MOTT MACDONALD

Cambourne to Cambridge Better Public Transport Project

Outline Business Case

Strategic Case

17 January 2020

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Document reference: | | 392438-MMD-BCA-XX-RP-BC-0027

Information class: Standard

Contents

Glossary of key terms

Analysis of Monetised Cost and Benefits (AMCB) table: Summarises the monetised impacts of a scheme that are included in the scheme's Net Present Value and Benefit-Cost Ratio.

Appraisal Summary Table (AST): Provides a complete summary of the scheme impacts, including the scheme's monetised impacts, and non-monetised impacts (both quantitative and qualitative).

Benefit Cost Ratio (BCR): Benefit Cost Ratio, is an indicator of the overall value for money of a project or proposal.

Cambridgeshire Autonomous Metro (CAM): CAM is the proposed metro style system for Greater Cambridge.

Committed Schemes: Where a scheme has been deemed likely to proceed and is therefore included within the option appraisals.

Conservation Area: An area designated under Section 69 of the Planning (Listed Buildings and Conservation Areas) Act 1990 as being of special architectural or historic interest and with a character or appearance which is desirable to preserve or enhance.

Context: The setting of a site or area, including factors such as traffic, activities and land uses as well as landscape and built form.

Countryside: The rural environment and its associated communities.

Cumulative Impact: The summation of effects that result from changes caused by a development in conjunction with other past, present or reasonably foreseeable actions.

Early Assessment Sifting Tool (EAST): Early Assessment Sifting Tool is used by DfT, to quickly summarise and present evidence on options. INSET is an enhancement of EAST and follows the same broad principles and approach.

Effect: The consequence of the scale of any change to the baseline environment, i.e. impact, on the environmental receptor, taking account of its particular value or sensitivity.

Element: A component part of the landscape (for example, roads, hedges, woods).

Enhancement: Landscape improvement through restoration, reconstruction or creation.

Environment: Our physical surroundings including air, water and land.

Environmental Impact Assessment (EIA): A formal, structured process of evaluating the likely environmental impacts of a proposed scheme, considering inter-related socio-economic, cultural and human-health impacts, both beneficial and adverse.

Full Business Case (FBC): The culmination of the final phase is the Full Business Case. An investment committee will consider the Full Business Case then make a recommendation to ministers. Ministers will decide whether a proposal should proceed to implementation.

Form: The layout (structure and urban grain), density, scale (height and massing), appearance (materials and details) and landscape of development.

Gross Domestic Product (GDP): A measure of the total value of goods produced and services provided in an area.

Gross Value Added (GVA): A measure of the economic productivity of an area.

High Quality Public Transport (HQPT): High Quality Public Transport, is a transport system that includes a range of features such as high levels of segregation, junction priority, high quality infrastructure (shelters, CCTV, real time, lighting, seating, help points etc), and high quality vehicles to name but a few.

Heritage Asset: A building, monument, site, place, area or landscape of historic value.

Investment Sifting and Evaluation Tool (INSET): INSET is Mott MacDonald's evaluation tool used in the optioneering process. INSET is an enhancement and expansion of EAST.

Landform: Combination of slope and elevation that produce the shape and form of the land.

Landscape: The character and appearance of land, including its shape, form, ecology, natural features, colours and elements and the way these components combine. Landscape character can be expressed through landscape appraisal, and maps or plans. In towns 'townscape' describes the same concept.

Landscape Character: The distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how this is perceived by people. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement. It creates the particular sense of place of different areas of the landscape.

Landscape Feature: A prominent eye-catching element, for example, wooded hilltop or church spire.

Landscape Quality: Based on judgements about the physical state of the landscape, and about its intactness, from visual, functional, and ecological perspectives. It also reflects the state of repair of individual features and elements which make up the character in any one place.

Landscape Sensitivity: The extent to which a landscape can accept change of a particular type and scale without unacceptable adverse effects on its character.

Land Use: The primary use of the land, including both rural and urban activities.

Local Liaison Forum (LLF): The LFF provide a link between a project team and the local community.

Multi Criteria Assessment Framework (MCAF): Multi-Criteria Assessment Frameworks are used in the optioneering assessment process and allow options to be assessed against a range of criteria linked to the scheme objectives as well as wider policy and strategy objectives.

Methodology: The specific approach and techniques used for a given study.

Mitigation: Measures, including any process, activity or design to avoid, reduce, remedy or compensate for adverse landscape and visual effects of a development project.

Modal Shift: A shift from one transport type to another e.g. road travel to rail travel.

Movement: People and vehicles going to and passing through buildings, places and spaces. The movement network can be shown on plans, by space syntax analysis, by highway designations, by figure and ground diagrams, through data on origins and destinations or

pedestrian flows, by desire lines, by details of public transport services, by walk bands or by details of cycle routes.

Option Assessment Report (OAR): The Options Assessment Report sets out the process undertaken to identify and assesses options, leading to the selection of the preferred option.

Outline Business Case (OBC): Is the second phase of the process which reconfirms the conclusions of set out in the Strategic Outline Business Case (SOBC). The OBC focuses on the detailed assessment of the options to find the best solution.

Public Accounts (PA) table: Records the investment and operating costs incurred by a public sector in delivering the scheme.

Receptor: Something that makes up the environmental baseline e.g. humans or other biological species, elements of the physical environment including water, air, soil, assets that make up the cultural heritage of an area.

SATURN: Simulation and Assignment of Traffic in Urban Road Networks, is a computer program that calculates route choices between origin and destination.

Strategic Outline Business Case (SOBC): This sets out the need for intervention (the case for change) and how this will meet strategic aims and objectives (the strategic fit). It provides suggested or preferred ways forward and presents the evidence for a decision.

Strategic View: The line of sight from a particular point to an important landmark or skyline.

Sustainability: The principle that the environment should be protected in such a condition and to such a degree that ensures new development meets the needs of the present without compromising the ability of future generations to meet their own needs.

Transparent Economic Assessment Model (TEAM): TEAM is a tool designed to calculate the economic impacts and benefits of proposed infrastructure interventions and policy measures.

Topography: A description or representation of artificial or natural features on or off the ground.

Townscape: Physical and social characteristics of the built and unbuilt urban environment and the way in which those characteristics are perceived. The physical characteristics are expressed by the development form of buildings, structures and space, whilst the social characteristics are determined by how the physical characteristics are used and managed.

Tranquillity: A state of calm or quiet.

Transport Appraisal Guidance (TAG): The DfT's Transport Appraisal Guidance (often referred to as TAG)

Transport Economic Efficiency (TEE) table: Summarises the monetised impacts against different user groups.

Transport User Benefit Appraisal (TUBA): TUBA is an economic appraisal computer programme developed for the Department for Transport (DfT) for appraising multi modal transport studies.

Visual Impact: Change in the appearance of the landscape as a result of development. This can be positive (i.e. beneficial or an improvement) or negative (i.e. adverse or a detraction).

Wider Economic Impacts (WEI): improvements in economic benefits that are acknowledged, but which are not typically captured in traditional cost-benefit analysis.

1 Introduction

This is the Strategic Case for the Camborne to Cambridge Better Public Transport project (C2C) and forms one of the 5 cases for the Outline Business Case.

The purpose of the Strategic Case is to set out the strategic and policy context of C2C, to demonstrate the need for the project and provide an assessment of the project options' ability to address transport and wider policy requirements.

The core elements of the Strategic Case include the project history and progress to date, the identification of the need for intervention, the evidence base upon which that need is based, and the key aims and objectives that have been developed as a result. The Strategic Case also identifies the preferred scheme option and how it was selected. A recap of the long list option generation and sifting process documented at Strategic Outline Business Case (SOBC) stage and of the options appraisal process at Outline Business Case (OBC) stage is provided in Section 10 as a lead in to the Economic Case. A full account of the option generation and appraisal process is provided in the accompanying Options Assessment Reports (OAR) Part 1 (Appendix A), Part 2 (Appendix B) and Part 3 (Appendix C).

1.1 Approach

The Strategic Case has been structured to align with the Department for Transport's (DfT) '*The Transport Business Case: Strategic Case*'[1] which outlines key areas that should be covered as part of the business case documentation. It has however been modified in terms of order and structure. Table 1 shows where the relevant information, in accordance with DfT requirements, can be found in the Strategic Case.

Table 1: Compliance with DfT requirements for the Strategic Case

Content	DfT requirements	OBC section
Introduction	Outline the approach taken to assess the Strategic Case and the study area.	1.1 – Approach
Project definition	Provide an update on previous work.	2.1 – Scheme background
Business strategy	Provide the context for the business case by describing the strategic aims and responsibilities of the organisation responsible for the proposal.	3 – Business Strategy and the City Deal 4 – Policy Review
Problem identified	Describe the problems including the evidence base underpinning this? Justification for intervention?	5 – Strategic Problems and Issues 6 – Transport Issues and Opportunities 7 – Environmental Issues and Opportunities
Impact of not changing	What is the impact of not changing?	8.7 – Impact of not changing
Internal drivers for change	What is the driving need to change e.g. improved technology, new business/ service development as a result of policy? (Non-compulsory).	3 – The City Deal 5 – Strategic Problems and Issues 8.1 – Underlying Drivers or Causes
External drivers for change	What is the driving need to change e.g. legislation, pressure from	4 – Policy Review

[1] DfT – 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

Content	DfT requirements	OBC section
	public/other departments? (Non-compulsory).	8.1 – Underlying Drivers or Causes
Objectives	Establish specific, measurable, achievable, realistic and time-bound objectives that will solve the problem identified. Ensure that they align with the organisation's strategic aims.	8.2 – Project vision 8.3 – Project objectives
Measures for success	Set out what constitutes successful delivery of the objectives.	8.5 – Measure of success
Scope	Explain what the project will deliver and also what is out of scope.	8.6 – Scope
Constraints	High level internal/external constraints e.g. technological environment, capability to deliver in-house major contracts with provider, etc.	11.4 – Project constraints
Stakeholders	Outline the main stakeholder groups and their contribution to the project. Note any potential conflicts between different stakeholder groups and their demands.	9.7 – Stakeholders
Options	Set out all the options identified (including low cost alternative) and evaluate their impact on the proposal's objectives and wider public policy objectives. Risks associated with each option should be identified as should any risks common to all options.	10 – Options Development and Appraisal 11 – The Preferred Option

Source: DfT - The Transport Business Case: Strategic Case

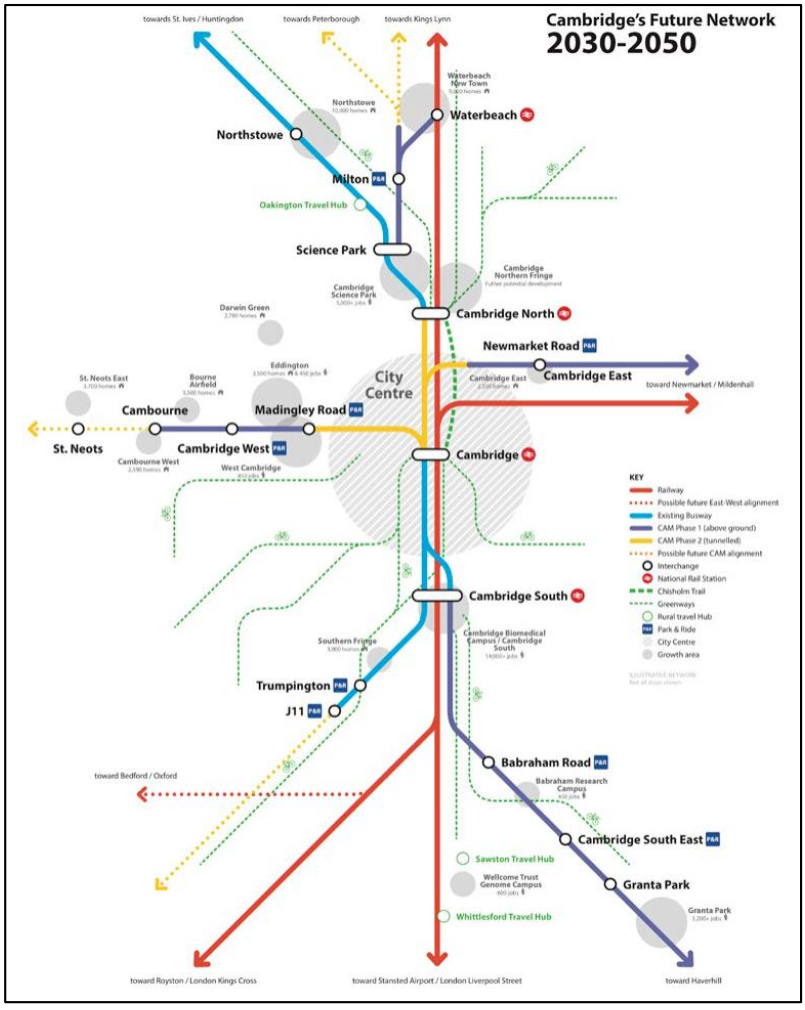
2 Scheme Background

2.1 Scheme background

The Cambourne to Cambridge Better Public Transport (C2C) project lies to the west of Cambridge, running between the town of Cambourne and Cambridge City Centre along the A428/A1303. The C2C project is a priority for the Greater Cambridge Partnership (GCP) and the Greater Cambridge region, creating a vital link to ease congestion, offering sustainable travel choices, connecting communities and supporting growth.

The C2C project is part of a range of GCP schemes that are currently being developed and delivered with an aim of contributing to the development of a better, greener transport network for the city region. Figure 1 shows the future transport network map for the city region and how schemes that are currently being progressed link with existing infrastructure[2].

Figure 1: Cambridge's Future Network



Source: C2C Project Update June 2019

[2] Further information about other transport schemes can be found at the GCP website www.greatercambridge.org.uk

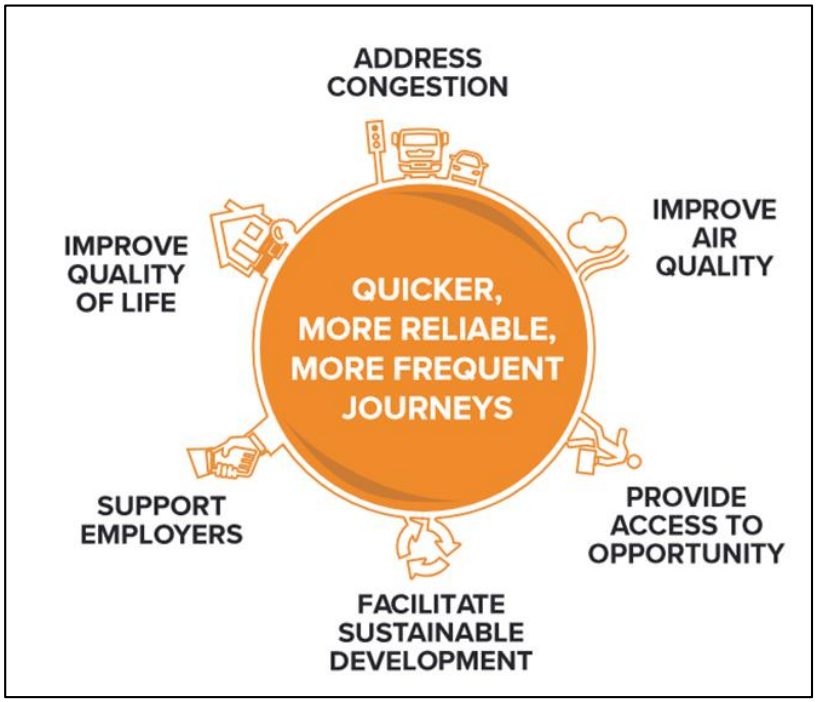
GCP is working in partnership with the Cambridgeshire and Peterborough Combined Authority (CPCA). CPCA is bringing forward proposals for the Cambridgeshire Autonomous Metro (CAM). CAM is the planned future Metro network for Cambridge that would see a high-quality tram-like system, running on rubber tyres, being introduced as a flexible form of public transport, running both over and underground. This new Metro network would connect housing and employment sites across Cambridge to provide quick and easy journeys for people to travel without the reliance on cars. Plans for CAM are at an early stage of development, with an SOBC completed in January 2019. Although the C2C project is an independent scheme in its own right, GCP and the CPCA have agreed that C2C will also comprise the first phase of CAM.

The C2C project aims to:

- **Achieve improved accessibility to support the economic growth of Greater Cambridge**
- **Deliver a sustainable transport network/system that connects areas between Cambourne and Cambridge along the A428/A1303**
- **Contribute to enhanced quality of life by relieving congestion and improving air quality within the surrounding areas along the A428/A1303 and within Cambridge city centre**

Figure 2 illustrates the benefits the C2C project will deliver:

Figure 2: C2C project benefits



Source: GCP

The project is intended to achieve these outcomes by delivering improved, faster and more reliable public transport services through a High Quality Public Transport (HQPT) system that makes use of the most up to date technology - connecting people to places of employment, study and key services - and help existing and new communities along the A428/A1303 to grow sustainably in the coming years by providing an alternative to the car as the primary mode of travel.

The scheme aims to be future-proofed, with regard being had to the aspirations of GCP and CPCA that the scheme should be capable of integration within CAM, should CAM be consented. For example, this may mean using a form of guidance technology that can be more easily adapted to the preferred CAM mode.

The key benefits of the scheme are set out in Table 2, set against the Do Minimum.

Table 2: C2C preferred option benefits vs Do Minimum

Benefit	The scheme (DS)	The DM
Journey times (inbound)	• 32 mins AM Peak (08:00-09:00) • 29 mins Inter Peak (10:00-16:00) • 32 mins PM Peak (17:00-18:00)	• 53 mins AM Peak (08:00-09:00) • 28 mins Inter Peak (10:00-16:00) • 38 mins PM Peak (17:00-18:00)
Demand (peak average hourly bus passengers two-way – East of Madingley Mulch)	• 863 passengers AM Peak • 233 passengers Inter Peak • 320 passengers PM Peak	• 370 passengers AM Peak • 248 passengers Inter Peak • 231 passengers PM Peak
Service Frequency	• 6 buses per hour • (10 min interval) direct express service between Cambourne High Street and central Cambridge, via the new Park & Ride site. • Local service running in parallel 2 buses per hour (30 min interval).	• 3 buses per hour • (20 min interval) non-express service between Cambourne High Street and central Cambridge.
Capacity (AM Peak 08:00-09:00, two way)	• 1,520 capacity	• 570 capacity
	• Demand with the scheme is forecast to increase by 233% by 2036, with capacity increasing by 267%, therefore catering for the additional demand.	
Journey time reliability	• C2C estimate at delivering £536,000 (2010 prices) in additional benefit from reliability improvements.	
Mode share (Percentage of trips undertaken by car vs bus. Two way mode share east of Scotland Farm Park & Ride across 12 hour weekday)	• 94% car • 6% bus	• 96% car • 4% bus
Wider economic impacts	• £102.8m direct GVA per annum • £676.1m in total GVA over 30 years • £458m (2019 prices) in Land Value Uplift	• None
Environmental	• Reduction in levels of private vehicle use will lead to: • Improved air quality in the Cambridge City Centre AQMA. • Improved setting around the SSSI and the American Cemetery.	• Higher levels of traffic compared to current levels, resulting in greater levels of congestion, resulting in: • Poorer air quality in the Cambridge City Centre AQMA. • Worsening of the setting of the SSSI and American Cemetery.

Source: Mott MacDonald

The proposed scheme is made up of three key elements:

- A **public transport link** between Cambourne and Cambridge
- A **new Park & Ride** site off the A428/A1303 to supplement the existing Madingley Road Park and Ride, and
- **New high-quality cycling and walking facilities** along as much of the route as is feasible.

2.2 Geographic scope

Figure 3 shows an overview of the C2C project corridor. The project will service existing and growing settlements along the route, including:

- Cambourne,
- Hardwick,
- Highfields Caldecote,
- Madingley, and
- Future developments, including Bourn Airfield and Cambourne West.

The scheme also aims to capture users travelling from further afield including settlements such as St Neots out towards the A1, and proposed housing growth in other locations along the Oxford to Cambridge corridor. Capturing these travellers will help to provide the Oxford-Cambridge Arc and provide key last mile connections.

Figure 3: C2C project corridor

Source: Mott MacDonald

2.2.1 A428

Within Cambridgeshire, the A428 road runs broadly west to east and links the A1 at St Neots to the A14 and M11 at Cambridge. The route also runs broadly parallel to the A14 Trunk Road to the north. The section of route between St Neots and Cambridge is classified as a Trunk Road and is managed by Highways England (HE). The route provides a second strategic west-east link between the A1 Trunk Road and Cambridge, as an alternative to the A14 further to the north. In conjunction with the A421, the A428 also provides a strategic link to the M1 motorway near Milton Keynes. At the Cambridge end, the A428 links to the Junction 14 of the M11 motorway and Junction 31 of the A14 Trunk Road, to the north west of the city.

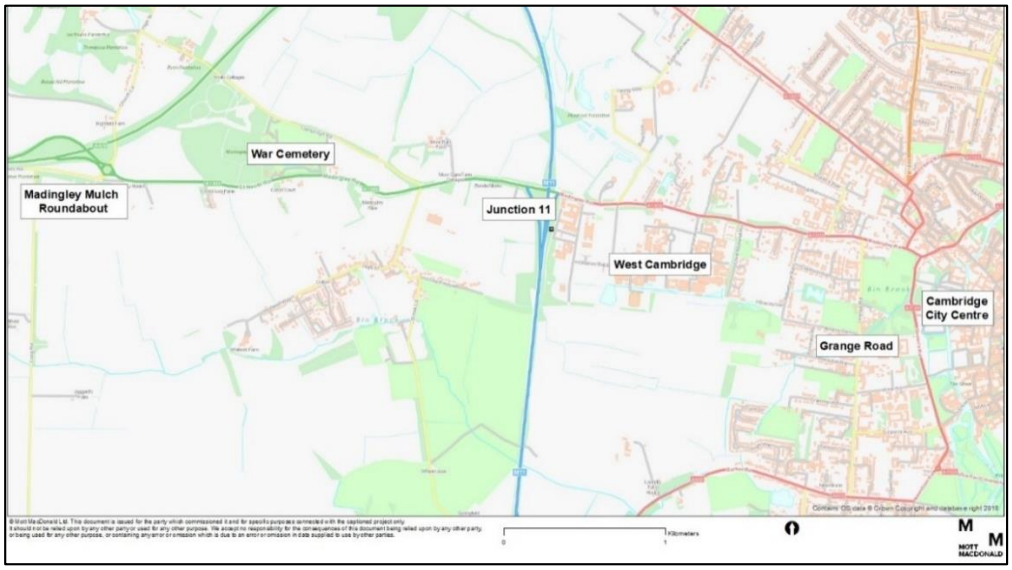
For around nine miles, from the Black Cat roundabout south of St Neots to Caxton Gibbet (Junction with the A1198), the A428 is single carriageway. Thereafter, for a further nine miles the road is dual carriageway as far as the Junction with the A14.

As part of the HE road investment scheme (RIS1) there are proposed investment improvements to the Oxford to Cambridge route that includes improving sections of the A428 between Black Cat and Caxton Gibbet. This scheme recognises the A428 as an important route in an area of the country where considerable growth in housing and employment is planned. A preferred option has now been selected for this scheme (see Section 4.1.2 for further detail).

2.2.2 A1303 Madingley Road from A428 to City Centre

As the A428 approaches the western edge of Cambridge it veers north to join the M11 and A14 at the Girton Interchange. The direct route into the City Centre from the A428 is along the single carriageway A1303 Madingley Road (Figure 4), which diverts from the A428 close to the Madingley Mulch interchange to enter the west side of the city.

Figure 4: Madingley Road from Madingley Mulch Roundabout to City Centre

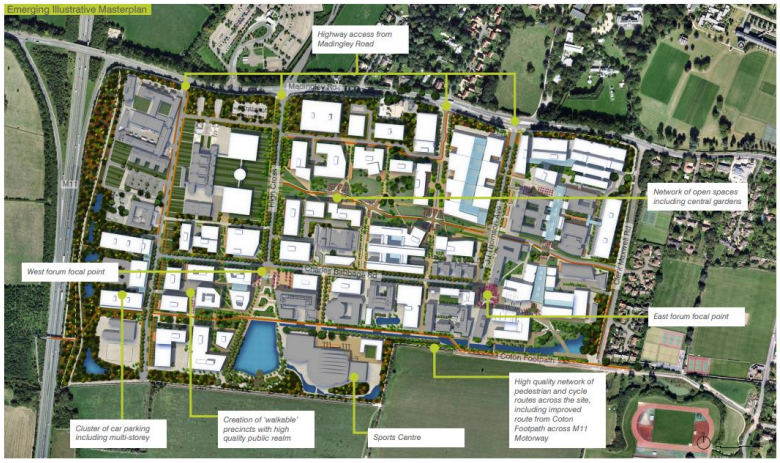


Source: Mott MacDonald

The first section of this route from the A428 slip roads to the Madingley Mulch roundabout and on to M11 Junction 13 is primarily in open countryside, with the American Cemetery located immediately to the north. The inbound approach towards the Junction with the M11 motorway has a bus lane. The Junction with the M11 caters for limited movements with south-only facing slip roads enabling entry towards, and exit from, London.

East of the M11 Junction, the road enters the outskirts of the built-up area of Cambridge with the existing Madingley Road Park & Ride site on the north side. The growing West Cambridge complex of research facilities and other buildings associated with the University of Cambridge (UoC) lies on the south side of the road, as well as sports fields / open spaces. There is an emerging masterplan for the development of the West Cambridge Site shown in Figure 5 which includes features that could impact the route, such as the expansion of the existing Sports Centre and additional nursery facility.

Figure 5: West Cambridge Masterplan



Source: West Cambridge Masterplan[3]

The new Eddington mixed used development lies to the north of the A1303. At this point there is still very little direct frontage land use, although footways are present. Further into Cambridge this starts to change with houses and a number of UoC sites on both sides of the road with a number of mature trees. Once at the Junction with Northampton Street, the A1303 becomes part of the inner ring road and there is much more direct frontage development.

2.3 Project phasing

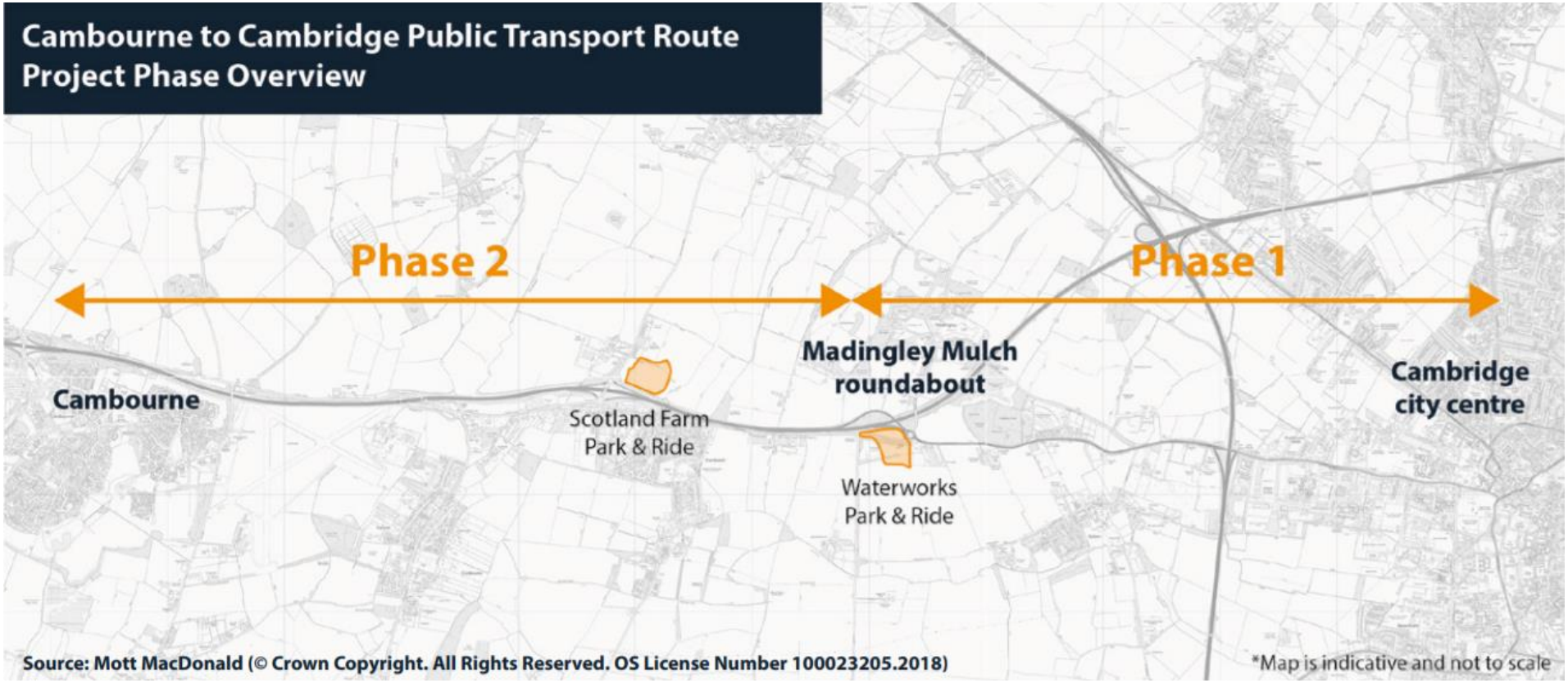
As the C2C project covers a wide area the planning and development of the project has been split into two phases, with a new Park & Ride facility being developed in parallel.

The Phase 1 route will run from the Madingley Mulch roundabout into Cambridge. The route will connect into the existing bus network on Grange Road, and onwards to other destinations such as the City Centre, Cambridge Biomedical Campus, Addenbrookes Hospital and Cambridge Science Park. Phase 2 will link the route further west, out to Cambourne, through the proposed development at Bourn Airfield. Phase 1 and 2 together would provide the complete end-to-end HQPT scheme between Cambourne and Cambridge and it is envisaged that both Phases and the Park & Ride site will be delivered in parallel.

Potentially, a future Phase 3 of the project could complement HE proposals for A428 Black Cat to Caxton Gibbett improvements by providing upgraded public transport connectivity to St Neots. Whilst this has been discussed in the context of the wider CAM network it does not form a part of the proposals contained in this OBC.

[3] http://www.westcambridge.co.uk/files/151002_nwcd_forum_board_3_emerging_masterplan_and_timescales.pdf

Figure 6: C2C phase overview



Source: C2C Project Update December 2018

3 Business Strategy and the City Deal

3.1 The City Deal objectives

Since 2010, the government has pursued a policy of devolving increasing levels of powers and funding away from Whitehall to local / regional areas, with City Deals playing a key part of the devolution process. City Deals are a means for central government and local partners to agree key investment programmes and outcomes, especially around promotion of local economic growth and development.

The Greater Cambridge City Deal (City Deal) was signed between government and Local Partners in 2014. The City Deal is overseen by the GCP which is the local delivery body set up to oversee the delivery of the City Deal and to promote local economic growth and development. The GCP membership consists of:

- Cambridgeshire County Council
- Cambridge City Council
- South Cambridgeshire District Council
- University of Cambridge

The GCP aims to enable a new wave of innovation-led growth in the Greater Cambridge area by investing in infrastructure, housing and skills, thereby addressing housing shortages and transport congestion bottlenecks that will facilitate its continued growth and a continuation of the "*Cambridge Phenomenon*"[4].

The City Deal is worth up to £1 billion over a 15-year period and includes an investment fund for transport improvements of £100m from government over a five-year period between 2015/16 and 2019/20.

This investment fund offers funding towards proposed infrastructure in the region to help grow and maintain Greater Cambridge's status as a prosperous economic area and to achieve the following outcomes in support of economic growth:

- Accelerated delivery of **33,500 new homes**
- Delivery of **44,000 new jobs**
- **Transport infrastructure improvements** to **support this housing and employment growth** while retaining the high quality of life in the region.

In order achieve these outcomes, the GCP Assurance Framework sets out four strategic objectives that all schemes being promoted by the Greater Cambridge authorities will be prioritised against:

- Create and retain investment to nurture the conditions necessary to enable the potential of Greater Cambridge to create and retain the international high-tech businesses of the future.
- Targeted business investment supporting the Cambridge Cluster to the needs of the Greater Cambridge economy by ensuring those decisions are informed by the needs of businesses and other key stakeholders such as the universities.
- Improve connectivity and networks between clusters and labour markets so that the right conditions are in place to drive further growth.

[4] Section 5.1 provides further detail on the Cambridge Phenomenon.

- Attract and retain skills by investing in transport and housing whilst maintaining a good quality of life, in turn allowing a long-term increase in jobs emerging from the internationally competitive clusters and more university spin-outs.

The Greater Cambridge City Deal Assurance Framework establishes the key strategic objectives against which investment projects will be prioritised:

- To nurture the conditions necessary to enable the potential of Greater Cambridge to create and retain the international high-tech businesses of the future;
- To better target investment to the needs of the Greater Cambridge economy by ensuring those decisions are informed by the needs of businesses and other key stakeholders such as the universities;
- To markedly improve connectivity and networks between clusters and labour markets so that the right conditions are in place to drive further growth; and
- To attract and retain more skilled people by investing in transport and housing whilst maintaining a good quality of life, in turn allowing a long-term increase in jobs emerging from the internationally competitive clusters and more UoC spin-outs.

The business case for the C2C project will be assessed by the GCP Executive Board to ascertain the extent to which any transport investment meets the strategic objectives of the City Deal, including:

1. How the scheme supports business investment and confidence
2. How the scheme represents targeted investment where business needs it
3. How the scheme links effectively into the key growth sites
4. How the scheme supports transport infrastructure and quality of life

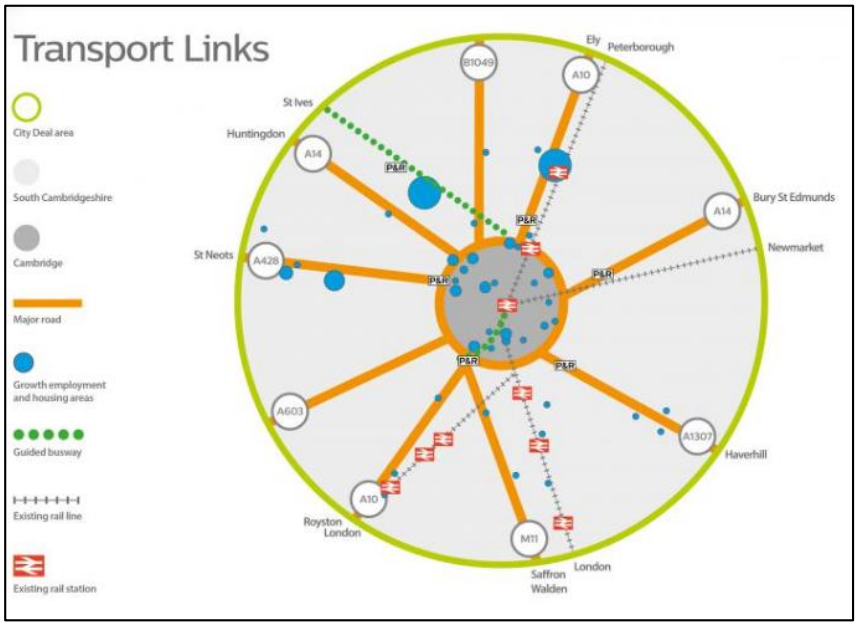
3.2 The City Deal investment programme

The City Deal includes a programme to enhance transport capacity in Greater Cambridge, especially in areas where capacity is identified as an issue. This capacity is needed along key strategic routes to and from the city (particularly along those routes where significant new housing and / or employment growth is planned) as well as within the built-up area of the city.

The City Deal vision for a comprehensive sub-regional infrastructure network is represented in Figure 7, which draws on the key components of the development strategies within the Local Plans[5] and the Transport Strategy for Cambridge and South Cambridgeshire.

[5] The SCDC Local Plan was adopted in full in September 2018 and CaCC Local Plan was adopted in October 2018.

Figure 7: The City Deal Vision for Greater Cambridge

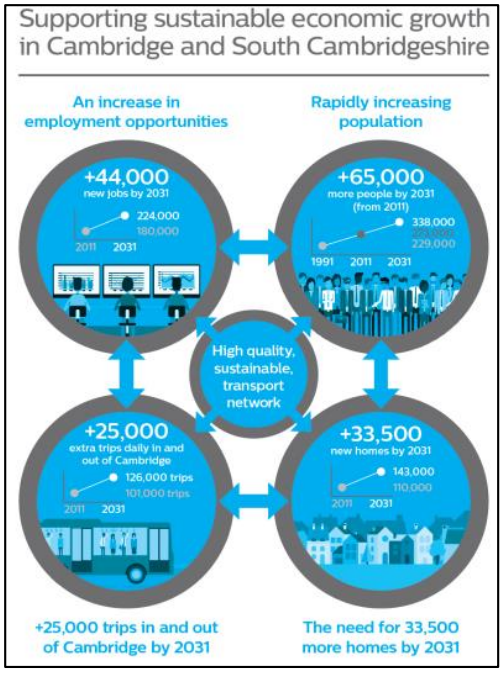


Source: Greater Cambridge City Deal

Development of a sustainable transport network aims to improve access to employment hubs and high-tech clusters in Greater Cambridge by making movement between them more straightforward, efficient and convenient.

The interrelationship between infrastructure and growth as envisaged by the City Deal is summarised in Figure 8 below:

Figure 8: City Deal transport investment package



Source: Greater Cambridge City Deal

The backbone of the proposed strategy is a transport network to link areas of population and employment within the Greater Cambridge area, featuring:

- New orbital public transport routes around Cambridge that taken together provide a wider variety of direct HQPT connections than would be traditionally possible under a traditional radial City Centre "*hub and spoke*" model;
- New HQPT links into Cambridge on key routes, connecting existing and new housing developments with major employment centres;
- A comprehensive network of pedestrian and cycle routes within Cambridge; and
- The main radial routes will have high quality bus priority measures.

This strategy will transform connectivity within and beyond the Greater Cambridge area, and allow significant increases in public transport and cycle use that will maximise the capacity for movement, particularly within the historic core of Cambridge. This strategy also supports carbon reduction objectives and promotes high quality of life for local communities by minimising the environmental impact of transport whilst promoting the ability for the area to grow.

