill any new road or junction capacity and cancel out any improvements in congestion. They will also undermine employment and retail in town centres, damaging the vitality of local towns.

Figure 8.11: Outline of proposed Cuerdon strategic development (Junction 1)



Image: © South Ribble Borough Council¹²³

8.6 Conclusions

Traffic impacts

The M65 Blackburn Southern Bypass has generated significant traffic growth, well beyond that predicted at the time it was built, and considerably outstripping growth in the region. It is currently operating at near-capacity at peak times on certain links, and it is predicted by 2026 that all junctions will be at capacity. Congestion has continued to be a problem in some areas of Blackburn and the M65 has not proved a long-term solution to its traffic problems, with some of the original routes continuing to act as alternative links. As one prescient objector to the original scheme, who had predicted this would happen, asked at the Public Inquiry¹²⁴:

‘What will then be proposed? Another motorway, another self-defeating strategy?’

With considerable political pressure to further widen the road to three lanes and extend the motorway eastwards, this does indeed appear to be the case.

Environmental impacts

The construction of the motorway resulted in significant and lasting landscape, ecological and other environmental impacts. It destroyed extensive areas of woodland, some of them ancient and of high ecological value, as well as hedgerows and agricultural land, and caused

high visual intrusion in an Area of Great Landscape Value. It resulted in noise impacts affecting thousands of homes and reduction in amenity value to walkers and users of the countryside. These impacts were only partly mitigated.

Economic impacts

The M65 bypass has been the focus for development of a number of new employment sites located at or near to motorway junctions. However, unemployment in Blackburn with Darwen remains high relative to its neighbours and similar local authorities elsewhere and the borough has relatively high levels of deprivation. The low levels of car ownership means that accessibility is a significant barrier to employment. Development at motorway junctions, especially retail or office development, also undermines investment in the town centres, a fact recognised by the local council and planning Inspectors.

Land use impacts

Open countryside areas around most of the M65 junctions have become increasingly industrialised and urbanised. The motorway was routed directly through Green Belt resulting in realignment of the Green Belt boundaries and increasing urbanisation south of Blackburn and north of Darwen to the line of the M65. There is pressure to release more Green Belt for development though much of the land north and south of the motorway retains a deeply rural character. However, as plans for massive new developments at Junctions 1 and 6 indicate, there is evidence of heavy pressure for further out-of-town developments centred around motorway junctions, eroding more open countryside, and creating more car-dependent destinations.

9. A46 Newark – Lincoln Case Study

9.1 Introduction

The A46 between Newark in Nottinghamshire and Lincoln in Lincolnshire follows the course of the Roman Fosse Way. It is part of a much longer route stretching originally from Bath in Somerset to Cleethorpes in Lincolnshire, though the route is not continuous.

Following a public inquiry in 1993, the decision was made to widen the single carriageway road between the junction with the A1133 at Winthorpe, north of Newark-on-Trent and the junction with the A1434 at Hykeham, south of Lincoln. Construction started in 2001 and the scheme opened in July 2003. The scheme involved a largely online 13km dual carriageway, a 2.5km by-pass of the village of Brough, changes to existing roundabouts and construction of new roundabouts and grade-separated junctions at Brough and Haddington Lane (Figure 9.1 and Table 9.1).

Figure 9.1: Location of scheme and inset showing wider setting



Image: © 2016 Google

Image: © Streetmap.co.uk/Streetmap EU 2016 and Googlemaps

Table 9.1: A46 Newark – Lincoln overview

Region	East Midlands
Opening date	2003
Scheme length	13 km
Scheme description	Dualling of existing road with bypass at Brough
Cost of scheme	£40.632 million at 2002 prices
Available evaluation reports	One Year After POPE 2004 and Five Year After POPE 2009

According to the OYA POPE, the main objectives of the scheme were to ‘*improve the reliability of journey times through dualling in order to provide the ability for overtaking*’ and ‘*improve safety, by the separation of carriageways and removal of direct farm accesses*’¹²⁵.

The scheme was the subject of both a ‘One Year After’ and ‘Five Year After’ Post Opening Project Evaluation (POPE) by the Highways Agency, published in 2005 and 2009 respectively.

Since completion of the Newark – Lincoln scheme, a further scheme on the A46 between Newark and Widmerpool in Nottinghamshire was completed in 2012, involving 28km of new dual carriageway. This means that the whole A46 route between Leicester and the junction with the A4134, south of Lincoln, is now dual carriageway. A short 1km section further north of Hykeham roundabout has also been dualled^{lxiv}.

The road runs in a north-easterly direction from Newark to Lincoln and crosses a gently undulating landscape, predominantly in agricultural use and generally open, with pockets of woodland and large hedgerows^{lxv}. It is part of a plateau overlooking the Trent and Witham Vales to the west and east respectively. There are villages set away from the road, and a number of scattered farmhouses. The former RAF airfield at Swinderby, now a housing development and business park, is the main significant manmade feature.

The southern part of the scheme lies within the district of Newark and Sherwood in Nottinghamshire, while north of Brough the road lies within the district of North Kesteven in Lincolnshire. Both districts have relatively low levels of deprivation^{lxvi} and both are classified as traditional rural in the ONS 2011 Area Classification for local authorities. It might therefore be categorised as a road scheme in a ‘Neutral’ area.

9.2 Traffic impact

Traffic growth on the A46 Newark – Lincoln since completion of the scheme has been much greater than predicted. In 2008 traffic flows at the northern end were 35% higher than predicted levels and the growth in traffic was at least three times greater than the county averages^{lxvii}. In 2015 traffic levels at the northern (Lincolnshire) end were over 70% higher than in 2002, which greatly exceeded growth rates at regional (9%) or county levels (12% in Lincolnshire, 14% in Nottinghamshire)¹²⁶ (Figure 9.2 and Table 9.2).

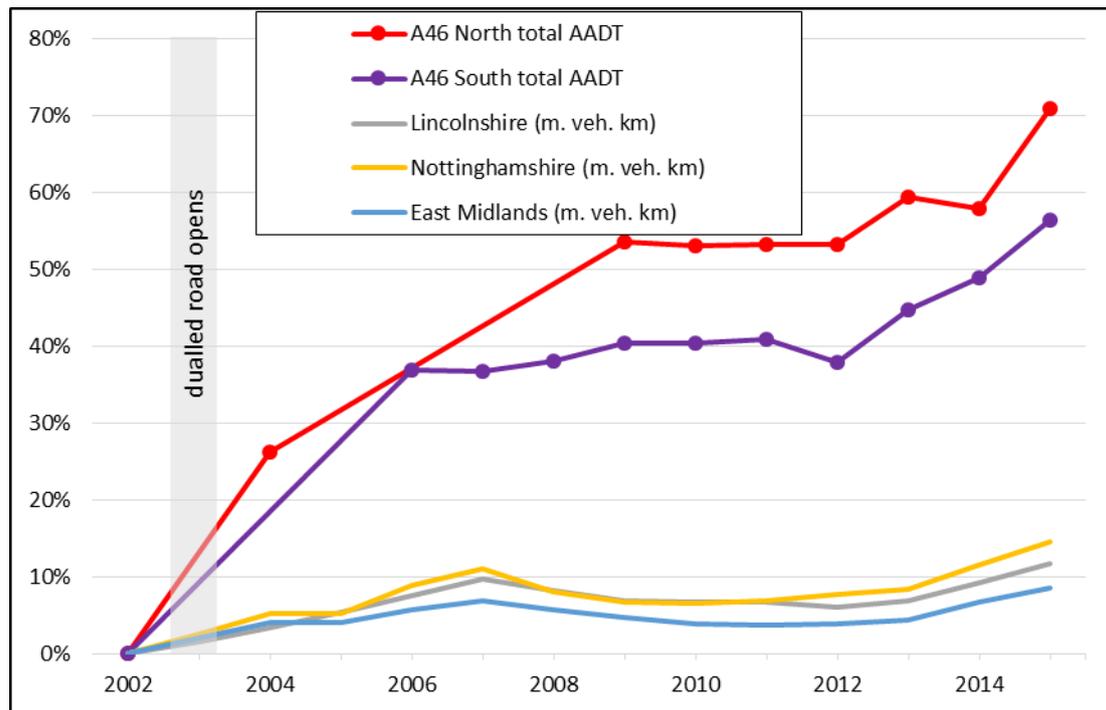
lxiv The section between Whisby Road and B1190, Doddington Road, completed in 2012.

lxv The A46 dissects two landscape character areas described as ‘Terrace Sandlands’ in Lincolnshire and ‘East Nottinghamshire Sandlands’ in Nottinghamshire which share many of the same characteristics. Both are low-lying vales of gentle undulations, with arable farmlands, scattered small red brick settlements and variable woodland cover, and large and less managed hedgerows. David Tyldesley and Associates (2007) *North Kesteven Landscape Character Assessment* Report by for North Kesteven District Council; Newark and Sherwood District Council (2013) *Newark and Sherwood Landscape Character Assessment*.

lxvi In 2015 North Kesteven ranked 200 and Newark and Sherwood ranked 139 out of 326 local authorities, in terms of the largest proportion of highly deprived neighbourhoods: IMD (2015)

lxvii Traffic was predicted to increase by normal background traffic growth of 2% per year, according to the FYA POPE.

Figure 9.2: Increase in traffic (AADT) on A46 northern section (Lincolnshire) and southern section (Nottinghamshire), since 2002 against regional and county comparators



See notes to Table 9.2 for source of data.

Table 9.2: Changes in traffic on the northern and southern section of the A46 Newark – Lincoln scheme and on a screenline across the northern section

Location	2002 AADT	Scheme opens	2008 AADT	2015 AADT	Change in AADT 2002 to 2015
Northern section A46	21,215		31,425*	36,255	+15,040 (+71%)
Southern section A46	22,095		30,483	34,543	+12,448 (+56%)
Northern screenline (A46, A57 and A607)	41,996		51,101	55,930	13,934 (+33%)

Note: northern screenline comprises A46, SW of A1434, Thorpe; A57, E of Saxilby; and A607, E of Harmston. In the absence of recent data for the A57 and A607 we have used the conservative assumption that there has been no growth on these other roads since 2008.

2002 AADT figures for the A46 and 2002 and 2008 AADT figures for the northern screenline have been adjusted from June Average Weekday Traffic (AWT) figures from the FYA POPE study using a correction factor based on average June AWT:AADT for the A46 for the period 2009-2015.

Data for A46 northern section 2008-2015 from WebTRIS, Highways Agency TMU counters 7073/1 northbound and 7074/1 southbound near Witham St Hughes. Data for 2002 and 2004 from Highways Agency TRADS counters 20289 near Thorpe.

Data for A46 southern section 2006-2015 from WebTRIS, Highways Agency TMU counters 8000/1 northbound and 8005/1 southbound, south of Brough. Data for 2002 and 2004 from Highways Agency counters MCC1 south of Brough.

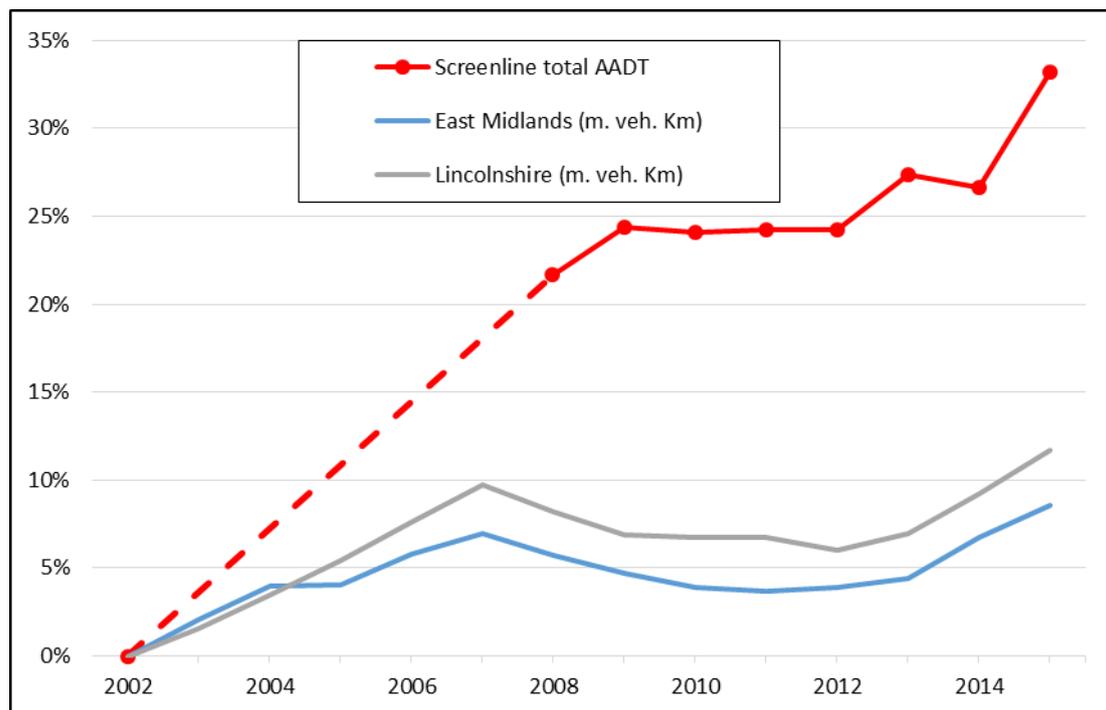
*The FYA POPE has a seven-day figure of 32,400 in 2008 but location is unclear and we have therefore used 'converted' AADT for 2008 at the same location for consistency.

The FYA POPE report presented data for two screenlines across wide corridors at the northern and southern ends of the scheme which showed traffic across the screenlines had increased overall despite reductions in traffic on the other 'A' roads. At the southern end of the scheme the growth of 11% across the screenline 2002-2008 matched regional growth which suggested traffic had reassigned from other roads. However at the northern end the

screenline growth was 22% over the same period, more than double that of regional growth, suggesting the A46 had generated additional traffic.

Using data from Highways England’s WebTRIS database, it is possible to estimate the traffic growth rate on the northern section of the A46 since 2008. More recent traffic count data are not available for the other roads used for the northern screenline (A57 and A607), but using the conservative assumption that there has been no growth on these other roads, we are able to estimate a minimum figure for the change in total traffic flows across this screenline between 2009 and 2015. Figure 9.3 illustrates the growth in traffic on the A46 northern screenline, and compares it to the county and regional growth trends.

