

Cambourne to Cambridge Better Public Transport Project

Interim Report

November 2018



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Executive Summary

Greater Cambridge is one of the most successful and fastest growing economies in the UK. The pace of economic growth is unlikely to slow which will lead to population growth and, if not supported by improved public transport infrastructure, increased congestion. As such, Greater Cambridge would be unable to achieve its full potential without investment in infrastructure and housing, which would otherwise act as a bottleneck on growth.

The C2C project will connect to a wider public transport network to enable people to travel for employment and education, and, by encouraging modal shift to public transport via a congestion free alternative to the car, will facilitate sustainable development at key strategic economic and housing sites.

It will provide a new or significantly improved public transport route, with public transport measures between Cambourne and Cambridge:

- Improvements that avoid traffic congestion;
- A new park and ride, and;
- New high-quality cycling and walking facilities

This Business Case Update for the emerging scheme has been produced, to provide an update to the GCP Executive Board on progress toward a final recommended option. The term 'Update' is used because the core considerations are related to Phase 1 of the scheme between Maddingley Mulch and Grange Road. The final Outline Business Case will consider the entire scheme from Cambourne to Cambridge in order to provide a final recommended option.

For Phase 1 a short-list of 4 options were appraised against each other, using the following methodology: assessment of the transport impacts based on transport modelling outputs, overall Benefit-Cost Ratio (BCR) based on scheme's projected capital and operating expenditure, and Value for Money (VfM) assessment based on BCR, Wider Economic Benefits and qualitative assessments.

In order to provide a strategic assessment an illustrative comparator option was also appraised. This option included an illustrative route from Cambourne to Cambridge (Phase 1 and Phase 2) with a park and ride at the Waterworks site. This option was used to understand the overall cost and benefits of a potential future scheme including both Phase 1 and Phase 2.

Route options for Phase 2 would be subject to public consultation and only at final OBC (October 2019) would a final recommended option for Phase 1, Phase 2 and the Park and Ride site will be presented.

Table 1 overleaf provides more detail on the options which were appraised.

The options which were appraised are as follows

Table 1: Options description

Option	Development
Low Cost a (optimised on-road with Waterworks Park and Ride)	An on-road scheme with a Park and Ride at the Waterworks site, near to Madingley Mulch roundabout. Provides Eastbound public transport lane along the existing A1303 between Madingley Mulch roundabout and High Cross along with short sections of Westbound public transport lanes where appropriate. Changes at M11 Junction 13 to provide an additional lane of traffic on the A1303 and a new pedestrian / cycle bridge over the M11. Changes to the Northbound M11 off-slip to allow both traffic lanes to turn right towards Cambridge.
Low Cost b (optimised on-road with Scotland Farm Park and Ride)	As Low Cost a but with a Park and Ride positioned at the Scotland Farm site, just off Scotland Road to the north of the A428.
Do Something 1a (off-road from Madingley Mulch Roundabout to Grange Road with Waterworks Park and Ride)	An off-road scheme between Madingley Mulch roundabout and Grange Road with a Park and Ride at the Waterworks site. From this point this scheme provides a new, fully segregated public transport route to Grange Road where journeys will continue to the city centre and other destinations. Provides a new bridge over the M11 where the public transport route passes through the West Cambridge site and joins to Grange Road using the former Rifle Range Track adjacent to the University of Cambridge Rugby ground.
Do Something 1b (off-road from Madingley Mulch Roundabout to Grange Road with Scotland Farm Park and Ride)	As Do Something 1a but with a Park and Ride positioned at the Scotland Farm site, just off Scotland Road to the north of the A428.

Illustrative Comparator

All of the options above were tested against an illustrative comparator from Cambourne to Cambridge. This illustrative comparator comprised an off-road scheme between Cambourne and Grange Road with a Park and Ride at the Waterworks site, near to Madingley Mulch roundabout. The illustrative comparator is used as a means to assess a strategic option and is not intended to preclude any options for Phase 2 including a Park and Ride at Scotland Farm. This scheme provides a new illustrative, fully segregated new public transport route from Cambourne to Grange Road where journeys will continue to the city centre and other destinations. Provides a new bridge over the M11 where the public transport route passes through the West Cambridge site and joins to Grange Road using the former Rifle Range Track access track adjacent to the University of Cambridge Rugby ground.



The total estimated costs for the illustrative comparator are £158m which is deemed affordable based on successfully securing funding from the following identified funding sources:

Funding Sources	Costs
City Deal Phase 1	£59m
City Deal Phase 2 & 3	£61m
Total City Deal Funding	£120m
Estimated developer contributions, S106 (secured in principal or currently under negotiation)	£38m
Total	£158m

The estimated developer contributions shown above are dependent upon on-going assessments and negotiations and so are indicative at this stage. However, it is currently anticipated that between 20 and 25% of the scheme costs can be attributed to development. Furthermore, there is an expectation that developers of Cambourne West and Bourn Airfield will implement the sections of the scheme through those sites which could potentially further reduce the need for City Deal Phase 2 funding set out above.

On the basis of this Business Case Update it is recommended that the GCP Executive Board should, for Phase 1, proceed to develop an off-road route from Madingley Mulch roundabout to Grange Road, and proceed to consult on a Phase 2 route between Cambourne and Madingley Mulch Roundabout with a Park and Ride site either at Waterworks or Scotland Farm. This option has the best strategic performance when taking into consideration the scheme objectives, wider economic benefits and the qualitative options assessment.

The choice of Park and Ride location can be best made once plans for Phase 2 of the scheme have been refined and subjected to consultation. The final Outline Business Case will recommend a scheme, including Phase 1 and 2 as well as a Park and Ride location, to be taken forward for the necessary statutory approvals including Environmental Impact Assessment.

1. Introduction

The Cambourne to Cambridge Better Public Transport Project aims to deliver high quality public transport (HQPT) through the provision of quick, frequent and reliable public transport services.

Purpose of the report

This report provides an update on the development of the Outline Business Case (OBC) for the A428 Cambourne to Cambridge (C2C) Better Public Transport project.

It provides a summary of the option assessment work as part of the development of the OBC, since the presentation of the Strategic Outline Business Case (SOBC) in October 2016 and the End of Stage report in 2017. The final OBC will present a single scheme between Cambourne and Cambridge for approval to progress to consent and then to construct the works.

The report focuses on work assessing proposed public transport infrastructure improvements on Phase 1 of the project between Madingley Mulch roundabout and Grange Road in particular the on and off-road alignment options. Phase 2 of the project (Madingley

Mulch Roundabout to Cambourne) will form part of the final OBC, along with a final recommendation for a Park & Ride site along the route.)

This Business Case Update includes both further public consultation on Phase 1 (carried out from November 2017 to January 2018) and technical work, the key outcomes of which are detailed in this report.

Background

The pace of economic growth is unlikely to slow which will lead to population growth and, if not supported by improved public transport infrastructure, increased congestion. As such, Greater Cambridge would be unable to achieve its full potential without investment in infrastructure and housing, which would otherwise act as a bottleneck on growth.

The recent report prepared by the Cambridge and Peterborough Independent Economic Review (CPIER) in September 2018 concluded the following:

“We also find evidence that, right across these economies, growth is higher than official figures suggest. Examination of employment growth in individual companies suggests firms are increasing employment at a rate greater than that captured by ONS (Office of National Statistics) data; similarly, turnover growth is strong.

There are strategic risks to the area if it cannot get the major infrastructure improvements it needs, and previous delays in bringing forward and delivering schemes must not continue.”

Investments in transport infrastructure are critical to ensuring that already high congestion levels and poor reliability issues are addressed, enabling the next wave of innovation led growth. The C2C project contributes towards addressing a transport constraint on growth by linking key employment and housing sites together, and with the city centre. Particularly with regards to the following developments:

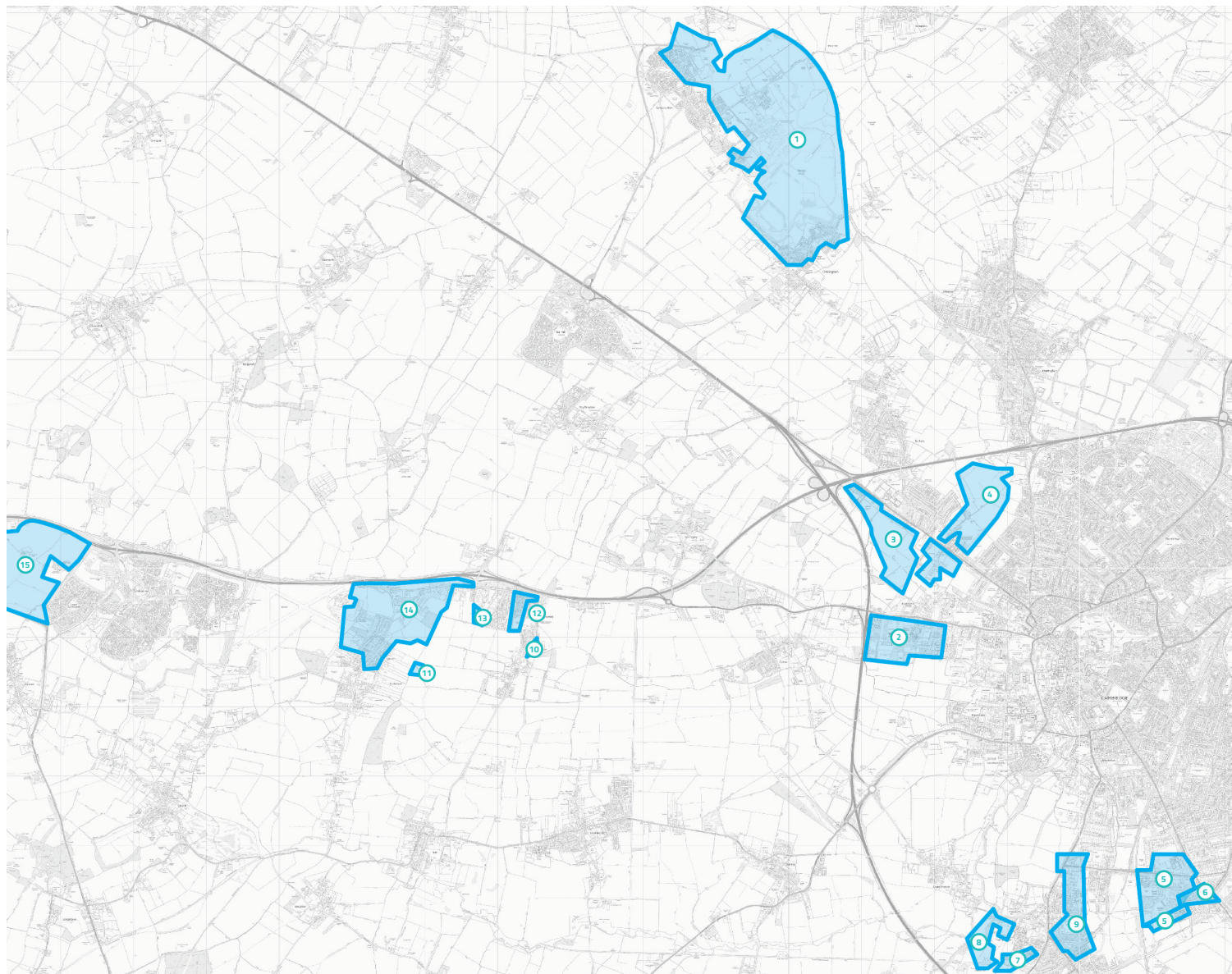
- Cambourne West;
- Bourn Airfield;
- Eddington;
- West Cambridge;
- City centre growth and wider growth as shown in figure 1

Figure 1: Future Development Sites

Site numbers	Site name	Dwellings/Jobs	
1	Northstowe	10,000 dwellings	
2	West Cambridge	10,000 jobs	
3	North West Cambridge	3,000 dwellings	4,000 jobs
4	Darwin Green	2,780 dwellings	
5	Cambridge Biomedical Campus (CBC) & Extension to CBC (Local Plan Proposal) ¹	14,000+ jobs	
6	Bell School	347 dwellings	
7	Glebe Farm	316 dwellings	
8	Trumpington Meadows	1,200 dwellings	
9	Clay Farm	2,300 dwellings	
10	Hardwick - West of Grace Crescent	98 dwellings	
11	Highfield Caldercote - Highfields Road	71 dwellings	
12	Hardwick - St Neots Road	155 dwellings	
13	Highfields Caldercote - Land East of Highfields Road	140 dwellings	
14	Bourn Airfield (Local Plan Proposal)	3,500 dwellings	
15	Cambourne West - (Resolution to grant planning Permission)	2,350 dwellings	

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1. The SCDC and CaCC Local Plans were adopted on 27th September 2018 and 18th October .



Context

The C2C project will connect to a wider public transport network to enable people to travel for employment and education, and by encouraging modal shift to public transport via a congestion free alternative to the car, will facilitate sustainable development at key strategic economic and housing sites.

The C2C project is being promoted by the Greater Cambridge Partnership (GCP), which is the local delivery body for a City Deal with central Government, bringing powers and investment to Cambridge and Greater Cambridgeshire, worth up to £1 billion over 15 years.

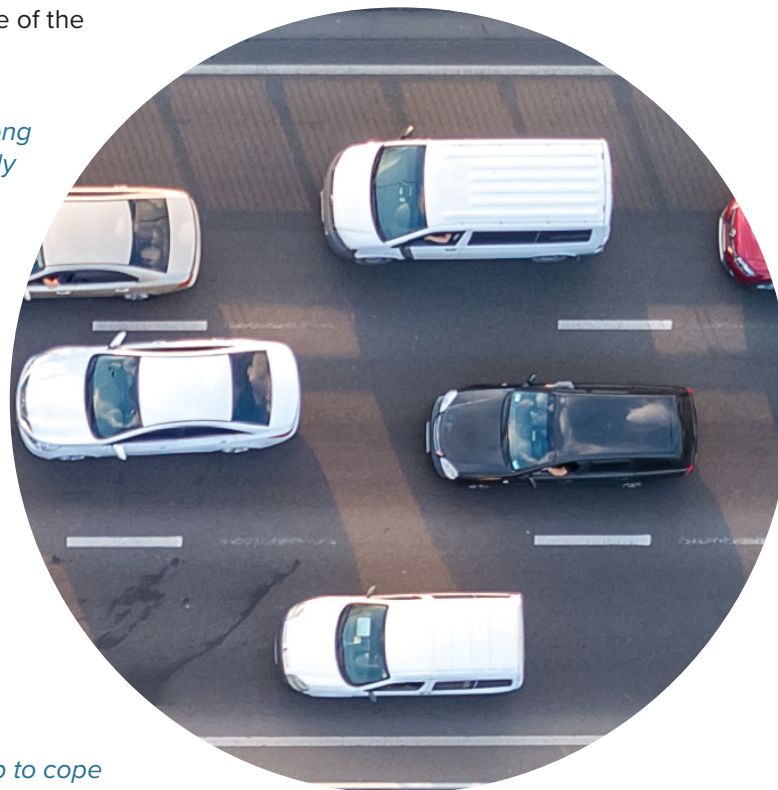
Through investment in transport and infrastructure, the GCP will bring forward schemes to connect people to places of employment and allow communities to grow sustainably in the coming years, by creating better and greener transport networks, reducing congestion and making better use of limited road space by prioritising sustainable transport.

