A12 Chelmsford to A120 widening

Options Assessment Report

March 2016

Contents

1. Introduction

1.1 Purpose of report

This report relates to proposals in the East of England Area 6 (south) including schemes for the A12 between the M25 and Ipswich. This report presents the proposals for the A12 Chelmsford to A120, between junction 19 and junction 25.

The purpose of this report is to present the outcomes of the first stage of a WebTAG scheme appraisal process in the form of an Option Assessment Report (OAR). This will be used to assist decision makers, inform the public, and ultimately support the delivery of the project as part of the RIS. The report is an update of an existing OAR for the scheme entitled 'Route Strategies: Option Assessment Report, Study 14 A12 J19 to A120W, September 2014', produced by consultants AECOM. This report is one of a number of deliverables being produced at this stage of scheme development which also include a Strategic Outline Business Case (SOBC) and an Appraisal Specification Report (ASR).

The key objectives of this stage of the project are to:

- review and document the current situation
- analyse the future situation
- identify the need for intervention
- establish targets/objectives that are consistent with Highways England policies and desired outcomes
- generate options that address the targets and objectives
- review and assess the potential options

This report is one of three OARs being prepared for the A12 corridor, as outlined below, in line with the RIS Investment Plan, as indicated in Figure 1.1, opposite.

- junctions 11 to 19
- junctions 19 to 25
- junctions 25 to 29

The RIS announcement for the A12 whole-route technology upgrade is being considered as part of a separate scheme development process and is being taken forward as a single option.

This OAR will support and inform the preparation of the SOBC, forming the basis of the updated strategic and economic cases for the A12 Chelmsford to A120 proposals.

1.2 Structure of report

This report follows the steps relating to the stage 1 process as set out in WebTAG and summarised above. The structure of this OAR is as follows:

- **Section 1** – Introduction – outlines the purpose and background of the report.
- **Section 2** – Policy and literature review – reviews relevant policy and strategy documents to establish the strategic policy context in the study area.
- **Section 3** – Current situation – describes existing transportation conditions to provide an understanding of existing transport supply and demand.
- **Section 4** – Future situation – presents forecast traffic conditions under a 'without intervention' scenario and describes future land-uses and policies, and committed changes to the transport system.
- **Section 5** – Need for intervention – summarises current and future transport-related problems and underlying causes that establish the need for an intervention.
- **Section 6** – Objectives and area of impact – sets out the objectives of the study and geographical area of impact.

- **Section 7** – Option generation – develops a range of interventions in order to achieve the study objectives identified.
- **Section 8** – Option sifting - summarises the results of the EAST.
- **Section 9** – Option assessment – assesses potential options against the '5 cases model' criteria.
- **Section 10** – Summary and next steps – summarises the results of this OAR and presents the better performing options.

1.3 Background

Following the 2013 spending review, the Government announced its plans for the biggest ever upgrade of the strategic road network (SRN). The HM Treasury document, Investing in Britain's Future[1] set out details of the programmes of infrastructure investment, which included the tripling of investment on Highways England major roads enhancements from today's levels to over £3bn annually by 2020/21.

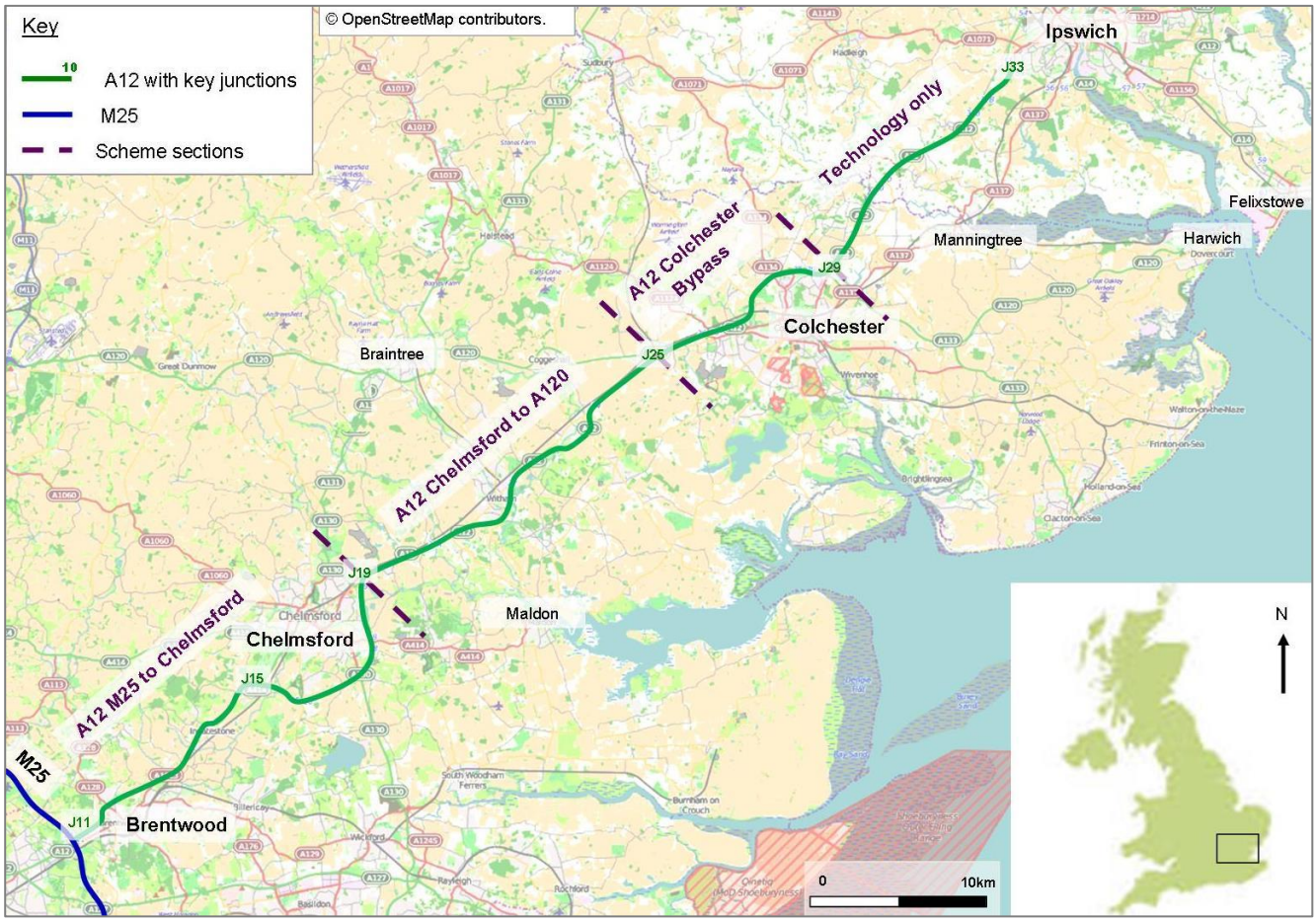


Figure 1.1 : Road Investment Strategy Schemes - A12

In April 2014 Highways England published its evidence reports for the 18 Route Based Strategies (RBS), which collectively cover the SRN. The full RBSs were published in March 2015. The East of England Route Strategy[2] is pertinent to this study as it covers the A12. The purpose of the strategy is to:

- be clear about what Highways England intend to do where, why and when within a five year spending control period
- outline Highways England priorities for the five year period and beyond

[1] HM Treasury, 2013. Investing in Britain's Future.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/209279/PU1524_IUK_new_template.pdf
[2] Highways England, 2015. East of England Route Strategy.
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/416730/East_of_England.pdf

- provide details about the proposed investment to improve asset condition and vision for customer operations service
- inform the RIS investment plan for the current five year period

The RBSs are being used to assist in generating efficiencies for Highways England's future investment plans and performance improvements, providing improvements in customer experience, and better informing the public. The intent is that the RBSs will also act as a catalyst for the further development and delivery of scheme priorities which tackle the most important challenges and opportunities for customers. Possible solutions for priority sections of the 18 routes were identified through this process. Highways England's Network Delivery and Development Directorate (NDD) then commissioned the production of initial SOBCs and OARs within each region, including the A12 corridor.

The A12 is a key strategic route for vehicles travelling through and within Essex and Suffolk, connecting London and south east England with the seaports of Harwich and Felixstowe. The A12 is part of the Trans-European Network, connecting to the M25 at junction 28. It also has local and regional significance, providing a link between the growing urban areas of Brentwood, Colchester, Chelmsford, and Ipswich.

The Department for Transport (DfT) report Action for Roads[3] outlines the role that major A roads, including the A12, play in the economy. These roads are particularly important to freight and make up a majority of the non-motorway SRN. Action for Roads identified the need to transform key A roads into 'expressways' in order to meet a minimum standard of build, safety and resilience. In terms of the A12 this is a longer term aspiration and the expressway standards are emerging.

The A12 is known to experience capacity, resilience and other operational issues. The A12/A120 Route Strategy[4] published in March 2013 notes that the route will be functioning above capacity by 2021 and will struggle to keep up with the growth in demand if the large amount of growth proposed in the local area eventuates. The operations at the seaports of Harwich and Felixstowe are also likely to increase, which would add further freight traffic demand to this corridor.

The A12 has previously been improved in stages and is now a dual carriageway for its entire length between the M25 and A14. However, this has resulted in a road constructed to varying standards with sections that are dual 2 and dual 3 lane, and locations where at-grade accesses to residential, commercial and agricultural properties have been retained. In March 2015, the DfT announced major new investment for the A12 as part of the RIS including widening, traffic technology improvements and a package of associated mitigation schemes.

1.4 Overview of assessment

The overall approach to the project has been developed to meet with the requirements of the Highways England PCF process, and for the purposes of this commission includes the following stages:

- Step 1: Review and gap analysis of existing document
- Step 2: Update and further develop OAR
- Step 3: Update and further develop SOBC
- Step 4: Deliver ASR and complete PCF Stage 0

This OAR draws upon a review and gap analysis and informs the updated SOBC. This OAR will provide the following, in order to meet the requirements set out within the DfT Transport Appraisal Process[5]:

[3] DfT, 2013, Action for Roads. A Network for the 21st Century. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/212590/action-for-roads.pdf
[4] Highways Agency, 2013, A12/A120 Route Based Strategy. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/364194/FINAL_A12_RBS__with_figures_.pdf
[5] DfT, 2014. Transport Analysis Guidance: The Transport Appraisal Process. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/275728/webtag-tag-transport-appraisal-process.pdf

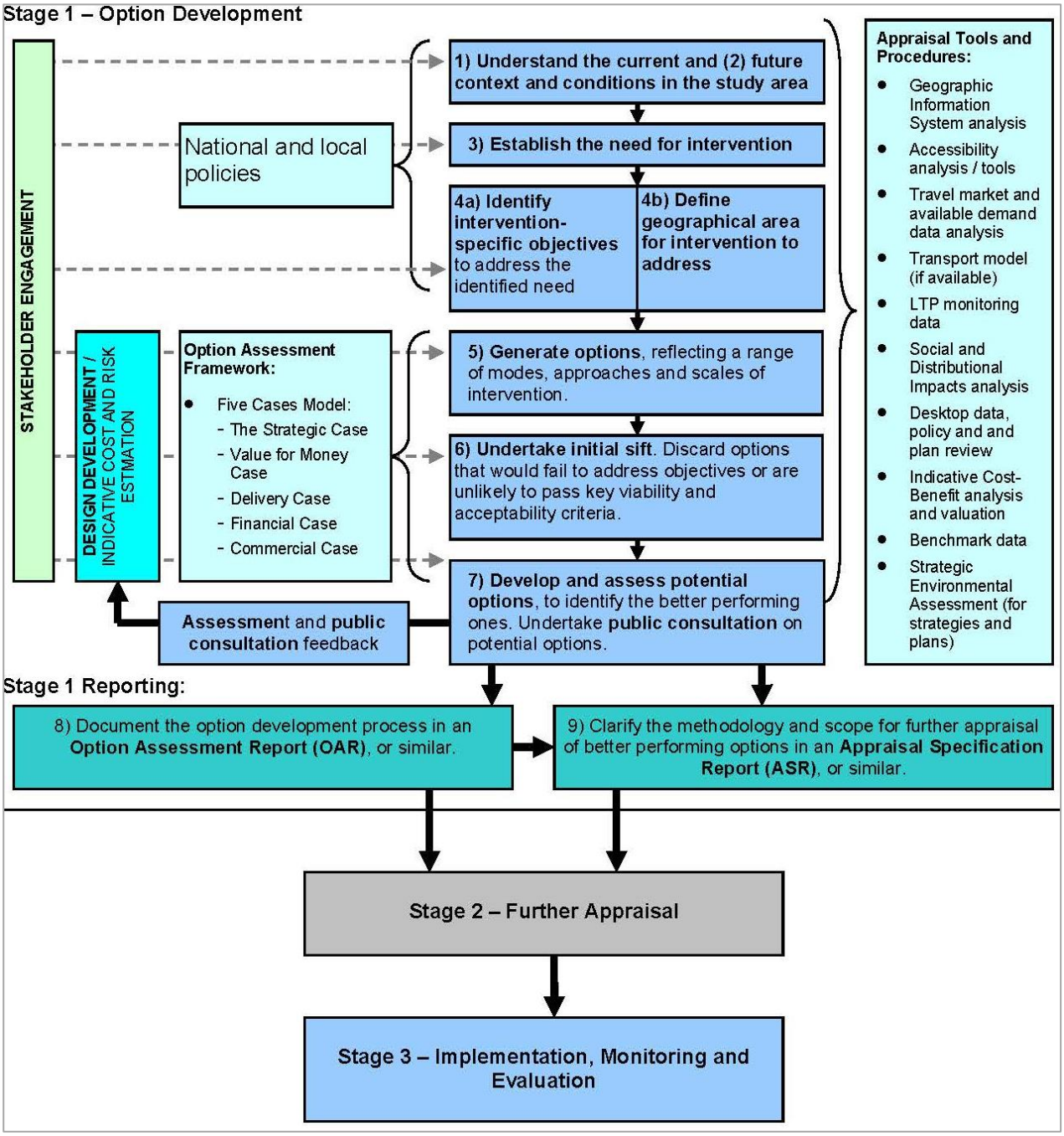


Figure 1.2 : Stage 1 (option development) process (source: WebTAG Transport Appraisal Process)

- Provide evidence of the problems, challenges and need for intervention, framed within the context of relevant policy and strategy objectives.
- A future 'without intervention' scenario, considering potential scenarios
- Identified study objectives and intended outcomes, and sufficient information to facilitate an understanding of the links between issues and context and the final statement of objectives
- Details of the stakeholder engagement strategy adopted
- Option generation, initial sifting, and assessment. Decisions made on discarded options are recorded, along with supporting evidence
- Consideration of options, including concept plans to identify the key areas for intervention with cost estimates. Early Assessment and Sifting Tool (EAST) is used to prioritise the options.

The DfT's Transport Appraisal Process describes the steps undertaken in the stage 1 (option development) process. These are outlined in Figure 1.2 and described in more detail in the following sections of this OAR.

2. Policy and literature review

2.1 Introduction

This section outlines the key policies and strategies relating to planning and transportation within the study area, as articulated at the national, regional and local level.

In developing an understanding of the current situation, it is important to recognise the strategic policy context for the scheme. This process identifies strategic objectives including the aims of Highways England and adopted and emerging land use policy that may have implications for the A12 proposals.

It is important to ensure that the development and appraisal of any interventions in the OAR process considers the policies and objectives. To ensure that the scheme development process retains a focus on delivering Highways England priorities, a set of scheme objectives and targets are developed that align with the RIS Plan/ Performance Specification Requirements and the Highways England Strategic Business Plan, as well as wider complementary policy objectives.

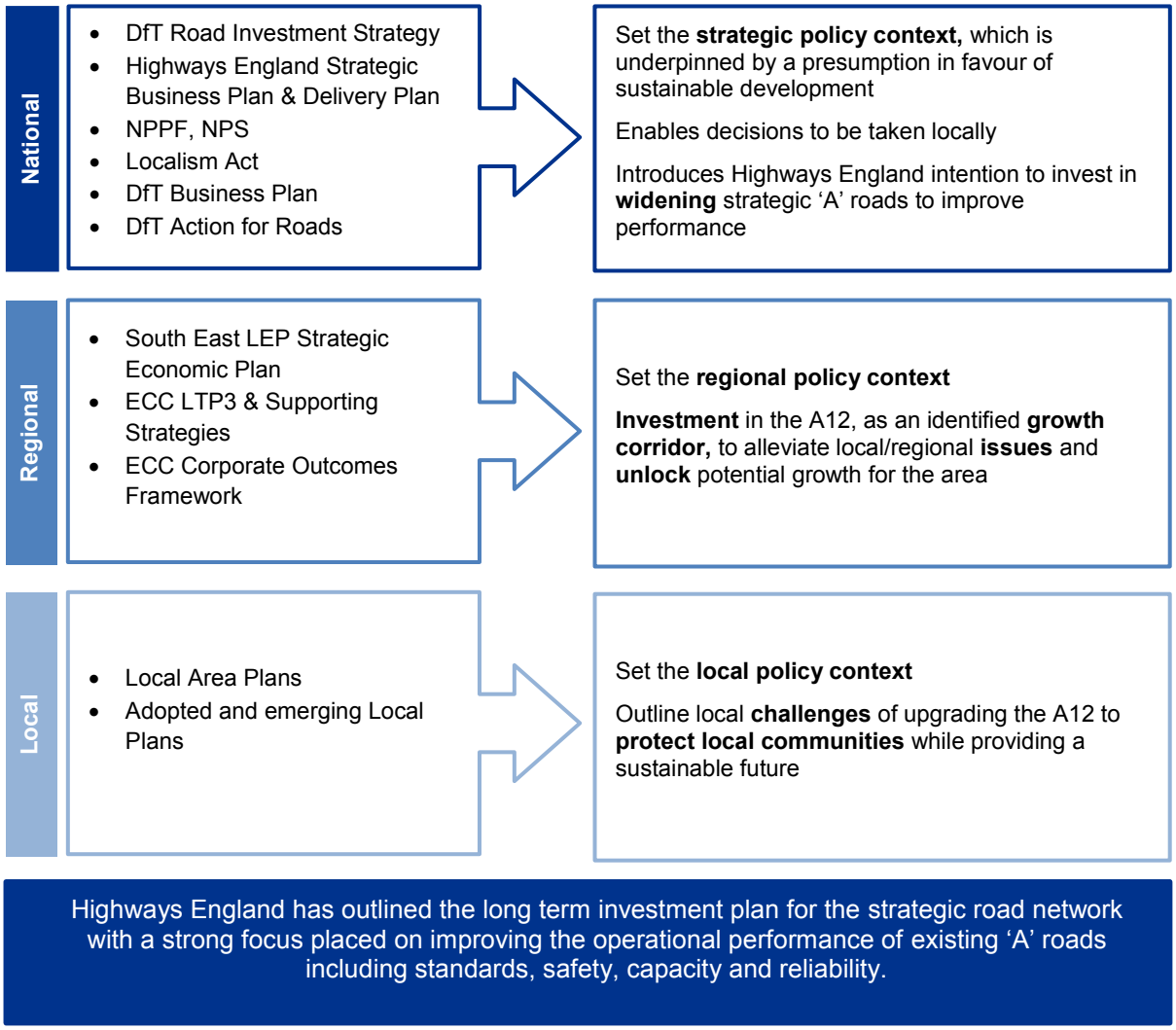


Figure 2.1 : Key policy documents

2.2 National policy

2.2.1 Department for Transport's Road Investment Strategy

In March 2015 the DfT released the RIS[Error! Bookmark not defined.], which outlines the government's long term mbition to revolutionise and modernise the SRN. It sets out a vision for a smoother, safer and more reliable network by 2040. The RIS contains an investment plan and performance specification for how this vision can be achieved. In the first period, the government has committed to investing £15.2bn on over 100 major schemes and the performance of these will be assessed in eight key areas:

- Making the network safer
- Improving user satisfaction
- Supporting the smooth flow of traffic
- Encouraging economic growth
- Delivering better environmental outcomes
- Helping cyclists, walkers and other vulnerable users of the network
- Achieving real efficiency
- Keeping the network in good condition

2.2.2 Highways England policy

The Strategic Business Plan[6] is the first in a series of five year plans. It details how Highways England proposes to deliver the DfT's Investment Plan and requirements of the performance specification.

Highways England's aim is to make best use of the increased certainty of long term funding. This is outlined in the Business Plan and will be achieved through modernising, maintaining and operating national roads to support safer, more efficient journeys which improve driver satisfaction. As part of modernising the network, an emphasis is placed on the importance of expanding the smart motorways programme and the upgrading of some of the most important major 'A' roads, transforming them into 'expressways'. An expressway is defined as a high speed, restricted access, dual carriageway (at least two lanes each way) which is entirely grade separated with focused operational control (including an on-road traffic officer presence). An illustration of the expressway concept is presented in Appendix B.

Highways England's Delivery Plan[7] was published in March 2015 and sets out how the strategic outcomes will be delivered during the first five year period to 2020. The plan also outlines how success will be measured and monitored against the RIS performance specification.

Included within the Strategic Business Plan are the outcomes of an investment mapping exercise, outlining a seven schemes in the east region that are planned to start construction during RIS period 1, including:

- A12 Chelmsford to A120 widening
- A12 whole-route technology upgrade

2.2.3 National Planning Policy Framework

In March 2012, the Department for Communities and Local Government (DCLG) published the National Planning Policy Framework (NPPF)[8], which sets out the Government's economic, environmental and social planning policies. The NPPF aims to simplify the planning system and is underpinned by a presumption in favour of sustainable development. There is a focus on planning for prosperity, people and places, promoting increased levels of development and supporting infrastructure, whilst also protecting and enhancing the natural

[6] Highways England, 2014. Strategic Business Plan 2015-2020.
https://www.gov.uk/government/publications/highways-england-strategic-business-plan-2015-to-2020
[7] Highways England, 2015 Delivery Plan 2015-2020
https://www.gov.uk/government/publications/highways-england-delivery-plan-2015-2020

[8] Department for Communities and Local Government, 2012. *National Planning Policy Framework.*
http://www.communities.gov.uk/documents/planningandbuilding/pdf/2116950.pdf

and historic environment. It is designed to be interpreted and implemented locally; and delegates responsibility for achieving this vision.

2.2.4 Localism Act

The Government's Localism Act[9] provides the legislative foundation for this change. The Act decentralises power, giving local government new freedom and flexibilities; provides new rights and powers for communities and individuals; reforms the planning system; and enables decisions to be taken locally.

2.2.5 Department for Transport's Business Plan (2013 to 2015)

The previous coalition government's (2010 to 2015) vision for transport is one that encourages growth, but is greener, safer and improves the quality of life in our communities. The government's transport priorities and key actions in order to deliver this national vision are set out within the DfT's Business Plan[10], which is updated annually. There is a focus on improving road safety, reducing congestion and pollution and making changes at a local level; priority 5outlines the need to 'invest in the strategic road network to promote growth and address the congestion that affects people and businesses, and continue to improve road safety'.

This ambition is echoed within the DfT Action for Roads[11] paper, which examines congestion up to the year 2040 and sets out a vision for the future of the road network. The economic importance of strategic roads is highlighted, and an emphasis placed on the need for greater investment to upgrade existing roads, address bottlenecks and open up new opportunities for growth. It states the need for key 'A' roads, such as the A12, to become corridors of opportunity and upgraded to a new 'expressway' standard or widened to increase capacity.

Investment in such routes is prioritised in accordance with Highways England's RBS, with a focus on:

- High standards, with route and junctions selected to give a high quality of journey, and with the capacity to handle strategic traffic
- Introducing technology, to better manage traffic and to provide more information to motorists
- Safety near motorway standard, closing the gap between expressways and the very safest roads
- Good maintenance a top priority, with problems dealt with at an early stage

2.3 Regional and local policy and guidance

2.3.1 The South East Local Enterprise Partnership (SELEP)

The Localism Act provided the power to abolish Regional Spatial Strategies and with that the South East Plan, which previously set out the region's targets for housing, economy, transport and environmental challenges. Local Enterprise Partnerships (LEPs) have taken on Regional Development Agencies' role in this process, with Essex forming part of SELEP.

[9] HM Government, 2010. Decentralisation and the Localism Bill: an essential guide. http://www.communities.gov.uk/documents/localgovernment/pdf/1793908.pdf
[10] DfT, 2013. Business Plan 2013-15 http://transparency.number10.gov.uk/business-plan/11
[11] DfT, 2013. Action for Roads. A network for the 21st century. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/212590/action-for-roads.pdf

Figure 2.2: SELEP area

The vision of SELEP is 'to create the most enterprising economy in the UK', with an aim to create 200,000 private sector jobs and 100,000 new homes across the LEP region by 2021. Proposals to deliver this ambition are set out within SELEP's Strategic Economic Plan (SEP)[12], which outlines how Local Growth Fund monies will be used to renew the physical and intellectual capital of the SELEP area. One of the key priority areas identified within the SEP includes enhancing transport connectivity.

The SEP identifies the A12 and the Great Eastern Mainline (GEML) as one of 12 growth corridors, seen as key to the delivery of economic growth not only in this area but across the LEP area and UK. The A12 corridor improvement scheme is highlighted as an essential trunk road network improvement scheme and the responsibility of Highways England. The scheme involves developing a detailed scalable programme through Highways England's RBS process for the corridor to facilitate growth in Brentwood, Chelmsford, Braintree and Colchester. It states packages are required as early as possible, but recognition is given to the fact that most

[12] SELEP, 2014. Growth Deal and Strategic Economic Plan. http://www.southeastlep.com/pdf/South_East_LEP_%E2%80%93_Growth_Deal_and_Strategic_Economic_Plan.pdf

work will be focused on preparing for delivery beyond 2021. The implementation of an A12 technology package to facilitate the efficient management of the A12 was highlighted by the SELEP as a measure of particular importance in the shorter term.

2.3.2 Essex Corporate Outcomes Framework

Essex County Council (ECC) has a clear vision for Essex, one in which innovation brings prosperity across the county. The Corporate Outcomes Framework[13] sets out specific outcomes and indicators that guide the work of commissioners in order to achieve this vision. The seven outcomes are as follows, with the strategic transport network playing an important role in achieving these ambitions:

- Children in Essex get the best start in life
- People in Essex enjoy good health and wellbeing
- People have aspirations and achieve their ambitions through education, training and lifelong-learning
- People in Essex live in safe communities and are protected from harm
- Sustainable economic growth for Essex communities and businesses
- People in Essex experience a high quality and sustainable environment
- People in Essex can live independently and exercise control over their lives

2.3.3 Essex Transport Strategy: the Local Transport Plan for Essex

Essex's Local Transport Plan[14] was published in June 2011. It is the third Local Transport Plan (LTP3) for the county, setting out policies, strategies and priorities to address transport related issues and challenges across the 15 year period to 2026. The LTP3 is focused on achieving the following five broad outcomes, developed in parallel with those of the Council's Highways Strategic Transformation (HST) programme:

- Provide connectivity for Essex communities and international gateways to support sustainable economic growth and regeneration
- Reduce carbon dioxide emissions and improve air quality through lifestyle changes, innovation and technology
- Improve safety on the transport network and enhance and promote a safe travelling environment
- Secure and maintain all transport assets to an appropriate standard and ensure that the network is available for use
- Provide sustainable access and travel choice for Essex residents to help create sustainable communities

In supporting sustainable economic growth and regeneration, LTP3 recognises that providing good connectivity to and within urban areas; providing good inter-urban connectivity within Essex and with adjacent major urban areas; and maximising the benefit to the local economy of Essex's international gateways and strategic transport are key challenges. To effectively support and facilitate such growth, the LTP3 further states that improving the capacity and reliability of the strategic road corridors in Essex is essential.

Within the LTP3, the A12 is identified as a strategic inter-urban route operating at or near to capacity. It highlights persistent network efficiency issues resulting in poor reliability and delays. Enhancements to the A12 are considered a strategic transport priority, with improvements to the resilience of the A12 recommended in accordance with the independent A12 inquiry.

Within the LTP3, specific priorities to be addressed at a more local level are identified in a number of area plans. Whilst the A12 plays an important, strategic role for the county as a whole, it runs through the heart of Essex (covering Chelmsford, Braintree, Maldon and Colchester). Transport priorities within these areas include:

- Delivering transport improvements to support growth

[13] Essex County Council, 2104. *Corporate Outcomes Framework 2014-2018.* https://www.essex.gov.uk/Your-Council/Strategies-Policies/Documents/Corporate_Outcomes_Framework.pdf

[14] Essex County Council, 2011. *Essex Transport Strategy: the Local Transport Plan for Essex.* http://www.essex.gov.uk/Environment%20Planning/Planning/Transport-planning/Documents/Essex_Transport_Strategy.pdf

- Tackling congestion and improving journey-time reliability
- Improving journey time reliability on key routes including the A12
- Developing long-term solutions to resolving gaps within the strategic network

2.3.4 Emerging Local Plans / Existing Core Strategies

The A12 passes through the local planning authorities of Chelmsford, Braintree, Maldon and Colchester between junctions 19 and 25. At the time of writing this report, emerging Local Plans were at various stages of development. These, however, in conjunction with adopted Core Strategies, set out the vision and spatial strategy for each region.

Across the emerging Local Plans and existing Core Strategies, there is a similar overall aim to protect the green belt and/or local character of each area, by focusing new development on previously developed land within existing settlements. Chelmsford has been highlighted as a principal area of focus, with residential and employment land uses designated within/on the outskirts of the built up areas.

The emerging Local Plans and Core Strategies also identify the necessary infrastructure to support development within these areas, as well as to address demographic change and other local issues, to ensure that sustainable communities are created.

With respect to the SRN, a common theme regarding traffic congestion is evident and moreover is stated to be one of the main issues affecting quality of life and economic performance locally.

2.4 Recent studies and consultation

The A12 has been subject to numerous studies and consultation exercises in recent years. These studies and existing consultation feedback have been reviewed to capture views and opinions on the key problems and issues affecting the performance of the A12 and changing problems over time:

- The A12 Commission Inquiry (2008)
- Substantial Transport Options for the Growing A12/GEML corridor towns (May 2010)
- Highways England Route Based Strategy Reports (2013 and 2014)

2.4.1 The A12 Commission Inquiry (2008)[15]

In March 2008 ECC appointed Sir David Rowlands, Professor Stephen Glaister, Dr David Quarmby, and Lord Whitty to the Commission of Inquiry into the A12, in order to focus attention, address widespread concerns and consider potential measures. The approach comprised a call for evidence and information from key organisations and individuals, as well as three public hearings (which included evidence from 36 witnesses from 24 organisations). Amongst others, witnesses comprised Local Authority representatives, the DfT, Highways Agency, emergency services, motorists, commercial users, port operators, railway, environmental and heritage organisations.

The report outlines a general agreement amongst stakeholders that the A12 is presently a ‘difficult’ road. With reference to development pressures across Essex from new housing, growing employment and substantial new port capacity in the Haven Gateway, it also stresses the likelihood of conditions deteriorating and the importance of intervention.

Key issues emerging from the Inquiry, which are common throughout the length of the A12 included high traffic volumes, vulnerability to incidents, poor driver behaviour and journey time reliability.

At a more localised level, issues on the section of road from Hatfield Peverel (junction 20a) to Marks Tey (junction 25) were highlighted specifically. Due to design standards, including radii below the desirable minimum, substandard junctions and a significant number of private accesses, this section was cited as ‘the worst section of the A12 and requiring urgent action’.

[15] ECC, 2008. The A12 Report of the Commission of Inquiry.

The Inquiry concluded that, in addition to partnership working, "the A12 should not be managed ad-hoc or improved in a piecemeal way but rather that there should be a proper all-embracing route management strategy which sets out planned short and medium term measures as well as improvements to the management of the road."

2.4.2 Sustainable Transport Options for the Growing A12/GEML Corridor Towns (May 2010)[16]

This study formed one of seven regional studies resulting from the East of England region's (EEDA) response to Delivering a Sustainable Transport System (DaSTS). It focuses on the three Key Centres of Development and Change (KCDC), Chelmsford, Colchester and Ipswich on the A12/GEML corridor, analysing the challenges of growth whilst also providing a more sustainable, affordable transport system.

The study was informed by a series of stakeholder meetings and workshops. Strategic stakeholders included Sustainable Transport for the East of England Region (STEER), Sustrans, Living Streets, Suffolk Chamber of Commerce, Chelmsford Business Forum, Essex and Suffolk FSB, Essex Chamber of Commerce, Mid- Essex Chamber of Commerce, North- Essex Chamber of Commerce and Suffolk and Essex Health.

The study highlights the importance of the A12/GEML corridor to the local economy of each of the towns in terms of access, as well as its supporting function to both the London and regional economies. It concludes that town wide integrated sustainable packages should be developed to accommodate planned growth. It also reiterates the findings of the Transport and the Economy in the East of England[17] (TEES), highlighting:

- The management of the A12 itself needs to be part of an overall transport solution to address current and future challenges in this important transport corridor and its interaction with local traffic within the KCDCs
- The need for longer term investment in the A12 should be investigated
- That investment in the GEML had the highest economic benefit of all public transport schemes

In 2008, the TEES Study concluded that there are expected to be significant agglomeration benefits associated with investment in the A12.

2.4.3 Highways England A12/A120 Route Based Strategy (March 2013)

The A12/A120 RBS[4] forms part of Highways England's response to Alan Cook's report 'A Fresh Start for the Strategic Network'[18]. This RBS was one of the first to be released due to the route's importance as part of a strategic national corridor and known issues in the corridor, and was informed by consultation with key stakeholders.

The RBS highlights the significance of the A12 in terms of supporting both the national and regional economy, as well as providing a commuter route locally between growing towns such as Chelmsford, Colchester and Ipswich.

The main areas of concern included the resilience of the route when an incident occurs; journey time reliability; and the variable standard of the route. Issues were compounded by a perceived lack of investment historically. Concern was also raised with regard to the poor geometric standard of junctions along the A12; poor driver behaviour; the lack of alternative routes; and road safety. Noise issues were also identified at the southern end of the corridor between the M25 and Chelmsford.

2.4.4 Highways England East of England Route Strategy (April 2014)

Building on the A12/A120 RBS pilot study, Highways England published the East of England Route Strategy[19] in April 2014. The strategy utilises information from both within Highways England and from external partners and stakeholders to gain an understanding of the key operational, maintenance and capacity challenges along the route. It considers these challenges in the context of local growth aspirations and wider transport network alterations.

[16] Mouchel, 2010. DaSTS: Sustainable Transport Options For The Growing A12/GEML Corridor Towns Draft Stage 1 Progress Report.
[17] Steer David Gleave, 2008. Transport And The Economy In The East Of England The Transport Economic Evidence Study (TEES).
[18] Cook, 2011. *A Fresh Start for the Strategic Network*. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/4378/strategic-road-network.pdf
[19] Highways Agency, 2014. East of England Route Strategy Evidence Report. http://assets.highways.gov.uk/our-road-network/route-strategies/East%20of%20England.pdf

With regard to the A12, the emerging issues echo those stated within the previous RBS, and centre on heavy traffic flows, congestion, disruption stemming from collisions and incidents, and the stressful conditions that these can create for drivers. It is stated again that Local Authorities and the business community perceive there to be a serious lack of investment in the A12 and believe this to be constraining growth in the corridor.

The 10 busiest sections on the A12 fall within the top 20-30% nationally, varying from 496th to 766th out of a ranking of 2497 sections.

In addition to the above, the following concerns were raised:

- Road safety, with five locations along the route within the top 250 collision locations on the network
- Capacity issues at specific junctions and links, exacerbated by future growth
- Lack of technology on the route to provide users with information and manage traffic flows
- Carrying out maintenance works is difficult due to limited suitable diversion routes
- Noise sensitivities, including Mountnessing, Brentwood and Ingatestone
- Air quality, stated to be particularly sensitive in Brentwood, in the vicinity of the M25
- Ensure communities are well connected with specific concern about non-motorised road users

3. Current situation

3.1 Introduction

The RIS proposals in the east of England for the A12 cover the full length of the route between the M25 at junction 11 and junction 29 north of Colchester. This OAR relates specifically to the section between Chelmsford at junction 19 and the A120 at junction 25.

This chapter describes the present conditions on this section of A12, including current traffic demand alongside the asset condition, safety and non-motorised users' facilities around the route. It also discusses the role of the full A12 route within the wider region, recognising no individual section of the route should be considered in isolation. This section provides evidence of the need for intervention and informs the option generation process.

3.2 Land use and demographics

The A12 between junctions 11 and 29 is situated within the local highway authority area of Essex County Council, forming part of a major strategic link between London and the east coast ports of Felixstowe and Harwich, via a number of major regional centres.

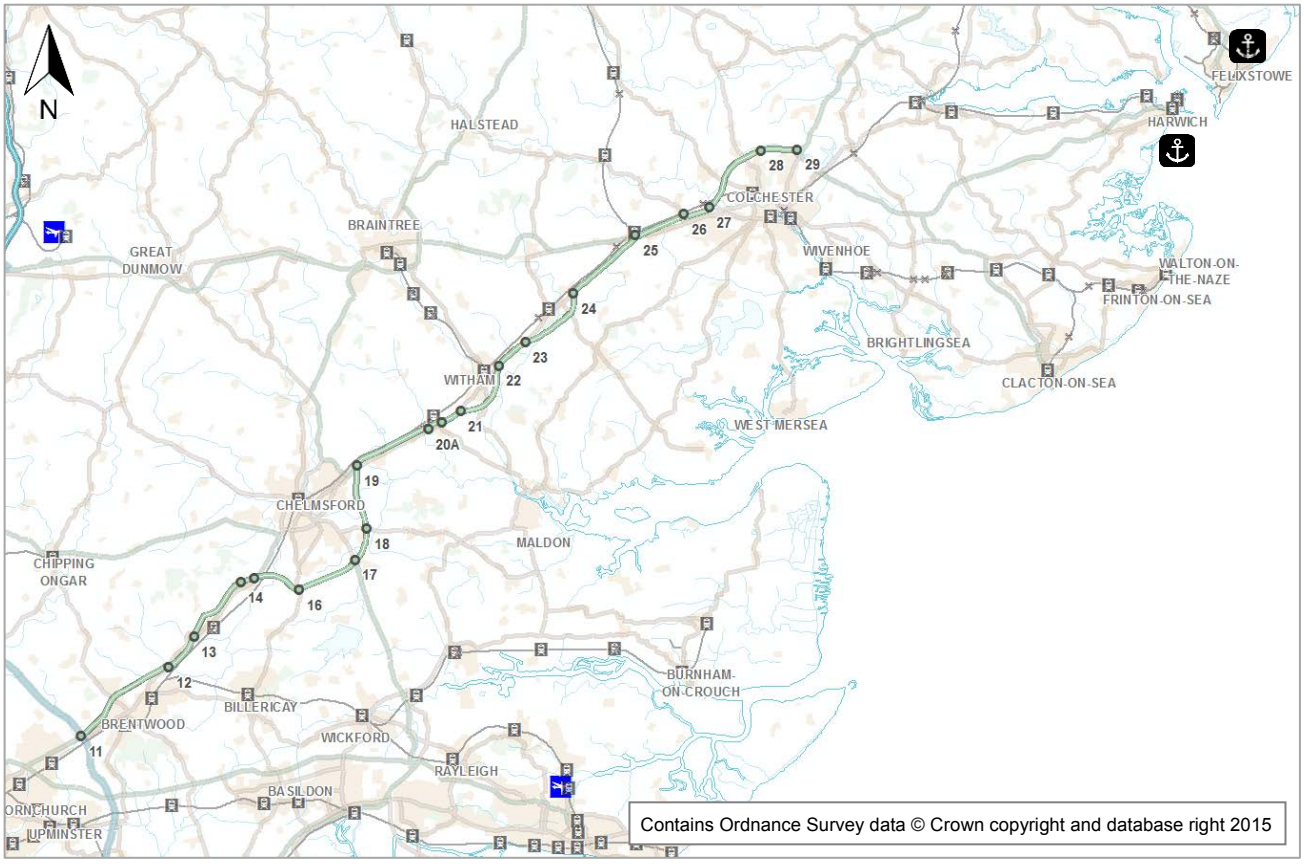


Figure 3.1: A12 corridor junctions 11 to 29

The section of the A12 between junction 19 at Chelmsford and junction 25 at Marks Tey passes through Hatfield Peverel and bypasses the towns of Witham and Kelvedon. This section of the A12 is a total of 15 miles (24km) in length.

The 2011 Census data illustrates that the Chelmsford, Braintree, Maldon and Colchester Districts have a combined population of over 550,000. The most densely populated areas are concentrated in the main towns of Colchester and Chelmsford (as shown in Figure 3.2). In addition to Brentwood and Ipswich, London, Harwich, Felixstowe, Stansted and the Thames Gateway, these form a focus of population and employment within the wider region.