Figure 9.3: Screenline across northern section of A46 showing percentage rise in traffic (AADT) since 2002 against regional and county comparators



See notes to Table 9.2 for source of data.

This indicates:

- Traffic across the A46 northern screenline grew by 33% over the period 2002-2015, compared to lower growth in Lincolnshire (12%) and the region (9%) over the same period.
- Although we have very limited data for traffic flows across the screenline between 2002 and 2008, it is likely that the growth over this period (shown by a dashed line on the graph) was non-linear. Traffic increased significantly (26%) on the A46 northern section one year after the road opened and is likely to have increased across the screenline by about 12% and then climbed steadily thereafter.
- Although the rate of traffic growth slowed after 2008/09 following the economic downturn, it increased again in 2012 at rates slightly higher than the county and regional comparators.

The unexpected growth on the northern section of the scheme was partly attributed by the FYA POPE to a 1,000-home development at Swinderby Airfield near Witham St Hugh’s

(opposite Halfway Houses, see Figure 9.1) built after the dual carriageway was completed. This was described in the POPE as *'a dormitory settlement reliant on commuting probably mostly to Lincoln'*. This was estimated to generate approximately 6,500 vehicles per day (two-way), the majority of which would be likely to use the A46 between Halfway Houses roundabout and Lincoln. While this will have contributed roughly 50% of the unexpected traffic growth, once background growth and reassigned traffic is taken into account this leaves roughly an additional 3,000 vpd generated across the northern corridor by 2015.

Other possible factors contributing to the growth in traffic include the construction in 2012 of 28km of new dual carriageway on the A46 between Newark and Widmerpool, 15km of which was offline. This made the entire A46 route from Leicester to Nottingham dual carriageway. It is likely that traffic on the A46 Newark – Lincoln section would have increased as a result of this new contiguous scheme leading to the M1. In 2013, one year after the Newark to Widmerpool dual carriageway opened, traffic increased by 23% on the northern section of the road (just south of Newark)^{lxviii}. At the time of the inquiry CPRE had suggested the £174 million regional contribution towards the Newark to Widmerpool widening would buy 4,500 affordable homes or pay for most of the rail improvements originally proposed by local authorities for funding from the same regional budget^{lxix}:

'The region has a choice. It can either spend all this money on the road, and help a few drivers save a few minutes for a few years. Or it can invest in the future in better homes and travel choices'^{lxx}.

9.3 Landscape and other environmental impacts

Construction of the widened A46 and the new bypass between Newark and Lincoln did not physically impinge on any nationally designated landscape or nature conservation areas. However, the scheme affected a number of locally-designated Sites of Nature Conservation Importance (SNCIs) in the vicinity and a then-locally-designated Area of Great Landscape Value (AGLV), an approximately 1km wide strip along the corridor of the route within the Lincolnshire boundary^{lxx}.

lxviii From 24,400 to 29,900 AWT, according to Atkins (2014) *Post Opening Project Evaluation A46 Newark to Widmerpool Improvement: One Year After Study*

lxix CPRE Press Release 6 Feb 2009. CPRE Nottinghamshire Branch and East Midlands Regional Group waged a long campaign against the new dual carriageway which was built across Green Belt with the permanent loss of 235 hectares of good farmland.

lxx The AGLV stretched between Field House Farm Cottage north of Brough and Hykeham roundabout. The basis for the designation is not known but the Environmental Statement notes that in contrast to the open agricultural landscape at either end of the road *'between Field House Farm Cottage and Stone Lane the roadside is dominated by overgrown hedgerows forming substantial wooded strips and linear blocks of woodland. This vegetation varies in length, either on the southern or northern boundary of the road, but gives the impression of being almost continuous to the road user (except adjacent to RAF Swinderby airfield). The road vegetation is a significant landscape feature in this central section of the A46 road length.'* It is not known why the designation was discontinued though with the adoption of the European Landscape Convention (ELC), which came into effect in the UK in 2007, there has been a move away from local designations towards an approach of landscape character assessment (LCA) which takes as its starting point 'All Landscapes Matter'. The ELC applies to all landscapes, towns and villages, open countryside, the coast and inland areas, ordinary and degraded landscapes, as well as those that are afforded protection. Landscape Character is defined as 'The tool that is used to help us to understand, and articulate, the character of the landscape. It helps us identify the features that give a locality its 'sense of place' and pinpoints what makes it different from neighbouring areas.'

The construction of the road had a number of adverse impacts on landscape, biodiversity and heritage, described below.

Landscape and visual intrusion

Construction of the road caused negative impacts on the then designated Area of Great Landscape Value (AGLV). Before the dual carriageway was built the mature vegetation lining the road was a significant landscape feature with overgrown hedgerows and substantial wooded strips *'giving the impression of almost continuous vegetation for half the road's length'*¹²⁸. However construction of the road led to complete destruction of the vegetation on the southern side of the carriageway. This included a group of ash trees and 1.3km of hedgerow of good age and species diversity which the (pre-construction) Environmental Statement had noted *'are important features in the open landscape; their loss would have a significant impact.'*

The FYA POPE noted that the impact on the Area of GLV was adverse, but that a significant amount of replacement planting had been undertaken along the scheme to replace the lost hedgerows and woodland, and *'this appeared to be establishing well'*¹²⁹. A site visit in late 2016 found that the planting had not established well in the area south of Hykeham roundabout, hedgerows were generally sparse and there was evidence of fly-tipping in the drainage channels. Figure 9.4 demonstrates that even after 15 years, the planting of saplings has not compensated for the loss of mature trees and hedgerows that were formerly considered of Great Landscape Value.

Figure 9.4: Planting to the south of the carriageway fails to compensate for loss of mature trees and hedgerows in an area formerly of Great Landscape Value where the road vegetation was a 'significant landscape feature'



A further significant visual impact of the road scheme was the introduction of lighting into the rural landscape which created visual intrusion at night time across the whole scheme¹³⁰. The road is lit by 12m high columns at roughly 45m intervals the length of the road. Natural England were reported in the FYA POPE as stating that the lighting is excessive and that they had requested that the lighting regime be revisited and the number of lighting columns

reduced. There has been no significant change to the lighting regime since the road opened^{lxxi}.

The lighting columns and two new overbridges at Haddington Lane and Brough Lane also created adverse visual impacts by introducing strong vertical features within a largely flat and expansive landscape (Figures 9.5 and 9.6).

Figure 9.5 (left): Overbridges and lighting columns on A46 create visual impacts in a flat expansive landscape.

Fig 9.6 (right): View just off A46 across Witham Valley



The FYA POPE acknowledged that the landscape impacts of the road were worse than expected. The North Kesteven Landscape Character Assessment, published in 2007, also states: *'The [A46 dual carriageway] road itself is a considerable detractor in the landscape and severs the landscape to the north and south'*¹³¹.

Biodiversity

The loss of established hedgerows, trees and other vegetation, particularly along the southern edge of the new carriageway resulted in significant ecological as well as landscape impacts. Nearly 10km of roadside hedges and woodland habitat were removed *'which represents a considerable loss of valuable ecological habitat within the survey corridor'*¹³². The loss of hedgerows on the southern verge would have significantly lowered the wildlife potential of the area¹³³.

Four locally important sites – Sites of Nature Conservation Importance (SNCIs) – were adversely affected. Three woodlands were partly destroyed: The Big Thorns (2,400m², approximately half the area), Hill Holt^{lxxii134} (around 3,000m²) and Romanstone Plantation (a 10m strip)^{lxxiii}. The Environmental Statement merely reports these as having *'no significant*

lxxi No lighting columns have been removed, although there have been slight changes to the timing when lights come on in relation to the ambient light. Personal communication with Highways Agency, November 2016.

lxxii In a 2008-2010 local wildlife review for North Kesteven, Hill Holt Wood was described as an area of ancient woodland. Hill Holt Wood is also listed as an SSSI in the North Kesteven local plan 2007 but not listed in NE's list of designated SSSIs. The 1992 Environmental Statement states that *'The wood is not ancient, ridge and furrow field systems being visible on the ground. However the wood is mature with a canopy of large oak and ash standards up to 200 years old.'*

lxxiii Given the long period between the publication of the Environmental Statement (1992) and the construction of the road in 2002 it is likely that the land owners may have felled some of the trees in anticipation of the road

ecological impact' and there was thus no mitigation planting for the loss and no evaluation of the impact in the FYA POPE. A number of other woodland belts that were not SNCIs were also destroyed¹³⁵.

The fourth SNCI, an un-named wood near Langford Hall, contained an ecologically valuable pond receiving field and road surface water runoff. The FYA POPE was unable to confirm the status of the pond, though noted that road drainage is no longer connected to the pond. A deterioration in water quality or quantity from road drainage would be detrimental to this habitat.

Cultural heritage

Due to the alignment along the old Roman Fosse Way a number of archaeological heritage sites existed within the road corridor, with those immediately adjacent to the A46 destroyed. Sections of Roman road, Anglo-Saxon settlements, and Bronze Age cemeteries were destroyed by the scheme, while cropmarks near to Crococalana, a former Romano-British small town and now a Scheduled Ancient Monument, were affected. These impacts were considered by the FYA POPE to be '*minor*' and '*balanced by interpretative opportunities*', consisting of an archaeological interpretation board in a layby. Archaeological excavations were conducted before the sites were destroyed but the knowledge gained should not be considered an adequate substitute for the loss of heritage itself.

There are also four Grade II listed buildings along the route: Langford Hall, the Church of St Stephen in Brough, Colton's Farmhouse and Halfway House Farm. The impacts on Colton's Farmhouse, a formerly isolated building in an open landscape, were higher than expected. Officers from Newark and Sherwood District Council commented that the new overbridge at Brough and associated embankments, rising from about 10-12 metres in front of the building to a substantial height, had compromised the setting of Colton's Farmhouse and had a worse than expected impact¹³⁶. They suggested the bridge should have been moved further to the south to minimise the setting issue. Officers spoken to as part of this study noted that the road has completely fragmented the historic setting of the farmhouse and potentially impacted on its long term viability.

construction, for example see <http://www.hillholtwood.co.uk/about/history/>. However this loss of trees in anticipation of construction is still a direct impact of the road. Some significant trees in the hedgerow on the west boundary (an ancient parish and county boundary) were retained in the new central reservation for about 700 metres (S. Donagain, Personal Communication).

Figure 9.7: Aerial view of Colton’s Farmhouse (top centre of picture) showing proximity of overbridge and embankment



Image: © 2016 Google

Despite this the Evaluation Summary Table in the FYA POPE states that the assessment of heritage impacts was ‘*as expected*’, i.e. neutral.

The POPE also noted that traffic noise and local air quality were worse than expected for the relatively few properties along the route. An award-winning social enterprise at Hill Holt Wood which provides woodland-based education, training, services and public access since 2002, finds that noise from the road impacts on the amenity of the site, particularly in winter when the trees provide less cover^{lxxiv}.

9.4 Economic impact

The main economic benefit listed in the Appraisal Summary Table (other than reducing journey times) was serving Lincolnshire Objective 5b (EU funding for regeneration of rural Lincolnshire). The FYA POPE could find no information that the A46 had directly affected any specific regeneration project in rural Lincolnshire.

No evidence was presented in either POPE on the direct impacts of the scheme on local economic activity. The main demonstrable economic effect has been to facilitate the development of the RAF Swinderby site at Witham St Hugh’s for housing and a business park, which was contingent on the construction of the road^{lxxv}. The site is now occupied by over 1,200 homes (with plans for a further 1,250 homes) and a number of agricultural and storage firms at the business park^{lxxvi}. This development has almost certainly contributed to the significant traffic growth on the northern section of the A46.

lxxiv CEO Steve Donagain noted that two earth mounds built for sound proofing at the time the road was constructed have proved inadequate. The only relatively quiet time is in the early hours of the morning. Visiting scouts and cubs prefer to camp further away because of the noise from the road. The social enterprise, which employs nearly 40 people, and receives thousands of visitors a year, has a hazardous hidden entrance though requests for signposting from the road and a cycle link to improve safe access have been rejected. <http://www.hillholtwood.co.uk/> S. Donagain, Personal Communication, January 2017.

lxxv The conditions for planning approval of the housing development link construction and occupancy of the housing to construction of the dual carriageway and roundabout at Halfway House.

lxxvi For example Cargill, Germinal, and Limagrain.

It is likely that the construction of the dual carriageway has also contributed to some of the development at Hykeham, just north of the scheme, which has developed considerably over the last 30 years^{lxxvii}. However this has also affected the type of development, with car sales showrooms, garden centres, hotels, takeaways and restaurants aimed primarily at motorists, which have developed around the area near to and along the A46. The area has become increasingly car-dependent. Car ownership levels in Hykeham are higher than regional averages^{lxxviii} and the area, where 9,000 people work, is a net importer of labour¹³⁷.

Road access to the A46 and A1 also played a part in the development of a new business park, Teal Park, sited off the A46 just north of the scheme, and considered by the County Council as an important employment site for Lincoln. This 35ha business park was facilitated by £9 million of significant roadworks and construction including additional widening of the A46 north of the scheme and new roundabouts *'to support increased traffic to and from the development'*¹³⁸. Teal Park is home to Siemens, a major employer who relocated their industrial gas turbine service from the city centre, as well as the council's energy to waste facility, and a number of smaller businesses^{lxxix}. Unsurprisingly, given its location, Teal Park is highly car-dependent: surveys in 2012 found that 76% of Siemens staff intended to use their car to commute to Teal Park following relocation, while 56% of Teal Park businesses also reported that their staff drove to access lunch due to lack of local facilities¹³⁹. Siemens, with over 500 staff and the largest employer at Teal Park, are keen to reduce the amount of car commuting by their staff and are working closely with the council^{lxxx}.