As such, to meet this growing demand, the role of the C2C project as defined in the business case 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 High Quality Public Transport (HQPT) services, together with high quality cycling and walking facilities serving a new Park & Ride site to the west of Cambridge.”

The recently published Cambridgeshire and Peterborough Independent Economic Review found evidence that, across the regional economy, growth is higher than official figures suggest. Examination of employment growth in individual companies suggests firms are increasing employment at a rate greater than that captured by ONS data; similarly, turnover growth is strong. There are, however:

“major doubts as to how well the area is set up to cope with future growth, particularly where the strain is already evident.”





National Infrastructure Commission (NIC)

The 2017 National Infrastructure Commission's (NIC) report on the Cambridge – Milton Keynes – Oxford Growth Corridor has concluded that improvements in east-west transport connectivity along the corridor are necessary to underpin the area's long term economic success, and alleviate the area's *"chronic undersupply of homes which could jeopardise growth, limit access to labour and put prosperity at risk"*. It estimates that infrastructure investment could support the delivery of up to 1 million new homes in a broad corridor between Oxford and Cambridge. This level of development will inevitably place additional pressure on the A428/A1303 and surrounding routes. Calling for City-scale transport infrastructure to enable growth, the NIC focuses on;

"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"

The NIC has identified the Cambridge – Milton Keynes – Oxford arc as a national priority stating that its world-class research, innovation and technology can help the UK prosper in a changing global economy.

Submissions made as part of the NIC's call for evidence on the corridor emphasised that congestion is becoming a threat to economic investment and quality of life as well as increasing levels of air pollution. Growing congestion in these towns and cities will limit people's ability to access employment in the arc's key towns and cities. The development of public transport and active travel options could make more efficient and effective use of road space in the arc's key cities, reducing the amount of road space required per person and enabling a greater volume of journeys using the existing transport networks. The NIC states that;

"It is greatly encouraging, therefore, that the local authorities in each of the arc's key towns and cities are working to bring forward ambitious, evidence-based proposals for improving the effectiveness of city-scale transport based on the concept of mass rapid transit (MRT)".

Project Objectives

The C2C project will provide improved public transport links - connecting people to places of employment, study and key services - and help existing and new communities along the A428/A1303 grow sustainably in the coming years.

By providing new travel choices, and alternatives to the car, the C2C project is intended to manage growing congestion on the A428/A1303, ensuring people have good access to employment opportunities thereby helping to secure Cambridge's continued economic success. Objectives of the C2C project are shown in Figure 2.

Figure 2: Project objectives



Cambourne to Cambridge Project

The study area for the C2C project is located on the A428 / A1303 route, between Cambridge City Centre and Cambourne which provides a connection to St Neots. The scheme will service communities within the study area including the following:

- Cambourne;
- Bourn Airfield (future development site)
- Caldecote;
- Madingley;
- Hardwick; and
- Coton

The project is made up of three core elements:

- A **new or existing public transport route**, with public transport priority measures between Cambourne and Cambridge, that avoids general traffic congestion;
- A **new park and ride** site, and;
- **New high-quality cycling and walking facilities.**

Various options have progressed through a series of assessments and refinement, including public consultation. The short-listed options were presented in a SOBC in September 2016, with work being progressed towards the selection of a recommended scheme and the development of an OBC.

This document provides an update on the development of the OBC, to demonstrate progress to the GCP Executive Board prior to submission of the final OBC.

The final OBC will use the five key cases required by Government for major investments:

- The **Strategic Case** sets out the case for change.
- The **Economic Case** demonstrates the value for money of the scheme including the impact on the economy.
- The **Commercial Case** considers how the scheme would be commercially viable, procured and attractive to the market.
- The **Financial Case** outlines how the costs and the scheme are to be funded/financed, including future maintenance and operational costs.
- The **Management Case** sets out how the scheme would be managed to minimise risk and maximise outcomes.



Would routes be designed to minimise the environmental impact?

Yes – Environmental impacts have been considered throughout the optioneering stages and whichever option is selected would be subject to further rigorous environmental assessment. This would aim to:

1. Avoid any adverse effects where possible;
2. Minimise adverse effects which cannot be avoided through intelligent design and mitigation measures where suitable; and
3. Only if the previous are not achieved then seek to compensate for any adverse effects which cannot be adequately mitigated on-route.

The results of this assessment would be reported in an Environmental Impact Assessment published in support of any approval process the selected scheme has to progress through.

Would the introduction of a new public transport route create ecological benefits?

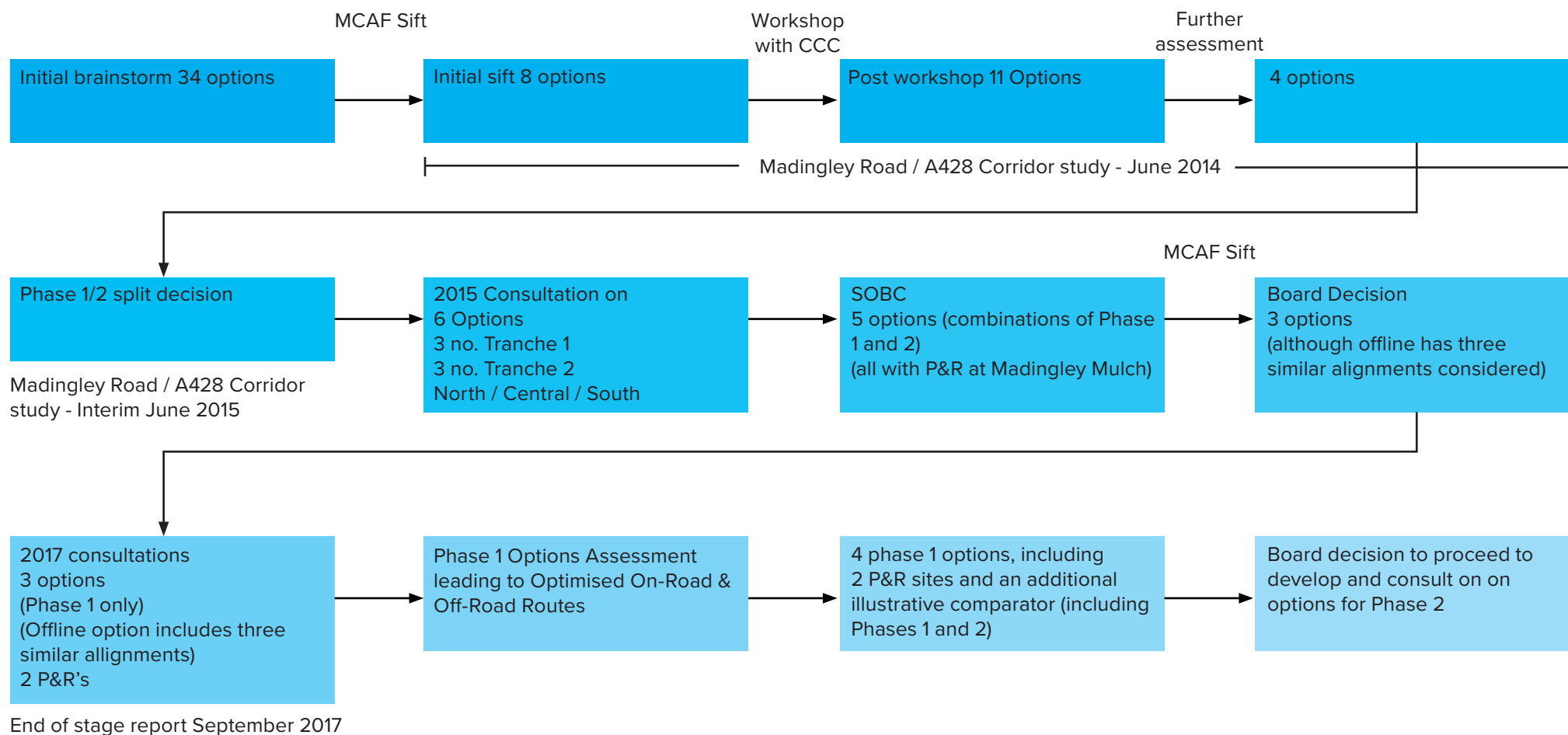
The off-road route option would apply a 'green lane' design treatment along its length to enhance biodiversity through the creation of habitats. This could be through the planting of new trees and hedges along the route. Landscaping at the Park and Ride site will be put in place in order to reduce any potential visual impacts.

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 then, the project has undergone significant development to generate options that address challenges to sustainable economic growth whilst harnessing the opportunities to connect local communities to employment opportunities in Greater Cambridge and the region. Options have been identified and evaluated including those that use the existing highway, a new alignment or hybrids which use both existing and new alignments.

The project has been informed by a number of Public Consultations and engagement with stakeholders. Designs have been created or amended in response to this engagement and feedback received.



Figure 3: C2C project development process



2. The Project

The need for the project

Based on current evidence and policy, the key underlying drivers for the need for change along the A428 / A1303 route and for investment in the C2C scheme 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 and 2019 Budgets and subsequent studies as a priority for growth.
- Large population growth is likely to 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, notably in 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.
- The demand generated by the growth in housing and employment will generate ever greater levels of demand for travel in and around Cambridge thereby exacerbating current congestion issues.
- Car ownership in Cambridge is high, with 85% of households having access to a car compared to the national average of 74%.
- The rail network does not serve 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 bus services are unable to offer an attractive alternative to private car.
- Without intervention, those living and working in the new developments could become locked into a cycle of car dependency and low use of other modes exacerbating capacity issues along the route.

Spending - Can't the money for an Off-road route be allocated to other transport solutions?

The Greater Cambridge Partnership Executive Board, at its meeting on January 2015, prioritised the Cambourne to Cambridge project as the highest priority according to economic impact and need for delivery.

Any decision on this project (and any other GCP project), and the allocation of funding, will be made on the overall value for money assessment in the proposal. The GCP Executive Board will have the final say whether or not to progress the project and will make that decision in the context of the overall GCP objectives.



Current Transport Network Review

Analysis of the A428/A1303 has identified congestion pinch points along the route particularly east of Madingley Mulch roundabout along the A1303.

Main issues that have been identified through the current network analysis are:



Severe congestion along the A428 transport route



Lack of connections to transport interchanges, limiting options to travel sustainably



Poor public transport provision along the route buses offer no competitive advantage over private cars in terms of journey times and reliability



Current Park & Ride site is reaching capacity and congestion on the highway network results in passengers experiencing difficulties accessing the site



There have been high number of serious and slight accidents along the A428/A1303 between 2012-17



Car dependency along the route and demand for car travel is causing congestion and delay, this could restrict growth aspirations



Growth in traffic causes an increase in noise



The historic environment has been degraded by the increased traffic volumes



Cambridge city centre has poor air quality which will only be exacerbated by future travel demand



Current exhaust emissions could impact the important flora in Madingley Wood – a Site of Special Scientific Interest (SSSI)

Current problems continued:



Large population growth is likely to 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.



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.



Employment is growing rapidly within Cambridge, notably in 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.



The demand generated by growth in housing and employment will generate ever greater levels of demand for travel in and around Cambridge, exacerbating current congestion issues



The existing A428/A1303 is inadequate for walking and cycling as a mode of transport into Cambridge.



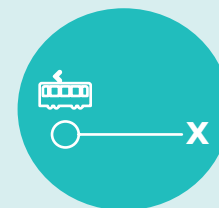
Congestion on the route means that current bus services are unable to offer an attractive alternative to private car.



Without intervention, those living and working in the new developments will become locked into a cycle of car dependency and exacerbating capacity issues along the corridor



Car ownership in Cambridge is high, with 85% of households having access to a car compared to the national average of 74%.



The rail network does not serve the movements along the A428/A1303 corridor.



Exiting buses do not provide reliable journey times

The C2C Project therefore offers:



The opportunity to build on the success of the existing Park & Ride site, by creating more capacity and public transport priority infrastructure that will benefit new and existing bus services



The ability to achieve growth through the use of sustainable modes on this corridor, a frequent, quick and reliable HQPT service with supporting measures is required



The creation of safe cycling and walking routes



A reduction in accidents achieved through managing congestion



Improved connectivity to Cambridge city centre and the rail links there, and encouragement of further growth and development to the western areas of Cambridge



Journey times (including the walking element at either end of the trip and waiting time) comparable with those of the private car



Addresses environmental challenges through a reduction in congestion



Improved connection on a section of the Oxford - Cambridge Arc

Alignment with planning and policies

A review has been conducted as a part of this Business Case Update to ensure that the options assessed align with published policy. The review takes into account national, regional and local policies, including:

- City Deal Objectives
- Transport Strategy for Cambridge and South Cambridgeshire – 2014
- Cambridgeshire Long Term Transport Strategy – 2015
- The Third Cambridgeshire Local Transport Plan – 2011 - 2026
- South Cambridgeshire Local Plan – 2018
- Cambridge Local Plan – 2018

The illustrative comparator has been assessed against the above policies and was found that it had the best fit due to its ability to facilitate sustainable economic growth by providing high quality, quick and reliable public transport.

What is the effect of the scheme on the greenbelt?

The off-road route lies mainly in Green Belt land.

An assessment of the key planning policy considerations relating to the off-road option concluded that the project's social and economic benefits and the transport objectives was strongly supported by both local and national planning policy. However, this needs to be weighed against the impact in environmental terms, particularly accounting for the location of large parts of the proposed route being situated within the Cambridge Green Belt.

The impacts on the Green Belt will continue to be assessed as the project proceeds.

Stakeholder engagement

Stakeholder and public involvement is important in the process for option appraisal and assessment. Extensive community and stakeholder engagement has taken place using a range of methodologies. Although the optioneering process is not based solely on popularity, gathering and then reflecting public and stakeholder support and views are a key factor in option selection. As such the robust public consultation has informed and shaped the scheme and optioneering process which has led to the strategic option.

Public and stakeholder involvement has taken place at every major stage in the optioneering process. It has allowed transparency between the emerging major transport scheme and the public, providing key stakeholders and communities the opportunity to raise any concerns and compile direct feedback on the proposals.