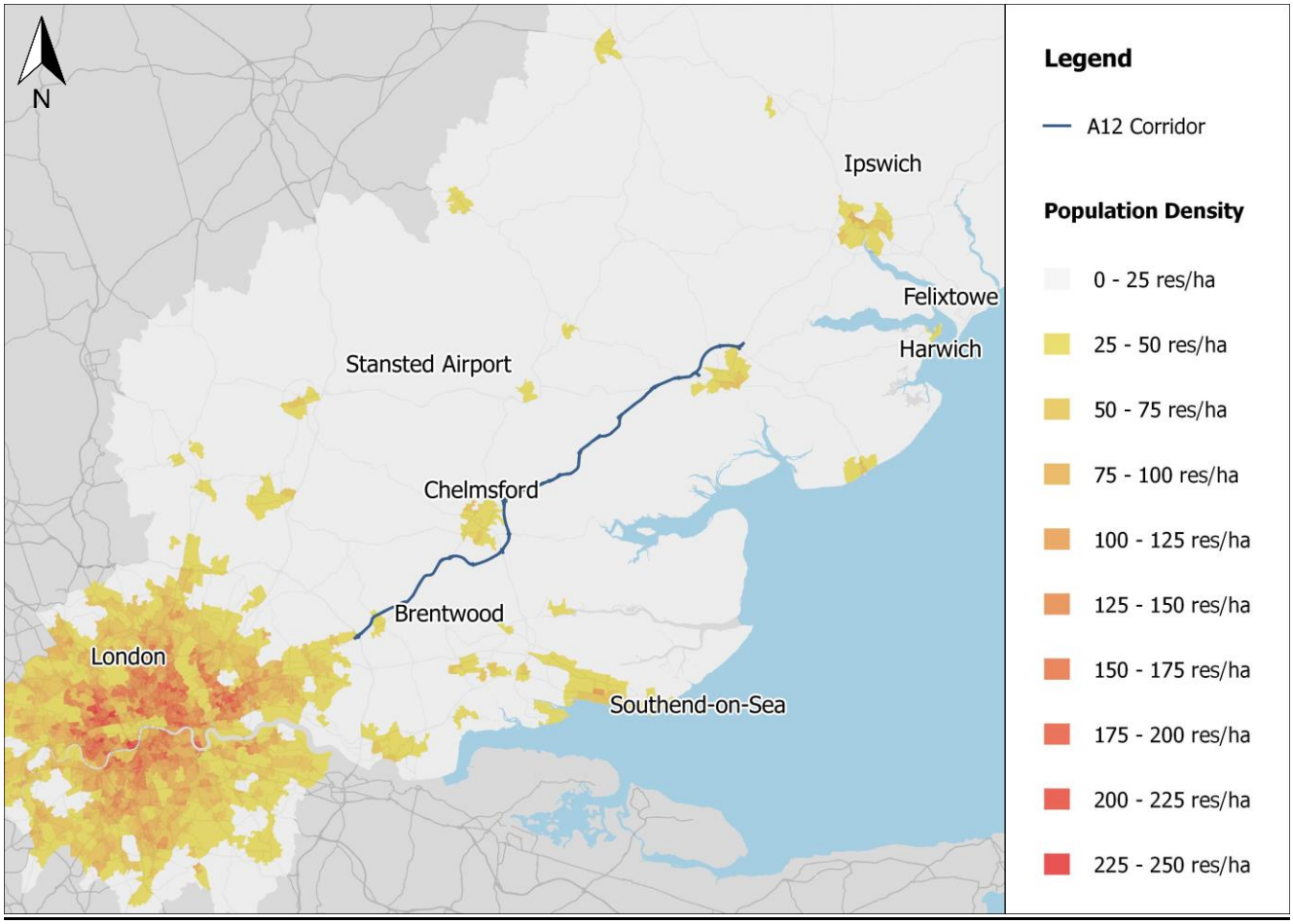


Figure 3.2: Population density

A selection of key figures from the Census[20] and Nomis[21] datasets for the regions along the route are provided in Table 3.1.

	Chelmsford	Braintree	Maldon	Colchester
A12 junctions	J14 - J19	J20a – J24	-	J24 – J29
Resident population	171,600	150,000	62,800	180,400
Jobs density	0.89	0.62	0.66	0.81
Attraction (% working outside the District)	40% (16% to London)	43% (10% to London)	45% (10% to London)	29% (7% to London)
Average distance commuted to work (km)	18.9	21.1	21.7	18.7
No cars or vans in household	16%	16%	13%	21%
Car/van to work	41%	45%	45%	39%

Table 3.1: Census/Nomis summary statistics

Based on employment data and an estimate of productivity per job in each broad sector, the 2008 DaSTS Study[17] highlighted Chelmsford and Colchester (followed by Ipswich) as the largest economic contributors of the regions through which the A12 runs. This is also reflected by the notably higher jobs densities. The relative

[20] ONS, 2011. Neighbourhood Statistics. http://www.neighbourhood.statistics.gov.uk/dissemination/
[21] ONS, 2013. Nomis Official Labour Market Statistics. https://www.nomisweb.co.uk/

spread of economic output throughout these regions, however, was stated to reflect the lack of any one dominant urban centre in the corridor. As a result, all exhibit relatively high levels of out-commuting.

Attraction between each of these centres varies; as indicated by Census 2011 data, the journey to work attraction between Chelmsford and Ipswich is negligible (< 0.5%), and between Chelmsford and Colchester, and Colchester and Ipswich approximately 4% in both instances. The journey to work attraction of London remains significant throughout these and other regions through which the A12 runs, generally decreasing with distance from the capital. The exception to this is Colchester, which has fewer people commuting to London for work.

The 2011 Census data (Districts average) shows 42% of working age (16 – 74) residents drive a car or van as their main method of travel to work. Methods of travel to work are summarised for the regions in Table 3.2, with car/van use followed by public transport use (train, bus, minibus, coach, underground, metro, light rail and tram) at 10% of the overall method of travel to work. This is broadly similar to the statistics for the east of England region. The corresponding percentage for those driving a car or van for this purpose in England, however, is 37%, with 11% using public transport.

Figure 3.3 shows the average car ownership levels of households within the four districts. Whilst there are variations (as also reflected in Table 3.1), 83% of households have access to at least one vehicle. This is notably higher than the overall figure for the east of England region (81%) and England as a whole (74%).

Overall, the area is characterised by relatively high car ownership and a relatively high proportion of travel to work by car or van.

Mode of travel	Districts average	East of England	England
Work mainly at or from home	4%	4%	3%
Underground, metro, light rail, tram	0%	1%	3%
Train	7%	5%	3%
Bus, minibus or coach	3%	3%	5%
Motorcycle, scooter or moped	0%	1%	1%
Driving a car or van	42%	41%	37%
Passenger in a car or van	3%	3%	3%
Bicycle	2%	2%	2%
On foot	7%	7%	7%
Not in employment	32%	33%	35%

Table 3.2: Method of travel to work

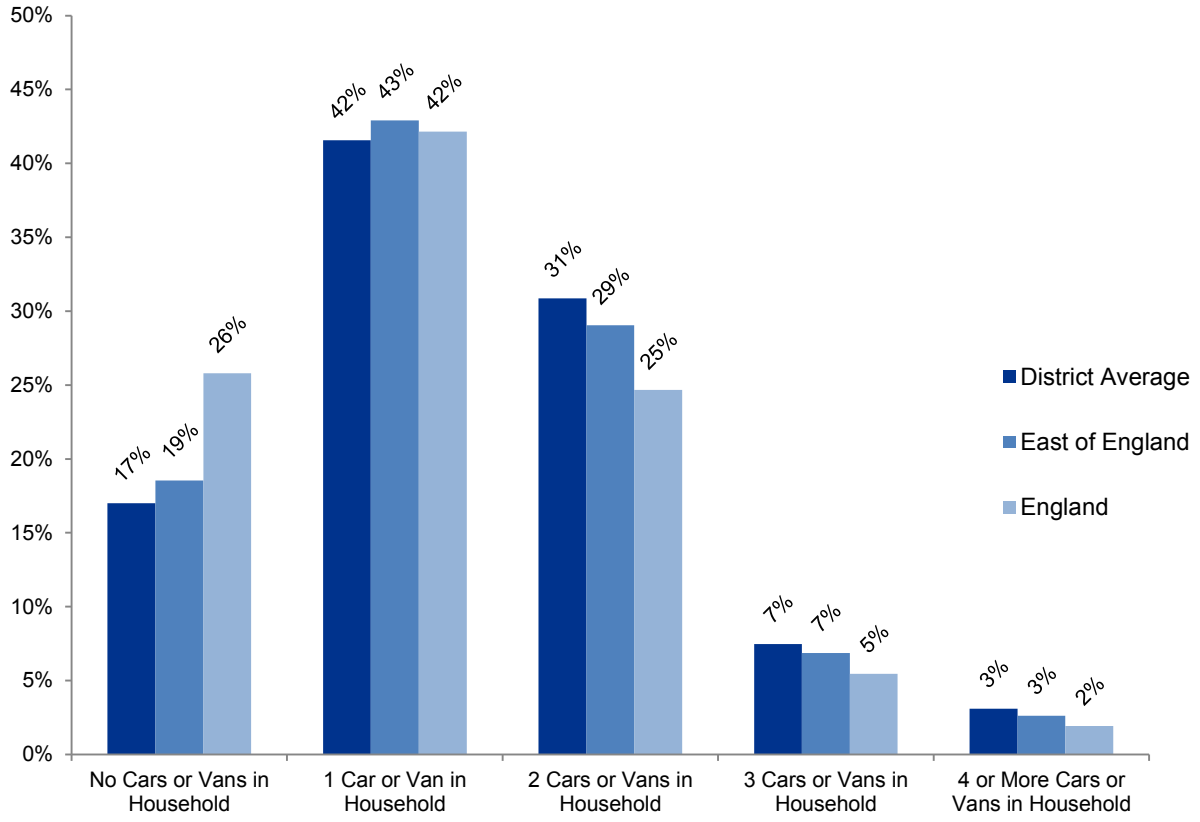


Figure 3.3: Car or van ownership (source: Census data © Crown Copyright Office of National Statistics)

3.3 Transport network

3.3.1 Highway network

The A12 is a major road located in the east of England, providing a south-west/north-east connection through Essex, Suffolk and Norfolk. It connects Great Yarmouth in the north of the region to London and the M25, intersecting with the A47, A14 and A120 which provide strategic connections to Peterborough, Cambridge and the M11 respectively.

The A12 between the M25 and J29 forms part of the road network managed by Highways England. It also serves as part of the Trans-European Network carrying international traffic. The A12 facilitates the distribution of goods and services, as well as access to holiday destinations across the region and to mainland Europe via the ports. Tourism is a key driver of economic growth in eastern England, which places seasonal traffic pressure on the A12 outside of typical peak times.

This section of the A12 provides the only strategic route (with the exception of the GEML) between the major settlements of Brentwood, Chelmsford, Colchester and Ipswich. As outlined above, these areas are significant exporters and importers of labour.

The A12 is therefore also used extensively for commuting, business and freight trips between these towns and the wider region, and plays an important role in the success of the local economy. The corridor is regarded as critical to the towns and communities it serves, in particular due to the lack of suitable alternative direct routes linking these major settlements.

The A12 is intersected by three major routes in this area; the A130 at junction 19, the A414 at Sandon and the A120 at Marks Tey. These routes add traffic demands to key junctions on the A12 which can negatively influence the performance of the route.

The A12 therefore performs important functions at national, regional and local levels as summarised in Table 3.3.

Strategically	The A12…	• Forms part of the Trans-European Network carrying international traffic • Provides a strategic connection to the ports of Felixstowe and Harwich for freight and passenger traffic • Forms part of the Highways England road network between London, the south east and the east of England
Regionally		• Links the major regional centres along the route • Provides for the distribution of goods and services • Provides access to holiday destinations within the region
Locally		• Forms a bypass of some of the towns along the route • Provides the only means of access to some communities along the route • Is used by commuters on a daily basis

Table 3.3 : Functions of the A12

3.3.1.1 Route standard

Over the years, the A12 has been improved in stages to meet growing needs in terms of capacity and the built environment. It is now a dual carriageway subject to the national speed limit for its entire length between the M25 and the A14. Due to this piecemeal improvement approach, however, the route has very little consistency in terms of provision, varying in standard between dual 2-lane and dual 3-lane all-purpose carriageways, with numerous variations of junction types and forms.

The section of A12 between junctions 19 and 25 has varying standards. The dual 2-lane section from junctions 20a at Hatfield Peverel through to junction 25 at Marks Tey has a substantial number of substandard lay-bys, horizontal radii below the desirable minima, substandard junctions and a significant number of private accesses. In some areas hardstrips and hardshoulders are not provided.

Along the A12 there are junctions with other major routes, including the M25 and other A and B Roads, as well as many local roads. The frequency of junctions is variable throughout the corridor. In certain locations junctions are spaced very close together.

Limited lengths of slip roads in combination with poor geometry, restricted visibility and the presence of bus stops or other accesses have been highlighted in previous studies to cause difficulty for merging traffic at a number of locations throughout the A12[22]. For example, the Rivenhall junction (an unnumbered junction between junctions 22 and 23), is cited as having an extremely poor geometric standard.

The A12 between junctions 19 and 25 also retains a number of at-grade accesses to residential, commercial and agricultural properties. Principal areas include the section of road from Hatfield Peverel to Marks Tey. The proximity and number of access points between junction 24 and 25 is significant, and likely to generate considerable interference with mainline traffic.

3.3.1.2 Asset condition

Carriageway surface condition

The east of England has a generally higher proportion of concrete carriageway surfacing than other regions. The majority is stated to typically be between 40 and 50 years old. Resurfacing of concrete sections of the network is seen as a priority to reduce noise disturbance.

The predominant surface material comprises Thin Surface Course Systems (TSCS); of which there is a 77.5 lane km located between junctions 19 and 24 as well as a number of slip roads. The majority of this material is in excess of 10 years old.

[22] ECC, 2008. The A12 Report of the Commission of Inquiry.

There is also 13 lane km of Pavement Quality Concrete (PQC) located between junction 22 and 25, with 3.1 lane km being retextured between junction 24 and 25 approximately five years ago. Texture depth data for this section does show, however, a section of category 3 & 4 pavement defect located between junctions 23 and 24 that coincides with this concrete surface section.

The coverage of Traffic Speed Deflectometer (TSD) data for this section of the A12 is limited which in part is due to the section of rigid pavement. Lengths of category 4 defects, however, can be seen especially at junction 25 Marks Tey on the south bound carriageway which is showing lateral cracking.

Structures

The A12 has many structural assets along its corridor between junction 19 and 25, including a number of bridges and culverts, gantries, retaining walls and masts. Some of these assets have been in existence for many years and are subject to ongoing maintenance.

3.3.1.3 Technology

As outlined within the RBS reports, the use of technology is limited on the A12 in terms of both coverage and scope. Existing provision on the A12 between junction 19 and 25 comprises:

- an MS4 variable message sign at Chelmsford on the approach to junction 19 on the A130 (westbound)
- emergency telephones (Type 354) in laybys
- CCTV coverage at a number of locations, with cameras at junctions 19, 20a, 24 and 25
- Automatic Number Plate Recognition (ANPR) sites providing journey time information at junction 19, 20a and 25
- a number of Automatic Traffic Count (ATC) sites

As a result of limited implementation, the A12 Report of the Commission Inquiry[15] described traffic on the road as being 'undermanaged'. For benchmarking purposes, Table 3.4 describes the technology provision on comparable routes within Highways England Area 6.

Comparable roads	Tech provision	Provision description
• A38 • A43 • A50	• VMS & CCTV • ERT in laybys • ANPR & count loops	Typical for strategic dual carriageway trunk roads with grade separated junctions.

Table 3.4 : Technology provision on comparable routes

3.3.2 Rail

The A12 is paralleled for much of its length by the Great Eastern Main Line (GEML), which runs from London Liverpool Street to Ipswich and Norwich, connecting all the major settlements along the corridor. It facilitates travel between the towns and to London, in particular to the City and Docklands. The route also provides the main artery for freight traffic between the east coast ports of Felixstowe and Harwich and the southern England via London.

The GEML is predominantly dual-track, but is constrained by the mix of fast and stopping passenger and freight services, complex junctions, lack of realistic diversionary routes and station occupancy. Single line sections on a number of the branch lines further exacerbate these issues.

The GEML carries over 50 million passengers per year[23]. There is increasing capacity pressures during the peak periods, with the most heavily utilised section between Liverpool Street and Colchester. Along the line Chelmsford is one of the busiest regional stations; according to the Office of Rail Regulation (ORR)[23] there were circa 8.3 million entries and exits at the station in 2013-2014, representing a 3.6% increase compared to 2012-2013 figures.

[23] ORR, 2013. Estimates of Station Usage. http://www.rail-reg.gov.uk/server/show/nav.1529

Network Rail's London and South East Market Study[24] forecasts further growth on the line, with peak hour passenger demand projections of 32% by 2023 compared to 2011 figures and between 52% and 75% by 2043. Without intervention, the London and South East RUS[25] forecasts a capacity gap on the GEML of 3,000 seats by 2031 in the peak hours. Outside the peaks, available track capacity remains heavily utilised by the mix of stopping patterns north of Shenfield and the growing number of freight trains.

As outlined within the London to Haven Ports Study, without intervention there is limited potential for modal shift from road to rail, particularly for international container traffic. Improving the GEML, however, is a high priority for Network Rail and Greater Anglia, as well as SELEP. Planned works to the GEML as well as the rail line between Felixstowe and Nuneaton may provide benefits for the A12 corridor.

3.3.3 Bus

As outlined within Essex's LTP3, connectivity between major centres by public transport is variable. The A12 is currently used by a number of local, regional bus and national coach services, which provide links between the major settlements along the corridor. However, the services vary in terms of journey time and frequency reduces at the evenings and weekends.

Regular bus services, with typical headways of every 30 minutes, as well as a number of more infrequent services operate along or adjacent to the A12 between Brentwood and Colchester. Services to neighbouring towns and more rural areas, as well as towns and cities outside the county (including Ipswich) are more limited, operating on restricted timetables that do not allow for flexibility. Typical frequencies are one to two hour intervals, which limits the viability of the service for some travellers.

Patronage is relatively low, with only around 3% of work-related journeys across the region (compared to 5% nationally) made by residents by bus. As outlined within the A12 Inquiry, this may reflect the fact that bus and coach services are also delayed by queuing traffic and congestion on the route, which can impact bus punctuality, journey reliability and journey times and make parallel rail services more attractive.

There are no park and ride facilities within this area of the A12 although there may be some use of the route by vehicular traffic that is intercepted by park and ride services to the south of Chelmsford.

3.3.4 Non-motorised users

Alongside the A12, there are nine miles (15 km) of cycleways and footpaths, between junctions 19 and 25 these include shared use footway / cycle ways between:

- Hatfield Peverel and Witham
- Witham (junction 22) and Kelvedon South (junction 23)
- Feering (junction 24) and Long Green
- Marks Tey (junction 25) to Kelvedon North (junction 24)

These routes are not continuous, however, and the volume and speed of traffic on the A12 can act as a further disincentive to their use as there is limited physical segregation provided. They are also relatively unclear, inconsistently marked and poorly signed. Whilst cyclists tend not to travel long distances along the A12, the A12 inquiry highlighted that stakeholders have long sought higher quality provision, particularly where there are no alternative parallel cycle-friendly routes. Dropped kerbs, maintenance and conflict points with slip roads, and a lack of navigational signage were stated as key issues.

Three cycle routes traverse this length of the A12, as depicted in Figure 3.4. National Cycle Route (NCN) 16 is an on-road route crossing the A12 at junction 22 via a bridge on the B1389. Regional route 50 is an on-road route which crosses the A12 via a bridge on Terling Hall Road. In addition, a local traffic free route in Witham passes under the A12 via a designated combined cycle/footpath. It links two residential areas, Witham and Wickham Bishops, which are divided by the A12.

[24] Network Rail, 2013. Long Term Planning Process: London and South East Market Study. http://www.networkrail.co.uk/improvements/planning-policies-and-plans/long-term-planning-process/market-studies/london-and-south-east/

[25] Network Rail, 2011. London and South East Route Utilisation Strategy. http://www.networkrail.co.uk/browse%20documents/rus%20documents/route%20utilisation%20strategies/rus%20generation%202/london%20and%20south%20east/london%20and%20south%20east%20route%20utilisation%20strategy.pdf

A total of 21 public rights of way cross various parts of the road between junctions 19 and 25[26], of which a number are still at grade. Therefore conflict may be created between the high speed, high volume traffic flows and non-motorised users, in particular at those facilities which have been truncated or where users are required to cross at grade. Detailed surveys will be undertaken during Stage 1.

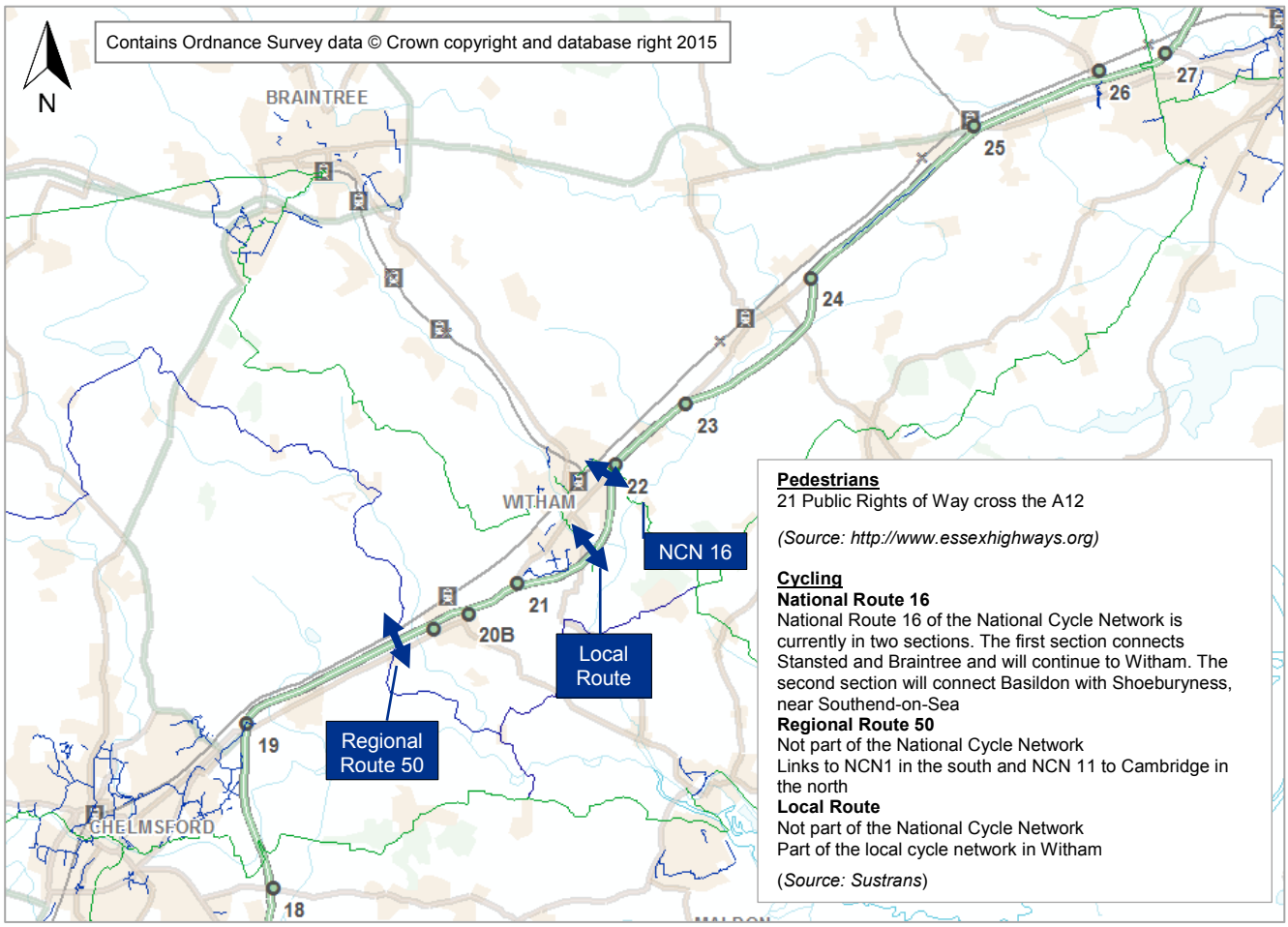


Figure 3.4 : Cycle route provision

3.4 Route performance

3.4.1 Travel patterns

NOMIS data (based on the 2011 Census ONS dataset) has been used to analyse travel patterns in the vicinity of this section of the A12. Data is available for different means of transportation, however, this analysis has only considered the category “driving a car or van” due to the focus of this study being the A12.

The A12 runs in a north-east, south-west direction with the key desire lines for car users between the main Districts in this area illustrated in Figure 3.5. The desire line along the A12 from Colchester to Chelmsford (circa 2,000 movements) adds commuting traffic to the full length of the route between junction 19 and junction 25. There is also a significant demand between Maldon and Colchester, some of which is thought to join the route in the area around Witham.

Braintree is located in relatively close proximity to the A12 between junctions 19 and 25, forming a triangular arrangement with Chelmsford to the south and Colchester to the north. The data indicates relatively large out- and in-flows of people travelling by car or van from Braintree to Chelmsford (circa 5,600 movements) and to Colchester (circa 3,100 movements). Whilst these trips do not predominantly utilise the A12, it is likely that

[26] ECC, 2015. Interactive Map. http://www.essexhighways.org/Transport-and-Roads/Getting-Around/Public-Rights-of-Way/Interactive-map.aspx

some movements utilise the route between Braintree and Witham to access the A12 at junction 21. The greater majority of these movements would likely utilise the A131 and A120 respectively. These movements add pressure that affects the performance of the route at both junction 19 and junction 25 (Marks Tey). The remaining use of the route relates to more strategic longer distance strategic movements.

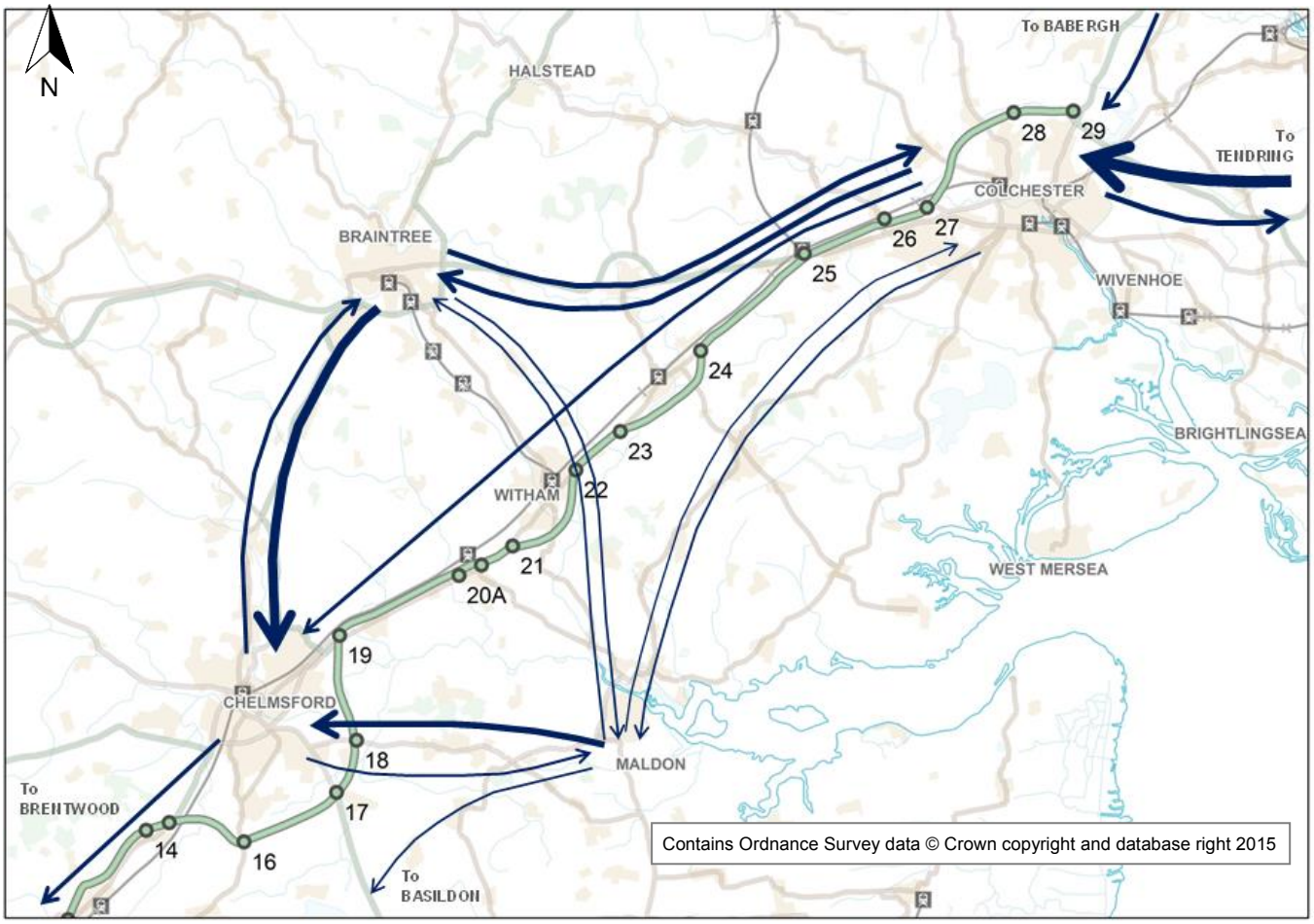


Figure 3.5 : Key desire lines in the vicinity of the A12

3.4.2 Traffic volumes

The traffic volume analysis on the route is based on a combination of the available data sources and is presented on the map shown in Figure 3.6. The main data source is the Highways England HATRIS database and in particular the annual tabular and annual report for 2014. The analysis has focused on:

- Average Annual Daily Flow (AADT)
- percentage of heavy goods vehicles (%HGV)[27]
- occurrence of AM and PM peak hours
- AM and PM peak hour traffic flows

The HATRIS count points do not cover all sections of the route. In those cases additional data was used (DfT Annual Average Daily Flow (AADF)).The information presented in Figure 3.6 is also summarised in Table 3.5 alongside the corresponding time period in the day when the peak traffic volumes occur.

The analysis of the traffic data shows a tidal movement on the A12 with the southbound stream busier during the AM and the northbound busier during the PM. This aligns with the journey to work analysis that has revealed commuting desire lines between Chelmsford and Colchester. Peak northbound traffic, however, is notably higher in volume than peak southbound.

[27] Approximated from TRADS data as % of vehicles > 6.6m

The busiest link on this section of the A12 is between junctions 20b and 21, with AADT flows of approximately 40,900 northbound and 41,300 southbound. This may indicate that this particular section is used by traffic "crossing" across the A12 and it is linked with the commuting desire line between Braintree and Maldon and to a lesser extent the desire line between Chelmsford and Braintree.

The percentage of heavy vehicles is greater than 8% throughout the route, indicating that it is used by significant volumes of freight traffic.

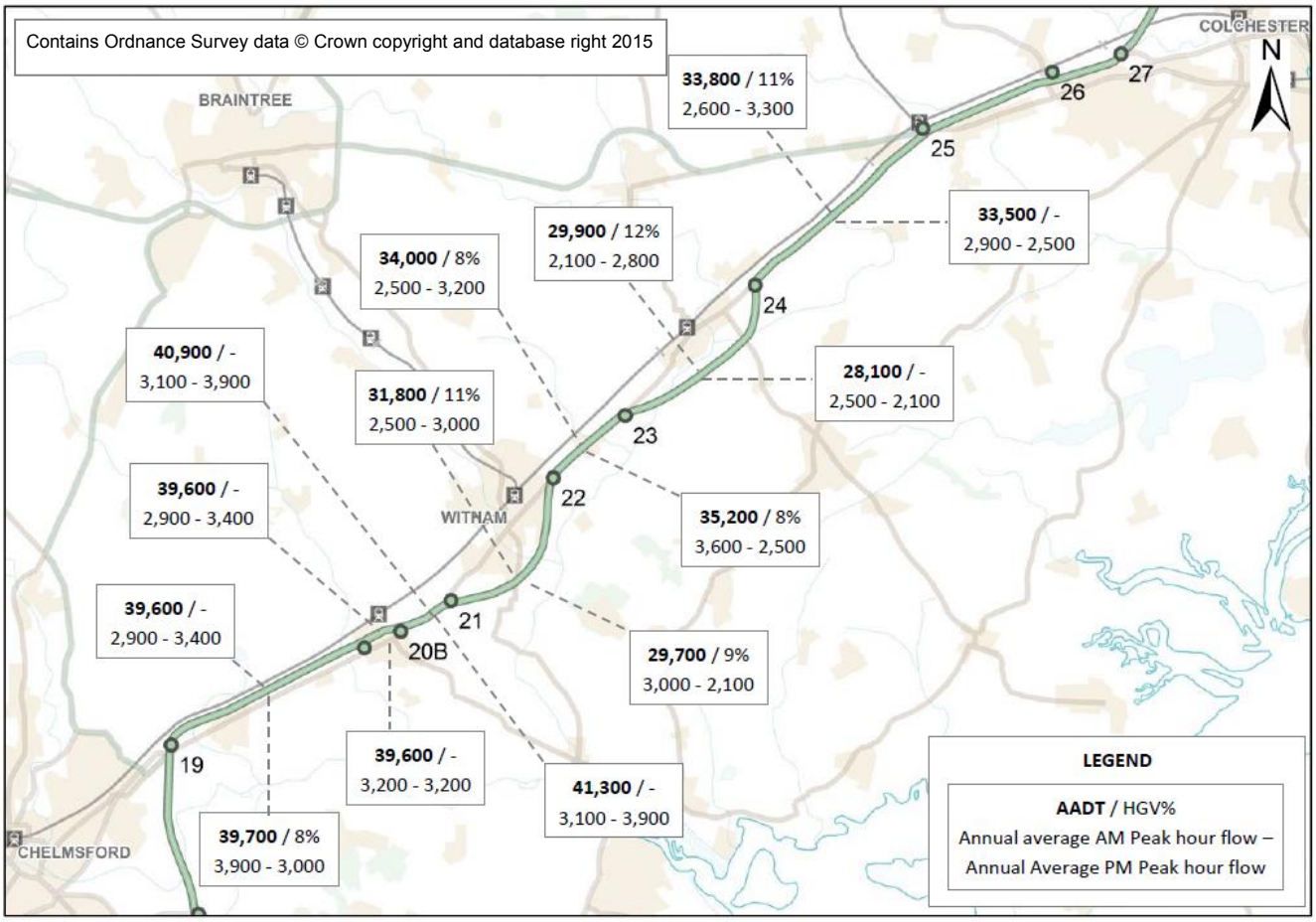


Figure 3.6 : Traffic volumes along the A12 (2014)

Link	AADT (2014)	HGV% (AADT)	AM peak hour flow	PM peak hour flow	AM peak hour	PM peak hour
Northbound						
Junction 19 to 20a	39,600	No data	2,900	3,400	08:00-09:00	16:00-17:00
Junction 20a to 20b	39,600	No data	2,900	3,400	08:00-09:00	No data
Junction 20b to 21	40,900	11%	3,100	3,900	08:00-09:00	16:00-17:00
Junction 21 to 22	31,800	11%	2,500	3,000	08:00-09:00	16:00-17:00
Junction 22 to 23	34,000	8%	2,500	3,200	08:00-09:00	16:00-17:00
Junction 23 to 24	29,900	12%	2,100	2,800	08:00-09:00	16:00-17:00
Junction 24 to 25	33,800	11%	2,600	3,300	08:00-09:00	17:00-18:00
Southbound						
Junction 25 to 24	33,500	No data	2,900	2,500	07:00-08:00	17:00-18:00
Junction 24 to 23	28,100	10% *(2011)*	2,500	2,100	07:00-08:00	17:00-18:00
Junction 23 to 22	35,200	8%	3,600	2,500	07:00-08:00	16:00-17:00
Junction 22 to 21	29,700	9%	3,000	2,100	07:00-08:00	16:00-17:00
Junction 21 to 20b	41,300	9% *(2011)*	3,100	3,900	08:00-09:00	16:00-17:00
Junction 20b to 20a	39,600	No data	3,200	3,200	No data	No data
Junction 20a to 19	39,700	8%	3,900	3,000	07:00-08:00	17:00-18:00

Table 3.5 : Traffic volumes along the A12 (2014) (Source: HATRIS/DfT)

3.4.3 Capacity and capability

A summary of the existing traffic volumes and estimated capacities on the A12 between junctions 19 and 25 are shown in Table 3.6, and a ratio of traffic volume to road link capacity (V/C), or 'stress' factor, for the AM and PM peaks presented. This traffic data was obtained from Highways England Traffic Database (TRADS) for the year 2014. Existing A12 mainline carriageway capacity and volume to capacity ratios have been estimated using traffic data from TRADS and the journey time database (JTDB). The process for estimating the lane capacities is documented in Appendix E.

A V/C ratio of 1.00 represents the theoretical capacity limit of a link. Links approaching 1.00 are also likely to experience an increased prevalence of queuing and congestion, and an increased sensitivity to incidents. The information presented in Table 3.6 shows the following sections between junctions 19 and 25 to be approaching capacity, with the V/C ratio exceeding 0.9:

- junctions 20b to 21 (northbound) during the PM peak hour
- junctions 21 to 20b (southbound) during the PM peak hour
- junctions 23 to 22 (southbound) during the AM peak hour

Link	Peak hour volume		Estimated capacity (veh/hr)	V/C ratio		DMRB reference capacity
	AM	PM		AM	PM	
Northbound						
Junction 19 to 20a	2,900	3,400	6,600	0.44	0.52	6,891
Junction 20a to 20b	2,900	3,400	3,900 – 4,200	0.69 - 0.74	0.81 - 0.87	4,196
Junction 20b to 21	3,100	3,900	3,900 – 4,200	0.74 - 0.79	0.90 - 0.97	4,196
Junction 21 to 22	2,500	3,000	3,900 – 4,200	0.60 - 0.64	0.71 - 0.77	4,196
Junction 22 to 23	2,500	3,200	3,900 – 4,200	0.60 - 0.64	0.76 - 0.82	4,196
Junction 23 to 24	2,100	2,800	3,900 – 4,200	0.50 - 0.54	0.67 - 0.72	4,196
Junction 24 to 25	2,600	3,300	3,900 – 4,200	0.62 - 0.67	0.79 - 0.85	4,196
Southbound						
Junction 25 to 24	2,900	2,500	3,900 – 4,200	0.69 - 0.74	0.60 - 0.64	4,196
Junction 24 to 23	2,500	2,100	3,900 – 4,200	0.60 - 0.64	0.50 - 0.54	4,196
Junction 23 to 22	3,600	2,500	3,900 – 4,200	0.86 - 0.92	0.60 - 0.64	4,196
Junction 22 to 21	3,000	2,100	3,900 – 4,200	0.71 - 0.77	0.50 - 0.54	4,196
Junction 21 to 20b	3,100	3,900	3,900 – 4,200	0.74 - 0.79	0.90 - 0.97	4,196
Junction 20b to 20a	3,200	3,200	3,900 – 4,200	0.76 - 0.82	0.76 - 0.82	4,196
Junction 20a to 19	3,900	3,000	6,600	0.59	0.45	6,891

Table 3.6 : Link volume over capacity along the A12 (2014)

Note 1: Shading (based on lower estimate) is consistent with light green = <0.50, medium green = 0.51 – 0.70, yellow = 0.71 – 0.90, amber = 0.91 – 1.10, red = >1.10

3.4.4 Journey times

Journey time data has been sourced from JTDB for the full year 2014. Further journey time surveys will be undertaken as part of scheme development. Analysis of the current travel times along the A12 between junctions 19 and 25 shown in Figure 3.7 indicates the following:

- The route journey times are influenced strongly by the tidal pattern of traffic volume
- The southbound journey time in the AM peak increases by approximately 4 minutes (25% difference) compared to the inter-peak scenario
- The northbound journey time in the PM peak increases by approximately 6 minutes (37% difference) compared to the inter-peak scenario
- The journey times for the non-tidal direction of travel appear to be broadly consistent with a typical inter-peak scenario

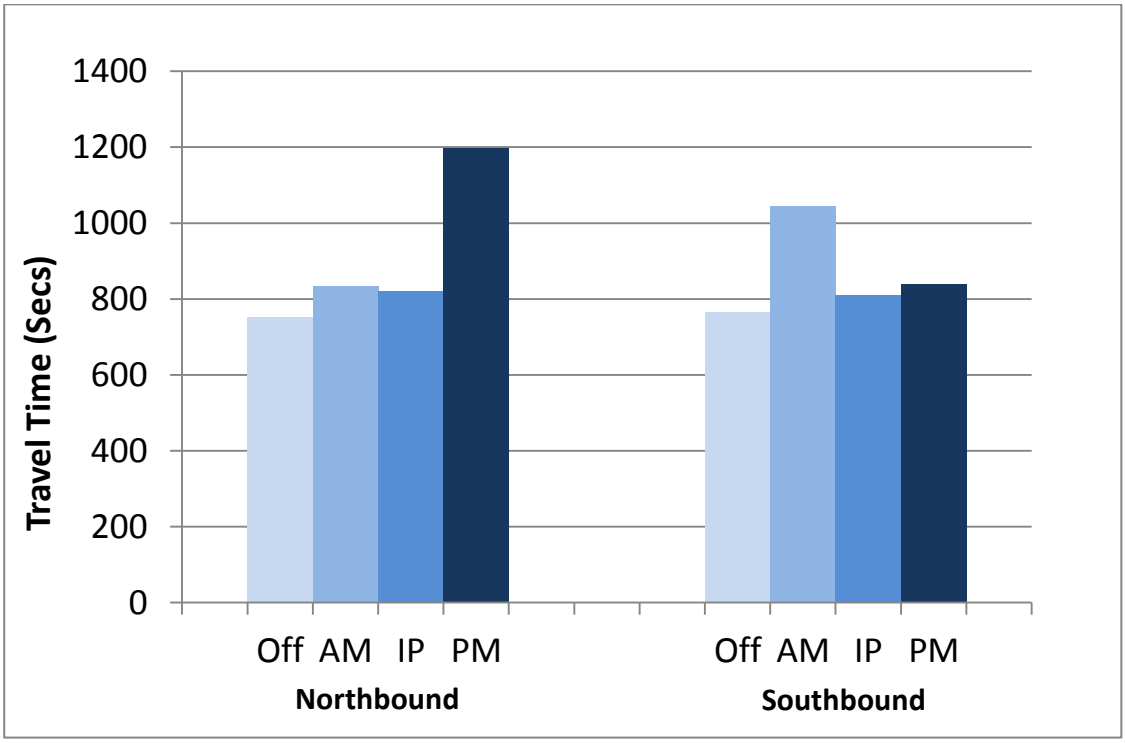


Figure 3.7 : Route journey time by time period

Day to day peak period journey time reliability has been measured using a buffer index derived from JTDB data recorded during normal working days during 2014. This represents the time a traveller should allow in addition to the average travel time to ensure on time arrival 95% of the time. Additional information on the calculation of the buffer index is included in Appendix F.