The net effect of these additional car-dependent developments on and around the A46 and Hykeham has been to create considerable congestion around Hykeham, to the detriment of local residents and businesses. In 2016 roundabouts at the Newark and Hykeham/Lincoln ends of the new scheme were identified as operating above capacity^{lxxxi}. This congestion is considered by both the local councils and businesses to constrain the economic growth potential of the area of Hykeham and South West Lincoln. A £6.6 million LSTF-funded sustainable transport programme in Lincoln (Access LN6) focussed on these areas precisely because *'Growth and subsequent import of labour combined with the relatively easy access by car and relative unattractiveness of more sustainable modes has resulted in congestion, journey delay and issues of accessing employment'*¹⁴⁰.

lxxvii Lincolnshire's 'Access LN6' Local Sustainable Transport Fund bid in 2012 noted that in the previous five years, Hykeham had seen over 200 new businesses and 2,000 new employees, accompanied by a growth of population. However, less than a third of jobs in the area were taken up by the area's residents, whilst two thirds of residents in work travelled to other locations (predominantly within the City of Lincoln). It suggested this indicated a need for local employment opportunities.

lxxviii The proportion of households without a car ranges from 6-12%, less than the regional average of 14%, according to Lincolnshire's 'Access LN6' Local Sustainable Transport Fund bid in 2012.

lxxix Blackwood Court has 19 industrial starter units and Vincent Court has speculative office/industrial/warehouse units, both built in the last 2 years. North Kesteven District Council (2015) *Grow LN6 Business Briefing*.

lxxx Siemens have a strategic objective to be carbon neutral by 2030 and are a key partner in the County Council's LN6 sustainable transport programme, investing in electric bikes, cycle storage and behaviour change programmes.

lxxxi The A46/A1/A17 roundabout, the A46/A1/B6166 roundabout, and the A1434/Station Road/Moor Lane junction. Planning application for Witham St Hugh's Phase III. Available from North Kesteven District Council Planning site. <http://planningonline.n-kesteven.gov.uk/online-applications/>.

Congestion has been identified by LN6 businesses as the main issue limiting the attractiveness of the area¹⁴¹. A study on how to address the needs of the LN6 business community suggested *'much more needs to be done to reduce the level of car movements within LN6'*¹⁴². According to a survey of businesses in LN6 the top-ranked measures to address congestion were improved walking/cycling links, a park and ride and increased awareness of bus services¹⁴³.

Lincolnshire County Council's Access LN6 programme has invested in improved walking/cycling links and improvements to Hykeham station, and worked with local businesses to encourage modal shift with some success^{lxxxii}. It is suggested that improved rail services for Lincoln would encourage mode change from road to rail, benefiting Lincoln businesses with reduced travel costs¹⁴⁴. Although the Castle rail line (to Newark and Nottingham) had £2 million of improvements in 2015, this line is still slow despite high passenger demand. Service frequency and journey times between Lincoln and London are well below national benchmarks¹⁴⁵ and described as *'shocking'*¹⁴⁶. It is reportedly often quicker for businesses in South Lincoln to drive to Newark to pick up the train to London. According to one source in 2013 *'the railway line that runs parallel to the A46 between Leicester and Lincoln has been shamefully neglected and arguably now has one of the worst train services in the country'*¹⁴⁷. More direct rail services from Lincoln to London will be included in the new East Coast Franchise from 2019, though the council are working to get these to commence earlier¹⁴⁸. This may enable more of the intermediate services from Lincoln to Newark to stop at Hykeham, which is an increasingly popular station with a large catchment^{lxxxiii}. There is also a growing demand for more services from Hykeham to Newark Northgate to pick up the London service¹⁴⁹.

The Council have been awarded further funding for sustainable travel, targeting employees in growth areas such as Teal Park as well as improving the walking/cycling infrastructure¹⁵⁰.

However efforts to encourage modal shift are being undermined by economic development strategies based on further road building. Plans for significant further growth in Lincoln^{lxxxiv} and the development of South West Lincoln as a key employment location have raised concerns of increased car commuting to and from the area. For example, concerns about the expansion of Teal Park were raised by North Hykeham Town Council in 2015. As one Councillor said:

*'As the Teal Park development grows, then the traffic issues will grow and they will impact heavily on the people of Hykeham. We already know the roads in our area are currently running at capacity. The growth of Teal Park will only add to this'*¹⁵¹.

In October 2016 the Government announced approval for the £95 million Lincoln Eastern Bypass with construction due to start in early 2017¹⁵². Much of the planned development

lxxxii The number of cyclists doubled along Station Road and Doddington Road in Hykeham, 2012-2014 and patronage at Hykeham Station doubled 2010-2014. Lincolnshire County Council *Our Sustainable Transport Journey. Celebrating the successes and achievements of Access LN6 March 2012-March 2015*.

lxxxiii LSTF improvements to Hykeham train station services and facilities have increased passenger numbers so that by February 2015 passenger numbers (56,784) were double the annual figure in 2010 (23,262). Lincolnshire County Council (2016) *2017-2020 Access Fund Bid*.

lxxxiv The current local plan proposes 39,960 new homes in Central Lincolnshire by 2036, of which 23,654 are in Lincoln (compared to current housing stock of 78,858). Central Lincolnshire Local Plan. Proposed Submission, April 2016.

around Lincoln is considered to be dependent on delivery of the Lincoln Eastern Bypass.¹⁵³ Although not connected to the A46 this is a step towards the completion of an eventual ring road around Lincoln, connecting to a future anticipated southern bypass which will link to the A46 at the Hykeham roundabout (Figure 9.8)¹⁵⁴. This is likely to generate significant additional traffic on the A46.

There is a widely held perception that faster road access is synonymous with economic growth and access to the A46/A1 is considered one of the key strengths of the Central Lincolnshire economy¹⁵⁵. However, it is difficult to single out the impacts of any given road scheme from the many different factors influencing the local economic situation.

Figure 9.8: Preferred alignment of Southern Lincoln Bypass (Hykeham roundabout centre left of plan) linking up with A46 to west and Eastern Lincoln Bypass to the east

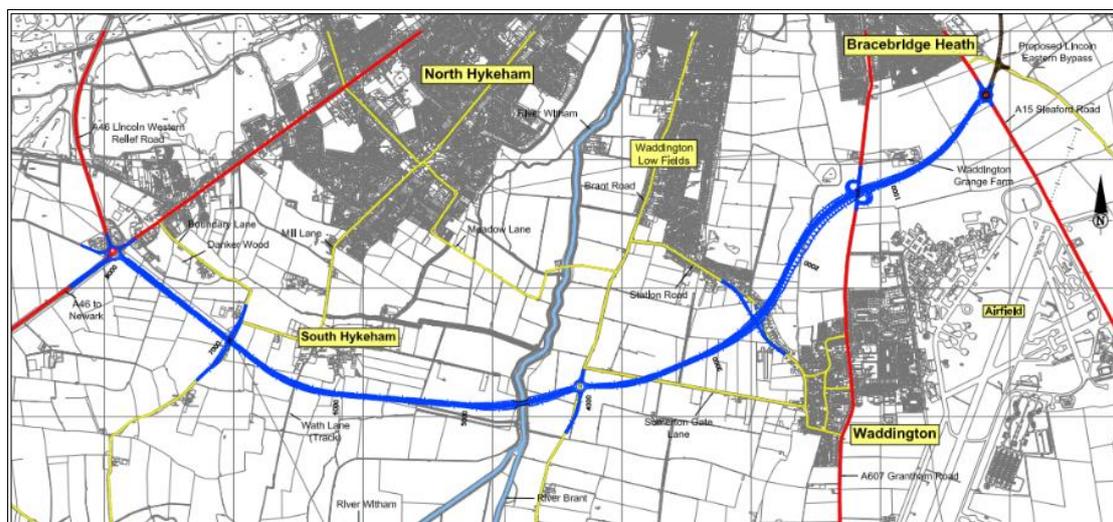


Image: © Lincolnshire County Council¹⁵⁶

It is also questionable whether the race for economic growth and increasing Gross Value Added (GVA) is the best or only metric to measure the attractiveness of Lincoln as a place to live or do business. It is recognised that *'GVA can't measure everything and as a comparative measure is of limited relevance to a sparsely populated rural economy with full employment, a range of attractive rural lifestyles and a historic and vibrant Cathedral City'*¹⁵⁷.

9.5 Land development impact

The land in the vicinity of the dualled A46 is still largely open countryside in agricultural use. However the construction of the road has facilitated car-based development at either end of the road as well as a large out of town housing development at Witham St Hugh's.

At the southern end of the dual carriageway, at the junction with the A1, there are car-based services, a distribution centre at the airfield site at Winthorpe and development on the adjacent Newark Showground site. At the northern end of the road around the Hykeham roundabout there are large car-based leisure and commercial developments, while further north there is the new business area at Teal Park. The approach road to Teal Park is also lined with car-based leisure and commercial facilities (hotels, restaurants, fitness centres etc.). At Hykeham new housing developments coupled with piecemeal business development *'has seen the area evolve as car-dependent'*¹⁵⁸. Further housing is proposed for North Hykeham, which is one of Lincoln's proposed Sustainable Urban Extensions (SUE). This would provide around 2,000 homes and 5 ha of employment land on greenfield agricultural

land. Although a network of walking and cycling routes are planned, transport access would primarily be via a new Southern Bypass connecting to the A46¹⁵⁹. With equivalent investment in alternative modes to car travel, including improved rail services at Hykeham, the SUE has the potential to become a sustainable location for travel. Yet the levels of funding available for investment in sustainable transport compared to that being invested in road schemes suggest this will be an uphill battle^{lxxxv}. While Highways England believe that the Lincoln Southern Bypass coupled with the Lincoln Eastern Bypass will somehow mitigate the impact of proposed development on the A46, they anticipate that *'in the medium and longer term, the A46 in the Lincoln area will come under pressure from background traffic growth and that this could affect its future operation'*¹⁶⁰. This, they suggest, could lead to further investment in the A46 in future.

Figure 9.9: Commercial area on A1434 just north-east of the A46 Hykeham roundabout



The construction of the A46 scheme also facilitated the development of 1,239 homes and over 70 hectares of employment land at the out-of-town RAF Swinderby site at Witham St Hugh's¹⁶¹. Despite the presence of a separate business park of light industrial and warehouse uses, the housing development is essentially a dormitory commuter village for Lincoln. Significant investment has been made by the County Council, particularly in the last few years, to encourage more sustainable travel to and from the development^{lxxxvi}. Unfortunately car commuting patterns will have been well established for many years and therefore more difficult to change.

A further greenfield extension to Witham St Hugh's, consisting of 1,250 dwellings, formation of a roundabout and A46 Junction works, has recently been granted planning permission¹⁶².

lxxxv Lincolnshire County Council's Access Fund bid for sustainable transport was for £1.22 million compared to £95 million for the Lincoln Eastern Bypass.

lxxxvi The original planning conditions required developer contributions towards five years of bus service. Lincolnshire County Council have also funded further bus services to Witham St Hugh's. There is a train station about two miles away at Swinderby and there have been recent improvements to the station facilities as a result of Access LN6, including a new car park and cycle racks. However walking/cycling access from Witham St Hugh's remains difficult partly because of the A46, and the rail service to both Lincoln and Nottingham is relatively infrequent.

While the housing is predicted to generate substantial increases in traffic, estimated at 791 two-way movements during the peak morning hour, a decision by the local authority notes that the A46 'has the capacity to accommodate increased traffic flows'¹⁶³. The developer optimistically predicted that 'the development traffic would disperse with minor/negligible additional impacts identified to the other junctions assessed'¹⁶⁴. The highway authority (Lincolnshire County Council) considered the development to have a severe impact upon the highway network in North Hykeham and recommended that outline planning permission for the development be refused¹⁶⁵. Planning conditions include a contribution towards the construction of the Lincoln Eastern Bypass which the Council consider would partly alleviate capacity issues at the Hykeham roundabout.

Figure 9.10 (left): Location of proposed housing development at Witham St Hugh's. Figure 9.11 (right) Aerial shot showing isolation of Witham St Hugh's from main urban areas



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Although this development will destroy 70ha of agricultural land in the countryside, the planning decision notes that it is classed as an urban development project. The location of such a large development on a greenfield site immediately adjacent to the road will have a significant urbanising effect^{lxxxvii}.

9.6 Conclusions

Traffic impacts

Traffic growth on the A46 Newark – Lincoln dual carriageway and bypass has been much greater than predicted. Traffic has grown by 71% on the northern section of the road and by 33% over a wider screenline compared to growth of 12% for the county and 9% for the region over the period 2002-2015. There is congestion, with roundabouts at either end currently operating above capacity. A development of housing and employment land at

lxxxvii Although the site significantly exceeds the indicative criteria for consideration of an Environmental Impact Assessment, the local council's decision was that this was not required as the urbanising effects would be contained by the A46, and any traffic or environmental impacts would be localised. North Kesteven Council. Screening opinion 16/0188/EIASCR. 17 Feb 2016.

Witham St Hugh's, as well as growth in Hykeham on the outskirts of Lincoln, have contributed a large proportion but not all of the additional traffic generated by the construction of the road. Since the scheme opened there has also been construction of a dual carriageway for the Newark to Widmerpool section of the A46, and a short section of dual carriageway associated with Teal Park, a new business park in South West Lincoln, both of which are likely to have also contributed to the observed traffic growth.

Environmental impacts

Construction of the road caused adverse impacts to the landscape, heritage and ecology of the area. These included impacts on a number of woodland areas, some of them Sites of Nature Conservation Importance, and extensive loss of hedgerows and individual trees along the south side of the road. In the area formerly designated as of Great Landscape Value, where the vegetation lining the road was a significant feature, the negative impact has not been mitigated by planting. The visual impact of the lighting and vertical structures associated with the road and the impacts on the setting of a Grade II listed farmhouse, were worse than expected.

Economic impacts

There is little evidence the road construction has contributed to regeneration of rural Greater Lincolnshire, despite this being a key economic objective. The scheme has facilitated the development of an out-of-town dormitory commuter settlement at Witham St Hugh's and is likely to have been a factor in the development of car-dependent housing and businesses at Hykeham, and the siting of a business park at Teal Park, north of Hykeham. These developments have in turn caused increasing congestion, particularly in Hykeham. Investment to reduce car dependency in Hykeham and remove cars from the highway network is now seen by businesses and local councils as necessary to tackle the congestion.

Land use impacts

As well as promoting car-dependent housing and employment, the scheme has influenced the decision for a large urban extension to the southwest of Lincoln, which is predicated on the completion of new bypasses connecting to the A46.

In terms of land use changes the A46 scheme has encouraged car-based commercial development at either end of the road and facilitated a large out of town housing development which was originally a village in the countryside. A large greenfield extension to this is now classed as urban development, despite being several miles from the main urban area.