What does this mean for C2C?

- There is a clear and coherent transport and wider economic investment strategy for Cambridge set out through the City Deal which is based on developing efficient and high capacity radial and orbital movement corridors.
- It is essential that transport investment is targeted such that it delivers strongly against each of the City Deal objectives, in turn maximising the wider economic benefits that can be achieved through infrastructure investment.
- The A428/A1303 contributes to a wide network of movement and connectivity, which, if enhanced sufficiently to link growth sites and support transport infrastructure and quality of life, could support wider business investment and confidence and ensure investment is targeted where businesses need it.
- The C2C project is a named scheme within the City Deal and contributes to the City Deal aims and objectives by removing some of the barriers to economic growth within Greater Cambridge by improving connectivity between current and future housing and key employment sites, thus helping to ensure there is sufficient access to a diverse labour market to contribute to continued economic growth.
- The project also provides additional transport capacity to allow for a growth in the number of trips from new developments along the A428/A1303 into Cambridge.

4 Policy Review

Any investment in transport infrastructure to the west of Cambridge must align with national, regional and local policy and strategy. The following section provides an overview of the alignment of the C2C project with policy and strategy documents.[6]

4.1 National policy and strategy

4.1.1 Transport Investment Strategy – July 2017

In July 2017, DfT published its Transport Investment Strategy (TIS). The TIS sets out the government's objectives and priorities for investment in transport, this includes propositions to guide future decision-making and guidance for those seeking investment. These priorities need to be taken into account in the development of scheme proposals and design, including in business cases in order to ensure schemes are assessed consistently across the UK.

The TIS sets out four objectives[7] that guide DfT investment decisions, and whilst the investment decision for the C2C project will be taken by the GCP Executive Board as part of the City Deal and the devolution of the funding, to ensure consistence across all transport investment decisions within the UK it is prudent that the C2C project is shown to align with these four objectives:

- Create a transport network that works for users, wherever they live;
- Improve productivity and rebalance growth across the UK;
- Enhance our global competitiveness by making Britain a more attractive place to invest, and
- Support the creation of new housing.

What does this mean for C2C?

- The C2C project will connect both existing settlements along the A428/A1303, such as Hardwick and Cambourne, and new housing developments at Bourn Airfield and Cambourne West, with current and future employment opportunities across Cambridge.
- The C2C project will improve commuter journeys and encourage greater productivity by supporting the labour market by providing access to more opportunities and jobs within Cambridge. In turn organisations and employers will see improved growth.
- The project creates a positive image of Cambridge which encourages further investment from companies, both locally to the UK and internationally. The global attraction of Cambridge can already be seen by the relocation of large companies such as AstraZeneca who has chosen Cambridge for its global research headquarters for 2,000 staff.

[6] The Greater Cambridge City Deal is not covered in this section. For detail on the City Deal, see Section 3 – Strategic Case – The City Deal.

[7] DfT – Strategic Case Supplementary Guidance: Transport Investment Strategy (December 2017)

4.1.2 National Planning Policy Framework

The National Planning Policy Framework (NPPF) (2019) sets out the UK Government's planning policies for England. This document sets out requirements of the planning system and how policy should be adhered to and delivered in local plan development and planning decisions.

The NPPF states that all developments that generate significant amounts of movement should take account of the following aims:

- Prioritising opportunities for encouraging the use of sustainable transport modes depending on the nature and location of the site, to reduce the need for major transport infrastructure;
- Achieving safe and sustainable access for all users;
- Only undertaking transport network improvements that cost to effectively limit the significant impacts of the development; and
- Only preventing or refusing developments on transport grounds where the residual cumulative impacts of development are severe.

What does this mean for C2C?

The C2C project supports the key principles of the NPPF by:

- Providing an attractive and sustainable alternative for commuters. Reducing current reliance on private car travel;
- Supporting a decrease in car emissions due to a reduction in congestion on key routes; and
- Supporting economic growth in Cambridge by ensuring growing employment attractors in the area are accessible and journeys to them are safe, easy and quick.

4.1.3 Highways England Road Investment Strategy

The first Road Investment Strategy (RIS1) was published by HE in 2014[8] and covers the long-term programme for investment by HE on the Strategic Road Network (SRN)[9] between 2015-2020. The high-level objectives of RIS1 include:

- Providing capacity and connectivity to support national and local economic activity;
- Joining our communities and linking effectively to each other; and
- Supporting delivery of environmental goals and the move to a low carbon economy.

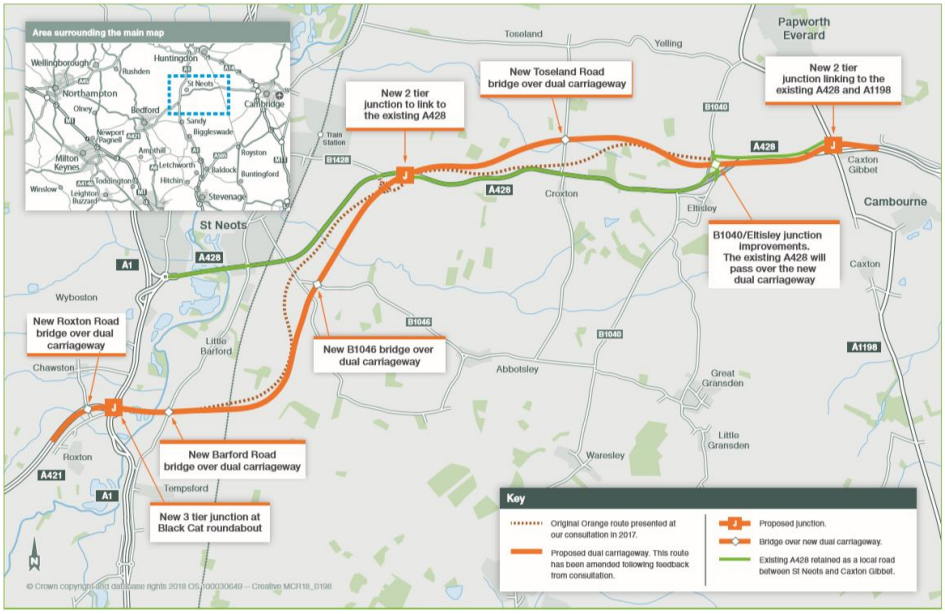
RIS1 includes investment improvements to the Oxford to Cambridge corridor. As part of the improvements to this corridor, RIS1 commits to improving sections of the A428 between Black Cat and Caxton Gibbet and recognises the A428 as an important route in an area of the country where considerable growth in housing and employment is planned.

The A428 Black Cat to Caxton Gibbet scheme lies to the west of the C2C project corridor, and includes improvements of the A428 near St Neots, linking the A421 to Milton Keynes with the existing dual carriageway section of the A428 to Cambridge, creating an expressway standard link between the two cities via Bedford. The scheme is expected to include significant improvements to the Black Cat roundabout, where the A1 currently meets the A421. Figure 9 shows the selected preferred option, with Cambourne shown to the east of the scheme.

[8] DfT – Road Investment Strategy: for the 2015/16 – 2019/20 Road Period, March 2015

[9] The SRN covers all motorways and major roads within England.

Figure 9: A428 Black Cat to Caxton Gibbet scheme options



Source: Highways England – A428 Black Cat to Caxton Gibbet improvements – Preferred route announcement, February 2019

Work is currently underway to develop RIS2, which will cover the long-term programme post-2020. Central to the development of RIS2 are six key strategic studies that are examining some of the biggest challenges facing the road network. This includes further investment proposals for the Oxford to Cambridge Expressway which is a proposed grade-separated dual carriageway between Oxford and Cambridge. The proposal aims to establish links between the key locations along the strategically important corridor, following a broad arc from Didcot – Oxford – Milton Keynes – Bedford – Cambridge. The SOBC for part of the Oxford-Cambridge Expressway between the M1 and the M40 was published by the DfT in September 2018[10]. The preferred route for the new Oxford-Cambridge Expressway sits alongside proposed East West Rail[11], which together will provide the arc with a 'multi-modal transport spine'[12] better connecting existing communities and enabling the development and growth of new ones.

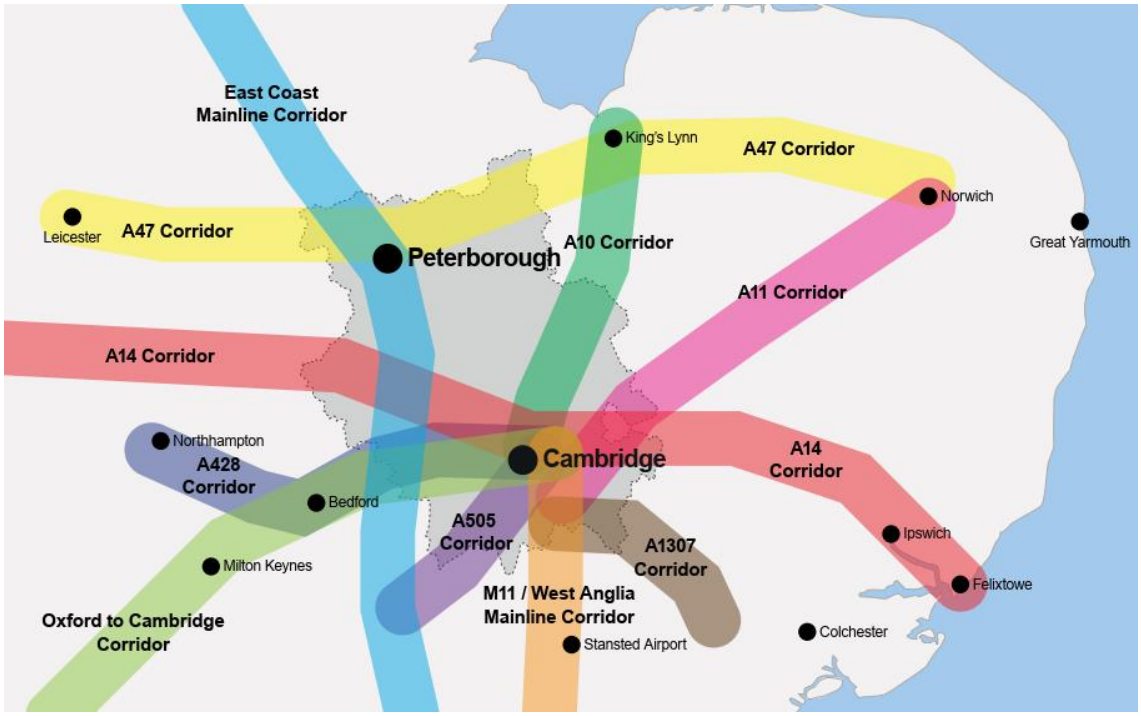
Figure 10, taken from the CPCA Spatial Framework, shows the Oxford to Cambridge corridor and indicates (at a high level) the route of the multi-modal transport spine which will comprise it. The lines marking the green 'Oxford to Cambridge corridor' and the purple 'A428 corridor' demonstrate the geographical overlap of proposals for an Oxford-Cambridge Expressway and the C2C project.

[10] Oxford to Cambridge expressway strategic study: strategic outline business case, Department for Transport, September 2018

[11] Oxford to Cambridge Expressway – The preferred corridor, Highways England, 2018

[12] 'Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc', National Infrastructure Commission, November 2017

Figure 10: Map of strategic transport corridors within the CPCA area, including the Oxford to Cambridge corridor



Source: Cambridgeshire and Peterborough Strategy Spatial Framework (Non-Statutory): Towards a sustainable growth strategy to 2050, Phase 1, 2018

What does this mean for C2C?

- The A428 forms an essential part of the Oxford to Cambridge route and complements the Black Cat to Caxton Gibbet improvements by providing a new Park & Ride site to intercept highway traffic coming from the west before it enters the congested city centre.
- As a major component of the Oxford to Cambridge route improvements, the project will help put more people within reach of a wider range of jobs and services through attractive, lower carbon alternative transport alternatives to private car use.
- Investing in HQPT along the A428/A1303 also contributes to the strategic objectives of RIS2 and forms a key part of the overall Oxford to Cambridge Expressway enhancements.
- The C2C project will contribute to the first-mile / last-mile strategies for the Cambridge-Milton Keynes-Oxford arc, helping to integrate the Oxford-Cambridge Expressway and other transport infrastructure enhancements, when they are constructed, along the arc into Cambridge's local network.

4.2 Regional policy and strategy

4.2.1 Greater Cambridgeshire and Peterborough Strategic Economic Plan

The Greater Cambridgeshire and Peterborough Strategic Economic Plan (SEP) forms the basis by which the Greater Cambridge Greater Peterborough Local Enterprise Partnership (LEP)[13] secured its Growth Deal with Government. Growth Deal funding will cover a period over six

[13] As of 1st April 2018 the business, trade, assets and liabilities of Greater Cambridge and Greater Peterborough LEP were transferred to Cambridgeshire and Peterborough Combined Authority.

years from 2015-21. The first round of Growth Deal that was awarded to the LEP in July 2014 was worth £110 million. A further bid of £70.5 million was submitted by the LEP in July 2016.

As a result of investment, the SEP and Growth Deal funding would support the delivery of 70,000 new jobs and 50,000 new homes, leading to a £2.8 billion uplift in GVA across the LEP area.[14]

The SEP has 6 core ambitions for the plan period:

- To be the UK's exemplar area for digital connectivity;
- Remove the skills barriers to continued growth;
- Deliver a growth hub to support business growth;
- Respond to existing pressure for the growth and retention of businesses by facilitation the addition of additional innovation and incubator space;
- Alconbury Weald Enterprise Campus; and
- A transport network fit for an economically vital high growth area.

In terms of the ambition for transport, the SEP identifies the delivery of transport priorities that provide opportunities to open up access to significant growth locations. Delivery of such schemes will support the five other aspirations of the SEP, enabling the growth of the developing science and digital sectors and providing viable and efficient transport solutions for the workforce in Cambridge and Peterborough.

What does this mean for C2C?

- The A428/A1303 forms an important east-west route providing connections between new and future employment sites and housing sites. This includes sites such as the Cambridge Biomedical Campus that is part funded by the Growth Deal.
- Investing in the C2C project, will support the growth potential referred to in the SEP and key employment sites funded through the Growth Deal.

4.2.2 Cambridge-Milton Keynes-Oxford Arc

The Cambridge - Milton Keynes - Oxford arc is considered a national priority due to its geographical scope that encompasses world leading research, innovation and technology centres[15]. The areas within the arc are seen as competing with locations across the globe, therefore attracting talent and bringing investment into the UK. The towns and cities within the arc are amongst the most economically productive outside London and make a vital contribution, both to national income and to national tax revenues. Accordingly, it is viewed that if the UK is to succeed in the global economy, it must invest in the success of the arc[16].

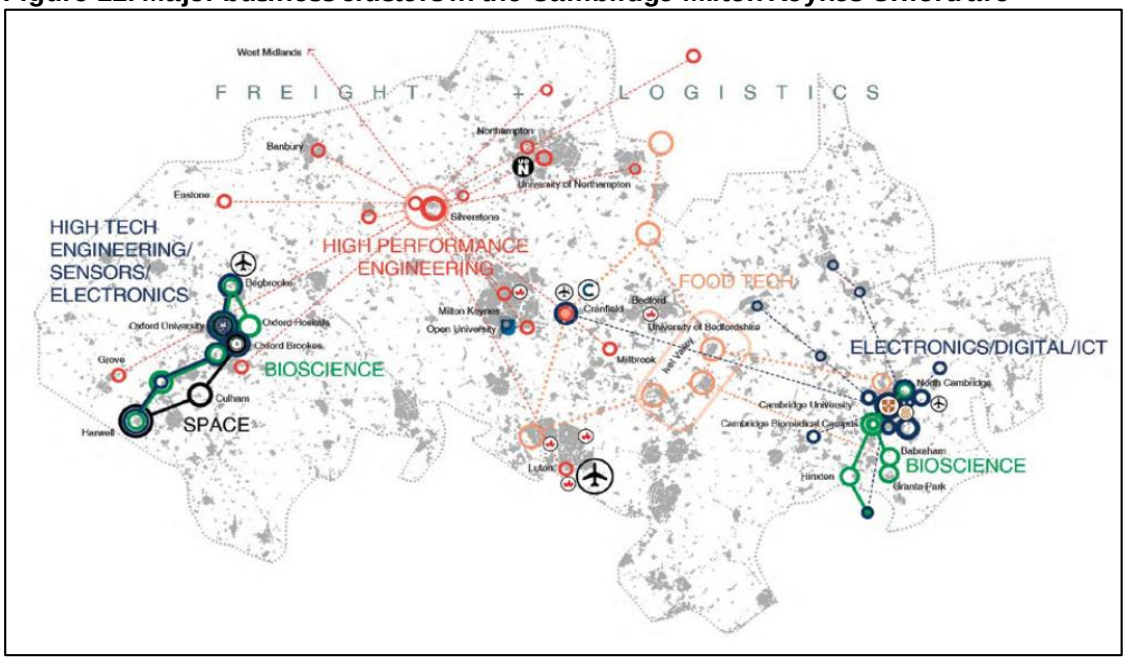
Figure 11 illustrates the business clusters and the nature of the high tech and research sectors that are located within the key centres across the arc.

[14] Greater Cambridgeshire and Peterborough Strategic Economic Plan, March 2014

[15] National Infrastructure Commission – Partnering for Prosperity: A new deal for the Cambridge-Milton Keynes-Oxford Arc (2016)

[16] National Infrastructure Commission – Partnering for Prosperity: A new deal for the Cambridge-Milton Keynes-Oxford Arc (2016)

Figure 11: Major business clusters in the Cambridge-Milton Keynes-Oxford arc



Source: National Infrastructure Commission – Partnering for Prosperity: A new deal for the Cambridge-Milton Keynes-Oxford Arc (2016)

Due to its strategic importance, the National Infrastructure Commission (NIC) was established in 2016 to consider how to maximise the potential of Cambridge – Milton Keynes – Oxford corridor and address the shortages in homes and adequate labour supply. The Commission identified the need to invest in infrastructure across the arc to create well designed and well-connected communities to maximise the economic potential of the corridor.[17] The NIC set out a 50-year vision in order to achieve this, including:

- Completion of the East – West rail line connecting Oxford and Cambridge by 2030;
- Development of the Oxford – Cambridge Expressway;
- New rail services to Cowley and South-East Oxford by 2019; and
- Opening of a new rail station in South Cambridge by 2022.[18]

The NIC was used to inform the Autumn 2017 Budget, which sets out an ambitious integrated programme of infrastructure, housing, business investment and development, including:

- **Housing** – 1 million new homes along the corridor by 2050;
- **Rail** – completion of the western section of the East West Rail and construction of the Cambridge South station; and
- **Road** – construction of key elements of an Expressway between Cambridge and Oxford.

The budget also included commitments to further investment along the arc including:

- £21m investment over 4 years to expand the Tech City UK's reach to become 'Tech Nation' and secure the UK's world-leading posting in digital innovation. This includes Cambridge as a regional hub.

[17] National Infrastructure Commission – Partnering for Prosperity: A new deal for the Cambridge-Milton Keynes-Oxford Arc (2016)
[18] National Infrastructure Commission – Partnering for Prosperity: A new deal for the Cambridge-Milton Keynes-Oxford Arc (2016)

- £1.7b Transforming Cities Fund to support intra-city transport connections that drive productivity by improving connectivity and reducing congestion. This includes £74m million allocated to the Cambridgeshire and Peterborough Combined Authority.

Calling for City-scale transport infrastructure to enable growth, the NIC also focuses on what it calls First-mile / Last-mile strategies. The purpose of which is:

> *"maximising the opportunities associated with the development of East West Rail and the Oxford-Cambridge Expressway – integrating mass rapid transit with these schemes to enable effective first/last mile connectivity, in a way that enhances the value of these strategic infrastructure projects"*[19]

What does this mean for C2C?

- The A428/A1303 forms part of the east-west corridor and is identified as being in need of investment in order to improve connections and be capable of opening up new housing developments and serving employment sites for future jobs growth.
- The five options currently under optioneering review for the East–West railway line include two which include a new rail station in Cambourne, linking the west of Cambridge to the city centre. This could compliment the C2C project and its aims and objectives by enhancing links to the C2C and enabling a choice of sustainable travel mode.
- The delivery of up to 1 million new homes in a broad area between Oxford and Cambridge will inevitably place additional pressure on the A428/A1303 and surrounding routes, requiring new transport infrastructure to manage the increase in demand.
- By investing in new infrastructure along the A428/A1303 and improving connectivity between new housing and key employment sites, the C2C project should help deliver the long-term vision for the Cambridge-Milton Keynes-Oxford Arc and help ensure Cambridge's on-going contribution to the economic success of the region and the UK.
- The C2C project will also contribute to the First-mile / Last-mile strategies by providing an integration between the Oxford-Cambridge Expressway and other enhancements along the arc into the local network of Cambridge.

4.2.3 Sub-national Transport Bodies (STBs)

The creation of Sub-National Transport Bodies (STBs) aims to enable areas to come together and speak with one voice on strategic transport planning with the aim to enable economic growth and development.

Currently there is no STB that incorporates Cambridge, however England's Economic Heartland is a joint alliance of Local Authorities established in 2014 that covers the Oxford-Cambridge area. Having formed a partnership, the Alliance has the aim of representing the areas within, and ensuring growth across, the corridor.

The Alliance shares a common aim, to:

- Address identified barriers to economic activity (both existing and planned growth); and
- Raise productivity to match, and where possible exceed, that of our global competitors.

The Alliance has also begun to work on a Transport Strategy covering the Heartland area and will look to identify priority schemes for investment that will support planned economic and

[19] National Infrastructure Commission – Partnering for Prosperity: A new deal for the Cambridge-Milton Keynes-Oxford Arc (2016)

housing growth. The strategy will emphasise how local connections within cities and towns can be improved, ensuring smoother journeys from transport hubs to jobs and homes. An outline strategy was published for engagement in July 2019 and will be used to develop the draft Transport Strategy which will be published in the first half of 2020.[20]

What does this mean for C2C?

- An STB would have greater input into how funding is invested, and transport infrastructure is used to support the region, including the A428.
- The C2C project aligns with the Alliance's aims of removing barriers to economic growth across the Oxford-Cambridge arc by providing additional capacity and linking up new and planned housing to key employment sites across Cambridge.

4.2.4 The role of the Cambridgeshire and Peterborough Combined Authority

The Cambridgeshire and Peterborough Combined Authority (CPCA) was established to pursue a devolution deal with Central Government that included the devolution of both decision-making powers and funding to the region. Following the signing of the devolution deal in November 2016, the CPCA was formally established in March 2017. The CPCA is made up of eight partners across Cambridgeshire and Peterborough.[21] The key ambitions of the CPCA include:

- Doubling the size of the local economy;
- Accelerating house building rates to meet local and UK need;
- Delivering outstanding and much needed connectivity in terms of transport and digital links;
- Providing the UK's most technically skilled workforce;
- Transforming public service delivery to be much more seamless and responsive to local need;
- Growing international recognition for our knowledge-based economy; and
- Improving the quality of life by tackling areas suffering from deprivation.

The CPCA is also led by a Mayor, elected in May 2017. The Mayor gives the CPCA a focal point and is the contact for Central Government. The Mayor has responsibilities that were devolved from Central Government as part of the devolution deal. Such responsibilities include a transport budget, a key route network of local authority roads and creating a non-statutory spatial framework for Cambridgeshire and Peterborough.

The CPCA, following a letter sent by the Mayor to the GCGP LEP in November 2017, has also agreed to support the development of a new LEP for the area which is to be known as the Business Board.

[20] England's Economic Heartland - http://www.englandseconomicheartland.com

[21] The eight partners are: Cambridge City Council, Cambridgeshire County Council, East Cambridgeshire District Council, Fenland District Council, Huntingdonshire District Council, Peterborough City Council, South Cambridgeshire District Council and Business Board of the Cambridgeshire and Peterborough Combined Authority.

4.2.4.1 Interim Transport Strategy Statement

The Mayor published an Interim Transport Strategy Statement in May 2018 that clarified its transport priorities. The Strategy provides direction for existing projects, and ensures they align with the strategic framework within the new LTP.[22]

This interim strategy set out the guiding principles of the new LTP, that include:

- Economic growth and opportunity by connecting dynamic workforce with a growing number of jobs.
- Equity to ensure that all areas of the Combined Authority can prosper.
- Environmental responsiveness by encouraging active and sustainable travel choices.

The interim strategy states that the CPCA is:

> *"…committed to delivering a world-class public transport system that integrates metro, rail, bus and mobility services with walking and cycling facilities that supports more active travel choices. The aim must be create a sustainable transport system that is so good and appealing that public transport, walking and cycle become the preferential travel choice over the car."*[23]

This will include a focus on key strategic transport projects, including a CAM network across the city, and the Oxford to Cambridge Expressway (A428).

The interim strategy makes it clear that any current transport schemes and associate strategies must align with new policy commitments, and specifically the commitment to create a metro solution.

4.2.4.2 Cambridgeshire and Peterborough Local Transport Plan

As part of the Mayor's powers, the CPCA have produced the first updated Cambridgeshire and Peterborough Local Transport Plan (CPLTP), which was published in June 2019. The consultation period for the Plan finished in September 2019, with a final CPLTP set to be published once consultation feedback has been considered.

The CPLTP replaces the Interim Local Transport Plan which was produced in June 2017 and is based upon the Cambridgeshire Local Transport Plan (LTP3) and the Peterborough Local Transport Plan (LTP4).

The goals of the CPLTP are to provide an accessible transport system that delivers economic growth and opportunities, and protects and enhances the environment to tackle climate change together. There are ten objectives which have been formed to underpin the delivery of the goals relating back to the economy, environment and society.

The route along the A428 from Cambridge city centre towards Cambourne, St Neots and Bedford has been highlighted as a strategic project to help travel by foot, bicycle and public transport more attractive than private car journeys, alleviating congestion and supporting the region's growth. In particular the CPLTP supports the delivery of a segregated public transport corridor from Cambourne to West Cambridge and other key employment sites and destinations. It is highlighted that this will provide the first phase of CAM, again a scheme which is supported by CPLTP.

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[22] CPCA Board - May oral Interim Transport Strategy Statement – 30th May 2018

[23] CPCA Board - May oral Interim Transport Strategy Statement – 30th May 2018

What does this mean for C2C?

- The C2C project aligns with the guiding principles and primary goals of the Interim Transport Strategy Statement by aiming to deliver a sustainable public transport system alongside cycling and walking enhancements that enables existing and future trips to be undertaken without the use of a private car.
- The C2C project aligns with the Cambridge and Peterborough Local Transport Plan by supporting the opportunity to create a world class transport system and creating sustainable growth and opportunity for all.
- The C2C will project contributes to the delivery of the Cambridge-Milton Keynes-Oxford arc by enabling first mile/last mile trips to be made along the arc and helping to support forecasted development and associated economic growth.
- The C2C project is aligned with new policy commitments around CAM, and forms the initial phases of delivering the metro network by providing the transport link to the West of the city. The design will need to be compatible with any future upgrade or integration to the CAM network.

4.3 Local policy and strategy

The City of Cambridge and South Cambridgeshire both have Local Plans that were adopted in 2018. The Local Plans set out the transport objectives, strategies and policies for these areas. The Transport Strategy for Cambridge and South Cambridge (TSCSC) was developed to ensure that the local councils plan together for transport that supports the sustainable economic growth of the county. These plans, prepared in parallel, are intended to support one another.

From the Local Plans, and the TSCSC, a clear and distinct overall vision is set out that highlights the need for future housing and economic growth to take place in both a sensitive and sustainable manner, with any future development being done for the benefit all.

Cambridge City Council and South Cambridgeshire District Council are committed to preparing a joint Local Plan for their combined districts (Greater Cambridge). The Councils' new Local Plans (2018) both include a policy which makes a commitment to an early review of those Plans to commence before the end of 2019. A 'Call for Sites' exercise was undertaken in early 2019 to identify sites for housing, employment and other usage.

New developments should promote the use of sustainable modes of transport and should seek to facilitate the infrastructure required to support growth. A key focus of the transport system will be the use of sustainable modes that will centre around the use of HQPT along dedicated passenger transport routes, offering fast and frequent links to and from key destinations. The Local Plans promote the accessibility of new housing development by HQPT, noting that new homes should be located close to employment centres or HQPT routes providing sustainable access to the City Centre and major employment centres. Included as part of this sustainable transport network should also be an improved system of direct cycling and walking routes.

The proposed developments supported through the Local Plans will help ensure that Cambridge meets the targets set in the City Deal of accelerating delivery of over 33,500 new homes in and around the city and delivering 44,000 new jobs.

4.3.1 South Cambridgeshire Local Plan – 2018

Table 3 summarises how the C2C project contributes and meets the South Cambridgeshire Local Plan objectives.

Table 3: South Cambridgeshire Local Plan objectives and C2C contribution

Local Plan Objective	How the C2C project contributes
To support economic growth by supporting South Cambridgeshire's position as a world leader in research and technology-based industries, research, and education; and supporting the rural economy.	• Economic growth is predicated upon the ability for people to access their place of work by non-car modes and to travel easily / efficiently during the course of their working day. • A HQPT system will significantly improve connectivity – by improving journey options and times between housing areas and major employment areas; and between the major employment areas themselves.
To protect the character of South Cambridgeshire, including its built and natural heritage, as well as protecting the Cambridge Green Belt. New development should enhance the area and protect and enhance biodiversity.	• The built and natural heritage of the area will come under increasing threat from higher levels of air pollution and noise, which are the result of high forecast road traffic. • Better Public Transport services will seek to reduce forecast levels of road traffic by moving people in buses which (if well-used) are a much more environmentally sustainable means of moving large numbers of people.
To provide land for housing in sustainable locations that meets local needs and aspirations, and gives choice about type, size, tenure and cost.	• If housing is to be both economically and environmentally sustainable the travel demand that it generates will need to avoid a large increase in levels of car traffic. • Better public transport services will provide a viable alternative to driving for commuting, education, personal business and leisure trips into Cambridge from new developments located in the rural hinterland.
To deliver new developments that are high quality and well-designed with distinctive character that reflects their location, and which responds robustly to the challenges of climate change.	• An important aspect of development design is to ensure that public transport services are able to move efficiently within areas (in particular avoiding long and circuitous routes) and also gain access to as many people as possible within an acceptable walking distance. • Public transport infrastructure will be integrated into the design of new developments, especially around Cambourne and Bourn Airfield and will also serve the employment areas of West Cambridge and North-West Cambridge.
To maximise potential for journeys to be undertaken by sustainable modes of transport including walking, cycling, bus and train.	• The reason for delivering the project is to take advantage of the potential that undoubtedly exists and to ensure that bus-based Public Transport is a viable and credible alternative
Bourn Airfield and Cambourne West have been identified as strategic housing sites within this Local Plan. **The policies surrounding these sites require segregated public transport links between Cambourne and Cambridge.**	• The C2C project will support the developments of new residential sites west of Cambridge by providing a HQPT from residential areas to areas of employment. This will promote the new developments as accessible areas to live and work. • As the proposed C2C project will provide segregated HQPT from Cambourne to Cambridge

Source: C2C SOBC (September 2016). Objectives taken from South Cambridgeshire Local Plan

4.3.2 Cambridge Local Plan – 2018

Table 4 summarises how the C2C project contributes and meets the Cambridge Local Plan objectives.

Table 4: Cambridge Local Plan objectives and C2C contribution

Local Plan Objective	How the C2C project contributes
Contribute to the vision of Cambridge as an environmentally sustainable city, where it is easy for people to make a transition to a low carbon lifestyle.	• The delivery of significantly better public transport services will make it much easier for people to choose to live a low-carbon / low energy lifestyle which does not rely on private car. • Better choice of efficient and reliable public transport services along one of the key transport routes in Cambridge, will serve the important development areas in the west and north-west of the city.
Meet the housing needs of the city within its sub-region, delivering an appropriate mix of housing types, sizes and tenures to meet existing and future needs, including affordable housing.	• If housing is to be both economical and environmentally sustainable the travel demand that it generates will need to avoid a large increase in levels of car traffic. • Housing affordability could be supported, if it is possible to get around without a household having to own multiple cars. Better public transport services will provide a viable alternative to driving for commuting, education, personal business and leisure trips.
Assist the creation and maintenance of inclusive, environmentally sustainable communities.	• Bus-based public transport is an important part of inclusivity, as it is more likely to be affordable for a larger proportion of the population than car travel and rail. • Bus infrastructure measures will assist operators to keep bus fares as low as possible by minimising the operating costs associated with traffic congestion delays, and the need to provide additional buses to maintain a specific service headway.
Promote and support economic growth in environmentally sustainable and accessible locations, facilitating innovation and supporting Cambridge's role as a world leader in higher education, research, and knowledge-based industries, while maintaining the quality of life and place that contribute to economic success.	• Bus base public transport can – if based on strong radial route and high-density urban form – promote development in locations which minimise the need to travel, both as part of the daily commute and also during the course of business. • Economic benefits associated with greater levels of face to face collaboration can be promoted by the use of public transport. • Public transport services on the A428/A1303 will, as part of a wider network for Cambridge, help to link up employment and research establishments across the city, making travel easy by HQPT.
Support Cambridge's vibrant and thriving centres, with a varied range of shopping facilities in accessible locations that meet the needs of people living, working and studying in, or visiting, the city and the Greater Cambridge Area.	• Improved public transport services running into Cambridge along the A428/A1303, from the expanding housing areas to the west, will provide a boost to the retail economy by enabling more people to access the City Centre without a large increase in traffic and congestion.
Development located to help minimise the distance people need to travel, and be designed to make it easy for everyone to move around the city and access jobs and services by sustainable modes of transport.	• Bus-based public transport can promote development in locations which minimise the need to travel, both as part of the daily commute and also during the course of business. • Better bus infrastructure and services will encourage development to be located on the A428/A1303 route, which can become a strong radial spine which provides sufficient numbers of passengers to support a frequent service.
Ensure appropriate and timely provision of environmentally sustainable forms of infrastructure to support the demands of the city, including digital and cultural infrastructure	• If constructed as part of major developments, new public transport infrastructure can be used by new residents before their travel patterns become set in favour of the private car. • Provision of public transport infrastructure and services as part of both housing and employment developments and will therefore enable sustainable travel choices to be designed in from the start.

Source: C2C SOBC (September 2016). Objectives taken from Cambridge Local Plan

4.3.3 Transport Strategy for Cambridge and South Cambridgeshire - 2014

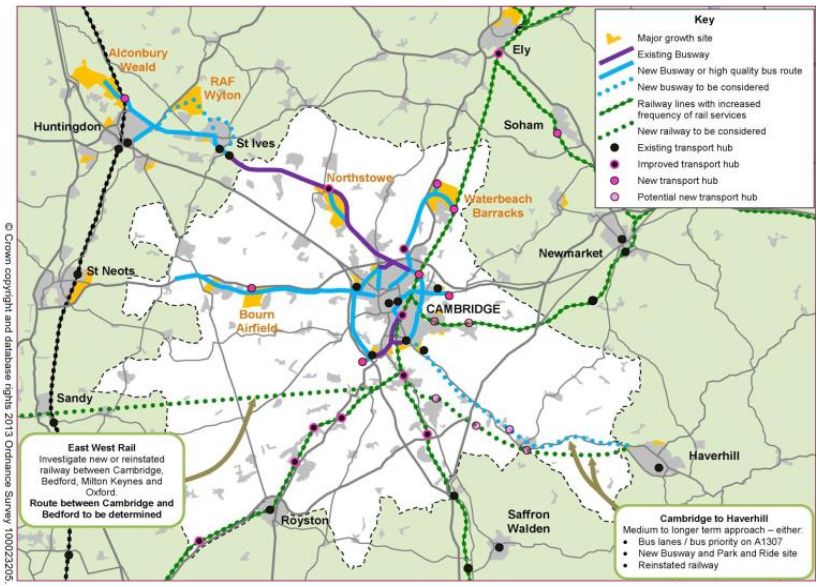
The TSCSC, adopted in 2014, recognises that attempting to cater for current and future local travel demand by car will increase congestion in Cambridge and surrounding towns.

The TSCSC proposes that travel demand is catered for by:

> "…increasing walking, cycling and use of passenger transport for journeys into and out of Cambridge; and in particular on passenger transport services on main radial corridors to Cambridge and other key destinations."[24]

Figure 12 shows the main transport routes between Cambridge and neighbouring towns where investment will be focused in order to meet the travel demands within Cambridge.

Figure 12: Focus for HQPT provision / enhancement on main transport routes between Cambridge and neighbouring towns.



Source: TSCSC

In the local and regional context, the A428/A1303 connects the market town of St Neots, villages and employment areas around Cambourne and the major employment, healthcare, educational and retail destinations in Cambridge. In the medium to long term the route's importance will increase as significant housing growth is planned in St Neots, Cambourne and Bourn Airfield – coupled with employment growth in Cambridge itself. The housing and employment growth will therefore contribute to significant additional travel demand along the route, particularly for shorter distance local trips.

