A428 Black Cat to Caxton Gibbet

Option Assessment Report

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Contents

1. Introduction

1.1 Purpose of report

Jacobs has been commissioned by Highways England to progress a number of the proposals announced in the Autumn Statement 2014 (AS14) Roads Investment Strategy[1] (RIS) through the Project Control Framework (PCF) Stage 0 process. This commission relates to proposals in the east of England Areas 6 and 8 including schemes for the A428. This report presents the proposals for the A428 Black Cat to Caxton Gibbet.

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). The report is an update of an existing OAR document for the scheme entitled 'Route Strategies: Option Assessment Report, A428: A421 to Caxton Gibbet, 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 outcomes of this stage of the project are to:

- review and document the current situation
- analyse the future situation
- identify need for intervention and establish SMART 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

1.2 Background

Following the 2013 Spending Review, the Government announced its plans for the biggest ever upgrade of the strategic roads network (SRN). The HM Treasury document, Investing in Britain's Future[2] 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 £3 billion annually by 2020/21.

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 Felixstowe to Midlands Route Strategy is pertinent to this study. 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
- provide details about the proposed investment to improve asset condition and the vision for customer operations service
- inform the RIS investment plan for the current five year period

The RBSs are being used to assist generating efficiencies for Highways England's future investment plans and performance improvements, providing improvement 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.

[1] DfT, 2015. *Road Investment Strategy: for the 2015/16-2019/20 Road Period*.
https://www.gov.uk/government/publications/road-investment-strategy-for-the-2015-to-2020-road-period
[2] 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

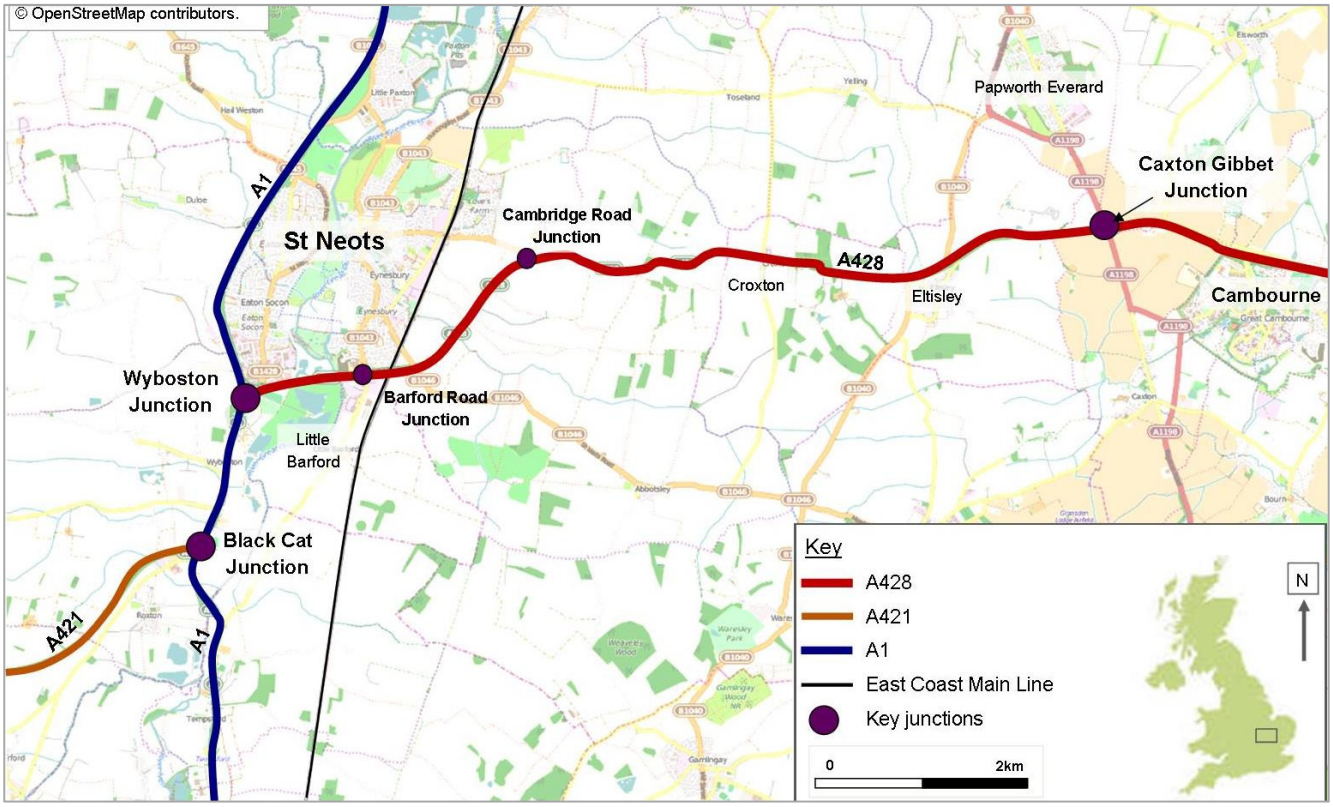

Figure 1.1 : A428 Black Cat to Caxton Gibbet – geographical area

Figure 1.1 illustrates the location of the A428 between Black Cat and Caxton Gibbett. The A428 forms part of the Felixstowe to Birmingham corridor which is an important strategic link connecting seaports on the east coast of England to the Midlands, is part of the trans-European network, and intersects with other major north-south road corridors.

The A428 is a strategic route for vehicles travelling east-west between Oxford and Cambridge, via urban settlements including Milton Keynes and Bedford. The A428 extends approximately 17 miles between the A1 and A14/M11. The A428 is a single lane carriageway between the A1 and A1198 at Caxton Gibbet, being the only section of the A428 that is not dual carriageway.

The A428 was identified as experiencing significant junction capacity issues; specifically, the Felixstowe to Midlands Route Strategy highlighted the following issues and opportunities:

- Junction capacity improvements at the Black Cat Roundabout
- Severe lack of capacity (links and junctions) on the A428 between the A1 and A1198
- Creating an expressway by 'filling the gap' between the Black Cat Roundabout and A428/ A1198 Caxton Gibbet Roundabout

This OAR includes consideration of the intersections with the A1 at the Black Cat Roundabout and Wyboston junctions. This OAR considers the upgrade for the section of the A428 between the Caxton Gibbet and the junction with the A1.

1.3 Overview of assessment

The overall approach to the project has been developed to align 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 SOBC. This OAR will provide the following, in order to meet the requirements set out within the DfT Transport Appraisal Process[3]:

- A sound body of analysis to 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 will be recorded, along with supporting evidence
- Development of options, including concept plans to identify the key areas for intervention with cost estimates. Early Assessment and Sifting Tool (EAST) will be used to prioritise the options

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

[3] 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

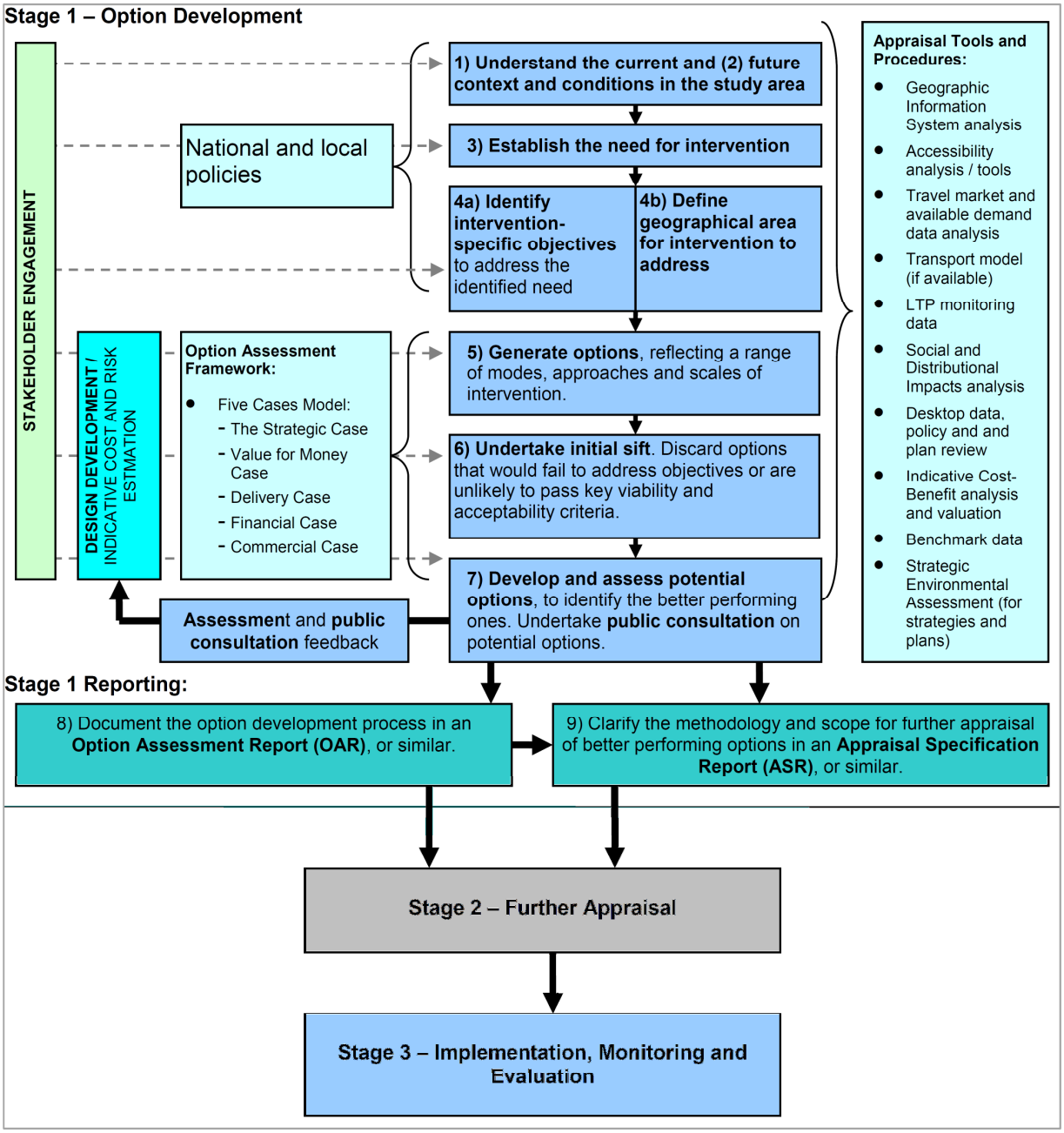

Figure 1.2 : Stage 1 (option development) process (source: WebTAG Transport Appraisal Process)

1.4 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 preferred option.

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 a national, regional and local level.

In developing an understanding of the current situation, it is important to establish the strategic policy context for the scheme. This process identifies strategic objectives including the aims of the scheme promoting organisation and adopted and emerging land use policy that may have implications for the A12 proposals. A summary has been provided in Figure 2.1.

It is important to ensure that the development and appraisal of any interventions in the OAR process is consistent with 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.

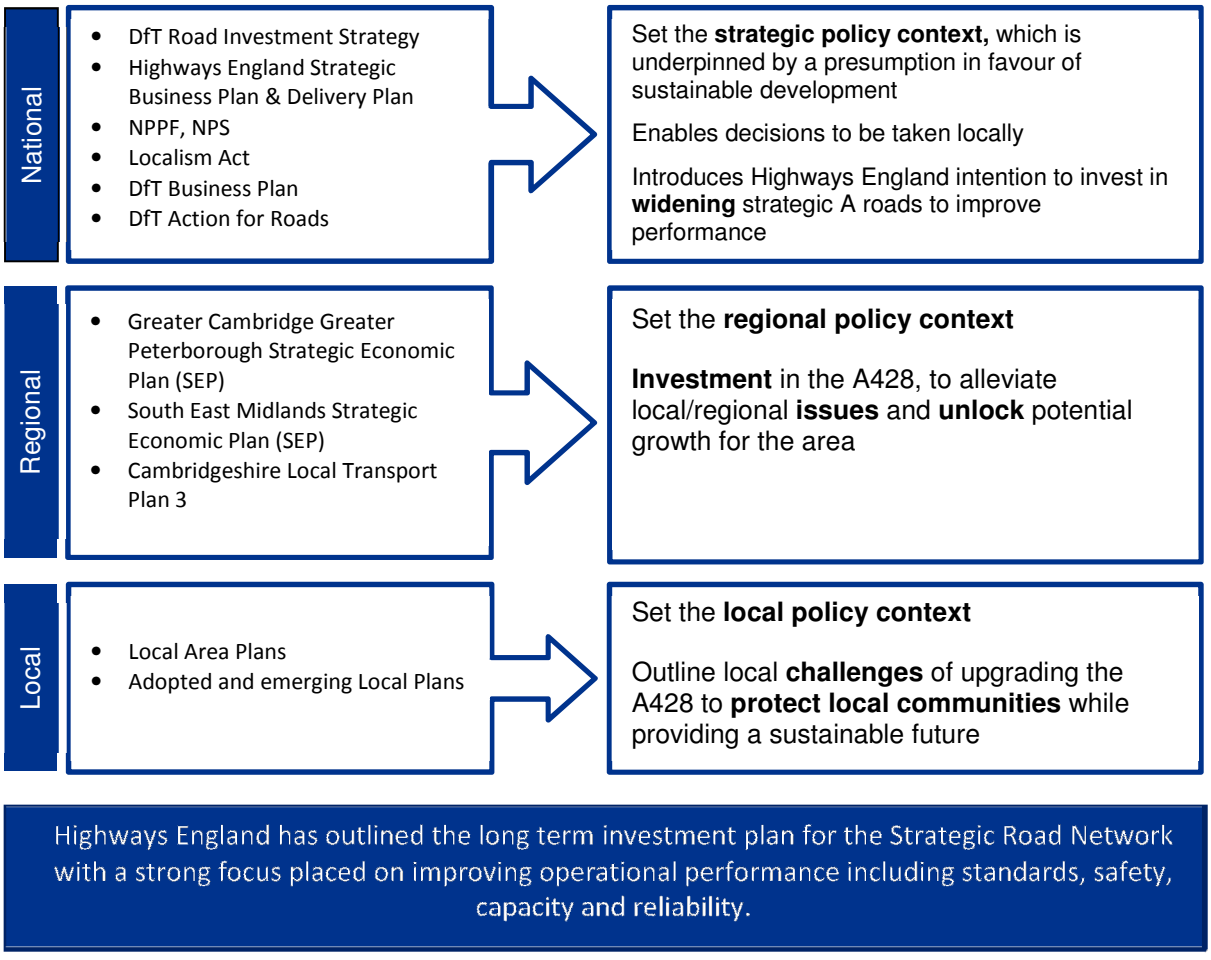

Figure 2.1 : Key policy documents

The SRN is entering a time of transformation as the Highways Agency has transitioned to a government-owned strategic highways company, Highways England. Furthermore, transport and land use policy has been and continues to be in a state of change and development; therefore the information presented in this report is accurate at the time of writing but may change during the course of the scheme and business case development.

2.2 National policy

2.2.1 DfT's Road Investment Strategy

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. The RIS contains an investment plan and performance requirements for how this vision can be achieved. In the first period, the Government has committed to investing £15.2 billion 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

Highways England aim to make best use of the increased certainty of long term funding. As outlined in the Business Plan, this 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).

Highways England's Delivery Plan[4] was published in March 2015 and set out how the strategic outcomes would 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.

2.2.3 National Planning Policy Framework (NPPF)

In March 2012, the Department for Communities and Local Government (DCLG) published NPPF[5], which sets out the Government's economic, environmental and social planning policies. The NPPF aims to reform 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 and historic environment.

[4] Highways England, 2015 Delivery Plan 2015-2020
https://www.gov.uk/government/publications/highways-england-delivery-plan-2015-2020

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

2.2.4 Localism Act

The Government's Localism Act[6] 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

The previous coalition government's vision for transport is also 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[7], which is updated annually. There is a focus on improving road safety, reducing congestion and pollution and making changes at a local level; priority 5 in particular outlines 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[8] paper, which 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 to become corridors of opportunity and upgraded to a new 'expressway' standard or widened to three lanes to increase capacity.

Investment in such routes is to be prioritised in accordance with the Highways England's RBSs, 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 Greater Cambridge Greater Peterborough Local Enterprise Partnership

The Localism Act provided the power to abolish Regional Spatial Strategies and with that the East of England 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 Cambridgeshire forming part of Greater Cambridge Greater Peterborough (GCGP) LEP.

Their vision is for a transport network that is 'fit for this economically vital high growth area that helps to facilitate sustainable growth and enhance economic prosperity and enables efficient movement of goods and people'. Proposals to deliver this ambition are set out within GCCP LEP's recently released Strategic Economic Plan (SEP)[9], which outlines how Local Growth Fund funding will be used to renew the physical and intellectual capital of the GCGP LEP area. One of the key priority areas identified within the SEP includes enhancing transport connectivity.

The SEP identifies that improving east west rail links and access along the A428, A47 and A14 will enhance economic growth opportunities and connectivity with Milton Keynes, Oxford, Luton and Bedford and the east coast ports. It is highlighted throughout the report that the A428 had seen a 43% increase in traffic since 2001, the highest growth of any trunk road in Cambridgeshire. The stretch of the A428 between the A1 and the A1198

[6] HM Government, 2010. *Decentralisation and the Localism Bill: an essential guide.* http://www.communities.gov.uk/documents/localgovernment/pdf/1793908.pdf
[7] DfT, 2013. *Business Plan 2013-15* http://transparency.number10.gov.uk/business-plan/11
[8] 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
[9] GCGP LEP, 2014. *Strategic Economic Plan*. http://www.gcgp.co.uk/wp-content/uploads/2013/10/Delivery-Plan-2015.pdf

is the only section of the route between Milton Keynes and Cambridge that is single carriageway, and suffers from significant congestion around St Neots and at Caxton Gibbet.

2.3.2 The South East Midlands Local Enterprise Partnership

Bedfordshire forms part of the South East Midlands (SEM) LEP. The SEM is a national growth area, home to the UK's fastest growing city, Milton Keynes. Its vision is to reinforce and develop the SEM as one of them most innovative, successful and high performing economies in England by 2020. Proposals to deliver this ambition are set out within SEM LEP's recently released SEP[10]. The plans are to deliver 86,700 new homes and 111,200 new jobs accommodating an increase in population of 151,400. Two of its key objectives are to deliver infrastructure (transport, utilities and broadband) to accelerate sustainable growth in jobs, housing and investment in town centre and to secure long term and on-going funding to deliver the infrastructure plan. SEMLEP are working closely with Highways England to ensure that planned investment in the SEMLEP area can proceed to schedule. These include improvements to the Black Cat roundabout on the A1/A421.

2.3.3 Cambridgeshire Local Transport Plan 2011 – 2031: Long Term Transport Plan

Cambridgeshire Local Transport Plan[11] was published in July 2015. 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 2031. The LTP3 is focused on achieving the following eight objectives:

- To ensure that the transport network supports sustainable growth and continued economic prosperity
- To improve accessibility to employment and key services
- To encourage sustainable alternatives to the private car, including rail, bus, guided bus, walking and cycling, car sharing and low emission vehicles
- To encourage healthy and active travel, supporting improved well-being
- To make the most efficient use of the transport network
- To reduce the need to travel
- To minimise the impact of transport on the environment
- To prioritise investment where it can have the greatest impact

Across the county, major growth is planned in the period to 2031, with over 72,000 new dwellings needed to meet the predicted demand for housing for current and new residents of the area. Within the plan, it emphasises that there are a number of areas on the strategic and primary route network that require measures to be introduced for capacity reasons, one of which is the A428. As such, their plan identifies that improvements are to be made to the A428 Caxton Gibbet to Black Cat in order to deliver their transport strategy.

2.3.4 Emerging Local Plans and existing Core Strategies

The A428 passes through the local planning authorities of Huntingdonshire and Central Bedfordshire. 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.

The Huntingdonshire District Council LDF Core Strategy (September 2009) states that in St Neots and Little Paxton, there are plans for up to 2,650 homes, 25 ha of employment and 9,000m^2 retail space by 2026. It also identifies that in order to deliver to this, improvements will be needed to the three roundabouts on the A428 and other traffic management measures to mitigate the impact of development related traffic arising from the Core Strategy proposals.

[10]South East Midlands Local Economic Partnership Strategic Economic Plan 2015 – 2020
http://www.semlep.com/news/2014/strategic-economic-plan-submitted-to-government/
[11] Cambridgeshire's *Local Plan 2011 – 2031 Long Term Transport Strategy*
http://www.cambridgeshire.gov.uk/info/20006/travel_roads_and_parking/66/transport_plans_and_policies/5

2.4 Recent studies and consultation

2.4.1 Felixstowe to the Midlands Route Based Strategy Evidence Report April 2014

The Felixstowe to Midlands RBS forms part of Highways England's response to Alan Cook's report A Fresh Start for the Strategic Network[12]. The RBS was one of the first to be released due to the routes importance as part of a strategic national corridor and known issues, and was informed by consultation with key stakeholders. The report highlights that the A428 between St Neots and Cambridge routinely experiences major delays at its junction and links during peak periods. It also highlights the routes importance, linking the Port of Felixstowe to the A1, M1 via the A421 and Milton Keynes, the largest growing city in the UK.

The report states that proposals to substantially expand St Neots during the life of the Local Plan will significantly add to the pressure on the route which already experiences severe and frequent congestion, with peak hour speeds of between 31mph and 40mph.

Other issues identified in the report include lack of technology such as overhead gantries, lane specific signals and driver information signs, lack of provision for cyclists and lack of alternative routes during incidents and maintenance.

2.4.2 London to Leeds (East) Route Based Strategy Evidence Report April 2014

The section of the A1 between junctions with the A428 (Wyboston) and A421 (Black Cat) also fall within the London to East Leeds RBS. The report states that three of the top 10 least reliable links between London and Leeds (on both the A1 and M1) fall either side of the Wyboston and Black Cat junctions and are as follows:

3rd: A428 Wyboston to A421 Black Cat junction;

6th: A428 Wyboston to A421 Black Cat junction; and

7th A421 Black Cat junction to A603 Sandy junction.

In addition to this, the Black Cat junction lies 69th in the national safety rankings (1 being the worst safety record) on the strategic road network 2009 to 2011. The report states that improvements to Black Cat roundabout would provide a major opportunity for improved east west links between Cambridgeshire and Milton Keynes. Although short term improvements to increase capacity at the roundabout (to widen the approaches, installation of signals) has received pinch point funding, longer term additions are likely to be required in order that the A421/A1/A428 corridor operates efficiently with increases in demand resulting from traffic growth.

2.4.3 A428 Route Strategies OAR and SOBC (AECOM, 2014)

Following the outcomes of Highways England's RBS studies a number of problem bottlenecks on the SRN were highlighted as being in need of improvement. The A428 between Black Cat and Caxton Gibbet was one of the locations highlighted.

AECOM was commissioned to produce a high level OAR and SOBC for potential improvements on the A428 between Black Cat and Caxton Gibbet roundabouts. These documents were reviewed as part of the first step in this study process.

The following evidence was presented to show the problems and issues on the A428:

- The Black Cat, Wyboston, Barford Road, Cambridge Road and Caxton Gibbet junctions were identified as having capacity issues by the Highways Agency (now Highways England)
- The route as a whole was identified having safety and maintenance issues by Highways England

[12] 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

- The A428 between Wyboston and Caxton was identified by Highways England as having peak hour speeds of less than 40mph with link delays in the top 20% nationally
- The A428 was identified by Highways England as one of the least reliable journey time sections nationally.
- Black Cat roundabout has been identified as having a safety problem (69th highest number of accidents nationally)
- The A428 between Wyboston and Caxton was identified as being within the top 25% of highway links nationally for casualties per billion vehicle miles
- Stakeholders identified flooding issues along the A1 between Black Cat roundabout and Wyboston

A number of policies that support improvements to the A428 were noted, including the Cambridgeshire County Council Local Plan, The Greater Cambridge and Peterborough Strategic Economic Plan, the South Cambridgeshire Local Plan and the Huntingdonshire District Local Plan alongside a high level summary of environmental and legal constraints. The key constraints at the junction are the following:

- The East Coast Mainline runs near the route
- There are numerous residential and commercial buildings along the route
- The Wyboston Lakes surround the route near St Neots
- The route passes across the flood plain of the River Great Ouse

However, it was also noted that there an improvement will offer several opportunities, including removing traffic from sensitive woodland areas, moving traffic away from residential buildings, resolving long standing community severance issues, and creating a new cycle path along the route.

It was also noted that forecast growth in the vicinity of the scheme was likely to exacerbate the existing problems and issues on the route with a number of key development sites nearby. This is despite the completion of the A14 Cambridge to Huntingdon improvement

The following objectives were generated for any improvement at the junction:

- Reduce existing and future levels of delay and congestion
- Support significant levels of planned growth expected in the area
- Address current road safety issues
- Minimise environmental impact on sensitive receptor(s)

3. Current situation

3.1 Introduction

This chapter describes the current situation in the A428 study area. It considers the demographics of the area, the current travel demand and level of service, and the current opportunities and constraints which would affect any transport interventions.

The chapter is structured under the following sub-headings:

- Land use and demographics
- Transport network
- Route performance
- Environment
- Constraints and opportunities

3.2 Land use and demographics

3.2.1 Land use

The A428 corridor provides a strategic link between the A421, A1, A14, M11, linking Cambridge with Bedford via smaller towns including St Neots and Camborne.

Cambridge is located at the eastern end of the A428 and to the east of the M11. Cambridge has become the heart of high-technology industries for software and bioscience companies. Cambridge science and business parks are located to the north-east of the town. Smaller industrial areas are present across the town, including Clifton Road Industrial Estate near Cambridge rail station.

Bedford is located to the west of the A428 further along the A421. The major employment and industrial land use is broadly located in the near vicinity of the A421, including Elm Farm and Woburn Road Industrial Estates.

St Neots is one of the largest and fastest growing towns in Cambridgeshire with a population of 31,165 in 2011. It has undergone two major expansion schemes in the last 10 years including 1,250 new homes at Love's Farm. The town is bounded to the west by the A1 and predominantly to the south by the A428. The major employment site is adjacent to the Wyboston junction in the south-west of the town.

Cambourne is a new settlement on the A428, 9 miles east of Cambridge. It is the largest settlement in South Cambridgeshire and is home to South Cambridgeshire District Council and Camborne Business Park.

The study area used for the demographic analysis in this chapter is defined by a 50 kilometre buffer around this A428 corridor. The demographic data is also compared against data for the east of England region, and for England as a whole. These regions are outlined in Figure 3.1.

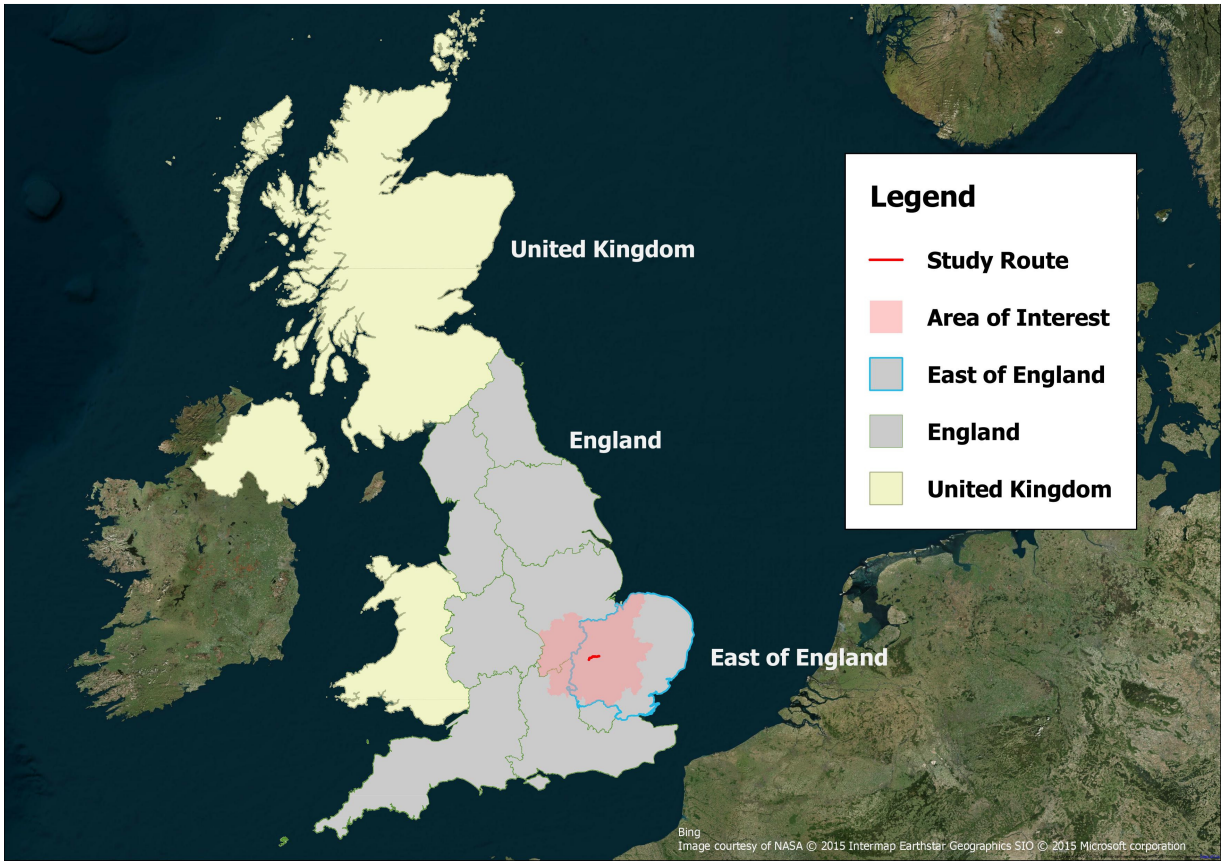

Figure 3.1: Study catchment area and A428 section route

3.2.2 Population

There are numerous population centres near the A428, the closest being St Neots and Cambourne which are located at either end of the A428 study corridor. Other large centres such as Milton Keynes, Cambridge, Northampton, Peterborough, Luton, Bedford and Huntingdon are also within the study catchment area as shown in Figure 3.2. The 2011 Census showed that the study area had a total population of 4,350,000 people.

Recent growth of the City of Cambridge has increased its population to approximately 123,900 people in 2011. Bedford Borough has a higher population that is also increasing, from 148,100 in 2001 to 163,900 in 2014. The local towns of St Neots and Camborne are home to 31,165 and 8,000 residents respectively.

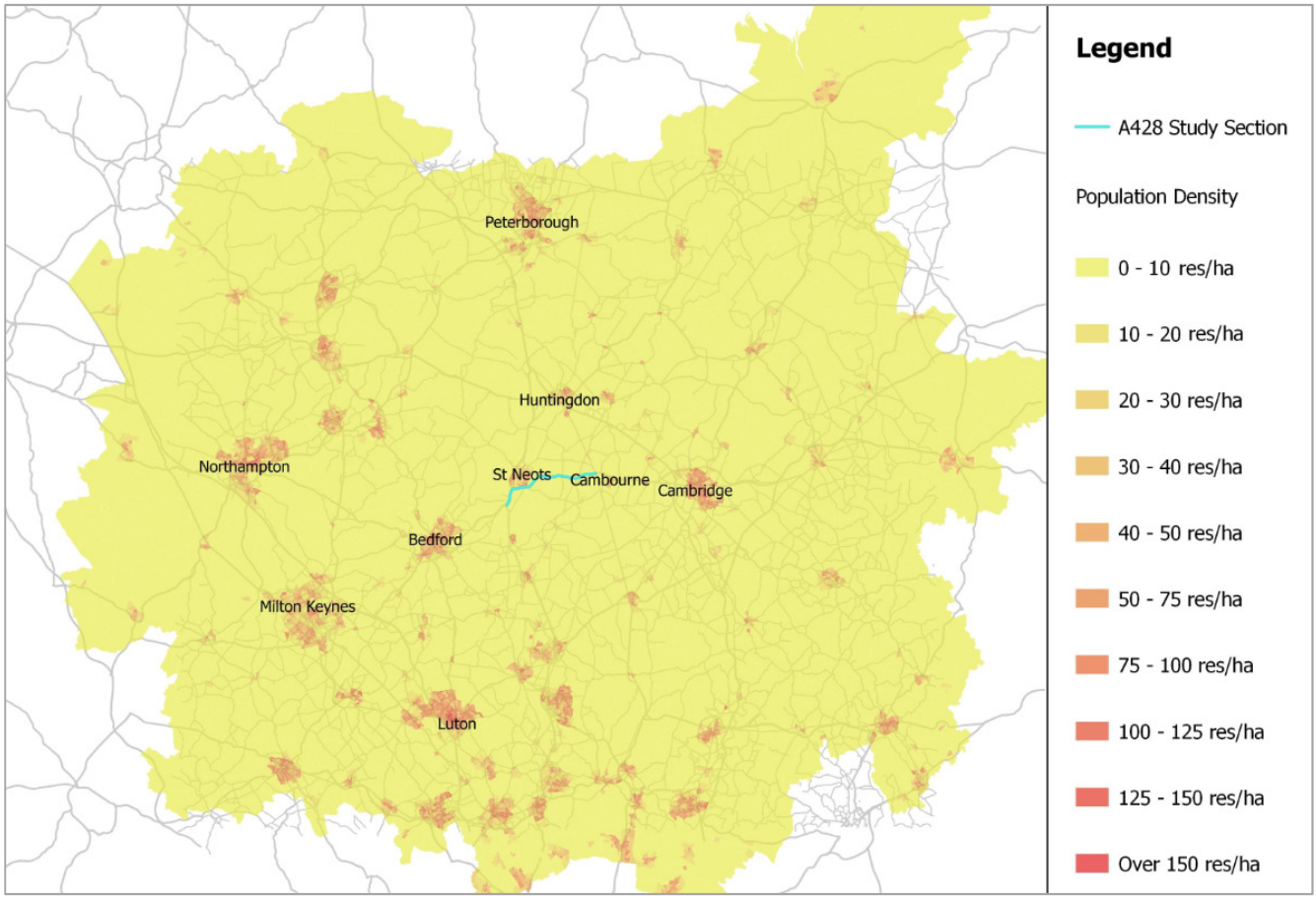

Figure 3.2: Population density in study catchment area

3.2.3 Car availability

The number of households with access to a car / van has been examined from 2011 census data. As shown in Figure 3.3, 76% of households in the study area have access to one or more vehicles. This is in line with the average for England (74%), but lowers than for the east of England region (81%).

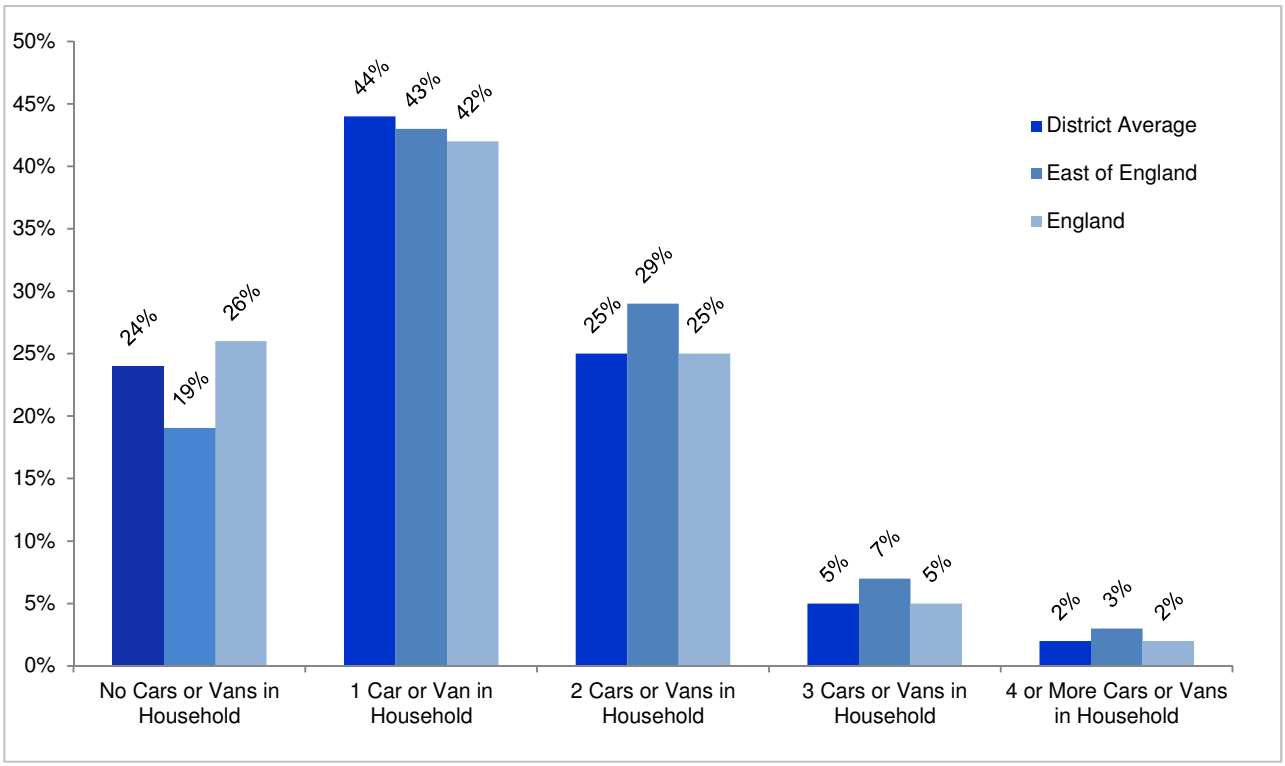

Figure 3.3 : Car or van ownership

There are a higher proportion of residents in employment in the study area compared with the east of England region and England as a whole. A total of 45% of working age residents in the study area travel to work in a car (either as a driver or passenger) while 7% commute using public transport. The statistics for the east of England region are very similar to those for the study area. The corresponding proportions for England as a whole are 40% traveling by car and 11% using public transport.

