A1 East of England Strategic Study

Stage 3 Report

Department for Transport

highways england

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Executive summary

The A1 East of England Strategic Study was commissioned by Highways England and overseen by the Department for Transport to identify and provide an initial appraisal of potential improvements to the A1, between the M25 (Junction 1) and Peterborough (Junction 17). This 62 mile stretch of road comprises three distinct sections: the A1(M) from Junctions 14-17 built to a high standard (11 miles); the A1(M) from Junctions 1-10 still at motorway standard but more variable in layout (25 miles); and, in-between, a 26 mile section of the A1 with five roundabouts, numerous unnumbered junctions and accesses, which is of variable layout and quality, with settlements and housing in close proximity.

The area's road network is underperforming and there is a risk that this will stifle the potential for sustained economic growth in a region which makes a disproportionate contribution to national economic success. The key problems on the route are:

- Poor journey time reliability with variable speed and congestion;
- Long delays;
- Constrained road and restricted free traffic flow;
- Collisions;
- Capacity;
- Poor conditions for public transport;
- Noise and air quality;
- Impact on landscape and townscape;
- Impact on biodiversity;
- Contributing to undermining growth potential; and
- Anticipated pressure on existing road network as a result of estimated population growth.

An initial list of more than fifty options was generated to address these problems and meet the study objectives and this was then shortlisted to five options which were formed into three packages and appraised. A Strategic Outline Business Case is being prepared for these Packages.

Package A	Package B	Package C
Section of new motorway between Junctions 10 and 14 (mostly offline)	Local improvements to A1 non-motorway section between Junctions 10 and 14	Upgrade non-motorway routes which link to the A1/ A1(M) at Junctions 3 and 4
Add capacity to A1(M) motorway sections through smart motorway management		
Local public and active transport improvements, including behavioural change measures between Junctions 10 and 14		

Package A and B achieve significant levels of benefit, although those are notably lower than the costs. Package A is of higher cost than package B. Package C is lower cost than packages A and B and delivers lower levels of benefit, but could be considered as

complementary to package A or B. Following further refinement and appraisal of the packages, an optimal package could be developed. This optimal package could be considered for inclusion in a future Roads Investment Strategy (RIS). Further analysis of the packages will be undertaken to understand which elements of each package perform comparatively well. Incorporating elements of the packages into the design of the committed schemes could be more cost effective and cause less disruption.

Planned transport schemes will impact on the study area, for example: the A14 Cambridge to Huntingdon A1(M) upgrade, the A1(M) Junction 6 to 8 Smart Motorway scheme and the A428 A1 to Caxton Gibbet scheme. Similarly relevant is the Oxford to Cambridge Expressway strategic study. The next stage of this work should consider the changing transport context as the schemes and study progress. The optimal package should ensure compatibility with planned and potential schemes, and consider potential efficiencies which can be made through concurrent delivery of multiple schemes.

The planned route for East West rail will intersect the study area in the vicinity of Sandy. The Oxford to Cambridge Expressway, if delivered, could intersect the A1 at a similar location. Potential and planned improvements to east west connectivity within the study area raise important strategic questions about the level and location of future growth.

1.1 Study background

1.1.1 The A1 East of England Strategic Study was commissioned by the Department for Transport and Highways England to identify and provide an initial appraisal of potential improvements to the A1. The requirements were set out in the first Road Investment Strategy (RIS) published in December 2014, which announced a programme of six Strategic Studies to explore options to address emerging issues and challenges. The RIS Investment Plan describes the purpose of this study as follows:

"This study will look at bringing consistency to the southern section of the route, from the junction with the M25 in the south to Peterborough in the north. In particular, it will look at the case for improving the non-motorway section linking the two parts of the A1(M) to motorway standard.

"Given the age of the road, much of the current route was chosen with little thought to the impact on the nearby environment. This study will examine whether improvements, including changing the alignment of the road, could reduce the environmental impact of the existing route and benefit local communities."

1.1.2 The study objectives are:

- Assess and form a preliminary strategic case for improving the transport network in the region based on the strategic and economic benefits.
- Define the transport objectives that this ongoing study should seek to identify options for.
- Identify a long-list of options which could meet the transport objectives, and undertake a high level assessment of the potential value for money, benefits and impacts of the different options using the Early Assessment and Sifting Tool (EAST)[1] and WebTAG[2] Options Assessment Framework (OAF).
- Short-list the better options to be carried forward.
- Prepare a Strategic Outline Business Case for the better option(s) for consideration in the development of future RIS.

1.1.3 This study is concerned with a southerly stretch of around 62 miles of the A1 between Junction 1 (intersecting the M25 on the outskirts of London) and Junction 17 (intersecting the A605 and Fletton Parkway near Peterborough). This broadly comprises three distinct sections: the 'northern' A1(M) section from Junctions 14-17 built to a high standard; the 'southern' A1(M) from Junctions 1-10 still at motorway standard but more variable in layout; and, in-between, the A1 with numerous unnumbered junctions and of variable layout and quality.

1 DfT (2011) Early Assessment and Sifting Tool (EAST) Guidance. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/4475/east-guidance.pdf

2 DfT (2014) Transport analysis guidance: WebTAG https://www.gov.uk/guidance/transport-analysis-guidance-webtag, retrieved 28/04/2016.

1.1.4 The Local Planning Authorities throughout the study area forecast continued population and economic growth and the A1 route is a central spine to supporting and assisting this growth. The road has lower traffic speeds, higher congestion and an inconsistent profile compared to alternative Strategic Road Network options including the M11 and M1.

1.1.5 This study investigates improvements to the A1 which could contribute to assisting free flow conditions, reducing the number of collisions and managing the severe congestion. As part of this, improvements to the local environment for example improving aquatic habitats, improving biodiversity and opportunities to prevent groundwater flooding, are considered.

1.1.6 The transport objectives for this study, formulated considering the problems identified on the route and the views of stakeholders, are listed in the table below.

Transport Objectives
1. To bring consistency to the route
2. To deliver better environmental outcomes for air quality, noise, biodiversity, CO2 / greenhouse gases, built heritage, water and landscape / townscape
3. To improve connectivity to benefit local communities, address severance, achieve a local / strategic balance, improve accessibility for all modes and improve safety*
4. To encourage growth, including economic and employment, population and housing, and freight
5. To improve the operation of the road network to improve journey time reliability, reduce delays and queues, promote resilience and improve safety*
** Safety is a cross-cutting issue relating to both road operation and local communities.*