10. A120 Stansted to Braintree Case Study

10.1 Introduction

The A120 is in the east of England, and runs from west to east between the A10 and the port of Harwich. The Stansted to Braintree scheme was a 23km dual carriageway road, mostly built on a new alignment, between Stansted Airport (at the western end) and the town of Braintree (at the eastern end). It involved three new grade-separated junctions. The dual carriageway was completed in 2004. After the new road opened, the parallel former A120 single carriageway road was renumbered as a 'B' road, the B1256.

Figure 10.1: Route of the A120 Stansted to Braintree dual carriageway

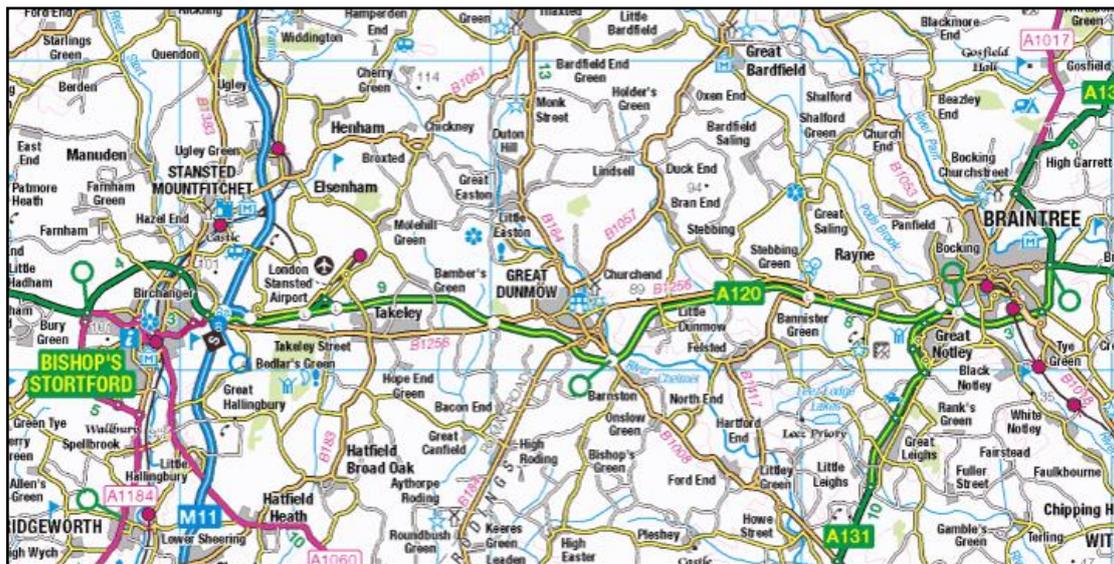


Table 10.1: A120 Stansted to Braintree overview

Region	East
Opening date	2004
Scheme length	23km
Scheme description	Dual carriageway, mostly (19km) on new alignment
Scheme cost	£100.5 million (2002 prices)
Available evaluation reports	'Five Years After' POPE

The A120 Stansted to Braintree scheme was the subject of a FYA POPE by the Highways Agency, published in 2011. There was no OYA POPE, although Essex County Council published an A120 Stansted to Braintree 'After' Study in July 2006 that it has not proved possible to access for this research.

According to the FYA POPE, the scheme objectives included provision of additional traffic capacity; providing adequate access for towns and villages on the corridor; providing better links to Stansted Airport; providing new employment and regeneration opportunities;

improving journey times and reliability; and improving safety and removing heavy traffic flows from villages.

There has been one other recent road scheme in the immediate area: the M11/A120 Slip Road scheme, between Stansted Airport and the M11, which opened in 2003. However, there are currently proposals for further dualling of the A120 to the east of the Stansted to Braintree scheme.

The geographical area around the A120 is fairly economically buoyant. Braintree is classified as 'prosperous Home Counties' in the Office for National Statistics 2011 Area Classification for local authorities. The scheme might therefore be categorised as a road scheme in a 'pressure cooker' area. However, it does not give an unqualified impression of prosperity: Braintree was also one of the 'Portas Pilots' in an attempt to revitalise an ailing town centre^{lxxxviii 167}.

The countryside through which the A120 passes is arable farmland, with irregularly shaped fields bounded by hedgerows and interspersed with small woods. It was assessed in the Appraisal Summary Table as including 'areas of good landscape quality'.

Figure 10.2: A120 dual carriageway south of Great Dunmow



Image: ©2016 Infoterra Ltd & Bluesky. Map data ©2016 Google

lxxxviii One of the measures introduced in Braintree as part of this initiative was reduced parking charges of 10p after 3pm and all day on Sundays.

10.2 Traffic impact

Traffic levels on the new A120 and the parallel former A120 increased dramatically in the period immediately after the road was completed. The FYA POPE reports traffic flows before and after scheme completion for four screenlines across the two roads. For the three screenlines not immediately adjacent to the M11 and Stansted Airport (screenlines 3, 4 and 5 in the FYA POPE), the increase in traffic between 2002 and 2009 was between +68% and +79%. For the screenline adjacent to the M11 and Stansted Airport (screenline 2), the increase in traffic was lower in percentage terms (+28%) because baseline levels of traffic were higher, but was similar in absolute terms, as shown in Table 10.2.

Table 10.2: Changes in traffic flow on screenlines across the new A120 and former A120

Screen-line	Location	2002 AADT	2009 AADT	Change in AADT
2	Close to M11 / Stansted Airport	56,300	71,800	+15,500 (+28%)
3	Between Takeley & Great Dunmow	26,800	47,900	+21,100 (+79%)
4	West of Great Dunmow	27,600	48,500	+20,900 (+76%)
5	East of Great Dunmow	24,100	40,500	+16,400 (+68%)

Note: screenline 1 in the FYA POPE did not cross the A120. Screenlines 2-5 all cross the former A120 and new A120, with screenline 2 at the western end of the road scheme, and screenlines 3, 4 and 5 progressively to the east. Source: FYA POPE.

Over the same time period, traffic volumes in Essex grew by under 4%, and traffic volumes in the East of England region grew by under 7%^{lxxxix}.

Using data from Highways England's WebTRIS database, it is possible to estimate the traffic growth rate on the new A120 since 2009, at a location comparable to that used for screenline 5^{xc}. More recent traffic count data are not available for the former A120, but using the conservative assumption that there has been no growth on the old road, we are able to estimate a minimum figure for the change in total traffic flows across this screenline between 2009 and 2015.

There is also a figure for the traffic flows on the old A120 at a point equivalent to screenline 5 *before* the construction of the scheme, in 1995, from an update to the Environmental Assessment that was produced in 1996.

Figure 10.3 illustrates the growth in traffic on the A120 screenline, and compares it to the county and regional growth trends. The following points may be drawn from this figure:

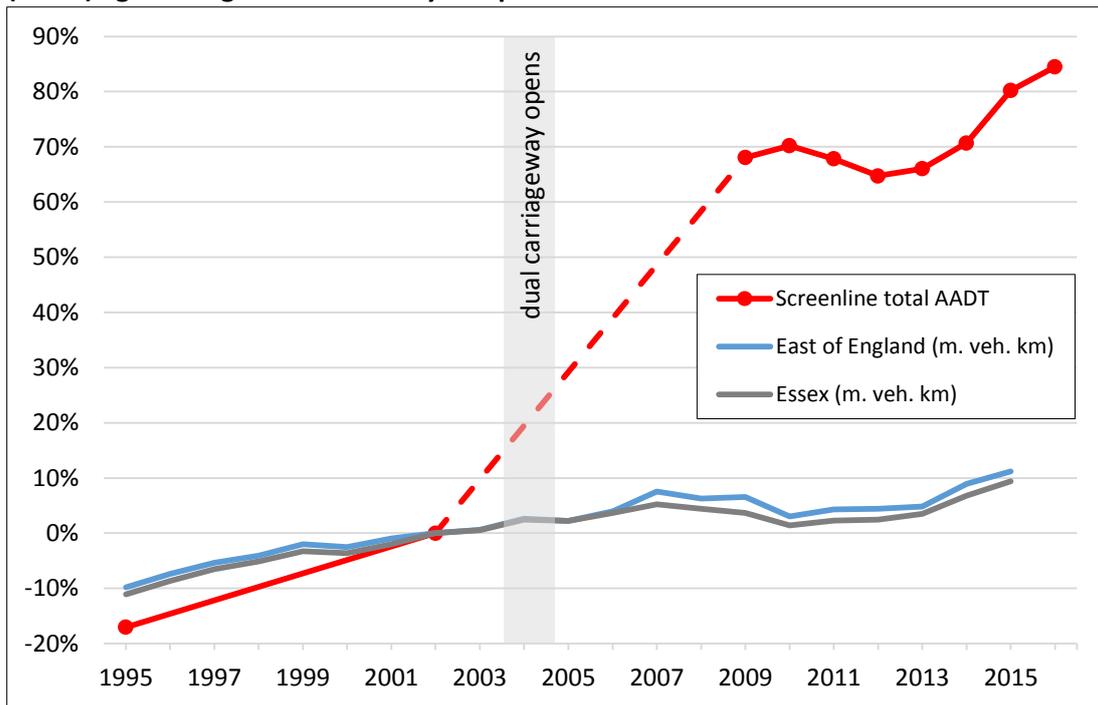
- Prior to construction of the new road, the traffic growth rate on the A120 was somewhat higher than the county and regional trend, but not greatly so.
- Although we have no data for traffic flows across the screenline between 2002 and 2009, it is likely that the growth over this period (shown by a dashed line on the graph) was non-linear, only beginning after the completion of the new road and possibly increasing then at an even greater rate than shown.

lxxxix Using DfT statistics table TRA8904 of million vehicle km per year for local authorities and regions.

xc Screenline 5 is the only screenline for which suitable traffic count data are available to examine the trend after 2009.

- Between roughly 2008 or 2009 and 2012, coinciding with the economic downturn, traffic stopped growing on the A120 screenline.
- However, from 2012 onwards, the growth in traffic on the A120 resumed, and this was at a greater rate than both the county and regional growth trend.
- Taken overall, traffic in the A120 corridor increased by 80% (i.e. nearly doubled) between 2002 and 2015, during a period when the county and regional growth trend was 9-11%.

Figure 10.3: Screenline across A120 and former A120 showing percentage rise in traffic (AADT) against regional and county comparators



Note: figure for old A120 in 1995 is from *Update of environmental effects and mitigation* (1996). Figures for screenline in 2002 and 2009 are from 'screenline 5' in FYA POPE; figures for new A120 in 2010 onwards are from WebTRIS traffic count sites 7106/1 eastbound and 7105/1 and 7105/2 westbound / westbound slip road. No data are available for former A120 after 2009 so growth has been conservatively assumed to be zero; if growth at the 'Essex' rate was assumed, overall flows across the screenline would be higher than shown. Screenline traffic volumes in 2016 involve extrapolation of data for October – December.

The high levels of traffic growth on the A120 corridor *were* predicted prior to the construction of the new road, as summarised in Table 10.3. These predictions were published in 1996^{xci}, and would have been based on contemporaneous road traffic forecasts which subsequently proved to be inaccurate, being very much higher than observed traffic growth^{xcii}. According to the FYA POPE, the 1996 Traffic Forecasting Report also assumed a

xci It has not been possible to obtain a copy of the A120 Stansted to Braintree Traffic Forecasting Report (1996).

xcii The National Road Traffic Forecast in use at the time would have been the 1989 NRTF, which predicted national (GB) traffic volumes would grow by between 82% and 142% between 1988 and 2025. By interpolation, the implied national growth between 2002 and 2009 would have been 12 – 17%. Actual GB traffic growth in this time period was 2.5% (from DfT statistics TRA8904).

20% increase in passenger car trips to Stansted Airport between 2002 and 2009, whereas in fact passenger car trips remained static^{xciii}. However, these two factors alone cannot fully account for the high forecast, and the Traffic Forecasting Report may also have assumed a substantial amount of induced traffic. In other words, the forecast was right, but (in part) for the wrong reasons.

Table 10.3: Comparison of actual and predicted traffic flow on screenlines across the new A120 and former A120

Screenline	2009 actual AADT	2009 predicted AADT (low / high growth forecasts)
2	71,800	66,400 – 70,700
3	47,900	45,400 – 50,100
4	48,500	45,700 – 50,500
5	40,500	39,100 – 43,400

Source: FYA POPE: forecasts are summed for screenline on the new A120 and former A120. 2009 predictions, as given in the FYA POPE, were interpolations between forecast traffic for 2000 and 2015, from *A120 Stansted to Braintree Traffic Forecasting Report* (1996).

The large increase in traffic on the dualled section of the A120 had a negative effect on the single carriageway section of the A120 east of Braintree. In response to the FYA POPE, Braintree District Council commented that the biggest impact of the scheme was:

‘...the resultant increase in traffic using the new A120 which is then shoe-horned onto the Braintree to Marks Tey section of the old A120’.

The council believed that:

‘...the increased traffic levels have caused a significant bottleneck of traffic at the Galleys Corner roundabout in Braintree leading to the deterioration of air quality in the immediate vicinity.’

The effect of the scheme was also felt on more minor roads. During evidence-gathering for this case study, one Braintree councillor who lives on a minor country lane three miles from the end of the dualled A120 commented that he *‘noticed an almost overnight increase in peak hour traffic once the scheme was completed.’*

Since one of the stated objectives of the scheme was to remove heavy traffic from villages, it might have been expected that once the old A120 was downgraded to a ‘B’ road, the opportunity would have been taken to introduce traffic calming, cycle paths and wider pavements. However, this was not done, and the old A120 (B1256) remains heavily trafficked in 2016. Pavements in villages are narrow; there is no separate provision for cyclists, and the volume of traffic means it does not feel safe to cycle on the carriageway (Figure 10.4).

xciii The number of people using Stansted Airport increased from 16 million to 20 million between 2002 and 2009, but this increase appears to have been taken up by an increased public transport mode share, rather than resulting in more car trips (A120 Stansted to Braintree FYA POPE, Figures 0.6 and 0.7).