Mode of travel	Study Area	East of England	England
All public transport	7%	8%	11%
Work from home	3%	4%	3%
Taxi/motorcycle/other	1%	1%	1%
Driving a car or van	41%	41%	37%
Passenger in a car or van	4%	3%	3%
Bicycle	4%	2%	2%
On foot	8%	7%	7%
Not in employment	32%	33%	35%

Table 3.1: Method of travel to work

The average distance travelled to work by the study area residents is 16.3 kilometres, which is higher than the national average (14.9 kilometres). Table 3.2 illustrates that 42% of workers in the study area travel less than five kilometres to work.

Mode of travel	Study Area	East of England	England
Less than 2km	21%	17%	17%
2km to less than 5km	21%	15%	18%
5km to less than 10km	11%	13%	17%
10km to less than 30km	20%	23%	21%
30km to less than 60km	6%	9%	5%
60km and over	6%	4%	3%
Work mainly at or from home	9%	11%	10%
Other	7%	9%	8%
Average distance (km)	16.3	17.3	14.9

Table 3.2: Distance travelled to work

3.2.4 Economy

The scheme is located within the GCGP LEP and provides a key connection between it and the SEM LEP. Thus, the SEPs of both of the LEPs have been reviewed to establish a baseline of the local economy.

The GCGP area is one of the UK's fastest growing and most dynamic areas and makes a strong contribution to UK in the form of £30 billion gross value added (GVA) per annum. However, transport constraints represent a key challenge to supporting housing and employment growth and continued economic prosperity.

The GCGP see many of the constraints which inhibit business and housing growth are:

- road and rail 'bottlenecks' causing congestion and unreliable journey times
- limitations on the capacity of the rail network
- barriers to the delivery of housing for local workers
- limited public transport in rural areas
- east-west connectivity across the LEP area, and beyond
- potential for mode shift towards sustainable travel modes which are not fully realised
- access issues in relation to Stansted and Luton Airports as well as Heathrow and Gatwick airports

High house prices and lack of affordable housing has led to more people travelling further to work, with the average length of commute greater than the national average. Across the GCGP area, access to employment, education and services remains a real challenge without a car, especially in the more rural areas outside of the cities and market towns.

The GCGP area is forecast to experience significant population growth over the next twenty years. For large parts of the area this represents a continuation of past trends; for example, population growth in Cambridgeshire from the 2001 Census to 2011 was faster than in any other English County. Additionally, Peterborough saw the largest population growth nationally of any city over the past 20 years. The GCGP area's economic strengths and related population growth have led to significant and continued pressure for growth over recent times.

The A428 forms an east west link between the GCGP LEP and the cities of Bedford and Milton Keynes which are in the SEM LEP. The SEM LEP features many different industries such as high performance technology, manufacturing and advanced technology, pharmaceutical and healthcare and the creative and cultural sector. Examples of key businesses include Nissan, AstraZeneca, Jordans/Ryvita, Carlsberg, Vinci, Kier and BAE

Systems. Silverstone, the home of the British F1 Grand Prix is also located within the SEM LEP, as well as Cosworth who are based in Northampton.

The SEM LEP is located within the 'innovation' triangle which is formed by the university centres of Oxford, Cambridge and London. These, as well as other universities within the SEM LEP all offer businesses with a local pool of talented, skilled graduates, attracting businesses in to the area. Therefore, the area has a strong track record of growth and ambitious plans to deliver 87,000 new homes by 2021.

3.3 Transport network

3.3.1 Highway network

The focus of this study is formed by a section of the A1 from Black Cat roundabout to Wyboston Junction, and a section of the A428 from Wyboston Junction to Caxton Gibbet roundabout. This section of the A428 is the only remaining single carriageway section of the route between Felixstowe and the M1 at Milton Keynes.

There are a number of junctions on the route and only one grade separated junction at Wyboston between the A1 and the A428. There are a number of priority junctions along the single carriageway section of the route and five roundabouts at Black Cat, Wyboston, Barford Road, Cambridge Road and Caxton Gibbet. Of these, Black Cat roundabout (which forms the interchange between the A1 and the A421) has recently been improved as part of Highways England's Pinch Point Programme to alleviate problems at the junction, however, it is recognised that the improvements are not a long term solution.

The A1 connects London with Edinburgh. It is the main link between the south and north of the study area, passing through Stevenage, Huntingdon and Peterborough among others. The A428 is a major road in central and eastern England. It links the cities of Coventry and Cambridge providing a connection via the county towns of Northampton, Milton Keynes and Bedford.

These sections of the A1 and A428 perform important functions at the strategic, regional and local levels as summarised in Table 3.3.

	The A428...	
Strategically		• Forms a nationally important corridor between South Midlands and east coast ports • Provides a western access to Cambridge for HGVs
Regionally		• Links the major regional centres along the route • Provides for the distribution of goods and services • Alternative route to other national routes
Locally		• Forms the St Neots bypass • Provides the only means of access to some communities along the route, farmlands and woodlands

Table 3.3: Functions of the A428

3.3.1.1 Route standard

Throughout this 17km section, there are two changes in width, variations in geometry, access, lighting and lay-by provision. Such characteristics, in combination with the high traffic volumes, are widely cited to result in congestion on the network and increased delays following an incident, which impact journey time reliability and network resilience. In addition there are safety concerns with breakdowns, recovery and emergency vehicle access, in particular where compliant cross sectional carriageway components are not provided, such as hardstrips / hardshoulders.

Horizontal alignment and sight stopping distance

The majority of the horizontal radii along the length of the alignment do not meet the 'Desirable Minimum'[13].Whilst relaxations are permitted, sufficient widening in the vicinity of or on the immediate approach to junctions is required in order to accommodate Desirable Minimum Sight Stopping Distances (SSD).

The requirements for stopping sight distances (SSD) have evolved. Direct accesses and lay-bys are now both classified as junctions and are therefore subject to SSD requirements. There are a number of direct accesses and lay-bys along certain sections of the A428 corridor that do not meet the current SSD requirements under the DMRB. '[14] These include the following locations:

- A1 northbound near School Lane and Kelpie Marine
- A1 both directions just south of Black Cat Roundabout
- A428/A1 link road northbound (vegetation)
- A428 between B1040 and North East Farm

Generally SSD at these locations is restricted due to lack of verge width or presence of mature vegetation on the verges. In addition, connector road abutments and oncoming traffic, level differences and direct accesses (including bus stops) can obscure visibility.

Whilst for the majority of the A428 corridor the lane widths appear to be compliant, there are deficiencies in hardstrip and hardshoulder provision, on the A1 part of the route.

Junctions and direct access

Along the A428 there are junctions with other major routes, including the A1 and other A and B Roads, as well as many local roads. All major junctions have been allocated numbers in a similar manner to those of motorway junctions, and primarily consist of grade separated interchanges with 2 at-grade major / minor junctions outside of St Neots (A1/A428 interchange). There is one traffic signalled at-grade roundabout (Black Cat), two roundabouts without traffic signals and nine give-way junctions.

The frequency of junctions is variable throughout the corridor. In certain locations junctions are spaced very close together, which has resulted in sub-standard on/off slips or limited weaving lengths e.g. B1040, Abbotsley Road. This is likely to affect the mainline resilience, with an increased susceptibility to congestion and delays during peak periods. Turbulence between the merge and diverge may also impact upon operational performance.

There are sections of the A428 that retain at-grade accesses to residential, commercial and agricultural properties. There are 49 private accesses and three service stations with direct frontage access. The proximity and number of access points along the route is significant, and likely to generate considerable interference with mainline throughput. This creates the potential for increased incidents, thus impacting upon network resilience and journey time reliability, and is ultimately a hindrance and unsafe on a high speed (60mph) road.

Lay-bys

There are currently 17 lay-bys on the scheme route which vary in terms of provision and layout. Concern has been raised with regard to both the standard and siting (including issues associated with positioning, frequency, SSD) of this provision.

Assessment indicates that the level and standard of provision of lay-bys on the A428 is well below that required by current departmental standards. Typical concerns include:

- Layout issues
- No physical kerbed segregation island
- No through lane provided within lay-bys

[13] DMRB, 2002. *TD 9/93 Highway Link Design*. http://www.dft.gov.uk/ha/standards/dmrb/vol6/section1/td993.pdf
[14] DMRB, 2002. TD 9/93 Highway Link Design. http://www.dft.gov.uk/ha/standards/dmrb/vol6/section1/td993.pdf

- Location on horizontal radius, restricting SSD
- Desirable Minimum SSD not achievable on the immediate approach to the start of the lay-by
- Poor merge taper layout
- Length of lay-by

3.3.1.2 Asset condition

A review of the asset condition of the A1 and A428 between Black Cat roundabout and Caxton Gibbet roundabout has been undertaken making use of available data sources that are maintained by Highways England to monitor and review the condition of the SRN.

The review has identified that the majority of the current pavement surfacing material will have exceeded its anticipated lifecycle by 2020, and will require replacement.

The review has also highlighted minor maintenance interventions of structures along the A428, with the most significant intervention being the River Great Ouse Crossing which has been identified as having high priority. The River Great Ouse crossing has a cracking concrete bearing pad which requires monitoring at regular intervals, severely deteriorated expansion joints, delamination and spalling at abutments that require repair, and blocked gullies.

No issues were identified with geotechnical, lighting, vehicle restraint system (VRS), fencing, signage or technology through analysis of available data.

3.3.1.3 Technology

Existing technology provision on the A428 between the Black Cat Roundabout (A1) and Caxton Gibbet (A1198) comprises the following:

- Three traffic measurement equipment (TME) traffic counting sites
- A single automatic number plate recognition (ANPR) camera site providing journey time information, which is located on the A428 at the junction with the A1 (Wyboston)

There are no signals, closed circuit television (CCTV) or emergency telephones on the A428 between the A1 and A1198.

There is no National Roads Telecommunications Services (NRTS) communications network on the A428. Communications to traffic count and ANPR sites are provided over GSM/GPRS networks.

As reported in the RBS evidence reports, stakeholders have identified the need for greater provision of driver information along the A428 between Wyboston and Caxton Gibbet and the need for intelligent technology along the whole route.

3.3.2 Public transport

St Neots Railway Station is located on the East Coast Main Line (ECML) and provides rail services between London Kings Cross and Peterborough every 30 minutes. Journey times are between 53 and 69 minutes to London Kings Cross and 25 minutes to Peterborough. No east west rail services currently operate in the study area.

There are limited bus services operating along the A428. The X5 service operated by Stagecoach runs between Cambridge and Oxford via St Neots, Bedford and Milton Keynes. It operates every 30 minutes during the middle of the day, and up to every 15 minutes during the morning and evening peaks.

Two National Express services also operate along the A428 at a frequency of once per day: the 305 service between Liverpool and Clacton-on-Sea and the 314 service between Southport and Cambridge. Both of these services stop at Bedford, St Neots, Cambourne and Cambridge.

3.3.3 Non-motorised users (NMU)

The A428 / A1 study area provides some facilities for non-motorised users. These include various footways, crossing facilities and underpasses. Part of the Sustrans national cycle network (NCN) route 12 runs on Roxton Road parallel to the section of A1 between Black Cat and Wyboston.

The RBS evidence reports identified that the Black Cat, Wyboston and Caxton Gibbet roundabouts, and the A428 link between Wyboston and Caxton Gibbet have issues regarding cycling and pedestrian provision. Stakeholders highlighted the poor NMU provision between the Phoenix Park Triangle and the Eaton Socon urban area.

3.4 Route performance

3.4.1 Travel patterns

The pattern of commuting trips in the study area was analysed, based on 2011 Census journey to work information. Table 3.4 shows the daily commuting trips made by car, taxi or motorcycle, between several major towns and cities in the relative proximity of the A428.

The most significant movements are from St Neots to Bedford and fom St Neots to Cambridge which are most likely to use sections of the A428 between Black Cat and Caxton Gibbet.

	Bedford	Cambridge	Cambourne	Huntingdon	Luton	Milton Keynes	Northampton	Peterborough	St Neots
Bedford		165	32	132	n/a	n/a	n/a	154	280
Cambridge	77		n/a	n/a	49	49	17	n/a	120
Cambourne	25	n/a		n/a	7	6	2	n/a	42
Huntingdon	59	n/a	n/a		12	57	n/a	n/a	n/a
Luton	n/a	41	7	12		n/a	n/a	35	20
Milton Keynes	n/a	82	2	64	n/a		n/a	79	53
Northampton	n/a	28	0	n/a	n/a	n/a		n/a	17
Peterborough	100	n/a	n/a	n/a	105	126	n/a		n/a
St Neots	455	571	97	n/a	47	139	30	n/a	
	*Impact on A1**								
	*Impact on A428**								
	*Impact on A1 and A428**								

Table 3.4 : Daily commuting trips using study corridor

An ‘n/a’ indicates no movement was recorded between each urban areas. Assumptions have been made with regard to the potential for certain journeys to utilise particular sections of the road network.

3.4.2 Traffic volumes

Observed traffic count data and HGV percentages have been obtained from the Highways England Traffic Database System (TRADS). Data was obtained for the 2014 calendar year.

For locations where observed traffic data was not available, it was taken from the A14 traffic model (CHARM). This model was developed to support the A14 Cambridge to Huntingdon improvement scheme, and has a base year of 2014. Further information on the use of this model is provided in Appendix B.

The traffic data is summarised in Figure 3.4 and Table 3.5. Traffic volumes are provided as peak hour flows and as Annual Average Daily Traffic (AADT). AADT represents the average number of vehicles passing a given point on a road each day. The percentage of HGVs is also provided.

The A1 between Black Cat roundabout and Wyboston junction has on average 28,000 vehicles per day in each direction. The A428 between Wyboston and Caxton Gibbet has between 8,500 and 14,000 vehicles per day in each direction.

Figure 3.4 shows that annual average PM peak hour flows are higher in volume than the AM peak hour flows on both the A1 and A428. The percentage of HGVs on each section varies between 10% and 15%. This is broadly in line with the national rural trunk roads typical average of 10.3%.

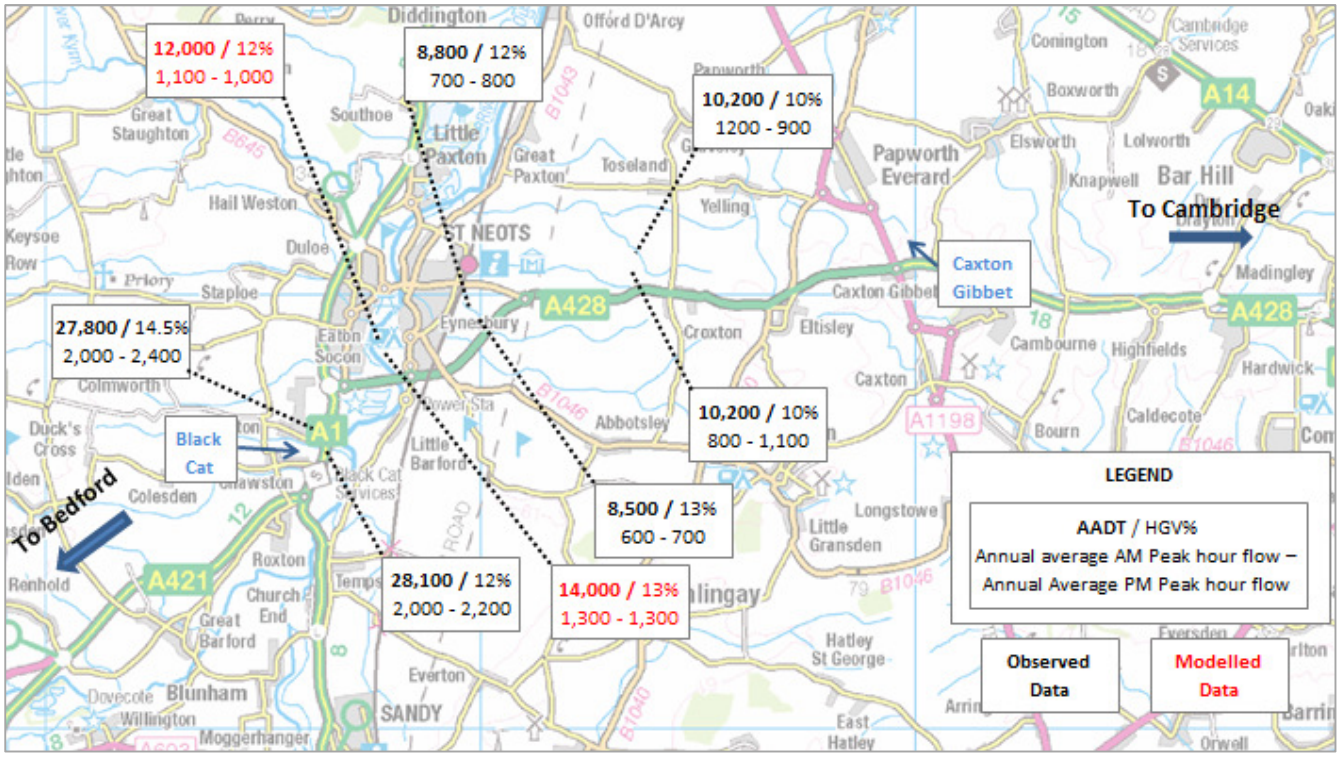

Figure 3.4 : A428 / A1 traffic volumes and HGV percentages **Value factored to 2014 from 2012 counts*

From	To	Source Data	AADT (2014)	HGV% (AADT)	AM peak hour flow	PM peak hour flow	AM Peak Hour	PM Peak Hour
Eastbound								
Black Cat Roundabout	Wyboston Junction	Observed Data	27,800	14.5%	2,000	2,400	7-8am	5-6pm
Wyboston Roundabout	Barford Rd Roundabout	A14 Traffic Model	12,000	12%	1,100	1,000	8-9am	5-6pm
Barford Rd Roundabout	Cambridge Rd Roundabout	Observed Data	8,800	12%	700	800	7-8am	5-6pm
Cambridge Rd Roundabout	Caxton Gibbet Roundabout	Observed Data	10,200	10%	1,200	900	7-8am	5-6pm
Westbound								
Caxton Gibbet Roundabout	Cambridge Road Roundabout	Observed Data	10,200	10%	800	1,100	7-8am	5-6pm
Cambridge Rd Roundabout	Barford Rd Roundabout	Observed Data	8,500	13%	600	700	7-8am	4-5pm
Barford Rd Roundabout	Wyboston Roundabout	A14 Traffic Model	14,000	13%	1,300	1,300	8-9am	5-6pm
Wyboston Junction	Black Cat Roundabout	Observed Data	28,100	12%	2,000	2,200	7-8am	5-6pm

Table 3.5 : A428 traffic volumes and HGV percentages **2012 count factored to 2014*

3.4.3 Capacity and capability

The volume to capacity (V/C) ratios have been estimated for the study corridor using the volume of traffic on the road divided by the theoretical capacity of the road link. This provides an indication of how close to capacity a road is operating at. A value of 1 would represent a road operating at maximum theoretical capacity.

Existing A428 and A1 carriageway capacities have been estimated using guidance outlined in DMRB. This is documented in Appendix B. Traffic volumes have been based on either observed or modelled peak hour data, as provided in Table 3.5.

The calculated V/C ratios are provided in Table 3.6. Several sections of the route are operating close to or above their theoretical capacity. The worst performing section of the A428 is between Barford Road and Wyboston. This is estimated as being above capacity in both the AM and the PM peaks in the westbound direction while it approaches capacity in the AM peak in the eastbound direction. The section of the A428 between Cambridge Road roundabout and Caxton Gibbet is also estimated to be operating above capacity in the AM peak in the eastbound direction while it is approaching capacity in the PM peak westbound.

Section	Peak Hour Volume		V/C Ratio		DMRB ref. capacity (veh/hr)
	AM	PM	AM	PM	
Eastbound					
A1: Black Cat roundabout to Wyboston Junction	2,000	2,400	0.54	0.65	3,700
A428: Wyboston Junction to Barford Road roundabout	1,100	1,000	0.92	0.83	1,200
A428: Barford Road roundabout to Cambridge Road roundabout	700	800	0.58	0.67	1,200
A428: Cambridge Road roundabout to Caxton Gibbet	1,200	900	1.00	0.75	1,200
Westbound					
A428: Caxton Gibbet roundabout to Cambridge Road roundabout	800	1,100	0.67	0.92	1,200
A428: Cambridge Road roundabout to Barford Road roundabout	600	700	0.50	0.58	1,200
A428: Barford Road roundabout to Wyboston Junction	1,300	1,300	1.08	1.08	1,200
A1: Wyboston Junction to Black Cat roundabout	2,000	2,200	0.54	0.59	3,700

Table 3.6 : A428 traffic volume and capacity **2012 count factored to 2014*

The route also has several low-capacity junctions along its length within a short distance of each other. Previous analysis undertaken in support of development sites in the area identified that the roundabouts at Wyboston, Barford Road and Caxton Gibbet would be operating at, or close to, their theoretical maximum capacity by 2015. Table 3.7 shows the predicted ratio of flow to capacity (RFC) in the PM time period each of these roundabouts which indicates that each junction is operating either beyond or close to their maximum theoretical capacity.

Junction	RFC
Wyboston Roundabout	**0.85**
Barford Road Roundabout	**0.88**
Caxton Gibbett	**1.13**

Table 3.7 : A428 junction ratio flow to capacity

3.4.4 Journey times

Trafficmaster data provided by Highways England has been analysed to estimate current journey times for the A428 corridor between Caxton Gibbet roundabout and Black Cat roundabout. Trafficmaster data provides individual vehicle speeds obtained via GPS devices fitted to both private and commercial vehicles. Trafficmaster data is able to provide a large sample of vehicle speeds for the A428 which can be analysed.

Average AM peak (7am - 10am), inter-peak (11am - 12pm), PM peak (4pm - 7pm) and off peak (9pm-10pm) time periods between September 2013 and May 2014 were used in the journey time analysis.

Table 3.8 shows the average journey times along the full route of the A1 and A428 between Black Cat roundabout and Caxton Gibbet roundabout in both directions. This table shows that the AM and PM journey times take significantly longer, in both directions, than off-peak journey times.

From	To	AM	IP	PM	OP
Black Cat Roundabout	Caxton Gibbet Roundabout	20m 34s	14m 39s	16m 58s	12m 54s
Caxton Gibbet Roundabout	Black Cat Roundabout	20m 16s	14m 37s	17m 13s	13m 01s

Table 3.8 : A428 route journey times

Figure 3.5 and Figure 3.6 plot the cumulative travel time between the A421/A4280 junction on the A421 (west of Black Cat) and Scotland Road roundabout on the A428 (east of Caxton Gibbet). These figures present journey time information for a broader area of network than the route analysed in Table 3.7.

The figures show that the AM and PM peak period journey times take significantly longer, in both directions, than in the inter-peak and off-peak time periods.

Figure 3.5 shows that in the eastbound direction there are significant delays on the A421 approaching Black Cat roundabout in the PM time period. This is likely to be due to commuter traffic travelling northbound along the A1 from the south of Black Cat roundabout. The figure also shows that there is significant congestion between Barford Road roundabout and the B1040/ St Ives Road junction during the AM time period. This is likely to be due to traffic travelling along the A428 into Cambridge.

Figure 3.6 shows that in the westbound direction there is significant congestion on the A428 at Caxton Gibbet roundabout in all time periods and on the A1 approaching Black Cat roundabout in the AM time period. However, recent improvements to Black Cat roundabout may have now improved this issue.

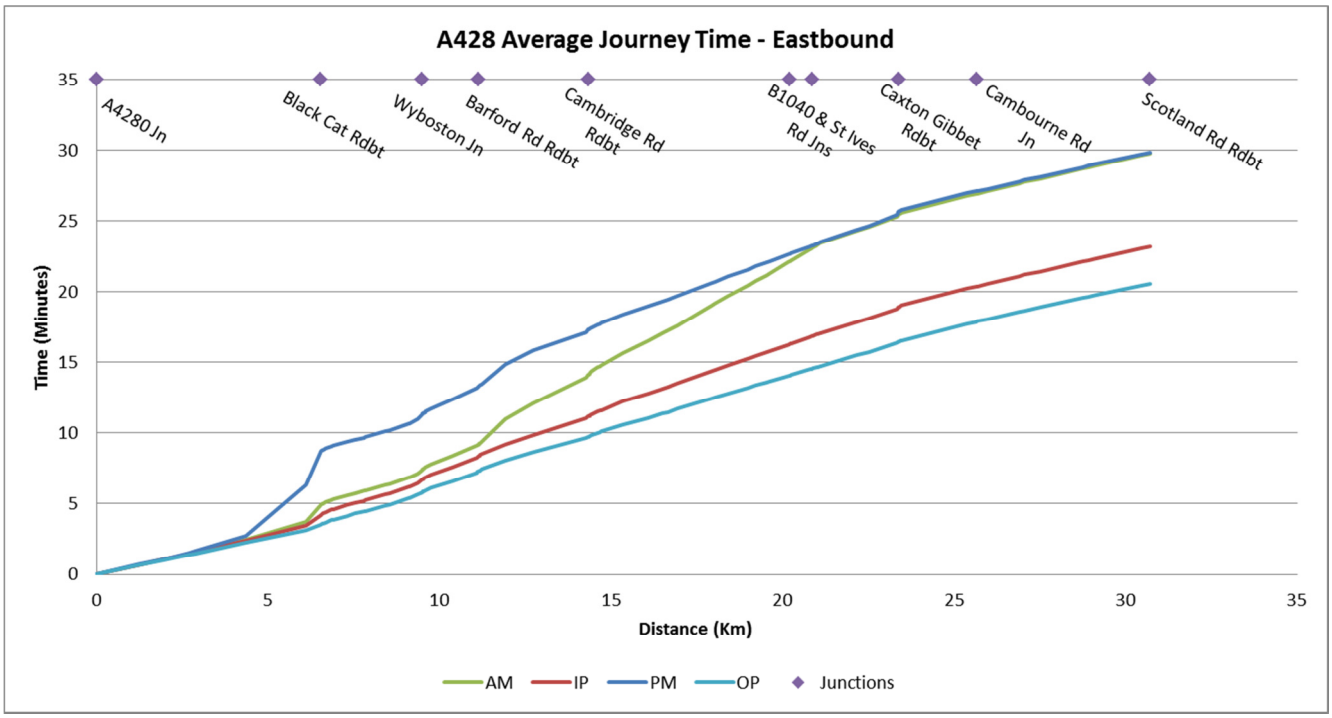

Figure 3.5 : Eastbound from Scotland Rd roundabout to A421/A4280 junction

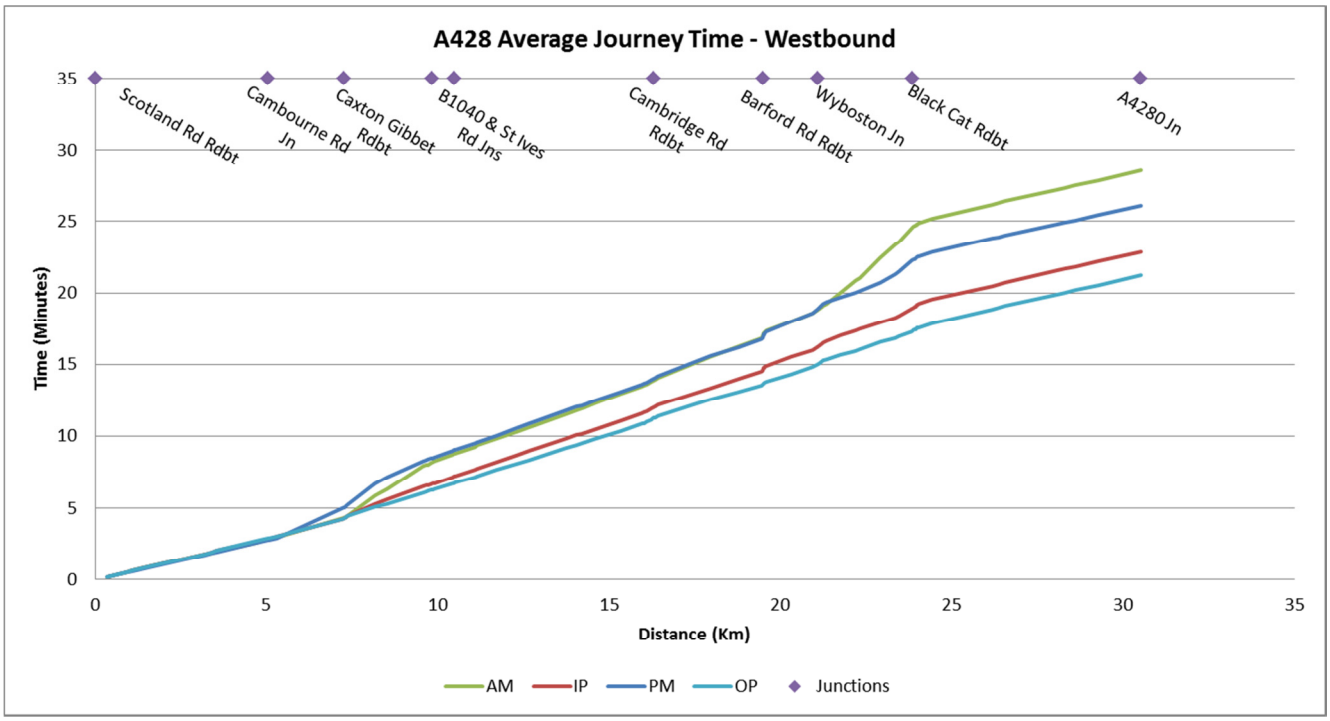

Figure 3.6 : Westbound from Scotland Rd roundabout to A421/A4280 junction

3.4.5 Speed analysis

Trafficmaster data has also been used to calculate average link speeds. These speeds have been analysed to illustrate in greater detail the performance of junctions along the route. Figure 3.7, Figure 3.8 and Figure 3.9 show the average AM (7am-10am), IP (11am-12pm), and PM (4pm – 7pm) peak time periods between September 2013 and May 2014.

The figures clearly show that the average speeds on the single carriageway sections of the route are significantly lower than on the dual carriageway sections on either side of the area of interest (A421 to the west of Black Cat roundabout and the A428 to the east of Caxton Gibbet roundabout).

The AM speeds are particularly low, especially on the approaches to Black Cat and Caxton Gibbet roundabouts. Over half of the eastbound journey between Wyboston Junction and Caxton Gibbet has an average speed of below 30mph.

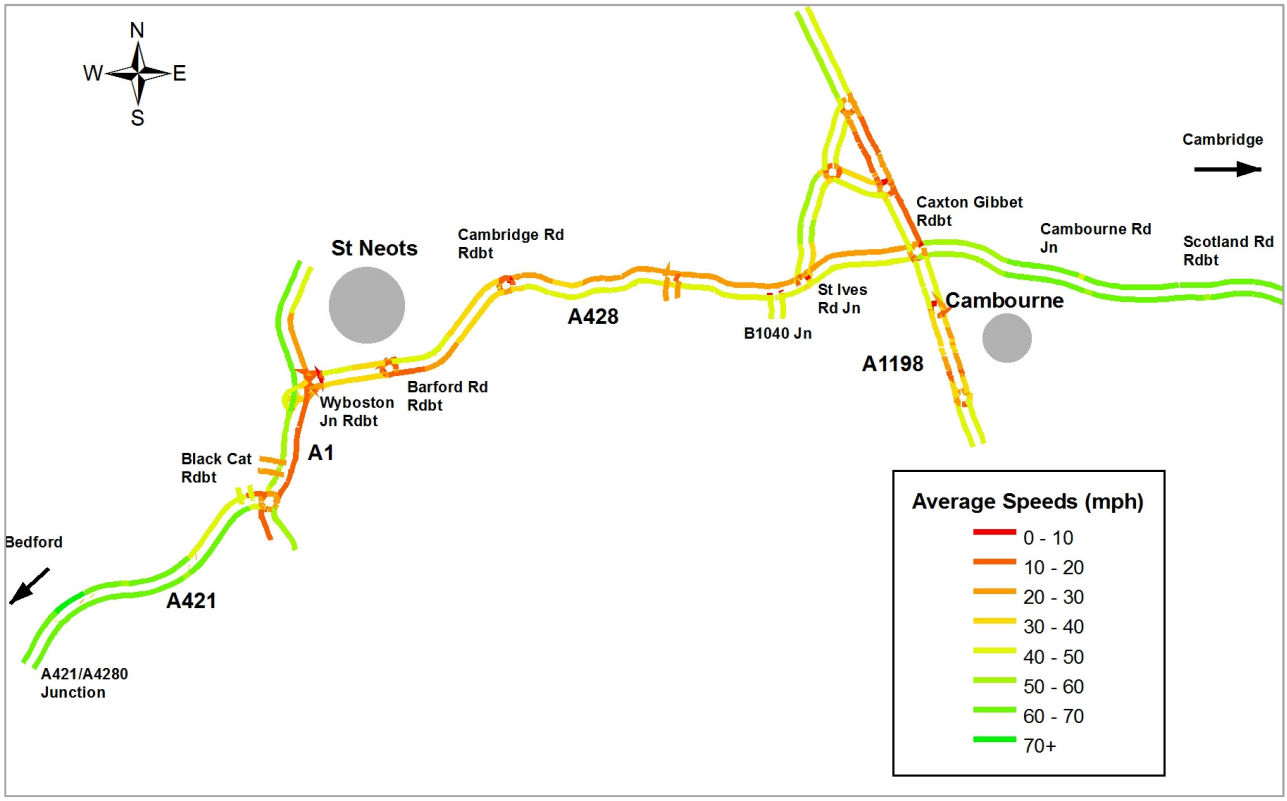

Figure 3.7 : AM average traffic speeds (mph)

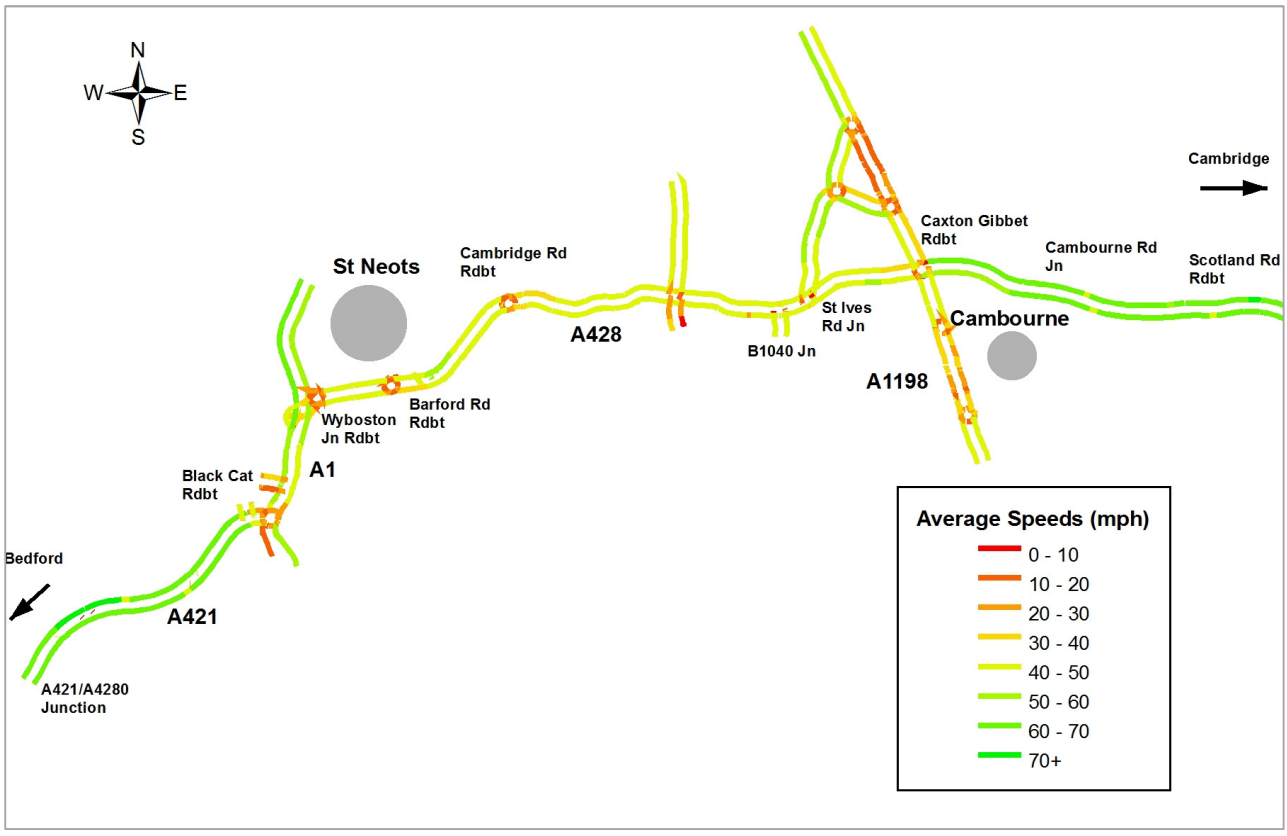

Figure 3.8 : IP average traffic speeds (mph)

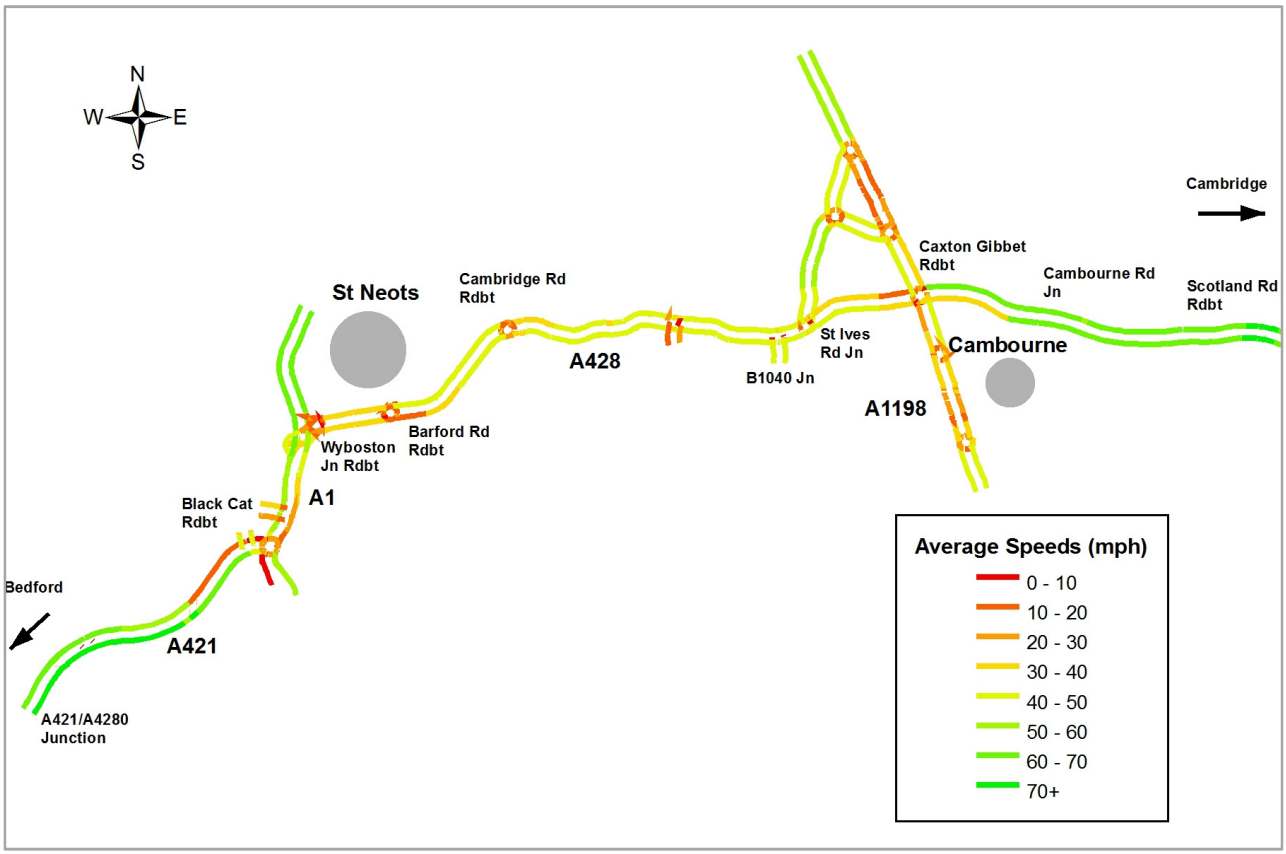

Figure 3.9 : PM average traffic speeds (mph)

In addition to the average speed, all individual speed observations were used to build a speed distribution profile for each link. This shows the proportion of observed vehicles travelling at or below speeds given in increments of 10mph.