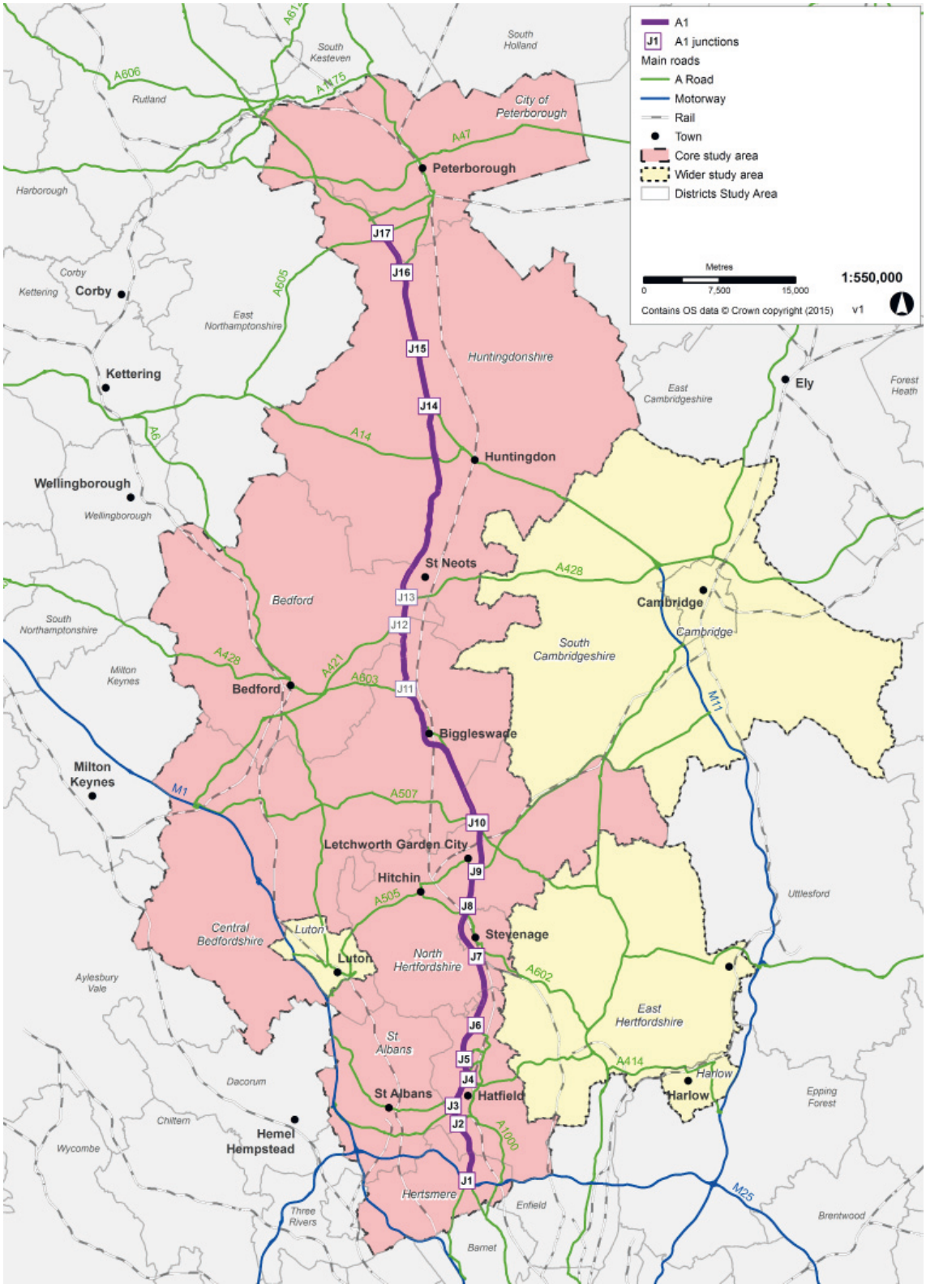


Figure 1: Study Area

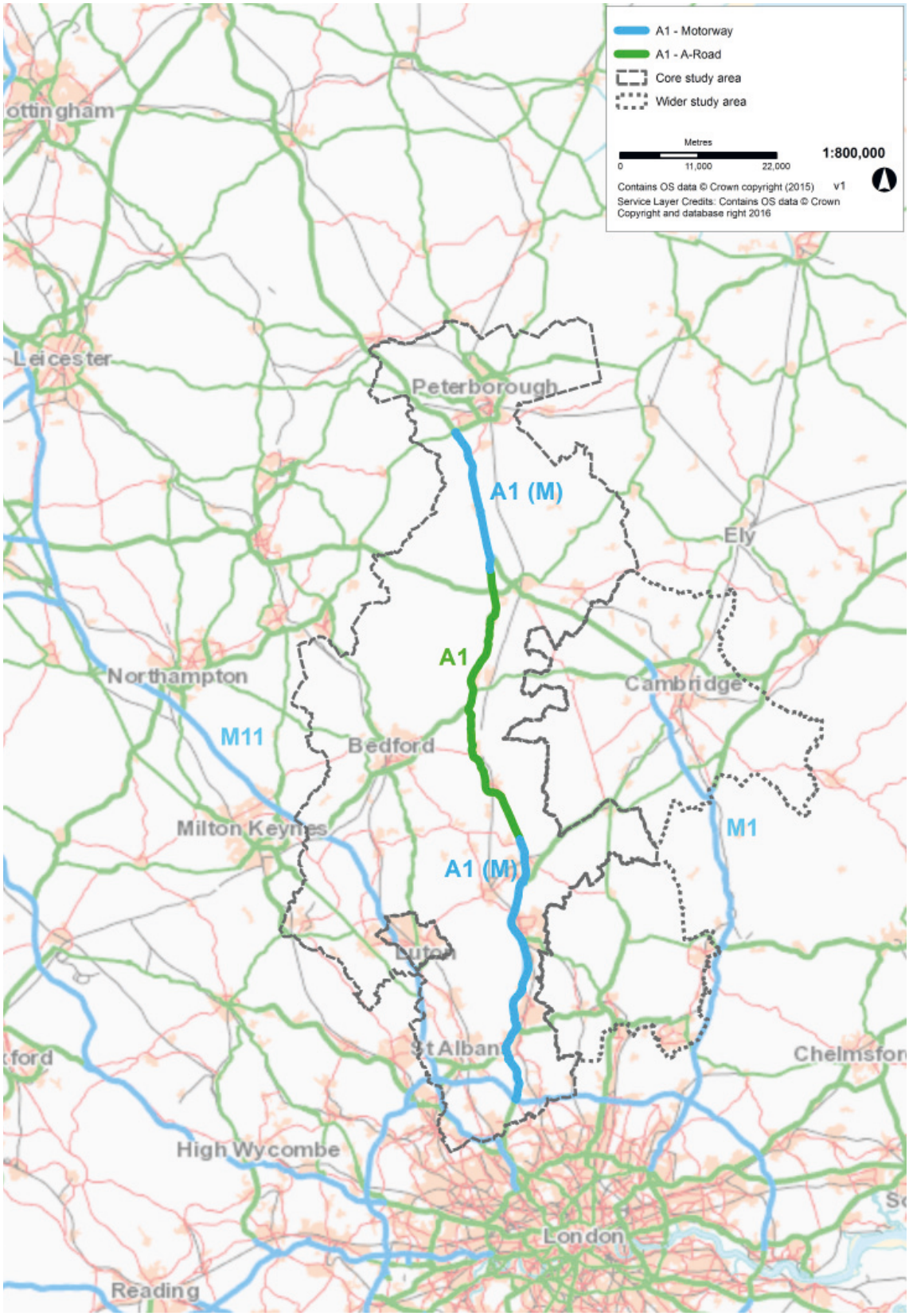


Figure 2: A1 and Wider Strategic Road Network

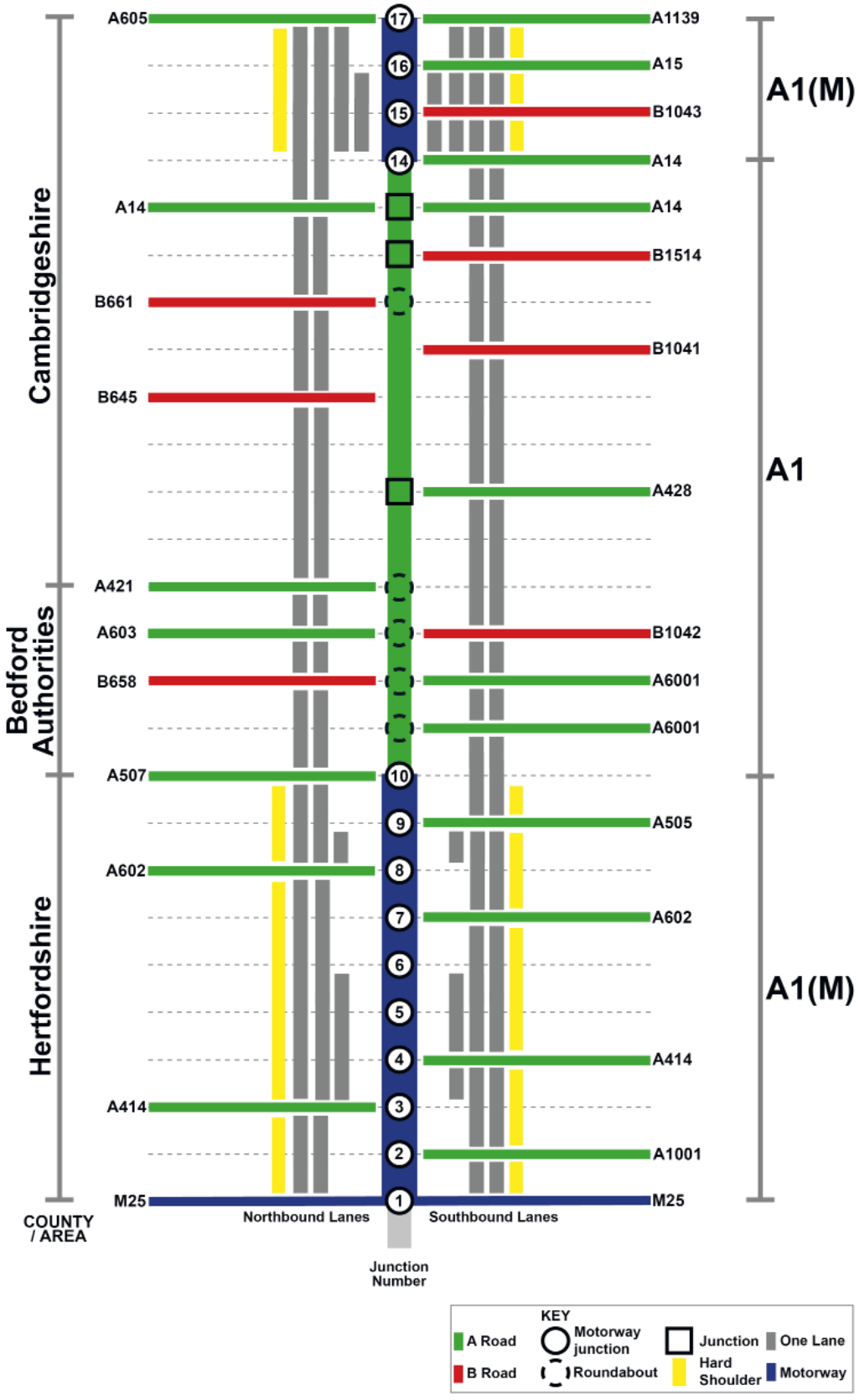


Figure 3: A1/A1(M) Route summary diagram

1.1.7 Figure 3 is a schematic diagram showing the A1 route within the study area. It shows: junctions, key interconnecting routes, the road standard (motorway / non-motorway), the number of lanes on each route section and whether hard shoulder is available.

1.2 The strategic case

The Study Area

1.2.1 The A1/A1(M) in the East of England plays an important role as part of the Strategic Road Network (SRN). It is a strategic inter-regional route for commuting and leisure, both southbound into London and northbound to the rest of the UK. The A1 forms part of the Trans European Transport Network (TEN-T) and is designated as a comprehensive status route in addition to its designation as forming part of the SRN. The route is part of the London – Leeds corridor and provides connectivity via other major roads that lead off the A1 road to a number of key international freight gateways including Stansted, Luton, Heathrow and Gatwick for air; and Felixstowe and London Gateway for deep sea and the Haven Ports/Dover for the short sea routes to continental Europe. It is also a significant secondary freight route and is part of the national freight network. The districts within the study area are economically high performing and there are strong relationships with the London functional urban area and its concentrations of employment and spheres of economic influence defined by the in and out flows of commuting.

1.2.2 Taken overall, the study area is affluent, has a high standard of living, with a wide range of employment opportunities and low levels of deprivation when compared to other parts of the UK. Significant population growth is anticipated, with the existing established industries, the skilled work-force, and the (inter)national focus on the area all factors to encourage private sector employers and investors to relocate or start-up.

1.2.3 The number of working age people is expected to increase across the study area, offering a mobile and skilled workforce for the growing industries in the area. Whilst some districts exhibit high numbers of industrial (Peterborough), manufacturing (Luton) and service and retail economies, others plan to build on their existing thriving economies, for example, research and high-technology (Cambridge and South Cambridgeshire), distribution and film (East Hertfordshire) and development and engineering (Central Bedfordshire).

1.2.4 Businesses communities and government have highlighted the study area as a specific area of investment, with Enterprise Zones at Luton, Cambridge, and Alconbury Weald, four LEPs covering the area and increasing agglomerations of businesses. The Hertfordshire LEP has been explicitly targeting the A1/A1(M) corridor as a focus for business growth. Drivers for success therefore come from county, regional and national levels.

1.2.5 There is a need for investment to support this planned growth without causing undue environmental impacts. The A1 runs through a number of sensitive receptors such as settlements located within 200m of the current alignment, scattered residential properties and environmental areas designated for conservation or amenity value. There are issues with air quality and noise at sensitive locations along the route. Additionally, the A1 negativity impacts on the setting of heritage assets through visual or noise disturbances.

Photograph 1: Welwyn at Junction 5, new development in proximity to A1(M)

1.2.6 The current A1/A1(M) in the study area was constructed to its current alignment and standards in stages. Some sections date back to the late 1950s, whilst others are of more recent construction, having been opened to traffic in the late 1990s. A number of previous studies and proposals for improvements have been considered within the study area. These include grade separation of a number of the roundabout junctions and a proposal for a motorway between Baldock and Alconbury. None of these were progressed.

1.2.7 Committed and potential schemes are set to improve strategic east west transport links within the study area. The potential for growth, particularly within the vicinity of Sandy where schemes are likely to intersect the A1, is important to consider. The Oxford to Cambridge Expressway strategic study is examining the case for creating an Expressway to connect the towns and cities of the 'Brain Belt'. The East West Rail project aims to establish a strategic railway connecting East Anglia with Central, Southern and Western England. The project consists of three sections, an eastern, western and central section, and is being promoted by the East West Rail Consortium, a group of local authorities and businesses. Cambridgeshire County Council, Central Bedfordshire Council and Hertfordshire County Council are all members of the Consortium. The western section is a committed and funded scheme which will link Bedford, Oxford, Milton Keynes and Aylesbury. The Central section, which would connect Bedford and Cambridge, is not currently committed or funded.

1.2.8 As demonstrated in the Task 1 report and summarised in section 1.3 of this report, the A1 route is currently underperforming evidenced by the current traffic conditions, route inconsistencies (variable route standard and number of lanes) and the impact of the route on communities and its environmental impacts. Despite it being difficult to measure the extent of economic growth potential lost by an underperforming road network, socio-economic indicators suggest that worsening road conditions are likely to impinge on drivers of growth, including on the levels of inward investment, the agglomeration of businesses and a buoyant labour market.

The Role of the A1/A1(M) Road

1.2.9 A well-functioning network enables growth by reducing business costs, improving access to markets, improving labour mobility and helping attract inward investment. Good road networks also support quality of life for communities by improving the local environments, enabling better access to facilities and services and widening employment opportunities.