The buffer indices for A12 junctions 19 to 25 are shown in Table 3.7. This shows the additional time drivers require to drive through this section of the A12, and arrive on time, is variable. This further illustrates the directional peak that reverses from AM to PM peak hours.

Junction 19 to 25	Buffer index	
	AM (8am to 9am)	PM (5pm to 6pm)
Northbound	8%	34%
Southbound	44%	10%

Table 3.7 : Buffer indices for the A12 journey time reliability analysis

3.4.5 Speed analysis

Analysis of current travel speeds along the A12 has been undertaken using travel speed data from JTDB for the full year of 2014. The northbound and southbound speeds for the full length between junctions 19 and 25 are presented in Table 3.8; speeds are shown for the AM (08:00 – 09:00) and PM (17:00 – 18:00) peaks, inter-peak (12:00-13:00) speeds have also been included for comparative purposes and data indicating the proportion of peak hours during a year where speed is below a certain threshold.

Average peak speeds reflect the typical volumes of traffic and tidal patterns of flow, with average southbound journey speeds 13mph lower than the inter-peak speeds during the AM peak and average northbound journey speeds 19mph lower than the inter-peak speeds during the PM peak.

Junction 19 to 25	Average speed (mph)				Average % time below speed (mph) during peak hours				
	AM	IP	PM		<70	<60	<50	<40	<30
Northbound	64	65	46		63%	12%	4%	1%	0%
Southbound	53	66	64		66%	11%	3%	1%	0%

Table 3.8 : Average vehicle speeds (mph), and % breakdown of speeds during peak hours

Average speeds on different sections of the A12 during the AM and PM peak hours are shown in Appendix G. In the AM peak period, reduced vehicle speeds on the A12 are observed at the following locations:

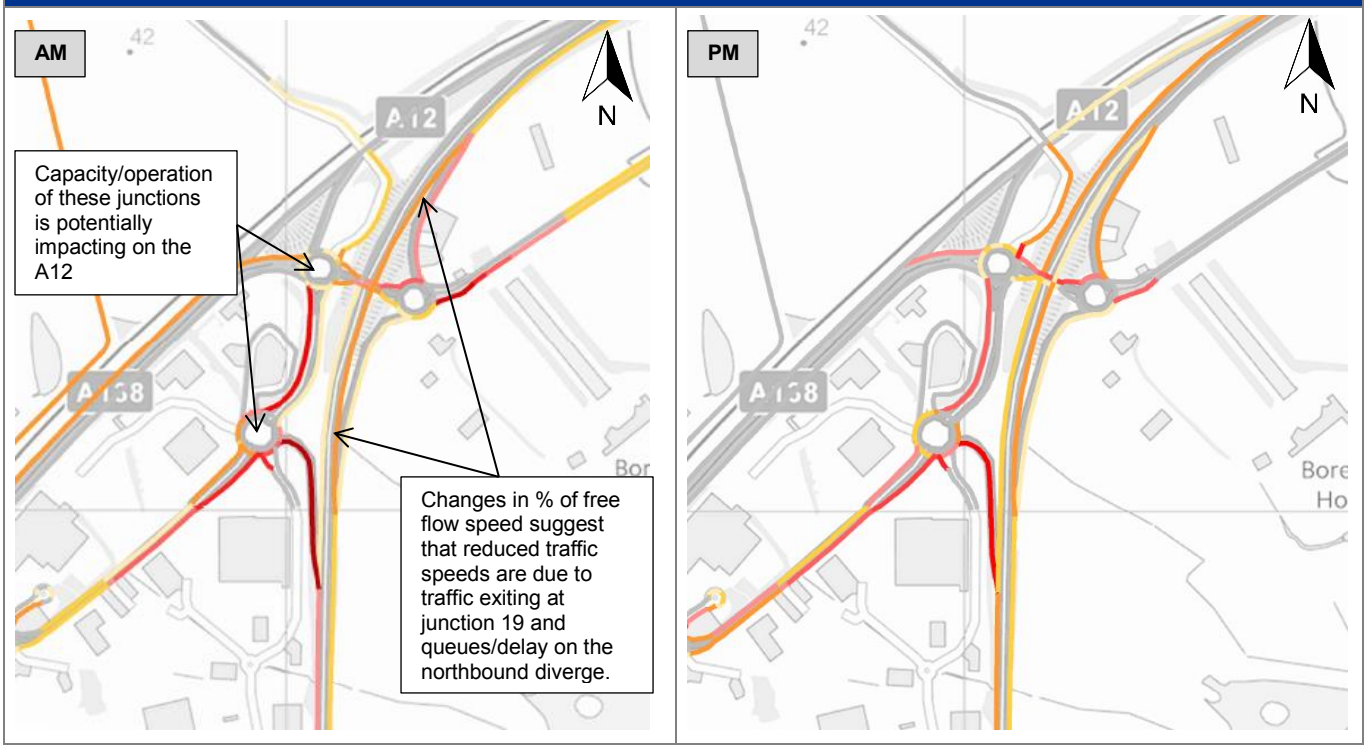
- Southbound approach to Chelmsford (junction 19).
- Both directions between junction 20a and 20b in Hatfield Peverel.
- Southbound from Marks Tey (junction 25) to Hatfield Peverel, and around Kelvedon and Witham.

In the PM peak, the average link speed information illustrates that the A12 southbound is relatively free flowing during this period. Northbound, however, reduced vehicle speeds and consequent delays from Chelmsford to Rivenhall End are typical throughout the PM peak period.

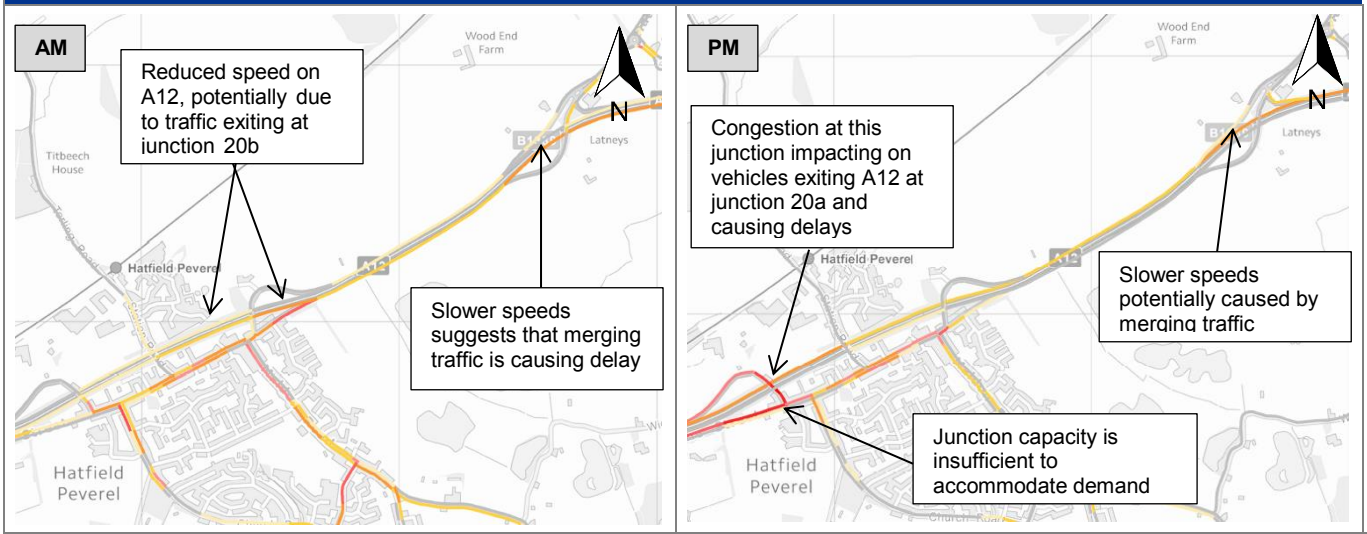
At locations where reduced link speeds have been identified, year 2013-14 TrafficMaster vehicle speed data has been interrogated to understand local conditions in more detail. Observations are summarised in Table 3.9 with images presenting average speeds as a percentage of free flow speed for both the AM and PM peaks (whereby darker colours reflect slower % free flow vehicle speeds).

The % free flow speed indicates significant queuing on the approaches to the main towns along the corridor and through Hatfield Peverel. This is due to queues extending back into the A12 from junctions in Hatfield Peverel.

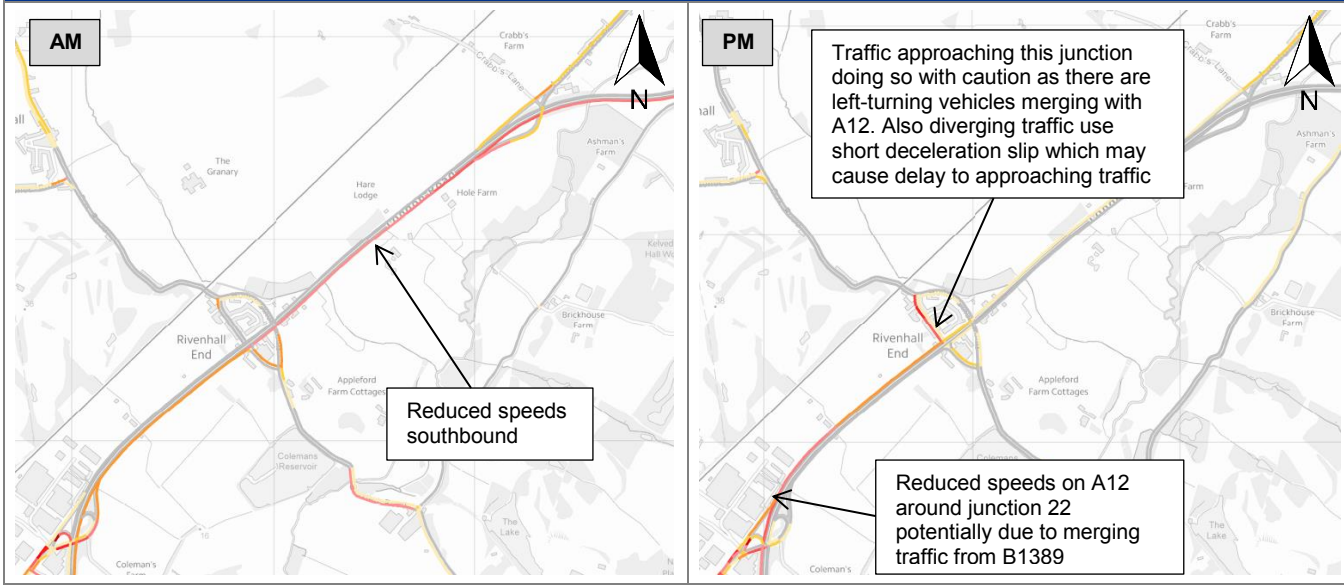
Junction 19 - Boreham Interchange



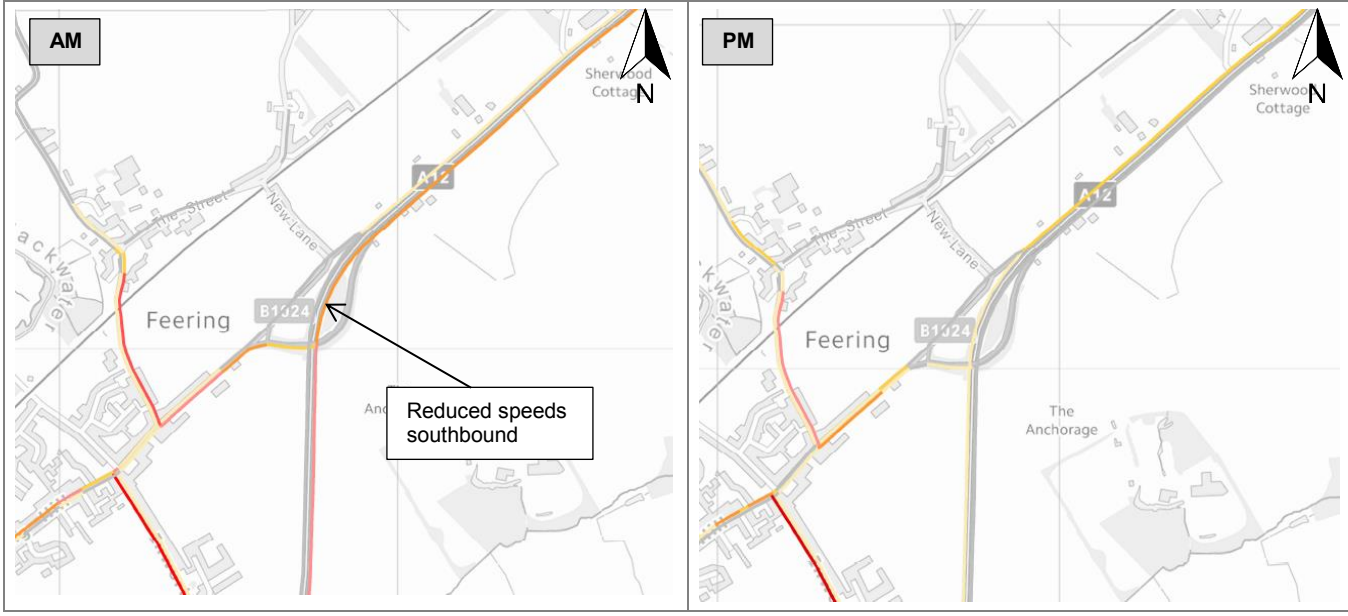
Junctions 20a, 20b and 21 – Hatfield Peverel



Junctions 22 and 23 – Rivenhall End



Junctions 24 – Kelvedon North



Junctions 25 – Eight Ash Green

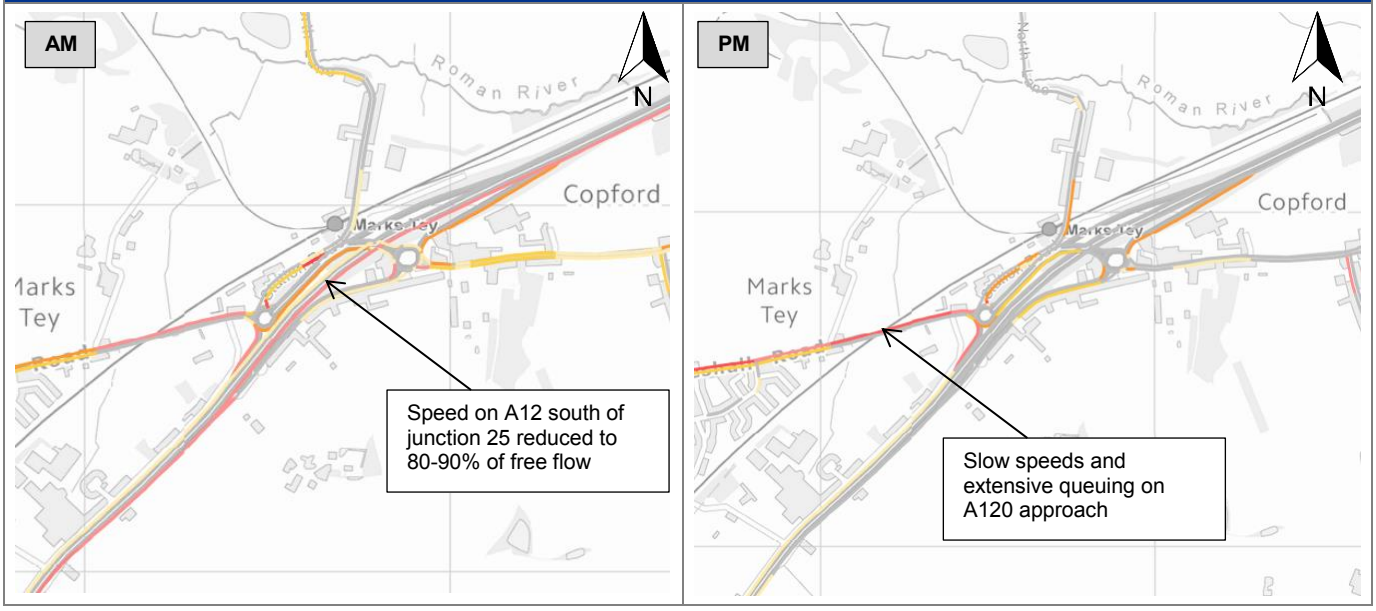


Table 3.9 : 2013 -14 TrafficMaster flow speed data for the A12 Junctions 19 – 25

3.4.6 Road safety

Incident data has been reviewed for the period May 2010 to June 2015, as classified in Table 3.10.

Incident grouping	Incident type breakdown
Traffic collision	Road traffic collision - no injury, road traffic collision - injury/fatality
Breakdown	Live lane, not in live lane
Other	Animal on network, critical asset monitoring, event off network (old), obstruction – other, planned roadworks, congestion, fire – vehicle, abortive ert call (old), infrastructure defect, observation, pedestrian, spillage, assistance to other agencies, abandoned vehicle, medical emergency, snow/ ice/ freezing rain, flooding, abnormal load, fire - non vehicle, suicide/ attempted suicide, unplanned roadworks

Table 3.10 : A12 Incident data type classification

Total incidents per year by classification are summarised in Figure 3.8. This indicates that there is a slight increasing trend in traffic collisions between 2011 and 2014 and some significant fluctuations in the number of 'other' incidents. The average five year incident breakdown statistics, by direction, are presented in Appendix H. These show that there are a greater number of incidents occurring in the northbound direction.

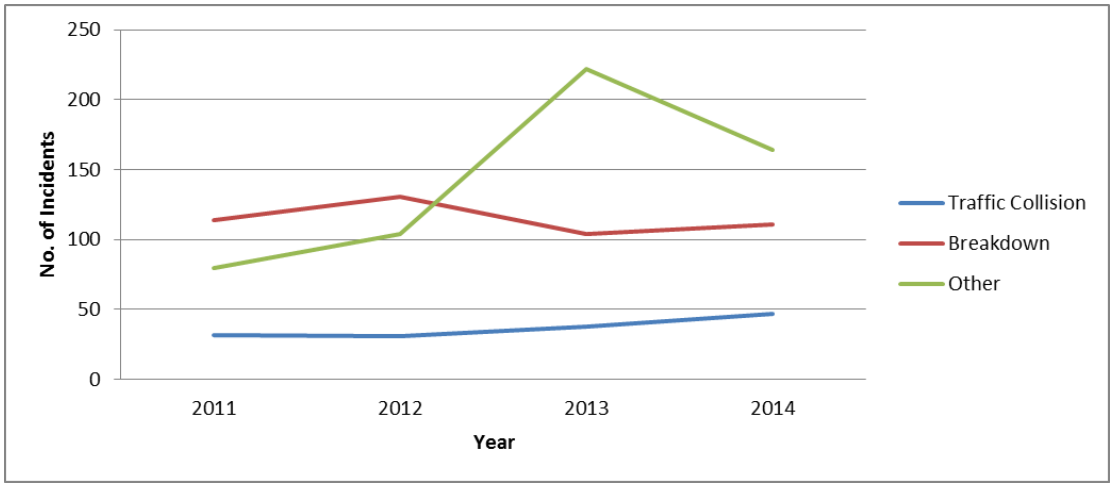


Figure 3.8 : Yearly incident breakdown

The annual average closure frequency (averaged over five years) due to incidents has also been considered. Data revealed that between junctions 19 and 25 northbound the carriageway was closed 0.4 times per year on average. The average duration of the carriageway closure was 210 minutes. Southbound, whilst the average frequency was slightly less at 0.2 times per year, closure duration was slightly longer at 215 minutes.

Safety is expressed as a particular concern along the route by users. Particular areas of concern include the following, which appear within Highways England's top 250 casualty locations across the SRN:

- A12 Bury Lane northbound off-slip (junction 20a)– Rank 98
- A12/A120 Marks Tey roundabout (junction 25)– Rank 202

Collision clusters were also identified on this section of the A12 using a weighted number methodology for fatal, serious and slight collisions.

At junction 22 (eastbound) one fatal and three slight collisions occurred on the eastbound carriageway, three on the off-slip and one on the main carriageway. Two of the slight collisions were single vehicle loss of control collisions. The fatal collision involved a rear end shunt on the slip road and driver fatigue.

The highest rate of collisions (per mile) along this section of the A12 is between junctions 20a and 21. Furthermore, the link between junctions 20a and 20b has a casualty rate per hundred million vehicle miles (38.7) significantly greater than the average for all-purpose dual carriageways (26.5). Other links within this section of road indicate casualty rates lower than the average.

Table 3.11 presents the collisions and casualties for 70 mph roads (non-motorway dual carriageway roads nationally - 2013 figures) compared with the A12 junction 19 to 25 over the five year period. These show the levels of serious and KSI casualties, compared with all severities to be higher than the national figures, but the level of serious collisions to be similar. The level of fatal collisions is higher but involves relatively small numbers.

It is concluded that the severities of collisions on this section are generally similar to the national level for this type of route, whilst the level of KSI casualties is slightly higher.

	Fatal		Serious		KSI		Slight	
Collisions								
70mph	121	2.6%	637	13.6%	758	16.2%	3919	83.8%
A12 J19 - J25	8	4.2%	26	13.5%	34	17.7%	158	82.3%
Casualties								
70mph	133	1.9%	766	10.7%	899	12.6%	6263	87.5%
A12 J19 - J25	8	2.8%	37	12.8%	45	15.5%	245	84.5%

Table 3.11 : Collisions & casualties by severity versus national figures (2013) for 70 mph non-motorway roads - A12 J19-25

A comparison of casualty rates per collision between junction 19 and 25 and 70 mph roads nationally for the same time periods indicate this section of A12 to have a rate of 1.51 against 1.53 nationally.

3.5 Environment

The A12 runs south-west to north-east though a mixture of agricultural and urban settings; a summary of the landscape and environmental constraints that this presents is provided below. Key features within the study area are presented in the environmental constraints plans in Appendix A.

3.5.1 Air quality

There are no air quality management areas (AQMA) declared along this section of the A12; the nearest AQMA is in Chelmsford, declared for annual NO_2 (Defra, 2015). Potential sensitive receptors to air quality are residential properties in Boreham, Hatfield Peverel, Witham, and Rivenhall End. Chipping Hill Primary School is located approximately 200m from the A12 north-east of junction 21.

3.5.2 Cultural heritage

There are no world heritage sites (WHS) within 5km of the study area, or registered battlefields within 1km. There are 29 grade II and three grade II* listed buildings within 250m of the A12 in the study area. There are three scheduled monuments within 500m of the A12:

- Rivenhall long mortuary enclosure, located approximately 380m from the A12 north-east of junction 22.
- Anglo-Saxon cemetery 150m east of Easterford Mill, located approximately 380m from the A12 north-east of junction 22.
- Circular brick kilns, W H Collier brick and tile works, Church Lane, located approximately 500m from the A12 at junction 25.

There are four registered parks and gardens within 1km of the study area:

- Boreham House (Grade II) – located approximately 100m from the A12, east of junction 19
- New Hall, Boreham (Grade II) – located approximately 750m from the A12, north-west of junction 19
- Hatfield Priory (Grade II) – located approximately 850m from the A12, at Hatfield Peverel
- Braxted Park (Grade II*) – located approximately 950m from the A12, east of Witham

3.5.3 Landscape

There are no areas of outstanding natural beauty (AONB) or national parks within 5km of the study area. The study area does not fall within any green belt land.

The study area is within the South Suffolk and North Essex Clayland National Character Area (NCA). The landscape is characterised by its chalky boulder clay plateau, with gentle undulations caused by the numerous small-scale river valleys that cross it. The landscape contains a complex network of ancient woods and parklands, species-rich hedgerows, and meadows with streams and rivers. The study area borders the Northern Thames Basin NCA towards junction 25 (Natural England, 2014).

3.5.4 Ecology and nature conservation

There are no national nature reserves (NNR), special areas of conservation (SAC), special protection areas (SPA), or ramsar sites located within 5km of the study area. Marks Tay Brickpit Site of Special Scientific Interest (SSSI) is located approximately 150m north-west of junction 25. This site is important for Pleistocene sediment vegetation records (Natural England, 2015a).

Whet Mead Local Nature Reserve (LNR) is located adjacent to the A12 between junctions 21 and 22. This site consists of a rough meadow bordered by scrub and young woodland. Brockwell Meadows is located approximately 350m from the A12 in Kelvedon. Located on the banks of the River Blackwater, this site includes water meadow, hedgerows, woodlands, and ponds (Natural England, 2015b).

There are a number of biodiversity action plan (BAP) habitats adjacent to the A12 in the study area including deciduous woodland, wood pasture and parkland, young trees and felled trees. Toppinghoehall ancient replanted woodland is located approximately 500m from the A12 north-east of Boreham. There are likely to be protected species along the A12 corridor.

3.5.5 Geology and soils

The majority of the study area has an underlying geology of clay, silt, sand, and gravel sedimentary bedrock, with a combination of diamicton till, glacial sand and gravel, and river terrace drift deposits (British Geological Society, 2015). The ground of the majority of the study area is composed of freely draining slightly acid loamy soils, with lime rich loamy and clayey soils with impeded drainage around junction 21, and between junctions 24 and 25. Soil around junction 19 has impeded drainage.

The study area is designated as having bedrock non-productive strata, with pockets of secondary A, secondary B, and undifferentiated superficial aquifers across the area. There is an inner zone of a small source protection area (SPZ) located adjacent to the A12 in Kelvedon (Environment Agency, 2015). There are five historic landfill sites located adjacent to the A12 within the study located in Witham, and at junction 25.

3.5.6 Nosie and vibration

The existing noise climate is dominated by road traffic emanating from the A12, B1137, B1389, and B1024 and surrounding networks to the study area. There are likely to be sensitive receptors in the adjacent properties, towns and villages.

3.5.7 Effect on all travellers

Centenary Circle path crosses the A12 south of junction 19. There are a number of footpaths which cross, or are adjacent to, the A12 in the study area. There are two national cycle routes which cross the A12 in the study area: national route 1 which crosses the A12 in Witham; and national route 16 which crosses the A12 at junction 22. Regional route 50 also crosses the A12 west of Hatfield Peverel. These routes can be seen in Figure 3.4.

The Great Eastern Main Line railway line travels adjacent to the A12 between junctions 19 and 20a, and within 200m of the A12 between junctions 22 and 23, and junctions 24 and 25.

3.5.8 Community and private assets

The main land use in the study area is grassland and arable agricultural. The majority of land is classed as ALC grade 2 with small pockets of grade 3 around junction 19 and south of Witham.

3.5.9 Road drainage and the water environment

There are a number of rivers and brooks which cross the A12 in the study area. These include the River Ter at junction 20a; River Brain, south-east of Witham; River Blackwater, east of junction 23; Boreham tributary, at Boreham; and Domsey Brook, east of Kelvedon. In addition there are numerous unnamed field drainage ditches, irrigation reservoirs, and ponds which cross, or are adjacent to, the A12 throughout the study area. 'Main rivers' and other watercourses are listed in the accompanying Environmental Assessment Report.

The area where the A12 crosses the River Blackwater is designated as flood zone 3 with a 1 in 100 chance of annual flooding from the water body. The scheme falls within SWSGZ1029 and SWSGZ1029 surface water safeguard zones for pesticides. The study area also falls within a surface water and groundwater nitrate vulnerable zone (NVZ) (Environment Agency, 2015).

3.6 Constraints and opportunities

The physical, legal and institutional constraints, and the opportunities affecting the A12 and surrounding area are outlined to assist with the development of potential transport options. This section summarises evidence presented previously in this report.

3.6.1 Physical constraints

In summary, the physical constraints identified include:

- Land ownership for road widening schemes and junction upgrades. This may require compulsory purchase order (CPO) of land.
- Widening beneath bridges on A12 generally. This would be considered as part of the overall cost of the scheme.
- The GEML and the A12 are in close proximity between junction 19 north of Chelmsford and junction 20a south of Hatfield Peverel and within 200m of the A12 between junctions 22 and 23, and junctions 24 and 25.
- Sensitive receptors (air quality):
  - Potential sensitive receptors to air quality are residential properties in Boreham, Hafield Peverel, Witham, and Rivenhall End.
  - Chipping Hill Primary School is located approximately 200m from the A12 north-east of junction 21.
- Cultural heritage:
  - There are 29 grade II and three Grade II* listed buildings within 250m of the A12 in the study area.
  - Three scheduled monuments within 500m of the A12.
  - Four registered parks and gardens within 1km of the study area.
- Landscape:
  - The study area includes two National Character Areas (NCAs).
- Ecology and nature conservation:
  - One LNR within 1km of the study area.
- Noise and vibration:
  - Road traffic noise emanating from the A12, B1137, B1389, and B1024 and surrounding networks to the study area. There are likely to be sensitive receptors in the adjacent properties, towns and villages.

3.6.2 Legal and institutional constraints

The legal and institutional constraints include:

- The potential for mode shift away from road to rail (for passenger and freight) is influenced by rail operators pricing strategies, Network Rail's expansion/ upgrade plans, and expansion proposals for rail terminal capacity at Felixstowe and Harwich Seaports.

- Emerging development patterns in terms of allocated sites is reliant on the local authority local plan process, and the timescales for developing these.
- Community and private assets:
  - The majority of land is classed as ALC grade 2 with small pockets of grade 3 around junction 19 and south of Witham.

3.6.3 Opportunities

The opportunities are considered to be the following:

- Improve economic conditions for businesses, including Felixstowe and Harwich Seaports through improved journey time reliability and journey speed by:
  - Additional road capacity between A12 junctions 19 and 25 through road widening.
  - Increased junction capacity/ signalisation of approach arms to junctions to reduce likelihood/ management of queues impacting the journey speed on the A12. Junctions to consider include in particular 19, 20a, 20b, 21, 22 and 25.
  - Planned upgrade works to junction 19 as part of Boreham Interchange improvements and proposed Chelmsford North East Bypass.
  - Review of merge points between the on-slip and the A12 carriageway.
  - Improved technology in the corridor.
- Facilitate local and regional growth in housing and employment due to additional road capacity.
- Remove or improve access to A12 at Rivenhall End.
- Improve environmental conditions through:
  - Resurfacing of pavement to lower noise surfaces, particularly in areas which are within close proximity to residential areas and other sensitive receptors e.g. schools.
  - Smoothed journey speeds reducing vehicle emissions from idling, constant accelerating/ braking by providing additional capacity and technology upgrades.
- Improve road safety on the A12 and manage incidents more efficiently through:
  - Deployment of traffic officers and a ‘minuteman’ service (a fast-response service for clearing minor incidents such as breakdowns or very minor collisions in order to reduce consequent delays).
- Improve user satisfaction through improved journey time reliability, journey speeds, and pavement condition.
- Improve facilities for pedestrians, cyclists and equestrians by providing grade separated crossings, where appropriate. Formalise facilities at junctions and create links and improve the safety of existing facilities where they are next to the carriageway.
- Maintain pavement condition to improve user satisfaction and noise performance.

3.7 Summary

The A12 provides the main south-west/north-east route through Essex and Suffolk, connecting Ipswich in the north to London and the M25 in the south. It forms part of both Highways England Strategic Road Network and Trans-European Network. It is of strategic importance, linking East Anglia - and in particular the ports of Felixstowe and Harwich - to London and the South East. It is also of critical importance regionally and locally to the economic and social wellbeing of the towns and communities it serves.

The A12 between junctions 19 and 25 accommodates high volumes of traffic, and is shown to experience congestion at peak times, with reduced link speeds and increased vehicular delays and journey times. Due to the variability in the standard of the corridor and limited suitable diversion routes, it is vulnerable to incidents which can cause significant disruption over a wide area and is generally regarded as stressful and costly for drivers.

4. Future situation

4.1 Introduction

Considerable growth in residential and employment land use is planned across the wider region. Significant housing and economic growth aims are set out in SELEP's Strategic Economic Plan and existing and emerging local plans. In addition, there are planned major port developments and continued year-on-year growth at Stansted Airport. Such development will increase travel demand and inevitably add further pressure onto the A12 corridor.

This section provides an assessment of the forecast transport conditions along the route between junctions 19 and 25, looking to a horizon of 2023 as the assumed opening year and 2038 (opening year + 15 years) as a longer term 'design year'.

4.2 Planned growth and infrastructure changes

4.2.1 Planned growth

The NPPF triggered a need for local authorities to revisit their local planning strategies to ensure they were consistent with national planning policy. Local authorities are in the process of reviewing their housing and employment targets for the next 15 year planning period.

The A12 passes through and across the boundaries of many planning authorities. Of particular relevance to this study are Braintree, Chelmsford, Colchester, and Maldon although there is a need to be cognisant of the planned growth in other local authorities within the wider study area between the M25 (A12 junction 11) and the A12/ A120 (A12 junction 29). A summary of the key growth aspirations in these areas, as outlined in existing Core Strategies and emerging Local Plans, is provided in Table 4.1 below.

Local Authority	Housing target	Employment target	Data source
Basildon Borough Council	800 homes per annum or 16,000 homes over the plan period 2011-2031.	Net increase of at least 8,600 B use class jobs across the Borough	Basildon Borough Local Plan, Core Strategy – Revised Preferred Options Report (December 2013)
Brentwood Borough Council	3,500 homes between 2015 and 2015, equating to between 200 and 250 homes per year	5,400 B use class jobs jobs between 2015 and 2030, approximately 285 per year	Brentwood Borough Council - Local Plan 2015-2030 Preferred Options for Consultation[28]
Chelmsford City Council	700 to 800 homes per annum between 2001 and 2021. This equates to 16,000 houses between 2001 and 2021.	9,600 new jobs between 2001 and 2021	Chelmsford Borough Council Local Development Framework 2001-2021, Core Strategy and Development Control Policies (February 2008)

[28] http://brentwood.jdi-consult.net/localplan/readdoc.php?docid=4&chapter=3&docelemid=d85#d85

Local Authority	Housing target	Employment target	Data source
Braintree District Council	750 to 900 homes per annum between 2015 and 2033. This equates to between 18,000 and 22,800 homes. 761 to 883 new homes per year (according to the Strategic Housing Market Assessment (SHMA)	14,000 new jobs by 2026	Braintree District Council, Local Plan, Issues and Scoping (January 2015) DCA - Braintree District Council, Strategic Housing Market Assessment, Final Report (2014) Braintree District Council, Building a Prosperous District, Braintree District Economic Development Prospectus 2013/2026
Maldon District Council	4,410 homes (minimum) between 2014 and 2029. This 294 per annum.	Minimum of 2,000 new jobs by 2029.	Maldon District Council, Pre-submission Local Development Plan, 2014 to 2029
Colchester Borough Council	1,065 homes per annum for 20 year period	Not stated	Colchester Borough Council, Local Plan Issues and Options (January 2015).
Tendring District Council	5,625 homes between 2014 and 2029.	5,000 new jobs between 2014 and 2029.	Tendring District Council, 2012 Draft Local Plan (as amended by the 2014 Focussed Changes)

Table 4.1 : Existing core strategy and emerging Local Plan growth aspirations

4.2.2 Highway network improvements and operational changes

There are a number of planned highway network changes that will influence the on-going performance and operation of the A12 between junctions 19 and 25, including the following announced Highways England schemes:

- A12 whole route technology upgrade by end of 2019/20 including detection loops, CCTV cameras and variable message signs to allow better information to drivers and active traffic management of traffic on the route.
- Widening the A12 to three lanes between the M25 junction 28 and Chelmsford, and around Colchester from the A120 junction to A12 junction 29.

The Chelmsford North East Bypass is also a major network improvement scheme that has been proposed by ECC (A130/A131 scheme) that would connect to an expanded and upgraded A12 junction 19. The bypass would close a gap in the strategic network which could help to alleviate congestion and shorten journey times over a wider area. No decision has been taken about junction layouts and the Council's website[29] states that funding is unlikely to be available for delivery of the bypass before 2021; an interim option for Boreham Interchange is therefore being delivered to include northbound slip extension and roundabout signalisation to support increased traffic volumes and facilitate efficient access to/from the local developments.

ECC are also progressing early Business Case development studies associated with improvements to the A120 between Braintree and the A120.

In addition to the above schemes, indirect effects may also be felt on the A12 through the delivery of SELEP growth deal schemes. The following schemes in close proximity to the A12 have secured funding and may have the potential to support reduced travel and modal shift:

- Chelmsford City Integrated Transport Package (Chelmsford Station / Station Square / Mill Yard).
- Colchester Local Sustainable Transport Programme.

[29] http://www.essexhighways.org/Transport-and-Roads/Highway-Schemes-and-Developments/Major-Schemes/Chelmsford-North-East-Bypass.aspx

- Colchester Integrated Transport Package.
- A127 Fairglen Interchange

4.2.3 Public transport

ECC works with the DfT, public transport operators and developers in order to deliver public transport improvements for Essex. There are forward plans to increase the availability of live departure information, expand ticketing options and introduce other improvements across the county, as outlined in the recently published Passenger Transport Strategy[30].

There are also a number of major public transport projects that are expected to offer potential benefits (in terms of both accessibility and journey times) for the A12 corridor.

Beaulieu Park Station, Chelmsford

As set out within the North Chelmsford Area Action plan[31], a new railway station is a key element of the Borough Council's planning strategy for north-east Chelmsford. The station is seen as a vital component of delivering the sustainable new mixed-use development Beaulieu Park, providing train services for residents and workers, supporting future business activity and relieving pressure at the central Chelmsford station.

The station is to be located in the vicinity of the Boreham Interchange, and together they are intended to comprise an important transport hub.

GEML improvements

Improving the GEML is a high priority for Network Rail, Abellio Greater Anglia, and SELEP. The following works have been announced for 2015[32] to address capacity and congestion issues along the line:

- Overhead line upgrade: Continuation of upgrading the 60-year-old equipment to improve reliability along the GEML. In 2015, work in the Chelmsford area will be completed
- Witham: Installation of new track and points
- Colchester: Engineers are returning to Colchester to complete remodelling of the track and installing new sets of points
- Norwich in 90: In September 2015 the Government announced requirements for the next East Anglia rail franchise. This includes improved quality of trains running on East Anglia's network, 180 additional weekly services and plans for 90 minute journeys between Norwich and London

4.2.4 Airports

The operators of Stansted Airport have significant growth aspirations for the airport. Whilst the focus of road based transport growth will be on the M11 and A120, sections of the A12 are likely to experience some increase in traffic as a result of the proposed expansion of the airport. The airport can accommodate an increase of 15 million passengers per annum within the existing permissions, and this volume (35 million passengers per annum) is forecast to be achieved within the next 10 years.

The Stansted Airport Sustainable Development Plan (SDP)[33] states that the airport has the following mode share targets by 2019:

- 50% of passengers arriving/ departing by public transport.
- A maximum of 65% of staff employed at the site arriving/ departing as single occupancy car trip.

The SDP also states that 40-45 million passengers per annum and 400,000 tonnes of cargo could be accommodated within the existing boundaries of the site. 10,000 extra jobs could be created at the airport, if 45 million passengers per annum is achieved.

[30] ECC, 2015. Getting around in Essex A bus and passenger transport strategy http://www.essexhighways.org/Transport-and-Roads/Getting-Around/Bus/Bus-review.aspx
[31] Chelmsford Borough Council, 2011. North Chelmsford Area Action Plan. Chelmsford Borough Local Development Framework 2001- 2021.
[32] Network Rail, 2014. Major investment for the London to Norwich line http://www.networkrail.co.uk/news/2-14/oct/Major-investment-for-the-London-to-Norwich-line/
[33] London Stanstead Airport, 2015. Stansted Airport Sustainable Development Plan 2015 http://www.stanstedairport.com/about-us/developmentplan/

The London Southend Airport and Environs Joint Area Action Plan[34] references a target of 2 million passengers per annum by 2030. This also references the Southend Airport Surface Access Strategy which sets targets for passenger public transport mode shares of 20% at 1.5 million passengers per annum and 25% at 2 million passengers per annum.