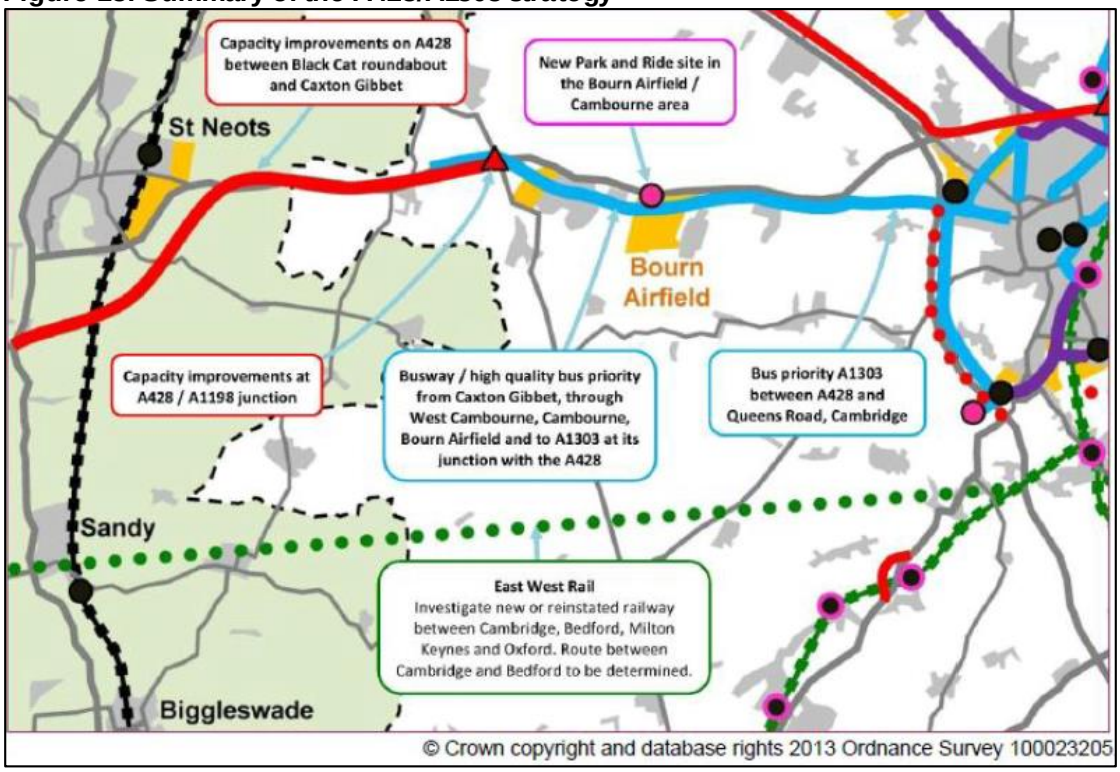
The A1303 Madingley Road, in particular, is seen as a key radial route into the centre of Cambridge and also a significant employment / research destination in its own right. The TSCSC notes that a major impediment to the reliability of, and the further increase in usage of, bus services within and into Cambridge is the delay experienced by buses due to congestion caused by general vehicular traffic in the city. With the growth that is planned for the city, this impediment must be removed if the bus network is to become the mode of choice for many more journeys. A step change in the quality, availability and reliability of bus services within the city is needed. To achieve this, comprehensive bus priority is required over time on main routes used by buses, including Madingley Road.

[24] (Policies TSCSC 2: Catering for travel demand in Cambridge and TSCSC 3: Catering for travel demand in South Cambridgeshire)

In relation to the A428/A1303 the TSCSC proposes (Figure 13):

- Providing bus priority in locations where services currently get caught up in congestion, in particular between the A1303 and A428 (covered by this scheme), and also around the A428 / A1198 Caxton Gibbet roundabout (covered by a HE scheme);
- Interchange at strategic points along the route to enable trips that begin in some of the villages off the route to be able to access HQPT services;
- A cycling and walking network which links into the interchanges along the route, but that also connects the outlying villages to employment sites, such as at Cambourne and also to secondary schools in Comberton, Cambourne and further afield in Gamlingay; and
- Busway or HQPT bus infrastructure along the A1303 section of the route to completely segregate buses from other traffic, servicing a second Park & Ride site between Cambourne and the A1303, which will intercept traffic further out from Cambridge and free up more capacity at the existing Madingley Road site which would then be used principally for traffic coming off the M11.

Figure 13: Summary of the A428/A1303 strategy



Source: TSCSC

With reference to the A428, **Policy TSCSC 21**: Planning obligations for Bourn Airfield and West Cambourne' indicates consideration of the following:

- Segregated bus links between the A428 and the M11;
- A1303 / A428 outer Park & Ride capacity;
- Direct, segregated high quality pedestrian/cycle links to west Cambridge, Papworth Everard, Highfields, Hardwick, Caxton, Bourn, Caldecote, Comberton, Bar Hill and Dry Drayton;
- Any mitigation measures needed at the junctions of the A428 with the A1303 and A1198;
- Delivery of funding of any measures required to mitigate the traffic impact of the developments on Bourn, Caldecote, Toft, Comberton and Barton; and,

- A smarter choices package including residential school and workplace travel planning for a busway between West Cambourne and the junction of the A1303 and A428.

Other key related policies highlight a number of requirements for PT, Walking and Cycling:

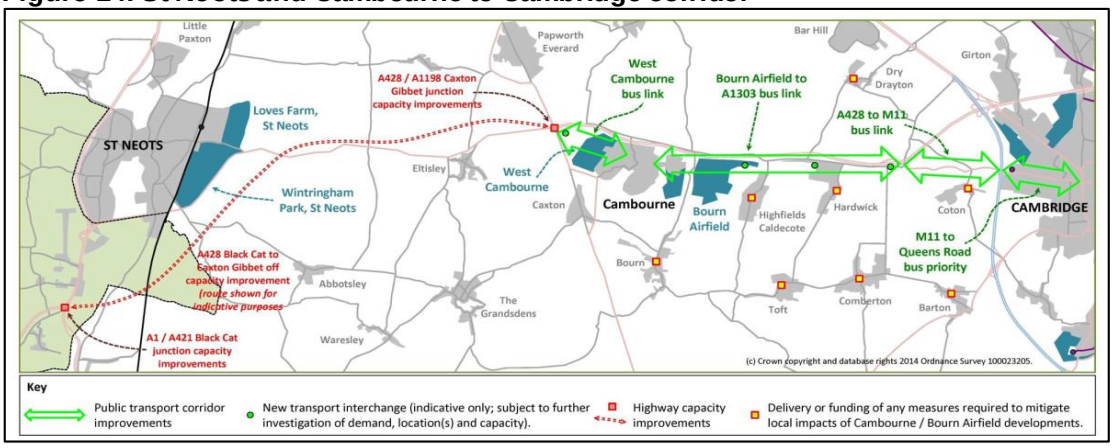
- **Policy TSCSC 1:** The strategy approach notes that 'The backbone of the strategy will be a HGPT network of bus, guided bus and rail services, fed and complemented by comprehensive pedestrian and cycle networks. Highways capacity enhancements will ensure that traffic can move efficiently in appropriate locations without interfering with passenger transport corridors.'
- **Policy TSCSC 8:** Improving bus services notes that 'The County Council will work with partners and passenger transport operators to develop an improved and integrated network of HQPT.'
- **Policy TSCSC 9:** Access to jobs and services notes that the transport network needs to be efficient and effective with HQPT and cycle network routes near major employment, education and service centres.
- **Policy TSCSC 12:** Encouraging cycling and walking makes a number of suggestions to improve capacity and also notes that where feasible, pedestrian and cycle facilities will be provided alongside HQPT and new road infrastructure (citing the Busway facilities as a standard example).
- **Policy TSCSC 15:** Managing travel demand highlights that measures for managing demand could include reallocation of road space to be used by passenger transport, pedestrians and cyclists.

4.3.4 Cambridgeshire Long Term Transport Strategy – July 2015

The Cambridgeshire Long Term Transport Strategy (LTTS) identifies the major infrastructure requirements that are needed to address existing problems and capacity constraints on Cambridgeshire's transport network, and the further infrastructure that is required to cater for the transport demand associated with planned growth.

One of the highlights of the LTTS is the implementation of bus priority measures on the A428 and proposals for additional park & ride capacity. These are illustrated in Figure 14. The key objectives set out are to improve overall accessibility on the SRN address key barriers and capacity constraints. These priorities are vital improvements in order to facilitate growth and continued economic prosperity. City Deal Funding will be used to deliver the strategy, bringing infrastructure that's necessary to support housing and jobs growth in and around Cambridge, notably on the Cambourne to Cambridge Corridor.

Figure 14: St Neots and Cambourne to Cambridge corridor



5 Strategic Economic Case

This section provides an overview of the strategic economic context for the C2C project, in terms of current economic performance, drivers of change and the scale of growth anticipated within Cambridge and the sub-region over the next 20 years and beyond. Infrastructure investment, such as the C2C project, will be critical if Greater Cambridge and the wider area is to continue this growth trajectory.

Note this section draws on the full strategic economic narrative of how the scheme supports economic growth within Greater Cambridge that is presented within an accompanying standalone report (Appendix J – Strategic Economic Narrative Report) which has informed both the Strategic and Economic Cases of this OBC.

The synopsis of this section then draws out the key strategic problems and issues that the scheme is directly contributing towards, namely the provision of infrastructure to support these growth ambitions by linking housing and employment growth areas more closely.

5.1 The Greater Cambridge economy and the 'Cambridge Phenomenon'

Greater Cambridge[25] has grown into a highly successful city region where economic success, high quality of life and quality of place are inextricably linked. The thriving hi-tech and biotech industry, which has developed since the 1960s and is known as the "Cambridge Phenomenon", accounts for 23.9% of employment[26].

Cambridge is one of the UK's fastest-growing and most productive cities; between 2009-2017 total jobs growth in Greater Cambridge was 21.4% (in absolute terms) compared to 13.8% regionally and 11.7% nationally[27]. Over 2016-17 Cambridge ranked third highest out of all of the UK's cities for net private sector jobs growth (5.7%), with a net increase of 3,500 private sector jobs[28].

The city embodies the key foundations of the national Industrial Strategy[29] for the UK to become the world's most innovative economy. Cambridge helps the UK to compete globally, attracting high value jobs and net economic growth through internationally mobile employees in knowledge-based industries.

UoC attracts global talent, fosters innovation and encourages business spin-outs. Cambridge has been at the forefront of the development of disruptive technologies, ranging from drug modelling, DNA sequencing and alternative fuels to network computing, inkjet printing, low power semiconductors, speech recognition software and telecommunications.

Today, the Cambridge sub-region is home to world-leading life sciences research centres such as the Medical Research Council Laboratory for Molecular Biology, the Babraham Institute for

[25] Defined here to include Cambridge and South Cambridgeshire local authorities, in line with the Greater Cambridge Partnership (GCP).

[26] Based on high tech manufacturing and service-related activities within the high-tech and biotech industries. Definition, using Standard Industrial Classification (SIC) codes, encompasses manufacture of pharmaceuticals, computer, electrical & optical equipment, electrical equipment and other specialist manufacturing (air & space craft and medical and dental instruments) and telecoms, computer related activities and relevant professional services (i.e. excludes financial and legal services and real estate) and. A full definition is included in Appendix A. Data from Business Register Employment Survey (BRES), Office of National Statistics (ONS), 2017 and relates to Greater Cambridge (Cambridge and South Cambridgeshire).

[27] Refers to employees using BRES, ONS, 2009-17 and relates to Cambridge district.

[28] Cities Outlook 2019, Centre for Cities, 2019

[29] Industrial Strategy: Building a Britain fit for the future, HM Government, November 2017

immunology research, and the Wellcome Trust Sanger Institute for genomic research. This year the new Papworth Hospital opened at the Biomedical Campus, uniting this internationally-recognised heart and lung treatment institution with other world-leading healthcare organisations.

UoC also has huge expansion plans along the Cambourne to Cambridge corridor, including at North West Cambridge and West Cambridge, whilst Cambridge Science Park is one of Europe's largest centres for commercial research and development.

This entrepreneurial environment and concentration of people focused on science and engineering is attracting international businesses to invest in the area. Cambridge has transformed from a city characterised by a high rate of start-ups to a city which major companies class worthy of housing headquarters. More than 25 of the world's largest corporations have established operations in Cambridge, including Amazon, Apple, HP, Illumina, Microsoft, Sanofi, Siemens and Qualcomm. AstraZeneca has chosen Cambridge for its global research headquarters for 2,000 staff.

Understanding Cambridge's success

- The Greater Cambridge City Deal attributes Greater Cambridge's economic success largely due to:
  - A world class university that draws talent from across the globe, fostering innovation and encouraging new businesses;
  - The area's scale and connectedness allow clusters of overlapping networks to develop and facilitates a culture of co-operation and cross-fertilisation between entrepreneurs and academics; and,
  - Retaining a strong heritage and sense of place, thereby competing with other world cities as a good place for business leaders and their families to live, not just a good place to do business.

Examination of key performance indicators, as shown in Table 5 below, clearly demonstrates that the Greater Cambridge economy, when compared to the UK and a range of other benchmark locations that are growing rapidly and fuelling national growth (Oxford, London and Manchester), is:

- Highly productive with productivity levels (measured by GVA per worker[30]) exceeding the UK national average by £5,700, driven by a very high proportion of employment within knowledge intensive sectors, at 23.9% compared to 9.8% nationally. This reflects the importance of the knowledge and innovation economy, particularly the life sciences cluster, which is vital to the UK's life sciences sector at large (see the box below on Astra Zeneca).
- This economic success and productivity is underpinned by the very high level of skills of the workforce. Cambridge has very high levels of its population educated to degree level or above (NVQ4+) at 58.1% compared to 38.4% nationally. Furthermore, this does not just

[30] Productivity tends to be measured by output per employee. At a sub-national level by ONS this is based on Gross Value Added (GVA) per productivity job. Overall when estimating using ONS data (note that GVA per worker is not available below NUTS3 area, in this case Cambridgeshire) the level for Greater Cambridge is largely in line with the national figure as productivity level for Cambridge are comparatively low. Given the structure of the Cambridge economy it is highly likely that GVA per worker is in fact higher and underestimated. The ONS data does not exist to interrogate this further and it is suspected that whilst education and health are clearly part of the life sciences cluster there are probably ancillary services which dampen down the overall figure. This working assumption is also further confirmed by workplace wages (given GVA is essentially wages plus profit) which are substantially higher than the UK levels and demonstrate the highly productive jobs that are present within the economy. Given this the figures presented for Cambridge, South Cambridgeshire and Greater Cambridge, are based on the East of England Forecasting Model (EEFM) 2013 figures adjusted for inflation.

represent recent graduates (within the age cohort 16-24) from the University but is also embedded within the workforce aged over 24.

- Greater Cambridge is home to a high proportion of highly skilled non-UK born migrants. 21.7% of Greater Cambridge's residents were born outside of the UK, compared to 15.7% nationally. Of its non-UK born population, 57% are qualified to degree level or above, which is significantly higher than the national average and exceeding the proportion seen in Manchester, Oxford and London.
- Cambridge's economic success is putting pressure on its housing market. Like Oxford and London, Greater Cambridge experiences high house prices with an average house price of £503,182 in Cambridge and £407,156 in South Cambridgeshire in 2018, against a national average of just £295,284. Nationally, this places house prices in Cambridge in the 1st decile and South Cambridgeshire in the 2nd decile, when ranked against all local authorities across England.
- Demonstrating its high levels of innovation, and as cited in the Centre for Cities' Cities Outlook 2019, Cambridge had the highest number of patents published per resident in 2017[31] at 270 per 100,000 population compared to 113 in Coventry and only 94 in Oxford (the closest contenders).

Table 5: Performance indicators

Indicator	Cambridge	South Cambs	Greater Cambridge	London	Oxford	Manchester	UK
Headline statistics							
Population, 2017	124,900	156,700	281,600	8,825,000	154,600	545,500	66,040,200
Employment, 2017	103,000	84,000	187,000	5,134,000	118,000	386,000	29,550,000[1]
GVA, £million, 2017	£5,900	£5,200	£11,100	£431,200	£6,800	£19,700	£1,819,800
Population density (persons per hectare), 2017	30.7	1.7	3.0	56.1	33.9	47.2	2.7
Productivity and innovation							
GVA per worker, £, 2017[1]	£52,700*	£69,400*	£60,000*	£77,125	£52,400	£48,200	£54,300
GVA per head, £, 2017	£47,200	£33,300	£39,500	£48,900	£44,000	£36,100	£27,600
Wages - workplace, mean	£39,600	£41,700	-	£50,300	£36,800	£34,800	£35,400
% employed in knowledge intensive sectors[3], 2017	17.3%	32.1%	23.9%	13.0%	8.8%	9.8%	9.8%
Patent applications per 100,000 of population, 2017	270	n/a	n/a	22	94	10	9
Skills							
% population aged 16-64 qualified to NVQ4+, 2017	58.1%	55.1%	56.6%	51.8%	63.0%	39.9%	38.4%
% population aged 16-24 qualified to NVQ4+, 2017	46.6%	19.5%	35.5%	26.6%	31.7%	22.4%	18.7%
% population aged 25-64 qualified to NVQ4+, 2017	61.3%	61.1%	61.2%	56.5%	67.4%	44.6%	42.5%
% of population non-UK born	32.2%	12.4%	21.7%	42.8%	31.7%	28.2%	15.7%[4]
% of population non-UK born with skills NVQ4+	57.2%	56.7%	57.0%	38.6%	51.0%	32.4%	34.8%[4]
Quality of life and living environment							
Mean house price paid, £, Year ending Sep 2018	£503,200	£407,200	n/a	£606,500	£504,300	£200,500	£295,300[4]
Wages - resident, mean	£40,200	£44,000	-	£47,000	£37,200	£29,300	£35,400

[31] Cities Outlook 2019, Centre for Cities, 2019

Source: Population Estimates, Annual Population Survey, Annual Survey of Hours and Earnings, Business Register and Employment Survey (BRES), Census 2011, Regional gross value added (balanced) local authorities by NUTS1 region 2017, Nominal regional gross value added (balanced) per head and income components 2017, Subregional productivity: labour productivity indices by UK NUTS2 and NUTS3 subregions, Mean house prices for administrative geographies (existing dwellings): House Price Statistics for Small Areas (HPSSA) dataset 14, all ONS. Patent data from Centre for Cities Data Tool, available at https://www.centreforcities.org/data-tool/#graph=map&city=show-all, PATSTAT; Intellectual Property Office. NVQ4+ refers to those educated to degree level or equivalent.

[1] Data not available for UK. Data shown is for Great Britain. * Cambridge figures taken from East of England Forecasting Model (EEFM 2017, accessible at https://cambridgeshireinsight.org.uk/eefm/).

[2] GVA per worker figures for London, Manchester and UK from dataset 'Subregional productivity: labour productivity indices by UK NUTS2 and NUTS3 subregions', ONS Regional and Subregional Productivity February 2019 release. GVA per worker figures for Cambridge, South Cambridgeshire and Oxford estimated based on scaling employee jobs data (from BRES) and Self-employment jobs (from the APS).

[3] See definition in Appendix A.

[4] Data for England only.

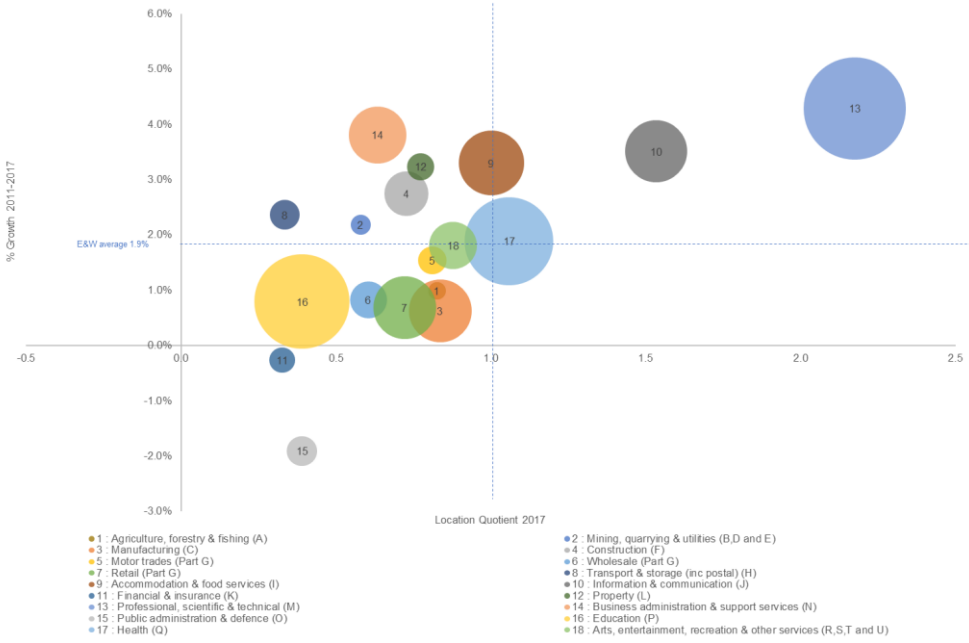
n/a Data not available.

Chart 1 explores the performance of the Cambridge economy in further detail by summarising the structure and relative strength of the Greater Cambridge economy by comparing:

- **Nationally growing sectors**, by examining average annual employee growth between 2010 and 2017 on the vertical axis for England & Wales (with the national economy average across all sectors being 2.0% per annum).
- **Degree of specialism**, by examining Location Quotients (LQs) by industry on the horizontal axis. The LQ is the ratio of the share of an industry in total employment in Greater Cambridge compared to the corresponding national share and thereby an LQ above 1 represents a degree of specialism or over-representation compared to the national economy.
- **Absolute sector size** by total employees represented in circle size.

Chart 1: Greater Cambridge - employees by sector, growth and specialism (compared to England & Wales)

Circle size represents total employment size. LQ is the employment concentration in relation to England and Wales (E&W) averages. The growth rate refers to the average annual growth rate for England and Wales over 2011-17 (the economy average was 1.9%).



Source: BRES, ONS, 2010-17

The following trends can be observed:

- Greater Cambridge's economy is structured towards high growth sectors, including health, professional, scientific & technical services and information and communication services, which are growing rapidly nationally and represent significant specialisms with LQs approaching or exceeding 2. The health sector is growing rapidly at a local level (albeit more modestly nationally), which is reflective of the world-leading research centres mentioned above located in the area.
- Other sectors growing at a national level are under-represented in Greater Cambridge yet still employ a sizeable proportion of the population including business administration & support services and accommodation & food services. These sectors are key to supporting both university activities and wider business activities within knowledge intensive sectors and therefore play an important role in the Greater Cambridge economy.
- Positively, there are no industries over-represented but declining at a national rate (bottom right quadrant) demonstrating the competitive nature of the economy in high value sectors.

5.2 Growth ambitions

As noted under the previous policy section there are significant growth ambitions within the sub-region including the following:

- The **CPCA's Devolution Deal**[32] , signed in March 2017, which aims to enable significant economic growth, building on Cambridgeshire and Peterborough economic success to date, increasing economic output by nearly 100% over 25 years with GVA increasing from £22 billion to more than £40 billion. To support this, the CPCA received control of a £600 million investment fund over 30 years. The Deal also aims to accelerate the delivery of 72,000 new homes by 2031 with £170 million investment, £70 million of which is ring-fenced for Cambridge over a period of five years to meet its housing needs.
- The **City Deal**[33], which was signed in June 2014 (three years prior to the Devolution Deal) and is the largest of the UK's City Deal programmes. The City Deal aims to enable the continued growth of the Cambridge Phenomenon through a new wave of innovation-led growth with investment in new homes, infrastructure and skills. The City Deal aims to accelerate the delivery of the 33,500 new homes allocated in Local Plans (see below) and support the creation of over 44,000 new jobs in the city region.
- At a more local level, housing and employment growth targets for Greater Cambridge are presented in the **Cambridge City Council** and **South Cambridgeshire District Council Local Plans**[34], both adopted in 2018. Over the planning period 2011-2031 the overall growth targets are for 44,100 jobs and 33,500 new homes across Greater Cambridge. It is anticipated, however, that these figures will be updated over the coming year. Both councils are committed to preparing a joint Local Plan for Greater Cambridge with an early review of the existing Local Plans commencing before the end of 2019 and a Local Plan submission to the Secretary of State for examination anticipated by the end of Summer 2022. This is reflective of a move toward Greater Cambridge adopting a joint approach to spatial planning and assessment of its housing needs.

[32] Cambridgeshire and Peterborough Combined Authority Devolution Deal, Ministry of Housing, Communities & Local Government and Department for Business, Energy & Industrial Strategy, March 2017

[33] Greater Cambridge City Deal, Deputy Prime Minister's Office, June 2014

[34] Cambridge Local Plan, Cambridge City Council, October 2018. South Cambridgeshire Local Plan, South Cambridgeshire District Council, Adopted September 2018

- The **Cambridge-Milton Keynes- Oxford Arc** also highlights Cambridge's contribution to the national economy and the need to maximise the growth potential of this arc by ensuring a joined up plan for jobs, homes and infrastructure to maximise the arc's economic potential. The National Infrastructure Commission (NIC) clearly identifies that the arc should be a national priority[35] given the talent and investment it already attracts and competes for with other locations across the globe.

A key report that is particularly significant when considering future growth ambitions is the Cambridgeshire and Peterborough Independent Economic Review[36], which is fully outlined below.

5.2.1 CPIER – long term growth potential[37]

Published in 2018, the Cambridgeshire and Peterborough Independent Economic Review (CPIER)[38] has developed an evidence base on the economic performance and growth potential of Cambridgeshire and Peterborough, which has included consideration of a range of different growth scenarios beyond those set out in the Local Plans. Undertaken by an independent economic commission, the purpose of the review was to create a single strategic position to help Cambridgeshire and Peterborough 'consider the case for greater fiscal devolution and powers to unlock the delivery of major infrastructure, including showing how the area delivers benefits to the rest of UK'[39].

The CPIER 2018 Final Report[40] is clear that not only has historical growth been underplayed but future growth could be much higher than the levels set out above. A central element of the Devolution Deal for the CPCA was the commitment to doubling the area's economic output (GVA) over the following 25 years (from £22bn to over £40bn) in return for new powers. Achieving this level of growth will depend largely on the economy of Greater Cambridge.

The CPIER report has examined what the future for the CPCA economy could be – termed the Cambridgeshire and Peterborough Futures. The work sets out a 'base case' which is what is expected to happen given current development in Cambridgeshire and Peterborough, taking account of proposals in local plans, produced by councils, and the build out of the remainder of the planned new settlements. In this way the 44,100 jobs reported above can be viewed as the relevant 'base case' for Greater Cambridge.

The commission sets out four scenarios for the future of the area to inform recommendations about how development will be carried out and what infrastructure is likely to be needed to position the area well in the future. This includes examining the options for densification, fringe growth, dispersal, transport corridors and deeper digital transformations.

The modelling carried out is driven by employment growth and as this grows so does the demand for housing and the pressure on the transport system. The model has been run by the CPIER for four scenarios:

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[35] Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc, National Infrastructure Commission, November 2017, page 20

[36] Cambridgeshire and Peterborough Independent Economic Review (CPIER) Final Report, Cambridge and Peterborough Independent Economic Commission, September 2018

[37] This sub-section refers and summarises the CPIER report as relevant to this study.

[38] Cambridgeshire and Peterborough Independent Economic Review (CPIER) Final Report, Cambridge and Peterborough Independent Economic Commission, September 2018

[39] See https://www.cpier.org.uk/about-us/cpier/ [Accessed 10 May 2019]

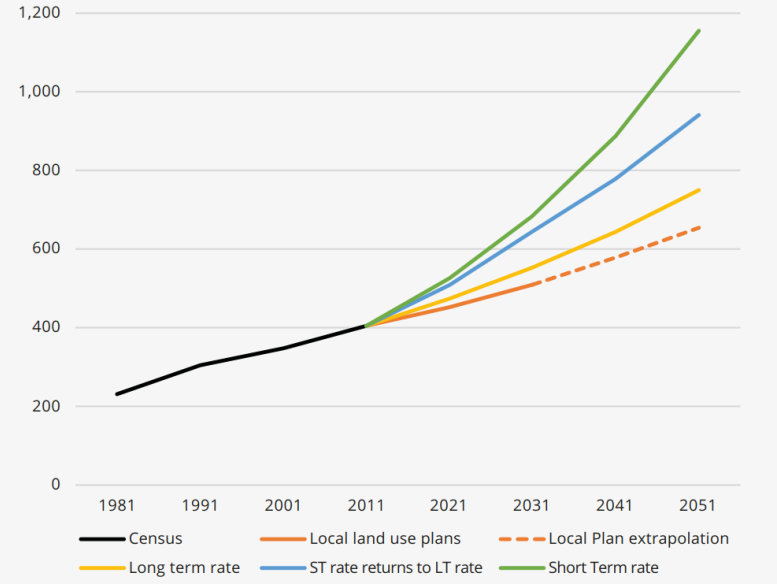
[40] Cambridgeshire and Peterborough Independent Economic Review (CPIER) Final Report, Cambridge and Peterborough Independent Economic Commission, September 2018

1. **Local land use plans** – capturing the assumptions around the employment targets underpinning the Local Plans. This can be considered a Business-as-Usual (BAU) scenario.
2. **Employment Growth** – Longer term rate. Based on a continuation of the 1981-2016 trend of employment growth (no weight given to recent high-levels of employment growth).
3. **Employment Growth** – Shorter term rate. Based on a continuation of the 2010-2015 employment growth trends according to recent CPIER data.
4. **Employment Growth** – shorter (ST) rate returning to longer term (LT) rate. Based on continuation of recent higher growth rates but then a gradual return to long term ONS growth rates. This projection is the commission's central projection of the four model runs.

The findings in relation to these scenarios are shown in Chart 2, taken directly from the CPIER report. Clearly, growth according to the employment projections from historical performance demonstrate that the growth within the Local Plans are very low and at the lower bound of the projections. Discrete figures for Greater Cambridge are not available, but this analysis indicates that the 44,100 jobs target within the Local Plans is perhaps inherently pessimistic and planning and transport policy needs to be actively planning for further growth. The 'central projection' of employment growth in the CPIER report (which continues at the shorter-term rate then returning to the longer term rate) sets out a future where employment increases to 900,000 by 2051 (blue line in Chart 2); this significantly exceeds a future projection based solely extrapolating on local plan ambitions (orange line in Chart 2) but is lower than the projection that assumes the recent high levels of employment growth continue throughout the period (green line in Chart 2).

Overall, the difference between the BAU scenario based on Local Plan extrapolation compared with the central projection is over 250,000 jobs by 2051, at the Combined Authority level.

Chart 2: Employment projections for Cambridgeshire and Peterborough – '000s of people



Source: Dr Ying Jin, Department of Architecture, University of Cambridge, extracted from Cambridgeshire and Peterborough Independent Economic Review (CPIER) Final Report, Cambridge and Peterborough Independent Economic Commission, September 2018

Understanding the future growth potential of Cambridge and South Cambridgeshire is important not just for the sub-region itself, but also due to its potential impacts nationally for the UK, i.e. the net additionality provided by future economic growth in Cambridge once displacement between locations has been accounted for.

Recognising that for some knowledge-intensive sectors Cambridge is the only viable cluster in the UK, the CPIER[41] highlights the net additionality impact of the area to the UK's economic output and its national importance. The CPIER report included results from a qualitative survey which demonstrated that if a knowledge intensive company is forced to move away from the sphere of clustering activity, of those respondents who said they would likely or certainly move activity outside of the area, 44% responded that they would move abroad, compared to just 25% who would stay in the UK. The CPIER recommends a 'Cambridge or overseas' approach:

> "The UK Government should adopt a 'Cambridge or overseas' mentality towards knowledge-intensive (KI) business in this area, recognising that in an era of international connectivity and footloose labour, many high-value companies will need to relocate abroad if this area no longer meets their needs. Ensuring that Cambridge continues to deliver for KI businesses should be considered a nationally strategic priority."
>
> Cambridge & Peterborough Independent Economic Review (CPIER), Final Report, September 2018

5.2.2 Cambridgeshire and Peterborough Local Industrial Strategy

The Local Industrial Strategy[42] sets out an evidence-based plan to support industry across the area in ensuring Cambridgeshire and Peterborough can enhance its position as a global leader in knowledge and innovation, particularly within life sciences, information and commination, creative and digital industries, clean tech, high-value engineering and agri-business. The foundation for the Local Industrial Strategy is the CPIER which set out a series of key recommendations that have been further reiterated and developed.

The three priorities for the Local Industrial Strategy include:

- Improving the long-term capacity for growth in Greater Cambridge by supporting the foundations of productivity. This will reduce the risk of any stalling in the long-term high growth rates that have been evidenced in the area over the last several decades. The focus will be on investing heavily in housing; supporting supply chain development; delivering transformational transport and infrastructure; whilst leveraging the strengths and better connecting the Cambridge cluster.
- Increase sustainability and broaden the base of local economic growth. This will be done by identifying opportunities for high growth companies to accelerate growth where there is greater absorptive capacity, addressing the current bottlenecks to growth in Greater Cambridge.
- Expand and build upon the clusters and networks that have enabled Cambridge to become a global leader in innovative growth. The strategy sets out how business leaders, sectors, and places will join together to build an economy-wide business support ecosystem. This eco-system will promote business growth; greater productivity; innovation commercialisation; greater global market access; and more effective skills development.

In terms of infrastructure, it was noted that the views of businesses surveyed and engaged in the development of place and sector strategies is that poor infrastructure is hampering growth and is set to increase as a problem over the next decade. 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. The report notes the importance of establishing in-principle the viability of CAM, which could support sustainable growth in and beyond Cambridge City.

[41] Cambridge & Peterborough Independent Economic Review (CPIER), Final Report, September 2018
[42] Cambridgeshire and Peterborough Local Industrial Strategy, HM Government, July 2019

5.2.3 The Cambridge-Milton Keynes-Oxford Arc

Cambridge's contribution to the national economy also comes to the fore in proposals for improving infrastructure and connectivity across the Cambridge-Milton Keynes-Oxford Arc, the aims of which are to maximise the potential of the arc as a connected, knowledge-intensive cluster that competes on a global stage[43]. For Cambridge, these proposals cite the city's strengths in electronics, digital tech and bioscience (see Section 4.2.2).

The National Infrastructure Commission's (NIC) report 'Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc' outlines the role of Cambridge, Milton Keynes and Oxford as amongst the UK's most productive cities, however highlights that these are currently diverse and disjointed economies, with the arc comprising a polycentric housing area and labour market. The NIC argues that a joined-up plan for jobs, homes and infrastructure is required to help achieve the arc's economic potential.

> "The success of the Cambridge-Milton Keynes-Oxford arc should be a national priority. The arc competes with locations across the globe, attracting talent and bringing investment into the UK. Its towns and cities are amongst the most economically productive outside London and make a vital contribution, both to national income and to national tax revenues.
>
> If the UK is to succeed in the global economy, it must invest in the success of the arc. This matters, not just for those who live and work in the arc, but for all parts of the UK."
>
> 'Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc', National Infrastructure Commission, November 2017, page 20

Significantly, the NIC argues that without action there is a real risk that a chronic undersupply of homes could limit growth, access to labour and the future prosperity of the arc. The report's central finding is that rates of house building must double in order for the arc to fully achieve its economic potential. The report also makes recommendations around new strategic infrastructure that will help bridge the gap between towns and cities in the arc, focusing in particular on a new East West Rail and the Oxford-Cambridge Expressway. This is of particular relevance for the C2C project as the St Neots and Cambourne - Cambridge corridor is part of the proposed alignment for the Oxford-Cambridge Expressway[44].

5.2.4 London-Stansted-Cambridge Corridor

The London-Stansted-Cambridge-Corridor (also known as the UK's Innovation Corridor) connects Peterborough and Cambridge to London, via the research centres of Hertfordshire and Essex, and the international airport at Stansted[45]. The Corridor shares a set of fast growing and highly productive industries supported by a global centre for business and financial services, which are underpinned by a shared housing market, labour market and infrastructure system. This area has the potential to generate 400,000 new jobs, half of which would be in technological jobs, by 2036[46]. This Corridor plays a significant role in the growth of the Life Sciences sector across the wider region

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[43] 'Partnering for Prosperity: a new deal for the Cambridge-Milton Keynes-Oxford Arc', National Infrastructure Commission, November 2017

[44] Greater Cambridge CaMKOx Firsts/last Mile Strategy, GCP, September 2017

[45] Encompassing 15 local authority areas of London Boroughs of Enfield, Hackney, Haringley, Islington, Redbridge and Waltham Forest, Cambridge City and South Cambridgeshire, Peterborough City, Broxbourne, East Herts, Stevenage, Epping Forest, Harlow and Uttlesford.

[46] Findings and Recommendations of the London Stansted Cambridge Corridor Growth Commission, The Next Global Knowledge Region: Setting the Ambitions and Delivering the Vision, London Stansted Cambridge Corridor (LSCC) Growth Commission, July 2016.

The London Stansted Cambridge Consortium (LSCC) was formed in June 2013 as a strategic partnership of public and private organisations and has a 20 year ambition to ensure the corridor becomes a competitive global tech and life sciences region. This includes priorities to ensure new powers and financial vehicles, provide place-making for tech and life sciences, building talent and ensuring everyone can benefit, ensuring London Stanstead Airport acts as a dynamic driver of growth and deepening the partnership with London.

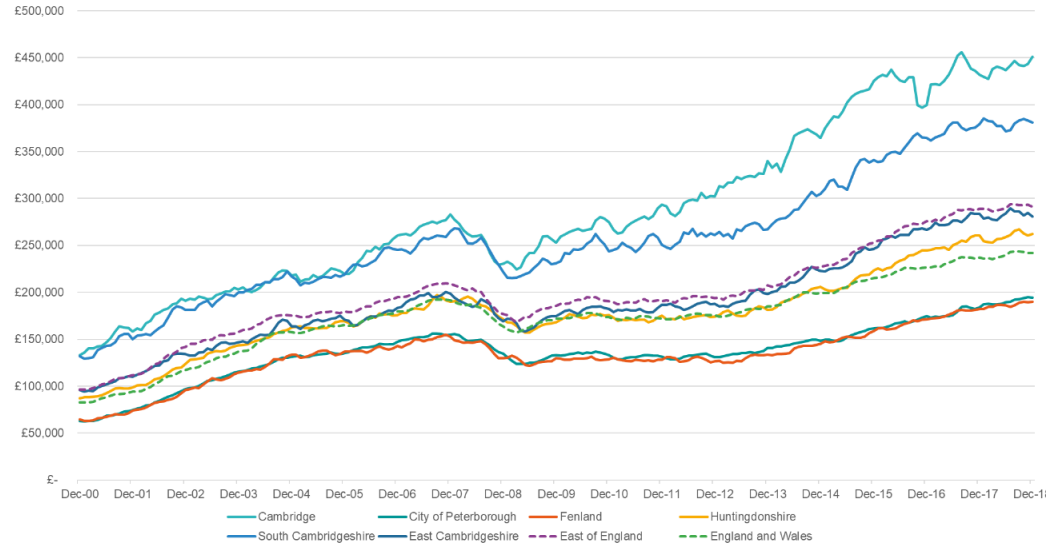
5.3 Constraints to growth

Whilst Cambridge's success brings benefits for the national economy, businesses based in and around the city, and the people that choose to live and work there, it also brings with it challenges and constraints to further growth. As evidenced in the CPIER housing supply and house price affordability is a key challenge for Cambridge which is well-documented in both local and national literature. Transport connectivity and high levels of congestion also pose a threat to further growth. The key challenges surrounding housing and transport, and how the proposed C2C project aims to help address these constraints to growth, are described in more detail below.