1.2.10 However, the current configuration of the A1/A1(M) risks jeopardising sustained economic growth and the benefits it could bring to businesses and to communities. The route is one of England's oldest trunk roads and also one of the least consistent. With more than fifty years of local upgrades, the road today is a patchwork of different standards, ranging from four-lane motorway to elderly dual carriageway – often within the same ten-mile stretch. The road has severe congestion-related challenges and existing capacity problems and low travel speeds on numerous sections of the road are expected to continue or worsen without extensive intervention. This has implications for future use of the route for freight, commuting and leisure travel. Committed RIS1 schemes will alleviate some pressure but will not address fundamental problems with other sections of the route such as varying speeds along the route and changeable road conditions.

1.2.11 The local authorities served by the A1/A1(M) in the East of England are amongst the highest performing in the country outside of London in terms of their regional share of total Gross Value Added (GVA) and play an important role in contributing to national economic performance. The study area supports a number of strong and growing economic sectors in both employment and output terms. The area's road network is underperforming and there is a risk that this will stifle the potential for sustained economic growth in a region which makes a disproportionate contribution to national economic success.

1.2.12 It is challenging to appraise the extent to which the A1 supports – or thwarts – planned growth across the region. Whilst the districts in the study area have updated evidence bases including Strategic Housing Market Assessment and population and dwelling stock forecasts, the lack of adopted Local Plan coverage (post the 2012 updated National Planning Policy Framework) makes it uncertain where the growth is planned for within the Districts and what the strategic sites are. Direct implications on the road network are therefore difficult to estimate. On trend projections alone, and accounting for growth plans already in place, the population in the study area is anticipated to increase to over 296,000 people over the period to 2037 (14% on 2014 levels), matched with significant anticipated employment growth and new homes provision.

1.2.13 The planning policy 'gap' creates challenges when planning for the future of the area. Taken as a whole, the authorities surrounding the A1 do not yet collectively have a view as to where and how it will be able to deliver to meet anticipated growth and thus of the level and location of growth that the A1/A1(M) might be required to support. Without a clear and agreed policy framework it is not possible to infer where improvements to the A1 route would unlock growth. Therefore, whilst the overall level of growth along the route is clear, the locations for this future development has not yet been defined.

Photograph 2: Black Cat Roundabout

1.2.14 Photographs 3-5 show the inconsistencies on the south, middle and north sections of the A1.

Photograph 3: Junction 16-17, motorway section, high standard with free-flow conditions

Photograph 4: A421-Sandy, non-motorway section, dual carriageway through established communities

Photograph 5: Junction 3-4, motorway section

Committed and potential transport schemes affecting the route

1.2.15 Three improvement schemes within the study area are included in the RIS published in December 2014. These are:

- A14 Cambridge to Huntingdon - a major upgrade to the A14 between the A1 and north Cambridge: widening the road to three lanes; providing a new bypass around Huntingdon; creating distributor roads for local traffic; and remodelling key junctions along the route. The scheme includes improving the A1 between the B1514 and south of J14.
- A1(M) Junctions 6 to 8 Smart Motorway - upgrading the existing two-lane section of the A1(M) around Stevenage to Smart Motorway to provide a third lane of capacity.
- A428 A1 to Caxton Gibbet - improvement of the A428 near St Neots, linking the A421 to Milton Keynes with the existing dual carriageway section of the A428 to Cambridge, creating an Expressway standard link between the two cities via Bedford. The scheme is expected to include substantial improvements to the Black Cat roundabout, where the A1 currently meets the A421.

1.3 Current problems

Transport Issues

1.3.1 The A1 study route varies between motorway and all-purpose standard. There are congestion-related challenges, existing capacity problems and low travel speeds on numerous sections of the road which are expected to worsen without intervention.

1.3.2 The section between Junctions 1 and 3 shoulders London and serves both large communities and numerous businesses in the area, as well as connecting to the north. However it is also one of the least reliable stretches on the route with low average speeds in its two lanes in each direction.

1.3.3 The section between Junction 10 at Baldock and Junction 14 at Alconbury has a number of at-grade roundabouts, minor side roads and direct frontage accesses, often very close to the carriageway. This severely restricts free flow and several sections have speed limits of 50 or 60mph.

1.3.4 The A1 between Junctions 14 and 17 has both the highest volume of HGVs and the highest proportion of HGV movements (19%), reflecting the freight from the A14 which carries substantial volumes from the Ports of Felixstowe and Dover. The A1 between Junction 9 (Letchworth Garden City) and the A14 has a lower proportion of HGVs (13%) and the lowest total number of HGVs. The southern section between the M25 and Junction 9 experiences a higher number of HGVs relative to the A1 between Junction 9 and the A14, although HGVs make up a smaller proportion (9%) of total vehicle movements. This reflects the existence of a number of warehouse facilities, logistics hubs and depots serving Greater London and the South East. HGV flows are shown in Figure 4 and Figure 5.

1.3.5 The A1 is regarded by the local authorities it runs through as an important strategic route assisting in supporting the regional economies and as a strategic link to London and the North. The availability and frequency of public transport varies through the study area, with rail and bus provision poor in some areas. The proximity to London, large communities and buoyant economies suggest that road demand will continue to be high; this is supported by national road traffic forecasts[3]. The road has variable quality, frequent changes between two, three and four lanes, low speeds as a result of congestion and hazardous slip roads. This highlights the case for targeted road improvements to rationalise and improve the road.

1.3.6 Figure 4 and Figure 5 show total daily HGV flows, and HGVs as a percentage of Average Annual Weekly Traffic (AAWT) on the A1 route.

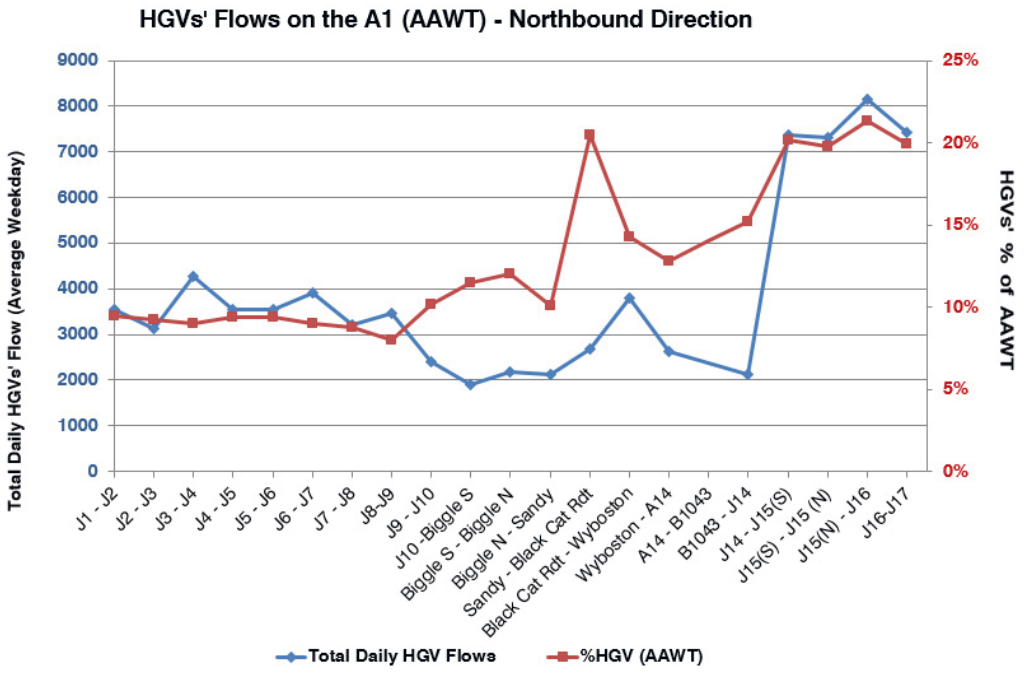


Figure 4: HGV Flows on the A1 Route – NB Direction[4]

3 DfT Road Traffic Forecasts, March 2015
4 TRADS 2015

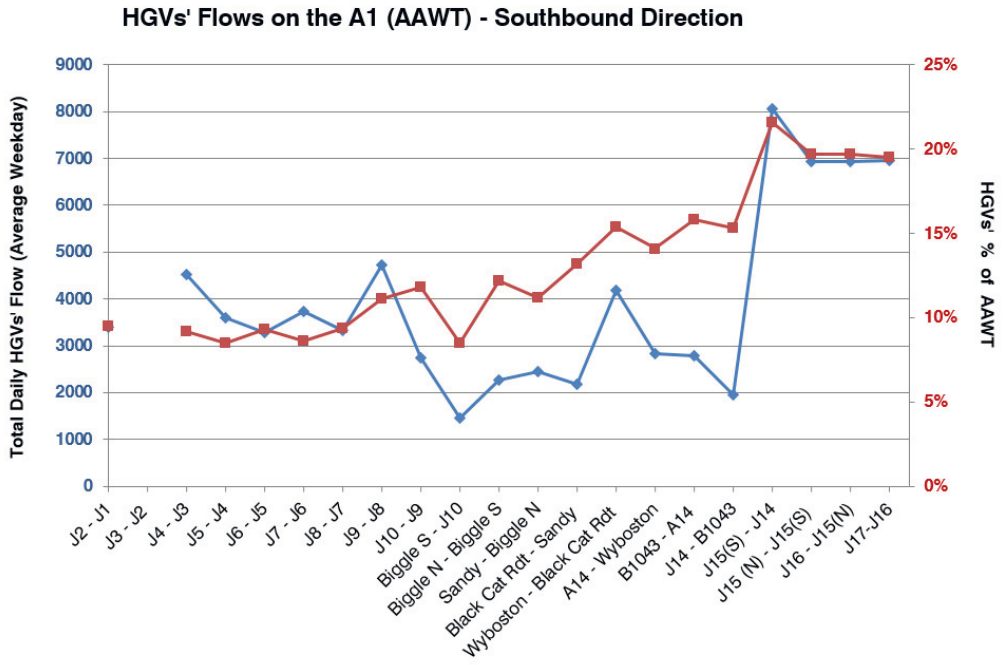


Figure 5: HGV Flows on the A1 Route – SB Direction[5]

1.3.7 Figure 6 and Figure 7 show cumulative travel times (minutes) along the corridor by direction (northbound/ southbound) in the AM and PM peak hours compared to free flow travel times (for this analysis these were based on the prevailing speed limit). The comparison highlights where on the route journey times differ most compared to free flow conditions.

1.3.8 Northbound, there are delays between Junction 6 and Junction 7 and between Sandy and Black Cat roundabout, particularly in the evening peak hour. Southbound, there are delays between Wyboston and Black Cat roundabout and between Junction 8 and Junction 6, particularly in the morning peak hour.

5 ibid.

