A10 Junctions and Dualling

Strategic Outline Business Case

Cambridgeshire and Peterborough Combined Authority

July 2020

CAMBRIDGESHIRE & PETERBOROUGH COMBINED AUTHORITY | JAMES PALMER CAMBRIDGESHIRE & PETERBOROUGH MAYOR

Jacobs

A10 Junctions and Dualling

Project No:	BESP0020
Document Title:	Strategic Outline Business Case
Document No.:	
Revision:	Rev 2
Document Status:	Issued
Date:	July 2020
Client Name:	Cambridgeshire and Peterborough Combined Authority
Client No:	
Project Manager:	Kate Beirne
Author:	Virginia Hernandez Jara, Ros Schaverien, Hermann Maier
File Name:	A10_SOBC_rev2.docx

Jacobs U.K. Limited

www.jacobs.com

Document history and status

Revision	Date	Description	Author	Checked	Reviewed	Approved
0	05/07/2020	SOBC for Client Issue	VHJ/ HM	RS	JW	KB
1	15/07/2020	Update following comments from client team and Steer review	RS/HM/SW	RS	JW	KB
2	22/7/2020	Update following further comments from CPCA and Steer	RS	TC	TC	KB

Contents

Executive Summary

The A10

The A10 between Cambridge and Ely is a primary route in the Cambridgeshire area, used by local traffic, public transport, agricultural vehicles and long-distance traffic including freight.

The single carriageway road forms part of the direct route between London (via the M11 and A14), Cambridge and King's Lynn. The A10 provides onward connections to the Strategic Road Network (A47 and A17) and primary routes (A142, A1122 and A148) within Cambridgeshire and Norfolk. The A10 also connects with locally important east-west routes such as the A1123 between Newmarket and St. Ives.

The corridor is characterised by numerous private access points and junctions (largely priority junctions and roundabouts). These junctions provide connectivity to communities such as Milton, Landbeach, Waterbeach, Stretham and Little Thetford; centres of employment such as the Cambridge Science Park and Cambridge Research Park; and the Milton Park and Ride site for Cambridge.

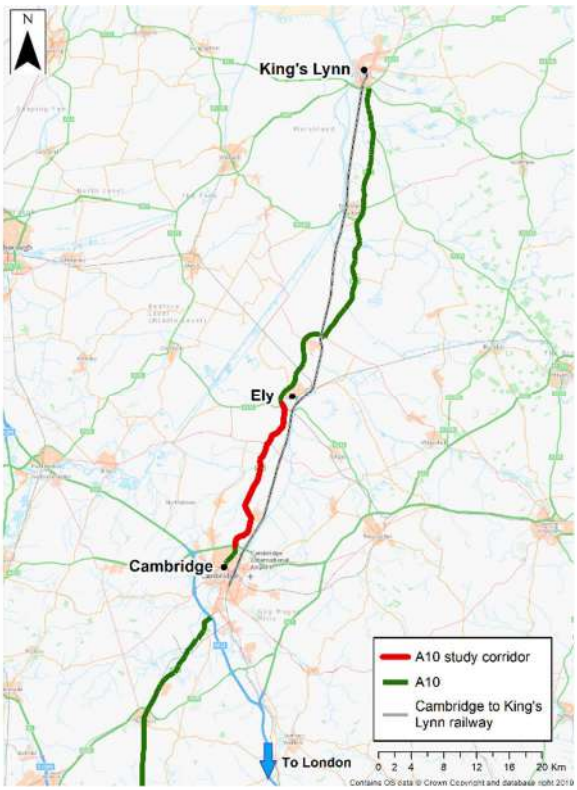


Figure 1. Study Area

Why are we seeking to invest?

The Cambridgeshire and Peterborough Independent Economic Review (CPIER) identified that economic growth in the Cambridgeshire and Peterborough Combined Authority (CPCA) area has outpaced both the East of England and UK over the last decade. The CPIER noted that the CPCA economy is responsible for 1.37% of the UK's Gross Value Added (GVA) contribution and in effect a net contributor to UK plc. This has been driven primarily, but not entirely, by rapid business creation and growth in Cambridge and South Cambridgeshire. Its internationally important knowledge-intensive industries and history of innovation and entrepreneurs provide a vibrant basis for growth across the economy. This economy extends beyond the city of Cambridge (population 125,000) along a series of key corridors, including the A10 to Ely and west Norfolk.

Economic growth has been sustained by good access to highly skilled labour markets. Housing growth before 2000 focussed on towns and villages outside Cambridge's Green Belt adding to commuter traffic on radial routes such as the A10 into Cambridge. Ely and neighbouring market towns have proved to be attractive places to live given their own character and proximity to Cambridge's leisure, retail and cultural opportunities.

Recent Local Plans and Local Transport Plans developed by the Combined Authority and local authority partners have actively sought to manage these issues with an increase in sustainable developments in and around Cambridge's fringes alongside active planning and delivery of sustainable transport policies and infrastructure. Nevertheless, the buoyant success of Cambridge's economy has meant that even this housing growth has not kept up with demand. The affordability of housing to buy or rent has continued to worsen in and around Cambridge resulting in further increases in commuting along key road (e.g. the A10) and rail (e.g. Fen Line) corridors as people seek to reduce their housing costs.

Average house prices are 10 to 13 times median incomes	Renters spend 32-41% of their median income on rent

The CPIER identified Cambridgeshire and Peterborough's housing crisis as a major constraint on the region's ability to fulfil its economic potential. The CPCA and its partners hold a strong ambition to double the size of the CPCA economy over the next 25 years, yet realising this true potential needs sustained investment to remove current limits to growth. Without suitable action some businesses may seek to relocate.

The issue for the UK economy is that many of these firms will take a "Cambridge or Overseas" approach when considering where to locate, if nothing is done.

The Adopted South Cambridgeshire Local Plan 2018 has allocated three locations to meet the majority of its housing need to 2031, with Waterbeach New Town on the A10 corridor initially allocated for 8,000 to 9,000 homes, but with planning applications received for up to 11,000 homes in total. Looking further ahead, the Combined Authority is developing a non-statutory strategic spatial framework for 100,000 quality new homes and more than 90,000 additional jobs, signposting how the area might grow to 2050 in a sustainable and inclusive manner. Within this spatial framework, the A10 is one of ten corridors of particular importance in terms of the Combined Authority area's connectivity and economic growth.

Cambridgeshire County Council, as the local highway authority, has long adopted a strong sustainable transport policy to manage and mitigate the effects of new development. Major employment growth in the City's Northern Fringe East and the first phase of homes at Waterbeach New Town can be accommodated through a further step change in multi-modal transport provision, transport trip budgets and modest junction improvements, to minimise car use. The Combined Authority, Greater Cambridge Partnership and developers are actively developing plans for a suite of multi-modal transport provision within the corridor including:

- The Cambridgeshire Autonomous Metro (CAM) to Waterbeach – a state of the art segregated transit system into the city centre
- Greenway from Cambridge to Waterbeach – an off-road route for walking, cycling and horse-riding
- Mereway – a shared walking and cycling route from Waterbeach to Cambridge Science Park including a cycle bridge over the A10
- A relocated Waterbeach railway station including provision for rail-based park and ride
- Working with Network Rail as part of the Ely Taskforce to explore solutions to increase the number of train paths through Ely
- Working with Highways England to develop a long-term solution for the A14/A10 Milton Interchange.

However, these improvements will only go so far before the following long-standing issues with the A10 corridor restrict the full delivery of Waterbeach New Town and further productivity improvements to the Cambridge economy.

- Peak time congestion with consequent impacts on emissions and the productivity of workers and businesses
- Unreliable journey times for cars, goods vehicles and local buses
- Road safety problems
- Rat-running on parallel routes such as the B1047, B1049 and B1050
- Community severance in villages alongside the A10 and these parallel routes
- Lack of parallel segregated route for cyclists.

The Combined Authority, through its Local Transport Plan, is planning for targeted highway improvements to provide additional capacity for essential highway trips where major population growth is expected, complementing the planned sustainable transport investment.

Design Context

The future design of the project and its fit within a wider package of multi-modal transport measures for the corridor must take the following context fully into account:

- The Combined Authority's vision for the Local Transport Plan (LTP) to "deliver a world-class transport network for Cambridgeshire and Peterborough that supports sustainable growth and opportunity for all." [1]
- The LTP vision is intended to capture the aspirations for Cambridgeshire and Peterborough's transport network, reflecting its ambition to provide:
    - " 'A world-class transport network' – Cambridgeshire and Peterborough aspire toward a transport system of the highest quality on a global stage, which meets the needs of residents, businesses, and visitors.
    - 'Sustainable growth' – the network will support the delivery of future economic and housing growth across the region that enhances overall quality of life, supports the transition to a net zero carbon economy and protects or enhances the environment.
    - 'Opportunity for all' – the network should support access to jobs, services and education for all, irrespective of income, age, ability, location, or access to a car."
- The Combined Authority has endorsed the ambition of 'Doubling Nature' policy which seeks to double the land managed for nature, putting nature at the heart of the ambitious growth agenda. This includes enhancing biodiversity and helping nature adapt to the impacts of climate change, of which the area faces significant challenges.
- The vehicle fleet is gradually moving away from the combustion engine with a UK Government target for all new cars to be electric by 2035. Opportunities exist to widen uptake as part of the scheme. But whilst welcome from a carbon and air quality perspective, electric vehicles do not negate the need to tackle congestion from an economic perspective, and the need to address longstanding issues on the A10.
- Alongside any road scheme, a package of measures must exist to lock in the benefits, further encourage sustainable and active travel modes (public transport, walking, cycling and horse riding) and avoid traffic returning to previously bypassed routes.

Options

The project team and partners have used the problems, opportunities and context described to define a series of objectives and a multi-criteria analysis framework to objectively take forward a short list of options for modelling and appraisal as part of this Business Case. Figure 2 (see end of Executive Summary) illustrates the seven shortlisted options that have been appraised at this stage. The shortlisted options include different route permutations of offline and online dual carriageway for part or the whole section of the A10 between the A14 and A142, as well as junctions' improvements under some of the options. The dual carriageway will be designed to encourage active modes by providing continuous, segregated route for cyclists, walkers and horse riders within the corridor or nearby.

The Financial Case notes that options are likely to cost (at 2020 Q2 Factor Prices) around £25m for Junctions, £70m to £80m for southern dualling and £180m to £215m for full dualling. These are inclusive of contingency, risk and inflation allowances, but exclude the uplift for optimism bias that is used in the economic case.

[1] CPCA (2020). The Cambridgeshire and Peterborough Local Transport Plan, para 1.51 – 1.52, https://cambridgeshirepeterborough-ca.gov.uk/assets/Transport/LTP/CPCA-LTP-WEB250220.pdf, accessed 15 July 2020

Funding options include a combination of developer contributions through either Section 106 Agreements or a Community Infrastructure Levy, local funding and Government funding. The scale of the scheme and that development can normally only be required to mitigate its own impact means that Government funding of 85% of the scheme budget is likely.

The Commercial Case provides an overview of the different procurement and delivery route options available to the Combined Authority. Whilst the procurement strategy is still in review, the current thinking is that the programme could be procured via OJEU competitive tender as an Early Contractor Involvement (ECI) contract to maximise the opportunity to embed buildability, innovation, cost planning and value into the design development. The Combined Authority would supplement this with separate lots for business case management, funding and finance, environment and commercial services, with the potential for a further lot for the Project Management Client Team.

The Management Case demonstrates that whilst the Combined Authority is a relatively new organisation, it has developed a highly capable team and set of governance and assurance arrangements to sponsor and manage its programme of major transport projects including the A10. It will continue to strengthen its capability and capacity as schemes such as the A10 are endorsed by Government. It also has the flexibility to bring in wider support from its portfolio of professional service providers.

A Communications and Stakeholder Management Plan is in place, and this has helped to inform the virtual public exhibition held in June and July 2020. This non-statutory engagement provides a great opportunity for the public and other stakeholders to share their ideas and thoughts on the seven shortlisted options and will help to inform and refine these options.

Summary of benefits

The following table shows the performance of each option in terms of its strategic fit with scheme objectives, the DfT's Major Road Network objectives and value for money.

Table 1. Summary of Option Strategic Fit and Value for Money

	Criteria	Option A	Option B	Option C	Option D	Option E	Option F	Option G
Strategic Fit	Scheme objectives & 'other criteria' score	33	32	30	31	30	28	26
	Scheme objectives & 'other criteria' Rank	1	2	=4	3	=4	6	7
	MRN objectives	✓✓✓	✓✓✓	✓✓	✓✓✓	✓✓✓	✓✓	✓
Economic Case	Initial NPV	666.9	652.8	313.7	557.8	581.6	213.8	20.9
	Initial BCR	5.5	5.4	5.7	4.3	5.2	4.6	1.9
	Net impact of dependent development (£m, 2010 prices)	108.4	71.2	82.3	66.4	32.6	-13.0	21.0
	VfM Criteria	Very high	Very high	Very high	Very high	Very high	Very high	Medium

Next Steps

The Combined Authority plans to share this Strategic Outline Business Case with the Department for Transport in summer 2020. Following on from the non-statutory virtual exhibition in summer 2020, the Combined Authority plans to carry out a statutory consultation early in 2021, to provide the public and stakeholders with a formal input into option selection. The Combined Authority will use the output of these activities to help progress option selection and design, with this feeding into an Outline Business Case for development in 2021.

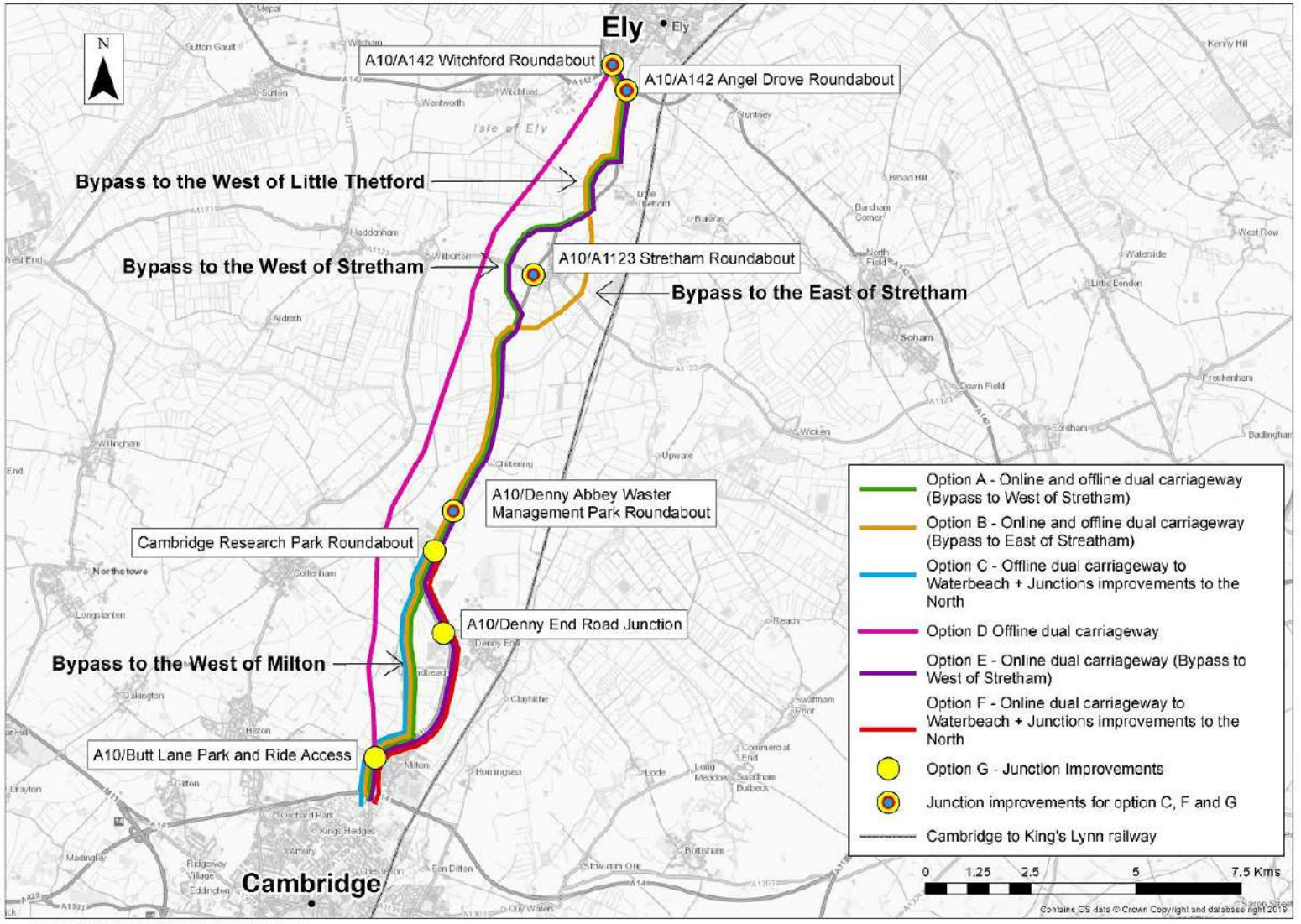


Figure 2. Shortlisted options

Abbreviations

Abbreviation	Explanation
A10ETC	A10 Ely to Cambridge Model
AADF	Annual Average Daily Flows
AEB	Adult Education Budget
AMCB	Assessment of Monetised Costs and Benefits
ANPR	Automatic Number Plate Recognition
ASR	Appraisal Specification Report
BCIS	Building Cost Information Service
BCR	Benefit Cost Ratio
CAM	Cambridgeshire Automated Metro
CCC	Cambridgeshire County Council
CCS	Construction Computer Software
CEEQUAL	Civil Engineering Environmental Quality Assessment and Award Scheme
CIL	Community Infrastructure Levy
CNEF	Cambridge North East Fringe
CPCA	Cambridgeshire and Peterborough Combined Authority
CPIER	Cambridgeshire and Peterborough Independent Economic Review
CPO	Compulsory Purchase Order
CSP	Cambridge Science Park
CSRM2	Cambridge Sub-Regional Model (version 2)
D&B	Design and Build
D2APR	Dual Two Land All Purpose Road
DfT	Department for Transport
DoS	Degree of Saturation
EAST	Early Appraisal and Sifting Tool
ECDC	East Cambridgeshire District Council
ECI	Early Contractor Involvement
EEH	England's Economic Heartland
EHAF	Eastern Highways Alliance Framework
EIA	Environmental Impact Assessment
ESPO	Eastern Shires Purchasing Organisation
EUAs	European Union Allowances
FBC	Full Business Case
GCP	Greater Cambridge Partnership
GDP	Gross Domestic Product
GVA	Gross Value Added
ha	hectare
HE	Highways England

Abbreviation	Explanation
HGV	Heavy Goods Vehicle
IP	Inter-Peak
LEP	Local Enterprise Partnership
LGV	Light Goods Vehicle
LIS	Local Industrial Strategy
LP	Local Plan
LTP	Local Transport Plan
MCA	Multi-Criteria Assessment
MHCLG	Ministry of Housing, Communities and Local Government
MOD	Ministry of Defence
MRN	Major Road Network
MSOA	Middle Layer Super Output Area
NIC	National Infrastructure Commission
NPV	Net Present Value
NTEM	National Trip End Model
OBC	Outline Business Case
OBR	Office for Budget Responsibility
OJEU	Official Journal of the European Union
ONS	Office of National Statistics
ORR	Office of Rail and Road
PA	Public Accounts
PAS	Publicly Available Specification
Pre SOBC	Preliminary Strategic Outline Business Case
PVB	Present Value of Benefits
PVC	Present Value of Cost
RAG	Red Amber Green
RFC	Ratio of Flow to Capacity
SCDC	South Cambridgeshire District Council
SHMA	Strategic Housing Market Assessment
SOBC	Strategic Outline Business Case
SRN	Strategic Roads Network
SRO	Side Roads Order
TAG	Transport Analysis Guidance
TDP	Transport Decarbonisation Plan
TEE	Transport Economic Efficiency
TIS	Transport Investment Strategy
TUBA	Transport User Benefit Appraisal
VAT	Value Added Tax
VOC	Vehicle Operating Costs

Abbreviation	Explanation
VoT	Value of Time
WW2	World War II

1. Introduction

1.1 Location overview

Jacobs is working with the Cambridgeshire and Peterborough Combined Authority (CPCA) to develop and appraise a short list of options to solve identified problems and realise potential opportunities on the A10 corridor between Cambridge and Ely that can be delivered in the short to medium term.

Figure 3 shows the location of interest.

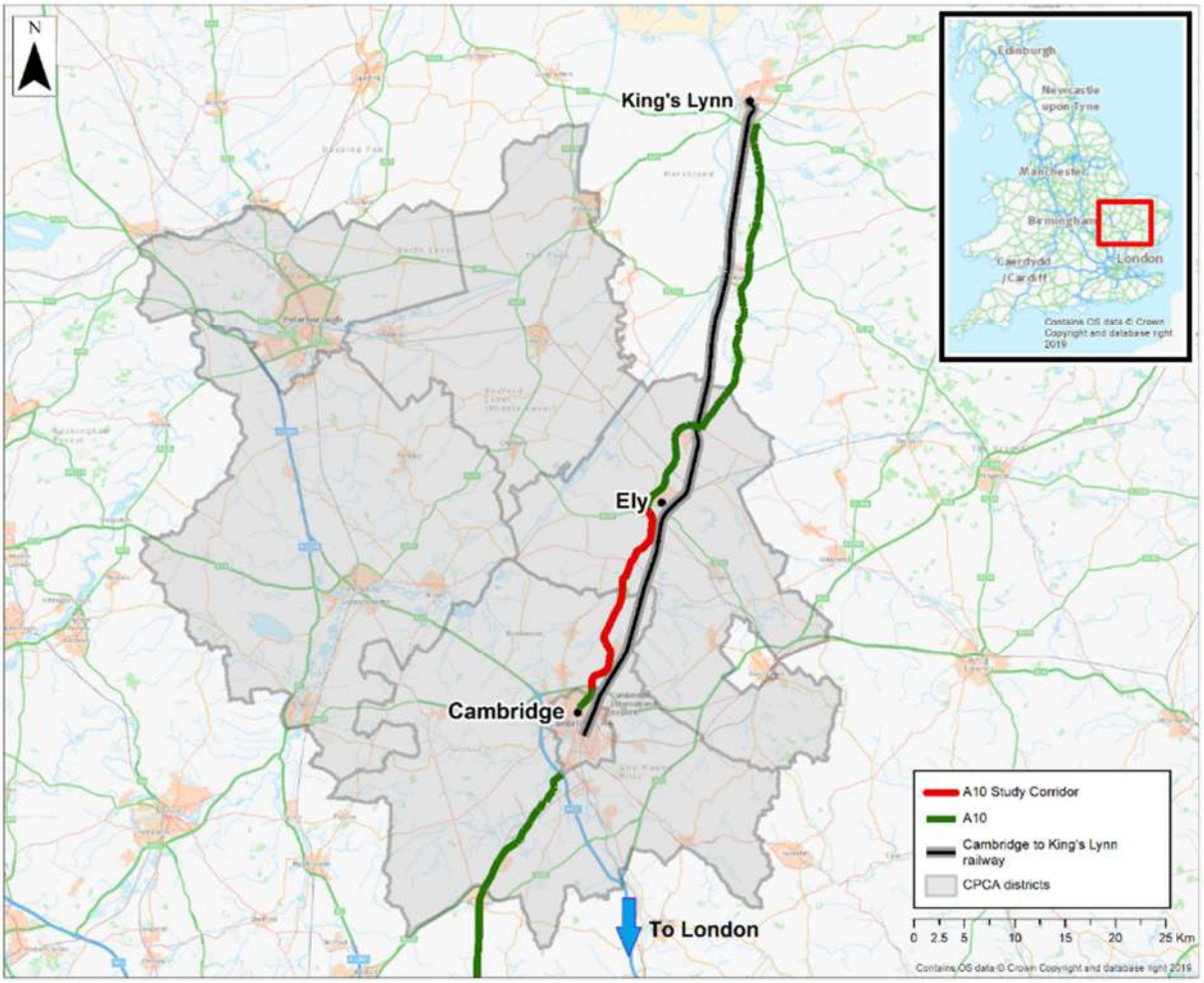


Figure 3. A10 Corridor Study Area

The A10 corridor between Cambridge and Ely is a primary route in the Cambridgeshire area, used by local traffic, public transport, agricultural vehicles and long-distance traffic including freight. The single carriageway road forms part of the direct route between London (via the M11 and A14), Cambridge and King's Lynn, with the road providing onward connections to the Strategic Road Network (A47 and A17) and primary routes (A142, A1122 and A148) within Cambridgeshire and Norfolk. Locally it provides connectivity to communities such as Milton, Landbeach, Waterbeach, Stretham and Little Thetford, as well as centres of employment such as the Cambridge Science Park and Cambridge Research Park. It also provides access to locally important east-west routes such as the A1123 between Fordham, Haddenham and St. Ives.

Secondary B-roads (B1049 and B1050) provide additional north-south links and an alternative to the busy A10. The A10 does not have any designated cycle infrastructure. It has only one regular hourly bus service from Cambridge Bus Station to Ely and Littleport during the working day.

The Cambridge to Ely railway line runs parallel to the A10. The line is used by a mix of passenger and freight services. Passenger trains operate from London King's Cross and Liverpool Street to Ely and King's Lynn, and Stansted Airport to Norwich, Peterborough and Birmingham New Street. Major rail capacity constraints exist at Ely, where its complex junction of five routes, multiple level crossings and aged infrastructure limit the potential for additional train paths. Given the strategic importance of this junction and taking a wider view of the area, Network Rail is working on the Ely Area Capacity Enhancement Programme, that provides the opportunity to deliver more capacity benefits that the original Ely north junction programme on its own. At present, Network Rail has secured some funding from the CPCA, New Anglia Local Enterprise Partnership and the Strategic Freight Network to understand the scale of the challenge to increase capacity through Ely, and this stage of work will be completed with the submission of a SOBC to the DfT later in 2020.

The Cambridge to Ely A10 study corridor runs through a largely flat landscape dominated by arable farmland, including the flood zone adjacent to the River Great Ouse.

1.2 The Ely to Cambridge Transport Study

A series of interrelated studies have been undertaken within the North East Cambridge area and Cambridge – Waterbeach – Ely corridor since 2017, analysing baseline conditions, major components of growth, and the overall corridor. In 2018, Cambridgeshire County Council and its advisors developed an initial business case for the A10 corridor itself, undertaking a Preliminary Strategic Outline Business Case (SOBC) stage in order to set out the strategic case and high-level value for money and deliverability of a range of interventions.

Figure 4 presents an overview of interconnections between the three strands of the Ely to Cambridge Transport Study: Strand 1 is the options study and preliminary SOBC for the overall package of interventions in the Ely-Cambridge study area; Strand 2 is the transport study for the development of Waterbeach New Town; and Strand 3 is the transport study for Cambridge Northern Fringe East and Cambridge Science Park.

The Ely to Cambridge Transport Study recommended a joined-up strategy across three types of measure, with this approach assessed through the preliminary SOBC:

- Policy planning and regulation – securing funding for improvements, managing demand, contributions from developers, monitor & review.
- Multi-modal quick wins – non-car measures and parking restraint, cycle measures, public transport corridor.
- Longer term highway interventions – junction improvements and carriageway capacity upgrades.

This approach enables development at Cambridge Northern Fringe East, Cambridge Science Park and the first phase of homes at Waterbeach New Town to be progressed without improvements to the A10, except for minor junction improvements which are committed through developer contributions. Any further development at Waterbeach beyond these first phases would be dependent on the A10 or alternative measures.

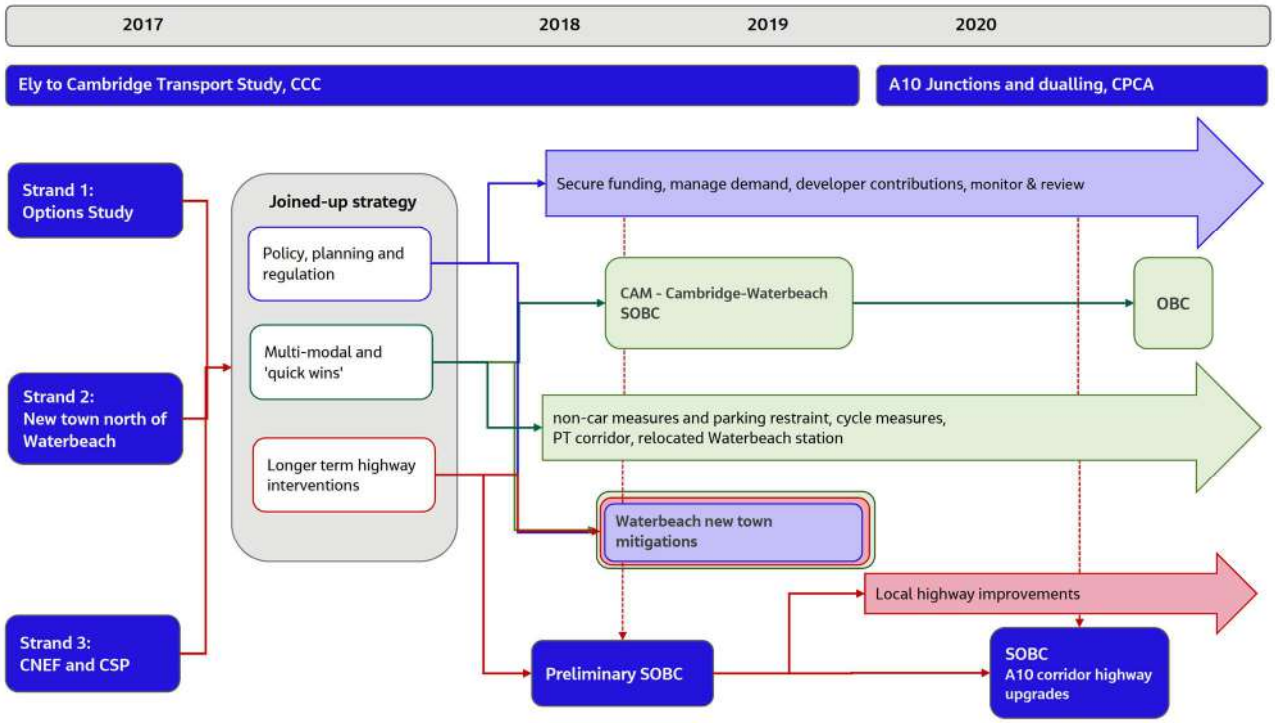


Figure 4. Joined up strategy for the A10 Corridor

1.3 Waterbeach New Town

The spatial strategy for growth at Waterbeach New Town was examined and adopted as part of the South Cambridgeshire Local Plan 2018. In addition, South Cambridgeshire District Council has prepared a Supplementary Planning Document, which was adopted in February 2019 to assist in delivering the objectives as set out in Policy SS/6: Waterbeach New Town, with this a material consideration in the planning applications that follow.[2]

The Waterbeach New Town site comprises a former military barracks and airfield (about two thirds of the site area) and agricultural land. The former military base falls under the ownership of the Ministry of Defence Infrastructure Organisation (D.I.O) and is being promoted for development by Urban & Civic (U&C). Land to the east is held in a Trust that pulls together the individual areas and involves a joint venture led by Turnstone Estates with St John's College and Royal London Asset Management and is known as RLW Estates.

During 2017-18, South Cambridgeshire District Council received three planning applications for the development of Waterbeach New Town, totalling up to 11,000 homes:

- An outline planning application (0559/17/OL) for up to 6,500 dwellings and associated other uses and infrastructure, received in February 2017 from Urban & Civic. This was approved in September 2019.
- A full planning application (0791/18/FL) for the proposed relocation of Waterbeach railway station, received in 2018 from RLW Estates. This was approved in January 2020.
- An outline application (2075/18/OL) for up to 4,500 dwellings and associated other uses and infrastructure, received in May 2018 from RLW Estates. No decision has been made at the time of writing.

As part of the planning process South Cambridgeshire District Council and CCC have been working with the developers to agree development mitigation and trigger points arising from their respective first phases of

[2] https://www.scambs.gov.uk/planning/local-plan-and-neighbourhood-planning/waterbeach-new-town-spd/ accessed 15 July 2020

development. In accordance with the Ely to Cambridge Transport Study findings, this has included mode shift and local highway infrastructure as presented in Table 2. Improvements to the A10 would be needed to release further housing phases.

Table 2: Waterbeach New Town Mitigations

Development	Mitigation	Trigger Points
Urban & Civic (Phase 1, 1600 dwellings)	Local Buses, Quick win junction improvements and trip budget monitoring	First homes
	Mere Way Cycle Route and Bridge over the A10	150 homes
	Link Road to new station	900 homes
	Further junction upgrades depending on monitoring results	1,600 homes
RLW (Phase 1, 800 dwellings)	Re-located Waterbeach railway station 200 Park and Ride Spaces Contribution to Cambridge to Waterbeach Greenway	200 homes

1.4 Progressing other findings of the Ely to Cambridge Transport Study

Since the publication of the Ely to Cambridge Transport Study, the Combined Authority, Greater Cambridge Partnership (GCP) and CCC have been working together and with other project partners to progress other elements.

The Combined Authority and GCP have been developing plans for the Cambridge Autonomous Metro (CAM) and Greenways. CAM is a proposed metro network that aims to connect Cambridge City Centre, key rail stations, major city fringe employment site and key “satellite” growth areas. This includes a branch from Cambridge North station to Waterbeach. Public consultation on CAM was launched on 21 February 2020, after the Secretary of State for Transport granted permission for the development of an Outline Business Case for CAM on August 2019.

The Greenways project aims to create a network of sustainable walking, cycling and equestrian routes connecting surrounding villages and towns to Cambridge within a ten-mile radius from the city. Twelve routes are currently proposed, including a route from Cambridge to Waterbeach, which was subject to consultation in 2019.

Separately from the scope of this project, Highways England, the Combined Authority, Cambridgeshire County Council and Greater Cambridge Partnership CCC have joined together as a collaborative working group to examine potential issues and solutions associated with the A14/A10 Milton Interchange, and the impact on both the A10 and A14 as well as Milton and the surrounding area.

As previously noted, the Combined Authority and partners have funded Network Rail to develop a SOBC to make the case for investment to increase the number of train paths through Ely to accommodate medium and long-term growth in freight and passenger services.

The transport planning undertaken for Waterbeach New Town and the Ely to Cambridge corridor as a whole indicates that the up front and early investment in modal shift and local highway improvements can only go so far before further highway investment is needed to unlock growth. The Combined Authority used information from the pre-SOBC and a subsequent Junctions Assessment Report undertaken by CCC to submit two pre-SOBC proforma to England’s Economic Heartland and Department for Transport in July 2019:

- Junction improvements – Major Road Network funding
- Dualling improvements – Large Local Major funding.

The Chancellor announced on 11 March 2020 that junction improvements had been identified for further development. The Combined Authority has discussed both projects with the DfT since this announcement making it clear that the purpose of this SOBC is to further develop the case for junction and / or carriageway capacity upgrades to the A10 as part of a robust approach to option assessment and appraisal. In doing so it considers the wider package of measures already planned, and how an improved A10 could also complement the CAM and Greenways projects in development (i.e. by facilitating future extension and / or access) and climate change, biodiversity and sustainable transport policies in development or in existence.

1.5 Purpose of the Business Case

This report sets out the Strategic Outline Business Case (SOBC) for investment in the A10 corridor, between Ely and Cambridge. The purpose of this SOBC is to establish the case for investment in A10, following HM Treasury's Five Case Business Case model. Each case is clearly set out as a respective chapter of this SOBC as stated below:

- Chapter 2 – Strategic Case; provides robust evidence for need to change that aligns with wider objectives.
- Chapter 3 – Economic Case; proves value for money.
- Chapter 4 – Financial Case; demonstrates that the scheme is financially affordable.
- Chapter 5 – Commercial Case; determines that the scheme is commercially viable.
- Chapter 6 - Management Case; outlines the scheme is achievable.
- Chapter 7 – Conclusion; including a summary of the next steps.

At this stage, the SOBC sets out the need for intervention (the case for change) and how this will further Government's, the Combined Authority's and relevant statutory stakeholders' aims and objectives (the strategic fit). It provides suggested or preferred ways forward and presents the evidence for a decision to further develop the project to an Outline Business Case.

1.6 Limitation Statement

The document should be read in full with no excerpts to be representative of the findings. It has been prepared exclusively for the Cambridgeshire & Peterborough Combined Authority and key stakeholders such as Cambridgeshire County Council, Greater Cambridge Partnership, East Cambridgeshire District Council, South Cambridgeshire District Council, Cambridge City Council, Highways England and Department for Transport and no liability is accepted for any use or reliance on the report by third parties.

2. Strategic Case

2.1 Introduction

The strategic case 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 Combined Authority, the Government and relevant statutory stakeholders such as Cambridgeshire County Council. The strategic case follows the requirements of DfT guidance[3], providing the greatest emphasis for going ahead with a project at an early stage and a shortlist of options at the strategic outline business case stage. The Strategic Case covers the following sections in turn:

- Business Strategy of the promoter (Section 2.2), describes the Combined Authority's motivation for seeking funds to improve the A10 corridor and how this aligns with its strategy.
- Existing situation (Section 2.3), discusses population and housing, education and skills, economic trends, deprivation, transport and movement context, travel demand, commuting patterns, baseline traffic conditions and the environmental context.
- Future situation (Section 2.4), discusses expected growth and infrastructure changes, land use and planning context, and employment and housing plans.
- The Need for Intervention (Section 2.5) summarises the problems and opportunities arising in Sections 2.3 and 2.4 to succinctly set out the case for change.
- Scheme objectives and measures for success (Section 2.6), sets up the drivers for an effective Option Assessment process, showing links to the identified problems and opportunities in the previous section.
- Scheme scope (Section 2.7), describes the details of the main scheme and what is included and excluded from the scope.
- Issues and constraints are presented in Section 2.8.
- Interdependencies (Section 2.9), refers to both interdependent and complementary schemes and growth.
- Stakeholders attitudes (Section 2.10), provides an overview of stakeholder engagement and political support
- Option assessment (Section 2.11), sets out all the history of option assessment and evaluates their impact on the proposal's objectives.
- Strategic fit (Section 2.12), provides a commentary on how the options align with pertinent DfT, wider national, regional, Combined Authority and local policy
- Strategic Risks identifies common and specific risks to the options (Section 2.13)
- Conclusions (Section 2.14).

[3] The Transport Business Cases, 2013

2.2 Business strategy of the promoter

The Combined Authority forms the regional body responsible for devolved powers from Central Government. The Devolution Deal for Cambridgeshire and Peterborough[4] sets out key ambitions for the Combined Authority, including:

- Doubling the size of the local economy and Gross Value Added (GVA) over 25 years;
- Accelerating house delivery to meet local and UK needs, with 72,000 new homes across the Combined Authority area by 2032[5];
- Delivering outstanding and much needed connectivity in terms of transport and digital links;
- Investing in skills, and providing the UK's most technically-skilled workforce;
- Transforming public service delivery to be much more seamless and responsive to local need;
- Boosting the region's international recognition for its knowledge-based economy, including in life sciences and information and communication technologies; and
- Improving local quality-of-life by tackling areas suffering from deprivation.

Figure 5 summarises the overarching context of CPCA policy and strategy and how its Ambition Statement has influenced the development of its Business Plan[6], strategy development and resulting suite of priority schemes to realise its ambition. This includes improvements to the A10.

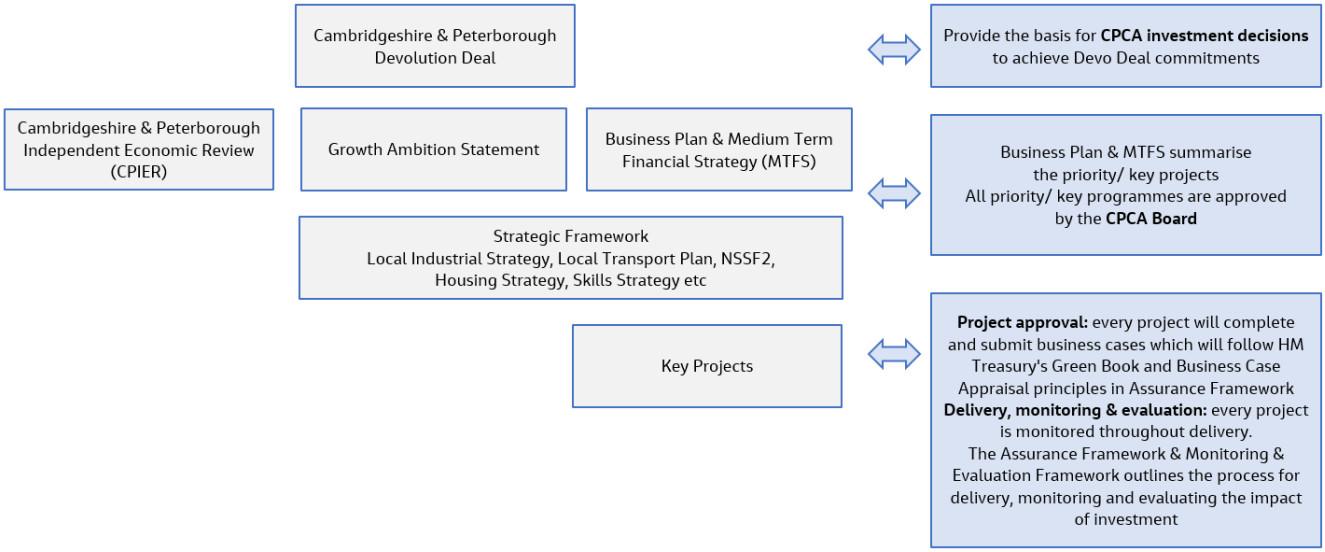


Figure 5. CPCA Policy Context

The Combined Authority has an ambitious vision to build further on the region's transformational economic success over the last two decades – termed the 'Cambridge Phenomenon'. More than 33,500 new homes and 44,000 jobs are planned by 2030, with the potential, highlighted by the National Infrastructure Commission (NIC)[7] and supported by the Government[8], for significant growth beyond this. The Combined Authority and its partners hold a strong ambition to double the size of its economy over the next 25 years, yet realising these true potential needs sustained investment to remove current limits to growth.

[4] Cambridgeshire and Peterborough Devolution Deal, published March 2017
[5] CPCA Business Plan 2019-2020
[6] Combined Authority Business Plan 2019-2020
[7] Partnering for Prosperity: A new deal for the Cambridge-Milton Keynes-Oxford Arc, published November 2017 by NIC
[8] Government response to "Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc"

The Combined Authority established the Cambridgeshire and Peterborough Independent Economic Commission in June 2017 to provide a robust and independent assessment of the Combined Authority area economy and its potential for growth. A key message from its Independent Economic Review study (CPIER)[9], published in September 2018, is that its successful local economy is of national significance, but its future success will only be achieved through careful prioritisation of infrastructure projects.

The Local Industrial Strategy (LIS) is one of a family of four linked strategies covering the Oxford – Milton Keynes – Cambridge corridor that have since been developed. The LIS recognises the existence of three different sub-economies in the area: Greater Cambridge, Greater Peterborough and The Fens, with each one being unique and facing its own opportunities and challenges. Therefore, while the overall goal is the same: an inclusive, prosperous and productive economy, each sub-economy will tackle different challenges and opportunities. that have since been developed. The LIS recognises the existence of three different sub-economies in the area: Greater Cambridge, Greater Peterborough and The Fens, with each one being unique and facing its own opportunities and challenges. Therefore, while the overall goal is the same: an inclusive, prosperous and productive economy, each sub-economy will tackle different challenges and opportunities.

The LIS states that the full economic potential of the region can only be realised by identifying diverse strengths – from Peterborough's rapid growth, Cambridge's global research strengths, and The Fens' innovative micro and agricultural businesses and working to tie them together. The LIS maintains that sustaining and de-risking the area's full potential for economic growth relies on transforming the transport, housing and infrastructure capacity in Greater Cambridge and improving the transport system for market towns. Improving connectivity is vital if recent growth is not to stall and will contribute to addressing the Future of Mobility Grand Challenge set by Government.

The Combined Authority sets out through its Strategic Spatial Framework (non-statutory)[10] the imperative and its approach to accelerating housing delivery and transforming transport connectivity to unlock constraints on growth and realise the ambition to double the area's economic output. Similarly, the National Infrastructure Commission highlights the unrivalled economic potential of the Oxford – Milton Keynes - Cambridge corridor, but stress that poor transport connectivity and the slow rate of housing delivery places future growth at risk.

Greater Cambridge's transport infrastructure currently acts to constrain growth, which must be overcome if the region is to fulfil its stated ambitions for sustainable long-term growth. Cambridge's high-tech, high-skill economy also relies heavily on the productivity benefits that come from close proximity to one another (agglomeration benefits), and firms' ability to recruit workers across a wider labour market.

If Cambridge is to continue to grow, businesses within the 'Cambridge cluster' must be able to locate across a wider geography, yet still benefit from easy access to the region's innovative, skilled workforce and from close proximity to each other. Growth in 'satellite' communities at Cambourne, Bourn, Northstowe and Waterbeach, and in market towns such as Ely and Huntingdon, have the potential to spread the benefits of Cambridge's success across the wider region, tackling local deprivation and deliver tens of thousands of additional homes, but are predicated on significantly improved transport accessibility.

The Housing Strategy[11] builds on the Strategic Framework. It notes that whilst the region as a whole has a strong and growing economy, its housing markets are not providing enough new housing, and sufficient affordable housing across all tenures. Consequently, the CPCA has ambitious targets for housing delivery. These are a mix of strategic ambitions – at least 100,000 additional new homes (including at least 40% new affordable homes) by

[9] Cambridgeshire and Peterborough Independent Economic Commission (2018), Cambridgeshire and Peterborough Independent Economic Review (CPIER)

[10] CPCA (2018). Cambridgeshire and Peterborough Strategic Spatial Framework (Non Statutory) Towards a Sustainable Growth Strategy to 2050. Available at: https://cambridgeshirepeterborough-ca.gov.uk/assets/Combined-Authority/Combined-Authority-Spatial-Plan.pdf accessed 15 July 2020

[11] CPCA (2018). CPCA Housing Strategy. Available at: https://cambridgeshirepeterborough-ca.gov.uk/assets/Uploads/CPCA-Housing-Strategy-Part1.pdf accessed 15 July 2020

2036 – and short term delivery targets of at least 2,000 new affordable homes by 2022, using £100 million of government grant, plus 500 new Council homes in a government grant ring-fenced for Cambridge City Council.

To achieve this ambition the Mayor together with the partner organisations within the Combined Authority has agreed the following strategic response:

- Accelerating housing delivery to support economic growth, which includes integrating transport and housing;
- Creating prosperous places where people want to live – such as Waterbeach New Town; and
- Expanding housing choices to meet a range of housing needs.

Following devolution, the Combined Authority is the Local Transport Authority with strategic supporting powers. Its Cambridgeshire and Peterborough Local Transport Plan (LTP)[12] provides an overview of the area's aims and objectives, its strategies to address challenges and summarises the major transport schemes required to achieve their strategy.

The LTP sets out the vision, goals and objectives which will define the strategic approach up to 2050, and the policies designed to deliver the objectives. The vision for the Cambridgeshire and Peterborough Combined Authority is "to deliver a world-class transport network for Cambridgeshire and Peterborough that supports sustainable growth and opportunity for all", and this is intended to capture the aspirations for Cambridgeshire and Peterborough's transport network, reflecting future ambition in the county. The LTP goals are intended to outline the wider implications that the Combined Authority want the transport network to achieve in Cambridgeshire and Peterborough. These are:

Cambridgeshire and Peterborough LTP Goals

- Economy: Deliver economic growth and opportunity for all our communities.
- Society: Provide an accessible transport system to ensure everyone can thrive and be healthy.
- Environment: Preserve and enhance our built, natural and historic environment and implement measures to achieve net zero carbon.

Each of the ten objectives of the LTP underpin the delivery of the goals. These are shown below in Table 3.

[12] CPCA (2020). The Cambridgeshire and Peterborough Local Transport Plan, https://cambridgeshirepeterborough-ca.gov.uk/assets/Transport/LTP/CPCA-LTP-WEB250220.pdf, accessed 15 July 2020

Table 3. Cambridgeshire and Peterborough Local Transport Plan objectives[13]

Theme	Objectives	
Economy	Housing - Support new housing and development to accommodate a growing population and workforce, and address housing affordability issues	Business and Tourism - Ensure all of our region's businesses and tourist attractions are connected sustainably to our main transport hubs, ports and airports
	Employment - Connect all new and existing communities sustainably so all residents can easily access a good job within 30 minutes by public transport, spreading the region's prosperity	Resilience - Build a transport network that is resilient and adaptive to human and environmental disruption, improving journey time reliability
Society	Safety - Embed a safe systems approach into all planning and transport operations to achieve Vision Zero – zero fatalities or serious injuries	Health and Wellbeing - Provide 'healthy streets' and high quality public realm that puts people first and promotes active lifestyles
	Accessibility - Promote social inclusion through the provision of a sustainable transport network that is affordable and accessible for all	Air Quality - Ensure transport initiatives improve air quality across the region to exceed good practice standards
Environment	Environment - Deliver a transport network that protects and enhances our natural, historic and built environments	Climate Change - Reduce emissions to 'net zero' by 2050 to minimise the impact of transport and travel on climate change

Improvements to the A10 corridor feature within the list of projects referenced in the Devolution Deal, Business Plan, CPIER, Strategic Spatial Framework, Housing Strategy and Local Transport Plan (relevant paragraphs are referenced in Section 2.12.6 – Strategic Fit with Local Policy).

[13] Ibid, p11

2.3 Existing situation

This section of the report sets out the socio-economic, transport and environmental context within the study area to evidence existing problems and opportunities. The key points for each issue are highlighted in "problem / opportunity" call-out boxes throughout the section, designed to draw attention to the issues the scheme assists in solving and the benefits which it can provide.

2.3.1 Population and housing context

Together, the six districts of Cambridgeshire and Peterborough are home to an estimated population of more than 850,000[14], 15% of which reside within the City of Cambridge. Figure 6 presents the current population estimates within each of the Combined Authority's constituent local authority districts.