Furthermore, research with communities located in proximity to the project has provided an understanding of transport users' needs and the impact that a high quality public transport scheme could have on their travel behaviour.

Table 2 summarises when public consultation has taken place along with the outcomes and impact on scheme development. Stakeholder engagement has been ongoing including discussions with land owners, developers and statutory and non-statutory bodies e.g. Highways England.

Table 2: Consultation to date

Consultation Activity	Outcome / Impact on Scheme Development
2015 Public Consultation	<ul style="list-style-type: none"> The majority of respondents agreed that better bus services are needed, most preferred elements of a potential scheme included: <ul style="list-style-type: none"> An on-road bus lane in bound from Madingley Mulch roundabout into the city centre A bus priority route from Madingley Mulch roundabout to Bourn Airfield along the old A428 A bus only route between Cambourne and Bourn Airfield Alternative options and modifications were taken for further assessment.
2016 Local Liaison Forum (LLF) Established	<ul style="list-style-type: none"> Continuous engagement with LLF throughout scheme history. New route option suggested and taken forward for further appraisal work. Scoring of options in appraisal was a joint operation undertaken with input from LLF representatives.
December 2016 Stakeholder Workshop Consultations	<ul style="list-style-type: none"> Local Stakeholder Workshop – 8th December 2016. Cambourne Workshop – 14th March 2017. Local Planning Authority Workshops – January 2017 – May 2017. The start of a formal dialogue between GCP, statutory consultees and local stakeholders.
July – August 2017 Busway User Research	<ul style="list-style-type: none"> Speed, reliability of journey and frequency of service are key service elements which motivate people to use the service, this has assisted in informing the specification of the proposed scheme. When informed of the potential new bus service between Cambourne and Cambridge, around a third of respondents indicated a fair to strong likelihood of using it.
August 2017 Stakeholder Workshop Consultations	<ul style="list-style-type: none"> Utilising feedback from the workshop, the Park & Ride locations were narrowed down. This led to further evaluation and two sites: Waterworks and Scotland Farm. These were presented for public consideration in the 2017-18 consultation.
December 2017 - January 2018 Public Consultation & Focus Groups	<ul style="list-style-type: none"> 40% of respondents preferred Option B, an On-Road tidal Public Transport lane 33% of respondents preferred Option C, an Off-Road Public Transport route 40% of respondents preferred Option A, an On-Road tidal eastbound Public Transport lane Bi-directional bus lanes and an optimised on-road option to include both inbound and out bound bus priority were taken forward for further consideration. The bus lane was removed from the on-road option and cycle provisions were included and formed part of the do minimum option.
March 2018 – Stakeholder Workshops	<ul style="list-style-type: none"> No preference was shown for a preferred on-road or off-road solution from the options presented. There was a preference for a separate cycle and pedestrian walkway on the on-road option so the pedestrian bridge was taken forward in the ‘Low Cost’ options. The consultees suggested that the proposed bus lane from High Cross junction be removed from the on-road option. As such this has been proposed to be included in a ‘Low Cost’ option.

3. Option Development

This chapter will discuss:

- Option development
- Headline criteria assessed
- Environmental
 - Social and distributional
 - Strategic economic
 - Summary
- The Emerging Strategic Option

Options Development and Appraisal since October 2016 has been undertaken in 2 stages:

Stage 1 – assessed the options that were presented as part of the 2017 public consultation, taking into account responses from the consultation and stakeholder engagement to arrive at the highest scored On-Road route and the highest scored Off-Road routes.

Stage 2 – the short-listed options were appraised against each other to arrive at a strategic option that has been taken forward through into this Business Case Update.

Stage 1 – Definition of Preferred On-Road and Off-Road Option

Stage 1 definition of the three options consulted in 2017 were as follows:

- **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.

Photo montage and cross section illustrating how Route A could look



Photo montage and cross section illustrating how Route B could look

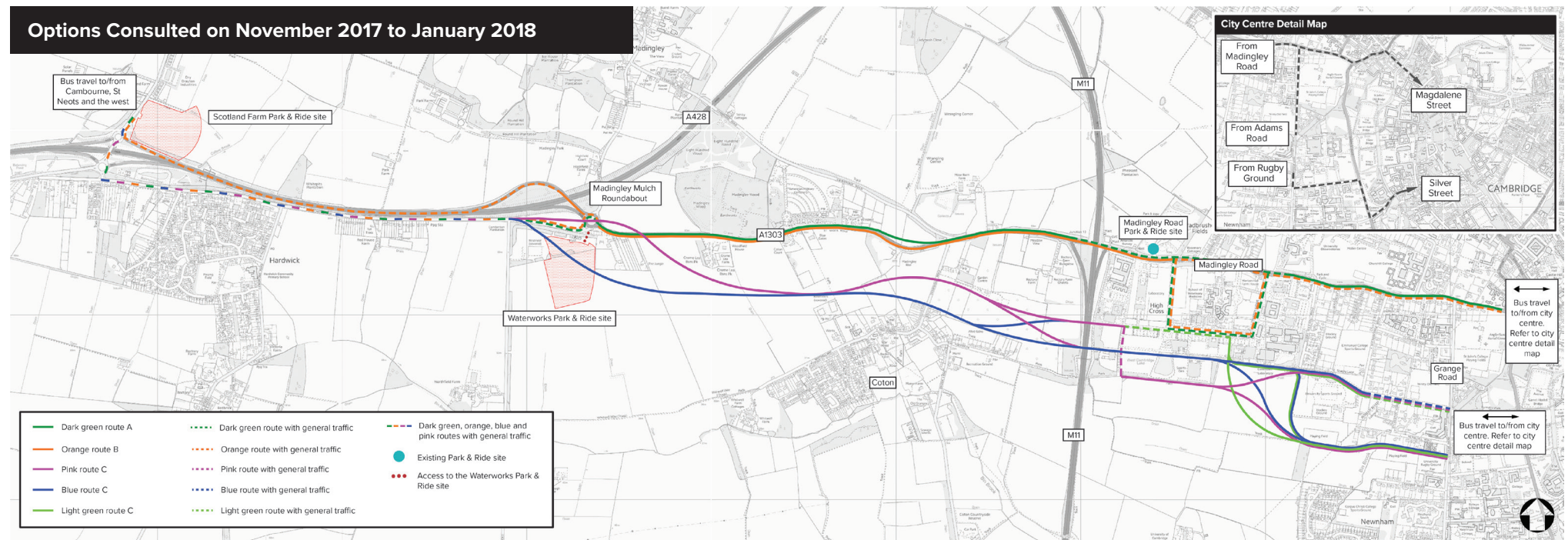


Photo montage and cross section illustrating how Route C could look



Option visualisations produced as part of the 2017 consultation documentation illustrate how each option could look when implemented.

Figure 4: November 2017 - January 2018 consultation options



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

Further Option Assessment Summary

The three options presented as part of the public consultation were then assessed to arrive at a specific route alignment for both an on-road and off-road option.

Table 3: Development of Options Stage 2

Option	Development
Option A	<ul style="list-style-type: none"> Option A and Option B were assessed against each other using Mott MacDonald's in-house Investment Sifting and Evaluation Tool (INSET) to arrive at a preferred on-road option. The findings of the INSET assessment have concluded that the on-road option is Option A. However, a potential "optimisation" of the route has been explored 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.
Option B	<ul style="list-style-type: none"> Option A and Option B were assessed against each other using Mott MacDonald's in-house Investment Sifting and Evaluation Tool (INSET) to arrive at the highest scoring on-road option. Option B did not score as high as option A. The need for gantries was a significant reason for the differences in scores. Although, this was not in the original proposal by the LLF gantries were included for safety and operational purposes.
Option C	<ul style="list-style-type: none"> Option C was split into the pink, blue and (through West Cambridge) development light green routes. These represented different alignment routes for Option C. The route was broken down into five areas and assessed using INSET to arrive at a recommended Specific Route Alignment The recommended off-road specific route alignment is substantially the "Blue" route through Madingley Mulch, and adjacent to Coton Village and the light green route through West Cambridge, and the former Rifle Range track past the Rugby Ground to Grange Road.

Why are gantries needed on Option B?

Gantries are required to operate the tidal public transport lane by indicating the direction of traffic flow and ensure the safety of vehicles using the route. In practice it would not be acceptable for a relatively lightly used public transport lane to be unsigned as to the direction of traffic. Any other central 'tidal' lane in the UK has involved integrated gantries.

“Optimised” on-road option

This optimisation of Route A reflected 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 optimisation was modelled to assess the impact of the following changes highlighted in figure 5:

1. Carriageway widening for 200m of west bound bus lane on the approach to Madingley Mulch Roundabout.

2. Signalisation of Cambridge Road Junction

3. Change to M11 junction 13 to allow two right turn lanes from off-slip

4. Park and Ride access relocated to Eddington Avenue, additional eastbound and westbound bus lane and bus gate at approach to High Cross junction

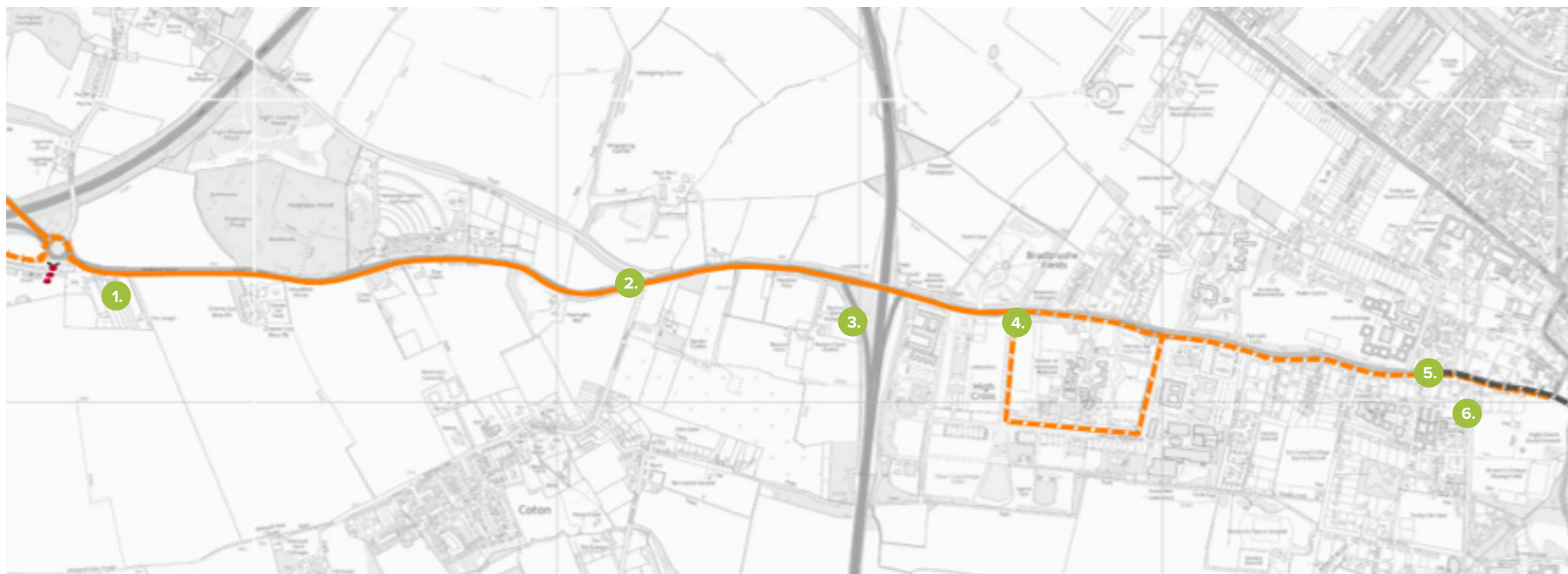
5. Removal of Public Transport lane from West Cambridge development to Storeys Way

6. Signalisation of Grange Road Junction

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 Low cost a and b.

As a result of the optimisation process and stakeholder engagement, past the junction with High Cross/ Eddington Avenue the proposed public transport lane has been removed from the scheme and cycling improvements are recommended for further consideration by GCP.

Figure 5: Optimised On-Road Option

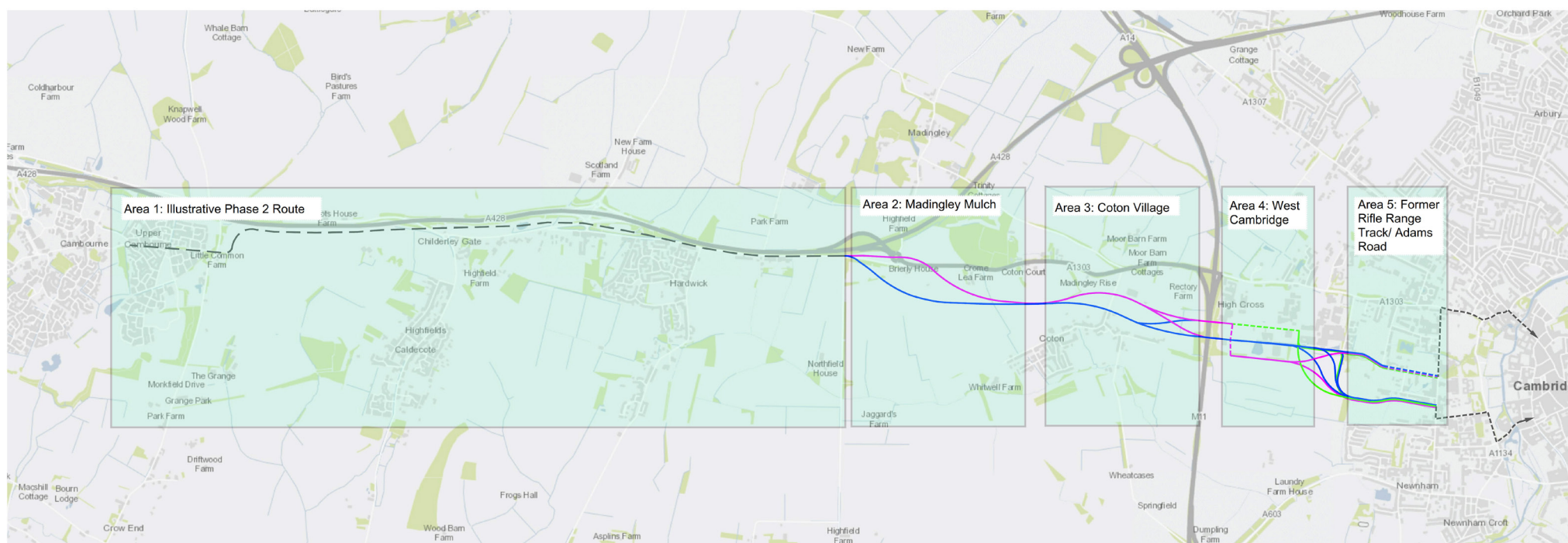


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Option C

Figure 6 shows how Option C was broken down into five areas and table 4 shows the alignment selection for each of the 5 areas and the summary of the assessment and why each alignment was chosen.