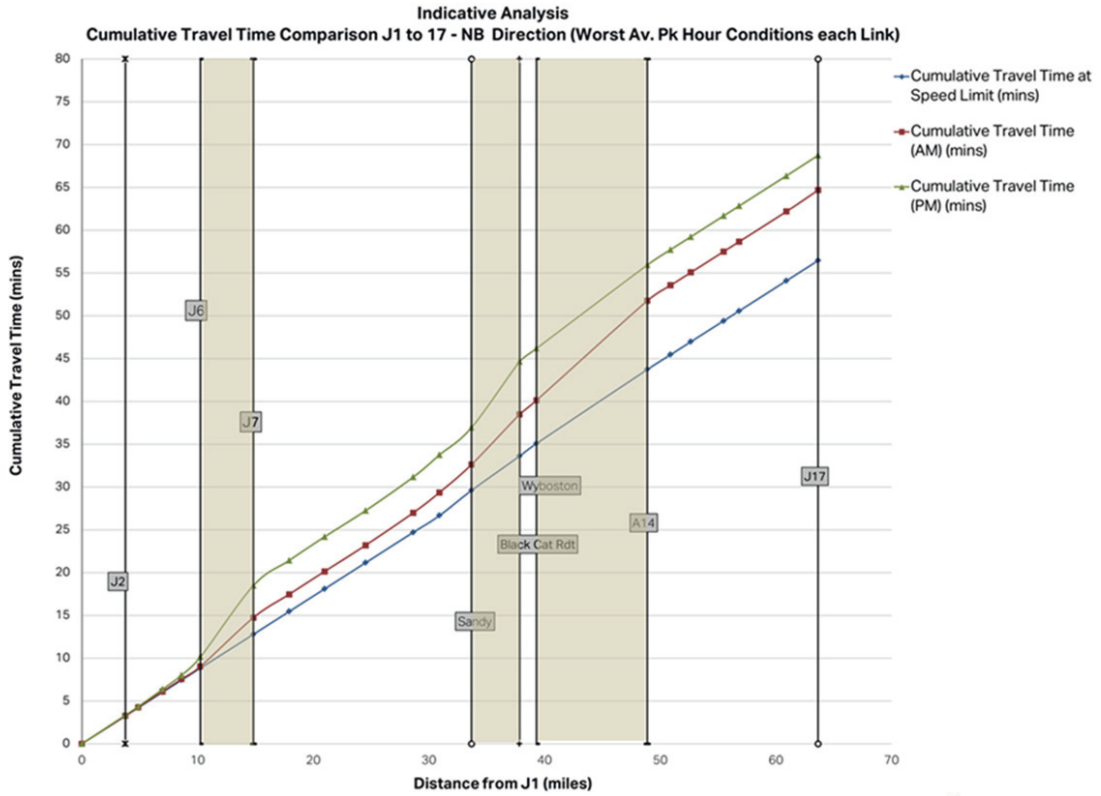


Figure 6: Cumulative Travel Time Comparison (AM/PM Peak Hour vs Free Flow) - NB Direction[6]

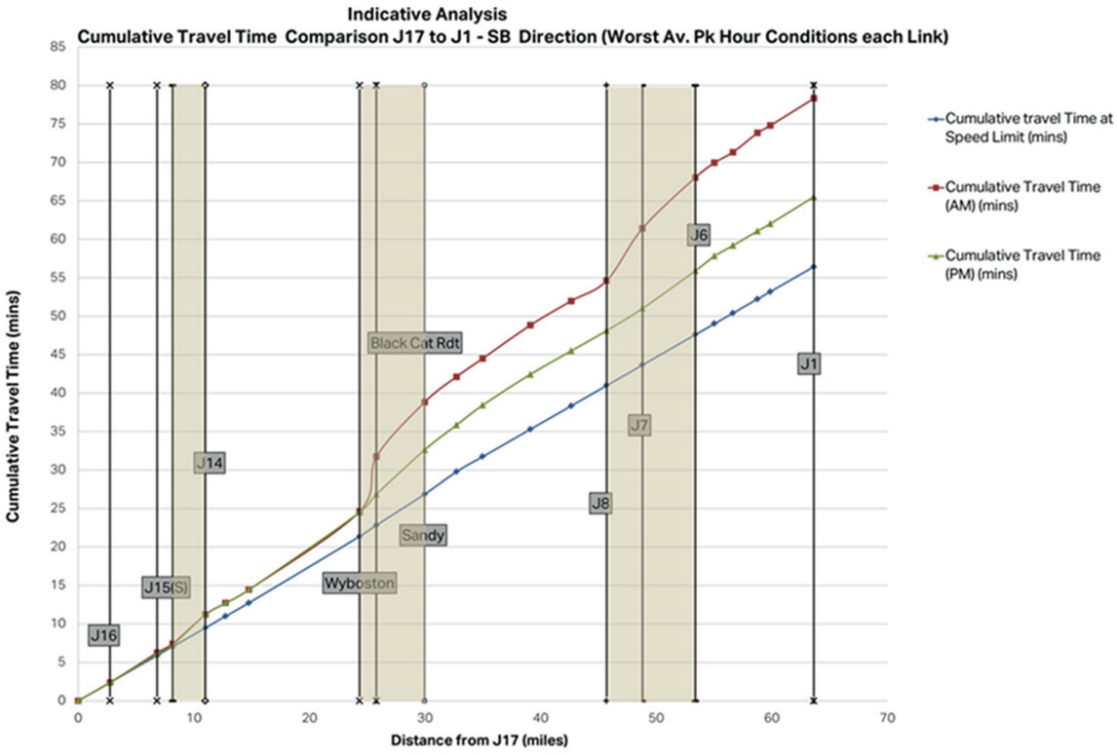


Figure 7: Cumulative Travel Time Comparison (AM/PM Peak Hour vs Free Flow) – SB Direction[7]

6 HATRIS, March 2015
7 ibid

1.3.9 Figure 8 and Figure 9 show speed levels (in mph) and their variability during the entire peak period by direction (AM Peak 07:00 to 10:00 southbound and PM Peak 16:00 to 19:00 northbound respectively), along with the average speed by peak period and the respective speed limits for each link.

1.3.10 The charts indicate substantial journey time variability along much of the route between Junction 1 and Junction 14 (particularly those links identified in Figure 6 and 7 as having the greatest departure from free flow conditions). Such variations indicate poor journey time reliability. There are lower levels of variability between Junction 14 and Junction 17.

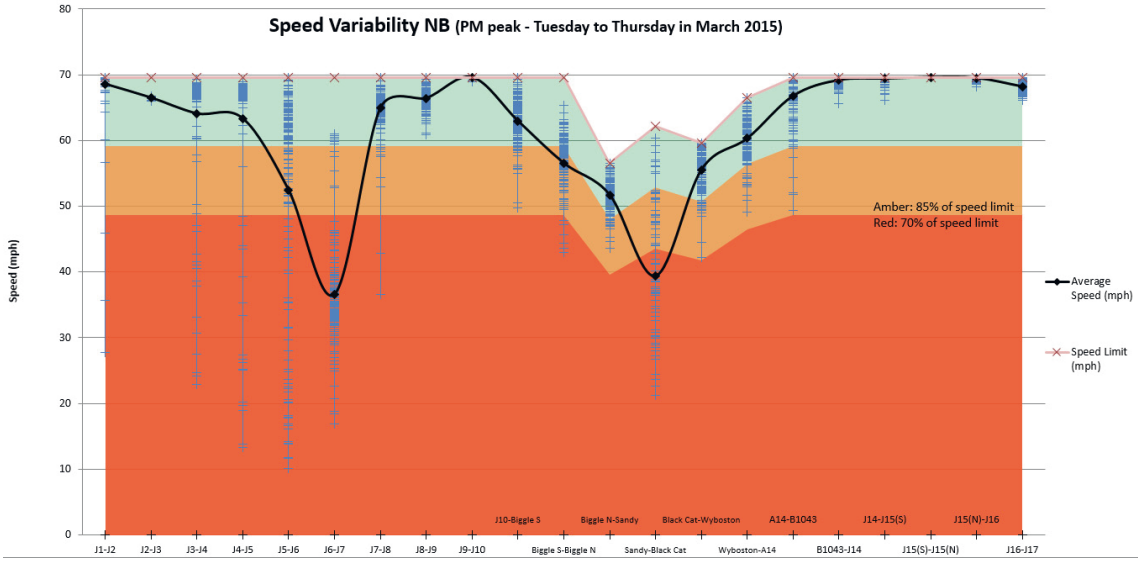


Figure 8: Speed Variability by Link - Northbound Direction PM Peak Period[8]

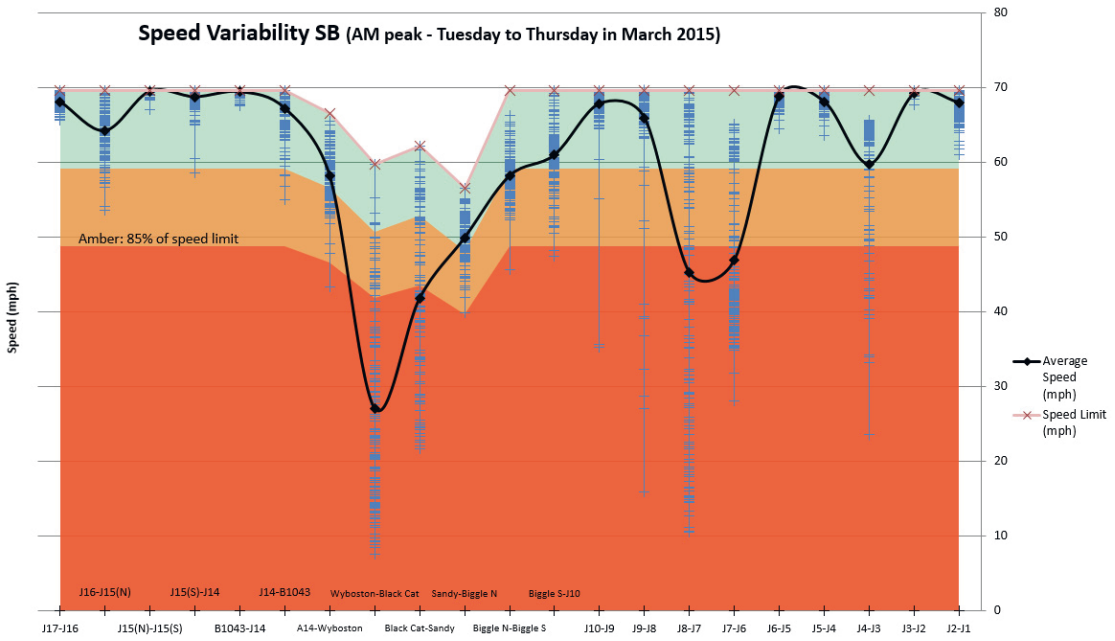


Figure 9: Speed Variability by Link - Southbound Direction AM Peak Period[9]

8 ibid
9 ibid

1.3.11 Figure 10 and Figure 11 show collision rates along the corridor compared to the national average in the northbound and southbound directions respectively.

1.3.12 The average collision rate in the northbound and southbound directions is higher than the national average in the motorway section between Junction 1 and Junction 10. The average collision rate in the northbound and southbound directions for the non-motorway section and the motorway section between Junction 14 and Junction 17 is lower than the national average, likely to be as a consequence of lower speeds on the non-motorway sections.