Figure 10.4: Heavy traffic and inadequate provision for cyclists and pedestrians on the former A120

10.3 Landscape and other environmental impacts

The attractive landscape through which the new A120 was built is well-described in a Landscape Character Assessment undertaken for Essex County Council in 2002, before construction of the scheme¹⁶⁸. Most of the scheme is in an area that was categorised as ‘Central Essex farmlands’, with an *‘irregular field pattern of arable fields marked by sinuous hedgerows; many small woods and copses; frequent small hamlets; isolated moated farmsteads; a network of narrow winding lanes; a mostly tranquil character away from major roads and Stansted Airport.’* A small part of the scheme near the market town of Great Dunmow passes through the ‘River Valley Landscape’ of the Chelmer Valley, described as a *‘narrow valley characterised by dense riverside trees; arable valley-sides; small linear settlements; historic watermills and Second World War pillboxes; and a mostly tranquil character.’*

The Landscape Character Assessment graded the landscape sensitivity level with respect to major transportation schemes as ‘moderate’ in Central Essex farmlands, and ‘high’ in the Chelmer Valley, because of the intrinsic small-scale character of the valley and its mostly tranquil character. According to the assessment, a ‘high’ sensitivity level meant that the landscape was unlikely to be capable of absorbing the impacts of development and other change, and that there should therefore be a presumption against development unless there was over-riding need.

The Environmental Statement for the scheme (undertaken in 1990 and updated in 1996)¹⁶⁹ acknowledged that the scheme would have some significant negative effects on landscape quality. It recorded that the scheme would result in the loss of over 9000m² of woodland, nearly 6km of hedgerow and over 300 trees. More than 30 footpaths and bridleways were to

be either diverted or stopped up, and four Protected Lanes would be affected. It recorded that south of Great Dunmow, the route would run through:

'...an attractive and well-wooded stretch of countryside which forms part of the Chelmer Valley Special Landscape Area. It passes through parkland around the listed buildings at Olives and Clapton Hall [and] a Grade 1 Protected Lane which would be stopped up on the northern side and diverted ... on the southern side.'

However, the pre-scheme appraisal for the A120 minimised the impact of the scheme on the landscape through which it would pass. It stated that the A120 scheme passed through areas of good landscape quality, but that much of the scheme would be in a cutting. It therefore assessed the overall landscape impact as 'slight negative'.

There were particular issues with the impact of the road scheme at High Wood, the Fitch Way, and where the road crossed the River Chelmer and Stebbing Brook.

High Wood is an SSSI and ancient woodland. The A120 destroyed 1,300m² of the SW corner of the wood (Figure 10.5). The Environmental Statement considered the impact to be 'moderate adverse' and commented that:

'High Wood is an historic, visual and ecological feature and the loss of woodland and in particular the edge of woodland is significant...Close to High Wood the proposed West Dunmow Junction will form a significant and intrusive feature in the landscape....At night the lighting will be visible for a considerable distance'

Figure 10.5: Aerial view of High Wood SSSI, where cut by A120



Image: © 2016 Infoterra Ltd and Bluesky. Map data ©2016 Google

The Fitch Way is a walking and cycling route along the former railway line between Braintree and Bishop's Stortford, which runs fairly close to the new A120 along its entire length. One section of it was of particular interest for nature conservation because of its chalky grassland, and the Environmental Statement recorded that it supported uncommon plants including Bee Orchids, Zig Zag Clover, Sulphur Clover and Quaking Grass. The A120

affected the Flitch Way in three places, for a total length of 400m, including crossing the path in the most sensitive location from a biodiversity perspective. The Appraisal Summary Table noted that there would be an 'intermediate adverse' impact on biodiversity as a result of 'severance of a calcareous grassland site of local conservation importance'.

The places where the road crossed the River Chelmer and Stebbing Brook were also identified in the Environmental Statement as likely to suffer an adverse impact:

'...[the proposed route] does not fit into the landscape particularly well across the Special Landscape Areas of the Chelmer Valley or Stebbing Brook... the proposed route rises on an embankment with a maximum height of 8m above existing levels across the valley of the River Chelmer. This structure is combined with a grade separated junction, sliproads to the A130 and a bridge over the river. The structure will be a major new feature in this valley and run against the natural flow of the topography, producing a visual and physical barrier across the valley. The junction will be lit which will further emphasise the cross valley feature.'

The update of the Environmental Statement records that a survey of the site where the scheme would cross the River Chelmer found that it had:

'...Potential bat roosts in mature trees...potential for nesting kingfisher in steep earth banks. Numerous nesting habitat for small birds...Known trout fishery with gravel substrate suitable for spawning salmonids...Very high nature conservation value.'

Post-scheme evaluation in the FYA POPE notes a number of concerns about the actual impacts of the scheme on landscape and biodiversity:

- The new road layout detracted from the listed gatehouse at High Wood SSSI, which Uttlesford District Council commented had '*lost its sense of place*'; use of artificial turf at the roundabout adjacent to the gatehouse was considered by the council to be entirely inappropriate^{xciv}.
- 'Compensation planting' to replace the ancient woodland lost from High Wood SSSI was unlikely to become established, because a deer fence had not been provided around it as recommended in the Environmental Statement.
- Translocation of turves from areas of chalky grassland on the Flitch Way containing species such as Bee Orchids had not taken place as recommended. The contractor reported that '*relocation of turves was constrained by the stage of the works. There was nowhere to put the turves at the time of the clearance and the benefit would have been slight*'.
- The Flitch Way was also affected by traffic on the road; one parish council commented that noise and exhaust pollution made the path unpleasant to walk.
- The River Chelmer and Stebbing Brook bridges had been vandalised, and there was graffiti on the Stebbing Brook and Rayne bridges.
- Lighting at junctions and the airport approach road had an impact on the rural night-time landscape.

xciv The artificial turf at the roundabout remains in place in 2016.

- Many of the plants provided for screening of the road had failed.
- Many lanes in the area were thought to date back to Roman times and were often bordered by ancient hedgerows; four protected lanes had suffered a loss of 500m of hedgerows, verges and ditches as a result of the scheme.
- One parish council commented on the presence of a lot of litter on one section of the A120.
- Parish / town councils at Rayne, Great Notley and Great Dunmow all commented that traffic noise had increased following the scheme; a parish councillor from Great Notley referred to the elevated section of the A120 near Panners Junction generating '*a constant drone of noise*'.

In 2016, more than a decade after scheme completion, the landscape through which the A120 passes between Stansted and Braintree remains rural and largely undeveloped between settlements (but with substantial new and planned development closer to settlements). The road has a significant adverse impact on the countryside, as illustrated by the photographs on the next page.

Figure 10.6 shows the A120 near Great Dunmow, where the Flitch Way has been diverted to run alongside it, and, by contrast, the Flitch Way at a location unaffected by the road. Road noise and visual intrusion makes use of the walking and cycling route unappealing at the former location.

Figure 10.7 shows the A120 where it crosses the River Chelmer, also close to Great Dunmow, and, again by contrast, the River Chelmer about a mile upstream. The point where the A120 crosses the Chelmer is also on the route of the Flitch Way. Graffiti, rubbish in the river, evidence of vandalism, unvegetated river banks and noise of the road overhead make the Flitch Way feel unsafe and the river appear severely degraded. The A120 at this point is more than six lanes wide, because of on- and off-slip roads. Drivers crossing the River Chelmer on the A120 here would be oblivious to the effect of the road on the foot / cycle path and river below them.

10.4 Economic impact

The Appraisal Summary Table for the A120 scheme stated that the scheme was necessary in order to facilitate development, in particular housing for employees, associated with the expansion of Stansted Airport. In terms of its wider economic benefits, the AST said that the scheme would serve the Harwich / Clacton Assisted Area and the Braintree Single Regeneration Budget investment area. It also noted that the A120 corridor was designated for industry and housing development in local plans.

The evaluation in the FYA POPE concluded that the scheme had '*improved access to important local developments such as Stansted Airport and also provided the opportunity for future housing and economic growth in the area.*'

The FYA POPE makes no comment on any effects of the scheme on the Harwich / Clacton Assisted Area, or the Braintree SRB investment area.

Twelve years after scheme completion, it is difficult to identify evidence of economic benefit to the local area, either in terms of new businesses moving in, or more jobs being created for local people.

Figure 10.6: Impact of A120 on the Flitch Way



Route of Flitch Way diverted alongside A120



Flitch Way where unaffected by A120

Figure 10.7: Impact of A120 on River Chelmer



River Chelmer where crossed by A120



River Chelmer where unaffected by A120

Bottom right image: © Roger Jones, licensed for use under Creative Commons Licence

In Great Dunmow, only 18% of land allocated for employment use in 2005 had been taken up for this use by 2016¹⁷⁰. An employment land study in 2011 found that there was no demand for B1 business development in the market town¹⁷¹.

Using Census data for 2001 (before the road scheme) and 2011 (after the road scheme) it is possible to assess the change in the number of jobs in the broad A120 corridor as a whole, and at each of the main employment locations within this corridor. The results are shown in Table 10.4. For the corridor as a whole, the number of jobs increased by 16% over this period, which was comparable to (albeit somewhat less than) the figure for Essex (+25%). However, most of this growth in jobs was within the towns themselves: the number of jobs based in Braintree rose by 13% (from 14,600 in 2001 to 16,700 ten years later), and the number of jobs in Great Dunmow rose by 19% (from 3,400 to 4,200). In contrast, the number of jobs at Stansted Airport, the location that might have been expected to be the main beneficiary of the new road, fell by 3% (from 10,300 to 10,000). Moreover, jobs in Braintree and Great Dunmow were more likely to be taken by local people than jobs at Stansted. For example almost two-thirds of the jobs in Braintree were taken by people who lived less than 10km from their workplace, whereas this applied to less than a third of the jobs at Stansted Airport.

Table 10.4: Change in number of jobs at main employment sites along A120 corridor

	Number of jobs before A120 scheme (2001)	Number of jobs after A120 scheme (2011)	Change in number of jobs (2001 to 2011)	Proportion of jobs held by local people (living <10km from workplace) 2011*
A120 corridor	32,300	37,400	+16%	52%
Braintree	14,600	16,700	+13%	63%
Great Dunmow	3,400	4,200	+19%	48%
Stansted Airport	10,300	10,000	-3%	31%*
Essex (comparator)	527,400	659,800	+25%	61%

Figures are for the workplace population. Figures for 2001 are based on output areas while those for 2011 are based on either output areas or workplace zones. 2001 output areas and 2011 workplace zones are not identical within built-up areas, but the gross areas included in the analysis were selected to give an identical match between 2001 and 2011.

* Proportion of Stansted Airport jobs held by people living within 10km is for 2001 rather than 2011, as 2011 data not available on a comparable basis. Comparison with trends for Braintree and Great Dunmow suggests that the proportion at Stansted in 2011 is probably worse (i.e. lower) than shown by around 10%-points.

Notwithstanding the absence of hard evidence that the A120 Stansted to Braintree scheme has benefitted the local economy, there remains a belief that road construction is an effective means to create jobs.

Essex County Council is now lobbying for the A120 east of Braintree to be dualled. It is undertaking a feasibility study¹⁷² on route options for a dualled A120 between Braintree and Colchester, with the aim of achieving inclusion of the scheme in the government's next Road Investment Strategy (RIS2) for 2020-2025. Its 'A120 Essex' website emphasises that further dualling is necessary in order to cater for economic development that, it argues, is being held back by the congestion and unreliable journey times on the single carriageway road. Examples cited as case studies include Stansted Airport, whose Head of External Affairs

argues that *'this part of the country has relatively low unemployment, so we need to look further afield for our workforce...but getting to Stansted is so difficult because the A120 is so poor, that this is an unattractive option to many'*; and the Managing Director of Earls Colne Business Park, north-east of Braintree, who states that *'huge daily traffic jams on the A120...are blocking expansion'* and that *'one of the main impediments to further expansion ...[is] the lack of available employees within an acceptable drive time'*.

Meanwhile, the Haven Gateway Partnership (a consortium of business interests and local authorities) is currently coordinating an A120 Campaign which claims that the dualling of the A120 east of Braintree could result in more new jobs. Their 'prospectus'¹⁷³ identifies 11 sites along the A120 where this employment growth could be achieved, including some sites on the section that is already dualled: Stansted Airport Aviation and Business Area; and Eastlink 120 Business Park, south of Braintree *'situated in a highly accessible location close to the junction of the A120 and A131 providing fast access to Stansted Airport, Chelmsford, London, Cambridge, the M11, A12 and across the national motorway network'*.

The 2014 'Growth Deal and Strategic Economic Plan' for Essex states that¹⁷⁴:

'The [A120] Haven Gateway Growth Corridor...is one of the key international gateways to the UK; home to Harwich International Port, one of the UK's leading multi-purpose freight and passenger ports, and supporting the neighbouring port of Felixstowe...In this corridor we have the opportunity to directly create 4,784 jobs and 2,953 new homes by 2021 and facilitate 24,100 jobs and 28,500 homes through our proposed transport schemes....The development of the A120, in particular dualling sections which are currently single carriageway, will dramatically improve connectivity and access along the corridor, unlocking growth and enabling both Harwich and Stansted to realise their economic potential.'

Notwithstanding these claims, the evidence from the dualling between Stansted and Braintree, which did not result in jobs growth, may perhaps suggest that the predicted economic benefits from further dualling of the A120 should be treated with some scepticism.

10.5 Land development impact

In the period since the A120 Stansted to Braintree scheme was completed, the main land development impact has been the provision of new housing on sites along the old A120 (B1256).

This new housing is often highly-priced, making it poorly suited to the needs of local people. A Bovis development at Takeley, The Ashes (Figure 10.8), was recently offering houses for sale at prices ranging from £343,000 to £550,000¹⁷⁵. Other housing developments appear similarly expensive. A survey carried out as part of Great Dunmow's Neighbourhood Plan found that half of respondents felt there was not enough housing at affordable prices / rents in the market town, and starter homes were ranked as the number one priority for new development; this is not reflected in the type of development that is taking place^{xcv}. During research for this case study, a Braintree councillor commented that:

xcv Starter homes are currently defined by the Government as costing no more than £250,000 outside London <https://www.gov.uk/guidance/starter-homes>

'A lot of the development pressure is non-local, resulting from people moving out from London, cashing in on high property prices in the capital, or buying in the Braintree area because they can't afford to live in London. So beautiful countryside is being sacrificed while not meeting the local need. House prices are high, and completely unaffordable for most local people.'