This speed distribution is shown in Table 3.9. It can be seen that the majority of vehicles on dual carriageways in the peak hours travel at more than 60mph (with the exception of the A1 between Black Cat roundabout and Wyboston junction). On single carriageway sections of the A428, a high proportion of vehicles travel at less than 40mph, especially between Wyboston and Barford Road roundabouts.

The A428 Eltisley, Caxton Gibbet Improvement Review by URS identified that significant queues develop at Caxton Gibbet roundabout in the AM peak on the A428 in the eastbound and westbound directions, as well as on the A1198 southbound. It is noted that in the AM peak eastbound queues on the A428 can extend to the Eltisley junctions, and in the PM peak, westbound queues can extend to the Cambourne Junctions.

From	To	Dual / Single C'way	Average Speed (mph)				% time below speed in peak hours (mph)				
			AM	IP	PM		<70	<60	<50	<40	<30
Eastbound											
A421/A4280 Jn	Black Cat Roundabout	Dual	59	63	45		56%	29%	19%	16%	13%
Black Cat Roundabout	Wyboston Roundabout	Dual	49	48	48		99%	86%	43%	19%	8%
Wyboston Roundabout	Barford Rd Roundabout	Single	38	43	36		100%	99%	95%	73%	45%
Barford Rd Roundabout	Cambridge Rd Roundabout	Single	37	47	45		100%	96%	75%	48%	38%
Cambridge Rd Roundabout	A428/B1040 W Jn	Single	28	44	41		100%	99%	79%	39%	16%
A428/B1040 W Jn	A428/B1040 E Jn	Single	25	44	42		100%	99%	79%	32%	20%
A428/B1040 E Jn	Caxton Gibbet Roundabout	Single	24	41	30		100%	98%	80%	48%	34%
Caxton Gibbet Roundabout	Cambourne Rd Roundabout	Dual	61	61	63		78%	32%	3%	0%	0%
Cambourne Rd Roundabout	Scotland Rd Roundabout	Dual	67	67	69		60%	13%	1%	0%	0%
Westbound											
Black Cat Roundabout	A421/A4280 Jn	Dual	66	66	69		60%	24%	9%	1%	0%
Wyboston Roundabout	Black Cat Roundabout	Dual	18	42	34		99%	91%	67%	54%	43%
Barford Rd Roundabout	Wyboston Roundabout	Single	36	39	32		100%	100%	97%	75%	50%
Cambridge Rd Roundabout	Barford Rd Roundabout	Single	29	44	32		100%	99%	86%	67%	54%
A428/B1040 W Jn	Cambridge Rd Roundabout	Single	43	46	44		100%	98%	78%	26%	8%
A428/B1040 E Jn	A428/B1040 W Jn	Single	44	47	45		100%	98%	73%	19%	7%
Caxton Gibbet Roundabout	A428/B1040 E Jn	Single	44	47	42		100%	98%	75%	27%	12%
Cambourne Rd Roundabout	Caxton Gibbet Roundabout	Dual	56	58	38		79%	48%	21%	11%	6%
Scotland Rd Roundabout	Cambourne Rd Roundabout	Dual	67	66	68		55%	12%	1%	0%	0%

Table 3.9 : Average vehicle speeds and distribution of speeds

3.4.6 Journey time reliability

Day to day peak period journey time reliability along the A428, A1 and A421 has been measured in terms of the buffer index (BI). This index represents the time a traveller should allow in addition to the average travel time to ensure on time arrival 95% of the time. A higher BI value reflects a more unreliable journey time. Additional information regarding the BI as a measure of travel time reliability is presented in Appendix D.

The BI has been calculated for each road segment using Trafficmaster data recorded during normal working days from September 2013 to May 2014. For this analysis, AM and PM peak cover the same time periods as previous analysis in this section.

Peak period travel time reliability is illustrated visually in Figure 3.10 and Figure 3.11.

The reliability analysis shows that peak period travel along the A428 is relatively unreliable, with a significant number of segments having a BI of above 40%. Journey times are more unreliable in the eastbound direction in the morning, and in the westbound direction approaching Black Cat roundabout in the PM. This is likely to be due to commuters travelling to and from Cambridge during peak periods.

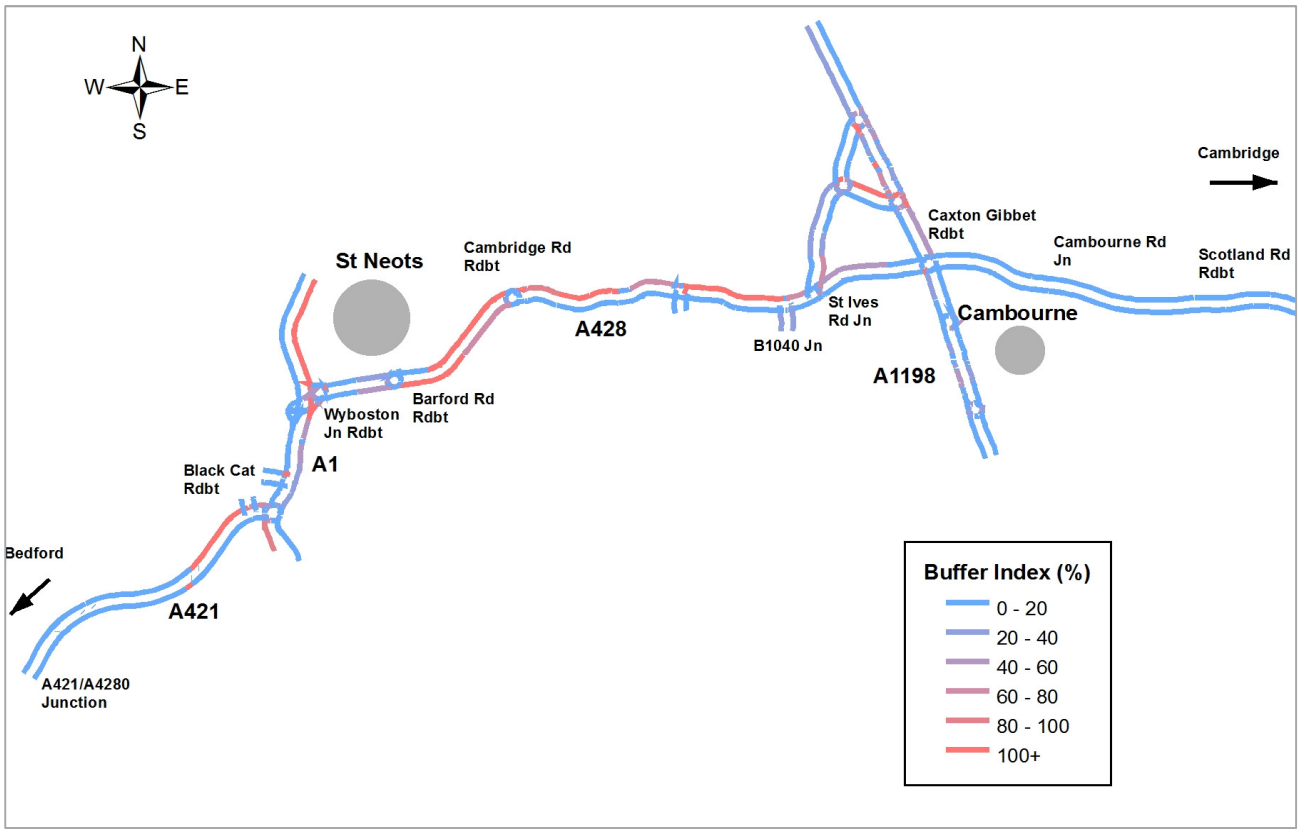

Figure 3.10 : A428 AM buffer index

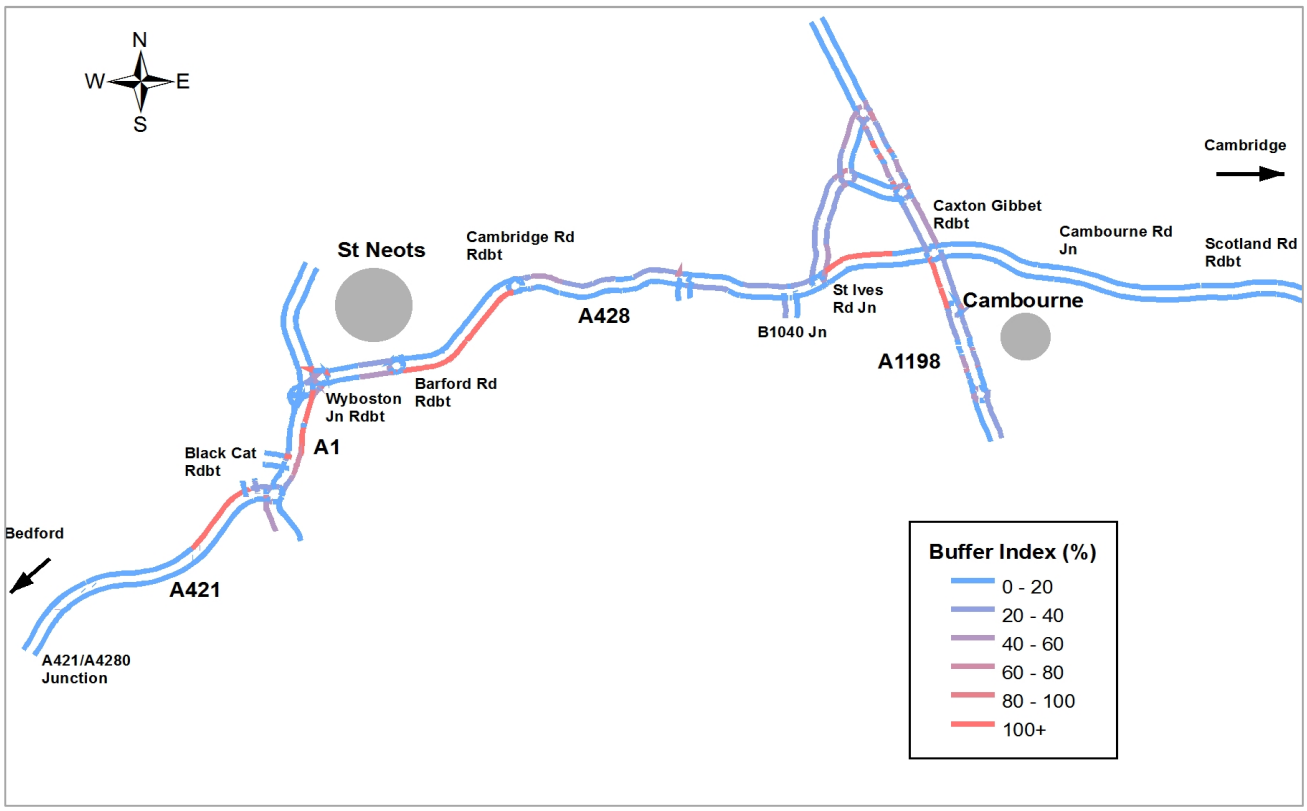

Figure 3.11 : A428 PM buffer index

The A428 Eltisley, Caxton Gibbet Improvement Review by URS identified that significant queues develop at Caxton Gibbet roundabout in the AM peak on the A428 in the eastbound and westbound directions, as well as on the A1198 southbound. It is noted that in the AM peak eastbound queues on the A428 can extend to the Eltisley junctions, and in the PM peak, westbound queues can extend to the Cambourne Junctions.

3.4.7 Road Safety

3.4.7.1 Collision analysis

A review of available collision data for the five years from January 2010 to December 2014 has been undertaken to help understand whether there is currently a safety problem along the study corridor and identify any potential areas in need of improvement.

For the purpose of this review the study corridor was separated into three main areas: the A1, A428 and remainder of study area. In the five year period there were 57 accidents (seven serious, 50 slight) recorded along the A1, and 100 accidents (three fatal, 20 serious, 77 slight) recorded along the A428.

The locations of the collisions have been analysed, and clusters of collisions have been identified. It is notable that there are major collision clusters at the A1/A421 Black Cat roundabout, and at Caxton Gibbet roundabout.

The average KSI rate/hmvm for the A428 for the five year period is marginally higher than the national average, however, this is skewed through a large number of KSIs occurring in 2010 compared to the rest of the assessment period with the observed KSI rates in 2011, 2012, 2013 and 2014 being below the national average.

The casualty rates for the A1 for the period are significantly higher than the national averages except in 2012. This could be explained by the presence of the large cluster site (A1/A421 Black Cat Roundabout) being located mid-way along the section. The Black Cat roundabout has previously been identified as a collision black spot by Highways England and local authorities.

There is low level of NMU collisions on the trunk road (two on A1, both of which involved pedestrian and three on A428, one of which involved a pedestrian and two involved pedal cyclists). The accidents were at separate locations, and so no pattern can be discerned. One of the pedal cycle collisions was at A428/A1198 Caxton Gibbet roundabout.

In contrast, NMU collisions account for 37 of 119 collisions on local roads, which is a high level (31%, as compared to 22.3% nationally[15]). Of these, 20 were cyclists and 17 were pedestrians. Nine of the NMU casualties/collisions occurred on the B1428, Great North Road, and a further nine at Cromwell Road, St Neots.

3.4.7.2 Incidents and Road Closures

Analysis of incident frequency along the A428 has been undertaken using historic incident data supplied by Highways England for four years between May 2010 and May 2014.

Incident types have been grouped into traffic collision, breakdown and other (e.g. planned roadworks, animal on road, fire, spillage, weather).

Presented in Figure 3.12 is the average four year incident rate per vehicle kilometres travelled (VKT) by section, also broken down by type.

From Figure 3.12 it is clear that the majority of incidents that occur within the area of interest are defined as being 'Other', which includes planned roadworks, spillages, congestion etc. The rates of incidents are higher on the A421 and the dual carriageway section of the A428 than on the single carriageway section of the A428.

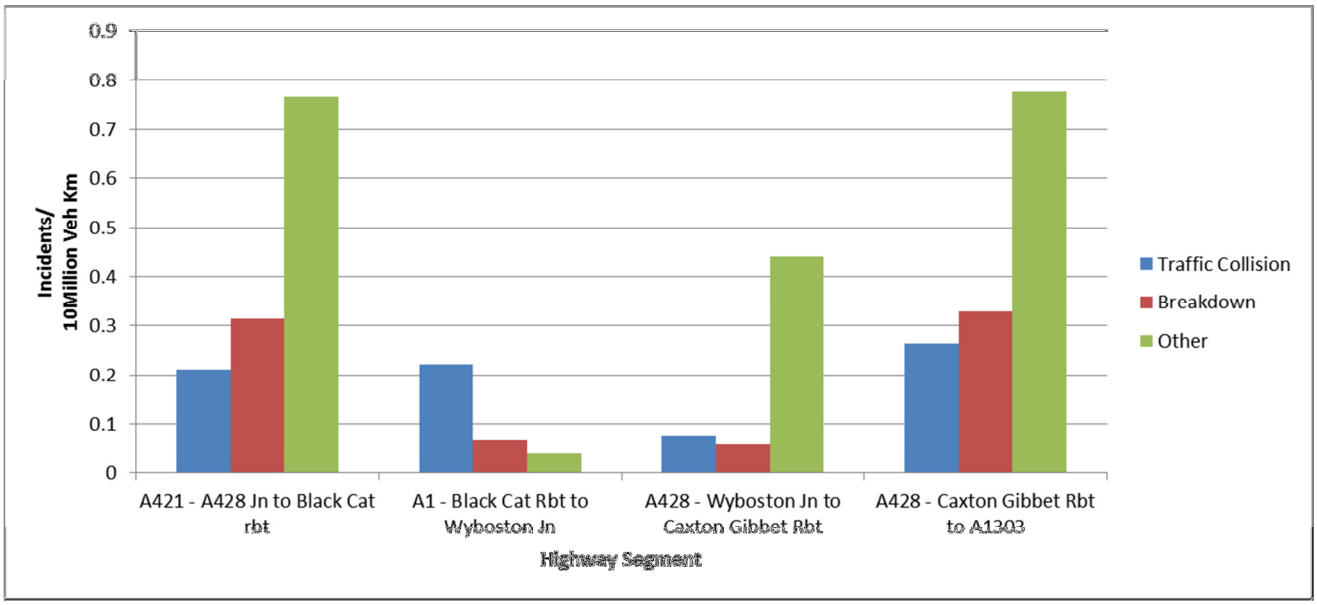

Figure 3.12 : A428 incidents per vehicle kilometres

The incident occurrence time series results, illustrated in Figure 3.13, shows that there have been a significant increase in 'other' incidents since 2012. This is likely to be due to roadworks taking place in the area. The number of breakdowns and traffic collisions have remained relatively stable between 2011 and 2013.

[15] Reported Road Casualties Great Britain: 2013 – Annual Report – Table RAS 30004
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/359311/rrcgb-2013.pdf

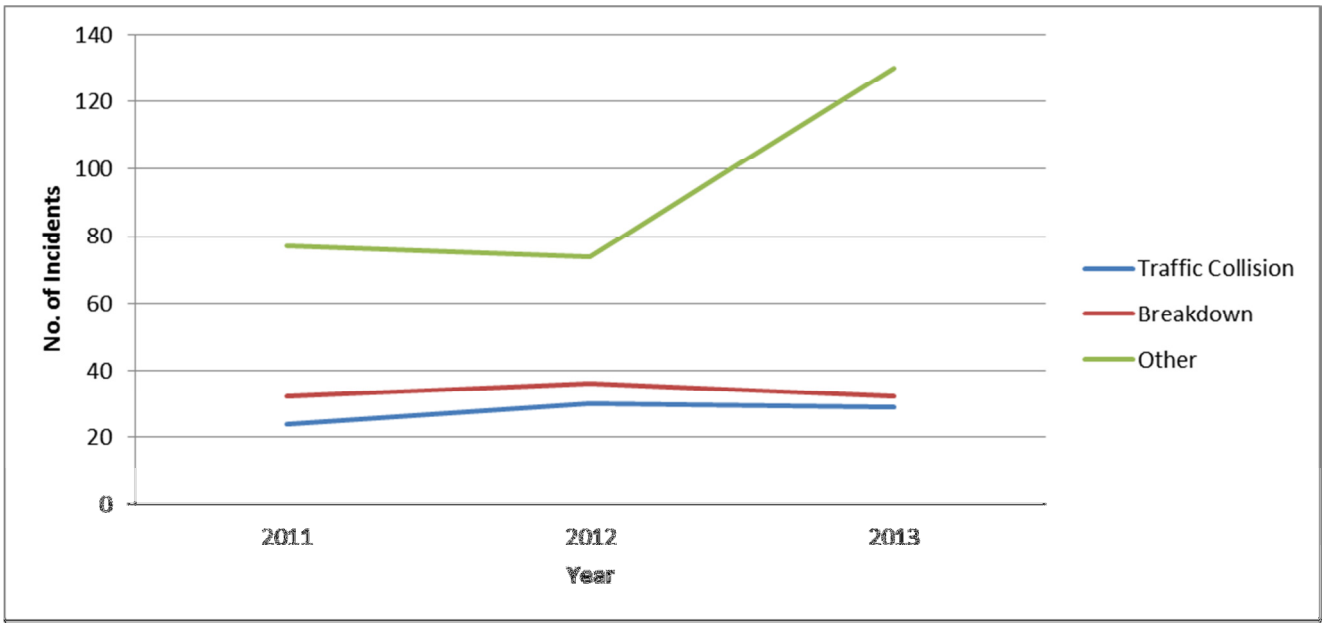

Figure 3.13 : Yearly profile of incident breakdown types

The frequency of carriageway closures between May 2010 and May 2014 has been calculated for each section, and is shown in Table 3.10. This shows that on average there are seven lane closures a year on the single carriageway of the A428. This is considerably higher than the number of carriageway closures on the A421, A1 and the dual carriageway section of the A428. The lower number of incidents on the single carriageway and higher closure rate indicates the lack of resilience on the single carriageway sections of the route when compared to the dual carriageway sections.

Highway segment	Annual average lane closures
A421:A428 Junction to Black Cat	3
A1: Black Cat roundabout to Wyboston Junction	2
A428: Wyboston junction to Caxton Gibbet roundabout	7
A428: Caxton Gibbet roundabout to Scotland Junction	1

Table 3.10 : Annual lane closure frequency

3.4.8 Public transport

Section 3.3 set out the lack of an alternative rail route for commuters along the corridor. However, there are bus services along the A428, of which the X5 bus service operated by Stagecoach offers the only realistic commuting option. Year 2011 census data shows that only 7% of commuters in the study area commute via bus compared to 11% nationally.

A comparison of travel time and availability of bus services along the corridor versus commuting by car has been undertaken to understand how appealing east-west public transport is to the general public.

Table 3.11 and Table 3.12 show the comparison for commuters heading to Cambridge from destinations to the west.

Town	Peak hour service frequency to Cambridge (buses per hour)	Scheduled travel time to Cambridge Parkside (minutes)	Estimated Journey time by car in the AM peak (minutes)
Bedford	2	74	45-100
St Neots	2	43	40-75

Table 3.11 : Commuting to Cambridge Parkside via bus services vs road (AM peak)

Town	Peak hour service frequency to Cambridge (buses per hour)	Scheduled travel time to Cambridge Parkside (minutes)	Estimated Journey time by car in the PM peak (minutes)
Bedford	2	74	45-90
St Neots	2	43	30-45

Table 3.12 : Commuting to Cambridge Parkside via bus services vs road (PM peak)

Bus services become a more preferable choice for commuting when journey times are quicker than commuting by car. However, in this case the estimated journey time by car is comparable to the scheduled journey time by bus in both the AM and PM periods. Therefore commuting by bus does not offer a significant advantage over commuting by private car.

Table 3.13 and Table 3.14 show the comparison for commuters heading to Bedford from destinations to the east.

Town	Peak hour service frequency to Bedford (buses per hour)	Scheduled travel time to Bedford (minutes)	Estimated Journey time by car in the AM peak (minutes)
St Neots	2	44	24-40
Cambridge	3	69	50-75

Table 3.13 : Commuting to Bedford via bus services vs road (AM peak)

Town	Peak hour service frequency to Bedford (buses per hour)	Scheduled travel time to Bedford (minutes)	Estimated Journey time by car in the PM peak (minutes)
St Neots	2	36	24-40
Cambridge	3	69	50-85

Table 3.14 : Commuting to Bedford via bus services vs road (PM peak)

3.5 Environment

The study corridor passes through a landscape that contains a number of sensitive environmental features. These are described in brief below.

3.5.1 Air quality

There are no air quality management areas (AQMAs) within the study area. The nearest AQMA is located in St. Neots' High Street, which is declared for nitrogen dioxide (NO_2) and operated by Huntingdonshire District Council[16] (Defra, 2015).

3.5.2 Cultural heritage

There are no world heritage sites (WHS) within 5 kilometres of the study area, or registered battlefields within 1 kilometre. There are 11 scheduled monuments within the study area. These include seven within 500 metres of the existing road:

- Tempsford Bridge, part of the A1 crossing the River Great Ouse south of the Black Cat junction.
- Moated enclosure and associated building platforms, The Lane, Wyboston, located approximately 230 metres from the A1.
- Deserted village at Wintringham, located approximately 500 metres from the A428 east of St Neots.
- Deserted village (site of) at Weald, located approximately 200 metres from the A429 east of St Neots.
- Croxton deserted medieval village and 16th-17th century garden remains, located adjacent to the A428 in Croxton.
- Moated site at Pond Farm, located approximately 250 metres from the A428 in Eltisley.
- Moated site at Pastures Farm, located approximately 450 metres from the A428 south-west of the Caxton Gibbet junction.

Croxton Park Grade II* registered park and garden is located adjacent to the A428. This park consists of a mid-18th Century house and walled garden set within an early 16th Century deer park, and contains the Croxton deserted medieval village scheduled monument.

There are over 70 listed buildings within the study area. The majority of these are clustered in St. Neots, and Croxton, Eltisley, and Wyboston villages. Of these, there are 14 Grade II listed buildings within 100 metres of the existing road. There is also a conservation area in the town of St. Neots which ends south of the town adjacent to the A428. Conservation areas seek to preserve or enhance the historic character or appearance of towns[17].

3.5.3 Landscape

There are no areas of outstanding natural beauty (AONB) or national parks within 5 kilometres of the study area. The study area is not within any greenbelt.

The study area falls within the Bedfordshire and Cambridgeshire Claylands national character area (NCA). This area is a broad lowland plateau dissected by shallow river valleys, including the River Great Ouse and its tributaries. The predominant land use in the NCA is commercial and arable farming; however, there are also a diverse range of semi-natural habitats, including national and international designated sites which support a wide range of species[18].

The majority of the study area falls within the Northern Wolds landscape character area (LCA). This is a historic landscape with a dispersed pattern of villages, with little modern development and many medieval features. The landscape is also characterised by its well vegetated valleys and open ridges and plateaus[19].

[16] Department for Environment Food & Rural Affairs. (2015). AQMAs Interactive Map. http://uk-air.defra.gov.uk/aqma/maps. Accessed 14th May 2015
[17] Huntingdon District Council. (2006). St Neots Conservation Area Character Assessment
[18] Natural England. (2014). NCA Profile: 88 Bedfordshire and Cambridgeshire Claylands (NE555). http://publications.naturalengland.org.uk/publication/5091147672190976?category=587130. Accessed 5th May 2015
[19] Bedfordshire County Council and Bedford Borough Council. (2007). Bedford Borough Landscape Character Assessment. Land Use Consultants

3.5.4 Ecology and nature conservation

There are no special protection areas (SPA), special areas of conservation (SAC), national nature reserves (NNR), or Ramsar sites located within 5 kilometres of the study area. There is one SAC designated for bats within 30km of the study area. Eversden and Wimpole Woods SAC lies 8.5 kilometres to the south east of the study area and is primarily designated for *barbastelle* bats (*Barbastella barbastellus*).

There are no sites of special scientific interest (SSSI) within the study area. The nearest site is Elsworth Wood SSSI located approximately 1.8 kilometres north-east of Caxton Gibbet junction.

There are no local nature reserves (LNR) within the study area. The non-designated Begwary Brook Nature Reserve is located to the north-east of the Black Cat roundabout. A Bedford Borough Council County wildlife site is located around a section of the River Great Ouse, centred on the Wyboston leisure park[20].

The study area includes a number of biodiversity action plan (BAP) priority habitat including deciduous woodland, wood pasture and parkland, coastal and floodplain grazing marsh, lowland fens, and young trees. Eltisley wood, an ancient replanted woodland, is located approximately 1 kilometre from the A1 south of Eltisley (NGR TL 272588). There is the potential for legally protected and notable species in the study area.

3.5.5 Geology and soils

The underlying geology of the area is composed of mudstone, siltstone and sandstone, with alluvium and river drift deposits near the River Great Ouse and diamicton till deposits north of the A428[21]. The ground in the area is mainly composed of lime-rich loamy and clayey soils with impeded drainage; around the River Great Ouse the soils are freely draining slightly acid loamy soils and loamy and clayey floodplain soils with naturally high groundwater.

In terms of hydrogeology, the study area is classed as unproductive strata, with the nearest bedrock aquifer located approximately 5.2 kilometres south-east of the Black Cat junction. The area between St Neots and the Black Cat junction is classed as a secondary A superficial aquifer. This means that there are permeable layers within the drift deposits capable of supporting water supplies at a local level. There are no groundwater source protection zones in the area[22].

The study area includes one active landfill to the north of Eltisley, off the B1040. There are historic landfill sites located in Wyboston and the Wyboston interchange.

3.5.6 Noise and vibration

Given the semi-rural location, it is likely that existing noise levels would be low within the study area. The highest noise levels are likely to be experienced at Eltisley, Croxton and Gallow Hill, where baseline noise levels are likely to be higher due to existing road traffic.

3.5.7 Effect on all travellers

There are seven footpaths and two bridleways located adjacent to the existing A428. These are located near Black Cat Roundabout; south-east of St. Neots, between Hen Brook and Wintringham; north of Weald Farm; north of Croxton Park; and north of Eltisley. The Ouse Valley Way trail runs adjacent to and crosses the Great North Road, and is a regionally important route. National Cycle Route 12 runs to the west of the Black Cat Roundabout.

The East Coast Main Line lies parallel to the A1 within open countryside to the south and east of St. Neots.

[20] Bedford Borough Council. (2008). Core Strategy and Rural Issues Plan
[21] British Geological Society. (2015). Geology of Britain Viewer. http://mapapps.bgs.ac.uk/geologyofbritain/home.html. Accessed 5th May 2015.
[22] Environment Agency. (2015). What's in your Backyard. http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e. Accessed 5th May 2015.

3.5.8 Community and private assets

The main land use in the area is agricultural with the majority of land being classed as grade 2 (very good) under the agricultural land classification (ALC). There is a small pocket of grade 1 (excellent) land near the Black Cat roundabout. There is no registered common land within the study area.

There are a number of commercial buildings in the study area, including: hotels at the Black Cat service area, Wyboston interchange, and near the Caxton Gibbet junction; Kelpie Marine boatyard located at Tempsford Bridge; Colmsworth business park south of St Neots; and Wyboston Leisure Park between Wyboston and St Neots.

3.5.9 Road drainage and water environment

The River Great Ouse cuts through the open countryside to the east of the Black Cat roundabout. Areas around the river are designated as flood zone 3 with a 1 in 100 chance of annual flooding from the river. The study area also contains the Hen Brook south east of St. Neots, and South Brook and Begwary Brook north of Black Cat: these are all also designated as flood zone 3. All three of these waterbodies are classified as 'moderate ecological status' with the objective of achieving 'good' status by 2027. These waterbodies are within the Upper and Bedford Ouse catchment, which forms part of the Anglian River Basin Management Plan[23]. In addition, there are numerous unnamed field drainage ditches in the study area.

The study area falls within the SWSGZ1012 surface water safeguard zone for pesticides, and is within a nitrate vulnerable zone (NVZ) for both surface waters and groundwater. An NVZ is an area of land that drains into water known to be polluted by nitrates.

3.6 Constraints and opportunities

3.6.1 Constraints

Early identification of any constraints, especially those which may be "show-stoppers", is essential to the option generation process. These constraints can be physical, legal or institutional and can affect the definition of the area of interest for any potential improvement.

A number of physical constraints along the A1 and A428 between Black Cat roundabout and Caxton Gibbet roundabout have been identified at this stage. These are outlined below:

- Housing and other development close to the A1 alignment between Black Cat roundabout and Wyboston junction.
- Bridge crossing between Wyboston junction roundabout and Barford Road roundabout.
- Bridge crossovers of the A428 between Barford Road roundabout and Cambridge Road roundabout including a railway line.
- Housing within close proximity to the current alignment between Cambridge Road roundabout and Caxton Gibbet roundabout.
- A petrol garage within close proximity to the West of Caxton Gibbet roundabout.

In addition to the constraints highlighted above, Croxton Park is designated as a Scheduled Monument, a Grade II* Registered Park and Garden and a Conservation Area. This site lies immediately south of the existing A428 and would be affected by online options and offline solutions to the south of the existing road. An offline route located to the south of the existing road is likely to have significant effects on the designated features and also on their views and settings. In addition, the villages of Croxton and Eltisley lie to the south of the existing road. These are likely to experience increased noise levels, a deterioration in air quality and significant changes to their character, setting and views from a route option to the south of the existing A428 compared to a route to the north.

Appendix E illustrates the location of the environmental constraints along the A1 and A428 between Black Cat roundabout and Caxton Gibbet roundabout.

[23] Environment Agency. (2009). River Basin Management Plan Anglian River Basin District

3.6.2 Opportunities

There are a number of opportunities that could be realised through improvements along the A1 and A428, and these are described below:

- Improve economic conditions for businesses utilising this route as part of wider east-west strategic connections between Oxford and Cambridge
- Facilitate local and regional growth in housing and employment due to additional road capacity
- Reduce queuing around Black Cat roundabout; this can have a particular impact on development close-by through reducing air quality and noise impacts
- Improve user satisfaction through improved journey time reliability, journey speeds, and pavement condition. Improvement to lay-by facilities will also assist this.
- Improve NMU facilities along the study corridor, and improve the pedestrian environment for developments close to the current alignment
- An offline solution to the north of the existing A428 would move traffic away from sensitive receptors and could result in positive effects on sensitive areas due to reduced noise levels and lower air pollution concentrations. A route to the north of the existing A428 would also provide greater distance between traffic and the designated sites, which is likely to lead to fewer stakeholder concerns and a lower risk of a significant effect to the designated sites

4. Future situation

4.1 Introduction

This chapter describes a future transport situation in the study area to provide a baseline for the development of scheme options. Policy documents and travel demand forecasts have been reviewed to identify any changes that are likely to occur in the study area, in terms of future land-use and policies, future changes to the transport system, and future travel demands and levels of service.