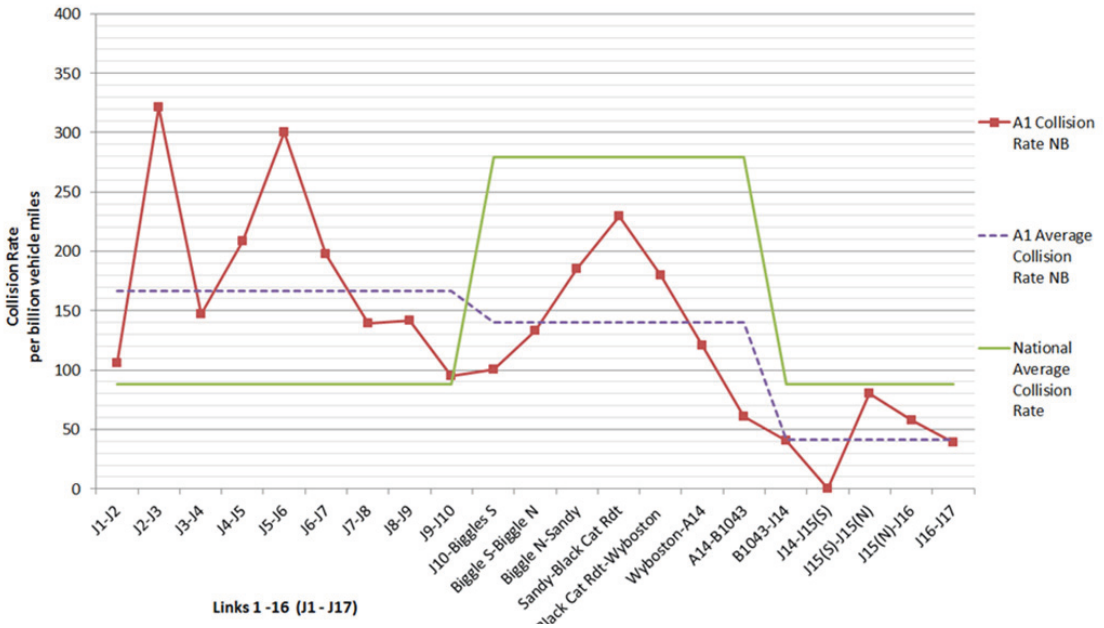


Figure 10: Collision Rate (per billion vehicle miles) 2012-2014 by Link (northbound)[10]

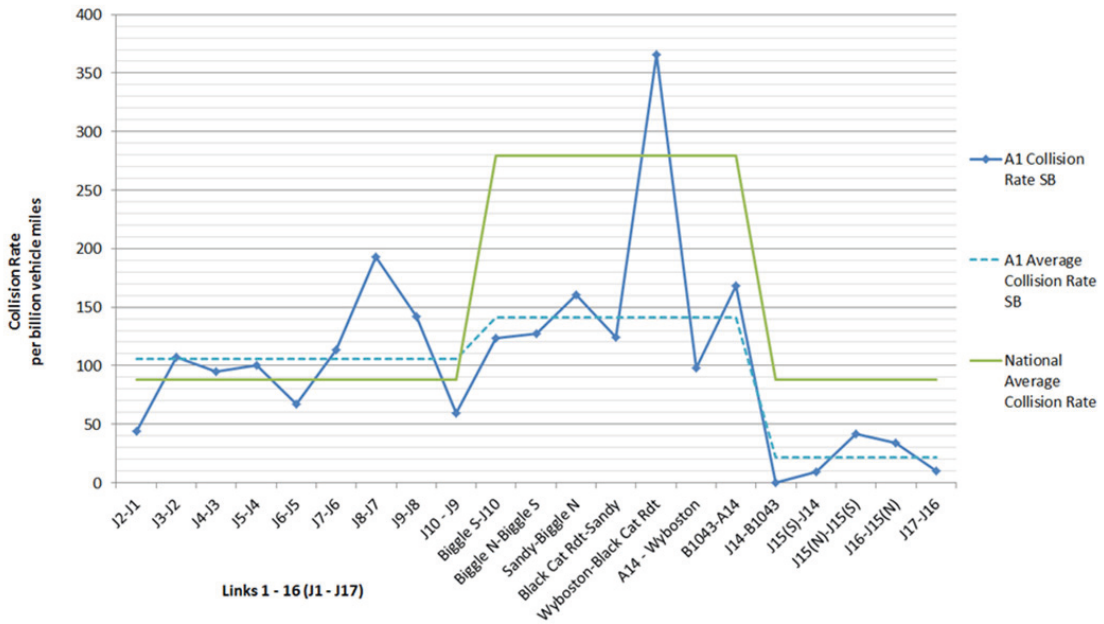


Figure 11: Collision Rate (per billion vehicle miles) 2012-2014 by Link (southbound)[11]

[10] ibid
[11] ibid

1.3.13 In total, 83 people were killed or seriously injured on the route between 2012-2014[12]. Improvements to the A1 route have the potential to reduce the collision rate presented in Figures 10 and 11, and reduce the number of people killed or seriously injured on the route.

Environmental Issues

1.3.14 The A1 runs through a number of sensitive receptors such as settlements located within 200m of the current alignment, scattered residential properties and environmental areas designated for conservation or amenity value. Understanding the environmental context of the A1 is critical to ensure suitable opportunities are explored which enhance the surrounding environment whilst also delivering an improved infrastructure network.

1.3.15 There are five First Priority Locations situated along the study area road where the effects of excessive noise are most significant. These sites are largely dense residential areas, housing estates and retail and commercial areas. There are localised occurrences of poor or reduced air quality, primarily at the northern and southern ends of the study route. A review of traffic data shows that the hotspots of poor air quality are characterised by high traffic flow, congestion issues and a lack of capacity in the road network.

1.3.16 Due to its length, size and importance, the original construction of the A1 undoubtedly affected numerous heritage assets that the road passes through, over, or in close proximity to. The operation of the road also affects the environment in terms of the effect of noise on the integrity of listed buildings and any visitor experience. The impact on heritage assets during ongoing operation of the A1 is minor in comparison to the effects from its original construction.

Photograph 6: Tempsford Bends

12 Department for Transport Road Safety Data https://data.gov.uk/dataset/road-accidents-safety-data

1.3.17 There are four nationally designated sites, including a Scheduled Ancient Monument at Tempsford Bends. Biodiversity and habitats have the potential to be affected by vehicle strike, prevention of movement by the road, disturbance of species as a result of noise, light, and vibration from vehicles and contamination through road run-off and vehicle emissions. The A1 also crosses several major and minor watercourses and their associated floodplains, including the River Great Ouse, River Ivel, River Kym and the River Lee/Lea. There are existing flood defences situated in places along the route to protect existing communities; these have been considered in the development and appraisal of options. Regulation of soil moisture using land drainage systems impacts on the fertility of farmland; this has also been considered. An RSPB reserve is located east of the A1 at Sandy.

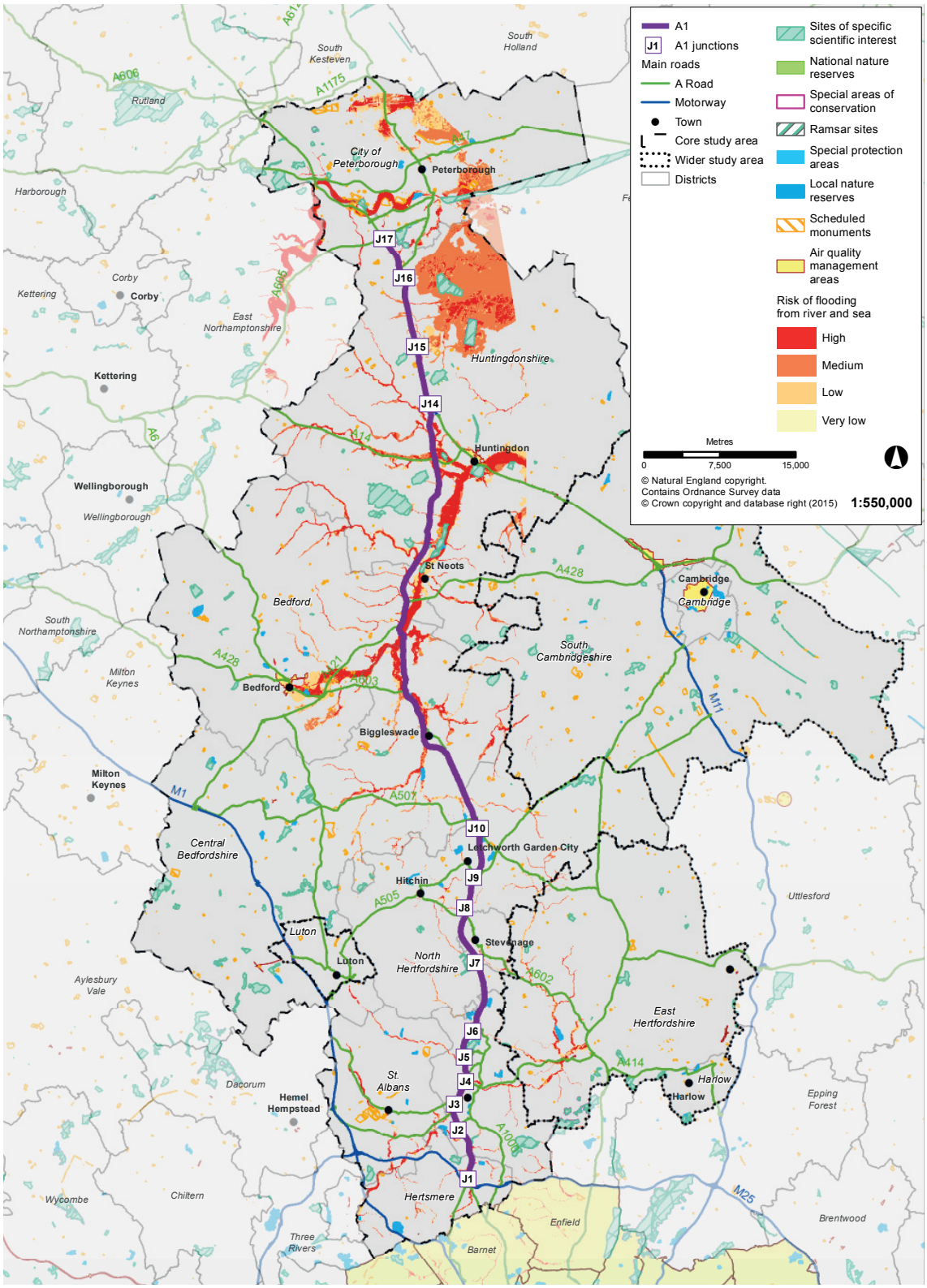


Figure 12 - Environmental Constraints within the Study Area

Summary of Key Problems

1.3.18 The key problems identified (including problems relating to planning and economics) are summarised below. These have been evidenced from reviews of Local Plans and other district strategies, from consultation with stakeholders and from an analysis of evidence-based research including transport models and accidents data.