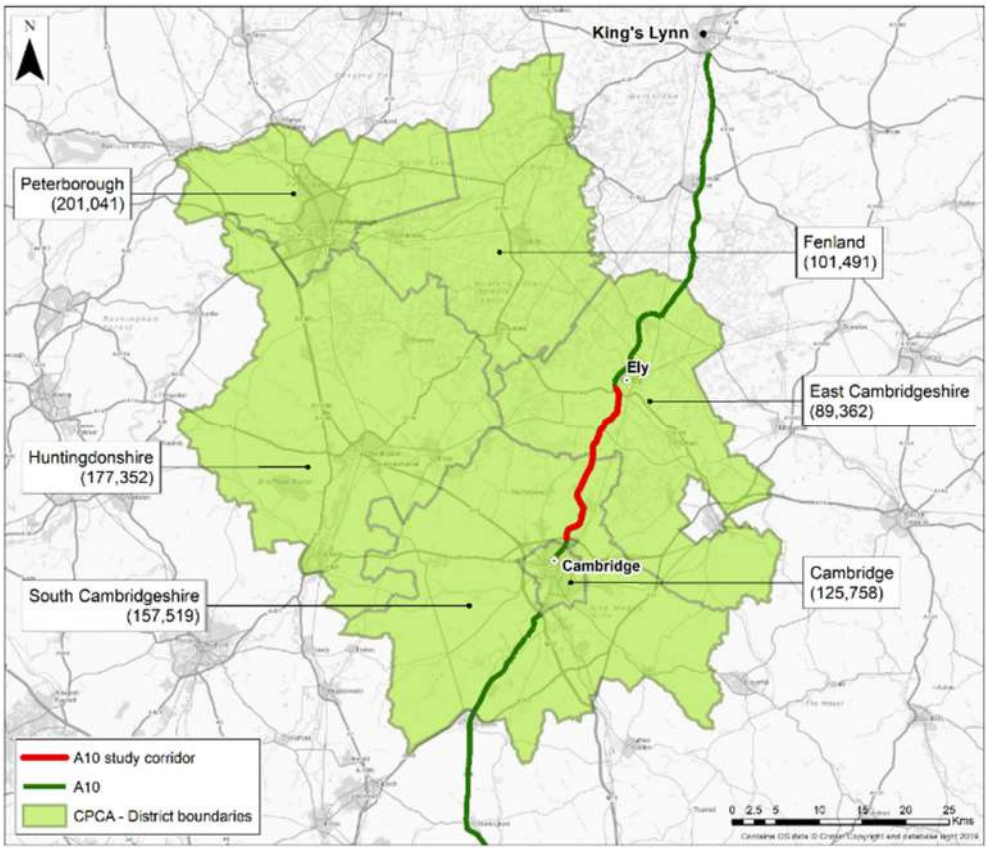


Figure 6. Population and County's district boundaries

Figure 7 presents population growth for locations along the Ely-Cambridge corridor. The northern end of the corridor has seen the highest growth since 2011, with Ely's population having grown by 5.7% from 20,438 inhabitants in 2011 to 21,624 in 2018. The population of the city of Cambridge has increased at a slower rate with an overall increase of 2% between 2011 and 2018, consistent with the constraining effect of the shortage of land within Cambridge. The population of Milton and Waterbeach decreased by around 11% between 2011 and 2013, which can be linked to the announcement of the closure of the Waterbeach Barracks military site in July 2011. The site was a Royal Air Force station from 1966 and then was used by the Royal Engineers until its closure in March 2013. The closure of this site impacted the population of Waterbeach as direct and indirect jobs were lost and people moved to other areas for employment opportunities.

[14] 2018 Mid-year population estimate from Cambridgeshire insight and sourced from ONS

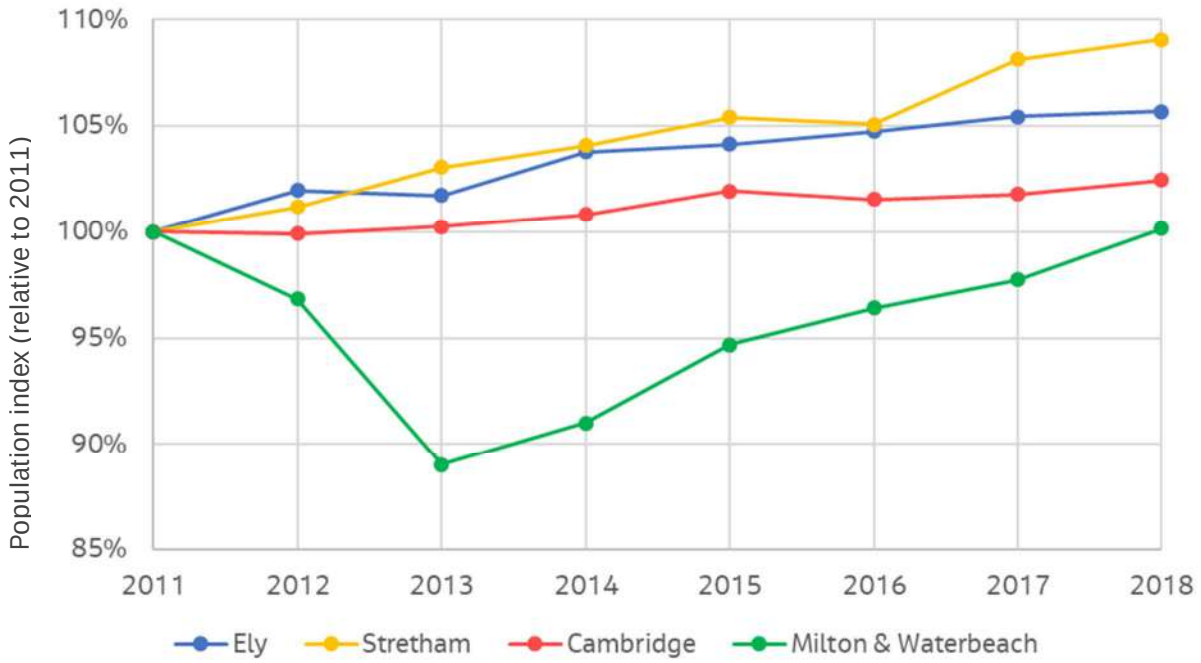


Figure 7. Population Growth - index 2011=100%

2.3.2 Housing affordability

The delivery of homes in the corridor has failed to keep up with increased demand from the rising population, leading to house prices rising at a faster rate than the national average. The ratio of average house prices to average earnings has more than doubled in England since 1998, making it harder for millions of people to afford their own home.

Over the last two decades, the strong economic performance of the Cambridge area has created many jobs of very high value (with GVA per head around £45,000 compared to between £22,000 and £28,000 across the rest of the county and around £25,000 across the UK as a whole). Consequently, it has attracted a large and affluent workforce. These successes have rightly been widely celebrated, but alongside its many positive impacts, growth has nonetheless contributed to a situation in which house prices have risen much faster than inflation over the past twenty or more years.

Figure 8 below illustrates an upward trend since 1995 which saw the average house price in Cambridge City climb from under £100,000 to some £500,000 in 2018, while the volume of sales fell over the same period. This is strong evidence of increasingly intense competition among a growing number of (increasingly affluent) would-be purchasers for what is effectively a fixed supply of housing, with those on lower income being priced out of the Cambridge housing market.

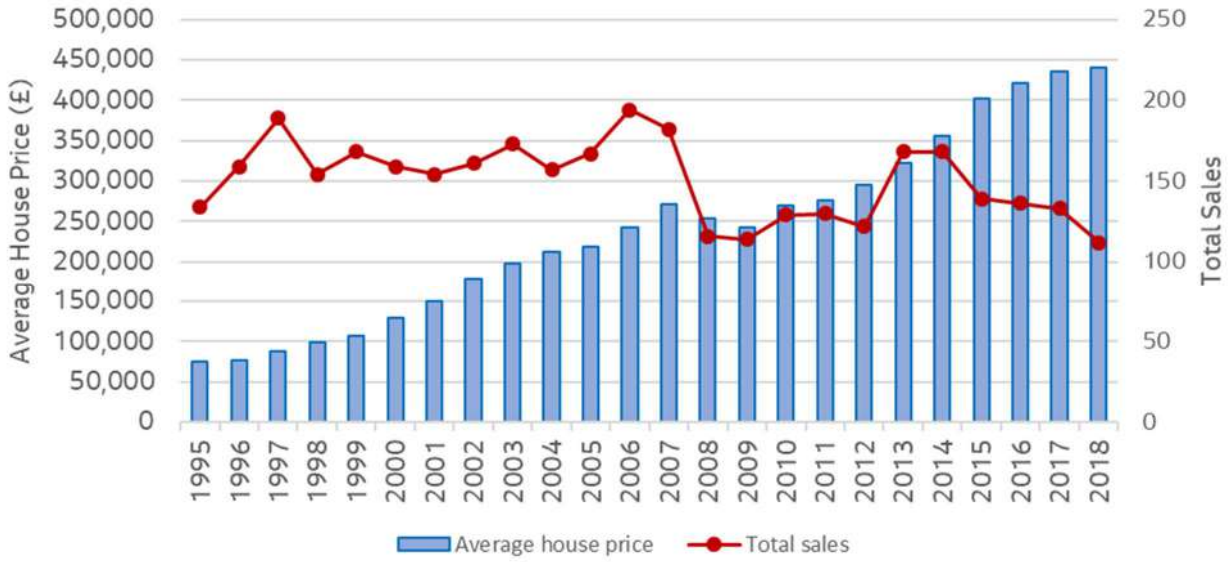


Figure 8. House prices and sales in Cambridge City, 1995-2018[15]

Figure 9 below makes clear that this is a particular problem in Cambridge and South Cambridgeshire; prices here have grown by between £300,000 and £400,000 since 1995, while prices in Fenland have risen by around £150,000.

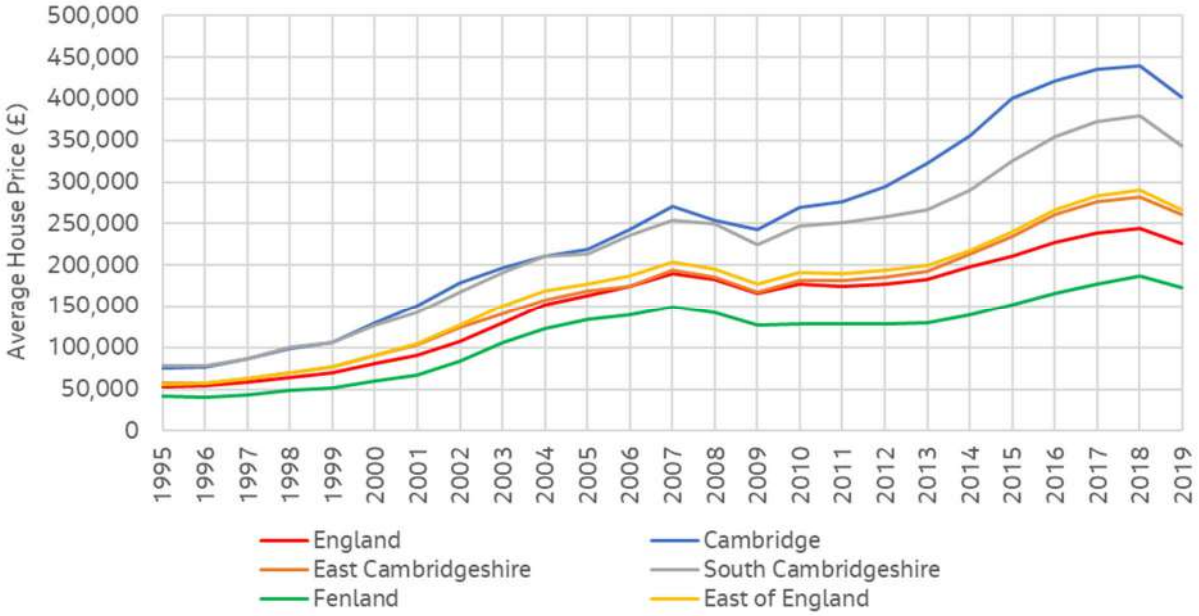


Figure 9. House prices by district, East of England and England, 1995 - 2018[16]

The availability of affordable housing may cause difficulty for employers to recruit suitably qualified employees who would need to be willing both to commute long distances, and also to locate in parts of the county which

[15] Source: HM Land Registry
[16] Source HM Land Registry

offer fewer of the conveniences such as ready access to high quality public transport, which are on offer closer to the urban core of the city of Cambridge.

Ultimately, if the cost of suitable accommodation in areas with sufficient transport connectivity and amenities becomes prohibitive within the context of the wages that businesses in Cambridge and the surrounding areas of South Cambridgeshire are able to pay, then businesses may find themselves unable to recruit appropriately qualified staff. Figure 10 illustrates housing affordability as measured by the ratio of average house prices to average earnings. Although housing affordability has declined since 1997 across all districts within the Combined Authority area, Cambridge has experienced a steeper increase during the last 5 years, where median house prices have increased from 10 to 13 times workplace-based average annual earnings. In other districts, housing affordability ratios have increased less steeply and from a lower base, particularly in Fenland and King's Lynn and West Norfolk.

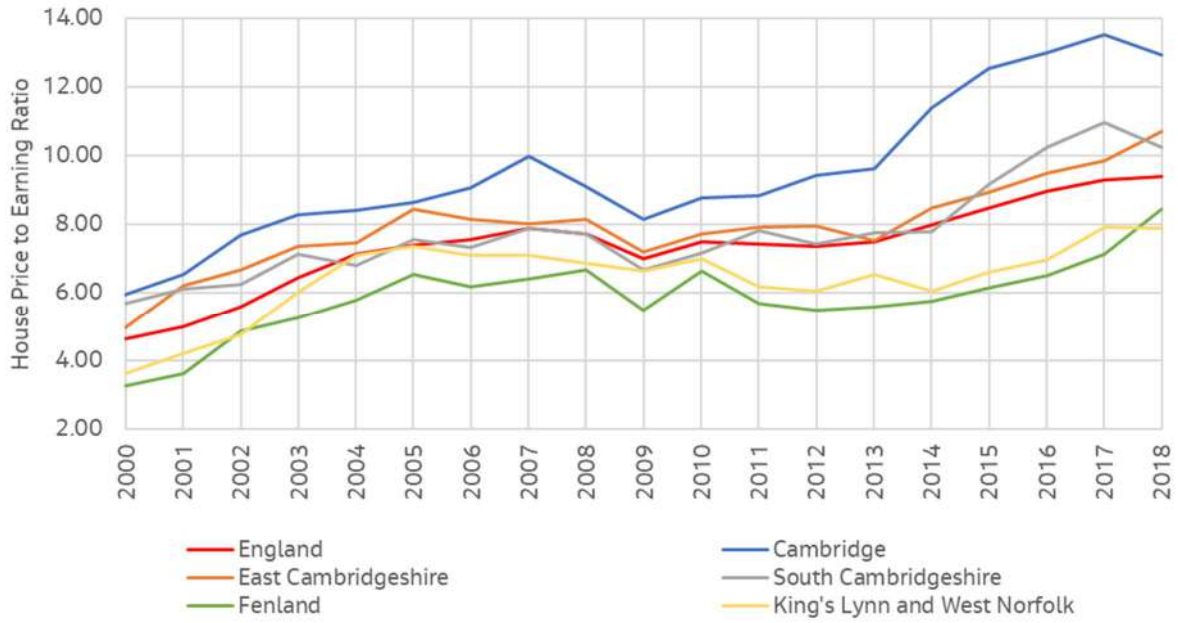


Figure 10. Housing affordability based on median house price to earnings ratio

The cost of housing in Cambridge has led to people moving further afield to afford a home, leading to increased numbers of commuters, adding pressures to the transport network, including the A10. Comparing the Travel to work pattern between available census: 2001 and 2011, the total number of people travelling from district in the north, namely East Cambridgeshire and King's Lynn and West Norfolk to Cambridge had been increased by 16% and 22%, respectively. This evidence is further detailed in section 2.3.7. where travel to work patterns are described.

Table 4. Private median rent as a proportion of median income (%), 2016

District	Percentage
Peterborough	25.56
Cambridge	41.36
East Cambridge	34.16
Fenland	27.27
Huntingdonshire	30.48
South Cambridgeshire	32.43
East of England	31.19
England	27.37

Another indicator of housing affordability is the median rent[17]. The supply-side pressures on housing will have similar effects on rents as house prices. Table 4 shows that the proportion of income spent on rent varies widely across the area from a quarter in Peterborough to over 34% in East Cambridgeshire and 40% in Cambridge – well above the average for England.

[17] Source: ONS Housing Summary Measures 2016

2.3.3 Housing need

During 2015, Peter Brett Associates objectively assessed housing need on behalf of Cambridge City Council and South Cambridgeshire District Council[18] to provide further evidence to the Strategic Housing Market Assessment (the "SHMA") developed in 2008 and last updated in 2013. This assessment provided evidence on housing need and housing targets, in response to questions raised by the Inspectors examining their Local Plans. The housing numbers were developed consistent with past demographic trends and adjusted for market signals in each local authority area, also to provide enough labour to support expected job growth as part of a Housing Market Area wide strategy. The assessment concluded that the objectively assessed housing needs in the study area was 19,337 dwellings for South Cambridgeshire and 14,000 for Cambridge City for the 2011 to 2031 period. Furthermore, for the same period the Councils' evidence base identified an affordable housing need of 10,402 and 5,573 dwellings for Cambridge and South Cambridge, respectively. The findings are summarised in Table 5.

Table 5. Strategic Housing Market Assessment for period 2011 to 2031

Local Authority	Overall housing need	Affordable housing need	% affordable housing
Cambridge	14,000	10,402	74%
South Cambridgeshire	19,337	5,573	29%

In November 2019, Greater Cambridge published its Trajectory and Five Year Housing Land Supply[19]. Table 6 presents annual new housing completions against targets since 2011, developed based on the SHMA and the Housing Trajectory and Five-Year Housing Land Supply reports. In order to meet their targets, Cambridge and South Cambridgeshire would need to deliver 700 and 975 dwellings respectively per year during the period 2011 to 2031. Currently, Cambridge is ahead of its cumulative target of 5,600 new homes between 2011 and 2019 with nearly 7,000 homes completed but South Cambridge is behind its target of 7,800 homes having completed 5,866 homes to date. Collectively there has been a cumulative shortfall of circa 600 homes over the past 8 years.

Table 6. Total Housing Net Completion versus target for period 2011 to 2019

	Type	2011-2012	2012-2013	2013- 2014	2014- 2015	2015- 2016	2016-2017	2017-2018	2018-2019	Cumulative
Cambridge	Market Completed	295	417	900	523	596	725	445	523	4,424
	Affordable Completed	60	56	422	197	300	458	667	345	2,505
	Total Completed	355	473	1,322	720	896	1,183	1,112	868	6,929
	Planned	700	700	700	700	700	700	700	700	5,600
South Cambridgeshire	Market Completed	525	486	481	539	550	435	557	811	4,384
	Affordable Completed	168	69	150	329	129	116	180	341	1,482
	Total Completed	693	555	631	868	679	551	737	1,152	5,866
	Planned	975	975	975	975	975	975	975	975	7,800

[18] Cambridge and South Cambridgeshire Local Plan Examination - Objectively Assessed Housing Need: Further evidence
[19] Greater Cambridge Housing Trajectory and Five Year Housing Land Supply

The identification of suitable locations for development of both residential and employment space, coupled with an effective strategy for delivery of supporting infrastructure is a key objective of the current and future Local Plans and the draft non-statutory spatial strategy developed by the Combined Authority. This objective is also in line with the Combined Authority's ambition of delivering 72,000 new homes in the combined authority area by 2032 and additional homes beyond then as stated in the Growth Ambition statement.

The Adopted South Cambridgeshire Local Plan 2018 allocates significant levels of development in the study area, principally within the proposed new settlement north of Waterbeach, where there are opportunities to focus growth along with the necessary infrastructure.

As noted in Section 1.3, the Waterbeach New Town site is being progressed by two developers (Urban & Civic and RLW), reflecting the existing land ownership (former Ministry of Defence airfield and barracks / agricultural land) with their first phases of 1,600 and 800 homes respectively. The sustainable transport measures, minor junction mitigation and station relocation required as part of their respective first phases will only go so far before the A10 presents a barrier to growth. Further capacity improvements on the A10 will be required to accommodate travel demand from additional phases up to the potential site capacity of 11,000 dwellings.

The Local Plans were prepared in parallel with the Transport Strategy for Cambridge and South Cambridgeshire, which established the transport interventions that would be necessary to support growth. This includes measures to provide access to developments by walking and cycling, public transport, and to address highway impacts.

To ensure that growth is not simply accommodated at the expense of significant deterioration in travel conditions, development will need to be carefully planned, and supported by an appropriate strategy for transport. Therefore, as identified in previous transport studies, housing growth in Cambridgeshire and Peterborough is subject to increasing infrastructure capacity by improving existing networks or building new links.

Problem 1 – Lack of Housing	
	Housing affordability pressures are one of the main threats to growth in the Combined Authority, particularly in Cambridge, and one of the main burdens on people's lives. Demand for housing has risen strongly, while supply, though increasing, has not been able to keep pace.

2.3.4 Economy and employment trends

Introduction

The Cambridgeshire and Peterborough Combined Authority has an ambition, set out in its devolution deal, to double GVA over 25 years. The CPIER has endorsed the ambition of doubling GVA over 25 years. This section references the findings presented in the CPIER to provide a brief overview of the Combined Authority's economy, describe the economic characteristics of the A10 corridor area, and present a brief analysis of economic and employment trends.

The three economies

In many ways, the Combined Authority area is a microcosm of the UK as a whole. It has a prosperous south, based around one principal city, which receives the majority of foreign investment and attracts high value companies and talent from across the world. International evidence increasingly shows that this concentration of growth leads to both high living standards and significant inequality. Further north, there is much industry and innovation, but while there are many success stories, business investment, skill levels and wages are lower. The gap in prosperity and skills between the north of the area and the south of the area is growing; women earn significantly less than men and transport congestion costs businesses millions in lost productivity. High house

prices and lack of infrastructure may severely restrict the capacity of the economy to grow. High carbon emissions will increase the vulnerability of businesses and residents to possible future increases in energy prices.

The CPIER identified the CPCA economy as not a single uniform economy but three interconnected but different sub-economies ones. This is known as "the three economies": the south of the area or Greater Cambridge, the north west area or Greater Peterborough and the Fens (Figure 11).

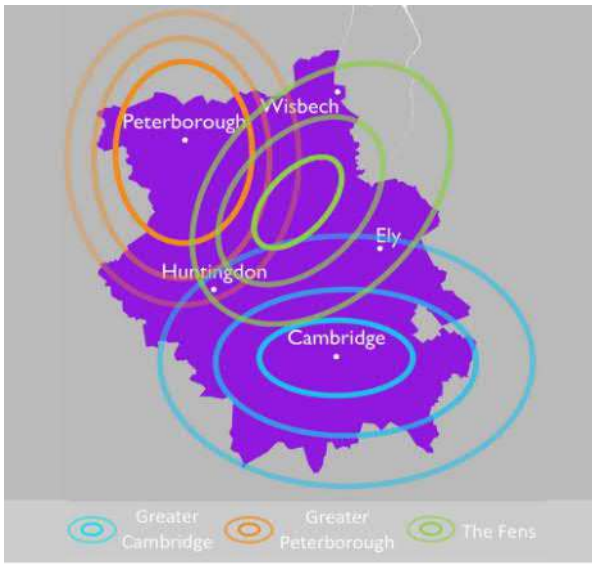


Figure 11. The three economies areas

Source: Cambridgeshire and Peterborough Local Industrial Strategy

The "Greater Cambridge" area, which covers Cambridge, South Cambridgeshire and south parts of Huntingdonshire and East Cambridge, is prosperous and attracts many international businesses to come to the area and grow, mainly due to the University of Cambridge and research and science institutes. Skills levels and wages are high. The economy of Greater Cambridge has been performing strongest. Within the Greater Peterborough area there is much industry and potential; however, deprivation levels are higher, and many residents feel untouched by the economic success of the Greater Cambridge area. The Fens economy is supported mainly by the agricultural sector and market towns. Within these last two economies, wages are notably lower than the southern districts of Cambridge and South Cambridgeshire.

Strong business performance

A distinguishing feature of the area is how strongly it has grown recently. Figure 12 illustrates that economic growth has outpaced both the East of England and UK over the last decade. This has been driven primarily, but not entirely, by rapid business creation and growth in the south – Cambridge and South Cambridgeshire. This business is innovation rich – in fact Cambridge had the highest number of patent applications per 100,000 people for any city in the UK (341, more than twice the closest competitor, Coventry, with 118). It has been supported by waves of finance, with early acquisitions of companies (often by US firms) providing additional finance which could be invested in other new business. Beginning with computers and software, entrepreneurs began to branch out into other sectors with different business models, such as telecommunications, and (more recently) life sciences.

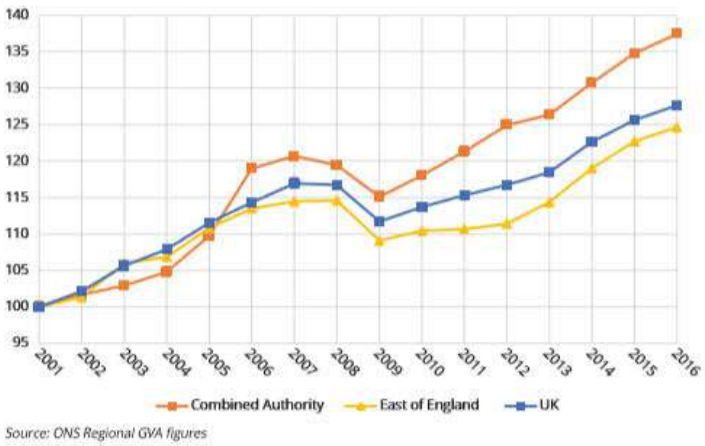


Figure 12. Change in Real Gross Value Added (GVA) – Index 2001 = 100.

Source: Cambridgeshire and Peterborough Independent Economic Review

A further reason for the success of the business environment is the quality of the local labour force. In a piece of qualitative research commissioned for CPIER, PwC and Cambridge Ahead surveyed businesses to get their views on what was important to them in the area. 45% of business surveyed stated that the quality and availability of

the local labour force was either very important or critically important. To understand long-term employment growth, the CPIER looked at different scenarios to assess the impact of different levels of employment growth in the area. The base case was developed in line with anticipated housing delivery as set out in the Local Plans and infrastructure being upgraded based on current trends. The figures below are taken from this assessment and show forecasts for two growth scenarios; the first scenario is an extrapolation of short-term recent trends (2011-2019) to longer term; the second scenario considers the effect of additional business costs that arise from high employment growth.

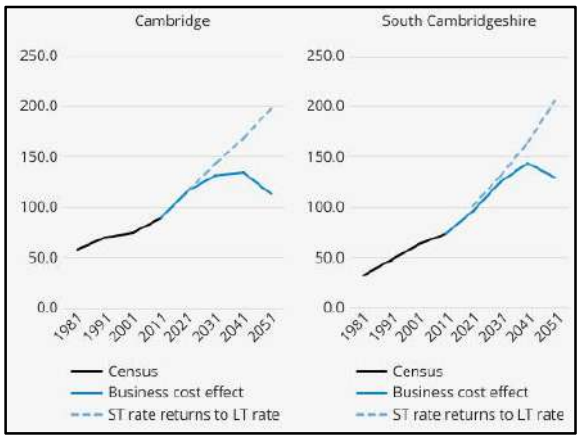
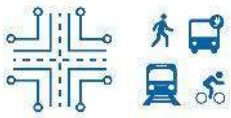


Figure 13. Employment growth scenarios[20]

Negative side effects of high employment growth include the need to pay employees more, in order for them to afford housing costs, and lengthy commutes. When business cost effects are included in the model, employment growth begins to slow by 2021, and is expected to reverse beyond 2031. The CPIER concluded that, at this point businesses would start shrinking and moving away from the area, as the Cambridge area will become unsustainable for business economy. Lower value firms may leave the area hollowing out supply chains whilst high value firms would leave the UK entirely, as the unique qualities of the Cambridge area in terms of the quality of local labour and business to business relationships would no longer be as strong. The key recommendation of this assessment is to invest in infrastructure and housing above what is planned to prevent this scenario happening.

Problem 2 – Lack of Infrastructure	
	Lack of infrastructure to sustain the current growth of Cambridge is a key contributor to the likely future impact on business costs, with conditions on the A10 restricting the full build out of housing at Waterbeach New Town. Without intervention this will make it more difficult for growing firms in Cambridge to recruit and retain the people they need.

The A10 Corridor area

The A10 corridor lies on the edge of the Greater Cambridge and the Fens economies areas. Here, three key economy sectors have been identified within the area: tourism, agricultural and technology.

Ely is a small city and the main market town in East Cambridgeshire. With its wealth of history, Ely is an important tourist destination for day trips. Ely is a compact city, with the medieval town layout still clearly evident. The city centre's economy remains relatively healthy, with a good mix of retail, commercial and leisure, although some uses are in need of updating or expansion. However, the historic fabric limits opportunities for new development in the central area; forcing developments to the 'edge of centre'. Ely has an Enterprise zone in it, located on the corridor. Due to the shortage of high-quality office jobs, residents in Ely often find their workplace in London, Cambridge or South Cambridgeshire. This results in a significant imbalance between homes and jobs, with a high number of commuters leaving Ely to work. These findings are supported in section 2.3.7, where travel to work figures from East Cambridgeshire into Cambridge had increased from Census 2001 to 2011 by 16%.

[20] Figure 15 – Rising business costs damage employment growth, extracted from CPIER

The A10 corridor lies within the south of The Fens, an area of rich farmland where farming has played a central role in its history. Due to the predominance of high-quality land, farms in the Fens are exceptionally productive and are famous for producing large quantities of vegetables, wheat, potatoes and sugar beet as well as ornamental plants such as daffodils. This activity, and the advantage of world leading research institutes, is attracting global agri-tech Innovation Hubs. These hubs act as a catalyst for the region's agri-tech cluster, showcasing relevant new research, technology and innovation to farmers, producers and processors. These hubs also assist to secure the region's future as Britain's leading bio-tech economy. Furthermore, Cambridge is home to The National Institute of Agricultural Botany (NIAB) a major international centre for plant research, crop evaluation and agronomy. Cambridge is also home to leading agri-tech organisations, namely The Sainsbury's Laboratory, Bayer CropScience, and John Innes Centre.

Cambridge is the site of the world-leading University of Cambridge and Anglia Ruskin University, and possesses a thriving knowledge economy. As well as being a major employer in its own right, the university sector generates associated business activity of exceptionally high value through spin-off technology enterprises located at the science and business parks located to the north of the city and in South Cambridgeshire, at the Cambridge Biomedical Campus to the south of the city, and at other locations in the sub-region.

These digital and life science businesses make Cambridge a major centre for employment in the technology sector across the UK, and indeed across Europe, with major businesses such as Acorn Computers (and the related microprocessor designer ARM), Solexa, Raspberry Pi, and Darktrace having emerged there since the late 1970s, and global tech companies such as Amazon and Apple establishing a presence in the city. Cambridge also has a strong business and management sector which has grown up around the universities and technology businesses.

Over time, business clusters have emerged beyond Cambridge along the A10 corridor. Cambridge Research Park, north of Waterbeach, hosts companies from knowledge intensive industries supporting scientific and medical research as well as technology manufacturers, professional services and catering. Figure 14 below illustrates the location of key employments sites along the corridor.

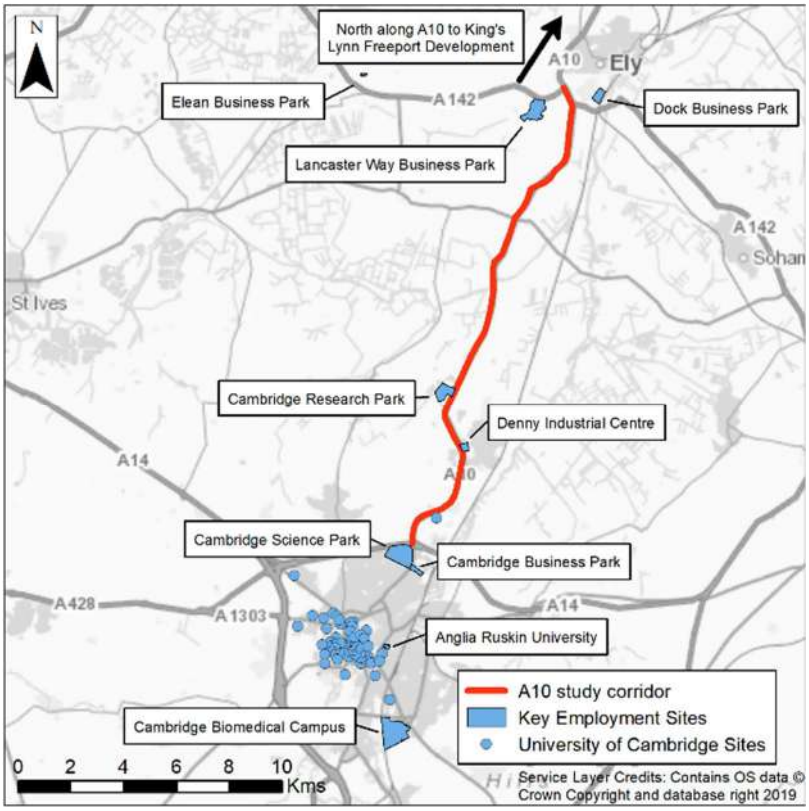


Figure 14. Location of key employment sites along the A10 corridor

Finally, the A10 corridor forms part of the direct route between London (via the M11 and A14), Cambridge and King's Lynn. King's Lynn is the economic driver for the King's Lynn and North West Norfolk area, due to its port and the economy activity around it. King's Lynn port is categorised as minor port, with cargo volumes below 1million tonnes annually. Much material traded in the port is related to agri-bulks, and recent years steel or scrap has also increased substantially. This economic importance is reflected within the King's Lynn and North West Norfolk Local Plan, where most growth will be located within or adjoining this town.

In addition to the strategic link to the King's Lynn port, the A10 is also used as a route to reach North Norfolk, where this area is known as a holiday destination with numerous holiday cottages and beaches. This tourism driven travel is likely to add pressures to travel on Thursday and Friday evenings, as well as at weekends and bank holidays.

Opportunity 2 – Spread economic growth north along the corridor to Ely and beyond
 The A10 serves both the Greater Cambridge and The Fens economies. The region has outperformed the rest of the England and there is an opportunity to spread the benefits of rapid business creation and growth experienced in Cambridge to areas along the A10 corridor including Waterbeach, Ely, the Fens and West Norfolk, where there is already established business agglomeration, through improved connectivity.
Opportunity 3 – Opportunity to benefit businesses along the A10 through improved connectivity and journey time reliability
 Opportunity to benefit businesses along the A10 through improved connectivity and journey time reliability.

Growth constraints within Cambridge

The detailed evidence base created for the CPIER shows that Cambridgeshire has specialism in knowledge-intensive business. These businesses have a focus on the creation of new knowledge (research) and the commercialisation of it at their centre. If a knowledge intensive company is forced to move away from the sphere of clustering activity, it is likely to relocate to another cluster, rather than stay in the local area. For some of these knowledge intensive sectors, Cambridge is the only viable cluster in the UK and therefore these businesses would be more likely to move abroad than to relocate to another part of the UK. As part of the CPIER, a qualitative survey was undertaken by PwC and Cambridge Ahead to understand the views, issues and concerns of businesses within the Combined Authority area. Results from the qualitative survey show that a high proportion of the business would move activity abroad to elsewhere in Europe if they are unable to grow at their current locations.

It is also believed that companies may be deterred from setting up in the area if they do not believe suitable housing will be available for the workers they require. 45% of the business surveyed for the CPIER stated that the quality and availability of the local labour force was either very important or critically important. One respondent to the qualitative survey commented:

"It is definitely an attractive location, but access to affordable housing and extended commuting times need to be addressed or talented people will have to go elsewhere."

Another commented similarly:

"Cambridge is very attractive but very few new staff can afford to live there, which makes it potentially unsustainable in the longer term."

In total, 44.5% of respondents described 'Affordable housing for employees' as a moderately significant or very significant limitation on company growth.

Problem 3 – Labour Supply	
	The Combined Authority wishes to double the economy and productivity over the next 25 years. However, housing issues are likely to constrain future growth and productivity if nothing is done. Companies are experiencing difficulties in hiring and retaining talent due to the high cost of living in areas within a reasonable commuting time to Cambridge. There is evidence that foreign firms and knowledge-intensive businesses are mainly interested in Cambridge as their UK base, and in some cases, Cambridge is their Europe base. Therefore, there is a risk of these foreign companies leaving the country for other European cities if they are not able to grow within this area., with a consequent negative economic impact on UK plc.

2.3.5 Educational and skills attainment

Residents of the Combined Authority area tend to reach a higher level of education than the rest of the UK, with approximately 30% of the population holding Level 4 qualifications and above, compared to the England average of 27%[21]. However, levels of educational attainment vary widely across the Combined Authority. Most of those with Level 4 qualifications live in Cambridge and South Cambridgeshire, where 47% and 40% of the population over 16 respectively hold Level 4 qualifications and above. Conversely, in Fenland 31% of the working population hold no qualifications.

The Cambridgeshire and Peterborough Local Transport Plan seeks to support and ensure that residents across the region have access to educational opportunities, providing transport opportunities and ensuring individuals have access to jobs for which they are appropriately qualified. This will allow wider and more effective contribution to the local economy. As CPIER noted, local businesses value having quality local labour easily accessible.

The Combined Authority's skills strategy supports a local skills system that is world-class in matching the needs of employers, learners and communities. The principles of the strategy include simplifying access to skills support for employers and learners and tailoring interventions to appropriate geographies, sectors and learners through the development of the Progression and Apprenticeship Market Place, the new University of Peterborough and Adult Education Budget (AEB). The strategic priorities are ensuring local provision that is matched to industry need, making sure people are work-ready, raising aspirations, and influencing choices.

2.3.6 Indices of Multiple Deprivation

There are wide disparities between life outcomes across different parts of Cambridgeshire. Fenland and East Cambridgeshire, for example, lag well behind the Cambridge city average for incomes, and have higher levels of deprivation than most other parts of the county, as illustrated in Figure 15. Local policy seeks to ensure that these areas can share in the success of the activity clustered in and around Cambridge.

[21] Source: Highest level of qualification by age (ONS, 2011) https://www.nomisweb.co.uk/query/construct/summary.asp?menuopt=200&subcomp=

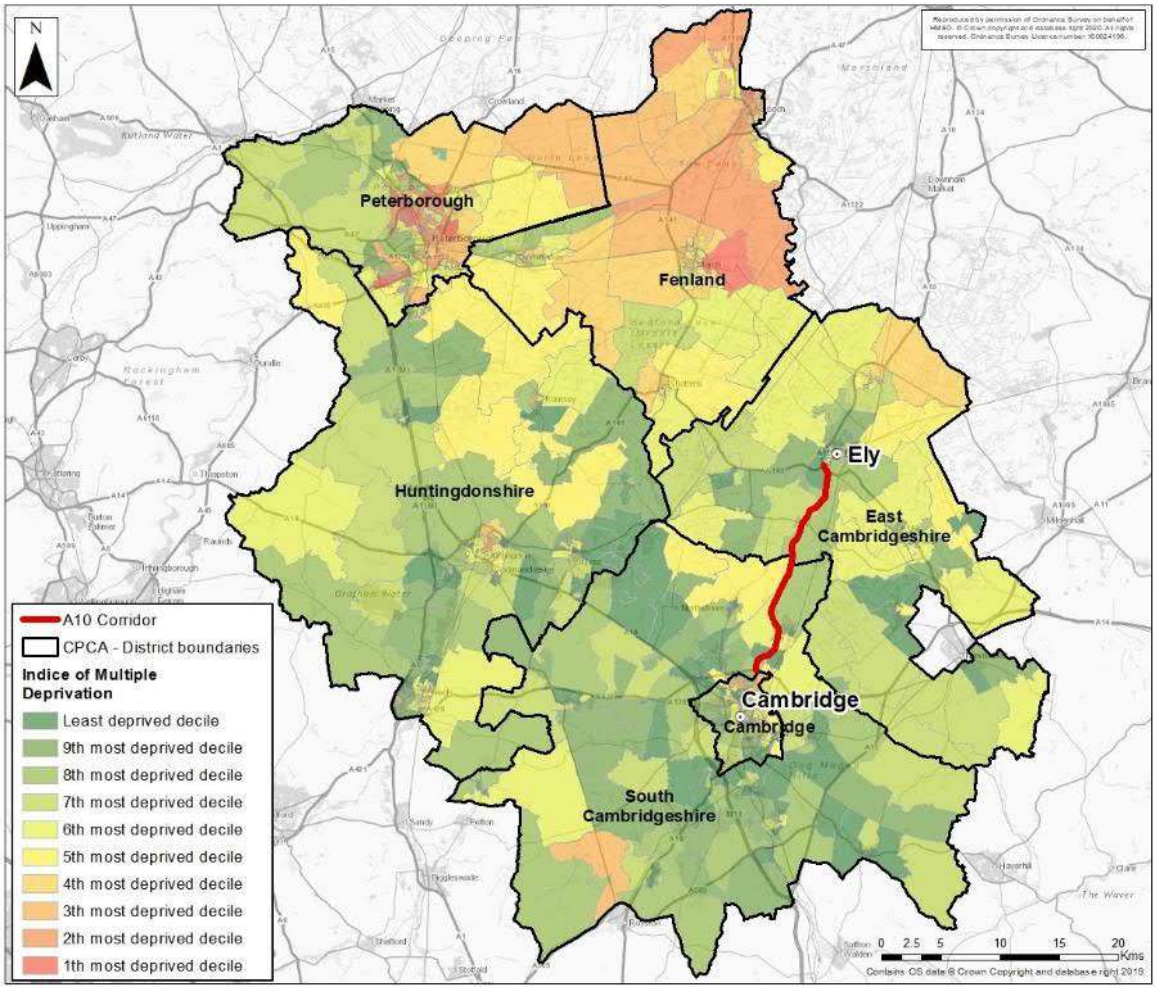


Figure 15. Indices of Multiple Deprivation[22] across Cambridgeshire & Peterborough

2.3.7 Car ownership and travel to work

The travel to work catchment for Cambridge has increased markedly, such that it is now not uncommon for workers to commute to Cambridge from towns and villages around Norfolk, Suffolk, Hertfordshire, Essex, and even the north of London. At the same time, there is continued growth in commuting from the surrounding districts of Cambridgeshire which have always supplied the city with workers.

The trend in the level of commuting has been assessed by comparing census travel to work between the most recent census years, 2001 and 2011. These provided the most recent available detailed breakdowns of commuter travel by location and mode. To enable comparison between the two datasets, the data was extracted at local authority district level, selecting as destination or place to work, Cambridge, and as origin or location of usual residence those districts that are likely to use the A10 to travel to work: East Cambridgeshire and King's Lynn and West Norfolk. South Cambridgeshire has not been included because it covers all corridors into Cambridge and not just the A10.

Table 7 below shows an increase in the total number of people that travelled to work to Cambridge of 1,072 between 2001 and 2011. This involved a 16% increase in commuters for East Cambridgeshire and a 22% increase in commuters from King's Lynn and West Norfolk. By method of travel or mode share, the greater increase related to the use of train from both districts, but a more substantial change in commuters from East

[22] English indices of deprivation, index of multiple deprivation (IMD) 2019

Cambridgeshire. Single occupancy vehicle usage from East Cambridgeshire also increased albeit at a lower level of growth than rail, both in absolute and percentage terms. Car use declined from King's Lynn and West Norfolk, reflected in the mode shift to rail.

Table 7. Cambridge commuter inflow through A10. Source: Census 2001 and 2011 Travel to Work

	Origin: East Cambridgeshire				Origin: King's Lynn and West Norfolk			
Method of travel to work	2001	2011	Variance	% Variance	2001	2011	Variance	% Variance
Train	420	1,173	753	179%	134	247	113	84%
Bus, minibus or coach	401	315	-86	-21%	0	3	3	-
Driving a car or van	4,761	5,078	317	7%	245	222	-23	-9%
Passenger in a car or van	425	368	-57	-13%	20	13	-7	-35%
Other method of travel to work	218	272	54	25%	9	14	5	56%
Total	6,225	7,206	981	16%	408	499	91	22%

The output of this analysis reflects a trend towards more and longer-distance commuting from districts north of the study area to Cambridge, with greater use of rail, and for medium distance journeys from East Cambridgeshire at least, an increase in highway users. This has led to increased pressure on the A10, the radial highway of Cambridge and public transport connections into Cambridge, leading to increases in journey times, reductions in journey time reliability, and increases in crowding.

These issues not only lead to frustration and delay for those travelling in the affected areas but at the extreme could lead to an inability to efficiently deliver employees to their places of work that may also threaten the county's otherwise strong prospects for growth.

In addition to the above, an analysis of the Census 2011 travel to work data at MSOA level has been carried out to understand the commuting inflow through A10 to Cambridge and the surrounding ring area of South Cambridgeshire. Using MSOAs has allowed a better understanding and accuracy of the likely use of the A10 section by commuters from the north, by excluding from the analysis areas such as Soham or Newmarket that are not likely to have a lot of commuters using the A10 to get to Cambridge. Table 8 summarises by mode the estimated numbers of people commuting along the A10 to Cambridge and surrounding areas in South Cambridgeshire.

Table 8. Commuters inflow through A10 (Source: Census 2011 Travel to Work at MSOAs level)

Method of travel to work	East Cambridgeshire	King's Lynn and West Norfolk area	Total
Train	1,140	260	1,400
Bus, minibus or coach	159	3	162
Driving a car or van	3,865	366	4,231
Passenger in a car or van	288	19	307
Other method of travel to work	163	16	179
Total	5,615	664	6,279

Figure 16 summarises the method of travel to work or mode share. Car accounts for a high proportion of the mode share, followed by train with a 22% share, mainly due to the high train frequency between key settlements in East Cambridgeshire and Cambridge. Other public transport (bus, minibus or coach) has a minimal share of 3%.

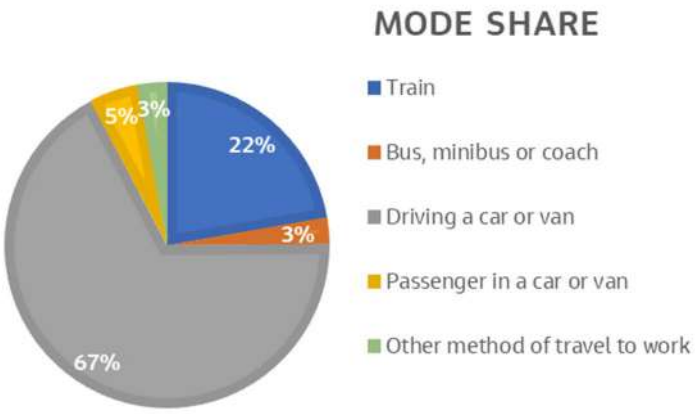


Figure 16. Mode share through A10 (Source: Census 2011 Travel to Work at MSOAs level)

2.3.8 Climate Change and Environment

As noted in Section 2.2, the Cambridgeshire and Peterborough Local Transport Plan (LTP) includes an environmental goal to achieve its overall vision. This goal seeks to preserve and enhance our built, natural and historic environment and implement measures to achieve net zero carbon. Building on this goal, it includes specific environment and climate objectives, namely:

- Climate Change - Reduce emissions to 'net zero' by 2050 to minimise the impact of transport and travel on climate change
- Environment - Deliver a transport network that protects and enhances our natural, historic and built environments

A summary of climate change and carbon issues and opportunities below is followed by a summary of environmental issues and opportunities.

Climate Change and Carbon

The LTP notes that road transport is the highest contributor of carbon dioxide emissions of any sector in the region. The Combined Authority launched an independent Climate Change Commission in June 2020. The Mayor appointed Julia King, Baroness Brown of Cambridge, as the chairman of the commission. The commission will conduct analysis, identify challenges and opportunities and make recommendations on how the region can mitigate climate change and adapt to its impact and look at what actions are necessary to reduce carbon emissions to zero by 2050.[23]

The LTP's journey to net zero carbon emissions by 2050 is supported by guided principles, namely:

- integrating spatial planning and reducing the need to travel;
- providing attractive alternatives to driving – 'mode shift';
- preparing for the future of mobility;
- greening our transport infrastructure;
- supporting social mobility and access to opportunity for all; and
- protecting and increasing biodiversity.

[23] https://cambridgeshirepeterborough-ca.gov.uk/news/starting-gun-fired-on-regions-own-climate-change-strategy-to-eradicate-emissions-by-2050/, accessed 15 July 2020

In parallel to the A10 project, project partners are progressing a range of initiatives to encourage and embed low / zero carbon transport. As both these and the A10 scheme develops there may be an opportunity to provide integration.

- The Cambridge Autonomous Metro (CAM) will be an expansive metro-style network using electric rubber-tyred vehicles that connects regional settlements, major city fringe employment sites and key satellite growth areas across the region. The proposed network includes a section to link Waterbeach New Town with Cambridge, assisting to reduce the traffic pressure on the A10. An OBC is under development taking on board public consultation for the City Tunnel Section and surface sections completed in April 2020.
- Waterbeach station relocation to be closer to the new town north of Waterbeach and rail-based park and ride (200 spaces).
- Local bus services planned for Waterbeach New Town, to ensure appropriate bus priority and ease of access to the New Town and surrounding trip attractors.
- "Greenways": commuter cycle routes from surrounding towns and villages within a ten-mile radius. In particular, there is a proposed 8 km Waterbeach greenway route to enable cyclists, walkers and equestrians to travel sustainably from Waterbeach into Cambridge. This route was assessed as a number one priority due to its high cost benefit and its strategic fit with Waterbeach development, among others. In February 2020, after public consultation, the Executive Board took the decision to proceed with the Waterbeach Greenway and approved an outline budget of £8 million.
- Continued policy support for the introduction of the necessary parking and charging infrastructure to support electric vehicle use on a wider scale.