4.2.5 Seaports

The seaports of Felixstowe and Harwich have expansion proposals, including:

- Felixstowe[35]:
  - Currently the port handles more than 3.7 million Twenty-foot Equivalents Units (TEUs) per year, welcoming over 3,000 ships yearly. The port operators are planning to increase capacity to 6 million TEUs per year by 2020 and double capacity to 8 million TEUs by 2030.
  - Planning permission was granted in December 2015[36] for the first phase of a 1.4 million square foot logistics park at the port to provide 1 million square feet of storage space in four warehouses, in-line with current expansion plans.
- Harwich
  - The port is already one of the UK's most important passenger ferry terminals, benefitting from the recent introduction of two new super ferries accommodating approximately 1 million passengers per year travelling by ferry to the Netherlands,[37] as well as being a cruise terminal and container and cargo handling port.
  - A new container terminal is planned at Harwich (Bathside Bay) to accommodate an extra 2.14 million TEUs per year, connecting Harwich with North Sea Ports in continental Europe, as well as Ireland, Iberia and the Mediterranean.[38]

4.3 Forecasting and scenario development

4.3.1 Forecasting methodology (core scenario)

A 2038 forecast year scenario has been developed to assess the likely future traffic situation on the A12. Growth to 2038 for all trips on the corridor has been assumed to be in accordance with the National Trip End Model (NTEM) growth predictions.

The re-assignment of traffic as a result of increasing levels of congestion or network improvement schemes has not been considered at this stage. Therefore, the assessment assumes journey patterns would remain consistent with current observed conditions. Furthermore, no assessment of suppressed or induced traffic has been made.

A more detailed assessment will be undertaken as part of the further stages of business case development beyond PCF Stage 0.

4.3.2 Sensitivity testing

The forecast for the A12 J19-25 is based on a core scenario using the National Trip End Model (NTEM). WebTAG Unit M4 Forecasting and Uncertainty[39] describes the definition of high and low growth scenarios. The proportion of demand increase or decrease for high and low growth for between 1 and 36 years after the base year is calculated as the square root of the years multiplied by a parameter p which varies by mode. In this case, the value of p is 2.5%. This gives a range of +/- 12% for the high and low growth respectively. This is considered further in chapter 9 of this report.

[34] Rochford District and Southend Borough Councils , 2014. London Southend Airport & Environs Joint Area Action Plan (JAAP) http://www.rochford.gov.uk/sites/rochford.gov.uk/files/documents/files/planning_jaap_adoptedversion.pdf
[35] https://www.portoffelixstowe.co.uk/#/investing-in-the-future/
[36] Port of Felixstowe - ttps://www.portoffelixstowe.co.uk/press/news-archive/port-of-felixstowe-logistics-park-receives-planning-consen
[37] Harwich International Port – Port Services http://www.harwich.co.uk/port_info.asp
[38] Harwich International Container Terminal http://www.hict.co.uk/content/thescheme/whybathside.asp
[39] DfT, Tag Unit M4 - Forecasting and Uncertainty, 2014. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/427130/TAG_Unit_M4_Forecasting_and_Uncertainty_November2014.pdf

4.4 Future route performance

4.4.1 Travel patterns

Over 50,000 dwellings and 20,000 jobs are planned in the Districts through which the A12, junctions 19 to 25, runs. This will intensify the already substantial local commuting, business and freight trips along and around this section of the A12.

Such development pressures will be further intensified by the planned major port developments at Bathside Bay (Harwich) and prospective development at Stansted Airport which could increase the existing 8% to15% proportions of HGV traffic on the A12.

The strategic journey patterns observed throughout the area are assumed to remain consistent with current conditions. However, with increasing trips, the potential for traffic redistribution and 'rat running' would increase. Motorists might respond to increasing levels of congestion by changing route should alternative feasible routes be available to do so e.g. through adjacent urban areas.

There has been no detailed consideration of mode shift towards or away from other modes. It is understood that the rail network in this corridor is currently operating close to or at capacity and therefore it is assumed that without intervention there is no opportunity for road users to transfer to rail. It is also noted that the A12 also accommodates car trips not well served by the rail network. For example, NOMIS data (that uses the 2011 Census ONS dataset) shows that a higher proportion of commuters travelling between Braintree and Maldon are choosing to travel by car or van (1,181 people) compared with train (24 people) as this journey is not well served by the railway.

4.4.2 Traffic volumes

Figure 4.1 and Table 4.2 present the forecast traffic volumes for the A12 in 2038. The data derived from NTEM suggests significant growth. In terms of overall traffic growth for the A12, there is forecast to be an average increase in link flows of 37% in the peak periods associated with:

- new land use development generating new travel demand
- changes in fuel price and income affecting travel choices
- demographic factors including population age profiles which affect timing and purpose of travel

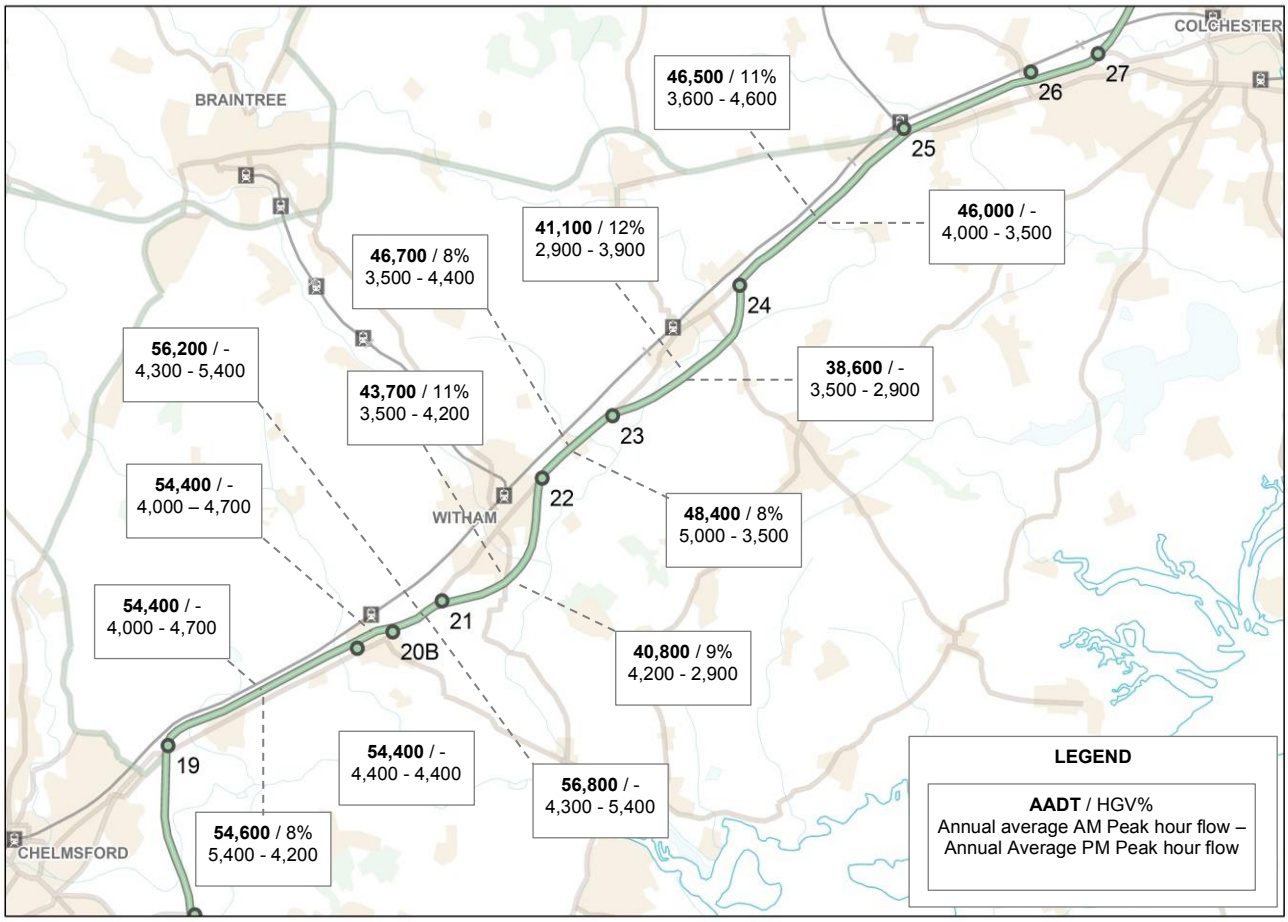


Figure 4.1 : 2038 forecast traffic volumes along the A12 (core scenario)

A proportional increase in traffic volume along the route would likely lead to greater absolute impacts in those areas already subject to relatively high levels of traffic volume.

The traffic volumes on the southbound approach to Chelmsford (between junctions 20a and 19) are forecast to increase by approximately 1,400 vehicles to 5,400 in the AM peak and by 1,200 vehicles to 4,200 in the PM peak. This equates to around 12 additional vehicles per minute.

The A12 link between junctions 20b and 21 is also forecast to experience high absolute changes in traffic volume, forecast to increase by approximately 1,200 vehicles to 4,300 in the AM peak and by 1,400 vehicles to 5,400 in the PM peak.

Elsewhere along the A12, traffic volumes typically increase by around 800 – 1,000 vehicles per hour per direction.

Link	AADT	HGV% (AADT)	AM peak hour flow	PM peak hour flow	AM peak hour	PM peak hour
Northbound						
Junction 19 to 20a	54,400	-	4,000	4,700	08:00-09:00	16:00-17:00
Junction 20a to 20b	54,400	-	4,000	4,700	08:00-09:00	No data
Junction 20b to 21	56,200	11%	4,300	5,400	08:00-09:00	16:00-17:00
Junction 21 to 22	43,700	11%	3,500	4,200	08:00-09:00	16:00-17:00
Junction 22 to 23	46,700	8%	3,500	4,400	08:00-09:00	16:00-17:00
Junction 23 to 24	41,100	12%	2,900	3,900	08:00-09:00	16:00-17:00
Junction 24 to 25	46,500	11%	3,600	4,600	08:00-09:00	17:00-18:00
Southbound						
Junction 25 to 24	46,000	-	4,000	3,500	07:00-08:00	17:00-18:00
Junction 24 to 23	38,600	10%	3,500	2,900	07:00-08:00	17:00-18:00
Junction 23 to 22	48,400	8%	5,000	3,500	07:00-08:00	16:00-17:00
Junction 22 to 21	40,800	9%	4,200	2,900	07:00-08:00	16:00-17:00
Junction 21 to 20b	56,800	9%	4,300	5,400	08:00-09:00	16:00-17:00
Junction 20b to 20a	54,400	-	4,400	4,400		No data
Junction 20a to 19	54,600	8%	5,400	4,200	07:00-08:00	17:00-18:00

Table 4.2 : 2038 forecast traffic volumes along the A12

4.4.3 Capacity and capability

As traffic volumes increase by 2038, V/C ratios or 'stress' factors on the network would increase. The forecast V/C ratios are shown in Table 4.3 for the 2038 AM and PM peak do minimum forecasts alongside an estimated capacity range and reference capacity taken from DMRB[40].

[40] Design Manual For Roads and Bridges, TA46/97 Traffic Flow Ranges for use in the Assessment of New Rural Roads. http://www.standardsforhighways.co.uk/dmrb/vol5/section1/ta4697.pdf

Link	Peak hour volume		Estimated capacity (veh/hr)	V/C ratio		DMRB reference capacity
	AM	PM		AM	PM	
Northbound						
Junction 19 to 20a	4,000	4,700	6,600	0.61	0.71	6,891
Junction 20a to 20b	4,000	4,700	3,900 – 4,200	1.03 - 0.95	1.21 - 1.12	4,196
Junction 20b to 21	4,300	5,400	3,900 – 4,200	1.10 - 1.02	1.38 - 1.29	4,196
Junction 21 to 22	3,500	4,200	3,900 – 4,200	0.90 - 0.83	1.08 - 1.00	4,196
Junction 22 to 23	3,500	4,400	3,900 – 4,200	0.90 - 0.83	1.13 - 1.05	4,196
Junction 23 to 24	2,900	3,900	3,900 – 4,200	0.74 - 0.69	1.00 - 0.93	4,196
Junction 24 to 25	3,600	4,600	3,900 – 4,200	0.92 - 0.86	1.18 - 1.10	4,196
Southbound						
Junction 25 to 24	4,000	3,500	3,900 – 4,200	1.03 - 0.95	0.90 - 0.83	4,196
Junction 24 to 23	3,500	2,900	3,900 – 4,200	0.90 - 0.83	0.74 - 0.69	4,196
Junction 23 to 22	5,000	3,500	3,900 – 4,200	1.28 - 1.19	0.90 - 0.83	4,196
Junction 22 to 21	4,200	2,900	3,900 – 4,200	1.08 - 1.00	0.74 - 0.69	4,196
Junction 21 to 20b	4,300	5,400	3,900 – 4,200	1.10 - 1.02	1.38 - 1.29	4,196
Junction 20b to 20a	4,400	4,400	3,900 – 4,200	1.13 - 1.05	1.13 - 1.05	4,196
Junction 20a to 19	5,400	4,200	6,600	0.82	0.64	6,891

Table 4.3 : 2038 forecast volume over capacity along the A12

In line with increasing traffic volumes, Table 4.3 shows significant worsening of conditions in the peak hours. The A12 approach to Chelmsford from junction 21 and south of Kelvedon, between junctions 23 and 22, are shown to have the highest V/C ratios and therefore likely to experience the highest levels of congestion. The A12 in both directions through Hatfield Peverel is also forecast to be over capacity.

In the PM peak there is a worsening of the same links and in addition between junction 24 and 25, albeit in a northbound direction in line with tidal traffic flows.

The A12 south of Witham, between junctions 20b and 21 is shown to have the highest V/C ratios, with values reaching 1.38 in both directions. This will result in a marked deterioration in traffic conditions on this link.

4.4.4 Journey time and speed

The route is currently operating close to capacity with reduced free flow speeds on links as shown in Table 3.9 and the situation is going to deteriorate with 24 years of growth.

Junctions 19 and 20a northbound are examples of junctions which are currently suffering reduced free flow speeds. Congestion at these junctions impacts on vehicles exiting the A12 and exacerbates link capacity issues.

This study has not used a detailed traffic assignment model and therefore forecast travel behaviour, travel speeds and journey times for route users have not been forecast. This analysis will be undertaken as part of further business case and scheme development both prior to, and post public consultation.

4.5 Summary

Considerable growth is planned across the region in coming years, with significant housing and economic growth aims set out by both local authorities and the SELEP. In addition, there are planned major port

developments and the year on year growth at Stansted Airport, which will inevitably increase pressure on the A12 corridor.

NTEM growth forecasts indicate that traffic volumes on the A12 are anticipated to increase by up to 37% in the peak periods although this level of growth may not materialise on the A12 in practice due to wider capacity constraints. The A12 route between junctions 19 and 25 is already operating close to capacity in some locations, and with growth in traffic volumes route performance is likely to be degraded further, leading to increased congestion and poor connectivity that will have a negative impact on the local economy, society and environment. This may culminate in a poorer standard of living for residents and a reduction in the economic competitiveness of the surrounding areas.

5. Need for intervention

5.1 Introduction

This section establishes the need for intervention in the study area. It summarises the current and future transport-related problems and their underlying causes. The identification of problems and issues builds upon the evidence presented in previous chapters, both from previous studies and from study-specific analysis.

5.2 Current transport related problems

Over the years, the A12 has been improved and upgraded in stages. As a result of this piecemeal improvement approach, however, the route has very little consistency in terms of provision, varying in standard with the added disadvantage of numerous variations of junction types and forms.

The 15 mile (24km) section between junctions 19 and 25 is a poorly performing section of the wider corridor. The dual 2-lane section from junction 20a at Hatfield Peverel through to junction 25 at Marks Tey in particular has a substantial number of variations in geometry, access, asset condition, lighting and lay-by provision. Carriageway surfacing comprises a mixture of TSCS and PQC, the majority of which is past its anticipated lifecycle with a number of Category 3 & 4 pavement defects present. In addition, there are a significant number of at-grade private accesses and discontinuous pedestrian and cycle infrastructure. Such characteristics present particular safety concerns.

This section of the A12 accommodates high volumes of traffic, with average daily flows of between 60,000 and 80,000 vehicles (two-way). The use of technology is currently limited in this section of the A12, but the traffic flows would justify MIDAS and VMS. The corridor experiences congestion at peak times, with reduced link speeds and increased vehicular delays; the following locations have been shown to be suffering from limited capacity and poor performance:

- Junctions 20a to 21 through Hatfield Peverel, due to merging and diverging traffic between the A12 and local road network
- Junctions 25 and 21 southbound during the AM peak where vehicle speeds are 30-70% of free flow speeds
- During the PM peak hour there is a reduced vehicle speed of 30-70% of free flow speeds in a northbound direction between junctions 19 and Rivenhall End (north of junction 22)
- The approaches to the A120/A12/Station Road roundabout at junction 25 during the AM and PM peak hours
- Journey times are approximately 4 minutes slower in the AM southbound and 6 minutes slower in the PM northbound between junctions 19 - 25

Due to variability in the standard of the corridor and limited suitable diversion routes, the A12 is vulnerable to collisions and incidents which can cause significant disruption over a wide area which is generally regarded as stressful and costly for drivers. Congestion, and associated journey time variability and unreliability, can result in lost productive time for strategic freight movement to/from Felixstowe and Harwich Seaports, and for individuals and businesses. It can also affect commuting patterns and reduce labour market catchment areas, and impact upon leisure travellers. To arrive on time, analysis reveals drivers need to allow between 8% and 44% additional time when travelling in the peak periods.

5.3 Future transport related problems

By 2038 there is forecast to be an average increase in overall traffic volume of 37% in the peak periods during peak periods on the A12, associated with new land use, changes in fuel price and income, and demographic factors.

A proportional increase in traffic volume along the route would lead to greater absolute impacts in those areas already subject to relatively high levels of traffic volume. The A12 south of Witham, between junctions 20b and 21, is forecast to experience the highest volume/capacity ratios and therefore likely to be subject to the highest levels of congestion. In addition to the locations listed above, the following links are also shown to have exceeded capacity, with remaining sections forecast to be at or close to capacity:

- north of Chelmsford between junctions 19 and 21

- junction 23 to 22 between Kelvedon and Witham

On the route, the reliability of public transport journeys would also be increasingly affected, leading to potential issues associated with service viability. Existing concerns regarding road safety and the environment would also be exacerbated, with negative economic consequences.

5.4 Impacts of no intervention on network

Transport-related problems on the A12 corridor between junctions 19 and 25 are shown in Figure 5.1 and can be summarised as:

- constrained economic growth
- congestion and delay
- inadequate and varying route standards, with concerns with regard to road safety and operational impacts
- ageing assets and deteriorating carriageway surface condition
- lack of resilience, due to variability in the standard of the corridor and limited suitable diversion routes

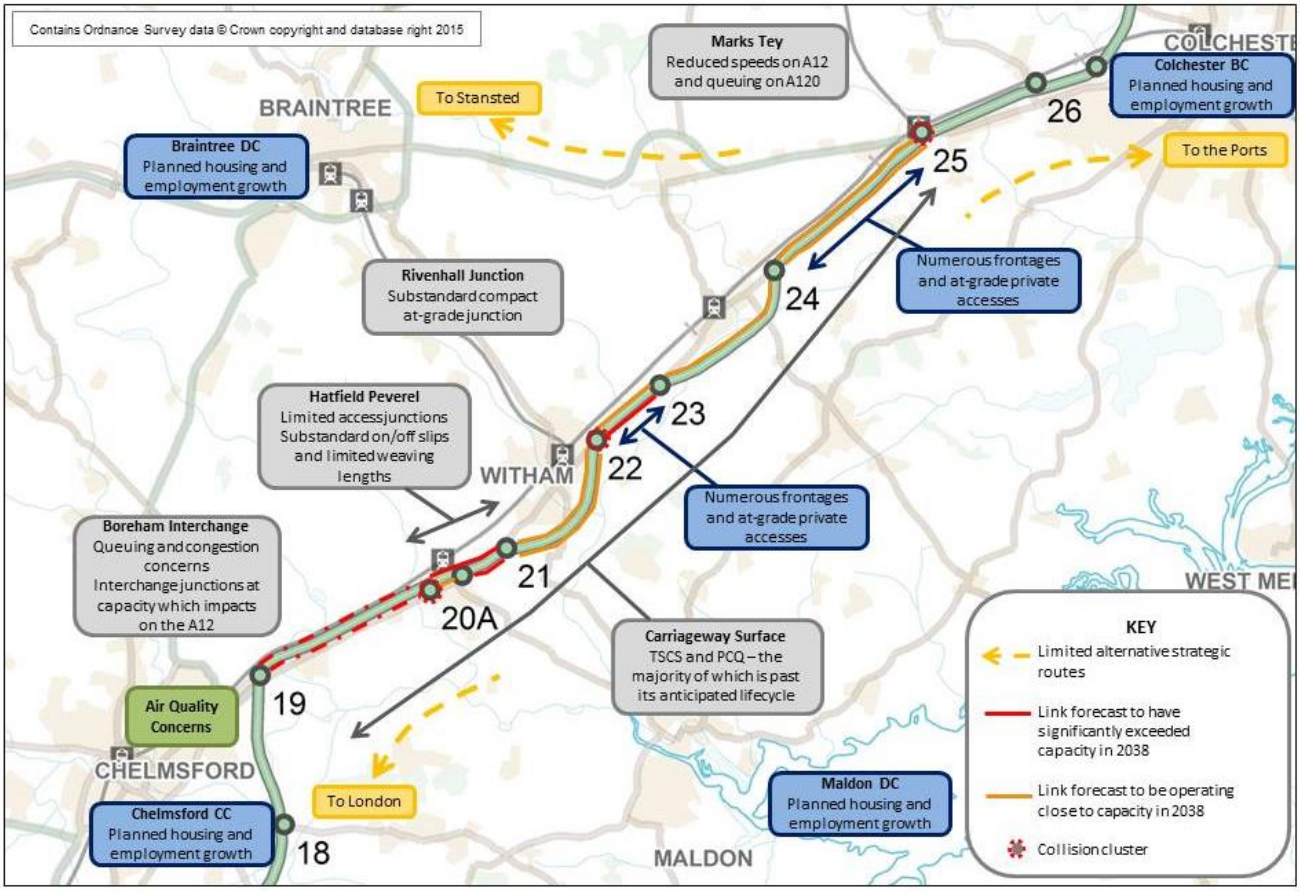


Figure 5.1 : Transport related problems on the A12 corridor

Such issues are anticipated to worsen in the future, exacerbated by forecast traffic growth both locally and strategically. Increases in traffic volume and corresponding reductions in performance of the network could also have negative implications in terms of:

- accessibility
- journey time reliability
- noise and air quality
- redistribution of traffic

Wider challenges associated with these implications may include broader economic, social and environmental impacts.

Impacts on economic growth and prosperity

Deteriorating assets and limited capacity, in combination with increasing volumes of traffic, are likely to exacerbate existing performance and reliability issues on the A12. There are considerable aspirations for growth along the corridor in terms of both housing and commercial developments.

Trade-offs between housing and employment growth and the costs from associated traffic growth, however, may impede the deliverability of designated residential and commercial land uses at key sites, which would in turn limit the capability of the SELEP to achieve the proposed growth targets over the SEP period.

In addition, lost productive time and reduced accessibility are likely to increase over time as future traffic growth exacerbates current transport problems. Transport-related constraints on the A12 may therefore fail to support and sustain local (and wider) economic prosperity and productivity. This is likely to result in Gross Value Added (GVA) not being realised, as conditions on the A12 corridor restrict the number of jobs proposed within existing and emerging Local Plans.

The A12 corridor is also an important strategic route for freight. Congestion on the corridor, however, is likely to impede the efficient movement of goods. The delays experienced by freight traffic on these routes as a result of increased traffic volumes and reduced journey time reliability will generate productivity losses to businesses at a regional and national level.

Impacts on society

Transport, particularly in terms of accessibility, is increasingly recognised as having a significant role to play in both the creation and alleviation of societal barriers. The forecast traffic volumes and congestion on the A12 corridor is likely to exacerbate severance and affect sustainable travel, hindering movement by non-motorised modes and access to goods and services. It could also have negative implications for emergency vehicle access and response time.

In addition to the direct time costs created by congestion, there is evidence of welfare disbenefits associated with deteriorating travel conditions (e.g. frustration and annoyance). Resultant welfare disbenefits of transport-related problems would negatively impact quality of life and well-being, particularly those in less affluent areas adjacent to the A12 corridor.

Impacts on the environment

The level of emissions and noise closely relate to traffic flow, and are exacerbated when congestion and delay is more acute. Therefore an increase in traffic volume and the corresponding increase in queuing/congestion would likely result in a reduction in air quality and increased noise pollution along the corridor. This is likely to be more severe at key locations, particularly within the vicinity of urban areas (including Chelmsford, Witham and Colchester) and the M25, where congestion is already a problem.

In addition, the resultant air quality and noise disbenefits of transport-related problems can negatively impact quality of life and well-being for communities close to the A12 corridor including visual impacts

Impacts on road safety

Incident data indicates that the number of traffic collisions on the A12 has slightly increased between 2011 and 2014, with the proportion of fatal and serious collisions greater than the national average figures for 70mph non-motorway roads. Road safety is therefore already considered an important concern along the route, and is one of the key areas to be addressed as part of the DfT's RIS**Error! Bookmark not defined.**.

The high volume of traffic using the A12 corridor, combined with the forecast growth in traffic, is likely to result in a greater level of conflict between highway users, with the potential to result in a greater number of incidents. In addition, without intervention network resilience is likely to reduce as traffic volumes increase, resulting in a network less able to cope with incidents.

5.5 Underlying drivers or causes

The underlying drivers/causes of the transport-related problems identified are summarised below in Table 5.1.

Driver	Description	Transport-related problems
Historic Investment / Piecemeal Approach to Route Upgrades	Improvements to the A12 have taken place in stages, which has resulted in a road constructed to varying standards.	Ageing assets, road safety and operational issues. including: • factors associated with SSD, hardstrip and hardshoulder provision, on/off slips, weaving lengths, junction geometry. • number of at-grade accesses to residential, commercial and agricultural properties • level and standard of provision of lay-bys • lack of technology and driver information
Lack of Alternative Routes	The A12 is the main north-east/south-west route in the East of England, providing a critical link between communities, London and the East to the ports of Harwich and Felixstowe and serves as an abnormal load route. There are limited suitable alternative and diversionary routes in the region.	Lack of resilience - the A12 is vulnerable to collisions and incidents which can cause significant disruption over a wide area
Relative Prosperity	Higher than average levels of car ownership and use across the East of England.	The A12 accommodates high volumes of traffic, and is known to experience congestion at peak times. *This results in:* • *reduced link speeds* • *increased vehicular delays* • *poor journey time reliability* *Wider Impacts* *Economic Growth/Prosperity* • constrained growth • lost productive time • reduced access to labour markets *Social/Environmental* • air quality and noise issues • reduced quality of life/welfare
Level of Travel Demand	Excess of travel demand over available capacity, which is forecast to increase.	
Commuting Patterns	High commuting levels in the region. High average trip length for the journey to work.	

Table 5.1 : Underlying drivers and causes

6. Objectives and area of impact

6.1 Objectives

The RIS outlines Highways England's long term ambition to revolutionise and modernise the SRN and sets out the performance requirements for how Highways England aim to achieve this. The performance will be assessed in eight key areas; six of which have been used to define the study objectives for the A12 scheme. Two of the objectives, improving user satisfaction and achieving real efficiency, have not been utilised in the scheme appraisal process as these are outcomes of how successful the scheme is rather than targetable objectives that could be used to prioritise options. Therefore, the six key study objectives are as follows:

- Making the network safer;
- Improving user satisfaction;
- Supporting the smooth flow of traffic;
- Encouraging economic growth;
- Delivering better environmental outcomes;
- Helping cyclists, walker and other vulnerable users of the network;

The six study objectives are used as part of the options sifting process to identify the most suitable package of improvements to implement on the A12.

The RIS objectives support the Highways England Business Plan and also the associated policy objectives of Essex County Council.

In line with policy based objectives which align with local and regional transport and land use objectives, a set of intervention specific objectives has been established. These reflect the problems and opportunities identified in sections 3 to 5 of this report, and are used to target the key issues for improvement on a more localised level. Combining these specific objectives with the six broader study objectives will help ensure that the chosen solutions resolve key local and strategic issues.

The key problems and issues are summarised as follows:

- Link capacity issues exacerbated by continued growth in traffic
- Resilience and reliability issues in particular associated with incidents
- Junction performance issues affecting A12 mainline and access to urban centres
- Constrained local and regional economic growth potential
- Limited NMU provision along and across the route

6.2 Targets

The transport improvements of the intervention options will result in a range of measurable impacts on traffic and travel conditions. Impacts and measurable indicators relevant to improving conditions on the A12 have been identified in the RIS and are summarised in Table 6.1.

Category	KPI	Target
Road Safety	The number of KSIs on the SRN	Ongoing reduction in network KSIs to support a decrease of at least 40% by the end of 2020 against 2005-09 average baseline.
Traffic Flow	Network availability: the percentage of SRNs available to traffic Incident management: percentage of motorway incidents cleared within one hour	Network availability: maximise lane availability so that it does not fall below 97% in any one rolling year Incident management: at least 85% of all motorway incidents should be cleared within one hour
Economic Growth	Average delay (time lost per vehicle)	No target set
Environment	Noise: number of noise important areas mitigated Biodiversity: delivery of improved biodiversity, as set out in the Company's Biodiversity Action Plan	Noise: mitigate at least 1,150 noise important areas over RP1 Biodiversity: The Company should publish its Biodiversity Action Plan by 30 June 2015 and report annually on how it has delivered against the Plan to reduce net biodiversity loss on an ongoing annual basis.
Cyclists, walkers and other vulnerable users	The number of new and upgraded crossings	No target set
Network condition	The percentage of pavement asset that does not require further investigation for possible maintenance	Percentage to be maintained at 95% or above

Table 6.1 : A12 scheme targets

Setting targets is an iterative process and they will evolve as further evidence is collected. Further quantified targets would be developed during the next stages of the PCF process and business case development, in line with the principles listed above, and set out as 'SMART' (Specific-Measureable- Acceptable-Realistic-Time defined) targets.

6.3 Geographic area of impact

The geographical area of impact to be addressed by potential intervention has been informed through evidence reviewed in sections 3, 4 and 5 which have outlined the current scope of the travel market and key origins and destinations, as well as the extent of current and future transport problems. However, the area defined also aligns with the configuration and geographical extent of the Highways England RIS announcements. A wider area of influence is shown related to the later (RIS2) phases of A12 improvement.

The core geographical area of impact comprises the section of A12 between junctions 19 to 25 inclusively bordering the railway line to the north. It includes urban areas such as eastern Chelmsford, Hatfield Peverel, Witham and Marks Tey and all of the junctions as shown in Figure 6.1 below within the highlighted area. Areas outside these boundaries are excluded from this study however are acknowledged as wider context and with other schemes being considered as part of RIS and ECC scheme delivery programmes.

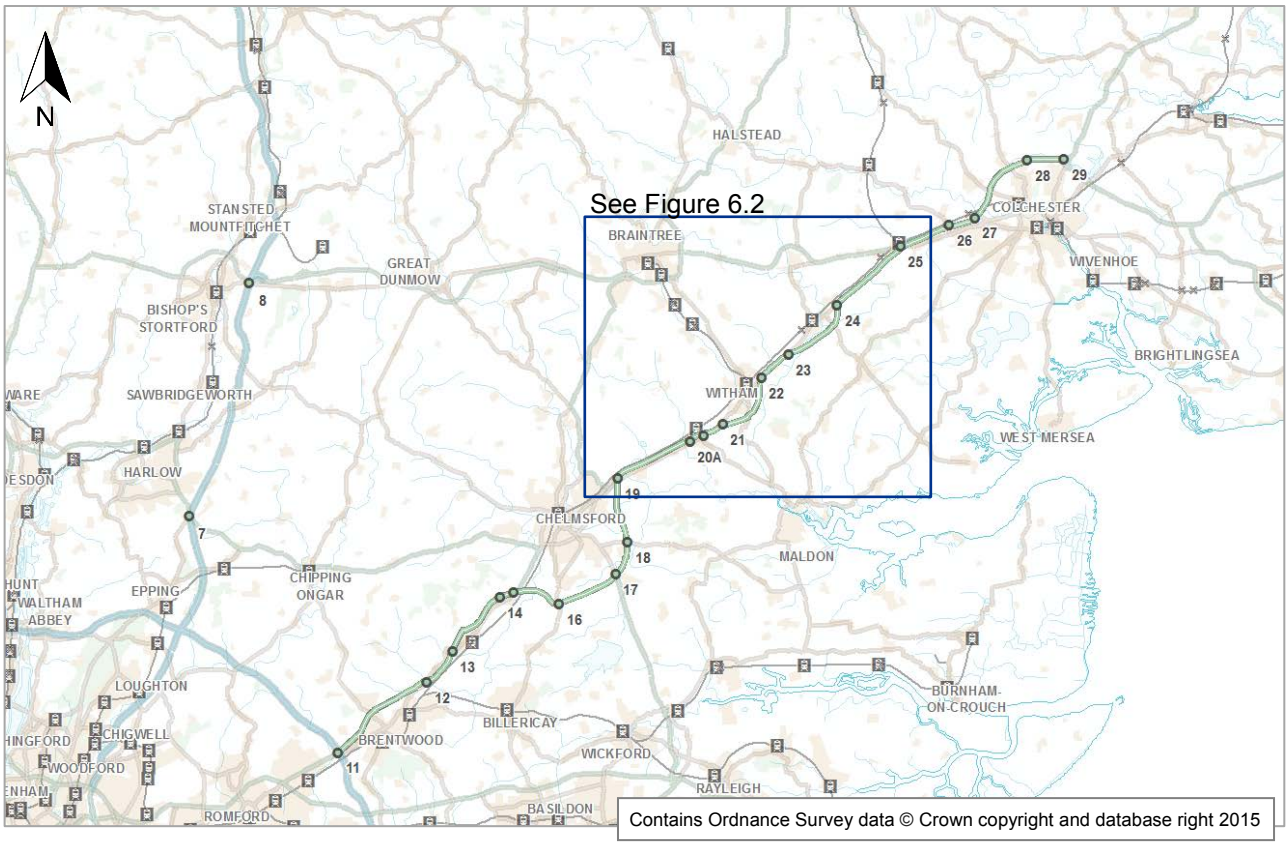


Figure 6.1 : Wider geographical area

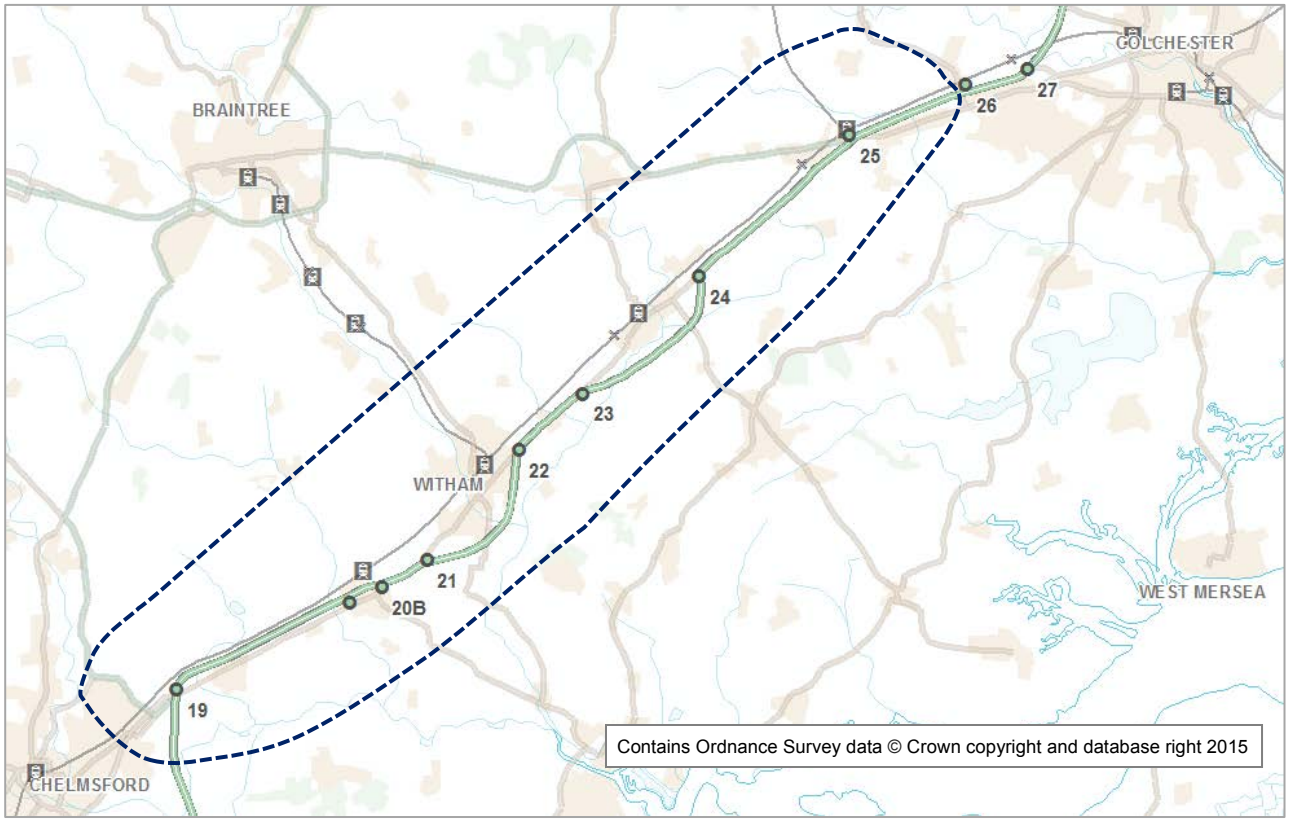


Figure 6.2: Core study area

7. Option generation

7.1 Introduction

This section presents the generation of intervention options for the A12 junction 19 to junction 25. It details the option generation process and introduces the initial options identified which will be carried forward into the early sifting process and ultimately forward for more detailed appraisal.

7.2 Consultation and engagement process

This scheme appraisal process has been informed by the stakeholder engagement strategy outlined in Figure 7.1 commensurate with the stage of scheme development. This process consists of a number of key stages to ensure that stakeholder views have been captured to help inform the option generation and development process.

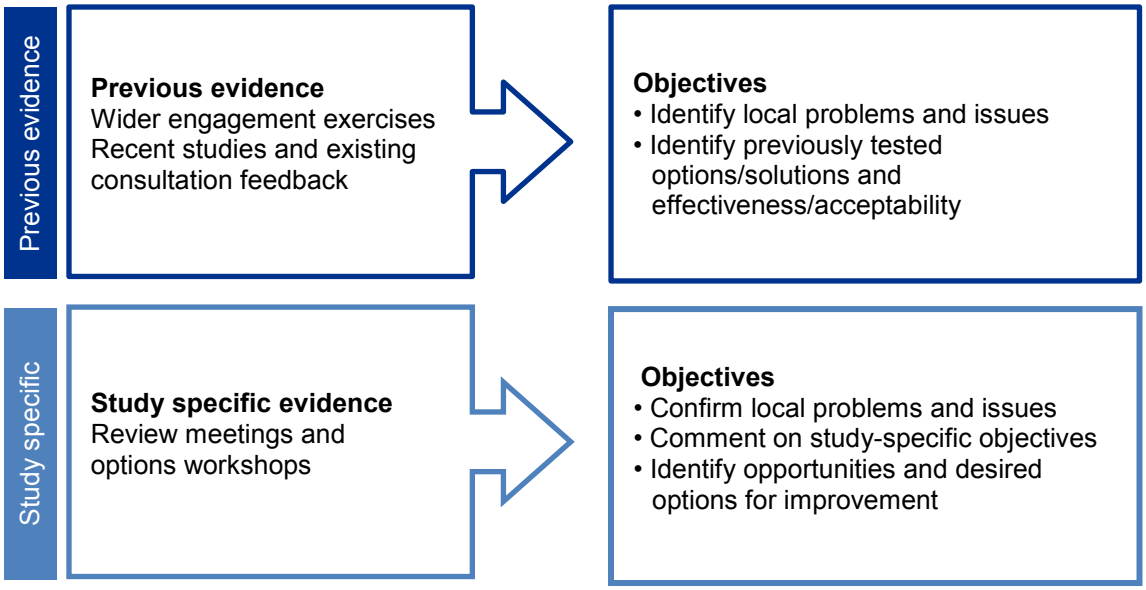


Figure 7.1: Summary of stakeholder engagement strategy

7.2.1 Previous evidence

Within the study area, there was scope to draw on consultation evidence collected as part of engagement exercises within a number of policy and strategy documents, as well as recent studies. The outcomes form part of the policy review within section 2.

7.2.2 Study specific evidence

Whilst existing evidence provided useful input, there was a need for further study-specific engagement to ensure that views on current issues and constraints, and potential solutions for the corridor were captured. As such, the following review meetings and discussions have taken place with Highways England, Jacobs, and County Council officers throughout the study:

A12 corridor growth workshop – 12 May 2015

The purpose of this workshop was to discuss the RIS programme, for the District, Borough, City Council representatives to provide a progress update on the Local Plan and to discuss the approach to collaborative working.

A12 interactive planning workshop – 14 July 2015

In this workshop involving Highways England representatives there was a discussion on the key issues and constraints along this section of the A12, growth proposals, impact of growth and proposals to mitigate growth and improve flow on the A12.

Feedback on current issues has been incorporated within sections 3, 4 and 5, and proposed options assessed as part of the option generation and appraisal process.

A12 options workshop – 4 August 2015

An options assessment workshop was held in August 2015 with representatives of Highways England and Jacobs, in order to further discuss and agree the potential types of options which should be considered and taken forward.