4.2 Planned growth and infrastructure changes

4.2.1 Planned growth

Planned growth along the A428 between Black Cat Roundabout and Caxton Gibbett has been investigated using the local plans of the local authorities in the vicinity of the route. Forecasts of the housing need and the available housing space and estimates of the number of new jobs required in each area are detailed in these plans along with information about key development sites identified by the council.

4.2.1.1 Cambridge

The 2011 census showed that Cambridge had a population of 123,900; by 2031 this is predicted to increase to 150,000. As such the need for new housing is high with large scale housing developments already underway at a number of sites in and around the city that are expected to provide over 7,000 new homes. Sites include the Trumpington Meadows, Clay Farm, Glebe Farm, National Institute of Agricultural Botany and the University of Cambridge's North West development all of which are adjacent to the M11.

Future housing needs are estimated at 14,000 new dwellings by 2031, as such there is currently a shortfall that the Cambridge Local Plan (Cambridge City Council, 2014) aims to address.

In addition to these 14,000 homes the strategic housing market assessment (SHMA) for Cambridgeshire undertaken by Cambridgeshire and Peterborough City Councils has forecast that Cambridge will require an additional 22,100 jobs between 2011 and 2031. The Local Plan seeks to deliver new employment land at six key locations in Cambridge: the area round Cambridge Station, West Cambridge, Cambridge Biomedical Campus, north-west Cambridge, Fulbourn Road and Cambridge Northern Fringe East. Development at these locations is intended to help continue the growth of the "Cambridge Cluster"; a world leader in education and research. In addition there is proposed retail and leisure development in central Cambridge (the Fitzroy/Burleigh Street/Grafton area of major change).

4.2.1.2 South Cambridgeshire

South Cambridgeshire is a largely rural district which surrounds the city of Cambridge and comprises over 100 villages, none with a population of over 8,000. The 2011 census showed that South Cambridgeshire had a population of 146,800. The SHMA forecast that there was a need for 19,000 new dwellings and 22,000 new jobs in the district.

Proposals to accommodate this housing growth that are considered the most sustainable are to develop on the edge of the city of Cambridge and the creation of a new town north of Waterbeach accommodating 8,000 to 9,000 new houses, however it is recognised that this new town is not expected to be able to deliver housing until towards the end of the plan period (2031). Other developments include proposals at Bourn Airfield (3,500 houses) and Cambourne West (1,200 houses). There are already plans for a new town at Northstowe providing 9,500 homes as outlined in the Northstowe Action Plan.

The Local Plan (South Cambridgeshire District Council, 2013) aims to maintain the role of the Cambridge area as a world leader in research, education and knowledge based industries through encouraging growth at Cambridge Science Park, Hinxton Hall, Granta Park and Peterhouse Technology park.

4.2.1.3 Huntingdonshire

Huntingdonshire is a predominantly rural in character with an area of 350 square miles. The population is currently around 160,000 people with approximately half living in the four market towns of Huntingdon, St Neots St Ives and Ramsey. The District lies within the London / Stansted / Cambridge / Peterborough Growth Area.

The Local Plan period (2001 – 2026) states that a total of 14,000 homes will be provided in Huntingdonshire. Of these, at least 2,650 homes are planned for St Neots and Paxton, as well as 25 hectares of land to be allocated for B1, B2 and B8 uses and 9000m^2 of retail use. Thus the town is to become a significant attractor of trips in the future.

4.2.1.4 Central Bedfordshire

Central Bedfordshire is a mainly rural location in the east of England and is considered to be a highly desirable place to both live and work. Much of the area has either a suburban or rural feel, with picturesque villages, hamlets and historic market towns. The largest towns are Leighton Buzzard, Dunstable, Houghton Regis, Biggleswade, Flitwick and Sandy. Central Bedfordshire covers some 716 square kilometres from Leighton Buzzard and Dunstable in the west to Sandy, Biggleswade and Stotfold in the east. Its population is currently around 264,500. The Local Plan states that between 2001 and 2031, 27,000 new dwellings and 27,000 new jobs are planned for the area up to 2031.

4.2.1.5 Bedford Borough Council

Bedford Borough Council contains the large urban area of Bedford, the adjacent town of Kempston and the surrounding villages. The Borough has a population of 163,900, of which 75% of the live in the Bedford Urban Area and the five large villages which surround it. The Local Plan states that between 2001 and 2031, 16,270 dwellings are planned.

4.2.1.6 North Hertfordshire

North Hertfordshire includes a range of settlements, including isolated rural hamlets, numerous villages, the four towns of Hitchin, Letchworth Garden City, Baldock and Royston, and large parts of the Great Ashby estate on the edge of Stevenage. It has a population of approximately 130,000.

The Local Plan states that over the period of 2011 – 2031, sufficient land is to be released for development to enable the delivery of at least 14,200 dwellings as well as over 30 hectares of employment land.

4.2.1.7 Summary

Table 4.1 below provides a summary of the future growth ambitions of Cambridge, South Cambridgeshire, Huntingdonshire, Central Bedfordshire and Bedford Borough Local Authorities and North Hertfordshire as laid out in their local plans.

Local Authority	Housing Target	Employment Target	Data Source
Cambridge City	14,000 new dwellings by 2031	22,100 new jobs	Cambridge Local Plan (Cambridge City Council), 2014
South Cambridgeshire	19,000 new dwellings by 2031	22,000 new jobs	South Cambridgeshire Local Plan (South Cambridgeshire District Council), 2013
Huntingdonshire	14,000 new dwellings, with 2650 within St Neots and Paxton	25 hectares of land to be allocated for B1, B2 and B8 uses and 9000m2 of retail use within St Neots and Paxton	Huntingdonshire LDF Core Strategy (Huntingdonshire Local Development Framework), 2009
Central Bedfordshire	27,000 new dwellings	27,000 new jobs	Central Bedfordshire Local Plan 2014
Bedford Borough	16,270 dwellings are planned	21 hectares of class B1, B2 and B8.	Bedford Borough Council Local Plan, July 2013
North Hertfordshire	14,200 dwellings	30 hectares of employment land	North Hertfordshire District Council Local Plan, 2014

Table 4.1 : Housing and employment planned growth summary

4.2.2 Highway network improvements

The upgrading of Black Cat junction was completed in spring 2015. The capacity has been increased by increasing the size of the roundabout and installing part time signals. This is seen as an interim measure prior to grade separation in the future.

Highways England is currently involved in the A14 Cambridge to Huntingdon Improvement scheme set to begin construction in 2016 at a cost of £1.5 billion. This scheme aims to widen a section of the A1 between Brampton and Alconbury and create a new bypass to the south of Huntingdon and improve the junctions with the M11 and A1 among other improvements to the local road network. This scheme is expected to relieve congestion, improve safety and the environment and to enhance economic growth.

Cambridgeshire County Council has committed to a number of improvements in order to improve transport between the A428 and Cambridge, including replacing the A10 Foxton level crossing west of M11 Junction 11 with either an underpass or overbridge. The Cambridgeshire Long Term Transport Strategy (Cambridgeshire County Council, 2014) set out the following schemes that may be required in the future:

- Cambridge orbital highway capacity
- A505 capacity improvements
- M11 capacity in Cambridge area
- M11 capacity south of Cambridge
- A14 capacity improvements east of Cambridge

Bedford Borough Council are also involved in a number of improvements near to the route, in particular the Bedford Western Bypass which links the A421 to the A428 and the A6, phase one of this work has already been completed while work on phase two started in October 2014.

4.2.3 Public Transport

Cambridge County Council, Cambridge City Council, South Cambridgeshire District Council, the Greater Cambridge Grater Peterborough Enterprise Partnership and Cambridge University have secured significant future investment in the area through a city deal. Schemes which are to be completed along the St Neots to Cambridge corridor through the city deal include:

- Segregated bus links on the A1303 or an offline alignment on the A428 and the M11
- Eastbound bus priority through the A428/A1198 Caxton Gibbet roundabout
- Provision of an outer Park & Ride on the A428 between Cambourne and A1303
- A1303 busway to serve Bourn Airfield and Cambourne

A cycling and walking network will be provided which links into the interchanges along the corridor, but that also connects the outlying villages to employment sites, such as at Cambourne and also to secondary schools in Comberton, Cambourne and further afield in Gamlingay

There are proposals for a new train station at Cambridge Science Park to facilitate further development of the site and surrounding areas as outlined in the Cambridgeshire Long Term Transport Strategy (Cambridgeshire County Council, 2014).

The East West Rail Consortium (of which Cambridgeshire County Council, Bedford Borough Council and Central Bedfordshire Council are members) proposes to reopen the Varsity Line between Oxford and Cambridge. A number of options exist for the challenging central section of the route between Bedford and Cambridge. To the east of Cambridge, services would run on the existing rail network to Norwich and Ipswich. In December 2013, the DfT confirmed its commitment to the creation of a new railway between Bedford and Cambridge.

4.3 Forecasting and scenario development

4.3.1 Forecasting methodology

To inform the identification of future traffic issues, and to estimate the impacts of potential interventions, observed flows along the route have been growthed in line with forecast growth from the National Transport Model (NTM) Road Traffic Forecasts 2015 (RTF15).

Using the forecast flows on the route a future “do nothing” scenario will be developed, allowing future problems, issues and performance to be investigated.

4.3.2 Core scenario

RTF15 contains five different growth scenarios taking account for differing growth in trip rates, oil prices and gross domestic product (GDP) and differing relationships between these factors.

To estimate the growth on the A428 corridor between Black Cat and Caxton Gibbet roundabouts scenario 1 from RTF15 has been used. This scenario assumes the number of trips people make remains constant at the historic average, incomes and costs affect travel choices in the same way as modelled in previous forecasts and uses central forecasts for future changes to income and fuel price from the Office for Budget Responsibility (OBR) and the Department of Energy and Climate Change (DECC). Growth factors that represent a rural trunk road in the east of England have been used

4.4 Future route performance

4.4.1 Travel patterns

Existing travel patterns for commuting trips were shown in Table 3.4. With significant growth in housing and employment predicted across the entire study area, it is assumed that the general patterns of travel will remain broadly similar in the future.

4.4.2 Traffic volumes

Observed flows from 2014 have been growthed to 2039 using RTF15 as outlined in section 4.3, this leads to approximately 40% growth as shown in Figure 4.1 and Table 4.2.

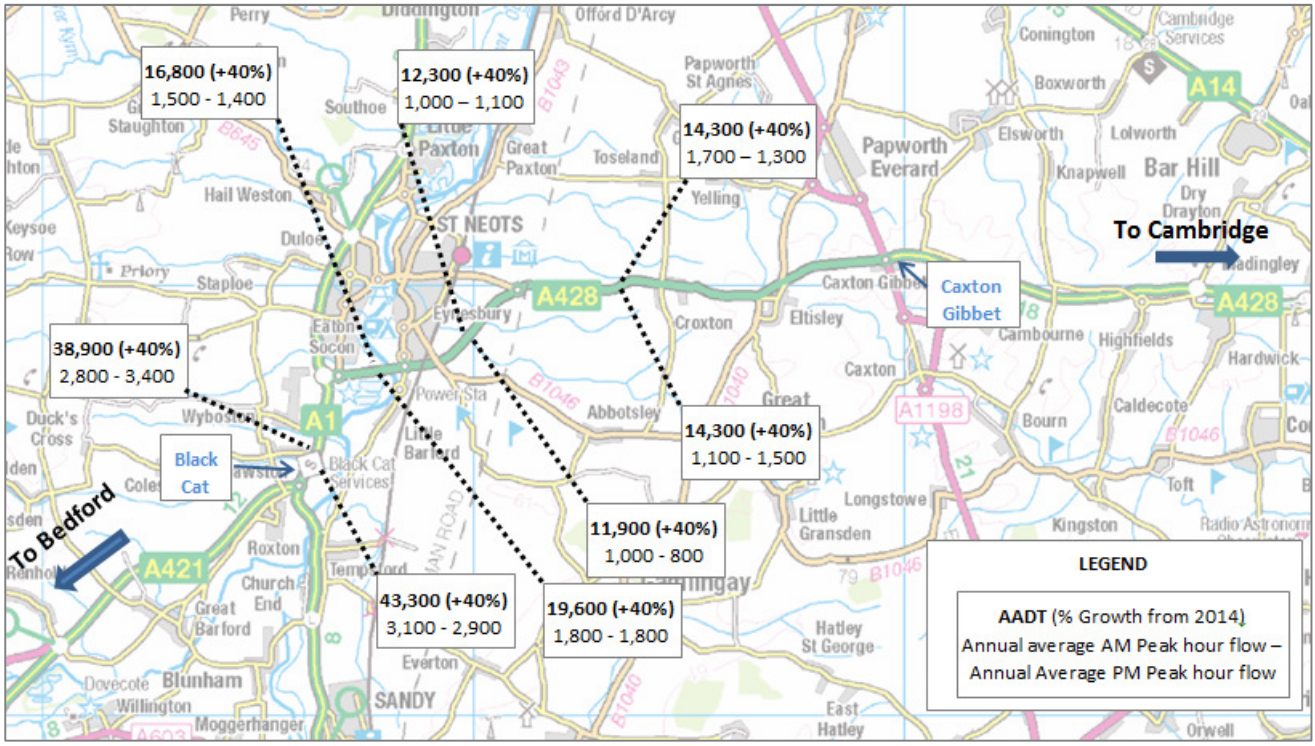

Figure 4.1 : Forecast traffic volumes in 2039

From	To	AADT (2039)	% Growth from 2014	HGV%	AM peak hour flow (8-9am)	PM Peak Hour (5-6pm)
Eastbound						
Black Cat Rbt	Wyboston Rbt	38,900	+40%	14.5%	2,800	3,400
Wyboston Rbt	Barford Rd Rbt	16,800	+40%	12%	1,500	1,400
Barford Rd Rbt	Cambridge Rd Rbt	12,300	+40%	12%	1,000	1,100
Cambridge Road Rbt	Caxton Gibbet Rbt	14,300	+40%	10%	1,700	1,300
Westbound						
Caxton Gibbet Rbt	Cambridge Road Rbt	14.300	+40%	10%	1,100	1,500
Cambridge Rd Rbt	Barford Rd Rbt	11,900	+40%	13%	1,000	800
Barford Rd Rbt	Wyboston Rbt	19,600	+40%	13%	1,800	1,800
Wyboston Junction	Black Cat Rbt	43,300	+40%	12%	3,100	2,900

Table 4.2 : Predicted traffic volumes in 2039

The proportion of HGVs on each section has been assumed to remain constant from 2014 levels.

4.4.3 Capacity and capability

The predicted forecast traffic shown in Table 4.2 have been compared with the theoretical link capacities that were calculated in Section 3.4.3 to produce predicted V/C ratios in 2039. The V/C ratios are expected to increase as a result of increased traffic flows, as shown in Table 4.3.

Section	Peak Hour Volume 2039		V/C Ratio 2039		DMRB reference capacity (veh/hr)
	AM	PM	AM	PM	
Eastbound					
A1: Black Cat roundabout to Wyboston Junction	2,800	3,400	0.76	0.92	3,700
A428: Wyboston Junction to Barford Road roundabout	1,500	1,400	1.25	1.16	1,200
A428: Barford Road roundabout to Cambridge Road roundabout	1,000	1,100	0.83	0.92	1,200
A428: Cambridge Road roundabout to Caxton Gibbet roundabout	1,700	1,300	1.42	1.08	1,200
Westbound					
A428: Caxton Gibbet roundabout to Cambridge Road roundabout	1,100	1,500	0.92	1.25	1,200
A428: Cambridge Road roundabout to Barford Road roundabout	1,000	800	0.83	0.67	1,200
A428: Barford Road roundabout to Wyboston Junction	1,800	1,800	1.50	1.50	1,200
A1: Wyboston Junction to Black Cat roundabout	3,100	2,900	0.84	0.78	3,700

Table 4.3 : Predicted V/C ratios in 2039

Table 4.3 shows that a large number of links are forecast to exceed their theoretical capacity in both the AM and PM peaks. In particular the entire route eastbound in the PM peak will either be approaching or exceeding capacity while westbound between Barford Road roundabout and Wyboston is forecast to significantly exceed capacity.

4.4.4 Journey time analysis

This study has not used a traffic assignment model and therefore future 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. However, RTF 15 provides an estimate of average delay per vehicle in seconds per mile that have been used in indicate increases in delay.

The forecast increase in delay between 2014 and 2039 for a rural trunk road in the east of England has been estimated at 23.8%. To provide an indication of increase in delay on the route the current delays have been established by comparing AM, IP and PM TrafficMaster journey times to the OP. This current level of delay has then been growthed in line with RTF15 to provide an estimate of the forecast journey times in 2039, as shown in Table 4.4.

Route	Description	AM	IP	PM
Black Cat Roundabout to Caxton Gibbet Roundabout	Observed 2014 Journey Times	20m 34s	14m 39s	16m 58s
	Predicted Journey Time Increase by 2039	**+1m 49s**	**+25s**	**+58s**
Caxton Gibbet Roundabout to Black Cat Roundabout	Observed 2014 Journey Times	20m 16s	14m 37s	17m 13s
	Predicted Journey Time Increase by 2039	**+1m 43s**	**+23s**	**+1m 0s**

Table 4.4 : Observed and forecast journey time comparisons

As would be expected with a significant (40%) forecast increase in traffic, journey times along the route are forecast to increase.

4.4.5 Safety

In the future it is likely that the observed patterns of collisions and incidents will continue as presented in section 3.4.7 of this report. Given the forecast increase of flow within the study area, there is potential for the total numbers of collisions to increase without further intervention.

4.4.6 Public transport

Network Rail undertook a series “Market Studies” in 2013 that looked at rail performance and growth in a number of areas in consultation with industry partners and a number of stakeholders. The studies identify the strategic goals for the respective market over the 30 year 2013-2043 period, forecast the levels of demand that may need to be accommodated, and formulate conditional outputs that would be needed in order to meet those strategic goals.

The ECML which services St Neots is contained with the London and South East England Market Study (Network Rail, 2013) area. The study forecasts that total numbers of peak hour travellers on the ECML are set to increase by between 36% and 106% between 2013 and 2043.

The National Travel Survey shows that the number of trips by bus has been falling over the past 20 years; however, the decline has slowed in the last five years.

4.5 Summary

There is significant forecast growth in the vicinity of the route with local districts all expected to see an increase in population and jobs as outlined in their local plan documents, with potentially over 100,000 new homes being built by 2031.

There are also a number of key infrastructure improvements planned, such as the A14 Cambridge to Huntingdon Improvement scheme and proposals to introduce a new east-west rail link between Bedford and Cambridge providing a realistic rail alternative to the A428.

Forecast traffic growth for the region predicts an increase in total number of trips of 40% by 2039 from 2014 levels. This suggests that a number of links on the route will be operating above capacity in the future, in particular between Wyboston interchange and Barford roundabout and between Cambridge Road roundabout and Caxton Gibbet roundabout. In addition, this increase in traffic volume will lead to a growth in the level of the delay, increased journey times and poorer resilience to incidents on the route.

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 and future transport related problems

The section of the A1 and A428 between Black Cat roundabout and Caxton Gibbet roundabout comprises a mixture of single and dual carriageway sections with a relatively large number of low-capacity at-grade junctions. The section of the A428 between Wyboston Junction and Caxton Gibbet roundabout is the only remaining single carriageway section.

The single carriageway section of the A428 has been identified as being unreliable, and Highways England has identified the A1 between Wyboston and Black Cat roundabout as being one of the least reliable journey time sections in the whole country.

The journey times between Black Cat roundabout and Caxton Gibbet roundabout are significantly longer in the peak time periods than in the off-peak period. This is as a consequence of road links and intermediate junctions reaching capacity and resulting in delays along the route including at the key junctions of Caxton Gibbet, Barford Road roundabout and Wyboston junction.

Significant traffic growth is predicted, with up to 100,000 new houses planned to be built in surrounding areas and over 70,000 jobs. A 40% increase in traffic flows on the A428 is forecast by 2039.

5.3 Impacts of not changing

The forecast increase in flow along the corridor will exacerbate the current problems experienced. Table 5.1 provides a summary of the future problems expected on the route.

Problem		Level of risk
1	Lack of public transport alternatives	
2	Lack of alternative routes to the A428	
3	Poor NMU provision along the route	
4	A number of junctions within a short distance of each other are operating at close to, or beyond, their maximum capacities	
5	Average speeds on the single carriageway section of the A428 are significantly lower than the dual carriageway sections on either side	
6	AM & PM peak hour traffic speeds are significantly lower than the rest of the day	
7	Unreliable journey times along the whole route between Black Cat roundabout and Caxton Gibbet roundabout	
8	Collisions and other incidents quickly lead to delays as the single carriageway offers low resilience against lane closures	
9	A lack of driver information along the A428	
10	Future economic growth potentially constrained by lack of transport provision	

	Problem Likely to be alleviated in the future (assuming currently proposed highway / land use development)
	Problem unlikely to change in the future (assuming currently proposed highway / land use development)
	Problem likely to be exacerbated in the future (assuming currently proposed highway / land use development)

Table 5.1 : Future Problems

5.4 Underlying drivers or causes

The key problems along the study corridor are insufficient capacity at certain links and junctions along the A1 and A428 resulting in unreliable journey times along certain links in the peak time periods, and low resilience to incidents due to a lack of alternative routes that run parallel to the A428.

There is low public transport patronage within the area, only 7%, compared to the national average of 11%, which is likely to be restricted due to limited public transport options within the area, particularly east west public transport services. This is also likely to have a negative impact on traffic congestion.

The key driver therefore behind these problems relates to mode choice and commuting patterns that focus journey patterns on the A428 corridor by private car, There is an excess of travel demand over the available capacity. This is exacerbated by low public transport patronage in the area which suggests that the area is heavily reliant on the private car. As such potential solutions should consider ways of reducing the demand on the route alongside ways of increasing the capacity of the route

6. Objectives and area of impact

6.1 Objectives

The RIS has eight targeted outcomes for eight designated performance areas that form the objectives for all the schemes set out in the RIS and the overall goals for the SRN within the RIS period.

Following a review of these targeted outcomes for the SRN it has been agreed that they will be used as the scheme objectives for any improvement along the A1 and A428 between Black Cat roundabout and Caxton Gibbet roundabout. The objectives are outlined below:

- 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

6.2 Targets

Setting targets allows schemes to have their success monitored and informs future network development.

The RIS performance specification sets out a number of indicators and requirements for any scheme. This sets out the key performance indictors (KPIs), performance indictors (PIs), requirements and national targets for each RIS objective.

Using these national targets as the targets for improvements to A428 would not be suitable as the targets proposed may not applicable for the corridor, however, performance against the KPIs should provide suitable, measurable targets for each of the RIS objectives. The KPIs, national targets and proposed targets for potential improvements for each of the RIS objectives are presented in Table 6.1.

RIS Objective	KPI(s)	National Target	A428 Black Cat to Caxton Gibbet target
Making the network safer	The number of KSIs on the SRN.	A decrease of at least 40% by the end of 2020 against 2005-09 baseline.	Reduce the number of KSIs along the corridor
User satisfaction	The percentage of National Road Users' Satisfaction Survey (NRUSS) respondents who are very or fairly satisfied.	Achieve a score of 90% by 31 March 2017 and then maintain or improve it.	N/A
Supporting the smooth flow of traffic	Network availability: the percentage of the SRN available to traffic	Maximise lane availability so that it does not fall below 97% within one rolling year.	Improve journey times and journey time reliability on the corridor.
	Incident management: percentage of motorway incidents cleared within one hour	At least 85% of all motorway incidents cleared within one hour	
Encouraging economic growth	Average delay (time lost per vehicle mile)	N/A	Improve journey times along the corridor improving the connectivity between economic centres.
Delivering better environmental outcomes	Noise: Number of noise important areas mitigated	Mitigate at least 1,150 noise important areas by the end of the first roads investment period.	Reduce noise impacts at sensitive receptors. There is a noise important area to the north of Black Cat junction.
	Biodiversity: Delivery of improved biodiversity, as set out in the company's biodiversity action plan.	Reduce net biodiversity loss on an ongoing annual basis.	Mitigate or compensate for any loss of biodiversity habitat.
Helping cyclists, walker and other vulnerable users of the network	The number of new and upgraded crossings.	N/A	Improve conditions for NMUs along the corridor
Achieving real efficiency	Cost savings: Savings on capital expenditure.	Total savings of at least £1.212 billion over Road Period[24] (RP1) on capital expenditure.	N/A
	Delivery plan progress: progress of work, relative to forecasts set out in the delivery plan, and annual updates to that plan, and expectations at the start of RP1.	Meet or exceed forecasts set out in the delivery plan.	N/A
Keeping the network in good condition	The percentage of pavement asset that does not require further investigation for possible maintenance.	Percentage of pavement not in need of maintenance to be 95% or above.	N/A

Table 6.1 : A428 scheme targets

[24] 2015/16-2019/20 Road Period 1 (RP1)
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/408514/ris-for-2015-16-road-period-web-version.pdf

6.3 Geographic area of impact

Identifying the geographic area of impact for any intervention is an important part of the option identification process as it sets bounds on what corridor or study area the objectives will apply to.

The objectives derived in this chapter were identified based on the problems and issues outlined in Section 5. These objectives are relevant to the A1 and A428 between Black Cat roundabout and Caxton Gibbet roundabout. The broad geographic area of impact to be addressed is shown in Figure 6.1. The definition of the area of impact will be refined further alongside the development of the ASR.

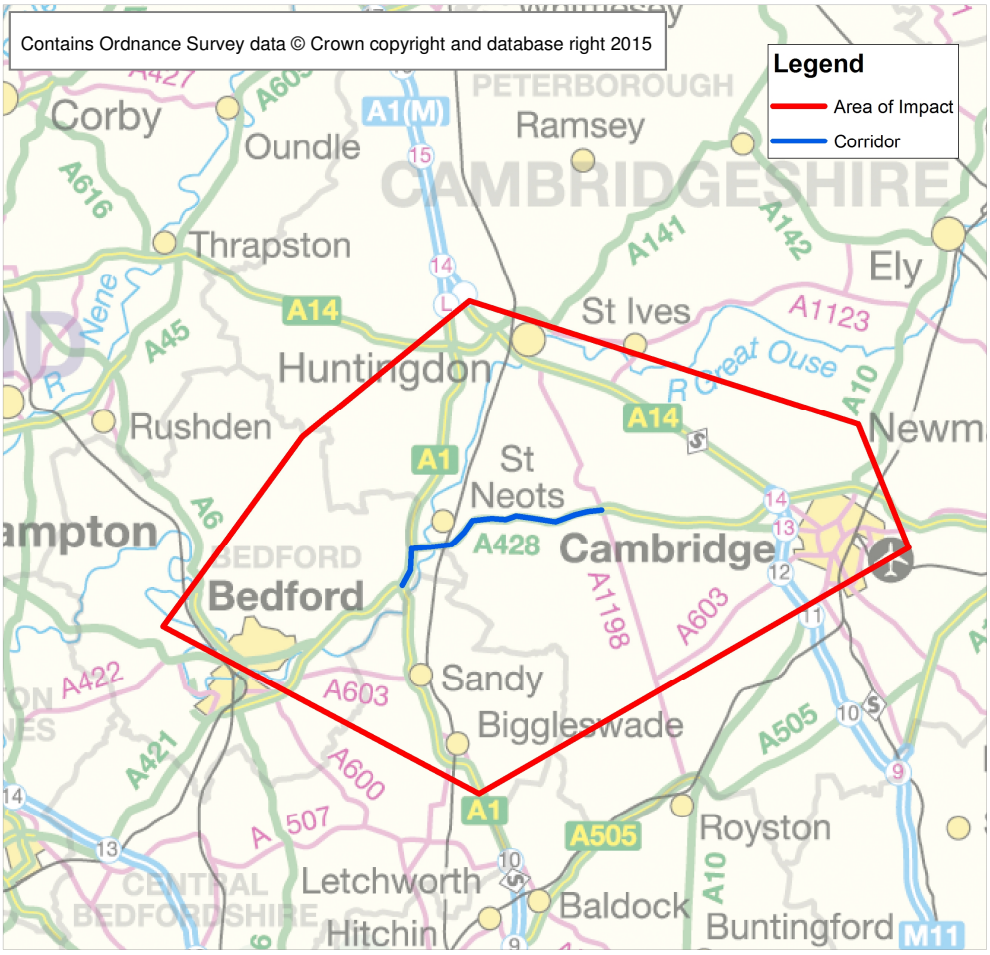

Figure 6.1 : A428 Black Cat to Caxton Gibbet Area of Impact

7. Option generation

7.1 Introduction

The purpose of the option generation process is to develop a wide range of measures or interventions that are likely to go some way to alleviating the problems and issues identified in chapter 5 and that are likely to achieve the objectives identified in chapter 6.

Options have been considered across all travel modes, infrastructure, regulation and other ways of influence travel behaviour or that influence the need to travel.

This options generation process adopted for this project is detailed in Figure 7.1.

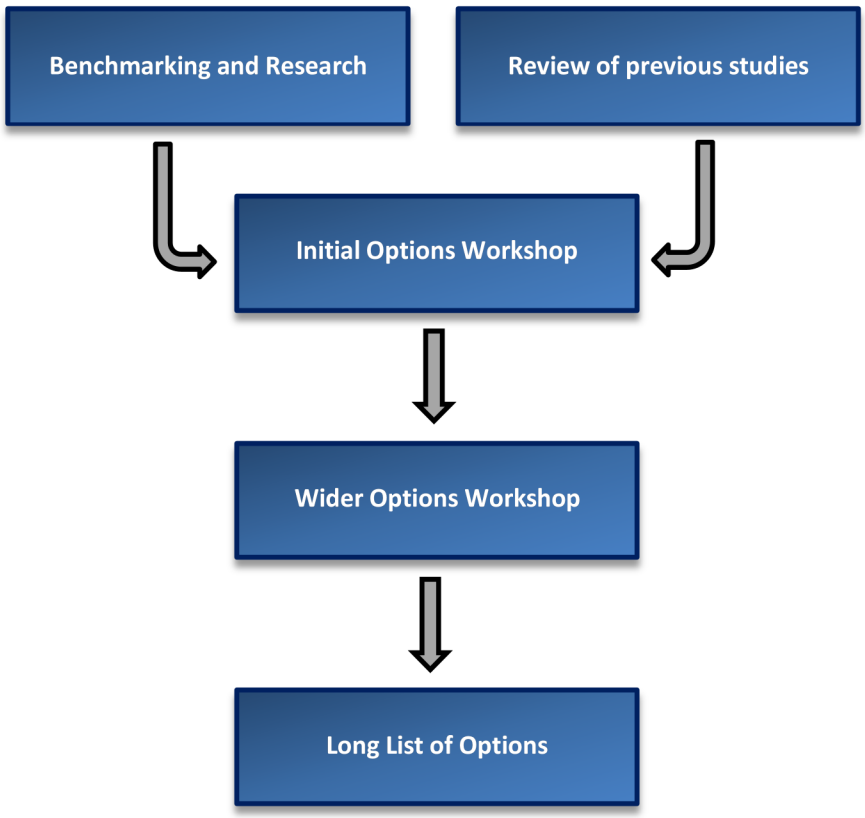

Figure 7.1 : Option generation process

7.2 Benchmarking and research

To help inform the option development process, planned and recently implemented junction schemes from around the UK and abroad have been examined to ensure current best practice is considered as part of the process. Additionally, innovative designs which have not yet been implemented in the UK have been examined.

The improvement schemes examined include:

- A1 North of Newcastle
- A421 Bedford to M1 Junction 13

7.3 Option generation

7.3.1 Introduction

The purpose of the option generation process is to develop a range of measures or interventions which have the potential to achieve the objectives outlined in Chapter 6. An initial long list of potential improvement options have been developed through a series of workshops informed by the following:

- Relevant policy and strategy documents
- Previous studies
- Analysis of available data
- Previous stakeholder engagement held during the RBS process

7.3.2 Options proposed in previous studies

The first stage of the option generation process was to review the previous studies into improvements on the A1 and A428 between Black Cat roundabout and Caxton Gibbet roundabout as described in section 2.

All options proposed as part of previous studies have been considered as part of this process and where appropriate taken forward into the long list of initial options.

7.3.3 Initial option generation workshop

The next stage of the option generation process was to hold an initial workshop to identify and discuss potential interventions. The workshop on 10/07/2015 included a review of the identified problems at the junction and a detailed discussion about the scheme objectives. In line with best practice, this ensured that potential objectives were driven by the needs of the transport users within the corridor. A high level list of potential improvements was developed considering all modes of transport.

Building upon the workshop outcomes, additional option variants were developed by the project team and added to the long list of options.

7.3.4 Wider option generation workshop

Following this, a second workshop attended by the wider Jacobs project teams was held on 04/08/15. This workshop included transport planning, highways, technology and safety specialists alongside Highways England representatives to provide a wide breadth of understanding and expertise.

The workshop covered a review of the proposed scheme objectives and how they linked to both policy and the identified problems and issues, including a review of the problems and issues evidence base. The attendees then split into groups to independently brainstorm potential solutions to feed back into the initial long list of options.

This approach allowed the independent generation of potential solutions from a range of perspectives, ensuring the options list was not constrained to a single travel mode or pre-conceived historical solutions.

7.3.5 Long List of Options

Following the two workshops and further development from the project team a long list of options has been developed, this categorises the improvements under the following headings:

- Lane widening.
- Junction improvements.
- Offline alignment.
- Public transport improvements.

In total 50 potential improvements have been considered and are presented in Appendix E.

8. Option sifting

8.1 Introduction

To quickly and effectively assess the large number of initial options generated, a two stage sifting process has been adopted; first an initial sift was carried out utilising a bespoke sifting tool, with the results feeding into a second stage using DfT's Early Assessment and Sifting Tool[25] (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 assessment.

Options that would fail to address the scheme 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 sifting tool is intended to quickly evaluate a large number of options and discard those which are clearly unsuitable ahead of further assessment. This framework provides an efficient, robust and easily presentable means of identifying legitimate 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 tool assesses options based on their ability to meet to the following criteria:

- Identified problems
- Study objectives
- Scheme deliverability
- Scheme feasibility

Options are scored on a five point scale against each problem and adjective, which is then been combined to produce an overall score. The scoring process is based on qualitative evidence as far as possible as well as professional judgement where required. The simple numerical approach allows consistency in evaluation across options.

Against deliverability and feasibility, each option is deemed to be either 'likely', 'likely (with challenges)' or 'unlikely'. The adopted definitions of deliverability and feasibility in this context are provided in Table 8.1.

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)

Table 8.1 : Criteria definition

Initial sifting criteria looks to identify and carry forward into EAST options which:

- have an overall moderate impact or greater against identified problems
- have an overall moderate fit or greater with route objectives

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

- are likely to be deliverable
- are likely to be feasible

Further details of the initial sift tool and the scoring methodology are provided in Appendix G.

8.2.2 Results

A copy of the initial sift tool is provided in Appendix H. This initial assessment suggested that there 16 options suitable to take forward for further assessment in EAST, as presented in Table 8.2.

Option ref.	Option description
A1	A428 full widening.
B1	A428 offline dualling between Black Cat roundabout and Caxton Gibbet roundabout.
C1	A428 full offline dualling with grade separation of Black Cat roundabout and grade separation of Caxton Gibbet roundabout.
C2	A428 full offline dualling with grade separation of Black Cat roundabout and signalisation of Caxton Gibbet roundabout.
C3	A428 bypass to Cambridge Road roundabout with grade separation at Caxton Gibbet, grade separation at Black Cat and local widening with channelisation between Cambridge Road roundabout and Caxton Gibbet roundabout.
C4	A428 bypass to Cambridge Road roundabout with signalisation at Caxton Gibbet roundabout, grade separation at Black Cat roundabout, local widening with channelisation between Cambridge Road roundabout and Caxton Gibbet roundabout.
C5	A428 bypass to Cambridge Road roundabout with grade separation at Black Cat, and grade separation at Caxton Gibbet roundabout.
C6	A428 bypass to Cambridge Road R'bout with grade separation at Black Cat roundabout, and signalisation at Caxton Gibbet roundabout.
C7	A428 single lane carriageway bypass to Cambridge Road roundabout with online dualling between Cambridge Road roundabout and Caxton Gibbet roundabout, grade separation at Black Cat roundabout and grade separation at Caxton Gibbet roundabout.
C8	A428 full online dualling with grade separation at Black Cat roundabout and Grade separation at Caxton Gibbet roundabout.
C9	A428 full online dualling with grade separation at Black Cat roundabout and signalisation at Caxton Gibbet roundabout.
C10	Local junction widening with channelisation at existing A428 junctions, grade separation at Caxton Gibbet roundabout, grade separation at Black Cat roundabout and upgrade to existing A1 junctions.