Doubling Nature Policy[24]

'Natural Cambridgeshire' is the Local Nature Partnership for Cambridgeshire and Peterborough. In 2019, Natural Cambridgeshire released its vision for the Natural Future of Cambridgeshire and Peterborough in 2050. Whilst the region has a number of attractive areas and designated areas for wildlife, the area is also characterised by substantial swathes of farmland with relatively low biodiversity and low tree cover. As one of the driest areas of the country with limited water resources, yet also at risk of surface water and tidal flooding, the area faces significant challenges in securing a sustainable future.

'Doubling Nature - A Vision for the Natural Future of Cambridgeshire & Peterborough in 2050' sets out Natural Cambridgeshire's vision that by doubling the area of rich wildlife habitats and natural green-space, Cambridgeshire and Peterborough will become a world-class environment where nature and people thrive, and businesses prosper.

A partnership delivery plan is being developed to achieve the ambition of doubling nature and natural green space across Cambridgeshire and Peterborough.

Cambridgeshire's Local Flood Risk Management Strategy 2015 – 2020[25]

This sets out the roles and responsibilities of flood risk management partners within the County, highlighting the position of the County Council as the Lead Local Flood Authority under the Flood and Water Management Act 2010. There are 5 key objectives within the strategy:

- Understanding flood risk in Cambridgeshire;
- Managing the likelihood and impact of flooding;

[24] Doubling Nature - A Vision for the Natural Future of Cambridgeshire & Peterborough in 2050', Natural Cambridgeshire, 2019
[25] Multiple Authors (2015) Cambridgeshire's Local Flood Risk Management Strategy 2015 – 2020, https://www.cambridgeshire.gov.uk/asset-library/cambridgeshirestrategyforfloodriskv1.pdf, accessed June 2020

- Helping Cambridgeshire's citizens to understand and manage their own risk;
- Ensuring appropriate development in Cambridgeshire; and
- Improving flood prediction, warning and post flood recovery.

Through these key objectives, the strategy aims to coordinate, minimise and manage the impacts of flooding within Cambridgeshire. The strategy also explains the various funding avenues for flood risk management activities and emphasises the need for local partnership and contributions in delivering local flood schemes.

Environmental constraints

The existing A10 between Cambridge and Ely passes through typically flat open countryside consisting of mainly agricultural land with some small settlements and isolated properties along the route. There are designated sites for heritage for example, associated with the Roman period and nature conservation particularly around the River Great Ouse. Noise from traffic on A10 has also led to the designation of a number of Noise Important Areas.

In developing the SOBC, we have identified environmental constraints as shown in the constraints plan (Appendix A). We anticipate that A10 options would impact few designated nature conservation sites. For options that would involve widening the existing A10 key considerations include private and commercial properties which may be affected by noise, loss of land, changes to access or even potentially demolition. For options that would involve a new road away from the existing A10 key considerations include loss of land, visual effects and effects on biodiversity. These are summarised in the table below with further detail for specific constraints in Table 9 and the supporting Environmental Report (Appendix B).

Table 9: Identified environmental constraints most relevant to the options

Potential design components	Key constraints									
	Loss of land for residential & commercial property	Loss of agricultural land	Flood risk	Noise to properties	Cultural heritage assets	Buried Archaeology	County designated Wildlife sites	Internationally designated nature conservation sites	Protected species	Tree loss
Junction upgrades	✓			✓	✓	✓			✓	✓
Widening the existing A10	✓		✓	✓	✓	✓	✓	✓	✓	✓
New road away from existing A10		✓	✓	✓		✓	✓	✓	✓	

Further Details for specific key constraints:

- Flood Risk: The proposed scheme could be at risk of flooding and / increasing flood risk elsewhere. There are areas of flood zones 2 (1 in 1,000 annual probability of river flooding) and 3 (1 in 100 or greater annual probability of river flooding) either side of the existing A10.
- Noise to properties: Noise Important Areas (NIA) identify areas where residential properties are affected by road noise. This can be due to factors such as the presence of junctions or congestion during peak hours. There are a number of NIA along the existing A10.
- Cultural heritage assets: These are considered to be irreplaceable buildings, monuments, and/or settlements that contribute to a nation's society, knowledge and/or culture. There are listed buildings and scheduled monuments alongside the existing A10.
- Buried Archaeology: Buried archaeology is either known or unknown archaeology. There is known archaeology alongside the existing A10 and a risk of unknown archaeology for all options.
- County designated wildlife sites: Wildlife sites which are of importance and value at a county level. This includes the River Great Ouse which would be crossed by all the road improvement options.
- Internationally designated nature conservation sites: Important European habitats and species designated through the through the European Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora 92/43/EEC. There are transient and resident harbour seals in the River Great Ouse which are protected by European legislation.
- Protected species: Plants and animal species such as bats, water voles, great crested newts and badgers which along with their habitats are protected by various legislation. There are likely to be protected species affected by all options.

As the scheme develops at OBC stage, environmental assessment will become more detailed with site surveys and modelling for flooding and noise being undertaken. Our design priorities will include:

- Reducing the loss of land as far as practical.
- Avoiding designated sites where practical.
- Ensuring that the design of the road fits within the landscapes through which it passes.
- Seeking to reduce the number of households affected by noise including avoiding road widening within Noise Important Areas as far as practical.
- Including measures to reduce the changes on flood risk.
- Protecting and enhancing protected species.
- Incorporating measures into the design to reduce the environmental effects including habitat creation to achieve the objective of: Biodiversity Net Gain. This could include consideration of a green corridor or off-site habitat creation.
- Integration of proposals to help achieve the objective of Net Carbon Zero. This could include measures such as innovative use of materials, sustainable and active travel, potential off-setting and wider carbon initiatives.

An environmental impact assessment will be completed to support an application for consent to build the scheme. This could include a Habitats Regulation Assessment, Water Framework Directive Assessment, noise modelling and flood modelling.

The following problems and opportunities are relevant to the environment.

Problem 4 – Climate Change and Environmental Quality	
	The Cambridgeshire and Peterborough Local Transport Plan sets out its ambition to reduce emissions to 'net zero' by 2050 to minimise the impact of transport and travel on climate change. Any solution for the A10 will need to proactively consider how it addresses this issue. Whilst the region has a number of attractive areas and designated areas for wildlife, the area is also characterised by substantial swathes of farmland with relatively low biodiversity and low tree cover. As one of the driest areas of the country with limited water resources, yet also at risk of surface water and tidal flooding, the area faces significant challenges in securing a sustainable future.
Opportunity 4 – Enhance environment through increasing biodiversity and by mitigating carbon impacts	
	Solutions for the A10 provide an excellent opportunity to increase the amount of land managed for nature through a combination of habitat corridors, habitat parcels and wetland. This will be explored in further detail at Outline Business Case stage as the solution definition matures. Carbon impacts may be mitigated through additional emphasis on sustainable transport and compensatory measures as the scheme design develops. This could include: ▪ Potential interfaces with the Greenways Programme (to be determined), providing segregated, dedicated routes for Non-Motorised Users. ▪ Potential interfaces with the electric battery powered Cambridgeshire Autonomous Metro (CAM) and local public transport (to be determined). ▪ Cater for and encourage uptake of Electric Vehicles through potential incorporation of charge-points and dynamic charging. ▪ Low carbon materials. ▪ Potential off-setting.

2.3.9 Transport and Movement Context

Strong transport connections link Cambridge to the county beyond

As Section 2.3.4 noted, the Greater Cambridge economy and to a lesser extent the Fens economy are of great relevance to transport connectivity within the study area. Cambridgeshire is relatively well served by public transport infrastructure. These links ensure that key employment zones can be readily reached by those living across the county, as well as by those living in Cambridge and its vicinity. Figure 17 shows the railway and main road connections in the study area.

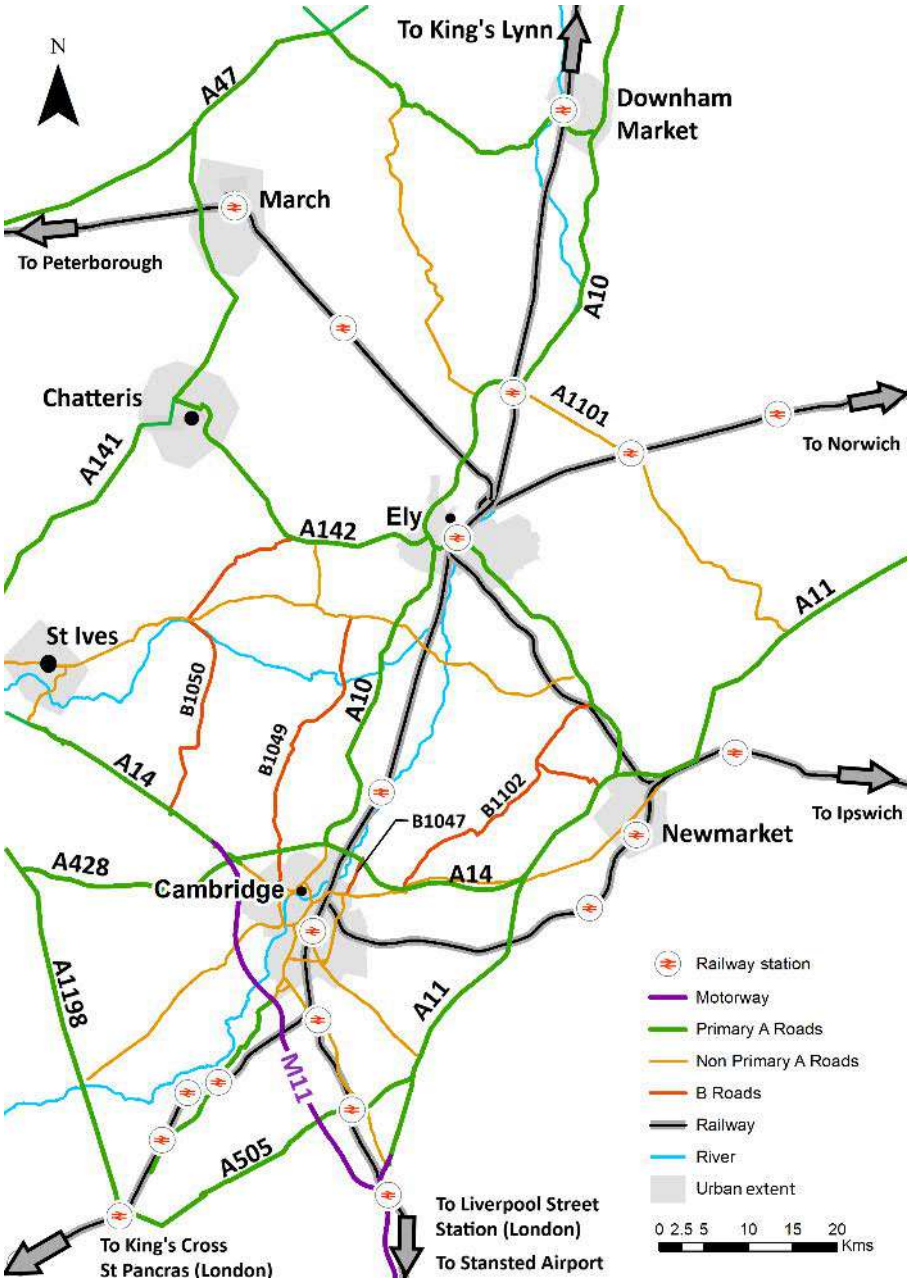


Figure 17. Strategic Network

It should be noted the data presented in the remainder of this section is the correct information up to early 2020, due to the COVID disruption this data may change during and post the COVID Disruption (e.g. bus and rail timetables and services).

Rail

Rail routes and connections north/south provide good national links to the north and south with these less satisfactory for east-west journeys. Capacity constraints at Ely junction affect the ability to increase services on many routes.

Cambridge railway station has direct links to key regional destinations Peterborough, Kings Lynn, Norwich, Ipswich, Stevenage, Newmarket, Ely, March and Stansted Airport, as well as frequent services to London Liverpool Street and London Kings Cross, and an hourly service to Birmingham. Cambridge railway station is the busiest in the East of England and was used by 11.98 million passengers in 2018/19; an increase of 450,000 passengers on the previous year. Railway stations along the A10 are among the busiest of the nineteen across the county: Cambridge, Ely and Cambridge North are among the top five busiest in Cambridgeshire, while Waterbeach is in the top ten[26].

Cambridge North station, located approximately 3 km to the north east of the city centre, opened in May 2017. As well as serving local residents it gives access from across the county and beyond to employment opportunities at Cambridge Science Park, and the Cambridge Business Park, both of which are nearby. The station is accessible by people cycling and walking and includes parking for 1,000 cycles. There are 450 parking spaces, supporting park and ride journeys from across the surrounding area. In 2018/19 813,000 passengers used the station up from 489,000 in 2017/18.

Waterbeach station is only served by trains between London, Cambridge, Ely and King's Lynn. A small decline in patronage was reported between 2017/18 and 2018/19 with a fall of 22,000 passengers to 408,000.

Ely Station, some 25km north of Cambridge, is served by direct trains to regional destinations including Cambridge, Stansted Airport, London, Ipswich, Norwich, King's Lynn, Peterborough, Leicester, Birmingham, Nottingham, Sheffield, Manchester and Liverpool. It also provides interchange between regional and local rail routes. The ORR data shows an increase in passengers from 2.28 million in 2017/18 to 2.39 million in 2018/19.

In summary Cambridge North and other rail industry trends have resulted in an increase in rail usage in the study area, with growth at all stations except for a modest decrease in usage at Waterbeach.

Bus

Figure 18 and Table 10 presents an overview of the bus routes that operate along parts of the A10 between Ely and Cambridge. Overall, services are irregular with some routes only operating once a day. There are currently no coach services along the A10.

The key bus service for the entire corridor is X9/9/9B, which is a commercially operated route provided by Stagecoach on an hourly basis. Waterbeach village is a key local market, and the overall route has undergone several changes in recent years which underlines its relative marginality in viability terms due to the sparse rural areas it serves.[27]

[26] Source: Office of Rail and Road statistics, 2019
[27] Peter Brett Associates (2018). Waterbeach Barracks and Airfield - Transport Assessment Addendum, p21

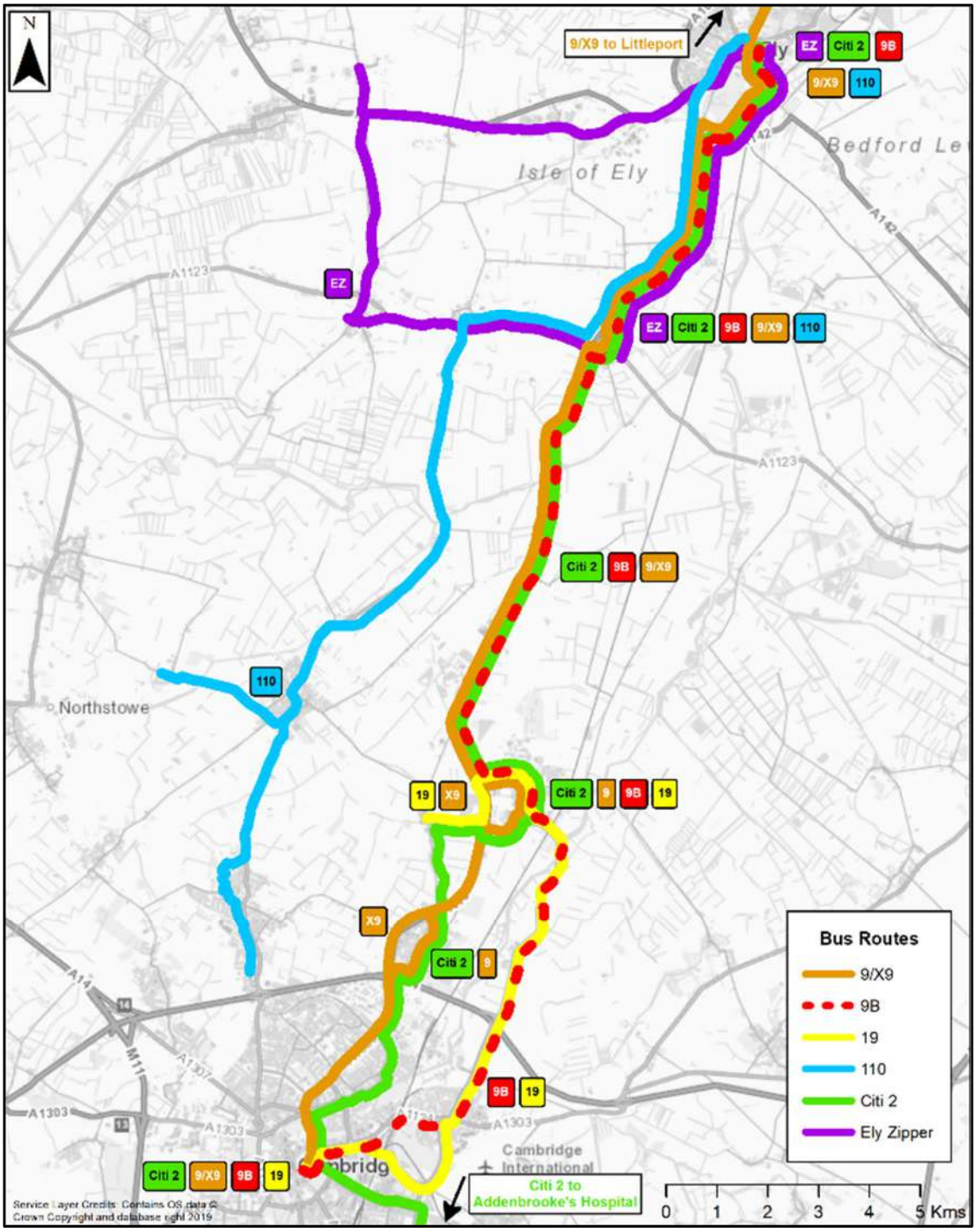


Figure 18. Overview of the bus routes that serves the A10 study corridor

Table 10: Bus routes serving A10

Route	Origin/Destination	Operator	Frequency
9	Cambridge Bus Station to Littleport via Ely	Stagecoach	Hourly services between approx. 9am to 7pm. Two early morning services
X9	Littleport to Cambridge, Drummer St Bus Station	Stagecoach	Weekdays - Ely to Cambridge- 3 morning and 1 evening service Cambridge to Ely - 3 early evening services Saturday - 1 morning service
9B	Cambridge Bus Station to Ely Market Street	Stagecoach	1 evening service with only one direction from Cambridge to Ely, Monday to Friday
Ely Zipper	Witcham, Haddenham, Wilburton, Stretham, Ely	Dews Coaches	Hourly service between 13:30 to 18:30.
Citi 2	Cambridge, Milton, Landbeach, Waterbeach, Stretham, Ely	Stagecoach	1 early morning service between Ely and Cambridge. 1 morning service between Waterbeach to Cambridge
19	Landbeach to Cambridge	Stagecoach	1 morning service
110	Ely, Cottenham, Impington	Big Green Bus Company	1 midday service

The B1049 runs parallel to the A10 to the west through the villages of Histon, Cottenham and Wilburton. It is served by route 110 between Ely, Cottenham and Impington which is operated by the Big Green Bus Company. The B1049 is also served by route Citi 8 hourly between Cottenham, Histon, Impington and Cambridge which is operated by Stagecoach. This service runs every hour terminating at Cottenham with one service from March in the morning and one returning in the evening.

Bus services are heavily impacted by congestion along the A10 between Ely town centre and Cambridge Drummer Street bus station. The impact of congestion along the A10 is reflected in the variation in bus journey times between the peak and off-peak periods. During the morning peak, the bus journey between Ely and Cambridge may take around 1 hour 20 minutes, whereas in the off-peak period it can be expected to take 45 minutes. More recently, COVID 19 has also impacted the frequency and capacity of bus services.

Early development at Waterbeach New Town results in the need for the developer to support enhanced local bus services. This is expected to include the extension of Milton Park and Ride services (current services are discussed below) with a temporary park and ride at Waterbeach New Town to intercept trips from the A10; and the provision of new services between Cambridge Research Park, Waterbeach New Town and Waterbeach station. It is expected that services to Cambridge would operate via Landbeach to avoid significant levels of congestion on the A10, thereby offering new residents with a high quality, high frequency, fast and reliable service to Cambridge city centre.[28]

The Cambridgeshire Guided Busway opened in 2011. It includes a mix of on road sections in central Cambridge and established settlements such as St Ives and Huntingdon, with dedicated guideway sections. A 10-minute frequency service is provided between Cambridge station and St Ives from circa 7am to 8pm made up of alternate Cambridge to Huntingdon and Trumpington Park and Ride to St Ives services. One bus an hour also serves Cambridge North station in each direction. The service connects key service and employment centres such as Addenbrooke's Hospital, Cambridge Science Park, Cambridge Regional College with Cambridge station, as well as also serving the planned new town of Northstowe. Whilst no services along the A10 corridor itself use the Guided Busway, it is an important means of providing commuters and business travellers to the Cambridge Science Park with a high quality alternative to the private car.

[28] Peter Brett Associates (2018), Waterbeach Barracks and Airfield Transport Assessment Addendum, p22

Park & Ride

Figure 19 presents the park and ride services in the study area. A park and ride service operates from Milton, based just north of the A10/A14/Milton Road Interchange. The bus service travels into central Cambridge via Milton Road, A1134, Victoria Avenue, Emmanuel Road, St Andrews Street, Park Terrace, East Road then back to the car park via Milton Road. The car park has 792 spaces of which four have electric vehicle charging infrastructure. Covered cycle parking is also provided. A footbridge over the A10 connects Milton with the Park and Ride site at Butt Lane, although cyclists need to dismount. The bus takes 15-20 minutes to get to Cambridge City Centre, and it operates every 10 minutes Monday to Saturday, with the first bus departing Milton P&R at 06:21 and the last departure from Cambridge City Centre is at 20:39. On Sundays, the service operates every 15 minutes, which begin at 09:00 with the final service returning from Central Cambridge at 18:35. Current charges comprise a return ticket to Cambridge for 2.60 GBP and free parking.

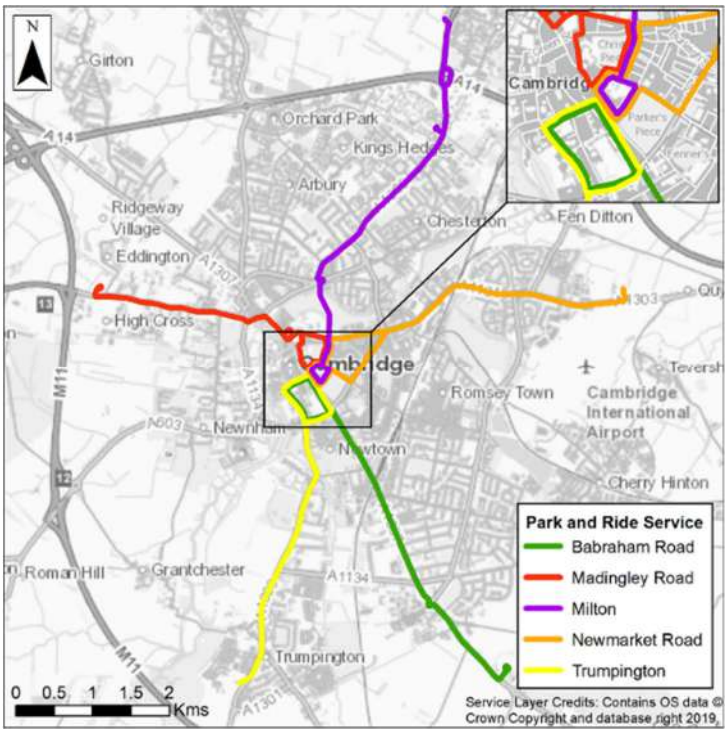


Figure 19 Park and Ride routes

Walking and cycling

The A10 corridor has some intermittent pedestrian infrastructure with this mainly found in the bypassed sections (such as in Milton village) and where there is residential ribbon development. Starting in the south of the corridor, a continuous footway is provided on the High Street through Milton village. This connects to Cowley Road in the north of Cambridge with a bridge over the A14. In the north of Milton, a narrow footway is found on the eastern side of Ely Road and the A10 from where Ely Road meets the bypass to provide connectivity to Waterbeach. There is then a footway on both sides of the A10 north of its junction with Waterbeach Road for approximately 400 metres, after which the footway is only on the eastern side of the carriageway. This remains until the start of the national speed limit section north of Waterbeach. There is a narrow footway on the eastern side of the carriageway through Chittering with some small breaks. Narrow footways are also found on the southern approach to the A10/A1123 Stretham Roundabout. A narrow footway resumes on the east side of the A10 at Little Thetford, continuing into Ely via Cambridge Road.

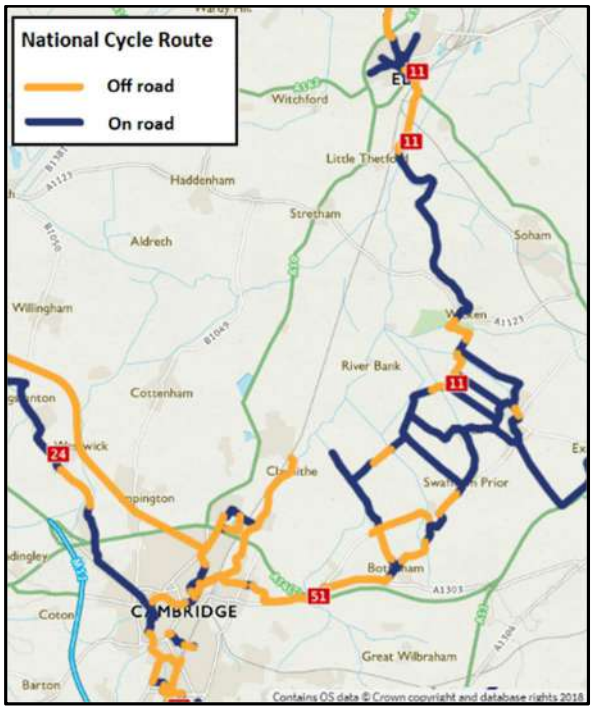


Figure 20 National Cycle Network routes. Source: Sustrans

The 2018 AADF records show a total of 11 pedal cycle counts daily average on the A10 in both ways, reflecting the lack of dedicated cycling infrastructure along the A10 itself. As an alternative, National Cycle Network Route 11 provides traffic-free cycling routes between Waterbeach and Cambridge and between Barway and Ely. When complete, Route 11 will connect Cambridge and Ely via Waterbeach. At present it is possible to cycle between Cambridge and Ely on the National Cycle Network by taking a section of Route 51 between Bottisham and Burwell. The distance between Cambridge and Ely along this route is approximately 22.3 miles, compared with 14.4 miles distance along the A10. The National Cycle Routes are presented in Figure 20 above.

Future plans for sustainable transport

Alongside this existing provision, the Combined Authority, Greater Cambridge Partnership and Cambridgeshire County Council are progressing plans for investment in public transport (Cambridgeshire Autonomous Metro), walking and cycling (Greenways), in addition to sustainable transport provision for the Waterbeach New Town being progressed by its developers. Section 2.4.6 provides details of these various initiatives.

Highway

Highway connectivity across the county is underpinned by a network of strategically important roads, many linking the city of Cambridge to important locations nearby – the M11 to Stansted Airport and London, the A14 to Huntingdon and Newmarket, the A10 to Ely and Royston and the A428 to St Neots for the A1 and A421.

The M11, A14 and A428 form part of the national Strategic Road Network managed by Highways England. Other than a section of the A428 between St Neots (A1) and Caxton Gibbet (A1198) these are all dual carriageway standard.

The A10 and A142/A141 form part of the Government's proposed Major Road Network (MRN). The broad principle of this new tier of road is to raise the standards of economically and regionally important roads in England that will join seamlessly with and complement the existing SRN (including roads such as the M11, A14 and A47).

The A10 between Cambridge and Ely forms part of the direct route between London (via the M11 and A14), Cambridge and King's Lynn. The A10 provides onward connections to the Strategic Road Network (A47 and A17) and primary routes (A142, A1122 and A148) within Cambridgeshire and Norfolk. The A10 also connects with locally important east-west routes such as the A1123 between Newmarket and St. Ives.

The A10 is a single carriageway road between Milton and Ely. The corridor is characterised by numerous private access points (for farms and private property) and junctions (largely priority junctions and roundabouts). These features have potential to cause delays when through-traffic is unable to overtake vehicles waiting to turn into side roads or slow-moving agricultural vehicles using the A10 as part of farming activities. Figure 21 illustrates an example.

Figure 21. Tractor slowing down traffic in A10 (photo taken during a site visit in early 2020)

The A10's junctions provide connectivity to communities such as Milton, Landbeach, Waterbeach, Stretham and Little Thetford; centres of employment such as the Cambridge Science Park and Cambridge Research Park; and the Milton Park and Ride site for Cambridge. At present, junctions such as Stretham, Denny End Road and Milton Park and Ride experiences long traffic queues during peak times as result of the junctions approaching their design capacity. During the pre-SOBC an analysis of the junction performance[29] along the A10 identified this situation will get worst in future years, due to the increase in the traffic demand.

The A142 runs in a broadly north-westerly direction from the A14 at Newmarket to Ely. The A142 Ely Southern Bypass opened in 2018 following DfT funding and allows east-west traffic to bypass a previous bottleneck associated with the level crossing at Ely station. The A142 shares a 500 metre section of the A10 between Angel Drove and Witchford Road roundabouts. The A142 then bypasses Witchford, Sutton, Mepal and Chatteris before joining the A141 for onward connection to March and the A47 at Guyhirn. The A142 experiences heavy congestion eastbound into Ely during the morning and evening peaks from Chatteris.

The A1123 is a cross-country route connecting Newmarket, Soham and Fordham with Wilburton, Haddenham, St Ives and Huntingdon. It intersects the A10 at Stretham with a roundabout to the west of the main village. The road is a single carriageway, surrounded by open fields along most of its length. This route provides a shorter but slower alternative to the A14 further south.

Parallel to the A10 are a series of secondary and unclassified roads, providing alternatives to the A10 for journeys between A14/Cambridge and the A1123 or A142 to the west of the A10. To the west the B1050 runs between the A14 at Bar Hill and the A1123 at Earith with onward connection to the A142 at Chatteris via the B1050 or at Sutton via the B1381.

[29] Ely to Cambridge Transport Study, A10 Junction Assessment Report (October 2018)

The B1049 runs between the A14 Histon Interchange and the A1123 at Wilburton with onward connection to the A142 at Witcham via the A1123 and the 2-mile long A1421.

The unclassified Clayhithe Road runs parallel to the A10 between the A14 at Fen Ditton (where it becomes the B1047 for onward connection to Cambridge) and Waterbeach via Horningsea. The Fenland environment east of the river Cam has resulted in few roads, with only the B1102 providing an alternative for journeys between Cambridge and the Fordham/Soham via the A10 and A1123.

2.3.10 Network performance

Vehicle mix on the A10

DfT Annual Average Daily Flow (AADF) data for 2014 to 2018 has been analysed for two permanent count sites, near Chittering (representing the northern section between A1123 and A142) and near Stretham (representing the southern section between A14 and A1123). Table 11 illustrates the results.

Table 11. Vehicle mix on the A10

Road name	Start Junction Road Name	End Junction Road Name	Direction of Travel	Two wheeled motor vehicles	Cars and taxis	Buses and coaches	LGVs	All HGVs	All Motor vehicles
A10	A1123 Stretham	A142 Ely	North	0%	78%	0%	11%	9%	100%
			South	1%	80%	1%	11%	8%	100%
			Both	1%	79%	1%	11%	9%	100%
	A14 (T) Milton	A1123 Stretham	North	2%	75%	0%	15%	8%	100%
			South	2%	77%	1%	13%	7%	100%
			Both	2%	76%	0%	14%	8%	100%
			TOTAL	1%	78%	0%	12%	8%	100%

The vehicle mix on the A10 is in line with the national average[30] across all road types for the same period. However, comparing against 'A' roads only, the A10 carries a higher proportion of HGVs, between 7% and 9% compared with a national average of 5%. This reflects the importance of the route for freight and agricultural vehicles. A specific ANPR survey could be carried out at the next stage of the project to capture more accurate data to further assess the use and impact of agricultural vehicles along this route.

Traffic demand

Available DfT AADF data for 2018 has been illustrated in Figure 22. This reflects the average two-way flow over the full calendar year.

Flows are higher on the A10 north of the A1123 at Stretham with this road providing connectivity to parallel B roads to the A10 to the south. Higher flows of 20,000 vehicles are experienced on the short section of the A10 between the A10/A142 Angel Drove and A10/A142 Witchford Roundabouts where east-west and north-south traffic mixes. It should be noted that there is no DfT data for the section of the A10 between Milton and Waterbeach.

[30] Road Traffic Estimates in Great Britain in 2018

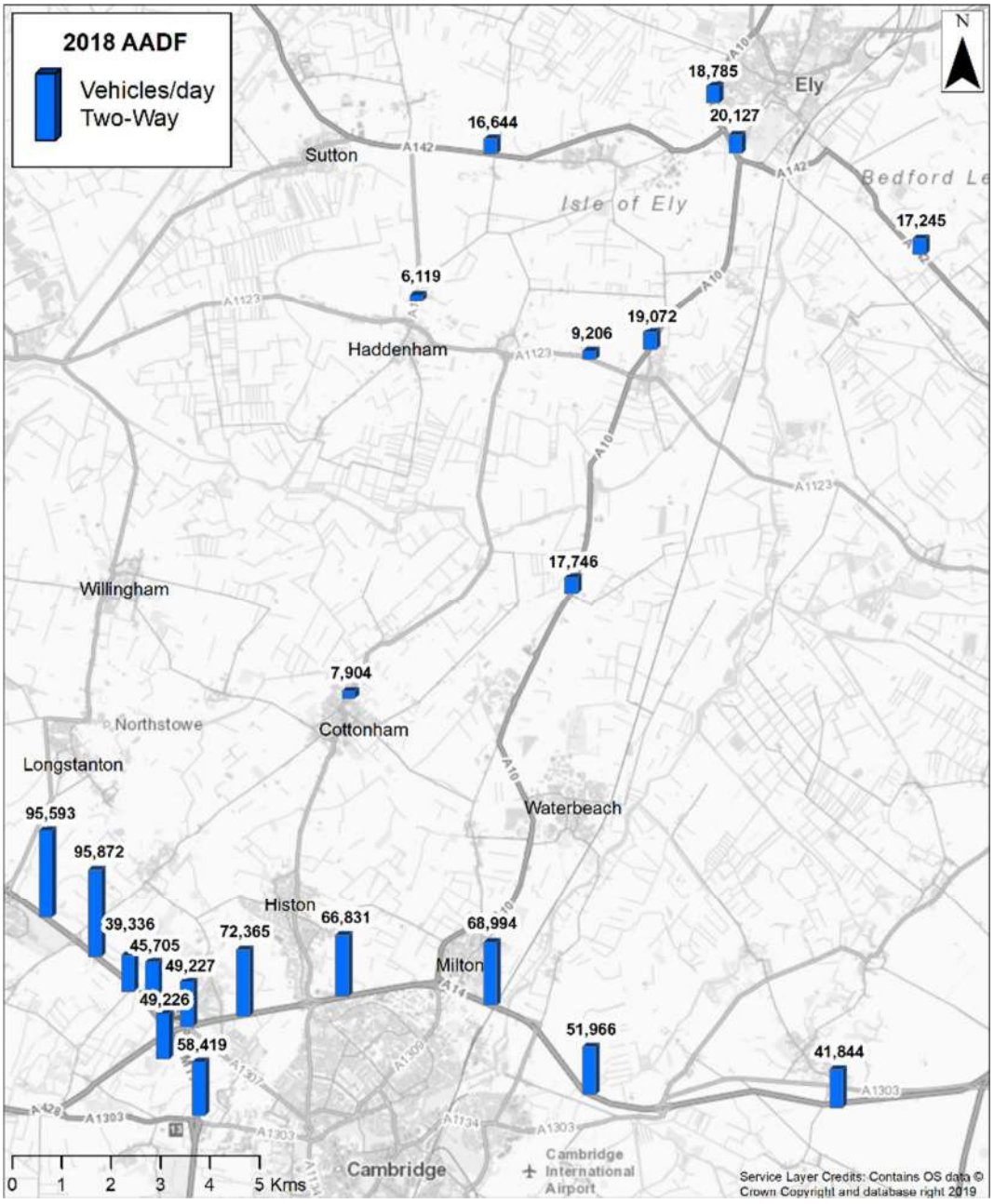


Figure 22. Annual Average Daily Flows 2018 (Source: DfT)

Figure 23 presents the modelled traffic volumes along roads in the study area for 2018 AM and PM peak periods. The plots demonstrate the high demand under the baseline scenario of the A10 based on outputs from the A10 Ely to Cambridge Model (A10E2C).

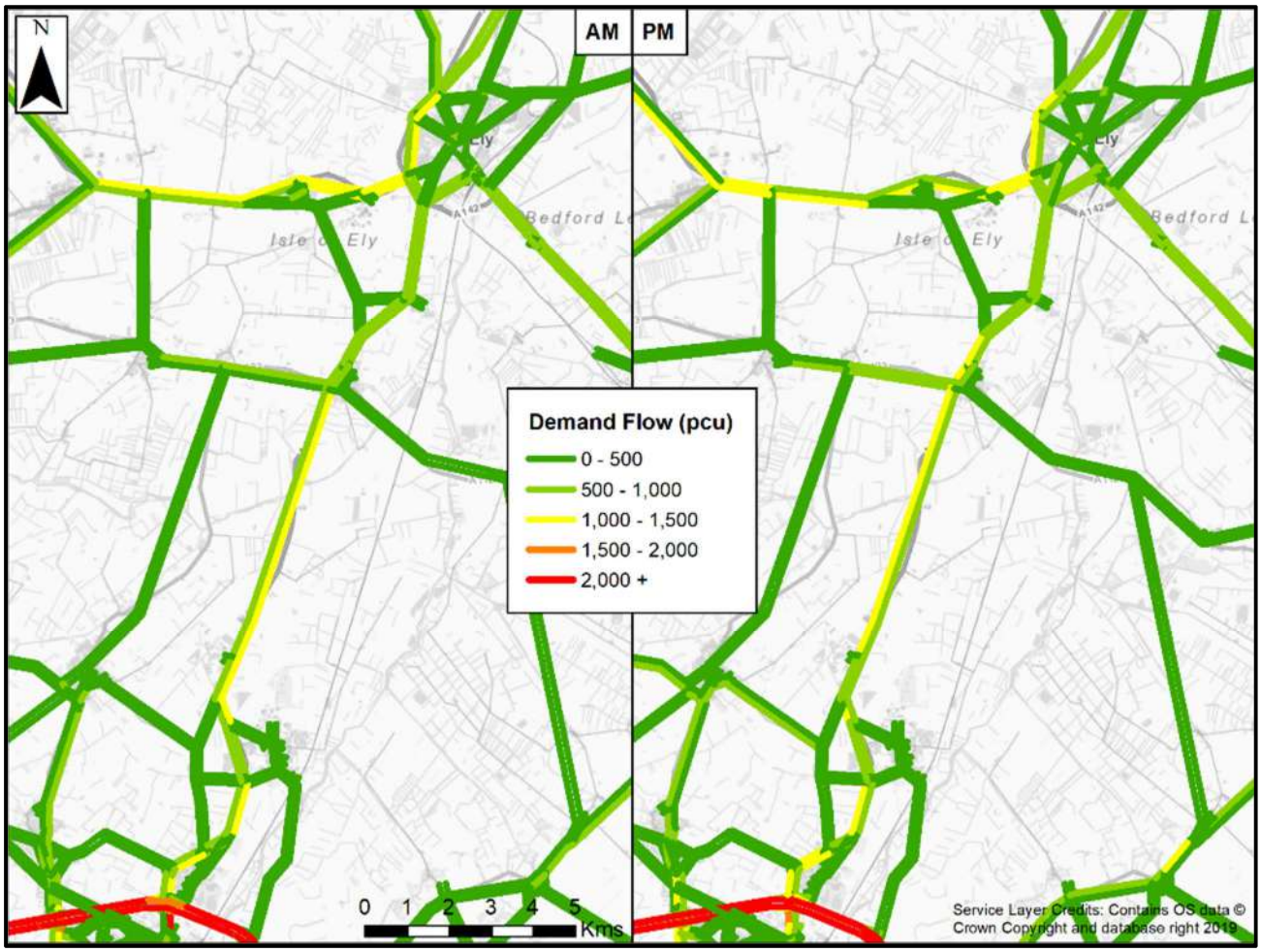


Figure 23: Weekday AM and PM demand 2018. Source: A10E2C Model.

Travel delays along the A10 and at key junctions

Estimated travel time data from Google Maps has been used to assess the current impact of congestion and delay along the A10 corridor. Hourly average travel times for a journey along the A10, between the A14 junction at Milton Interchange and A142 Angel Drove junction at Ely, were reviewed for the 12-hour period between 07:00 and 19:00.

Figure 24 presents the findings for an average weekday and a Saturday.

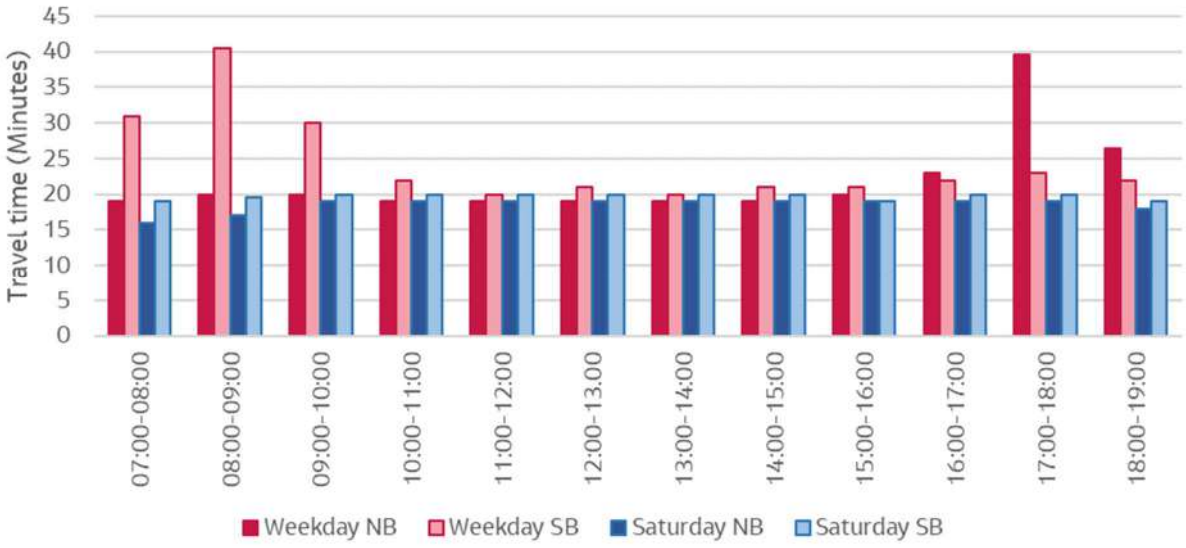


Figure 24. Congestion and delay along the A10 corridor[31]

The data shows significant increases in delays in the southbound direction during weekday between 7am and 10am and in the northbound direction between 5pm and 7pm, consistent with commuter demand into and out of Cambridge.

To provide context for the analysis of junction delay, Figure 25 illustrates key junctions on the A10 between Cambridge and Ely which were analysed by Cambridgeshire County Council and its advisors in 2018 following the Preliminary SOBC. At present, most of these junctions perform near or over their design capacity, leading to traffic queues and traffic congestion on the A10 and its connecting roads.

A summary of the do minimum baseline for 2021 is presented below in Table 12. Junctions are considered to be over-capacity if Ratio of flow to capacity (RFC) is at or over 85% or the Degree of Saturation (DoS) is at or over 90%.

The key issues and features for each of the junctions are then described, with reference to observed site visits from the A10 Junction Assessment report produced by Mott MacDonald in 2018.[32]

[31] Source: Google Maps travel time information accessed February 2020
[32] Mott MacDonald (2018): Ely To Cambridge Transport Study – A10 Junction Assessment Report

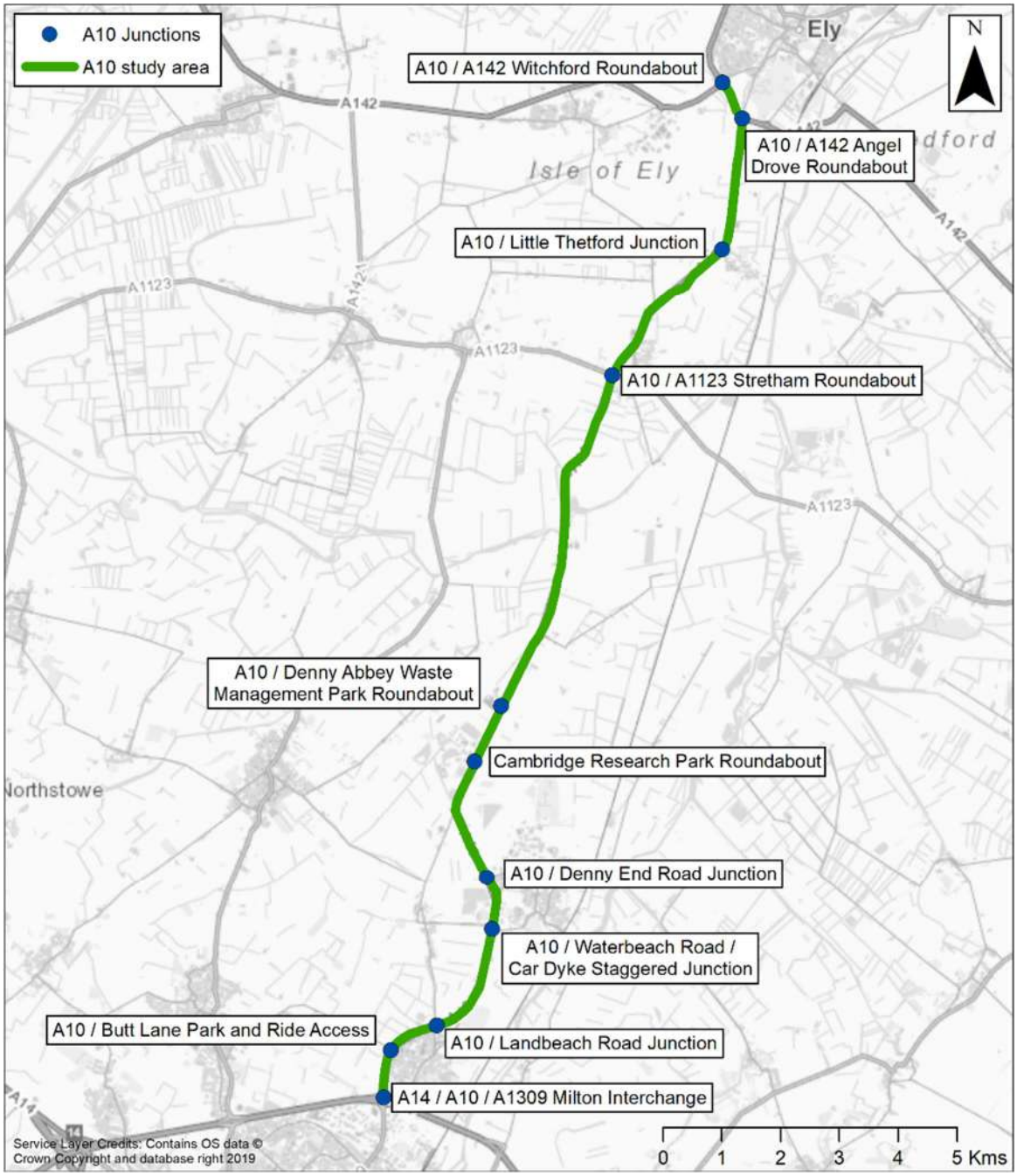


Figure 25. Key junctions along the A10

Table 12. Baseline Junction Performance. Source: Mott MacDonald

A10 Junction	Ratio of Flow to Capacity or Degree of Saturation	
	AM 2021	PM 2021
A14 / A10 / A1309 Milton Interchange	123.0	115.1
A10 / Butt Lane / Park and Ride	77.4	82.2
A10 / Landbeach Road / Humphries Way	49.4	29.2
A10 / Waterbeach Road / Car Dyke	35.4	44.3
A10 / Denny End Road	94.5	81.3
A10 / Cambridge Research Park	99.4	92.7
A10 / Waste Treatment Site	100	99
A10 / A1123 Stretham Roundabout	99.8	97.5
A10 / Little Thetford	Not assessed - no available data	
A10 / A142 Angel Drove Roundabout	94.2	99.1
A10 / A142 Witchford Roundabout	100	100

A14 / A10 / A1309 Milton Interchange: the Milton Interchange is a major traffic interchange located to the north of Cambridge. The junction is a large grade-separated gyratory over the east-west running A14, with signal control for four of the five intersection conflict points, and intelligent traffic system technology used to help manage queues on Cambridge Road from Milton. The junction suffers significant delays and queues due to a combination of insufficient circulatory capacity, blocking back from traffic signals and single or short two-lane exits. The junction has been identified for further investigation outside the scope of this study, subject to a collaborative working group between HE, CCC, GCP and CPCA for future consideration as a standalone scheme.

A10 / Butt Lane / Milton Park and Ride Access are two signal-controlled junctions spaced 150 metres apart. The southern junction provides access to just the Milton Park and Ride site, with no right turn from the north. The northern junction allows all movements with an access to the Park and Ride site off Butt Lane. The performance of this junction is highly influenced by the Milton Interchange junction and reflects the pattern of commuting traffic. The Milton Park and Ride junction and to a lesser extent Butt Lane are also experiencing delays. The delays are mainly experienced by southbound traffic on the A10 during the AM peak. During the PM peak, queues are experienced by A10 northbound traffic on the approach to the Park and Ride junction.