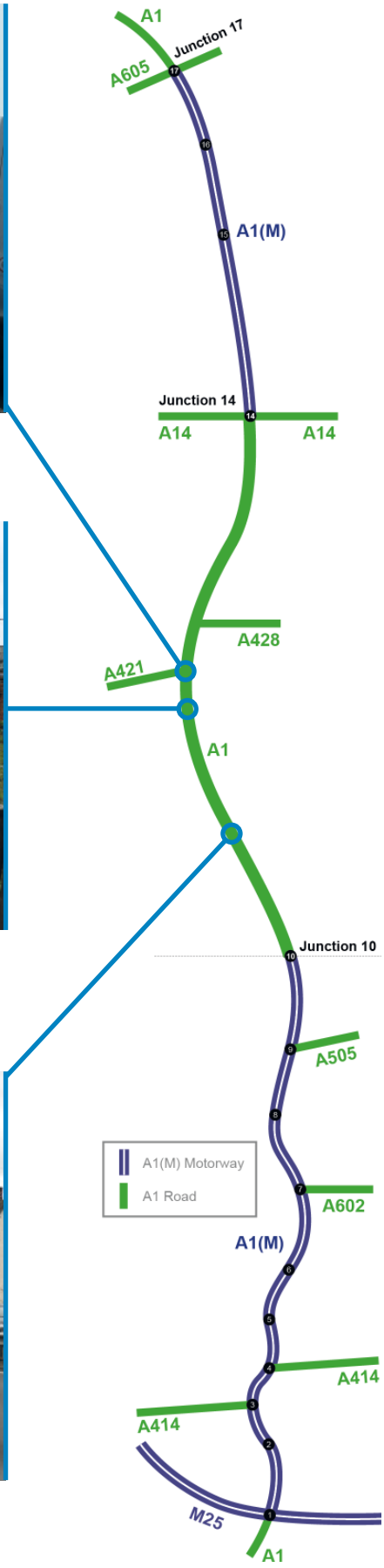
- Poor journey time reliability with variable speed and congestion
- Long delays
- Constrained road and restricted free traffic flow
- Collisions
- Capacity
- Poor conditions for public transport
- Noise and air quality
- Impact on landscape and townscape
- Impact on biodiversity
- Contributing to undermining growth potential
- Anticipated pressure on existing road network as a result of estimated population growth

1.3.19 Photographs 7-9 illustrate some of the key problems identified.

Photograph 7: Black Cat Roundabout – Wyboston. Queuing traffic.

Photograph 8 - Sandy - Black Cat Roundabout. Poor townscape, poor quality footways and hazardous vehicular accesses.

Photograph 9 – Biggleswade North - Sandy. Poor quality pedestrian environment, footways next to A1 route, pedestrian bridge unsuitable for vulnerable road users, segregation caused by A1.



1.3.20 Figure 13 shows the links and junctions examined in the context of this study. It also shows the RAG (Red/Amber/Green) rating given to each link or junction. The RAG rating relates to all problems identifed including transport problems, environmental problems and problems associated with planning and economics. The Figure shows only the motorway route section between Junction 15 and Junction 16 operates well, whilst all other route sections underperform.

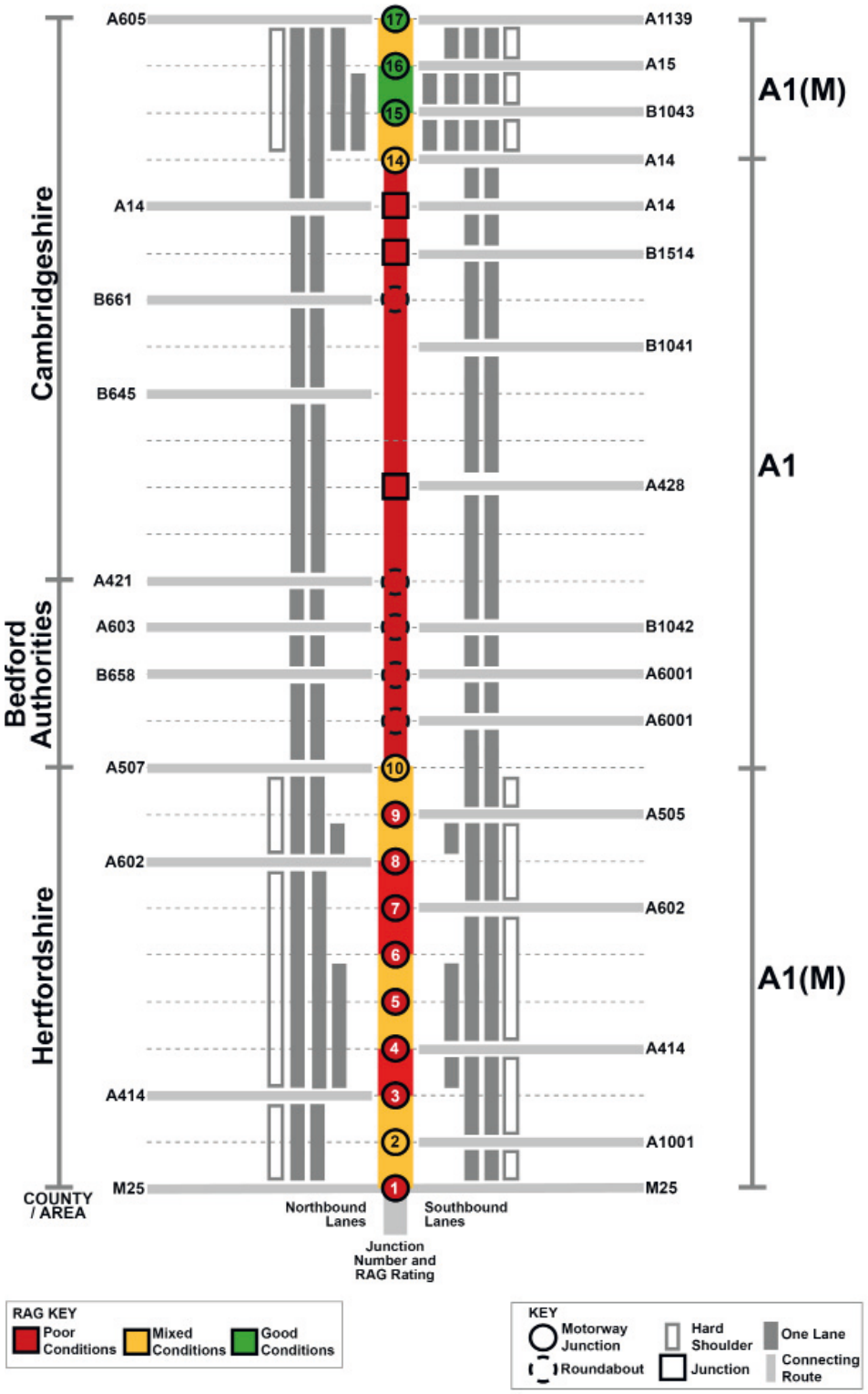


Figure 13 - RAG rating for links and junctions within study area

Case for Change

1.3.21 Current traffic conditions, road safety, environmental impacts and the socio-economic drivers of growth highlight a case for change to rectify and mitigate against the effects of the current A1 road operation.

1.3.22 In transport terms, the A1 is underperforming for much of its length in the East of England. The road has high traffic volumes, congestion, low traffic speeds and an inconsistent profile. An analysis of traffic conditions indicates noticeable journey time variability along much of the route between Junction 1 and Junction 14, with areas of traffic congestion. Such variations indicate poor journey time reliability. Conditions between Junction 14 and Junction 17 stand out in contrast with much lower levels of variability.

1.3.23 Safety issues along the route include collisions and casualties, especially along the most congested sections. Safety is poorest between Junctions 6-8, and between Wyboston Junction and Black Cat Roundabout. In areas between Junction 10 and 14 there are footways next to the A1, with no protection for pedestrians. Highways England are targeting a 40% reduction in the number of people killed or seriously injured on the strategic road network by 2020, and by 2040, no people should be killed or seriously injured on the strategic road network[13].

1.3.24 Poor air quality and noise have been identified as key environmental issues. These affect both the biodiversity in the area and the historic environment, with the impact likely to intensify without intervention. Opportunities for environmental enhancements also arise from road improvements, including river restoration, improved aquatic habitats and measures to improve habitat connectivity.

1.3.25 The study area is forecast to experience substantial growth over the next 20 years which the local areas must accommodate in both housing and job creation. Population increase puts upward pressure on demand for infrastructure services like energy, water and transport. Investment in infrastructure is key to sustaining economic growth. A majority of economic studies report that infrastructure has a significant positive effect on output, productivity, and growth rates, and is a key driver of jobs throughout the economy.

1.3.26 Investment in the road network is key to unlocking growth. Failure to invest in an efficient road network could compromise the sustainability of local economies, disinvestment from businesses, poor quality places to live, and cause further harm to the environment.

13 https://www.gov.uk/government/news/no-one-should-be-harmed-when-travelling-or-working-on-our-highways

1.4 Study approach, programme and development of options

This section presents the study objectives, summarises the four study stages and outlines the stakeholder engagement that has been undertaken.

Study Stages

1.4.1 **Task 1** - Review of existing evidence and confirm the strategic case for improved connectivity on the A1

Task 1 outlined the socio-economic, transport and environmental strategic case for road improvement and investment. Emerging issues and challenges for road efficiency and connectivity were identified; these are the 'problems' that the study brief refers to which then help to define the transport objectives. These problems relate to the current route alignment, with an appreciation of how the problems might develop in the future if not addressed or rectified. Initial stakeholder engagement considered the objectives for the A1 study and confirmed the strategic case for improvement.

1.4.2 **Task 2 - Defining transport objectives that will solve the problem identified and identifying a long-list of options which could meet the transport objectives**

Task 2 outlined the transport objectives for this study which were formulated considering the problems identified on the route and the views of stakeholders. An options 'long long list' was formulated by considering the problems on the A1 route and the identified objectives. The list was then assessed against the transport objectives; suitable options were identified, appropriately grouped and included in an options 'long-list' of eight options. A second stakeholder reference group meeting was held to consider options.

1.4.3 **Task 3a** - Initial sifting of options

In Task 3a the DfT's transport appraisal frameworks (EAST and WebTAG OAF) were used to assess the long-list of eight options. The following options were not taken forward:

- Do minimum – this option was not taken forward as it was considered that further appraisal of this option would not be beneficial.
- Upgrading the existing A1 non-motorway section to online motorway – this option was not taken forward. The scale and impact of property demolition on established communities was deemed not acceptable, particularly as most of the properties to be demolished would be residential. Additionally, the option increases severance, public acceptability is likely to be low and issues with the practical feasibility of the option were anticipated.
- Strategic public transport improvements, including behavioural change measures - this option was not taken forward. The option was considered a very high cost option which fails to adequately address key scheme objectives. It does little to bring consistency to the route, does not improve the performance of the road network and does not provide any significant environmental benefits.

1.4.4 The remaining five options were grouped into three packages for further appraisal. A third stakeholder reference group meeting considered the potential packages in July 2016.

1.4.5 **Task 3b - Work to assess the affordability, value for money and deliverability of short-listed potential options**

In Task 3b work was undertaken to assess the affordability, value for money and deliverability of the three packages A, B and C. The packages will be subject to more detailed appraisal by specialists in the project team to understand the benefits and problems. A Strategic Outline Business Case is being developed to aid in developing future Road Investment Strategies.

The options selection approach and option development process is shown in Figure 14.