Option ref.	Option description
C11	Local junction widening with channelisation at existing A428 junctions, signalisation at Caxton Gibbet roundabout, grade separation at Black Cat roundabout and upgrade to existing A1 junctions.
C13	Online dualling of the A428 between St Ives Road and Caxton Gibbet roundabout and signalisation of Caxton Gibbet roundabout.
C14	Grade separation of Black Cat roundabout and signalisation of Caxton Gibbet roundabout.
C16	A428 dual carriageway bypass to Cambridge Road roundabout with online dualling between Cambridge Road roundabout and Caxton Gibbet roundabout, grade separation at Black Cat roundabout and grade separation at Caxton Gibbet roundabout

Table 8.2 Potential intervention options

8.3 Stage two: early assessment and sifting process

The DfT's EAST has been used to further sift potential options identified by the initial sift tool. EAST is consistent with WebTAG 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 assessment area.

Details of the assessment of each potential option are included in Appendix I 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 a supporting environmental assessment report.

	Strategic			Economic						Managerial			Financial			Commercial
Option	Scale of Impact [illegible]	transport and government objectives	Fit with other objectives	Economic Growth	Carbon Emissions	Socio-distributional and the regions	Local Environment	Wellbeing	Expected VFM	Implementation time table	Public Acceptability	Practical Feasibility	Affordability	Capital Cost	Overall Risk	Flexibility of Option
Option A1	3	4	3	4	3	4	3	3	Medium	5-10 years	3	3	3	£500-1000	3	3
Option B1	4	4	3	4	3	4	2	4	Medium	5-10 years	4	5	2	£500-1000	5	2
Option C1	4	4	3	5	3	4	2	4	High	5-10 years	4	5	2	£500-1000	5	3
Option C2	4	4	3	4	3	4	2	4	High	5-10 years	4	5	2	£500-1000	5	3
Option C3	4	4	3	4	3	4	3	4	High	5-10 years	2	4	3	£500-1000	5	4
Option C4	4	4	3	3	3	4	3	4	High	5-10 years	2	4	3	£500-1000	5	4
Option C5	4	4	3	4	3	4	3	4	High	5-10 years	2	5	4	£250-500	5	3
Option C6	3	4	3	3	3	4	3	4	High	5-10 years	2	5	4	£250-500	5	3
Option C7	4	4	3	4	3	4	3	4	High	5-10 years	3	5	4	£250-500	3	4
Option C8	4	4	3	4	3	4	3	4	Medium	5-10 years	3	3	3	£500-1000	3	4
Option C9	4	4	3	3	3	4	3	4	Medium	5-10 years	3	3	3	£500-1000	3	3
Option C10	3	3	3	4	3	4	3	4	Medium	5-10 years	1	3	5	£100-250	3	5
Option C11	3	3	3	3	3	4	3	4	Medium	5-10 years	1	5	5	£100-250	3	5
Option C13	3	3	3	2	3	3	3	3	Medium	5-10 years	1	5	5	£50-100	3	3
Option C14	3	3	3	3	3	3	3	4	Medium	5-10 years	1	5	5	£50-100	3	3
Option C16	4	4	3	5	3	4	2	4	High	5-10 years	3	5	2	£500-1000	3	4

Table 8.3 : EAST summary

Following a review of EAST it was identified that all of the options fell within a £1 billion budget, however, some of the schemes were less expensive than others. The more expensive scheme were generally expected to provide a larger scale of impacts.

8.4 Shortlisted options

The following shortlist shown in Table 8.4 was considered to comprise distinct and feasible (or potential) options for further development and assessment.

Option ref.	Option description
C1	A428 full offline dualling with grade separation of Black Cat roundabout and grade separation of Caxton Gibbet roundabout.
C2	A428 full offline dualling with grade separation of Black Cat roundabout and signalisation of Caxton Gibbet roundabout.
C5	A428 bypass to Cambridge Road roundabout with grade separation at Black Cat, and grade separation at Caxton Gibbet roundabout.
C6	A428 bypass to Cambridge Road R'bout with grade separation at Black Cat roundabout, and signalisation at Caxton Gibbet roundabout.
C7	A428 single lane carriageway bypass to Cambridge Road roundabout with online dualling between Cambridge Road roundabout and Caxton Gibbet roundabout, grade separation at Black Cat roundabout and grade separation at Caxton Gibbet roundabout.
C10	Local junction widening with channelisation at existing A428 junctions, grade separation at Caxton Gibbet roundabout, grade separation at Black Cat roundabout and upgrade to existing A1 junctions.
C11	Local junction widening with channelisation at existing A428 junctions, signalisation at Caxton Gibbet roundabout, grade separation at Black Cat roundabout and upgrade to existing A1 junctions.
C16	A428 dual carriageway bypass to Cambridge Road roundabout with online dualling between Cambridge Road roundabout and Caxton Gibbet roundabout, grade separation at Black Cat roundabout and grade separation at Caxton Gibbet roundabout

Table 8.4 Shortlisted options for assessment

9. Option assessment

9.1 Introduction

This section presents the assessment of potential intervention options described in section 8.4. 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 preferred option to be taken forward. Further information is presented in Appendix J.

9.2 Assessment methodology

9.2.1 General approach

At this early stage of scheme development, an intentionally proportionate approach has been taken to the assessment of options. Aside from construction costings and measurement of economic benefits associated with travel time reduction, a high level qualitative approach has been generally adopted for assessment against the 5 case model. The approach to economic assessment and scheme costings is described in the following sections.

9.2.2 Economic assessment

The quantitative economic analysis considers the economic impact of change in road user travel time and vehicle operating cost benefits. Although improvement to the A428 would likely result in additional economic impacts such as those associated with altered traffic collision rates and travel reliability, these have been omitted from the analysis and will be consider in more detail at a later stage in the PCF process.

A 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.

The following input data has been used to undertake traffic analysis of the A428 scheme:

- Highways England Traffic Flow Data System (TRADS) two-way traffic volume data, recorded between January 2014 and December 2014.

- Trafficmaster travel speed data, recorded between September 2013 and August 2014, supplied by the Department for Transport.
- Trafficmaster origin-destination (OD) data recorded between September 2013 and August 2014, supplied by the Department for Transport.

To determine the likely split of traffic between the A428 bypass and the de-trunked A428 carriageway, current travel patterns have been analysed using Trafficmaster OD data.

As a consequence to the limited availability of traffic volume data at this stage of assessment, detailed junction modelling using standard packages such as LinSig or TRL Junctions has not been undertaken. Instead, to quantify the junction related impact to road user travel time resulting from the proposed scheme, the approach based on the premise of reduced control delay was adopted. This approach was applied to junction through movements which would be improved to free flow under the proposed scheme. It is expected that other junction movements would likely see a reduction in delay resulting from the scheme improvements.

This approach has been applied at the following locations:

- Caxton Gibbet roundabout; east and west through movements
- Black Cat roundabout; east and west and north and south through movements

The reduction in control delay for through movements improved to free flow is determined as follows:

- The spatial extent of control delay for each analysis period (AM, IP, PM) is determined visually using Trafficmaster average speed data
- The free flow speed on approach to the junction is determined using Trafficmaster average speed data at a point outside the influence of the junction
- Total travel time for the movement through the spatial extent of control delay is calculated using Trafficmaster data
- Reduction in delay (or travel time saving) is then calculated as the difference between the observed travel time and estimated free flow travel time over the delay extent
- This approach does not take into account lane flow capacity constraints which may result in reduced travel speeds under increased future demand, potentially leading to overestimation of travel time savings
- However, given the approach excludes time savings for turning movements and assumes fixed Do Minimum travel conditions, it is considered to be overall conservative

Due to the lack of available junction models, it was assumed that the signalisation of Caxton Gibbet roundabout provided half the benefits than if the roundabout was to be grade separated.

The construction of the A428 scheme is assumed to begin in 2022, with the scheme opening to traffic in 2024 and the design year being 2039. AM peak hour, inter-peak (IP) and PM peak hour traffic analysis has been undertaken for the both the opening and design years. Forecast traffic demands for the 2024 opening year and 2039 design year have been derived by applying Road Traffic Forecast (RFT15) Scenario 1 growth for a rural trunk road in the east of England to current year flows.

9.2.3 Scheme costs

For the purposes of the economic assessment, it has been necessary to develop indicative outline scheme costs for the proposed options. The information is the ‘most likely’ indicative 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 highly indicative and have only be used for the purposes of exploring potential viable options in this report. Table 9.1 provides a summary of the scheme cost used in the economic assessment.

Options C1 and C7 were estimated and identified within the CSD technical note. For all remaining shortlisted options, a broad likely cost range has been assigned based on professional judgement and the known cost of

similar schemes. These costs have been estimated Jacobs, rather than Highways England commercial services and carry a high level of uncertainty. Table 9.1 provides a summary of all scheme cost used in the scheme assessment. Costs are presented as year 2014 estimates.

Option	Cost
C1	£1bn
C2	£500m-£1bn
C5	£250m-£500m
C6	£250m-£500m
C7	£500m
C10	£100m-250m
C11	£100m-250m
C16	£500-1000m

Table 9.1 : Scheme costs

In order to develop present value costs (PVC) for use in the economic assessment of the options, the following assumptions have been made:

- A three year construction period has been assumed, with costs split evenly over the period 2022 – 2024
- 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 prices using a discount rate of 3.5% and converted to 2010 prices using GDP deflator

9.2.4 Limitations

Based on the adopted methodology, a number of caveats and limitations of the analysis presented in this technical report should be noted:

- Lack of an appropriate transport model for the assessment and calculation of scheme benefits
- A fixed traffic demand has been used across the DS and DM scenarios. As such, the effect of route choice behaviour is not captured
- Limited modelling of route choice
- Limited junction modelling. This is highlighted by the lack of sensitivity in estimated benefits to the differences between options which are primarily junction related. Additionally, the travel time benefits of removing at-grade junctions have likely been substantially under estimated
- National average trip purpose splits have been adopted, rather than locally adjusted ones
- Assumptions relating to availability of data, such as the use of the most recent available data and/or the use of data from adjacent sites for other road links where unavailable
- Exclusion of other benefits typically presented

9.3 Appraisal results

9.3.1 Case 1: strategic fit

As detailed in section 5, there is a clear need for intervention on the A428 between Black Cat roundabout and Caxton Gibbet roundabout. The likely outcome of no intervention is substantially worsened congestion on the A428, sections of the A1, and local routes including increases in travel time and constriction of development in and around St.Neots.

All the shortlisted options are expected to significantly improve traffic conditions on the A428 and A1, in particular all are likely to add capacity to congested sections of the A428 and alleviate queuing at the two major junctions Black Cat roundabout and Caxton Gibbet Roundabout. As such these are likely to aid the development goals of the region.

All options are likely to support national, regional and local policy, with Option C1 having the strongest fit with policy by having the largest impact on journey times, economic growth and congestion.

9.3.2 Case 2: value for money

Appraisal summary tables (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. 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. Appendix K contains the AST for each option.

Monetised impacts

A summary of the economic analysis of each option is provided in Table 9.2.

It has not been possible to calculate monetised benefits for the local junction widening with channelisation at existing A428 junctions, and the upgrade to existing A1 junctions as a consequence of the limited traffic data with regard to operation. It can be assumed that these measures would provide further benefits to Options C10 and C11 that are shown in Table 9.2.

Option	PVB	PVC	NPV	Estimated BCR
C1	£750m	£707m	£43m	1.1
C2	£694m	£354m-£707m	-£13m -£340m	1-2
C5	£481m	£177m-£354m	£127m -£304m	1.4-2.7
C6	£426m	£177m-£354m	£249m-£72m	1.2-2.4
C7	£606m	£354m	£252m	1.7
C10	£182m	£71-£177m	£5m- £111m	1-2.6
C11	£127m	£71-£177m	-£50m-£56m	0.7-1.8
C16	£637m	£354m-£707m	-£70m-£283m	0.9-1.8

Table 9.2 : Shortlisted options costs and benefits

From the economic results, it can be seen that the value of benefits generally scales with the size and cost of the scheme, with C1 providing the greatest benefit while C10 and C11 providing the least. However it should be noted that this pattern does not follows in the same way for the BCR values. The BCR's indicate a range of possible monetised impacts with schemes predominantly indicating low to medium value for money.

Social impacts

Given the similar nature of all the options being considered the options are all assessed as having similar social impacts, with neutral impacts on physical activity, accidents, security, access to services, affordability,

severance and option and non-use values and all the options having a varying degree of beneficial impact on journey quality.

Environment

Each of the options has been qualitatively assessed against the WebTAG environmental impacts. All the shortlisted options are considered to have a mix of beneficial and adverse environmental impacts. Options C1, C2, C7 and C16 are likely to have a moderate beneficial impact on noise while options C10 and C11 are likely to have a moderate adverse impact. Options C1, C2, C5, C6, C7 and C16 are expect to have a slight beneficial impact on air quality with their off line components likely to move traffic away from sensitive receptors and residential areas, Options C10 and C11 do not receive this benefit. All options are likely to have adverse impact on landscape, historic environment and water environment; however, options C10 and C11 are likely to have a lesser impact.

9.3.3 Case 3: financial case

A budget of £1 billion has been assumed for the purposes of this option assessment process although matters associated with budgets and affordability are under continual review.

All potential options fall within the £1 billion budget, however, the schemes estimated costs range from between £100 million to £1 billion.

Maintenance costs for the scheme are assumed to place a medium to long term ongoing maintenance liability on Highways England following the adoption of 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 some schemes 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.

9.3.4 Case 4: delivery case

Highways England's PCF process provides a robust assurance and risk management framework with a proven record through the successful delivery of a wide range of major highways schemes.

Given the scale of some of the options (C1, C2, C7 and C16) and the level of engineering required, Highways England may need to appoint multiple designers and contractors leading to more complex governance arrangements than would be required for lower cost scheme. Options C10 and C11 may be able to be delivered with a single designer and contractor leading to more simple governance and risk management arrangements.

It is likely that large scale options will have similar delivery timescales with works estimated to begin 2022 and the route opening to traffic 2024. However, it is recognised that smaller scale improvements such as C10 and C11 could be delivered in a reduced timescale.

No stakeholder engagement has taken place as part of this analysis; however, stakeholder engagement was carried out as part of the RBS process. Stakeholders in any scheme at the junction are likely to include Cambridgeshire County Council, Huntingdonshire District Council, GCGP LEP and statutory bodies such as Natural England.

No public consultation has taken place as part of this analysis but it is believed that all the shortlisted schemes are likely to receive some level of support from the public. However, it is acknowledged that smaller scale improvements such as options C10 and C11 may be considered insufficient by some members of the public.

9.3.5 Case 5: commercial case

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.

Currently the scheme is progressing through stage 1 of the options phase. Key outputs / deliverables to be produced during this phase include:

- An appraisal specification report (ASR) and AST.
- Refined cost estimates.
- A risk management plan, risk register and qualitative risk assessment.
- A public consultation strategy.

These outputs will provide 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.

Highways England's new procurement framework for the delivery of major highway schemes known as the collaborative delivery framework (CDF) provides a clear and robust procurement route for major projects. Therefore it is likely that any the shortlisted schemes would be brought to market via the CDF.

The principles of the CDF are to achieve continuous improvement in health and safety, sustainability, quality, time and cost.

Throughout the development of any option risks will be recorded and actively managed. Where appropriate, risk owners will be 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.

Any 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.

9.4 Preferred option

On review of the available evidence and assessment to date it is considered that Option C1 is the best performing option for the following reasons:

- It is considered to have the largest impact on the problems and issues affecting the operation of the route
- It is considered to have the best fit with government policy
- It is estimated to have the highest level of economic benefits
- It is considered to have a higher level of public acceptability than other options
- There is a robust assurance and risk management framework available
- There is a clear and defined procurement framework available

However, it is acknowledged that Option C1 is estimated to deliver low VfM whereas some options can deliver medium or high VfM.

Options C1 and C2 are considered to be variants of one another with the only difference being the level of intervention at Caxton Gibbet (grade separation compared to signalisation). At this stage it has not been determined whether a full grade separation of the junction will be required given future traffic flows and further assessment will need to be carried out in PCF stage 1 to better understand which variant is taken forward.

The "next best" performing option is difficult to identify with options C5, C6, C7 and C16 all performing similarly. Options C7 and C16 are considered variants of one option, with the only difference being a single carriageway or dual carriageway bypass between Black Cat roundabout and Cambridge Road roundabout; similarly options C5 and C6 are effectively the same aside from the level of intervention at Caxton Gibbet.

Options C7 and C16 provide a higher level of benefit than options C5 and C6 although they are more expensive; however, options C7 and C16 are expected to have a more significant beneficial impact on noise

(moderate beneficial compared to slight beneficial) and improved noise conditions are one of the major KPIs designated for the RIS, therefore it is considered the “next best”.

Options C10 and C11 are another pair of options that are only differentiated by the level of intervention at Caxton Gibbet roundabout and are the lowest cost options considered to perform well against the problems and issues on the route. Therefore options C10 and C11 are considered the “low cost” solution.

In summary the options proposed to be progressed through the SOBC are:

- **Preferred solution** – Option C1/C2 – Full offline dualling between Black Cat roundabout and Caxton Gibbet roundabout with grade separation Black Cat roundabout and either grade separation or signalisation at Caxton Gibbet.
- **Next best solution** – Option C7/C16 – An offline bypass between Black Cat Roundabout and Cambridge Road Roundabout, either dual or single carriageway standard, online widening between Cambridge Road Roundabout and Caxton Gibbet roundabout with both Black Cat roundabout and Cambridge Road roundabout being grade separated.
- **Low cost solution** – Option C10/C11 – Local junction widening along the A428, improvements to A1 junctions and Black Cat roundabout grade separated with either Grade Separation or signalisation at Caxton Gibbet roundabout.

10. Summary and next steps

10.1 Summary

Following collection of available data and subsequent analysis it has been identified that the A428 Black Cat to Caxton Gibbet route suffers from a series of problems, as outlined below:

- There are inadequate public transport options along the corridor; which has only limited bus services and no parallel rail service provision.
- There is a lack of viable alternative east-west routes between Cambridge and other economic centres such as Milton Keynes, Northampton and Bedford.
- There is poor non-motorised user provision along the corridor.
- A number of junctions along the corridor operate close to, or at capacity.
- Peak hour speeds along the corridor are significantly lower than the rest of the day.
- Speeds on the single carriageway sections of the corridor are significantly lower than those that are dualled.
- There is a high degree of journey time variability along the corridor, making it difficult for users to plan their journey with confidence.
- There is low resilience against accidents and incidents on the single carriageway sections of the corridor.
- There is a lack of driver information along the corridor.
- The above problems also constrain economic growth along the corridor.

The National Traffic Model's RTF15 forecasts predict a significant increase in traffic in the area by 2039 which is likely to exacerbate many of these problems.

As such there is a clear need for intervention at the junction. Improvements to the A1 and A428 were announced in the first RIS, as such the RIS' targeted outcomes for the SRN have been used as the objectives for any scheme taken forward, these are:

- 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

A wide range of options have been generated based on the identified problems and issues at the junction, this included consideration of innovative options that have not been implemented in the UK before alongside established solutions that have been shown to be successful elsewhere on the SRN. These options were then assessed using an initial sifting tool that assessed likely performance against the identified problems, route objectives, deliverability and feasibility.

Fifteen better performing options were identified for further assessment using the DfT's EAST which resulted in seven options being taken forward for further assessment against the Treasury Five Case Model in line with the DfT's Option Assessment Framework.

All the options provide significant benefits, with the more expensive options generally providing the larger benefits. Option C1 is the best performing as it is considered to have the largest impact on the identified problems along the study corridor, and one of the strongest fits with government policy. The estimated economic impacts including PVB and PVC are provided in Table 10.1.

Option	Estimated User Benefits	Estimated PVC (2010 costs, discounted to 2010)	BCR
C1 - A428 full offline dualling with grade separation of Black Cat roundabout and grade separation of Caxton Gibbet roundabout	£750m	£707m	1.06
C2 - A428 full offline dualling with grade separation of Black Cat roundabout and signalisation of Caxton Gibbet roundabout	£694m	£354m-£707m	1.0-2.0
C5 - A428 bypass to Cambridge Road roundabout with grade separation at Black Cat, and grade separation at Caxton Gibbet roundabout	£481m	£177m-£354m	1.4-2.7
C6 - A428 bypass to Cambridge Road roundabout with grade separation at Black Cat roundabout, and signalisation at Caxton Gibbet roundabout	£426m	£177m-£354m	1.2-2.4
C7 - A428 single lane carriageway bypass to Cambridge Road roundabout with online dualling between Cambridge Road roundabout and Caxton Gibbet roundabout, grade separation at Black Cat roundabout and grade separation at Caxton Gibbet roundabout	£606m	£354m	1.7
C10 - Local junction widening with channelisation at existing A428 junctions, grade separation at Caxton Gibbet roundabout, grade separation at Black Cat roundabout and upgrade to existing A1 junctions	£182m	£71-£177m	1.0-2.6
C11 - Local junction widening with channelisation at existing A428 junctions, signalisation at Caxton Gibbet roundabout, grade separation at Black Cat roundabout and upgrade to existing A1 junctions	£127m	£71-£177m	0.7-1.8
C16 - A428 dual carriageway bypass to Cambridge Road roundabout with online dualling between Cambridge Road roundabout and Caxton Gibbet roundabout, grade separation at Black Cat roundabout and grade separation at Caxton Gibbet roundabout	£637m	£354m-£707m	0.9-1.8

Table 10.1 : Shortlisted options costs and benefits

The identified schemes to be taken forward are:

- Preferred solution – Option C1/C2 – Full offline dualling between Black Cat roundabout and Caxton Gibbet roundabout with grade separation Black Cat roundabout and either grade separation or signalisation at Caxton Gibbet
- Next best solution – Option C7/C16 – An offline bypass between Black Cat roundabout and Cambridge Road roundabout, either dual or single carriageway standard, online widening between Cambridge Road

roundabout and Caxton Gibbet roundabout with both Black Cat roundabout and Cambridge Road roundabout being grade separated

- Low cost solution – Option C10/C11 – Local junction widening along the A428, improvements to A1 junctions and Black Cat roundabout grade separated with either grade separation or signalisation at Caxton Gibbet roundabout

10.2 Next steps

The next step in the process will be the development of an SOBC to further build the case for the progression of improvements of the A1 and A428 between Black Cat roundabout and Caxton Gibbet roundabout through to PCF Stage 1.

The SOBC will further develop the assessment against the Treasury 5 case model.

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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
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
EAST	Early Assessment and Sifting Tool
ERT	Emergency
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
KSI	Killed/Seriously Injured
LEP	Local Enterprise Partnership
LNR	Local Nature Reserve
LTP3	Local Transport Plan 3
MIDAS	Motorway Incident Detection and Automatic Signalling
NCA	National Character Area

Term	Description
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 69onetized 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
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
TAG	Transport Analysis Guidance, published by the Department for Transport (see also WebTAG)
TEE	Transport Economic Efficiency
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
TRADS	Highways England Traffic Information Database
TSCS	Thin Surface Course Systems
TSD	Traffic speed deflectometer
V/C	Volume/Capacity ratio
VfM	Value for Money

Term	Description
VMS	Variable Message Sign
WebTAG	The Department for Transport guidance document on the conduct of transport studies (see also TAG)

Appendix B. A14 Traffic model assessment

JACOBS

Memorandum

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Date	10th November 2015
To	Highways England TAME
From	Daragh Foley / Richard Smith
Subject	**Use of A14 Traffic Model in A428 Assessment**

1. Background

The A428 is a strategic route for vehicles travelling east-west between Oxford and Cambridge, via urban settlements including Milton Keynes and Bedford. The A428 extends approximately 17 miles between the A1 and A14/M11. Between the Black Cat roundabout on the A1 and its interchange with the A1198 at Caxton Gibbet, the route is of single carriageway standard. Previous studies have highlighted the severe lack of capacity on this section.

Jacobs have been commissioned by Highways England to progress a study relating to the A428 between Black Cat and Caxton Gibbet through their Project Control Framework (PCF) Stage 0 process. This includes updating an existing WebTAG Stage 1 Option Assessment Report (OAR) and Strategic Outline Business Case (SOBC).

2. Purpose of Note

Jacobs' study will identify the future traffic situation on the route if no intervention is made, and assess the traffic impacts of several potential options for intervention. Existing traffic models could provide a source of evidence to inform this assessment and be suitable for use moving into later PCF stages.

A traffic model has recently been developed to support the nearby A14 Cambridge to Huntingdon improvement scheme. This note will investigate to what extent the A14 model can be used to support later stages of the A428 study.

3. Overview of A14 Traffic Model

The A14 traffic model was developed to support the A14 Cambridge to Huntingdon improvement scheme, which proceeded through a Development Consent Order (DCO) statutory process. The model uses the SATURN modelling software. The most recent version of the model was developed with a base year of 2014, and forecast years of 2020, 2031, 2035 and 2041. The model represents the following time periods:

- Weekday AM Peak (08:00-09:00)
- Weekday Interpeak (average hour between 10:00-16:00)
- Weekday PM Peak (17:00-18:00)

The model includes a 'Fully Modelled Area' which is shown in Figure 1. This area consists of simulation network coding (i.e. delays at junctions are considered within the model). Within this the

'Area of Detailed Modelling' is coded in the highest level of detail, while the rest of the Fully Modelled Area is coded in slightly less detail.

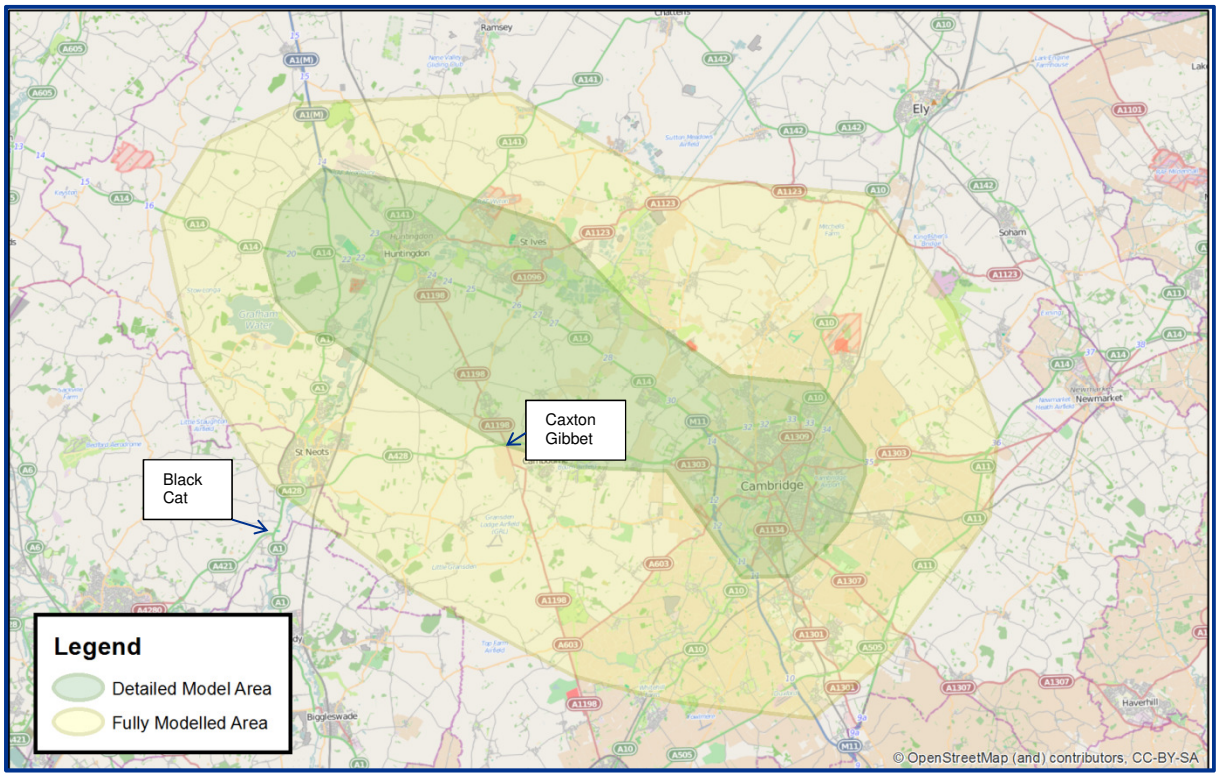

Figure 1 : A14 Model – Fully Modelled Area

Caxton Gibbet junction is included within the Detailed Model Area, while the A428 between Caxton Gibbet and Black Cat roundabout is within the rest of the Fully Modelled Area.

The area of the model outside the Fully Modelled Area is known as the 'External Area'. This is coded in less detail, with no junction delay included. Black Cat roundabout and the rest of the A428 east of this lie within the External Area. Any delays caused by Black Cat roundabout are therefore not specifically included within the A14 model. Speed-flow curves are used in the External Area as a proxy for junction delay.

4. Validation of A14 Model

In order to establish confidence in a traffic model, a comparison should be made between modelled and observed traffic data. A validation exercise was undertaken as part of the development of the A14 model. It was considered that overall the model validated well enough to be able to assess the impact of the A14 Cambridge to Huntingdon scheme.

However, this validation considered the model over a wide geographic area, with particular focus on the A14. In order to use this model to inform a continued A428 assessment into PCF Stages 1 and 2, we must focus on the performance of the model around the A428 itself. The validation around the A428, in terms of both traffic flows and speeds, is discussed below.

Link Flow Validation

Link flows predicted by a traffic model should be compared against link flows observed during traffic counts. WebTAG Unit M3.1 specifies the criteria that a model should meet in terms of flow validation:

- *For flow validation a statistic known as 'GEH' should be derived, which is based on both the relative and absolute error in modelled flows. WebTAG guidance suggests that GEH should be <5 for at least 85% of modelled links.*

The link flow validation for each modelled time period, as reported in the A14 Local Model Validation Report (March 2015), is shown in Figure 2 to Figure 4 below. This compares model flow against observed traffic counts, two of which are on the A428 between Black Cat and Caxton Gibbet, either side of the junction with the B1428 to St Neots.

Other than those reported in the figures below, no extra observed traffic counts are available with which to undertake further validation.

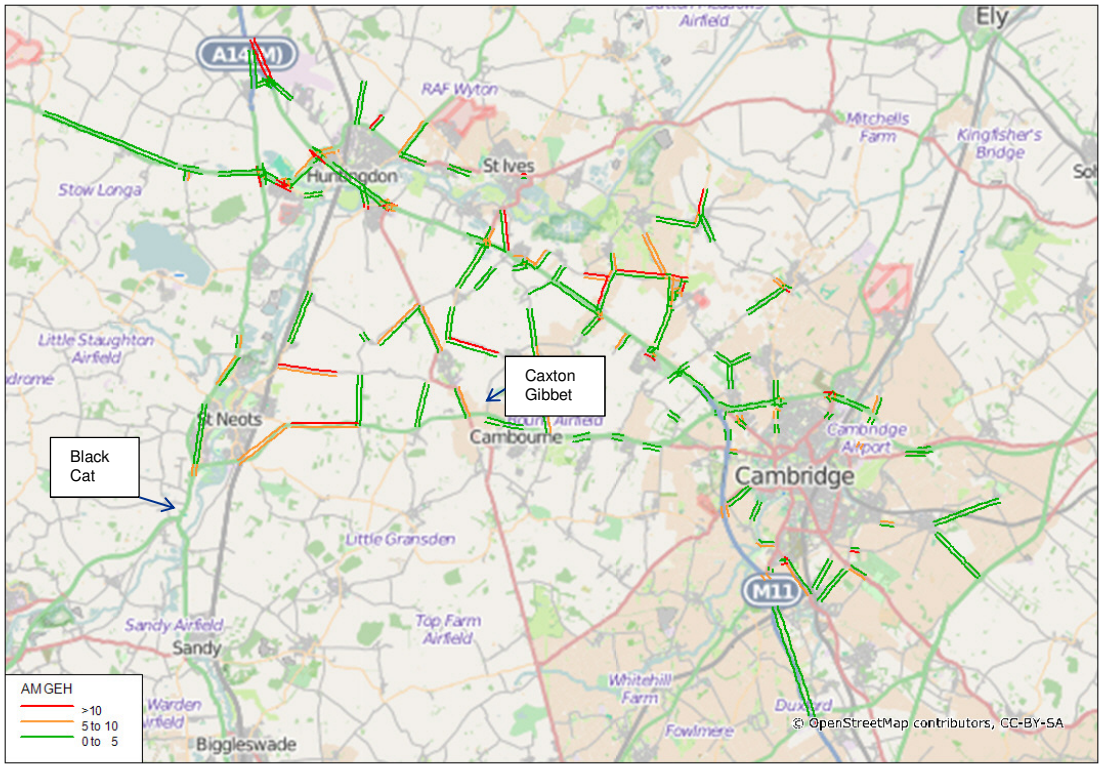

Figure 2 : Link Flow Validation – AM Peak

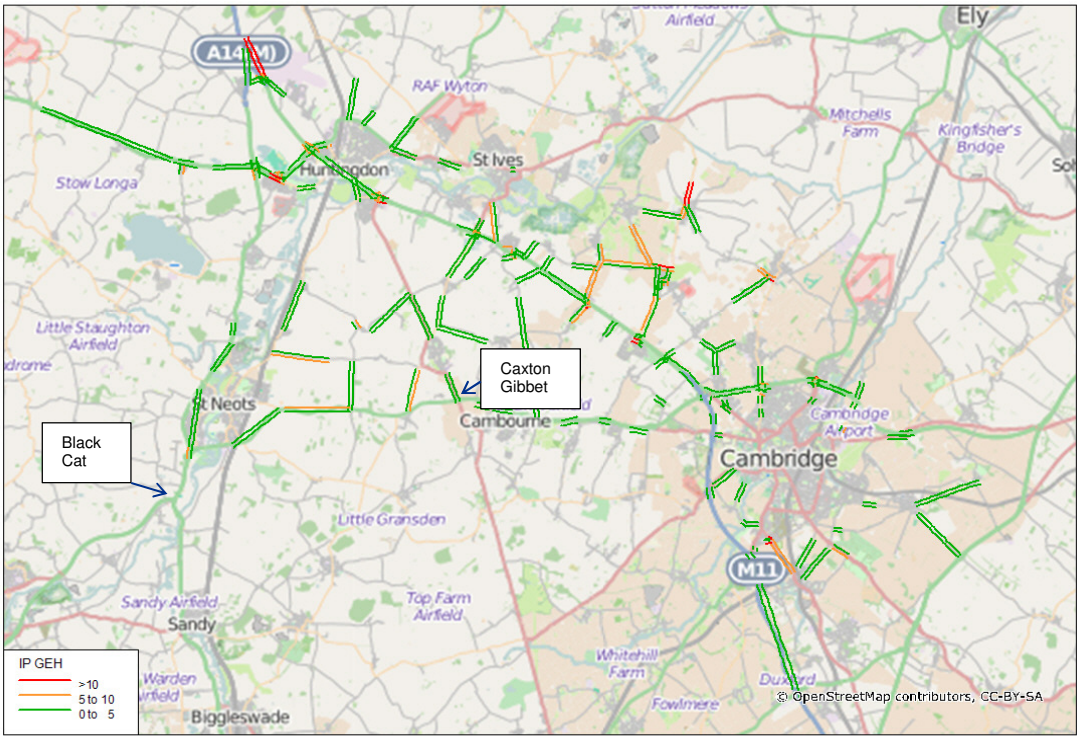

Figure 3 : Link Flow Validation – Interpeak

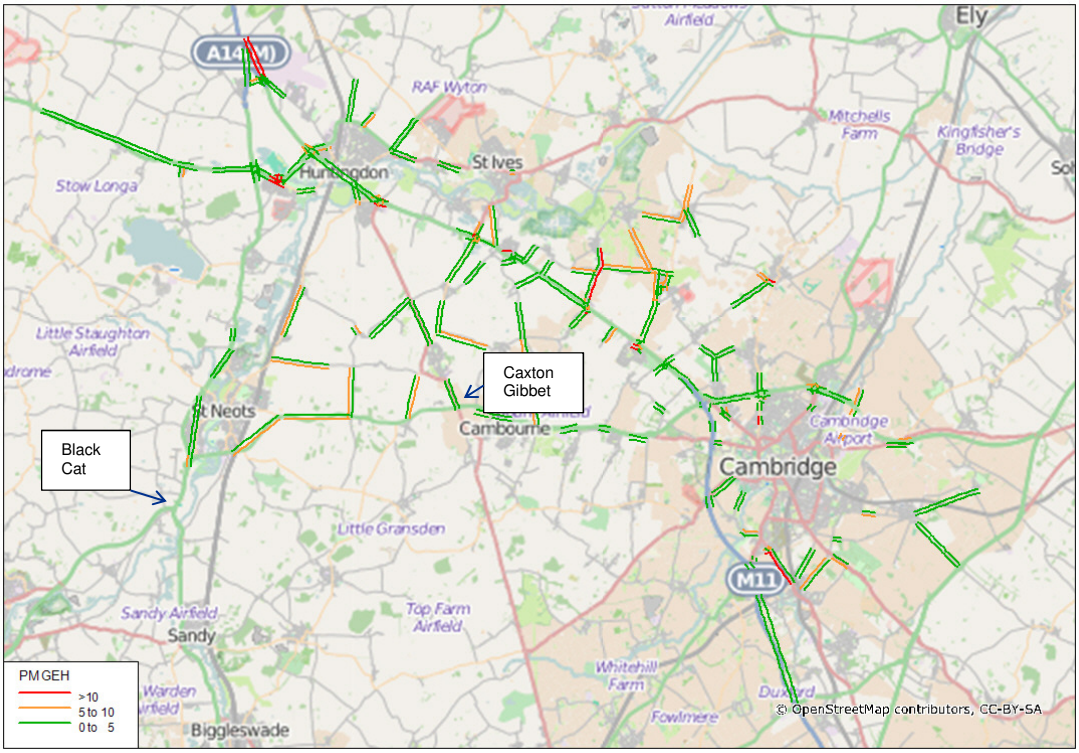

Figure 4 : Link Flow Validation – PM Peak

The figures above show that in the Interpeak and PM peak, validation on the A428 between Black Cat and Caxton Gibbet is within – or just outside – the GEH criteria set out in WebTAG. However, in the AM peak the validation is poor. None of the links on the A428 between Black Cat and Caxton Gibbet meet the GEH criteria, with one being considerably outside the criteria.