A10 / Landbeach / Humphries Way is a staggered crossroads junction with central separation islands providing protection to right turning traffic on the A10. The large junction footprint provides for free-flow movement for the A10 arms, good visibility, and two-stage right turning movements from both side-arms. No issues were noted either from the site visit or in the modelling.

A10 / Waterbeach Road / Car Dyke provides access to the southern end of Waterbeach village and Landbeach. This is a wide, staggered priority cross roads junction with central separation islands providing protection to right turning traffic on the A10, as well as access to a restaurant. No capacity issues were observed at the site visit or noted in the modelling.

A10 / Denny End Road; is a signal-controlled junction with two-lane northbound and southbound approaches. Denny End Road, which forms the eastern arm of the junction leads to the northern side of Waterbeach Village and has a single approach lane to the junction. Queues develop on all approaches during peak periods and the capacity is limited due to space constraints on all entry arms. The developer Urban & Civic is proposing a quick

win junction improvement on occupation of 150 homes at Waterbeach New Town, but a further upgrade is needed to solve longer-term issues.

Cambridge Research Park Roundabout was built to accommodate the Cambridge Research Park, which lies to the west of the A10. The northbound A10 arm diverges to provide a dedicated slip-lane to allow traffic to enter the Research Park and bypass the roundabout circulatory area. Two lane entries are present on both A10 arms of the roundabout, but the corresponding exit lanes are single lane only. Due to lack of arrow markings on the roundabout entry arms, drivers use both circulatory lanes for ahead movements but then must quickly merge for the single lane exit, which raises safety concerns and also constrains capacity. The junction is forecast to be operating at capacity at 2021 in the AM peak.

A10 / Denny Abbey Waste Management Park Roundabout is a roundabout junction which serves the entrance to the waste treatment site that lies to the west of the A10. It is also used for U-turns for vehicles to safely access Denny Abbey and the Farmland Museum. It is forecast to be operating at capacity in 2021 at peak times.

A10 / A1123 Stretham Roundabout is a four-arm roundabout located at the junction of the A10 and A1123 Wilburton Road, lying just to the west of Stretham village. With a relatively tight circulatory area, all approaches are currently single-lane, flaring to provide two short entry lanes at the roundabout. All roundabout exits are single-lane only. There are significant delays experienced by northbound A10 Traffic, which queues on the approach to this junction during the build up to the PM peak. This junction is highly constrained due to the proximity of private residential properties. The developer Urban & Civic is proposing a small scheme to widen the northern approach on occupation of 500 homes at Waterbeach New Town.

A10 / Little Thetford Junction is a crossroads junction under priority control with high approach speeds on the A10. To the east, The Wytches leads to the village of Little Thetford. To the west, Red Fen Road leads to the village of Witchford. This junction has been identified for future assessment.

A10 / A142 Angel Drove Roundabout is a compact four arm roundabout situated to the south of Ely. The configuration of the roundabout is non-typical with skewed approach arms and a tight circulatory area. All approaches are currently single-lane, flaring to provide two short roundabout approach entry lanes at the roundabout. All roundabout exits are single-lane only. The A10 arms are on the south and west sides of intersection. The eastern arm forms the A142 Angel Drove connecting to the south side of Ely and the northern arm, Cambridge Road, leads to the centre of Ely. The A10 suffers from long queues and delays on the northbound approach to this junction during the PM peak period. Queues have also been observed to block back to the junction from the A10/Witchford Road roundabout. Due to their proximity, the performance of both the A10/A142 Angel Drove and A10/A142 Witchford Road roundabouts are jointly influenced by each other.

A10 / A142 Witchford Roundabout is a four-arm roundabout located to the west of Ely. The A10 comprises the south-eastern and north-western arms. The southwestern Witchford Road arm of the junction forms the A142, while the north-eastern Witchford Road arm leads to Ely centre. The south western A142 arm flares on the approach to the junction to provide two short entry lanes to the roundabout. The south eastern A10 arm also flares on the approach to provide a nearside ahead and left lane and an offside right turn lane. The north eastern Witchford Road and north western A10 arms provide a single lane entry to the roundabout. All roundabout exits are single lane. The A10 suffers from long queues and delays on the approach from the south-east during the evening. Some queuing also happens on the A142 south-western entry arm. An interim fix is being progressed to support the growth of the Enterprise Zone at Lancaster Way, however there will be a need to provide segregated cycling, walking and horse riding facilities as well as a permanent congestion solution.

The impact of all of these junction issues on the wider network is clear from outputs from the 2018 modelled baseline scenario for both the AM and PM Peak (Figure 26). Significant delays are experienced in the direction of commuting travel to/from Cambridge, with significant southbound delays, south of Stretham, with this reversed on the northbound approach to the Stretham Roundabout in the evening peak. Notable delays are also clear at the Denny End Junction in both peaks and the northbound approach to the Angel Drove Roundabout in the

evening peak. The impact of congestion on the A10 also has a knock-on impact on parallel routes, with the B1049 experiencing significant delays in the evening peak on the approach to the A1123 at Wilburton.

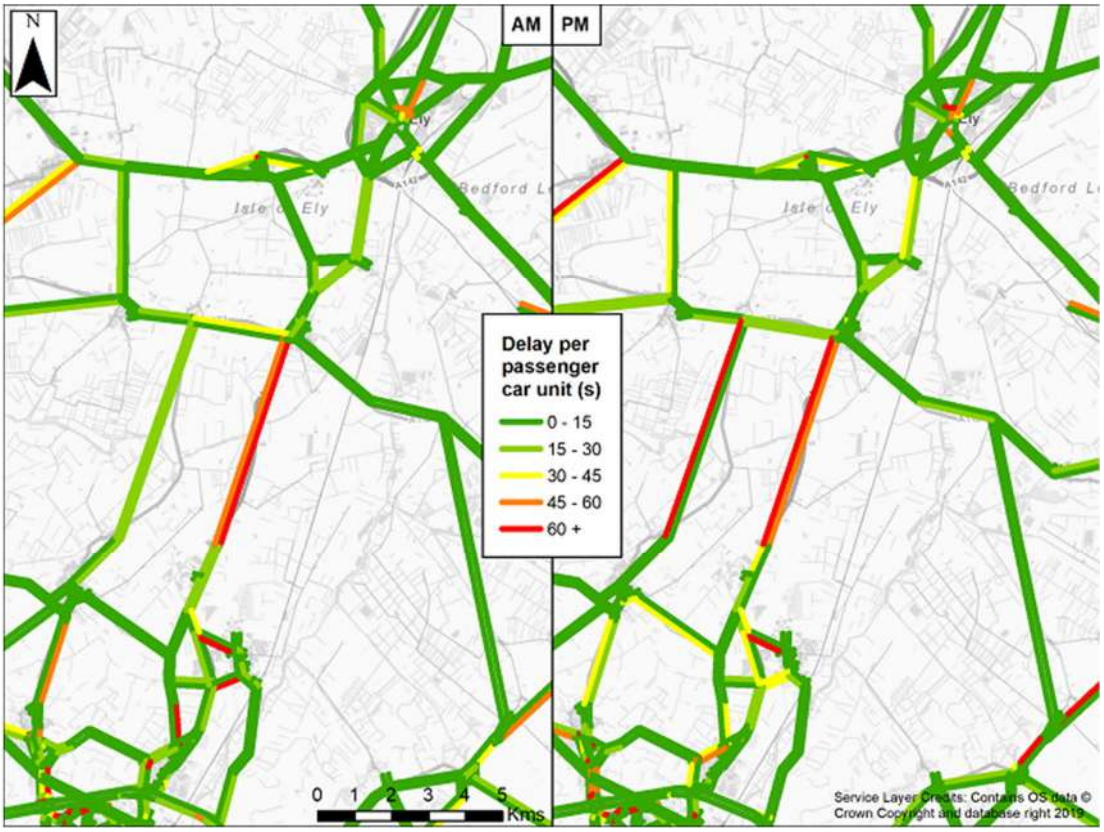


Figure 26: Weekday AM and PM delays 2018. Source: A10 Ely to Cambridge Model (A10E2C)

Journey quality

The variability in journey times along the A10 at different times of day provides evidence of unreliable journey time which can affect traveller stress and have a negative impact on journey quality[33] for drivers. The nature of the A10 as a single carriageway road where through-traffic is unable to overtake vehicles waiting to turn into side roads or slow-moving agricultural vehicles has potential to exacerbate the negative impact on driver experience.

2.3.11 Road safety

Collision data analysis

An analysis of road traffic collisions along the A10 and alternative routes has been undertaken using DfT STATS19 data covering the five year period between January 2014 and December 2018. The distribution of collisions is presented in .

Between 2014 and 2018 there were in total 110 collisions along the A10 between Ely and Cambridge, 4 of which involved fatalities (4%), 25 resulted in serious injuries (23%) and 81 resulted in slight injuries (74%). shows how these were distributed along the corridor. Collisions resulting in serious and slight accidents are distributed along the A10, clustering around junctions and access points to the route. Across the wider area there were 16 fatal collisions during the same period, including on road such as the A142 between Newmarket and Ely and the A1123 west of Stretham.

[33] TAG Unit A4.1 Social Impacts Appraisal, DfT, May 2020

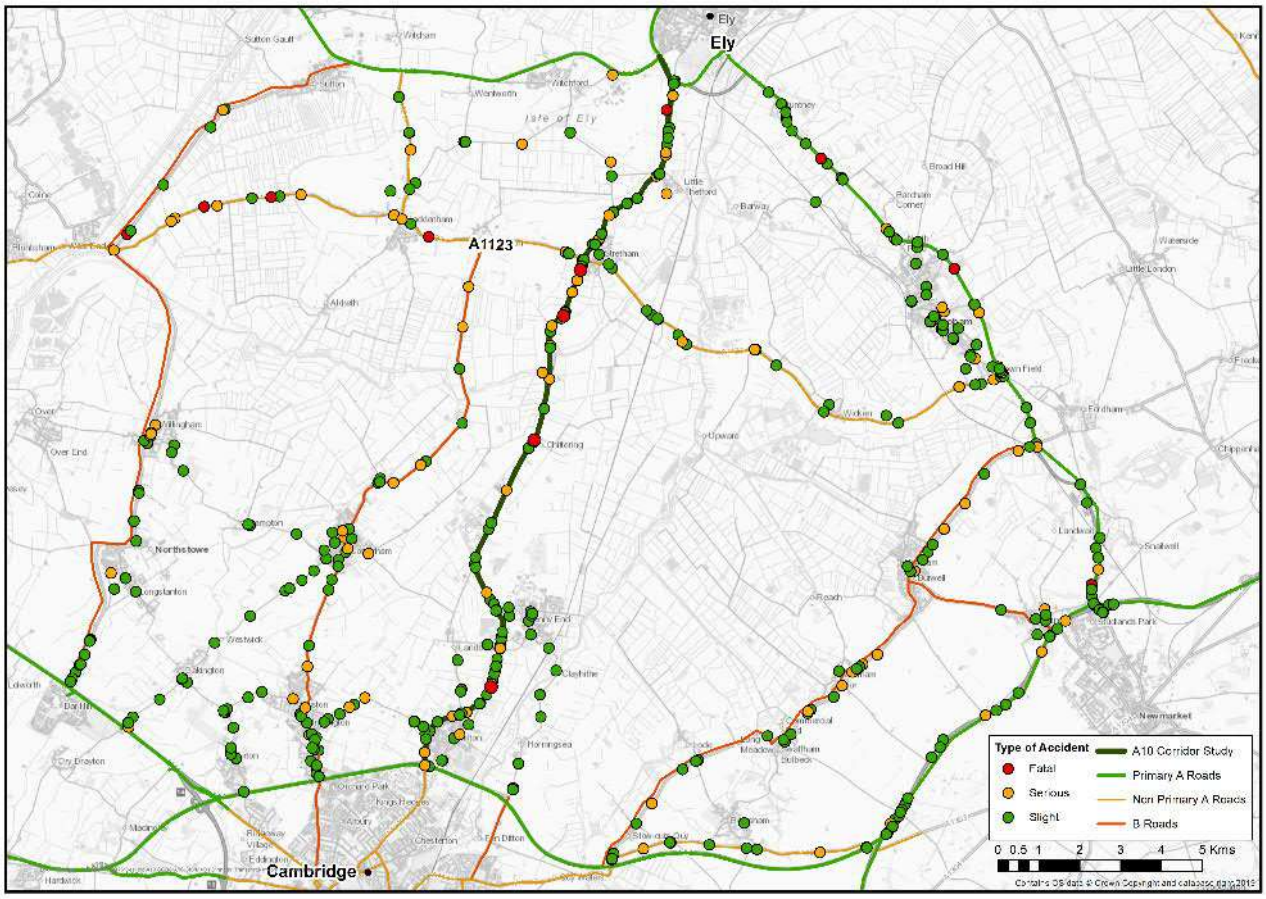


Figure 27: Collisions resulting in a personal injury accident along the A10 corridor, 2014-2018

It has been reported that the villages along the parallel roads experience negative impacts due to the volume of vehicles using these roads as rat runs. This has been reported most particularly on the B1047 Clayhithe Road but also the B1049 through Cottenham. The number of collisions observed at the east of A10, Clayhithe Road/Horningsea Road, reflects this road safety issue. This single carriageway route has seen 12 accidents over the five years, mostly around junctions and access points. Furthermore, to the west of the A10, via Milton Road, there were 11 accidents recorded with 2 of them being categorised as serious.

A comparison of the accident rates in the study area against the national average has been undertaken. This has been based on the measure of total accidents per billion vehicle miles.

Table 13. Accidents per billion vehicle miles – by section of the A10

Region	Vehicle Miles 2014-2018 (Billions)	Total accidents 2014-2018	Accidents per billion vehicle miles
A10 North of A1123	0.290	31	107
A10 South of A1123	0.111	79	710
A roads Great Britain	719.5	305,396	424
A roads East of England	87.7	24,554	280

The average accident rate along the whole route between Ely and Cambridge is lower than both the national and regional average for all 'A' roads. However, this hides an imbalance in safety between the sections north and

south of the A1123. The southern section between Cambridge and Stretham has a higher accident rate than the national and regional average, and one nearly seven times higher than the northern section to the A142 Angel Drove Roundabout. Most of the 110 collisions registered along the A10 corridor during the assessed period have taken place between Waterbeach and Cambridge, with nearly 50% of all accidents registered between the Milton Interchange and the Cambridge Research Park Roundabout. Also, it is worth noting that the four fatal accidents that occurred during this period happened on the southern section of the A10 corridor, with three of these on the rural section between Chittering and Stretham.

Problem 5 – Transport	
	▪ Current and future congestion, resulting in slow journey times, impacting on business productivity and commuters' quality of life. ▪ Unreliable journey times at all times of the day both for private vehicles and public transport, caused by combination of side roads, incidents, HGVs, agricultural vehicles and tourist traffic. ▪ Diversion of traffic to the parallel B1049, B1050 and the network of unclassified roads that connect these with the A10. ▪ Community severance and environmental impacts, both along the A10, parallel B roads and unclassified roads. ▪ No segregated, dedicated cycle route between Cambridge, Waterbeach & Ely. ▪ All of the above contribute to safety issues on the A10, parallel B roads and unclassified roads.

2.4 Future Situation

2.4.1 Introduction

This section describes at a high level the expected growth in population in the study area, the expected change in land use in terms of housing and employment from both Local Plans and long-term spatial planning, the likely baseline investment in transport included within traffic models, and what this all means for traffic growth. This section then concludes with an assessment of the impacts of this future situation on the A10 corridor, without any intervention.

2.4.2 Population growth context

ONS population projections estimate that the population of the Cambridgeshire and Peterborough Combined Authority area will grow an average of 11% relative to 2016 observed data. Table 14 outlines the ONS 2016-based sub-national population projections by local authority area and the combined authority. The predicted population growth is expected to correspond with an increase in commuting trips within the study area, as a result of large population increases in districts such as East Cambridgeshire, South Cambridgeshire and Fenland, connected with workplaces in Cambridge city. Of relevance is the fact that a large proportion of the development taking place in Greater Cambridge will be concentrated in sites close to or impacting the A10 corridor.

Table 14. ONS Population Projections (2016-based estimates)[34]

Area	Observed 2016	Forecast change 2016-2041	% change	Projected 2041
Cambridge City	125,000	3,000	2.40%	128,000
East Cambridgeshire	88,000	11,000	12.50%	99,000
Fenland	100,000	13,000	13.00%	113,000
Huntingdonshire	176,000	20,000	11.36%	196,000
Peterborough	197,000	30,000	15.23%	227,000
South Cambridgeshire	156,000	18,000	11.54%	174,000
Combined Authority	842,000	95,000	11.28%	937,000

2.4.3 Land use and planning context

The study area is covered by three local planning authorities, namely Cambridge City Council, South Cambridgeshire District Council and East Cambridgeshire District Council with their own Local Plans.

Figure 28 below sets out, in broad terms, strategic development sites in existing Local Plans with this collated in the Cambridgeshire and Peterborough Strategic Spatial Framework (non-statutory).

[34] Subnational population projections for England: 2016-based. Source: ONS https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/subnationalpopulationprojectionsforengland/2016based

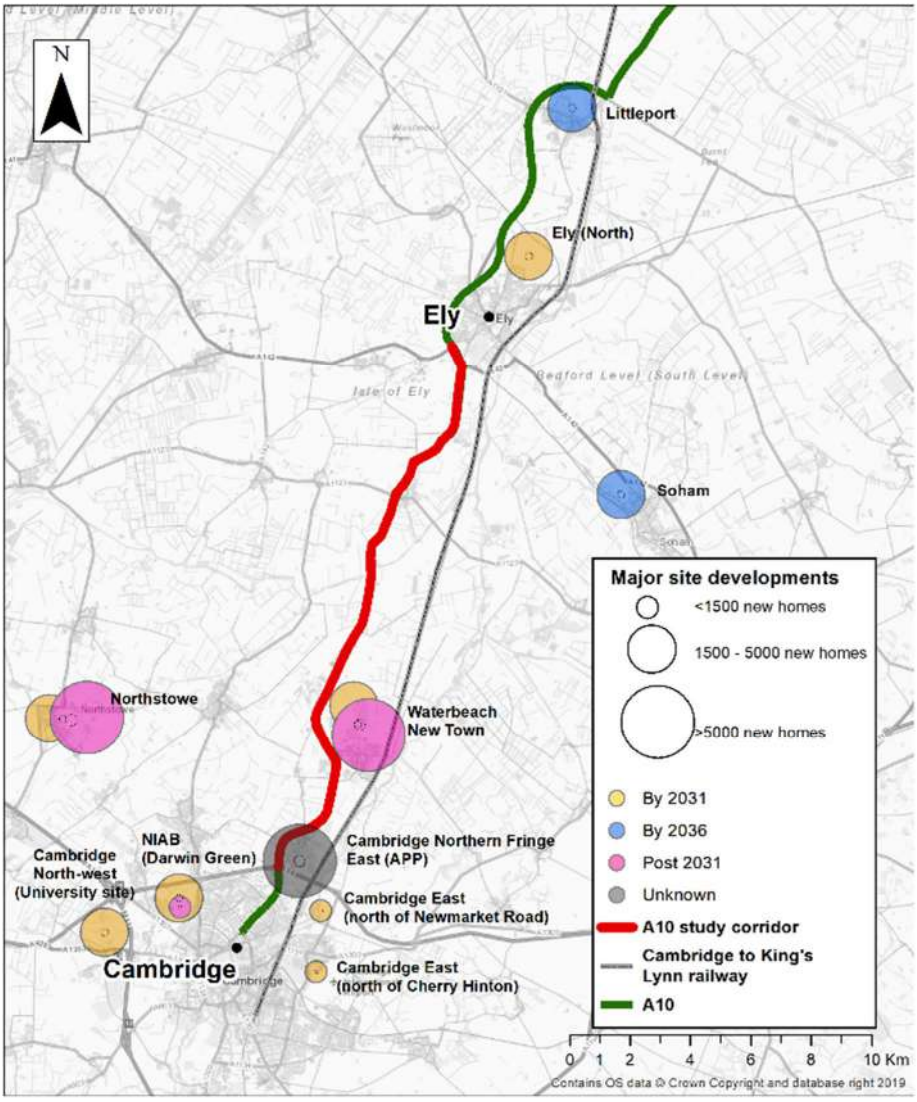


Figure 28. Major site developments within the study area

The project team have liaised with Cambridgeshire County Council officers to understand which of these developments are dependent on improvements to the A10.

Dependent Development

Waterbeach New Town, located on the A10 corridor approximately six miles north of Cambridge, is largely a mixed-use development of a former MOD site. The New Town is being delivered by two separate developers – Urban & Civic, and RLW reflecting the different land owners.

During 2017-18, South Cambridgeshire District Council received three planning applications for the development of Waterbeach New Town, totalling up to 11,000 homes:

- An outline planning application (0559/17/OL) for up to 6,500 dwellings and associated other uses and infrastructure, received in February 2017 from Urban & Civic. This was approved in September 2019.
- A full planning application (0791/18/FL) for the proposed relocation of Waterbeach railway station, received in 2018 from RLW Estates. This was approved in January 2020.

- An outline application (2075/18/OL) for up to 4,500 dwellings and associated other uses and infrastructure, received in May 2018 from RLW Estates. No decision has been made at the time of writing.

Cambridgeshire County Council and South Cambridgeshire District Council have been working with the two developers to agree development mitigation and trigger points arising from their respective first phases of development. This includes mode shift and local highway infrastructure as presented in Table 15.

Table 15: Waterbeach New Town Mitigations

Development	Mitigation	Trigger Points
Urban & Civic (Phase 1, 1600 dwellings)	Local Buses, Quick win junction improvements and trip budget monitoring	First homes
	Mere Way Cycle Route and Bridge over the A10	150 homes
	Link Road to new station	900 homes
	Further junction upgrades depending on monitoring results	1,600 homes
RLW (Phase 1, 800 dwellings)	Re-located Waterbeach railway station 200 Park and Ride Spaces Contribution to Cambridge to Waterbeach Greenway	200 homes

Any further development on top of the first 1,600 homes by Urban & Civic and 800 homes by RLW will be dependent on the increase of the network capacity on the A10, with a potential capacity to deliver a total of 11,000 homes at this site. Together with expansion of the Cambridge Research Park, it is expected to generate up to 5,800 new jobs.

Section 3.6.8 within the Economic Case describes the potential benefits associated with unlocking this dependent development.

Complementary Development

Clusters of high-tech employment on sites in the Cambridge Northern Fringe currently support many jobs for the sub-region and create significant economic value. Consequently, there is a clear incentive to facilitate further growth at these sites.

Cambridge Northern Fringe East (CNFE) and Cambridge Science Park (CSP) forms the area to the north of Cambridge, immediately south of the junction A14/A10 and the Milton Interchange, and adjacent to Cambridge North Station. Significant growth is expected within the Northern Fringe, with an estimated 36,000 additional jobs by 2031 under the City Deal. Redevelopment of the 36-acre Chesterton Sidings, known as the CB4 development and at an early planning stage, is expected to include 121,000 sq. m of office floorspace and residential or student accommodation[35].

In March 2019, Government announced £193m of Housing Infrastructure Funding to help facilitate the move of the sewage treatment works to make space for a new city district on the northern fringe. This new quarter could provide more than 5,000 residential units, as well as one million sq. ft. of office, with significant retail, leisure and community space.[36]

Both the Cambridge Science Park and Cambridge Business Park are comparatively low-density in nature, and site densification could deliver significant additional office space. One of the policy imperatives for CSP and CNFE

[35] Source: Cambridge North
[36] https://www.uandiplc.com/news-and-views/chancellor-s-investment-set-to-unlock-new-low-carbon-quarter-for-cambridge/, accessed 15 July 2020

development delivery is to not increase the number of car trips. Therefore, there is no development at this location dependent on improvements to the A10.

Ely North is located on the A10 corridor approximately 17 miles north of Cambridge. It is expected to include 3,000 additional homes as part of an urban extension of the town.

Growth will bring major opportunities

These developments should enable existing businesses to expand, both by offering physical floorspace for expansion and by providing residential space for new employees to live in, and by the same token should attract other businesses in related sectors who are likely to see benefits in joining a tightly agglomerated economic cluster offering a ready pool of experienced labour to take up new opportunities as they become available. Furthermore, this development will help to address the pressing issue of constrained housing supply and rising prices in Cambridge. However, growth at Waterbeach will lead to increased demand for north-south travel along the A10 and the road, public transport, pedestrian and cycle routes around it. This is analysed in Section 2.4.7.

2.4.4 Long term growth

CPCA has committed to double the size of the economy in terms of Gross Value Added (GVA) over 25 years[37]. It has committed to realising 100,000 extra homes and 90,000 new jobs across the region by 2036 in phase 1 of its Strategic Spatial Framework, through commitments in existing Local Plans. The non-statutory spatial framework includes the following as potential "building blocks" of a vision for future growth during phase 2 of the framework, covering the period from 2036 to 2050:

- "Embracing positively the need to build new homes, create jobs, and improve infrastructure – offering attractive homes, jobs and a high quality of life in a range of distinctive communities.
- Accommodate growth by providing new homes in sustainable locations, close to main centres of employment and along key dedicated public transport routes."

Figure 29 identifies the strategic corridors within the Combined Authority where future growth is likely to have the greatest impact. The A10 corridor between Cambridge and King's Lynn is one of these strategic corridors and its successful operation will be of key importance to the Combined Authority's longer-term growth ambitions.

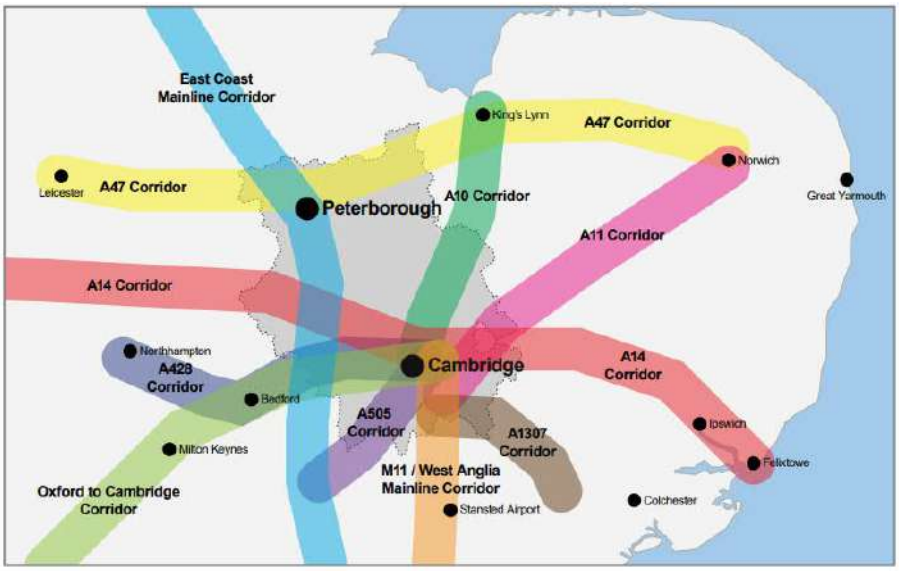


Figure 29. Strategic corridors within CPCA[38]

[37] Cambridgeshire and Peterborough Combined Authority Growth Ambition Statement: https://cambridgeshirepeterborough-ca.gov.uk/assets/Uploads/GROWTH-AMBITION-STATEMENT-.pdf

[38] Source: Cambridgeshire and Peterborough Strategic Spatial Framework (Non Statutory)

Opportunity 1 – Realising new sustainable housing opportunities	
	▪ Opportunity to unlock further homes at the former MOD site north of Waterbeach up to its site limit of 11,000 homes. ▪ Complements proposals for Ely North, a 3,000 home urban extension of the town. ▪ Support CPCA's non-statutory spatial framework (non-statutory) aspiration for 100,000 homes to be delivered in the region by 2036 and helping establish the area's future growth needs and ambitions beyond that to 2050.

2.4.5 Future infrastructure changes

The business case is based on comparison with a do minimum scenario for 2028 and 2043, incorporating anticipated infrastructure changes compared to the 2018 model base. The forecast models include schemes that have now been completed as of 2019/2020, as well as planned improvements. The principal strategic projects are:

- A428 Black Cat to Caxton Gibbet dualling scheme;
- A14 Improvement Scheme as of Design Freeze 3;
- A142 Ely Southern Bypass; and
- Northstowe Phase 2 – link road to Bar Hill known as Southern Access Road (West).

In addition, the do minimum scenario includes a combination of mode shift and junction improvements to help deliver the early phases of Waterbeach sustainably:

- Waterbeach station relocation to be closer to the new town north of Waterbeach
- New bus and rail-based park and ride at the new town north of Waterbeach to remove car trips from the southern section of the A10
- New high-quality segregated bus provision (route TBC) between the new town north of Waterbeach and Cambridge
- New or improved walking / cycling routes between Ely, Waterbeach and Cambridge
- Extension of A10 Southbound Flare at the A14 / A10 Milton Interchange
- A10 Capacity Enhancements between Butt Lane and Milton Park and Ride (works to widen the southbound single lane south of Butt Lane)
- A10 / Denny End Road junction localised widening
- A10 / Cambridge Research Park roundabout access enhancements
- A10 / A1123 Stretham Roundabout (northbound approach widening).

2.4.6 Expected growth

The Economic Case and the supporting Forecasting Report (Appendix F4) describes the assumptions behind forecast model development. This notes the impact of planned local growth in the Greater Cambridge area, which outstrips that expected by the National Trip End Model (NTEM). This higher expected traffic growth, shown in Table 16 is a consequence of the population growth, land use and infrastructure changes described in the previous sections.

The model suggests that the study area will experience the highest increase in the number of trips during the interpeak period, with a change of 25% and 65%, for year 2018 and 2043 respectively. The traffic growth along

the A10 during the AM and PM peak hours are expected to be consistent in the scheme opening year and the design year.

Table 16. Traffic growth between 2018, 2028 and 2043 Do Minimum Scenarios

Time period	2018	2028	2043
AM peak hour total	104,240	125,840	154,660
% Change relative to 2018	-	21%	48%
IP peak hour total	78,360	98,007	129,668
% Change relative to 2018	-	25%	65%
PM peak hour total	113,716	137,778	170,185
% Change relative to 2018	-	21%	50%

2.4.7 Impacts on the A10 Corridor and parallel routes

As detailed in the section before, the number of journeys made each day in Cambridgeshire will significantly grow over the coming years as a result of the anticipated population and job growth and the scale of committed and proposed development within the study area. Consequently, there will also be a significant increase in travel demand on the A10 and surrounding routes.

It is anticipated that will be an increase in local trips, as even with high quality sustainable transport provision the Waterbeach development adds many more trips with a local origin or destination at the expense of longer-distance trips through the area. This reflects the greater availability of alternative routes, but also leads to increase in traffic along less suitable routes or indeed increasing pressure on other strategic network links, such as A142, A1123 and B1049, and also on local routes namely Clayhithe Road and Ely Road (Milton).

In addition to the direct impacts on A10 users, there would also be impacts on those already living and working in Cambridge, notably those close to some of the routes running parallel to the A10 who would see traffic and journey times increase as traffic is displaced from the A10 by new traffic from the developments. Other effects, such as the increase in journey times on the A10, might actually undermine the prospects of the new developments themselves by reducing the accessibility of the sites and thereby making them relatively less attractive places to expand or set up businesses.

Figure 30 presents forecast demand flows for weekday AM and PM periods in 2028 with Figure 31 illustrating the forecast delays under the do minimum scenario. The figures demonstrate a significant increase in demand across the network and corresponding increase in delays relative to 2018. Delays would be exacerbated in 2043 due to the traffic growth presented in Table 16.

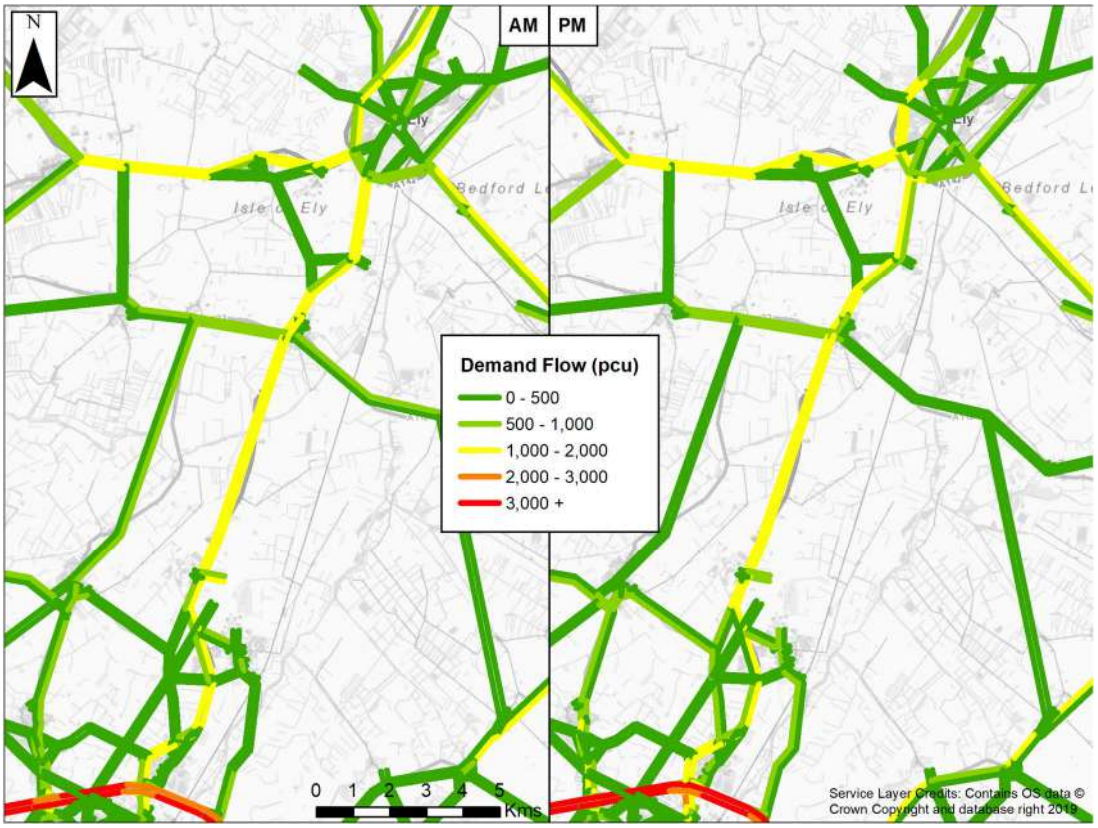


Figure 30 Weekday AM and PM demand flow 2028 DM. Source: A10 Ely to Cambridge Model (A10E2C)

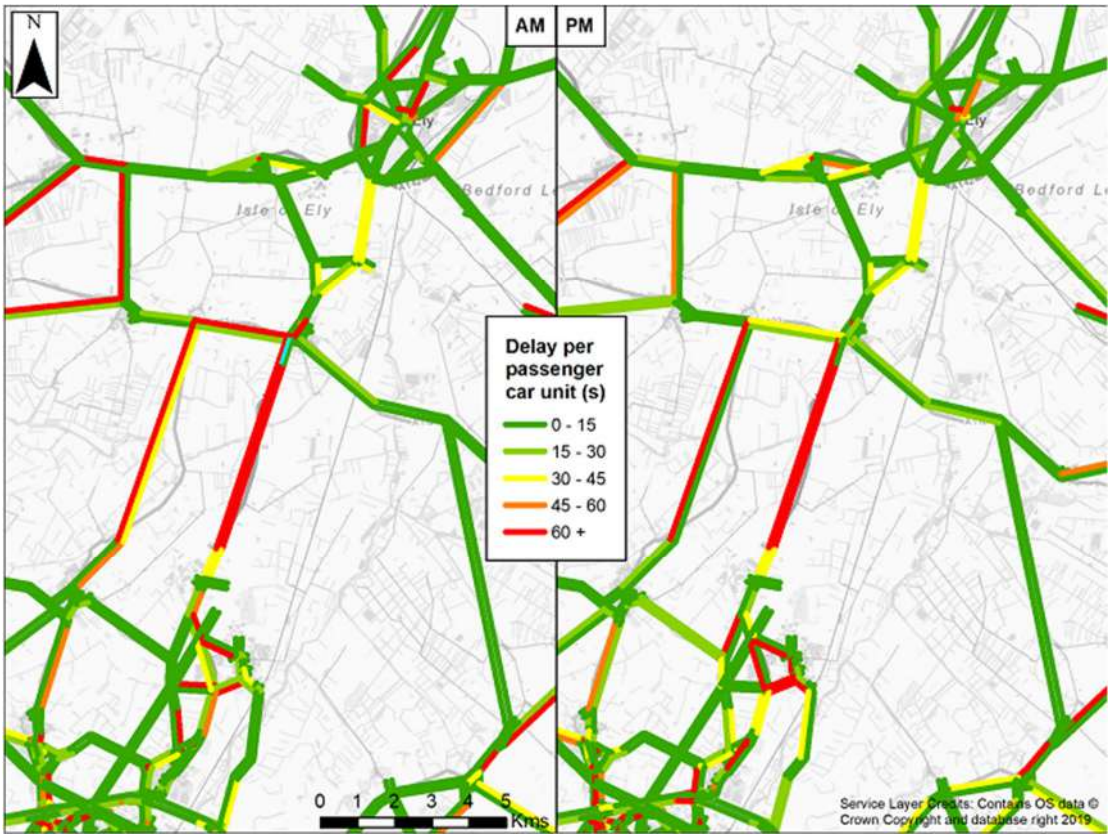


Figure 31. AM and PM total delays 2028 DM. Source: A10 Ely to Cambridge Model (A10E2C)

Whilst the analysis has demonstrated the issues on the corridor if nothing is done, there are also future opportunities to be realised from an A10 scheme as summarised below. Section 2.9.2 describes the potential for these interfaces further.

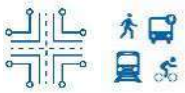
Opportunity 5 - Transport	
	▪ Improved connectivity to the Strategic Road Network via the A14 Milton Interchange ▪ Reduced congestion for public transport services ▪ Improved safety for all road users ▪ Contribute to meeting Local Transport Plan objective of providing residents accessibility to a place of good employment opportunities within 30 minutes travel time ▪ Potential interfaces with the Greenways Programme (to be determined), providing segregated, dedicated routes for walking, cycling and horse riding. ▪ Improved conditions for people walking, cycling and horse riding in the local area including rural villages along parallel routes ▪ Potential interfaces with the Cambridgeshire Autonomous Metro (to be determined) ▪ Cater for and encourage uptake of Electric Vehicles through potential incorporation of charge-points and dynamic charging

2.5 Need for Intervention

This section summarises the current and future land use and transport-related problems, issues and opportunities identified along the route and surrounding communities. This is derived from the preceding analysis of the existing and future situation.

2.5.1 Problems and opportunities

Problem 1 – Lack of Housing
 Housing affordability pressures are one of the main threats to growth in the Combined Authority, particularly in Cambridge, and one of the main burdens on people's lives. Demand for housing has risen strongly, while supply, though increasing, has not been able to keep pace.
Opportunity 1 – Realising new sustainable housing opportunities
 Opportunity to unlock further homes at the former MOD site north of Waterbeach up to its site limit of 11,000 homes Support proposals for Ely North, a 3,000 home urban extension of the town Support CPCA's non-statutory spatial framework (non-statutory) aspiration for 100,000 homes to be delivered in the region by 2036 and helping establish the area's future growth needs and ambitions beyond that to 2050.

Problem 2 – Lack of Infrastructure
 Lack of infrastructure to sustain the current growth of Cambridge is a key contributor to the likely future impact on business costs, with conditions on the A10 restricting the full build out of housing at Waterbeach New Town. Without intervention this will make it more difficult for growing firms in Cambridge to recruit and retain the people they need.
Opportunity 2 – Spread economic growth north along the corridor to Ely and beyond
 The A10 serves both the Greater Cambridge and The Fens economies. The region has outperformed the rest of the England and there is an opportunity to spread the benefits of rapid business creation and growth experienced in Cambridge to areas along the A10 corridor including Waterbeach, Ely, the Fens and West Norfolk, where there is already established business agglomeration, through improved connectivity.

Problem 3 – Labour Supply
 The Combined Authority wishes to double the economy and productivity over the next 25 years. However, housing issues are likely to constrain future growth and productivity if nothing is done. Companies are experiencing difficulties in hiring and retaining talent due to the high cost of living in areas within a reasonable commuting time to Cambridge. There is evidence that foreign firms and knowledge-intensive businesses are mainly interested in Cambridge as their UK base, and in some cases, Cambridge is their Europe base. Therefore, there is a risk of these foreign companies leaving the country for other European cities if they are not able to grow within this area, with a consequent negative economic impact on UK plc.
Opportunity 3 – Opportunity to benefit businesses along the A10 through improved connectivity and journey time reliability
 Opportunity to benefit businesses along the A10 through improved connectivity and journey time reliability.

Problem 4 – Climate Change and Environmental Quality

The Cambridgeshire and Peterborough Local Transport Plan sets out its ambition to reduce emissions to 'net zero' by 2050 to minimise the impact of transport and travel on climate change. Any solution for the A10 will need to proactively consider how it addresses this issue.

Whilst the region has a number of attractive areas and designated areas for wildlife, the area is also characterised by substantial swathes of farmland with relatively low biodiversity and low tree cover. As one of the driest areas of the country with limited water resources, yet also at risk of surface water and tidal flooding, the area faces significant challenges in securing a sustainable future.

Opportunity 4 – Enhance environment through increasing biodiversity and by mitigating carbon impacts

Solutions for the A10 provide an excellent opportunity to increase the amount of land managed for nature through a combination of habitat corridors, habitat parcels and wetland. This will be explored in further detail at Outline Business Case stage as the solution definition matures.

Carbon impacts may be mitigated through additional emphasis on sustainable transport and compensatory measures as the scheme design develops. This could include:

- Potential interfaces with the Greenways Programme (to be determined), providing segregated, dedicated routes for Non-Motorised Users (NMUs).
- Potential interfaces with the electric battery powered Cambridgeshire Autonomous Metro (CAM) and local public transport (to be determined).
- Cater for and encourage uptake of Electric Vehicles through potential incorporation of charge-points and dynamic charging.
- Low carbon materials.
- Potential off-setting.

Problem 5 – Transport

- Current and future congestion, resulting in slow journey times, impacting on business productivity and commuters' quality of life.
- Unreliable journey times at all times of the day both for private vehicles and public transport, caused by combination of side roads, incidents, HGVs, agricultural vehicles and tourist traffic.
- Diversion of traffic to the parallel B1049, B1050 and the network of unclassified roads that connect these with the A10.
- Community severance and environmental impacts, both along the A10, parallel B roads and unclassified roads.
- Lack of segregated, dedicated cycle route between Cambridge, Waterbeach & Ely.
- All of the above contribute to safety on the A10, parallel B roads and unclassified roads.

Opportunity 5 - Transport	
	▪ Improved connectivity to the Strategic Road Network via A14 Milton Interchange ▪ Reduced congestion for public transport services ▪ Improved road safety for all road users ▪ Contribute to meeting Local Transport Plan objective of providing residents accessibility to a place of good employment opportunities within 30 minutes travel time ▪ Potential interfaces with the Greenways Programme (to be determined), providing segregated, dedicated routes for NMUs ▪ Improved conditions for people walking, cycling or horse riding in the local area including rural villages along parallel routes ▪ Potential interfaces with the Cambridgeshire Autonomous Metro (to be determined) ▪ Cater for and encourage uptake of Electric Vehicles through potential incorporation of charge-points and dynamic charging.

2.5.2 Impact of doing nothing

Impacts on movement and accessibility

Future population growth and development will inevitably impact travel across the local area and between Cambridge and Ely. Some sections of the A10 already experience significant delays and poor journey time reliability; modelling shows that delays are anticipated to increase in the future. This will impact not only those who travel along the A10 but also those making local journeys through and across the study area.

The major developments proposed along the A10, and in particular Waterbeach New Town, would further exacerbate existing and future problems for travel and road safety on key routes in the county if implemented without the supporting transport infrastructure and modal shift.

Impacts on economic growth and prosperity

The CPIER identified Cambridgeshire and Peterborough's housing crisis as a major constraint on the region's ability to fulfil its economic potential. The lack of infrastructure is a barrier to housing delivery. With insufficient homes to meet demand, housing becomes ever less affordable.

The 'Cambridge Futures' study, widely cited in CPIER, modelled the economic impact that this increase in prices will have should current trends continue. This study found that the increased cost of living, driven through higher housing costs, could cause employment growth to slow beyond 2021 and decline beyond 2031. Key impacts on businesses include needing to pay employees more to afford housing costs, lengthy commutes or even the inability to attract the quality of local labour on which many firms see as very important or critically important to their presence in the area. If nothing is done businesses may start shrinking and moving away from the area. This will affect all types of companies. Lower value companies may relocate elsewhere in the UK thus hollowing out supply chains, whilst high value companies are likely to relocate abroad as they cannot be in Cambridge which results in a net loss for UK plc and irrecoverable damage to key knowledge and research and development business sectors.

Additionally, forecast levels of congestion, and associated journey time variability and unreliability, has the potential for far reaching economic implications. The declining performance of the primary road network such as the A10 would result in productivity losses for businesses, through impacts on their labour supply and potential for business-to-business activity.

The A10 also forms an inter-urban route used by freight (e.g. to and from King's Lynn port, as well as between the Greater Cambridge and The Fens economies). Congestion on these routes will impede the efficient movements of goods. The delays experienced by freight traffic will generate productivity losses to businesses at a regional level.

In the long term, the viability of North East Cambridge as a hub for economically important businesses would be compromised with the risk that businesses seek to relocate outside of the area and potentially outside of the UK. CPIER summarises the stark challenge as "a failure to invest in the development of infrastructure in and around Cambridge is the single biggest endogenous risk to growth facing the area".[39]

Impacts on society

Transport, particularly in terms of accessibility, is increasingly recognised as having a significant role to play in both the creation and alleviation of societal barriers. Increased traffic volumes on the A10 may also exacerbate severance and affect sustainable travel, hindering movement by non-motorised modes and access to goods and services. It could also have negative implications for emergency vehicle access and response time. In addition to the direct time costs created by congestion, there is evidence of welfare disbenefits associated with deteriorating travel conditions (e.g. frustration and annoyance). Resultant welfare disbenefits of transport-related problems would negatively impact quality of life and well-being.

Impacts on the environment

Increases in congestion and reduction in travel speeds along the A10 will result in negative impacts both on air quality along the route and on carbon and NO_2 emissions. Communities along the A10 and alternative routes will suffer a worsening of noise and air quality.

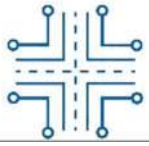
[39] Cambridgeshire and Peterborough Independent Economic Review, p. 79.

2.6 Scheme objectives and measures for success

2.6.1 Scheme objectives

Following a review of the emerging and policy objectives, the following scheme objectives have been defined in collaboration between Jacobs and the Combined Authority. The objectives have been defined with reference to the problems and opportunities highlighted in section 2.5, and refined through examination of objectives set out in key transport policy documents for the county – notably the Transport Strategy for Cambridge and South Cambridge, the Cambridgeshire and Peterborough Local Transport Plan, and the Cambridgeshire Long Term Transport Strategy. Table 17 presents these agreed objectives. All of these align with relevant LTP objectives.

Table 17. Scheme objectives

Theme	Objective
1. Housing 	1.1. Provide infrastructure needed to realise sustainable housing opportunities associated with existing Local Plans 1.2. Provide the opportunity to unlock thousands of new homes between Cambridge and Ely as part of the CPCA's emerging non-statutory spatial plan by 2050.
2. Productivity 	2.1. Increase productivity of the nationally important CPCA economy (including science, technology, agriculture) through improved connectivity to labour, suppliers and markets
3. Environment 	3.1. As part of a wider package for the Corridor contribute to the achievement of CPCA's LTP Net Zero by 2050 policy objective. 3.2. Enhance biodiversity in line with the CPCA's emerging 'doubling nature' policy aims by 2050 (100% increase in land managed for nature in km^2).
4. Quality of life 	4.1. Improve the quality of life for residents in local communities by reducing the community severance and environmental impacts of traffic on the built environment
5. Sustainable and Active Travel 	5.1. Encourage sustainable travel by improving the comfort, reliability, capacity and / or speed of alternative transport services (including rail, CAM, buses, walking, cycling and horse riding) along the A10 corridor
6. Network performance and safety 	6.1. Reduce the risk of collisions along the A10 and on parallel 'B' / unclassified roads in local communities relative to 2018 levels 6.2. Reduce congestion and improving journey time reliability along the A10, sustaining these benefits for the long-term.

These objectives align with the identified problems and opportunities as shown in Table 18 and Table 19 below.