Figure 6: Off-road route option areas



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Surely, the green route appears to offer the best access arrangements to the West Cambridge site?

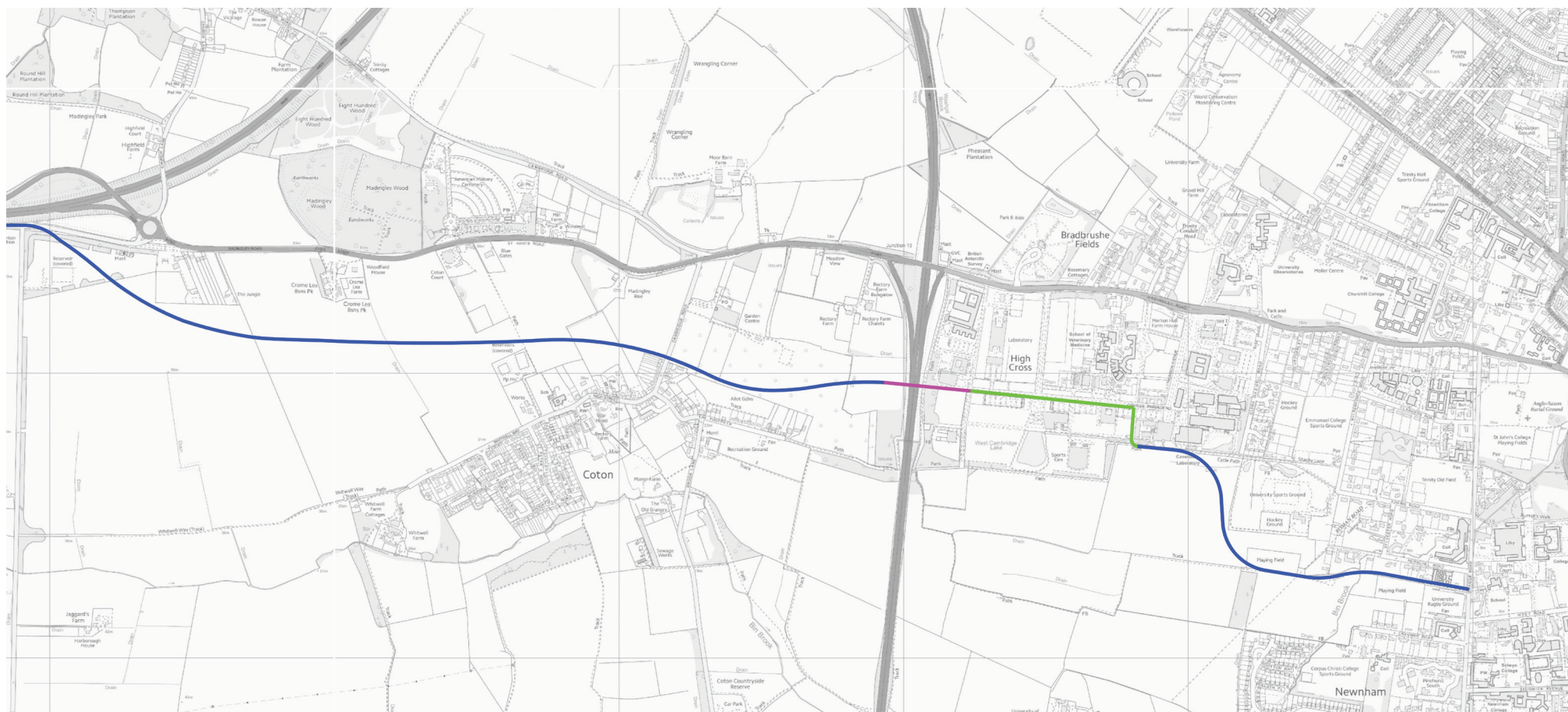
Both Green and Blue route options serve the West Cambridge site directly. The blue route would provide a new separate and additional public transport route passing through the site. The light green route runs through the site itself but would need to be segregated to ensure that public transport vehicles can operate reliably through the site and remain attractive to through passengers.

Table 4: Assessment Specific Route Alignment by Area

Area	Route section	Details
Area 1 Cambourne	N/A	Phase 2 has not been consulted on so only an illustrative comparator off-road option has been considered at this stage.
Area 2 Madingley Mulch	Blue	<ul style="list-style-type: none"> • Blue route is less costly and disruptive to build. • Blue route is segregated from other traffic, pedestrians, and cyclists. • Public transport vehicles and a future CAM will be able to run more quickly through the section
Area 3 Coton Village	Blue	<ul style="list-style-type: none"> • Blue Route is better aligned for a CAM stop to serve Coton. • Blue Route lower in landscape so less visible from Coton Village and Red Meadow and can be encompassed into the field edge with landscaping mitigation. • New cleaner public transport vehicles on the Blue Route will be no nearer the houses than the existing buses on Cambridge Road. • Blue Route has less of an impact on landowners • Blue route has less impact on the orchard and juicing business on site. • Blue Route invites less expansion of urban infill.
Area 4 West Cambridge	Light Green Segregated	<ul style="list-style-type: none"> • The initial green route had shared running through the west Cambridge site along Charles Babbage Road. However, through the development of the scheme it has been discovered that there is sensitive laboratory equipment in close proximity to the blue route. With this taken into consideration the Light green route becomes preferable.
Area 5 Former Rifle Range Track / Adams Road	Former Rifle Range Track (along access track adjacent to Rugby Club)	<ul style="list-style-type: none"> • Former Rifle Range Track allows for segregated rapid transit infrastructure, providing a quick and reliable route. • Former Rifle Range Track provides additional cycling and walking capacity to support West Cambridge. • Former Rifle Range Track has least impact on residents and most benefits to cyclists passengers and pedestrians.

Figure 7 below shows the final Recommended Specific Route Alignment following the assessment of each area.

Figure 7: Phase 1 Recommended Specific Route Alignment



Summary

Following the assessment it was concluded that the recommended On-Road route would be the “Optimised” Route A, which includes some outbound public transport priority and removal of the inbound public transport lane east of High Cross / Eddington Road junction. It was proposed that enhanced cycling and walking facilities should be provided in this area, which will be taken forward as a separate scheme.

The recommended Off-Road route was the Blue route through Madingley Mulch and adjacent to Coton Village, the light green segregated route through West Cambridge and the former Rifle Range Track leading to Grange Road.

The recommended options for Phase 1 were combined with a Park and Ride location and were assessed, during the next stage, along with a Strategic Option including both Phase 1 and 2, to provide an Initial Strategic Assessment for the entire project in order to form a recommendation for Phase 1.

The results of this assessment are presented in the following sections. A summary of the options assessed is shown below:

- Do Minimum – Committed Schemes
- Low Cost a – Recommended optimised on-road Phase 1 + Park and Ride at Waterworks
- Low Cost b – Recommended optimised on-road Phase 1 + Park and Ride at Scotland Farm
- Do Something 1a – Recommended off-road Phase 1 Madingley Mulch Roundabout to Grange Road + Park and Ride at Waterworks
- Do Something 1b – Recommended off-road Phase 1 Madingley Mulch Roundabout to Grange Road + Park and Ride at Scotland Farm
- Illustrative Comparator – Recommended off-road Phase 1 and Phase 2 Cambourne to Grange Road Park and Ride at Waterworks for comparative purposes



Stop Locations

Will there be stops at villages along the route?

As part of Phase 1 the current proposal is to have a stop serving West Cambridge although specific services patterns will need to be agreed with operators. However, there are opportunities for other stop locations to be added as the scheme progresses, should there be sufficient passenger demand.

Does the scheme end at Grange Road?

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.

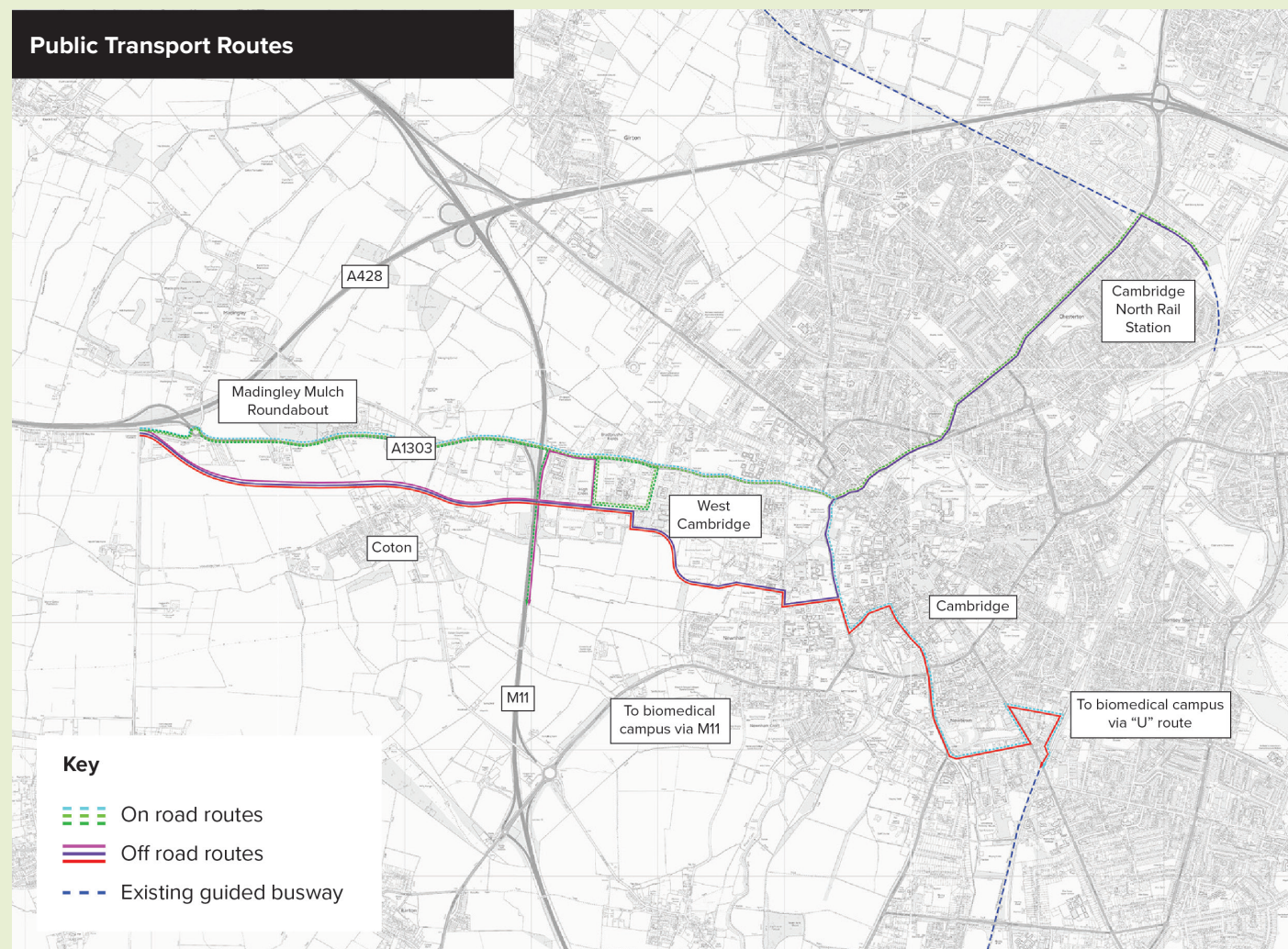
This Business Case Update modelling assumes three routes, to Cambridge Biomedical Campus, Addenbrookes and the Cambridge Science Park following a desire for these areas to served being a common theme identified during consultation. The Universal Bus service is one example of a route that might be followed.

The recommended segregated option brings 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.

Further work will continue alongside operators to ensure the routes modelled at the final OBC stage represent the most appropriate scenario.

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.

Figure 8: Public Transport Modelled for Business Case Update



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Economic Appraisal

A Value for Money (VfM) assessment that incorporates both the monetised impacts and the non-monetised assessment of each option has been carried out.

The VfM assessment used to inform the assessment of the illustrative comparator takes into account a number of factors such as direct user benefits (e.g. savings in time in using the scheme), and indirect benefits/costs such as delays or faster journey times for car users. Also operating and maintenance costs are considered as are potential fare incomes. These are then weighed against wider effects such as wider economic benefits including housing and growth.

The overall approach to the C2C project economic appraisal is being undertaken in two steps (see figure 10), with the results from the first step informing the illustrative comparator as reported in this Business Case Update.

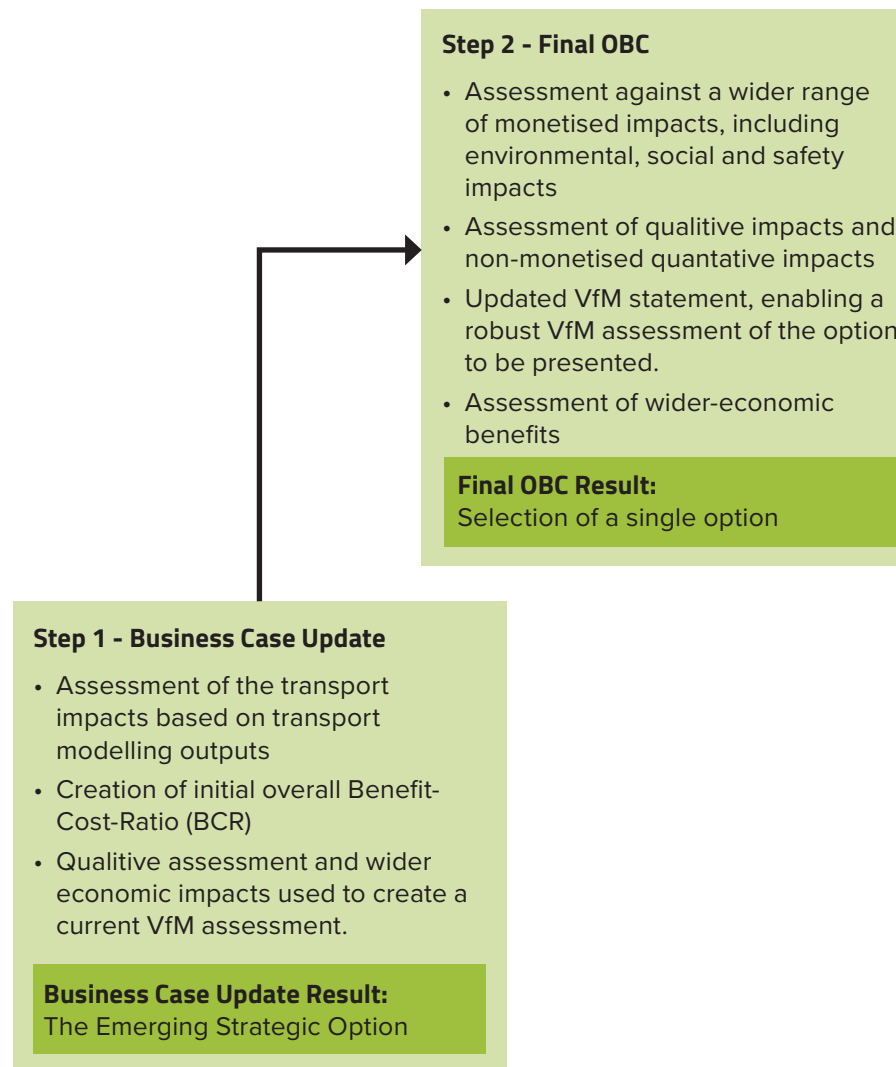
The principal tool used to undertake the appraisal is a strategic level traffic model. Model outputs are affected by growth assumptions, such as housing and employment; and decisions relating to other transport schemes, such as the closure of Madingley Road Park and Ride site and other committed transport schemes.