On all other nearby roads, including sections of the A428 to the east of Caxton Gibbet, validation is generally good.

Journey Time Validation

Journey times predicted by a traffic model should be compared against journey times over set routes observed in traffic surveys. WebTAG Unit M3.1 specifies the criteria that a model should meet in terms of journey time validation:

- *For journey time validation, the percentage difference between observed and modelled time over set routes should be measured. Modelled times should be within 15% of observed times for at least 85% of routes.*

The journey time routes used for validation in the A14 Local Model Validation Report (LMVR) are shown in Figure 5 below.

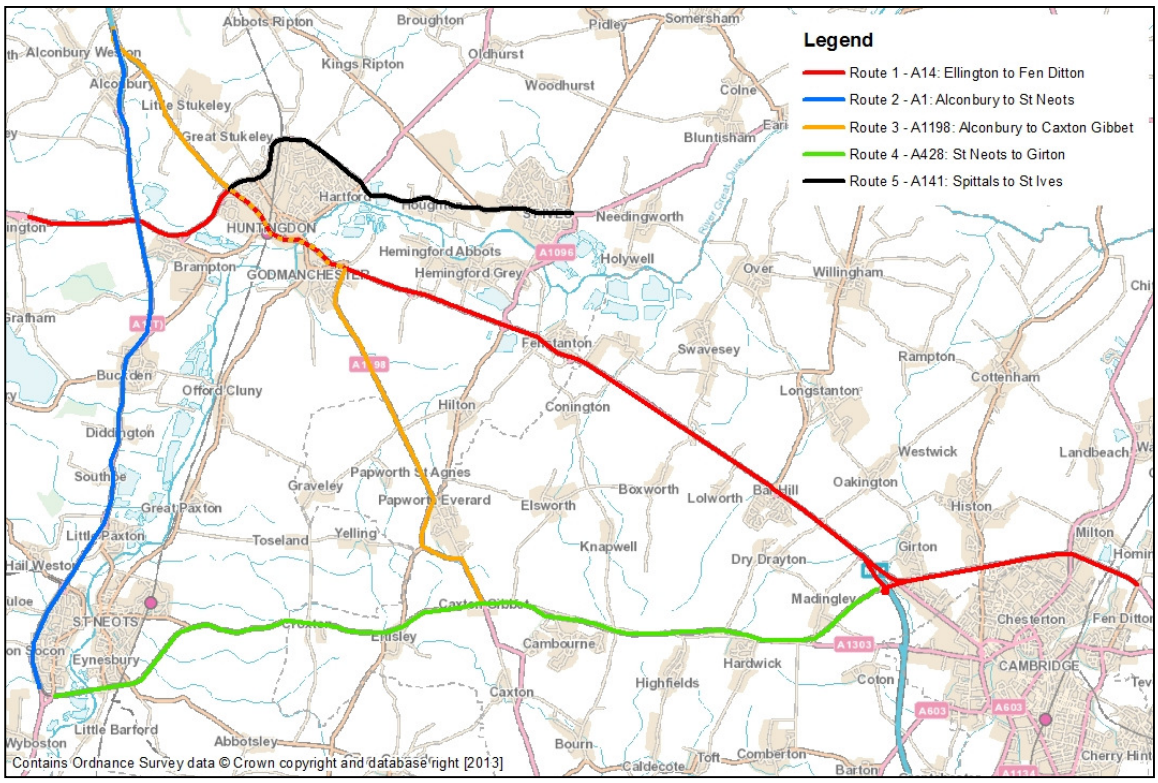

Figure 5 : Journey Time Validation Routes used in A14 LMVR

Route 4 (the green route in the figure above) consists of the A428 from Girton to the junction with the A1 at Wyboston. The journey time validation on this route is shown in Table 1 below.

	Eastbound			Westbound		
	AM	IP	PM	AM	IP	PM
Observed Journey Time (s)	1,447	1,146	1,163	1,244	1,132	1,201
Modelled Journey Time (s)	1,607	1,191	1,223	1,266	1,175	1,418
Difference (s)	160	45	60	22	43	217
% Difference	11%	4%	5%	2%	4%	18%
WebTAG compliant?	Yes	Yes	Yes	Yes	Yes	No

Table 1 : Journey Time Validation results from A14 LMVR: A428 route

All journey times on the A428 meet WebTAG validation criteria except for westbound in the PM period. Although the model consistently predicts longer journey times than those observed, in the majority of cases the difference is less than 5%.

5. Use of the model in A428 assessment

The advantages of the continued use of the A14 model for the A428 assessment is that the model is mature and considered well validated for its application to the A14 proposals. Relatively modest additional work could be undertaken to extent the simulation coding area, supplement the model with additional count data if necessary, and rerun calibration/validation to achieve a model that performs well overall, but achieves acceptable levels of fit with traffic volumes and journey time.

Appendix C. Capacity Analysis

Capacity = [A – B * Pk%H]

Where, Pk%H is the percentage of 'Heavy Vehicles' in the peak hour

A and B are parameters dependant on the road standard;

Road Type	A	B
Single Carriageway	1380	15.0
Dual Carriageway	2100	20.0
Motorway	2300	25.0

A428 (1 Lane)

= [1380 – 15.0 * 11.7]

= 1204.5

A1 (2 Lane)

=[2100-20*12.5]

=1850

Appendix D. 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 E. Environmental Constraints Plan

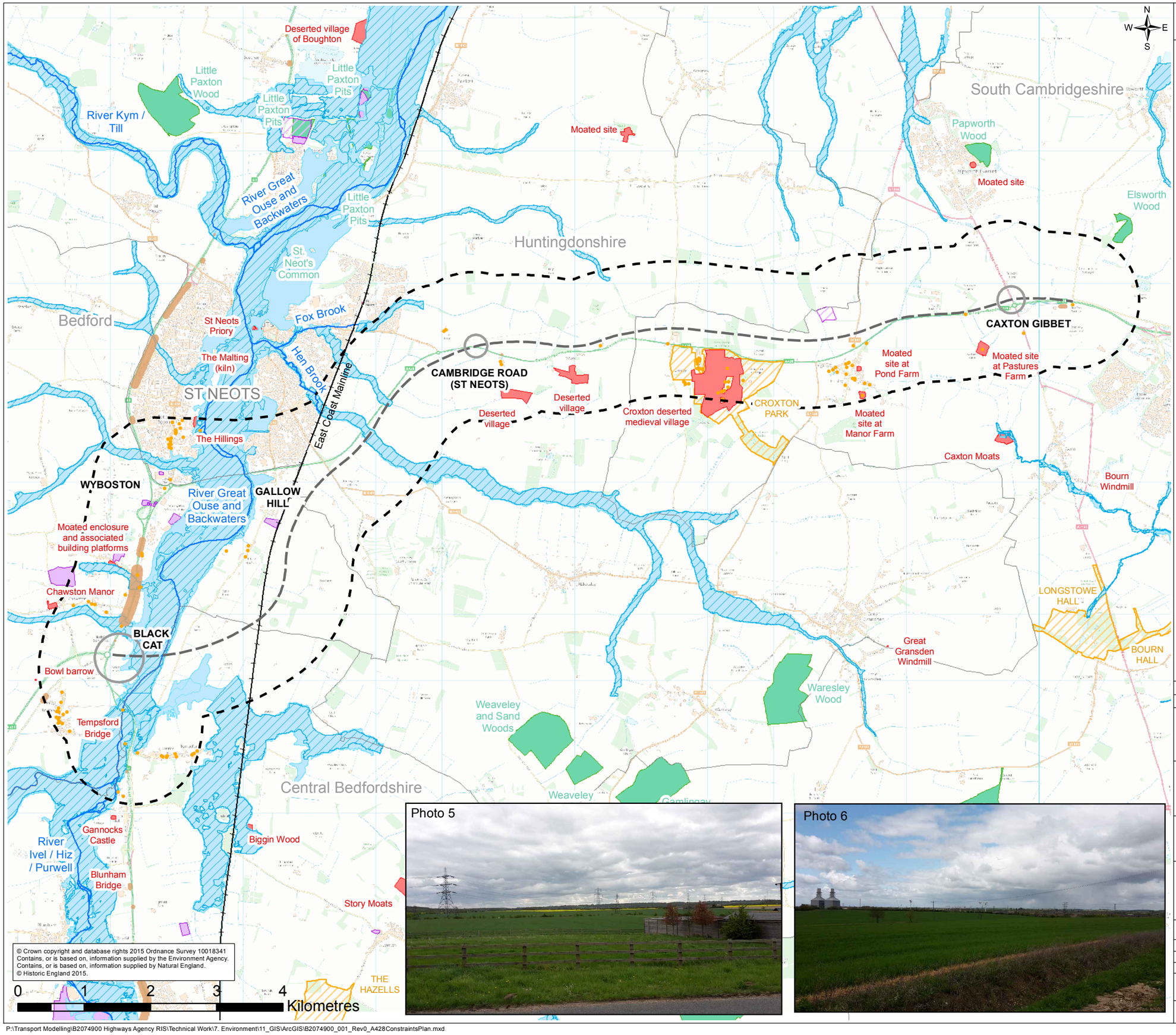

Photo 5

Photo 6

Legend

- Study Area
- Approximate Route Corridor
- Proposed Junction Improvements
- Listed Buildings
- Rivers
- Local Planning Authority Boundary
- Scheduled Monuments
- Flood Zone 3
- Flood Zone 2
- Current Landfill Sites
- Historic Landfill Sites
- Registered Parks
- Sites of Special Scientific Interest
- Noise Important Areas

Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd
0	26/10/2015	Initial Issue	CB	CW	IC	SB

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Client: highways england driving forward

Project: A428 BLACK CAT TO CAXTON GIBBET

Drawing Title: A428 CONSTRAINTS PLAN

Scale @ A3	1:55,000	DO NOT SCALE
Jacobs No.	B2074900	

P:\Transport Modelling\B2074900 Highways Agency RIS\Technical Work\7. Environment\11_GIS\ArcGIS\B2074900_001_Rev0_A428ConstraintsPlan.mxd

Appendix F. Long List of Options

A - Online Options	Description
1	A428 full widening
2	A428 localised widening
3	Grade separation at Caxton Gibbet Roundabout
4	Signalisation of existing roundabout at Caxton Gibbet
5	Signalisation and 'hamburger' style roundabout at Caxton Gibbet
6	Circulatory Capacity Increases (3 lanes) at Caxton Gibbet
7	Small scale signing and lining improvements at Caxton Gibbet
8	Upgrade (Signalisation) to existing A428 junctions
9	Grade separation at Black Cat
10	Signalised T-Junction at Black Cat
11	Dualling between Wyboston and Barford Road
12	Jetlane (x2) A428 to A1 (S) at Wyboston Roundabout
13	Upgrade to existing A1 junctions
14	Small scale improvements (Rationalisation of local roads accessing the A428 (eg, High St, Abbotsley Rd), prohibition of right-turn movements, signing and lining enhancements)
15	Driver advisory Signs (VMS)
16	Dualling between Barford Road and Cambridge Road Roundabout
17	Dualling between Cambridge Road and Caxton Gibbet
18	Dualling between St Ives Junction (B1040) and Caxton Gibbet
19	Widening the A1 between Wyboston and Black Cat
20	Tidal Flow lane on A428 providing additional capacity eastbound in the AM and westbound in the PM (zipper mechanism)

B - Offline Options	
1	Full offline dualling
2	Full offline single carriageway
3	Free-flow link between A1 and A428
4	A1 realignment west of St. Neots
5	A1 realignment east of St. Neots
6	A428 bypass to Cambridge Road Roundabout
C - Combined Package Options	
1	A428 full offline dualling, grade separation of Black Cat roundabout and grade separation of Caxton Gibbet roundabout
2	A428 full offline dualling, grade separation of Black Cat roundabout and signalisation of Caxton Gibbet roundabout
3	A428 bypass to Cambridge Road roundabout, grade separation at Caxton Gibbet, grade separation at Black Cat, local widening with channelisation between Cambridge Road roundabout and Caxton Gibbet
4	A428 bypass to Cambridge Road roundabout, signalisation at Caxton Gibbet, grade separation at Black Cat, local Widening with channelisation between Cambridge Road Roundabout and Caxton Gibbet
5	A428 bypass to Cambridge Road roundabout, grade separation at Black Cat, grade separation at Caxton Gibbet
6	A428 bypass to Cambridge Road roundabout, grade separation at Black Cat, signalisation at Caxton Gibbet
7	A428 single lane carriageway bypass to Cambridge Road roundabout, online dualling between Cambridge Road roundabout and Caxton Gibbet roundabout, improvements at Black Cat roundabout and Caxton Gibbet roundabout
8	A428 full online dualling with grade separation at Black Cat roundabout and grade separation at Caxton Gibbet roundabout
9	A428 full online dualling, grade separation at Black Cat roundabout and signalisation at Caxton Gibbet roundabout
10	Local junction widening with channelisation at existing A428 junctions, grade separation at Caxton Gibbet roundabout, grade separation at Black Cat and upgrade to existing A1 junctions
11	Local junction widening with channelisation at existing A428 junctions,

	Signalisation at Caxton Gibbet roundabout, grade separation at Black Cat and upgrade to existing A1 junctions
12	Online dualling of the A428 between St Ives Road and Caxton Gibbet and grade separation of Caxton Gibbet roundabout
13	Online dualling of the A428 between St Ives Road and Caxton Gibbet roundabout and signalisation of Caxton Gibbet roundabout
14	Grade separation of Black Cat roundabout and signalisation of Caxton Gibbet
15	Local junction widening with channelisation along A428 and signalisation of Caxton Gibbet
16	A428 dual carriageway bypass to Cambridge Road roundabout with online dualling between Cambridge Road roundabout and Caxton Gibbet roundabout, grade separation at Black Cat roundabout and grade separation at Caxton Gibbet roundabout
17	Dual carriageway bypass from Black Cat roundabout and Caxton Gibbet roundabout, and grade separation of Caxton Gibbet roundabout
D - Public Transport Options	
1	Reinstate East - West Rail Link
2	Park and Ride at St. Neots
3	Tram services
4	Bus service improvements
5	Guided bus way extension
E - NMU Options	
1	Segregated Cycle lanes
2	Improved pedestrian walkways

Appendix G. Sifting Process

G.1 Introduction

The Option Generation process (Chapter 7) identified an initial list of potential interventions to be considered further as part of the feasibility study.

The key principle of TAG is that potential improvements are driven by identified problems and defined objectives. This ensures that the need for investment can be clearly justified and evidenced.

The next stage within the option development process was therefore to 'sift out' any potential solutions that clearly failed to meet the defined objectives, fail to alleviate identified problems or fail to meet key deliverability / feasibility criteria.

DfT guidance recommend the use of the Early Assessment and Sifting Tool (EAST) which enables analysts to quickly assess options against the Treasury Five Case Model to discard any options that do not represent realistic solutions or are undeliverable. An example of EAST is provided in Figure G.1.

However, a limitation of EAST in the context of the Feasibility Study is that there is only a single opportunity to provide an assessment against the identified problems and objectives. As shown below these assessments are covered under 'Scale of Impact' for problems and 'Fit with other objectives' for route objectives.

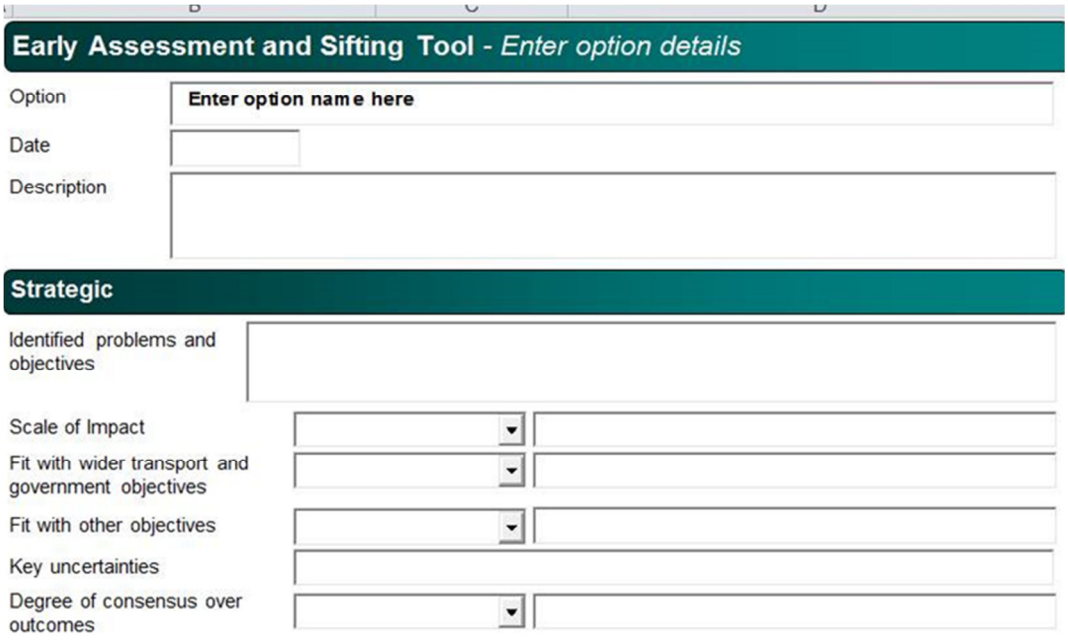


Figure G.1 : EAST Input (Scale of Impact / fit with other objectives)

Given that the feasibility study has identified several problems and objectives it is considered that a single assessment could be misleading and provide limited disaggregation between the benefits of each of the potential interventions considered. A spreadsheet has therefore been used in advance of EAST in order to better understand how each of the potential interventions could alleviate each of the identified problems and contribute to the defined objectives. This 'Initial Sift' spreadsheet has also included consideration of high level deliverability and feasibility criteria in order to identify any 'show stoppers' that are likely to prevent an option from being progressed.

The Initial Sift is discussed in more detail below, followed by a description of EAST.

G.2 Initial Sift

The Initial Sift spreadsheet includes the following components.

- Assessment against problems
- Assessment against objectives
- Feasibility / deliverability assessment
- Sifting criteria and sift

Each element of the Initial Sift is discussed in more detail below followed by a summary of the sifting process.

G.2.1 Initial Sift: Assessment against problems and objectives

Each of the potential interventions identified for further consideration were input into the initial sifting spreadsheet. Each intervention was assessed against how it may help to resolve the identified problems on the route and help achieve the defined objectives.

This exercise was undertaken by specialists from Transport Planning / Appraisal, Highway Design and Environmental disciplines and was based upon local knowledge, technical expertise, professional judgement and experience.

The assessment was undertaken using a five-point scale as illustrated in Figure G.2.

Reference (Route Section-Intervention)	Option Description	Problems (EAST Scale of Impact)												Objectives (EAST Fit with Other Objectives)								
		1	2	3	4	5	6	7	8	9	10	11	Total	1	2	3	4	5	6	7	8	Total
Online Options																						
1	A428 full widening	0	0	-1	1	2	2	1	2	0	0	2	9	1	-1	-1	2	2	2	0	2	5
2	A428 localised widening	0	0	0	1	1	1	1	0	0	0	1	5	0	0	0	1	0	1	0	1	2
3	Grade separation @ Caxton R'bt	0	0	0	1	1	1	0	0	0	1	1	5	1	0	0	1	0	1	0	1	3
4	Signalisation of existing roundabout @ Caxton Gibbet	0	0	1	1	1	1	1	0	0	1	1	7	1	1	1	1	0	1	0	1	5
5	Signalisation and 'hamburger' style rbt @ Caxton Gibbet	0	0	1	1	1	1	1	0	0	1	1	7	1	1	1	1	0	1	0	1	5
6	Circulatory Capacity Increases (3 lanes) @ Caxton Gibbet	0	0	-1	1	1	1	1	0	0	0	1	4	0	0	-1	1	1	0	1	0	1
7	Small scale signing and lining improvements @ Caxton Gibbet	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	2
8	Upgrade (Signalisation) to existing A428 junctions	0	0	1	1	1	1	1	0	0	1	1	7	1	1	1	1	0	1	0	1	5
9	Grade separation @ Black Cat	0	0	0	1	1	0	1	0	0	1	1	5	1	1	0	1	0	1	0	1	4

Figure G.2 : Scoring against problems and objectives

The resulting assessment provided a high level understanding of the potential benefits that could be delivered by each of the potential interventions.

G.2.2 Initial Sift: Feasibility / deliverability assessment

The next stage was to assess each of the potential interventions against key deliverability and feasibility criteria as listed below. Again, this exercise was undertaken by specialists from Transport Planning / Appraisal, Highway Design and Environmental disciplines and was based upon local knowledge, technical expertise, professional judgement and experience.

Deliverability Considerations

1) Political acceptability

   a) Who are the key stakeholders?

   b) What level of support is there likely to be from them for the option under consideration?

   c) What level of support is there likely to be from the public for the option under consideration?

   d) Are there any significant environmental impacts for the option under consideration?

2) Planning

   a) How far through the planning process is the option under consideration (e.g. not started, part-way through, nearing completion)?

   b) Are there any legal issues e.g. CPO?

3) Implementation timescales / funding likelihood

   a) What is the implementation timescale (e.g. short (less than 2 years), medium (2 to 5 years) and long (greater than 5 years))?

   b) What are the likely funding sources? Are they time-dependent? Is there likely to be a funding gap?

   c) Are there likely to be significant mitigation costs over and above the cost of the option itself?

4) Third Party Issues

   a) Is Third Party land required?

   b) Are there any legal issues e.g. CPO?

Feasibility Considerations

1) Physical constraints

   a) Are there any significant physical constraints that could have a direct impact on the costs and risks associated with the option under consideration e.g. existing structures (viaducts, bridges, retaining walls etc.) or structures required within option design?

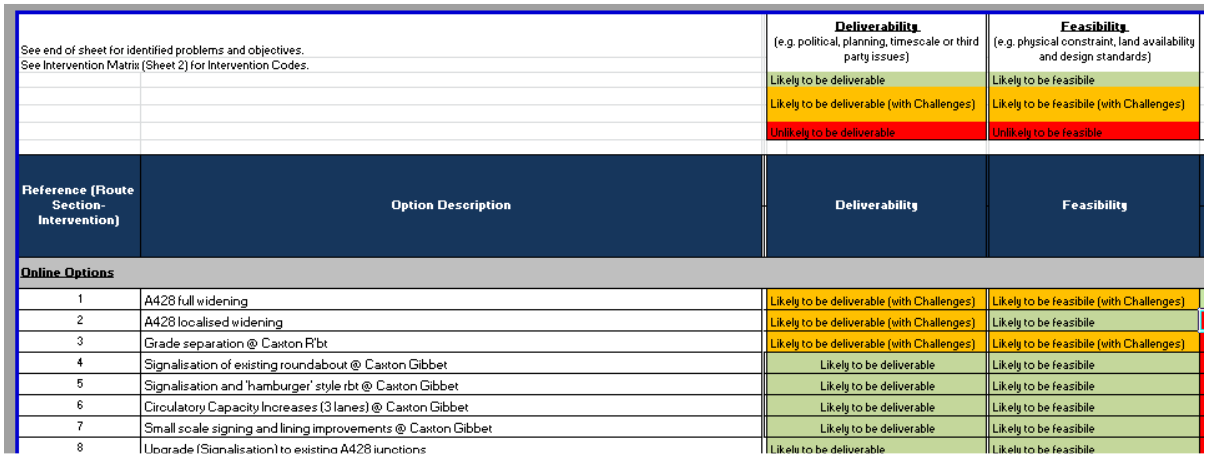
2) Land ownership / availability

   a) Will CPO be required?

3) Design standards

   a) Is the option under consideration technically possible from an engineering perspective?

Each of the potential interventions were assessed against a three-point scale as illustrated in Figure G.3.



See end of sheet for identified problems and objectives. See Intervention Matrix (Sheet 2) for Intervention Codes.		**Deliverability** (e.g. political, planning, timescale or third party issues)	**Feasibility** (e.g. physical constraint, land availability and design standards)
		Likely to be deliverable	Likely to be feasibile
		Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)
		Unlikely to be deliverable	Unlikely to be feasible
Reference (Route Section-Intervention)	**Option Description**	**Deliverability**	**Feasibility**
Online Options			
1	A428 full widening	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)
2	A428 localised widening	Likely to be deliverable (with Challenges)	Likely to be feasibile
3	Grade separation @ Caxton R'bt	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)
4	Signalisation of existing roundabout @ Caxton Gibbet	Likely to be deliverable	Likely to be feasibile
5	Signalisation and 'hamburger' style rbt @ Caxton Gibbet	Likely to be deliverable	Likely to be feasibile
6	Circulatory Capacity Increases (3 lanes) @ Caxton Gibbet	Likely to be deliverable	Likely to be feasibile
7	Small scale signing and lining improvements @ Caxton Gibbet	Likely to be deliverable	Likely to be feasibile
8	Upgrade (Signalisation) to existing A428 junctions	Likely to be deliverable	Likely to be feasibile

Figure G.3 : Scoring against deliverability and feasibility

G.2.3 Initial Sift: Sifting Criteria and Sift

A set of sifting criteria was developed to sift-out potential interventions that were unlikely to provide a significant contribution to the identified problems and defined objectives or were unlikely to be deliverable or feasible. The sifting criteria is illustrated in Figure G.4.

Initial Sifting Criteria

Each option must meet the following sifting criteria to be considered further within EAST:

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

Initial Sifting Criteria Prior to EAST				Take to EAST
1	2	3	4	
A - Making best use of the existing junction footprint				
✗	✓	✓	✓	✗
✗	✗	✓	✓	✗
✗	✗	✓	✓	✗
✗	✗	✓	✓	✗
✗	✗	✓	✓	✗
✓	✓	✓	✓	✓

Figure G.4 : Initial sifting criteria

Only those potential interventions that met all 4 sifting criteria were selected for further consideration within EAST.

G.3 Early Assessment and Sifting

Each of the options that remained after the 'initial sift' were then assessed within EAST against the Treasury Five Case Model as summarised below.

- Strategic Case
  - Identified problems and objectives of the option
  - Scale of Impact
  - Fit with wider transport and Government objectives
  - Fit with other objectives
  - Key uncertainties
  - Degree of consensus over outcomes
- Economic Case
  - Economic Growth
  - Carbon Emissions
  - Socio-distributional impacts and the regions
  - Local Environment
  - Well Being
  - Expected Value for Money Category
- Management Case
  - Implementation timetable from inception to delivery
  - Public acceptability
  - Practical feasibility
  - Quality of supporting evidence
  - Key risks
- Financial Case
  - Affordability
  - Capital Costs
  - Revenue Costs
  - Cost Profile
  - Overall Cost Risk
- Commercial Case
  - Flexibility of Option
  - Where is funding coming from?
  - Any Income generated?

EAST does not determine the best performing options on the user's behalf but simply enables the project team to view all the options' scores when looking at the summary sheet.

Once EAST had been populated the project team therefore had to determine which, if any, options should not be taken any further forward. A summary of EAST is provided in Table 11.1.

Option	Strategic			Economic						Managerial			Financial			Commercial
	Scale of Impact [illegible]	transport and government objectives	Fit with other objectives	Economic Growth	Carbon Emissions	Socio-distributional and the regions	Local Environment	Wellbeing	Expected VFM	Implementation time table	Public Acceptability	Practical Feasibility	Affordability	Capital Cost	Overall Risk	Flexibility of Option
Option A1	3	4	3	4	3	4	3	3	Medium	5-10 years	3	3	3	£500-1000	3	3
Option B1	4	4	3	4	3	4	2	4	Medium	5-10 years	4	5	2	£500-1000	5	2
Option C1	4	4	3	5	3	4	2	4	High	5-10 years	4	5	2	£500-1000	5	3
Option C2	4	4	3	4	3	4	2	4	High	5-10 years	4	5	2	£500-1000	5	3
Option C3	4	4	3	4	3	4	3	4	High	5-10 years	2	4	3	£500-1000	5	4
Option C4	4	4	3	3	3	4	3	4	High	5-10 years	2	4	3	£500-1000	5	4
Option C5	4	4	3	4	3	4	3	4	High	5-10 years	2	5	4	£250-500	5	3
Option C6	3	4	3	3	3	4	3	4	High	5-10 years	2	5	4	£250-500	5	3
Option C7	4	4	3	4	3	4	3	4	High	5-10 years	3	5	4	£250-500	3	4
Option C8	4	4	3	4	3	4	3	4	Medium	5-10 years	3	3	3	£500-1000	3	4
Option C9	4	4	3	3	3	4	3	4	Medium	5-10 years	3	3	3	£500-1000	3	3
Option C10	3	3	3	4	3	4	3	4	Medium	5-10 years	1	3	5	£100-250	3	5
Option C11	3	3	3	3	3	4	3	4	Medium	5-10 years	1	5	5	£100-250	3	5
Option C13	3	3	3	2	3	3	3	3	Medium	5-10 years	1	5	5	£50-100	3	3
Option C14	3	3	3	3	3	3	3	4	Medium	5-10 years	1	5	5	£50-100	3	3
Option C16	4	4	3	5	3	4	2	4	High	5-10 years	3	5	2	£500-1000	3	4

Table 11.1 : EAST Summary

Following a review of EAST it was identified that all of the options fell within the allowed £1bn budget, however, some of the schemes were cheaper than others, and the more expensive scheme were generally expected to provide bigger scale of impacts.

G.4 Shortlisted Options

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

- Option C1 - A428 full offline dualling with grade separation of Black Cat roundabout and grade separation of Caxton Gibbet roundabout;
- Option C2 - A428 full offline dualling with grade separation of Black Cat roundabout and signalisation of Caxton Gibbet roundabout;
- Option C5 - A428 bypass to Cambridge Road roundabout with grade separation at Black Cat, and grade separation at Caxton Gibbet roundabout;
- Option C6 - A428 bypass to Cambridge Road R'bout with grade separation at Black Cat roundabout, and signalisation at Caxton Gibbet roundabout;
- Option C7 - A428 single lane carriageway bypass to Cambridge Road roundabout with online dualling between Cambridge Road roundabout and Caxton Gibbet roundabout, grade separation at Black Cat roundabout and grade separation at Caxton Gibbet roundabout;
- Option C10 - Local junction widening with channelisation at existing A428 junctions, grade separation at Caxton Gibbet roundabout, grade separation at Black Cat roundabout and upgrade to existing A1 junctions;
- Option C11 - Local junction widening with channelisation at existing A428 junctions, signalisation at Caxton Gibbet roundabout, grade separation at Black Cat roundabout and upgrade to existing A1 junctions; and
- Option C16 - A428 dual carriageway bypass to Cambridge Road roundabout with online dualling between Cambridge Road roundabout and Caxton Gibbet roundabout, grade separation at Black Cat roundabout and grade separation at Caxton Gibbet roundabout

Appendix H. Initial Sift Tool

A428 Black Cat roundabout to Caxton Gibbet roundabout

Initial Sift of Options
(Draft Criteria for Approval)

See end of sheet for identified problems and objectives.
See Intervention Matrix (Sheet 2) for Intervention Codes.