Table 18. Objectives vs Problems

	Problems								
Scheme Objectives ✓ - Low Fit ✓✓ - Medium Fit ✓✓✓ - High Fit	Lack of Housing	Labour supply	Lack of infrastructure to sustain growth	Climate Change and Environment Quality	Congestion	Unreliable journeys	Inappropriate use of B roads	Community severance & environmental impacts	Safety
1.1 Provide infrastructure needed to realise sustainable housing opportunities associated with existing Local Plans	✓✓✓	✓✓	✓✓✓		✓✓✓		✓✓	✓✓	✓✓
1.2. Provide the opportunity to unlock thousands of new homes between Cambridge and Ely as part of the CPCA's emerging non-statutory spatial plan by 2050	✓✓✓	✓✓	✓✓✓		✓✓✓		✓✓	✓✓	✓✓
2.1. Increase productivity of the nationally important CPCA economy (including science, technology, agriculture) through improved connectivity to labour, suppliers and markets	✓✓	✓✓	✓✓		✓✓✓	✓✓✓			
3.1. As part of a wider package for the Corridor contribute to the achievement of CPCA's LTP Net Zero by 2050 policy objective.	✓		✓✓	✓✓✓	✓✓				
3.2. Enhance biodiversity in line with the CPCA's emerging 'doubling nature' policy aims by 2050 (100% increase in land managed for nature in km^2)				✓✓✓				✓	
4.1. Improve the quality of life for residents in local communities by reducing the community severance and environmental impacts of traffic on the built environment			✓✓	✓			✓✓	✓✓✓	✓✓
5.1. Encourage sustainable travel by improving the comfort, reliability, capacity and / or speed of alternative transport services (including rail, CAM, buses, walking, cycling and horse riding) along the A10 corridor	✓✓	✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓	✓✓	✓✓	✓✓
6.1. Reduce the risk of collisions along the A10 and on parallel 'B' / unclassified roads in local communities relative to 2018 levels					✓✓	✓	✓✓	✓	✓✓✓
6.2. Reduce congestion and improving journey time reliability along the A10, sustaining these benefits for the long-term.			✓✓	✓✓	✓✓✓	✓✓	✓✓	✓✓	✓✓

Table 19. Objectives vs opportunities

Scheme Objectives ✓ - Low Fit ✓✓ - Medium Fit ✓✓✓ - High Fit	Opportunities											
	New sustainable housing	Productivity of existing firms	Spread economic growth	Double nature and mitigate carbon	Improve connectivity to the SRN	Reduce congestion for PT	Improve accessibility to good employment	Segregated, dedicated routes for NMUs	Improve road safety for all users	Improve conditions for walking, cycling and horse riding	CAM Interfaces	Potential EV Charge points and Dynamic Charging
1.1 Provide infrastructure needed to realise sustainable housing opportunities associated with existing Local Plans	✓✓✓	✓✓	✓	✓	✓✓	✓✓	✓✓	✓	✓	✓	✓✓	
1.2. Provide the opportunity to unlock thousands of new homes between Cambridge and Ely as part of the CPCA's emerging non-statutory spatial plan by 2050	✓✓✓	✓✓	✓	✓	✓✓	✓✓	✓✓	✓	✓	✓	✓✓	
2.1. Increase productivity of the nationally important CPCA economy (including science, technology, agriculture) through improved connectivity to labour, suppliers and markets	✓✓	✓✓✓	✓✓✓		✓✓✓	✓✓	✓✓	✓	✓	✓	✓✓	
3.1. As part of a wider package for the Corridor contribute to the achievement of CPCA's LTP Net Zero by 2050 policy objective.				✓✓✓		✓		✓✓✓	✓	✓✓✓	✓✓✓	✓✓✓
3.2. Enhance biodiversity in line with the CPCA's emerging 'doubling nature' policy aims by 2050 (100% increase in land managed for nature in km^2)				✓✓✓				✓		✓		
4.1. Improve the quality of life for residents in local communities by reducing the community severance and environmental impacts of traffic on the built environment				✓			✓	✓	✓✓	✓✓✓		
5.1. Encourage sustainable travel by improving the comfort, reliability, capacity and / or speed of alternative transport services (including rail, CAM, buses, walking, cycling and horse riding) along the A10 corridor		✓	✓	✓		✓✓✓	✓✓✓	✓✓✓	✓	✓✓✓	✓✓✓	✓
6.1. Reduce the risk of collisions along the A10 and on parallel 'B' / unclassified roads in local communities relative to 2018 levels					✓			✓	✓✓✓	✓	✓	
6.2. Reduce congestion and improving journey time reliability along the A10, sustaining these benefits for the long-term.						✓	✓✓	✓	✓	✓✓	✓	

2.6.2 Fit of scheme objectives with wider policy objectives and strategy

Figure 32 demonstrates how the scheme objectives fit with wider policy objectives and Figure 33 demonstrates how the scheme objectives fit with LTP objectives.

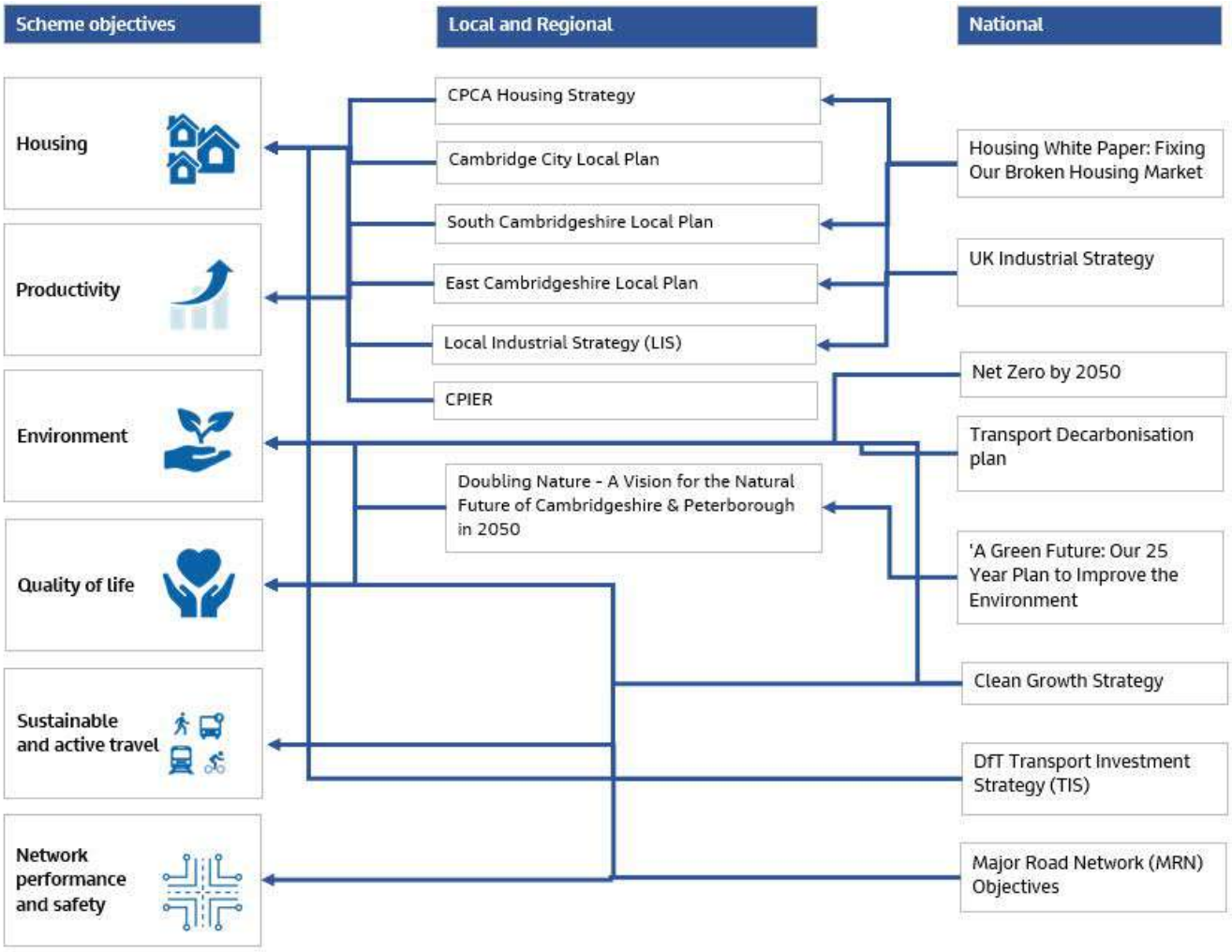


Figure 32: Fit with wider policy objectives and strategy

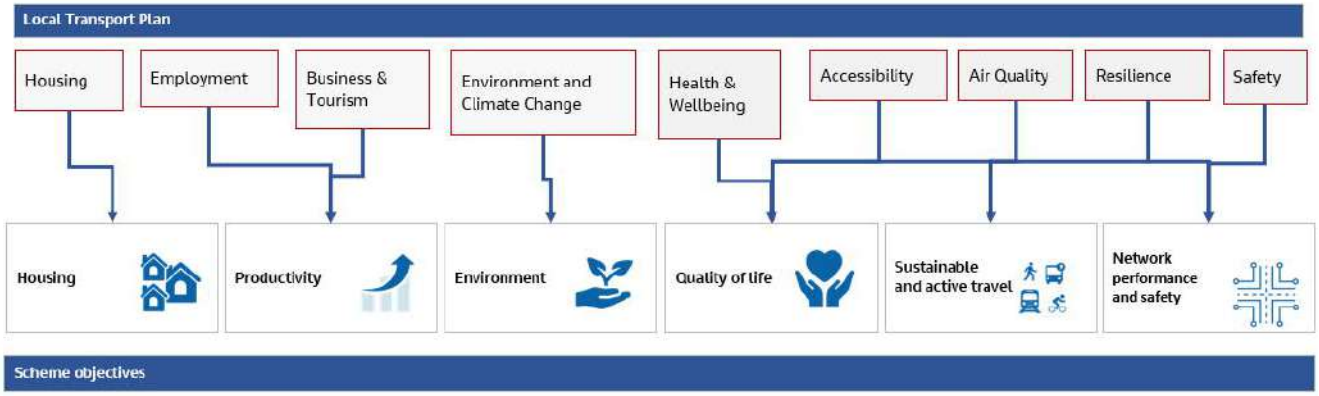


Figure 33: Fit with LTP objectives

2.6.3 Measures for success

The transport improvements of the intervention options will result in a range of measurable impacts on traffic and travel conditions. Impacts and measurable indicators relevant to improving conditions on the A10 could include:

- Delivery of identified housing for CPCA measured by the number of homes/jobs delivered/occupied.
- Reduced congestion on the A10 and improved journey time reliability for north-south traffic movements measured by traffic volume and relative difference in peak/off-peak journey times.
- Enhanced connectivity reflected by absolute journey time improvements on key routes compared against the 2043 do minimum situation.
- Improved/sustained air quality and reduced traffic noise on the A10 and near residential areas.
- Enhanced biodiversity by measuring the area of land that is managed for nature.
- Increased accessibility to alternative transport modes as measured by the change in mode share of sustainable and active travel modes.
- Reduced carbon emissions. A carbon assessment has been undertaken as part of the options appraisal. Once the preferred option has been selected and preliminary design undertaken a baseline carbon calculation will be completed. This will provide the basis against which carbon reductions can be evaluated and this would be linked into the overarching carbon management plan and CEEQUAL criteria. Longer term the project would be looking to implement PAS 2080, a global standard for managing infrastructure carbon.

2.7 Scheme scope

The A10 upgrade scheme will deliver a transport intervention option that not only tackles the identified challenges, but is affordable, deliverable, and represents value for money. The intervention option will deliver high quality transport improvements that will address congestion hotspots and support wider connectivity, sustainability, social and economic objectives.

The shortlist of options discussed in Section 2.11 include a combination of junction improvements and online and / or offline carriageway improvements for part of the route or the whole section between the A14 and A142.

Figure 34 shows a proposed indicative cross section of a new A10 dual carriageway.

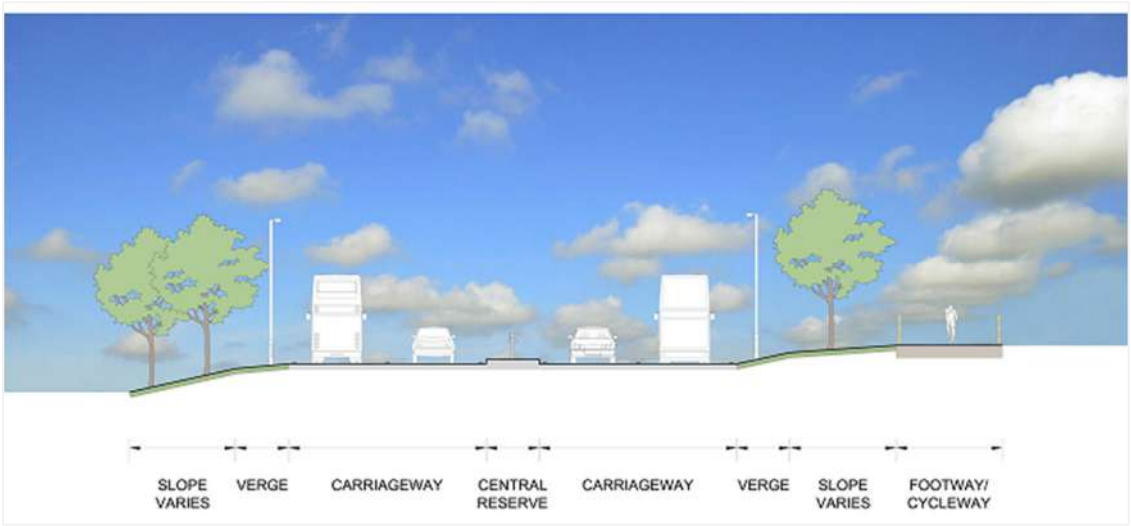


Figure 34. Indicative cross section - both online and offline route

A summary of what comprises an online and offline route is provided below.

Online route: An online route would follow the current A10 alignment and involve an upgrade of the existing road to a dual carriageway to accommodate the following:

- Provision of a continuous, segregated route for cyclists, walkers and horse riders within the corridor, or nearby. New infrastructure would be provided to tie in with other existing and/or planned routes, in the form of a segregated path on one side of the dualled road.
- Toucan crossings at junctions to provide connectivity into the ped/cycle route.
- Designed to allow provision for public transport.
- Design speed – 120 kilometres per hour; dependent on alignment and layout constraints.
- Lighting only at junctions.
- Provision for ducting to facilitate utilities and digital enablement. Ducting is a CPCA policy requirement.

Offline route: An offline route alignment would involve the construction of a new dual carriageway separate from the current A10 alignment. This scheme would have the following features:

- Dual Two Lane All Purpose Road (D2APR).
- Design Speed 120 kilometres per hour.
- Provision of a continuous, segregated route for cyclists, walkers and horse riders along the corridor; offset from main carriageway .
- Lighting only at junctions.
- Provision for ducting to facilitate utilities and digital enablement. Ducting is a CPCA policy requirement.
- Over/under bridges for side roads, public rights of way and farm accesses (or junction accesses for side roads in particular – new road still needs to connect to the existing network).
- Junctions incorporate toucan crossing facilities.
- Existing road reconfigured as a local road.

Both offline and online schemes options would also include some environmental measures, such as habitat creation (in-fill), linear habitat corridor alongside the road, and off-site tree planting. Although the linear habitat

is proposed in both online and offline options, an online alignment may have some constrained sections where planting would not be feasible, in which case additional off site mitigation would be considered.

2.8 Issues and Constraints

The following table identifies pertinent issues and constraints for consideration in the further development of junction and dualling upgrades on the A10.

Table 20. Summary of issues and constraints

Planning Position – The CPCA is promoting the scheme but it is not the local planning authority. For the purpose of highways schemes the Planning Authority is the County Council. The application would need to be made jointly in the names of the CPCA and Cambridgeshire County Council and then it could be determined by the County Council under Regulation 3 of the Town and Country Planning General Regulations 1992. Following the grant of consent the process for compulsory acquisition and the side road orders would need to be followed which could lead to a Public Inquiry. The CPCA may want to investigate with their lawyers and/or the Secretary of State if there are any ways these processes can be twin tracked. Any planning application would need to comply with the requirements of the National Planning Policy Framework and pertinent local planning policy as described in Section 2.11.7.
Cost and disruption - Should Option G - Junction Upgrades be pursued and then a dual carriageway is needed at a later date, the construction of subsequent upgrades would risk further cost and disruption to the MRN.
Decarbonisation – Project partners' policy objective is to deliver a net zero carbon solution. At a national level Government has pledged for all new motor vehicles to be electrically powered by 2035, with a gradual shift in the vehicle fleet in forthcoming years. While this initiative will make a difference there is an anticipation that other measures will be needed to offset the carbon emissions and embodied carbon in the short-term. There will need to be a discussion with the DfT as to whether the monetary costs (and benefits) for these decarbonisation measures (once determined) can be included in future iterations of the business case.
Funding timescales – Currently, a scheme of this size is likely to be considered by government under its Major Road Network Fund (MRN) Fund..." - The MRN Fund is for schemes for delivery between 2020 to 2025. Any dualling package would need to be a Large Local Major scheme, but it could not realistically be delivered until 2028.

2.9 Interdependencies and Complementary schemes

2.9.1 Interdependencies

Works at the "BP roundabout" (A10/A142 Witchford Roundabout) started in July 2020. These are being undertaken under a Section 106 agreement to enable growth of a business site at Lancaster Way in Ely (3,400 jobs as a result). Given its planned delivery from 2020 this is considered a low risk to any A10 scheme.

Highways England is an important stakeholder for the A10 scheme, given that the A10 intersects with the A14 at the Milton Interchange. The Combined Authority has set up a working group with Highways England, the GCP and Cambridgeshire County Council to explore what is required for the future connectivity of the A10 and A14. Its first meeting was on 17 July 2020. Any such scheme for the Milton Interchange would be a major project that requires detailed investigation in its own right. The Combined Authority will continue to work with project partners during the OBC phase to assess how the A10 options will connect into the Milton Interchange both in the short and longer term.

2.9.2 Complementary schemes

As the following projects and the A10 scheme further develops, there exists an opportunity to maximise the interface benefits, so that the road scheme complements the take-up of public transport, walking and cycling and electric vehicles (over conventional powered vehicles). This could include measures such as how the relocated Waterbeach station or a CAM stop is accessed and promoted from an improved A10, reuse of the old A10 alignment, provision of charging points etc. The schemes are as follows:

- The Cambridge Autonomous Metro (CAM) will be an expansive metro-style network using electric rubber-tyred vehicles that connects regional settlements, major city fringe employment sites and key satellite growth areas across the region. The proposed network includes a section to link Waterbeach New Town with Cambridge, assisting to reduce the traffic pressure on the A10. An OBC is under development taking on board public consultation for the City Tunnel Section and surface sections completed in April 2020.
- Waterbeach station relocation to be closer to the new town north of Waterbeach and rail-based park and ride (200 spaces).
- Local bus services planned for Waterbeach New Town, to ensure appropriate bus priority and ease of access to the New Town and surrounding trip attractors.
- "Greenways": commuter cycle routes from surrounding towns and villages within a ten-mile radius. In particular, there is a proposed 8 km Waterbeach greenway route to enable cyclists, walkers and equestrians to travel sustainably from Waterbeach into Cambridge. This route was assessed as a number one priority due to its high cost benefit and its strategic fit with Waterbeach development, among others. In February 2020, after public consultation, the Executive Board took the decision to proceed with the Waterbeach Greenway and approved an outline budget of £8 million.
- Continued policy support for the introduction of the necessary parking and charging infrastructure to support electric vehicle use on a wider scale, by working closely with CCC and local planning authority partners.[40] In addition the Combined Authority will support options for 'last mile' deliveries using electric car/taxi and/or bikes and providing 'click and collect' hubs at Park & Ride sites.
- The Ely area capacity enhancement is a Network Rail programme looking to provide more capacity in this area by improving the main rail junction to the north of Ely station and to address wider capacity constraints around Ely to enable the delivery of more rail services. At present, Network Rail is working on the Strategic Outline Business Case to be submitted to the DfT later in 2020.
- Soham station - the former station was closed in 1965 and a new single platform station with 50 parking spaces is proposed to reconnect the town with the rail network. This town is located on the eastern side of the study area and subject to gaining the consent required, the construction of the station is currently planned to begin later in 2020 and is expected to be completed in spring 2022. It would initially be served by Greater Anglia services between Ipswich, Ely and Peterborough.
- The Wisbech rail link project is looking to reopen the mothballed railway line between March and Wisbech, with direct services from Wisbech to March, Ely and Cambridge. This project has been promoted by the Combined Authority and has been included within their Local Transport Plan. It has been identified as a key transport scheme to provide a step-change in transport capacity and connectivity to enable development at Wisbech Garden Town. A full business case has been completed, and it is now at the detailed design stage, funded by the Combined Authority. The construction cost is estimated at £220m and if approved would likely be funded by Network Rail / Government.

Any non-delivery of schemes such as CAM and the Greenway to Waterbeach and a relocated Waterbeach station would likely add pressure on the A10 between Waterbeach and Cambridge. Depending on the option chosen, the A10 scheme would provide opportunities to re-use the existing A10 for public transport, walking and cycling,

[40] Policy 6.4.2 Provide the Infrastructure which will enable the uptake and optimisation of new transport and digital connectivity technologies, Cambridgeshire and Peterborough Local Transport Plan. https://cambridgeshirepeterborough-ca.gov.uk/assets/Transport/20190520-CPCA-LTP-Policies-Annex-v4.0.pdf

and a shared use, segregated walking / cycle route is also planned, mitigating to some extent non-delivery. Any non-delivery of the station's relocation and its impact on the full build out of housing at Waterbeach New Town would need to be considered by the planning authority depending on the alternative mitigation proposed by the developer. This could have a potential impact on the full realisation of the housing benefits discussed in the Economic Case.

2.10 Stakeholder attitudes (including political support)

The Management Case (Section 6.7.3) provides an overview of relevant stakeholders. Technical engagement has involved:

- A Stakeholder Meeting on 19 February 2020 at Shire Hall, Cambridge, featuring representatives from CPCA, Jacobs, Cambridgeshire County Council, Greater Cambridge Partnership, East Cambridgeshire District Council and Highways England to inform the development and validation of study specific problems, opportunities and objectives.
- Facilitated council member workshops to seek initial feedback from councillors on the A10 project objectives, issues and potential solutions. This feedback has been reflected in the preparation of the SOBC.
- Various Technical Officer Working Group sessions featuring representatives from CPCA, Jacobs and Cambridgeshire County Council to gather information, review and sign off the approach to option appraisal and assess key risks and opportunities with the different online and offline options, helping to generate and validate the long list and short lists generated.

To date engagement with statutory parties, such as the Environment Agency, utilities companies and Network Rail has been limited to informing them of the online engagement (discussed below). This is considered proportionate for the early stage of the project.

In June 2020 CPCA and Jacobs presented an outline of the SOBC, including need case and route options in a virtual online engagement event. Whilst a statutory public consultation is planned in later in 2020, the aim of this engagement exercise is to hear people's views as early as possible and invite their comments. This was launched in June 2020 for three weeks, concluding on 14 July 2020 and hosted on the Combined Authority's virtual exhibition space[41]. The press release for this can be found at: https://cambridgeshirepeterborough-ca.gov.uk/news/mayors-road-trip-shares-a10-options-with-public-despite-covid/ . A summary of the responses received through the online survey or by direct email is included in Appendix E. These responses will inform future development of the options in the next stage of the project.

Consultation with local stakeholders has suggested that additional interventions at other junction locations, such as at Little Thetford, are needed, and this is in part supported by the modelling work at this stage. It is proposed that a review is undertaken at the next stage of development.

The Combined Authority has received 22 letters of support for the scheme from local businesses. Letters of support can be found in Appendix E.

The scheme has the support of the South Cambridgeshire District Council, through whose authority this section of the A10 runs. It is also supported by Mayor James Palmer and South Cambridgeshire MP Lucy Frazer.

East Cambridgeshire District Council are supportive of the proposals, however, there has previously been a suggested new road to the North West of Ely, which would divert non-local traffic away from the two Ely roundabouts the Council requests that the Combined Authority investigates this proposal fully before making any decisions about preferred route options.

[41] https://a10dj.exhibition.app/ accessed 25 June 2020

2.11 Options

2.11.1 Introduction

The option assessment process in 2020 has been an inclusive exercise building on previous work undertaken in 2017 / 2018 at the preliminary SOBC stage. Through a structured option generation and sifting process, the option assessment has ultimately identified a shortlist of options, to address the identified operational and road safety problems, for more detailed modelling, forecasting and TAG appraisal, with this reported in the Economic Case.

This section provides an overview of the work completed on Option Assessment with further information found in the accompanying Option Assessment Report (Appendix C).

2.11.2 The Ely to Cambridge Transport Study 2018

As noted in Section 1.2 a series of inter-related studies were completed by Mott MacDonald for CCC as part of the Ely to Cambridge Transport Study 2018. This included a Preliminary SOBC which provided an initial evidence base covering the current situation, future issues and opportunities and strategic context. It established the need for improvements, developed a set of scheme objectives and identified appropriate transport packages that can be implemented within the study area.

Section 8.3 of the OAR provides a comprehensive overview of option development within the Preliminary SOBC study. The Preliminary SOBC study assessed progressively greater levels of transport investment, initially testing in isolation measures aimed at encouraging a shift from car use to public transport, walking, and cycling. It then tested these in conjunction first with junction improvements along the A10, and finally with the implementation of dual carriageway standards on the South, North, and full A10 corridor between Ely and Cambridge. The options are summarised below and displayed graphically within the OAR (Figure A1 to A5 in the OAR).

1) DS1 ‘Mode shift’: A package of measures to encourage mode shift. These include:
    - New or improved walking/cycling routes between Ely, Waterbeach and Cambridge.
    - New high-quality segregated public transport provision (route TBC) between Waterbeach development and Cambridge.
    - New park and ride sites at Waterbeach development, to remove car trips from southern section of A10.
    - Existing Waterbeach railway station relocated closer to Waterbeach development.
2) DS2 ‘Junction+’: DS1 + improvements to increase capacity at ten junctions on the A10 between Ely and Cambridge.
3) DS3 ‘North-dual’: incorporating mode shift and junction capacity improvements from DS1 and DS2 plus a dual carriageway route, on an alignment to be determined, on an alignment to be determined, between the new town north of Waterbeach and Ely.
4) DS4 ‘South-dual’: incorporating mode shift and junction capacity improvements from DS1 and DS2 plus a dual carriageway route, on an alignment to be determined, between the new town north of Waterbeach and A14 at the Milton Interchange.
5) DS5 ‘Full dual’: incorporating mode shift and junction capacity improvements from DS1 and DS2 plus a dual carriageway route, on an alignment to be determined, between Ely and A14 at the Milton Interchange.

The Study analysed each of the option packages through a range of indicators, using CCC’s Cambridge Sub-Regional Model (CSRM2) and bespoke option appraisal methodology. All option packages were found to have high value for money. The Study concluded by recommending a joined-up strategy across three types of measure:

- Policy planning and regulation – securing funding for improvements, managing demand, contributions from developers, monitor & review.
- Multi-modal quick wins – non-car measures and parking restraint, cycle measures, public transport corridor.
- Longer term highway interventions – junction improvements and carriageway capacity upgrades.

Separate workstreams then emerged to take each of these forward as standalone projects, whilst being cognisant of any interfaces. As noted in Sections 1.4 and 2.9.2 these multi-modal (non-highway) solutions are now being progressed through other workstreams.

CCC then commissioned a follow-on Junctions Assessment Report in 2018[42] to prioritise and assess junction options, reducing the list needing improvement from ten to eight junctions, with fifteen options considered across these eight junctions.

2.11.3 National Roads Fund Application 2019

Both the pre-SOBC and Junctions Assessment Report informed the two Pre-SOBC proformas completed by the CPCA for the local road component of the National Roads Fund. These were reviewed and endorsed by England's Economic Heartland prior to submission to DfT in July 2019. The Chancellor announced on 11 March 2020 that the Junctions package had been approved for further development. The Combined Authority has been in regular dialogue with the DfT following this announcement, to explain that the purpose of this SOBC is to further develop the case for junction and / or carriageway capacity upgrades to the A10 as part of a robust approach to option assessment and appraisal.

2.11.4 Long list options development and pre-sift

As the pre-SOBC had not defined specific alignments for its assessment of the various dualling options, an initial exercise was undertaken in early 2020 to develop a very long list of alignment options. 78 alignment options were generated by identifying plausible engineering alignments through the study area. The options consisted of combinations of the route segments presented in Figure 35.

[42] Mott MacDonald (2018): Ely To Cambridge Transport Study: A10 Junction Assessment Report.

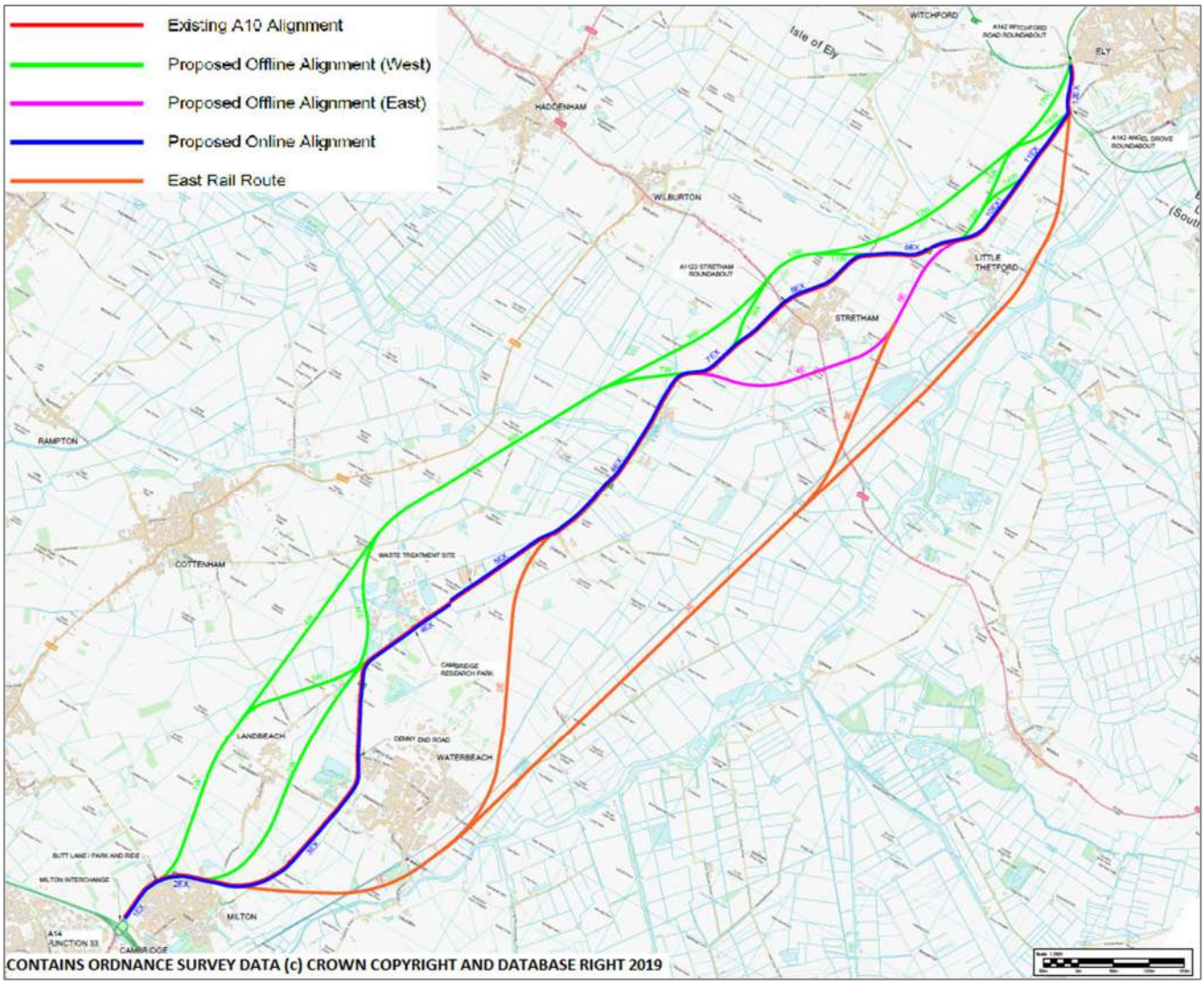


Figure 35. Longlist segment alignments

An initial sift was undertaken on the 'very long list' by assigning Red-Amber-Green scores to each option against deliverability and feasibility criteria. Any option that scored 'Red' against one or more criteria was excluded at that point. This provided a preliminary long list of 20 alignment options. A further four options representing dualling the northern section of the route were added for completeness and continuity from Pre-SOBC work, enabling full dualling, southern dualling and northern dualling to be considered. This resulted in a long list of 24 options to take through the full sift using Multi-Criteria Assessment.

2.11.5 Multi-criteria assessment

The long list of options was then assessed using Multi-Criteria Assessment (MCA). The MCA was developed to align with the DfT's Early Appraisal and Sifting Tool (EAST).

The MCA was undertaken in two stages:

1. First, all options were scored on a scale of -3 to +3 on their ability to meet the scheme objectives; total scores were calculated across objective themes, so that the Environment and Network performance themes with two objectives each were represented by average scores. Options scoring poorly for impact against scheme objectives were discarded after this stage.

2. Remaining options were scored on a scale of -3 to +3 against 'other criteria', namely: feasibility, deliverability, safety, environmental impact, social impact, affordability, compatibility with public transport provision, compatibility with provision for non-motorised users, and compatibility with a short-term package of junction improvements.

A series of multi-disciplinary internal team workshops were held to score the long list of options, based on available information, including findings from the Preliminary SOBC study. The methodology, scoring rationale and resulting scores and shortlist were presented to and approved by the CPCA at workshops on 11 March 2020 and 11 May 2020 respectively. It was agreed that no 'other criteria' would be scored more highly than any other.

The OAR explains the MCA methodology in more detail, along with scoring rationales for individual objectives.

2.11.6 Shortlist

There were a number of instances where more than one option with very similar layouts achieved equally high scores in the MCA. In these cases, a judgement was made as to whether the differences between them were significant in terms of the network to be modelled and in those cases to include only one in the shortlist instead of shortlisting both. This was a consequence of the very long list options having been defined at a more nuanced level of detail than would typically be required at this stage in the design process. These nuances in design have not been discarded but will be explored further during subsequent design phases.

Six distinct dualling options that scored the highest in the MCA along with the junction improvement package identified in the A10 Junction Assessment Report were taken forward for further appraisal. The options were relabelled using initials A to G, as presented in Table 21 and Figure 36. Individual scheme drawings of the shortlisted options are provided in Appendix D.

Table 21: Shortlisted options

Short List Ref	Long List Ref	Description
A	8F	'Full length' dual carriageway involving mainly widening of the existing A10. New bypass sections at three locations: i. west of Denny End between north Milton and Cardyke ii. west of Stretham iii. west of Little Thetford.
B	8L	'Full length' dual carriageway involving mainly widening of the existing A10. New bypass sections at three locations: i. west of Denny End between north Milton and Cardyke ii. east of Stretham iii. west of Little Thetford.
C	10B	'South' dual carriageway between Milton and Cambridge Research Park with a new route to the west between north Milton and Cardyke. The section north to Ely remains a single carriageway, with improvements at four junctions: i. A10 / Denny Abbey Waste Management Park Roundabout ii. A10 / A1123 Stretham Roundabout iii. A10 / A142 Angel Drove Roundabout iv. A10 / A142 Witchford Roundabout.

Short List Ref	Long List Ref	Description
D	1	'Full length' dual carriageway with a new route to the west of the A10 between Butt Lane Park & Ride and Ely.
E	5B	'Full length' dual carriageway involving mainly widening of the existing A10 except for western bypasses of Stretham and Little Thetford.
F	10A	'South' dual carriageway between Milton and Cambridge Research Park involving widening of the existing A10. The section north to Ely remains a single carriageway with improvements at four junctions: i. A10 / Denny Abbey Waste Management Park Roundabout ii. A10 / A1123 Stretham Roundabout iii. A10 / A142 Angel Drove Roundabout iv. A10 / A142 Witchford Roundabout.
G	12	'Junctions'. The A10 remains a single carriageway with improvements at seven junctions: i. A10 / Butt Lane Park and Ride Access ii. A10 / Denny End Road iii. A10 / Cambridge Research Park Roundabout iv. A10 / Denny Abbey Waste Management Park Roundabout v. A10 / A1123 Stretham Roundabout vi. A10 / A142 Angel Drove Roundabout vii. A10 / A142 Witchford Roundabout.

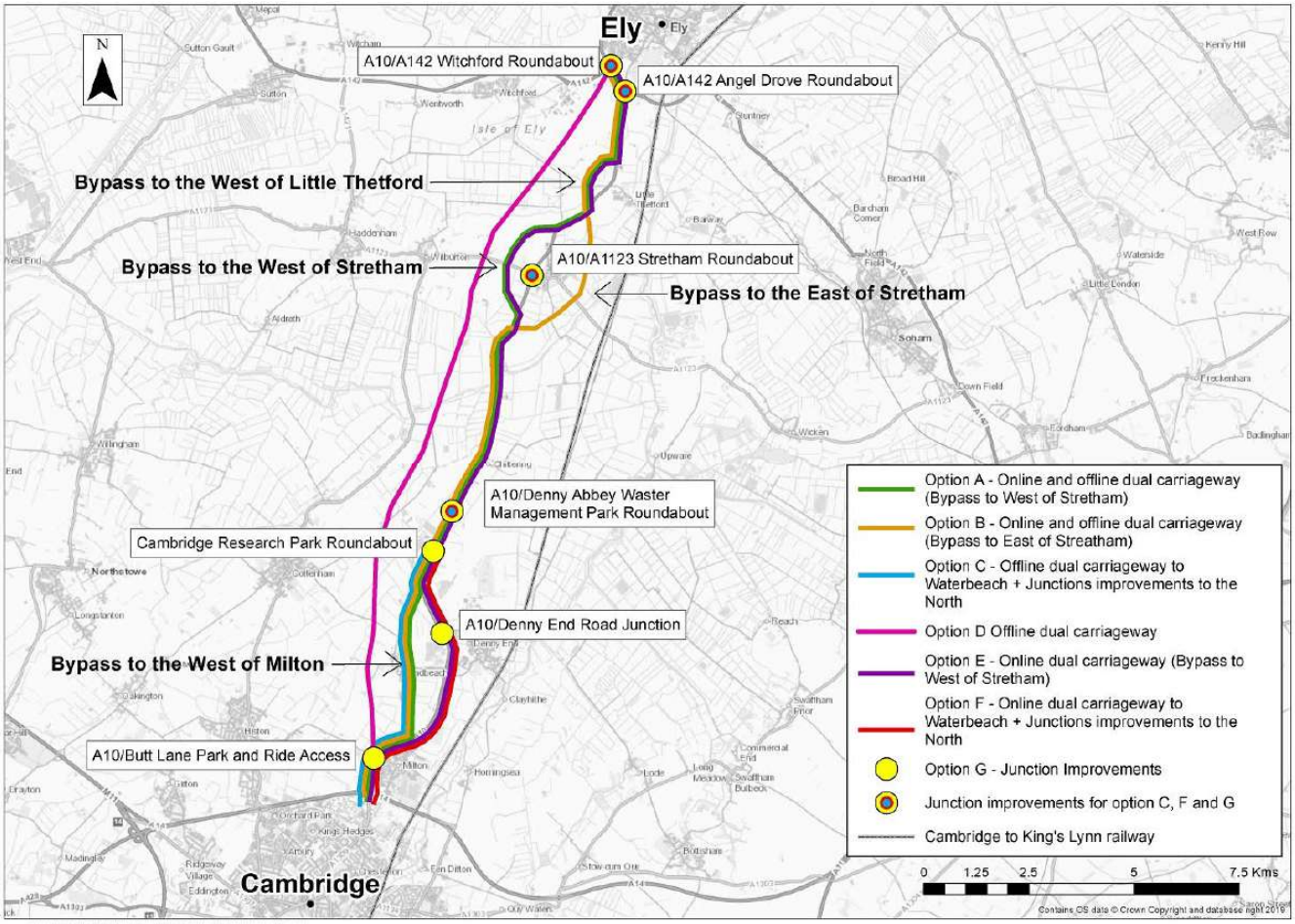


Figure 36. Shortlisted options

2.11.7 Alignment of the Option Shortlist with the Scheme Objectives

Table 22 summarises the performance of the shortlisted options in terms of their fit with the scheme objectives. The table also references the score for 'other criteria' generated as part of the MCA and their ranking based on the total scores.

Table 22. Summary of alignment between options and objectives

Objective	Option						
	A (Full Dual)	B (Full Dual	C (South Dual)	D (Full Dual)	E (Full Dual)	F (South Dual)	G (Junctions)
1.1 Housing – Local plan growth	3	3	3	3	3	3	3
1.2 Housing – Long-term growth	1	1	1	1	1	1	1
2.1 Productivity	3	3	2	3	3	2	1
3.1 Environment – Net Zero	-2	-2	-2	-2	-2	-2	-1
3.2 – Environment – Biodiversity	2	2	1	2	1	1	0
4.1 Quality of life	2	2	1	2	1	1	2
5.1 Sustainable and active travel	2	2	2	3	2	2	1
6.1 Network performance – road safety	3	3	2	3	3	2	1
6.2 – Network performance – congestion & reliability	3	3	3	3	3	3	2
Scheme objectives total	17	17	13	18	15	13	10
'Other criteria' total (see Section 2.11.5)	16	15	17	13	15	15	16
Total score	33	32	30	31	30	28	26
Rank	1	2	=4	3	=4	6	7

Key differences between options are as follows:

- Productivity – full dualling options have the greatest impact on connectivity between labour markets, businesses and each other, considering the wider impact on the corridor to Ely and further north into Fenland and west Norfolk.
- Net Zero Carbon – Pre-mitigation, Option G is expected to have a less negative impact, as it is purely focussed on solving pinch-points rather than improving connectivity
- Biodiversity – Option G offers little opportunity to increase biodiversity due to the smaller footprint. Dualling offers the opportunity to include substantial landscaping as part of the design scope. In real terms, land given to nature would be over and above the scheme itself. All options might therefore score the same for doubling nature, except for the ease of provision of mitigation, and so it is on this basis they have been scored, resulting in lower scores for the south dualling options C and F, and the largely online Option E.
- Quality of Life - Dualling offers greater traffic reduction on Cottenham Rd and Horningsea Rd than Option G. Online dualling may increase severance in communities along the A10, resulting in a lower score for Option E. There are several noise important areas along the existing A10; offline options that take traffic away would

benefit those areas, so these score more highly. These aspects and mitigation measures would be investigated at the OBC stage.

- Sustainable and Active Travel – Option D provides the best opportunity to improve provision for buses and active modes, both on the existing route as well as providing segregated facilities alongside the new A10. Dualling options provide greater opportunity to cater for active travel than Options G, which is limited to the junctions themselves.
- Road Safety – all options have a benefit, but option G scores lowest as it does not completely solve the road safety issues on the corridor and those parallel to it, in particular the section south of the A1123. Full dualling should theoretically deliver a safer road network than single carriageway, resulting in higher scores for Options A, B, D and E.
- Congestion and Reliability – Both full and southern dualling options scored equally given their positive impact on reduced journey times.

The Combined Authority will need to consider other factors such as public and stakeholder attitudes, and value for money to develop a shorter list for further design and development at the OBC stage.

2.12 Strategic fit of shortlisted options

2.12.1 Introduction

Reference is made to the strategic fit in terms of the following topics in turn:

- Transport Investment Strategy (TIS), as required by the DfT's Strategic Case Supplementary Guidance[43].
- Major Road Network objectives, given that the Business Case is seeking National Road Funds.
- Wider policy initiatives at the national level.
- Regional policy, i.e. England's Economic Heartland.
- Local policy, covering the Combined Authority's remit, Cambridgeshire County Council and the three local planning authorities between Cambridge and Ely.

2.12.2 Strategic fit with the Transport Investment Strategy objectives

This section provides an overview of how the scheme's shortlisted option aligns with relevant national strategic priorities identified within the Transport Investment Strategy as important to Government:

Create a transport network that works for users, wherever they live

The upgrade of the A10 will bring benefits to the whole eastern region of England, although more directly to Cambridgeshire and particularly to inhabitants in Ely and Cambridge that use this link regularly. At present, the A10 is a vital link within East England for both commuters and business.

All options contribute towards this strategic objective to a greater or lesser extent. The full-length dualling options A, B, D and E offer the best opportunities to align with this strategic priority by providing the maximum improvement for those who use the network. Options C and F would provide focus improvement to a key section of the route between Cambridge and Waterbeach. The package of short-term junction improvements (Option G) would have less impact but is still aligned with this objective.

While all but one option involves upgrading the road to dual carriageway standard to increase the capacity, there is a risk that such an upgrade may induce additional demand, reducing the resilience and performance

[43] DfT's Strategic Case Supplementary Guidance

improvements gained from the scheme. As with all transport schemes, variable demand modelling throughout the business case process will assess this potential impact.

Improve productivity and rebalance growth across the UK

Many companies based in Greater Cambridge are concerned about the lack of affordable homes for their employees, which could ultimately constrain their local growth as well as making the area less attractive to new businesses. Providing infrastructure such as improvements to the A10 will help to unlock further housing which in turn will help housing affordability in the area.

The A10 capacity improvements will tackle forecast levels of congestion, and associated journey time variability and unreliability. A reduction in congestion would benefit commuters, enable more efficient movement of goods and increase the connectivity between labour markets and businesses to increase the potential for business-to-business activity.

All options would boost productivity, although it is likely that the full dualling options A, B, D and E would have a greater impact in improving the connectivity between firms along the corridor, beyond Ely to the Fenland economy and the port of King's Lynn, helping to spread growth along the corridor and not just concentrate it at Cambridge.

Enhance our global competitiveness by making Britain a more attractive place to invest

As detailed in section 2.3.4., the CPIER asserts that many firms in the region take a 'Cambridge or Overseas' approach when considering where to locate. If Cambridge became a less attractive location, because of access to labour markets, congestion, etc, then businesses are more likely to locate abroad than to other locations within the UK. Survey evidence from the CPIER report indicates that significantly more businesses indicated that they would move abroad (44.2%) than elsewhere in the UK (25.0%).

There is evidence that foreign firms and knowledge-intensive businesses are mainly interested in Cambridge as their UK base, and in some cases, Cambridge is their Europe base. Therefore, there is a risk of these foreign companies leaving the country for other European cities if they are not able to grow within this area, with a consequent negative economic impact on UK plc.

Improving the performance of the route will enhance both the local and UK economy, by maintaining Cambridge's reputation as a great place to invest. All options contribute towards this strategic objective. The full-length dualling options A, B, D and E offer the best opportunities to align with this strategic priority by providing the maximum improvement for those who use the network. Options C and F would provide focussed improvement to a key section of the route between Cambridge and Waterbeach, where housing growth is focussed. The package of short-term junction improvements would have less impact but is still aligned with this objective.

Support the creation of new housing

Section 2.4.3. has presented a summary of the demand for housing growth along the corridor. As stated before, the realisation of the full scale of housing growth at Waterbeach New Town is subject to an improved A10.

The dual carriageway and / or junction upgrade of the A10 would assist in the delivery of further phases of development at Waterbeach New Town up to its site limit of 11,000 homes. Local Plans and the CPCA Transport Plan make clear that the A10 is vitally important in helping to deliver further homes in the county.

Dualling options may offer a better opportunity to align with this strategic priority by both supporting growth at Waterbeach and also assist with the Combined Authority's longer-term plans for growth to 2050, beyond the scope of current Local Plans. The A10 Corridor is clearly identified as one of the Strategic Corridors for Growth in

the Strategic Spatial Framework (Non-Statutory) although the location of growth beyond 2036 is not yet determined.

The 3,000 homes at Ely North are not dependent on the A10 Dualling and Junction scheme, although future residents would benefit from improved transport conditions for journeys to/from Ely North, Waterbeach and the A14.

2.12.3 Strategic fit with the Major Road Network policy

The Department for Transport consulted on proposals to create a Major Road Network (MRN) in 2017/18, building on the work of the Rees Jeffrey Road Fund report – A Major Road Network for England. Government noted that there was strong support for the concept of the MRN and its central policy objectives.

The idea of the MRN is that it will form a middle tier of the country's busiest and most economically important local authority 'A' roads, sitting between the national Strategic Road Network (SRN) i.e. the nation's motorways and major A roads (e.g. A14, A47), and the rest of the local road network. The primary goals of the MRN align strongly with the TIS, namely:

- Reduce congestion
- Support economic growth and rebalancing
- Support housing delivery
- Support all road users
- Support the Strategic Road Network (SRN).

The A10 between Cambridge and King's Lynn has been included in the MRN, in recognition of its role in regional connectivity and the economy. From the strategic point of view, building the A10 as dual carriageway will increase the resilience of the MRN. It should also help the area to cope with the significant long-term effects that wider development in the government-proposed Oxford-Cambridge Arc would be expected to have on the transport market in Cambridgeshire.

A summary of the strength of the strategic fit between each of the options and the MRN objectives is shown in Table 23, using a 3-point scale, with 3 demonstrating strong strategic fit, 2 moderate strategic fit, and 1 slight strategic fit.

Table 23. Strategic fit between the MRN objectives and the A10 options

MRN Objective	Option						
	A (Full Dual)	B (Full Dual	C (South Dual)	D (Full Dual)	E (Full Dual)	F (South Dual)	G (Junctions)
Reduce congestion	3	3	3	3	3	3	2
Support economic growth and rebalancing	3	3	2	3	3	2	1
Support housing delivery	3	3	3	3	3	3	3
Support all road users	2	2	2	3	2	2	1
Support the SRN	2	2	2	2	2	2	1

A10 options will help to achieve Government MRN goals by:

- Reducing congestion on the A10 and parallel routes, with Option G having a lesser impact.
- Improve connectivity between Cambridge and the Fenland economic areas, and ultimately with the port of King's Lynn, helping to spread economic growth along the corridor. Full dual options A, B, D and E have the

greatest alignment given their impact on connectivity beyond Ely, including areas of Fenland that experience multiple levels of deprivation.

- Supporting economic growth and improved productivity in the nationally important Greater Cambridge economy region by providing the infrastructure to unlocking significant housing at Waterbeach New Town, helping to address the housing demand issue that is critical for a growing economy.
- Supporting all road users, by enabling better integration of existing and new developments by walking, cycling and public transport through the dedicated provision for active modes. Option D has the greatest impact in that it also provides the opportunity to release capacity on the existing network for both public transport, walking, cycling and horse riding. Option G has a reduced benefit in that it can only improve provision at the junctions.
- Providing a more resilient network that provides an improved connection between Cambridge and Ely, as well as providing users with alternative routes to the SRN (i.e. A11, A14 and then either A142, A1101 or A1065) for journeys between the M11 Junction 9 and East Cambridgeshire and West Norfolk. As noted in the business case improvements to the A14 / A10 Milton Interchange is a separate project, and this would also be needed to deliver the full 3 out of 3 score for this aspect.

2.12.4 Strategic fit against wider public policy objectives

All of the options align well with relevant Government White Papers and National policy documents as follows.