Figure 10.8: The Ashes: high-price new housing at Takeley adjacent to old A120



A further concern is that the amount of housing now under construction adjacent to the old A120 will increase traffic, so that any traffic-relief initially provided to villages such as Takeley by construction of the dual carriageway will be eroded. Uttlesford District Council anticipates over 1000 new homes off the old A120 (B1256) in the village of Takeley over a nine-year period from 2011/12¹⁷⁶. Residents in these new housing developments will overwhelmingly travel by car. For the new Priors Green development at Takeley (Figure 10.9), analysis of 2011 Census data shows that 81% of people who work outside the home normally drive to work – as might be anticipated, given the development's location, low density, and the lack of frequent public transport.

Figure 10.9: Car-dependent new housing development at Priors Green, Takeley

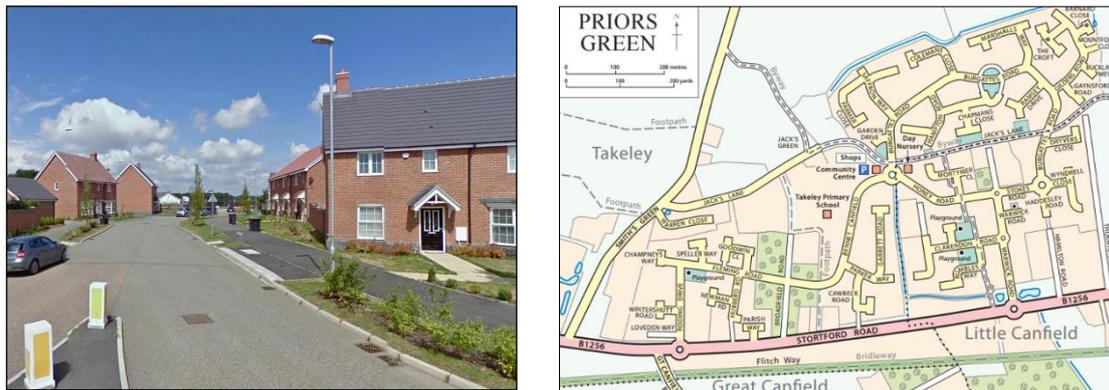


Image capture Aug 2010 ©2016 Google

There are plans for more housing development in the A120 corridor. Braintree District Council's Draft Local Plan (June 2016) notes plans for 10,000 – 13,000 new houses and a major business park in a 'West Braintree Garden Community' to the north of the A120 roughly half-way between Braintree and Great Dunmow. Uttlesford District Council has plans for more than 2,000 new houses on sites adjacent to Great Dunmow¹⁷⁷. It seems likely

that new car-dependent housing will be the main change in land use in the A120 corridor for the immediate future.

10.6 Conclusions

Traffic impacts

The dualling of the A120 between Stansted and Braintree resulted in a large increase in traffic on the corridor, with knock-on consequences for the rest of the road network, including both the A120 beyond the dualled section, and other roads in the area. Traffic flows in the corridor increased by 80%, compared to a county and regional growth trend of 9-11%.

In the short term, the large increase in traffic may have been partly due to release of suppressed demand. However, in the longer term, construction of the dualled A120 unlocked land for large-scale housing development. The nature of this housing development (highly car-dependent, and aimed at high income families) will have contributed to the traffic growth trend.

Environmental impacts

Construction of the road caused adverse environmental impacts including destruction of part of an ancient woodland SSSI, diversion or stopping up of numerous footpaths and bridleways, and degradation of the River Chelmer where it was crossed by the road. Efforts at mitigation were relatively unsuccessful: 'compensation planting' supposedly designed to replace the lost ancient woodland failed to establish because it was not protected from browsing deer; and turves containing Bee Orchid were not translocated from a site of local conservation importance as had been planned.

Economic impacts

There is little evidence that the dualling of the A120 between Stansted and Braintree stimulated economic development. The total number of jobs in the dualled A120 corridor *did* increase by 16%, comparing 2011 (after the scheme) with 2001 (before the scheme), but this was due to increases in jobs in the main towns of Braintree and Great Dunmow, rather than increases in jobs elsewhere on the corridor; in fact, the main employment site away from the towns, Stansted Airport, saw a reduction in employees over this period. There is no evidence of significant provision of new employment sites associated with either the dualled A120 or the B1256.

Land use impacts

For the future, there is heavy business pressure to dual the A120 east of Braintree. If the A120 east of Braintree is dualled, it is likely that this will cause more large increases in traffic in the short term, as seen after the dualling west of Braintree. If the dualling stimulates large-scale development at car-dependent sites such as Stansted Airport and Eastlink Business Park, the longer term effects on traffic volumes on the A120, and on surrounding roads, will be even more marked.

PART III: Evidence Synthesis and Recommendations

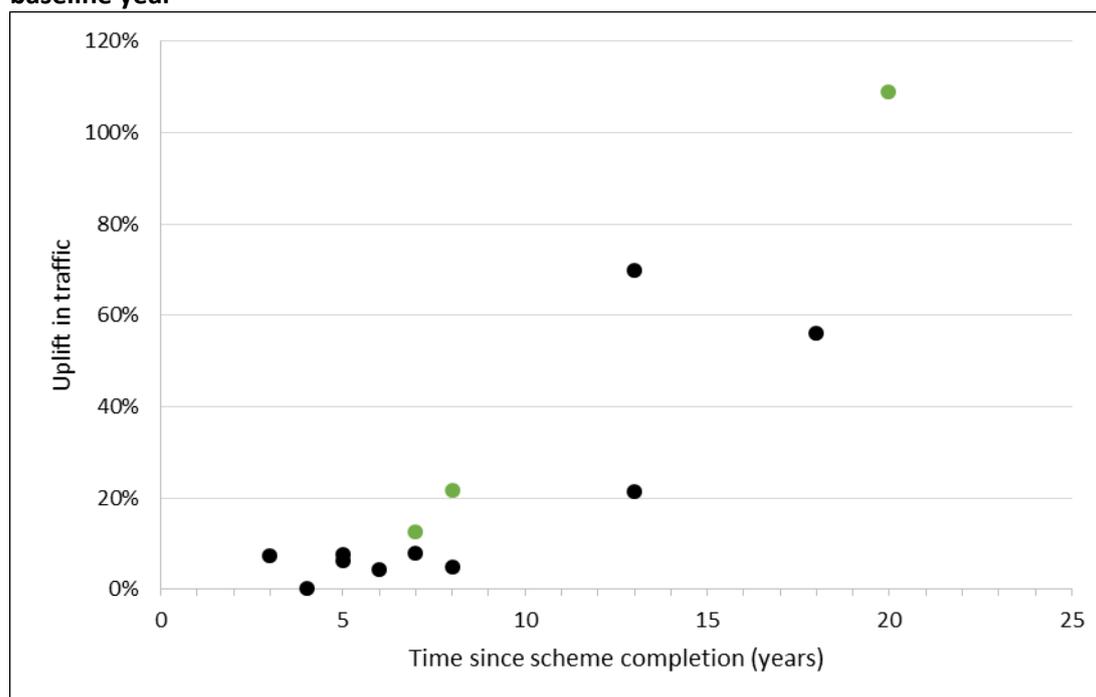
11. Overview of the effects of the roads programme

11.1 Roads and generated traffic

The nine road schemes for which we reviewed traffic data (see Table 2.2), and our four case study schemes, show evidence which is consistent with the conclusion that road schemes generate traffic, and suggest that this occurs both over the short and long term. By comparing changes in traffic flow for each scheme with county and regional trends, we were able to control for background traffic growth (a method also used in some, but not all, POPEs). We were also able to exclude the effect of reassignment from other roads in most cases, by examining changes in traffic across a screenline, as defined by the POPE^{xcvi}.

In the **short run, 3-7 years after the baseline year, the mean increase in traffic was fairly small, at +7%** (measured over-and-above background trends). In the **long run, 8-20 years after the baseline year, the mean increase in traffic was +47%**^{xcvii} (Figure 11.1 and Table 11.1).

Figure 11.1: Uplift in traffic in excess of background traffic growth, by elapsed time since baseline year



Each dot represents one of the road schemes listed in Table 11.1. Black dots denote schemes for which screenline data is used; green dots denote schemes for which no screenline available.

xcvi With three exceptions: no screenline was defined in the POPEs for A1 Willowburn – Denwick and M25 J12-15; and it was not possible to obtain traffic data for roads parallel to the M65 Blackburn Southern Bypass.

xcvii If schemes where screenline data was unavailable are excluded, both figures fall but only a little: to +6% in the short run and +38% in the long run.

Table 11.1: Changes in traffic flows relative to background trends

Time between baseline and post-scheme data (years) ^a	Year of 'post-scheme' data	Mean net increase in traffic	Uplift in traffic (relative to comparator) ^b	Road scheme
3	2010	+7%	+7%	A1 Bramham – Wetherby
4	2011	+0.1%	+0.1%	M1 J25-28 Widening
5	2008	+7%	+8%	A500 Basford, Hough & Shavington Bypass
	2010		+6%	A5 Weeford – Fazeley
6	2009	+4%	+4% ^c	A10 Wadesmill to Colliers End Bypass
7	2009	+10%	+8% ^c	A66 Stainburn & Gt Clifton Bypass
	2010		+13% ^{c d}	M25 J12-15 ^d
8	2008	+13%	+22% ^d	A1 Willowburn – Denwick ^d
	2012		+5%	A30 Bodmin – Indian Queens
13	2015	+46%	+21%	A46 Newark – Lincoln
	2015		+70%	A120 Stansted to Braintree ^e
18	2015	+56%	+56%	A34 Newbury Bypass
20	2015	+109%	+109% ^d	M65 Blackburn Southern Bypass ^{d f}
Short run average (3 – 7 years)		+7% (+6% excluding values for roads with no screenline)		Average of 7 (5) schemes
Long run average (8 – 20 years)		+47% (+38% excluding values for roads with no screenline)		Average of 6 (4) schemes

a: Date of baseline varies between one and three years before date of scheme opening.

b: (Average % increase in traffic pre / post-scheme across screenline in most recent year for which data available) minus (average % traffic growth for regional and county comparators over same period).

c: Figure is average of alternate figures in Table 2.2

d: Figure for uplift in traffic is for the road scheme itself, not a screenline.

e: Figure is for screenline, but with traffic flow on 'old' road (now B1256) assumed not to have shown any growth since date of FYA POPE (hence likely to be an underestimate)

f: Flows on opening estimated from average of low and high opening forecasts for 1995 rather than actual flows when scheme opened in 1997.

The observed increases in traffic took place during different time periods. It is notable that the time period for the scheme with the smallest net increase in traffic (M1 J25-28 widening, +0.1%) is from 2007 to 2011, which is the period of the economic downturn. Over this time period, all four of our case study schemes showed traffic flat-lining. The apparent absence of induced traffic for the M1 J25-28 may therefore have been a temporary phenomenon.

The short run increase in traffic is consistent with evidence from the SACTRA report on *Trunk Roads and the Generation of Traffic* (collected over 20 years ago, and relating to road schemes built in some cases many years earlier), which suggested an average road

improvement would see an additional 10% of base traffic in the short term¹⁷⁸. The long run figure is substantially higher than suggested by evidence from the SACTRA report (which indicated that an average road improvement would see an additional 20% of base traffic in the long term). This may be because of methodological differences, or because the time periods over which we have examined traffic data are longer.

This evidence suggests that the tendency for road schemes to generate traffic remains as strong now as it was in the past.

11.2 Roads and environmental impacts

More than half of road schemes for which a POPE is available (49 out of 86) affected an area that had a local or national designation for its landscape, biodiversity or heritage. A number of schemes had multiple impacts.

Evidence from the four case studies suggests that the environmental impacts of road schemes are long-lasting and significant:

- In Newbury, the visual impact of the road embankment across the Kennet Valley and the gouge through the rolling chalk downland of the North Wessex AONB are permanent. The saplings planted to replace mature woodland will take many decades to reach maturity, and even then will offer much poorer habitat, landscape and amenity value than the ancient woodland that was destroyed. A nature reserve was halved in size and SSSIs were severed.
- South of Blackburn, the environment where the road crosses the Stanworth Valley remains poor, with sparse tree cover and poor ground cover under the viaduct, in place of ancient woodland and rich bird and plant life that existed previously. Footpaths that were re-located and now run alongside the motorway are subject to noise and visual intrusion. Large numbers of houses along the route are also subject to noise impacts.
- In Lincolnshire, nearly 10km of hedgerows and wooded strips adjacent to the A46 were destroyed. Replacement planting has not established well, so that even after 20 years, the planting of saplings has not compensated for the loss of mature trees and hedgerows in an area formerly designated as an Area of Great Landscape Value. Three other woodlands of local conservation importance were also partly destroyed.
- In Essex, land was taken from an ancient woodland SSSI and the intended 'compensation planting' was inadequately protected so that it did not become established. A long distance footpath, the Flich Way, is in places diverted to run alongside the A120, greatly reducing the attractiveness of the path for walkers. The site where the A120 crosses the River Chelmer is severely degraded, with graffiti, rubbish in the river, evidence of vandalism, unvegetated river banks and the noise of the road overhead.

Evaluation of landscape impacts by POPEs involves a mechanistic box-ticking approach, focussed on issues such as whether planting schemes are 'neat and tidy', or whether tree guards need to be adjusted, but fails to consider the overall impacts of schemes on the landscapes through which they pass.

The effect of road schemes in generating traffic means that they also cause substantial increases in carbon emissions. The method used in the POPEs to estimate the effect of individual road schemes on carbon emissions is problematic, and appears likely to systematically and significantly underestimate the effects of individual roads because of its

failure to recognise induced traffic. Even so, taking the Highways England estimates of emissions resulting from road schemes at face value, the cumulative impact of 54 road schemes that were completed in an eight year period from 2002 to 2010 is probably of the order of an extra 8 MtCO₂ to date. In a single year, the increased emissions due to these 54 road schemes is likely to be around 3% of the annual emissions of CO₂ from *all* motorway and trunk road traffic in England. Another way of saying this is that it is the equivalent of putting an extra 590,000 cars with average mileage and average emissions onto the road.