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 feasibile
Likely to be feasibile (with Challenges)
Unlikely to be feasible

Initial Sifting Criteria
Each option must meet the following sifting criteria to be considered further within EAST:
1: Overall moderate impact against identified problems (Appraisal score >4, see East Conversion below)
2: Overall moderate fit with route objectives (Appraisal score >3, see East conversion below)
3: Likely to be deliverable
4: Likely be feasible in theory

Reference (Route Section-Intervention)	Option Description	Problems (EAST Scale of Impact)											Objectives (EAST Fit with Other Objectives)									Deliverability	Feasibility	Initial Sifting Criteria Prior to EAST				Take to EAST
		1	2	3	4	5	6	7	8	9	10	Total	1	2	3	4	5	6	7	8	Total			1	2	3	4	
A - Online Options																												
1	A428 full widening	0	0	-1	1	2	2	1	2	0	2	9	1	2	2	2	-1	-1	0	2	7	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✓	✓	✓	✓	✓
2	A428 localised widening	0	0	0	1	1	1	1	0	0	1	5	0	1	1	1	0	0	0	0	3	Likely to be deliverable (with Challenges)	Likely to be feasibile	✗	✗	✓	✓	✗
3	Grade separation @ Caxton Gibbet R'bt	0	0	0	1	1	1	0	0	0	1	4	1	1	1	1	0	0	0	0	4	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✗	✗	✓	✓	✗
4	Signalisation of existing roundabout @ Caxton Gibbet	0	0	1	1	1	1	0	0	0	1	6	1	1	1	1	1	1	0	0	6	Likely to be deliverable	Likely to be feasibile	✗	✓	✓	✓	✗
5	Signalisation and 'hamburger' style rbt @ Caxton Gibbet	0	0	1	1	1	1	0	0	0	1	6	1	1	1	1	1	1	0	0	6	Likely to be deliverable	Likely to be feasibile	✗	✓	✓	✓	✗
6	Circulatory Capacity Increases (3 lanes) @ Caxton Gibbet	0	0	-1	1	1	1	1	0	0	1	4	0	1	1	1	0	-1	0	0	2	Likely to be deliverable	Likely to be feasibile	✗	✗	✓	✓	✗
7	Small scale signing and lining improvements @ Caxton Gibbet	0	0	0	1	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	2	Likely to be deliverable	Likely to be feasibile	✗	✗	✓	✓	✗
8	Upgrade (Signalisation) to existing A428 junctions	0	0	1	1	1	1	0	0	0	1	6	1	1	1	1	1	1	0	0	6	Likely to be deliverable	Likely to be feasibile	✗	✓	✓	✓	✗
9	Grade separation @ Black Cat	0	0	0	1	1	0	1	0	0	1	4	1	1	1	1	1	0	0	0	5	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✗	✓	✓	✓	✗
10	Signalised T-Junction @ Black Cat	0	0	1	0	0	0	0	0	0	1	2	0	0	0	0	0	1	0	0	1	Likely to be deliverable	Likely to be feasibile	✗	✗	✓	✓	✗
11	Dualling between Wyboston and Barford Road	0	0	0	1	1	1	1	1	0	1	6	0	1	1	1	-1	0	0	1	3	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✗	✗	✓	✓	✗
12	Jetlane (x2) A428 to A1 (S) at Wyboston Rbt	0	0	0	1	0	0	0	0	0	1	2	1	1	0	1	1	0	0	0	4	Likely to be deliverable	Likely to be feasibile	✗	✗	✓	✓	✗
13	Upgrade to existing A1 junctions	0	0	0	1	1	0	1	0	0	1	4	1	1	1	1	1	0	0	0	5	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✗	✓	✓	✓	✗
14	Small scale improvements (Rationalisation of local roads accessing the A428 (eg, High St, Abbotsley Rd), prohibition of right-tur	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	0	2	Likely to be deliverable	Likely to be feasibile	✗	✗	✓	✓	✗
15	Driver advisory Signs (VMS)	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	Likely to be deliverable	Likely to be feasibile	✗	✗	✓	✓	✗
16	Dualling between Barford Road and Cambridge Road Roundabout	0	0	0	0	1	1	1	1	0	1	5	0	1	-1	1	1	0	0	1	3	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✗	✗	✓	✓	✗
17	Dualling between Cambridge Road and Caxton Gibbet	0	0	0	1	1	1	2	1	0	1	7	0	1	-1	1	1	0	0	1	3	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✗	✗	✓	✓	✗
18	Dualling between St Ives Junction (B1040) and Caxton Gibbet	0	0	0	1	1	1	1	1	0	1	6	0	1	-1	1	1	0	0	1	3	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✗	✗	✓	✓	✗
19	Widening the A1 between Wyboston and Black Cat	0	0	0	0	1	0	1	0	0	1	3	0	0	1	1	0	0	0	1	3	Unlikely to be deliverable	Unlikely to be feasible	✗	✗	✗	✗	✗
20	Tidal Flow lane on A428 providing additional capacity eastbound in the AM and westbound in the PM (zipper mechanism)	0	0	-1	0	2	1	2	0	0	1	5	-1	1	2	2	0	-1	0	1	4	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✗	✗	✓	✓	✗
B - Offline Options																												
1	Full offline dualling	0	2	1	2	2	2	2	2	0	2	15	1	2	2	2	-2	1	0	2	8	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✓	✓	✓	✓	✓
2	Full offline single carriageway	0	2	1	2	2	1	1	2	0	2	13	0	1	1	1	-1	1	0	1	4	Unlikely to be deliverable	Likely to be feasibile (with Challenges)	✓	✗	✗	✓	✗
3	Free-flow link between A1 & A428	0	0	0	1	1	1	1	1	0	1	6	0	1	1	1	-1	0	0	0	2	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✗	✗	✓	✓	✗
4	A1 realignment west of St. Neots	0	0	1	1	1	0	1	0	0	1	5	1	1	1	1	-2	1	0	1	4	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✗	✗	✓	✓	✗
5	A1 realignment east of St. Neots	0	0	1	1	1	0	1	0	0	1	5	1	1	1	1	-2	1	0	1	4	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✗	✗	✓	✓	✗
6	A428 bypass to Cambridge Road Roundabout	0	1	0	1	1	1	1	1	0	1	7	1	1	1	1	-1	1	0	1	5	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✗	✓	✓	✓	✗
C - Combined Package Options																												
1	A428 full offline dualling, grade separation of Black Cat roundabout and grade separation of Caxton Gibbet roundabout	0	2	1	2	2	2	2	2	0	2	15	1	2	2	2	-2	1	0	2	8	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✓	✓	✓	✓	✓
2	A428 full offline dualling, grade separation of Black Cat roundabout and signalisation of Caxton Gibbet roundabout	0	2	1	2	2	2	2	2	0	2	15	1	2	2	2	-2	1	0	2	8	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✓	✓	✓	✓	✓
3	A428 bypass to Cambridge Road roundabout, grade separation at Caxton Gibbet, grade separation at Black Cat, local widening with channelisation between Cambridge Road roundabout and Caxton Gibbet	0	1	1	2	2	1	2	1	0	2	12	1	1	1	2	-1	1	0	1	6	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✓	✓	✓	✓	✓
4	A428 bypass to Cambridge Road roundabout, signalisation at Caxton Gibbet, grade separation at Black Cat, local Widening with channelisation between Cambridge Road Roundabout and Caxton Gibbet	0	1	1	2	2	1	2	1	0	2	12	1	1	1	2	-1	1	0	1	6	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✓	✓	✓	✓	✓
5	A428 bypass to Cambridge Road roundabout, grade separation at Black Cat, grade separation at Caxton Gibbet	0	1	1	2	2	1	2	1	0	2	12	1	1	1	2	-1	1	0	1	6	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✓	✓	✓	✓	✓
6	A428 bypass to Cambridge Road roundabout, grade separation at Black Cat, signalisation at Caxton Gibbet	0	1	1	2	2	1	2	1	0	2	12	1	1	1	2	-1	1	0	1	6	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✓	✓	✓	✓	✓
7	A428 single lane carriageway bypass to Cambridge Road roundabout, online dualling between Cambridge Road roundabout and Caxton Gibbet roundabout, improvements at Black Cat roundabout and Caxton Gibbet roundabout	0	1	1	2	2	1	2	1	0	2	12	1	1	1	2	-1	1	0	1	6	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✓	✓	✓	✓	✓
8	A428 full online dualling with grade separation at Black Cat roundabout and grade separation at Caxton Gibbet roundabout	0	0	-1	2	2	2	2	2	0	2	11	1	2	2	2	-1	-1	0	2	7	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✓	✓	✓	✓	✓
9	A428 full online dualling, grade separation at Black Cat roundabout and signalisation at Caxton Gibbet roundabout	0	0	-1	2	2	2	2	2	0	2	11	1	2	2	2	-1	-1	0	2	7	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✓	✓	✓	✓	✓
10	Local junction widening with channelisation at existing A428 junctions, grade separation at Caxton Gibbet roundabout, grade separation at Black Cat and upgrade to existing A1 junctions	0	0	0	2	2	0	2	0	0	1	7	1	1	2	1	1	1	0	1	8	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✗	✓	✓	✓	✗
11	Local junction widening with channelisation at existing A428 junctions, Signalisation at Caxton Gibbet roundabout, grade separation at Black Cat and upgrade to existing A1 junctions	0	0	0	2	2	0	2	0	0	1	7	1	1	2	1	1	1	0	1	8	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✗	✓	✓	✓	✗
12	Online dualling of the A428 between St Ives Road and Caxton Gibbet and grade separation of Caxton Gibbet roundabout	0	0	0	1	1	1	1	1	0	1	6	1	1	1	1	1	0	0	1	6	Likely to be deliverable	Likely to be feasibile	✗	✓	✓	✓	✗
13	Online dualling of the A428 between St Ives Road and Caxton Gibbet roundabout and signalisation of Caxton Gibbet roundabout	0	0	1	1	1	1	1	1	0	1	7	1	1	1	1	1	1	0	1	7	Likely to be deliverable	Likely to be feasibile	✗	✓	✓	✓	✗
14	Grade separation of Black Cat roundabout and signalisation of Caxton Gibbet	0	0	1	1	1	0	2	1	0	1	7	1	1	1	1	1	1	0	1	7	Likely to be deliverable	Likely to be feasibile	✗	✓	✓	✓	✗
15	Local junction widening with channelisation along A428 and signalisation of Caxton Gibbet	0	0	1	1	1	0	1	1	0	1	6	1	1	1	1	1	1	0	1	7	Likely to be deliverable	Likely to be feasibile	✗	✓	✓	✓	✗
16	A428 dual carriageway bypass to Cambridge Road roundabout with online dualling between Cambridge Road roundabout and Caxton Gibbet roundabout, grade separation at Black Cat roundabout and grade separation at Caxton Gibbet roundabout	0	1	1	2	2	2	2	2	0	2	14	1	2	1	2	-1	1	0	1	7	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✓	✓	✓	✓	✓
17	Dual carriageway bypass from Black Cat roundabout and Caxton Gibbet roundabout, and grade separation of Caxton Gibbet roundabout	0	1	0	-1	1	2	1	1	0	1	6	1	1	1	1	-2	0	0	1	3	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✗	✗	✓	✓	✗

A428 Black Cat roundabout to Caxton Gibbet roundabout

Initial Sift of Options
(Draft Criteria for Approval)

See end of sheet for identified problems and objectives.
See Intervention Matrix (Sheet 2) for Intervention Codes.

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 feasibile
Likely to be feasibile (with Challenges)
Unlikely to be feasible

Initial Sifting Criteria
Each option must meet the following sifting criteria to be considered further within EAST:
1: Overall moderate impact against identified problems (Appraisal score >4, see East Conversion below)
2: Overall moderate fit with route objectives (Appraisal score >3, see East conversion below)
3: Likely to be deliverable
4: Likely be feasible in theory

Reference (Route Section-Intervention)	Option Description	Problems (EAST Scale of Impact)											Objectives (EAST Fit with Other Objectives)									Deliverability	Feasibility	Initial Sifting Criteria Prior to EAST				Take to EAST
		1	2	3	4	5	6	7	8	9	10	Total	1	2	3	4	5	6	7	8	Total			1	2	3	4	
D - Public Transport Options																												
1	Reinstate East - West Rail Link	2	1	0	0	1	0	1	0	0	2	7	1	1	1	2	1	0	0	0	6	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✗	✓	✓	✓	✗
2	Park & Ride @ St. Neots	1	0	0	0	0	0	0	0	0	1	2	0	0	0	1	1	0	0	0	2	Likely to be deliverable (with Challenges)	Likely to be feasibile	✗	✗	✓	✓	✗
3	Tram services	2	0	0	1	1	0	0	0	0	1	5	0	1	0	1	1	0	0	0	3	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✗	✗	✓	✓	✗
4	Bus service improvements	2	0	0	1	1	0	0	0	0	1	5	1	1	0	1	1	0	0	0	4	Likely to be deliverable	Likely to be feasibile	✗	✗	✓	✓	✗
5	Guided bus way extension	2	1	0	0	1	0	1	0	0	2	7	1	1	1	2	1	0	0	0	6	Likely to be deliverable	Likely to be feasibile	✗	✓	✓	✓	✗
E - NMU Options																												
1	Segregated Cycle lanes	0	0	2	0	0	0	0	0	0	0	2	1	1	0	0	0	2	0	0	4	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✗	✗	✓	✓	✗
2	Improved pedestrian walkways	0	0	2	0	0	0	0	0	0	0	2	1	1	0	0	1	2	0	1	6	Likely to be deliverable (with Challenges)	Likely to be feasibile (with Challenges)	✗	✓	✓	✓	✗

Identified Problems

1 There are inadequate public transport options along the corridor; which has only limited bus services and no parallel rail service provision
2 There is a lack of viable alternative east-west routes between Cambridge and other economic centres such as Milton Keynes, Northampton and Bedford
3 There is poor non-motorised user provision along the corridor
4 A number of junctions along the corridor operate close to, or at capacity;
5 Peak hour speeds along the corridor are significantly lower than the rest of the day
6 Speeds on the single carriageway sections of the corridor are significantly lower than those that are dualled
7 There is a high degree of journey time variability along the corridor, making it difficult for users to plan their journey with confidence
8 There is low resilience against accidents and incidents on the single carriageway sections of the corridor
9 There is a lack of driver information along the corridor
10 The above problems also constrain economic growth along the corridor

Route Objectives

1 Making the network safer
2 User satisfaction
3 Supporting the smooth flow of traffic
4 Encouraging economic growth
5 Delivering better environmental outcomes
6 Helping cyclists, walkers and other vulnerable users of the Network
7 Achieving real efficiency
8 Keeping the network in good condition

East Conversion

Problems (Scale of Impact)

Appraisal Score	East Rating
≤0	Very small impact
1	
2	Minor Impact
3	
4	
5	Moderate Impact
6	
7	
8	
9	
10	
11	
12	Significant impact
13	
14	
15	
16	
17	
18	Fully addresses identified problems
19	
20	
21	
22	

31

Objectives (Fit with Other Objectives)

Appraisal Score	Rating
≤0	Very small impact
1	Minor Impact
2	
3	
4	
5	Moderate Impact
6	
7	
8	
9	Significant Impact
10	
11	
12	
13	Fully Addresses Objectives
14	
15	
16	

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Appendix I. Early Assessment and Sifting Tool (EAST) Outputs

Early Assessment and Sifting Tool (EAST)

Change text size

This tool aims to help you to record and compare data on your options. Below is a summary of all saved options.
To add a new option: click on the 'Add New Option' button above and complete the assessment sheet.
To view a saved option: click on its name in the 'Name/No.' column below.
To edit an option: click on its name in the 'Name/No.' column below, edit the data and save it.
To read further guidance on how to use this tool, please double-click on the 'Tool User Guide' icon above.

← To read the user guide to the tool, please double-click on this icon

16 option(s) have been saved in total. 16 is now currently

Document

		Overall			Strategic						Economic										Managerial					Financial								Commercial			
Option No.	Delete option	Name/No.	Date	Description	Identified problems and objectives of the option	Scale of impact	Scale of impact - Comments	Fit with the strategic case	Wider transport and non-transport objectives - Comments	Fit with other objectives	Fit with other objectives - Comments	Key uncertainties	Degree of consensus over outcomes?	Degree of consensus over outcomes? - Comments	Economic Growth	Economic growth - Comments	Carbon emissions	Carbon emissions - Comments	Air quality and local impacts	Socio-distributional impacts and the regions - Comments	Social cost impacts	Local environment - Comments	Net Iteing	Well being - Comments	BCR/AMVOR Category	Expected VfM Category - Comments	Implementation timetable	Implementation timetable - Comments	Flight acceptability	Public acceptability - Comments	Pre-Bid Activity	Practical feasibility - Comments	What is the quality of the supporting evidence?	What is the quality of the supporting evidence? - Comments	Key risks	Affordability	Affordability - Comments	Capital Cost (2m)?	Capital Cost (2m)? - Comments	Revenue Cost (£m)?	Revenue Costs (£m)? - Details	Cost Profile	Overall net risk	Other costs	Feasibility studies	Flexibility of option - Comments	Where is funding coming from?	Is the option supported by a Member of Parliament?	Is the option supported by a Member of Parliament? - Comments
1	Delete #1		11/09/2015	A426 tait widening		3		4				1. Little	Little to no consultation taken place at this stage.		4. Amber/green	The scheme is likely to significantly reduce journey times and improve journey time reliability, which will have a positive impact on economic growth	3. Amber	The Scheme is not likely to result in any change to carbon emissions. It is not possible to quantify greenhouse gases at this stage.	4. Amber/green	The scheme is likely to have a moderate fit with the defined RIS objectives.	2. Amber	The scheme would likely have slight negative impacts on air quality and noise, and slight adverse impacts on the historic environment and biodiversity.	3. Amber	Scheme is likely to improve access to goods and services and reduce accidents, therefore having a positive impact	3 Medium 1.5>2	6. 9-10 years	Construction phasing and traffic management could be more onerous considering the online nature of the option	3	The option is likely to receive mixed support. The A426 is recognised as a problem and any improvement will likely receive some support, however, there will also be opposition from environmental groups.	3	Traffic Management phasing during construction resulting in a lengthy construction period	3	Reasonable level of supporting evidence, good underlying data and basic level of supporting traffic modelling.	Funding or policy change	3	£1bn of funding has been allocated to improvements along the A1 and A426 between Black Cat roundabout and Cavton Gibbet, however, this option is likely to cost less.	0m. 500-1000	Guesstimate without Highways England Commercial Services Team. Likely to be cheaper than offline solution, but greater than £500m	01. None	N/A	3	Construction costs with Traffic Management and Statutory Undertakers equipment	3	As an online dualling option this is relatively flexible with the ability to only widen a certain distance or certain sections if there is an appetite for funding change and the scheme needs to be scaled up or down	Government RIS	No
2	Delete #2		11/09/2015	A426 offline dualling between Black Cat roundabout and Cavton Gibbet roundabout	See initial sifting spreadsheet	4		4				1. Little	Little to no consultation taken place at this stage.		4. Amber/green	The scheme is likely to significantly reduce journey times and improve journey time reliability, which will have a positive impact on economic growth	3. Amber	Offline options will involve major construction; however, on the whole, the Scheme is unlikely to affect overall carbon emissions.	4. Amber/green	The scheme is likely to have a positive impact on journey quality and minimal or neutral impact on other social sub objectives.	2. Red/amber	The Scheme will likely have a positive impact on air and noise. However, this will likely be outweighed by adverse impacts to biodiversity, landscape heritage, and the water environment	4. Amber/green	Scheme is likely to improve access to goods and services and therefore having a positive impact	3 Medium 1.5>2	6. 9-10 years	DCO required for design phase, with offline route assisting with the construction phase	4	The option is likely to receive mixed support. The A426 is recognised as a problem and any improvement will likely receive some support, however, there will also be opposition from environmental groups.	5. High	No significant issues. Floodplain and East Coast Main Line to cross, but there is time in the design programme to mitigate issues.	3	Reasonable level of supporting evidence, good underlying data and basic level of supporting traffic modelling.	Funding or policy change	3	£1bn of funding has been allocated to improvements along the A1 and A426 between Black Cat roundabout and Cavton Gibbet, however, this option is likely to cost less.	0m. 500-1000	The Highways England Commercial Services Team has estimated slightly over £1bn, but estimate makes allowance over-estimation in some areas and therefor deliverable within £1bn affordability threshold	01. None	N/A	5. Low risk	Deemed affordable within the £1bn	2	As an offline option there is limited scope to alter the scheme once construction has begun.	Government RIS	No
3	Delete #3		11/09/2015	A426 tait offline dualling with grade separation at Black Cat roundabout and grade separation at Cavton Gibbet roundabout	See initial sifting spreadsheet	4		4				1. Little	Little to no consultation taken place at this stage.		4. Amber/green	The scheme is likely to significantly reduce journey times and improve journey time reliability, which will have a positive impact on economic growth as it provides a more free flowing network.	3. Amber	Offline options will involve major construction; however, on the whole, the Scheme is unlikely to affect overall carbon emissions.	4. Amber/green	The scheme is likely to have a positive impact on journey quality and minimal or neutral impact on other social sub objectives.	2. Red/amber	The Scheme will likely have a positive impact on air and noise. However, this will likely be outweighed by adverse impacts to biodiversity, landscape heritage, and the water environment	4. Amber/green	Scheme is likely to improve access to goods and services and therefore having a positive impact	2. High 2-4	6. 9-10 years	DCO required for design phase, with offline route assisting with the construction phase	4	The option is likely to receive mixed support from the public. The A426 is recognised as a problem and a large improvement such as this that significantly addresses the issues with the A426 is likely to be well supported, however, there will also be opposition from environmental groups.	5. High	No significant issues. Floodplain and East Coast Main Line to cross, but there is time in the design programme to mitigate issues.	3	Reasonable level of supporting evidence, good underlying data and basic level of supporting traffic modelling.	Funding or policy change	2	£1bn of funding has been allocated to improvements along the A1 and A426 between Black Cat roundabout and Cavton Gibbet, however, this option is likely to cost less.	0m. 500-1000	The Highways England Commercial Services Team has estimated slightly over £1bn, but estimate makes allowance over-estimation in some areas and therefor deliverable within £1bn affordability threshold	01. None	N/A	5. Low risk	Deemed affordable within the £1bn	3	As a combination of interventions there is the opportunity to remove elements should funding change allowing for relatively significant changes in scale of the overall scheme.	Government RIS	No
4	Delete #4		11/09/2015	A426 tait offline dualling with grade separation at Black Cat roundabout and signalisation at Cavton Gibbet roundabout	See initial sifting spreadsheet	4		4				1. Little	Little to no consultation taken place at this stage.		4. Amber/green	The scheme is likely to significantly reduce journey times and improve journey time reliability, which will have a positive impact on economic growth	3. Amber	Offline options will involve major construction; however, on the whole, the Scheme is unlikely to affect overall carbon emissions.	4. Amber/green	The scheme is likely to have a positive impact on journey quality and minimal or neutral impact on other social sub objectives.	2. Red/amber	The Scheme will likely have a positive impact on air and noise. However, this will likely be outweighed by adverse impacts to biodiversity, landscape heritage, and the water environment	4. Amber/green	Scheme is likely to improve access to goods and services and therefore having a positive impact	2. High 2-4	6. 9-10 years	DCO required for design phase, with offline route assisting with the construction phase	4	The option is likely to receive mixed support from the public. The A426 is recognised as a problem and a large improvement such as this that significantly addresses the issues with the A426 is likely to be well supported, however, there will also be opposition from environmental groups.	5. High	No significant issues. Floodplain and East Coast Main Line to cross, but there is time in the design programme to mitigate issues.	3	Reasonable level of supporting evidence, good underlying data and basic level of supporting traffic modelling.	Funding or policy change	2	£1bn of funding has been allocated to improvements along the A1 and A426 between Black Cat roundabout and Cavton Gibbet, however, this option is likely to cost less.	0m. 500-1000	The Highways England Commercial Services Team has estimated slightly over £1bn, but estimate makes allowance over-estimation in some areas and therefor deliverable within £1bn affordability threshold	01. None	N/A	5. Low risk	Deemed affordable within the £1bn	3	As a combination of interventions there is the opportunity to remove elements should funding change allowing for relatively significant changes in scale of the overall scheme.	Government RIS	No
5	Delete #5		11/09/2015	A426 bypass to Cambridge Road roundabout with grade separation at Black Cat, and local widening with channelisation between Cambridge Road roundabout and Cavton Gibbet roundabout	See initial sifting spreadsheet	4		4				1. Little	Little to no consultation taken place at this stage.		4. Amber/green	The scheme is likely to significantly reduce journey times and improve journey time reliability, which will have a positive impact on economic growth	3. Amber	The Scheme will likely have a beneficial impact on noise and air, however this will likely be balanced by the adverse impacts to the natural/heritage environment.	4. Amber/green	Scheme is likely to improve access to goods and services and therefore having a positive impact	2. High 2-4	6. 9-10 years	DCO required for design phase, with offline route assisting with the construction phase	2	The option is likely to receive mixed support as it is not the full improvement. The A426 is recognised as a problem and any improvement will likely receive some support, however, there will also be opposition from environmental groups.	4	No significant issues. Floodplain and East Coast Main Line to cross, but there is time in the design programme to mitigate issues. Some on-line improvements requiring Traffic Management phasing	3	Reasonable level of supporting evidence, good underlying data and basic level of supporting traffic modelling.	Funding or policy change	2	£1bn of funding has been allocated to improvements along the A1 and A426 between Black Cat roundabout and Cavton Gibbet, however, this option is likely to cost less.	0m. 500-1000	The Highways England Commercial Services Team has estimated slightly over £1bn, but estimate makes allowance over-estimation in some areas and therefor deliverable within £1bn affordability threshold	01. None	N/A	5. Low risk	Deemed affordable within £1bn	4	As a combination of interventions there is the opportunity to remove elements should funding change allowing for relatively significant changes in scale of the overall scheme.	Government RIS	No
6	Delete #6		11/09/2015	A426 bypass to Cambridge Road roundabout with signalisation at Cavton Gibbet roundabout, grade separation at Black Cat roundabout and local widening with channelisation between Cambridge Road roundabout and Cavton Gibbet roundabout	See initial sifting spreadsheet	4		4				1. Little	Little to no consultation taken place at this stage.		3. Amber	The scheme is likely to reduce journey times and improve journey time reliability, which will have a positive impact on economic growth. However, there is still likely to be queuing at a number of junctions on the route.	3. Amber	Offline options will involve major construction; however, on the whole, the Scheme is unlikely to affect overall carbon emissions.	4. Amber/green	The scheme is likely to have a positive impact on journey quality and minimal or neutral impact on other social sub objectives.	2. High 2-4	The Scheme will likely have a beneficial impact on noise and air, however this will likely be balanced by the adverse impacts to the natural/heritage environment.	4. Amber/green	Scheme is likely to improve access to goods and services and therefore having a positive impact	2. High 2-4	6. 9-10 years	DCO required for design phase, with offline route assisting with the construction phase	2	The option is likely to receive mixed support as it is not the full improvement. The A426 is recognised as a problem and any improvement will likely receive some support, however, there will also be opposition from environmental groups.	4	No significant issues. Floodplain and East Coast Main Line to cross, but there is time in the design programme to mitigate issues. Some on-line improvements requiring Traffic Management phasing	3	Reasonable level of supporting evidence, good underlying data and basic level of supporting traffic modelling.	Funding or policy change	2	£1bn of funding has been allocated to improvements along the A1 and A426 between Black Cat roundabout and Cavton Gibbet, however, this option is likely to cost less.	0m. 500-1000	The Highways England Commercial Services Team has estimated slightly over £1bn, but estimate makes allowance over-estimation in some areas and therefor deliverable within £1bn affordability threshold	01. None	N/A	5. Low risk	Deemed affordable within £1bn	4	As a combination of interventions there is the opportunity to remove elements should funding change allowing for relatively significant changes in scale of the overall scheme.	Government RIS	No
7	Delete #7		11/09/2015	A426 bypass to Cambridge Road roundabout with grade separation at Black Cat, and grade separation at Cavton Gibbet roundabout	See initial sifting spreadsheet	4		4				1. Little	Little to no consultation taken place at this stage.		4. Amber/green	The scheme is likely to significantly reduce journey times and improve journey time reliability, which will have a positive impact on economic growth	3. Amber	Offline options will involve major construction; however, on the whole, the Scheme is unlikely to affect overall carbon emissions.	4. Amber/green	The scheme is likely to have a positive impact on journey quality and minimal or neutral impact on other social sub objectives.	3. Amber	The Scheme will likely have a beneficial impact on noise and air, however this will likely be balanced by the adverse impacts to the natural/heritage environment.	4. Amber/green	Scheme is likely to improve access to goods and services and therefore having a positive impact	2. High 2-4	6. 9-10 years	DCO required for design phase, with offline route assisting with the construction phase	2	The option is likely to receive mixed support. The A426 is recognised as a problem and any improvement will likely receive some support, however, there will also be opposition from environmental groups.	5. High	No significant issues. Floodplain and East Coast Main Line to cross, but there is time in the design programme to mitigate issues. Some on-line improvements requiring Traffic Management phasing	3	Reasonable level of supporting evidence, good underlying data and basic level of supporting traffic modelling.	Funding or policy change	2	£1bn of funding has been allocated to improvements along the A1 and A426 between Black Cat roundabout and Cavton Gibbet, however, this option is likely to cost less.	0m. 250-500	Guesstimate, based on the Highways England Commercial Services estimate for Option C1	01. None	N/A	5. Low risk	Deemed affordable within £1bn	3	As a combination of interventions there is the opportunity to remove elements should funding change allowing for relatively significant changes in scale of the overall scheme.	Government RIS	No
8	Delete #8		11/11/2015	A426 bypass to Cambridge Road Ribsci with grade separation at Black Cat roundabout, and grade separation at Cavton Gibbet roundabout	See offline spreadsheet	3		4				1. Little	Little to no consultation taken place at this stage.		4. Amber	The scheme is likely to reduce journey times and improve journey time reliability, which will have a positive impact on economic growth. However, there is still likely to be queuing at a number of junctions on the route.	3. Amber	Offline options will involve major construction; however, on the whole, the Scheme is unlikely to affect overall carbon emissions.	4. Amber/green	The scheme is likely to have a positive impact on journey quality and minimal or neutral impact on other social sub objectives.	3. Amber	The Scheme will likely have a beneficial impact on noise and air, however this will likely be balanced by the adverse impacts to the natural/heritage environment.	4. Amber/green	Scheme is likely to improve access to goods and services and therefore having a positive impact	2. High 2-4	6. 9-10 years	DCO required for design phase, with offline route assisting with the construction phase	2	The option is likely to receive mixed support. The A426 is recognised as a problem and any improvement will likely receive some support, however, there will also be opposition from environmental groups.	5. High	No significant issues. Floodplain and East Coast Main Line to cross, but there is time in the design programme to mitigate issues. Some on-line improvements requiring Traffic Management phasing	3	Reasonable level of supporting evidence, good underlying data and basic level of supporting traffic modelling.	Funding or policy change	2	£1bn of funding has been allocated to improvements along the A1 and A426 between Black Cat roundabout and Cavton Gibbet, however, this option is likely to cost less.	0m. 250-500	Guesstimate, based on the Highways England Commercial Services estimate for Option C1	01. None	N/A	5. Low risk	Deemed affordable within £1bn	3	As a combination of interventions there is the opportunity to remove elements should funding change allowing for relatively significant changes in scale of the overall scheme.	Government RIS	No
9	Delete #9		11/11/2015	A426 single lane carriageway bypass to Cambridge Road roundabout with online dualling between Cambridge Road roundabout and Cavton Gibbet roundabout, grade separation at Black Cat roundabout and grade separation at Cavton Gibbet roundabout	See offline spreadsheet	4		4				1. Little	Little to no consultation taken place at this stage.		4. Amber/green	The scheme is likely to significantly reduce journey times and improve journey time reliability, which will have a positive impact on economic growth	3. Amber	Offline options will involve major construction; however, on the whole, the Scheme is unlikely to affect overall carbon emissions.	4. Amber/green	The scheme is likely to have a positive impact on journey quality and minimal or neutral impact on other social sub objectives.	3. Amber	The Scheme will likely have a beneficial impact on noise and air, however this will likely be balanced by the adverse impacts to the natural/heritage environment.	4. Amber/green	Scheme is likely to improve access to goods and services and reduce accidents, therefore having a positive impact	2. High 2-4	6. 9-10 years	DCO required for design phase, with offline route assisting with the construction phase	2	The option is likely to receive mixed support. The A426 is recognised as a problem and any improvement will likely receive some support, however, there will also be opposition from environmental groups.	5. High	No significant issues. Floodplain and East Coast Main Line to cross, but there is time in the design programme to mitigate issues. Some on-line improvements requiring Traffic Management phasing	3	Reasonable level of supporting evidence, good underlying data and basic level of supporting traffic modelling.	Funding or policy change	2	£1bn of funding has been allocated to improvements along the A1 and A426 between Black Cat roundabout and Cavton Gibbet, however, this option is likely to cost less.	0m. 250-500	Guesstimate, based on the Highways England Commercial Services estimate for Option C1	01. None	N/A	3	Online section TM & STATS	4	As a combination of interventions there is the opportunity to remove elements should funding change allowing for relatively significant changes in scale of the overall scheme.	Government RIS	No
10	Delete #10		11/11/2015	A426 tait online dualling with grade separation at Black Cat roundabout and Dode separation at Cavton Gibbet roundabout	See offline spreadsheet	4		4				1. Little	Little to no consultation taken place at this stage.		4. Amber/green	The scheme is likely to significantly reduce journey times and improve journey time reliability, which will have a positive impact on economic growth	3. Amber	The Scheme is not likely to result in any change to carbon emissions. It is not possible to quantify greenhouse gases at this stage.	4. Amber/green	The scheme is likely to have a positive impact on journey quality and minimal or neutral impact on other social sub objectives.	3. Amber	The scheme would likely have slight negative impacts on air quality and noise, and slight adverse impacts on the historic environment and biodiversity.	4. Amber/green	Scheme is likely to improve access to goods and services and reduce accidents, therefore having a positive impact	3 Medium 1.5>2	6. 9-10 years	Construction phasing and traffic management could be more onerous considering the online nature of the option	3	The option is likely to receive mixed support. The A426 is recognised as a problem and any improvement will likely receive some support, however, there will also be opposition from environmental groups.	3	Traffic Management phasing during construction resulting in a lengthy construction period	3	Reasonable level of supporting evidence, good underlying data and basic level of supporting traffic modelling.	Funding or policy change	3	£1bn of funding has been allocated to improvements along the A1 and A426 between Black Cat roundabout and Cavton Gibbet, however, this option is likely to cost less.	0m. 500-1000	Guesstimate without Highways England Commercial Services Team. Likely to be cheaper than offline solution, but greater than £500m	01. None	N/A	3	Construction costs with Traffic Management and Statutory Undertakers equipment	3	As a combination of interventions there is the opportunity to remove elements should funding change allowing for relatively significant changes in scale of the overall scheme.	Government RIS	No
11	Delete #11		11/11/2015	A426 tait online dualling with grade separation at Black Cat roundabout and signalisation at Cavton Gibbet roundabout	See offline spreadsheet	4		4				1. Little	Little to no consultation taken place at this stage.		4. Amber	The scheme is likely to reduce journey times and improve journey time reliability, which will have a positive impact on economic growth. However, there is still likely to be queuing at a number of junctions on the route.	3. Amber	The Scheme is not likely to result in any change to carbon emissions. It is not possible to quantify greenhouse gases at this stage.	4. Amber/green	The scheme is likely to have a positive impact on journey quality and minimal or neutral impact on other social sub objectives.	3. Amber	The scheme would likely have slight negative impacts on air quality and noise, and slight adverse impacts on the historic environment and biodiversity.	4. Amber/green	Scheme is likely to improve access to goods and services and reduce accidents, therefore having a positive impact	3 Medium 1.5>2	6. 9-10 years	Construction phasing and traffic management could be more onerous considering the online nature of the option	3	The option is likely to receive mixed support. The A426 is recognised as a problem and any improvement will likely receive some support, however, there will also be opposition from environmental groups.	3	Traffic Management phasing during construction resulting in a lengthy construction period	3	Reasonable level of supporting evidence, good underlying data and basic level of supporting traffic modelling.	Funding or policy change	3	£1bn of funding has been allocated to improvements along the A1 and A426 between Black Cat roundabout and Cavton Gibbet, however, this option is likely to cost less.	0m. 500-1000	Guesstimate without Highways England Commercial Services Team. Likely to be cheaper than offline solution, but greater than £500m	01. None	N/A	3	Construction costs with Traffic Management and Statutory Undertakers equipment	3	As a combination of interventions there is the opportunity to remove elements should funding change allowing for relatively significant changes in scale of the overall scheme.	Government RIS	No
12	Delete #12		11/11/2015	Local junction widening with channelisation at existing A426 junctions, grade separation at Black Cat roundabout, grade separation at Black Cat roundabout and upgrade to existing A1 junctions	See sifting spreadsheet	3		3				1. Little	Little to no consultation taken place at this stage.		4. Amber/green	The scheme is likely to significantly reduce journey times and improve journey time reliability, which will have a positive impact on economic growth	3. Amber	The Scheme is not likely to result in any change to carbon emissions. It is not possible to quantify greenhouse gases at this stage.	4. Amber/green	The scheme is likely to have a positive impact on journey quality and minimal or neutral impact on other social sub objectives.	3. Amber	Junction improvements would likely result in no significant impacts to the local environment	4. Amber/green	Scheme is likely to improve access to goods and services and reduce accidents, therefore having a positive impact	3 Medium 1.5>2	6. 9-10 years	CPO, SRO, Planning required	1. Low	The option is likely to receive mixed support as it will not be personnel to address the issues. The A426 is recognised as a problem and any improvement will likely receive some support, however, there will also be opposition from environmental groups.	3	Significant works to existing junctions	3	Reasonable level of supporting evidence, good underlying data and basic level of supporting traffic modelling.	Funding or policy change	5. Affordable	£1bn of funding has been allocated to improvements along the A1 and A426 between Black Cat roundabout and Cavton Gibbet, however, this option is likely to cost less.	0m. 100-250	Guesstimate based on the Highways England Commercial Services estimate for the Black Cat grade separated junction at Ellsbi	01. None	N/A	3	Online improvements with construction phasing	5. Dynamic	As a combination smaller scale and junction improvement interventions with no significant impact on the height stretches of dualling it is likely that the scheme could be easily reduced in scale should funding change	Government RIS	No
13	Delete #13		11/11/2015	Local junction widening with channelisation at existing A426 junctions, grade separation at Gibbet roundabout, grade separation at Black Cat roundabout and upgrade to existing A1 junctions	See sifting spreadsheet	3		3				1. Little	Little to no consultation taken place at this stage.		3. Amber	The scheme is likely to significantly reduce journey times and improve journey time reliability, which will have a positive impact on economic growth. However, there is still likely to be queuing at a number of junctions on the route.	3. Amber	The Scheme is not likely to result in any change to carbon emissions. It is not possible to quantify greenhouse gases at this stage.	4. Amber/green	The scheme is likely to have a positive impact on journey quality and minimal or neutral impact on other social sub objectives.	3. Amber	Junction improvements would likely result in no significant impacts to the local environment	4. Amber/green	Scheme is likely to improve access to goods and services and reduce accidents, therefore having a positive impact	3 Medium 1.5>2	6. 9-10 years	CPO, SRO, Planning required	1. Low	The option is likely to receive mixed support as it will not be personnel to address the issues. The A426 is recognised as a problem and any improvement will likely receive some support, however, there will also be opposition from environmental groups.	3	Significant works to existing junctions	3	Reasonable level of supporting evidence, good underlying data and basic level of supporting traffic modelling.	Funding or policy change	5. Affordable	£1bn of funding has been allocated to improvements along the A1 and A426 between Black Cat roundabout and Cavton Gibbet, however, this option is likely to cost less.	0m. 100-250	Guesstimate based on the Highways England Commercial Services estimate for the Black Cat grade separated junction at Ellsbi	01. None	N/A	3	Online improvements with construction phasing	5. Dynamic	As a combination smaller scale and junction improvement interventions with no significant impact on the height stretches of dualling it is likely that the scheme could be easily reduced in scale should funding change. Given the small length of dualling and minor improvements to junctions it is likely that the scope to scale the scheme will be somewhat limited. However, it may be possible to only complete one component or the other allowing for some flexibility	Government RIS	No
14	Delete #14		11/11/2015	Online dualling of the A426 between Dr Isek Road and Cavton Gibbet roundabout and signalisation of Cavton Gibbet roundabout	See sifting spreadsheet	3		3				1. Little	Little to no consultation taken place at this stage.		3. Red/amber	The scheme is likely to provide some savings in journey time and to improve journey time through Cavton Gibbet. However, it is unlikely to unlock significant growth along the scheme.	3. Amber	The Scheme is not likely to result in any change to carbon emissions. It is not possible to quantify greenhouse gases at this stage.	3. Amber	The scheme is likely to have a small positive impact on journey quality and minimal or neutral impact on other social sub objectives.	3. Amber	The Scheme is unlikely to have any significant impact on the local environment	3. Amber	The scheme is likely to improve access to goods and services and reduce accidents at Cavton Gibbet roundabout therefore having a positive impact	3 Medium 1.5>2	6. 9-10 years	CPO for the dualling	1. Low	The option is likely to receive mixed support as the overall objectives are not addressed. The A426 is recognised as a problem and any improvement will likely receive some support, however, there will also be opposition from environmental groups.	5. High	Widening the existing route	3	Reasonable level of supporting evidence, good underlying data and basic level of supporting traffic modelling.	Funding or policy change	5. Affordable	£1bn of funding has been allocated to improvements along the A1 and A426 between Black Cat roundabout and Cavton Gibbet, however, this option is likely to cost less.	0m. 50-100	Guesstimate based on the Highways England Commercial Services	01. None	N/A	3	CPO and Statutory Undertakers diversion costs	3	As a combination of a smaller scale and junction improvement and a minor junction improvement there is some treatment to scale the scheme if funding changes.	Government RIS	No
15	Delete #15		11/11/2015	Grade separation of Cavton Gibbet roundabout and signalisation of Cavton Gibbet roundabout	See sifting spreadsheet	3		3				1. Little	Little to no consultation taken place at this stage.		4. Amber	The scheme is likely to significantly reduce journey times and improve journey time reliability, which will be queuing at Cavton Gibbet.	3. Amber	The Scheme is not likely to result in any change to carbon emissions. It is not possible to quantify greenhouse gases at this stage.	3. Amber	The scheme is likely to have a small positive impact on journey quality and minimal or neutral impact on other social sub objectives.	3. Amber	Junction improvements would likely result in no significant impacts to the local environment	4. Amber/green	Scheme is likely to improve access to goods and services and reduce accidents, therefore having a positive impact	3 Medium 1.5>2	6. 9-10 years	DCO, SRO and Planning required	1. Low	The option is likely to receive mixed support as it is not the full improvement. The A426 is recognised as a problem and any improvement will likely receive some support, however, there will also be opposition from environmental groups.	5. High	Traffic Management required	3	Reasonable level of supporting evidence, good underlying data and basic level of supporting traffic modelling.	Funding or policy change	5. Affordable	£1bn of funding has been allocated to improvements along the A1 and A426 between Black Cat roundabout and Cavton Gibbet, however, this option is likely to cost less.	0m. 50-100	Guesstimate based on the Highways England Commercial Services Team for the Black Cat roundabout grade separated junction	01. None	N/A	3	CPO and Statutory Undertakers diversion costs	3	As a combination of a smaller scale and junction improvement and a minor junction improvement there is some treatment to scale the scheme if funding changes.	Government RIS	No
16	Delete #16		14/12/2015	A426 dual carriageway bypass to Cambridge Road roundabout with online dualling between Cambridge Road roundabout and Cavton Gibbet roundabout, grade separation at Black Cat roundabout and grade separation at Cavton Gibbet roundabout	See sifting spreadsheet	4		4				1. Little	Little to no consultation taken place at this stage.		4. Amber	The scheme is likely to significantly reduce journey times and improve journey time reliability, which will have a positive impact on economic growth	3. Amber	Offline options will involve major construction; however, on the whole, the Scheme is unlikely to affect overall carbon emissions.	4. Amber/green	The scheme is likely to have a positive impact on journey quality and minimal or neutral impact on other social sub objectives.	3. Amber	The Scheme will likely have a beneficial impact on noise and air, however this will likely be balanced by the adverse impacts to the natural/heritage environment.	4. Amber/green	Scheme is likely to improve access to goods and services and reduce accidents, therefore having a positive impact	3 Medium 1.5>2	6. 9-10 years	DCO required for design phase, with offline route assisting with the construction phase	3	The option is likely to receive mixed support. The A426 is recognised as a problem and any improvement will likely receive some support, however, there will also be opposition from environmental groups.	5. High	No significant issues. Floodplain and East Coast Main Line to cross, but there is time in the design programme to mitigate issues. Some on-line improvements requiring Traffic Management phasing	3	Funding or policy change	2	£1bn of funding has been allocated to improvements along the A1 and A426 between Black Cat roundabout and Cavton Gibbet, however, this option is likely to cost less.	0m. 500-1000		01. None	N/A	3	Online section TM & STATS	4	As a combination of interventions there is the opportunity to remove elements should funding change allowing for relatively significant changes in scale of the overall scheme.	Government's funding of the first RIS period	No