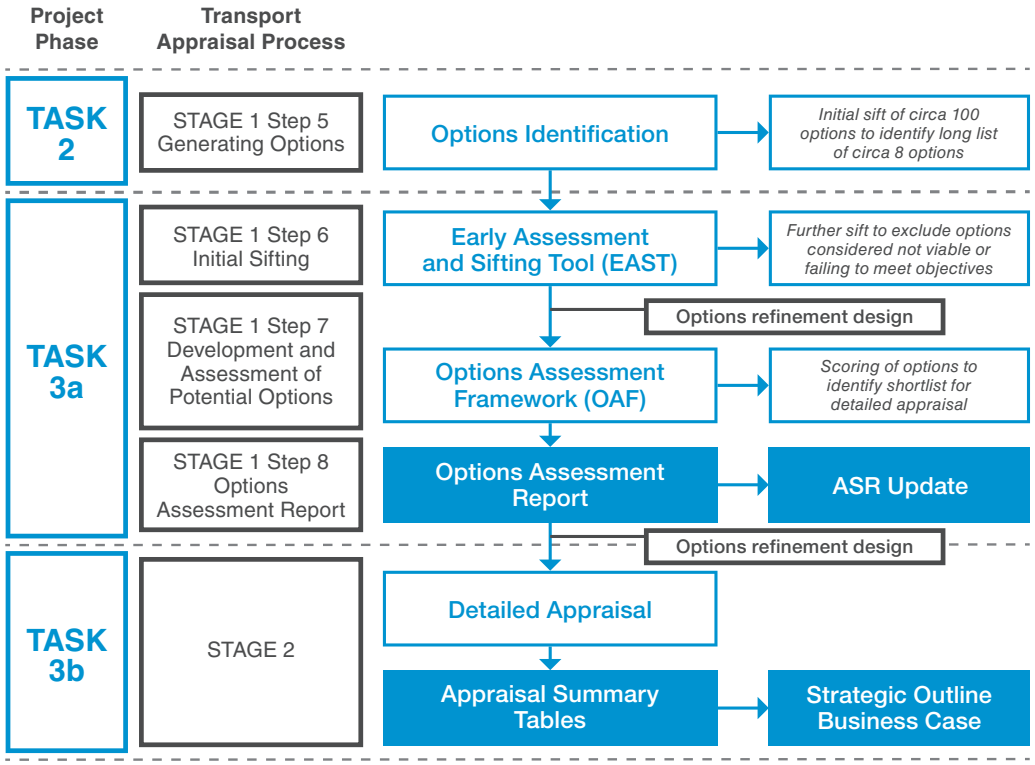


Figure 14 - Options Selection Approach and Option Development Process

1.5 Packages

1.5.1 The output from Task 3a was a short-list of 5 options that were formed into 3 packages to be taken forward for more detailed appraisal. The packages can be described as follows:

- Package A - Middle bypass;
- Package B - Improve existing junctions and route; and
- Package C - Modest improvements.

1.5.2 The diagram below shows the options refinement and development process.

Options Long Long List

A long long list of 56 options was generated. 18 of these options were identified for the long list and then these were grouped and refined to form the long list.

Options Long List and Shortlisting for Further Appraisal

Suitable options from the 'long long list' were identified, appropriately grouped and included in an options 'long list' of eight options. The long-list of eight options is provided below, it includes whether the option is to be taken forward to the next appraisal stage.

1. Do minimum - option not pursued.
2. Online upgrade of existing A1 non-motorway section to motorway (J10-J14) - option not pursued.
3. Section of new motorway (J10-J14, mostly offline) - option shortlisted.
4. Local improvements to A1 non-motorway section (J10-J14) - option shortlisted.
5. Add capacity to A1(M) motorway sections through smart motorway management - option shortlisted.
6. Upgrade non-motorway routes which link to the A1/A1(M) (A414 at J3 and J4)- option shortlisted.
7. Local public and active transport improvements, including behavioural change measures (J10-J14) - option shortlisted.
8. Strategic public transport improvements, including behavioural change measures - option not pursued.

Packages

A summary of the packages, created from the shortlisted options, is presented in brief below:

Package A comprises option 3, option 5 and option 7.

Package B comprises option 4, option 5 and option 7.

Package C comprises option 6, option 5 and option 7.

Full details of the packages is provided on the following page.

1.5.3 The table below shows the packages to be taken forward.

Package A	Package B	Package C
Section of new motorway between Junctions 10 and 14 (mostly offline) A new section of motorway to the west of the existing A1 non-motorway section, with downgrading of the existing route. It is assumed there would be two junctions on the new motorway section, and the route would comprise of three running lanes plus hard shoulder in each direction.	**Local improvements to A1 non-motorway section between Junctions 10 and 14** Various local improvements to the non-motorway section, including: grade separating junctions, removing roundabouts, removing minor accesses, signalising some accesses, rationalising road crossings, provision of bypasses, localised realignment and providing elevated road sections if required.	**Upgrade non-motorway routes which link to the A1/A1(M) at Junctions 3 and 4** Improvements to the A414 between Junction 3 and Junction 4 of the A1(M) including a new link south of Oldings Corner (J4), with upgrading of local roads to provide dual carriageway between J3 and J4.
Add capacity to A1(M) motorway sections through smart motorway management Introduce smart motorway management on A1(M) motorway sections to add capacity. Variable speed limits and ramp metering could also be introduced.		
Local public and active transport improvements, including behavioural change measures between Junctions 10 and 14 Improvements to bus service provision, focusing on local connections and services. Improvements to pedestrian, cycle and equestrian provision which could include new screened or separated routes. Behavioural change measures such as walk or cycle to work initiatives could complement physical improvements.		

1.5.4 Figures 15 to 17 show the packages taken forward.

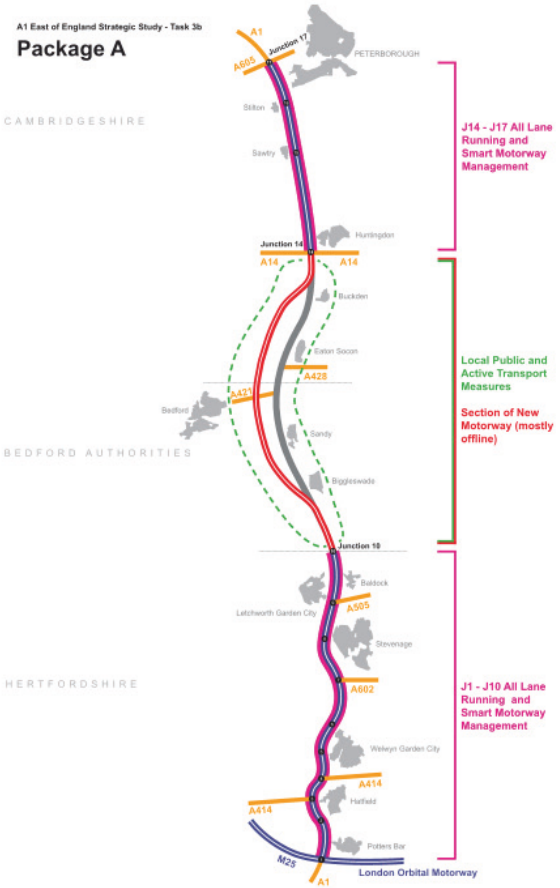


Figure 15: Package A Diagram

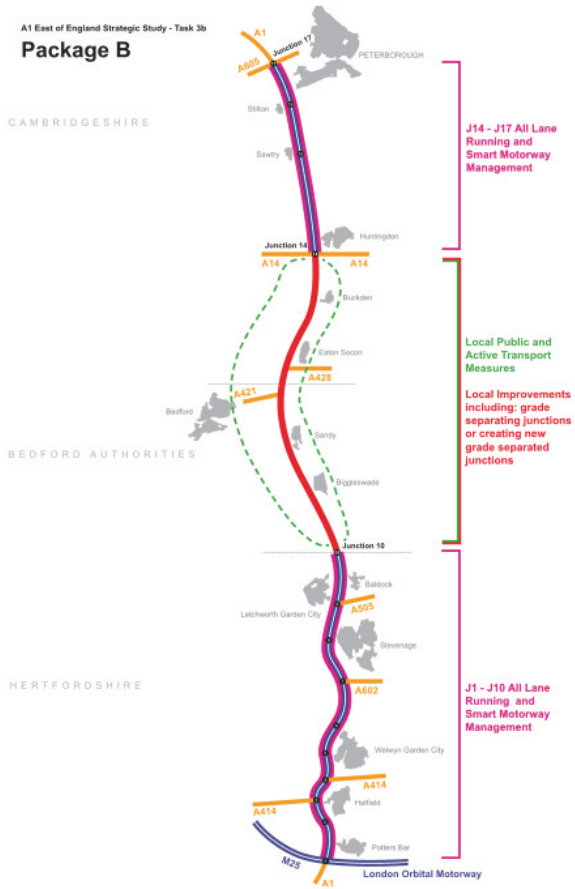


Figure 16 – Package B Diagram

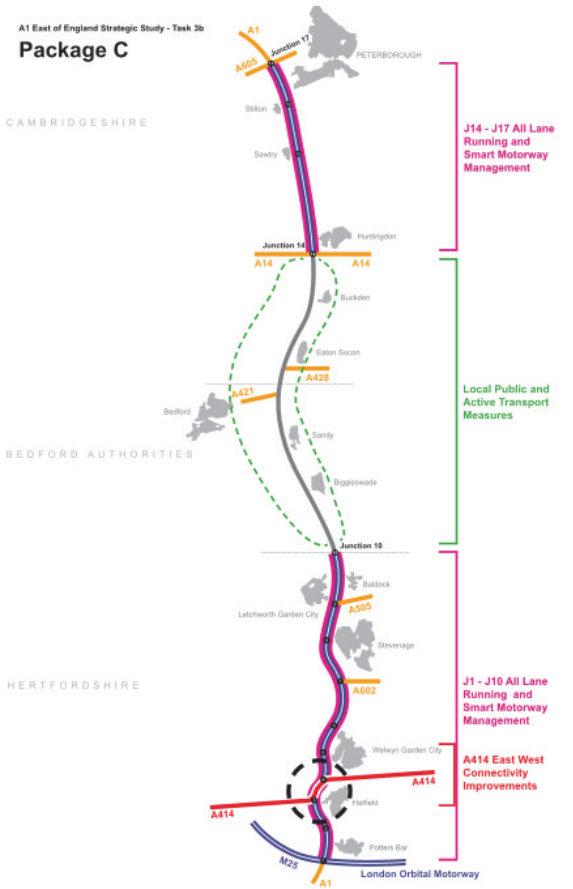


Figure 17 – Package C Diagram

1.5.5 The packages have been evaluated on the basis of their likelihood to bring significant improvements to the A1/A1(M) road network which will cater for increased commuter flows, serve functional urban areas and stimulate an already productive economy with high value activities. The modelling work that underpins this appraisal is based on best-available data on the scale and location of planned growth, but it should be recognised that this is in the context of a region with low local plan coverage.

1.5.6 The appraised packages aim to reduce generalised costs (the sum of monetary and non-monetary costs of a journey) along the length of the route, enabling greater accessibility, including connectivity to employment opportunities. Improvements to the A1/A1(M) as part of the wider Strategic Road Network in the East of England region might be expected to impact upon economic performance by reducing transport costs for business users through lower journey times and improved reliability; through static clustering effects by increasing effective density and improved labour market functioning; and through dynamic clustering as a result of land use change as a result of improved accessibility.