5.3.1 Housing

Whilst Cambridge is seen as good place to do business and a good place for business leaders and their families to live[47], one of the challenges associated with these high levels of growth is focused on housing. Housing in and around the city has become less affordable as demand outstrips supply. House prices in Cambridge are also amongst the highest in the UK, with a mean price paid of over £500,000 in the year to September 2018[48], which is more than two thirds more than the national average[49] of £295,284. Both Cambridge and South Cambridgeshire have experienced significant growth post-recession and the house price gap continues to widen when compared to surrounding districts and national averages.

Chart 3: Average house prices, 2000-2018



Source: Average price of all property types, UK House Price Index, December 2000-December 2018.

[47] City Deal, Greater Cambridge City Deal Document, 2014

[48] Mean house prices for administrative geographies (existing dwellings): HPSSA dataset 14, ONS, 2019.

[49] For England and Wales.

As such, house prices are over 10 times average workplace wages, and house purchase in Cambridge itself is increasingly unattainable for first time buyers despite the strong employment opportunities. When compared to other UK cities, Cambridge experienced the third highest housing affordability ratio in 2018[50]. This is driving the demand for housing outside Cambridge in locations such as Cambourne and St Neots, and consequentially traffic growth on the A428/A1303 route (see Section 5.3.2 below for a wider discussion of traffic and transport issues and their potential impact on Cambridge's growth). The housing pressures are likely to be acutely felt in the attraction and retention of highly skilled and qualified graduates at the onset of their careers, where the wages to house prices will be higher.

High prices in Greater Cambridge are driven by the city's economic success and high wage high skill economy (demand driven) as well as constraints on housing supply due to the city's tightly defined local authority boundaries and greenbelt. As a result, Cambridge has experienced some of the fastest housing price growth in England and Wales over the last decade.

Coupled with the city's high employment growth, as Cambridge's high house prices drive the demand for housing beyond the city's boundaries this in turn impacts on transport infrastructure and levels of community. The CPIER interim report[51] outlined the potential impact of increasing employment numbers on commuting:

> "If employment grows at the rates envisaged by the local plans, by 2031 there will be 32% more in-commuters in 2031 than in 2011. However, if employment growth continues at recent high rates, this could be as much as 82%."
>
> Cambridge & Peterborough Independent Economic Review (CPIER), Interim Report, May 2018

The CPIER highlights a risk to Cambridge's future growth whereby if house prices and rents increase in some areas, and heavier commuting leads to extra delays, the wages demanded by workers to compensate for these difficulties would increase in such areas[52]. The work done by CPIER suggests that this would be particularly acute in Greater Cambridge and that the area would be unable to maintain its present growth given current infrastructure and housing plans, and that growth will tail off as house prices, office rents and congestion make the area too costly a place to live and do business[53].

Importantly, CPIER recognises that the Local Plans are very proactive in planning for growth and that the constraints on growth are really the result of such unusually high levels of local growth. This will also put a strain on the CPCA's target of nearly doubling GVA since Greater Cambridge, as the largest economy, could start to falter in the foreseeable future. This reinforces how important investing in the infrastructure of Greater Cambridge, as the main economic driver, of the CPCA area is.

Greater Cambridge is already responding to challenges regarding its housing supply. Cambridge recorded the highest growth in its housing stock out of all UK cities, with a 2.3% increase in housing stock between 2016-17; Cambridge now has 10% more houses than it did five years previously[54].

[50] Cities Outlook 2019, Centre for Cities, 2019
[51] Cambridge & Peterborough Independent Economic Review (CPIER), Interim Report, May 2018
[52] Cambridge & Peterborough Independent Economic Review (CPIER), Interim Report, May 2018
[53] Cambridge & Peterborough Independent Economic Review (CPIER), Final Report, September 2018
[54] Cities Outlook 2019, Centre for Cities, 2019

5.3.2 Transport

It is not just in its housing supply and affordability, however, that Cambridge is facing challenges which threaten to undermine further growth. As demonstrated above, for example, through reference to work done by the CPIER, housing supply and affordability can in turn influence use of and requirement for transport infrastructure.

Transport infrastructure is a fundamental enabler of supporting the additional housing and jobs growth required to support the wider growth ambition of Greater Cambridge and its partners. Both current and emerging transport policies set out in Cambridgeshire[55] and the CPCA's non-statutory Spatial Framework[56], firmly establish the role of high-quality public transport corridors in providing the required sustainable transport capacity and connectivity to support growth. By comparison, additional growth in the use of the private car is highly unlikely to support the same growth as:

- Little existing capacity exists on the current network, and any additional capacity would be used to promote the de-clustering of the economy. Such de-clustering would manifest itself through both lower densities reducing spatial proximity of businesses and workers, including the need for parking provision, but also through increased congestion reducing connectivity; and,
- It will lead to adverse impacts on residents and workers quality of life through significant disbenefits on the townscape, landscape, natural environment (including local air quality and global greenhouse gas emissions), and society through increased severance effects.

Rather than enabling growth, however, aspects of Greater Cambridge's existing transport infrastructure are currently acting as a barrier to the future growth of the city (see Section 6 for detail examples of existing transport issues within Cambridge and along the A428/A1303 that are acting as constraints to growth). Whilst Cambridge is well-served by connections to the strategic highway network and bus and rail services, many of its roads suffer from high levels of congestion, particularly at peak times. Cambridge's city centre streets, many of which are narrow and/or pedestrianised, and the historical buildings which line them, contribute to this challenge. It is not just the city centre though which suffers from high levels of congestion. Cambridgeshire's third Local Transport Plan (2011-2031) highlighted the challenge of congestion along the main corridors into Cambridge and on the inner radial routes, which it argued is already having a detrimental effect on businesses in the area[57]. The importance of addressing the first/last mile problem (the first part and last part of a trip) along the main corridors into and out of Cambridge to supporting the city's economic growth should not be underestimated as this is often seen as a barrier to public transport which does not serve these elements of trips as well as cars.

Routes into Cambridge have been mapped into seven radial corridors which connect Cambridge to its surrounding towns and villages in South Cambridgeshire[58]. The GCP describes Cambridge's orientation 'like a hub and spoke network'[59], with the city of Cambridge as the hub and the seven corridors as the spokes (Figure 15). The proposed C2C project falls within the Cambridge to Cambourne and St Neots corridor to the west, which follows the A428 up to the A1.

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[55] For example, Draft CPLTP, Steer for Cambridgeshire and Peterborough Combined Authority, May 2019; Cambridgeshire Local Transport Plan 2011-2031, Policies and Strategy, Cambridgeshire County Council, July 2015 and Cambridgeshire Local Transport Plan 2011-2031, Long Term Transport Strategy, Cambridgeshire County Council, July 2015

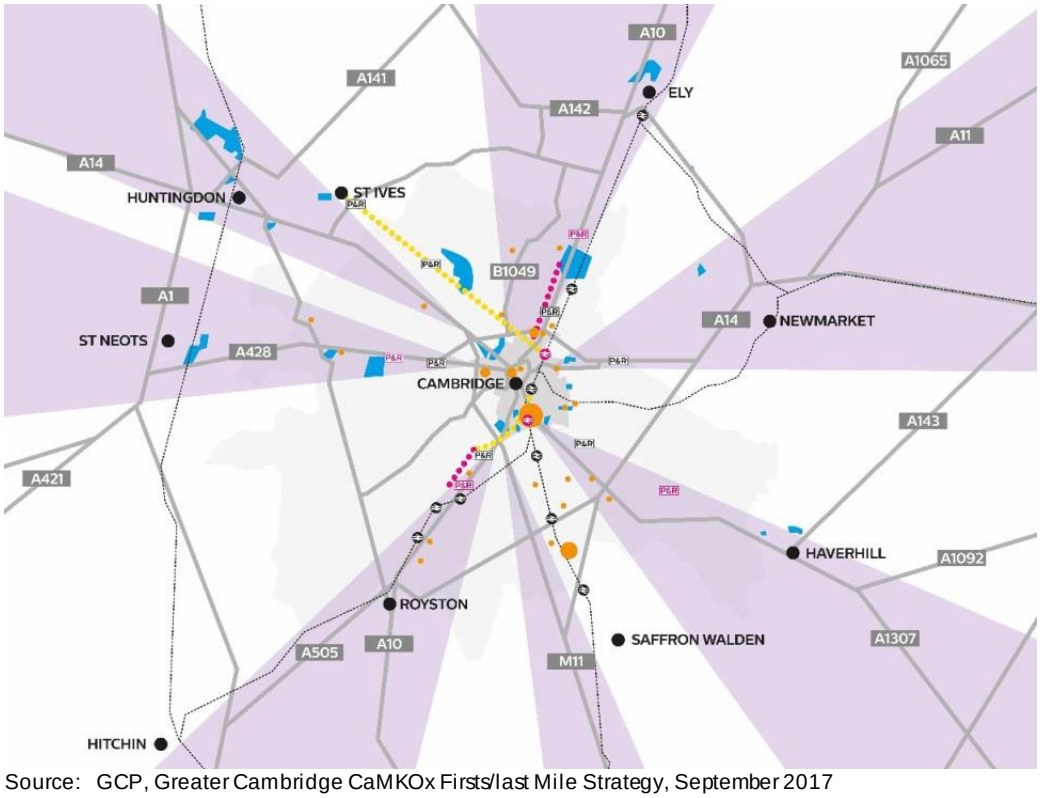
[56] Cambridgeshire and Peterborough Strategy Spatial Framework (Non-Statutory): Towards a sustainable growth strategy to 2050, Phase 1, 2018

[57] Cambridgeshire Local Transport Plan 2011-2031, Policies and Strategy, Cambridgeshire County Council, July 2015

[58] Cambridgeshire County Council, Transport Strategy for Cambridge and South Cambridgeshire, March 2014

[59] GCP, Greater Cambridge CaMKOx Firsts/last Mile Strategy, September 2017

Figure 15: Greater Cambridge seven radial corridors ('spokes' shown in purple)



Source: GCP, Greater Cambridge CaMKOx Firsts/last Mile Strategy, September 2017

The C2C project is identified in the draft CPLTP[60], which describes how the scheme will not only help to reduce current levels of traffic congestion but also how it supports regional objectives for new housing and development to accommodate Cambridge's growing population and workforce.

> "Along the A428/A1303 corridor, the Cambourne to Cambridge scheme being led by the Greater Cambridge Partnership will deliver a segregated public transport corridor from Cambourne, and future housing sites at Cambourne West and Bourn Airfield, to West Cambridge and other key employment sites and destinations. Similarly to Waterbeach, this will form a first phase of the CAM network, operated by high-quality electric vehicles, and will include a new Park & Ride site at Scotland Farm or Madingley Mulch. It will help to attract those who currently drive to public transport, and hence contribute towards reducing the impacts of traffic on local communities."
>
> Draft CPLTP, Steer for Cambridgeshire and Peterborough Combined Authority, May 2019

More details regarding the key housing and employment development sites along the Cambridge to Cambourne and St Neots / A428/A1303 corridor, and analysis of how and to what extent the C2C project will support the development of these sites, is provided below. Further detail on transport related issues contributing to the constraining of growth are presenting in Section 6.

[60] Draft CPLTP, Steer for Cambridgeshire and Peterborough Combined Authority, May 2019

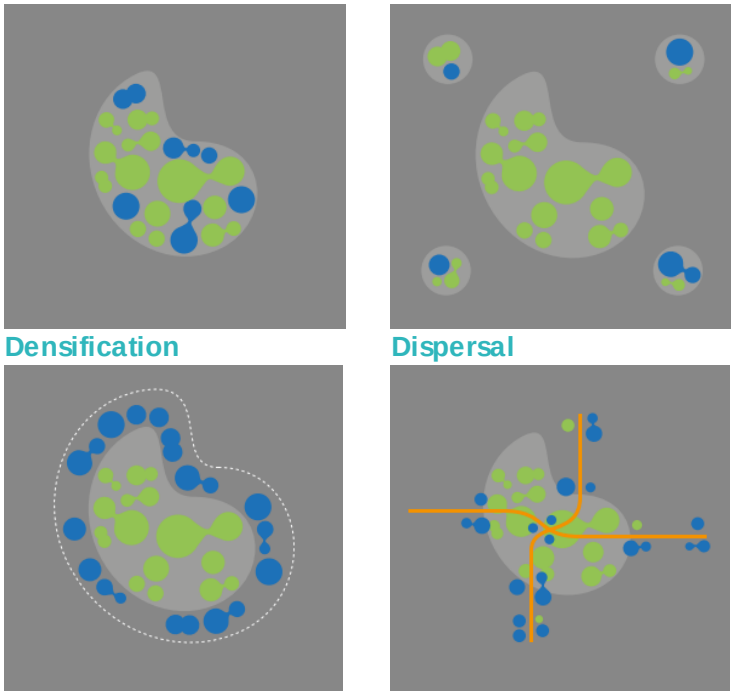
5.4 Spatial development

This section provides an overview of the major development plans within Greater Cambridge and the surrounding area, including those planned along the Cambourne to Cambridge corridor. Note the Strategic Economic Narrative Report (Appendix J) provides a more detailed review, especially in relation to those along the corridor which informs the assessment of the wider economic benefits. This begins by considering the overall spatial framework emerging for Cambridgeshire and Peterborough.

5.4.1 Cambridgeshire and Peterborough strategic spatial framework

To support the required level of future growth in Cambridgeshire and Peterborough the CPIER recommended that the CPCA should adopt a 'blended spatial strategy' which provides flexibility to ensure development meets the needs of residents, business and the environment[61]. In the Final Report, the CPIER set out four possible scenarios for development along with their respective advantages and disadvantages. The four possible scenarios are: densification, dispersal, fringe growth and transport corridors (Figure 16). The CPIER conclude that a dispersal strategy, whereby homes and businesses are relocated away from city centres is unlikely to be successful, but the three other options - densification, fringe growth, and transport corridors - all have potential benefits. In recommending a blended spatial strategy, the CPIER pose that these three strategies should be pursued to an extent, though none should be taken to its extreme.

Figure 16: CPIER Spatial Scenarios



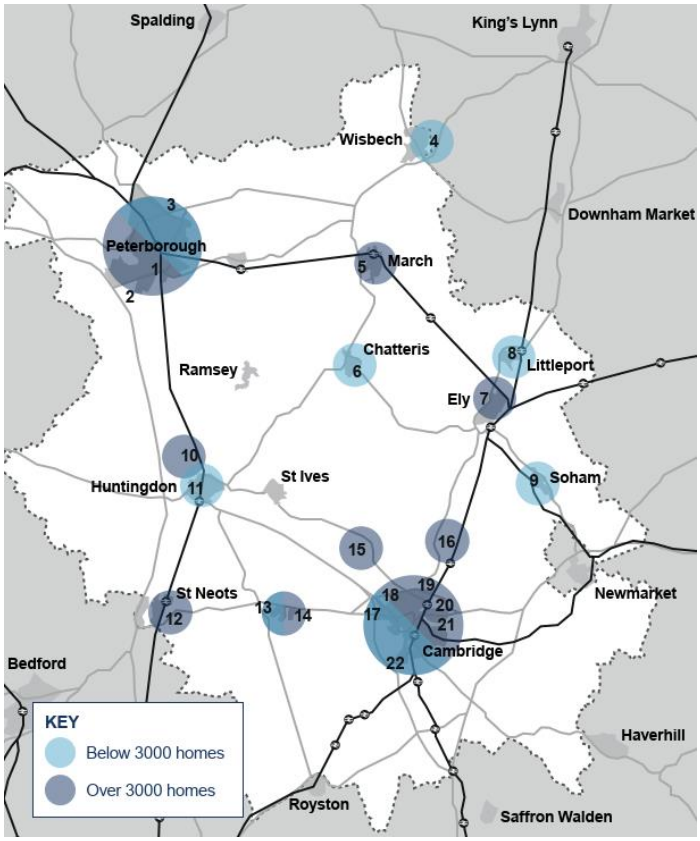
Source: Cambridgeshire and Peterborough Independent Economic Review (CPIER) Final Report, Cambridge and Peterborough Independent Economic Commission, September 2018

[61] Cambridgeshire and Peterborough Independent Economic Review (CPIER) Final Report, Cambridge and Peterborough Independent Economic Commission, September 2018

The CPCA has developed a non-statutory Strategic Spatial Framework for Cambridgeshire and Peterborough, which is divided into two phases. Phase 1 of the Framework, adopted in March 2018, defines the Authority's immediate priorities for sustainable growth to support the delivery of 100,000 new homes and over 90,000 jobs as set out in existing Combined Authority plans and Local Plans[62]. Phase 2 of the Framework, which is yet to be published, will take a longer-term view, setting out a growth strategy beyond the current Local Plan periods to 2031/36 and toward 2050.

The non-statutory Strategic Spatial Framework identifies 22 'strategic growth sites' which together will provide over 74,000 news homes for the CPCA area. This is a significant portion of the overall housing target for the CPCA, which highlights their important role in meeting the area's growth needs. Of particular relevance to this scheme, sites at Cambourne West and Bourn Airfield New Village, allocated in South Cambridgeshire's adopted Local Plan[63], are both identified as strategic growth sites for the entire CPCA area (see Site ID 13 and 14 on Figure 17). Other key sites include West Cambridge (see Site ID 17 on Figure) and North West Cambridge (see Site ID 18 on Figure 17) which are both fringe sites on the West along the Cambourne to Cambridge corridor. Continuing westwards along the Cambourne to Cambridge corridor, St Neots East, allocated in Huntingdonshire's draft Local Plan 2036[64], is also identified as a strategic growth site (see Site ID 12 on Figure 17) and also forms part of area covered by the Oxford to Cambridge Expressway.

Figure 17: Cambridgeshire and Peterborough Strategic Spatial Framework - strategic sites



Source: Cambridgeshire and Peterborough Strategy Spatial Framework (Non-Statutory): Towards a sustainable growth strategy to 2050, Phase 1, 2018

[62] Cambridgeshire and Peterborough Strategy Spatial Framework (Non-Statutory): Towards a sustainable growth strategy to 2050, Phase 1, 2018

[63] South Cambridgeshire Local Plan, South Cambridgeshire District Council, Adopted September 2018

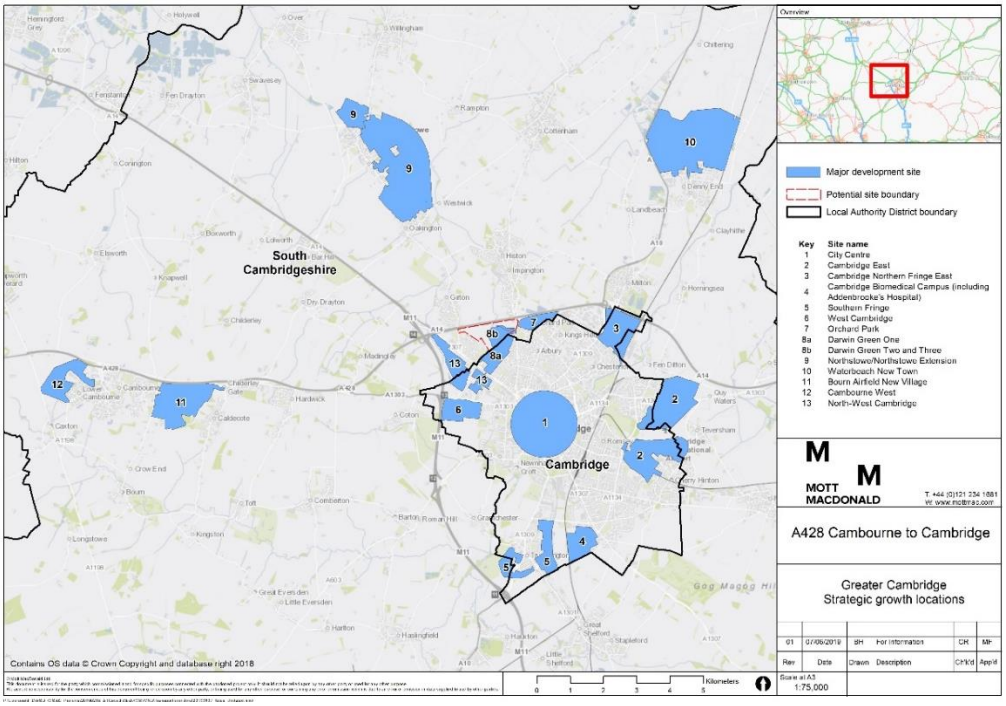
[64] Huntingdonshire's Local Plan to 2036, Huntingdonshire District Council, Adopted May 2019.

5.5 Greater Cambridge - strategic growth locations

The Local Plans for Cambridge and South Cambridgeshire were adopted in 2018. Both plans included the policy[65] to undertake an early review of the Local Plans to commence before the end of 2019 and with submission of a joint Greater Cambridge Local Plan to the Secretary of State for examination anticipated by the end of Summer 2022. This will include an updated assessment of housing needs and the progress being made towards implementing the spatial strategy for Greater Cambridge, in particular the new settlements at Waterbeach and Bourn Airfield. This will also follow the non-statutory spatial plan being developed for the wider area by CPCA (as outlined above).

The review of the existing spatial strategy is based on the current Local Plans and the employment and residential targets within the plans (33,500 homes and 44,100 jobs across both plans) which informed the GCCD targets of creating 44,000 new jobs and 33,500 new homes by 2031. Figure 18 below provides an overview of the spatial development pattern (which is accompanied by a detailed breakdown of the constituent sites within the accompanying Strategic Economic Narrative Report – Appendix J).

Figure 18: Greater Cambridge strategic growth locations



Source: Mott MacDonald

Overall, substantial levels of housing and employment development are planned across Greater Cambridge with a preferred sequential approach focused on the existing urban area of Cambridge, the defined fringe sites and the existing and newly identified settlement locations. In terms of the scheme, those directly relevant along the route include Cambourne West, Bourn Airfield, West Cambridge and North West Cambridge, however, the scheme will ultimately link housing with the city centre and other very significant fringe sites including the Biomedical Campus to the south and North East Cambridge to the North.

[65] Policy 9 within the Cambridge Local Plan, Cambridge City Council, October 2018 and Policy S/13 within the South Cambridgeshire Local Plan, South Cambridgeshire District Council, September 2018.

These key development areas and sites (excluding those along the Cambourne to Cambridge corridor) are summarised further below:

- City centre growth (Map ID 1): the city centre will be the primary focus for developments attracting a large number of people and for meeting retail, leisure, cultural and other needs appropriate to its role as a multi-functional regional centre. The scheme is clearly supportive of city centre growth since it will provide a fast and sustainable transport route from key areas of housing growth into the city centre thereby linking housing and employment sites. It will link the Western fringe sites more effectively to the other key cluster sites.
- Cambridge Northern Fringe East (CNFE) (Map ID 3): Within both local authority boundaries CNFE contains one of the last remaining substantial brownfield sites within the City and is a genuine opportunity to create a sustainable new City District, supporting future growth needs. The existing local plans placed no reliance on the development in this area in accommodating the current growth needs of Greater Cambridge (given the constraint of a Water Recycling Centre, which has now been removed). The strategic development planned for through the North East Cambridge Area Action Plan (AAP) will feed into the wider joint Greater Cambridge Local Plan but it is worth acknowledging that a Housing Infrastructure Fund (HIF) for the site references up to 7.600 new homes on the site[66].
- Cambridge Biomedical Campus (CBC) ((including Addenbrooke's Hospital) (Map ID 4): CBC combines world-class biomedical research, patient care and education on a single site. It is now undergoing major expansion that includes the co-location of companies alongside the existing healthcare professionals and research scientists and will drive growth to 2031 and beyond. By 2031 the area is expected to see 26,000 workers accessing the campus, with 25,100 patients and visitors also needing access. The Southern Fringe (Map ID 5) will also create attractive, well-integrated, accessible and sustainable new neighbourhoods and provide approximately 3,300 new homes.
- New settlements of Northstowe (Map ID 9) and Waterbeach (Map ID 10): Major new settlements which will provide approximately 10,000 and 8,000 to 9,000 dwellings respectively.
- St Neots East (within Huntingdonshire, Map ID 14): A 226 ha of land allocated for mixed use sustainable development in accordance with the St Neots Eastern Expansion Urban Design Framework 2010, including provision for approximately 3,800 homes.

The scale of development planned also demonstrates that there is a considerable amount of development in the pipeline post 2031, especially at the new settlements and major fringe sites, which demonstrates that the land capacity exists to continue supporting the growth of high-tech businesses and the Cambridge Cluster.

Both councils are committed to producing a joint Greater Cambridge Local Plan, with an early review of the current Cambridge and South Cambridgeshire Local Plans to begin before the end of 2019. This demonstrates that local planning policy needs to respond promptly to the levels of growth being experienced with the assessment of the objective housing need being a key component of the early review.

5.6 Key developments along Cambourne to Cambridge corridor

Clearly the C2C project will support the spatial plans of Greater Cambridge as a whole given the scale of jobs and housing that are likely to be accommodated within the city centre, the fringe sites and the new settlements, however, the scheme is likely to impact the most on those

[66] North East Cambridge Area Action Plan: Issues and Options 2019 consultation, Cambridge City Council and South Cambridgeshire District Council, March 2019

developments along the corridor. These have been reviewed in full in the accompanying Strategic Economic Narrative Report (Appendix J) and assessed for the level of dependency with the scheme. Each is summarised below:

Cambourne West (Map ID 12)

Following the Local Plan, which allocated the site as new sustainable village that would accommodate 1,200 dwellings by 2031, an outline planning permission was submitted for 2,350 homes on a larger site Cambourne West site (147 ha). This outline application for Cambourne West was approved by the Council's planning committee on 11th January 2017[67]. This approval was based on the argument that delivering the larger site would result in a more comprehensive and sustainable form of development than if the land to the west of the proposed Local Plan allocation were to be developed at a later date. It also ensured that SCDC could demonstrate it had a sufficient deliverable sites to deliver five years' worth of housing supply against the Local Plan requirement, as required by the government through the National Planning Policy Framework (NPPF). Although there is no Grampian Condition that prevented the start of the development until infrastructure works began the Section 106 agreement negotiated contributions towards the C2C project.

The Section 106 agreement for Cambourne West includes funding for the C2C project of "the sum of £8.7m to be used to fund improvements for highway infrastructure so as to improve links by bus between Cambourne and the City Centre of Cambridge"[68].

In addition to the proposed residential development and associated infrastructure included within the Cambourne West application there is also provision for up to 1.04ha of land for retail uses and up to 6.25ha of land for office/light industrial uses.

Bourn Airfield (Map ID 12)

Bourn Airfield is allocated in the adopted Local Plan for the development of a new village of approximately 3,500 homes and is a long term development opportunity, which will take place over the plan period, and beyond.

> "Bourn Airfield will be a distinct new South Cambridgeshire village acknowledging its historic past but with its own contemporary identity. A diverse, yet integrated community, with a range of facilities and services to complement, not compete with, existing local provision. Well connected to the wider area by high quality public transport and providing employment and homes to support the Greater Cambridge economy."
>
> Vision for the new village, Bourn Airfield New Village: A Spatial Framework & Infrastructure Delivery Plan, Supplementary Planning Document, Greater Cambridge Share Planning, Consultation Draft, June 2019

A Supplementary Planning Document (SPD) has been drafted for Bourn Airfield to guide the implementation of the new village[69]. A key strategic objective within the SPD for Bourn Airfield is that it must be a well connected place that facilitates sustainable movement within the site and to/from surrounding villages, shaped around a network of traffic-free active travel routes,

[67] The full planning application, reference S/2901/14/OL can be found at the following link: http://plan.scambs.gov.uk/swiftlg/apas/run/WPHAPPDETAIL.DisplayUrl?theApnID=S/2903/14/OL&theTabNo=3 [Accessed 02/07/2019].

[68] Section 106 Agreement dated 29 December 2017 – Full Document, Schedule 4: C Highway and Transport Matters, Section 2, p.45, Planning Application reference (S/2903/14/OL)

[69] Bourn Airfield New Village: A Spatial Framework & Infrastructure Delivery Plan, Supplementary Planning Document, Greater Cambridge Share Planning, Consultation Draft, June 2019.

integrated public transport, and delivering excellent connections along the A428 corridor to Cambridge and St. Neots via a high-quality public transport route (the C2C project).

The SPD also clearly states that the developer will make a contribution towards the C2C project within Fig. 55: Infrastructure Delivery Plan[70]. A contribution towards the scheme will be negotiated through a Section 106 agreement.

West Cambridge (Map ID 6)

The West Cambridge site is allocated in the Cambridge Local Plan adopted in October 2018 for uses related to UoC. Development has begun in accordance with an approved planning permission and supported by an agreed masterplan and development guidelines.

The overall site, which covers 66.5 hectares is seeking outline planning permission[71] for up to 383,300m² of development including 370,000m² of academic floorspace (Class D1 space) and commercial/research institute floorspace (Class B1b and sui generis research uses), of which not more than 170,000m2 will be commercial floorspace (Class B1b).

The Section 106 negotiations are still ongoing but a contribution will be secured from UoC towards the C2C project[72].

North West Cambridge (Map ID 13)

The 150-hectare North West Cambridge development was granted outline planning consent[73] in 2013 for 1500 homes for University and College key workers, 1,500 homes for sale, accommodation for 2,000 post-graduate students, 100,000m² of research facilities (including 40,000m² for research institutes and private research facilities linked to the University), and a wide range of community facilities.

5.6.1 Economic growth supported – housing and jobs[74]

Based on a review of all relevant planning documents and applications, particularly supporting socio-economic chapters, the overall level of growth supported by these developments has been calculated. This refers to the total number of residential units planned up to 2031 and post 2031 as well as the total level of gross jobs[75] across business uses that will be created on site once these developments are fully complete. By business uses this means jobs created within B1 and D1 uses only, i.e. office and academic jobs, and excludes retail and ancillary uses, given these are not strategically planned for and drive economic growth. It also looks at major sites only and does not take account of any windfall development along the corridor.

Overall based on current plans, both those within the current Local Plan or well established through planning applications or known to be emerging, there is around **11,700 of additional housing** planned and development is estimated to support **13,400 additional jobs along the Cambourne to Cambridge corridor**. These jobs assuming an average GVA per worker figure of £61,800 per worker[76] would generate approximately £827.5m of GVA per annum. This is a very significant level of development with around 50% of all housing planned (c. 6,000 houses)

[70] Ibid, p. 74, Fig 55.

[71] Planning application (16/1134/OUT), received 16/06/2016.

[72] Further information can be found within the Financial Case.

[73] Planning application reference S/1886/11, submitted in September 2011 and granted in February 2013.

[74] Note all key workings and assumptions are outlined in Table 6 within the accompanying Strategic Economic Narrative Report – Appendix J.

[75] Apart from West Cambridge where a high level of the academic jobs created on site will be displacement from those located elsewhere in the University campus once consolidated on the new development (estimated at 65% in the planning application).

[76] As referenced in Table 2: Performance Indicators and converted to 2019 figures using Consumer Price Index (CPI), ONS.

at the new settlements which will be directly linked to Cambridge city centre and other key employment locations via the C2C project.

5.7 Strategic economic benefits

Fundamentally, the C2C project will support economic growth by providing faster and more reliable journey times which will improve connectivity and accessibility. This will more closely link housing and employment growth areas. At the 'first phase' of CAM, the scheme will become part of a wider network that seamlessly connects the fringe growth areas to the West with central Cambridge and other key growth areas. This offers the potential for significant new housing development along the corridor given it will have high public transport accessibility to key employment areas in Greater Cambridge, and where the developments themselves can be developed to a higher-density and more sustainable manner. The key channels via which the scheme will impact on the economy are:

- **Improving labour market access and mobility:** The scheme will ensure that major growth sites, via a congestion free HQPT corridor, are connected to one another, enabling an adequate supply of labour to both the city centre and other major fringe sites. The scheme will ensure that the housing and employment planned at the new settlements at Bourn Airfield and Cambourne West, North West Cambridge and Cambridge West are effectively linked both between each other and with Cambridge city centre. It will also ensure, via onward connections at key interchanges, better linkages to other key fringe growth locations, particularly Cambridge Biomedical Campus and North East Cambridge. Ultimately this benefits both the workforce, who can access more opportunities, and employers, who can access a wider labour market.

  The scheme will also support the labour market by providing better connectivity and accessibility to education and training opportunities in Cambridge, which in the longer term will promote up-skilling.

- **Supporting business investment and long term economic growth:** The scheme will ensure efficient public transport access from the West to the city centre and other fringe sites for markets, suppliers and labour, which is essential for businesses. Better connectivity and capacity along the route will enhance investment prospects for the entire corridor and in particular will support the development at the new settlements and West Cambridge. This is likely to result in accelerated development along the corridor at the key growth sites. As the first phase of CAM, the scheme will also provide certainty and confidence to investors that over the longer term Cambridge is addressing its key growth constraints, namely the lack of housing and inadequate transport accessibility and capacity. This is linked closely to how the scheme also enhances the quality of life (see below) ensuring that the positive impact of Cambridge as a place to live, invest and do business is upheld – important attributes that have played a crucial role in the city's success to date.

  The CPIER report and spatial overview and the commitment to producing a new Joint Local Plan (with the review starting in 2019) demonstrates the high levels of demand that exist and development that is planned for Greater Cambridge, which has both the demand and quantum of employment land to drive regional growth. The scheme ensures that higher capacity (including the potential CAM upgrade) can be accommodated in the future and therefore represents an investment in longer term economic growth.

- **Supporting productivity growth through agglomeration**: The fringe sites and transport corridors for Cambridge will continue to become more dense, both in terms of employees and businesses. The scheme, by providing high public transport accessibility to the city

centre and other key employment sites for workers and other businesses, will support a higher density of development. This densification process is well underway within Greater Cambridge, especially within the city centre (for example CB1, the new city quarter) and at Cambridge Science Park which is planning to intensify uses substantially. Promotion of densification through 'dynamic clustering' (densification of land use) is proven to raise productivity through agglomeration economies. The second productivity impact – 'static clustering' – occurs as a result of the reduction in travel times and costs which the scheme will deliver, increasing the *effective* density of the area independent of changes in land use[77].

These core channels of economic impact will also have a number of knock-on impacts via promoting economic growth particularly in relation to:

- **Supporting inclusive economic growth:** The scheme potentially reduces social inequalities from the creation of employment opportunities and housing market improvements, particularly in relation to improving housing market affordability and providing access for those do not have a car available.
- **Quality of life impacts:** The scheme will help to prevent increased road traffic, reducing negative externalities such as local and global emissions, road traffic accidents, general road traffic congestion, noise, and severance. The scheme via reducing congestion will also ensure that the quality of life in Cambridge is not compromised, which is important to both existing and potential investors. These impacts are captured within the standard Level 1 impacts from the core transport modelling.

The economic impact assessment of the C2C project focuses on quantitatively assessing the level of benefits by examining the level of development and growth at those sites identified along the Cambourne to Cambridge corridor (Strategic Economic Narrative Report – Appendix J). The approach focuses on examining the potential jobs and GVA supported at the developments as well as the Land Value Uplift (LVU) impacts.

The two new settlements (Cambourne West and Bourn Airfield), in housing terms, are judged to be fully dependent upon the C2C project given the clear policy postilion within the local plan and Section 106 commitments and ongoing negotiations. Housing development is likely to come forward incrementally before the scheme but it is very clear the scheme is needed to facilitate sustainable development along the corridor. The employment dependency at new settlements is judged to be lower given it is largely in place to serve the developments and ensure they do not become dormitory towns whilst the employment site at Bourn Airfield is already established. Clearly, the C2C project will support all commercial development plans, especially those at West Cambridge, but the primary focus is to support housing development and support employment across Greater Cambridge's growth areas.

Overall the C2C project is anticipated to support, at a gross level:

- In the region of 975 jobs; and,
- £102.8m of GVA per annum for Greater Cambridge.

This is a very significant economic impact and over a 30 year time period[78] from 2019 the present value of benefits amounts to £1,075.9m (2019 value and 2019 prices).

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[77] See TAG Unit A2-4 for further detail on productivity impacts through agglomeration economies: https://www.gov.uk/government/publications/webtag-tag-unit-a2-4-productivity-impacts-may-2018

[78] A 30-year time horizon has been used with an average duration of GVA benefits of 13 years. Although commercial buildings would last longer than 30 years the new businesses locating within them (linked to the C2C project) are likely to move on sooner than this and therefore this time horizon is a reasonable assumption. An average discount rate of 3.5% has been used in line with HM Treasury Guidelines.

Within central government there has been a shift towards capturing economic benefits by calculating the LVU of an intervention, as set out in HM Treasury's Green Book and the TAG. Any increase in land value as a result of a change in its use reflects the economic benefits of conversion to a more productive use. This is the recommended approach for capturing the benefits of dependent development. In the case of the C2C project this is deemend appropriate given the fundamental aim of the scheme is to facilitate housing supply. Using this approach, the overall net LVU impact of the C2C project is estimated to be £458.0m (in 2019 values and 2019 prices), assuming a 30 year time period from 2019.

What does this mean for C2C?