In addition to their environmental impacts, roads have health impacts. While some road schemes (such as bypasses) may result in short-term improvements in air quality in bypassed areas, their long-term effect is to increase overall levels of traffic, leading to increased emissions of nitrogen oxides and particulates that are damaging to human health. Evidence from our case studies (notably the Newbury Bypass) suggests that any traffic / air quality benefit to bypassed areas is quickly eroded. The car-based lifestyles that are encouraged by the combination of road building and car-dependent development are also a major contributor to obesity and all the diseases that are associated with lack of physical activity^{xcviii}.

11.3 Roads and economic impacts

Of 25 road schemes which had been justified on the basis that they would benefit the local economy, only five had any evidence of any economic benefit. Because of the paucity of evidence for these five schemes, it is not possible to say whether any economic improvement was directly attributable to the road scheme; there is also no evidence on whether new economic activity associated with these road schemes was genuinely additional, or simply a displacement of economic activity from elsewhere.

Where a road scheme had been justified on the basis that it would boost or speed the amount of regeneration in an area with a struggling economy, a common pattern was for economic development following completion of the road scheme to be slower than expected, or not to materialise at all. In cases where some development took place, it was not necessarily the type of development that was desired or needed for the area in question. In Blackburn, there *has* been development since completion of the M65, much of it concentrated around motorway junctions. This includes out-of-town retail and office units that are likely to be undermining the town centre, and warehousing which mainly provides poorly paid hourly rate jobs. Sites are heavily car-dependent. This economic model has not worked well for Blackburn's residents: unemployment is higher than in neighbouring areas, wages are lower, and these jobs are difficult to access for the third of all Blackburn households that do not own a car.

Where a road scheme had been justified on the basis that it was necessary to cater for current and future traffic levels in a 'pressure cooker' area with a buoyant economy, the common pattern was for the scheme to be followed by a large amount of development in car-dependent locations. This led to rapid traffic growth and resulting congestion, affecting both the road scheme and the pre-existing road network. This pattern was strongly evident

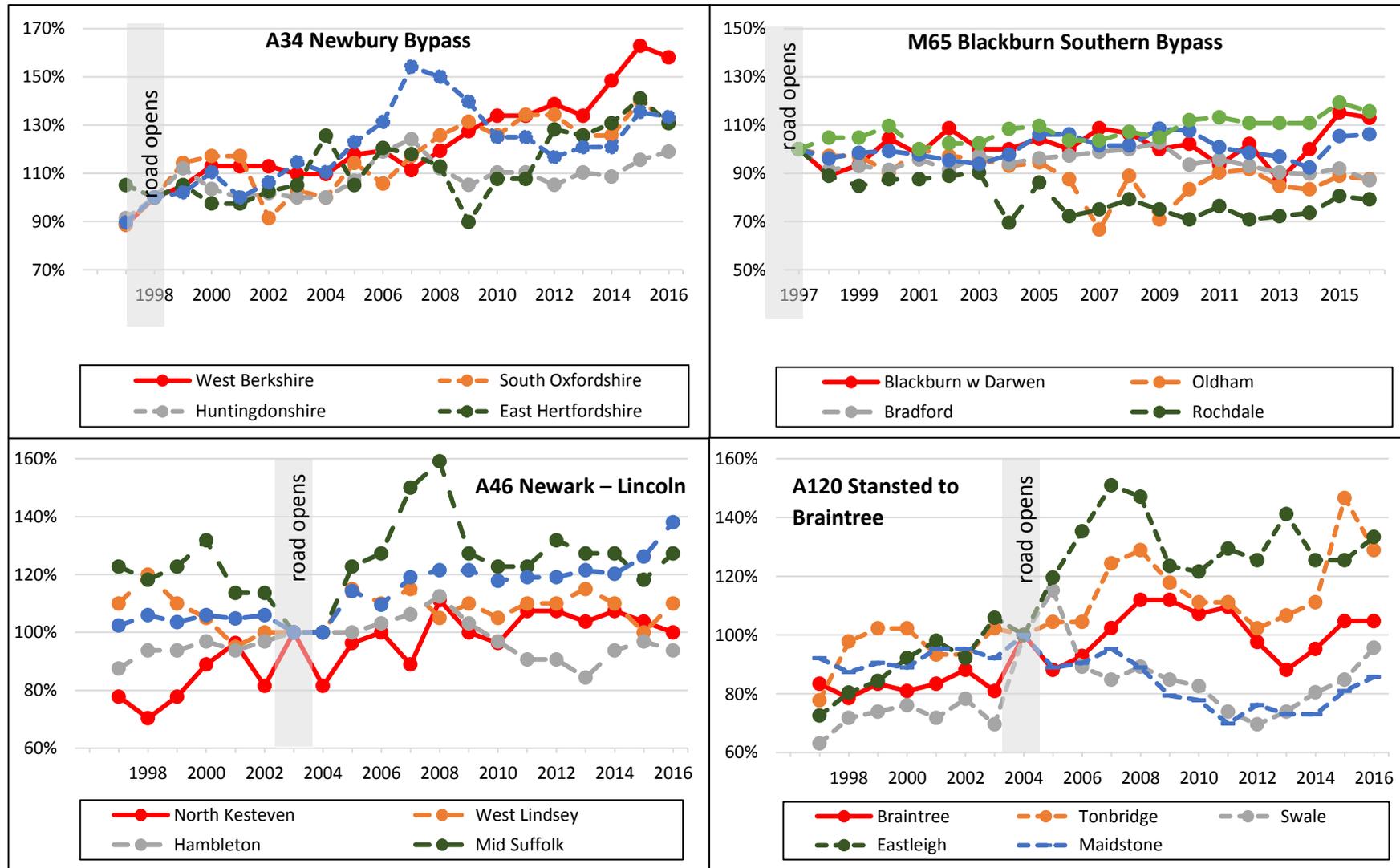
xcviii Each additional hour per day spent in a car is associated with an increased likelihood of obesity, according to Frank LD et al. (2004) *Obesity relationships with community design, physical activity, and time spent in cars* American Journal of Preventive Medicine 27 pp87-96.

in Newbury, where there has been a large amount of highly car-dependent development since the bypass was built, leading to severe traffic congestion on the 'old' road that was supposed to have been relieved by the bypass. For example, the Vodafone site on the 'old' road is surrounded by a ring of seven double-deck car parks to accommodate the vehicles of its employees and visitors.

Some road schemes were justified on the basis that by reducing journey times, they would increase the number of jobs that were accessible to local people, or, alternatively, increase the potential workforce able to access major employment sites. The business cases for these schemes tended to make large claims for the many thousands of additional jobs that would become accessible, or prospective employees that would be able to access key employment sites. However, there was no post-scheme evidence to suggest that the effects were on the scale claimed.

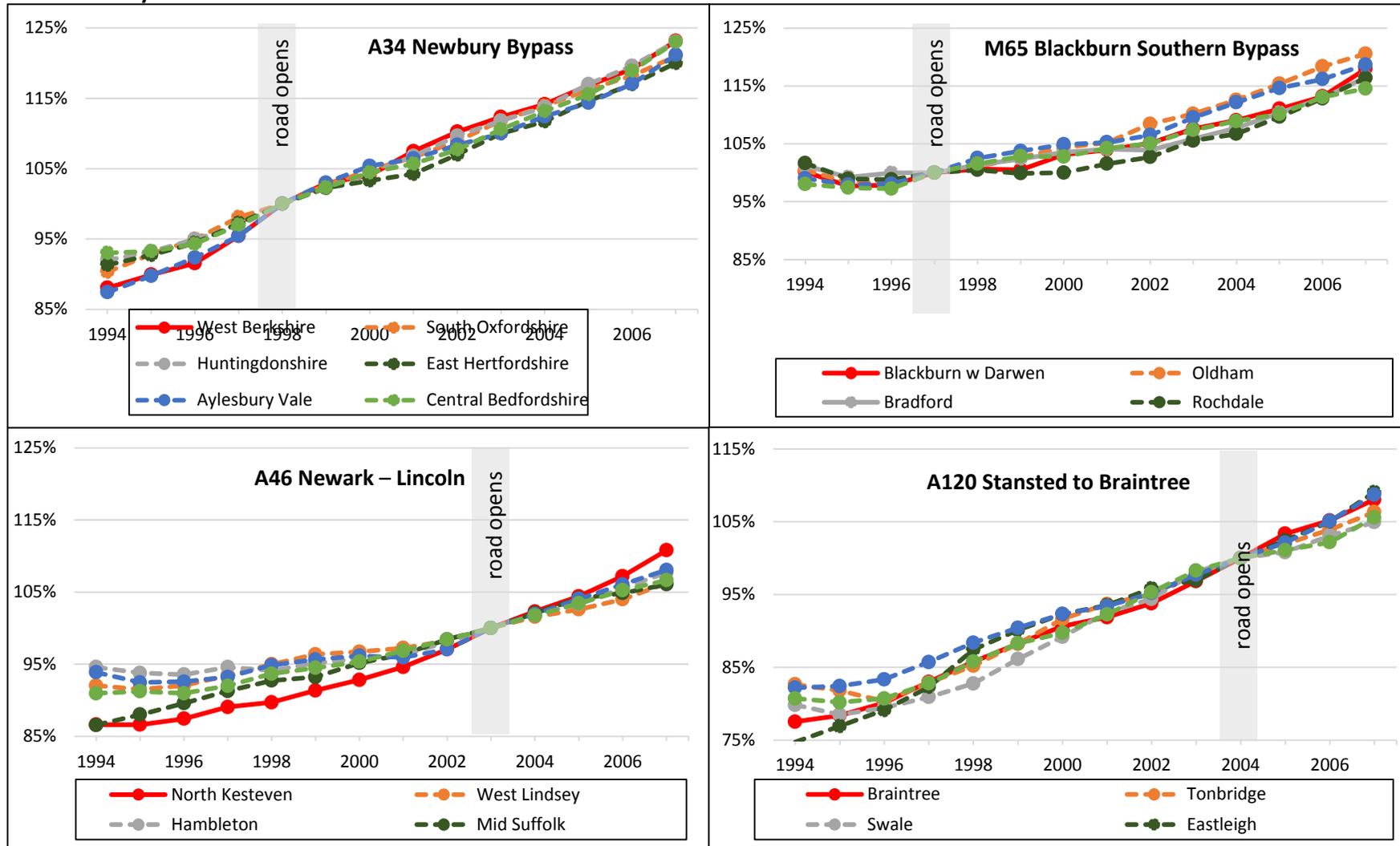
In order to substantiate (or reject) the claim that road schemes are beneficial to local economies, there is a need for the POPE process to include a thorough examination of economic changes – such as change in the number of jobs and businesses – in the areas of road schemes, compared to economic changes in comparator areas where there have been no road schemes. Figures 11.2 and 11.3 show just such a comparison for our four case study areas. Here, the local authority areas in which the case study road schemes are located are compared with the five 'most similar' local authorities in England, in terms of demographic, socio-economic and employment characteristics, using the National Statistics 2011 Area Classification for Local Authorities. These plots show little evidence of any superior performance in the case study areas in the period following completion of the road schemes, either in terms of jobs or net number of businesses. This cannot be taken as definitive 'evidence of no effect' (for example, it is possible that there was an effect but it is too small to show up at the local authority level). However, coupled with more detailed scrutiny at the output area level, as in Table 10.4 for the A120 Stansted to Braintree scheme, it does not provide convincing evidence that road schemes give a boost to local economies. If there is such an effect, it must be small.

Figure 11.2: Indexed change in total jobs in local authority areas of case study road schemes, compared to change in matched local authority areas



Trends in 'road scheme' local authority show by red solid line; trends in 'matched' local authorities shown by dotted lines. Source: Annual Survey of Hours and Earnings.

Figure 11.3: Indexed change in number of VAT-registered businesses in local authority areas of case study schemes, compared to change in matched local authority areas



Trends in 'road scheme' local authority show by red solid line; trends in 'matched' local authorities shown by dotted lines. Source: VAT registrations / deregistrations. These are considered to be an indicator of the level of entrepreneurship and health of the business population. This dataset was discontinued in 2007 and replaced with a Business Demography Dataset from 2010.

11.4 Roads and land use change

All four case study schemes showed how road building is closely associated with a pattern of land development that is highly car-dependent. The increased capacity created by a widened or new road is often 'consumed' in the form of housing developments with few or no facilities, marooned in the countryside. These become dormitory commuter villages, with the vast majority of residents having no option but to commute and shop by car. This pattern was evident in Lincolnshire, where the A46 dualling facilitated development of over 1,200 homes on a disused RAF airfield in the middle of the countryside, with a further 1,250 homes recently given planning permission. In Essex, over 13,000 new dwellings are anticipated at various rural locations along the 'old' A120. The housing that has already been built on sites adjacent to the 'old' A120 is to a car-dependent lay-out, and Census data shows that its residents overwhelmingly drive to work.

Road schemes are also associated with development of car-dependent business parks and retail parks. In Newbury, the multiple business parks and retail parks that have been developed or expanded since construction of the bypass generate large numbers of vehicle movements, causing serious congestion on the 'old' road (now the A339). These sites include many businesses and retailers that could otherwise be in the town centre. In Lincolnshire, the A46 dualling has facilitated car-based leisure and commercial developments at either end of the scheme.

In Blackburn, the development of new sites around M65 junctions has created a semi-industrial / urban landscape of motorway services, light industrial areas, storage and distribution sites, car showrooms and business parks, where there was once open countryside. The Green Belt around the town has been cut back to the line of the motorway, and there is pressure to release further Green Belt for development.

This pattern of development is a major cause of the high levels of traffic growth associated with road schemes in the long term.

11.5 Roads, safety and physical activity

For 15 POPEs which had used a robust methodology to analyse effects on road safety, the 2015 meta-analysis found that eight showed a reduction in collisions (relative to the counterfactual), and seven showed an increase in collisions, over short time-periods of five years or less. At best, this finding suggests the roads programme has a mixed effect on road safety. We might conclude that some schemes improve road safety and some worsen it; or, alternatively, that there is random variation in casualty numbers and the overall roads programme has no effect on road safety.

However, this short-term evidence tells us nothing about longer-term effects. Over longer timescales of 10-15 years, it might be expected that excess traffic growth (above background trends) arising from road schemes will result in *more* collisions and injuries than would otherwise have happened. For the Newbury Bypass, our analysis of personal injury collision data supplied by Highways England showed a doubling in personal injury collisions involving death or serious injury (so-called KSI collisions) after the new road opened: from an average of four per year in the four years before the bypass opened, to an average of eight per year in the four years afterwards. After this, KSI collisions fell for a period (as did national trends), but then started to increase again (the opposite of national trends). If KSI collisions on the

A34 had followed the trend for Britain, there would only have been two per year by 2011-2015; in fact, there were nearly six per year.