Benefits were determined through the strategic traffic model which reflect the predicted changes in traffic flow. These are categorised as direct economic benefits.

Direct benefits are calculated for all users including commuters and business users. These benefits are based upon changes in travel time, vehicle operating costs, user charges and delays during construction.

Other economic benefits will be calculated in full as part of the preparation of the final OBC, which include, but are not limited to, the detailed assessment of environmental impacts, social impacts, and safety impacts.

Figure 9: Economic Appraisal Process



Wider Economic Benefits

Wider economic benefits (WEBs) are the additional, non-transport related benefits to the economy which could be delivered by the scheme and are central to the strategic case for the scheme and the need for investment. An initial assessment has been carried out on the scheme, that included:

- Land utilisation benefits:
Contributing towards bringing forward development associated with the schemes and the creation of jobs.
- Access to more productive jobs:
The remaining Gross Value added (GVA) benefits derived from those jobs created in Greater Cambridge which support existing UK residents to access more productive jobs than they may currently hold.
- Reductions in spatial inequalities and structural unemployment:
The welfare benefits/Government cost savings associated with any jobs created in areas with high levels of deprivation and reductions in long term structural unemployment.
- Option and non-use values:
The benefits relating to the value residents place on having access to opportunities due to the schemes (option values) and that they may place on a public transport service even if they never intend to use it (non-use values).

The full appraisal of each option based on their WEBs

would be carried out as part of the preparation of the final OBC. However, the results from the previous studies for C2C project examining the WEBs for a fully segregated option from Cambourne to Cambridge can be used to support the strategic option.

The results show that at a Greater Cambridge level, a high quality segregated option from Cambourne to Cambridge (used as the illustrative comparator in this report) could support an additional £22.6m GVA per year and a total of £680m over 30 years.

When considering the scheme's GVA benefits at a Greater Cambridge level against the scheme costs, the illustrative comparator has the potential to deliver a **“Local WEBs ratio” of 3.68.**



Benefit Cost Ratios (BCRs)

BCRs provide an indication of value for money which can be used to compare scheme options using economic, social and environmental impacts that can be expressed in monetary terms. WebTAG outlines the calculation of two BCRs:

- An initial BCR – based on transport user benefits
- An adjusted BCR – incorporating wider economic impacts

Table 5 shows the direct economic benefits generated by each of the scheme options, as well as the wider economic impacts for the C2C project that are additional to these transport user benefits. These have all been calculated in line with WebTAG (the Government's web-based Transport Appraisal Guidance).

Table 6 presents the initial BCRs and adjusted BCRs for each option based on the Present Value of Benefits included in Table 6, set against the options' costs.

Conventional transport schemes are appraised primarily on the basis of the BCR, which reflect existing and committed developments and associated travel demand. One of the reasons to allocate City Deal funds is to enable Cities to plan the infrastructure needed to unlock future development and enable growth. The Wider Economic Benefits better reflect the potential growth that the scheme will facilitate. Therefore, whilst the standard BCRs are low, they do not take into account the wider economic benefits and form just one element of the final VfM assessment and therefore should not be read in isolation.

Non-monetised Benefits Assessment

At this stage in the development of the C2C project, the economic appraisal and VfM assessment focuses on the monetised transport user benefits to produce the initial BCR, as well as incorporating wider economic impacts for an adjusted BCR. However, a full VfM assessment should be based on the consideration of non-monetised benefits as well, both quantitative and qualitative. At this stage in the scheme's development, the options non-monetised impacts have been assessed using a multi-criteria model (INSET).

Using INSET, options were assessed against list of 37 criteria. Each criteria was scored on a scale of 1 to 7. Table 7 summarises the results showing lower scores as yellow, changing to purple for higher scores.

Table 5: Summary of economic impacts (£'000s)

Benefit (£'000s)	Low Cost a	Low Cost b	Do Something 1a	Do Something 1b	Illustrative Comparator
Transport User Benefits (PVB)	2,213	2,604	23,411	18,990	20,763
Wider economic impacts (PVB)	323	380	3,388	2,753	3,005
Total PVB	2,537	2,985	26,799	21,742	23,768

Table 6: Benefit / Cost Ratios

Benefit	Low Cost a	Low Cost b	Do Something 1a	Do Something 1b	Illustrative Comparator
Initial BCR	0.03	0.03	0.19	0.15	0.11
Adjusted BCR	0.03	0.04	0.22	0.17	0.13

Key

- 1 Lowest
 2
 3
 4 Neutral
 5
 6
 7 Highest

Table 7: 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 Draft Local Plan	●	●	●	●	●	●
	Cambridge City Draft 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 and Ride	●	●	●	●	●	●

		Do Minimum	Low Cost a	Low Cost b	Do Something 1a	Do Something 1b	Illustrative Comparator
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		145	155	156	170	170	178

Source: Mott Macdonald

Table 8 shows how the options rank based on this assessment.

Table 8: INSET Assessment Results

Option	INSET Scoring Summary Ranks
Do Minimum	Ranked 6th
Low Cost a	Ranked 5th
Low Cost b	Ranked 4th
Do Something 1a	Ranked 2nd
Do Something 1b	Ranked 2nd
Illustrative Comparator	Ranked 1st

Source: Mott Macdonald

The following headings set out a brief summary of some the headline criteria assessed and the reasoning behind the INSET scoring shown above.

1. Environment

The environmental criteria taken into account covered:

- Landscape
- Noise
- Air Quality
- Carbon / Greenhouse gases
- Biodiversity
- Heritage
- Green Belt

From an environmental perspective there are essentially two options (one on-road and one off-road) with two park and ride options for the scheme. This summary of the assessment outlines the key environmental issues that each scheme option faces.

In addition to previous reports, the ongoing appraisal was informed by the following activities (completed since the End of Stage Reports issued in September 2017):

- Stakeholder Engagement with landowners and local authority environmental specialists
- Geophysical surveys for archaeology of 13 hectares of Farmland West of the M11 along pink and blue route options and of the route between West Cambridge and the former Rifle Range Track across the West Fields

- Arboricultural survey of the former Rifle Range Track, with special emphasis on the potential impacts on three trees which have Tree Preservation Orders (TPO) located just north of the former Rifle Range Track and of the TPO areas along the St Neots Road between the Waterworks site and Scotland Farm Road
- Early schematic design for a possible crossing over Bin Brook looking at the flood levels and what level of flood storage would be required to ensure no deterioration in flood risk
- Heritage Study on the Conservation Areas in West Cambridge and Coton shared with Historic England
- Development of a Green Bridge concept design as an option for the crossing over the M11
- Additional photographic information of views of the routes from different viewpoints in winter and summer. The results have informed the further development of the Green Land Concept and potential landscaping and ecological treatment
- Ecological surveys of winter birds and habitat surveys for badgers covering Phase 1 and Phase 2 options
- Ecological surveys for summer covering, amongst other receptors breeding birds, Great Crested Newts, Badgers, Bat roosts, invertebrates, Water Voles and Otters covering Phase 1 and Phase 2 options.

A full Environmental Impact Assessment will be completed as part of the planning and consent process.





2. Park and Ride Options

With regard to noise, air quality, carbon/greenhouse gases and Green Belt issues there is no significant difference between the two Park and Ride sites, each would have similar effects on these environmental issues.

The Waterworks site has greater potential sensitivity in relation to landscape, biodiversity and heritage than Scotland Farm. The Waterworks site has higher biodiversity value than Scotland Farm site due to the latter site being intensively farmed and the former left being relatively undisturbed and having a grouped Tree Preservation Order (TPO) covering part of the site which would be impacted by access roads.

Information from the geophysical and desk studies of heritage in the area shows the Waterworks site has specific area of interest, whereas Scotland Farm may have potential but there is no direct evidence to indicate the presence of heritage assets on the site.² The Waterworks site has potential for more impact on distant views of the site (particularly at night) than the Scotland Farm site, although both introduce some visual intrusion to their surrounding areas of similar scale.

Either location would be required to go through further environmental assessment alongside the final recommended option.

2. Due to access constraints no surveys have been possible on the Scotland Farm site

Natural England Consultation Response

Environmental Concerns

Off-line

This off-line route option appears to be sufficiently distance from designated sites and therefore unlikely to have any adverse impact on these.

On-line

Options A and B are located in close proximity to this (Madingley Wood SSSI) nationally designated site and proposals could have an adverse impact, through direct and indirect effects, on the notified features of the ancient woodland.

Historic England Consultation Response

Heritage Concerns

Off-line

We consider that the harm associated with either of the options for Route C could be minimised or avoided subject to a robust mitigation strategy.

On-line

The proposal by reason of the proximity to the cemetery and loss of verge would result in irreversible, adverse impacts upon the approach, setting and layout of the cemetery site.

Low cost On-Road a and b options

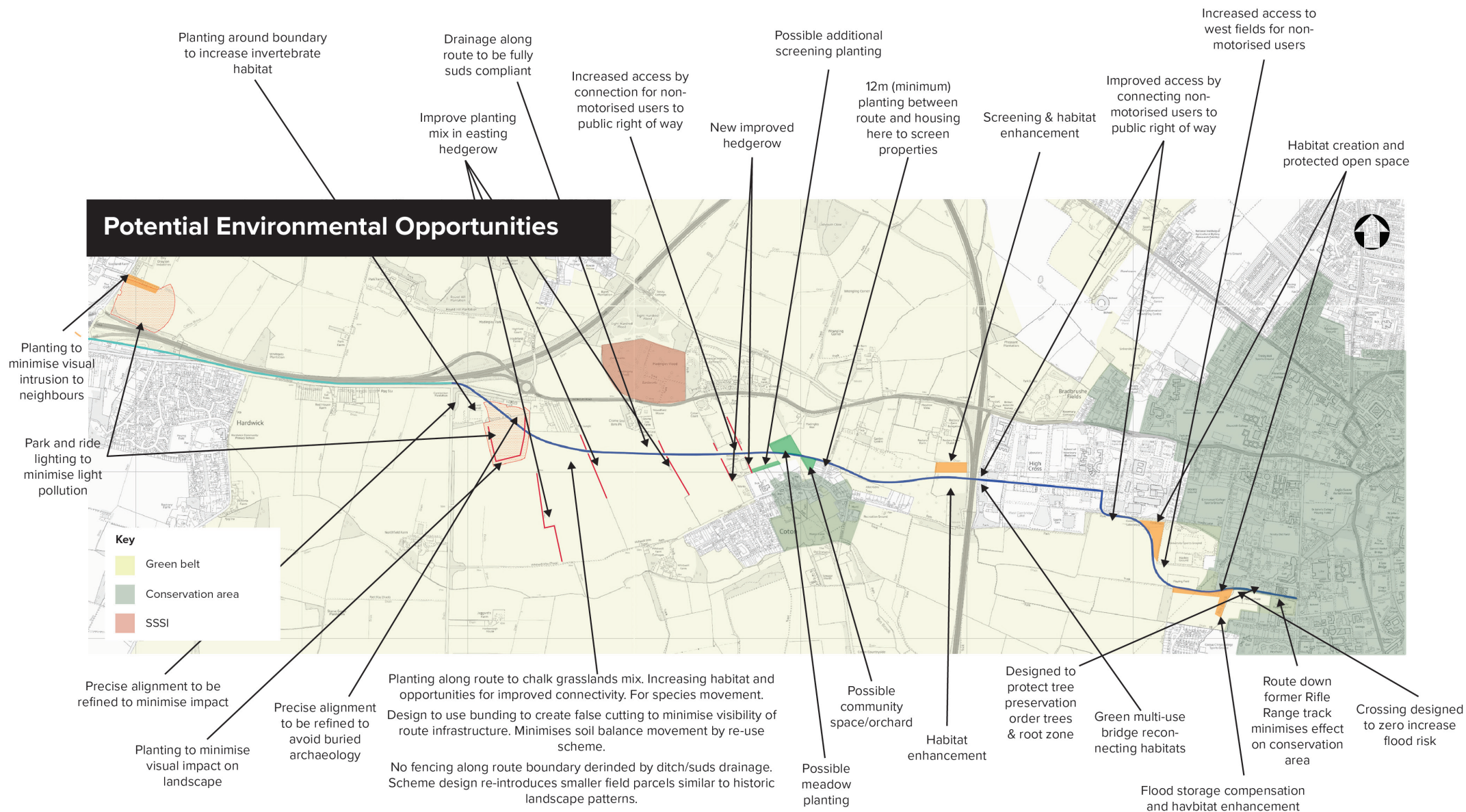
The most significant environmental receptors in the area are located immediately adjacent to the route for either option, namely the Madingley Wood SSSI and the American Cemetery. The route option requires numerous trees along the Madingley Road to be removed. This will potentially affect the setting of the Cemetery in a negative way, as raised by Historic England. Natural England have also raised concerns about the potential to increase impacts on the SSSI. There is limited potential to make any significant change to the design to mitigate these effects.

Due to the potential loss of trees along Madingley Road there are some adverse effects on the landscape character immediately along the road.

Off-Road

The maps on the following pages highlight the environmental opportunities and constraints that have been identified through the option development process.