- The Greater Cambridge economy is highly successful and outperforms national averages and other leading UK cities across a range of key socio-economic indicators. Its economic success is underpinned by the very high level of skills of the workforce, which include a high proportion of highly skilled non-UK born migrants.
- Greater Cambridge has been growing rapidly and will continue to do so in the future.
- Cambridge's economic success is putting pressure on its housing market. Like Oxford and London, Greater Cambridge experiences high house prices with an average house price of £503,182 in Cambridge and £407,156 in South Cambridgeshire in 2018, against a national average of just £295,284.
- Cambridge's transport infrastructure is also under pressure, with high levels of congestion in the city centre and on key corridors into and out of the city.
- The C2C project has been recognised in the Local Plans and local transport strategy as a key project to help address these infrastructure constraints on growth by linking Cambridge to growth areas to the west.
- Substantial levels of housing and employment development are planned across Greater Cambridge with a preferred sequential approach focused on the existing urban area of Cambridge, the defined fringe sites and the existing and newly identified settlement locations.
- In terms of the scheme, those directly relevant along the route include Cambourne West, Bourn Airfield, West Cambridge and North West Cambridge (Eddington), however, the scheme will ultimately link housing with other very significant fringe sites including the Biomedical Campus to the south and North East Cambridge to the North.
- Overall, based on a review of all relevant planning documents and applications, there is a substantial level of economic growth planned with approximately 8,400 dwellings and 13,300 jobs planned on those sites directly along the C2C corridor. These figures do not include the substantial levels of growth planned on the other major fringe sites and other strategic growth locations and also largely relate to growth planned up to 2031, i.e. do not consider future additional sites. Furthermore, a great deal of this growth, around 50% of the housing figure, is linked to the new settlements which will be directly linked to Cambridge city centre and other key employment locations via the C2C project.
- Fundamentally, the C2C project will support economic growth by providing faster and reliable journey times that will improve connectivity and accessibility and thereby link housing and employment growth areas more closely.
- Overall the C2C project is anticipated to support, at a gross level, in the range of 975 jobs, £102.8m of GVA per annum for Greater Cambridge, and over a 30 year time period present value of benefits amounting to £1.1bn (2019 value and 2019 prices).
- The LVU impact, which adjusts for displacement and wider effects emerging from the development, is £458.0m (in 2019 discounted values and 2019 prices).

6 Transport Issues and Opportunities

This section summarises issues and opportunities associated with the current transport network and traffic conditions along the A428/A1303. Issues and opportunities have been identified from a variety of sources such as local traffic data, congestion data and the Office of National Statistics (ONS).

6.1 How people travel

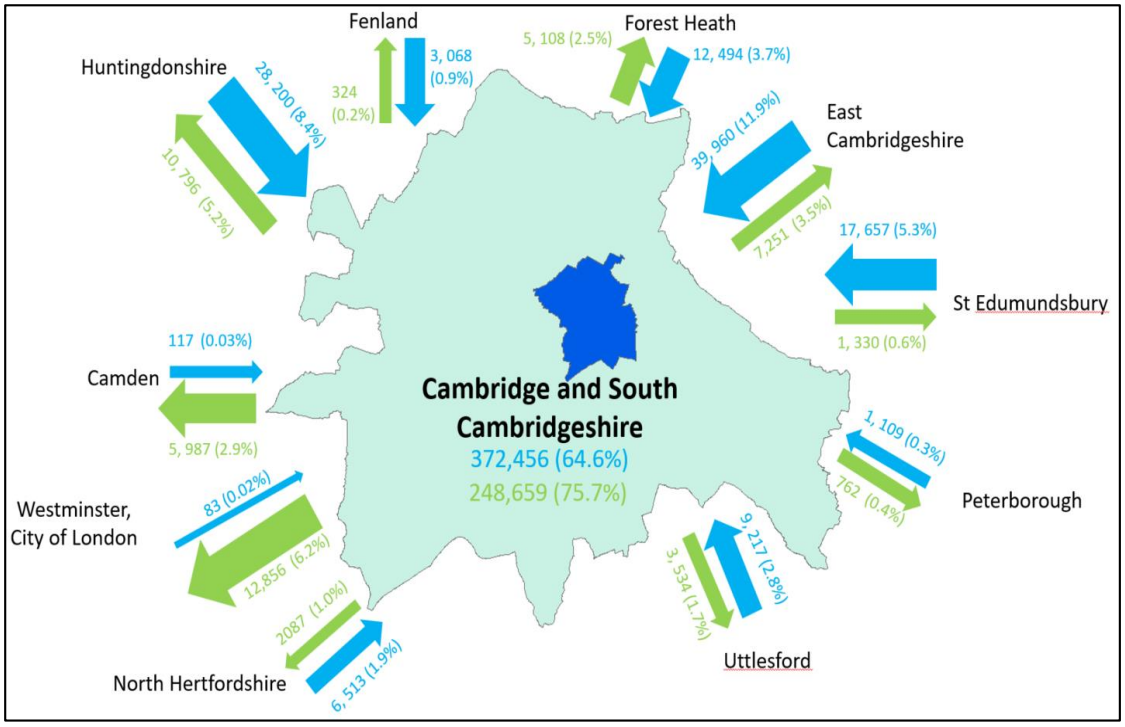
Figure 19 provides an overview of the journey to work trips between Cambridge and South Cambridgeshire and key employment locations. The blue arrows show inbound travel to work trips, while the green arrows show outbound travel to work trips. Total numbers of people travelling are shown as well as the percentage share of the total incoming and outgoing trips.

Commuter flows indicate that inbound flows (372,456) are larger than outbound flows (248,659), highlighting the significance of the area as an employment hub for the surrounding region. The largest proportion of Cambridge and South Cambridgeshire's workforce travel from East Cambridgeshire and Huntingdonshire.

The largest proportion of outbound flows are to Westminster, City of London and Huntingdonshire, both to the west of Cambridge and South Cambridgeshire.

As a large proportion of Cambridge and South Cambridgeshire's workforce live outside of the area and commute inbound, this makes the connectivity of employment sites crucial to sustaining the necessary workforce.

Figure 19: Incoming and Outgoing Commuter Flows

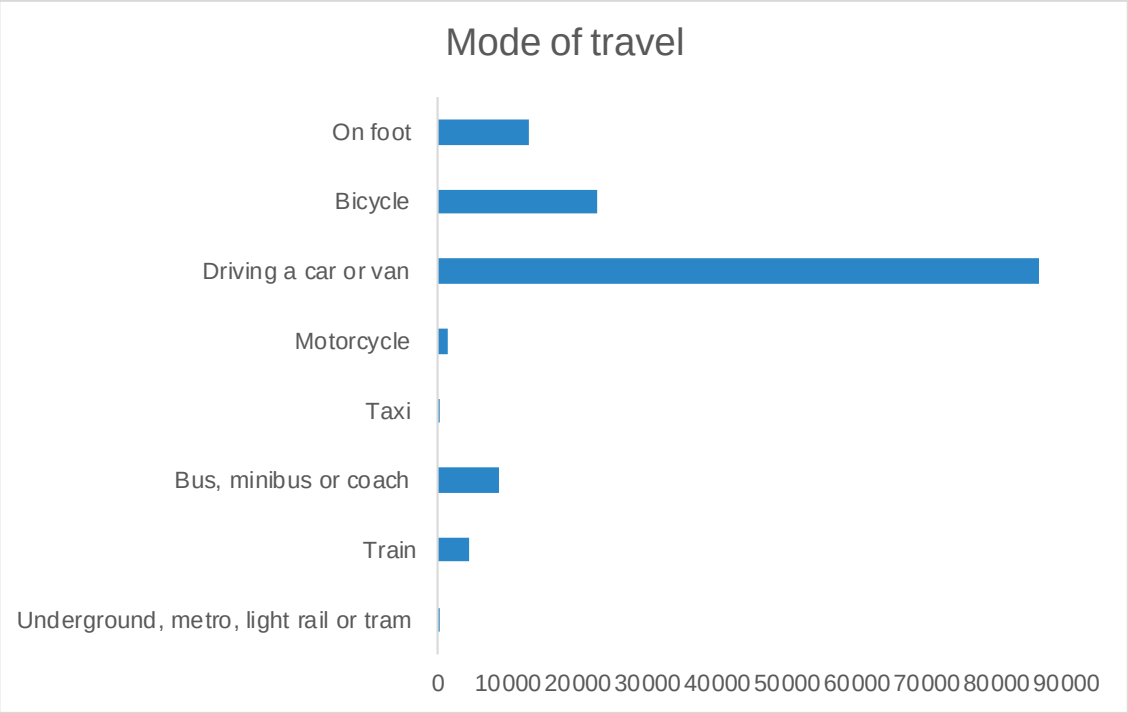


Source: NOMIS WU03- Location of usual residence and place of work by method of travel to work (2011)

6.1.1 Car dependency

Figure 20 displays the modal split of Cambridge and South Cambridgeshire workforce. 63% of Cambridge and South Cambridgeshire's workforce commute by car or van, contributing significantly to the congestion experienced across the transport network.

Figure 20: How People Travel



Source: NOMIS WU03- Location of usual residence and place of work by method of travel to work 2011

Travel to work data for key origins (Table 6) further demonstrate the high level of car use along the route, with the car mode share in the new settlement of Cambourne being particularly high. In contrast, parts of the established settlement of St Neots have relatively high levels of non-car mode use. On Madingley Road in Cambridge, the levels of cycling are far higher than bus use and even exceed levels of car travel. This suggests that if the infrastructure is available, providing an attractive and viable alternative to the car such as a HQPT route, there is scope to shift mode choice to the more sustainable options.

Table 6: Mode split for Travel to Work

Area	Car Driver (%)	Bus (%)	Walk (%)	Cycle (%)
Upper Cambourne	61.7	4.7	3.6	2.0
Lower Cambourne	64.8	3.1	3.5	0.9
Eynesbury, St Neots	45.1	1.1	11.0	4.4
Eaton Socon, St Neots	65.5	1.6	4.7	2.9
St Neots centre	34.3	10.4	14.2	3.8
Hardwick	58.3	8.5	2.8	3.6
Comberton	41.7	3.1	1.8	7.0
Madingley Road, Cambridge	17.3	4.1	12.4	22.6

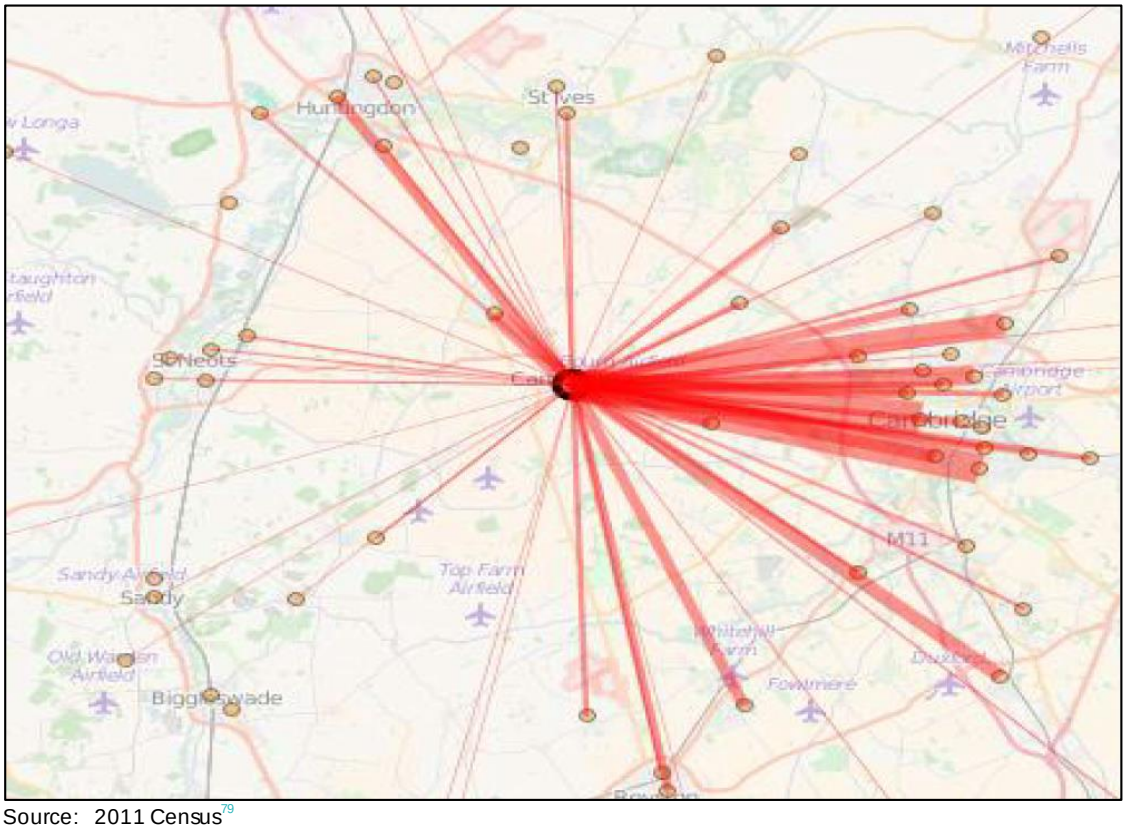
Source: 2011 Census

Travel to work data has been used to identify trends in travel patterns in the study area around Cambourne, including key origins / destinations and mode choice. Whilst private car use is inherently flexible, bus services tend to best facilitate origin to city centre movements, following relatively direct and fixed radial routes.

Therefore, a particular challenge for developing attractive and commercially viable public transport services comes when there are significant multiple destinations across an urban area. Figure 21 shows how car trips from Cambourne have a wide variety of destinations within the city of Cambridge itself – although this also shows the general demand for trips to the city centre which attracts the majority of the travel demand and therefore in scope for a public transport route serving the corridor and linking up residential areas to the city centre. In contrast, Figure 22 shows that there are only four destinations for public transport commuting from the same origin, with the city centre being the main reported work destination.

Therefore, the challenge is to plan and design public transport infrastructure and services that, as far as possible, provide journey options for a wider range of destinations within Cambridge – especially by providing interchange opportunities for services towards the north and south of the city where significant additional development is planned. This presents a key opportunity for future development to better connect growth areas to key employment centres, in line with the City Deal objectives. C2C would help to achieve this by providing direct connections to the city centre were interchange opportunities are available, and allowing services fast and reliable journeys towards the city centre before diverting off to employment sites around the city.

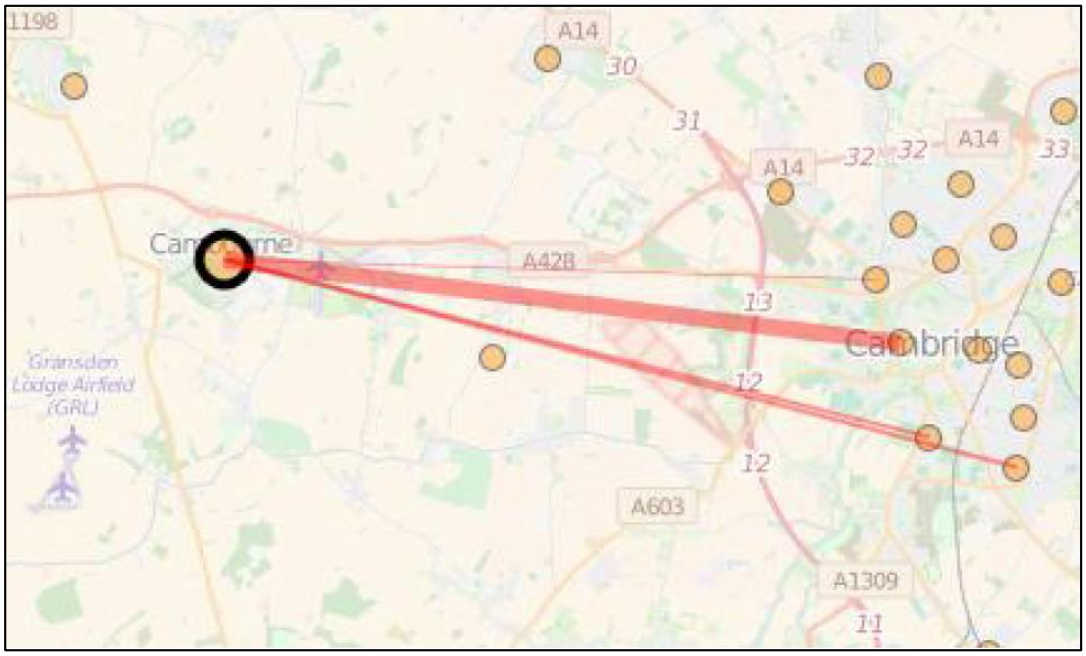
Figure 21: Travel to Work destinations from Cambourne by car



Source: 2011 Census[79]

[79] Image taken from the Cambourne to Cambridge Better Public Transport Scheme: Strategic Outline Business Case (Atkins, September 2016)

Figure 22: Travel to Work destinations from Cambourne by bus[80]



Source: 2011 Census

6.2 Highways connectivity

The ambitious economic growth proposals within Cambridgeshire, and the scale and type of growth taking place, necessitates improving the existing transport infrastructure. Congestion and transport network capacity issues will need to be addressed to ensure that they do not become constraints to economic growth, and to keep the city connected as it expands.

6.2.1 Current highway network and traffic

As an economically successful area, there is already a very high demand for motor vehicle travel in Cambridge which is leading to increasing levels of congestion and delay. This is evidenced by the fact that traffic density on Cambridgeshire's rural trunk A roads is almost twice the national average. In addition, the highest growth since 2002 on trunk roads within the County has occurred on the A428 (25%) which is related to the development of Cambourne.[81]

Analysis of traffic counts on the A428 / A1303 route shows that cars make up the majority of motor vehicle traffic – around 75% along the A428 (2015 count) and 66% along the A1303 (2017 count)[82]. The numbers of HGVs and light vans are higher on the rural sections of the A428, reflecting its use as part of the SRN. The flows for pedal cycles and buses / coaches are higher on the A1303 into the urban centre of Cambridge. The dual carriageway section of the A428 also has a two-way daily traffic flow of over 30,000 vehicles, which is nearly two-thirds higher than the adjacent single carriageway section.

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[80] Image taken from the Cambourne to Cambridge Better Public Transports Scheme: Strategic Outline Business Case (Atkins, September 2016)

[81] Cambourne to Cambridge Better Public Transports Scheme: Strategic Outline Business Case (Atkins, September 2016)

[82] Cambridgeshire County Council Road Traffic Data - https://www.cambridgeshire.gov.uk/residents/travel-roads-and-parking/roads-and-pathways/road-traffic-data/

Table 7: A428/A1303 Traffic Counts

	A428 (2015)		A1303 (2017)	
	Count	% Share	Count	% Share
Pedestrians	0	0.0%	46	0.2%
Pedal Cycles	1	0.0%	409	2.1%
Motorcycles	89	0.3%	155	0.8%
Cars	23,202	75.6%	12,668	66.0%
LGVs	3,263	10.6%	1,525	7.9%
HGVs	2016	6.6%	258	1.3%
Buses	118	0.4%	2,115	11.0%
Total	30,704	100%	19,193	100%

Source: Cambridgeshire County Council Traffic Count Data

TM Speed data (2018) has been utilised to highlight current traffic problems occurring on the route[83]. There are a number of pinch points including between the A428/A1303 junction and the M11 and some severely congested sections of the highway network, in particular along the A1303 from Madingley Mulch Roundabout towards the city centre, resulting in unreliable journey times and long delays. There are also increasing difficulties in accessing the Madingley Road Park & Ride site due to existing congestion on the adjacent highway network.

Table 8: Summary of current traffic problems along A1303

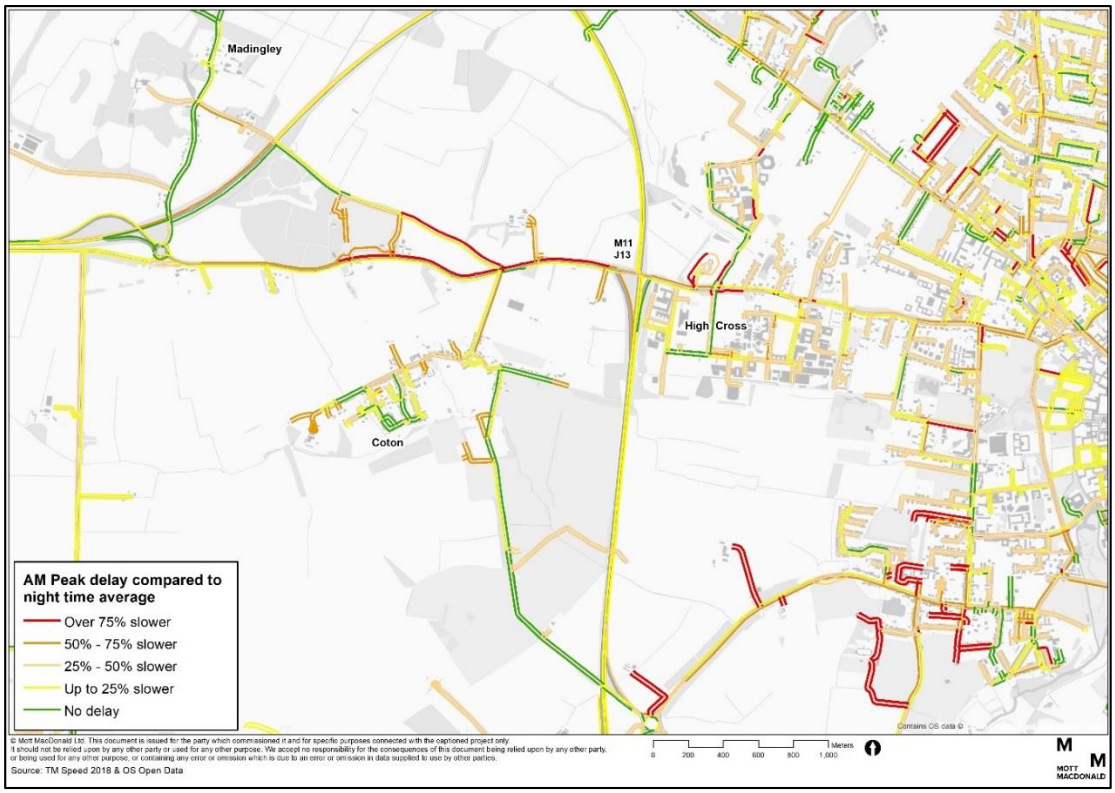
Section	Issue
Between Madingley Mulch Roundabout and M11 Junction	• High levels of variability and congestion • **Traffic moves at over 75% slower** travelling in to Cambridge in the AM Peak compared to night time average speeds • **Traffic moves at between 25% - 50% slower** travelling westbound in the PM Peak compared to night time average speeds
A1303 / M11 Junction	• Traffic exiting the M1 motorway moves at **between 50% and 75% slower** compared to night time average in both the AM and PM Peak
Madingley Road Park & Ride site	• Delays occur in both the AM and PM Peak with traffic moving **at over 75% slower** than the night time average speed

Source: TM Speed (2018) – Basemap and Trafficmaster[84]

[83] TM Speeds data is aggregated version of Trafficmaster data, with speeds for four peak periods averaged over a calendar year.

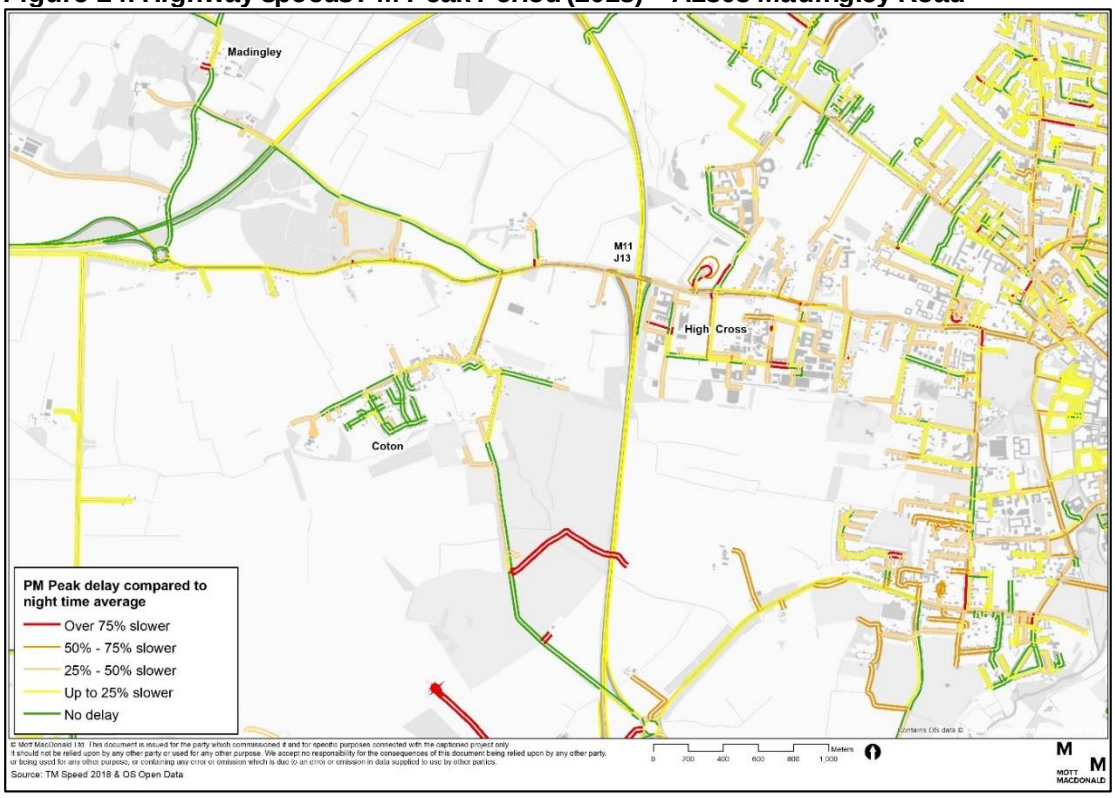
[84] Cambourne to Cambridge Better Public Transports Scheme: Strategic Outline Business Case (Atkins, September 2016)

Figure 23: Highway speeds AM Peak Period (2018) – A1303 Madingley Road



Source: TM Speed (2018) – Basemap and Trafficmaster

Figure 24: Highway speeds PM Peak Period (2018) – A1303 Madingley Road



Source: TM Speed (2018) – Basemap and Trafficmaster

6.2.2 Future highway network and traffic

Using the Cambridge Sub-Regional Model (CSRM), future traffic forecasts in the Cambridge area indicate a significant increase in demand for travel, which will exacerbate existing problems – particularly east of Madingley Mulch roundabout along the A1303. Between 2015 and 2036, car trips along the A428/A1303 route eastbound are forecast to increase by:

- 14% in the AM Peak hour;
- 82% in the Inter-peak period, and
- 37% in the PM Peak period.

The model predicts that traffic flow levels on Madingley Road will remain relatively unchanged in the AM Peak as the road is already at capacity and therefore unable to accommodate additional traffic, however this will cause more congestion on the wider corridor, particularly at the A1303 / M11 junction.

With the number of developments and housing sites set to continue growing along the A428/A1303 and within and around Cambridge city centre, the number of trips generated along the route is likely to continue growing. In the absence of any high-quality public transport service, it is likely that a large proportion of these new trips will be made by car.

What does this mean for C2C?

- Existing car mode share on the A428/A1303 route is high, and future growth is expected to generate additional demand for car use in this area. Therefore, HQPT and additional cycling and walking facilities has a key role in providing an attractive and competitive alternative to car use on this route, which will alleviate a number of network operation issues (namely, congestion, poor journey time reliability and long delays).
- Crucially, such intervention will help to accommodate future growth planned to the west of Cambridge, improve access to housing and employment sites alike, and improve quality of life in the local communities.

6.3 Park & Ride

The existing Park & Ride site on Madingley Road, close to M11 Junction 13, provides 930 car parking spaces and 40 bicycle spaces. It has been successful, showing consistent growth in patronage, capturing up to 45% of "in-scope" traffic passing the site[85]. This indicates that the Park & Ride is attractive to car drivers because it provides both a fast and reliable journey into the City Centre, which is not the case with existing bus services that come from the Cambourne area and beyond. The Park & Ride site however, is reaching capacity and passengers are increasingly experiencing difficulties in accessing the site due to existing congestion on the adjacent highway network.

With the site becoming increasingly full, there is the growing need for a new Park & Ride site which will provide more capacity for current users and future growth. There is also the opportunity to capture car based trips further to the west along the A428 before they reach the more suburban areas closer to the city centre.

[85] Cambourne to Cambridge Better Public Transports Scheme: Strategic Outline Business Case (Atkins, September 2016)

Figure 25: Madingley Road Park & Ride

Source: Cambridge Park& Ride website - http://cambridgeparkandride.info/madingleyroad.shtml

6.4 Wider transport network

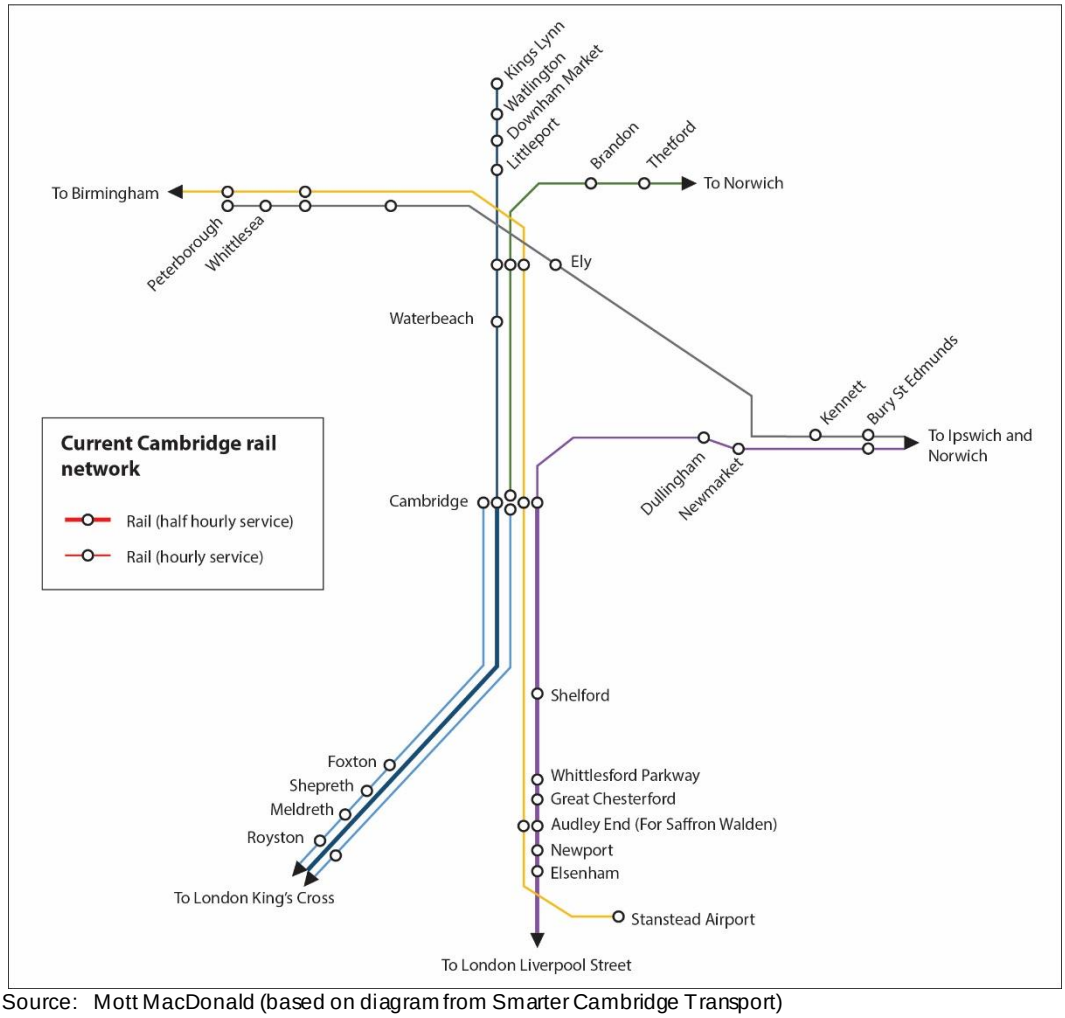
It is worthwhile considering what alternative transport choices are available for journeys destined for central Cambridge from further afield and how they tie into the A428/A1303 to understand the alternatives to the private car that are on offer. This section therefore examines the wider transport network in Cambridge, examining network provision and related issues on a mode by mode basis. This section reviews bus, train and active travel options.

6.4.1 Rail connectivity

Figure 26 illustrates the rail network in Cambridge. Rail plays a key role within the Cambridge transport network, by providing key links to surrounding areas, as well as national links. 11.5 million people[86] used Cambridge station during 2016-2017, making it the 13th busiest station outside of London.

[86] Office for Rail and Road

Figure 26: Cambridge Rail Network



Source: Mott MacDonald (based on diagram from Smarter Cambridge Transport)

However, there are currently no rail links connecting the west of Cambridge to the city centre. For Cambourne and other settlements along the A428/A1303, Cambridge Station is the closest rail link available, approximately 9 miles away. Whilst rail does not perform a central role to the trips undertaken along the A428/A1303 route, providing effective links into the city centre and to Cambridge Station is crucial to ensuring the Cambridge transport network is to be fully integrated and is capable of supporting economic growth at a national level as well as local.

6.4.1.1 East West Rail proposals

Whilst currently there is no direct rail link along the A428/A1303, there are plans for rail improvements to the west of Cambridge along the Oxford to Cambridge Arc in the form of the East West Rail proposal. The East West Rail central section will run between Cambridge and the Midland Main Line between Bedford/Luton[87]. Still at the early stages of development, the scheme has the potential for a frequency of 6 trains per hour along the route, providing strategic connections to neighbouring towns and cities. Construction is planned to begin in the mid-2020s with trains operating by the early 2030s.

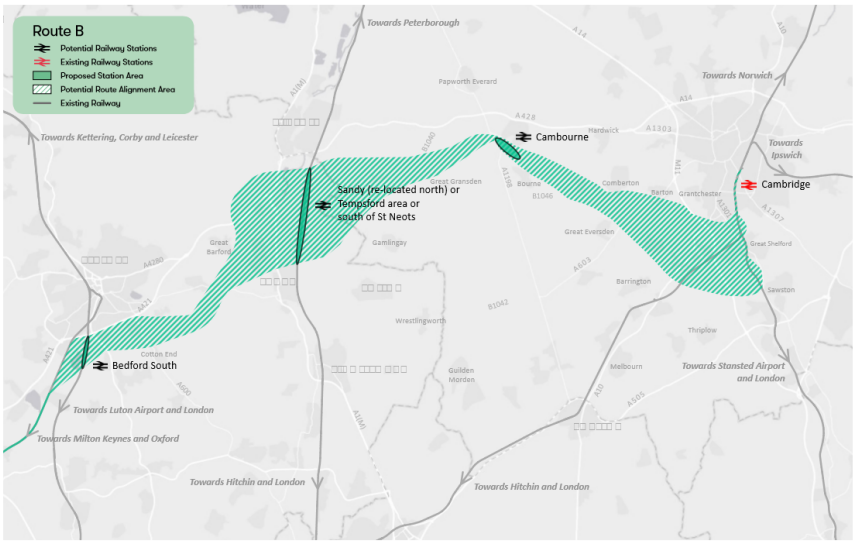
[87] Eastwestrail.org.uk

Five options for the East West Rail route between Bedford and Cambridge were consulted on in early 2019, with a final preferred option being released in the latter half of 2019. Two of the five options released for consultation include a new rail station in Cambourne village. If the East – West route will incorporate a station in Cambourne, it would offer another attractive mode of travel from Cambourne to Cambridge City Centre. The East West Rail scheme would be considered complementary to C2C as it would offer good connections for those in Cambourne travelling to destinations easily accessible from the Cambridge stations. However, it would not offer the same level of local service access to areas along the A428/A1303. Neither would it serve other housing and employment locations along the corridor such as Bourne Airfield and West Cambridge.

Figure 27: East West Rail Central Section – Cambourne Options

ROUTE B

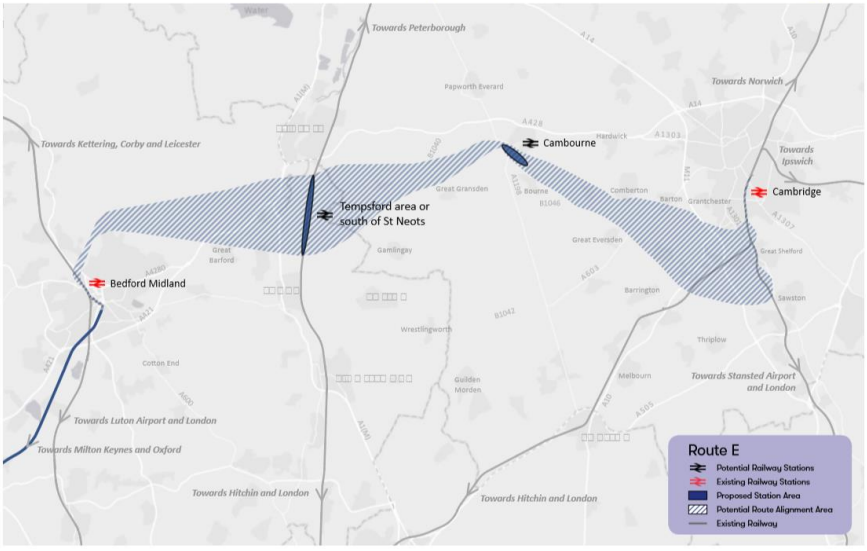
Bedford South – Sandy (re-located north) / Tempsford area / south of St Neots – Cambourne – Cambridge



Source: https://eastwestrail-production.s3.eu-west-2.amazonaws.com/public/Central-Section-Consultation/af057165a3/Maps2.pdf

ROUTE E

Bedford Midland – south of St Neots / Tempsford area – Cambourne – Cambridge



Source: https://eastwestrail-production.s3.eu-west-2.amazonaws.com/public/Central-Section-Consultation/af057165a3/Maps2.pdf

6.4.2 Bus connectivity

Without rail connections to the west of the city centre, the main form of public transport provision for Cambourne and other settlements along the A428/A1303 is therefore the bus network. There is a total of eight bus services that operate on the A428/A1303 route.