1.6 Likely benefits and opportunities

Transport

1.6.1 Package A has the highest level of benefit, compared with the other packages. It is also the highest cost package. The package is anticipated to have a negative impact on greenhouse gas emissions, and is anticipated to have a positive impact on: accidents; wider public finances; economic efficiency for commuting, other users, and for business users and providers.

1.6.2 Package B has a lower level of benefit than package A and a higher level of benefit than package C. Similarly, the cost is between the costs of package A and package C. The package is anticipated to have a negative impact on greenhouse gas emissions and economic efficiency for commuting. It is anticipated to have a positive impact on: accidents; wider public finances; economic efficiency for other users, and for business users and providers.

1.6.3 Package C has the lowest level of benefit, compared with the other packages. It is also the lowest cost package. In contrast with the other packages, package C is anticipated to have a positive impact on greenhouse gas emissions. It is also anticipated to have a positive impact on accidents, and economic efficiency for commuting and for other users. It is anticipated to have a negative impact on economic efficiency for business users and providers, and on wider public finances.

1.6.4 The table below compares the benefits for each package. Package A can be considered high cost and high benefit, package B can be considered medium cost and medium benefit, and package C can be considered low cost and low benefit.

Economic Case	Package A	Package B	Package C
Benefits	Accidents (reduce accident rate) Wider public finances Economic efficiency for commuting Economic efficiency for other users Economic efficiency for business users and providers	Accidents (reduce accident rate) Wider public finances Economic efficiency for other users Economic efficiency for business users and providers	Accidents (reduce accident rate) Greenhouse gas emissions Economic efficiency for commuting Economic efficiency for other users
Scale of Benefits	High	Medium	Low

1.6.5 Further refinement and appraisal of the packages could be undertaken to understand which elements of each package perform comparatively well. The benefits and costs of the refined package components could then be considered. Additionally, incorporating elements of the packages into the design of the committed schemes would be more cost effective and cause less disruption.

Environment

1.6.6 Package A has the greatest potential for significant environmental effects. These include:

- Increased emissions of nitrogen oxides and greenhouse gases with an overall disbenefit despite some localised areas of improvement;
- Land take and severance of Ickwell Bury (Grade II listed Park and Garden);
- Potential direct impacts on a number of other designated heritage assets;
- Impacts on the settings of further heritage assets;
- Direct and indirect impacts on landscape and views over a substantial area;
- Potential loss of habitats and species decline; habitat fragmentation; biodiversity loss; loss of land for wildlife over a wide area;
- Effects on flow, hydromorphology and Water Framework Directive (WFD) chemical and ecological status of a number of watercourses; and
- Effects on flood risk and groundwater.

1.6.7 With sensitive design there is the potential to avoid or reduce many of the adverse effects and introduce benefits, particularly in terms of biodiversity, landscape and the water environment. However, the scale of the works is such that many effects cannot be fully mitigated. In addition, package A is the most favourable for noise. Whilst the new section of motorway would result in a potentially large impact, the area is not densely populated. Furthermore, with appropriate mitigation measures, such as very low noise road surfacing, earthworks (i.e. cuttings and earth bunds) and noise barriers, this impact can be reduced.

1.6.8 The effects from package B on heritage assets, landscape, biodiversity and the water environment would be broadly of the same nature as those for package A. However as the works would be over a much smaller area, the potential for significant effects is reduced, and the potential to fully mitigate the effects is also improved. In terms of air quality, package B would result in increased emissions of nitrogen oxides and greenhouse gases resulting in an overall disbenefit despite some localised areas of improvement. Package B would also provide localised areas of improvement in terms of noise at Sandy and Buckden.

1.6.9 The works required for package C are minimal by comparison to packages A and B. Furthermore they are in an area that is significantly less sensitive in terms of heritage, landscape, biodiversity and the water environment, i.e. in very close proximity to the current A1(M) alignment and the urban fringe of Hatfield. The potential for significant effects could be reduced. There is good potential for mitigating effects, and mitigation requirements are also expected to be minimal. Package C also provides an overall benefit in terms of air quality, with reduced emissions of nitrogen oxides and greenhouse gases. In terms of noise, package C is less favourable that package A, but more so than package B.

Planning and Economics

1.6.10 All transport interventions will contribute to realising planning and growth aspirations. Local Plan coverage in the area is limited and as such there is uncertainty over growth areas and developments sites. However, while the connection between functional and developed transport networks and housing and employment growth has been established, as discussed in The Strategic Case, it is difficult to measure the levels of growth that have been missed as a result of the underperforming road network, or account for number of business start-ups or relocations that may have occurred. However, stakeholders have raised the existing route as a key issue in the area and as an obstacle to growth. This is due to unreliable travel times and journey quality, some areas of limited local and regional connectivity, present levels of congestion and accidents, and issues caused by severance such as the accessibility to services, housing and employment.

1.6.11 **Package A** would have positive benefits for business users, freight, and commuters. End to end journey times and reliability would be improved for all road users, particularly for freight and long distance journeys, as bottlenecks and congestion levels will be reduced. A new motorway alignment could deliver substantial wider economic benefits. This would reduce business costs, including for freight, potentially allowing businesses to operate more efficiently and making the area more attractive as a business location. It may also lead to agglomeration benefits to the local and regional economy. It would widen labour, supply chain and customer catchments for businesses to access and would allow local residents to more easily access a wider range of employment opportunities. The option also opens up the potential for major new settlements or urban extensions.

1.6.12 **Package B** also has positive impacts to realising growth in the study area. End to end journey times, cost and reliability would be improved for all road users, particularly for long distance journeys and for freight, although to a lesser extent than package A. There may be opportunities for more commuter and local buses to use the road, benefitting transport providers and creating opportunities for modal shift. An upgraded non-motorway section would also have moderate economic benefits including improved journey times, reliability and speed. Reduced congestion and improved reliability would assist in reducing business costs, including for freight, potentially allowing businesses to operate more efficiently and making the area more attractive as a business location.

1.6.13 **Package C** would also have benefits, but to a lesser extent than packages A and B. The package would have a slight positive impact for business users, freight and commuters as end to end journey times would improve, as would the cost and reliability of journeys, although modest in scale. There will be positive local impacts for business users who use the affected section of the A414 and the A1(M), primarily between Junctions 3 and 4. There will be some modest wider economic benefits including to increased road capacity and speed of journeys, assisting in reducing travel costs and assisting in the agglomeration of businesses.

Economic Modelling Analysis

1.6.14 This study has utilised modelling tools to appraise the value for money, economic efficiency and benefits of three proposed packages of road improvement schemes. An economic assessment has been undertaken with reference to current DfT guidance, as proportionate and applicable at Task 3b of the study. Combined link and junction assessments have been undertaken to derive the accident benefits for each package.

1.6.15 Air quality, noise and journey time reliability or quality impacts have not been monetised, nor have the potential impacts of construction on transport user benefits. It should be noted that at this stage the ongoing maintenance and operating costs associated with each package that might be additional to those that would be incurred in the Do Minimum have not been included.

1.6.16 Each package has been assessed as a whole, as part of an overarching objective to bring consistency to the route. A further round of modelling is being undertaken to better understand the nature of benefits and their impact on the network. Full findings will be available in the completed SOBC.

1.6.17 The initial assessment shows that the overall benefits are highest for packages A and B, however, there is a number of high cost components within each package that may not necessarily be justified given the benefits achieved.

1.6.18 Some package elements include redesigning major infrastructure schemes assumed to have been already delivered (such as the Black Cat to Caxton Gibbet scheme, and the A14 Cambridge to Huntingdon improvement scheme). In such cases, the marginal increase in benefits is unlikely to justify such costs, as well as increasing potential negative construction impacts. Incorporating elements of the packages into the design of these committed schemes in the appropriate locations would be more cost effective and cause less disruption.

1.6.19 If combined with the better performing elements of the packages and removing those for which there is little justification (e.g. sections of smart motorway where there is little need to increase existing capacity) and addressing some of the local access issues identified in this report, a more optimal package could be developed. This could however conflict with the aim of bringing consistency to the route. It should also be noted that no enhancements have been modelled north of Junction 17, which may also act as a potential constraint.

1.6.20 The overarching results, and not taking into account wider impacts (such as wider economic impacts or environmental impacts) demonstrate that there are challenges in making a corridor-wide packaged investment that brings overall consistency to the route, on top of the already significant investment planned as part of committed schemes that address the most critical pinch points on the A1(M) and A1. The challenge relates to both the costs of such an investment, and balancing the benefits and disbenefits of different package elements.

1.6.21 Further modelling is being undertaken to better understand the nature of benefits for each package and their impact on the network. Full findings will be available in the completed SOBC.

Costs

1.6.22 The estimated costs of each package are presented below. For each of the packages this comprises the core element of smart motorway and the individual package element i.e. middle bypass for package A, improvements to existing junctions and route for package B, and modest improvements for package C. The costs do not include ongoing operations and maintenance.

	Package A	Package B	Package C
2014 base cost most likely	£1.69bn	£1.14bn	£0.63bn

1.6.23 Local public and active transport improvements, including behavioural change measures between Junction 10 and 14, are proposed as part of all packages. The cost of these measures is in addition to costs in the table above. It is anticipated that the measures will be cost neutral when considered with the benefits, as such measures typically have high benefit cost ratios.

Other Studies

1.6.24 Planned transport schemes, mentioned in Section 1.2, will impact on the study area and on the A1 route. Planned improvements to East West connectivity, notably East West rail, the A14 Cambridge to Huntingdon A1(M) upgrade, the A428 A1 to Caxton Gibbet scheme, and potentially the Oxford to Cambridge Expressway (if the scheme is to go ahead) will be likely to increase demand on the A1 corridor thus supporting the case for intervention. As these other schemes progress it may be worthwhile reconsidering the benefits of an intervention on the A1 corridor.

1.7 Next steps

1.7.1 Packages A and B achieve significant levels of benefit, although these are notably lower than the costs. Package A is of higher cost than package B.

1.7.2 Package C is lower cost than packages A and B, and delivers lower levels of benefit. This is not to say that package C is not worthwhile. Package C could be considered as complementary to package A or B.

1.7.3 Further analysis of the packages will be undertaken to understand which elements of each package perform comparatively well. The benefits and costs of the refined package components will also be considered. Additionally, incorporating elements of the packages into the design of the committed schemes could be more cost effective and cause less disruption.

1.7.4 Following further refinement and appraisal of the packages, an optimal package could be developed. This optimal package could be considered for inclusion in a future Roads Investment Strategy (RIS).

1.7.5 Planned transport schemes will impact on the study area, for example: the A14 Cambridge to Huntingdon A1(M) upgrade, the A1(M) Junction 6 to 8 Smart Motorway scheme and the A428 A1 to Caxton Gibbet scheme. Similarly relevant is the Oxford to Cambridge Expressway strategic study. The next stage of this work should consider the changing transport context as the schemes and study progress. The optimal package should ensure compatibility with planned and potential schemes, and consider potential efficiencies which can be made through concurrent delivery of multiple schemes.

1.7.6 The planned route for East West rail will intersect the study area in the vicinity of Sandy. The Oxford to Cambridge Expressway, if delivered, could intersect the A1 at a similar location. Potential and planned improvements to east west connectivity within the study area raise important strategic questions about the level and location of future growth.

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