Fixing our Broken Housing Market[44] recognises that housing is becoming increasingly unaffordable and as a nation we need build more homes to slow the rise in housing costs: "We need to build many more houses, of the type people want to live in, in the places they want to live. To do so requires a comprehensive approach that tackles failure at every point in the system."

This means amongst other things providing more land for homes where people want to live (places such as Greater Cambridge), and building homes faster. "Development is about far more than just building homes. Communities need roads, rail links, schools, shops, GP surgeries, parks, playgrounds and a sustainable natural environment. Without the right infrastructure, no new community will thrive."

"Whilst housing within the region's Local Plans can be delivered and successfully mitigated by policy and infrastructure measures to the mid to late 2020s (e.g. Cambridgeshire Autonomous Metro, Greenways, public transport), and developer contributions for modest highway infrastructure upgrades, it is recognised that the delivery of long-term growth up to 11,000 homes at Waterbeach New Town – a key component of South Cambridgeshire's Local Plan on the A10 corridor requires a step change in capacity on the A10 through either junction or dualling upgrades. Allocations such as this within South Cambridgeshire's Local Plan are key to helping to meet Cambridge's housing need and provide the space for people to live to contribute to Cambridge's growing and nationally important economy."

The scheme would also support the aims of the National Planning Policy Framework (2019)[45] in facilitating sustainable development; creating a more reliable, less congested, and better-connected transport network; enhancing productivity and responding to local growth priorities; and supporting the creation of new housing.

The Industrial Strategy[46] sets out a vision for the future economy and the government strategy to boost the productivity, earning power and quality of the life of the British people. Solving grand challenges such as Artificial Intelligence and data, ageing society, clean growth and the future of mobility are integral to the Government's aims.

[44] MHCLG (2017) Fixing our Broken Housing Market, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/590464/Fixing_our_broken_housing_market_-_print_ready_version.pdf, accessed May 2020
[45] https://www.gov.uk/government/publications/national-planning-policy-framework--2
[46] https://www.gov.uk/government/topical-events/the-uks-industrial-strategy

The Industrial Strategy recognises the value of the Cambridge economy to the UK in many ways and through initiatives such as the wider Oxford – Milton Keynes – Cambridge Arc even greater growth can be achieved. Key research clusters associated with science and technology are well adept at attracting inward investment with the spin off benefits for the wider local economy in terms of job creation and benefits to society. Cambridge businesses and thought leadership is well suited to helping address the Grand Challenges.

However, we know through other research discussed below, the economy can only grow so much more before "growing pains" affect the ability of firms to source the local labour they need and be as productive in Cambridge as they could be in another country. Investment in infrastructure on corridors such as the A10 to expand the local labour supply through the housing unlocked is crucial to enabling Greater Cambridge to help to meet the Government's aspirations for its Industrial Strategy.

Clean Growth is an integral component of the Government's Industrial Strategy. The Clean Growth Strategy[47] sets out the actions the government is taking to put clean growth at the centre of UK modern Industrial Strategy (e.g. changing the way houses are heated, cars are powered, electricity grid is run). Clean Growth means growing our national income while cutting greenhouse gas emissions, and the strategy recognises transport is one of the sectors where we need to see the greatest progress, both through technological breakthroughs and large-scale deployment.

The intent of this project is more than just providing additional highway capacity on the A10. It is part of a wider package of measures that has first considered modal shift and sustainable transport measures, with additional highway capacity as the next step. In addition, the project provides an opportunity for Low Carbon transport infrastructure (such as a parallel walking and cycling route and potentially electric vehicle charging infrastructure as the vehicle fleet becomes increasingly electric based) to be incorporated into the design as it develops. These measures will assist the government to achieve their target of 24% reduction in UK transport emissions.

In June 2019, the Government became the first global economy to pass a law that require the UK to achieve "net zero" greenhouse gas (GHG) emissions by 2050. Transport has been identified as an area to play a huge role in the economy reaching net zero. During the recent months the Government has been working closely with the transport sector to develop a comprehensive plan of actions; the Transport Decarbonisation Plan (TDP)[48]. The final plan is expected to be published in Autumn 2020 and will be fully considered during the next stage of this business case. At this stage and as stated in early points of this section, a carbon assessment has been undertaken as part of the options appraisal. At the following stage of the business case, once the preferred option has been selected and preliminary design undertaken a baseline carbon calculation will be completed. This will provide the basis against which carbon reductions can be evaluated and this would be linked into the overarching carbon management plan and CEEQUAL criteria. Longer term the project aims to implement PAS 2080.

2.12.5 Strategic Fit with Regional Policy

England's Economic Heartland (EEH) is a partnership of councils and local enterprise partnerships which stretches from Swindon to Cambridgeshire and from Northamptonshire to Hertfordshire. The EEH partnership covers a wider geographic area than the defined 'Oxford-Milton Keynes – Cambridge Arc' reflecting the nature of connectivity in the region.

EEH consulted on their Outline Transport Strategy[49] in 2019 with an updated version due for publication in summer 2020. The Outline Transport Strategy set out that their approach to improving connectivity will be shaped by three factors:

[47] https://www.gov.uk/government/publications/clean-growth-strategy
[48] https://www.gov.uk/government/publications/creating-the-transport-decarbonisation-plan
[49] EEH (2019) Outline Transport Strategy, http://www.englandseconomicheartland.com/Documents/Agenda%20Item%205a%20Outline%20Transport%20Strategy%20Annex%20A.pdf, accessed June 2020

- Local connectivity – ensuring that connectivity offers convenient, attractive and safe choices for movement and supports the underpinning principles of being active and inclusive
- Freight and logistics – the continued success and growth of our economy will be dependent upon our businesses having access to labour and access to markets
- National/international connectivity – ensuring that connections beyond the region operate as a system, one that aligns with the strategies of our neighbouring regions.

Following feedback on the Outline Transport Strategy and in response to the current Coronavirus pandemic, EEH has further developed its thinking on areas such as decarbonisation – through a reduction in single occupancy car journeys, smart digitally enabled corridors such as an east-west spine, and the need for low carbon alternative travel choices such as greenways for walking and cycling.[50]

As part of their role, EEH transmitted on CPCA's behalf a series of Major Road Network and Large Local Majors funding bids to the DfT in summer 2019. Both the A10 Junctions and Dualling Package Pre-SOBC proformas prepared by the CPCA were transmitted by EEH in line with DfT guidance, recognising the role of the A10 to the region. The A10 project has incorporated thinking on carbon, walking and cycling and digital connectivity in to initial design thinking, with this to be developed further as the design develops to Outline Business Case stage.

The government has asked the National Infrastructure Commission[51] to develop proposals for unlocking growth, housing and jobs in the Oxford – Milton Keynes – Cambridge arc.

Considering the arc's national importance, improvements to the A10 have the potential to play an important complementary role given its connectivity to Cambridge and the similarity of some A10 corridor issues and objectives (e.g. support the provision of new housing and connect it to local and regional labour markets).

The Cambridge and Peterborough Local Industrial Strategy[52] is one of a family of four linked strategies covering the Oxford-Cambridge Arc, with the other strategies covering Oxfordshire, Buckinghamshire and the South East Midlands. It considers the wider economic context and identifies those priorities within each Local Industrial Strategy (LIS) which can be developed at scale across the Arc, complementing the specific Cambridgeshire and Peterborough strategic objectives which sit at the heart of the Cambridge and Peterborough LIS. The LIS also recognises the existence of three different sub-economies in the area: Greater Cambridge, Greater Peterborough and The Fens, with each one being unique and facing its own opportunities and challenges. Therefore, while the overall goal is the same: an inclusive, prosperous and productive economy, each sub-economy will tackle different challenges and opportunities. The LIS states that the full economic potential of the region can only be realised by identifying diverse strengths – from Peterborough's rapid growth, Cambridge's global research strengths, and The Fens' innovative micro and agricultural businesses and working to tie them together.

The LIS' development was informed by business engagement. Through this exercise it was commonly agreed that poor infrastructure is hampering growth and is set to increase as a problem over the next decade, if nothing is done. The LIS maintains that sustaining and de-risking the area's full potential for economic growth relies on transforming the transport, housing and infrastructure capacity in Greater Cambridge and improving the transport system for market towns. Improving connectivity is vital if recent growth is not to stall and will contribute to addressing the Future of Mobility Grand Challenge.

All the A10 Options will make a useful contribution to the realisation of LIS objectives, although the greatest strategic fit is with options that provide full dualling, in that they improve connectivity between the Greater

[50] EEH (2020), Strategic Transport Forum 19 June 2020 – Agenda Item 4 – Draft Transport Strategy, http://www.englandseconomicheartland.com/Documents/Agenda%20Item%204%20Draft%20Transport%20Strategy.pdf accessed 19 June 2020

[51] https://www.gov.uk/government/organisations/national-infrastructure-commission

[52] https://www.gov.uk/government/publications/oxford-cambridge-arc-local-industrial-strategies/cambridgeshire-and-peterborough-local-industrial-strategy

Cambridge and Fenland economies as well as strengthen links along the A10 further afield to West Norfolk and King's Lynn.

2.12.6 Strategic Fit with Local Policy

Earlier sections of the Strategic Case have provided a comprehensive overview of policy and strategy development led and commissioned by the Combined Authority. These include Section 2.2 (an overview of the business strategy of the CPCA, including its Strategic Spatial Framework, Housing Strategy and Local Transport Plan), Section 2.3 (existing situation including an overview of the economic prize within CPIER and Natural Cambridgeshire's 'Doubling Nature' agenda) and Section 2.4.4 (an overview of the Strategic Spatial (Non-Statutory) Framework for growth.

It is not the intention to reprise previous sections, except to say that the A10 Junctions and Dualling project is of clear strategic importance to the Combined Authority's aspirations, helping to unlock local plan growth at Waterbeach, support productivity gains, improve cycling provision between the Cambridge Research Park and the A1123 and solve chronic traffic congestion. This is clearly referenced in the LTP, with the following paragraphs noting the Combined Authority's commitment to the project:

Cambridgeshire and Peterborough Local Transport Plan Extracts[53]

Para. 3.75. "Dualling of the A10, combined with upgrades to Milton Interchange, will provide additional highway capacity where required to support the development, as well as alleviating the chronic traffic congestion along the corridor."

Para. 3.132. "Capacity is most constrained on the A10, which links Littleport, Ely and Waterbeach to Cambridge, and suffers from severe peak time congestion and poor road safety. We will prioritise investment on this key route, improving journey times and reliability for drivers and freight movements, while also providing new high-quality segregated walking and cycling facilities for the first time."

Para. 3.142. …"At the Ely end of the A10 corridor, further highway improvements are planned to support employment development at Grovemere and Lancaster Way Business Parks by increasing the capacity of the Witchford Road and Cambridge Road [A10/A142 Angel Drove] roundabouts. Junction improvements, in particular at the Witchford Road 'BP' roundabout, will provide a safe route for pedestrians and cyclists to cross the A10, helping to provide attractive alternatives to the private car…"

Three local planning authorities are of particular interest to the study area, namely Cambridge, South Cambridgeshire and East Cambridgeshire, with a discussion of their local plans provided in turn. It can be seen from this discussion that the delivery of housing growth at Waterbeach and improvements to the A10, whilst providing high quality sustainable transport options is central to the spatial strategy for the corridor.

The vision of the Cambridge Local Plan 2018[54] is to deliver sensitive and sustainable growth providing affordable housing and an accessible, compact city from where people can have sustainable choices about how they access work, study, leisure and other services. This vision builds on the city's reputation for design excellence, Cambridge's new development will be innovative and will promote the use of sustainable modes of transport, helping to support the transition to a more environmentally sustainable and successful low carbon economy. The plan sets out how the council will meet the important development needs that must be accommodated, but also how this special city's outstanding heritage and environmental assets are intended to be protected.

The overarching development strategy for the administrative areas of both Cambridge and surrounding South Cambridgeshire for the period to 2031 follows a broadly similar sequence for the preferred location of new development as the 2006 strategy, where the preferred approach for new development is: (first) being within the

[53] https://cambridgeshirepeterborough-ca.gov.uk/assets/Transport/Draft-LTP.pdf
[54] https://www.cambridge.gov.uk/local-plan-2018

existing urban area of Cambridge; (second) being within the defined fringe sites on the edge of Cambridge; (third) within the six small scale Green Belt sites proposed to be released from the inner Green Belt boundary; (fourth) within existing and newly identified new settlement locations at Cambourne, Northstowe, Bourn Airfield and Waterbeach; and lastly in identified villages. This approach has been endorsed by the Joint Strategic Transport and Spatial Group (JST&SPG), the member governance group set up to guide the collaborative preparation of development plans in Cambridge and South Cambridgeshire and the associated transport strategy.

The Adopted South Cambridgeshire District Council Local Plan[55] sets out the vision, objectives and development needs for South Cambridgeshire to 2031. The Local Plan has allocated three locations to meet the majority of its housing need to 2031. One of these is Waterbeach New Town on the A10 corridor initially allocated for 8,000 to 9,000 homes. Furthermore, South Cambridgeshire District Council has prepared a Supplementary Planning Document (adopted in February 2019) to assist in delivering the objectives as set out in Policy SS/6: Waterbeach New Town, with this a material consideration in the planning applications that follow.

Policy SS/6 Waterbeach New Town[56] notes in paragraph 4 that the planned allocation "will deliver an example of excellence in sustainable development and healthier living, which will make a significant contribution to the long-term development needs of the Cambridge area. It will deliver high quality public transport links to Cambridge, including a relocated railway station, to enable a high modal share of travel by means other than the car."

Paragraph 11 of Policy SS/6 describes the comprehensive movement network for the New Town, which includes:

- Significant improvements in Public Transport, including a relocated railway station, provision of park and ride site and new segregated bus link into Cambridge
- Measures to Promote Cycling and Walking, from the start of the development including a direct segregated high quality links to north Cambridge, surrounding villages and existing facilities
- Highway Improvements, including the following of relevance:
    - Primary road access from the A10;
    - Additional capacity to meet the forecast road traffic generation of the new town, particularly on the A10 and at the junction with the A14;
    - Measures to mitigate the traffic impact of the new town on surrounding villages.

Subsequent to the adoption of the Local Plan, South Cambridgeshire District Council has received planning applications from the two developers of the Waterbeach New Town site for a total of up to 11,000 homes.[57]

The Transport Strategy for Cambridge and South Cambridgeshire (2014)[58] recognises that to provide major new capacity for local car trips on interurban routes between Cambridge and surrounding towns will increase congestion in Cambridge and those towns. If this congestion is to be minimised, other modes of transport must provide the additional capacity needed. Within this document the A10 was identified as of the key scheme to cater for the demand for car trips associated with the new town at Waterbeach.

The Adopted East Cambridgeshire District Council Local Plan 2015[59] identifies the increase of out-commuting and congestion as a key issue; mentioning the A10 as one of the key roads suffering significant congestion. The Local Plan supports the tackling of these capacity issues through investment in transport infrastructure, and the

[55] South Cambridgeshire District Council Local Plan: https://www.scambs.gov.uk/planning/local-plan-and-neighbourhood-planning/the-adopted-development-plan/south-cambridgeshire-local-plan-2018/
[56] https://www.scambs.gov.uk/media/12737/4-chapter-3-strategic-sites.pdf
[57] https://www.scambs.gov.uk/planning/local-plan-and-neighbourhood-planning/waterbeach-new-town-spd/
[58] https://www.cambridgeshire.gov.uk/residents/travel-roads-and-parking/transport-plans-and-policies/cambridge-city-and-south-cambs-transport-strategy
[59] East Cambridgeshire District Council Plan: https://www.eastcambs.gov.uk/local-development-framework/east-cambridgeshire-local-plan-2015

provision of sustainable travel options, recognising the challenge presented by the rural nature of the district and the dispersed population. The Local Plan's vision for transport includes developing the A10 as a high quality public transport corridor, and providing better cycling and pedestrian facilities and links, including segregated cycle routes along key routes linking towns and villages.

Policy Growth 3. Infrastructure Requirements includes the following transport initiatives of relevance to this Business Case:

- Dualling of the A10 between A142 Witchford Road and A142 Angel Drove
- Improvements to the junctions of the A14/A142 and A14/A10.
- Capacity and junction improvements to the A10.
- Improved rail and bus services.
- Improvements to pedestrian and cycle networks within settlements and between settlements (including segregated cycle routes with appropriate crossings at key points where possible).

As can be seen from the above, there are ambitious growth plans across Cambridgeshire, with around 72,500 new homes expected to be built by 2031/6. The County Council has worked closely with district and neighbouring authorities to produce a Long Term Transport Strategy[60] to support these areas and keep Cambridgeshire moving. A10 capacity improvements is one of the proposals that feature in this strategy.

[60] https://www.cambridgeshire.gov.uk/residents/travel-roads-and-parking/transport-plans-and-policies/long-term-transport-strategy

2.13 Strategic Risks for the shortlisted options

The Management Case (section 6.9) provides a summary of key strategic and technical risks as of July 2020. These have been summarised below, for the different options, presenting those pertinent to all options first, before considering option specific risks.

2.13.1 Strategic Risks (Options A to G)

- COVID-19 – impacts on demand for travel and mode choice. It is too early to assess what the impact will be on travel in the corridor, and the impacts on travel in the opening year, 2028. DfT statistics show that as of July 2020 show that national private car use has rebounded to 80%, with goods vehicle traffic close to pre-virus levels, with cycling use at 150%. [61] Ongoing transport modelling will consider these impacts, making use of latest available information on traffic flows, travel patterns, land use change and economic parameters at a local and national level.
- Climate Emergency – as noted net zero carbon is one of the scheme objectives. As the preferred option develops there will be a greater opportunity to mitigate the carbon impacts of the scheme through design and compensatory measures, albeit that these could come at an increased cost. Other factors such as the take-up of electric vehicles and its impact on the carbon baseline of the local vehicle fleet are largely outside of the control of the project team.
- Delivery of Waterbeach New Town – the full realisation of housing growth and the benefits documented in the Economic Case are dependent on delivery of housing by the two developers. Whilst a recession could have a short term impact on house building and demand, it is considered that the popularity of the Cambridge Housing Market Area is sufficiently strong to weather any impacts in the long-term.[62] The OBC will revisit these benefits using latest available information on planned development at Waterbeach.

2.13.2 Technical Risks (Options A to G)

- Buried Archaeology, including Car Dyke (former roman watercourse) and the former course of a roman road between Cambridge and Littleport, whose precise route is unclear north of Landbeach.
- Environmental mitigation, in terms of noise to properties, cultural heritage, ecology – i.e. county designated wildlife sites, internationally designated nature conservation sites, protected species, and avoiding invasive species.
- Buried utilities are especially relevant for online widening and junction improvements (Options A, B, C, E, F and G)
- Contamination (both buildings and in ground).

2.13.3 All dualling options (Options A to F)

- Flood Risk – there are areas of flood zones 2 and 3 (1 in 1,000 and 1 in 100 annual probability of river flooding respectively) either side of the A10
- Great Ouse river crossing – ground conditions, flood risk, ecology
- Soil improvement measures
- Dewatering measures in an area which is low lying and flat, with significant potential for a high water table
- Side Roads / Public Rights of Way / Accommodation Works for landowners to be determined.
- A14 / A10 Milton Interchange Solution. Whilst this is seen as a separate project, a solution will need to be developed to satisfy Highways England requirements and maintain their support for the A10 scheme. As

[61] https://www.gov.uk/government/statistics/transport-use-during-the-coronavirus-covid-19-pandemic, accessed 13 July 2020
[62] https://blogs.lse.ac.uk/politicsandpolicy/covid-19-housing/, accessed 13 July 2020

previously noted the CPCA will work closely with Highways England to discuss this project following the submission of this SOBC.

2.13.4 Offline dualling (Option D)

- Former RAF Witchford – Potential ground conditions for this former WW2 airfield which is now agricultural land.

2.13.5 Mitigation of Technical Risks

Future option development will seek to mitigate the above risks through a combination of:

- Surveys and further desktop research covering topics such as Air Quality, Archaeology, Ecology, Ground Investigation, Noise, Topography, Utilities, etc
- Environmental Impact Assessment
- Flood Risk Modelling
- Transport and Traffic Modelling
- Land Ownership
- Public / Stakeholder engagement and consultation
- Design of horizontal and vertical alignments.

2.14 Conclusion

The Strategic Case has provided a comprehensive overview of the existing situation in the study area. This has demonstrated that the Cambridgeshire and Peterborough region makes a strong contribution to the UK economy and that the A10 between Cambridge and Ely is of key importance to maintaining the area's strong business performance and to achieving the Combined Authority's housing and productivity aspirations.

This assessment has helped to guide the need for intervention and identification of objectives, outputs and outcomes which have continued to drive the scheme development and option appraisal. This has built on a long study history of analysis and option development summarised in section 2.11.1 including the Ely to Cambridge Transport Study and Preliminary SOBC led by Cambridgeshire County Council.

The Strategic Case has identified that intervention is needed to provide the necessary infrastructure to unlock new homes and overcome constraints to future growth. Improvements to the A10 are needed to address problems of congestion and route reliability that also impact on local communities both along the A10 itself but also across the wider area. The scheme offers opportunities to unlock sustainable housing opportunities, spread growth along the corridor, improve productivity for businesses along the A10, increase biodiversity and positively impact local communities through transport connectivity.

Initial option development has shown that a capacity upgrade is necessary to meet the scheme's strategic objectives. A substantial option generation and sifting exercise has identified a shortlist of options for upgrading the capacity of the whole route or the southern section route, involving a combination of online and offline alignments.

Lastly the scheme has been assessed against the Transport Investment Strategy and wider policy objectives at a national, regional and local level. This has demonstrated a good strategic fit, in particular the Housing White Paper and Industrial Strategy.

Principal updates for the Outline Business Case's Strategic Case will cover

Existing situation

- Update of any key policy changes at a national, regional or local level.
- Consolidation of contextual material between the Strategic Case and Option Assessment Report to provide more of the background detail in the latter document where relevant.

Future situation

- Update of any assumptions around forecast growth within the traffic modelling.

Need for Intervention

- Update as required depending on the further refinement of the existing situation and future situation.

Scheme scope

- Further definition as the design moves into preliminary design.

Constraints, interdependencies and stakeholders

Summary of the planning position

Overview of public and stakeholder feedback on scheme design options

Option assessment

- A description of how the preferred option has been selected, considering strategic fit, public / stakeholder acceptability, value for money, affordability and deliverability.

Strategic Fit

- Further detail on how the scheme aligns with the Transport Investment Strategy or any updates to similar Government policy objectives where relevant.
- Update of alignment with any new pertinent policy documents at a national, regional or local level.

3. Economic Case

3.1 Background

The economic case assesses the options to identify their economic impacts and the resulting value for money. The appraisal has been undertaken in line with the stipulations in the Department for Transport's Transport Analysis Guidance (TAG)[63] and with the requirements of HM Treasury's 'Green Book[64]'.

The impacts considered are not limited to those directly impacting on the measured economy, nor to those which can be monetised. The economic, environmental, social and distributional impacts of a proposal are all examined, using qualitative, quantitative and monetised information. In assessing value for money, all of factors that can be monetised are consolidated to determine the extent to which a proposal's benefits outweigh its costs.

The Economic Case covers the following topics:

- The appraisal methodology including a broad overview, specifics for both monetised and non-monetised benefits, assessment of wider economic impacts and environmental aspects, assessment tools, land use and economic growth assumptions, and how uncertainty has been treated (Section 3.2)
- Details of the schemes appraised (Section 3.3)
- Assumptions in relation to modelling and appraisal (Section 3.4)
- The development of the scheme cost for economic appraisal (Section 3.5)
- Assessment of monetised benefits (Section 3.6)
- Assessment of non-monetised benefits (Section 3.7)
- Appraisal Summary Tables (Section 3.8)
- Assessment of Distributional Impacts (Section 3.9)
- Assessment of Wider Economic Impacts (Section 3.10)
- Sensitivity test results (Section 3.11)
- Value for money conclusions (Section 3.12)
- Summary and next steps (Section 3.13).

Reference is made to various supporting appendices as follows:

- Appendix F: Modelling Reports
    - F1. Data Collection report
    - F2. A10 E2C Local Model Validation Report
    - F3. A10 E2C Model Update Report
    - F4. Forecasting
- Appendix G: TUBA Input and Output Files (electronic only)
- Appendix H: Preparation of costs for Economic Case and Financial Case including the DfT Cost Proforma (electronic only in .xls format)
- Appendix I: Appraisal Summary Table, Worksheets and Appraisal Tables (including .xls format)
- Appendix J: Distributional Impacts

[63] In particular TAG Unit 1.3, User and Provider Impacts, Department for Transport, March 2017
[64] The Green Book, Central Government Guidance on Appraisal and Evaluation, HM Treasury 2018

- Appendix K: Cost Report.

3.2 Methodology

3.2.1 Outline approach to assessing Value for Money

Industry-standard approaches have been used to calculate and define the benefits of the different scheme options through the use of the DfT approved software package TUBA, using the output from the A10E2C highway model. This SATURN-based strategic model is a development of the Cambridgeshire Sub-Regional Model (version 2) (CSRM2).

The 'Value for Money' assessment is a staged process which includes appraisal of the schemes' economic, environmental, social, distributional and fiscal impacts using qualitative, quantitative and monetised information.

It starts with assessment of monetised costs and benefits and calculation of the Benefit Cost Ratio (BCR) of the Scheme. The next stage is to capture and analyse those impacts which cannot be monetised but can be presented as qualitative information. Finally, it looks at how the impacts of the scheme are distributed across different social groups - the Distributional Impacts assessment.

3.2.2 Assessment of Monetised Costs and Benefits

In line with DfT guidance, the Value for Money assessment starts with the calculation of those impacts that can be expressed in monetary terms. These monetised impacts are derived, discounted[65] and summed to generate a Present Value of Benefits (PVB). The total costs are similarly summed to a Present Value of Cost (PVC). These monetised benefits and scheme costs are used to calculate a Benefit Cost Ratio (Initial BCR) and the Net Present Value (NPV), which is the difference between the PVB and the PVC. The BCR is calculated by dividing the Present Value of Benefits (PVB) by the Present Value of Cost (PVC).

DfT advice[66] suggests a flexible approach to economic appraisal to ensure time and resources spent on the development of a business case are proportionate to the size of the investment.

The summary of the monetised information along with the BCR is presented in the standard Assessment of Monetised Costs and Benefits (AMCB) Table, which is provided in Appendix I.

The following monetised impacts have been included in the economic assessment and are presented in the AMCB and BCR tables:

- Transport Economic Efficiency (TEE) as a result of the scheme for (1) business users and private sector transport providers; (2) consumer users (commuting); and (3) consumer users (other journey purposes) – each in terms of:
  - Travel time
  - Vehicle operating costs
  - User charges
  - Greenhouse gases (using the methods set out in TAG Unit A3.4); and
  - Wider public finances (changes in indirect tax revenues).

Journey quality has not been monetised given that the impact of the scheme on this area is relatively limited.

[65] Discounting is the process of determining the present value of a stream of costs or benefits that is to be incurred in the future.
[66] Value for Money Assessment: Advice Note for Local Transport Decision Makers, Department for Transport, December 2013

The impact on physical activity will be examined at the OBC stage when the supporting walking and cycling measures have been developed.

3.2.3 Assessment of non-monetised Impacts

The next stage of a Value for Money assessment builds on the initial monetised costs and benefits and considers qualitative and quantitative information on those impacts where it is not proportionate to monetise them at this stage or where they cannot be monetised and how these contribute to the Value for Money of the scheme.

Road safety impacts have not been monetised at this stage of the appraisal, for reasons of proportionality. A qualitative appraisal has been undertaken with a commentary on the differences between options.

Impacts which cannot be monetised but which have been appraised using qualitative and quantitative information and given an overall qualitative assessment score are listed below:

- Journey Quality
- Severance.

These have been appraised in line with TAG Unit A4.1 Social Impact Appraisal.

3.2.4 Wider Economic Impacts

For a proportionate appraisal at this stage in the project development, a full assessment of wider economic impacts has not been undertaken. However, we have considered dependent development and its impact on the case for the scheme.

Due to the risk of double counting of benefits, TAG Unit A.2.2 notes that output change in imperfectively competitive markets should not be estimated for schemes which have associated dependent development. While this can usually be estimated relatively easily as 10% uplift to Business User and Freight User Benefits, this has therefore been excluded in this appraisal.

3.2.5 Environmental aspects

In the interest or proportionality, the environmental impacts have not been subject to a full TAG appraisal at this stage where a total of seven different options are being appraised. Following further option selection, scoping and surveys will document the areas to be mitigated with the TAG assessment to be reported in the OBC and Full Business Case.

An initial environmental assessment of the options is reported in Appendix B and is supported by qualitative appraisal summary tables. In addition, impacts on the emission of carbon have been calculated and monetised for each of the options as part of the Value for Money assessment.

3.2.6 Assessment tools

The assessment methodology requires use of appropriate tools and procedures to quantify and monetise the scheme impacts. Transport User Benefit Appraisal (TUBA) (version 1.9.13) has been used to derive travel time benefits, Vehicle Operating Costs (VOC) and indirect tax benefits of the scheme. The TUBA program takes, as its principal input, zone to zone matrices of trip numbers, times taken, and distances travelled. TUBA then applies values of time and operating cost and discounts a 60-year stream of benefits to the present value year (defined by the DfT as 2010) and expresses the benefits in 2010 market prices. For the appraisal of road user costs standard values of time, operating cost and other related economic parameters for traffic appraisal were applied, using the standard 'Economics File' data available from the DfT TUBA website.

3.2.7 Land Use growth assumptions

The creation of forecast scenarios for modelling and appraisal requires three key sets of inputs:

- Future 'Do Minimum' infrastructure development in the absence of the schemes we want to test. The Do-Minimum scenario has been produced in line with TAG guidance to include only infrastructure changes that are considered 'near certain' or 'more than likely';
- Future land use changes; and, specifically for the appraisal;
- Economic Growth assumptions.

The infrastructure and land use assumptions assumed in the modelling are set out separately in the demand model documentation. With regard to housing growth, two separate scenarios were run – with and without 'dependent development'.

The analysis of the Greater Cambridge Housing Trajectory[67] sets out the latest position on land supply and housing development trajectory in the Greater Cambridge area. A particular area of growth is Waterbeach New Town. The first phase Urban and Civic development envisages a total of 1,600 dwellings, with the potential for a further 800 dwellings following the relocation of Waterbeach railway station. Significant additional development would then be triggered following the planned investment in capacity along the A10 corridor, bringing the total to around 11,000 housing units and this additional development is considered to be 'dependent' on the scheme.

The total of 11,000 housing units is based on applications from the two developers of the Waterbeach New Town site[68] which were received by South Cambridgeshire District Council subsequent to the adoption of the Local Plan.

In line with TAG, the Value for Money assessment of A10 scheme options uses two separate growth forecasts as inputs: with and without 'dependent development.' The pure transport-economic benefits are assessed without the dependent development in place and both the Do-Minimum and Do-Something scenarios contain the same land use assumptions. For a prudent assessment, a total of 1,600 housing units was assumed for the Waterbeach site.

In a separate assessment, the impact of the dependent development is examined. The assessment is twofold – considering the 'value' of the additional development in terms of a land value uplift and calculating the impact of the additional trips from the development on other road users.

3.2.8 Economic parameters

The economic input parameters to the appraisal are based on guidance in the May 2019 TAG databook, which was the latest available at the outset of this work. While it is clear that the COVID-19 pandemic has a profound impact on the travel demand by all modes in 2020, it is not clear what longer-term impacts should be expected. While aviation demand and demand for public transport travel may take a long term to return to pre-pandemic levels, it is possible that highway demand will recover more quickly as people seek the isolation of their own car when travelling.

Towards the end of this appraisal work, the Department for Transport published the May 2020 edition of the TAG databook. In line with the Department's guidance on proportionate update[69], we have decided not to adopt this databook to underpin this appraisal. To do so would have introduced inconsistencies between modelling and appraisal.

[67] Greater Cambridge Housing Trajectory and Five Year Housing, Land Supply, Main Document, Greater Cambridge Shared Planning, November 2019
[68] https://www.scambs.gov.uk/planning/local-plan-and-neighbourhood-planning/waterbeach-new-town-spd/
[69] Department for Transport, Transport Analysis Guidance, The Proportionate Update Process, January 2014

A review of the May 2020 databook suggests that the updates have been slight and do not yet take account of a revised economic outlook as a result of COVID-19. The most significant impact of databook updates on any economic appraisal will be a change in the Value of Time (VoT). The 2010 VoTs in both the May 2019 and May 2020 databooks are identical and therefore the main driver of any difference in benefits will be the GDP/head growth which drives the growth in the VoT. A comparison of how that growth differs between the two databooks from 2010 onwards, shows that the differences are very small indeed. It can be assumed that using the May 2020 databook values for the appraisal would have a minimal impact on the economic case as reported here and a sensitivity test using the values from the updated databook has not been carried out.

On the 14th of July 2020, the Office for Budget Responsibility (OBR) has published an assessment of the economic effects of COVID-19 in its scenario analysis as part of the Financial Sustainability Report[70]. This postulates three scenarios:

- An upside scenario, where activity rebounds relatively quickly, recovering its pre-virus peak by the first quarter of 2021, and there is no enduring economic scarring.
- A central scenario, where output recovers more slowly, regaining its pre-virus peak by the end of 2022. Cumulative business investment is 6 per cent lower than in the March forecast over five years, while unemployment and business failures remain elevated. Real GDP is 3 per cent lower in the first quarter of 2025 than in the March forecast.
- A downside scenario, where output recovers even more slowly, returning to its pre-virus peak only in the third quarter of 2024. This results in a more significant loss of business investment, more firm failures and persistently high unemployment as the economy undergoes significant restructuring. Real GDP is 6 per cent lower in the first quarter of 2025 than in the March forecast.

The OBR does not provide any forecasts beyond 2025. To fully assess the impact of these scenarios would require a re-running of the modelling with modified long-term forecasts for land use and economic inputs. However, at a high level we can assume that the impact of the central scenario on scheme benefits accruing over the appraisal period of 2028 to 2087 would be a reduction in benefits of three percent or less.

3.2.9 Uncertainty and sensitivity Tests

Sensitivity tests that seek to understand the impact of changes in cost and demand are presented alongside the main case to enable the decision maker to understand the impacts of these changes on the scheme's value for money.

The main demand inputs to the scheme modelling used the growth assumption from the "C"-series forecasts of the CSRM2, which is largely local plan based. These forecasts lie above those provided in NTEM and growth has not been constrained to NTEM level. Against this background, we have not undertaken a low and high growth sensitivity test as suggested in TAG.

However, as part of the economic case, indicative sensitivity tests have been used to explore:

- A 25% reduction in scheme benefits resulting from reduced economic activity and travel demand;
- A 25% increase in overall project costs; and
- A combination of the above two factors.

These are all downside tests. Given that the demand forecasts and economic parameters are still based on pre-COVID guidance, it is not considered appropriate to undertake an upside test on economic activity and travel demand.

In addition, sensitivity tests on the valuation of scheme carbon impacts, using the currently published high and low carbon values series from the May 2019 TAG databook (Table A3.4), have been undertaken to report

[70] https://cdn.obr.uk/OBR_FSR_July_2020.pdf, accessed 14 July 2020

whether the choice of carbon values series materially affects the overall scheme Value for Money. We have also reviewed the carbon values from the May 2020 TAG databook; these are very marginally lower than the 2019 values and the difference is not material.

These results are provided in section 3.11.

3.3 Scheme Options appraised

Details of the scheme options appraised are provided in chapter 2, with outline scheme drawings provided in Appendix D. In summary, the options comprise highway improvement schemes as follows:

A. Option A: Predominantly online full length dualling, bypassing the key pinchpoints at Milton (western bypass) and at Stretham (western bypass) and Little Thetford
B. Option B: Predominantly online full length dualling, bypassing the key pinchpoints at Milton (western bypass) and at Stretham (eastern bypass) and Little Thetford
C. Option C: Offline dualling of the southern section to Cambridge Research Park in addition to junction improvements along the rest of the corridor
D. Option D: Full length, offline dualling, running to the west of Milton and Stretham
E. Option E: Full length dualling, maximising the extent of online dualling, whilst bypassing the key pinchpoints at Stretham (western bypass) and Little Thetford
F. Option F: Online dualling of the southern section to Cambridge Research Park in addition to junction improvements along the rest of the corridor
G. Option G: Junctions only improvements.

3.4 Assumptions and inputs

3.4.1 Traffic model

The traffic model used to appraise the benefits of the scheme options is the A10 Ely to Cambridge (A10E2C) model, which was developed on behalf of CPCA by consultants Atkins, specifically for the purposes of appraising transport schemes along the A10 corridor.

The A10E2C base model was derived from the Cambridgeshire Sub-Regional Model (version 2) (CSRM2). To do this, the network and zone structure of the parent CSRM2 model was used as a basis from which enhancements in the area of the A10 study area were carried out. These enhancements ensured that the A10E2C model would have sufficient spatial detail to allow for a detailed assessment of proposed highway improvements on the A10. The wider CSRM2 highway model structure was maintained, thereby ensuring a link between the A10E2C and the parent CSRM2. This allows the A10E2C to have consistency with other schemes being tested in the CSRM2 and provides access to the demand modelling element of CSRM2.

The CSRM2 model has a variety of forecast scenarios, for different years. These are developed in iterations, reflecting regular updates to the forecasting assumptions (in terms of land use and transport schemes). The latest available forecast come from the D-series, whilst the next iteration, E-series, is currently being developed. The CSRM2 is a multi-modal model, with highway assignments run using SATURN software (and therefore the A10E2C model is also in SATURN), and with PT assignments and a variable demand model run in MEPLAN software.

Scheme improvements on the A10, including junction improvements, and a full dualling scenario, have previously been appraised using forecast models derived from the CSRM2 C-Series forecast. These forecasts were run through the full suite of CSRM2, including highway and PT assignments, and variable demand

modelling. These were undertaken as part of the pre-SOBC for the A10 scheme and forecast reports produced describing the development of the 'do minimum' forecast[71] and the various 'do something' options[72]. It should be noted that the forecasts were undertaken for a single forecast year only (2031), for the AM and PM peak only, and using the CSRM2 'Foundation Case" forecasts (which were largely based on local plans to inform likely land uses in the future).

Given the availability of the existing A10E2C base model, and the CSRM2 forecasts, the approach to developing forecasts of the A10E2C was to use the existing CSRM2 forecast scenarios developed for the A10 pre-SOBC. This made use of the functionality of the CSRM2 (including variable demand modelling) and was considered a proportionate approach to undertaking the modelling appraisal at the SOBC stage. The existing link between the A10E2C and CSRM2 also allowed forecasts from the latter to be readily converted for use for developing forecasts for the former.

There were some adjustments made to the CSRM2 forecasts in preparation for use in developing A10E2C. These included interpolation/extrapolation to the scheme opening and design years, adjustments to undertake an appraisal of dependent development, and combining the AM and PM peak forecasts to identify growth in the Interpeak period.

3.4.2 Time periods

In the A10E2C SATURN highway model, the time periods are as follows:

- AM peak hour (weekday 08:00 to 09:00);
- Interpeak average hour (10:00 to 16:00); and
- PM peak hour (weekday 17:00 to 18:00).

Appropriate assumptions have been made regarding the annualisation of the benefits (i.e. converting from one-hour traffic models to produce benefits for a full year) for TUBA. Annualisation factors have been calculated to expand each model time period to reflect a full year of transport benefits. Weekday annualisation factors are shown in Table 24.

Table 24: Weekday Annualisation Factors (All Vehicle Types)

Model Period	AM (08:00-09:00)	IP (10:00-16:00) average hour	PM (17:00-18:00)
Expanded Model Period	AM (07:00 - 10:00)	IP (10:00-16:00)	PM (16:00 -19:00)
Number of Weekdays	253	253	253
Assumed Modelled Hour to Period Expansion Factor	2.5	6	2.5
Annualisation Factor	632.5	1,518	632.5

These annualisation factors account for the weekday peak and interpeak periods only – they give total annual demand during the weekday time period from 07:00 to 19:00. That means we are not taking account of any benefits that may be occurring outside these periods. As these periods have not been modelled this is a prudent approach but it should be noted that there may be additional benefits that do not form part of the current case.

[71] Ely to Cambridge Transport Study, Do Minimum Modelling Report, Feb 2018, Mott McDonald
[72] Ely to Cambridge Transport Study, Strand 1 – Options Modelling Report, Jan 2018, Mott McDonald

3.4.3 User classes

The A10E2C model has 12 user classes defined.

TUBA also has user classes, with each user class representing a particular combination of vehicle type (or sub-mode), purpose and person type.

The A10E2C model user classes have been represented in TUBA as shown in Table 25. The different transport modes have not been disaggregated by purpose or person type, "All purposes" parameter has been used. In this case the default purpose splits defined in the standard economics file are used to disaggregate the data. The same applies to "All person types" parameter. Default person splits (occupancies) are used to calculate the mean Value of Time (VOT) per vehicle.

Table 25: Summary of User Classes

Model User Classes	TUBA Vehicle/submode	TUBA Trip Purpose
User class 1 - Car home base work with low income	1 - Car	2 - Commute
User class 2 - Car home base work with medium income	1 - Car	2 - Commute
User class 3 - Car home base work with high income	1 - Car	2 - Commute
User class 4 – Car Education	1 - Car	3 - Other
User class 5 - Car employ business	1 - Car	1 - Business
User class 6 - Car Other with low income	1 - Car	3 - Other
User class 7 – Car other with medium income	1 - Car	3 - Other
User class 8 - Car other with high income	1 - Car	3 - Other
User class 9 – HGV	4- HGV	1 - Business
User class 10 – HGV (Huntington)	4- HGV	1 - Business
User class 11 – LGV	3 - LGV	1 - Business
User class 12 – LGV Business	3 - LGV	1 - Business

3.4.4 Forecast years and appraisal period

In line with TAG guidance, the impacts of the scheme have been assessed over the 60-year period after the schemes opens.

Traffic forecasts have been developed for a scheme opening year of 2028 and a forecast year of 2043 (long term design year – fifteen years after the scheme has opened). TUBA is calculating the data for years between two modelled years linearly interpolating between those two years. Beyond the last modelled year data is extrapolated using a horizontal line.

A summary of forecast years, opening year and current year is highlighted in Table 26.

Table 26: TUBA Scheme Parameters

Year	Years
First Year	2028
Horizon Year	2087
Modelled Years	2028 and 2043
Current Year	2020
Price and Discount Base Year	2010

3.4.5 Discounting, units of account and inflation

Costs and benefits occur in different years throughout the assessment period, e.g. the scheme development and construction costs occur before the scheme opens, whilst the benefits occur over the DfT standard appraisal period of 60 years. Also, it is considered that benefits that accrue now are considered to be more valuable than those that accrue further into the future.

Given the above, in order to compare benefits and costs it is essential that they are all converted to a common base and a common value (known as the Present Value Year). The process used is called discounting and the Present Value Year is currently 2010.

Discounting is undertaken internally within the assessment tools mentioned above, using the standard DfT discount rates of 3.5% per year for the first 30 years from the current year and 3.0% per year thereafter.

The unit of account must also be consistent between costs and benefits in order to allow comparison between the two. There are two different units of accounts:

- Market price unit of account – this refers to the prices paid by consumers for goods and services and therefore includes indirect taxation (e.g. VAT); and
- Factor cost unit of account – this excludes indirect taxation. Prices paid by Government bodies are usually quoted in the factor cost unit of account as any tax paid is recovered by the Government and is therefore ignored.

While scheme benefits are calculated in market prices, scheme costs are usually quoted as factor costs.

Costs can also be in different price bases. In order to enable comparisons to be made between such costs and to take account of the effect of inflation all monetary values in the calculation of costs and benefits are adjusted so that they are all in a common price base of 2010.

The scheme costs must therefore be adjusted to market prices for economic assessment purposes. This economic appraisal reports the Present Value Cost (PVC) at a price base of 2010 discounted to 2010. The PVC includes the following adjustment factors:

- An adjustment for inflation from the year in which the costs are incurred to 2010;
- An adjustment to market prices (gross of indirect tax); and
- A discount factor based on the HM Treasury “Green Book” to adjust costs to a standard base year of 2010.

3.4.6 Checks

DfT's TUBA manuals have been followed, and no TUBA errors were found. We have undertaken a thorough review of TUBA warnings and have compared output files between different iterations and tests and all revealed sensible outputs. Some warnings are related to trips between zones that do not have any demand and for others the benefits/disbenefits associated are irrelevant to the conclusions of the economic assessment. The TUBA input and output files associated with the appraisal are included as Appendix G.

3.5 Scheme cost for Economic Assessment

3.5.1 General approach

Along with the estimation of benefits, the costs are also required for the economic assessment of the scheme. Costs can be defined as the total amount of money spent on developing, constructing and maintaining the scheme. The costs are therefore referred to as Scheme costs and Maintenance costs:

- Scheme costs represent the investment associated with construction, land, preparation (planning and designing the scheme) and supervision during the scheme construction.
- Maintenance costs are the cost of people, machinery and materials required to maintain the highway network. These costs are also known as the Capital Costs of Maintenance.

Investment costs for construction, land / property, and design / supervision are based on the latest scheme design.

The base costs for the proposed schemes have been estimated in current prices (Q2 2020). They have then been inflated to the relevant year of expenditure using the BCIS General Civil Engineering Costs Index for construction-related costs. The GDP-deflator series as published in the May 2019 TAG Data book has then been used to bring them back to a 2020 price base (and within TUBA they are then further adjusted to a 2010 price base). This ensures that we take account of the extent to which construction-related inflation deviates from general inflation.

Prior to using the base costs in the Economic Assessment, as per the DfT guidance TAG (Unit A1-2), these have been adjusted to account for measured risks and optimism bias. The following assumptions have been used:

- Contingency: 10%[73]
- Risk Allowance: 45%
- Uplift to mitigate against Optimism Bias: 44% for roadworks and 66% for structures.

The optimism bias uplift is calculated after the risk allowance has been added to the scheme costs.

In line with TAG requirements, any 'sunk' costs that have already been spent have been excluded from the costs used in economic assessment.

3.5.2 Land costs

No detailed assessment of land acquisition costs is available at this stage in the project. Indicative cost estimates have been developed by assessing the land take of each option and applying a cost assumption to this.

The approximate new construction area for each route option has been used as a basis for potential land acquisition. These areas were calculated using the length of the routes by the width of the new construction

[73] Note the contingency allowance was added for the Economic and Financial cases in addition to the costs provided in the cost report (Appendix K)

(including new pavement, verges, central reserve and footway) and does not include any areas beyond this. It has also been assumed that for junctions the new widened carriageway area will equal the new land required.

Land costs were derived from two sources:

- An assessment of historic land values in Britain by property agents Savills[74]; and
- Guidance by the Ministry of Housing, Communities and Local Government (MHCLG)[75].

Both sources offer a remarkably similar view of the value of agricultural land:

- Savills: £8,715 per acre in December 2019 for Prime Arable Agricultural Land, UK; and
- MHCLG: £21,000 per hectare in April 2017 for Agricultural Land, Cambridgeshire.

Converted to a common unit and price base, this gives £2.19 per m^2 for Savills and £2.22 per m^2 for MHCLG in 2020 prices. A value of £2.20 has therefore been used for the assessment.

Given the level of uncertainty around land costs, a risk allowance of 45% and a high uplift of 66% for optimism bias have also been applied in addition to a contingency of 10%. The land cost estimates are summarised in Table 27: Land Cost Estimates (£, 2020 prices).

Table 27: Land Cost Estimates (£, 2020 prices)

Option	Indicative Land & Property Cost	Contingency (10%)	Risk Allowance (45%)	Allowance for Optimism Bias (66%)	Total Cost (including Uplifts for Risk and Optimism Bias)
A	1,067,000	106,700	528,165	1,123,231	2,825,096
B	1,100,000	110,000	544,500	1,157,970	2,912,470
C	1,896,000	189,600	938,520	1,995,919	5,020,039
D	1,221,000	122,100	604,395	1,285,347	3,232,842
E	1,023,000	102,300	506,385	1,076,912	2,708,597
F	1,852,000	185,200	916,740	1,949,600	4,903,540
G	1,533,000	153,300	758,835	1,613,789	4,058,924

The land and property costs were assumed to be incurred in 2024.

[74] https://www.savills.co.uk/property-values/rural-land-values.aspx, accessed 23 June 2020
[75] Land Value Estimates for Policy Appraisal, Ministry of Housing, Communities & Local Government, May 2017

3.5.3 Maintenance costs

No schedule of maintenance has been developed at this stage in the scheme development and the maintenance cost estimate has been based on a broad assumption derived from indicative analysis of Highways England maintenance spending. This was derived as follows:

- The then Highway Agency estimated that it spent between £27,000 and £60,000 per mile per annum on its motorways and A-roads in 2010-2012[76].
- As the A10 upgrade options are not to motorway standard, it is appropriate to assume the lower value of £27,000. Translated to 2020 prices, that is about £32,000.
- Applying this to Option A suggests that maintenance costs would amount to around 0.2% of the initial construction costs per annum.

Therefore, an indicative assumption of 0.2% per annum of initial construction cost was applied to each of the options, incurred throughout the appraisal period from year 3 after scheme opening. This can only be an indicative assumption at this stage. In reality, maintenance cost will be more 'lumpy', with minimal costs incurred in many years but a significant outlay required from time to time (for example when resurfacing becomes necessary).

As a sensitivity test, we have run an assumption of a more 'lumpy' spread of maintenance expenditure through the cost model for option E as an example. We have assumed that 15% of the overall maintenance cost is incurred in 'lumps' every 15 years with the remainder of the cost evenly spread. The effect is a reduction in the present value of costs by some £200k and a corresponding increase in the NPV of £200k. The BCR remains unchanged within the level of rounding we report.

3.5.4 Appraisal input costs

The calculated risk and optimism bias adjusted investment costs form the inputs to the DfT's TUBA software. Costs are entered in TUBA as 2020 factor prices, along with the appropriate Gross Domestic Product (GDP) deflator to allow the software to deflate costs. The resulting costs are presented in Table 28.