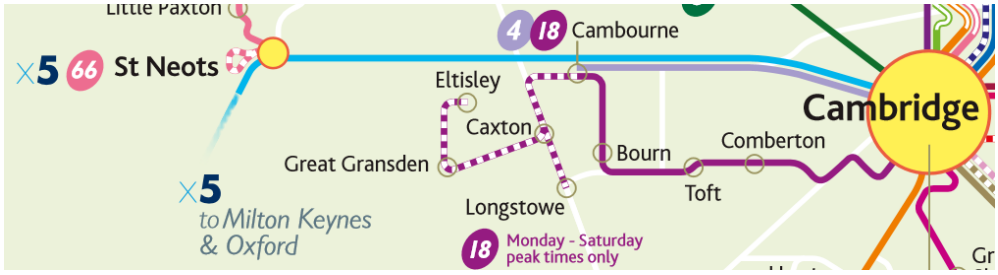
Table 9: Buses serving the A428/A1303

Route Number	Route Operator	Route Description	Weekday Daytime Freq	Saturday Daytime Freq	Sunday Daytime Freq
3 / X3	Whippet Coaches	Huntingdon – Godmanchester – Papworth Everard – Lower Cambourne – Cambourne – Madingley Road – Cambridge	90 minutes	120 minutes	No Service
4	Stagecoach	Cambridge – Hardwick – Great Cambourne – Upper Cambourne – Lower Cambourne	20 minutes	20 minutes	60 minutes
X5	Stagecoach	Cambridge – St Neots – Bedford – Milton Keynes – Buckingham – Bicester - Oxford	30 minutes	30 minutes	30 minutes
8	Whippet Coaches	Papworth / Hilton - Cambridge	Only three services between 1000 and 1600		
18	Stagecoach	Cambridge – Comberton – Cambourne – Longstowe / Eltisley	60 minutes	60 minutes	No Service
66	Stagecoach	Huntingdon – Brampton – Little Paxton – St. Neots – Eaton Socon	60 minutes	60 minutes	No Service
Red P&R	Stagecoach	Madingley Road – Cambridge City Centre	10 minutes	10 minutes	15 minutes
Universal	Whippet Coaches	Eddington – Biomedical Campus	15 minutes	20 minutes	30 minutes

Source: Cambridgeshire County Council

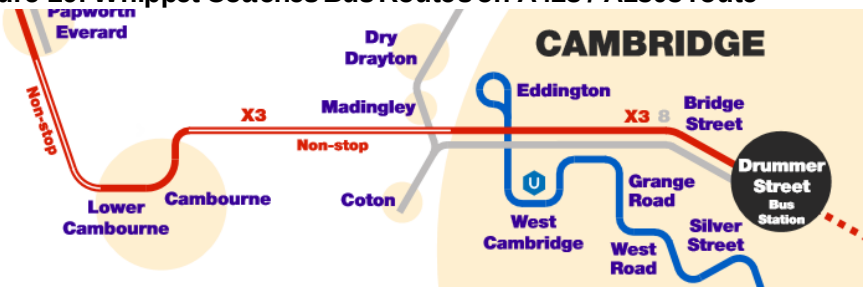
Figure 28, 29 and 30 illustrate the bus network along the A428/A1303 route for the two main operators, Stagecoach and Whippet Coaches.

Figure 28: Stagecoach Bus Routes on A428 / A1303 route



Source: Stagecoach East

Figure 29: Whippet Coaches Bus Routes on A428 / A1303 route



Source: Whippet Coaches

Figure 30: Park and Ride Service

Source: http://www.cambridgeparkandride.info/madingleyroad.shtml

In the absence of substantial bus priority along the route, congestion and delays mean that buses offer no competitive advantage over private cars in terms of journey times and reliability.

Table 10 shows that scheduled peak hour journey times from Cambourne in particular are very slow – taking over an hour for a journey of around 10 miles. This is partly due to the length of time that the bus takes to traverse the roads within Cambourne. However, the impact of peak hour congestion into Cambridge, notably on the approaches to the M11 Junction 13 is the major reason in the variation between the peak and off-peak periods. The X5 limited stop service from St Neots has a much lower journey time than the Cambourne services; however, it has fewer stops. There is no variation in the scheduled peak and off-peak times for the Park & Ride service as this does not have to cross the M11 Junction 13.

There is very limited priority for bus services along the route, with the exception of a short bus lane on the approach to the M11 Junction 13; this is a key barrier to the quality of bus service provision on the route.

Table 10: Monday to Friday Peak and Off-Peak bus journey times (as timetabled)

No	From / To	Peak (minutes)	Off Peak (minutes)	Variation (minutes)
3 / X3	Cambourne to Cambridge	60	40	20
4	Cambourne to Cambridge	57	55	2
X5	St Neots to Cambridge	69	45	14
18	Cambourne to Cambridge	60	60	0
Red	Madingley Road Park & Ride to City Centre	12	12	0

Source: Cambridgeshire County Council

6.4.3 Walking and cycling connectivity

In comparison to the national average, cycle commuting is generally high within Cambridge, with the 2011 Census Data showing that 30% of journeys to work are made by pedal cycle. There are substantial cycle traffic flows on radial routes in and out of Cambridge on weekdays, suggesting that it is a key mode for commuters and students accessing employment and education sites. The shared footway/cycleway that runs alongside the Cambridgeshire Guided Busway (Huntingdon to the city centre) is particularly well used, carrying nearly a thousand cycle trips on weekdays.

Since the opening of the Cambridgeshire Guided Busway in 2011, the 2015 Traffic Monitoring Report suggests that the maintenance track running alongside it had contributed to a 5.8% rise in cycling in Cambridge by 2015[88].

Furthermore, when comparing figures of counts of cyclists using the maintenance track at different points of the guided busway in the reports in 2015 and 2018[89] there is a further increase of 1% at St Ives Park & Ride, 46% at Under Impington and 70% at Trumpington. Another significant difference was pedestrians using the maintenance road, except for the location in Impington.

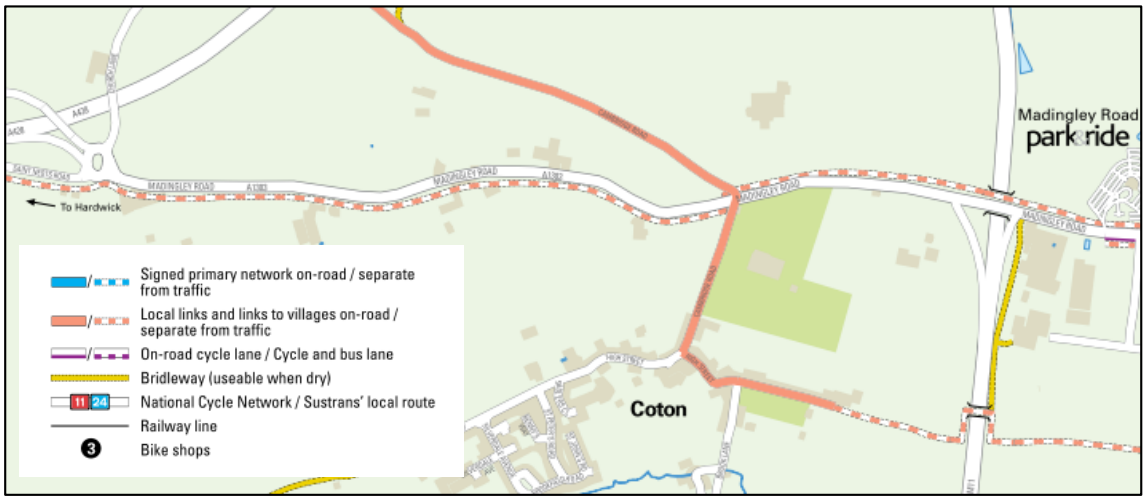
Table 11: Cycling and pedestrian increases on existing busway

	2015			2018			% Difference		
Mode	St Ives Park & Ride	Under Almping-ton	Trumpi-ngton	St Ives Park & Ride	Under Imping-ton	Trumpi-ngton	St Ives Park & Ride	Under Imping-ton	Trumpi-ngton
Cycling	373	1,322	1,122	377	1,628	1,911	+1%	+46%	+70%
Walking	37	364	322	557	212	603	+1,405%	-71%	+87%

Source: Cambridgeshire County Council, Traffic Monitoring Report, 2015 and 2018

The C2C route currently has some local cycling links illustrated in Figure 31 and 32. The route has a combination of signed on and off-road routes as well as local links connecting villages with on road and segregated paths. However, it does not offer end to end segregated cycle routes from Cambourne through to the City Centre.

Figure 31: Cycling routes on the C2C route



Source: Cambridgeshire County Council

[88] Traffic Monitoring Report 2015, Cambridgeshire County Council, 2015
[89] Traffic Monitoring Report 2018, Cambridgeshire County Council, 2018

Figure 32: Cycling routes along the C2C route

Source: Cambridgeshire County Council

The existing cycle routes do not represent a coherent or complete network. At present 20% of residents living along the A428/A1303 route cycle to work, with 11% walking to work. The C2C project aims to significantly support new and existing cyclists on this route, with cyclist and pedestrian support representing an integral part of the scheme.

The existing cycle network includes the Comberton Greenway, a segregated off carriageway route which provides links to the communities west of the M11, the West Cambridge developments and the City Centre. Minor improvements were planned in 2016 to provide a new link to the existing M11 crossing and through Coton Village. A temporary solution to link Camborne to this route, before the C2C project is completed, was considered.

The C2C project offers improved cycling infrastructure to help complete the existing network or offer a completely new piece of infrastructure, which could have similar impacts to the existing guided bus way, as detailed earlier in this section. The growth in walking and cycling along the A428/A1303 would reduce current and future traffic and environmental concerns associated with the future growth of Cambridge.

6.5 Road safety

Road safety is an important issue for South Cambridgeshire District Council and Cambridge City Council and is specifically included within the TSCSC. Policy 16 sets out how road safety will be addressed through the use of a variety of methods to work towards local and national road safety targets and to prioritise pedestrian and cycle safety.

Current accident rates taken from accident records data[90] indicates there have been high number of serious and slight accidents along the A428/A1303 route between 2012-17, including:

- **19 serious accidents** along the A1303 Madingley Road between 2012-17, including one fatal;
- **24 serious accidents** along the A428 between the A1 and Madingley Road roundabout, and;

[90] All accident data is collected by the police in relation to any road traffic crashes where there is an injury. This is reported to the DfT.

- One hot spot at the junction between the A1303 and Cambridge Road which has had 9 accidents (5 serious and 4 slight).

So, what does this mean for C2C?

- On the A428/A1303 route, conventional public transport offers little to no competitive advantage over private cars. This has meant that car use is the dominant transport mode and as a result has caused congestion on the wider transport network. This in turn causes disruption to existing bus routes.
- The C2C project offers the opportunity to build on the success of the existing Park & Ride site, by creating more dedicated infrastructure that will benefit new and existing public transport services.
- To achieve growth in the use of sustainable modes on this route, a frequent, fast and reliable HQPT service with supporting measures is required. Journey times (including the walking element at either end of the trip and waiting time) need to be comparable with those of the private car. The creation of safe cycling and walking routes will also play a role in reducing congestion on the wider road network.
- These interventions will improve connectivity to Cambridge city centre and the rail links there and encourage further growth and development of the western areas of Cambridge.
- Although the East – West Railway route could potentially include a station in Cambourne, benefitting those from the west and Cambourne itself, the benefits will not extend along the A428 and the villages surrounding the corridor. The two schemes would be seen as complementary to each other in providing a multi-model set of options for trips being undertaken along the corridor.
- The C2C project could significantly increase walking and cycling as an alternative mode of transport, especially when looking at the current guided bus way's impact on walking and cycling growth figures.
- The C2C project offers the opportunity to reduce accidents along the A428/A1303 by contributing to the reduction in congestion, by creating a new alternative route for cyclists, and by re-designing pinch points to decrease the total amount of accidents occurring.

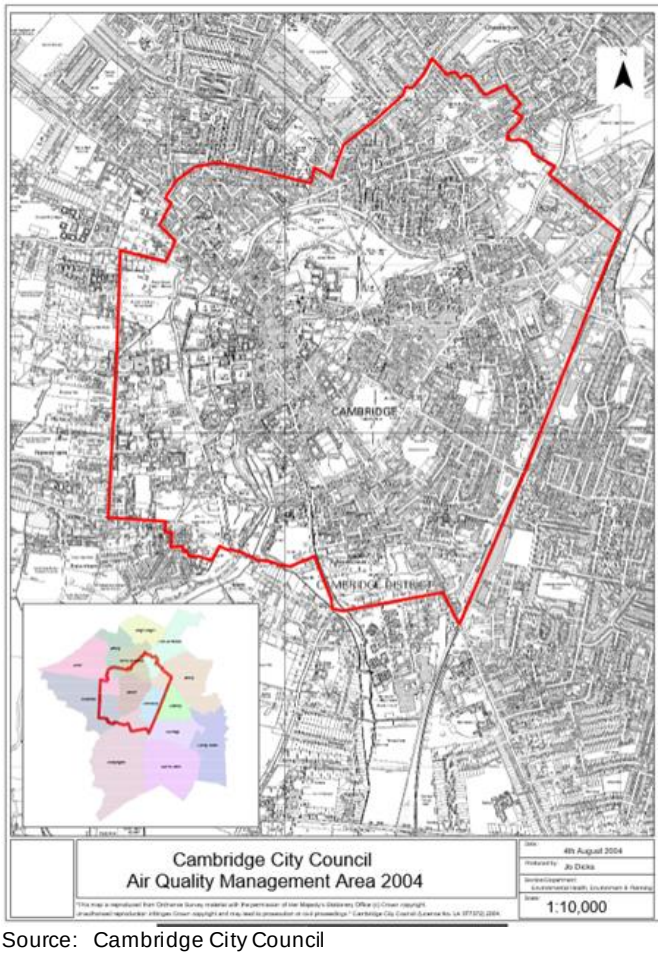
7 Environmental Issues and Opportunities

The environmental issues affecting the area are divided into local issues and global issues. Local issues of significance include air quality, historic environment (including townscape), landscape and biodiversity. Global issues relate to climate change related greenhouse gas emissions.

7.1 Air quality

The centre of Cambridge has had an Air Quality Management Area (AQMA) since 2004 due to poor air quality (mainly due to high nitrogen dioxide from traffic) that does not meet National Air Quality Objectives. The AQMA extends along Grange Road, includes Shire Hall and then swings around north and south of the city centre to the main London-Kings Lynn railway line.

Figure 33: Cambridge Centre AQMA



Source: Cambridge City Council

To implement improvement in air quality a series of Air Quality Management Plans have been implemented and integrated into the local transport plans. The latest air quality action plan is under development (Air Quality Action Plan 2015-2025) in which some of the main themes include:

- Continuing to improve emissions from the vehicles being driven around Cambridge
- Continuing to improve access to public transport across the city
- Promoting smarter travel choices

Air quality outside of the city is deemed to be good as indicated by Defra's modelling of air quality across the UK. In addition, there is no AQMA set by SCDC along the A428/A1303, which would be a requirement if air quality was likely to exceed national thresholds for poor air quality or was currently not meeting these national standards. However, the introduction of a HQPT system that encourages lower private vehicle use, which is a key contributing factor to poor air quality in the city centre, has the potential to contribute to improvements in air quality in the city, and maintain good air quality outside of the city along the route.

7.2 Noise

Noise is increasingly understood to have an impact on human health. Traffic noise can be a significant contribution to ambient noise levels, with adverse consequences for human health. Any scheme that seeks to reduce noise levels can bring benefit to human health, although changes in traffic levels would need to be significant before noticeable improvements in ambient noise levels are noticed.

7.3 Historic environment

The Cambridge American Cemetery and Memorial is the largest war grave for American service personnel in the UK. The Cemetery occupies a rural position on the north slope of a hill and aimed to provide a peaceful environment with a tranquil outlook over the countryside to the north of the site. The context of the site has been degraded by the increasing traffic volumes (and associated noise) on Madingley Road which runs past the entrance to the south of the Cemetery.

Cambridge city centre has a world famous historic build and natural environment that generates a very significant tourist industry in addition to providing the setting for its outstanding academic institutions. It is vital to preserve the setting of the historic buildings and open spaces, which the City Council has a duty to do, in the exercise of its development management functions, particularly within designated Conversation Areas. There are 12 such Conservation Areas in and around the centre of Cambridge, and whilst the emphasis in the conservation areas is to preserve and enhance the built environment (townscape) there is also a need to manage traffic levels to avoid noise and congestion (and pollution) which can have a significant impact on the character and appearance of the city. Section 7 (Protecting and Enhancing the Character of Cambridge) of the Cambridge City Council Local Plan 2018 sets out a range of policies to ensure the cities heritage is protected including:

- Policy 55: responding to context
- Policy 56: creating successful places
- Policy 59: designing landscape and the public realm
- Policy 61: Conservation and enhancement of Cambridge's historic environment
- Policy 62: Local heritage assets

7.4 Landscape

Policy NH/2 in the South Cambridgeshire District Council (SCDC) Local Plan 2018 requires development to respect and retain the landscape character of the area. SCDC has produced a supplementary planning document (SPD) on how Landscape in New Developments (March

2010) is to be taken into account, and identifies the landscape character for the scheme area as Bedfordshire and Cambridgeshire Clayland. The SDP has a number of landscape enhancement measures identified for this landscape which would be taken into account when delivering the C2C project.

The design of the scheme design will need to take into account the landscape character along the route, with planting and infrastructure designed to minimise any negative impacts on the landscape.

7.4 Green Belt

In relation to Cambridge City Council's (CaCC) adopted Proposals Map (2006) the C2C project would pass through substantial areas of land that is within the Cambridge Green Belt. As set out on the SCDC adopted Proposals Map (2012), the scheme between Hardwick and the Cambridge City Council boundary are situated within the Cambridge Green Belt. Land to the west of Hardwick up to Cambourne is situated outside of the Cambridge Green Belt.

The Green Belt has a strong protection at both National and Local Level. Policy 4 of the adopted CaCC Local Plan (2018) sets out a presumption against inappropriate development in the Green Belt. Policy GB/1 of the SCDC Development Control Policies also sets out the presumption against inappropriate development in the Green Belt. Both CaCC and SCDC are seeking to maintain the strong policy of Green Belt protection within their Local Plans (2018).

The detailed policy basis for determining inappropriate development in the Green Belt is set out in Chapter 13, paragraphs145 to 147 of the NPPF (2019).

When considering the acceptability of the principle of scheme development within the Green Belt, the key policy criteria is set out within paragraph 90 of the NPPF. Paragraph 146 of the NPPF states the following:

> *"Certain other forms of development are also not inappropriate in Green Belt provided they preserve the openness of the Green Belt and do not conflict with the purposes of including land in the Green Belt. These are:*
>
> - *Local transport infrastructure which can demonstrate a requirement for a Green Belt location."*

Paragraph 146 of the NPPF is consistent with Policy 4/1 of the CaCC Local Plan and policy GB/1 of the SCDC Development Control Policies (2007), which states that there is a presumption against inappropriate development in the Cambridge Green Belt as defined on the Proposals Map.

7.5 Biodiversity

The A1303/Madingley Road passes directly adjacent to Madingley Wood Site of Special Scientific Interest (SSSI) (which is identified as being in a favourable condition at present and is the most significant biodiversity site in the project area). The reason for notification of the SSSI are its ash-maple woodland ranging in age from ancient woodland to more recent growth and it has noted moss and ground flora. It has been and continues to be an important area for research into woodland colonisation and historical ecology. It is important to avoid any direct land take that could affect the SSSI itself, but is equally important to reduce traffic and thus nutrient loading from exhaust emissions – which could impact the important flora in SSSIs of this nature.

The SCDC adopted policy (2018) on biodiversity (NH/4) states:

"New development must aim to maintain, enhance, restore or add to biodiversity. Opportunities should be taken to achieve positive gain through the form and design of development. Measures may include creating, enhancing and managing wildlife habitats and networks, and natural landscape. The built environment should be viewed as an opportunity to fully integrate biodiversity within new development through innovation. Priority for habitat creation should be given to sites which assist in the achievement of targets in the Biodiversity Action Plans (BAPs) and aid delivery of the Cambridgeshire Green Infrastructure Strategy."

Policy 70 in the Cambridge Local Plan 2018 relates to biodiversity specifically and has the same overarching objectives as NH/4 in the SCDC Local Plan 2018. The general requirement in Policy 70 is to preserve and protect biodiversity from inappropriate development and to enhance biodiversity where possible.

The C2C project has the potential to deliver positive gain for biodiversity. There are significant opportunities to achieve this strategic objective as part of the design providing both enhanced connectivity in places and new habitat in other locations. Government is generally seeking to ensure a minimum of 10% biodiversity net gain for all new development (final policy is still being developed), and this level of gain should be readily achieved by the proposed scheme, and could achieve substantially better than this if all opportunities for enhancements are deliverable.

7.6 Greenhouse gases

The Climate Change Act 2008 sets the response of UK government to climate change, and includes legally binding requirements to reduce the national greenhouse gas emissions. The Climate Change Act commits the UK Government to reduce greenhouse gas emissions to net zero by 2050. Transport schemes provide both a risk to reducing greenhouse gas emissions and an opportunity if modal shift to lower emitting transport can be achieved. Public transport schemes such as the C2C project has the potential to lead to a reduction in greenhouse gas emissions by introducing a carbon efficient public transport fleet, removing traffic off the road and reducing congestion.

SCDC Local Plan 2018 policy CC/2 and the Cambridge Local Plan 2018 policy 29 promote the generation of renewable energy from projects where possible. The C2C provides the opportunity to potential introduce infrastructure that helps generate renewable energy, for example solar panels at the Park & Ride site. Opportunities to do so would be assessed at a later stage of the scheme's development.

7.7 Water and flood risk

There are numerous policies at national and local level relating to the protection of water resources. The general theme of all policies is development and day to day activities must avoid any negative impacts on the quality of water bodies (surface or groundwater) from any anthropological activities, including from transport schemes where the greatest risks are from road drainage and accidents.

National and local policies on flooding all have a common basis to prevent development in flood zones that is not flood resilient. NPPF sets out requirements in relation to flood risk which are administered by the Environment Agency or the local lead flood authority. Generally, the requirement is that no new development (taking proper account of climate change impacts on rainfall) should increase flood risk to surrounding areas.

CaCC Local Plan 2018 policy 32 sets out the requirements in relation to Flood Risk and development. Policy 31 requires developments to have drainage networks that use Sustainable Urban Drainage (SuDs) principles in the design.

SCDC Local Plan 2018 requires that development should demonstrate that flood risk from all sources has been avoided or managed (Policy CC/9), and that development has designed drainage using SuDS (Policy CC/8).

The C2C project should have a very limited impact on integrated water resources, with no likely special measures to be required to ensure the relevant policies in the SCDC Local Plan 2018 and the CaCC Local Plan 2018 will be fully complied with. However, where any element of the scheme may be located in a floodplain then the design will fully comply with the requirements of the Environmental Agency, the lead local flood authority and in accordance with local plan policies. Any opportunities to provide additional attenuation of flood risks through mitigation on the scheme would be identified and pursued where reasonable and practical.

7.8 Environmental review conclusions

The most significant environmental issue facing Cambridge from transport is the degradation of air quality by fossil fuel powered vehicles. In addition, increasing traffic levels harm the historic environment, townscape and conservation areas, landscape settings and potentially biodiversity generally. In Cambridge one practical fix is to encourage mode shift to public transport. Aside from increasing the potential improvements to the environment such mode shift could negate the need for new transport infrastructure by maximising use of the current network.

So, what does this mean for C2C?

- The C2C project has the potential to assist in meeting air quality objectives by increasing uptake of public transport and reducing the worsening of traffic related air quality in the city centre.
- The project also presents an opportunity to contribute to the maintenance (if not improvement) in the low levels of pollution currently present along the route itself.
- The C2C project provides an excellent opportunity to create additional habitat and improve linkages between habitats along the route, and should improve biodiversity as a result.
- There are real opportunities to install solar panels on the selected travel hub which will reduce the carbon footprint of the scheme during operation.
- Reducing traffic in the city should help to reduce noise nuisance (improving public health) and help to maintain (if not improve) the setting of the historic environment in the city centre. Such measures should contribute to upholding the good quality of life experienced in the area.
- Improving public transport and achieving mode shift onto carbon efficient public transport should contribute to the national objective to reduce greenhouse gases.
- There are opportunities to include mitigation of any visual impact that could provide landscape enhancements such as improving hedges and increasing the number of hedges in the landscape, and increasing planting of native species in road verges which would meet the requirements of the Landscape in New Developments SDP.
- Increasing opportunities for non-motorised user access to the countryside increases public experience of nature.
- Where the project may cross a flood zone then there are practical options to design the scheme such that no increase in flood risk would arise, and there could be opportunities to include measures in the design to both increase flood storage upgradient of a crossing that also benefits biodiversity.

8 Project Aims and Objectives

This section sets out the project objectives and aims of the C2C project. The objectives identified for this project have been developed to reflect the key issues and opportunities identified in Sections 5-7, and align with the key aims of the GCP and the City Deal (Section 3), and national, regional and local policy (Section 4).

In order to achieve this growth in a manner that is sustainable and also contributes to the quality of life of those living and working in Cambridge, supporting infrastructure, such as the C2C project, is required. It is important that the project objectives capture the aim of this project and the way that it contributes towards creating a sustainable transport network that supports growth and development, as well as improving access to key development locations and maintaining a high quality of life.

8.1 Underlying drivers or causes – The need for intervention

Based on the current evidence and policy review, and in line with existing strategies, the key underlying drivers for the need for change along the A428/A1303 route and for investment in the C2C project are:

- The A428 is a nationally important route and forms part of the nationally strategically important Oxford-Cambridge Arc which was highlighted in the 2017 Budget as a priority for growth.
- Large population growth will require the delivery of significant additional housing, much of which is planned to be located to the West of Cambridge along the A428/A1303 route.
- Employment is growing rapidly within Cambridge with an increase of 44,000 new jobs being created by 2031. Notably, destinations on the edge of the city such as West Cambridge and the Biomedical Campus to the South with a need to provide effective transport connections from existing and future settlements to support the 33,500 new homes being built within Cambridge.
- Current delay on the A1303, eastbound, in the AM Peak is up to and over 75% slower than average night time speeds. This is mirrored in the westbound PM Peak with between 50%-75% slower speeds than night time average speeds.
- Car ownership in Cambridge is high, with 85% of households having access to a car compared to the national average of 74%.
- The demand generated by the growth in housing and employment will generate ever greater levels of demand for travel in and around Cambridge, with approximately 29% increase in trips during the AM peak, 31% increase during the PM peak and 38% increase during the interpeak period by 2036, and will thereby exacerbate current congestion issues.
- The greater levels in travel demand show that trips made by car for commuting purposes in Cambridgeshire are predicted to grow by up to 14% and 36% respectively during the AM and PM peak periods by 2036 exacerbating current congestion issues.
- The rail network does not serve the movements along the A428/A1303 route.
- The existing A428/A1303 is inadequate for walking and cycling as a mode of transport into Cambridge.
- Congestion on the route means that current public transport services are unable to offer an attractive alternative to private car.

8.2 Project vision

Based on the existing and future issues identified in Cambridge, the proposed overall vision for the C2C project is as follows:

> ***"To connect existing and new communities along the A428/A1303 to places of employment, study and key services to enable the sustainable growth for Greater Cambridge. We will deliver this through improved, faster and more reliable HQPT services, together with high quality cycling and walking facilities serving a new Park & Ride site to the west of Cambridge."***

8.3 Project objectives

A set of strategic objectives has been identified for the C2C project in order to achieve the aim of the project. As well as being informed by the evidence and policy review, these draw on the project objectives as previously set out in the SOBC.[91] These objectives provide the overarching direction for the project, with each objective having a set of more specific sub-objectives that are more specific and measurable.

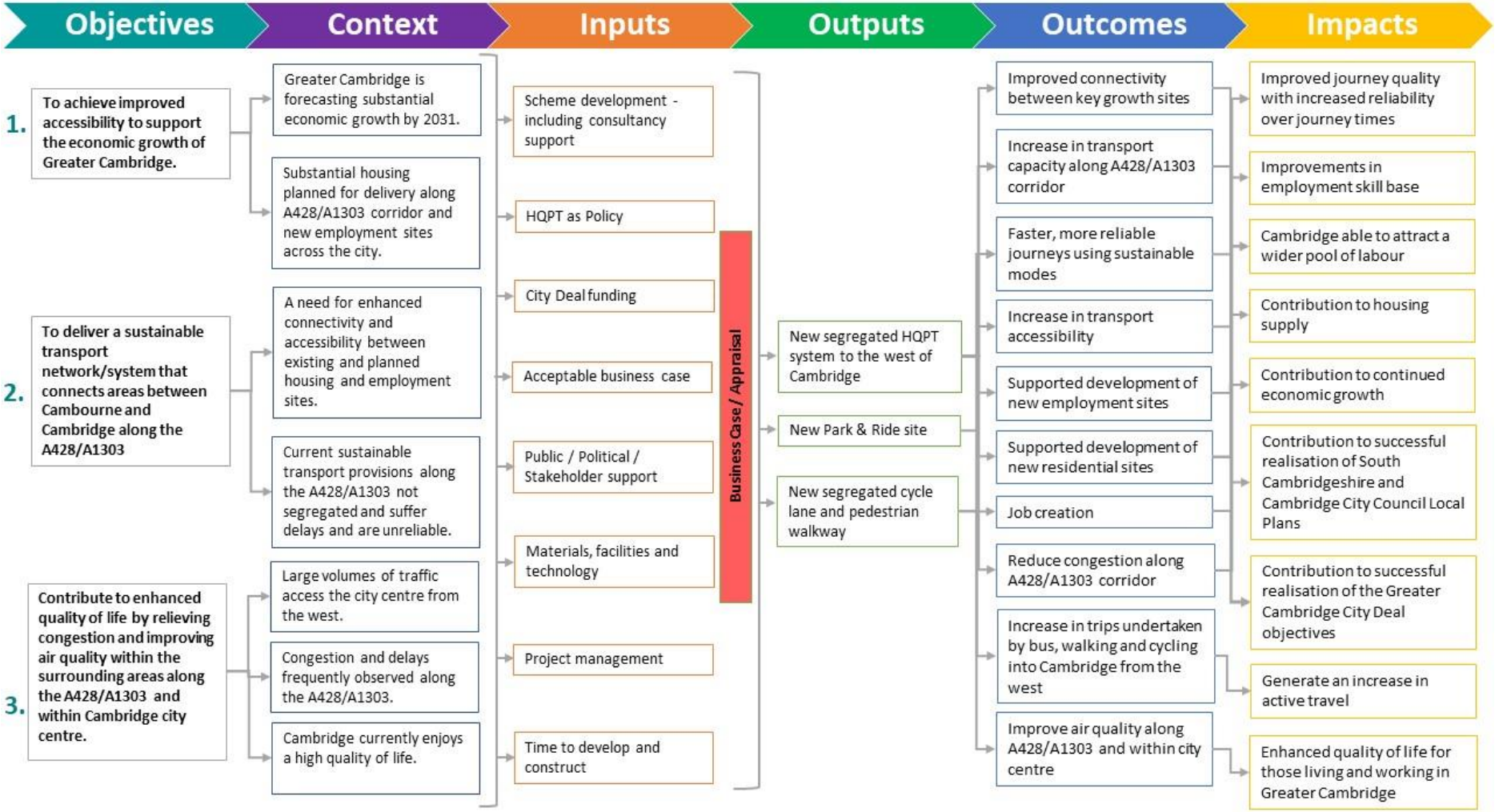
[91] The original scheme objectives in the SOBC were presented as High-Level Objectives, Planning Objectives and Wider Objectives (these are all presented and summarised in the SOBC). The scheme objectives as presented in this OAR reconfirm the SOBC objectives.

Figure 34: C2C project objectives

8.4 Logic map

The delivery and expected benefits of the C2C project is demonstrated in a logic process map in Figure 35. Here, the causal pathway between the objectives of the project, the inputs required to deliver tangible outputs and expected outcomes as a result of the investment are shown

Figure 35: C2C logic map



Source: Mott MacDonald

8.5 Measure of success

In order to establish whether objectives have been achieved, a Monitoring and Evaluation Plan is in development that sets out how outcomes associated with successful achievement of objectives will be measured. A summary of this plan will be included in the Management Case for the final OBC. The emerging key performance indictors by which success of each of the objectives will be measured though shown in Table 12. These are categorised by those which will be monitored at project level and those which will be monitored at programme level as part of the wider City Deal delivery of infrastructure.

Table 12: Measures of success

Anticipated benefit	Performance indicator – Expected level of benefit	Relating to Objective
• Improved accessibility to key employment and education sites within and around Cambridge City Centre. • Greater access to a wider employment pool for Cambridge.	• An increase in the number of key employment centres within 30 minutes of settlements along the A428/A1303 using the core public transport network. • An increase in the number of the working population able to access key employment centres (City Centre, Biomedical Campus, University etc) within 30 minutes using the core public transport network.	• Support the delivery of new housing and job creation through the provision of HQPT that serves current and future housing sites along the A428/A1303, including Cambourne and Bourn, and employment sites within and around Cambridge city centre. • Provide additional capacity during the peak periods to meet forecasted growth in demand along the A428/A1303. • Supports Cambridge in achieving continued economic growth whilst retaining the high quality of life and place associated with the city.
• Improved business to business connections. • Improved business and workforce productivity. • Growth of Cambridge's key employment sectors.	• An increase in business productivity - Increase in GVA pa within Cambridge. • An increase in the average level of GVA output per employee. • An increase in employment levels within Cambridge's professional services, manufacturing and education sectors.	• To achieve improved accessibility to support economic growth of Greater Cambridge. • Supports Cambridge in achieving continued economic growth whilst retaining the high quality of life and place associated with the city.
• Increase in the labour pool that can access employment using non-motorised transport. • Mode shift from private car to public transport along the A428/A1303.	• Increase in active modes along the A428/A1303. • Increased uptake in public transport and active modes; reduced private car usage.	• Introducing improvements which enhance levels of safety for cyclists and pedestrians and promote a healthier life style. • To deliver a sustainable transport network/system that connects areas between Cambourne and Cambridge along the A428/A1303. • Improve connectivity into Cambridge using sustainable modes of transport such as walking, cycling, and HQPT. • Improve the attractiveness of sustainable modes of travel as an alternative to using cars, leading to an increase in their mode share To achieve improved accessibility to support economic growth of Greater Cambridge. • Provide HQPT that offers peak journey times that are equal to or less than the equivalent journey by car with end to end journey time reliability better than the car alternative journeys.

Anticipated benefit	Performance indicator – Expected level of benefit	Relating to Objective
		• HQPT offering improved waiting and in-vehicle environments that are comparable to Cambridge's existing Guided Busway.
• Increase in economic activity within Cambridge's retail and leisure industries. • Increase in business and retail occupancy rates.	• An increase in productivity of retail and leisure businesses within Cambridge. • Reduction in the number of unoccupied retail business and retail units within and around Cambridge City Centre.	• Improve connectivity on part of the Oxford-Cambridge Arc. • Supports Cambridge in achieving continued economic growth whilst retaining the high quality of life and place associated with the city.
• Greater network efficiency, including more efficient freight operations.	• Increase in the number of freight and support services using A428/A1303.	• Provide additional capacity during the peak periods to meet forecasted growth in demand along the A428/A1303. • Does not to impede existing road traffic, resulting in a growth in delays for highway trips along the A428/A1303. • Improve connectivity on part of the Oxford-Cambridge Arc.
• Increased attractiveness of new and future housing settlements along the A428/A1303. • Increased housing development opportunities along the A428/A1303 enabling Local Plan housing allocations to be achieved.	• Land values along the A428/A1303 to appreciate at a greater rate than along other rou tes within Cambridge. • Increase in number of new housing units built within developments along A428/A1303.	• Supports Cambridge in achieving continued economic growth whilst retaining the high quality of life and place associated with the city. • Support the delivery of new housing and job creation through the provision of HQPT that serves current and future housing sites along the A428/A1303, including Cambourne and Bourn, and employment sites within and around Cambridge city centre.
• Reduction in traffic on the SRN (M11). • Reduction in congestion along the A428/A1303. • More reliable commuter times using buses for employment in the city centre. • More reliable journey times for leisure and other trips into the city centre. • Improved user experience of those travelling along the A428/A1303.	• Reduction in congestion on the SRN indicated by an increase in average speeds and a reduction in journey time variability. • Increase in free-flowing traffic during peak periods. • Increase in bus service reliability along A428/A1303 during the peak period. • Improvement in commuters' journey satisfaction along the A428/A1303.	• Provide a transport systems that do not to impede existing road traffic, resulting in a growth in delays for highway trips along the A428/A1303. • HQPT that offers peak journey times that are equal to or less than the equivalent journey by car. • HQPT frequency during the peak periods of six buses or more an hour. • End to end journey time reliability better than the car alternative journeys. • HQPT offering improved waiting and in-vehicle environments that are comparable to Cambridge's existing Guided Busway. • Improve the attractiveness of sustainable modes of travel as an alternative to using cars, leading to an increase in their mode share.
• Reduction in NOx and PM10 pollution along the A428/A1303 and within Cambridge city centre. • Improved health and wellbeing of those living and travelling along A428/A1303. • Enhanced connectivity to green space amenity and recreational opportunities.	• Reduction in measurable levels of NOx and PM10 pollution. • Reduction in cases of reported health problems associated with traffic congestion - including respiratory and heart related illnesses. • Increase in recreational/leisure trips along A428/A1303.	• Contribute to enhanced quality of life by relieving congestion and improving air quality within the su rrounding areas along the A428/A1303 and within Cambridge city centre. • Supports Cambridge in achieving continued economic growth whilst retaining the high quality of life and place associated with the city.

Anticipated benefit	Performance indicator – Expected level of benefit	Relating to Objective
• Reduction in accident rates along A428/A1303.	• Reduction in KSI along A428/A1303.	• Introducing improvements which enhance levels of safety for cyclists and pedestrians and promote a healthier life style. • Supports Cambridge in achieving continued economic growth whilst retaining the high quality of life and place associated with the city.

Source: Mott MacDonald

8.6 Scope

The scope of the scheme has been defined based on the objectives of the scheme which have in turn been developed based on the problems and opportunities identified both along the A428/A1303 route and in the wider Cambridge area.