A comprehensive list of initial options emerged from this workshop and included solutions that combined physical highway alterations, such as junction modifications and online/off-line widening, with a package of complementary sustainable transport measures. The list below outlines the high level options which emerged:

- Online widening (whole route)
- Limited widening (priority sections)
- Rail capacity enhancements
- Offline widening (whole route)
- Offline widening (limited sections)
- Junction upgrades only (grade separation / removal / relocation of accesses / ramp metering)
- Park & Ride
- Bus rapid transit
- Bus/high occupancy vehicle lanes
- Road user charging
- Technology enhancements
- Managed motorway & widening (combination of)

7.3 Option generation

The purpose of the option generation process is to derive a broad range of measures or interventions, in a logical, transparent and auditable manner, that look to address or ameliorate the problems faced on the A12 between junctions 19 and 25.

An initial set of potential transport improvement options were developed, informed by the following sources and approaches:

- Relevant policy and strategy documents
- Recent studies
- Baseline review and forecasting process
- Consultation and engagement process, as outlined above

The nature and scale of the transport improvement options developed reflect the work undertaken in setting the objectives identified in section 6.1.

The options aim to address strategic issues along the corridor but also concerns of a more localised nature, tackling areas and facilities that could be enhanced and developed in order to reduce congestion, address safety concerns and improve the local environment.

A range of modes have been considered, and an incremental approach to potential combinations of online and offline highway improvements adopted in order to develop a range of options that reflect various scales of intervention.

The options generated in consultation with the stakeholders for consideration in addressing the highlighted problems within the overall scheme objectives are set out in Table 7.1. These were considered to comprise potential options for further development and assessment for the A12 junction 19 - 25 corridor.

All potential schemes are at an early concept stage and successive stages of scheme development would be required to better define and refine the scope of each improvement. Options have been grouped by type and each assigned a unique option code for reference at this stage of the appraisal process.

Option ref.	Option description
Highway improvement options	
HI-01	Provision of a new parallel offline route from junction 19 to 25.
HI-02	Offline improvements between junctions 19 and 21, 22 and 23, and 24 and 25 to bypass areas of the A12 constrained by at-grade private accesses and suffering from safety and capacity issues, online widening between junction 23 and 24. Associated junction improvements.
HI-03	Online link capacity improvements between junction 19 and 22, and 23 and J24. Junction 21 upgrade to allow all movements, and the reconfiguration or removal of either junction20b or 20a. Offline improvements from junction 22 to 23, and junction 24 and 25, to bypass areas of the A12 constrained by at-grade private accesses. Associated junction improvements.
HI-04	Online link capacity improvements between junction 19 and 22. Offline improvements from junction 22 to J23, and 24 to 25, to bypass areas of the A12 constrained by at-grade private accesses and suffering from safety and capacity issues. Associated junction improvements.
HI-05	Online link capacity improvements between junction 19 and 22, bringing the section up to modern dual 3-lane standard to provide a consistent, high quality route. Offline improvements from junction 22 to 23 to bypass areas of the A12 constrained by at-grade private accesses. Associated junction improvements.
HI-06	Online link capacity improvements between junction 19 and 21, bringing the section up to modern dual 3-lane standard to provide a consistent, high quality route. Offline improvements from junction 22 to 23 to bypass areas of the A12 constrained by at-grade private accesses and suffering from safety and capacity issues, with associated junction improvements.
HI-07	Online link capacity improvements between junction 19 and 25 bringing the section up to modern dual 3-lane standard with carriageway cross sections, lay-bys and on- and off-slip roads provided in line with current standards to provide a consistent, high quality route. Associated junction improvements.
HI-08	Online link capacity improvements between junction 19 and 21, and 22 and 23. Associated junction upgrades to accommodate online improvements and increase capacity.
HI-09	Online link capacity improvements between junction 19 and 21. Associated junction upgrades to accommodate online improvements and increase capacity.

Option ref.	Option description
HI-10	A major upgrade to the A120 between Braintree and Marks Tey to provide a suitable strategic diversion route to increase network resilience within the sub-region.
HI-11	A parallel M12 scheme running south from the A120 to join the M25 between the A12 and M11, with connections to the A414 and to the A130.
HI-12	Review and rationalisation of junctions (with a view where possible to reduce the number and frequency, or to relocate) to address hazards.
HI-13	Improvements to the carriageway (e.g. hard strip provision) and vehicle restraint systems to allow for increased resilience when an incident occurs.
HI-14	Pavement repairs.
HI-15	Removal, replacement or improvement of sub-standard lay-bys and provision of new lay-bys in line with current requirements.
Public transport	
PT-01	Reduce the number of HGVs transporting freight to ports by road, using rail freight links instead.
PT-02	Extend Crossrail line north to connect with Chelmsford.
PT-03	Implementation of Bus Rapid Transit (BRT) between key destinations to provide a high quality alternative to the car.
PT-04	Upgrade existing rail routes and branch lines to encourage commuter traffic from road to the railways.
PT-05	Implement high occupancy vehicle lanes (HOV) to discourage single occupancy travel
Collision reduction and incident management measures	
CR-1	Implement safety measures such as: Introduce “keep apart” chevrons to encourage drivers to keep a safer distance. Implement a HGV overtaking ban between Hatfield Peverel and Marks Tey.
CR-2	Consider removal and diversion of at grade rights of way across the A12 and/or provide grade-separated crossings for NMU routes, or improved at-grade crossings (junction slip roads and side road arms)

Option ref.	Option description
CR-5	Provide emergency service provisions such as: • Deploy traffic officers or use other techniques such as 'MinuteMan' (a fast-response service for clearing minor incidents such as breakdowns or very minor collisions in order to reduce consequent delays). • Explore with the Essex Fire and Rescue Service the reintroduction of a 'blue light' heavy recovery vehicle. • Review in conjunction with the emergency services potential locations for staging areas alongside the carriageway for disabled or recovered vehicles and recovery equipment.

Table 7.1 : Potential intervention options

8. Option sifting

8.1 Introduction

This section summarises the initial sift, undertaken to identify any 'showstoppers' which are likely to prevent any further development of the options generated.

A two stage process has been adopted; the first utilising a bespoke appraisal framework tool which then fed in to a second stage using DfT's Early Assessment and Sifting Tool[41] (EAST).

All options identified in the option generation stages have been considered in terms of meeting the key objectives identified for intervention; fit with existing local, regional and national programmes and strategies; and key viability and acceptability criteria to establish the appropriateness of each option for full appraisal.

Options that would fail to address objectives or are unlikely to pass key viability and acceptability criteria were discarded.

8.2 Stage one: initial sift

8.2.1 Methodology

The initial assessment of potential options described in section 7.3 has been carried out using a bespoke appraisal framework tool. The framework has been developed to assess options based on their ability to contribute to the following criteria:

- Identified route problems
- Study objectives
- Scheme deliverability, feasibility, and affordability

The framework aims to provide an efficient, robust and easily presentable means of identifying appropriate options to be considered further. It has been developed with consideration of the DfT's EAST, and supports the 'scale of impact' and 'fit with other objectives' criteria within the tool.

The framework is spreadsheet based and in addition to the above includes an outline cost and indicative timeframe to assist the prioritisation of the options for improvement. Estimates are based on Jacobs' experience of the timescales and costs associated with implementing similar schemes and an order of magnitude estimate produced by Highways England Commercial for the announced solution. These high level outline costs should not be used for any purpose other than this initial sifting exercise.

Route problems and study objectives are set out as above in sections 5.4 and 6.1 respectively. Each option has been scored on a five point scale against these elements, which have then been combined to produce an overall score for each. The scoring process is based on existing evidence where available and judgements based on experience to allow a qualitative approach to be adopted. The simple numerical basis aims to provide consistency in the approach to appraising each option.

Each option has also been assessed and sifted against deliverability, feasibility and affordability, descriptions of which are set out in Table 8.1, with outcomes classified as 'likely' 'likely (with challenges)' and 'unlikely'.

[41] DfT, 2013. Early Assessment and Sifting Tool (EAST). https://www.gov.uk/government/publications/transport-business-case

Supporting analysis	Description
Deliverability	Consideration of issues around deliverability e.g. in terms of political, planning, timescale or third party issues.
Feasibility	Consideration of practicalities which may present issues in delivery (e.g. physical constraint, land availability and design standards)
Affordability	Assessing what extent of additional funding would be required to deliver the scheme and whether this is likely to be available through existing funding sources

Table 8.1 : Supporting analysis

The appraisal results for each of the options put forward were used as the basis for selecting and prioritising the most appropriate solutions. Initial sifting criteria has looked to identify options that:

- have an overall moderate impact or greater against identified problems
- have an overall moderate fit or greater with route objectives
- are likely to be deliverable
- are likely to be feasible
- are likely be affordable

Total scores against identified route problems and study objectives have been combined to produce an overall score for each option and a prioritised list of measures.

A copy of the appraisal framework and full results are included in Appendix J.

8.2.2 Discounted options

Through the appraisal framework options that did not address the identified route problems, study objectives, or were considered to not be feasible or deliverable in planning or engineering terms, were discounted at this stage. The discounted options and reason for removal of particular highway improvement schemes are outlined in Table 8.2. Appendix L provides further information on the option review.

The collision reduction, incident management and public transport options would not, as measures in their own right, be expected to deliver the level of improvements required to fully address the transport-related problems on this section of the A12. As a result these options have been discounted. However, they may provide benefits as part of a complementary package of measures for the A12, and could be developed in addition to highway improvements to deliver additional benefits. This would be further explored as part of the next stage of scheme development.

Option ref.	Option	Description
HI-01	Provision of a new parallel offline route from junctions 19 to 25.	This option was discounted as it is unfeasible and unlikely to be deliverable.
HI-02	Offline improvements between junctions 19 to 21, 22 to 23 and 24 to 25 to bypass areas of the A12 constrained by at-grade private accesses and suffering from safety and capacity issues, online widening between junctions 23 and 24. Associated junction improvements.	This option was discounted as it is unfeasible and unlikely to be deliverable.
HI-07	Online link capacity improvements between junction 19 and 25 bringing the section up to modern dual 3-lane standard with carriageway cross sections, lay-bys and on- and off-slip roads	This option was discounted as it is unfeasible and unlikely to be deliverable.

	provided in line with current standards to provide a consistent, high quality route. Associated junction improvements.	
HI-08	Online link capacity improvements between junctions 19 and 21, and 22 and 23. Associated junction upgrades to accommodate online improvements and increase capacity.	This option was discounted as it is unfeasible and unlikely to be deliverable.
HI-11	A parallel M12 scheme running south from the A120 to join the M25 between the A12 and M11, with connections to the A414 and to the A130.	This option was discounted as it is unfeasible and unlikely to be deliverable.
HI-12	Review and rationalisation junctions (with a view where possible to reduce the number and frequency, or relocate) to address hazards.	This option was discounted because it had limited impact against the identified problems and didn't align well with achieving the route objectives.
HI-13	Improvements to the carriageway (e.g. hard strip provision) and vehicle restraint systems to allow for increased resilience when an incident occurs.	This option was discounted as it did not address the identified route problems and didn't align well with achieving the route objectives.
HI-14	Pavement repairs.	This option was discounted as it did not address the identified route problems and didn't align well with achieving the route objectives.
HI-15	Removal, replacement or improvement of sub-standard lay-bys and provision of new lay-bys in line with current requirements.	This option was discounted as it did not address the identified route problems or meet the study objectives.
PT-01	Reduce the number of HGVs transporting freight to ports by road, using rail freight links instead.	The existing rail network is under pressure and providing additional train paths is likely to require extensive upgrade of the rail network in this area.
PT-02	Extend Crossrail line north to connect with Chelmsford.	The planned extension to Shenfield will result in Crossrail services replacing the existing metro service. Extension of the service north to Chelmsford might not be attractive to passengers as there will likely be faster train services to London from Chelmsford Station.
PT-03	Implementation of Bus Rapid Transit (BRT) between key destinations to provide a high quality alternative to the car.	The distance of travel in this corridor would reduce the viability of the mode. A BRT would also be in competition with existing rail services, so mode shift may be from rail to bus, rather than car to bus.
PT-04	Upgrade existing rail routes and branch lines to encourage commuter traffic from road to the railways.	Capacity improvement options are being explored by Network Rail. This might provide some benefit to the A12 corridor, but it is outside the jurisdiction of Highways England.
PT-05	Implement high occupancy vehicle lanes (HOV) to discourage single occupancy travel	There are sections which are only two lanes in both directions. The potential for car sharing is unknown and dedicating one lane to HOV's might result in significant delay to others who do not

		have the opportunity to car share.
CR-1	Implement safety measures such as: Introduce “keep apart” chevrons to encourage drivers to keep a safer distance. Implement a HGV overtaking ban between Hatfield Peverel and Marks Tey.	This could assist with smoothing traffic flow and reducing some collision types. However, the volume of traffic on the A12 might ‘force’ vehicles to travel closer together albeit at slower speeds. Strategic placement of chevrons might offer some accident reduction benefit. An HGV overtaking ban could improve the safety on the road, but will not increase the capacity of the A12.
CR-2	Remove and divert all at grade rights of way across the A12.	This could improve the safety on the road, but will not increase the capacity.
CR-5	Provide emergency service provisions such as: • Deploy traffic officers or use other techniques such as ‘MinuteMan’ (a fast-response service for clearing minor incidents such as breakdowns or very minor collisions in order to reduce consequent delays). • Explore with the Essex Fire and Rescue Service the reintroduction of a ‘blue light’ heavy recovery vehicle. Review in conjunction with the emergency services potential locations for staging areas alongside the carriageway for disabled or recovered vehicles and recovery equipment.	This could reduce the impact of delay caused by traffic incidents. It would help improve time lost during incidents, but would not increase the capacity of the A12.

Table 8.2 : Discounted options

8.3 Stage two: early assessment and sifting process

The DfT’s EAST has been utilised to inform this process. EAST is consistent with transport business case principles and has been developed to summarise and present evidence on options in a clear and consistent format. It utilises a simple 5-point / Red/Amber/Green (RAG) scoring system for each of the assessment areas, which aims to facilitate the early assessment and comparison of scheme options.

Details of the assessment of each potential option are included in Appendix J and a summary of the resulting EAST scores is given in Table 8.3 (where higher scores represent more positive impacts). The summary table is intended to provide a visual guide of the performance of each option; overall impact will depend on the strength of individual impacts and identified risks. Environmental considerations at this stage have been informed through the accompanying environmental assessment report.

Public acceptability and cost risk have been discounted from the EAST summary. There has been no public consultation to date and cost risk is currently unknown.

Ref	Option	Strategic	Economic	Management	Financial	Commercial	Key considerations
HI-03	Offline improvements junctions 22 to 23 and 24 to 25. Online widening and junction improvements (capacity and safety enhancements) including removal of junction 20b	4.0	3.8	3.0	1.0	3.0	This option has a strong strategic case as it provides upgrades to the whole section of the A12 between junctions 19 and 25. It is a higher cost option but offers good value for money.
HI-03a	As option HI03 with a reduced specification of upgrades on road links between junctions 19 and 25. This option removes certain elements from the overall costed package including a reduced number or more limited specification of structures, earthworks, pavement, landscaping and technology, with programme savings.	3.8	3.8	3.0	2.0	4.0	As with option HI-03, this option has a strong strategic case providing upgrades to the whole section of the A12 between junctions 19 and 25. This is a slightly lower cost option.
HI-04	Online link capacity improvements between junctions 19 and 22. Offline improvements between junctions 22 and 23, and 24 and 25. Junction improvements to junction 19 could be delivered separately as part of the Chelmsford north east bypass works.	3.3	3.3	3.5	3.0	4.0	This option offers a good strategic and lower cost scheme. However by not including junctions 21 to 22 and 23 to 24 in this scheme it may be difficult to justify upgrading these at later date.
HI-05	Offline improvements between junctions 22 and 23. Online widening and junction improvements (capacity and safety enhancements).	3.0	3.2	3.5	4.0	3.0	This is a good lower cost option which would provide a viable solution to the scheme objectives.
HI-06	Online widening between junctions 19 and 21 and offline improvements between junctions 22 and 23.	3.0	3.0	3.0	5.0	3.0	This option would offer a good strategic and lower cost scheme. However by not including junctions 21 to 22 and 23 to 24 in this scheme it may be difficult to justify upgrading these at a later date.
HI-09	Online widening between junctions 20a and21, and junction improvements (capacity and safety enhancements)	2.8	2.8	3.0	5.0	2.0	This is a lower cost option but provides a low strategic benefit compared to other options.

Table 8.3 : EAST summary

8.4 Options for appraisal

The following shortlist was considered to comprise distinct and feasible (or potential) options for further development and assessment.

Option Ref.	Option	Description
HI-03	Offline improvements junctions 22 to 23 and24 to 25. Online widening and junction and junction improvements (capacity and safety enhancements) including removal of junction 20b *Note: Blue links indicate 3-lane carriageway capacity through existing, new or upgraded roads. Blue circles indicate junction upgrades. A black circle indicates junction rationalisation.*	Capacity upgrade at junction 19 of the A12, to include new expanded / signal controlled junctions with the A138 and B1137, widening to 3 lane approaches and facilitating connections to a potential future Chelmsford north east bypass. Online link capacity improvements would be provided between junctions 19 and 22, bringing the section up to modern dual 3-lane standard, to provide a consistent, high quality route. Junction 21 would be upgraded to allow all movements, to support the reconfiguration/removal of junction 20b or junction 20a. Offline improvements would be provided between junctions 22 and 23, and 24 and 25, to bypass areas of the A12 constrained by at-grade private accesses and suffering from safety and capacity issues, with associated junction improvements. Link capacity improvements would be provided between junctions 23 and 24, which would include widening the existing carriageway from dual 2-lane to dual 3-lane standard for continuity.
		
HI-03a	Offline improvements between junctions 22 and 23, and 24 and 25. Online widening and junction and junction improvements (capacity and safety enhancements) with reduced specification.	As option HI-03 with a reduced specification of upgrades on road links between junctions 19 and 25. This option removes certain elements from the overall costed package including a reduced number or more limited specification of structures, earthworks, pavement, landscaping and technology, with commensurate programme savings.
		
HI-04	Offline improvements between junction 22 and-23 and 24 and 25. Online widening and junction improvements (capacity and safety enhancements)	Online link capacity improvements would be provided between junctions 19 and 22, bringing the section up to modern dual 3-lane standard to provide a consistent, high quality route. Associated junctions would be upgraded to accommodate online improvements and increase capacity. Offline improvements would be provided between junctions 22 and J23, and 24 and 25, to bypass areas of the A12 constrained by at-grade private accesses and suffering from safety and capacity issues, with associated junction improvements. Junction 25 would be upgraded to accommodate offline improvements and address safety concerns / queuing on the off-slips.

		Major junction improvements at junction19 could be delivered alongside the Chelmsford north east bypass works.
	HI-04 	
HI-05	Offline improvements between junctions 22 - and 23. Online widening and junction improvements (capacity and safety enhancements)	Online link capacity improvements would be provided between junctions 19 and 22, bringing the section up to modern dual 3-lane standard to provide a consistent, high quality route. Associated junctions would be upgraded to accommodate online improvements and increase capacity. Offline improvements would be provided between junctions 22 and 23 to bypass areas of the A12 constrained by at-grade private accesses and suffering from safety and capacity issues, with associated junction improvements. There may be potential for route and junction improvements from Kelvedon to junction 25 to be delivered by the developers of the potential Stanway growth area. Major junction improvements at junction19 could be delivered alongside the Chelmsford north east bypass works.
	HI-05 	
HI-06	Offline improvements between junctions 22 and 23. Online widening and junction improvements (capacity and safety enhancements)	Online link capacity improvements would be provided between junctions 19 and 21, bringing the section up to modern dual 3-lane standard to provide a consistent, high quality route. Associated junctions would be upgraded to accommodate online improvements and increase capacity. Offline improvements would be provided between junctions 22 and 23 to bypass areas of the A12 constrained by at-grade private accesses and suffering from safety and capacity issues, with associated junction improvements. There may be potential for route and junction improvements from Kelvedon to junction 25 to be delivered by the developers of the potential Stanway growth area or other funding. Major junction improvements at junction19 could be delivered alongside the Chelmsford north east bypass works.
	HI-06 	
HI-09	Online widening between junctions 20a and 21, and junction improvements (capacity and safety enhancements)	Bring the section of A12 between junctions 19 and 21 up to modern dual 3-lane standard with carriageway cross sections and on- and off-slip roads provided in line with current standards to provide a consistent, high quality route. Associated junctions would be upgraded to accommodate online improvements and increase capacity. There may be potential for route and junction improvements from Kelvedon to junction 25 to be delivered by the developers of the Stanway growth area. Major junction improvements at junction19 could

		be delivered alongside the Chelmsford north east bypass works. Limited improvements could be considered to resolve some private accesses onto the A12 between junctions 21 and 25.
	HI-09 	

Table 8.4 : Options for appraisal

9. Option assessment

9.1 Introduction

This section presents the assessment of potential intervention options described in section 8.4 for the A12 corridor between junctions 19 and 25. It outlines the option assessment methodology developed in order to distinguish the relative costs, benefits and impacts of the options under consideration.

Options have been assessed against the '5 cases model' criteria: strategic, value for money (economic), delivery (management), financial and commercial. Results have allowed the identification of the better performing options, and informed recommendations of the better performing options to be taken forward.

9.2 Assessment methodology

9.2.1 Scheme assessment

A bespoke spreadsheet-based approach has been developed for appraisal purposes in order to assess the journey time and vehicle operating cost benefits that might be realised from the introduction of the respective schemes. This tool has been developed for use where no appropriate modelling tool is available.

This spreadsheet-based tool was developed in line with WebTAG guidance and seeks to make best use of readily available traffic data. The premise of the assessment is that the introduction of a scheme and associated upgrading of any existing carriageway standards will result in changes in the speed and/or distance that vehicles travel. The benefits of these changes can be monetised using standard economic parameters of traveller's value of time (VOT) and vehicle operating costs (VOC) as provided in the WebTAG data book (November 2014).

An important feature of the spreadsheet assessment is the user definition of a carriageway type with and without the introduction of a scheme. Based upon the carriageway type, a WebTAG defined speed flow curve is assigned in the spreadsheet, which for a given level of traffic flow outputs an average travel speed. The approach only considers changes in average speed that are caused by link capacity issues. The link speeds that are derived from the spreadsheet are reviewed against the available observed data. When the results are not found to be intuitive when compared to known conditions, alternative assumptions for forecast link speeds are considered, based on the observed data.

It is through a comparison of the with and without scheme travel speeds (and distances) in the opening and design years, that the travel time and vehicle operating cost benefits of the scheme can be interpolated over a 60 year appraisal period and monetised. The tool has been previously reviewed and approved for use by TAME on Highways England projects. Fully WebTAG compliant modelling will be required to inform the development of a full business case at a later date.

9.2.2 Options appraised

The potential schemes consist of the alterations to the section between junctions 19 and 25 of the A12. The link improvements are accompanied by a necessary package of junction alterations, as described in Table 8.4. A reference to the Highways England Commercial scheme ID is listed below.

- HI-03 (option 2)
- HI-03a (option 3)
- HI-04 (option 4)
- HI-05 (option 5)
- HI-06 (option 6)
- HI-09 (option 7)

9.2.3 Limitations

Based on the adopted methodology, a number of caveats and limitations of the analysis should be noted. These include that there is limited modelling of route choice, and there is lack of an appropriate transport model for assessment and calculation of scheme benefits. Where necessary assumptions are made and data from adjacent traffic count sites is used. Average trip purpose splits have been adopted but locally adjusted to account for the actual percentages of light and heavy vehicles.

TrafficMaster data was used to calculate the average observed speeds along each of the junction to junction links for the AM, IP and PM time periods. This data was compared to the results derived from the speed flow curves (SFC). The spreadsheet approach suggested the calculated link speeds were significantly higher in a Do Minimum scenario than the current observed speeds, and hence did not represent realistic conditions. It is thought this is due to the limitations in the methodology concerning instances where blocking back from junctions is a key influence on link performance. To provide an alternative assumption, the average observed speeds were assumed for the Do Minimum scenario in place of speeds calculated based on the SFCs. This is considered to be a conservative estimate of forecast conditions on the mainline in this scenario as no account has been taken of the further deterioration of speed conditions due to increases in traffic volume along the route.

The forecast 'with scheme' scenarios assume the successful delivery of an effective solution. The assessment excludes other benefits that would typically be presented at this stage of the business case process.

9.3 Case 1: strategic fit

9.3.1 Overview

The scheme aims to address several issues at the local and regional level, including:

- The existing and future levels of delay and congestion and the resulting environmental impact on the strategic route
- The resilience, reliability and safety concerns affecting the strategic route
- The constrained local and regional economic growth potential resulting from the performance of the strategic route

Without the proposed improvements to technology and the suggested capacity provision provided by the scheme, delay and journey times along the A12 are likely to worsen in future years. In addition, there is already committed development taking place or planned within the A12 corridor which is likely to add additional traffic to the A12, and future development may also slow down or stop as the existing infrastructure becomes unable to cope with the increased demand.

9.3.2 Business strategy

Highways England is responsible for operating, maintaining and improving the SRN in England on behalf of the Secretary of State for Transport. The aim of Highways England is "to provide safe roads, reliable journeys and to inform travellers of the condition and flow of the road network". In March 2015 the DfT released the RIS which outlines the Government's long term ambition to revolutionise and modernise the SRN. It sets out a vision for a smoother, safer and more reliable network by 2040. In the first period, the Government has committed to investing £15.2bn on over 100 major schemes.

Highways England's first strategic business plan details how it proposes to deliver the investment plan and its performance requirements. With the proposed increased investment in the SRN over the coming decades the objective is to modernise, maintain and operate the network to support safer, more efficient journeys which improve driver satisfaction. As part of the modernisation of England's major roads Highways England place an emphasis on the importance of smart motorways and the introduction of a new standard for A roads, known as 'expressways'. They have also expressed an ambition to widen a number of A roads from dual to three lanes including sections of the A12.

9.3.3 Measures of success

The transport intervention options and resulting improvements to the network will result in a range of measurable impacts on traffic and travel conditions. Impacts and measureable indicators relevant to the scheme have been identified within the Highways England RIS, including metrics relating to traffic flow, road safety, the environment, economic growth, network conditions, and non-motorised modes of transport.

Setting targets is an iterative process and they will evolve as further evidence is collected. Final targets would be produced during full business case development, in line with the principles listed above, and set out as 'SMART' (Specific-Measurable-Accepted-Realistic-Time defined) targets.

The successful delivery of the scheme will depend upon its ability to meet the scheme objectives after completion and this will be monitored as part of the post-opening scheme evaluation.

9.3.4 Impact of not changing

Future population growth and planned development will inevitably impact travel along the A12 corridor. As it stands, the route experiences heavy traffic flows, with HGVs accounting for between 10% and 15% of the total flow. When compared to other roads within the east of England, the A12 is amongst the most heavily trafficked.

As a result, sections of the A12 corridor suffer from congestion, delay and reduced journey time reliability during peak travel times, which has negative implications economically, socially and environmentally. Such issues are anticipated to worsen in future, exacerbated by forecast traffic growth both on the local and strategic network.

9.3.5 Options performance in terms of volume and capacity

The impact of each of the schemes in terms of volume and capacity has been undertaken for the forecast 2038 traffic flows. This is shown in Table 9.1, which indicates the following:

- Options that provide additional capacity (through an additional lane in both directions) offer the greatest reduction in the v/c ratio. All sections in options HI-03 and HI-03a have a v/c ratio of 0.82 or less.
- Option HI-04 does not include a link capacity upgrade to the section between junction 23 and 24, but this is forecast to be approaching capacity.
- Option HI-05 and HI-06 include additional sections which would not have additional link capacity, including the section between junctions 24 and 25, which is forecast to operate at or over capacity.
- Option HI-09 only includes additional road capacity between junctions 19 and 21. The sections that would not be upgraded are forecast to be approaching, or exceeding capacity, in 2038.

The high and low growth scenarios (+/- 12% respectively) are also considered. A high growth scenario would not change the conclusions that are drawn from the option performance. A low growth scenario would mean most sections of the road operate within capacity.

Link section	2038 peak volume (vehicles)		Option HI-03			Option HI-03a			Option HI-04			Option HI-05			Option HI-06			Option HI-09		
			Option capacity	V/C		Option capacity	V/C		Option capacity	V/C		Option capacity	V/C		Option capacity	V/C		Option capacity	V/C	
	AM	PM		AM	PM		AM	PM		AM	PM		AM	PM		AM	PM		AM	PM
Northbound																				
19 to 20a	4000	4700	6600	0.61	0.71	6600	0.61	0.71	6600	0.61	0.71	6600	0.61	0.71	6600	0.61	0.71	6600	0.61	0.71
20a to 20b	4000	4700	6600	0.61	0.71	6600	0.61	0.71	6600	0.61	0.71	6600	0.61	0.71	6600	0.61	0.71	6600	0.61	0.71
20b to 21	4300	5400	6600	0.65	0.82	6600	0.65	0.82	6600	0.65	0.82	6600	0.65	0.82	6600	0.65	0.82	6600	0.65	0.82
21 to 22	3500	4200	6600	0.53	0.64	6600	0.53	0.64	6600	0.53	0.64	6600	0.53	0.64	3900 - 4200	0.90 - 0.83	1.08 - 1	3900 - 4200	0.90 - 0.83	1.08 - 1
22 to 23	3500	4400	6600	0.53	0.67	6600	0.53	0.67	6600	0.53	0.67	6600	0.53	0.67	6600	0.53	0.67	3900 - 4200	0.90 - 0.83	1.13 - 1.05
23 to 24	2900	3900	6600	0.44	0.59	6600	0.44	0.59	3900 - 4200	0.74 - 0.69	1 - 0.93	3900 - 4200	0.74 - 0.69	1 - 0.93	3900 - 4200	0.74 - 0.69	1 - 0.93	3900 - 4200	0.74 - 0.69	1 - 0.93
24 to 25	3600	4600	6600	0.55	0.70	6600	0.55	0.70	6600	0.55	0.70	3900 - 4200	0.92 - 0.86	1.18 - 1.1	3900 - 4200	0.92 - 0.86	1.18 - 1.1	3900 - 4200	0.92 - 0.86	1.18 - 1.1
Southbound																				
25 to 24	4000	3500	6600	0.61	0.53	6600	0.61	0.53	6600	0.61	0.53	3900 - 4200	1.03 - 0.95	0.90 - 0.83	3900 - 4200	1.03 - 0.95	0.90 - 0.83	3900 - 4200	1.03 - 0.95	0.90 - 0.83
24 to 23	3500	2900	6600	0.53	0.44	6600	0.53	0.44	3900 - 4200	0.90 - 0.83	0.74 - 0.69	3900 - 4200	0.90 - 0.83	0.74 - 0.69	3900 - 4200	0.90 - 0.83	0.74 - 0.69	3900 - 4200	0.90 - 0.83	0.74 - 0.69
23 to 22	5000	3500	6600	0.76	0.53	6600	0.76	0.53	6600	0.76	0.53	6600	0.76	0.53	6600	0.76	0.53	3900 - 4200	1.28 - 1.19	0.90 - 0.83
22 to 21	4200	2900	6600	0.64	0.44	6600	0.64	0.44	6600	0.64	0.44	6600	0.64	0.44	3900 - 4200	1.08 - 1	0.74 - 0.69	3900 - 4200	1.08 - 1	0.74 - 0.69
21 to 20b	4300	5400	6600	0.65	0.82	6600	0.65	0.82	6600	0.65	0.82	6600	0.65	0.82	6600	0.65	0.82	6600	0.65	0.82

Link section	2038 peak volume (vehicles)		Option HI-03			Option HI-03a			Option HI-04			Option HI-05			Option HI-06			Option HI-09		
			Option capacity	V/C		Option capacity	V/C		Option capacity	V/C		Option capacity	V/C		Option capacity	V/C		Option capacity	V/C	
	AM	PM		AM	PM		AM	PM		AM	PM		AM	PM		AM	PM		AM	PM
20b to 20a	4400	4400	6600	0.67	0.67	6600	0.67	0.67	6600	0.67	0.67	6600	0.67	0.67	6600	0.67	0.67	6600	0.67	0.67
20a to 19	5400	4200	6600	0.82	0.64	6600	0.82	0.64	6600	0.82	0.64	6600	0.82	0.64	6600	0.82	0.64	6600	0.82	0.64

Table 9.1: V/C ratio for scheme options

9.4 Case 2: Economics (value for money)

9.4.1 Overview

This section presents the economic case for the scheme. It considers the likely benefits and costs of the options in terms of economic, environmental and social impacts, and impacts on public accounts. A proportionate approach has been adopted in line with the current stage of scheme development. Scheme costs are based on limited information available at this stage.

The following base and forecast scenarios have been developed as part of the economic assessment:

- Assessment base year: 2014
- Scheme opening year: 2023 do minimum (without scheme) and do something (with scheme)
- Scheme design year: 2038 do minimum (without scheme) and do something (with scheme)

The following input data has been used to produce the economic analysis for the scheme:

- Trafficmaster travel speed data, recorded between September 2013 and August 2014, supplied by the DfT
- Traffic flows and HGV proportions for the current year, which were derived from Highways England's TRADS system and/or DfT manual census counts.
- Link distances between existing junctions. These were taken from publicly available street mapping, whilst the distances of the announced schemes were measured from general arrangement drawings
- Road traffic forecast (RTF15) for deriving growth factors for the forecast traffic volumes

RTF 15 (Scenario 1) factors for the east of England region have been applied to the current traffic flows to predict future traffic volumes for the do minimum and do something forecast scenarios. Travel speeds (and distance) from both forecast scenarios have then been compared for the opening and design years to establish the level of benefit derived from the scheme. The travel time and vehicle operating cost changes associated with the scheme have been interpolated over a 60-year appraisal period and monetised.

9.4.2 Scheme present value benefits

A present value of benefits (PVB) was calculated assuming a scheme opening year of 2023. The figures presented in Table 9.2 show the PVB for the full scheme (HI-03/a) broken down by road section. The figures presented are discounted to 2010 and are in 2010 prices, and are limited to travel time and vehicle operating cost changes on the mainline carriageways.

Section	PVB
J19-20a	£280m
J20a-20b	£240m
J20b-21	£250m
J21-22	£30m
J22-23	£140m
J23-24	£10m
J24-25	£200m
Total	**£1,150m**

Table 9.2: A12 sections PVB (2010 prices)

The link-based information allows scheme PVB to be determined for each of the options. These are summarised in Table 9.3.

Option	Option PVB
HI-03	£1,150m
HI-03a	£1,150m
HI-04	£1,140m
HI-05	£940m
HI-06	£910m
HI-09	£770m

Table 9.3: Option PVB (2010 Prices)

9.4.3 Scheme costs

For the purposes of the economic appraisal, high level outline scheme costs have been developed for the potential options. The information is the 'most likely' high level outturn cost taken from 'Commercial Services Division (CSD) Technical Note – A428 & A12-A120 Optioneering Report 15102015'.

It should be noted that these estimates should be treated as high level and have only be used for the purposes of exploring potential viable options in this report. Table 9.4 provides a summary of the scheme cost used as input to the economic assessment.

Option	Option cost
HI-03	£750m
HI-03A	£600m
HI-04	£500m
HI-05	£350m
HI-06	£250m
HI-09	£150m

Table 9.4: High level scheme costs

In order to develop the cost estimates for use in the economic assessment of the options, the following assumptions and limitations are noted:

- A three year construction period has been assumed, with costs split evenly over the period 2021 to 2023.
- Land and preparation costs are likely to be incurred prior to 2021 but the spend profile of these costs has not been considered as part of this work.
- Scheme costs have been discounted to 2010 using a discount rate of 3.5%, and converted to 2010 prices using GDP deflator in line with WebTAG A1-2 and the WebTAG databook.

9.4.4 Appraisal summary table (AST)

The AST provides decision-makers with a concise overview of a scheme across the full range of potential monetised, qualitative and quantitative impacts. This includes economic, environmental, social, and impacts on public accounts.

At this stage potential benefits and disbenefits to be accrued from sub-objectives such as noise, local air quality, landscape, biodiversity, water environment, accident savings, physical activity and journey quality have not been quantified. Due to the current stage of scheme development and level of information currently available, these have instead been assessed qualitatively. Further details of the environmental constraints can be found in the Environmental Assessment Report. Full monetised assessments will be completed as the business case develops based on the availability of more detailed information at successive stages of scheme development. 0 contains the AST for each of the scheme options.

9.4.5 Economic impacts

The PVB, present value cost (PVC) and benefit cost ratio (BCR) for each option considered are presented in Table 9.5.

Monetised cost and benefits						
Option:	**HI-03**	**HI-03a**	**HI-04**	**HI-05**	**HI-06**	**HI-09**
Present value of benefits (PVB)	£1,150m	£1,150m	£1,140m	£940m	£910m	£770m
Present value of costs (PVC)	£550m	£440m	£370m	£260m	£180m	£110m
Overall Impacts						
Net present value (NPV)	£600m	£710m	£770m	£680m	£730m	£660m
Initial benefit to cost ratio (BCR)	**2.1**	**2.6**	**3.1**	**3.6**	**5.1**	**7.0**
Note 1: Benefits for a 60 year appraisal period *Note 2: Figures shown as 2010 prices and values* *Note 3: Figures are rounded to the nearest £10m* *Note 4: HI-03 (option 2), HI-03a (option 3), HI-04 (option 4), HI-05 (option 5), HI-06 (option 6), HI-09 (option 7).*						

Table 9.5: Economic summary statistics

9.4.6 Value for money

Table 9.6 provides a summary of the conclusions from the value for money assessment outlined in the economic case. This includes the BCR, qualitative assessment and overall value for money category for the options assessed.

The options have been shown to deliver substantial benefits in terms of reduced journey times and costs to users, and as such scores highly across economic and social, as well as a number of environmental indicators. Initial BCRs show options represent a 'high' value for money to 'very high' value for money. Some of the options do this at significantly lower PVCs.

	Option assessment	Detail
BCR	2.1 – 7.0	Includes only the monetised benefits of travel time savings and vehicle operating cost benefits.
Qualitative assessment	Overall slight benefit	Benefits are anticipated through a reduction in congestion and delay along the A12 corridor contributing positively to local accessibility, journey times, noise and improved air quality. Adverse impacts on landscape, air quality, biodiversity, the historic environment and the water environment are expected in the immediate vicinity of the carriageway, associated with widening and offline improvements.
Key risks and sensitivities	Risk budget applied to scheme cost	Key risks include potential environmental implications and required mitigation measures have been considered. A risk budget has also been included in the economic appraisal.

	Option assessment	Detail
Value for money category	High to very high	Monetised assessments suggests a 'high' or 'very high' value for money category for the scheme. It is anticipated that appropriate mitigation measures can be provided to address negative qualitative assessment outcomes.

Table 9.6: Value for money

At this stage potential monetised benefits/ disbenefits to be accrued from a number of sub-objectives have not been accounted for. Additional benefits are anticipated through reductions in congestion as well as improvements for non-motorised users, providing accident savings, physical activity and journey quality enhancements. Changes in noise and local air quality will be assessed as part of the further stages of business case development, and outcomes will be used to inform any mitigation requirements.

The findings of the qualitative assessments indicate subsidiary benefits are also anticipated through a reduction in delay and congestion on existing sections of the A12 corridor and at particular junctions, contributing positively to local accessibility. Adverse impacts associated with new road construction have been identified, including impacts on historic environment, biodiversity, air quality and the water environment. Mitigation measures will be developed as the project progresses to minimise environmental impacts and where possible, to provide environmental enhancements.

9.4.7 Summary

The assessment demonstrates that all of the schemes have a high or very high value for money. Therefore, all of the option packages would provide significant economic benefit.

9.5 Case 3: financial case

9.5.1 Introduction

This section presents the financial case for the scheme. It concentrates on the affordability of the proposal and its funding arrangements.

9.5.2 Capital expenditure

Scheme costs have been estimated for each option, and are summarised in Table 9.4. The cost estimates include construction costs only and it should be noted that these estimates should be treated as high level and have only be used for the purposes of comparative assessment.

9.5.3 Maintenance expenditure

Maintenance costs for the scheme are assumed to place a medium to long term ongoing maintenance liability on Highways England following the adoption of the new roads e.g. resurfacing / renewal of the additional highway infrastructure, a net increase in additional drainage clearance, lighting operation, structural inspections etc. It could also be considered, however, that the scheme will reduce traffic volumes on existing roads which could have a positive impact upon the condition of those roads. At this stage, however, the cost implications of this are unknown, and have not been incorporated into a whole life value for money assessment.

This assumption needs to be kept under review as designs progress and a like-for-like assessment of 60-year maintenance costs completed when the better performing options are fully specified. A whole-life cost analysis will be completed as part of further business case development, with further adjustments to the NPV and BCR calculation accordingly (following a maintenance profile such as that outlined in the QUADRO user manual).

9.5.4 Budget provision

Funding for the scheme is expected to be provided from RIS budgets. However, opportunities for securing a mix of funding through private sector sources would be further considered at the next stage of scheme development, In particular, the lower cost options that exclude particular link upgrades do so on the basis that an alternative scheme funding strategy could be developed to fund in part of in full particular components of the overall corridor solution.

9.5.5 Summary

Highways England has set out a funding envelope of £750m for the delivery of this scheme and is considering further the possible governance arrangements around the budget which is over the current limit of devolved responsibility. Lower cost schemes less than £500m may be considered more affordable, however, this affordability needs to be considered in the context of the wider issues surrounding the strategic and delivery cases. Matters associated with affordability are under continual review.