Illustrative Environmental Opportunities

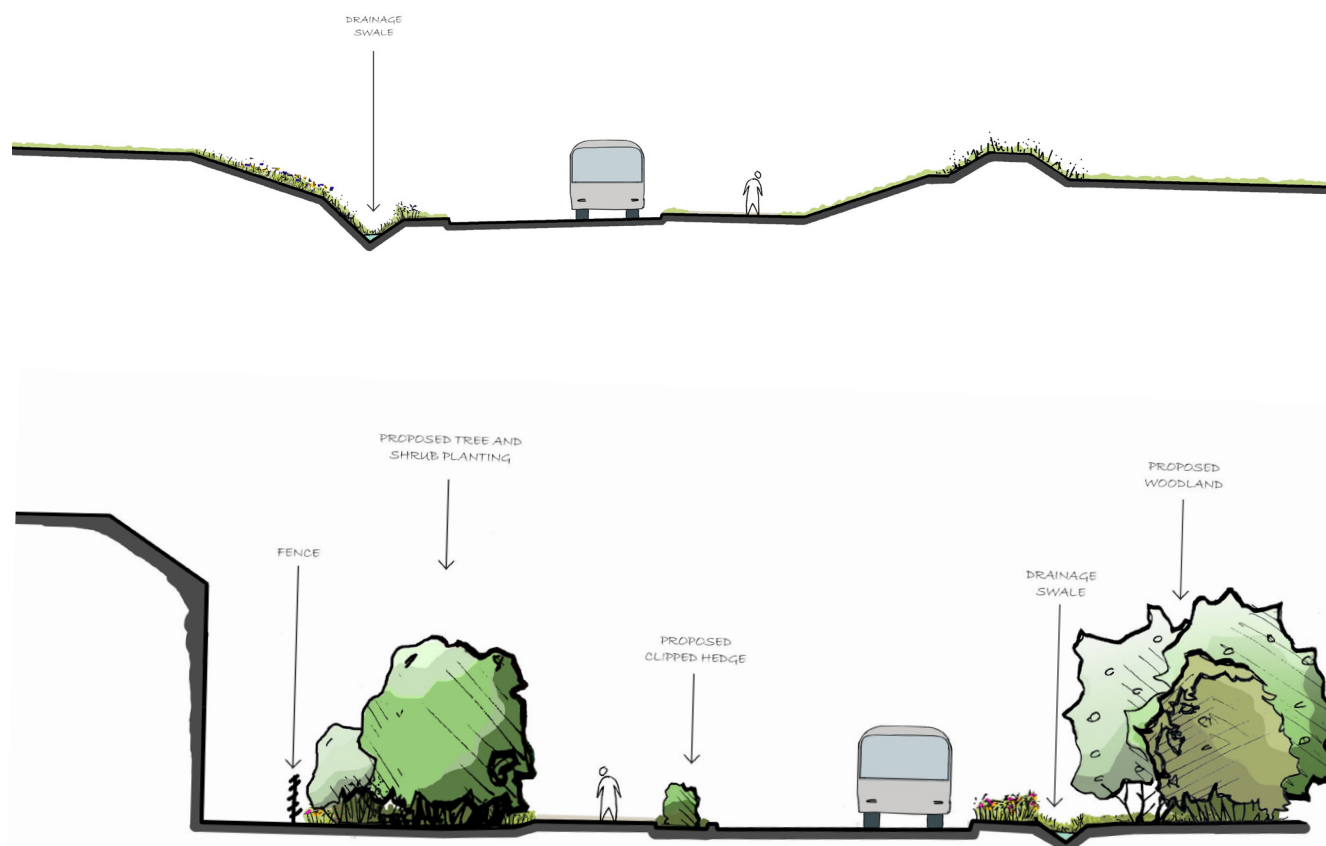
Through option development a number of mitigation treatment methods are being developed. These will be developed with assistance of stakeholders as the project progresses.

Phase 1 Cross section

A possible opportunity within the phase 1 option could be placing the route in shallow cutting at strategic locations. This may help to screen the route and vehicles passing along it from surrounding properties and viewpoints and could reduce the need for screening planting that would highlight the position of the route crossing the fields.

Coton Village Cambridge Road Junction

Cambridge Road is currently 12m away from the properties at the northern extremity of Coton. The recommended route is proposed to also be set a minimum of 12m from the adjacent properties on Cambridge Road, therefore no public transport vehicles will be closer than existing. This gives opportunity to allow the creation of a landscape buffer between the route and the property boundary which could help to link habitats, screen potential views towards the route and enhance biodiversity.



Possible Landscape and Ecological Treatment

Wildflower Meadow/ Orchard

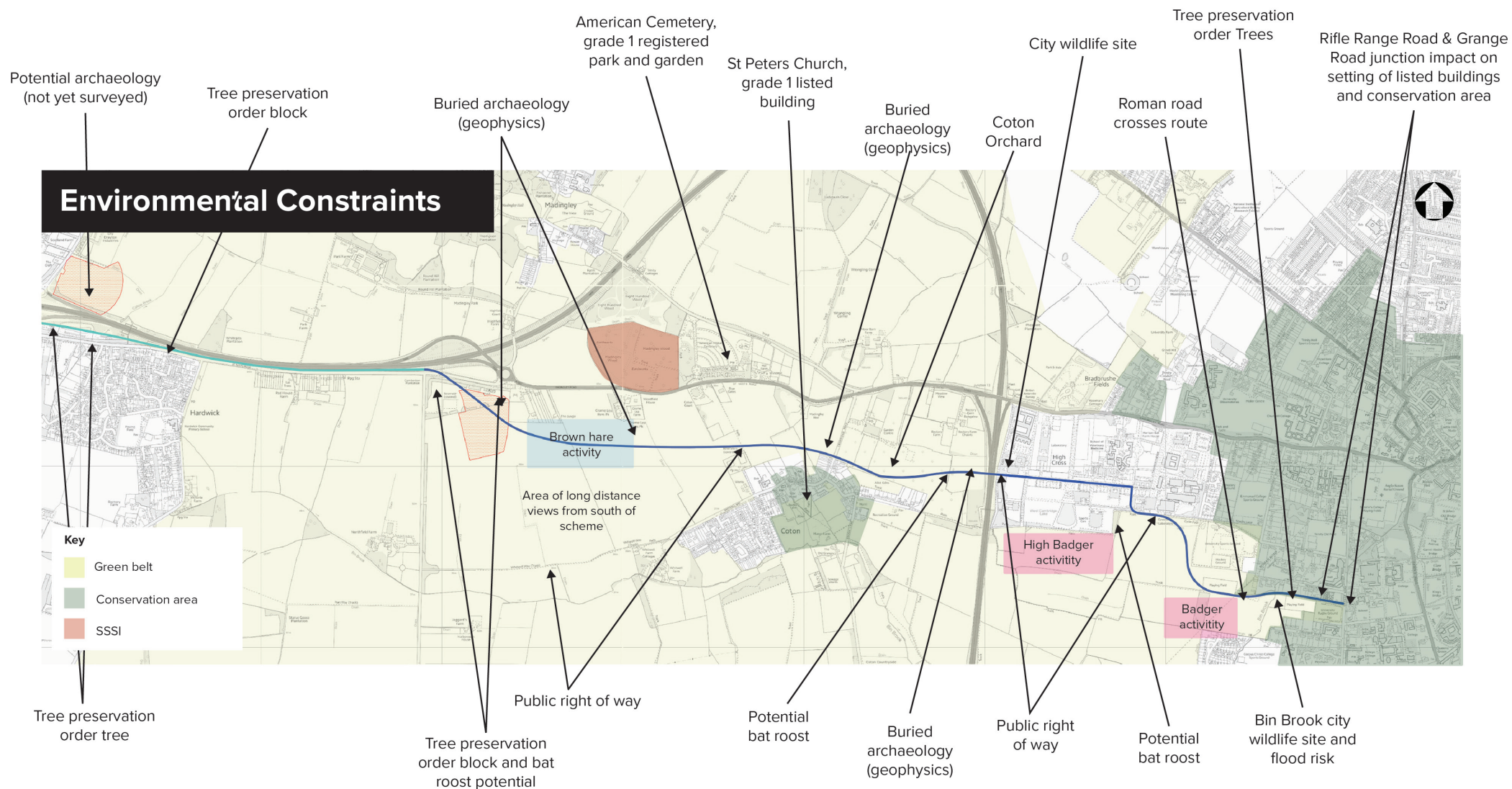
There is an opportunity to include a number of landscape and environmental measures such as the creation of an orchard near Coton. This could provide a new publicly accessible amenity and offset the loss of orchard trees elsewhere along the route and increase overall habitat of this type. In addition to this there could be the introduction of a wildflower meadow which could provide a positive environmental feature to enhance the biodiversity of the area.



Grange Field Wild Flower Meadow

Within the Grange field site there is an opportunity to include a meadow and pond, this could enhance the biodiversity and seasonal variation of the area, whilst preserving the openness of the green belt and views across the West Fields.





Do Something 1a and 1b

The main impacts of either option are on the landscape, on biodiversity and on the heritage /archaeology and Green Belt.

The route options through the Green Belt are deemed to be not-inappropriate development for Green Belt, and the effect on openness and access to the countryside will be enhanced by the mitigation planned for the route to be a “green lane” through the Green Belt.

There are no significant environmental issues related to the various route options (blue, pink, green) through West Cambridge as this site is largely developed with few sensitive environmental receptors affected by the scheme.

Illustrative Comparator

The two routes from Cambridge to the Park and Ride sites are discussed under Do Something 1a and 1b above.

Almost all environmental issues reflect a neutral potential effect, with heritage showing some potential adverse effect due to the route crossing an area not yet impacted by modern developments and highways.

3. Land and Property

Land and property would be acquired or used for the project in a number of different ways, including:

- Temporary use of land and property;
- Permanent acquisition of land and property;
- The safeguarding and survey of land and property; and
- Permanent acquisition of rights over land and property.

Temporary use of land and property is required where it is needed for construction purposes, but not for the future operation of the project. Permanent acquisition of land and property is required for both the siting of the permanent structures, equipment and its operation and maintenance, it is also required for landscaping and mitigation measures, including those of drainage, environment and severance.

The land required to accommodate the various options assessed is proposed to be the following:

- Land that is required for the construction of the project, for the construction and safeguarding of works to be carried out, together with all construction work sites and working areas; and
- Land which will need to be acquired for the permanent structures and equipment associated with the Project, or land over which rights will be required to maintain, operate and safeguard its operation.

The project would seek to minimise land take, whilst ensuring that the extent is sufficient for the purposes of the construction and operation of the Project, including working areas and worksites. As the project progresses the amount of land required will further be defined and further assessment work will be required to inform the land and property requirements for the scheme.

All property interests will be identified as the scheme is developed and any further land interest identified will be incorporated within the existing stakeholder engagement.

Community Impacts

Community Impacts also known as Social and Distributional Impacts (SDI) are assessed in order to confirm whether or not any specific social groups are particularly disadvantaged by transport investment. A full SDI appraisal will be undertaken alongside the wider Environmental Impact Assessment when a final scheme is defined. For now we have undertaken a brief review of local demographic characteristics.

4. Social and Distributional Impacts

Figure 11 and Figure 12 provide an appraisal of the distribution of income and indices of multiple deprivation along the corridor that the project follows. They confirm that Cambourne is relatively deprived compared to the rest of the corridor area and, as such, that connecting it to Cambridge provides access to employment in Cambridge for the low income groups in Cambourne. The areas crossed by the scheme are generally relatively advantaged amongst the 20% of highest earning areas of the country.