The scope of the C2C project is defined as:

- A HQPT route, between Cambourne and Cambridge, that bypasses general traffic congestion;
- A new Park & Ride site enabling traffic on the A428/A1303 access to the HQPT route, and;
- New continuous high-quality cycling and walking facilities along the route

The C2C project also aspires to utilise innovative future technologies where doing so would provide the solutions to its aims and objectives. This includes exploring the options of using alternative guidance technologies for the guided HQPT route and electric vehicles (note – for the purposes of costings, economic assessment and establishing the current preferred procurement route and planning route, the HQPT route technology is based on a kerb guided system – this is assumed to represent the current worst case scenario in terms of technological solution. As alternative technology becomes more viable, the business case would be updated to reflect the adoption of said technology).

8.7 Impact of not changing

In establishing the need for the proposed project, it is important to consider the counterfactual. Specifically, what would happen if the status quo was allowed to continue and the GCP did not intervene.

- The A428 has been recognised as part of the nationally strategically important Oxford – Cambridge Arc, which without improvements would limit national economic growth.
- There is a risk that current traffic congestion issues along the route, and in particular along the A1303 worsen, therefore restricting the connectivity between new housing developments and employment sites, making Cambridge less attractive for on-going investment.
- In not changing, Cambridge runs the risk of not providing sufficient transport capacity to accommodate the demand created by the proposed scale of development along the A428/A1303 limiting the support of the economic growth of Cambridge.
- The large-scale employment growth predicted for Cambridge requires improved transport facilities to ensure existing and future settlements are ably connected by all modes of transport to limit detrimental impact on local highways. The A428 plays a highly strategic role in connecting people with workplaces, however if the current lack of modal choice is not expanded, the existing congestion issues will exacerbate.
- The current public transport, walking and cycling opportunities along the A428 offer no attractive alternative to the private car. Private car journeys, especially during peak hours are

expected to increase by 14% and 36% in the AM and PM peaks respectively which will exacerbate current congestion issues if attractive alternatives are not offered to promote modal shift.

- Not providing the required level of connectivity to support the economic growth of Cambridge, reduces the positive economic growth trends which have been experienced over recent decades i.e. the Cambridge Phenomenon.
- Without intervention, those living and working in the new developments will become locked into a cycle of car dependency and low use of other modes exacerbating capacity issues along the route.
- Without intervention, those living in existing settlements, such as Cambourne, will remain car dependent with no attractive alternatives offering faster, more reliant transport into Cambridge city centre.

9 Interdependencies

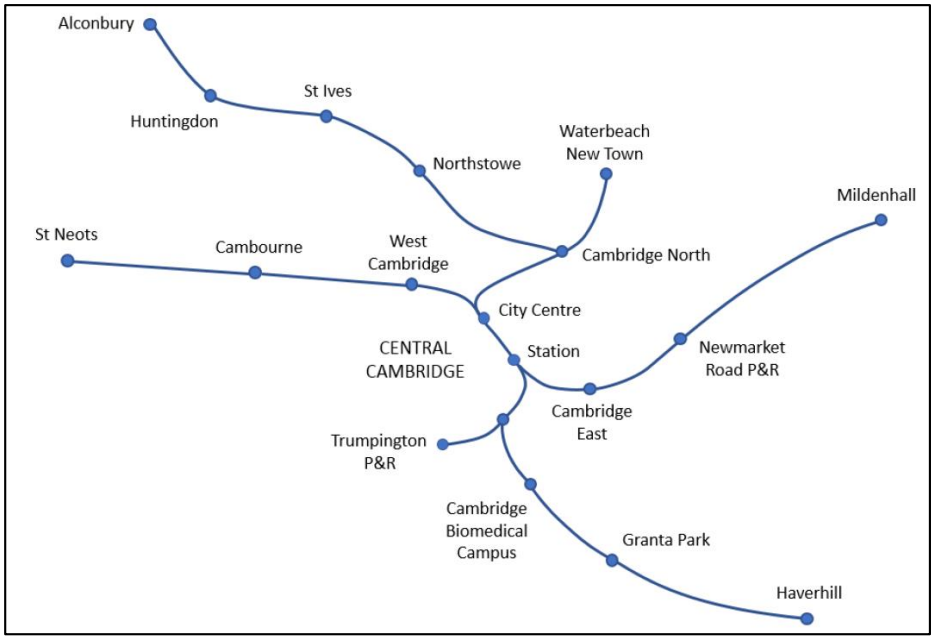
The following section sets out the key interdependencies for the C2C project. This covers other schemes currently being progressed or considered to serve trips arriving into Cambridge along the A428 and A1303, that may influence the level of demand for Park and Ride, as well as affecting travel flows in the local area. Due to the interaction between these schemes and C2C, they must be considered in conjunction with delivery of the C2C project.

9.1 Cambridgeshire Autonomous Metro

CAM forms a key element of the transport vision for Greater Cambridge. As set out in the CAM SOBC[92], the vision for CAM is an expansive metro network which seamlessly connects central Cambridge, its current and future rail stations, major employment sites on the city's fringe and key 'satellite' growth areas in Cambridge and across the wider sub-region. The SOBC for CAM illustrates how up to 10,000 jobs and 60,000 new homes could result from the scheme[93].

Proposals for CAM are heavily reliant on the success of other schemes in and around Cambridge, some of which are already in place and others planned, which form the 'building blocks' of the CAM network[94]. The C2C project, although an independent scheme in its own right, would form the 'first phase' of CPCA's planned scheme, should CAM be consented. The proposed network map for CAM is shown in Figure 36.

Figure 36: CAM Network Map



Source: Cambridgeshire Autonomous Metro Strategic Outline Business Case, Final Draft Report, Steer, February 2019

[92] Cambridgeshire Autonomous Metro Strategic Outline Business Case, Final Draft Report, Steer, February 2019
[93] Cambridgeshire Autonomous Metro Strategic Outline Business Case, Final Draft Report, Steer, February 2019
[94] Cambridgeshire Autonomous Metro Strategic Outline Business Case, Final Draft Report, Steer, February 2019

The scale of the CAM project reflects Cambridge's need for transformational improvements in the city's infrastructure and connectivity to the wider region. The CAM SOBC states:

> *"CAM has been designed to support the shared CPCA and GCP priorities and outcomes around economic growth, accelerating housing delivery, promoting equity and encouraging sustainable growth and development. These outcomes have directly informed the development of four overarching CAM scheme objectives."*[95]

To demonstrate the alignment and interdependence of the CAM and C2C projects, Table 13 outlines their respective objectives.

Table 13: Alignment of C2C and CAM scheme objectives

C2C project Objectives	CAM Scheme Objectives
To achieve improved accessibility to support the economic growth of Greater Cambridge • Support the delivery of new housing and job creation through the provision of HQPT that serves current and future housing sites along the A428/A1303, including Cambourne and Bourn, and employment sites within and around Cambridge city centre. • Provide additional capacity during the peak periods to meet forecasted growth in demand along the A428/A1303. • Does not impede existing road traffic, resulting in a growth in delays for highway trips along the A428/A1303. • Improve connectivity on part of the Oxford-Cambridge Arc. **To deliver a sustainable transport network/system that connects areas between Cambourne and Cambridge along the A428 / A1303.** • Improve connectivity into Cambridge using sustainable modes of transport such as walking, cycling, and HQPT. • HQPT that offers peak journey times that are equal to or less than the equivalent journey by car. • HQPT frequency during the peak periods of six Public Transport Vehicles or more an hour. • End to end journey time reliability better than the car alternative journeys. • HQPT offering improved waiting and in-vehicle environments that are comparable to Cambridge's existing Guided Busway **Contribute to enhanced quality of life by relieving congestion and improving air quality within the surrounding areas along the A428 /A1303 and within Cambridge city centre.** • Improve the attractiveness of sustainable modes of travel as an alternative to using cars, leading to an increase in their mode share. • Supports Cambridge in achieving continued economic growth whilst retaining the high quality of life and place associated with the city. • Introducing improvements which enhance levels of safety for cyclists and pedestrians and promote a healthier life style	**Promote economic growth and opportunity** • Improve transport connectivity • Improve journey time reliability • Promote agglomeration • Support new employment by enhancing access to and attractiveness of key designated employment areas • Increase labour market catchment **Support the acceleration of housing delivery** • Direct high-quality public transport access to key housing sites (existing designations) • Serve and support areas for sustainable housing development • Provide overall transport capacity to enable and accommodate future growth **Promote Equity** • Promote better connecting other towns with C&P to Cambridge • Improved opportunities for deprived residents **Promote sustainable growth and development** • Improve air quality • Promote low carbon economy • Support environmental sustainability

Source: Cambridgeshire Autonomous Metro Strategic Outline Business Case, Final Draft Report, Steer, February 2019

[95] Cambridgeshire Autonomous Metro Strategic Outline Business Case, Final Draft Report, Steer, February 2019

9.2 City Access

The City Access project is developing a package of measures to deliver a commitment to reduce traffic in Cambridge by 10-15% on 2011 levels by 2030 and is a key dependency for the C2C project. To optimise success of the scheme, and to enhance the Park & Ride usage along the A428/A1303, it is vital that the C2C project is not delivered in isolation to the City Access Strategy, rather in conjunction with the eight packages comprising the Strategy, see Figure 37.

Figure 37: Cambridge City Access Strategy Measures

Source: Greater Cambridge Partnership

The proposed options for the C2C project, therefore, have been designed based on the assumption that they will both contribute to and benefit from the packages displayed in Figure 37. These benefits include:

- Reduced congestion within the city centre;
- Faster, cheaper and more reliable bus journeys, enabling expansion of Park & Ride capacity and facilities;
- Safer, easier and more attractive walking and cycling journeys;
- Reduced pollution and cleaner air;
- Fewer stationary or slow-moving vehicles;
- More cycling and pedestrian infrastructure;
- Preservation and enhancement of Cambridge's historic environment;
- Improvements to the quality and reliability of public transport; and
- Continued growth in cycling.

9.3 Cambridge South East Transport System

The Cambridge South East Transport System (CSETS) is very closely aligned to the C2C project as it aims to deliver a similar high-quality public transport system based around the same aims and principles of the C2C project. This includes the introduction of segregated routes for dedicated public transport services linked to Park & Ride site. As such CSETS and C2C will help to deliver a wider network of public transport interventions to help the growth of Cambridge, and looked to implement systems based on similar infrastructure and vehicle technology.

9.4 Cambridge South West Travel Hub

The Cambridge South West Travel Hub scheme is at an early stage of development. It seeks to deliver an increase in Park & Ride capacity serving those trips coming from the South using the M11 and Junction 11, that would otherwise travel on into the city centre and developments to the south of the city, including the Biomedical Campus. Linked to this scheme are public transport priority measures along the A1309 Hauxton Road/High Street/Trumpington Road corridor and an enhanced high-quality public transport services between the Park & Ride site and Cambridge City Centre/Cambridge Biomedical Campus. This scheme would be expected to remove some trips that might otherwise use the A1303 at Junction 13 to access the City Centre.

9.5 Greenways

GCP are committed to improving the infrastructure for non-motorised users (walking cycling and equestrians) within Cambridgeshire. As such the 'Greenways Team' have been working with communities to find out what the public would like from local non-motorised user routes. In total there are 12 planned Greenways, one of which runs parallel to the A428: The Comberton Greenway.

The Comberton Greenway runs parallel to Madingley Road to the south, from Cambridge City Centre to Comberton. It passes through Coton Village which will link with C2C. The Comberton Greenway is expected to offer an alternative to using the A428 for non-motorised users.

9.6 East West Rail

East West Rail is creating a new rail connection between Oxford and Cambridge. A public consultation was held in early 2019 to ask for views on five of the route options (see section 6.3.2.1 for more detail). The potential of a Cambourne Rail station appeared in two of the options for consultation. Depending on the preferred option outcome, East West Rail may become a key project interdependency for the C2C project in delivering improved public transport connections for those living and working along the A428 route.

Whilst a station at Cambourne would be good news for residents and improve overall connectivity from Cambourne into Cambridge, it would not serve the C2C objectives to connect new developments along the full length of the corridor i.e. Bourne Airefield, West Cambridge. C2C is also planned for completion in 2024 in order to tackle the existing and worsening issues of congestion along the A428 and A1303, whilst it is envisaged East West Rail will take longer to deliver and therefore any associated benefits to be realised.

GCP would look to work in collaboration with the East West Rail scheme where possible to ensure that C2C is complementary to any future station at Cambourne in providing interchange opportunity for last mile journeys along the corridor by bus.

9.7 Stakeholders

The stakeholders for the C2C project are a key interdependency for the project to ensure it meets stakeholder needs. Key stakeholders have identified issues and fed back to GCP throughout the development of the C2C project. A consultation plan was developed by the GCP to validate the issues identified and gain feedback on proposed solutions (interventions). The approach to consultation and the findings are noted within the following separate reports, appended to the Business Case Update:

- Appendix G: Statement of Community Involvement; and,
- Appendix H: Stakeholder Engagement and Communication Plan.

10 Option Development and Appraisal

This section summarises the work undertaken to identify the options for addressing the issues and opportunities of the project, and how those options have been assessed and refined to arrive at a single recommended option.

10.1 Background to optioneering

Work on developing plans for the C2C project began in 2014, with the project being prioritised for funding from the City Deal by the GCP in 2015. Since this, the scheme has undergone significant development to generate options that would address the issues of congestion and reliability along the A428/A1303, and to develop opportunities to connect local communities to employment opportunities in Greater Cambridge. The options have progressed through a series of assessments and refinement, including public consultation. The short-listed options were presented in an SOBC in September 2016. Since then, there has been progress towards the selection of a preferred scheme and the development of an OBC.

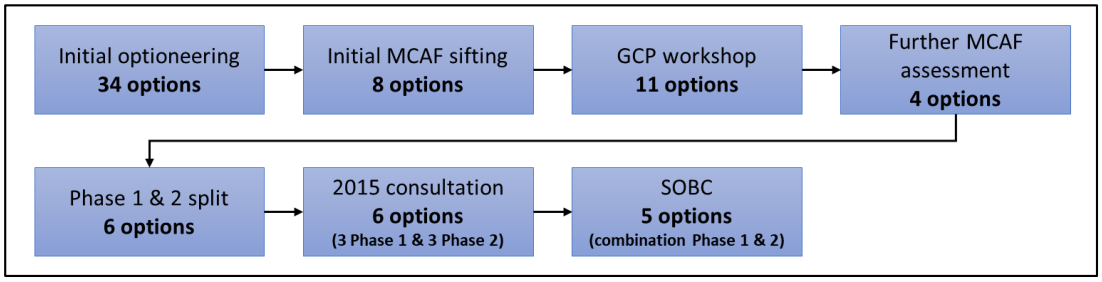
The options appraisal process for the C2C project aligns Stage 1 of the DfT's guidance 'The Transport Appraisal Process'[96]:

10.1.1 Options development and assessment through to SOBC

The options development and assessment process (set out in Figure 38) took place between 2014 and 2016. The outcome of this stage of development were 5 options presented in the SOBC to take forward for further assessment and consultation. All route alignment optioneering carried out to inform the SOBC is summarised within the reports listed below. These reports are also published on the GCP project website[97].

- Madingley Road/A428 Corridor Study, Options Assessment Report (June 2014);
- Madingley Road/A428 Corridor Study Interim Report (June 2015); and
- C2C SOBC (September 2016).

Figure 38: C2C SOBC Options Development Process



Source: Mott MacDonald

[96] DfT – The Transport Business Cases (January 2013)

[97] https://www.greatercambridge.org.uk/transport/transport-projects/cambourne-to-cambridge/cambourne-to-cambridge-background/

10.2 Park & Ride options selection

A key element of the C2C project is the inclusion of a new Park & Ride site. The options for the location of the new Park & Ride site were considered in conjunction with the main route options development.

The process for identifying the new Park & Ride site has been carried out in two stages:

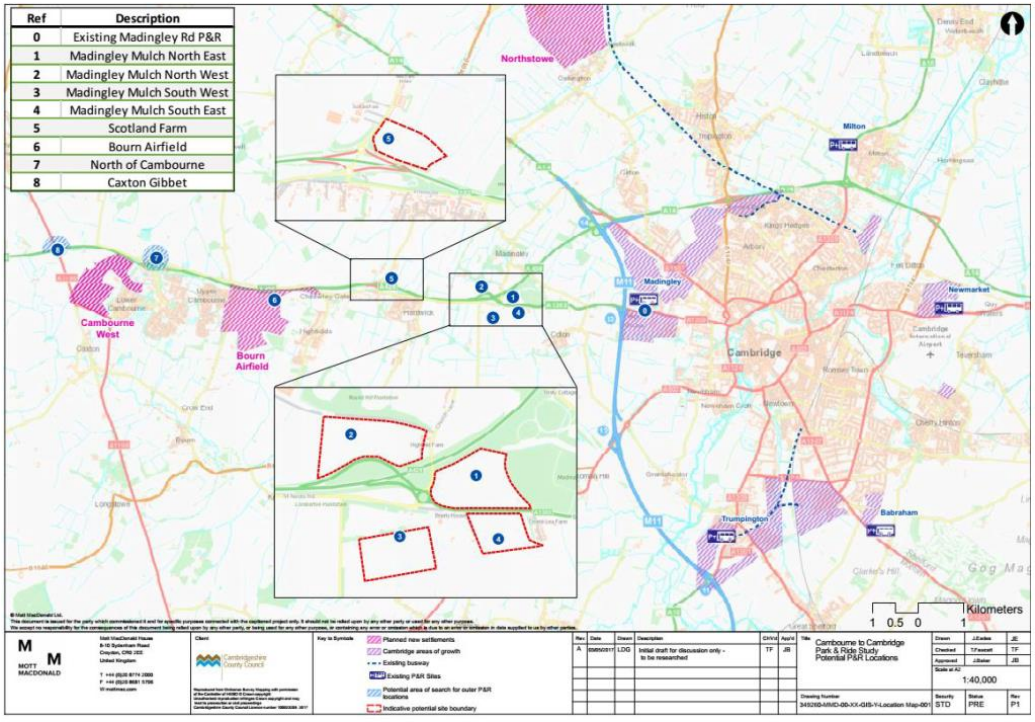
- Shortlisting, and
- Specific site evaluation

10.2.1 Shortlisting

The shortlisting process considered three broad location areas for a proposed new site, for which the transport characteristics and suitability for a Park & Ride site (Figure 39):

- A western, outer, area with potential sites including 6, 7 and 8 (all close to Cambourne);
- A central area, which includes site 5 (Scotland Farm); and
- An eastern, inner, area around Madingley Mulch (sites 1, 2, 3 and 4).

Figure 39: Stage 1 - Park & Ride sites



Source: Mott MacDonald - Cambourne to Cambridge Better Public Transports Park & Ride Study (September 2017)

Using Mott MacDonald's multi-criteria assessment tool called INSET (Investment Sifting and Evaluation Tool) the nine sites were assessed reflecting the following key criteria agreed with stakeholders:

- High level theme – Policy Alignment;
- Intermediate level theme – Benefits; and
- Operational theme – Deliverability.

A full break down of the criteria and scores can be found in the Cambourne to Cambridge Better Public Transport Park & Ride Study (Mott MacDonald, September 2017)[98].

Following the assessment of the proposed Park & Ride sites, five were recommended for taking forward into a further stage of assessment. These were:

- Site 0 Madingley Road;
- Site 3 Water Works;
- Site 4 Crome Lea;
- Site 5 Scotland Farm; and
- Site 6 Bourn Airfield.

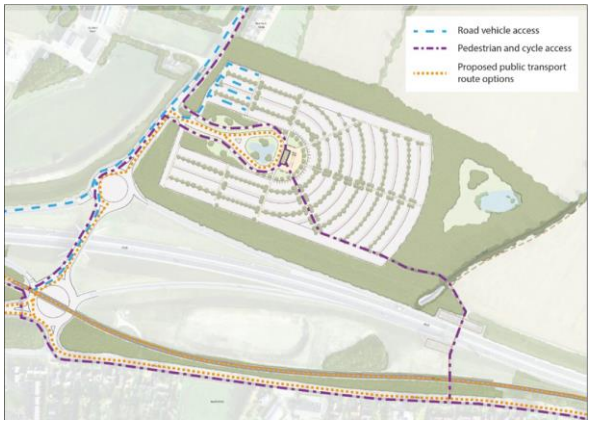
It should be noted that although site 7, North of Cambourne, received the equal highest score, it was not taken forward as it is similar to site 6. Furthermore, site 6 was identified in the submitted local plan at the time of that assessment, and was subsequently included in the adopted local plan.

10.2.2 Specific site evaluation

Further research and development of the Park & Ride sites was undertaken to select two options that would be taken to public consultation. Following this, an INSET assessment was undertaken. Two options were taken forward, one from the Madingley options and one from the western options:

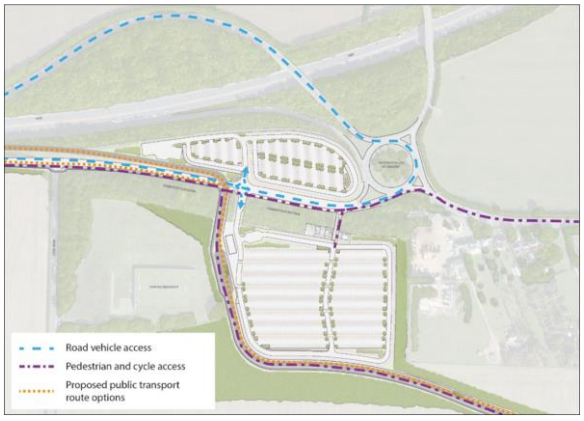
- Water Works from the Madingley options; and
- Scotland Farm from the western options.

Figure 40: Scotland Farm Park & Ride option



Source: Mott MacDonald

Figure 41: Water Works Park & Ride option



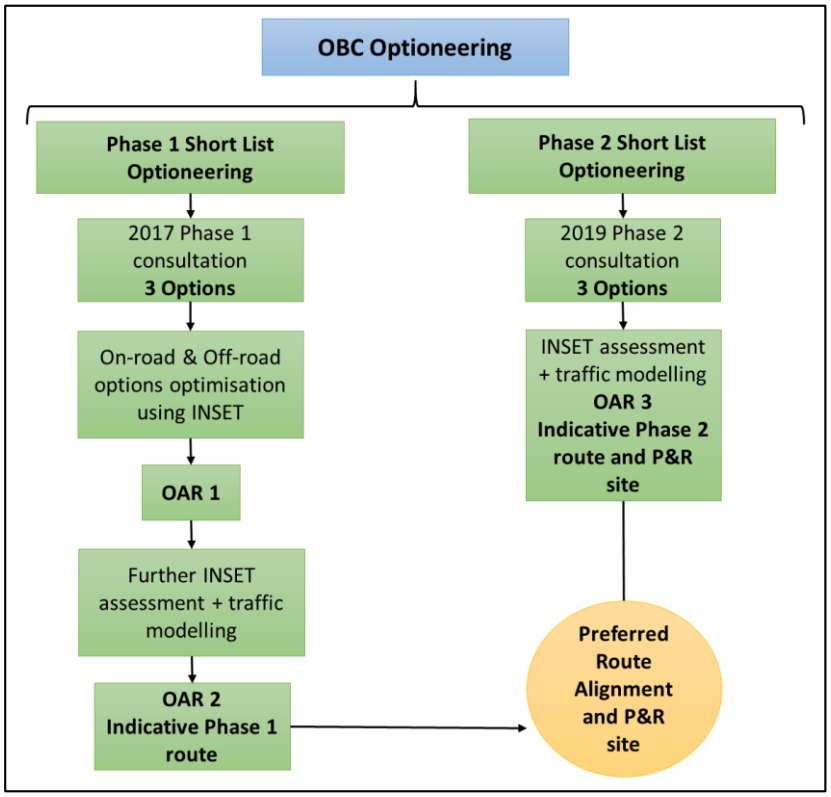
Source: Mott MacDonald

10.3 Options development and assessment through to OBC

Following the approval of the SOBC, further work has been undertaken to identify a preferred route alignment for Phase 1 and 2 (Figure 43), as well as the Park & Ride site. Figure 42 illustrates the optioneering process carried out in identifying a preferred option.

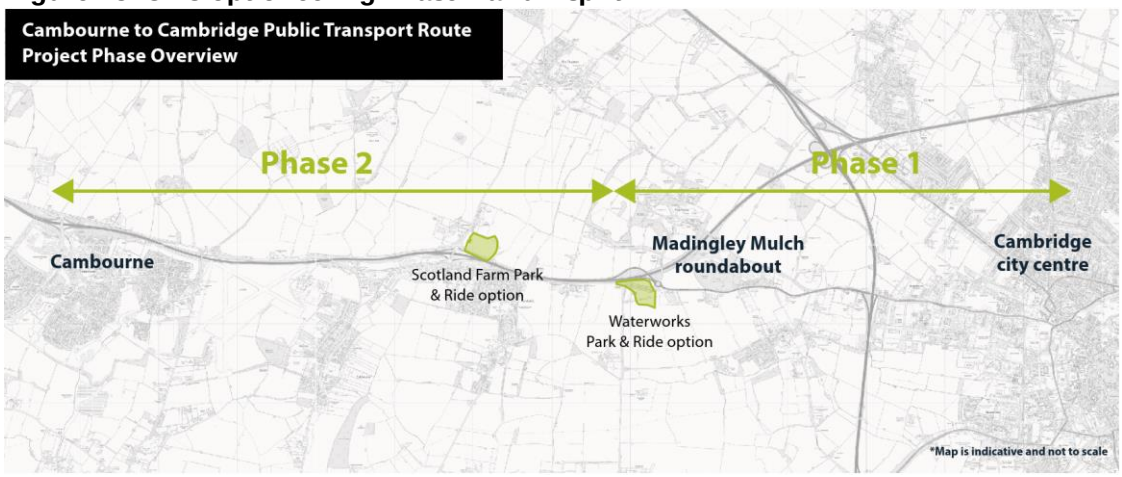
[98] Full report published on the GCP project website for the C2C project - https://www.greatercambridge.org.uk/transport/transport-projects/cambourne-to-cambridge/cambourne-to-cambridge-background/

Figure 42: C2C OBC optioneering process



Source: Mott MacDonald

Figure 43: OBC optioneering Phase 1 and 2 split



Source: Mott MacDonald

The options assessment methodology for Phase 1 and 2 applied a multi criteria assessment utilising INSET and assessed options against 37 criteria linked to the scheme vision and objectives. The criteria were grouped into themes that reflect the scheme objectives (Table 14). A detailed description of each assessment criterion can be found in OAR1 (Appendix A).

Table 14: INSET Assessment Criteria

Theme	Assessment criteria
Policy fit	Cambridgeshire Local Transport Plan 3[99]
	Highways England Road Investment Strategy
	Greater Cambridge and Greater Peterborough Strategic Economic Plan
	Greater Cambridge City Deal
	South Cambridgeshire Local Plan
	Cambridge City Local Plan
Contribution to economic growth	Labour Market and Activity
	Business investment and Growth
	Cambridge Positive Image
	Future potential growth post 2031
	Capacity
Contribution to improved transport network	Reliability of journey
	Route flexibility Links into existing public transport routes
	Walking and cycle connectivity
	Impact on existing traffic
	Journey times
	Service frequency
	Mode share
	Connectivity to Park & Ride
Contribution to quality of life	Environmental impacts - Landscape Impact
	Environmental impacts – Noise
	Environmental impacts - Air Quality
	Environmental impacts - CO_2 emissions
	Environmental impacts – Biodiversity
	Environmental impacts – Heritage
	Environmental impacts – Green Belt
	Safety
	Accessibility
Scheme deliverability	Scheme Cost
	Engineering feasibility - construction method
	Land acquisition required
	Impact on local road network during construction
	Future proofing
	Legislative Powers
	Scheme Maintenance and Renewals
Stakeholder support	Public acceptability

Source: Mott Macdonald

Scoring was based on a combination of qualitive and quantitative assessment and was informed by feedback from stakeholder and public consultation. This facilitated a comparison and ranking of the options.

[99] Note - The Mayor's Interim Transport Strategy (MITSS) was published in May 2018 and the Combined Authority (CA) are currently in the process of developing a revised LTP, a draft of which was published in April 2019 for public consultation However, the criteria adopted in the INSET process were adopted before the publication of the MITSS and already cover the key issues identified in the MITSS and it is therefore considered to be compliant with emerging CA policy at this stage.

In addition, an initial assessment of the options value for money was carried out, with individual Benefit Cost Ratios (BCR) for the options calculated using transport modelling outputs. The user benefits were derived from journey time savings and calculated using the strategic Cambridge Sub Regional Model (CSRM2). A final comparative assessment of the options was also carried out examining the wider economic impacts of the on-road and off-road options.

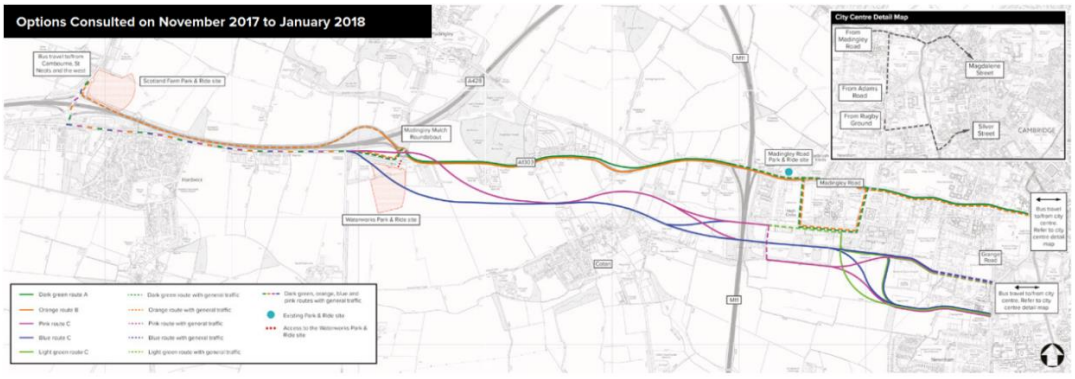
The results of the Phase 1 options assessment are presented in OAR1 (Appendix A) and OAR2 (Appendix B) and the Interim Report (2018), whilst the results of Phase 2 options assessment are presented in OAR3 (Appendix C).

10.3.1 Phase 1 options assessment

The options assessed for Phase 1 were:

- **Option A:** An on-road option which includes the introduction of an inbound bus lane on Madingley Road between Madingley Mulch roundabout and Lady Margaret Road;
- **Option B:** An on-road tidal bus lane on Madingley Road running between Madingley Mulch roundabout and the new entrance to Eddington (High Cross); and
- **Option C:** An off-road public transport route running between Madingley Mulch roundabout and Grange Road, Cambridge (this included three variants).

Figure 44: Phase 1 Options



Source: Consultation leaflet, 2017-2018, (© Crown Copyright. All Rights Reserved. OS License Number 100023205.2018)

Source:November 2017 to January 2018 consultation leaflet

The option development and appraisal for Phase 1 route alignment was undertaken in two stages:

10.3.1.1 Stage one

The first stage involved the assessment of the on-road options (Option A and B) against each other, and the assessment of the different variations of the off-road option (Option C) using the identified assessment criteria. This was done to generate an '*optimised*' on-road option that reflected the best performing elements of Option A and Option B and a single specific off-road route alignment from Option C that narrowed down the three variants to one. The results of this stage are presented in OAR Part 1 – Appendix A.

Through the assessment of the on-road options, the findings concluded that the preferred on-road option was Option A. However, elements of Option B were shown through the assessment to have merit. As part of the optimisation of the on-road option, the desire to reflect the aspiration in Option B for some improvements to outbound traffic, and a need to further consider the operation of Junction 13 of the M11. The key areas and recommendations that came out of this assessment are shown in Table 15.

Table 15: Optimised Route A – key areas and recommendations

Area	Recommendations
Madingley Mulch Roundabout (All Options)	Modelling suggests section of westbound bus lane and priority at Madingley Mulch roundabout should be included in the preferred option.
Cambridge Road Junction (option 7.1)	Modelling suggests the junction should not be signalised.
M11 Junction 13 (Option 7A)	Modelling suggests additional lanes over the M11 would be beneficial but further assessment may be required to assess the cost implications of the chosen layout.
Park & Ride at High Cross Junction	Eastbound bus priority at the junction seems to be of benefit but further modelling required to check impact on general traffic and to test the effects of the changes to the park & ride entrance and exit.
Grange Road Junction	Modelling suggests bus priority measures should not be included.
Removal of bus lane from University West to Storeys Way	Modelling suggests little benefit but further modelling recommended. Assess potential to provide improved cycling facilities if bus lane is not taken forward

Source: Mott MacDonald, OAR Part 1 (Appendix A)

Apart from Cambridge Road and Grange Road junction signalling, which showed no benefit when modelled, all the other optimisations were included in the final on-road option.

Figure 45: Optimised on-road option

Source: Mott MacDonald

Whilst there was a single off-road option, it comprised of two variants “Blue” and “Pink” along a similar corridor, with an additional “Green” option through the West Cambridge development and two options to connect to Grange Road, Adams Road and the former Rifle Range track (see Figure 47). The INSET appraisal identified the preferred off-road option as the “Blue” route through Madingley Mulch roundabout, Coton Village and West Cambridge, and the Rifle Range connection to Grange Road.

Prior to the second stage of assessment, the Phase 1 options went through a series of developments that resulted in changes to the options. These included reflecting the results of the 2017/18 public consultation and the emerging CPCA Mayoral Vision for the wider strategic transport network for Cambridge.

Figure 46: Stage 1 – Optimised on-road and off-road Phase 1 options

Source: Mott MacDonald

10.3.1.2 Stage two

For the second stage of assessment, the two options were taken forward for direct comparison. Each option was considered with each of the two short listed Park & Ride sites, as well as a Do Minimum scenario. An additional option that included new infrastructure between Cambourne and Madingley Mulch roundabout (Phase 2) was also included for further appraisal to illustrate any potential step change in benefits resulting from the implementation of both Phase 1 and 2. This was called the "Illustrative Comparator" option. The results of this stage are presented in OAR Part 2 – Appendix B.

Table 16: Shortlisted off-road options

Shortlisted Options	Park & Ride location	Option Route Description
Do Minimum	N/A	• Committed Schemes i.e. schemes that have been deemed likely to proceed
Low Cost a (Preferred on-road Phase 1)	Water Works	• Madingley Mulch Roundabout becomes signalised and a new bus lane is added to the A428. • East bound bus lane and sections of westbound bus lanes along Madingley Road (A1303). • New pedestrian bridge over M11 and additional traffic lane on existing bridge. Alterations to the slip to allow two lanes of traffic. • Bus gate at High Cross junction. • Changes to access to existing Park & Ride.
Low Cost b (Preferred on-road Phase 1)	Scotland Farm	
Do Something 1a (Preferred off-road Phase 1)	Water Works	• Changes to Madingley Mulch Roundabout to accommodate off-road route • Junction with Cambridge Road • New bridge over M11 • Junction with Ada Lovelace road • Junction with Grange Road
Do Something 1b (Preferred off-road Phase 1)	Scotland Farm	
Illustrative Comparator	Water Works	• Off road alignment for Phase 1 and 2 from Cambourne to Grange Road with Park & Ride located at Waterworks for comparative purposes.

Source: Mott MacDonald

10.3.1.3 Consultation and stakeholder views

The following stakeholder consultation and engagement took place to inform the development of the short-listed options:

- Formal public consultation: took place between November 2017 and January 2018;
- Key stakeholder workshops: two stakeholder workshops to discuss details of the project in February and March 2018; and
- Market research: five focus groups in January 2018 with residents in and around Greater Cambridge.

A detailed summary of each event and key findings can be found in Appendix G – Statement of Community Involvement.

10.3.1.4 Option design changes in response to public consultation

Whilst many suggestions have been previously considered and discounted, some public consultation responses were adopted into the options for assessment. These are detailed in Table 17.

Table 17: Option design changes in response to public consultation

Option	OAR part 1 Option Description	Design Change following consultation
Low Cost a/b	An additional lane was required on the M11. There were two options for consideration. Widening the existing bridge or building a separate pedestrian bridge and using the existing footway to accommodate the extra lane.	The workshop feedback on the on-road option showed preference for a separate cycle and pedestrian walkway so. the pedestrian bridge was taken forward
Low Cost a/b	The original option A only had provisions for bus priority inbound to Cambridge.	Consultation showed general support for Option B, a reason for this was the provision for both in and outbound bus priority. Therefore, the project has taken the bi-directional bus lanes and optimised the on-road option to include both inbound and out bound bus priority.[100]
Do minimum Low Cost a/b	The original option A had a bus lane from High Cross Junction to Lady Margaret Road.	Consultees suggested that there should be better cycle provisions from High Cross junction to Lady Margaret Way therefore the bus lane has been removed from the on-road option and cycle provisions have been included outside of the scheme and will form part of the do minimum option.[101]

Source: Mott MacDonald

West Cambridge Development

During public consultation with stakeholders, most notably UoC, it became apparent that there was additional, previously unknown information regarding the West Cambridge development site. Near the current blue route option is a highly sensitive laboratory. The laboratory equipment used within the Material Science and Metallurgy building is very sensitive to changes in Electromagnetic Interference (EMI) and vibrations and as such it was decided to complete a review of the route options through this area.

These initial assessments show that the "Blue" route could potentially cause EMI and vibrational problems for the sensitive equipment, but this needs to be verified through more detailed assessment and discussion with UoC.

An alternative route was also tested which showed that there would be a reduction in any impact. This was a segregated version of the "Green" route assessed at OAR (Part 1) stage.

INSET assessments were reviewed and the conclusion was that the segregated "Green" route would be taken forward for assessment as part of the second step of assessment for Phase 1 route alignment (report in OAR Part 2). As such the "Do Something" options being assessed as part of stage 2 were revised accordingly.

10.3.1.5 Phase 1 INSET results

A summary of the Phase 1 options against the assessment criteria is shown in Table 18. Each option was scored against each criteria on a scale of 1 to 7. A RAG (red, amber, green) rating has been used to represent the following scores:

- Scores of 1 and 2 being negative and rated as red;
- Scores between 4 and 6 being neutral or slightly positive/negative, rated as amber; and
- Scores of 6 and 7 being positive and rated green.

[100] It is now proposed to include this instead as part of the "Quick Wins" discussed further in Section 9.1.1.

[101] It is now proposed to include this instead as part of the "Quick Wins" discussed further in Section 9.1.1.