Table 28: Undiscounted Scheme Costs by Cost Element for Economic Appraisal (2020 Factor Prices)

Cost Element (£m)	Option A	Option B	Option C	Option D	Option E	Option F	Option G
Construction	214.0	216.9	90.2	252.1	202.5	77.5	26.9
Land & Property	2.8	2.9	5.0	3.2	2.7	4.9	4.1
Preparation (incl. Design)	26.6	26.6	13.1	26.9	26.5	13.0	5.2
Total Capital cost	243.4	246.4	108.4	282.3	231.7	95.3	36.2
Maintenance Cost (total over appraisal period)	24.8	25.2	10.5	29.2	23.5	9.0	3.1

A separate cost report which documents how the scheme costs have been derived is provided in Appendix K while Appendix H provides the workings to convert these costs into inputs for TUBA in spreadsheet form.

[76] https://www.gov.uk/government/publications/cost-of-maintaining-the-highways-agency-s-motorway-and-a-road-network-per-lane-mile

3.5.5 Phasing of expenditure

The construction, preparation and land costs for each of the options were assumed to be incurred as set out in Table 29.

Table 29: Cost Phasing for Appraisal

Year	Options A, B, D & E Construction Costs	Options C, F & G Construction Costs	All Options Preparation Costs	All Options Land & Property Costs
2020	-	-	7%	-
2021	-	-	13%	-
2022	-	-	18%	-
2023	-	-	30%	-
2024	-	-	22%	100%
2025	20%	50%	10%	-
2026	40%	45%	-	-
2027	30%	5%	-	-
2028	5%	-	-	-
2029	5%	-	-	-
Total	100%	100%	100%	100%

Maintenance costs were assumed to be incurred from year three after scheme opening for a total of 58 years to the end of the appraisal period.

3.5.6 Developer / local contributions

The Cambridgeshire County Council Section 106 team have negotiated contributions with local developers at the most significant development site at Waterbeach. Here, two main developers are active – Urban and Civic and RLW Estates.

A Section 106 contribution has been agreed with RLW Estates, and this is tied to the relocation of Waterbeach Railway Station. Urban and Civic are due to make a Section 106 contribution of the order of £65 million. Of this, some £8 million are allocated to transport and it is understood that the majority of that is earmarked for the funding of the Greenways project. The Combined Authority will be seeking a release of developer contribution funds from CCC when appropriate.

Local Planning Authorities as well as the Mayor for the Combined Authority have the power to introduce a Community Infrastructure Levy (CIL) through the planning system but it is too early to estimate the possible level of contribution at this stage.

However, irrespective of the potential sources and levels of private contributions, the Combined Authority has committed to providing 15% of the scheme funding from local sources. The financial and funding strategy will be developed at OBC stage, following similar scope and policy as for the CPCPA CAM project.

Given the level of uncertainty over any potential private sector contributions, the project has been treated as funded entirely by the public sector in terms of economic appraisal. These assumptions can be refined at Outline Business Case (OBC) stage.

3.5.7 Present value of costs

The costs used in scheme appraisal differ from the outturn costs used for funding decisions and discussed in the Financial Case. Costs for scheme appraisal are adjusted to the DfT standard present value year (2010) to allow direct comparison with the monetised benefits and are in calendar years.

The outturn scheme costs were entered into TUBA to be estimated over the 60-year appraisal period, converted to 2010 prices, discounted to 2010, and converted to the market price unit of account. A summary of the Present Value of Costs (PVC) output by TUBA is provided in Table 30.

Table 30: Present Value of Costs (2010 Prices, Discounted to 2010)

Cost Element (£m)	Option A	Option B	Option C	Option D	Option E	Option F	Option G
Scheme Costs	141.0	142.7	64.5	163.2	134.3	56.8	21.7
Maintenance	5.7	5.7	2.4	6.7	5.4	2.1	0.7
Total PVC	146.7	148.5	66.9	169.9	139.7	58.9	22.4

Further scheme cost information is provided within the Financial Case supporting the scheme.

3.6 Assessment of Monetised Impacts

3.6.1 TEE Benefits

The Transport Economic Efficiency (TEE) benefits consist of two key components as set out below.

- Travel time savings and Vehicle Operating Costs (VOC) benefits as a result of the schemes; and
- Impacts on private sector providers and other business impacts.

TEE Travel time savings and VOC benefits as a result of the scheme are calculated with the use of TUBA software and normally constitute by far the largest proportion of the scheme benefits used in BCR calculation.

TUBA takes trip, time and distance matrices from the traffic forecast model for each future year, vehicle type and journey purpose (i.e. each User Class) and each time period and calculates travel time saving benefits. It does this by comparing the travel times in the Do-Minimum (without the schemes) scenario with those in the Do-Something (with the schemes) scenario. It then applies monetary values (known as Values of Time) to derive the monetary benefits of those time savings over the standard 60-year appraisal period.

TUBA also calculates Vehicle Operating Cost (VOC) changes which occur over the standard 60-year appraisal period due to changes in costs associated with such items as fuel, maintenance, and wear and tear. These occur due to changes in speed and distance when the scheme is implemented and can include both positive and negative values depending upon the scheme's impact upon traffic flows and routing. TUBA also calculates Greenhouse Gas emissions in lieu of a more detailed environmental appraisal.

A summary of the TEE benefits by journey purpose is shown in Table 31.

Table 31: TEE Benefits (Journey Time and Vehicle Operating Cost Saving) by Journey Purpose

Journey Purpose (£m PV, 2010 Prices)	Option A	Option B	Option C	Option D	Option E	Option F	Option G
Business	130.9	130.0	55.1	111.5	125.8	50.4	1.3
Commuting	362.1	346.1	180.3	324.0	333.1	128.9	26.2
Other	321.5	325.0	139.3	291.1	262.6	86.8	13.9
Total Benefits (PV)	814.6	801.0	374.7	726.6	721.5	266.2	41.3

This shows that the highest benefits are generated by options A and B, which both offer online full length dualling and bypassing of the key pinchpoints at Milton, Stretham and Little Thetford. The choice between a western bypass (option A) or an eastern bypass (option B) at Streatham makes little difference to the economic performance of the scheme and that decision should be taken using other criteria.

The next best performing schemes are options D and E, both of which also offer full length dualling. In the case of option D, the more limited access points to the offline corridor reduce the benefits compared with options A and B.

Options C and F offer noticeably lower levels of benefits as the extent of dualling is restricted to the southern section, with some junction improvements only in the north of the corridor.

The lowest level of benefits is generated by option G which includes junction improvements only. In the absence of a full corridor approach, junction improvements simply move congestion along to the next pinchpoint in many cases.

The journey time benefit component of the TEE table has also been assessed against the level of time saved by journey purpose for each of the schemes, as shown in Table 32. Note this does not include vehicle operating costs.

Table 32: Split of Journey Time Benefit by Size of Time Saving and Journey Purpose

Journey Purpose (£m PV, 2010 Prices)	0 to 2 Minutes	2 to 5 Minutes	More than 5 Minutes
Option A			
Business	44.0	33.7	76.2
Commuting and other	211.0	208.6	494.4
Total Benefits	255.0	242.3	570.6
Option B			
Business	43.7	34.9	77.6
Commuting and other	209.4	209.5	501.1
Total Benefits	253.1	244.3	578.7
Option C			
Business	39.7	30.9	35.6
Commuting and other	204.1	171.5	249.2
Total Benefits	243.8	202.5	284.8
Option D			
Business	48.4	33.7	86.1
Commuting and other	222.9	190.1	545.6
Total Benefits	271.3	223.8	631.7
Option E			
Business	47.0	36.4	73.8
Commuting and other	216.8	215.9	468.7
Total Benefits	263.8	252.3	542.5
Option F			
Business	44.0	32.4	35.9
Commuting and other	208.7	182.6	237.5
Total Benefits	252.6	215.0	273.4
Option G			
Business	24.8	13.8	5.9
Commuting and other	125.8	75.9	53.3
Total Benefits	150.6	89.8	59.2

The pattern we observe here is that for the options that offer full length dualling (A, B, D and E), a much larger proportion of benefits falls in the highest category of time savings (above 5 minutes). By contrast, benefits are more evenly spread between the time savings bands for the options that only offer partial dualling (C and F). In option G (junction improvements only), a majority of benefits is generated by very small time savings (up to 2 minutes).

The spatial distribution of journey time benefits has been mapped for each of the scheme options and documented as part of the distributional analyses in Appendix J.

3.6.2 TEE Dis-Benefits (Construction and Maintenance)

We have not sought to quantify the construction and maintenance disbenefits for the options at this stage as no detailed schedule of construction activities is available yet. We have chosen an opening year for economic assessment which reflects the completion of the entire scheme. Some benefits would arise from the earlier completion of parts of the scheme which have not been monetised and which would likely balance out the negative impacts of construction on transport users.

3.6.3 Greenhouse Gases

Changes in traffic flows caused by the introduction of the scheme will result in changes in greenhouse gas emissions from vehicles due to changes in flows, speeds and distance travelled.

The principal impact of the schemes will be on the non-traded sector (petrol, diesel and gas oil emissions) of the greenhouse gas emissions trading scheme. The cost of any EU Allowances (EUAs) purchased to cover traded emissions is reflected in the purchase price of traded sector goods (such as electricity) and is 'internalised' in the appraisal in the cost of such goods. Therefore, the changes in greenhouse gas emissions reported in the Transport Economic Efficiency appraisal are those relating to the non-traded sector only.

These changes have been calculated using TUBA and are presented in Table 33 below. The negative monetary value here represents a disbenefit and means an increase in greenhouse gas emissions.

Table 33: Greenhouse Gasses Impacts, 60-Year Period

Impacts (£m PV, 2010 Prices)	Option A	Option B	Option C	Option D	Option E	Option F	Option G
Greenhouse Gases	-0.4	-1.8	-8.0	-2.6	-1.2	-8.8	-2.3

3.6.4 Changes in Indirect Tax

Indirect taxes relate to the taxation levied on goods and services and therefore include excises, duties and VAT. TUBA calculates the changes in indirect taxes as a result of changes in speed and distance. These changes affect the amount of fuel being used and therefore affect the amount of taxes the Government receives.

According to the TAG guidance changes in indirect tax revenues are included as part of the Present Value of Benefits (PVB). Therefore, change in indirect taxes, as a monetary value in 2010 prices discounted to 2010, is included within the AMCB and PA tables and form part of the BCR.

The results output from TUBA for the entire study area predict the following changes in indirect tax revenues, as shown in Table 34 below. This decrease in revenue is applied to the benefits, as shown in the AMCB Table.

Table 34: Indirect Tax, 60-Year Period

Impacts (£m PV, 2010 Prices)	Option A	Option B	Option C	Option D	Option E	Option F	Option G
Indirect Tax	-0.5	2.1	13.9	3.7	1.0	15.3	4.3

In general, changes in indirect tax revenue are a mirror image of the changes in greenhouse gas emissions. Increases in greenhouse gas emissions stem from increases in fuel consumption, which in turn is the main driver of changes in indirect tax revenue. The exception here is option A, which shows very small changes in both.

3.6.5 Time Benefits

The impacts summarised thus far have been expressed in terms of monetary value. Time benefits have also been quantified in hours and are summarised by year for all vehicle types and purposes, as show in Table 35 below.

Table 35: Time Benefits by Year for all Vehicle Types and Purposes ('000 Person Hours)

Year	Option A	Option B	Option C	Option D	Option E	Option F	Option G
2028	2,623	2,492	1,615	2,342	2,189	1,211	269
2043	4,477	4,540	2,388	4,112	3,871	1,522	257

A useful common-sense check is to consider the average benefit (in minutes) accruing to users of the schemes. However, clearly identifying the scheme beneficiaries is not straightforward. For a simple scheme, a reasonable proxy is to take the maximum flow of traffic along the corridor as representative of the key beneficiaries. For a complex 13-mile corridor, this would be inadequate. As an indicative check we have extracted the maximum two-way north-south flow at a point on the southern section and a point on the northern section of the corridor in the AM and PM peaks in 2043 and annualised these movements as shown in Table 36.

Table 36: Peak Hour key North-South movements (both sections, both directions), Person Trips, annualised

Year	Option A	Option B	Option C	Option D	Option E	Option F	Option G
AM	6,499,264	6,650,431	6,011,367	6,762,674	6,426,849	5,943,478	5,240,145
PM	8,101,792	8,051,203	6,627,206	8,621,739	7,837,603	6,643,132	5,783,113

While there will be some travellers that are common to both sections (and are thus double-counted), there will also be others (for example those making east-west movements) who benefit from the decongestion resulting for the scheme. There will also be more widespread benefits throughout the network. This can therefore only be a very broad estimate of the key beneficiaries of the scheme. Nevertheless, it is a useful order-of-magnitude check on the benefits, and an instructive indicator of the difference between the schemes. Table 37 summarises the approximate time benefit per north-south traveller on the busiest links in 2043.

Table 37: Approximate Time Benefits per north-south traveller on busiest links in 2043 (Minutes)

Year	Option A	Option B	Option C	Option D	Option E	Option F	Option G
AM	8.5	8.7	6.0	9.2	7.3	4.7	1.0
PM	14.6	14.2	11.4	11.6	12.2	6.0	0.4

The emerging pattern of benefits between the different scheme options is broadly consistent with that observed in Table 31 and Table 32 with the largest per-user benefits accruing to the scheme options that also generate the largest benefits overall (A and B), followed by D and E. Interestingly, option C which generates significantly lower overall benefits than the top four, also generates a high per-user benefit. Per-user benefits are particularly low for option G which is consistent with the observations in Table 32 where small time savings dominate for this option.

The per-user benefits are significantly larger in the PM than in the AM peak and are quite sizeable for most of the options. This is a result of the high degree of congestion and delay experienced in the 2043 do-minimum scenario following the significant growth in demand that has been assumed in the modelling.

As a further check on these numbers, we have extracted actual journey times for the 21km long A10 corridor for 2028 and 2043 from the model for the do-minimum run and for option E as an example. The results are shown in Table 38.

Table 38: Option E Journey Time Analysis

Option	Year	Direction	Time (minutes)			Time difference (minutes)		
			AM	IP	PM	AM	IP	PM
DM	2028	NB	29.48	29.78	46.78			
		SB	40.30	26.15	27.03			
	2043	NB	33.90	37.28	60.20			
		SB	43.93	28.68	30.02			
Option E	2028	NB	27.70	19.52	23.18	1.78	10.27	23.60
		SB	37.92	21.78	24.32	2.38	4.37	2.72
	2043	NB	26.70	20.15	29.57	7.20	17.13	30.63
		SB	36.38	23.62	30.30	7.55	5.07	-0.28

This indicates that there are substantial levels of delay incurred in the do-minimum scenario, particularly in the AM peak in the southbound direction and in the PM peak in the northbound direction. With the scheme itself, these delays are cut substantially giving a journey time difference of over 30 minutes for 2043 PM peak northbound movements that travel the full length of the A10 improvement section.

3.6.6 Others

The SOBC has not monetised the following impacts that could be monetised. The Appraisal Specification Report (ASR) for the OBC will consider whether and how these should be monetised.

- Reliability – whilst qualitative improvements are expected the method for monetising reliability benefits is not suited to predominantly rural dual carriageway roads such as the A10.
- Safety – benefits are expected because of the replacement of congested junctions with improved layouts reducing the likelihood of vehicle shunts, as well as the replacement of single carriageway roads experiencing high accident rates with safer dual carriageways. The OBC will consider these benefits in more detail using the DfT's COBA-LT software.
- Air quality and noise will be considered in the OBC based on the change in traffic volumes and speed in line with TAG Unit A3.3. In preparation for the OBC stage, some initial modelling and environmental impact screening will be undertaken to inform the approach.

- Physical Activity – the benefits of providing dedicated facilities for pedestrians and cyclists, either on the existing route or parallel to a new offline A10 can be assessed and monetised using the DfT's Active Modes Toolkit in line with TAG unit A1.3. This will be examined further as the design develops at the OBC stage.

3.6.7 AMCB Summary

The tables for the Analysis of Monetised Costs and Benefits (AMCB) table for each of the options are presented in Appendix I. Key headlines from this table in terms of the Present value of Benefits (PVB), Present Value of Costs (PVC), Net Present Value (NPV) and Benefit Cost Ratio (BCR) are shown in Table 39 below.

Table 39: Summary Assessment of Monetised Costs and Benefits

Element (£m, 2010 Prices)	Option A	Option B	Option C	Option D	Option E	Option F	Option G
PVB	813.6	801.3	380.6	727.7	721.3	272.7	43.3
PVC	146.7	148.5	66.9	169.9	139.7	58.9	22.4
NPV = (PVB – PVC)	666.9	652.8	313.7	557.8	581.6	213.8	20.9
BCR = (PVB ÷ PVC)	5.5	5.4	5.7	4.3	5.2	4.6	1.9

This shows that while options A, B, D and E (the options that offer full length dualling) provide the highest benefits overall, the highest benefit/cost ratio is generated by option C, where the expensive dualling is focussed on the busy southern part of the corridor only. Option G, junction improvements only, offers the lowest benefit/cost ratio despite the relatively low scheme costs as it does not really address the problem of delays and congestion along the whole corridor.

3.6.8 Dependent Development

The value for money aspect of dependent development is assessed outside the main Benefit/Cost appraisal and no Benefit/Cost ratio is calculated that includes the impact of dependent development.

The benefits of dependent development are assessed in terms of land value uplift – that is the value of the land with the development compared to the value of the land if the development had not taken place.

As outlined above, the additional development that is considered to be facilitated by the scheme amounts to 9,400 housing units. The units cover a site of some 293 hectares.

Land costs were derived from guidance by the Ministry of Housing, Communities and Local Government (MHCLG)[77]. Given the history of the Waterbeach site as a former barracks and airfields, it has been assumed the existing (no development) land valuation should be based on the 'industrial land' category for Greater Cambridge. The 'with development' land value was based on the value for Residential in South Cambridgeshire. In line with the other aspects of the economic case, the values were adjusted to 2010 market prices and discounted to 2010. The discounting assumed that the land value uplift occurs, on average, by around 2030. The calculation is summarised in Table 40.

[77] Land Value Estimates for Policy Appraisal, Ministry of Housing, Communities & Local Government, May 2017

Table 40: Land Value Uplift as a result of Dependent Development (All Scheme Options)

Element	Value
Land Area (ha)	293
Land Value, Industrial, Greater Cambridge, April 2017 (£/ha)	875,000
Land Value, Residential, South Cambridgeshire, April 2017 (£/ha)	5,300,000
Land Value Uplift from DD, 2017 Factor Prices (£m)	1,297
PV of Land Value uplift from DD, 2010 Market Prices, discounted to 2010	690.1

The assessment is necessarily simplistic at this stage and will be refined at OBC stage. It assumes that the land value uplift will occur, and apply to the whole site, as a result of the higher density development to 11,000 homes and it assumes the benefit will be the same for all options. The benefit from the land value uplift needs to be balanced by the impacts of the additional trips generated by the development on other road users (externalities). This has been quantified through modelling and TUBA analysis as follows set out in Table 41.

Table 41: TUBA set-up for calculating the Externalities from Dependent Development

TUBA Scenario	Time and cost matrices	Trip matrices
Do minimum	A10 DS without Dependent Development	A10 DS without Dependent Development
Do something	A10 DS with Dependent Development	A10 DS without Dependent Development

This provides the impact of the levels of traffic with the Dependent Development in place on all other road users (those that are present in the absence of Dependent Development). The results are summarised in Table 42, together with the net impact of the DD (the balance between the land value uplift and externalities).

Table 42: Externalities and Net Impacts from Dependent Development (DD)

DD Impacts (£m, 2010 Prices)	Option A	Option B	Option C	Option D	Option E	Option F	Option G
PV of DD Externalities	-581.7	-618.9	-607.8	-623.7	-657.5	-703.1	-669.1
PV of Net DD Impacts	108.4	71.2	82.3	66.4	32.6	-13.0	21.0

This shows some significant disbenefits arising from the additional traffic generated by the Dependent Development, of a similar order of magnitude to the benefits arising from the land value uplift. While the overall balance remains positive in all but one case (option F), this underlines the importance of design to encourage sustainable travel patterns for the large-scale development and Waterbeach. Any additional modal shift towards public transport or other more sustainable modes, or measures to minimise long distance commuting from the development, would act to minimise this disbenefit.

3.7 Assessment of Non-Monetised Benefits

3.7.1 Journey quality

TAG Unit A4.1 defines journey quality as "a measure of the real and perceived physical and social environment experienced while travelling". Journey quality addresses changes to the end to end journey experience of transport users with respect to traveller care, travellers' views, and traveller stress. A qualitative approach has been used to assess whether the difference between the without scheme and each scheme option will be better, worse or neutral. The findings are summarised in Table 43 below.

Table 43: Journey Quality Impact Assessment

Category	Impact Assessment
Traveller Care (cleanliness, facilities, information)	In general, all scheme options will have minimal impacts on this aspect of journey quality for vehicles. All scheme options provide some improved crossing facilities for pedestrians and cyclists.
Travellers' Views	Due to improved landscaping for new sections of road, all the options involving dualling and bypassing key pinchpoints will generate some improvements to travellers' views. This is especially the case for the offline dualling option. At junctions, the change is generally insignificant (i.e. slightly larger junctions and provision of traffic signals).
Traveller Stress (frustration, fear of accidents and route uncertainty)	The scheme proposal will improve link flows and junction operation especially in the cases where links and junctions are operating close to capacity. This will have a beneficial impact on congestion-related accidents (i.e. rear-end collisions) and driver frustration will be reduced following the upgrades. Environmental measures and public realm improvements in the villages of Landbeach, Waterbeach, Horningsea and Milton, including improvements for pedestrians and cyclists are being planned independently of the scheme. However, similar measures would generate benefits as Stretham in scheme options where it is bypassed. This will reduce traveller frustration and stress as well as the fear of accidents.

3.7.2 Severance

Community severance is defined in TAG Unit A4.1 as "the separation of residents from facilities and services they use within their community caused by substantial changes in transport infrastructure or by changes in traffic flows". Severance is caused where vehicle flows "significantly impede pedestrian movement or where infrastructure presents a physical barrier to movement".

The main locations in the study area which either experience severance currently or may experience a change in severance as a result of the scheme are:

- Communities directly adjacent to the A10, namely Little Thetford, Stretham, Chittering and Waterbeach. These communities experience a slight hindrance to pedestrian movement due to the high volumes of traffic using the existing route.
- Populated areas that are close to roads that would be affected by an offline A10 alignment, such as between Waterbeach and Landbeach. These areas could experience severe severance if a new alignment causes a barrier to pedestrian movements.
- Communities directly adjacent to alternative routes to the A10, such as the B1049 through Cottenham, Histon, Impington, as well as unclassified roads through Landbeach and Horningsea. These communities may experience some hindrance to pedestrian movement depending on the volume of traffic using the routes.

A high-level assessment of severance effects of each of the scheme options is summarised in Table 44 below. These currently do not include the impacts of any mitigation measures associated with new road alignments, which will be explored as the designs develop.

Table 44: Severance Impacts of scheme options

Option	Description of impact	Overall Assessment
A	Slight increase in severance at Chittering due to widening and large increase between Landbeach and Waterbeach due to new offline section, likely to affect <200 people per day. Bypasses will slightly decrease severance at Stretham and Little Thetford. Slight severance benefits for communities along B1049 and Horningsea Road depending on magnitude of change in traffic volumes.	Neutral
B	Slight increases in severance at Chittering and Waterbeach due to widening of existing carriageway. Bypasses will slightly decrease severance at Stretham and Little Thetford. Slight severance benefits for communities along B1049 and Horningsea Road depending on magnitude of change in traffic volumes. Likely to affect <200 people per day	Slight positive
C	Severe increase in severance between Landbeach and Waterbeach due to new offline section, likely to impact <200 people per day. Neutral impact in settlements along the rest of the route.	Slight negative
D	Slight decreases in severance at Stretham, Little Thetford, Chittering and for communities along B1049 and Horningsea Road depending on magnitude of change in traffic volumes. Likely to affect <200 people per day	Slight positive
E	Bypasses will slightly decrease severance at Stretham and Little Thetford. Slight increase in severance at Chittering and Waterbeach due to carriageway widening. Slight severance benefits for communities along B1049 and Horningsea Road depending on magnitude of change in traffic volumes. Likely to affect <200 people per day	Slight positive
F	Slight increase in severance at Waterbeach, slight decrease in severance in Stretford at A10/A1123. Likely to balance out overall	Neutral
G	Junction improvements will have localised slight severance benefits but likely to impact few people as they are not in populated areas	Slight positive

Options A and F would have a neutral impact on severance overall, because their positive and negative impacts would broadly balance out. Option C would have a slight negative impact due to severe severance impact of the offline alignment between Waterbeach and Landbeach, likely to affect a relatively low number of pedestrian movements. Options B, D, E and G would have a slight positive overall impact on severance.

3.7.3 Safety

A qualitative assessment of safety impacts has been made by considering the locations that would be affected by changes in traffic flow or improved road layout for each option, with reference to the collision analysis reported in section 2.3.10.

Table 45: Accident Impacts of scheme options

Option	Description of impact	Overall Assessment
Option A	Significant reduction in collisions would be expected between A14 and Cambridge Research Park and on minor alternative routes due to demand diverting to the new offline sections. Modern dual carriageways are statistically safer than older single carriageway A roads.	Moderate beneficial
Option B	Significant reduction in collisions would be expected between A14 and Cambridge Research Park and on minor alternative routes due to demand diverting to the new offline sections. Modern dual carriageways are statistically safer than older single carriageway A roads.	Moderate beneficial
Option C	Significant reduction in collisions would be expected between A14 and Cambridge Research Park and on minor alternative routes due to demand diverting to the new offline section. Slight decrease in collisions at junctions along the rest of the route. Whilst the northern section would not be dualled, its safety record is better than the national average.	Moderate beneficial
Option D	Significant reduction in collisions would be expected along the length of the existing alignment and on minor alternative routes due to demand diverting to the new route. Modern dual carriageways are statistically safer than older single carriageway A roads.	Large beneficial
Option E	Moderate reduction in collisions due to congestion reduction along the route and bypass of Stretham. Modern dual carriageways are statistically safer than older single carriageway A roads.	Moderate beneficial
Option F	Moderate reduction in collisions between A14 and Cambridge Research Park, slight improvements at upgraded junctions. Whilst the northern section would not be dualled, its safety record is better than the national average.	Moderate beneficial
Option G	Moderate reduction in collisions at upgraded junctions but no impact on congestion-related collisions along A10	Slight beneficial

All options would be expected to have a positive impact on reducing the frequency and severity of collisions. Option D would have the largest beneficial impact by drawing traffic away from the existing alignment to an upgraded offline carriageway. Option G would have only a slight beneficial impact focused on the upgraded junctions. Other options would have moderate beneficial impacts.

3.7.4 Environment

The conclusion of the initial environmental assessment is that the likely environmental effects of many of the options under consideration for the Proposed Scheme would be broadly comparable in terms of the likely significant environmental effect with likely risks around flooding, ecology, heritage and noise. The initial environmental assessment is included in full in Appendix B.

Option G would be the preferred environmental option as it would require only junction upgrades and so would be the least intrusive and require the smallest amount of land take. Consequently, when compared with the other options the likely significant effects of Option G would be less.

Options C and F would be the next preferred options for similar reasons to option G. These options would combine junction improvements and restricted lengths of dualling (not the whole length of the A10). Consequently, the adverse environmental effects would be less than options that involve dualling along the

majority of the length of the A10. However, although these options (Options C and F) would generally be preferred they would perform less well in carbon terms. This would be because, (along with G), they would be the least effective in reducing congestion and as they would also have higher embodied carbon within the materials required compared with Option G so the carbon impacts would be largest for these options compared with the others.

The options involving extended lengths of dualling either on-line or off-line would be very comparable in environmental terms (Option A, B, D and E).

- Option B and Option E would be the least preferred due to the potential for adverse effects upon population and health, biodiversity and cultural heritage.
- Option D, the full off-line option would be strongly preferred for some topics specifically noise and air quality because traffic would be removed from the existing A10 and existing residential receptors. This would have beneficial effects for those receptors. However, this option would also be likely to have the largest adverse effects associated with land take (because it would have the largest footprint) and as a result was least preferred for biodiversity, landscape and water environment. It would also have a large carbon impact (3rd highest whole life carbon impact) as it would need a completely new dual carriageway to be built.
- Option A would be the option that has neither the largest adverse effects or the greatest potential benefits and so in the ranking of options was consistently in the middle of the options. However, it would be the preferred option in terms of carbon.

For an option that involved full dualling from Milton Interchange to Ely, Option A or Option D would be the preferred options based on the current level of information and assessment. Of all the options Option G would be the preferred and Options B and E the least preferred based on environmental considerations.

3.8 Appraisal Summary Tables

These results are summarised for each option in the standalone Appraisal Summary Table (Appendix I).

3.9 Assessment of Distributional Impacts

The current screening proforma and the distributional impacts assessment completed for the SOBC is included in Appendix J. This covers the following elements of the appraisal:

- User benefits;
- Severance; and
- Affordability for car users with respect to fuel and non-fuel operating costs.

3.10 Assessment of Wider Economic Benefits

According to TAG Unit A2.2, additional consumer surplus arises due to the presence of imperfect competition (the market structure distorts the efficient operation of the market), if there is evidence that business would increase output in response to the transport investment.

However, while the Strategic Case has demonstrated that the current and future performance of the A10 corridor in the absence of the schemes has a negative impact on existing business activities and constrains prospects for growth (with key issues including congestion and journey time reliability), an allowance for the consumer surplus has not been estimated because it may be considered double-counting with any benefits arising from dependent development (TAG Unit A2.2, section 4.2.3).

3.11 Sensitivity test results

Three indicative sensitivity tests have been conducted and used to explore:

- A 25% reduction in scheme benefits resulting from reduced economic activity and travel demand[78];
- A 25% increase in overall project costs; and
- A combined test where the above two downsides coincide.

Table 46 to Table 48 below provide the high-level impacts of the sensitivity tests on PVB, PVC, NPV and BCR, as well as the impact on Wider Economic Benefits.

Table 46: Benefit Reduction Sensitivity Test Results

Element (£m, 2010 Prices)	Option A	Option B	Option C	Option D	Option E	Option F	Option G
PVB	610.2	601.0	285.5	545.8	541.0	204.5	32.5
PVC	146.7	148.5	66.9	169.9	139.7	58.9	22.4
NPV	463.5	452.5	218.6	375.8	401.3	145.6	10.1
BCR	4.2	4.0	4.3	3.2	3.9	3.5	1.5

Table 47: Cost Escalation Sensitivity Test Results

Element (£m, 2010 Prices)	Option A	Option B	Option C	Option D	Option E	Option F	Option G
PVB	813.6	801.3	380.6	727.7	721.3	272.7	43.3
PVC	183.4	185.6	83.6	212.4	174.6	73.6	28.0
NPV	630.2	615.7	297.0	515.3	546.7	199.1	15.3
BCR	4.4	4.3	4.6	3.4	4.1	3.7	1.5

Table 48: Combined Sensitivity Test Results: Benefit Reduction and Cost Escalation

Element (£m, 2010 Prices)	Option A	Option B	Option C	Option D	Option E	Option F	Option G
PVB	610.2	601.0	285.5	545.8	541.0	204.5	32.5
PVC	183.4	185.6	83.6	212.4	174.6	73.6	28.0
NPV	426.8	415.4	201.9	333.4	366.3	130.9	4.5
BCR	3.3	3.2	3.4	2.6	3.1	2.8	1.2

[78] This test could also serve as a proxy for an extreme case of COVID-related economic downturn.

This indicates that the value for money of the schemes is robust against a range of input changes. Option G, which returns the lowest Benefit/Cost ratio of the schemes drops to a medium value for money rating (see Table 50 below for definitions) under both of the single sensitivity tests and to a low rating under the combined test. All other options retain their high rating even under the combined test.

In addition, sensitivity tests on the valuation of scheme carbon impacts have been undertaken. Table A3.4 of the TAG Databook provides central, low and high values per tonne of non-traded CO_2e by year and the standard valuation in TUBA reported in Table 33 above is based on the central value.

The low value ranges from 49% of the central value in the scheme opening year of 2028 to 34% in 2083, the final appraisal year. The equivalent percentages for the high value range from 150% to 166% respectively. When applied to the greenhouse gas outputs as reported in TUBA, the sensitivity test results are as reported in Table 49.

Table 49: Greenhouse Gasses Impact Sensitivity Test Results, 60-Year Period

Impacts (£m PV, 2010 Prices)	Option A	Option B	Option C	Option D	Option E	Option F	Option G
Central	-0.4	-1.8	-8.0	-2.6	-1.2	-8.8	-2.3
Low	-0.2	-0.9	-3.8	-1.2	-0.6	-4.2	-1.1
High	-0.6	-2.7	-12.2	-4.0	-1.8	-13.4	-3.5

The largest impacts of the sensitivity tests are observed for options C and F, where the high value for carbon increases the greenhouse gas disbenefit by £8.4m and £9.3m (PV) respectively. These changes would not have a material impact on the overall value for money of the schemes.

3.12 Value for Money statement

The Department for Transport defines Value for Money Categories as shown in Table 50 below.

Table 50: DfT's Value for Money Benefit Cost Ratio Categorisation

Value for Money Category	BCR Range
Poor VfM	Less than 1.0
Low VfM	Between 1.0 and 1.5
Medium VfM	Between 1.5 and 2.0
High VfM	Between 2.0 and 4.0
Very High VfM	Greater than 4.0

Taking the identified BCRs, the VfM level for each scheme option can be defined as shown in Table 51 below.

Table 51: Value for Money Assessment

BCR and VfM	Option A	Option B	Option C	Option D	Option E	Option F	Option G
BCR	5.5	5.4	5.7	4.3	5.2	4.6	1.9
VfM Category	Very high	Very high	Very high	Very high	Very high	Very high	Medium

Consideration has been given to the impact on the value for money categorisation if costs or benefits could be assigned to the factors that have not currently been monetised in the OBC appraisal. This is known in DfT's Value for Money Framework as the concept of "switching values". The required change in scheme costs or benefits required for the scheme to move to either a higher or a lower value for money categorisation from its initial categorisation is shown in Table 52 below.

Table 52: Scale of Change in Costs or Benefits to switch the Scheme from its initial VfM Categorisation to a higher or lower Category

BCR and VfM	Option A	Option B	Option C	Option D	Option E	Option F	Option G
BCR	5.5	5.4	5.7	4.3	5.2	4.6	1.9
VfM Category	Very high	Very high	Very high	Very high	Very high	Very high	Medium
Cost increase required to shift into next lower VfM Category	39%	35%	43%	7%	29%	16%	30%
Cost reduction required to shift into next higher VfM Category	n/a	n/a	n/a	n/a	n/a	n/a	-3%
Benefit reduction required to shift into next lower VfM Category	-28%	-26%	-30%	-7%	-23%	-14%	-23%
Benefit increase required to shift into next higher VfM Category	n/a	n/a	n/a	n/a	n/a	n/a	114%

The most sensitive option to change is option D, which requires a change of only 7% in costs or benefits to drop from a very high to a high value for money rating. Option G would drop from a medium to a low rating with a change of 30% in costs or 23% in benefits.

3.13 Expected updates at Outline Business Case stage

The economic appraisal undertaken as part of this SOBC shows a strong case for several of the scheme options. The further refinements that are likely to be made at Outline Business Case stage are summarised in Table 53.

Table 53: Principal Updates to the Economic Case for the Outline Business Case

Principal updates for the Outline Business Case's Economic Case will cover
▪ Feedback from public consultation will feed into further option development. This may lead to some option modifications and inform further option selection work. ▪ The OBC is then likely to focus on a smaller number of preferred options only. ▪ Modelling work will be updated. ▪ Updated transport user benefits and vehicle operating costs in line with latest TAG values at the time. ▪ If TAG has not been updated to take account of the longer-term economic impacts of COVID-19, this should be explored through sensitivity testing. ▪ Updated scheme costs. ▪ Consideration of Safety benefits through COBA-LT software. ▪ Consideration of monetised impacts of air and noise based on traffic flow and speed changes. ▪ Consideration of Maintenance and Construction Delay Impacts through QUADRO software. ▪ Update of Distributional Impacts Report. ▪ Consideration of wider economic impacts and seasonality impacts (if appropriate).

4. Financial Case

4.1 Background

The financial case concentrates on the affordability of the proposal, its funding arrangements and technical accounting issues (value for money is scrutinised in the economic case). It presents the financial profile of the different options and the impact of the proposed deal on the Department's budgets and accounts.

Appendix K provides supporting information on the cost breakdown for each option.

4.2 Scheme Capital Costs

4.2.1 Methodology and Assumptions

The derivation of the scheme capital costs is detailed in the cost report in Appendix K. The costs have been prepared using the Construction Computer Software (CCS), CostX Estimating Software. Quantities are either directly entered into take off sheets or measured electronically using the built in Quantity Take off package.

The Highways Works element of this estimate have wherever possible been quantified in accordance with the Manual of Contract Documents for Highway Works - Volume 4 Bills of Quantities for Highway Works published by the Highways Agency (now Highways England).

Percentage allowances have been included in this estimate for preliminaries, miscellaneous works (environmental mitigation works), accommodation works and facilitating works (works for statutory undertakers). A contingency allowance has also been included.

Approximate estimating rates have been used in this estimate for site clearance based on area of existing carriageway, flood relief culverts based on length of routes and attenuation ponds based on area of new carriageway, traffic signs and road marking based on the area of carriageway, planting based on area of verge and bridge structures based on area of bridge deck.

Unit rates have been used to price fencing, road restraints, drainage, earthworks, pavement, kerbs, footways and paved areas, road lighting, and electrical work associated with road lighting and traffic signs.

The rates used are in pounds sterling and reflect construction projects of a similar size and nature. The base date of the estimate is 2nd Quarter 2020 (2Q 2020).

4.2.2 Inflation

Allowances have been included for tender and construction inflation, based on the Building Cost Information Service (BCIS) Road Cost Index. The current published forecast goes to 3Q 2024 only. Beyond 2024, a year on year inflation of 3.6% which was assumed based on the percentage for 2024.

4.2.3 Allowance for risk and Optimism Bias

A fully quantified risk assessment has not been undertaken at this stage in the project development and the cost estimates include an indicative allowance of 45% on the cost of Highway Works for design development risks, construction risks, employer change risks and employer other risks.

An allowance for Optimism Bias is included in the economic case as described in chapter 3. For the purposes of the Financial Case, an uplift to mitigate against optimism bias has not been included. This approach is in line with TAG Unit A1.2 paragraph 3.5.3.

4.2.4 Value Added Tax (VAT)

Value Added Tax (VAT) is excluded from this cost estimate.

4.2.5 Summary of capital costs

A summary of the scheme capital costs shown in Table 54 below. Note these differ from the costs presented in the economic case. Costs for economic appraisal exclude general inflation but include allowances for optimism bias. The costs in the financial case include general inflation but exclude allowances for optimism bias. In addition to the costs presented in the cost report in appendix K, a 10% contingency allowance has been added here to reflect the relatively early stages in scheme design and costing.

Table 54: Scheme Capital Costs (Q2 2020 Factor Prices)

Cost Element	Option A	Option B	Option C	Option D	Option E	Option F	Option G
Preliminaries (30%)	18,575,310	18,833,026	7,937,401	21,619,683	17,641,177	6,883,654	2,390,246
Roadworks	52,844,764	53,659,031	22,683,151	55,438,635	51,708,315	21,245,847	6,752,108
Structures (Bridges, Viaducts, etc)	5,845,000	5,845,000	1,815,000	12,870,000	4,030,000	Excluded as no requirement	Excluded as no requirement
Miscellaneous	1,173,795	1,190,081	489,963	1,366,173	1,114,766	424,917	135,042
Accomm. Works (1% of Roadworks and Structures)	586,898	595,040	244,982	683,086	557,383	212,458	67,521
Facilitating Works (various %)	1,467,244	1,487,601	1,224,908	1,707,716	1,393,458	1,062,292	1,012,816
Project / design team fees	10,000,000	10,000,000	5,000,000	10,000,000	10,000,000	5,000,000	2,000,000
Tender Inflation	20,451,420	20,703,810	8,903,362	23,432,876	19,536,592	7,871,392	2,792,848
Construction Inflation	6,101,944	6,177,247	1,304,067	6,991,499	5,828,993	1,152,915	409,066
Contingency (10%)	11,704,638	11,849,084	4,960,283	13,410,967	11,181,068	4,385,348	1,555,965
Sub-Total	128,751,013	130,339,920	54,563,117	147,520,635	122,991,752	48,238,823	17,115,612
Risks (45%)	57,937,956	58,652,964	24,553,403	66,384,286	55,346,289	21,707,470	7,702,025
Total	186,688,968	188,992,883	79,116,520	213,904,920	178,338,041	69,946,293	24,817,637

4.2.6 Land costs

No detailed assessment of land acquisition costs is available at this stage in the project. Indicative cost estimates have been developed by assessing the land take of each option and applying a cost assumption to this as described in the previous chapter. However, in contrast to the values in Table 27: Land Cost Estimates (£, 2020 prices), an allowance for Optimism Bias has been excluded in the Financial Case.

The land cost estimates for the Financial Case are summarised in Table 55. These include contingency and risk allowance.

Table 55: Land Cost Estimates (£, 2020 prices)

	Option A	Option B	Option C	Option D	Option E	Option F	Option G
Land Costs	1,701,865	1,754,500	3,024,120	1,947,495	1,631,685	2,953,940	2,445,135

4.2.7 Expenditure profile

The construction, preparation and land costs for each of the options were assumed to be incurred as set out in Table 29 in the previous chapter.

4.3 Maintenance costs

No schedule of maintenance has been developed at this stage in the scheme development and the maintenance cost estimate has been based on a broad assumption derived from indicative analysis of Highways England maintenance spending. This has led to an assumption of 0.2% per annum of initial construction cost for each of the options, incurred from year 3 after scheme opening.

This can only be an indicative assumption at this stage. In reality, maintenance cost will be more 'lumpy', with minimal costs incurred in many years but a significant outlay required from time to time (for example when resurfacing becomes necessary).

4.4 Funding options

4.4.1 Developer contributions

The Cambridgeshire County Council Section 106 team have negotiated contributions with local developers at the most significant development site at Waterbeach. Here, two main developers are active – Urban and Civic and RLW Estates.

A Section 106 contribution has been agreed with RLW Estates, and this is tied to the relocation of Waterbeach Railway Station. Urban and Civic are due to make a Section 106 contribution of the order of £65 million. Of this, some £8 million are allocated to transport and it is understood that the majority of that is earmarked for the funding of the Greenways project. The Combined Authority will be seeking a release of developer contribution funds from CCC when appropriate.

Local Planning Authorities as well as the Mayor for the Combined Authority have the power to introduce a Community Infrastructure Levy (CIL) through the planning system but it is too early to estimate the possible level of contribution at this stage.

4.4.2 Local funding

The Combined Authority has committed to providing 15% of the scheme funding from local sources. This would be made up of any developer contributions plus other available local funds. It would not be in addition to any developer (s106) contributions. The financial and funding strategy will be developed in the OBC, following scope and policy as for the CPCA's CAM project.

4.4.3 Government funding

Development can only be expected to mitigate its own impact and therefore any contributions from s106 and CIL cannot cover the scheme costs. Local government funding options are limited and cannot be stretched beyond a commitment to providing 15% of scheme funding.

Given the strategic nature of the A10 corridor and the existing capacity constraints in the area, there is a need for government to fund the remaining 85% of the scheme costs. The Value for Money case outlined in the Economic Case provides a strong rationale for the investment.

4.5 Expected updates at Outline Business Case Stage

The further refinements that are likely to be made at Outline Business Case stage are summarised in Table 56.

Table 56: Principal Updates to the Financial Case for the Outline Business Case

Principal updates for the Outline Financial Case's Financial Case will cover
▪ Feedback from public consultation will feed into further option development. This may lead to some option modifications and inform further option selection work. ▪ The OBC is then likely to focus on a smaller number of preferred options only. ▪ Updated scheme costs based on Final Target Costs. ▪ Updated land costs. ▪ A fully quantified risk assessment. ▪ Further details on local developer contributions. ▪ Further details on the sources of the 15% local contribution.

5. Commercial Case

5.1 Introduction

At the Strategic Outline Business Case (SOBC) stage, the existing and future problems and issues have been identified, scheme-specific objectives have been defined and options have been generated and assessed in terms of delivery of the scheme's objectives and value for money. As such the Commercial Case is common to all options.

This section sets out the Commercial Case including the commercial viability and procurement strategy for the scheme. At the SOBC stage, it is expected, as set out in the Department for Transport's transport business cases guidance[79], that as a minimum the Commercial Case should describe in full the approach to assessing commercial viability, as well as providing an initial overview of the output-based specification and procurement strategy.

Further detail on the preferred method to source and select contractors, payment mechanisms, the pricing framework, risk allocation, contract length and management will be provided in subsequent business case updates.

5.2 Commercial viability

The initial commercial viability of the scheme has been determined through the following activities:

- Development of the output-based specification through desktop research and ratification within the project delivery team.
- Using this specification to then guide a project delivery team discussion around procurement options, including a consideration of the options that have worked well before either in the local area or through team member's own experiences

The Combined Authority is committed to achieving best value in the delivery of major transport projects across Cambridgeshire and Peterborough. It will continue to review options for procurement as the project develops. As with all construction projects, there is a need for time, cost and quality issues to be managed and their inevitable tensions balanced. The process of contract selection and formulation will help to ensure scope of project and project-specific risks are controlled through procurement.

Details on contract length, human resource issues and contract management will be developed and finalised subject to approval, at a later stage of scheme development. The commercial viability of the scheme will continue to be assessed using the governance arrangements discussed in the Management Case.

5.3 Output based specification

The Commercial Case is based upon a need to secure the outputs and outcomes that flow logically from the scheme objectives documented in the Strategic Case. These outputs and outcomes apply to the ongoing and future design, as well as its subsequent construction, to ensure that its "intent" is carried forward into reality.

The link between the objectives, output and outcome specification is shown below.

[79] Table 5.1 of "The Transport Business Cases", January 2013. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/85930/dft-transport-business-case.pdf

Table 57. Output and Outcome Specification for the A10

Scheme objective	Outputs sought from the procurement process	Outcomes sought from the scheme's delivery
Provide infrastructure needed to realise sustainable housing opportunities associated with existing Local Plans Provide the opportunity to unlock thousands of new homes between Cambridge and Ely as part of the CPCA's emerging non-statutory spatial plan by 2050	▪ An upgraded road corridor between the Cambridge and Ely that balances growth and movement (by all modes) ▪ Appropriate environmental mitigation in the delivery of temporary and permanent works ▪ Delivery within available funding constraints ▪ Competitive procurement exercise, with strong interest from multiple, capable suppliers, aided by early engagement with suppliers to gauge market maturity and encourage interest ▪ Strike appropriate balance between further design preparation costs, total installed costs and delivery programme based on risk and complexity (time, cost and quality) ▪ Place risk ownership with the most appropriate party to manage them, to reduce risks as far as reasonably practicable. ▪ Affordable Whole Life Cost Solution	▪ Support delivery of the South Cambridgeshire Local Plan including timely delivery of new housing at Waterbeach New Town ▪ A long-term solution for housing growth and connectivity in South Cambridgeshire and East Cambridgeshire districts ▪ Maximise development viability and hence contributions for infrastructure ▪ Optimise Value for money for HM Treasury and CPCA ▪ Cost certainty for CPCA ▪ Availability and affordability of housing stock for local residents ▪ Affordable asset to operate and maintain by CCC

Scheme objective	Outputs sought from the procurement process	Outcomes sought from the scheme's delivery
Increase productivity of the nationally important CPCA economy (including science, technology, agriculture) through improved connectivity to labour, suppliers and markets	▪ As above ▪ Minimise disruption to the rest of the road network during construction and maintenance ▪ Provide appropriate capacity and connectivity for all modes	▪ Support the delivery of the recommendations made by CPIER and the Cambridgeshire and Peterborough Local Industrial Strategy ▪ Improved journey time reliability and resilience of connections between suppliers and markets ▪ Improved access to employment from residential communities along the A10 corridor ▪ Improved business productivity and investment in the Combined Authority area ▪ Minimal delays during construction
As part of a wider package for the Corridor contribute to the achievement of CPCA's LTP Net Zero by 2050 objective	▪ Minimise and mitigate emissions through design solutions during construction, operation and maintenance	▪ Support the achievement of Draft Net Zero policy objective
Enhance biodiversity in line with the CPCA's emerging "doubling nature" policy aims by 2050	▪ Increase biodiversity through design and construction solutions ▪ Dedicated areas of land managed for nature	▪ Increase in biodiversity, contributing to Natural Cambridgeshire's aspiration to achieve a 100% increase in the land managed for nature within the region
Improve the quality of life for residents in local communities by reducing the community severance and environmental impacts of traffic on the built environment	▪ Improve quality of life through design and construction solutions ▪ Minimise and mitigate impacts during temporary works ▪ Explicit provision for all key desire lines and non-car modes in the scheme design, making reference to best practice and guidance.	▪ More appropriate routeing of traffic away from the local road network and rural communities ▪ Improved health and wellbeing through improved local air quality and reduced noise ▪ Reduced community severance

Scheme objective	Outputs sought from the procurement process	Outcomes sought from the scheme's delivery
Encourage sustainable travel by improving the comfort, reliability, capacity and/or speed of alternative transport services (including rail, CAM, buses, walking, cycling and horse riding) along the A10 corridor	▪ Explicit provision for all key desire lines and non-car modes in the scheme design, making reference to best practice and guidance. ▪ Segregated walking / cycle route paralleling the A10 corridor	▪ Increased opportunity for walking, cycling, public transport and horse riding, including access to services and the countryside from new and existing communities ▪ Support accessibility and inclusion
Reduce the risk of collisions along the A10 and on parallel 'B' / unclassified roads in local communities relative to 2018 levels	▪ Safe by design solutions during construction, operation and maintenance	▪ Reduced number and impact of accidents on A10 and parallel 'B' / unclassified roads in local communities relative to 2018 levels
Reduce congestion and improving journey time reliability along the A10, sustaining these benefits for the long-term	▪ Appropriate capacity for all modes	▪ Reduced delays sustained for the long-term ▪ Shorter journey times for commuters and businesses ▪ Reduced emissions from traffic

This specification provides a basis for developing the preliminary design of the scheme and will help to inform the monitoring and evaluation of the scheme's benefits. Further detail on the project performance criteria and design standards will be developed as the business case is updated.