9.6 Case 4: commercial case

9.6.1 Overview

This section sets out the commercial case including the procurement strategy for the scheme. A description of the expected approach is provided in relation to risk allocation and transfer, along with a description of the approach to contract management. The key outcomes and outputs expected to be delivered as part of the scheme are also described.

The preferred procurement options identified in this section are based on an initial assessment only and may be subject to change as the scheme is developed further. The final procurement strategy will be confirmed at a later stage of business case development.

9.6.2 Outline approach

The procurement and delivery of the business case, scheme design and associated services will follow the Highways England PCF process. Details on contract length, human resource issues and contract management will be finalised and updated subject to approval, at a later stage of scheme development.

9.6.3 Output based specification

The PCF is a joint DfT and Highways England approach to managing major projects. It comprises a standard project lifecycle, standard project deliverables, governance arrangements and project control processes, which all major projects must adhere to as part of the development and delivery of a scheme.

At the next stage, the scheme will progress through PCF stage 1 of the options phase. Key outputs / deliverables to be produced during this phase include:

- An appraisal specification report (ASR) and ASST
- Business Case and funding products including in relation to modelling
- Refined cost estimates
- A risk management plan, risk register and qualitative risk assessment
- An OAR in terms of the scheme's environmental impact, traffic forecasts and economic benefits
- A public consultation strategy

Some of these outputs will inform the basis for monitoring and evaluating the success of the scheme in delivering the key objectives set out in Highways England's RIS, and will be updated as necessary as the business case develops.

9.6.4 Procurement strategy and sourcing options

Highways England is currently in the process of implementing a new procurement framework for the delivery of major highway schemes known as the CDF. It will provide a procurement route for any project over £15m thus avoiding individual OJEU procurement events. The principles of the CDF are to achieve continuous improvement in health and safety, sustainability, quality, time and value for money.

9.6.5 Risk allocation and transfer

Throughout the development of the scheme risks will be, recorded and actively managed. Where appropriate, risk owners have been allocated and tasked with eliminating risks, where possible, or identifying mitigation measures for residual risks. The same ethos will be taken through to the delivery stages of the scheme.

External risk allocation and transfer will be defined as per Highway England's CDF. The Highways England project manager would be primarily responsible for risk management and the dissemination of information at regular intervals to the SRO and project board.

9.6.6 Contract management

The contract will be managed through Highways England's contract terms and conditions and suppliers will be measured and evaluated against the measuring success toolkit (MST) on a bi-monthly basis.

9.6.7 Summary

The commercial case has been outlined above and it is considered that it will be broadly consistent for all of the scheme options.

9.7 Case 5: management case

9.7.1 Overview

This section sets out how the scheme is likely to be delivered. It demonstrates that timescales and phasing are realistic, that an appropriate governance structure is in place to oversee delivery, that risks have been identified and suitable risk management processes developed, and that there are robust plans for communications and stakeholder management.

The management case also ensures that the benefits set out in the economic case are realised, and that measures are included to assess and evaluate this.

There are a number of completed, current and planned Highways England major schemes which include widening and other offline improvements of a similar scale and comparable cost to the better performing options.

9.7.2 Scheme delivery

The management approach that has been proposed for the scheme has been developed with consideration of the overall scheme cost, deliverability and level of risk. It is likely to be tailored to the specific circumstances of each element in line with the development of the scheme. At this stage, the key points to note are:

- A project board will be established for the scheme, comprising representation from key stakeholders, to oversee delivery of the scheme. An SRO and project manager will be appointed, with the project manager providing the interface between the project board and the team managers.
- Outline project plans will be further developed for the scheme. At this stage, the timescale for project delivery is indicative, and subject to change as the business case develops. Commencement of works on site is estimated to begin Q4 2019/20, with the road opening to traffic in Q3 2023/2024.
- Consultation activities will continue through the PCF process and the communication strategy will be continuously updated to seek views, communicate progress and create consensus during development of proposals for the scheme.

- A high level risk register will be developed as part of the SOBC. This will be quantified through the next stage of the business case and updated regularly, with risk owners appointed as appropriate to the type of risk and the stage of scheme delivery at which the risk could be realised.
- The benefits realisation, monitoring and evaluation plan will be developed as an output of the full business case work to ensure that data collection and reporting is focused tightly on the objectives and success indicators that have been set out in the strategic case.

There are additional issues relating to delivery of each of the road sections between junctions. The benefits from upgrading each of the sections was summarised previously. This suggests that the delivery of the sections between junctions 21 and 22, and 23 and 24 should be included as part of a wider scheme because the upgrade of these independently offers lower benefit. This suggests that options HI-04 and HI-06 should be dismissed as these sections would not be upgraded as part these options.

The emerging Local Plans for the authorities in this area are considering significant new land use development site in the vicinity of the A12. This could potentially support the widening of the A12 between junctions 24 and 25 and creation of a new A12 junction to facilitate access to and from the emerging development. The section between junctions 24 and 25 could be delivered via a separate business case and funding package. This suggests that option HI-05 could be a viable lower cost option for this project, however with scheme costs in the order of £350m this may not be a sufficiently affordable for inclusion as a lower cost measure. Option HI-09 is the lowest cost measure with the highest overall BCR.

9.7.3 Summary

Options HI-03 and HI-03a can be considered deliverable, consistent with the RIS announcements and would fully meet the strategic objectives. Given the similarity of the schemes, these schemes together are considered to be a good solution.

The delivery of the sections between junctions 21 and 22, and 23 and 24 is shown to offer lower benefit relative to other sections of the route. However options HI-04 and HI-06 should be dismissed as they would leave sections of the A12 which may be difficult to justify in isolation through a business case process, resulting in an inconsistent route standard.

Option HI-05 could be a viable lower cost option for this project. The section between junctions 23 and 25 could be delivered via a separate business case and funding package, which includes a significant contribution from developers. However, this scheme is taken forward as an option as other lower cost solutions are available. Therefore, option HI-09 has been taken forward as a lower cost option on the basis that this scheme is shown to offer the highest BCR at the lowest cost.

9.8 Better performing options

In summary, the options that should be the focus of the SOBC are:

- HI-03 / HI-03a (BCR 2.1 / 2.6)
- HI-05 (BCR 3.6)
- HI-09 (BCR 7.0)

The better performing options are selected because they offer high value for money and include capacity upgrade of the whole section of the A12 between junctions 19 and 25. Option HI-05 also offers high value for money at a lower cost, and introduces the potential for phased delivery and an alternative funding and delivery model for some sections of the route. Option HI-09 includes upgrade of the section between junctions 19 and 21 and can be delivered at the lowest cost of the options considered.

10. Summary and next steps

10.1 Summary

10.1.1 Background

Jacobs has been commissioned by Highways England to progress a number of the proposals announced in the AS14 RIS programme. This commission relates to proposals in the east of England Area 6 (South) including schemes for the A12 between the M25 and Ipswich. This report presents the proposals for the A12, between junctions 19 and 25.

This OAR is one of a number of business case documents produced at this stage of scheme development and documents the scheme appraisal process of identifying the need for intervention and the process of option development and selection. Improvements to the A12 corridor between junctions 19 and 25 are seen as key elements of the transport solution that will be required to deliver economic growth and tackle the most important challenges and opportunities for customers.

10.1.2 Policy context

As outlined in DfT's RIS and strategic business plan, the focus for planning and future developments is one that helps to deliver strong, sustainable and balanced growth, whilst also being tailored to local aspirations and requirements.

There is also a focus within the SELEP on enhancing the connectivity in the south east and identifies the A12 corridor as one of the key growth corridors.

The schemes proposed for this section of the A12 support the national, regional and local policy objectives.

10.1.3 Need for intervention

The A12 is a strategic route which supports the national and regional economy by connecting the ports of Felixstowe and Harwich to London. It also has regional importance as it links the towns of Chelmsford, Witham and Marks Tey between junctions 19 and 25.

The A12 between junctions 19 and 25 accommodates high volumes of traffic, and is known to experience congestion at peak times, with reduced link speeds and increased vehicular delays and journey times. Due to the variability in the standard of the corridor and limited suitable diversion routes, it is vulnerable to incidents which can cause significant disruption over a wide area and is generally regarded as stressful and costly for drivers.

Future population growth and development will inevitably further impact travel in the A12 corridor. As it stands, congestion and journey time reliability are significant issues during the peak hours and without intervention are anticipated to worsen, exacerbated by forecast traffic growth both locally and strategically.

By providing the necessary infrastructure to stimulate growth, land values will increase in the Essex area, releasing development opportunities. This will attract new businesses and encourage expansion of existing businesses, creating employment opportunities and stimulating economic growth in the area, in line with national and regional strategies.

10.1.4 Scheme development and appraisal

All options identified through the option development stages were considered in terms of meeting the key objectives. The options identified in this report were informed through:

- relevant policy and strategy documents
- recent studies
- baseline review and forecasting process
- consultation and engagement process

Initial options identified included a variety of highway infrastructure schemes with a range of intervention levels. Options included provision of a new parallel offline route between junction 19 and 25; options with combinations of online and offline improvements between key junctions; and lesser options of carriageway improvements and pavement repairs. These options aimed to address strategic issues as well as concerns of a more localised nature.

Informed by the DfT's EAST, and through consideration of feasibility and deliverability in planning and engineering terms, a number of the above options were discounted through an initial sifting stage.

10.1.5 Economic assessment

The economic assessment for each of the options was carried out by comparing the transport user benefits in terms of potential travel time and vehicle operating cost savings compared with the cost of the scheme. This determined that the better performing options that should be the focus of the SOBC and continued scheme development are:

- HI-03 / HI-03a (BCR 2.1 / 2.6)
- HI-05 (BCR 3.6)
- HI-09 (BCR 7.0)

All three would bring benefits over the appraisal period. The BCR's for the options are all over 2, representing high value for money. Option HI-09 was identified as providing the best value for money however options HI-03 / HI-03a and HI-05 were shown to offer significant other benefits which align better with the scheme objectives.

Options HI-03 and HI-03a are selected because they offer high value for money and include capacity upgrade of the whole section of the A12 between junctions 19 and 25. Options HI-05 and HI-09 are based on a 'modular' delivery approach, with remaining sections being upgraded at later RIS stages, or through an alternative funding strategy that acknowledges the potential for major land use development, and other emerging strategic highway network improvement schemes.

10.2 Conclusions

The result of the overall appraisal has identified three better performing options. Each option achieves a high BCR and a good strategic fit, demonstrating a positive contribution against the identified intervention-specific objectives.

The appraisal also concludes that the options would deliver network performance improvements in both the AM and PM peak hours in terms of journey times and links speeds. It is also expected that any environmental implications and mitigation measures will be considered through an environmental assessment process. Each of the three options will have a delivery strategy and phasing plan which will be investigated and developed further.

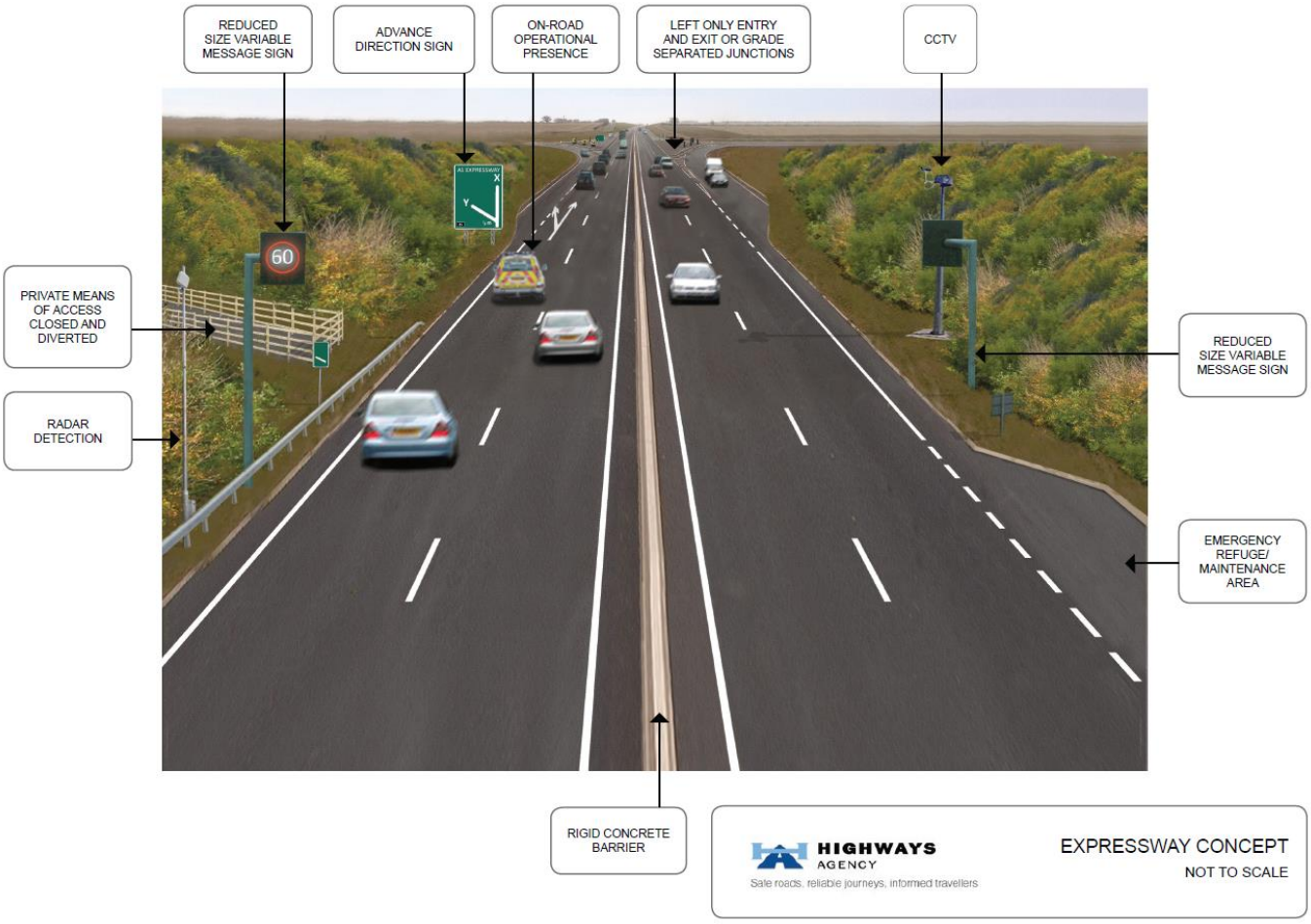
Appendix A. Glossary

Term	Description
AADF	Average Annual Daily Traffic
ALC	Agricultural Land Classification
AM	AM peak hour (8-9am)
AMCB	Analysis of Monetised Costs and Benefits
ANPR	Automatic Number Plate Recognition
AONB	Areas of Outstanding Natural Beauty
AQMA	Air Quality Management Area
ASR	Appraisal Specification Report
AST	Appraisal Summary Table
BAP	Biodiversity Action Plan
BCR	Benefit cost ratio. Calculated as the PVB divided by the PVC
Capacity	The ability of a highway link or junction to carry or accommodate traffic flow
CO2	Carbon Dioxide
CCTV	Closed-Circuit Television
CPO	Compulsory Purchase Order
CSD	Commercial Services Division
DaSTS	Delivering a Sustainable Transport System
DfT	Department for Transport
DM	Do Minimum – The modelled scenario which excludes the proposed intervention
DMRB	Design Manual for Roads and Bridges
DS	Do Something – The modelled scenario which includes the proposed intervention
ECC	Essex County Council
EAST	Early Assessment and Sifting Tool
ERT	Emergency
GEML	Great Eastern Mainline
GVA	Gross Value Added, a measure of economic output
HATRIS	Highways Agency Traffic Information System
HGV	Heavy Goods Vehicle
HST	Highways Strategic Transformation Programme
IP	Inter peak hour (12-1pm)
JTDB	Journey Time Database
KCDC	Key Centres of Development and Change
KSI	Killed/Seriously Injured
LEP	Local Enterprise Partnership
LNR	Local Nature Reserve
LTP3	Local Transport Plan 3

Term	Description
MIDAS	Motorway Incident Detection and Automatic Signalling
NCA	National Character Area
NCN	National Cycle Route
NDD	Network Delivery and Development directorate
NNR	National Nature Reserves
NO_2	Nitrogen Dioxide
NPPF	National Planning Policy Framework
NTEM	National Trip End Model
NVZ	Nitrate Vulnerable Zone
OAR	Option Assessment Report
ONS	Office for National Statistics
ORR	Office of Rail Regulation
PCF	Project Control Framework
PQC	Pavement Quality Concrete
ProW	Public Rights Of Way
PVB	Present Value Benefit. The monetised benefit of a scheme expressed in real terms, typically given in 2010 prices and values
RBS	Route Based Strategies
RIS	Roads Investment Strategy
RTF	Road Traffic Forecast
SAC	Special Areas of Conservation
SDP	Sustainable Development Plan
SELEP	South East Local Enterprise Partnership
SEP	Strategic Economic Plan
SHMA	Strategic Housing Market Assessment
SOBC	Strategic Outline Business Case
SPA	Special Protection Areas
SPZ	Source Protection Zone
SRN	Strategic Road Network
SSD	Sight Stopping Distances
STEER	Sustainable Transport for the East of England Region
TAG	Transport Analysis Guidance, published by the Department for Transport (see also WebTAG)
TEE	Transport Economic Efficiency
TEES	Transport and the Economy in the East of England Study
TEMPRO	Trip End Model Presentation Program – modelling tool designed to allow users to look at the growth in trip ends, using actual and forecast data supplied by the DfT
TEU	Twenty-foot Equivalents Units
TRADS	Highways England Traffic Information Database

Term	Description
TSCS	Thin Surface Course Systems
TSD	Traffic speed deflectometer
V/C	Volume/Capacity ratio
VfM	Value for Money
VMS	Variable Message Sign
WebTAG	The Department for Transport guidance document on the conduct of transport studies (see also TAG)

Appendix B. Expressway visualisation



Appendix C. Pedestrian crossings of the A12 corridor

Location	Type	Description
A12 J19	Segregated footway/cycleway	Footway/cycleway over A12 J19 bridge connecting Chelmsford and Boreham
Waltham Road Boreham	Footway	Footway present on both sides of the Waltham Road bridge between Boreham and the industrial estate and dwellings to the north of the A12
Terling Hall Road	Footway	Footway on the Terling Hall Road bridge, from the B1137 Main Road to accesses to the north of the A12
River Ter Hatfield Peverel	Footpath	PROW along the River Ter under the A12, from the B1137 The Street northwards to Terling Hall Road
Bury Lane B1137 (A12 J20A)	Footway	Footway on the Bury Lane bridge connecting Hatfield Peverel north and south of the A12
Station Road	Footway	Footway on the Station Road bridge connecting Hatfield Peverel north and south of the A12
B1137 (A12 J20B)	Footway	Footway on the B1137 over the A12 into Hatfield Peverel
B1389 Hatfield Road (A12 J21)	Footway	Footway on the Hatfield Road bridge connecting to footway on the A12 towards Hatfield Peverel and in to Witham in the north
B1018 Maldon Road	Footway	Footway present on both sides of road through underbridge in to Witham.
Blackwater Lane	Footpath	PROW alongside the River Brain from Maldon Road in Witham, connecting to footpath near Benton Hall and on to Blue Mills Hill.
Freebournes Road, Witham	Footpath	At-grade PROW across the A12, from Freebournes Road in Witham to Little Braxted Lane
B1389 Colemans Bridge (A12 J22)	Footway	Footway on Colemans Bridge connecting Witham and Little Braxted
Henry Dixon Road, Rivenhall End	Footway	Footway on eastern side of Henry Dixon Road through underbridge connecting Rivenhall End north and south of the A12.
B1024 London Road (A12 J23)	Footway	Footway present on both sides of London Road through underbridge, connecting fooways alongside the A12 in to Kelvedon.
Maldon Road, Kelvedon	Footway	Footway on eastern side of Maldon Road bridge over A12, connecting to Kelvedon to Highfields Lane
Ewell Hall Chase	Footpath	No specific NMU facilities. PROW and single track to access fields and properties near Kelvedon
B1023		No specific NMU facilities through underbridge.
Domsey Brook	Footpath	PROW alongside Domsey Brook between Kelvedon and Messing.
B1024 (A12 J24)	Footway	Slip road off A12 to Gore Pit, footway on the southern side.
Footbridge	Footpath	Footbridge between London Road and the A120
A12 J25 (A120)	Footway	Footway on both sides of the A120 road bridge over the A12

Appendix D. Journey time analysis

Junction	Direction	Travel Time (secs)			
		AM	IP	PM	Off-Peak
J19 to J25	A130/A138 to A120	834	821	1198	753

Table 10.1 : Travel times on the A12 - NB

Junction	Direction	Travel Time (secs)			
		AM	IP	PM	Off-Peak
J25 to J19	A120 to A130/A138	1045	810	840	766

Table 10.2 : Travel times on the A12 - SB

Appendix E. Capacity analysis

Although standard lane capacities for a variety of road types and design standards are provided in the Design Manual for Roads and Bridges (TA46/97, TA79/99), the extensive traffic speed and flow data collected by Highways England for the strategic road network presents an excellent opportunity to estimate capacity using recent data recorded on the subject road or a nearby road of similar design. This allows estimates of capacity to be produced which better take into account local road conditions and current behaviour of the local driver population.

To an estimate current mainline capacity of the A12, traffic speed and flow data obtained from the Highways England Journey Time Database for all of 2014 was used to produce a series of speed/flow diagrams for individual road segments. Maximum average lane capacity of each segment was then determined through visual inspection of the resulting diagrams, providing a range of representative capacities grouped by carriageway size.

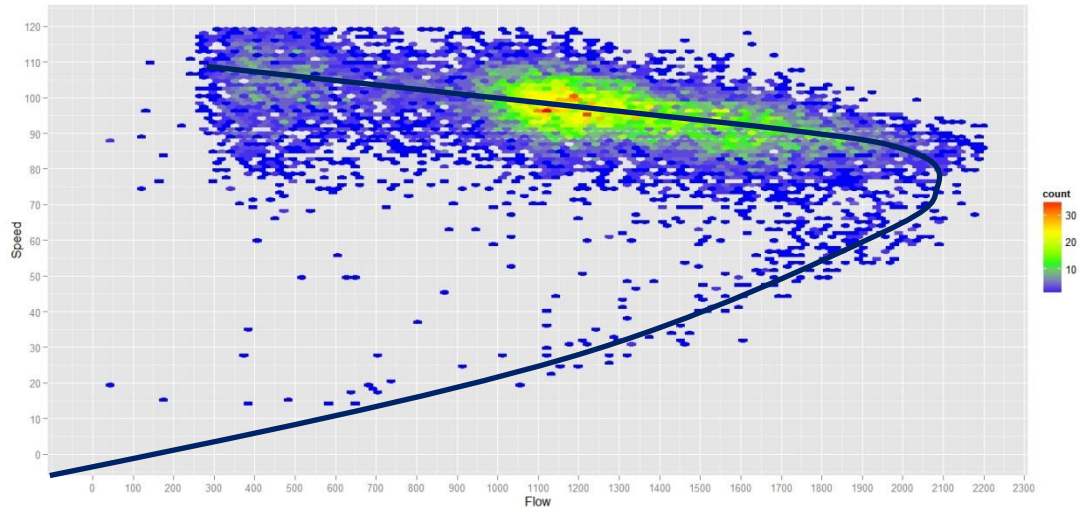
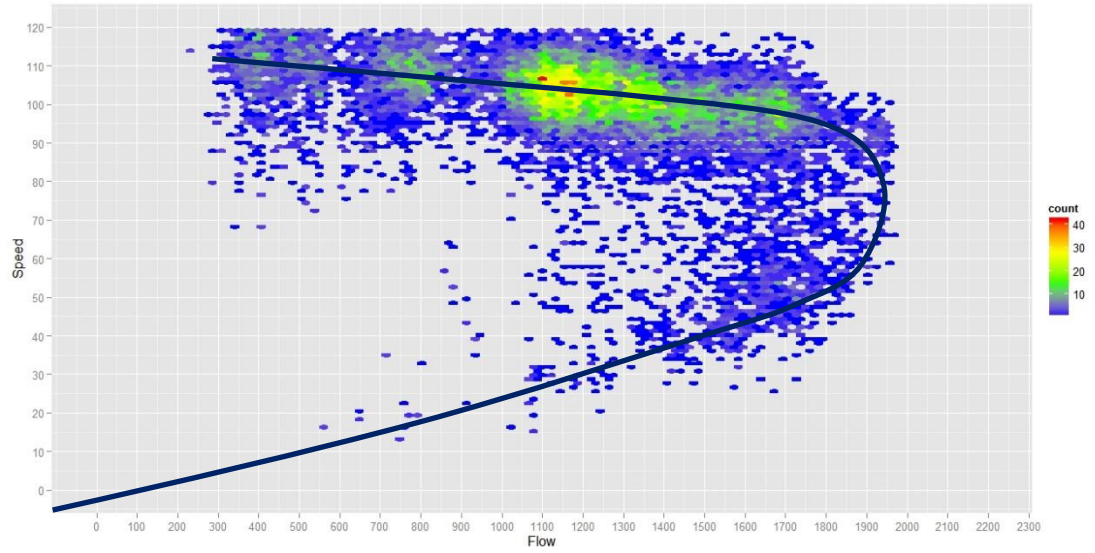
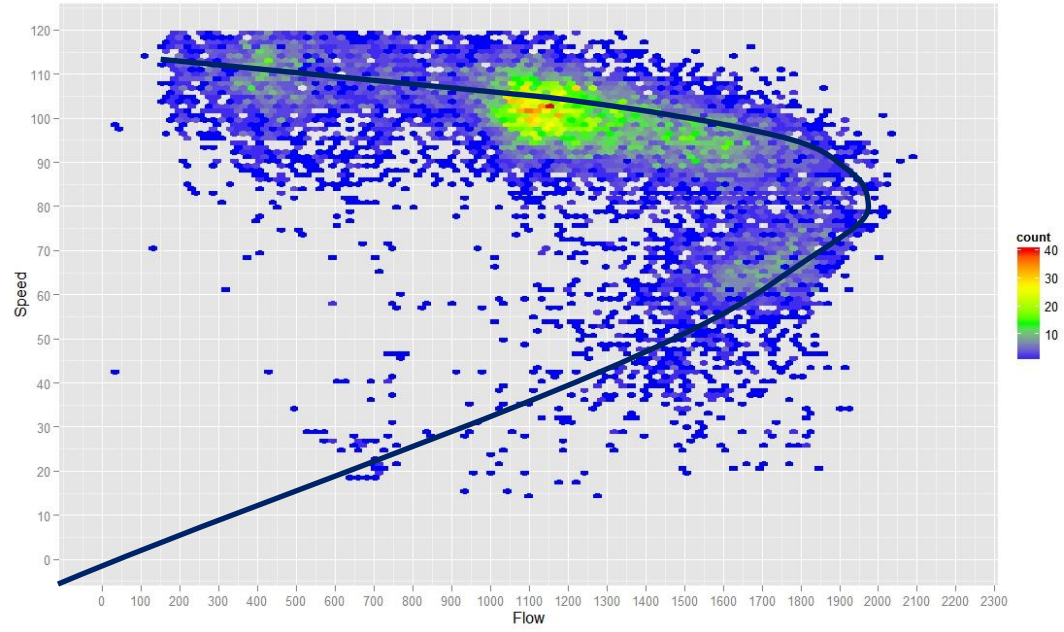
Ideally, data recorded entirely on the A12 would have been used for this analysis. However, current traffic demand on the three lane segments is not great enough to saturate available lane capacity and cause flow breakdown frequently enough to produce complete speed flow diagrams suitable for estimating maximum capacity. As such, data from congested segments of the M1 motorway has been used to estimate 3 lane carriageway segment capacity. Due to the higher level of technology and its designation as a motorway, the M1 is arguably of a higher standard than the A12. However, controlled motorway technology typically has minimal impact on peak lane capacity, providing greater improvements to travel reliability and incident response. Additionally, 3 lane segments of the A12 have been generally constructed to a motorway standard, with limited access, divided carriageways and grade separated junctions.

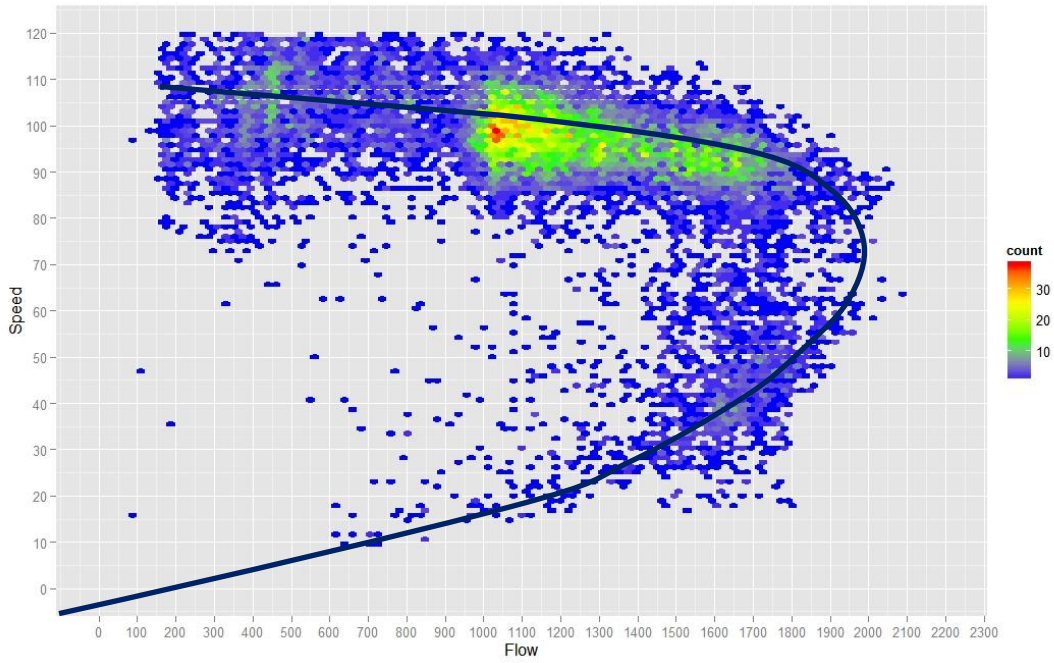
Speed flow curves for segments found to have suitable levels of congestion, along with estimated segment capacities are presented in the following tables. Compared against the 3-lane curves, the 2-lane curves generally show reduced capacity and an increased spread of speeds across the steady flow zone. This is as expected and suggests the speed / flow analysis is producing reasonable results.

Based on these curves, the following lane capacities have been adopted for existing condition analysis of the A12:

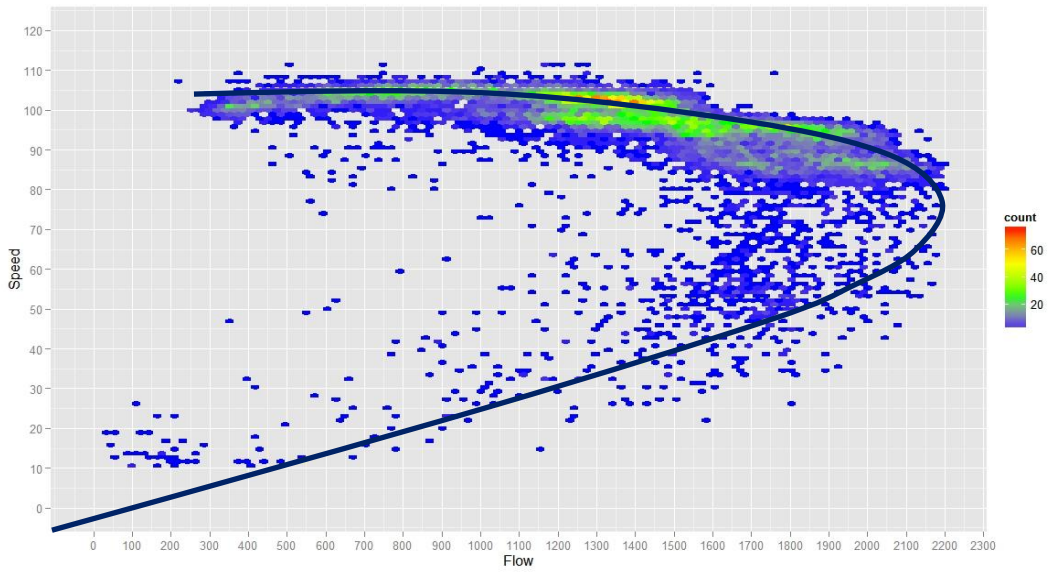
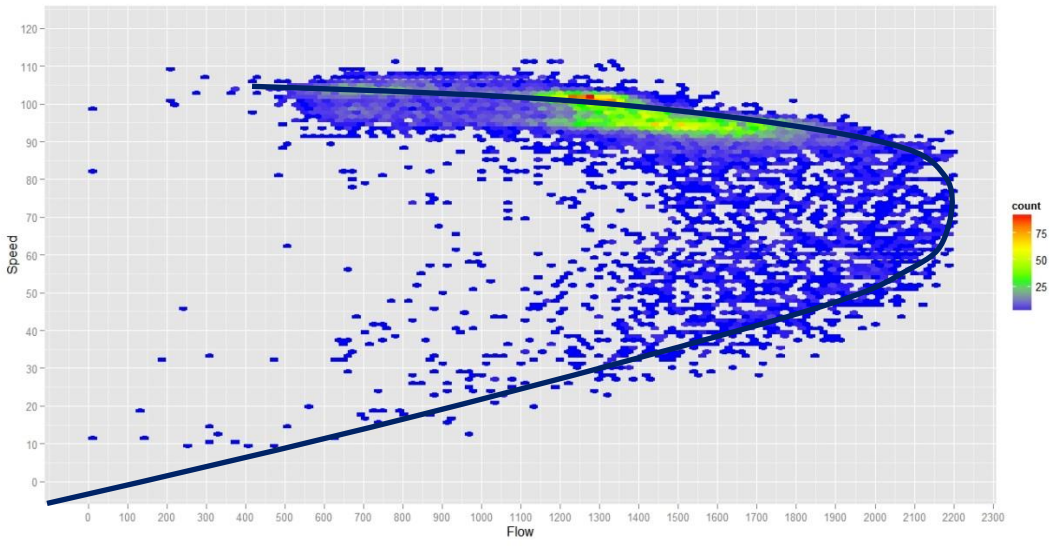
- **2 lane segments**: 1950 – 2100 veh/hr/lane
- **3 lane segments:** 2200 veh/hr/lane

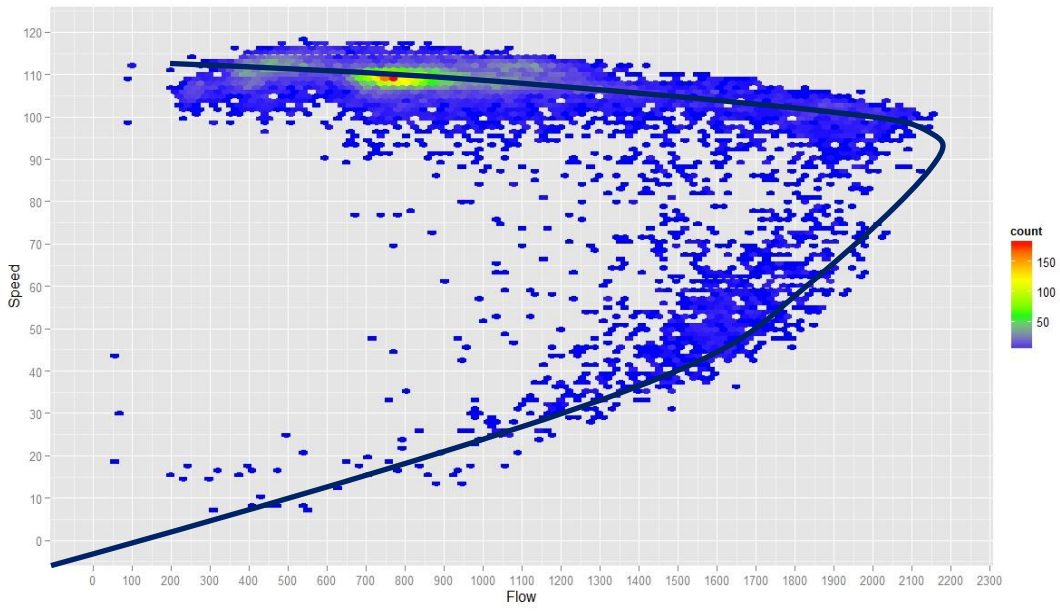
Two lane speed/flow curves

Location: A12 from A414 to A130 **HE link identifier:** AL193 **Number of Lanes**: 2 **Estimated Capacity**: 2100 veh/hr/lane	
Location: A12 from 130/A138 to A414 **HE link identifier:** AL196 **Number of Lanes**: 2 **Estimated Capacity**: 1950 veh/hr/lane	
Location: A12 from A414 to A130/A138 **HE link identifier:** AL2309 **Number of Lanes**: 2 **Estimated Capacity**: 1950 veh/hr/lane	

Location: A12 from A130 to A414 **HE link identifier:** AL2313 **Number of Lanes**: 2 **Estimated Capacity**: 2000 veh/hr/lane	

Three lane speed/flow curves

Location: M1 J10 to J11 **HE link identifier: LM153** **Number of Lanes: 3** **Estimated Capacity: 2200 veh/hr/lane**	
Location: M1 J11 to J10 **HE link identifier:** LM154 **Number of Lanes:** 3 **Estimated Capacity:** 2200 veh/hr/lane	

Location: M1 J6 to J5 **HE link identifier:** LM248 **Number of Lanes:** 3 **Estimated Capacity:** 2200 veh/hr	

Appendix F. Buffer index as a measure of journey time reliability

The buffer index is described by the U.S. Federal Highway Administration as:

The extra time (or time cushion) that travellers must add to their average travel time when planning trips to ensure on-time arrival.

For example, a buffer index of 40 percent means that for a trip that usually takes 20 minutes a traveller should budget an additional 8 minutes to ensure on-time arrival most of the time.