Table 18: Phase 1 INSET Assessment RAG Summary

		Do Minimum	Low Cost a	Low Cost b	Do Something 1a	Do Something 1b	Illustrative Comparator
1. Policy Fit	Cambridgeshire LTP3						
	Highways England Road Investment Strategy						
	Greater Cambridge and Peterborough SEP						
	Greater Cambridge City Deal						
	South Cambridgeshire Local Plan						
	Cambridge City Local Plan						
2. Contribution to Economic Growth	Labour market and activity						
	Supporting house construction						
	Business investment and growth						
	Cambridge positive image						
	Future potential growth post 2031						
	Capacity						
3. Contribution to Improved Transport Network	Reliability of journey						
	Route flexibility - Links into existing bus routes						
	Walking and cycle connectivity						
	Impact on existing traffic						
	Journey times						
	Service frequency						
	Mode share						
	Connectivity to Park & Ride						
4. Contribution to Quality of Life	Environment impacts - Landscape Impact						
	Environment impacts – Noise						
	Environment impacts - Air Quality						
	Environmental impacts - CO2 emissions						
	Environmental impacts – Biodiversity						
	Environmental impacts – Heritage						
	Environmental impacts – Green Belt						
	Safety						
	Accessibility						
5. Scheme Deliverability	Scheme Cost						
	Engineering feasibility - construction method						
	Land acquisition required						
	Impact on local road network during construction						
	Future-proofing						
	Legislative Powers						
	Scheme Maintenance and Renewals						
6. Stakeholder Support	Public acceptability						
	Overall Score	**4.00**	**4.22**	**4.24**	**4.70**	**4.68**	**4.89**

Source: Mott MacDonald

The INSET results show that the emerging route alignment and preferred option for Phase 1 was Do Something 1. However, no differentiate between the Park & Ride locations was shown at this stage.

Table 19: Phase 1 INSET Assessment Results

Option	INSET Scoring Summary Ranks
Do Minimum	Ranked 5th
Low Cost a	Ranked 4th
Low Cost b	Ranked 3rd
Do Something 1a	Ranked 1st
Do Something 1b	Ranked 1st

Source: Mott MacDonald

10.3.1.6 Phase 1 Value for Money

Table 20 presents an analysis of monetised costs and benefits for each of the options for Phase 1 as part of the assessment of the options.

Table 20: Phase 1 analysis of monetised costs & benefits (£'000s, 2010 prices discounted to 2010)

	Low Cost a	Low Cost b	Do Something 1a	Do Something 1b	Illustrative Comparator
Total Present Value Benefits (PVB)	2,213	2,604	23,411	18,990	20,763
Present Value Costs (PVC)	83,895	84,482	120,959	124,326	176,685
Benefit Cost Ratio (BCR)	**0.03**	**0.03**	**0.19**	**0.15**	**0.12**

Source: Mott MacDonald

Taking into account the monetised impacts vs the scheme costs, as well as the findings from the qualitative and non-monetised assessments carried out to inform the INSET assessment, the best performing option in terms of route alignment from Madingley Mulch roundabout to Grange Road for Phase 1, is the Do Something 1a option – Off-road alignment with Waterworks Park & Ride.

The results from the multi-criteria INSET assessment further demonstrates the strength of this option in meeting a wider range of criteria. The results from the INSET assessment also demonstrate that there was greater benefit from implementing the illustrative comparator and both Phase 1 and 2. This could incorporate both an off-road alignment for Phase 1 of the C2C project to Madingley Mulch Roundabout (i.e. Do Something 1a or 1b) and an off-line alignment for Phase 2 to Cambourne.

Whilst options for Phase 2 were not yet fully appraised and subject to public consultation at the point in time of Phase 1 optioneering completing, the assessment confirmed that extending the scheme west to Cambourne would deliver additional benefits. Specifically, ensuring that the project serves new developments in Cambourne West and Bourn Airfield, both of which are contained with the adopted Local Plan (2018).

To further demonstrate the benefits and value for money of implementing both Phase 1 and 2, and to demonstrate the strength of the Do Something 1 options for Phase 1, for the purpose of further demonstrating the VfM for the scheme, the option's VfM was assessed in relation to its wider economic impacts (WEI). This included examining the local wider economic benefits (WEBs) to Cambridge (see Table 21). The results of this analysis (report in the Strategic

Economic Appraisal of A428-A1303 Scheme[102]. The results of this test illustrated that the scheme has the potential to offer a high level of VfM to the Greater Cambridge area, with a **'Local WEIs' BCR of 3.84**, based on delivering benefits at a local level. Crucially where this differs from the standard BCR based on user benefits, this BCR is based on delivering those benefits linked to the scheme's overall objectives and those of the GCP in facilitating economic growth.

Table 21: Wider economic impacts VfM sensitivity - Greater Cambridge local level

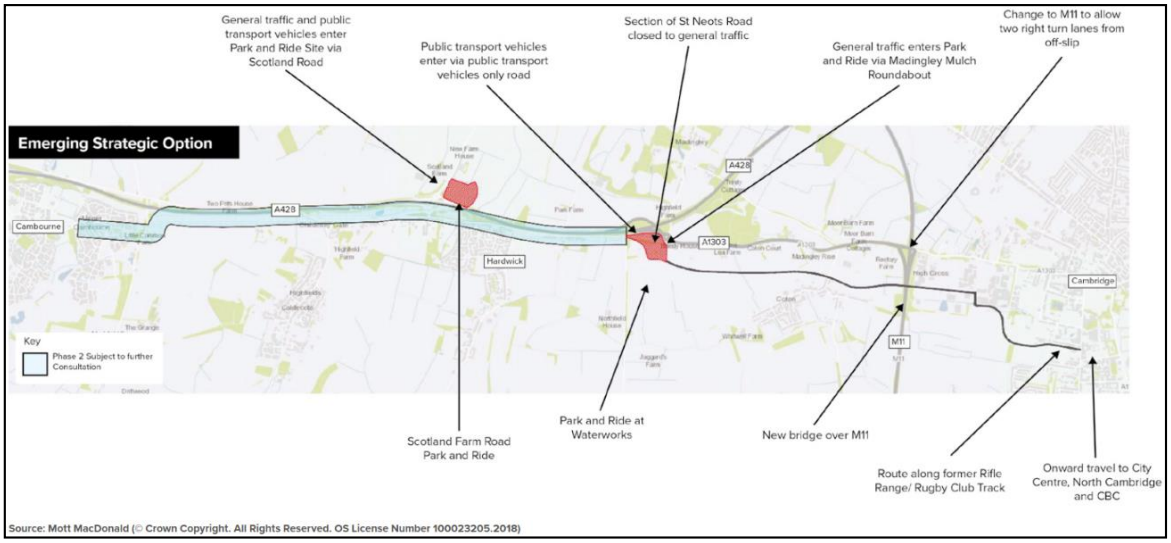
Benefit (£,000m)	Illustrative Comparator
GVA benefits – Greater Cambridge level	£679,300
Present Value Costs (PVC)	£176,685
OVERALL IMPACT	
"Local WEBs ratio"	**3.84**

Source: Mott MacDonald – Strategic Economic Appraisal of A428-A1303 Scheme (Sep 2016)

10.3.1.7 Phase 1 assessment summary

From the appraisal undertaken for Phase 1, a Specific Route Alignment which performs best from Madingley Mulch roundabout to Grange Road, Do Something option 1, was identified (illustrated in Figure 47). This is an off-road route alignment. The detailed assessment of the options for Phase 1 are set out in OAR 1 and 2 (Appendix A and B).

Figure 47: Phase 1 route alignment



Source: Mott MacDonald

Whilst the on-road route alignment for Phase 1 is not proposed for taking forward as part of the preferred option, elements of this option around cycling enhancements are being considered for further development. The implementation of these enhancements are considered outside the scope of the C2C project.

[102] GCP project website - Strategic Economic Appraisal of A428-A1303 Scheme (2016)

10.3.2 Phase 2 options assessment

The appraisal of the Phase 2 options used the same approach as Phase 1, with the assessment of the options against the same criteria utilising INSET. However, no initial optimisation for either the on-road or off-road options was carried out in advance of assessing each option against each other. Each option was assessed with the two Park & Ride variants in turn. Again, as with the assessment of options for Phase 1, an initial economic appraisal of each option based on transport user benefits using traffic modelling outputs was also carried out.

10.3.2.1 Phase 1 alignment changes

Following the conclusion of the Phase 1 options assessment, ongoing assessment and engagement resulted in some changes to the preferred Phase 1 alignment.

Grange Road Access

The initial assessment for the Off-Road route alignment to the east of Phase 1 showed that Rifle Range was the best option according to the assessment based on criteria derived from the scheme objectives.

However, as the scheme has progressed, results from consultation with key stakeholders and members of the public have been received, raising a number of questions concerning the impact on the West Fields, access and land ownership. This prompted a review of the original INSET assessment (summarised in OAR3 - Appendix C).

The results of the reassessment indicated that the Rifle Range option is more costly and has a greater impact on the West Fields and Green Belt (Appendix U - Green Belt Assessment). Whilst it delivers the long term requirements of C2C more effectively in provision of a segregated route, the degree of segregation is partially undermined by the need to maintain various access rights along the Rifle Range track.

Moreover, with C2C considered phase 1 of CAM, the case for a dedicated route to the east of West Cambridge has been questioned as it will likely become redundant once the full CAM network is operational. This is a key consideration from a future-proofing perspective.

On other issues such as ecology and parking and access there are pros and cons of both options but further development of the Rifle Range track has established a number of factors which undermine its potential.

A final key point is around Adams Road not offering the space to provide 3m segregated cycleways alongside 7.3m highway and an adequate walkway to serve properties. Selecting Adams Road would likely mean that the Comberton Greenway would need to provide a cycle route down to the Rifle Range as an alternative route that avoided conflict with buses. However, many cyclists may still potentially choose to use Adams Road.

Taking into account the reassessment, it was recommended at this stage in the scheme development that Adams Road, as the slightly better performing option with the reduction in harm to the Green Belt, would be the better route alignment for this segment of Phase 1.

West Cambridge

Since the confirmation of Phase 1 alignment, engagement with the West Cambridge Site has continued, including the provision of indicative drawings of the potential layout along Charles Babbage Road. During this engagement concerns about having two bi directional roads running parallel to one another have been raised, as the new segregated route would run directly south of Charles Babbage Road. Further engagement with UoC has indicated a desire to remove the

segregated route and have vehicles running on Charles Babbage Road itself. Measures are being considered by the University to reduce traffic on Charles Babbage Road to ensure reliability for the public transport vehicles. Plans currently retain the segregated route but it is recognised that work should continue to develop this route alongside the developing West Cambridge plans.

Taking into account the alterations to Phase 1 route alignment as highlighted above, 3 options were assessed for Phase 2, with each option linking into the preferred Phase 1 route alignment. The definition of the three options is as follows:

- **Option 1:** Off-road segregated route. A new public transport route adjacent to the A428 and St Neots Road. The route would be entirely off-road with minimal interaction with general traffic, except at junctions.
- **Option 2**: On-road with junction improvements. Public transport vehicles would run on-road along St Neots Road with general traffic east of the Bourn roundabout. There would be basic junction improvements.
- **Option 3:** On-road with public transport priority lanes. Public transport vehicles would run on-road along St Neots Road in priority lanes running in both directions.

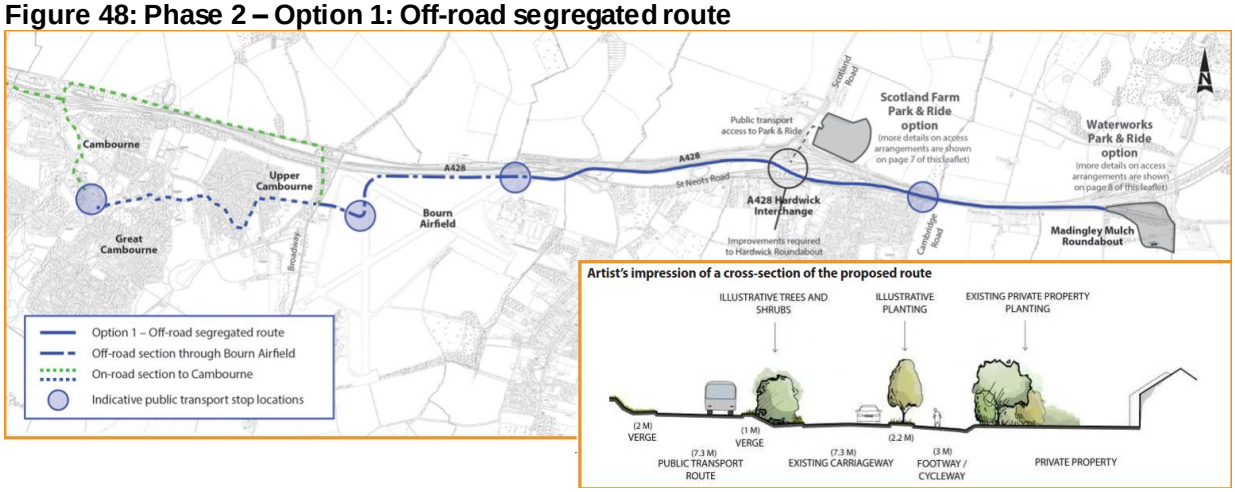
Each option was tested with the two Park & Ride short listed sites (Waterworks and Scotland Farm).

Table 22: Phase 2 options
(Summarised in OAR Part 3 – Appendix C)

Option	Route Description
Do Minimum	• Committed Schemes i.e. schemes that have been deemed likely to proceed
Option 1a – Off-road segregated with Waterworks Park and Ride	• Off road section through Bourn Airfield • New junction with St Neots road to the west of Bourn roundabout • New segregated route from new junction to Hardwick roundabout • New priority crossing at Hardwick Roundabout • New segregated route to the north of St Neots Road to Madingley Mulch roundabout • Off-Road Phase 1 scheme
Option 1b – Off-road segregated with Scotland Farm Park and Ride	
Option 2a – On-road junction improvements with Waterworks Park and Ride	• Improvements to Bourn roundabout • On road along St Neots road to Hardwick roundabout • Improvements to Hardwick roundabout • On road along St Neots road to Madingley Mulch Roundabout • Off-Road Phase 1 scheme
Option 2b – On-road junction improvements with Scotland Farm Park and Ride	
Option 3a – On-road public transport priority with Waterworks Park and Ride	• Improvements to Bourn roundabout • On road public transport lane along St Neots road to Hardwick roundabout • Improvements to Hardwick roundabout • On road public transport lane along St Neots road to Madingley Mulch Roundabout • Off-Road Phase 1 scheme
Option 3b – On-road public transport priority with Scotland Farm Park and Ride	

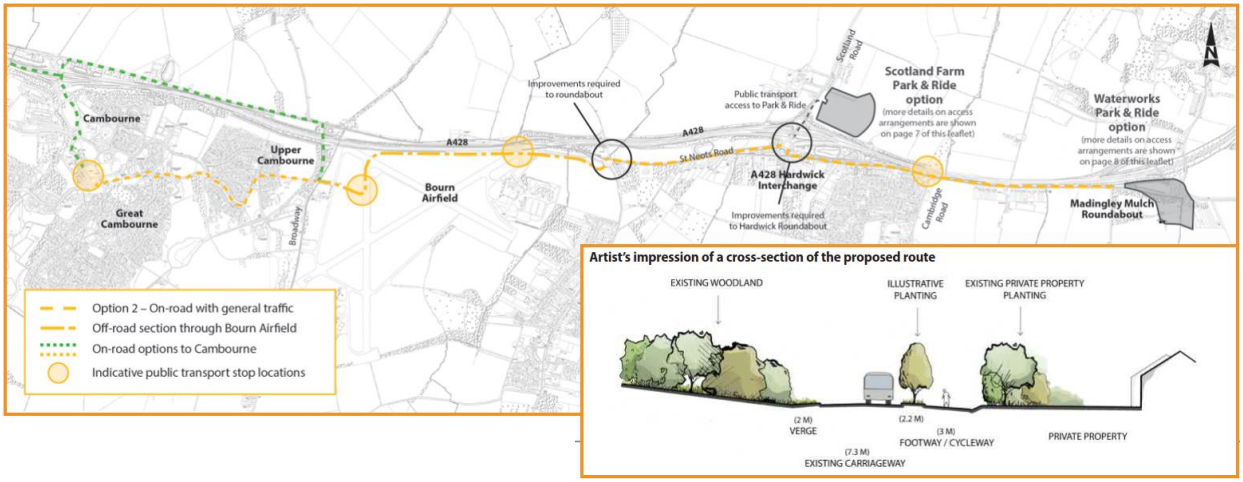
Source: Mott MacDonald

Figure 48: Phase 2 – Option 1: Off-road segregated route



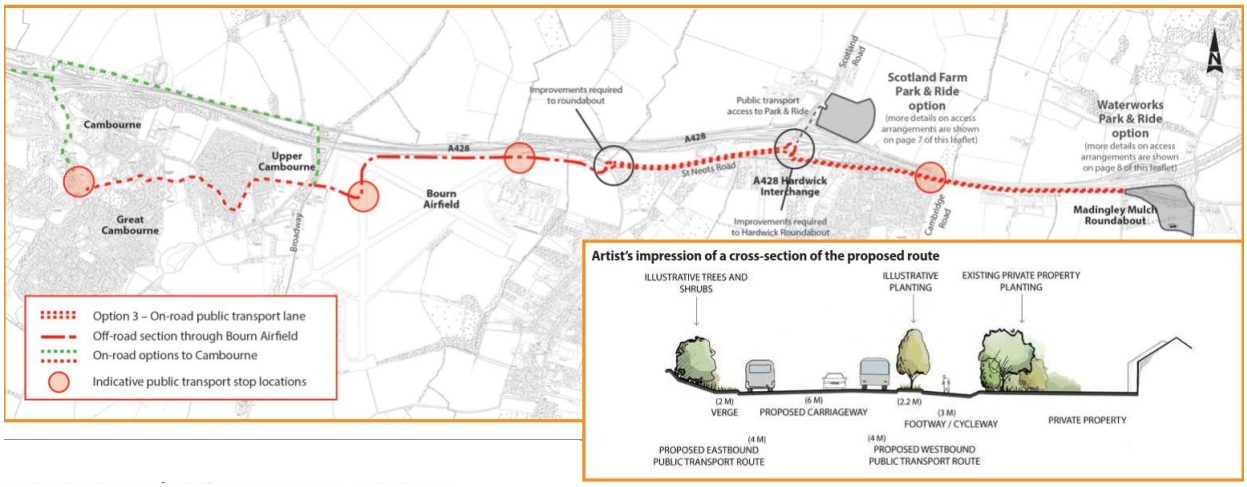
Source: February to March 2019 consultation leaflet

Figure 49: Phase 2 - Option 2: On-road junction improvements



Source: February to March 2019 consultation leaflet

Figure 50: Phase 2 – Option 3: On-road with public transport priority lanes



Source: February to March 2019 consultation leaflet

10.3.2.2 Phase 2 INSET results

Table 23: Phase 2 INSET Assessment RAG Summary

		Option 1a	Option 1b	Option 2a	Option 2b	Option 3a	Option 3b
1. Policy Fit	Cambridgeshire LTP3						
	Highways England Road Investment Strategy						
	Greater Cambridge and Peterborough SEP						
	Greater Cambridge City Deal						
	South Cambridgeshire Local Plan						
	Cambridge City Local Plan						
2. Contribution to Economic Growth	Labour market and activity						
	Supporting house construction						
	Business investment and growth						
	Cambridge positive image						
	Future potential growth post 2031						
	Capacity						
3. Contribution to Improved Transport Network	Reliability of journey						
	Route flexibility - Links into existing bus routes						
	Walking and cycle connectivity						
	Impact on existing traffic						
	Journey times						
	Service frequency						
	Mode share						
	Connectivity to Park & Ride						
4. Contribution to Quality of Life	Environment impacts - Landscape Impact						
	Environment impacts – Noise						
	Environment impacts - Air Quality						
	Environmental impacts - CO2 emissions						
	Environmental impacts – Biodiversity						
	Environmental impacts – Heritage						
	Environmental impacts – Green Belt						
	Safety						
	Accessibility						
5. Scheme Deliverability	Scheme Cost						
	Engineering feasibility - construction method						
	Land acquisition required						
	Impact on local road network during construction						
	Future-proofing						
	Legislative Powers						
	Scheme Maintenance and Renewals						
6. Stakeholder Support	Public acceptability						
	Overall Score	**5.00**	**5.03**	**4.43**	**4.51**	**4.84**	**4.86**

Source: Mott MacDonald

The INSET results show that the emerging route alignment and preferred option for Phase 2 was Option 1b – Off road segregated route with Scotland Farm as the preferred Park & Ride location. This included the preferred route alignment for Phase 1.

Table 24: Phase 1 INSET Assessment Results

Option	INSET Scoring Summary Ranks
Option 1a	Ranked 2nd
Option 1b	Ranked 1st
Option 2a	Ranked 6th
Option 2b	Ranked 5th
Option 3a	Ranked 4th
Option 3b	Ranked 3rd

Source: Mott MacDonald

10.4.2.3 Phase 2 Value for Money

The initial BCR values showed that the best performing option was Option 2a - On-road junction improvements with Waterworks Park and Ride. However, all options BCRs were close to each other and are not considered significantly different to suggest a clear preference.

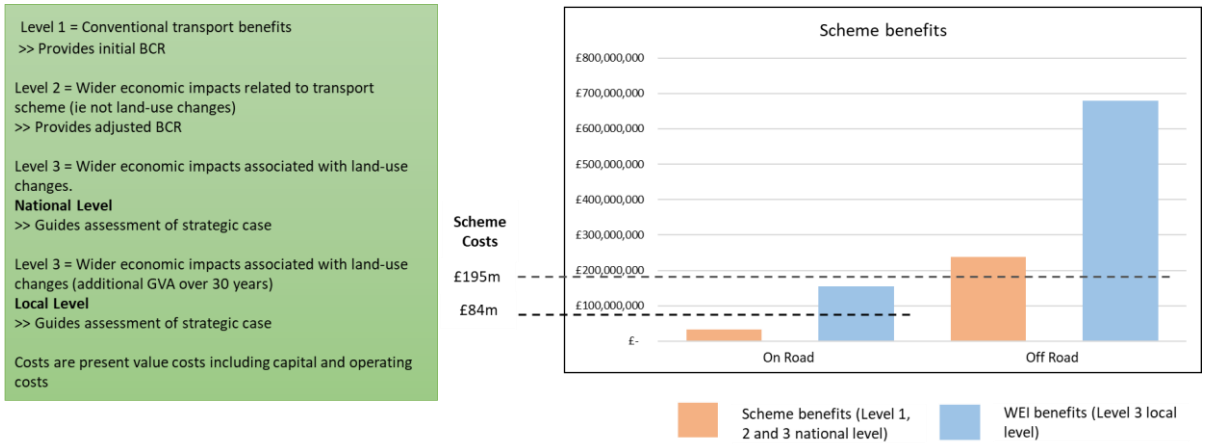
Table 25: C2C BCRs – Phase 2 options[103]

	Option 1a	Option 1b	Option 2a	Option 2b	Option 3a	Option 3b
BCR	0.31	0.32	0.35	0.33	0.31	0.34

Source: Mott MacDonald

In order to fully consider the value for money the options would potentially deliver and to inform the optioneering exercise, and to support the final decision of the best performing option, the incorporation of Wider Economic Impacts (WEI) assessment was done to compare an off-road to on-road option. The WEI appraisal confirms that there were substantial benefits to an off-road segregated route. Figure 51 illustrates how an off-road option compares to an on-road option in delivering WEI at both a national and local level.

Figure 51: C2C on-road vs off-road WEI comparison



Source: Mott MacDonald

[103] Note – each option for the value for money assessment included the recommended preferred option for Phase 1, which was an off-road route alignment.

10.4.2.4 Phase 2 assessment summary

Taking into account the results of the multi criteria assessment, consultation feedback and comparison of an off-road versus on-road solution with regards to WEI, **Option 1b – Off-road segregated with Scotland Farm Park and Ride** is the best performing option and therefore is recommended to be taken forward as the preferred option.

11 The Preferred Option

11.1 Preferred scheme

At the conclusion of the optioneering process, the preferred option for the route alignment for the C2C project is:

- **Off-Road Phase 1 and 2**

The preferred option for the Park & Ride location is:

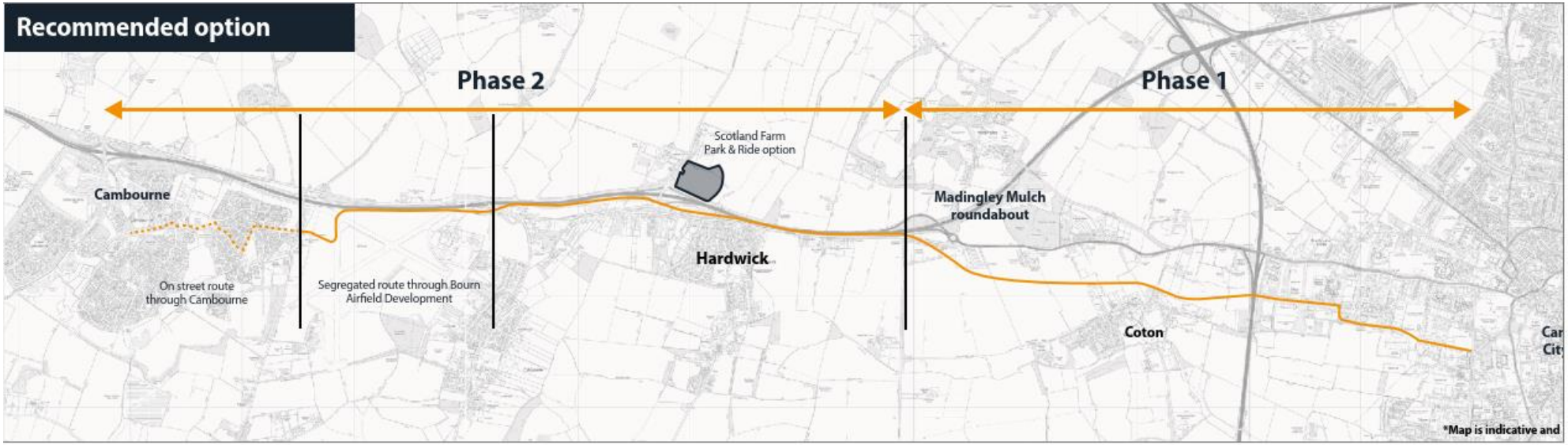
- **Scotland Farm**

11.1.1 Preferred option detailed description

- The preferred route alignment starts in Cambourne, running on the existing street network before turning off Sterling Way onto a new section of segregated public transport route which crosses Broadway and into the proposed Bourn Airfield development.
- It then travels along the northern edge of the proposed Bourn Airfield development along a segregated corridor, crossing St Neots Road west of the roundabout on St Neots Road / Highfields Road.
- From this point it continues east on a segregated route between the A428 and St Neots Road until it re-joins general traffic at the Scotland Road Junction.
- From here public transport vehicles will access the Park & Ride site at Scotland Farm, located to the east of Scotland Road, just north of the A428.
- On leaving the Park & Ride, vehicles re-join a segregated route between the A428 and St Neots Road via the existing roundabouts where it travels from Hardwick to the junction with Long Road.
- Here, the route crosses to the southern side of St Neots Road and continues through existing agricultural fields to the south of the A1303, Madingley Road.
- Passing north of Coton, the route crosses Cambridge Road at a new signalised junction, which will be implemented as part of the scheme, before continuing to cross the M11 on a new bridge.
- Entering the West Cambridge site the segregated route continues alongside Charles Babbage Road before turning south and exiting the West Cambridge site into the West Fields via the unnamed road leading to Forster Court where it immediately turns and heads east, following the line of, and to the south of, an existing cycleway / footway.
- Where it meets the junction with Adams Road and Wilberforce Road, public transport vehicles leave the segregated route and re-join general traffic along Adams Road, which will have existing parking bays removed along its length.
- Vehicles continue to the junction with Grange Road where they continue their onward journeys on the existing road network.
- A new footway-cycleway will be implemented as part of the scheme, that will follow the segregated sections of the route through Bourn Airfield up to the Scotland Road junction.
- At this point the cycleway / footway moves to the southern side of St Neots Road up to the junction with Long Road where it re-joins the segregated route to West Cambridge.
- Existing cycle routes are utilised through the West Cambridge site and the existing cycleway / footway is maintained between West Cambridge and the Adams Road / Wilberforce Road junction.

Figure 52 illustrates the high-level summary of the emerging scheme, with detailed drawings included in Appendix R – Preferred Option Drawings.

Figure 52: C2C Preferred Option



Source: Mott MacDonald (© Crown Copyright. All Rights Reserved. OS License Number 100023205.2018)

11.2 Preferred routing strategy

In parallel to the optioneering process and in identifying a preferred option, a routing strategy exercise has been undertaken to establish the service pattern that would use the system. This is set out in Appendix F.

The proposed Bus Network Strategy is based around three direct express services as follows:

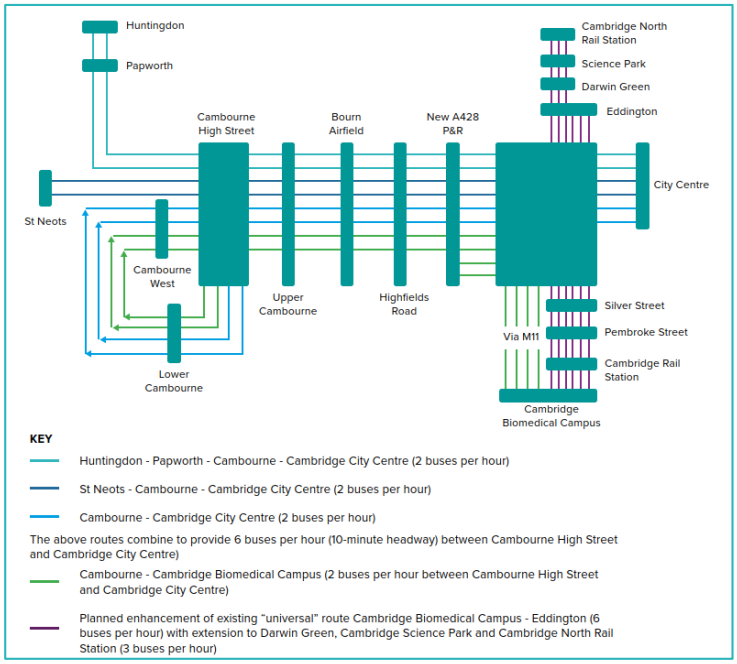
- Cambourne to Cambridge City Centre at 10-minute interval service (6 buses per hour)
- Cambourne to Biomedical Campus at 30-minute interval service (2 buses per hour)
- A428 Park and Ride site to Biomedical Campus at 30-minute interval service (2 buses per hour during peak periods)

In addition, passengers from Cambourne to Cambridge corridor services would also be able to interchange with the Universal service at West Cambridge which would serve Cambridge North Station and the Cambridge Science Park.

- Biomedical Campus to Eddington at 15-minute interval service (4 buses per hour)
- Biomedical Campus to Cambridge North Station & Cambridge Science Park 30-minute interval service (2 buses per hour)

The routes were developed using the Bus Operating Case draft report (Atkins, May 2017) and assessment from Mott MacDonald public transport specialist. For more detail on the development process see Appendix F. Whilst the routes are based on realistic service numbers and anticipated demand, it should be noted that the routes are proposed routes only and have not been agreed with the existing route operators.

Figure 53: C2C bus operating case network proposition

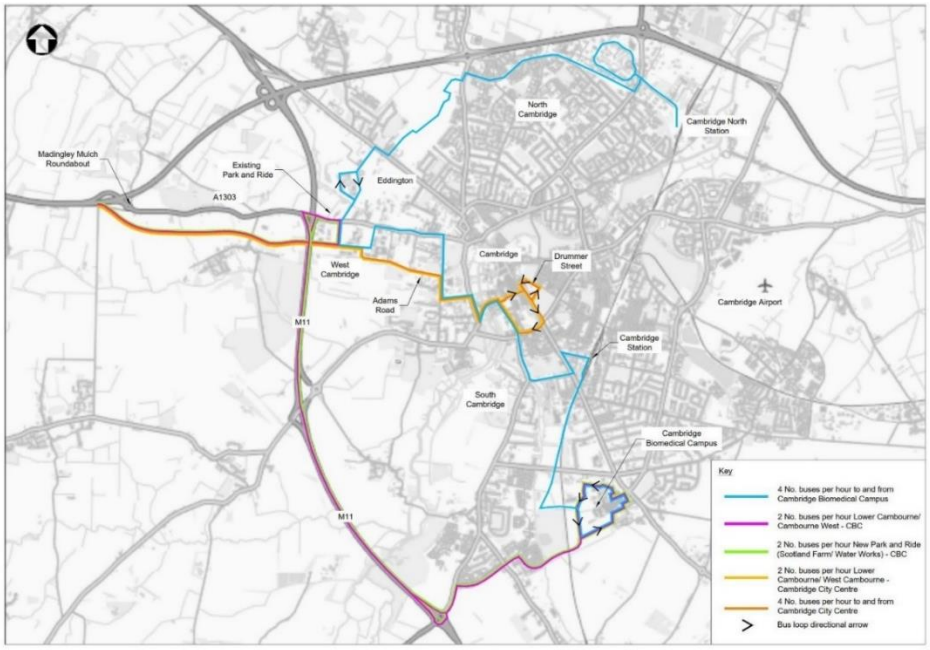


Source: Appendix F – Bus Network Strategy

Whilst the segregated off-road element of the scheme finishes at Grange Road with services continuing on to City Centre, railway station and other popular destinations via the established street patterns based on public demand, the recommended preferred option would bring public transport vehicles on a dedicated track to the closest possible point within central Cambridge

(even closer than the existing busway). This will ensure that public transport vehicles bypass the queues and unreliability between Cambourne and this point. Figure 54 below shows the routes from Madingley Mulch Roundabout into and around the City Centre.

Figure 54: City Centre Route Summary



Source: Appendix F – Bus Network Strategy

Further work will continue alongside operators to ensure the routes set out at the OBC stage represent the most appropriate scenario going forward. Additional routes could be considered, such as the route via West Cambridge and the new developments at Eddington and Darwin Green to the Cambridge Science Park.

11.3 Approach to future proofing

C2C has aspirations to utilise guidance technology that delivers the greatest level of benefits in relation to meeting its strategic objectives, and to ensure alignment to the future CAM network, for which C2C would comprise Phase 1, if CAM were consented.

It was recommended to the GCP Executive Board on 6 December 2018 that the preferred mode for the C2C project on opening is an electric rubber-tyred vehicle, which may become autonomous once technology allows. This recommendation makes it clear that the vehicles to be used during the period of C2C operation prior to CAM services starting should be electric. At present further work is required during the next stage of scheme development to fully specify the vehicles, understand market appetite for purchasing electric vehicles and carry out detailed costings and appraisal of air quality impacts. The OBC has been developed on the scenario of utilising existing Euro VI standard buses, which use proven technology which typically meets the standards of Clean Air Zones (a sensitivity test is presented in the Economic Case in relation to possible cost implications of using electric vehicles).

As part of these aspirations, the GCP are also seeking to utilise the most up to date guidance technology for the C2C project, including pursuing technological guidance systems that move away from a physical guidance system. The benefits of such a system include:

- Requiring limited fixed infrastructure;
- Allowing for alignment at stops for level boarding;
- Ease of retrofitting to existing/new buses; and,
- Providing a smooth transition between continuous guidance sections and no guidance sections off the core.

As these technologies are still developing, the assessment of the C2C project, including its economic appraisal and costings, have been based on utilising current technology i.e. a physically guided. Assessments and costings of utilising future technology are still being investigate.

Appendix E sets out the GCP's consideration of guidance technology options, and in particular considers the available options in the context of their compliance with existing Transport Works Act 1992 (TWA) legislation and the project objectives.

11.4 Scheme constraints

In further designing the preferred option for the C2C project, scheme designs will need to consider how best to overcome, incorporate or mitigate impacts relating to the following constraints:

- Coton Conservation Area including Grade 1 listed Church. The scheme must be reviewed in terms of the setting of these protected assets.
- Adams Road which lies in the West Cambridge Conservation Area. The scheme must seek to minimise impact on this area.
- Land parcels owned by Cambridge Past, Present and Future, which are protected by National Trust Covenants. Engagement with both organisations is needed to minimise the impacts.
- Crossing the M11 motorway which creates a severance impact for vehicles, pedestrians and cyclists travelling between Cambridge and areas to the West of the city.
- Fitting within available space in areas where the alignment passes relatively close to properties. For example, along some parts of the St Neots Road. Where necessary noise barriers will need to be explored as an option to ensure that traffic noise experienced by residents reduces.
- Minimising the impact on the Coton Orchard and a City Wildlife Site, to the west and east of the M11 respectively which the alignment for the preferred option bisects (note - neither site has national designation, but the impact on either should be minimised).
- Providing appropriate traffic calming and management proposals to mitigate rat-running to Park & Ride sites.
- Any new Park & Ride service will need to be to a standard similar to that currently operating for Cambridge's Park & Ride services as set out in the current Access Agreement, which states that the Bus Operator will operate the Park & Ride Bus Services in accordance with the established minimum requirements.
- Communities along the corridor are served by the Citi 4 Bus Service, amongst others. This is a stopping service which could provide a feeder for the busway. Whilst the decision as to future Bus Services lies with bus operators, the provision of the Busway should not prevent the provision of existing services.
- The scheme must provide a segregated route for non-motorised users, as a minimum to include cyclists and walkers, but where appropriate equestrians, and to ensure that all pedestrian facilities are accessible for all.

- The section of the scheme which runs through Bourn Airfield must comply with the SPD for the site and complement the development Masterplan.
- The scheme must achieve a 20% net biodiversity gain.
- The section of the scheme which runs through West Cambridge must complement the development Masterplan. Consideration must be given to vibration and EMI impacts on sensitive receptors such as the Department of Materials Science and Metallurgy.
- All buses are now required to be accessible for all including wheelchair users.
- Bus emissions are improving over time and Euro VI emission standard is now required for new buses as a minimum.
- The scheme must be capable of eventual upgrade to form part of the CAM network.

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