Figure 10: IMD Overall Deprivation Quintiles

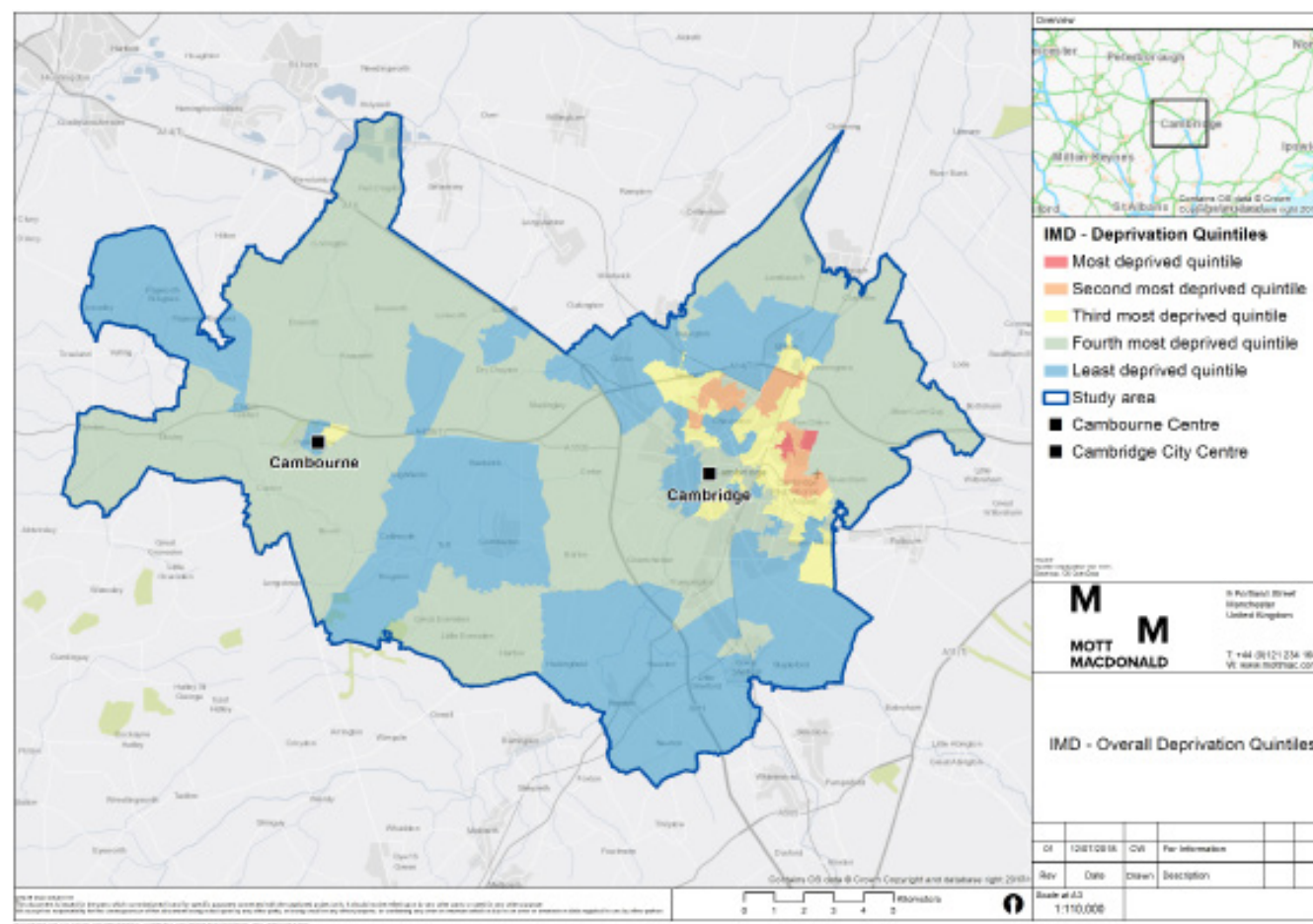
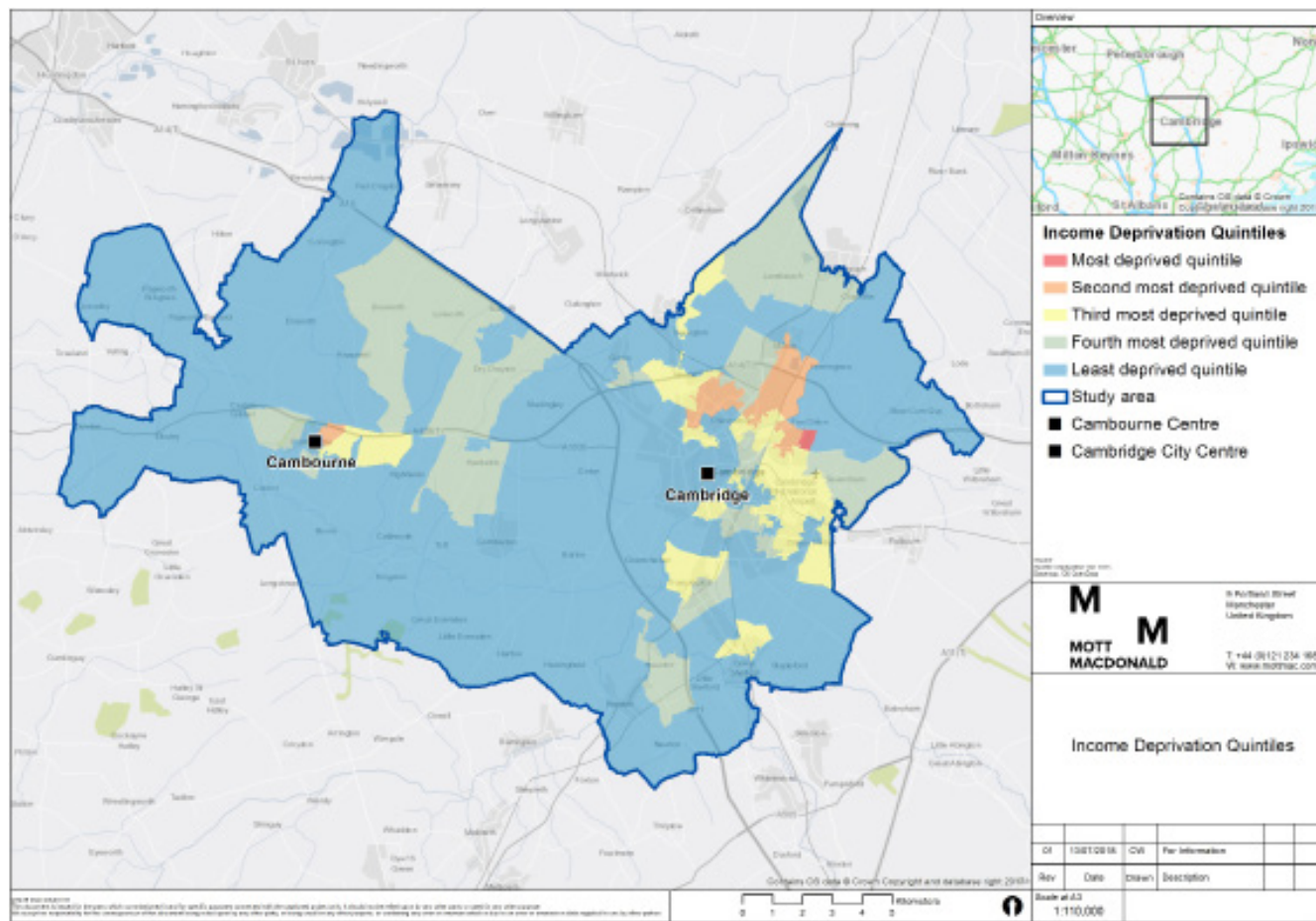


Figure 11: Income Deprivation Quintiles



Source: Mott Macdonald

5. Strategic Economic Case

The proposed scheme would significantly improve East-West connectivity and presents an opportunity to support Cambridge's growing population and workforce in conurbations to the west of the city, whilst managing the growing travel demand. The C2C project would help to connect such growing communities, whilst enabling them to evolve and access the increasing number of jobs and opportunities in the city and on its periphery.

The strategic economic benefits of the scheme are as follows:

- The total attributable proportion of remaining jobs (mainly B-use jobs relating to research and development, and light industry) to be created over 2016-2031 by a fully segregated scheme from Cambourne to Cambridge would be in the region of **800 jobs**;
- The total attributable proportion of housing in the region of **900 dwellings**;
- The C2C project would support around **£22.6m of GVA per annum**, equivalent to **£679.3m of GVA over a 30-year time horizon**; and
- Around **£198.1M of these strategic benefits** would be net additional to the UK.

Over and above these benefits, the delivery of major new developments such as Bourn Airfield (3,500 houses) are dependent on the provision of suitable access as enabled by this scheme.

Option Assessment Summary

Taking into account the initial BCR and adjusted BCR calculations, the best performing option in terms of route alignment from Madingley Mulch roundabout to Grange Road, is the Do Something 1a option – Off-road alignment with Waterworks Park and Ride (or Scotland Farm Park and Ride, subject to Phase 2 recommendation).

The results from the multi-criteria INSET assessment further demonstrate the strength of this option in meeting a wider range of criteria.

Whilst the options for Phase 2 are yet to be fully appraised and are subject to public consultation, the current assessment confirms that extending the scheme west to Cambourne would deliver additional benefits.

When taking into consideration the potential Wider Economic Benefits this option could deliver, it is clear that the Illustrative Comparator could deliver significant benefit at both at a national and local level. This further highlights the importance and need for investment in C2C in order to delivery economic growth both to the region and nationally.

Figure 12: Summary

Comparison of monetised benefits for full segregated option Cambourne to Cambridge vs full on-road option

Value for Money of Emerging Recommended Option: Based on current growth forecasts vs on-road option

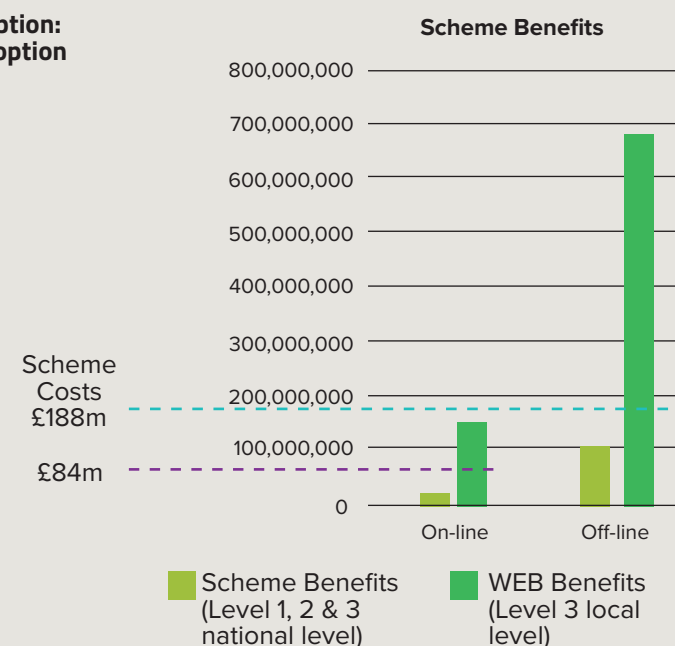
Level 1 = Conventional Transport Benefits
>> Provides BCR

Level 2 = Wider Economic Impacts related to transport scheme (ie not land-use changes)
>> Provides adjusted BCR

Level 3 = Wider Economic Benefits associated with land-use changes.
National level
>> Guides assessment of Strategic Case

Level 3 = Wider Economic Benefits associated with land-use changes.
Local level
>> Guides assessment of Strategic Case

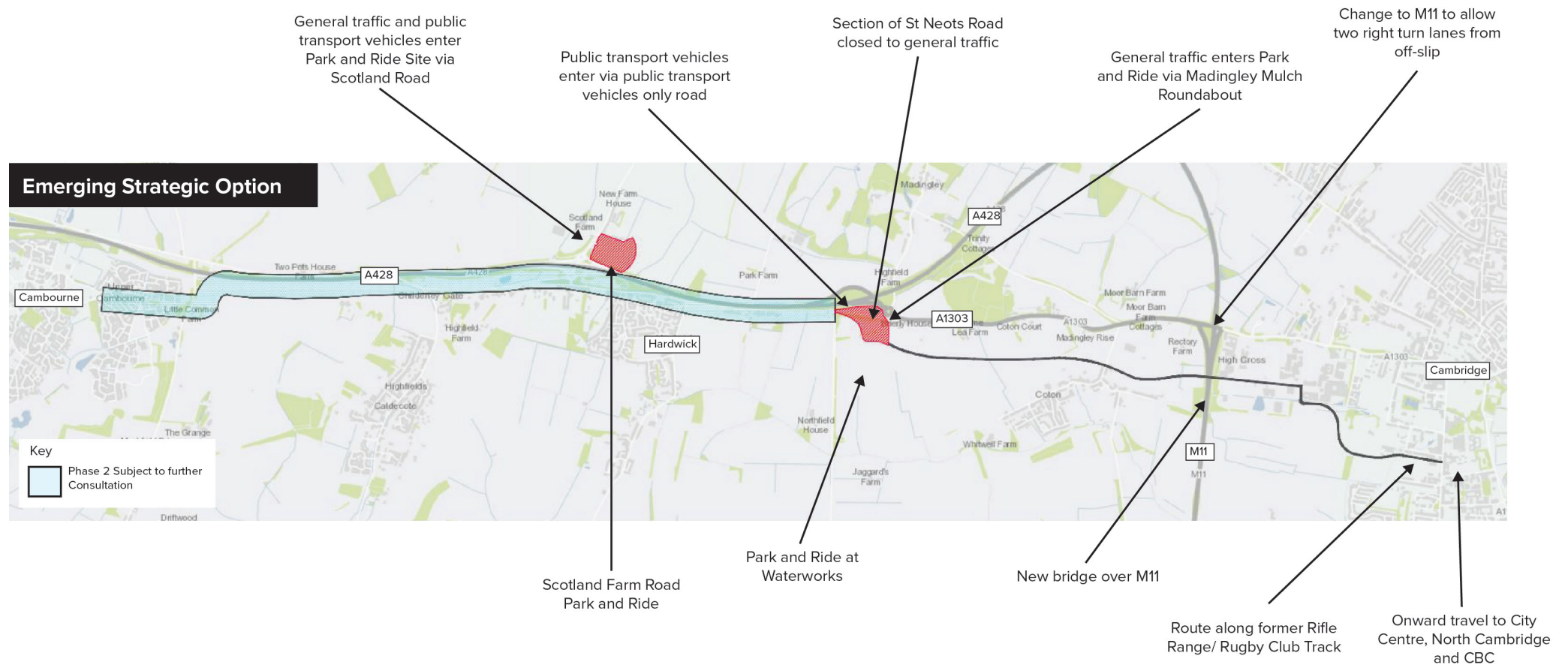
Costs are Present Value Costs including Capital and Operating Costs



Description of Emerging Strategic Option

The following figure shows the various features of the Emerging Strategic Option

Figure 13: Emerging Strategic Option



Phase 2

The following figures show indicative layouts that could be developed for consultation. In all options it is assumed that the section between Cambourne and through the proposed Bourn Airfield Development is a segregated off-road route (see figure 15).

The options for the remaining section include:

- Option 1: Off-Road Segregated (figure 16)
- Option 2: On-Road Junction Priority (figure 17)
- Option 3: On-Road with Public Transport Priority (figure 18)

Specific options for the Phase 2 section between Cambourne and Madingley Mulch have yet to be consulted on and as such consideration and

assessment of all options should be undertaken to the same extent as Phase 1. Once the phase 2 route option has been consulted on a preferred Park and Ride could be selected. An updated BCR and VfM assessment will need to be undertaken in order to arrive at a final preferred option as part of the final OBC.