Average travel time = 20 minutes
Buffer index = 40 percent
Buffer time = 20 minutes × 0.40 = 8 minutes

The 8 extra minutes is called the buffer time. Therefore, the traveller should allow 28 minutes for the trip in order to ensure on-time arrival 95 percent of the time. (FWHA)

The buffer index is calculated using the following equation:

$$For\ a\ specific\ route\ and\ time\ period:$$

$$Buffer\ index\ (\%) = \frac{95^{th}\ percentile\ travel\ time - average\ travel\ time}{average\ travel\ time}$$

Appendix G. Travel speed distributions

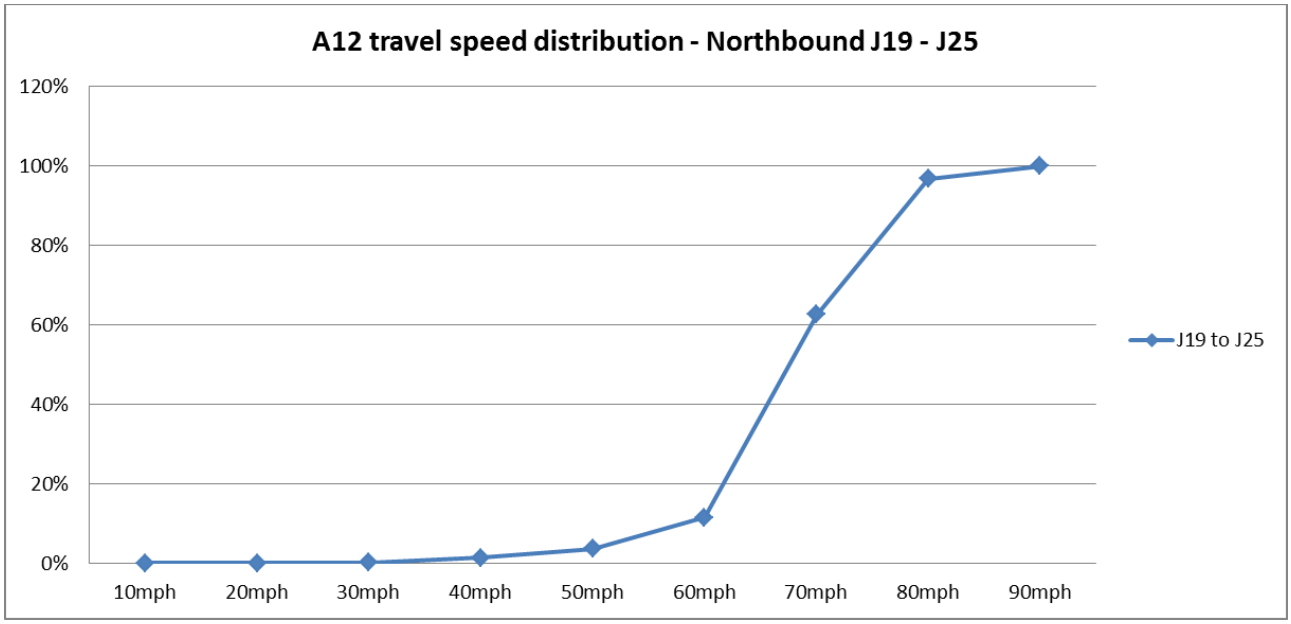


Figure 10.1 : Travel speed distribution on the A12 - NB

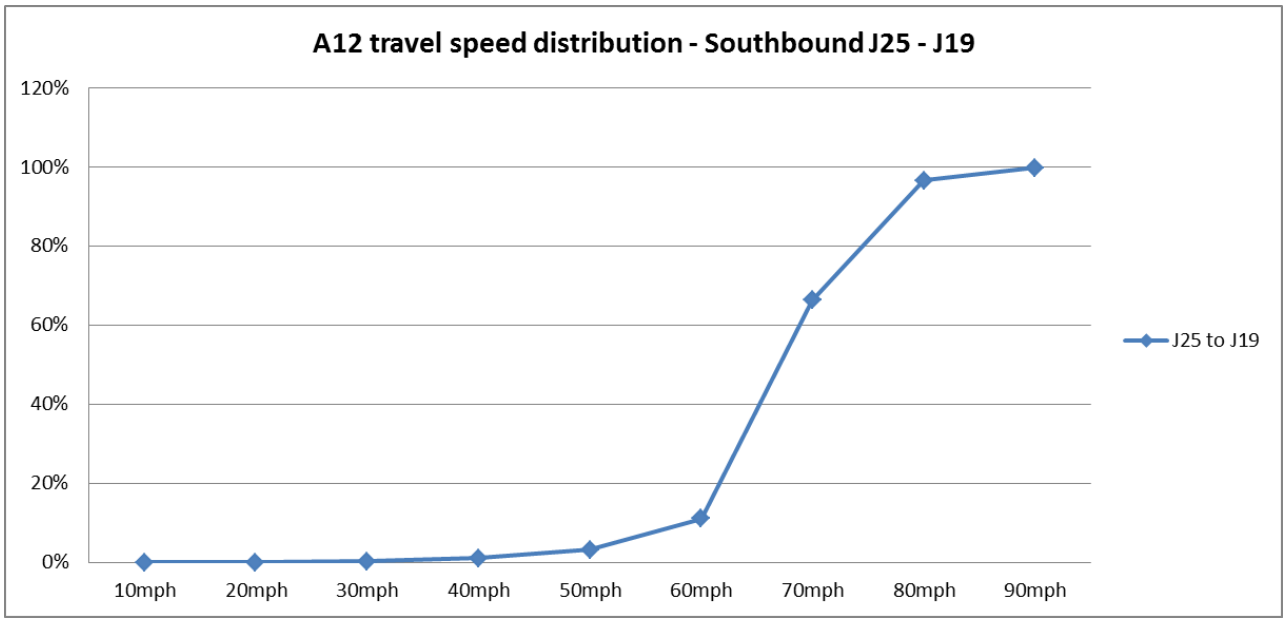


Figure 10.2 : Travel speed distribution on the A12 - SB

Appendix H. Collision and incident data

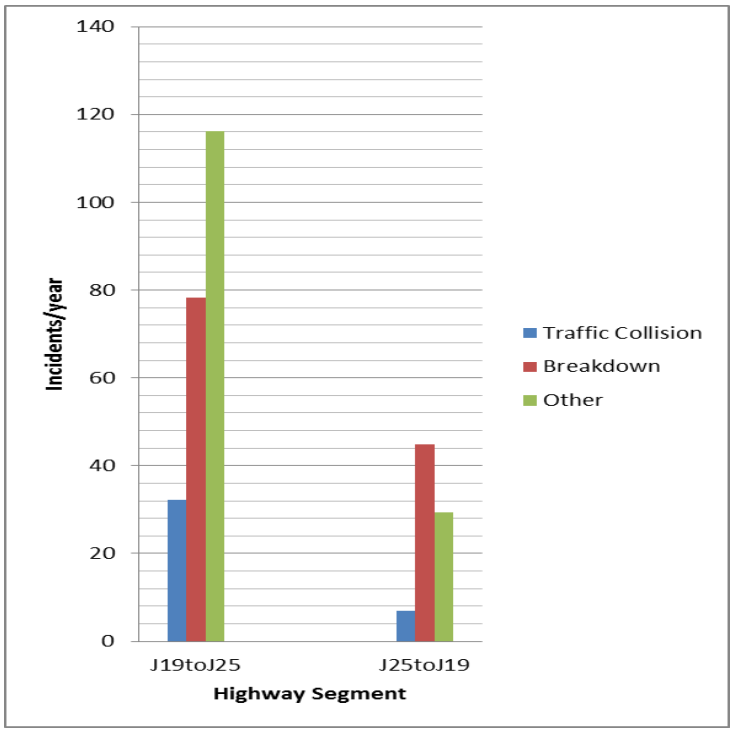


Figure 10.3 : Average 5 year Incident breakdown

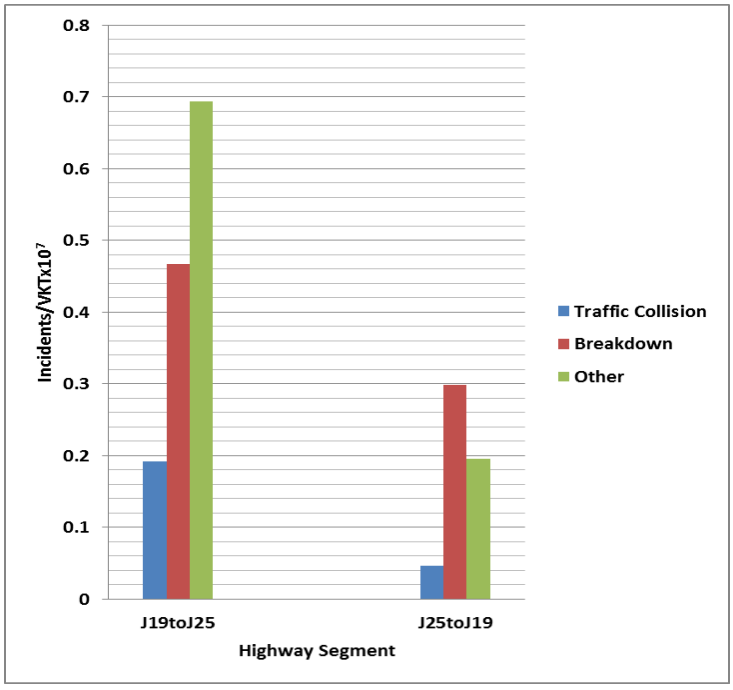
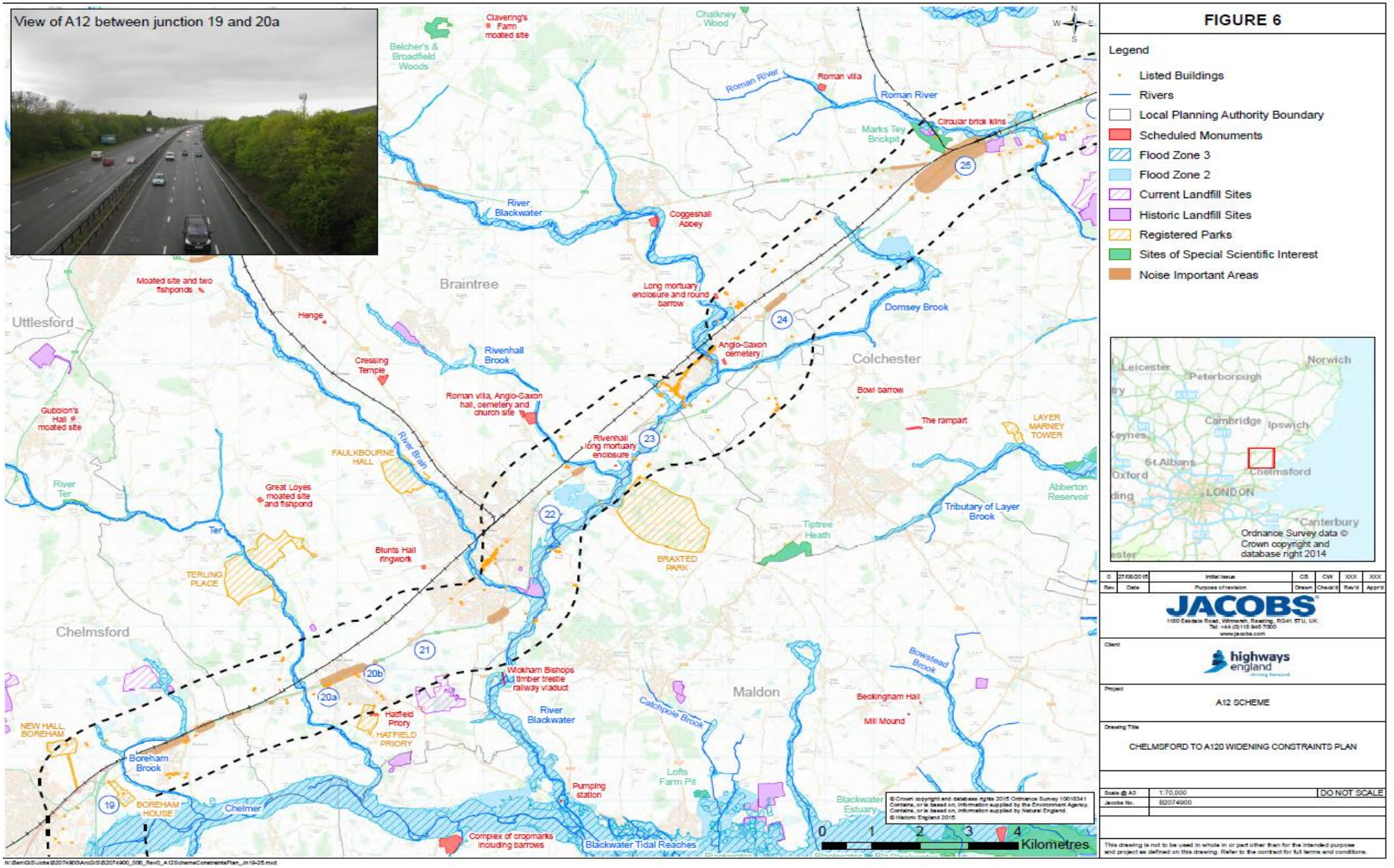


Figure 10.4 : 5 year annual average Incident per vehicle kilometres

Appendix I. Environmental constraints plan



Appendix J. Early assessment and sifting tool outputs

Early Assessment and Sifting Tool - *Saved Option*

Option name/no.	HI03 J19-J22, J22-J23, J24-25
Date	16/11/2015
Description	Offline Improvements J22-23, J24-25, Online Widening and Junction Improvements (Capacity & Safety Enhancements) including removal of J20B

Strategic

Identified problems and objectives	The A12 is a strategic route connecting London and South East England. The section of the A12 between J19-J25 has been identified to experience capacity and resilience issues and will struggle to operate under forecast growth demands. Online and offline	
Scale of Impact	5. Significant impact	These upgrades will significantly improve the operation of
Fit with wider transport and government objectives	4	This option fits well with the wider transport and
Fit with other objectives	4	This option fits well with local and regional objectives
Key uncertainties	The effect on overall journey times and carbon emissions. Land take and potential	
Degree of consensus over outcomes	3	Some consulation has taken place with stakeholders

Economic

Economic growth	5. Green	This scheme aims to improve journey time and reliability
Carbon emissions	3. Amber	Impacts on air quality and carbon emissions could
Socio-distributional impacts and the regions	5. Green	Potential benefit in terms of reduced congestion for local
Local environment	2. Red/amber	There could be both positive and negative impacts on
Well being	4. Amber/green	Minimal impact. However the scheme aims to improve
Expected VfM Category	2. High 2-4	Likely to deliver a high cost benefit

Managerial

Implementation timetable	6. 5-10 years	
Public acceptability	Don't know	No direct public consultation undertaken on the scheme
Practical feasibility	3	Feasible scheme with challenges
What is the quality of the supporting evidence?	3	Reasonable level of supporting evidence
Key risks	Enviornmental concerns/ecological unknowns. Close proximity of properties for online widening. Crossing of the railway line where route goes offline.	

Financial

Affordability	1. Not affordable		
Capital Cost (£m)	09. 500-1000		
Revenue Costs (£m)	Don't know	There would be on-going maintenance costs associated	
Cost profile			
Overall cost risk	Don't know	Other costs	

Commercial

Flexibility of option	3	This scheme could be scaled down depending on the
Where is funding coming from?		
Any income generated (£m)	No	

Early Assessment and Sifting Tool - *Saved Option*

Option name/no.	HI03a J19-J22, J22-J23, J24-25
Date	18/11/2015
Description	As Option HI03 with a reduced specification of upgrades on road links between J19-25. This option removes certain elements from the overall costed package including a reduced number or more limited specification of structures, earthworks, pavement, landscaping and technology, with

Strategic

Identified problems and objectives	The A12 is a strategic route connecting London and South East England. The section of the A12 between J19-J25 has been identified to experience capacity and resilience issues and will struggle to operate under forecast growth demands. Online and offline	
Scale of Impact	4	This scheme is expected to have a reasonably significant
Fit with wider transport and government objectives	4	Growth, tackling congestion and improving safety.
Fit with other objectives	4	This option fits well with local and regional objectives
Key uncertainties	Land take and potential building demolition requirements.	
Degree of consensus over outcomes	3	Some consultation has taken place with stakeholders

Economic

Economic growth	5. Green	This scheme aims to improve journey time and reliability
Carbon emissions	3. Amber	Impacts on air quality and carbon emissions could
Socio-distributional impacts and the regions	5. Green	Potential benefit in terms of reduced congestion for local
Local environment	2. Red/amber	There could be both positive and negative impacts on
Well being	4. Amber/green	Minimal impact. The scheme aims to improve travel in
Expected VfM Category	2. High 2-4	Likely to deliver high value for money.

Managerial

Implementation timetable	6. 5-10 years	
Public acceptability	Don't know	Public acceptability is unknown. Stakeholders aware of
Practical feasibility	3	Option is feasible, but cost of offline scheme that
What is the quality of the supporting evidence?	3	Commensurate with Stage 1 OAR.
Key risks	Environmental concerns/ecological unknowns. Close proximity of properties for online widening. Crossing of the railway line where route goes offline.	

Financial

Affordability	2	More affordable than HI03 because of reduced number or	
Capital Cost (£m)	09. 500-1000		
Revenue Costs (£m)	Don't know		
Cost profile			
Overall cost risk	Don't know	Other costs	

Commercial

Flexibility of option	4	
Where is funding coming from?		
Any income generated (£m)	No	

Early Assessment and Sifting Tool - *Saved Option*

Option name/no.	HI04
Date	17/11/2015
Description	Online link capacity improvements between J19 and J22. Offline improvements between J22 to J23, and J24 to 25. Junction improvements to J19 could be delivered separately as part of the Chelmsford North East

Strategic

Identified problems and objectives	The A12 is a strategic route connecting London and South East England. The section of the A12 between J19-J25 has been identified to experience capacity and resilience issues and will struggle to operate under forecast growth demands. Online and offline	
Scale of Impact	4	Impact less than HI-03 due to no upgrade between
Fit with wider transport and government objectives	3	Less of route upgraded so less of a fit (compared to other
Fit with other objectives	3	Same as fit with wider transport and government
Key uncertainties	Land take and potential building demolition requirements	
Degree of consensus over outcomes	3	Reduced consensus due to less of route (compared with

Economic

Economic growth	4. Amber/green	Would assist economic growth as most of section is
Carbon emissions	3. Amber	Impacts on air quality and carbon emissions could
Socio-distributional impacts and the regions	3. Amber	Potential benefits in terms of reduced congestion for
Local environment	2. Red/amber	There could be both positive and negative impacts on
Well being	4. Amber/green	Well being should improve as additional road capacity is
Expected VfM Category	2. High 2-4	High value for money expected.

Managerial

Implementation timetable	6. 5-10 years	
Public acceptability	Don't know	No public consultation has been undertaken. Scheme
Practical feasibility	4	Less road upgraded so feasibility is greater.
What is the quality of the supporting evidence?	3	Commensurate with Stage 1 OAR
Key risks	Enviommental concerns/ecological unknowns. Close proximity of properties for online widening. Crossing of the railway line where route goes offline.	

Financial

Affordability	3		
Capital Cost (£m)	09. 500-1000		
Revenue Costs (£m)	Don't know		
Cost profile			
Overall cost risk	Don't know	Other costs	

Commercial

Flexibility of option	4	
Where is funding coming from?		
Any income generated (£m)	No	

Early Assessment and Sifting Tool - *Saved Option*

Option name/no.	HI05
Date	18/11/2015
Description	Offline Improvements J22 - 23, Online Widening and Junction Improvements (Capacity & Safety Enhancements) . No upgrade J23 - J25

Strategic

Identified problems and objectives	The A12 is a strategic route connecting London and South East England. The section of the A12 between J19-J25 has been identified to experience capacity and resilience issues and will struggle to operate under forecast growth demands. Online and offline	
Scale of Impact	3	Sections between J23 and J25 have no change to the
Fit with wider transport and government objectives	3	Lower capacity improvement, therefore less of a fit with
Fit with other objectives	3	Lower capacity improvement, therefore less of a fit with
Key uncertainties	Performance of the scheme. The effect on overall journey times. Land take	
Degree of consensus over outcomes	3	Scheme likely to offer less benefit compared to other

Economic

Economic growth	3. Amber	Scheme likely to offer less benefit compared to other
Carbon emissions	3. Amber	Impacts on air quality and carbon emissions could
Socio-distributional impacts and the regions	3. Amber	Will afford less economic growth in this strategic
Local environment	2. Red/amber	There could be both positive and negative impacts on
Well being	4. Amber/green	Will afford less economic growth in this strategic corridor
Expected VfM Category	2. High 2-4	

Managerial

Implementation timetable	6. 5-10 years	
Public acceptability	Don't know	No public consultation has been undertaken, but
Practical feasibility	4	Less road widening, so therefore has greater feasibility.
What is the quality of the supporting evidence?	3	Commensurate with Stage 1 OAR.
Key risks	Environmental concerns/ecological unknowns. Close proximity of properties for online widening. Crossing of the railway line where route goes offline.	

Financial

Affordability	4	Scheme is more affordable that some of the alternatives.	
Capital Cost (£m)	08. 250-500		
Revenue Costs (£m)	Don't know		
Cost profile			
Overall cost risk	Don't know	Other costs	

Commercial

Flexibility of option	3	
Where is funding coming from?		
Any income generated (£m)	No	

Early Assessment and Sifting Tool - *Saved Option*

Option name/no.	HI06
Date	18/11/2015
Description	Online widening between J19-21 and offline improvements J22-23. No upgrades between J21-22 or J23-25

Strategic

Identified problems and objectives	The A12 is a strategic route connecting London and South East England. The section of the A12 between J19-J25 has been identified to experience capacity and resilience issues and will struggle to operate under forecast growth demands. Online and offline	
Scale of Impact	3	Less of the route (compared with other options) is being
Fit with wider transport and government objectives	3	Scheme fits with wider objectives, but may have less
Fit with other objectives	3	Scheme fits with objectives, but may have less impact.
Key uncertainties	Performance of the scheme. The effect on overall journey times. Land take	
Degree of consensus over outcomes	3	Scheme is being considered in optioneering.

Economic

Economic growth	3. Amber	Compared with other options, less of the network is
Carbon emissions	3. Amber	Upgraded sections may have improvement due to
Socio-distributional impacts and the regions	3. Amber	Will offer some improvement to conditions in the corridor.
Local environment	2. Red/amber	Offline widening likely to have local environmental impact.
Well being	3. Amber	Will offer some transport improvement in the A12
Expected VfM Category	2. High 2-4	

Managerial

Implementation timetable	6. 5-10 years	
Public acceptability	Don't know	Unknown. Options being considered in the OAR.
Practical feasibility	3	Feasible.
What is the quality of the supporting evidence?	3	Commensurate with stage in OAR process.
Key risks	Impact on adjacent junctions and links which are not being upgraded. Enviornmental concerns/ecological unknowns. Close proximity of properties for online widening.	

Financial

Affordability	5. Affordable		
Capital Cost (£m)	08. 250-500		
Revenue Costs (£m)	Don't know		
Cost profile			
Overall cost risk	Don't know	Other costs	

Commercial

Flexibility of option	3	
Where is funding coming from?		
Any income generated (£m)	No	

Early Assessment and Sifting Tool - *Saved Option*

Option name/no.	HI09
Date	18/11/2015
Description	Online Widening J20A-J21 and Junction Improvements (Capacity & Safety Enhancements)

Strategic

Identified problems and objectives	The A12 is a strategic route connecting London and South East England. The section of the A12 between J19-J25 has been identified to experience capacity and resilience issues and will struggle to operate under forecast growth demands. Online improvements would	
Scale of Impact	2	Option has online widening between junctions 19 and 21
Fit with wider transport and government objectives	3	Supports objectives, but offers lower capacity
Fit with other objectives	3	Supports objectives, but offers lower capacity
Key uncertainties	Performance of the scheme. The effect on overall journey times. Land take	
Degree of consensus over outcomes	3	Would potentially be the easiest scheme to deliver due

Economic

Economic growth	2. Red/amber	Less road upgraded, which potentially means less
Carbon emissions	3. Amber	Capacity improvements could facilitate smoother flow of
Socio-distributional impacts and the regions	2. Red/amber	Less road upgraded, which potentially means less
Local environment	3. Amber	There would be impacts on the local environment along
Well being	2. Red/amber	Less road upgraded, which potentially means less
Expected VfM Category	1. Very High >4	

Managerial

Implementation timetable	6. 5-10 years	
Public acceptability	Don't know	
Practical feasibility	3	
What is the quality of the supporting evidence?	3	
Key risks	Impact on adjacent junctions and links which are not being upgraded. Enviornmental concerns/ecological unknowns. Close proximity of properties for online widening.	

Financial

Affordability	5. Affordable		
Capital Cost (£m)	07. 100-250		
Revenue Costs (£m)	Don't know		
Cost profile			
Overall cost risk	Don't know	Other costs	

Commercial

Flexibility of option	2	
Where is funding coming from?		
Any income generated (£m)	No	

Appendix K: Appraisal summary tables

Appraisal Summary Table

Date produced:	7	12	2015

Contact:	
Name	TBC
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	A12 Chelmsford (Boreham Interchange) to Marks Tey (A120) Improvement
Description of scheme:	Improvement of A12 to expressway standard between junction 19 at Chelmsford and 25 at Marks Tey. Scheme includes offline bypasses between junctions 22 -23 and junctions 24-25, online widening for the remainder of the route and associated junction improvements.

Impacts		Summary of key impacts	Assessment					
			Quantitative			Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	The Scheme is likely to generate benefits for business users through addressing issues with the capacity and capability of the existing network. In the future, these issues will be exacerbated by growth across the Region which will generate significant issues for transport users. The Scheme is likely to improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits and vehicle operating cost savings.	Value of journey time changes(£) / Net journey time changes (£): 0 to 2min: Not quantified at this stage. | 2 to 5min: Not quantified at this stage. | > 5min: Not quantified at this stage.			Large Beneficial	WebTAG reliability analysis not carried out at this stage.	Not quantified at this stage.
	Reliability impact on Business users	Journey time reliability has been highlighted as a key problem on the route. The Scheme will improve journey time reliability for all users, including business users, through reduced congestion and junction delays during peak hours making the overall traffic situation more predictable.	Not quantified at this stage.			Large Beneficial	WebTAG reliability analysis not carried out at this stage.	
	Regeneration	Not assessed at this stage.	Not quantified at this stage.				WebTAG regeneration analysis not carried out at this stage.	
	Wider Impacts	Not assessed at this stage.	Not quantified at this stage.				WebTAG Wider Impacts analysis not carried out at this stage.	
Environmental	Noise	The bypass sections of the scheme could reduce the number of noise important areas along the route, as they will generally take traffic away from residential properties. However, there are sections where the widening is likely to move the traffic closer to residential areas, which is likely to result in increased noise to these properties. This could result in a significant impact for noise and will require mitigation to attenuate the effect. Assuming this mitigation is in place, the balancing of these positive and negative effects is considered to be neutral.	Not quantified at this stage.			Neutral	WebTAG noise analysis not carried out at this stage.	Not quantified at this stage.
	Air Quality	There are no AQMAs along this section of the route. Reduction in queueing is likely to result in an improvement in air quality. The bypass sections will generally move traffic further away from residential areas, which could improve air quality for local residents.	Not quantified at this stage.			Slight beneficial	WebTAG air quality analysis not carried out at this stage.	Not quantified at this stage.
	Greenhouse gases	Not assessed at this stage.	Change in non-traded carbon over 60y (CO2e): Not quantified / Change in traded carbon over 60y (CO2e): Not quantified			Unknown	TUBA analysis not carried out at this stage.	
	Landscape	The road widening and new bypass sections is likely to result in significant effects on the local landscape. The route will need to be designed to minimise the loss of existing mature screening along the current A12 and to avoid impacting on sensitive viewpoints. A landscape assessment would be required at the next stage to help inform the alignment of the route including making use of existing landscape features to minimise the visual intrusion e.g. minimising impacting mature trees which could screen the route and making use of local landforms.	Not quantified at this stage.			Large adverse	WebTAG landscape analysis not carried out at this stage.	
	Townscape	The road widening will affect the edges of existing settlements including Witham. Therefore the widening could have a significant effect on the townscape character, adding to the urban infrastructure.	N/A			Moderate adverse	N/A	
	Historic Environment	The new bypass routes and widening areas have the potential for significant effects on archaeology and the historic environment. The proposed offline sections will pass closer to Listed Buildings than the existing A12 between Junctions 24 and 25. A detailed programme of archaeological mitigation work is likely to be required.	N/A			Slight adverse	N/A	
	Biodiversity	There are no nationally designated sites affected by the route but there is the potential for impacts to protected species and local habitats. Part of the widening will also be located in / adjacent to Whet Mead Local Nature Reserve. An ecology survey will be required at the next stage to identify sensitive areas to avoid and to inform the detailed programme regarding surveys and consents.	N/A			Slight adverse	N/A	
	Water Environment	The route will cross the floodplain of the River Blackwater, Domsey Brook and other watercourses. The route will require an assessment under the Water Framework Directive and will also require a flood risk assessment. Mitigation will be required for any loss of floodplain or barrier to flows. This is likely to involve non-standard mitigation which will need to be agreed with the Environment Agency.	N/A			Slight adverse	N/A	
Social	Commuting and Other users	The Scheme is likely to generate benefits for commuters and other users through addressing issues with the capacity and capability of the existing network. In the future, these issues will be exacerbated by growth across the Region which will generate significant issues for transport users. The Scheme is likely to improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits and vehicle operating cost savings.	Value of journey time changes(£) / Net journey time changes (£): 0 to 2min: Not quantified at this stage. | 2 to 5min: Not quantified at this stage. | > 5min: Not quantified at this stage.			Large Beneficial	WebTAG reliability analysis not carried out at this stage.	Not quantified at this stage.
	Reliability impact on Commuting and Other users	The Scheme will improve journey time reliability for all users, including commuters and other users, through reduced congestion and junction delays during peak hours making the overall traffic situation more predictable.	Not quantified at this stage.			Large Beneficial	WebTAG reliability analysis not carried out at this stage.	
	Physical activity	Improving the A12 is unlikely to lead to increased numbers of walkers and cyclists nor is it likely to lead to longer trips for those that do. The Scheme is therefore expected to have minimal impact on physical activity.	Not quantified at this stage.			Neutral	WebTAG physical activity analysis not carried out at this stage.	
	Journey quality	The Scheme is likely to reduce congestion and improve journey times leading to reduced traveller stress alongside making travel along the A12 less confusing for unfamiliar travellers through having less at grade junctions.	Not quantified at this stage.			Moderate Beneficial	WebTAG journey quality analysis not carried out at this stage.	
	Accidents	The reduction in traffic flows on existing sections of the network and at particular junctions as a result of the proposed Scheme are anticipated to result in a slight reduction in the number and severity of accidents.	Not quantified at this stage.			Moderate Beneficial	COBALT analysis not carried out at this stage.	Not quantified at this stage.
	Security	No impacts on personal security are expected as a result of the Scheme.	N/A			Neutral	N/A	Neutral Impact
	Access to services	Slight benefits offered in terms of public transport reliability and punctuality through reduced congestion.	N/A			Slight Beneficial	N/A	Not quantified at this stage.
	Affordability	The Scheme offers potential benefits through reduced vehicle operating costs (e.g. car fuel and non-fuel operating costs) associated with changes in journey speeds and reduced congestion across the network.	N/A			Slight Beneficial	N/A	Not quantified at this stage.
	Severance	The Scheme does not propose to remove or add distance to any existing access routes for NMUs and it is therefore unlikely to lead to increase severance. It is likely that decreased traffic on the detrunked A12 between junctions 22 -23 (through Rivenhall End) and junctions 24-25 (through Long Green and Pott's Green) will reduce severance in these areas by creating a road environment more amenable to NMUs.	N/A			Moderate Beneficial	N/A	Not quantified at this stage.
	Option and non-use values	Not assessed - the Scheme in itself does not substantially change the availability of transport services within the study area.	N/A			Neutral	N/A	
Public Accounts	Cost to Broad Transport Budget	Highways England Commercial have estimated scheme cost at £750m in 2014 prices	N/A			N/A	Analysis not carried out at this stage.	
	Indirect Tax Revenues	Not assessed at this stage	N/A			N/A	Analysis not carried out at this stage.	

Appraisal Summary Table

Date produced:	7	12	2015

Contact:	
Name	TBC
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	A12 Chelmsford (Boreham Interchange) to Marks Tey (A120) Improvement
Description of scheme:	Improvement of A12 to expressway standard between junction 19 at Chelmsford and 25 at Marks Tey. Scheme includes offline bypasses between junctions 22 -23 and junctions 24-25, online widening for the remainder of the route and associated junction improvements.

Impacts		Summary of key impacts	Assessment					
			Quantitative			Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	The Scheme is likely to generate benefits for business users through addressing issues with the capacity and capability of the existing network. In the future, these issues will be exacerbated by growth across the Region which will generate significant issues for transport users. The Scheme is likely to improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits and vehicle operating cost savings.	Value of journey time changes(£)			Large Beneficial	WebTAG reliability analysis not carried out at this stage.	Not quantified at this stage.
			Net journey time changes (£)					
			0 to 2min	2 to 5min	> 5min			
			Not quantified at this stage.	Not quantified at this stage.	Not quantified at this stage.			
	Reliability impact on Business users	Journey time reliability has been highlighted as a key problem on the route. The Scheme will improve journey time reliability for all users, including business users, through reduced congestion and junction delays during peak hours making the overall traffic situation more predictable.	Not quantified at this stage.			Large Beneficial	WebTAG reliability analysis not carried out at this stage.	
	Regeneration	Not assessed at this stage.	Not quantified at this stage.				WebTAG regemeration analysis not carried out at this stage.	
	Wider Impacts	Not assessed at this stage.	Not quantified at this stage.				WebTAG Wider Impacts analysis not carried out at this stage.	
Environmental	Noise	The bypass sections of the scheme could reduce the number of noise important areas along the route, as they will generally take traffic away from residential properties. However, there are sections where the widening is likely to move the traffic closer to residential areas, which is likely to result in increased noise to these properties. This could result in a significant impact for noise and will require mitigation to attenuate the effect. Assuming this mitigation is in place, the balancing of these positive and negative effects is considered to be neutral.	Not quantified at this stage.			Neutral	WebTAG noise analysis not carried out at this stage.	Not quantified at this stage.
	Air Quality	There are no AQMAs along this section of the route. Reduction in queueing is likely to result in an improvement in air quality. The bypass sections will generally move traffic further away from residential areas, which could improve air quality for local residents.	Not quantified at this stage.			Slight beneficial	WebTAG air quality analysis not carried out at this stage.	Not quantified at this stage.
	Greenhouse gases	Not assessed at this stage.	Change in non-traded carbon over 60y (CO_2e)	Not quantified		Unknown	TUBA analysis not carried out at this stage.	
			Change in traded carbon over 60y (CO_2e)	Not quantified				
	Landscape	The road widening and new bypass sections is likely to result in significant effects on the local landscape. The route will need to be designed to minimise the loss of existing mature screening along the current A12 and to avoid impacting on sensitive viewpoints. A landscape assessment would be required at the next stage to help inform the alignment of the route including making use of existing landscape features to minimise the visual intrusion e.g. minimising impacting mature trees which could screen the route and making use of local landforms.	Not quantified at this stage.			Large adverse	WebTAG landscape analysis not carried out at this stage.	
	Townscape	The road widening will affect the edges of existing settlements including Witham. Therefore the widening could have a significant effect on the townscape character, adding to the urban infrastructure.	N/A			Moderate adverse	N/A	
	Historic Environment	The new bypass routes and widening areas have the potential for significant effects on archaeology and the historic environment. The proposed offline sections will pass closer to Listed	N/A			Slight adverse	N/A	
	Biodiversity	There are no nationally designated sites affected by the route but there is the potential for impacts to protected species and local habitats. Part of the widening will also be located in / adjacent to Whet Mead Local Nature Reserve. An ecology survey will be required at the next stage to identify sensitive areas to avoid and to inform the detailed programme regarding surveys and consents.	N/A			Slight adverse	N/A	
	Water Environment	The route will cross the floodplain of the River Blackwater, Domsey Brook and other watercourses. The route will require an assessment under the Water Framework Directive and will also require a flood risk assessment. Mitigation will be required for any loss of floodplain or barrier to flows. This is likely to involve non-standard mitigation which will need to be agreed with the Environment Agency.	N/A			Slight adverse	N/A	
Social	Commuting and Other users	The Scheme is likely to generate benefits for commuters and other users through addressing issues with the capacity and capability of the existing network. In the future, these issues will be exacerbated by growth across the Region which will generate significant issues for transport users. The Scheme is likely to improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits and vehicle operating cost savings.	Value of journey time changes(£)			Large Beneficial	WebTAG reliability analysis not carried out at this stage.	Not quantified at this stage.
			Net journey time changes (£)					
			0 to 2min	2 to 5min	> 5min			
			Not quantified at this stage.	Not quantified at this stage.	Not quantified at this stage.			
	Reliability impact on Commuting and Other users	The Scheme will improve journey time reliability for all users, including commuters and other users, through reduced congestion and junction delays during peak hours making the overall traffic situation more predictable.	Not quantified at this stage.			Large Beneficial	WebTAG reliability analysis not carried out at this stage.	
	Physical activity	Improving the A12 is unlikely to lead to increased numbers of walkers and cyclists nor is it likely to lead to longer trips for those that do. The Scheme is therefore expected to have minimal impact on physical activity.	Not quantified at this stage.			Neutral	WebTAG physical activity analysis not carried out at this stage.	
	Journey quality	The Scheme is likely to reduce congestion and improve journey times leading to reduced traveller stress alongside making travel along the A12 less confusing for unfamiliar travellers through having less at grade junctions.	Not quantified at this stage.			Moderate Beneficial	WebTAG journey quality analysis not carried out at this stage.	
	Accidents	The reduction in traffic flows on existing sections of the network and at particular junctions as a result of the proposed Scheme are anticipated to result in a slight reduction in the number and severity of accidents.	Not quantified at this stage.			Moderate Beneficial	COBALT analysis not carried out at this stage.	Not quantified at this stage.
	Security	No impacts on personal security are expected as a result of the Scheme.	N/A			Neutral	N/A	Neutral Impact
	Access to services	Slight benefits offered in terms of public transport reliability and punctuality through reduced congestion.	N/A			Slight Beneficial	N/A	Not quantified at this stage.
	Affordability	The Scheme offers potential benefits through reduced vehicle operating costs (e.g. car fuel and non-fuel operating costs) associated with changes in journey speeds and reduced congestion across the network.	N/A			Slight Beneficial	N/A	Not quantified at this stage.
	Severance	The Scheme does not propose to remove or add distance to any existing access routes for NMUs and it is therefore unlikely to lead to increase severance. It is likely that decreased traffic on the detrunked A12 between junctions 22 -23 (through Rivenhall End) and junctions 24-25 (through Long Green and Pott's Green) will reduce severance in these areas by creating a road environment more amenable to NMUs.	N/A			Moderate Beneficial	N/A	Not quantified at this stage.
	Option and non-use values	Not assessed - the Scheme in itself does not substantially change the availability of transport services within the study area.	N/A			Neutral	N/A	
Public Accounts	Cost to Broad Transport Budget	Highways England Commercial have estimated scheme cost at £750m in 2014 prices	N/A			N/A	Analysis not carried out at this stage.	
	Indirect Tax Revenues	Not assessed at this stage	N/A			N/A	Analysis not carried out at this stage.	

Appraisal Summary Table

Date produced:	7	12	2015

Contact:	
Name	TBC
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	A12 Chelmsford (Boreham Interchange) to Marks Tey (A120) Improvement
Description of scheme:	Improvement of A12 to expressway standard between junction 19 at Chelmsford and 25 at Marks Tey. Scheme includes online link capacity improvements between junctions 19 and J22, offline bypassses between junctions 22- 23, and 24 - 25. Junction improvements to junction 19 could be delivered separately as part of the Chelmsford north east bypass works.

Impacts		Summary of key impacts	Assessment: Quantitative	Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	The Scheme is likely to generate benefits for business users through addressing issues with the capacity and capability of the existing network. In the future, these issues will be exacerbated by growth across the Region which will generate significant issues for transport users. The Scheme is likely to improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits and vehicle operating cost savings.	Value of journey time changes(£) — Net journey time changes (£): 0 to 2min: Not quantified at this stage. / 2 to 5min: Not quantified at this stage. / > 5min: Not quantified at this stage.	Large Beneficial	WebTAG reliability analysis not carried out at this stage.	Not quantified at this stage.
	Reliability impact on Business users	Journey time reliability has been highlighted as a key problem on the route. The Scheme will improve journey time reliability for all users, including business users, through reduced congestion and junction delays during peak hours making the overall traffic situation more predictable.	Not quantified at this stage.	Large Beneficial	WebTAG reliability analysis not carried out at this stage.	
	Regeneration	Not assessed at this stage.	Not quantified at this stage.		WebTAG regemeration analysis not carried out at this stage.	
	Wider Impacts	Not assessed at this stage.	Not quantified at this stage.		WebTAG Wider Impacts analysis not carried out at this stage.	
Environmental	Noise	The bypass sections of the scheme could reduce the number of noise important areas along the route, as they will generally take traffic away from residential properties. However, there are sections where the widening is likely to move the traffic closer to residential areas, which is likely to result in increased noise to these properties. This could result in a significant impact for noise and will require mitigation to attenuate the effect. Assuming this mitigation is in place, the balancing of these positive and negative effects is considered to be neutral.	Not quantified at this stage.	Neutral	WebTAG noise analysis not carried out at this stage.	Not quantified at this stage.
	Air Quality	There are no AQMAs along this section of the route. Reduction in queueing is likely to result in an improvement in air quality. The bypass sections will generally move traffic further away from residential areas, which could improve air quality for local residents.	Not quantified at this stage.	Slight beneficial	WebTAG air quality analysis not carried out at this stage.	Not quantified at this stage.
	Greenhouse gases	Not assessed at this stage.	Change in non-traded carbon over 60y (CO2e): Not quantified	Unknown	TUBA analysis not carried out at this stage.	
	Landscape	The road widening and new bypass sections is likely to result in significant effects on the local landscape. The route will need to be designed to minimise the loss of existing mature screening along the current A12 and to avoid impacting on sensitive viewpoints. A landscape assessment would be required at the next stage to help inform the alignment of the route including making use of existing landscape features to minimise the visual intrusion e.g. minimising impacting mature trees which could screen the route and making use of local landforms.	Not quantified at this stage.	Large adverse	WebTAG landscape analysis not carried out at this stage.	
	Townscape	The road widening will affect the edges of existing settlements including Witham. Therefore the widening could have a significant effect on the townscape character, adding to the urban infrastructure.	N/A	Moderate adverse	N/A	
	Historic Environment	The new bypass routes and widening areas have the potential for significant effects on archaeology and the historic environment. The proposed offline sections will pass closer to Listed Buildings than the existing A12 between Junctions 24 and 25. A detailed programme of archaeological mitigation work is likely to be required.	N/A	Slight adverse	N/A	
	Biodiversity	There are no nationally designated sites affected by the route but there is the potential for impacts to protected species and local habitats. Part of the widening will also be located in / adjacent to Whet Mead Local Nature Reserve. An ecology survey will be required at the next stage to identify sensitive areas to avoid and to inform the detailed programme regarding surveys and consents.	N/A	Slight adverse	N/A	
	Water Environment	The route will cross the floodplain of the River Blackwater and other watercourses. The route will require an assessment under the Water Framework Directive and will also require a flood risk assessment. Mitigation will be required for any loss of floodplain or barrier to flows. This is likely to involve non-standard mitigation which will need to be agreed with the Environment Agency.	N/A	Slight adverse	N/A	
Social	Commuting and Other users	The Scheme is likely to generate benefits for commuters and other users through addressing issues with the capacity and capability of the existing network. In the future, these issues will be exacerbated by growth across the Region which will generate significant issues for transport users. The Scheme is likely to improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits and vehicle operating cost savings.	Value of journey time changes(£) — Net journey time changes (£): 0 to 2min: Not quantified at this stage. / 2 to 5min: Not quantified at this stage. / > 5min: Not quantified at this stage.	Large Beneficial	WebTAG reliability analysis not carried out at this stage.	Not quantified at this stage.
	Reliability impact on Commuting and Other users	The Scheme will improve journey time reliability for all users, including commuters and other users, through reduced congestion and junction delays during peak hours making the overall traffic situation more predictable.	Not quantified at this stage.	Large Beneficial	WebTAG reliability analysis not carried out at this stage.	
	Physical activity	Improving the A12 is unlikely to lead to increased numbers of walkers and cyclists nor is it likely to lead to longer trips for those that do. The Scheme is therefore expected to have minimal impact on physical activity.	Not quantified at this stage.	Neutral	WebTAG physical activity analysis not carried out at this stage.	
	Journey quality	The Scheme is likely to reduce congestion and improve journey times leading to reduced traveller stress alongside making travel along the A12 less confusing for unfamiliar travellers through having less at grade junctions.	Not quantified at this stage.	Moderate Beneficial	WebTAG journey quality analysis not carried out at this stage.	
	Accidents	The reduction in traffic flows on existing sections of the network and at particular junctions as a result of the proposed Scheme are anticipated to result in a slight reduction in the number and severity of accidents.	Not quantified at this stage.	Moderate Beneficial	COBALT analysis not carried out at this stage.	Not quantified at this stage.
	Security	No impacts on personal security are expected as a result of the Scheme.	N/A	Neutral	N/A	Neutral Impact
	Access to services	Slight benefits offered in terms of public transport reliability and punctuality through reduced congestion.	N/A	Slight Beneficial	N/A	Not quantified at this stage.
	Affordability	The Scheme offers potential benefits through reduced vehicle operating costs (e.g. car fuel and non-fuel operating costs) associated with changes in journey speeds and reduced congestion across the network.	N/A	Slight Beneficial	N/A	Not quantified at this stage.
	Severance	The Scheme does not propose to remove or add distance to any existing access routes for NMUs and it is therefore unlikely to lead to increase severance. It is likely that decreased traffic on the detrunked A12 between junctions 22 -23 (through Rivenhall End) and junctions 24-25 (through Long Green and Pott's Green) will reduce severance in these areas by creating a road environment more amenable to NMUs.	N/A	Moderate Beneficial	N/A	Not quantified at this stage.
	Option and non-use values	Not assessed - the Scheme in itself does not substantially change the availability of transport services within the study area.	N/A	Neutral	N/A	
Public Accounts	Cost to Broad Transport Budget	Highways England Commercial have estimated scheme cost at £750m in 2014 prices	N/A	N/A	Analysis not carried out at this stage.	
	Indirect Tax Revenues	Not assessed at this stage	N/A	N/A	Analysis not carried out at this stage.	