5.4 Outline Procurement Strategy

5.4.1 Context

Future public procurement legislation post exiting the European Union will be heavily influenced by the nature of any future trade agreements between the UK and the EU which is currently under negotiation. Any significant changes to public procurement post 2020 will need to be considered as part of the update to the Outline Business Case, but for the purposes of the Strategic Outline Business Case we have assumed the current approach remains the same.

Currently the Official Journal of the European Union (OJEU) is the publication in which all public-sector tenders valued above £4,104,394 (for infrastructure projects) must be advertised if not covered by an existing framework agreement.

There are several procurement procedures available to schemes to which the OJEU values apply. These include traditional two-stage procurement (design and construction as separate packages), design and build (D&B) and Early Contractor Involvement (ECI). In developing the scheme's programme, the schedule implications of each of these have been mapped out and considered collaboratively by the project team.

To date CPCA have called upon the services of Jacobs for design, environmental assessment and business case development, following a competitive tender process using the ESPO Consultancy Services Framework. The OBC stage will be procured through standard CPCA commercial procedures, using dedicated procurement resources with experience of multiple frameworks and large value projects via OJEU. This has been demonstrated most recently on the multi lot procurement of the CAM.

The remainder of the discussion concerns the potential procurement and delivery routes available for the construction of an A10 scheme.

5.4.2 Procurement options

The procurement options are as follows:

OJEU Notice – Open Procedure - This procedure allows an unlimited number of interested parties to tender against defined parameters. There are no restrictions (e.g. pre-qualification) on the parties who are permitted to tender, meaning that some parties may not be suitable to carry out the work. This procedure is straightforward and transparent but can attract a large number of potential bidders (which will require a greater degree of assessment and resource requirements). This route is not usually recommended for construction projects due to the high number of tenders that could be expected and the particular skills and experience that may be required of potential bidders.

OJEU Notice – Restricted Procedure - This is a two-stage procedure. The first stage allows the contracting authority to set the minimum criteria relating to technical, economic and financial capabilities that the potential bidders have to satisfy. Following evaluation of the responses to the first stage a minimum of five bidders (unless fewer qualify) are invited to tender in the second stage. This process is typically used to appoint consultants or contractors on traditionally procured projects.

OJEU Notice – Accelerated Restricted Procedure - This procedure is only intended for use where, for reasons of urgency, the contracting authority must procure the contract in a reduced time frame. Any contracting authority wishing to use this procedure must be able to demonstrate the reasons of urgency that necessitate its use. It is identical to the Restricted Procedure except that the timescales for each stage are reduced.

OJEU Notice – Competitive Dialogue Procedure - This procedure is appropriate for complex contracts where contracting authorities are not objectively able to define the technical means capable of satisfying their needs or objectives; and/or are not objectively able to specify the legal and/or financial make-up of a project. This is a multi-stage procedure. The first stage is a pre-qualification to select the potential bidders to participate in the dialogue. In the second stage the contracting authority enters into a dialogue with the potential bidders to identify and define the means best suited to satisfying their needs.

Any aspect of the contract may be discussed, including technical requirements for the works to be delivered and the commercial/contractual arrangements to be used. The dialogue may be conducted in successive phases with the remaining bidders being invited to tender. By the end of the dialogue phase the contracting authority's requirements will have been determined such that the scheme can be tendered. In the final stage, the remaining bidders from the dialogue phase are invited to tender for the scheme.

OJEU Notice – Competitive Procedure with Negotiation - This procedure is intended to be used where minimum requirements can be specified but negotiations with bidders may be needed to improve the initial tenders. The grounds for using this procedure are as follows:

- Where needs cannot be met without adaptation of readily available solutions;
- Where the contract includes design or innovative solutions;
- Where the requirement is complex in nature, in its legal and financial makeup or because of its risks;
- Where the technical specifications cannot be established with sufficient precision; or
- In the case of unacceptable/irregular tenders.

Within this procedure, bidders initially submit tenders based on the information issued by the contracting authority. The contracting authority is then able to review the tenders it has received and negotiate with the bidders, following which the tenders will be resubmitted. This procedure may therefore be useful where the requirements are well developed initially, and full tender documents can be produced but there may be advantage in retaining the ability to hold negotiations if there are certain aspects which bidders raise.

Eastern Highways Alliance Framework 3 – Cambridgeshire County Council is a Board member of the Eastern Highways Alliance. The current Eastern Highways Alliance Framework 2 (EHAF2) is a wide-ranging framework which covers structural work, surfacing, road works and capital schemes for highways. Typical schemes involve highway improvements, highway infrastructure works including bridges, subways, culverts and retaining walls; public realm works; drainage improvements, canal works, and other infrastructure works such as waste management facilities. There are 12 local authority members of the alliance including Cambridgeshire. The current framework started in 2016 and expires in 2020.

At present, Essex County Council, on behalf of the Eastern Highways Alliance, is leading the procurement for the Eastern Highways Alliance Framework 3, with a framework value of £400m. Running from 2020 to 2024, three lots are planned, covering schemes up to £2 million, £1.5 million to £7 million, and £5 million to £30 million.[80]

The current Framework allows the potential to direct award or hold mini competitions. It also has the flexibility to award construction package orders or time charge orders for time and Early Contractor Involvement (ECI). Schemes above the current maximum limit can also be included subject to approval from the Eastern Highways Alliance Board.

The EHAF mechanism could be used for ECI services for all options and construction services for just Option G – Junctions given the scale of the other options. The potential would exist to break Option G down into multiple packages if desired or needed to comply with future EHAF cost thresholds. Exact timing of any junction upgrade

[80] Eastern Highways Framework 3 - A Tender Notice by Essex County Council http://bidstats.uk/tenders/2020/W03/719061025

would need to be considered in terms of whether EHAF3 or its fourth edition would be used for actual construction.

Scape Framework - Scape is a public sector partnership that offers a full suite of national procurement frameworks and design solutions to any public sector body in the UK. Procured in compliance with The Public Contracts Regulations 2006, the framework allows public bodies with an access agreement in place to commission works without a further procurement process. There is no annual fee to access the framework.

Balfour Beatty is the only available contractor on this framework. The contract operates on a negotiated target cost basis. The contractor undertakes a 6-week feasibility study to assess the project, before developing a design and a negotiated price. As there is no separate tender period it has the advantage of saving potentially 3 months, but it also adds substantial risk in terms of price certainty and risk transfer.

The final option is developers of Waterbeach New Town with the road then adopted by the Highway Authority upon satisfactory completion. Given the interface of the A10 with the New Town development this could be considered for Option G – Junction Upgrades either in tandem with or Separate to the use of other frameworks such as EHAF.

Should the Combined Authority choose a multi package approach then it will need to consider appropriate interface management through a construction manager or small team either from within the Combined Authority or another source. Such an approach would add complexity and potentially prolong the delivery timescales.

5.4.3 Delivery approach

The following delivery procedures are available based on the procurement routes discussed:

- Early Contractor Involvement (ECI)
- Design and Build (D&B)
- Traditional two-stage procurement (design and construction as separate packages).

The procurement strategy is still in review and will require an understanding of the potential for funding from the DfT. Current thinking anticipates that the programme will be procured as an Early Contractor Involvement (ECI) contract.

ECI allows the contractor to be appointed under a two-stage contract, usually an Engineering and Construction (ECC) contract, before details of what is to be constructed have been fully developed and priced. This enables the Contractor the opportunity to contribute buildability, cost estimating and to take part in the design development and construction planning stages of a project with the intention to support improved team working, innovation and planning to deliver better value for money.

Typically, ECI would be enabled by a two-stage tender process and a two phased contract with key milestones / hold points between each of the phases of the contract. Phase 1 - Design Development, would be reimbursed on an agreed forecast of defined cost for development of the design to enable pricing and agreement of a target price and Phase 2 - Detailed Design and Construction would be reimbursed as a cost reimbursable target price contract for detailed design and construction of the works. Phase 2 would only be instructed to commence by the client on the satisfactory agreement of the Target Price for the works.

ECI is especially useful where the scheme is large or complex in nature and requires the specialist expertise of the ECI contractor which the client or consultant are unable to provide. Programme will be a key consideration with an ECI approach as the contractor will need sufficient time during phase 1, usually between 8 to 12 months, to develop the design and prepare / agree a target price acceptable to the client before the main construction works commence.

The downside of this approach is that it increases the risk of price escalation and does not provide the client with an easy alternative to deliver the scheme with a different contractor if agreement cannot be reached on the target price and notice to proceed to Phase 2 (Construction) is not given.

The Combined Authority's current thinking is that ECI and other professional services would be procured via OJEU competitive tender in 5 lots:

1. Business Case Management
2. Funding and Finance
3. Environmental
4. Commercial
5. Buildability.

There is also potential for a sixth lot to be procured for the Project Management Client Team, whose role is described in the Management Case.

5.5 Expected updates at Outline Business Case stage

The following tasks will need to be undertaken in order to update the Commercial Case at Outline Business Case stage:

Principal updates for the Outline Business Case's Commercial Case will cover
▪ Review changes to future public procurement legislation post Brexit ▪ Review the procurement outputs and outcomes sought ▪ Confirmation of the preferred procurement route and its programme ▪ Outline of the preferred forms of contract, with reference to the likely contract terms and conditions including contract length, payment mechanisms, pricing framework, risk allocation and transfer ▪ Confirmation of approach to contract management ▪ Outline of sourcing options.

6. Management Case

6.1 Introduction

This section sets out how the A10 corridor scheme will be delivered in accordance with Cambridgeshire and Peterborough Combined Authority's (CPCA) approach to implementing major capital projects, and Government expectations of public sector delivery. This chapter covers the following topics in turn:

- Evidence of similar projects (Section 6.2)
- An outline of programme / project dependencies (Section 6.3)
- Project Governance (Section 6.4)
- An outline of the project plan and programme (Section 6.5)
- Assurance and Approval Plan (Section 6.6)
- Communications and Stakeholder Management Plan (Section 6.7)
- Outline of project reporting arrangements (Section 6.8)
- The Risk Management Strategy (Section 6.9)
- Project Management Options (Section 6.10)
- Expected updates at Outline Business Case stage (Section 6.11)

As the Strategic Outline Business Case (SOBC) stage is an early point in the scheme development process, the Department for Transport (DfT)[81] does not require the Management Case to be fully developed at this stage.

6.2 Evidence of similar projects

The CPCA, in common with other Mayoral Authorities, was created to deliver transformational schemes. During the relatively short timeframe since its inception in 2017, the Combined Authority has already driven forward a number of ambitious transport projects within its Draft Local Transport Plan, taking them from conceptual thinking into design and business case development. These projects are being delivered by the Combined Authority's core team of experienced transport professionals, supported by specialist resources and consultancy input on a project by project basis. These include:

- The Cambridgeshire Autonomous Metro (CAM) – working in partnership with the GCP and other partners to develop a state of the art 140 km segregated transit system into Cambridge city centre from its growing hinterland, including Waterbeach, St Neots, Mildenhall, Alconbury and Haverhill. During 2020 the Combined Authority and partners have been developing the business case, design and undertaking public consultation (both in person and virtually).
- Ely Area Capacity Enhancement – working in tandem with Network Rail and other partners to unlock constraints on passenger and freight services posed by junctions and level crossings.
- Soham Station – a reopened station on the Ipswich – Ely line. A planning application was submitted to East Cambridgeshire District Council in 2020.
- Cambridge South station – a new station being developed in tandem with Network Rail and other partners. The Chancellor announced funding in March 2020, with a preferred location selected in June 2020.

[81] The Transport Business Cases, DfT, 2013, pp28-29. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/85930/dft-transport-business-case.pdf, [Accessed 24 April 2019]

- Transforming Wisbech Rail – the Combined Authority has developed a GRIP3 study and business case for bringing back rail services to the town, with this submitted to Government as part of its Restoring your Railway Fund in 2020.

6.3 Outline programme and project dependencies

This section is concerned with deliverables and decisions that are provided or received from other projects or programmes and are required for completion of an upgrade to the A10 corridor.

Works at the "BP roundabout" (A10/A142 Witchford Roundabout) started in July 2020. These are being undertaken under a Section 106 agreement to enable growth of a business site at Lancaster Way in Ely (3,400 jobs as a result). Given its planned delivery from 2020 this is considered low risk to any A10 scheme.

Highways England is an important stakeholder for the A10 scheme, given that the A10 intersects with the A14 at the Milton Interchange. The Combined Authority has set up a working group with Highways England, the GCP and Cambridgeshire County Council to explore what is required for the future connectivity of the A10 and A14. Its first meeting was on 17 July 2020. Any future works for the Milton Interchange would be a separate project and the impact of any A10 Junctions or Dualling scheme would likely depend on the options taken forward. The Combined Authority will continue to work with project partners during the OBC phase to evaluate any impacts associated with this A10 Junctions and Dualling project.

The following projects discussed in the Strategic Case are complementary to any A10 Upgrade. Whilst not needed to physically deliver an upgrade, these are important in terms of delivering a holistic multi-modal solution for the corridor:

- CAM to Waterbeach New Town
- Walk / cycle connections to Waterbeach New Town including Greenway and Mereway
- Relocation of Waterbeach station.

The delivery of the wider economic benefits associated with housing discussed in the Economic Case is predicated on the delivery of Waterbeach New Town. As noted in the Strategic Case, the site is allocated within the Adopted South Cambridgeshire Local Plan. Planning applications have also been lodged by both developers for 11,000 new homes in total and a relocated railway station.

6.4 Project governance

An appropriate governance structure is essential to the successful delivery of the A10's ongoing design, planning and construction. The CPCA already has effective programme, risk and project reporting arrangements in place across its capital projects. The scheme will be delivered in line with its project management and governance procedures.

Whether the scheme delivery will be led by the Combined Authority with Cambridgeshire County Council as the Highway Authority on the project board as the Senior User, or as a joint collaboration between the Combined Authority and the highways authorities as joint sponsors will be clarified in the next stage of the business case.

CPCA has taken measures to establish a Project Manager (CPCA's Robert Jones), Project Delivery Team (Jacobs) and set of representatives for Project Progress Meetings and Project Board Meetings for the SOBC stage of the project. The Senior Responsible Owner is Paul Raynes, Director of Delivery and Strategy. Rowland Potter is CPCA's Head of Transport.

The Project Manager and Project Board will review and refresh this team and stakeholder input for the OBC stage as appropriate. The current project and programme governance hierarchy is presented in Figure 37, with a description of the function of each layer of governance and advice provided below.

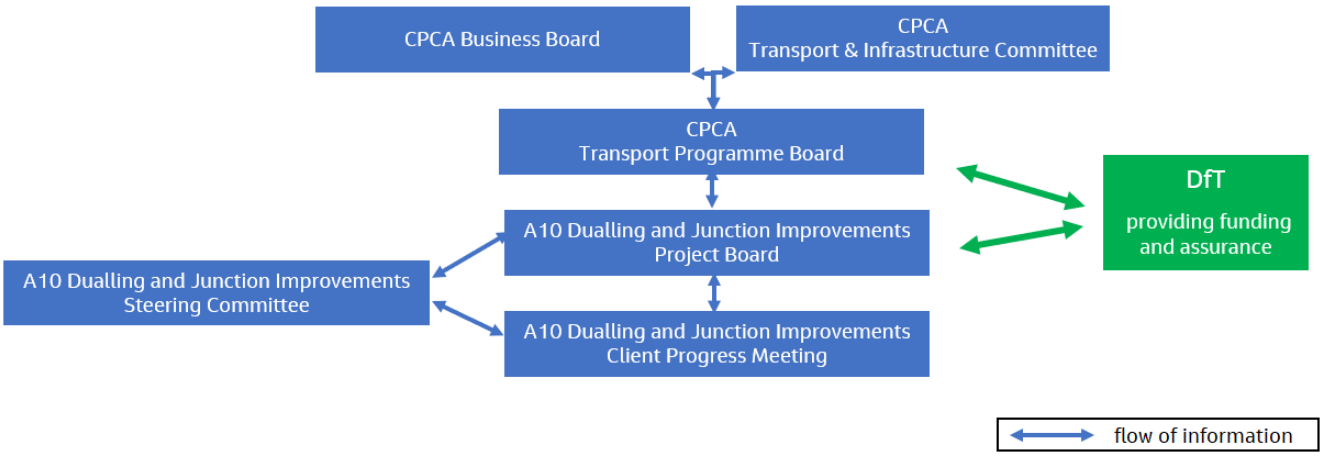


Figure 37: A10 Dualling and Junctions SOBC Project and Programme Governance

The Business Board is the Local Enterprise Partnership (LEP) for the region whose accountable body is the Cambridgeshire and Peterborough Combined Authority. It ensures that a clear business perspective is brought forward in strategy development and decision making relating to the Combined Authority.

The Transport and Infrastructure Committee makes recommendations to the Combined Authority Board on the annual programme of strategic transport projects and the associated capital investment budget.

Monthly 'Highlight Reports' are provided to the CPCA Transport Programme Board. The Programme Board meets monthly to discuss this and other CPCA projects. It will review the project's programme, budget and escalated risks.

The A10 Dualling and Junction Improvements Project Board includes representatives from the Combined Authority, Cambridgeshire County Council (CCC), East Cambridgeshire District Council (ECDC), South Cambridgeshire District Council (SCDC) and Jacobs.

Each Project Board meeting provides appropriate direction to the Project Manager and their Project Delivery Team. The Board is responsible for resolving any conflicts escalated by the Project Manager and Project Delivery Team as well as escalating any conflicts with other corporate activity. Formal meetings have been held at regular intervals (typically monthly for the SOBC stage).

The A10 Dualling and Junction Improvements Steering Committee includes councillors from the three stakeholder local authorities as well as representatives from the Combined Authority and Highways England.

Progress Meetings have been held at regular intervals throughout the project to date, allowing Kate Beirne (as Jacobs Project Manager) and technical leads to provide information and seek advice from CPCA and CCC officers. These meetings have been useful in validating A10 problems and opportunities, project objectives, the option selection process and short listed options.

An overview of the key personnel within the A10 specific part of the governance hierarchy is outlined in Table 58.

Table 58: Key personnel for the A10 Dualling and Junctions project to date

Role	Key Personnel
Project Board	Rowland Potter (CPCA), Robert Jones (CPCA), Tim Cuthbert (Jacobs Project Director), Jilur Hussain (CPCA),Paul van de Bulk (CPCA), Dominic Page(CPCA CAM), Jeremy Smith (CCC), Sally Bonnett (ECDC),Caroline Hunt (SCDC)
Client Progress Meetings	Robert Jones (CPCA), Francesca Houston (CPCA), Lou Mason-Walsh / Steve Newby (CCC Transport Modelling) Chris Poultney (CCC), Jilur Hussain (CPCA), Kate Beirne (Jacobs),
Steering Committee	Robert Jones CPCA), Francesca Houston (CPCA), Jilur Hussain (CPCA),Caroline Hunt (ECDC, SCDC and Cambridge City Council), Jeremy Smith (CCC), Chris Poultney (CCC), Sarah Hatcher (CCC), David Abbott (HE A14),Cllr Paola Trimarco (ECDC Ely West Ward), Cllr Christine Whelan (ECDC Ely West Ward),, Cllr Bill Hunt (ECDC Stretham Ward), Cllr Anna Bradnam (SCDC Milton & Waterbeach), Cllr Hazel Smith (SCDC Milton & Waterbeach), Cllr Judith Rippeth (SCDC Milton & Waterbeach), Cllr Ian Bates (Cambridgeshire County Council), Cllr Anna Bailey (ECDC Leader), Cllr Elisabeth Every (City of Ely Council), Cllr Tim Wotherspoon (CCC, Cottenham and Willingham Ward).

The detailed governance arrangements for the project will be further developed and kept under review as the scheme develops. This will ensure decision making is timely, efficient and effective, and that the overall governance structure is appropriate to, and proportionate for, each phase of the project.

6.5 Outline project plan

The project plan and key milestones for construction and scheme opening are still under consideration and will be dependent on the extent of the scheme taken forward after detailed appraisal and funding availability. A scheme that includes dualling would target an opening date in 2028 or earlier, while a junctions-only improvement scheme would be expected to open by 2026.

A collaborative planning exercise was undertaken in June 2020 to develop an outline project programme. This featured representatives from CPCA, CCC and Jacobs, including a project manager from a similar Jacobs project in Cheshire to provide their perspectives on delivery. An outline of the resulting key project milestones is provided in Table 59. This has been developed based on the assumption that the programme will include a combination of dualling and junction upgrades.

Table 59. Key Milestone indicative dates

Milestone	Date (s) and Status
Design, Environment and Planning	
SOBC Submission	August 2020
Outline Business Case	Oct 2020 – Oct 2022
Preferred Option	May – Aug 2021
Preliminary Design Completion	Oct 2021
EIA Complete	Apr 2022
Submit Planning Application	Jan 2023
Full Business Case	Feb – Dec 2025
Detailed Design	Feb 2025 – Mar 2026
Determination of Planning Application	Mar 2025

Milestone	Date (s) and Status
CPCA Executive Approval in Principle to Road Development	Nov 2025
Public Consultation	
Public consultation on options	Jan-Feb 2022
Public Consultation on final preferred scheme	Jul – Aug 2022
Land and Scheme Orders	
Prepare orders – CPO, SRO, etc	Mar 2023
Contractor Procurement (Design & Build)	
Tendering for FBC Consultants	Feb 2025
Complete Detailed Design/Construction Preparation	Mar 2026
Construction	
Mobilisation	Jan 2026
Construction Start	Apr 2026
Scheme Open to Public	2028

The indicative project plan is provided in programmatic form in Appendix L.

6.6 Assurance and Approval Plan

6.6.1 Decision process for Combined Authority Board and Business Board projects

The Combined Authority's Assurance Framework[82] sets out the decision process for investments in Cambridgeshire and Peterborough, to ensure accountability and transparent decision making.

Investment decisions using public funds will be made with reference to statutory requirements, conditions of the funding, local transport objectives and through formal LEP involvement. The Monitoring Officer and S73 review all proposed funding decision and their comments are included in all public or delegated power reports.

At the start of each stage, the Project Manager will prepare a Project Initiation Document, to identify the expected expenditure, timescales for delivery and proposed outcomes of the project.

Project Initiation Documents are appraised and approved during the Combined Authority weekly Director meetings. Following approval, the Project Manager can then arrange for the Outline Business Case to be developed, adapting HM Treasury's Five Case Model.

Business cases should be initially appraised and approved at the weekly Combined Authority Director Meetings. Once approved at the Director meetings, the Business Case will then require final approval to commence to project delivery. This may be via the monthly Combined Authority Board cycle or by Combined Authority Officers.

In addition, projects with political sensitivities or a variation to an original Board approval are required to go to Combined Authority Board for approval, even when the Chief Executive has delegated authority to sign off.

The Combined Authority Board will approve the Business Cases for Combined Authority funded projects and will approve the Business Case recommended by the Business Board.

[82] Cambridgeshire and Peterborough Combined Authority Assurance Framework, November 2019, https://cambridgeshirepeterborough-ca.gov.uk/assets/Assurance-Framework-Publication-Nov-2019.pdf

The decision making-process is illustrated in Figure 38.

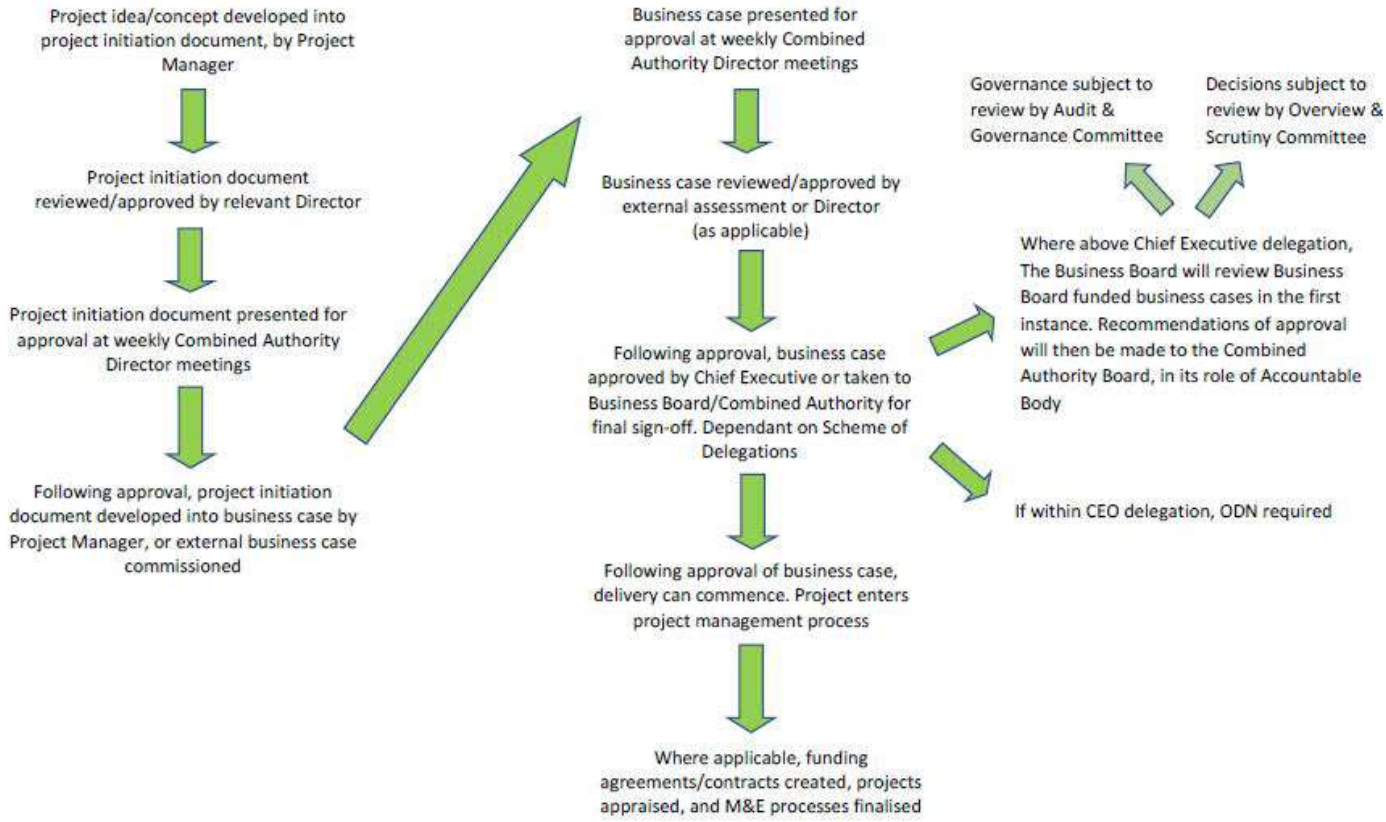


Figure 38: Decision making process for Combined Authority Board funded projects

6.6.2 DfT Assurance

It is likely that DfT funding will be sought. DfT will review the SOBC, subsequent business case updates and supporting documents such as the Appraisal Specification Report, Option Assessment Report and Modelling reports as they are developed. This will allow feedback to be incorporated in subsequent stages of the project documentation and reduce the likelihood of surprises or non-compliances causing a delay in agreeing a funding strategy for the scheme at OBC stage and then the project's final approval at FBC stage.

DfT Ministerial approval will be sought following the submission of the FBC in December 2025 to enable start of construction works by April 2026.

6.6.3 EEH Assurance

EEH provided initial prioritisation of the junction and dualling schemes as part of their Regional Evidence Base in summer 2019. As the scheme develops progress will be reported back to EEH through their reporting / assurance frameworks. Further detail will be included in the OBC.

6.6.4 Highways England Assurance

As noted in Section 6.3, The Combined Authority has started a discussion with Highways England,and other key partners, on the connectivity of the A14 and the A10 at the Milton Interchange, separate to this scheme. It is anticipated that Highways England would provide assurance on the impact on the SRN as the design develops.

6.7 Communications and Stakeholder Management Plan

6.7.1 Overarching strategy

The A10 dualling and junction upgrade will be of substantial interest to those living and working in Cambridge and the surrounding Ely to Cambridge route corridor, as well as businesses across Cambridgeshire. The overarching strategy will be to understand the views of stakeholders and the public on developing the A10 upgrade options.

The Combined Authority recognises that local engagement will be vital to the development of its proposals, and this will be undertaken in accordance with best practice. Plans will be developed responsibly and in a manner that supports environmental, social, economic and local community interests.

6.7.2 Engagement strategy

Stakeholder engagement is an ongoing process from the project outset. It can be defined as the strategy, plan and/or methods used to inform or interact with individuals and organisations that have an interest in a project or activity. It ranges from providing information to running a formal consultation.

There are eight key reasons for effective stakeholder engagement, presented in Figure 39:

- Greater stakeholder buy-in: improve trust, create greater acceptance, positive and productive interactions.
- Enhanced design and delivery: meet stakeholder requirements, utilise informed local knowledge, fewer changes and greater recognition.
- Smoother approvals: faster and easier approvals, saving time and money.
- Meeting requirements: Many projects are now required by law to demonstrate that they have carried out engagement.
- Reputation: Protect, manage and enhance reputations.
- Managing issues: identify and address issues before they arise.
- Supporting change: guiding stakeholders through change and reducing resistance
- Demonstrating corporate responsibility: leaving a positive legacy contribution and a positive legacy contribution to areas and communities.

Figure 39: Stakeholder Engagement Strategy

The Combined Authority is committed to provide tailored and adaptive engagement; focused on a mix of informing, consulting, involving, collaborating and empowering stakeholders. Through knowledge-based, timely and inclusive activity, stakeholders will have credible opportunities to understand and influence the project. Ultimately its engagement will help to leave a positive legacy for communities along the Ely to Cambridge A10 corridor.

6.7.3 Stakeholder mapping

Stakeholders who are likely to be affected by the project, or who have the potential to influence the outcome, will be consulted as the project progresses to help guide option development.

In addition to the local communities interested in and affected by the proposals, there are other key stakeholders who have been identified as having a strategic interest in the project. These include the local authorities and elected members who are supporting this stage of the project, business groups as well as environment, transport, access and recreation interest groups.

The following key stakeholders are likely to be affected by the project or have the potential to influence the outcome of the project, the project programme or project costs. The list shown below is not exhaustive, but it is expected that the following key stakeholders would be consulted to help guide option development, if the project progresses.

Table 60. Likely key stakeholders and their areas of interest

Group	Organisation or individual	Likely key areas of interest
MPs and Elected Members	▪ MPs ▪ The Mayor of Cambridgeshire and Peterborough ▪ County, City and District cabinet members ▪ Portfolio holders ▪ Ward members	▪ Project delivery ▪ Transport planning ▪ Environment impact ▪ Social and economic impact ▪ Community opportunities and constraints
National Government	▪ Department for Transport ▪ Department for Business, Energy and Industrial Strategy ▪ Ministry of Housing, Communities and Local Government	▪ Transport policy ▪ Need case ▪ Funding ▪ Route options and delivery ▪ Benefits to regional economy and businesses ▪ Planning policy and consent programme
Local Authorities, Local Enterprise Partnership, Sub-national Transport Bodies and relevant suppliers to these	▪ Cambridgeshire and Peterborough Combined Authority ▪ Cambridgeshire County Council ▪ Greater Cambridge Partnership ▪ Cambridge City Council ▪ South Cambridgeshire District Council ▪ East Cambridgeshire District Council ▪ England's Economic Heartland	▪ Project delivery ▪ Transport planning ▪ Environment impact ▪ Social and economic impact ▪ Community opportunities and constraints
Statutory Bodies (Regulators, Environmental Bodies, Utilities, National Agencies	▪ Highways England ▪ The Environment Agency ▪ Natural England ▪ Historic England ▪ Network Rail	▪ Transport opportunities and constraints ▪ Environmental impacts ▪ Heritage impacts ▪ Utility provision ▪ Security

Group	Organisation or individual	Likely key areas of interest
	▪ Great Northern Railway ▪ Anglian Water ▪ MOD Waterbeach Barracks ▪ Public Health England	▪ Health impacts
Parish Councils	Littleport; Ely; Coveney; Witcham; Mepal; Sutton; Wentworth; Witchford; Haddenham; Wilburton; Stretham; Soham; Isleham; West Row; Worlington; Freckenham; Fordham; Burwell; Reach; Swaffham Prior; Swaffham Bulbeck; Lode; Horningsea; Waterbeach; Cottenham; Landbeach; Rampton; Willingham; Over; Swavesey; Longstanton; Oakington and Westwick; Histon and Impington; Milton; Lode; Bottisham; Stow-cum-quy; Fen Ditton; Orchard Park; Girton; Madingley; Coton; Teversham; Little Wilbraham	▪ Local community opportunities and constraints, including transport, environment, social, and local business impacts.
Emergency Response Groups	▪ Fire Stations ▪ Police Stations ▪ Air Ambulance ▪ Hospitals	▪ Impact on emergency service response service
Environment, transport, access and recreation interest groups	Bedfordshire, Cambridgeshire and Northamptonshire Wildlife Trust, Cambridge Fish Preservation & Angling Society; Denny Abbey and The Farmland; Bridge Farm Riding School, Cycling UK; Cambridge Cycling Campaign; British Horse Society; Ely and District Cycling Club; Ely Walking Group; Ely Sailing Group; Milton Country Park Health Walks; Cambridge & District Riding Club; Sustrans; Cambridge Past, Present & Future	▪ Transport opportunities and constraints; ▪ Environmental impacts including ecology and heritage impacts; ▪ Access and recreational benefits ▪ Health impacts
Equalities and Diversity Groups	▪ Diasphoras, Immigrants ▪ Refuges and Emigrants (DIRE) ▪ Heritage ▪ Papworth Trust ▪ Dhiverse ▪ Centre 33 ▪ CCVS	▪ Impact upon and provision for equality and diversity groups ▪
Landowners	TBC	▪ Access to land ▪ Land acquisition ▪ Construction impact
Businesses	TBC	▪ Transport connectivity opportunities

Group	Organisation or individual	Likely key areas of interest
		▪ Impact on day to day business during construction
Education	TBC	▪ Transport opportunities and constraints particularly for pupils and students attending schools, colleges and universities

6.7.4 Current engagement activities

Activities to date have focused on technical engagement, including with the Cambridgeshire County Highways team. Technical officer working groups have been established to gather information and assess key risks and opportunities with the different online and offline options.

Jacobs has facilitated council member workshops to seek initial feedback from councillors on the A10 project objectives, issues and potential solutions. This feedback has been reflected in the preparation of the SOBC.

East Cambridgeshire District Council are supportive of the proposals, however, there has previously been a suggested new road to the North West of Ely, which would divert non-local traffic away from the two Ely roundabouts the Council requests that the Combined Authority investigates this proposal fully before making any decisions about preferred route options.

In June 2020 CPCA and Jacobs presented an outline of the SOBC, including need case and route options in a virtual online engagement event. Whilst a statutory public consultation is planned in later in 2020, the aim of the exercise is to hear people's views as early as possible and invite their comments. This was launched in June 2020 for three weeks, concluding on 14 July 2020 and hosted on the Combined Authority's virtual exhibition space[83]. The press release for this can be found at: https://cambridgeshirepeterborough-ca.gov.uk/news/mayors-road-trip-shares-a10-options-with-public-despite-covid/

Figure 40. A10 Virtual Room

[83] https://a10dj.exhibition.app/ accessed 25 June 2020

To date engagement with statutory parties, such as the Environment Agency, utilities companies and Network Rail has been limited to informing them of the online engagement. This is considered proportionate for the early stage of the project.

6.7.5 Future engagement activities

Engagement with key stakeholders will continue if the project progresses, to ensure that they are kept up to date on developments, their concerns understood, and their ongoing involvement and support is achieved. It will involve a range of activities to engage and build relationships with the different stakeholders. Activities will include online engagement, technical workshops, and written correspondence.

Public consultation

A statutory consultation on the SOBC options is proposed in early 2021. The public consultation will be a key step in the process to present emerging options to the local community and allow them to provide formal feedback on the project.

A range of methods will be used to inform the public of the consultation. The consultation material will aim to provide an overview of the routes and junctions, and environment and traffic assessment work. The public will be encouraged to submit their views using an online questionnaire located on the project website. The consultation will give members of the public an opportunity to view information and plans and speak to members of the project team.

It is recommended that the consultation is undertaken alongside the CAM consultation. This will give stakeholders the opportunity to understand the wider context of the strategy to improve the Ely to Cambridge corridor and how the A10 upgrade fits with the CAM proposals.

Beyond SOBC

Stakeholders' views and feedback about the project options will be considered and changes based on comments incorporated where possible.

Formal consultation on the preferred option(s), environmental impacts and mitigation will be undertaken ahead of submission of a planning application. Consultation approaches will be in line with national and local planning and highways requirements.

During construction the engagement team will work with stakeholders to manage potential temporary disruption and to ensure that commitments provided to stakeholders are translated into delivery.

6.8 Project reporting

The Combined Authority has a well-established reporting protocol for major projects and programmes, which is aligned with the project's governance structure, illustrated in Section 6.4.

As the project moves into the OBC stage and beyond, the supply chain will report to the CPCA's Project Manager with regular progress updates including programme, budget and risks.

CPCA's Project Manager will report to the Project Board which will meet quarterly to review progress against programme, budget performance and risks by exception where the board need to be aware.

The CPCA Transport Programme Board meets monthly and it will review the project's programme, budget and escalated risks. The Transport Programme Board report to the Transport and Infrastructure Committee and the Combined Authority Business Board, both of which meet on a bimonthly basis.

Regular report updates will be provided to DfT in connection with the development of the business case and funding requirements.

6.9 Risk Management Strategy

Risk Management for the project will follow the methodology set out in the Combined Authority's corporate Risk Management Strategy document, which describes the specific management activities undertaken for the organisation and the individual portfolios within the CPCA. The document outlines roles and responsibilities, arrangements for managing risk and monitoring arrangement. The Risk Management Methodology is built around a five-stage risk management cycle, with key stages of Initiate, Identify, Plan, Assess and Implement.

Risk registers will be held at project and programme level. The programme level risk register records general capability, political, environmental and programme risks. The project risk register contains project-specific risks as well as risks that feed in from the programme risk register. Each risk is assigned a RAG rating based on its impact and likelihood, as presented in Figure 41.

Overall RAG Status		Impact				
		1	2	3	4	5
Likelihood		Negligible	Marginal	Significant	Major	Monumental
5	Almost Certain	5	10	15	20	25
4	Likely	4	8	12	16	20
3	Moderate	3	6	9	12	15
2	Unlikely	2	4	6	8	10
1	Rare	1	2	3	4	5

Figure 41 Corporate Risk Strategy RAG Status table

Risks are reported up the governance hierarchy structure by exception, as described in section 6.8. The top five risks go into a monthly highlight report in the form of a dashboard summary to directors.

Technical risks have been considered for both generic and geographical specific risks to the corridor, with these summarised in Table 61 below. This will be developed in further detail as surveys and investigatory work is carried out and design progressed.

Table 61. Technical Risks for the A10 Project – July 2020

Risk	Commentary
Flood Risk	▪ The proposed scheme could be at risk of flooding and / increasing flood risk elsewhere. There are areas of flood zones 2 (1 in 1,000 annual probability of river flooding) and 3 (1 in 100 or greater annual probability of river flooding) either side of the existing A10. ▪ A10 could be categorised as "essential infrastructure" in terms of flood risk ▪ Design standard likely to be 1 in 100 (plus climate change) flood level subject to requirements not to increase flooding ▪ How this is achieved and the costs of a solution are a risk until flood modelling undertaken at next stage and could affect: horizontal and vertical profile, whether e.g. open span bridge needed and mitigation costs (for e.g. flood storage).

Risk	Commentary
Crossing of River Great Ouse	▪ Ground conditions, flood risk, environmental mitigation (i.e. there are transient and resident harbour seals in the river). Extent of issues for options and the mitigation requires survey and design work.
Buried Archaeology	▪ Former Roman watercourse – Car Dyke follows the A10 north of Waterbeach for approximately 1km before crossing the road in the vicinity of the junction with Green End ▪ Former Roman Road from Cambridge to Littleport largely follows the A10, but precise alignment unclear north of Landbeach ▪ Old Ely-St Ives railway line crossed the A10 at Thetford Corner ▪ Other potential archaeology unknown and is a risk for all options
Environmental Mitigation	▪ In terms of noise to properties, cultural heritage, ecology (i.e., county designated wildlife sites, internationally designated nature conservation sites, protected species, and avoiding invasive species). Extent of issues for options and the mitigation requires survey and design work.
Ground Conditions	▪ Contaminated land and buildings ▪ Soil improvement measurements. ▪ Dewatering measures in an area which is low lying and flat, with significant potential for a high water table
Former RAF Witchford	▪ Located to the west of the A10 south of Ely and the A142. ▪ WW2 airfield now agricultural land. Risk of ground conditions. ▪ Relevant for offline solutions in this area only.
Buried Utilities	▪ Especially for online widening and junction options
Side Roads / Public Rights of Way / Accommodation Works for Landowners	▪ Number of and form of junctions / crossings yet to be determined
A14 / A10 Milton Interchange Solution	▪ Whilst this is seen as a separate project, a solution will need to be developed to satisfy Highways England requirements and maintain their support for the A10 scheme. As previously noted the CPCA will work closely with Highways England to discuss this project following the submission of this SOBC.

6.10 Approach to Project Management

Although the Combined Authority is still a relatively new organisation it has made excellent progress in establishing a team to sponsor and manage the development of high value, complex infrastructure projects, particularly transport schemes, in the region. It has recent experience of delivering complex schemes, including the Cambridgeshire Autonomous Metro (CAM) tunnelling OBC which has been led by a permanent project director with dedicated supply chain client project and cost management team. Furthermore, there are seven dedicated supply chain lots delivering: programme / project management; commercial management; procurement; interface management; requirements management; engineering / innovation; transport planning and modelling; environmental and planning; business case development; funding and finance; land and property; engagement and comments; legal, systems safety / systems safety and operational certification.

Further endorsement from Government of its emerging projects such as the A10 scheme, will provide the impetus to further strengthen its capacity and capability to develop both the A10 project and its wider programme. As noted in the Commercial Case, the Combined Authority has two options, either it can continue to project manage the scheme using in-house resources, perhaps with extra recruitment, or instead procure these from consultancy providers. The Combined Authority has contemporary experience of both project management routes. Whether in house or consultancy resources are used, the project manager will be embedded within the local team, and will follow its well-defined corporate governance procedures, already being applied successfully to drive forward numerous significant ambitious transport projects including CAM, Soham Railway station and Wisbech to March Railway..

The junctions only option is likely to be delivered with a collaborative CPCA/CCC team and technical supply chain support. A larger dualling and junctions scheme would most likely follow the previously described CAM delivery with an employer's agent/client team and a multi lot technical supply team.

6.11 Expected updates at Outline Business Case stage

The Management Case of this SOBC has reviewed the Combined Authority's approach to delivering the intended benefits from scheme, up to and following investment in the scheme. It has also set out the proposed sponsorship, governance and delivery agencies for the scheme, alongside the processes required for stakeholder management and communications, change control and risk.

The Management Case will be continuously developed and refined through Outline and Full Business Case, in order to reflect the latest findings and agreements.

Principal updates for the Outline Business Case's Management Case will cover
▪ Further development of the project and programme management approach; ▪ Review of the programme and project dependencies; ▪ Any updates to the project governance, organisational structure and roles; ▪ Confirmation of project plan including key milestones and critical path; ▪ Any updates to the assurance and approvals plan; ▪ Confirmation of communications and stakeholder management plans; ▪ Confirmation of programme and project reporting arrangements; ▪ Confirmation of risk management strategy; and ▪ Confirmation of options and overall approach for project management at this stage.

7. Conclusion

This Strategic Outline Business Case (SOBC) represents the next stage of the A10 Junctions and Dualling project development. It has built on the work and evidence base that Cambridgeshire County Council and its advisors completed within the Ely to Cambridge Transport Study (2018). It establishes the need for intervention, with supporting evidence, and follows closely the HM Treasury Green Book Five Case model and Department for Transport's Business Case process.

7.1 Statement of Case

The Strategic Case sets out a clear rationale for an intervention and provides an agreed set of objectives. It provides an overview of the proportionate, yet extensive option assessment undertaken to move from a very long list of options to a short list of seven options for detailed appraisal purposes and stakeholder engagement. It also provides an overview of how the options broadly and specifically align with key policy documentation at a national, regional and local level.

The Strategic Case notes that the Greater Cambridge economy is of crucial importance to the UK economy. It is a popular location for both high value firms and people, but a lack of infrastructure is starting to cause 'growing pains'. High house prices, expanding commutes, congestion, rat-running, journey time reliability and road safety issues are all symptoms of this issue. The A10 corridor also does not work well for all road users, with slow bus services, and no dedicated provision for cyclists between the key settlements and trip attractors on the corridor.

South Cambridgeshire District Council has allocated 8,000 to 9,000 homes at Waterbeach New Town within its Adopted Local Plan 2018 to provide a key contribution to the area's housing need. Developers are keen to invest with outline planning applications received for up to 11,000 homes at Waterbeach.

The existing emphasis on a modal shift package and a modest package of junction improvements will help to deliver early phases of development at Waterbeach. However, without further investment, the A10 will start to become a constraint on the ability of Waterbeach and the Cambridge and Ely Corridor to realise its full potential. A cap on new homes will make it more difficult for expanding firms to recruit the labour force they need. There is a risk that without any action, high value knowledge intensive firms may not just relocate from Cambridge but leave the UK altogether. Investment in the A10 through dualling or junction improvements will enable this limit on housing growth to be removed.

The Economic Case identifies the economic, environmental and social impacts of the scheme, and sets out the Value for Money Statement. This has demonstrated that all of the options provide strong benefits for commuting and other journey purposes, with smaller benefits for business journeys. The land value uplift associated with dependent development at Waterbeach New Town outweighs the external impacts of traffic generated by the new housing for all options, except Option F – one of the partial dualling options.

All of the dualling options are expected to offer very high value for money, whilst the junctions package (Option G) is expected to offer high value for money. Lower benefits are achieved as the junction upgrades do not completely solve congestion on the corridor, with new pinchpoints emerging.

The Financial Case includes a sufficiently detailed cost breakdown and assumptions relating to risk, inflation and funding sources. It notes that options are likely to cost (at 2020 Q2 Factor Prices) around £25m for Junctions, £70m to £80m for southern dualling and £180m to £215m for full dualling. These are inclusive of contingency, risk and inflation allowances, but exclude the uplift for optimism bias that is used in the economic case.

Funding options include a combination of developer contributions through either Section 106 Agreements or a Community Infrastructure Levy, local funding and Government funding. The scale of the scheme and the need

for development to only mitigate its own impact means that Government funding of 85% of the scheme budget is likely.

The Commercial Case provides an overview of the different procurement and delivery route options available to the Combined Authority. Whilst the procurement strategy is still in review, the current thinking is that the programme will be procured via OJEU competitive tender as an Early Contractor Involvement (ECI) contract to maximise the opportunity to embed buildability, innovation, cost planning and value into the design development. The Combined Authority would supplement this with separate lots for business case management, funding and finance, environment and commercial services, with the potential for a further lot for the Project Management Client Team.

The Management Case describes how the scheme's development will be governed and progressed. The chapter demonstrates that whilst the Combined Authority is a relatively new organisation, it has developed a highly capable team and set of governance and assurance arrangements to sponsor and manage its programme of major transport projects including the A10. It is keen to continue to strengthen its capability and capacity as schemes such as the A10 are endorsed by Government. It also has the flexibility to bring in wider support from its portfolio of professional service providers.

The Management Case also includes a summary project plan, which shows that a scheme could be delivered by 2026 in the case of Option G: Junctions and 2028 for Options A to F: Full or Partial Dualling. The chapter also includes a summary of high level technical risks, which will be explored in further detail as the design develops.

7.2 Next Steps

At the time of writing, the Combined Authority is in the middle of a virtual exhibition on the A10 Junctions and Dualling project. This non-statutory engagement provides a great opportunity for the public and other stakeholders to share their ideas and thoughts on the seven shortlisted options and will help to inform and refine these options.

Following its conclusion (14 July 2020), the project team will take stock of the findings, and review the Business Case prior to submission to the Combined Authority Board in August 2020. Following sign off by the Board, the Combined Authority plans to share this SOBC with the Department for Transport.

The Combined Authority plans to carry out a further consultation exercise (statutory consultation) early in 2021, to provide the public and stakeholders with a formal input into option selection. The Combined Authority will use the output of all of these activities to help progress option selection and design, with this feeding into an Outline Business Case for development in 2021.

Future design development will take into account the intent behind the scheme objectives. It will examine ways to enhance public transport integration, provide dedicated facilities for pedestrians, cyclist and horse riders on the corridor, increase the land managed for nature and deliver a net zero carbon solution.

Appendices

Please refer to separate documents for the following appendices:

Appendix	Name	Format
A	Environmental Constraints Plan	PDF
B	Environmental Report	PDF
C	Option Assessment Report	PDF
D	Scheme Drawings	PDF
E	Stakeholder attitudes	PDF
F	Modelling Reports F1. Data Collection Report F2. A10 E2C Local Model Validation Report F3. A10 E2C Model Update Report F4. Forecasting Report	PDF
G	TUBA Input and Output Files	Electronic (text files)
H	Preparation of costs for Economic Case and Financial Case including the DfT Cost Proforma	Electronic (.xls)
I	Appraisal Summary Table, Worksheets and Appraisal Tables (including .xls format)	Electronic (.xls) and PDF
J	Distributional Impacts	PDF
K	Cost Report	PDF
L	Programme	PDF