Our review of POPEs did not include assessment of the reported effects of road schemes on physical activity. Effects on physical fitness are supposedly evaluated in POPEs, but the treatment is perfunctory, largely focussing on whether changes to the public rights of way network required for the scheme have actually been implemented. The more important question of the cumulative effect of road schemes on overall patterns of physical activity is not addressed: if road schemes generate additional traffic, a proportion of this must be replacing trips that would otherwise have been made by public transport, cycling or walking, all of which would have increased physical activity and therefore conferred health benefits.

11.6 Was road building the solution?

Set against all the disadvantages of road building documented in this report, we acknowledge that some local people in the areas of some of our case studies would see the widened and dualled A46 or A120 as better than what was there before. They would argue that dualling of, say, the A46 *did* provide an improvement in the 'driving experience': making it less stressful, because safer to overtake slow-moving agricultural vehicles, and somewhat reducing journey times. But this improvement for drivers is short-lived, because of the effects of road schemes on spatial development – over a period of a few decades, drivers' experience of using the A46 will gradually worsen. And the other effects on landscape, biodiversity and carbon emissions as a result of induced traffic are a permanent and heavy price for society to pay for this short-term benefit to one section of society (those who drive, i.e. excluding children, older people, non-drivers). Was £41 million a price worth paying for this, or might it have been possible to make some smaller changes to the road at a lower cost? It is not that there are no benefits at all from road building, but rather than the benefits are much smaller than the harm caused.

The roads that were the subject of our case studies did not provide 'the answer' to the problems that they were supposed to solve. In each case, the local authority and national government are together locked into a highly car-dependent development model, in which road building and the associated development generates more traffic, which in turn creates pressure for more road building. The case for more road building is partly justified on the basis that existing roads cannot take the strain any longer, and partly on the basis that increased road capacity will magically unlock the economic potential of the area. However, provision of more road capacity does not deliver a stable situation – the more capacity is increased, the more capacity increases are 'needed'.

- In Newbury, the large amount of development that was allowed after the construction of the bypass has brought increased traffic pressure onto the old bypassed road, instead of the traffic 'relief' that was promised to Newbury residents. The council is now seeking to enlarge junctions and sections of the old bypassed road, in an effort to accommodate this traffic.
- In Blackburn, car-dependent development associated with the motorway means that junctions and links are congested at peak times, and so there is pressure both to widen the motorway and to extend it eastwards.
- In Lincoln, the Government has recently approved the £95 million Lincoln Eastern Bypass; this is a step towards the completion of an eventual ring road around Lincoln,

connecting to a future anticipated southern bypass which would in turn link to the dualled A46.

- In Essex, there is now pressure to dual the A120 east of Braintree, because the traffic growth as a consequence of the dualled road west of Braintree is placing pressure on the remaining single carriageway section. Business lobby groups, and the county council, argue that a new off-line dual carriageway east of Braintree will help businesses and create thousands of new jobs, but the evidence from the previous road building is that it did not increase the number of jobs in the corridor at all.

The **roads → car-based development → traffic growth → roads** model of economic development does not deliver even on its own terms. It has not solved Blackburn's economic problems: unemployment is high and wage levels are low. It did not bring more jobs to the Stansted – Braintree A120 corridor. It is also extremely wasteful of land – a precious and finite resource. The ribbon-development of homes and businesses along supposedly 'strategic' corridors seen in Newbury, Blackburn, Lincolnshire / Nottinghamshire and Essex is ultimately self-strangling: it means that any respite from congestion provided by a road scheme is temporary.

Policy-makers may ask 'what is the alternative?' While alternatives to road building are not the subject of this study, we think that the answer lies in the following:

- Models of economic development in which housing and employment are focussed in towns and around existing and new rail stations, designed to densities and of an urban form which make walking and cycling the modes of travel of choice.
- Strategic investment in new high quality rail (and light rail) corridors, in locations that will unlock land for housing and employment, built to densities and form that enable rail + bus and rail + walk / cycle for the majority of trips; and investment in rail infrastructure to support modal shift from road to rail for freight. In all four case study areas, there were examples of 'missed opportunities' to reduce road traffic through rail improvements^{xcix}.
- Measures to take traffic off existing roads or to manage demand at peak times, including road pricing, levies on workplace car parking, and support for businesses to reduce car use for commuting and business travel with the money raised from road pricing and workplace parking levies being invested in frequent high-quality public transport along the same corridor.
- Broader assessment of the underlying reasons that local economies are not thriving (spanning across poor health, low educational attainment, mismatch of skills etc. as well as transport), and implementation of transport and non-transport schemes that directly address these factors.

xcix For example, part of the justification for the Newbury Bypass was to take HGVs travelling between Southampton port and the Midlands out of Newbury town centre. A better option would have been upgrade of existing rail infrastructure to create a strategic high-quality rail freight corridor. Measures such as gauge enhancement between Southampton port and the Midlands, and grade separation at Reading, have finally improved this corridor for rail freight, but further interventions such as track quadrupling between Oxford and Didcot are still needed.

- Far-reaching reform of the way in which road schemes are appraised, including examination of opportunity costs and how else objectives could be achieved; a complete re-think of the excessive weighting given to aggregated (but individually small) drivers' time savings in WebTAG; and recognition in modelling and appraisal of the likely effects of road schemes on land use.

11.7 Recommendations and conclusions

Our high-level recommendations and conclusions are set out below, in relation to three areas: national policy; appraisal of road schemes; and evaluation of road schemes.

National policy

The findings of this study suggest that a major change to national policy is called for, involving a move away from large-scale road building. The evidence of the last 20 years suggests that:

- Any benefits of road schemes in terms of congestion relief are short-lived
- Road schemes cause permanent environmental damage
- The evidence that they deliver economic benefits is lacking.

Alternatives to road building need to be properly considered at an early stage, with any road proposal properly weighed against ambitious multi-modal options including new rail services and lines for both passengers and freight, new light rail services, very high quality bus services, demand management, speed management, and public transport-oriented development.

The potential for a national road pricing scheme to reduce congestion and carbon emissions, and improve air quality, should be back on the agenda.

A changed role for Highways England

Amid all this change, Highways England should still have a role. Its job should be refocussed on managing demand on the existing road network, with the aim of preserving and even improving our environmental capital, rather than on expanding that network at the expense of permanent destruction of our environmental capital.

The appraisal process

The appraisal of road schemes should be radically changed, reducing the manifestly ridiculous priority given to seconds of drivers' time savings, and instead giving proper weight to loss of countryside, tranquillity, ecology, climate change, local pollution, public health, town centre vibrancy, and urban public realm.

The evaluation process

The evaluation of road schemes is important and necessary, but the way in which it is currently being undertaken does not provide a suitable basis for policy-making. Instead, the POPE approach produces self-evidently incorrect or misleading results:

- There is a failure to establish a robust counterfactual by use of appropriate comparator datasets, and a failure to collect the necessary pre-scheme traffic data to enable

pre/post comparison of traffic volumes on road schemes with pre/post traffic volumes at comparator sites.

- There is a failure to check comparisons against *actual* trends as opposed to predicted trends, which are often very different (for example, traffic growth associated with schemes is classed 'as predicted' by comparison against national traffic forecasts which were vastly higher than the outturn trends).
- Impacts which any sensible member of the lay public would consider severe are left out or described in ways that make them sound minimal (for example, permanent damage of areas of National Park or Areas of Outstanding Natural Beauty is reported as having had an effect which was 'as expected', and the focus of evaluation is on micro-effects such as whether trees planted survived, rather than on the large-scale landscape impacts).
- There is little evidence of serious work to assess the effects of road schemes on local economies. Despite the oft-repeated claims by politicians about the strong economic benefits of road building, the POPE process has so far been able only to describe 'anecdotal' evidence that road schemes have assisted local and regional economic development. There has been no proper effort to measure the economic effects of road schemes against suitable counterfactuals, with regard to job creation, business creation, or any other metric of economic wellbeing.
- No attempt is made to re-survey to assess the long-term impacts of schemes on landscape, biodiversity or heritage.

At best, there is a sense that the POPE process is going through the motions for the sake of it. At worst, there is a sense that inconvenient adverse impacts are downgraded, ignored, buried, or even described as the reverse of what the data actually shows. The overall sense is of a process designed so that, however much damage past schemes have caused, and however far they have fallen short of their stated objectives, it can never throw up any serious impediment to future road building. The effect is, in essence, a continuous process of cover-up under the name of evaluation. This is not what evaluation should be about.

For the future, there are a number of ways that we suggest the POPE process could be improved. Our detailed recommendations on the methodology used for individual POPEs are set out in the box on the next page.

Beyond this, we also recommend that the arrangements for the POPE and POPE meta-analysis process are overdue for reform and should be changed:

- The POPE and POPE meta-analysis process should be overseen by a standing committee of independent evaluation experts under the aegis of the Department for Transport's Evaluation Centre for Excellence. The committee of experts should be specifically tasked with reforming and then overseeing the POPE process to raise its standard to a level which can provide credible and robust evidence as to the outcomes (both positive and negative) that are attributable to road schemes.
- Meta-analyses should be undertaken by impartial academic researchers with a track record in evaluation, and should include sufficient budget to allow for re-analysis of original datasets, rather than relying on the erratic, incomplete and poor quality data as presented in POPEs.

We believe that these reforms would increase the rigour and quality of the evaluation of road schemes. They would go some way to reducing the problem of evaluation bias arising when the agency commissioning the evaluation is also the body that requires ‘positive’ evaluation results in order to justify its ongoing budget.

We also suggest that reform of Highways England’s record-keeping processes is badly needed, in order for robust evaluation to be possible. The 2015 meta-analysis noted that – remarkably – 72 (89%) of POPEs had succeeded in obtaining *less than half* of the information that they had requested. In gathering information for this study, we also found that Highways England appears to dispose of traffic flow data once it is over ten years old (or is unable to locate it in its archives, which amounts to the same thing for all practical purposes). This is a serious limitation, as it makes it impossible to analyse long-run effects of road building. We therefore also suggest that:

- Highways England should improve its record-keeping processes, so that traffic flow data is retained and readily accessible to researchers, rather than being apparently discarded (or made impossible to locate) once more than 10 years old.

In its evaluation of **traffic and associated impacts**, the POPE process should:

1. Adopt a consistent approach to identifying the magnitude of induced traffic, using robust, consistent and clearly-justified comparator groups (for example, traffic data in the region and county of the scheme), and assessing change in traffic across a screenline.
2. Develop a monitoring strategy well in advance of scheme construction, so that traffic growth rates over several years *before* a road scheme is built can be measured, enabling pre/post comparison of traffic trends for the scheme and for the comparator group.
3. Avoid use of the misleading 'Route Stress' approach when reporting effects on journey time reliability.
4. Assess 'long run' effects of road schemes on generated traffic and journey reliability, over time periods of 10 – 15 years, and for the end-to-end journey (rather than solely focussing on reliability on the short section covered by a scheme). This implies the need for a 'Fifteen Year After' POPE for a subset of road schemes.
5. Similarly, assess 'long run' effects of road schemes on road safety, over time periods of 10 – 15 years, comparing pre/post scheme numbers and post-scheme trends in personal injury collisions in the corridor of the road scheme (including any bypassed roads) with trends in robust, consistent and clearly-justified comparator areas.

In its evaluation of **environmental impacts**, the POPE process (and, where relevant, WebTAG and the appraisal process) should:

6. Pay more attention to large-scale factors that determine the overall impact of a scheme: the scale of the road in relation to the grain of the landscape through which it passes; the size of the area over which the road is visible and traffic audible; the effect on tranquillity.
7. Assess whether each road scheme has facilitated inappropriate traffic-generating development such as industrial or retail outlet 'tin sheds' in the countryside, or has led to in-fill of former Green Belt.
8. Consider whether the design of the scheme has created what the Roads Minister terms '*a destructive sense of alienation from the built environment*', evidenced by repeated problems of vandalism, graffiti or fly-tipping in particular areas, such as beneath overpasses.
9. Report any examples where a road scheme has improved the natural landscape compared to what was there previously: for example, by putting the road into a tunnel, or by enabling closure of a previous road that bisected an important landscape area.
10. Assess the significance of landscape impacts so that appropriate value is assigned to all landscapes, not just designated landscapes, in line with the European Landscape Convention.
11. Undertake new environmental surveys, involving qualified landscape professionals / ecologists, to measure the medium-term impacts of schemes at five years after opening, and, where there are grounds for concern, repeated at fifteen years after opening.
12. Avoid classing overall impact as 'neutral' if there are both positive and negative impacts, or as 'slight adverse' when there are some 'moderate adverse' effects (both of which are contrary to WebTAG guidance on environmental impact appraisal, TAG Unit A3, paragraph 5.3.19).
13. Give weight to cumulative adverse effects in multiple locations along the route of a scheme.
14. Revisit its approach to the calculation of carbon impacts of road schemes, by allowing for the existence of induced traffic by the approach described in point 1.

In its evaluation of **economic and land use impacts**, the POPE process should:

15. Consider the effects of any new development following a road scheme: how well does it match local community need; what effect (positive or negative) is it likely to have on town centre vitality; how accessible are any new employment sites to job-seekers; how appropriate are any new employment sites to the needs of the local job-market. Answering these questions will require qualitative methods alongside the current quantitative approach (as recommended in Department for Transport (2016) *Strengthening the links between appraisal and evaluation*).

16. Use readily available data from datasets such as the Annual Survey of Hours and Earnings, Business Register and Employment Survey, Census data on the workforce population, VAT registrations / deregistrations etc. to evaluate pre/post change in economic activity and employment proximal to road schemes, relative to robustly chosen comparator areas; and to evaluate overall change in the wider area of a road scheme (i.e. to take account of displacement effects).

17. Assess the credibility of pre-scheme forecasts of job creation, including an analysis of changes in employment density proximal to the road scheme, compared to changes in employment density in the county and region as a whole, and in other suitably selected comparator areas where road schemes have not been built.

18. Rigorously avoid making claims of economic benefit that cannot be substantiated, both in the detailed analysis and in high-level summaries.

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