Appraisal Summary Table

Date produced:	7	12	2015

Contact:	
Name	TBC
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	A12 Chelmsford (Boreham Interchange) to Marks Tey (A120) Improvement
Description of scheme:	Improvement of A12 to expressway standard between junction 19 at Chelmsford and 25 at Marks Tey. Scheme includes an offline bypass between junctions 22 - 23, online widening and junction improvements (capacity and safety enhancements).

Impacts		Summary of key impacts	Assessment			
			Quantitative	Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	The Scheme is likely to generate benefits for business users through addressing issues with the capacity and capability of the existing network. In the future, these issues will be exacerbated by growth across the Region which will generate significant issues for transport users. The Scheme is likely to improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits and vehicle operating cost savings.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min: Not quantified at this stage. 2 to 5min: Not quantified at this stage. > 5min: Not quantified at this stage.	Large Beneficial	WebTAG reliability analysis not carried out at this stage.	Not quantified at this stage.
	Reliability impact on Business users	Journey time reliability has been highlighted as a key problem on the route. The Scheme will improve journey time reliability for all users, including business users, through reduced congestion and junction delays during peak hours making the overall traffic situation more predictable.	Not quantified at this stage.	Large Beneficial	WebTAG reliability analysis not carried out at this stage.	
	Regeneration	Not assessed at this stage.	Not quantified at this stage.		WebTAG regeneration analysis not carried out at this stage.	
	Wider Impacts	Not assessed at this stage.	Not quantified at this stage.		WebTAG Wider Impacts analysis not carried out at this stage.	
Environmental	Noise	The bypass section of the scheme could reduce the number of noise important areas along the route, as it will generally take traffic away from residential properties. However, there are sections where the widening is likely to move the traffic closer to residential areas, which is likely to result in increased noise to these properties. This could result in a significant impact for noise and will require mitigation to attenuate the effect. Assuming this mitigation is in place, the balancing of these positive and negative effects is considered to be neutral.	Not quantified at this stage.	Neutral	WebTAG noise analysis not carried out at this stage.	Not quantified at this stage.
	Air Quality	There are no AQMAs along this section of the route. Reduction in queueing is likely to result in an improvement in air quality. The bypass section will generally move traffic further away from residential areas, which could improve air quality for local residents.	Not quantified at this stage.	Slight beneficial	WebTAG air quality analysis not carried out at this stage.	Not quantified at this stage.
	Greenhouse gases	Not assessed at this stage.	Change in non-traded carbon over 60y (CO2e): Not quantified Change in traded carbon over 60y (CO2e): Not quantified	Unknown	TUBA analysis not carried out at this stage.	
	Landscape	The road widening and new bypass section is likely to result in significant effects on the local landscape. The route will need to be designed to minimise the loss of existing mature screening along the current A12 and to avoid impacting on sensitive viewpoints. A landscape assessment would be required at the next stage to help inform the alignment of the route including making use of existing landscape features to minimise the visual intrusion e.g. minimising impacting mature trees which could screen the route and making use of local landforms.	Not quantified at this stage.	Large adverse	WebTAG landscape analysis not carried out at this stage.	
	Townscape	The road widening will affect the edges of existing settlements including Witham. Therefore the widening could have a significant effect on the townscape character, adding to the urban infrastructure.	N/A	Moderate adverse	N/A	
	Historic Environment	The new bypass route and widening areas have the potential for significant effects on archaeology and the historic environment. A detailed programme of archaeological mitigation work is likely to be required.	N/A	Slight adverse	N/A	
	Biodiversity	There are no nationally designated sites affected by the route but there is the potential for impacts to protected species and local habitats. Part of the widening will also be located in / adjacent to Whet Mead Local Nature Reserve. An ecology survey will be required at the next stage to identify sensitive areas to avoid and to inform the detailed programme regarding surveys and consents.	N/A	Slight adverse	N/A	
	Water Environment	The route will cross the floodplain of the River Blackwater and other watercourses. The route will require an assessment under the Water Framework Directive and will also require a flood risk assessment. Mitigation will be required for any loss of floodplain or barrier to flows. This is likely to involve non-standard mitigation which will need to be agreed with the Environment Agency.	N/A	Slight adverse	N/A	
Social	Commuting and Other users	The Scheme is likely to generate benefits for commuters and other users through addressing issues with the capacity and capability of the existing network. In the future, these issues will be exacerbated by growth across the Region which will generate significant issues for transport users. The Scheme is likely to improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits and vehicle operating cost savings.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min: Not quantified at this stage. 2 to 5min: Not quantified at this stage. > 5min: Not quantified at this stage.	Large Beneficial	WebTAG reliability analysis not carried out at this stage.	Not quantified at this stage.
	Reliability impact on Commuting and Other users	The Scheme will improve journey time reliability for all users, including commuters and other users, through reduced congestion and junction delays during peak hours making the overall traffic situation more predictable.	Not quantified at this stage.	Large Beneficial	WebTAG reliability analysis not carried out at this stage.	
	Physical activity	Improving the A12 is unlikely to lead to increased numbers of walkers and cyclists nor is it likely to lead to longer trips for those that do. The Scheme is therefore expected to have minimal impact on physical activity.	Not quantified at this stage.	Neutral	WebTAG physical activity analysis not carried out at this stage.	
	Journey quality	The Scheme is likely to reduce congestion and improve journey times leading to reduced traveller stress alongside making travel along the A12 less confusing for unfamiliar travellers through having less at grade junctions.	Not quantified at this stage.	Moderate Beneficial	WebTAG journey quality analysis not carried out at this stage.	
	Accidents	The reduction in traffic flows on existing sections of the network and at particular junctions as a result of the proposed Scheme are anticipated to result in a slight reduction in the number and severity of accidents.	Not quantified at this stage.	Moderate Beneficial	COBALT analysis not carried out at this stage.	Not quantified at this stage.
	Security	No impacts on personal security are expected as a result of the Scheme.	N/A	Neutral	N/A	Neutral Impact
	Access to services	Slight benefits offered in terms of public transport reliability and punctuality through reduced congestion.	N/A	Slight Beneficial	N/A	Not quantified at this stage.
	Affordability	The Scheme offers potential benefits through reduced vehicle operating costs (e.g. car fuel and non-fuel operating costs) associated with changes in journey speeds and reduced congestion across the network.	N/A	Slight Beneficial	N/A	Not quantified at this stage.
	Severance	The Scheme does not propose to remove or add distance to any existing access routes for NMUs and it is therefore unlikely to lead to increase severance. It is likely that decreased traffic on the detrunked A12 between junctions 22 -23 (through Rivenhall End) will reduce severance in these areas by creating a road environment more amenable to NMUs.	N/A	Moderate Beneficial	N/A	Not quantified at this stage.
	Option and non-use values	Not assessed - the Scheme in itself does not substantially change the availability of transport services within the study area.	N/A	Neutral	N/A	
Public Accounts	Cost to Broad Transport Budget	Highways England Commercial have estimated scheme cost at £750m in 2014 prices	N/A	N/A	Analysis not carried out at this stage.	
	Indirect Tax Revenues	Not assessed at this stage	N/A	N/A	Analysis not carried out at this stage.	

Appraisal Summary Table

Date produced:	7	12	2015

Contact:	
Name	TBC
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	A12 Chelmsford (Boreham Interchange) to Marks Tey (A120) Improvement
Description of scheme:	Improvement of A12 to expressway standard between junction 19 at Chelmsford and 25 at Marks Tey. Scheme includes online widening between junctions 19 and 21 and offline improvements between junctions 22 and 23.

Impacts		Summary of key impacts	Assessment: Quantitative	Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	The Scheme is likely to generate benefits for business users through addressing issues with the capacity and capability of the existing network. In the future, these issues will be exacerbated by growth across the Region which will generate significant issues for transport users. The Scheme is likely to improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits and vehicle operating cost savings.	**Value of journey time changes(£)** — **Net journey time changes (£)**: 0 to 2min: Not quantified at this stage.; 2 to 5min: Not quantified at this stage.; > 5min: Not quantified at this stage.	Large Beneficial	WebTAG reliability analysis not carried out at this stage.	Not quantified at this stage.
	Reliability impact on Business users	Journey time reliability has been highlighted as a key problem on the route. The Scheme will improve journey time reliability for all users, including business users, through reduced congestion and junction delays during peak hours making the overall traffic situation more predictable.	Not quantified at this stage.	Large Beneficial	WebTAG reliability analysis not carried out at this stage.	
	Regeneration	Not assessed at this stage.	Not quantified at this stage.		WebTAG regemeration analysis not carried out at this stage.	
	Wider Impacts	Not assessed at this stage.	Not quantified at this stage.		WebTAG Wider Impacts analysis not carried out at this stage.	
Environmental	Noise	The bypass section of the scheme could reduce the number of noise important areas along the route, as it will generally take traffic away from residential properties. However, there are sections where the widening is likely to move the traffic closer to residential areas, which is likely to result in increased noise to these properties. This could result in a significant impact for noise and will require mitigation to attenuate the effect. Assuming this mitigation is in place, the balancing of these positive and negative effects is considered to be neutral.	Not quantified at this stage.	Neutral	WebTAG noise analysis not carried out at this stage.	Not quantified at this stage.
	Air Quality	There are no AQMAs along this section of the route. Reduction in queueing is likely to result in an improvement in air quality. The bypass section will generally move traffic further away from residential areas, which could improve air quality for local residents.	Not quantified at this stage.	Slight beneficial	WebTAG air quality analysis not carried out at this stage.	Not quantified at this stage.
	Greenhouse gases	Not assessed at this stage.	Change in non-traded carbon over 60y (CO2e): Not quantified; Change in traded carbon over 60y (CO2e): Not quantified	Unknown	TUBA analysis not carried out at this stage.	
	Landscape	The road widening and new bypass section is likely to result in significant effects on the local landscape. The route will need to be designed to minimise the loss of existing mature screening along the current A12 and to avoid impacting on sensitive viewpoints. A landscape assessment would be required at the next stage to help inform the alignment of the route including making use of existing landscape features to minimise the visual intrusion e.g. minimising impacting mature trees which could screen the route and making use of local landforms.	Not quantified at this stage.	Large adverse	WebTAG landscape analysis not carried out at this stage.	
	Townscape	The road widening will affect the edges of existing settlements including Witham. Therefore the widening could have a significant effect on the townscape character, adding to the urban infrastructure.	N/A	Moderate adverse	N/A	
	Historic Environment	The new bypass route and widening areas have the potential for significant effects on archaeology and the historic environment. A detailed programme of archaeological mitigation work is likely to be required.	N/A	Slight adverse	N/A	
	Biodiversity	There are no nationally designated sites affected by the route but there is the potential for impacts to protected species and local habitats. Part of the widening will also be located in / adjacent to Whet Mead Local Nature Reserve. An ecology survey will be required at the next stage to identify sensitive areas to avoid and to inform the detailed programme regarding surveys and consents.	N/A	Slight adverse	N/A	
	Water Environment	The route will cross the floodplain of the River Blackwater and other watercourses. The route will require an assessment under the Water Framework Directive and will also require a flood risk assessment. Mitigation will be required for any loss of floodplain or barrier to flows. This is likely to involve non-standard mitigation which will need to be agreed with the Environment Agency.	N/A	Slight adverse	N/A	
Social	Commuting and Other users	The Scheme is likely to generate benefits for commuters and other users through addressing issues with the capacity and capability of the existing network. In the future, these issues will be exacerbated by growth across the Region which will generate significant issues for transport users. The Scheme is likely to improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits and vehicle operating cost savings.	**Value of journey time changes(£)** — **Net journey time changes (£)**: 0 to 2min: Not quantified at this stage.; 2 to 5min: Not quantified at this stage.; > 5min: Not quantified at this stage.	Large Beneficial	WebTAG reliability analysis not carried out at this stage.	Not quantified at this stage.
	Reliability impact on Commuting and Other users	The Scheme will improve journey time reliability for all users, including commuters and other users, through reduced congestion and junction delays during peak hours making the overall traffic situation more predictable.	Not quantified at this stage.	Large Beneficial	WebTAG reliability analysis not carried out at this stage.	
	Physical activity	Improving the A12 is unlikely to lead to increased numbers of walkers and cyclists nor is it likely to lead to longer trips for those that do. The Scheme is therefore expected to have minimal impact on physical activity.	Not quantified at this stage.	Neutral	WebTAG physical activity analysis not carried out at this stage.	
	Journey quality	The Scheme is likely to reduce congestion and improve journey times leading to reduced traveller stress alongside making travel along the A12 less confusing for unfamiliar travellers through having less at grade junctions.	Not quantified at this stage.	Moderate Beneficial	WebTAG journey quality analysis not carried out at this stage.	
	Accidents	The reduction in traffic flows on existing sections of the network and at particular junctions as a result of the proposed Scheme are anticipated to result in a slight reduction in the number and severity of accidents.	Not quantified at this stage.	Moderate Beneficial	COBALT analysis not carried out at this stage.	Not quantified at this stage.
	Security	No impacts on personal security are expected as a result of the Scheme.	N/A	Neutral	N/A	Neutral Impact
	Access to services	Slight benefits offered in terms of public transport reliability and punctuality through reduced congestion.	N/A	Slight Beneficial	N/A	Not quantified at this stage.
	Affordability	The Scheme offers potential benefits through reduced vehicle operating costs (e.g. car fuel and non-fuel operating costs) associated with changes in journey speeds and reduced congestion across the network.	N/A	Slight Beneficial	N/A	Not quantified at this stage.
	Severance	The Scheme does not propose to remove or add distance to any existing access routes for NMUs and it is therefore unlikely to lead to increase severance. It is likely that decreased traffic on the detrunked A12 between junctions 22 -23 (through Rivenhall End) will reduce severance in these areas by creating a road environment more amenable to NMUs.	N/A	Moderate Beneficial	N/A	Not quantified at this stage.
	Option and non-use values	Not assessed - the Scheme in itself does not substantially change the availability of transport services within the study area.	N/A	Neutral	N/A	
Public Accounts	Cost to Broad Transport Budget	Highways England Commercial have estimated scheme cost at £750m in 2014 prices	N/A	N/A	Analysis not carried out at this stage.	
	Indirect Tax Revenues	Not assessed at this stage	N/A	N/A	Analysis not carried out at this stage.	

Appraisal Summary Table

Date produced:	7	12	2015

Contact:	
Name	TBC
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	A12 Chelmsford (Boreham Interchange) to Marks Tey (A120) Improvement
Description of scheme:	Improvement of A12 to expressway standard between junction 19 at Chelmsford and 25 at Marks Tey. Scheme includes online widening between junctions 20a and21, and junction improvements.

Impacts		Summary of key impacts	Assessment					
			Quantitative			Qualitative	Monetary £(NPV)	Distributional 7-pt scale/ vulnerable grp
Economy	Business users & transport providers	The Scheme is likely to generate slight benefits for business users through addressing issues with the capacity and capability of the existing network. In the future, these issues will be exacerbated by growth across the Region which will generate significant issues for transport users. The Scheme is likely to improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits and vehicle operating cost savings.	Value of journey time changes(£) / Net journey time changes (£): 0 to 2min: Not quantified at this stage. / 2 to 5min: Not quantified at this stage. / > 5min: Not quantified at this stage.			Large Beneficial	WebTAG reliability analysis not carried out at this stage.	Not quantified at this stage.
	Reliability impact on Business users	Journey time reliability has been highlighted as a key problem on the route. The Scheme will improve journey time reliability for all users, including business users, through reduced congestion and junction delays during peak hours making the overall traffic situation more predictable.	Not quantified at this stage.			Large Beneficial	WebTAG reliability analysis not carried out at this stage.	
	Regeneration	Not assessed at this stage.	Not quantified at this stage.				WebTAG regemeration analysis not carried out at this stage.	
	Wider Impacts	Not assessed at this stage.	Not quantified at this stage.				WebTAG Wider Impacts analysis not carried out at this stage.	
Environmental	Noise	There are sections where the widening is likely to move the traffic closer to residential areas, which is likely to result in increased noise to these properties. This could result in a significant impact for noise and will require mitigation to attenuate the effect.	Not quantified at this stage.			Neutral	WebTAG noise analysis not carried out at this stage.	Not quantified at this stage.
	Air Quality	There are no AQMAs along this section of the route. Reduction in queueing is likely to result in an improvement in air quality.	Not quantified at this stage.			Slight beneficial	WebTAG air quality analysis not carried out at this stage.	Not quantified at this stage.
	Greenhouse gases	Not assessed at this stage.	Change in non-traded carbon over 60y (CO2e): Not quantified / Change in traded carbon over 60y (CO2e): Not quantified			Unknown	TUBA analysis not carried out at this stage.	
	Landscape	The road widening is likely to result in significant effects on the local landscape. The route will need to be designed to minimise the loss of existing mature screening along the current A12 and to avoid impacting on sensitive viewpoints. A landscape assessment would be required at the next stage to help inform the alignment of the route including making use of existing landscape features to minimise the visual intrusion e.g. minimising impacting mature trees which could screen the route and making use of local landforms.	Not quantified at this stage.			Large adverse	WebTAG landscape analysis not carried out at this stage.	
	Townscape	The road widening will affect the edges of existing settlements including Hatfield Peverel. Therefore the widening could have a significant effect on the townscape character, adding to the urban infrastructure.	N/A			Moderate adverse	N/A	
	Historic Environment	The new bypass route and widening areas have the potential for significant effects on archaeology and the historic environment. A detailed programme of archaeological mitigation work is likely to be required.	N/A			Slight adverse	N/A	
	Biodiversity	There are no nationally designated sites affected by the route but there is the potential for impacts to protected species and local habitats. Part of the widening will also be located in / adjacent to Whet Mead Local Nature Reserve. An ecology survey will be required at the next stage to identify sensitive areas to avoid and to inform the detailed programme regarding surveys and consents.	N/A			Slight adverse	N/A	
	Water Environment	The route will cross the floodplain of the River Chelmer and other watercourses. The route will require an assessment under the Water Framework Directive and will also require a flood risk assessment. Mitigation will be required for any loss of floodplain or barrier to flows. This is likely to involve non-standard mitigation which will need to be agreed with the Environment Agency.	N/A			Slight adverse	N/A	
Social	Commuting and Other users	The Scheme is likely to generate benefits for commuters and other users through addressing issues with the capacity and capability of the existing network. In the future, these issues will be exacerbated by growth across the Region which will generate significant issues for transport users. The Scheme is likely to improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits and vehicle operating cost savings.	Value of journey time changes(£) / Net journey time changes (£): 0 to 2min: Not quantified at this stage. / 2 to 5min: Not quantified at this stage. / > 5min: Not quantified at this stage.			Large Beneficial	WebTAG reliability analysis not carried out at this stage.	Not quantified at this stage.
	Reliability impact on Commuting and Other users	The Scheme will improve journey time reliability for all users, including commuters and other users, through reduced congestion and junction delays during peak hours making the overall traffic situation more predictable.	Not quantified at this stage.			Large Beneficial	WebTAG reliability analysis not carried out at this stage.	
	Physical activity	Improving the A12 is unlikely to lead to increased numbers of walkers and cyclists nor is it likely to lead to longer trips for those that do. The Scheme is therefore expected to have minimal impact on physical activity.	Not quantified at this stage.			Neutral	WebTAG physical activity analysis not carried out at this stage.	
	Journey quality	The Scheme is likely to reduce congestion and improve journey times leading to reduced traveller stress alongside making travel along the A12 less confusing for unfamiliar travellers through having less at grade junctions.	Not quantified at this stage.			Moderate Beneficial	WebTAG journey quality analysis not carried out at this stage.	
	Accidents	The reduction in traffic flows on existing sections of the network and at particular junctions as a result of the proposed Scheme are anticipated to result in a slight reduction in the number and severity of accidents.	Not quantified at this stage.			Moderate Beneficial	COBALT analysis not carried out at this stage.	Not quantified at this stage.
	Security	No impacts on personal security are expected as a result of the Scheme.	N/A			Neutral	N/A	Neutral Impact
	Access to services	Slight benefits offered in terms of public transport reliability and punctuality through reduced congestion.	N/A			Slight Beneficial	N/A	Not quantified at this stage.
	Affordability	The Scheme offers potential benefits through reduced vehicle operating costs (e.g. car fuel and non-fuel operating costs) associated with changes in journey speeds and reduced congestion across the network.	N/A			Slight Beneficial	N/A	Not quantified at this stage.
	Severance	The Scheme does not propose to remove or add distance to any existing access routes for NMUs and it is therefore unlikely to lead to increase severance.	N/A			Moderate Beneficial	N/A	Not quantified at this stage.
	Option and non-use values	Not assessed - the Scheme in itself does not substantially change the availability of transport services within the study area.	N/A			Neutral	N/A	
Public Accounts	Cost to Broad Transport Budget	Highways England Commercial have estimated scheme cost at £750m in 2014 prices	N/A			N/A	Analysis not carried out at this stage.	
	Indirect Tax Revenues	Not assessed at this stage	N/A			N/A	Analysis not carried out at this stage.	

Appendix K. Sifting Spreadsheet

Qualitative assessment against identified problems	Qualitative assessment against identified objectives	Deliverability (e.g. political, planning, timescale or third party issues)	Feasibility (e.g. physical constraint, land availability and design standards)	Affordability (e.g. extent of additional funding required and available funding sources)	Initial Sifting Criteria Each option must meet the following sifting criteria for inclusion in the prioritised list:
2 Large beneficial impact	2 Large beneficial impact	Likely to be deliverable	Likely to be feasible	Likely to be affordable	1: Overall moderate impact against identified problems (Appraisal score >2.5, see East Conversion)
1 Beneficial impact	1 Beneficial impact	Likely to be deliverable (with Challenges)	Likely to be feasible (with Challenges)	Likely to be affordable (with Challenges)	2: Overall moderate fit with route objectives (Appraisal score >3, see East Conversion)
0 Neutral / marginal impact	0 Neutral / marginal impact	Unlikely to be deliverable	Unlikely to be feasible	Unlikely to be affordable	3: Likely to be deliverable
-1 Adverse impact	-1 Adverse impact				4: Likely be feasible in theory
-2 Large adverse impact	-2 Large adverse impact				5: Likely be affordable

Ref	Option	Description	Problems							Objectives							Deliverability	Feasibility	Affordability	Initial Sifting Criteria					For inclusion in prioritised list
			1	2	3	4	5	-	-	Total	1	2	3	4	5	6	-	Total									
Highway Infrastructure Improvements																											
HI-01	New Parallel Offline Route J19-J25	A parallel offline scheme running south from the A12 at an upgraded J19, to accommodate offline route and free-flow connection to the proposed Chelmsford North East Bypass, to the A120 at J25. J25 would be upgraded to accommodate offline improvements and address safety concerns / queuing on the off-slips.	1	2	2	2	2			9	2	2	-2	2	1	0		5	Unlikely to be deliverable	Unlikely to be feasible	Unlikely to be affordable	✓	✓	×	×	×	×
HI-02	Offline Improvements J19-21, J22-23, J24-25, Online Widening in other sections and Junction Improvements (Capacity & Safety Enhancements)	A parallel offline route running south of the existing carriageway from the A12 at an upgraded J19 to an upgraded J21 at Witham. Junction upgrades would accommodate the offline route and allow a free-flow connection at J19 to the proposed Chelmsford North East Bypass. J21 would be upgraded to allow all movements, to support the reconfiguration/removal of J20b or J20a. This is a priority area for improvement as identified in SELEP SEP, to aid growth at Witham. Offline improvements would also be provided from J22 to J23, and J24 to J25, to bypass areas of the A12 constrained by at-grade private accesses and suffering from safety and capacity issues, with associated junction improvements. Link capacity improvements would be provided between J23 and J24, which could include widening the existing carriageway from dual 2-lane to dual 3-lane standard, to provide a consistent, high quality route.	1	2	2	2	2			9	2	2	-2	2	1	0		5	Unlikely to be deliverable	Unlikely to be feasible	Unlikely to be affordable	✓	✓	×	×	×	×
HI-03	Offline Improvements J22-23, J24-25, Online Widening and Junction and Junction Improvements (Capacity & Safety Enhancements) including removal of J20B	Capacity upgrade at J19 of the A12, to include new signal controlled junctions with the A138 and B1137, widening to 3 lane approaches and free-flow connection to the proposed Chelmsford North East Bypass. Online link capacity improvements would be provided between J19 and J22, bringing the section up to modern dual 3-lane standard, to provide a consistent, high quality route. J21 would be upgraded to allow all movements, to support the reconfiguration/removal of J20b or J20a. This is a priority area for improvement as identified in SELEP SEP, to aid growth at Witham. Offline improvements would be provided from J22 to J23, and J24 to J25, to bypass areas of the A12 constrained by at-grade private accesses and suffering from safety and capacity issues, with associated junction improvements. Link capacity improvements would be provided between J23 and J24, which could include widening the existing carriageway from dual 2-lane to dual 3-lane standard for continuity.	1	2	2	2	0			7	2	2	-2	2	1	0		5	Likely to be deliverable (with Challenges)	Likely to be feasible (with Challenges)	Likely to be affordable (with Challenges)	✓	✓	✓	✓	✓	✓
HI-04	Offline Improvements J22-23, J24-25, Online Widening and Junction and Junction Improvements (Capacity & Safety Enhancements)	Online link capacity improvements would be provided between J19 and J22, bringing the section up to modern dual 3-lane standard to provide a consistent, high quality route. Associated junctions would be upgraded to accommodate online improvements and increase capacity. Offline improvements would be provided from J22 to J23, and J24 to J25, to bypass areas of the A12 constrained by at-grade private accesses and suffering from safety and capacity issues, with associated junction improvements. J25 would be upgraded to accommodate offline improvements and address safety concerns / queuing on the off-slips. Junction improvements at J19 could be delivered separately as part of the Chelmsford North East Bypass works.	1	2	2	1	0			6	2	2	-2	1	1	0		4	Likely to be deliverable (with Challenges)	Likely to be feasible (with Challenges)	Likely to be affordable (with Challenges)	✓	✓	✓	✓	✓	✓
HI-05	Offline Improvements J22 - 23, Online Widening and Junction Improvements (Capacity & Safety Enhancements) . No upgrade J23 - J25	Online link capacity improvements would be provided between J19 and J22, bringing the section up to modern dual 3-lane standard to provide a consistent, high quality route. Associated junctions would be upgraded to accommodate online improvements and increase capacity. Offline improvements would be provided from J22 to J23 to bypass areas of the A12 constrained by at-grade private accesses and suffering from safety and capacity issues, with associated junction improvements. There may be potential for route and junction improvements from Kelvedon to J25 to be delivered by the developers of the Stanway growth area. Junction improvements at J19 could be delivered separately as part of the Chelmsford North East Bypass works.	1	1	1	1	0			4	1	2	-1	1	1			4	Likely to be deliverable (with Challenges)	Likely to be feasible (with Challenges)	Likely to be affordable	✓	✓	✓	✓	✓	✓
HI-06	Offline Improvements J24-25, Online Widening and Junction Improvements (Capacity & Safety Enhancements)	Online link capacity improvements would be provided between J19 and J21, bringing the section up to modern dual 3-lane standard to provide a consistent, high quality route. Associated junctions would be upgraded to accommodate online improvements and increase capacity. Offline improvements would be provided from J22 to J23 to bypass areas of the A12 constrained by at-grade private accesses and suffering from safety and capacity issues, with associated junction improvements. There may be potential for route and junction improvements from Kelvedon to J25 to be delivered by the developers of the Stanway growth area. Junction improvements at J19 could be delivered separately as part of the Chelmsford North East Bypass works.	1	1	1	1	0			4	1	2	-1	1	1			4	Likely to be deliverable (with Challenges)	Likely to be feasible (with Challenges)	Likely to be affordable	✓	✓	✓	✓	✓	✓
HI-07	Online Widening J19-J25 and Junction Improvements (Capacity & Safety Enhancements) including removal of J20B	Bring the section of A12 between J19 and J25 up to modern dual 3-lane standard with carriageway cross sections, lay-bys and on- and off-slip roads provided in line with current standards to provide a consistent, high quality route. Junctions would be upgraded to accommodate online improvements and increase capacity. A free-flow connection would be provided at J19 to the proposed Chelmsford North East Bypass, improvements at J25 to address safety concerns / queuing on the off-slips, and J21 would be upgraded to allow all movements, to support the reconfiguration/removal of J20b or J20a	1	2	2	2	1			8	2	2	-2	2	1	0		5	Unlikely to be deliverable	Unlikely to be feasible	Unlikely to be affordable	✓	✓	×	×	×	×

Qualitative assessment against identified problems	
2	Large beneficial impact
1	Beneficial impact
0	Neutral / marginal impact
-1	Adverse impact
-2	Large adverse impact

Qualitative assessment against identified objectives	
2	Large beneficial impact
1	Beneficial impact
0	Neutral / marginal impact
-1	Adverse impact
-2	Large adverse impact

Deliverability (e.g. political, planning, timescale or third party issues)
Likely to be deliverable
Likely to be deliverable (with Challenges)
Unlikely to be deliverable

Feasibility (e.g. physical constraint, land availability and design standards)
Likely to be feasible
Likely to be feasible (with Challenges)
Unlikely to be feasible

Affordability (e.g. extent of additional funding required and available funding sources)
Likely to be affordable
Likely to be affordable (with Challenges)
Unlikely to be affordable

Initial Sifting Criteria

Each option must meet the following sifting criteria for inclusion in the prioritised list:

1: Overall moderate impact against identified problems (Appraisal score >2.5, see East Conversion)
2: Overall moderate fit with route objectives (Appraisal score >3, see East Conversion)
3: Likely to be deliverable
4: Likely be feasible in theory
5: Likely be affordable

Ref	Option	Description	Problems								Objectives								Deliverability	Feasibility	Affordability	Initial Sifting Criteria					For inclusion in prioritised list
			1	2	3	4	5	-	-	Total	1	2	3	4	5	6	-	Total				1	2	3	4	5	
HI-08	Online Widening J20A-J21, J22-23 and Junction Improvements (Capacity & Safety Enhancements)	Bring the section of A12 between J19 and J21, and J22 and J23, up to modern dual 3-lane standard with carriageway cross sections, lay-bys and on- and off-slip roads provided in line with current standards to provide a consistent, high quality route. Associated junctions would be upgraded to accommodate online improvements and increase capacity. There may be potential for route and junction improvements from Kelvedon to J25 to be delivered by the developers of the Stanway growth area. Junction improvements at J19 could be delivered separately as part of the Chelmsford North East Bypass works.	1	1	0	1	0			3	1	2	-1	1	1	0		4	Unlikely to be deliverable	Unlikely to be feasible	Likely to be affordable	✓	✓	×	×	✓	×
HI-09	Online Widening J20A-J21 and Junction Improvements (Capacity & Safety Enhancements)	Bring the section of A12 between J19 and J21 up to modern dual 3-lane standard with carriageway cross sections, lay-bys and on- and off-slip roads provided in line with current standards to provide a consistent, high quality route. Associated junctions would be upgraded to accommodate online improvements and increase capacity. There may be potential for route and junction improvements from Kelvedon to J25 to be delivered by the developers of the Stanway growth area. Junction improvements at J19 could be delivered separately as part of the Chelmsford North East Bypass works.	1	1	0	1	0			3	1	2	-1	1	1	0		4	Likely to be deliverable (with Challenges)	Likely to be feasible (with Challenges)	Likely to be affordable (with Challenges)	✓	✓	✓	✓	✓	✓
HI-10	Upgrades to the A120	Investigate a major upgrade to the A120 between Braintree and Marks Tey - It is clear that this route section acts as a significant diversion route for the A12 despite being very unsuitable for the purpose. Bringing it up to the standard where it is suitable as a strategic diversion route would significantly increase network resilience within the sub-region.	1	1	0	0	2			4	1	1	-1	1	1	0		3	Likely to be deliverable (with Challenges)	Likely to be feasible (with Challenges)	Likely to be affordable (with Challenges)	✓	×	✓	✓	✓	✓
HI-12	Junction rationalisation	Review and rationalisation (with a view where possible to reduce the number and frequency, or relocate) to address the hazards caused by accesses from private properties including farms to the A12, substandard access from minor roads and substandard access from the A12 to service providers such as petrol stations. Principal areas include the section between J20A-25, from Hatfield Peverel to Marks Tey.	0	0	1	0	0			1	0	0	0	1	1	-1		1	Likely to be deliverable (with Challenges)	Likely to be feasible (with Challenges)	Likely to be affordable (with Challenges)	×	×	✓	✓	✓	×
HI-13	Improvements to the carriageway and vehicle restraint systems	Improvements to the carriageway (e.g. hard strip provision) and vehicle restraint systems to allow for increased resilience when an incident occurs. A phased investment plan should be developed for the short to longer-term.	0	0	1	1	0			2	0	0	0	1	1	0		2	Likely to be deliverable	Likely to be feasible (with Challenges)	Likely to be affordable	×	×	✓	✓	✓	×
HI-14	Pavement Repairs	Calls for pavement repairs along the A12 generally, particularly northbound between Chelmsford and Colchester. Would be delivered as part of a package.	0	0	0	1	0			1	0	0	0	1	1	0		2	Likely to be deliverable	Likely to be feasible (with Challenges)	Likely to be affordable	×	×	✓	✓	✓	×
HI-15	Improved lay-by provision	Develop improvement programme to include the removal, replacement or improvement of sub-standard lay-bys and provision of new lay-bys in line with current requirements. Provision of customer facilities including roadside services, particularly between J11-29. Could be delivered as part of a package.	0	0	1	0	0			2	0	0	0	1	1	0		2	Likely to be deliverable	Likely to be feasible (with Challenges)	Likely to be affordable	×	×	✓	✓	✓	×
Public Transport																											
PT-01	Freight line by rail	Reduce the number of HGV vehicles transporting freight to ports by road, using rail freight links instead.	0	1	0	0	0			1	0	1	1	0	0	0		2	Likely to be deliverable (with Challenges)	Likely to be feasible (with Challenges)	Likely to be affordable (with Challenges)	×	×	✓	✓	✓	×
PT-02	Extend the Crossrail line to Chelmsford	Extend Crossrail line north to connect with Chelmsford to increase public transport patronage between Chelmsford and London. Would primarily benefit links south of J19.	1	1	0	0	0			2	1	1	0	0	0	2		4	Unlikely to be deliverable	Likely to be feasible (with Challenges)	Likely to be affordable (with Challenges)	×	✓	×	✓	✓	×
PT-03	Rapid Transit/ Bus Rapid Transit	Implementation of BRT between key destinations with bus priority measures, to offer greater transport choice, improve connections with the wider transport network and provide a high quality alternative to the car.	1	1	0	0	0			2	1	1	0	0	0	2		4	Unlikely to be deliverable	Unlikely to be feasible	Likely to be affordable (with Challenges)	×	✓	×	✓	✓	×
PT-04	Upgrade existing rail routes and branch lines	Investigate capacity improvement options and reopening former routes to encourage commuter traffic from road to the railways.	1	1	0	0	1			3	1	1	0	0	0	2		4	Unlikely to be deliverable	Likely to be feasible (with Challenges)	Likely to be affordable (with Challenges)	✓	✓	×	✓	✓	×
PT-05	HOV lanes	Implementation of high occupancy vehicle lanes (HOV) to discourage single occupancy and reduce traffic flows	0	1	0	0	0			1	0	1	0	0	0	0		1	Likely to be deliverable (with Challenges)	Likely to be feasible (with Challenges)	Likely to be affordable (with Challenges)	×	×	✓	✓	✓	×
Collision Reduction and Incident Management Measures																											
CR-1	Chevrons	Introduce "keep apart" chevrons to encourage drivers to keep a safer distance. This would require a change in the current regulations, however.	0	0	0	0	0			0	0	0	0	1	0	0		1	Likely to be deliverable (with Challenges)	Likely to be feasible (with Challenges)	Likely to be affordable	×	×	✓	✓	✓	×
CR-2	Rights of Way	Consider the position of all at grade rights of way across the A12 and, in consultation with local residents, take steps to remove or divert them.	0	0	0	0	0			0	0	0	0	1	0	1		2	Likely to be deliverable	Likely to be feasible (with Challenges)	Likely to be affordable	×	×	✓	✓	✓	×
CR-3	HGV Overtaking Bans	Introduce as a 12 month trial, and then evaluate for its effectiveness, an HGV overtaking ban between Hatfield Peverel and Marks Tey.	0	0	0	0	0			0	0	0	0	1	0	0		1	Likely to be deliverable	Likely to be feasible (with Challenges)	Likely to be affordable	×	×	✓	✓	✓	×
CR-5	Traffic Officers	Investigate whether there is a case to deploy traffic officers or use other techniques such as 'MinuteMan' (a fast-response service for clearing minor incidents such as breakdowns or very minor collisions in order to reduce consequent delays)along the route. The A12 Inquiry recommended introducing a three year pilot on the A12.	0	0	0	0	1			1	0	0	0	1	0	0		1	Likely to be deliverable	Likely to be feasible (with Challenges)	Likely to be affordable (with Challenges)	×	×	✓	✓	✓	×

Qualitative assessment against identified problems	Qualitative assessment against identified objectives	Deliverability (e.g. political, planning, timescale or third party issues)	Feasibility (e.g. physical constraint, land availability and design standards)	Affordability (e.g. extent of additional funding required and available funding sources)	Initial Sifting Criteria
2 Large beneficial impact 1 Beneficial impact 0 Neutral / marginal impact -1 Adverse impact -2 Large adverse impact	2 Large beneficial impact 1 Beneficial impact 0 Neutral / marginal impact -1 Adverse impact -2 Large adverse impact	Likely to be deliverable Likely to be deliverable (with Challenges) Unlikely to be deliverable	Likely to be feasible Likely to be feasible (with Challenges) Unlikely to be feasible	Likely to be affordable Likely to be affordable (with Challenges) Unlikely to be affordable	Each option must meet the following sifting criteria for inclusion in the prioritised list: 1: Overall moderate impact against identified problems (Appraisal score >2.5, see East Conversion) 2: Overall moderate fit with route objectives (Appraisal score >3, see East Conversion) 3: Likely to be deliverable 4: Likely be feasible in theory 5: Likely be affordable

Ref	Option	Description	Problems							Objectives							Deliverability	Feasibility	Affordability	Initial Sifting Criteria					For inclusion in prioritised list
			1	2	3	4	5	-	-	Total	1	2	3	4	5	6	-	Total									
CR-6	Heavy Rescue Vehicles	Explore with the Essex Fire and Rescue Service the reintroduction of a 'blue light' heavy recovery vehicle.	0	0	0	0	1			1	0	0	0	1	0	0		1	Likely to be deliverable	Likely to be feasible (with Challenges)	Likely to be affordable (with Challenges)	×	×	✓	✓	✓	×
CR-7	Emergency Service Staging Areas	Review in conjunction with the emergency services, potential locations for staging areas alongside the carriageway for disabled or recovered vehicles and recovery equipment.	0	0	0	0	1			1	0	0	0	1	0	0		1	Likely to be deliverable	Likely to be feasible	Likely to be affordable	×	×	✓	✓	✓	×

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Highways England creative job number S160569

Report No HA540039-HHJ-ZZZ-REP-ZZZ-010

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The Technical Assessment Report details the assessment of options leading up to consultation.