Appendix J. Option Assessment Framework

DfT option assessment framework	
Case	**Assessment area**
Strategic case The strategic case determines whether or not an investment is needed, either now or in the future. It demonstrates the case for change – that is, a clear rationale for making the investment; and strategic fit, how an investment will further the aims and objectives of the organisation.	
	Regional Policy
	Local Policy
	Route Objectives 'strategic fit'
Economic Case The economic case considers the Economic, Environmental and Social Impacts which when combined with estimated costs determine the overall Value for Money of a proposal.	
- Economic Impacts	Business Users and Transport Providers
	Reliability
	Regeneration
	Wider Impacts
- Environmental Impacts	Noise
	Air Quality
	Greenhouse Gases
	Landscape
	Townscape
	Historic Environment
	Biodiversity
	Water Environment
- Social Impacts	Non-business users
	Physical Activity
	Journey Quality
	Accidents
	Security
	Access to services
	Affordability
	Severance
	Option Values

DfT option assessment framework	
Case	**Assessment area**
- Public Accounts	Cost to the broad transport budget
	Indirect Tax Revenues
- Distributional Impacts	
- Indicative BCR	
Financial Case The Financial Case of the scheme considers the cost of the scheme (both the initial development and construction costs, and the later operating and maintenance costs). It also considers significant risks that may impact upon those costs and considers the likely funding source(s) for a scheme.	
- Capital and Revenue Costs	Outturn costs to implement
	Operating and maintenance costs
- Funding Assumptions	Funding assumptions and allocations
Management / Delivery Case The management case assesses whether a proposal is deliverable. It tests the project planning, governance structure, risk management, communications and stakeholder management, benefits realisation and assurance (e.g. a Gateway Review). There should be a clear and agreed understanding of what needs to be done, why, when and how, with measures in place to identify and manage any risks. The management case sets out a plan to ensure that the benefits set out in the economic case are realised and will include measures to assess and evaluate this. All projects and programmes are expected to have a risk management plan, proportionate to their scale.	
	Likely delivery agents
	Stakeholder acceptability
	Public acceptability
Commercial Case The commercial case provides evidence on the commercial viability of a proposal and the procurement strategy that will be used to engage the market. It should clearly set out the financial implications of the proposed procurement strategy. It presents evidence on risk allocation and transfer, contract timescales and implementation timescale as well as details of the capability and skills of the team delivering the project and any personnel implications arising from the proposal.	
	Route to market
	Difficulty / risks

Appendix K. Appraisal Summary Tables

Appraisal Summary Table

Date produced:	1	12	2015

Contact:	
Name	TBC
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	Option C1
Description of scheme:	A428 full offline dualling with grade separation of Black Cat roundabout and grade separation of Caxton Gibbet roundabout

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 improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min / 2 to 5min / > 5min	Large Beneficial	£359m	
	Reliability impact on Business users	Journey time reliability has been highlighted as a key problem on the route and this scheme would likely significantly improve the consistency of journey times.		Large Beneficial		
	Regeneration	Not assessed at this stage				
	Wider Impacts	Not assessed at this stage				
Environmental	Noise	The scheme is likely to improve noise levels in the noise improvement areas around Wyboston. A route corridor to the north of the existing road would also improve noise levels in the existing		Moderate beneficial		
	Air Quality	Reduction in queueing is likely to result in an improvement to air quality. A bypass route that is located further away from St Neots is also likely to improve local air quality.		Slight beneficial		
	Greenhouse gases	Not assessed at this stage	Change in non-traded carbon over 60y (CO2e) Change in traded carbon over 60y (CO2e)	Unknown		
	Landscape	A new bypass route with grade separated junctions could result in significant effects on the local landscape. The route will need to be designed to avoid sensitve view points e.g. from Croxton Park. A landscape assessment would be required at the next stage to help inform the alignment of the route as part of 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.		Large adverse		
	Townscape	Not assessed at this stage		Neutral		
	Historic Environment	The new route has the potential for significant effects on archaeology and the historic environment, particularly if located to the south of the existing A428. Croxton Park is a registered park and garden and Scheduled Monument and the surrounding landscape has a number of known archaeological sites. A detailed programme of archaeological mitigation is likely to be required. A route to the north of the the existing A428 is likely to result in a much reduced qualitative effect than a route to the south.		Large adverse		
	Biodiversity	There are no nationally designated sites affected by the route but there is the potential for impacts to protected species and local habitats. An ecology survey will be required at the next stage to advise on sensitive areas to avoid and to inform the detailed programme regarding surveys and consents.		Slight adverse		
	Water Environment	The route will cross the floodplain of the River Ouse and its tributaries. This will require an assessment under the Water Framework Directive and the likely need for 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.		Moderate adverse		
Social	Commuting and Other 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.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min / 2 to 5min / > 5min		£390m	
	Reliability impact on Commuting and Other users	Journey time reliability has been highlighted as a key problem on the route and this scheme would likely significantly improve the consistency of journey times.		Large Beneficial		
	Physical activity	The scheme is unlikely to lead to a significant increase in the number of people walking or cycling in the area as it is a primarily highways scheme. Some existing Public rights of way and cycle paths will be impacted by the scheme; however any design is likely to include new footpaths and cycle ways mitigating the impact of these lost facilities. Therefore, it is unlikely that this scheme will lead to an increase in the number of people walking and cycling or the distance that current users travel and has been assessed as having a neutral impact on physical activity.		Slight benefical		
	Journey quality	The scheme is likely to reduce congestion and improve jourmey times leading to reduced traveller stress alongside making travel along the A428 less confusing for unfamiliar travellers through having less at grade junctions.		Large Beneficial		
	Accidents	Not assessed at this stage				
	Security	The scheme is unlikely to have any impact on security for users at the route		Neutral		
	Access to services	The scheme is unlikely to impact the availability and cost of public transport which will lead to an improvement or worsening of the existing ability of non-car users to access services.		Neutral		
	Affordability	The scheme is unlikely to impact the cost of travel for users.		Neutral		
	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 A428 near Croxton and Eltisley will reduce severance in this area by creating a road environment more amenable to NMUs.		Moderate Beneficial		
	Option and non-use values	The scheme does not propose any changes to the existing public transport services.		Neutral		
Public Account	Cost to Broad Transport Budget	Highways England Commercial have estimated scheme cost at £1bn in 2014 prices			£707m	
	Indirect Tax Revenues	Not assessed at this stage				

Appraisal Summary Table

Date produced:	1	12	2015

Contact:	
Name	TBC
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	Option C2
Description of scheme:	A428 full offline dualling with grade separation of Black Cat roundabout and signalisation of Caxton Gibbet roundabout

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 improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min / 2 to 5min / > 5min	Large Beneficial	£331m	
	Reliability impact on Business users	Journey time reliability has been highlighted as a key problem on the route and this scheme would likely significantly improve the consistency of journey times.		Large Beneficial		
	Regeneration	Not assessed at this stage				
	Wider Impacts	Not assessed at this stage				
Environmental	Noise	The scheme is likely to improve noise levels in the noise improvement areas around Wyboston. A route corridor to the north of the existing road would also improve noise levels in the existing		Moderate beneficial		
	Air Quality	Reduction in queueing is likely to result in an improvement to air quality. A bypass route that is located further away from St Neots is also likely to improve local air quality.		Slight beneficial		
	Greenhouse gases	Not assessed at this stage	Change in non-traded carbon over 60y (CO2e) Change in traded carbon over 60y (CO2e)	Unknown		
	Landscape	A new bypass route with grade separated junctions could result in significant effects on the local landscape. The route will need to be designed to avoid sensitve view points e.g. from Croxton Park. A landscape assessment would be required at the next stage to help inform the alignment of the route as part of 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.		Large adverse		
	Townscape	Not assessed at this stage		Neutral		
	Historic Environment	The new route has the potential for significant effects on archaeology and the historic environment, particularly if located to the south of the existing A428. Croxton Park is a registered park and garden and Scheduled Monument and the surrounding landscape has a number of known archaeological sites. A detailed programme of archaeological mitigation is likely to be required. A route to the north of the the existing A428 is likely to result in a much reduced qualitative effect than a route to the south.		Large adverse		
	Biodiversity	There are no nationally designated sites affected by the route but there is the potential for impacts to protected species and local habitats. An ecology survey will be required at the next stage to advise on sensitive areas to avoid and to inform the detailed programme regarding surveys and consents.		Slight adverse		
	Water Environment	The route will cross the floodplain of the River Ouse and its tributaries. This will require an assessment under the Water Framework Directive and the likely need for 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.		Moderate adverse		
Social	Commuting and Other 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.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min / 2 to 5min / > 5min		£363m	
	Reliability impact on Commuting and Other users	Journey time reliability has been highlighted as a key problem on the route and this scheme would likely significantly improve the consistency of journey times.		Large Beneficial		
	Physical activity	The scheme is unlikely to lead to a significant increase in the number of people walking or cycling in the area as it is a primarily highways scheme. Some existing Public rights of way and cycle paths will be impacted by the scheme; however any design is likely to include new footpaths and cycle ways mitigating the impact of these lost facilities. Therefore, it is unlikely that this scheme will lead to an increase in the number of people walking and cycling or the distance that current users travel and has been assessed as having a neutral impact on physical activity.		Slight benefical		
	Journey quality	The scheme is likely to reduce congestion and improve jourmey times leading to reduced traveller stress alongside making travel along the A428 less confusing for unfamiliar travellers through having less at grade junctions.		Large Beneficial		
	Accidents	Not assessed at this stage				
	Security	The scheme is unlikely to have any impact on security for users at the route		Neutral		
	Access to services	The scheme is unlikely to impact the availability and cost of public transport which will lead to an improvement or worsening of the existing ability of non-car users to access services.		Neutral		
	Affordability	The scheme is unlikely to impact the cost of travel for users.		Neutral		
	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 A428 near Croxton and Eltisley will reduce severance in this area by creating a road environment more amenable to NMUs.		Moderate Beneficial		
	Option and non-use values	The scheme does not propose any changes to the existing public transport services.		Neutral		
Public Account	Cost to Broad Transport Budget	Highways England Commercial have estimated scheme cost at £1bn in 2014 prices			£354m-£707m	
	Indirect Tax Revenues	Not assessed at this stage				

Appraisal Summary Table

Date produced:	1	12	2015

Contact:	
Name	TBC
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	Option C5
Description of scheme:	A428 bypass to Cambridge Road roundabout with grade separation at Black Cat, and grade separation at Caxton Gibbet roundabout

	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 improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits.	Value of journey time changes(£)			Large Beneficial	£234m	
			Net journey time changes (£)					
			0 to 2min	2 to 5min	> 5min			
	Reliability impact on Business users	Journey time reliability has been highlighted as a key problem on the route and this scheme would likely significantly improve the consistency of journey times.				Large Beneficial		
	Regeneration	Not assessed at this stage						
	Wider Impacts	Not assessed at this stage						
Environmental	Noise	The scheme is likely to improve noise levels in the noise improvement areas around Wyboston. Increasing traffic along the existing road will noise levels to properties along the existing road and may require additional mitigation.				Minor beneficial		
	Air Quality	Reduction in queueing is likely to result in an improvement to air quality. A bypass route that is located further away from St Neots is also likely to improve local air quality.				Slight beneficial		
	Greenhouse gases	Not assessed at this stage	Change in non-traded carbon over 60y (CO2e)			Unknown		
			Change in traded carbon over 60y (CO2e)					
	Landscape	A new bypass route with a grade separated junctions could result in significant effects on the local landscape. A landscape assessment would be required at the next stage to help inform the alignment of the route as part of 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.				Large adverse		
	Townscape	Not assessed at this stage				Neutral		
	Historic Environment	The new route has the potential for significant effects on archaeology due to being located through green field sites. A detailed programme of archaeological mitigation is likely to be required.				Moderate adverse		
	Biodiversity	There are no nationally designated sites affected by the route but there is the potential for impacts to protected species and local habitats. An ecology survey will be required at the next stage to advise on sensitive areas to avoid and to inform the detailed programme regarding surveys and consents.				Slight adverse		
	Water Environment	The route will cross the floodplain of the River Ouse and its tributaries. This will require an assessment under the Water Framework Directive and the likely need for 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.				Moderate adverse		
Social	Commuting and Other 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.	Value of journey time changes(£)				£247m	
			Net journey time changes (£)					
			0 to 2min	2 to 5min	> 5min			
	Reliability impact on Commuting and Other users	Journey time reliability has been highlighted as a key problem on the route and this scheme would likely significantly improve the consistency of journey times.				Large Beneficial		
	Physical activity	The scheme is unlikely to lead to a significant increase in the number of people walking or cycling in the area as it is a primarily highways scheme. Some existing Public rights of way and cycle paths will be impacted by the scheme; however any design is likely to include new footpaths and cycle ways mitigating the impact of these lost facilities. Therefore, it is unlikely that this scheme will lead to an increase in the number of people walking and cycling or the distance that current users travel and has been assessed as having a neutral impact on physical activity.				Neutral		
	Journey quality	The scheme is assessed as having neutral impacts on Traveller Care and Travellers' Views while also having beneficial impacts on Frustration and Fear of potential accidents. Therefore the scheme is awarded an overall score of "Beneficial".				Moderate beneficial		
	Accidents	Not assessed at this stage						
	Security	The scheme is unlikely to have any impact on security for users at the route				Neutral		
	Access to services	The scheme is unlikely to impact the availability and cost of public transport which will lead to an improvement or worsening of the existing ability of non-car users to access services.				Neutral		
	Affordability	The scheme is unlikely to impact the cost of travel for users.				Neutral		
	Severance	The scheme is considered to have negligible impact on the current severance situation. The option it is very unlikely to have any impact on Public rights of way and cycle paths.				Neutral		
	Option and non-use values	The scheme does not propose any changes to the existing public transport services.				Neutral		
Public Accou	Cost to Broad Transport Budget	Highways England Commercial have estimated scheme cost at £1bn in 2014 prices					£177m-£354m	
	Indirect Tax Revenues	Not assessed at this stage						

Appraisal Summary Table

Date produced:	1	12	2015

Contact:	
Name	TBC
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	Option C6
Description of scheme:	A428 bypass to Cambridge Road roundabout with grade separation at Black Cat roundabout, and signalisation at Caxton Gibbet roundabout

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 improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min / 2 to 5min / > 5min	Large Beneficial	£206m	
	Reliability impact on Business users	Journey time reliability has been highlighted as a key problem on the route and this scheme would likely significantly improve the consistency of journey times.		Large Beneficial		
	Regeneration	Not assessed at this stage				
	Wider Impacts	Not assessed at this stage				
Environmental	Noise	The scheme is likely to improve noise levels in the noise improvement areas around Wyboston. Increasing traffic along the existing road will noise levels to properties along the existing road and may require additional mitigation.		Minor beneficial		
	Air Quality	Reduction in queueing is likely to result in an improvement to air quality. A bypass route that is located further away from St Neots is also likely to improve local air quality.		Slight beneficial		
	Greenhouse gases	Not assessed at this stage	Change in non-traded carbon over 60y (CO2e) Change in traded carbon over 60y (CO2e)	Unknown		
	Landscape	A new bypass route with a grade separated junction could result in significant effects on the local landscape. A landscape assessment would be required at the next stage to help inform the alignment of the route as part of 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.		Large adverse		
	Townscape	Not assessed at this stage		Neutral		
	Historic Environment	The new route has the potential for significant effects on archaeology due to being located through green field sites. A detailed programme of archaeological mitigation is likely to be required.		Moderate adverse		
	Biodiversity	There are no nationally designated sites affected by the route but there is the potential for impacts to protected species and local habitats. An ecology survey will be required at the next stage to advise on sensitive areas to avoid and to inform the detailed programme regarding surveys and consents.		Slight adverse		
	Water Environment	The route will cross the floodplain of the River Ouse and its tributaries. This will require an assessment under the Water Framework Directive and the likely need for 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.		Moderate adverse		
Social	Commuting and Other 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.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min / 2 to 5min / > 5min		£220m	
	Reliability impact on Commuting and Other users	Journey time reliability has been highlighted as a key problem on the route and this scheme would likely significantly improve the consistency of journey times.		Large Beneficial		
	Physical activity	The scheme is unlikely to lead to a significant increase in the number of people walking or cycling in the area as it is a primarily highways scheme. Some existing Public rights of way and cycle paths will be impacted by the scheme; however any design is likely to include new footpaths and cycle ways mitigating the impact of these lost facilities. Therefore, it is unlikely that this scheme will lead to an increase in the number of people walking and cycling or the distance that current users travel and has been assessed as having a neutral impact on physical activity.		Neutral		
	Journey quality	The scheme is assessed as having neutral impacts on Traveller Care and Travellers' Views while also having beneficial impacts on Frustration and Fear of potential accidents. Therefore the scheme is awarded an overall score of "Beneficial".		Moderate beneficial		
	Accidents	Not assessed at this stage				
	Security	The scheme is unlikely to have any impact on security for users at the route		Neutral		
	Access to services	The scheme is unlikely to impact the availability and cost of public transport which will lead to an improvement or worsening of the existing ability of non-car users to access services.		Neutral		
	Affordability	The scheme is unlikely to impact the cost of travel for users.		Neutral		
	Severance	The scheme is considered to have negligible impact on the current severance situation. The option it is very unlikely to have any impact on Public rights of way and cycle paths.		Neutral		
	Option and non-use values	The scheme does not propose any changes to the existing public transport services.		Neutral		
Public Accou	Cost to Broad Transport Budget	Highways England Commercial have estimated scheme cost at £1bn in 2014 prices			£177m-£354m	
	Indirect Tax Revenues	Not assessed at this stage				

Appraisal Summary Table

Date produced:	1	12	2015

Contact:	
Name	TBC
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	Option C7
Description of scheme:	A428 single lane carriageway bypass to Cambridge Road roundabout with online dualling between Cambridge Road roundabout and Caxton Gibbet roundabout, grade separation at Black Cat roundabout and grade separation at Caxton Gibbet roundabout

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 improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min / 2 to 5min / > 5min	Large Beneficial	£293m	
	Reliability impact on Business users	Journey time reliability has been highlighted as a key problem on the route and this scheme would likely significantly improve the consistency of journey times.		Large Beneficial		
	Regeneration	Not assessed at this stage				
	Wider Impacts	Not assessed at this stage				
Environmental	Noise	The scheme is likely to improve noise levels in the noise improvement areas around Wyboston. A route corridor to the north of the existing road would also improve noise levels in the existing		Moderate beneficial		
	Air Quality	Reduction in queueing is likely to result in an improvement to air quality. A bypass route that is located further away from St Neots is also likely to improve local air quality.		Slight beneficial		
	Greenhouse gases	Not assessed at this stage	Change in non-traded carbon over 60y (CO2e) Change in traded carbon over 60y (CO2e)	Unknown		
	Landscape	A new bypass route with grade separated junctions could result in significant effects on the local landscape. The route will need to be designed to avoid sensitve view points e.g. from Croxton Park. A landscape assessment would be required at the next stage to help inform the alignment of the route as part of 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.		Large adverse		
	Townscape	Not assessed at this stage		Neutral		
	Historic Environment	The new route has the potential for significant effects on archaeology and the historic environment, particularly if located to the south of the existing A428. Croxton Park is a registered park and garden and Scheduled Monument and the surrounding landscape has a number of known archaeological sites. A detailed programme of archaeological mitigation is likely to be required. The online wideing in the area of Croxton Park is likely to result in a significant effect on the heritage features.		Large adverse		
	Biodiversity	There are no nationally designated sites affected by the route but there is the potential for impacts to protected species and local habitats. An ecology survey will be required at the next stage to advise on sensitive areas to avoid and to inform the detailed programme regarding surveys and consents.		Slight adverse		
	Water Environment	The route will cross the floodplain of the River Ouse and its tributaries. This will require an assessment under the Water Framework Directive and the likely need for 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.		Moderate adverse		
Social	Commuting and Other 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.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min / 2 to 5min / > 5min		£313m	
	Reliability impact on Commuting and Other users	Journey time reliability has been highlighted as a key problem on the route and this scheme would likely significantly improve the consistency of journey times.		Large Beneficial		
	Physical activity	The scheme is unlikely to lead to a significant increase in the number of people walking or cycling in the area as it is a primarily highways scheme. Some existing Public rights of way and cycle paths will be impacted by the scheme; however any design is likely to include new footpaths and cycle ways mitigating the impact of these lost facilities. Therefore, it is unlikely that this scheme will lead to an increase in the number of people walking and cycling or the distance that current users travel and has been assessed as having a neutral impact on physical activity.		Neutral		
	Journey quality	The scheme is assessed as having neutral impacts on Traveller Care and Travellers' Views while also having beneficial impacts on Frustration and Fear of potential accidents. Therefore the scheme is awarded an overall score of "Beneficial".		Moderate beneficial		
	Accidents	Not assessed at this stage.				
	Security	The scheme is unlikely to have any impact on security for users at the route.		Neutral		
	Access to services	The scheme is unlikely to impact the availability and cost of public transport which will lead to an improvement or worsening of the existing ability of non-car users to access services.		Neutral		
	Affordability	The scheme is unlikely to impact the cost of travel for users.		Neutral		
	Severance	The scheme is considered to have negligible impact on the current severance situation. The option it is very unlikely to have any impact on Public rights of way and cycle paths.		Neutral		
	Option and non-use values	The scheme does not propose any changes to the existing public transport services.		Neutral		
Public Account	Cost to Broad Transport Budget	Highways England Commercial have estimated scheme cost at £1bn in 2014 prices			£354m	
	Indirect Tax Revenues	Not assessed at this stage				

Appraisal Summary Table

Date produced:	6	11	2015

Contact:	
Name	TBC
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	Option C10
Description of scheme:	Local junction widening with channelisation at existing A428 junctions, grade separation at Caxton Gibbet roundabout, grade separation at Black Cat roundabout and upgrade to existing A1 junctions

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 improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits.	Value of journey time changes(£) Net journey time changes (£): 0 to 2min / 2 to 5min / > 5min	Moderate Beneficial	£95m	
	Reliability impact on Business users	Journey time reliability has been highlighted as a key problem on the route and this scheme would likely significantly improve the consistency of journey times.		Moderate Beneficial		
	Regeneration	Not assessed at this stage				
	Wider Impacts	Not assessed at this stage				
Environmental	Noise	The scheme is likely to increase noise levels in the noise levels in the noise improvement areas around Wyboston. This is likely to require mitigation.		Moderate adverse		
	Air Quality	Reduction in queueing may result in an improvement to air quality but this could be offset by an increase in desirability of the route. The route will remain close to the residential properties in St Neots.		Neutral		
	Greenhouse gases	Not assessed at this stage	Change in non-traded carbon over 60y (CO2e) Change in traded carbon over 60y (CO2e)	Unknown		
	Landscape	The widening with grade separated junctions could result in significant effects on the local landscape. The route will need to be designed to avoid sensitve view points e.g. from Croxton Park. A landscape assessment would be required at the next stage to help inform the alignment of the route as part of 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.		Moderate adverse		
	Townscape	Not assessed at this stage		Neutral		
	Historic Environment	The new route has the potential for significant effects on archaeology and the historic environment. Croxton Park is a registered park and garden and Scheduled Monument and the surrounding landscape has a number of known archaeological sites. A detailed programme of archaeological mitigation is likely to be required.		Moderate adverse		
	Biodiversity	There are no nationally designated sites affected by the route but there is the potential for impacts to protected species and local habitats. An ecology survey will be required at the next stage to advise on sensitive areas to avoid and to inform the detailed programme regarding surveys and consents.		Slight adverse		
	Water Environment	The existing road crosses the floodplain of the River Ouse and its tributaries. This will require an assessment under the Water Framework Directive and the likely need for 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.		Minor adverse		
Social	Commuting and Other 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.	Value of journey time changes(£) Net journey time changes (£): 0 to 2min / 2 to 5min / > 5min		£87m	
	Reliability impact on Commuting and Other users	Journey time reliability has been highlighted as a key problem on the route and this scheme would likely significantly improve the consistency of journey times.		Moderate Beneficial		
	Physical activity	The scheme is unlikely to lead to a significant increase in the number of people walking or cycling in the area as it is a primarily highways scheme. Some existing Public rights of way and cycle paths will be impacted by the scheme; however any design is likely to include new footpaths and cycle ways mitigating the impact of these lost facilities. Therefore, it is unlikely that this scheme will lead to an increase in the number of people walking and cycling or the distance that current users travel and has been assessed as having a neutral impact on physical activity		Neutral		
	Journey quality	The scheme is likely to reduce congestion and improve jourmey times leading to reduced traveller stress		Large Beneficial		
	Accidents	Not assessed at this stage				
	Security	The scheme is unlikely to have any impact on security for users at the route		Neutral		
	Access to services	The scheme is unlikely to impact the availability and cost of public transport which will lead to an improvement or worsening of the existing ability of non-car users to access services.		Neutral		
	Affordability	Th scheme is unlikely to impact the cost of travel for users.		Neutral		
	Severance	The scheme is considered to have negligible impact on the current severance situation. The option it is very unlikely to have any impact on Public rights of way and cycle paths.		Neutral		
	Option and non-use values	The scheme does not propose any changes to the existing public transport services.		Neutral		
Public Account	Cost to Broad Transport Budget	Highways England Commercial have estimated scheme cost at £1bn in 2014 prices			£71m-£177m	
	Indirect Tax Revenues	Not assessed at this stage				

Appraisal Summary Table

Date produced:	6	11	2015

Contact:	
Name	TBC
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	Option C11
Description of scheme:	Local junction widening with channelisation at existing A428 junctions, signalisation at Caxton Gibbet roundabout, grade separation at Black Cat roundabout and upgrade to existing A1 junctions

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 improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits.	Value of journey time changes(£) Net journey time changes (£): 0 to 2min / 2 to 5min / > 5min	Moderate Beneficial	£67m	
	Reliability impact on Business users	Journey time reliability has been highlighted as a key problem on the route and this scheme would likely significantly improve the consistency of journey times.		Moderate Beneficial		
	Regeneration	Not assessed at this stage				
	Wider Impacts	Not assessed at this stage				
Environmental	Noise	The scheme is likely to increase noise levels in the noise levels in the noise improvement areas around Wyboston. This is likely to require mitigation.		Moderate adverse		
	Air Quality	Reduction in queueing may result in an improvement to air quality but this could be offset by an increase in desirability of the route. The route will remain close to the residential properties in St Neots.		Neutral		
	Greenhouse gases	Not assessed at this stage	Change in non-traded carbon over 60y (CO_2e) Change in traded carbon over 60y (CO_2e)	Unknown		
	Landscape	The widening with a grade separated junction could result in significant effects on the local landscape. The route will need to be designed to avoid sensitve view points e.g. from Croxton Park. A landscape assessment would be required at the next stage to help inform the alignment of the route as part of 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.		Moderate adverse		
	Townscape	Not assessed at this stage		Neutral		
	Historic Environment	The new route has the potential for significant effects on archaeology and the historic environment. Croxton Park is a registered park and garden and Scheduled Monument and the surrounding landscape has a number of known archaeological sites. A detailed programme of archaeological mitigation is likely to be required.		Moderate adverse		
	Biodiversity	There are no nationally designated sites affected by the route but there is the potential for impacts to protected species and local habitats. An ecology survey will be required at the next stage to advise on sensitive areas to avoid and to inform the detailed programme regarding surveys and consents.		Slight adverse		
	Water Environment	The existing road crosses the floodplain of the River Ouse and its tributaries. This will require an assessment under the Water Framework Directive and the likely need for 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.		Minor adverse		
Social	Commuting and Other 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.	Value of journey time changes(£) Net journey time changes (£): 0 to 2min / 2 to 5min / > 5min		£60m	
	Reliability impact on Commuting and Other users	Journey time reliability has been highlighted as a key problem on the route and this scheme would likely significantly improve the consistency of journey times.		Moderate Beneficial		
	Physical activity	The scheme is unlikely to lead to a significant increase in the number of people walking or cycling in the area as it is a primarily highways scheme. Some existing Public rights of way and cycle paths will be impacted by the scheme; however any design is likely to include new footpaths and cycle ways mitigating the impact of these lost facilities. Therefore, it is unlikely that this scheme will lead to an increase in the number of people walking and cycling or the distance that current users travel and has been assessed as having a neutral impact on physical activity		Neutral		
	Journey quality	The scheme is likely to reduce congestion and improve jourmey times leading to reduced traveller stress		Moderate Beneficial		
	Accidents	Not assessed at this stage				
	Security	The scheme is unlikely to have any impact on security for users at the route		Neutral		
	Access to services	The scheme is unlikely to impact the availability and cost of public transport which will lead to an improvement or worsening of the existing ability of non-car users to access services.		Neutral		
	Affordability	Th scheme is unlikely to impact the cost of travel for users.		Neutral		
	Severance	The scheme is considered to have negligible impact on the current severance situation. The option it is very unlikely to have any impact on Public rights of way and cycle paths.		Neutral		
	Option and non-use values	The scheme does not propose any changes to the existing public transport services.		Neutral		
Public Account	Cost to Broad Transport Budget	Highways England Commercial have estimated scheme cost at £1bn in 2014 prices			£71m-£177m	
	Indirect Tax Revenues	Not assessed at this stage				

Appraisal Summary Table

Date produced:	4	12	2015

Contact:	
Name	TBC
Organisation	Highways England
Role	Promoter/Official

Name of scheme:	Option C16
Description of scheme:	A428 dual carriageway bypass to Cambridge Road roundabout with online dualling between Cambridge Road roundabout and Caxton Gibbet roundabout, grade separation at Black Cat roundabout and grade separation at Caxton Gibbet roundabout

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 improve journey times along the route and remove queuing for key movements at major junctions, therefore providing significant benefits.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min / 2 to 5min / > 5min	Large Beneficial	£307m	
	Reliability impact on Business users	Journey time reliability has been highlighted as a key problem on the route and this scheme would likely significantly improve the consistency of journey times.		Large Beneficial		
	Regeneration	Not assessed at this stage				
	Wider Impacts	Not assessed at this stage				
Environmental	Noise	The scheme is likely to improve noise levels in the noise improvement areas around Wyboston. A route corridor to the north of the existing road would also improve noise levels in the existing		Moderate beneficial		
	Air Quality	Reduction in queueing is likely to result in an improvement to air quality. A bypass route that is located further away from St Neots is also likely to improve local air quality.		Slight beneficial		
	Greenhouse gases	Not assessed at this stage	Change in non-traded carbon over 60y (CO2e) Change in traded carbon over 60y (CO2e)	Unknown		
	Landscape	A new bypass route with grade separated junctions could result in significant effects on the local landscape. The route will need to be designed to avoid sensitve view points e.g. from Croxton Park. A landscape assessment would be required at the next stage to help inform the alignment of the route as part of 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.		Large adverse		
	Townscape	Not assessed at this stage		Neutral		
	Historic Environment	The new route has the potential for significant effects on archaeology and the historic environment, particularly if located to the south of the existing A428. Croxton Park is a registered park and garden and Scheduled Monument and the surrounding landscape has a number of known archaeological sites. A detailed programme of archaeological mitigation is likely to be required. The online wideing in the area of Croxton Park is likely to result in a significant effect on the heritage features.		Large adverse		
	Biodiversity	There are no nationally designated sites affected by the route but there is the potential for impacts to protected species and local habitats. An ecology survey will be required at the next stage to advise on sensitive areas to avoid and to inform the detailed programme regarding surveys and consents.		Slight adverse		
	Water Environment	The route will cross the floodplain of the River Ouse and its tributaries. This will require an assessment under the Water Framework Directive and the likely need for 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.		Moderate adverse		
Social	Commuting and Other 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.	Value of journey time changes(£) Net journey time changes (£) 0 to 2min / 2 to 5min / > 5min		£330m	
	Reliability impact on Commuting and Other users	Journey time reliability has been highlighted as a key problem on the route and this scheme would likely significantly improve the consistency of journey times.		Large Beneficial		
	Physical activity	The scheme is unlikely to lead to a significant increase in the number of people walking or cycling in the area as it is a primarily highways scheme. Some existing Public rights of way and cycle paths will be impacted by the scheme; however any design is likely to include new footpaths and cycle ways mitigating the impact of these lost facilities. Therefore, it is unlikely that this scheme will lead to an increase in the number of people walking and cycling or the distance that current users travel and has been assessed as having a neutral impact on physical activity.		Neutral		
	Journey quality	The scheme is assessed as having neutral impacts on Traveller Care and Travellers' Views while also having beneficial impacts on Frustration and Fear of potential accidents. Therefore the scheme is awarded an overall score of "Beneficial".		Moderate beneficial		
	Accidents	Not assessed at this stage.				
	Security	The scheme is unlikely to have any impact on security for users at the route.		Neutral		
	Access to services	The scheme is unlikely to impact the availability and cost of public transport which will lead to an improvement or worsening of the existing ability of non-car users to access services.		Neutral		
	Affordability	The scheme is unlikely to impact the cost of travel for users.		Neutral		
	Severance	The scheme is considered to have negligible impact on the current severance situation. The option it is very unlikely to have any impact on Public rights of way and cycle paths.		Neutral		
	Option and non-use values	The scheme does not propose any changes to the existing public transport services.		Neutral		
Public Account	Cost to Broad Transport Budget	Highways England Commercial have estimated scheme cost at £1bn in 2014 prices			£354m-£707m	
	Indirect Tax Revenues	Not assessed at this stage				