Figure 14: Phase 2 Schematic - Cambourne to Bourn Airfield

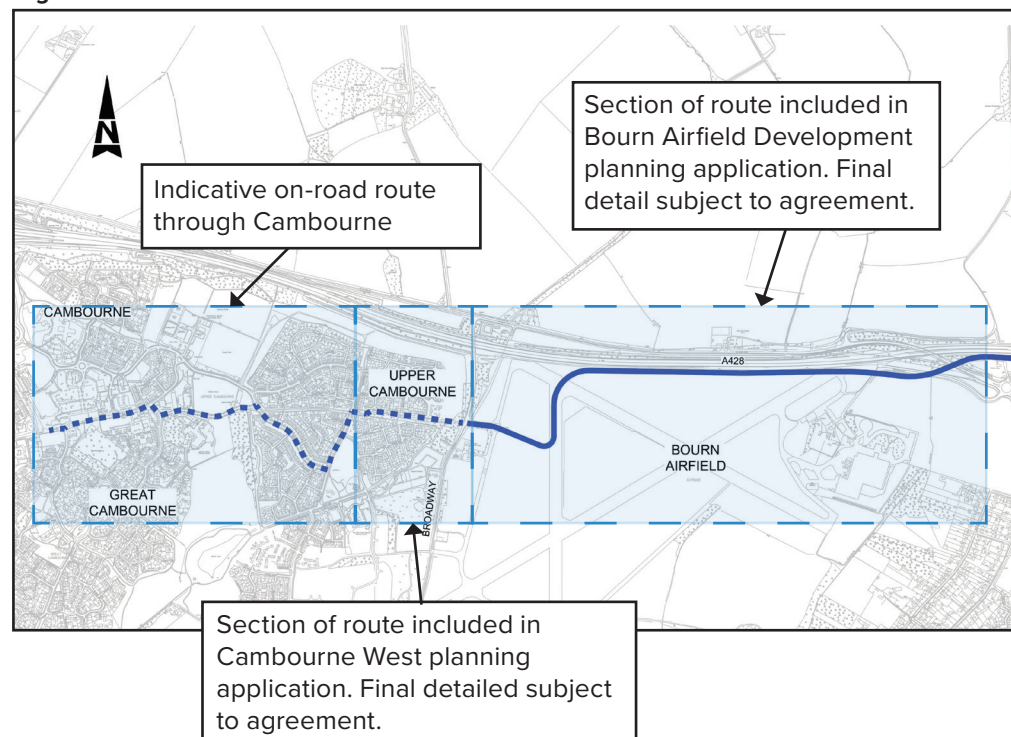
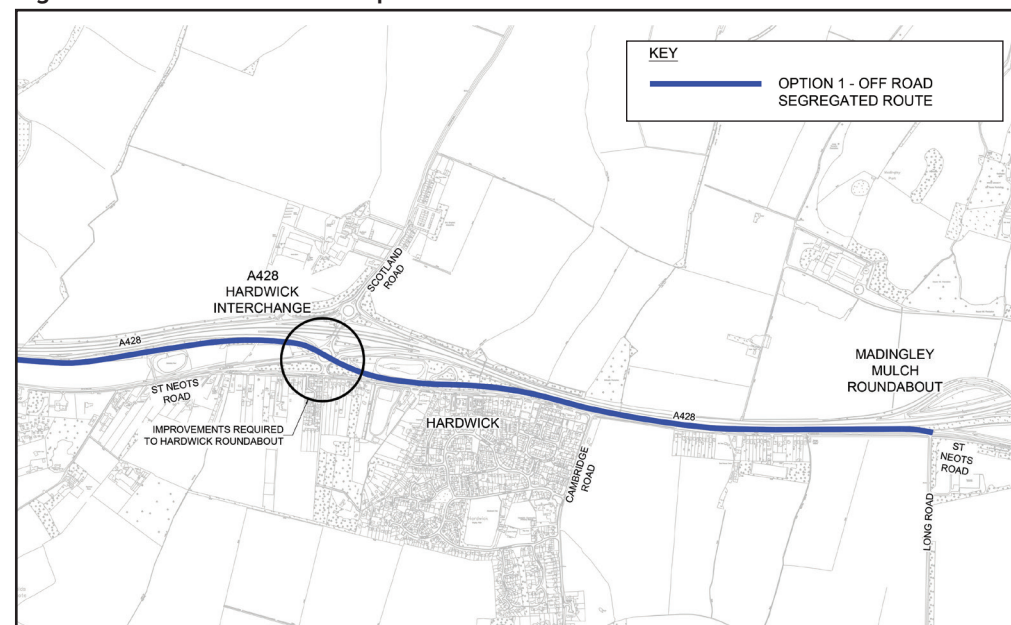
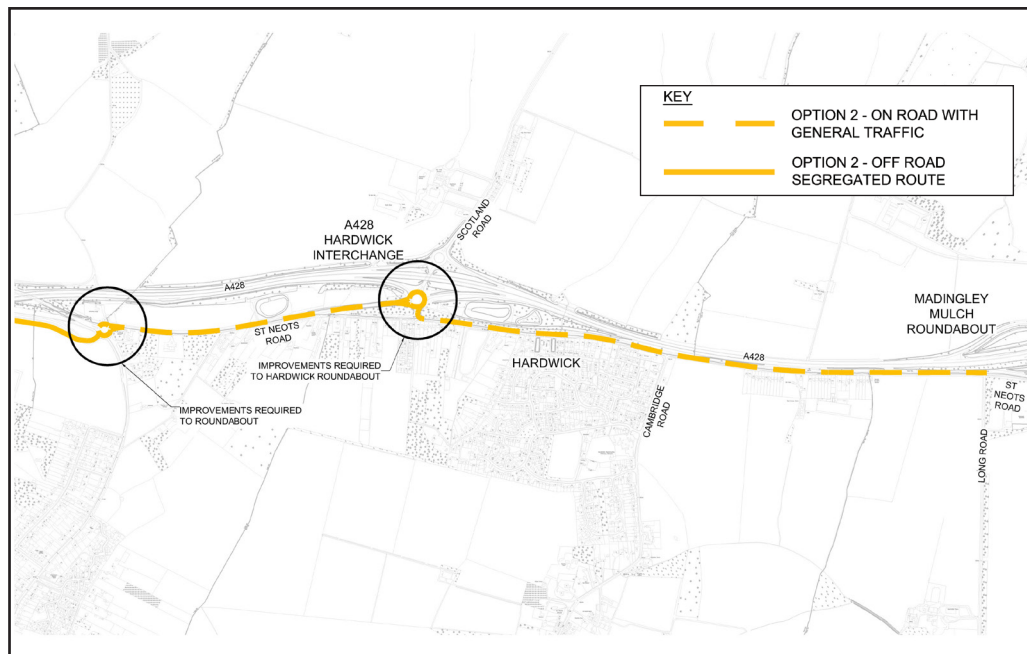


Figure 15: Phase 2 Schematic - Option 1



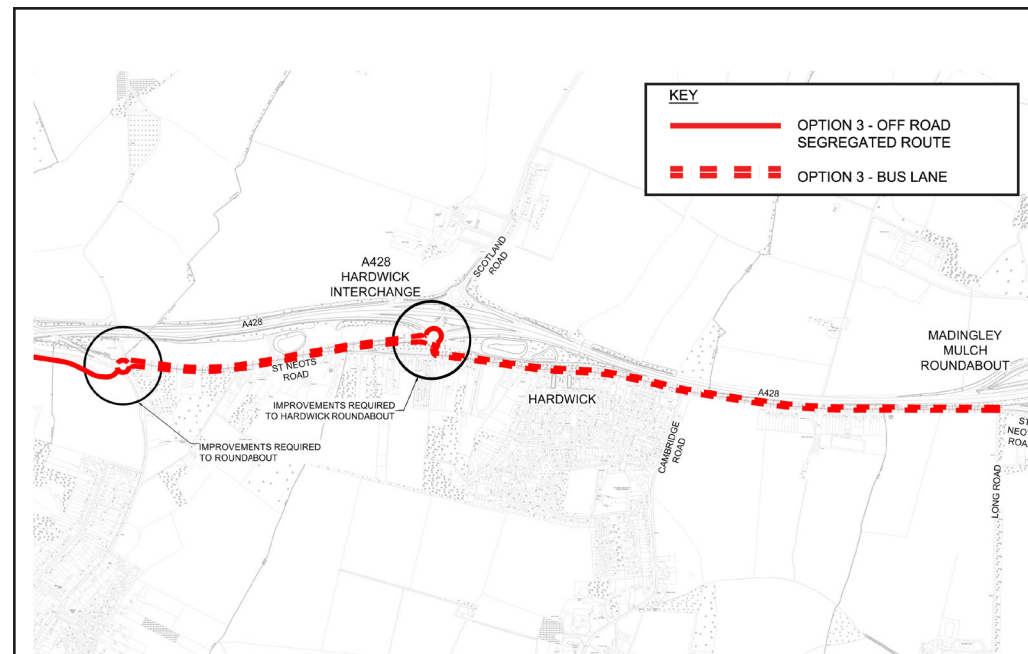
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Figure 16: Phase 2 Schematic - Option 2



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Figure 17: Phase 2 Schematic - Option 3



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4. Delivering the Scheme

Update on Option Costs

Introduction

An assessment of affordability, overall scheme costs and funding certainty has been undertaken. It outlines how the costs and the scheme are to be funded/financed, including future maintenance and operational costs.

Scheme costs have been developed based upon the latest designs. The scheme cost is considered proportionate and affordable to the scale of the issues identified and the predicted benefits of the scheme.

Base cost estimates have been produced, these include preparation costs, the design, construction, land acquisition, inflation and other costs.

These indicative costs of each of the shortlisted options considered within this Business Case Update can be found in Table 9 adjacent. The range of costs shown indicate the potential cost difference depending on the final choice of Park and Ride site.

Costs for options including the Scotland Farm Park and Ride site would increase if a segregated access were to be required to allow for future CAM vehicles. At present the access is with general traffic from Scotland Road but a segregated access could require a new structure over the A428.

Table 9: Scheme Option Costs

Option	Total Cost adjusted for Risk (£000's)
Low Cost (On Road)	47,377 to 49,472
Do Something 1 (Off Road Phase 1)	90,185 to 99,882
Emerging Strategic Option (Off Road Phase 1 and Phase 2)	157,841

Table 10 shows the breakdown of costs for the illustrative comparator with risk allowance.

Table 10: Base Costs Adjusted for Risk – Illustrative Comparator

Cost Item	Illustrative Comparators (£000's) Adjusted for Risk Costs
Construction	£105,731
Testing and commissioning	£881
Preparation costs	£22,027
Statutory undertakings	£1,100
Land costs	£11,100
Inflation	£17,002
TOTAL	£157,841

Maintenance and Operating Costs

The potential financial costs of ongoing maintenance include:

- General inspection of the public transport route and regular maintenance / replacement
- Replacement of asphalt to footways, maintenance tracks and new highway works
- General street cleaning
- Landscaping maintenance
- Gully cleaning
- Replacement of street lighting fittings e.g. ticket vending machines
- Maintenance of stop fittings
- Maintenance of traffic signals
- Maintenance of toilet building at Park and Ride site.

As is usual in calculations of Whole Life Cost, a 60 year period has been used. As such, the assessment of maintenance costs assumes a period from opening year of 2024 to 2084 with a budget of £24.358m. This equates to yearly maintenance cost of £406,000 per year. There are peaks and troughs with the maintenance as some of the works are carried out as part of annual highway maintenance, others such as planning and resurfacing is carried out periodically as and when the top surface reaches the end of its design life.

Operating costs and transport infrastructure have been included in the maintenance costs outlined above.

Vehicle Operator Costs

Operators using the existing guided busway pay an access charge to Cambridgeshire County Council to use the infrastructure. Cambridgeshire County Council pays to maintain and operate the infrastructure whereas the Bus Operator pays to maintain and operate the vehicles themselves. It is currently expected that this project will operate in a similar manner. Further considerations around the Combined Authority approach to public transport franchising may also be relevant in this context.

Whilst detailed calculations of expected fare revenues have not been calculated for this Business Case Update, these will be undertaken for the final OBC. At present a worst case has been assumed when calculating BCRs for this scheme whereby the infrastructure owner is assumed to bear the cost of maintenance.



Funding

The total estimated scheme costs for the Emerging Strategic Scheme of £158m are deemed affordable based on successfully securing funding from the identified funding sources as follows:

- £120m would be sought from City Deal:
 - Of which £59m is currently allocated as part of the agreed funding pot.
 - £61m could be sought from the City Deal future investment programme.
- At least £38m is being sought from developers through S106 contributions:
 - Of which £8.7m has been secured in principle through a S106 agreement with Cambourne West.

Managing the Project

Cambridgeshire County Council (CCC) has delivered a number of large-scale transport projects across the County in recent years, investing over £200m in transport schemes to address congestion, support growth and encourage use of sustainable travel modes. The delivery of these projects demonstrates CCC's ability and experience in relation to major infrastructure projects. This valuable experience has not been without challenges, but these have provided valuable learning in the planning and delivery of future projects including C2C.

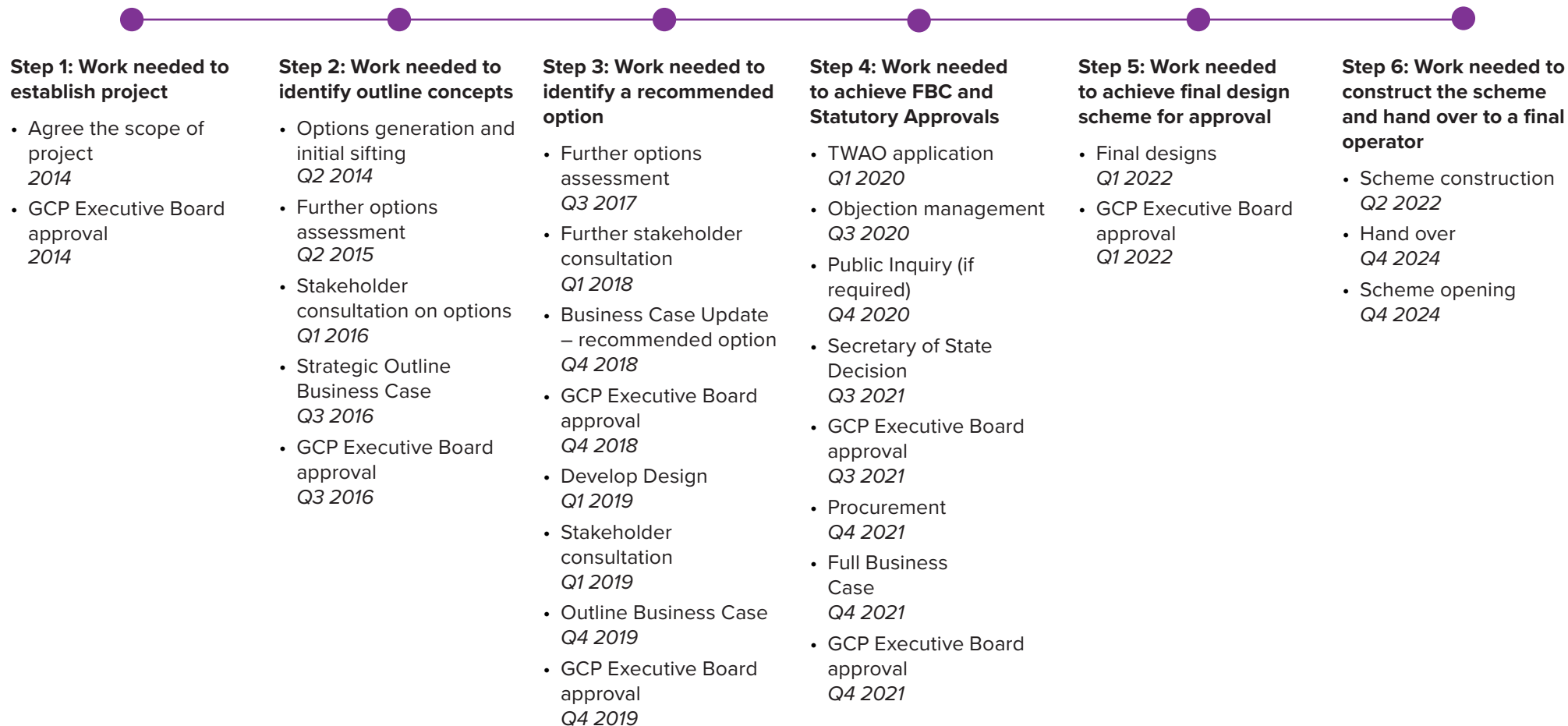
The delivery of C2C Project is overseen by the Greater Cambridge Partnership (GCP), who are the scheme promoters.



Way Forward

The high-level project milestones to date and moving forward are shown in Figure 19. This will be subject to ongoing review and approval by GCP board.

Figure 18: Key Milestones





Summary

On the basis of this Business Case Update it is recommended that the GCP Executive Board should, for Phase 1, proceed to develop an off-road route from Madingley Mulch roundabout to Grange Road, and, subject to consultation on the section between Madingley Mulch roundabout and Cambourne, proceed to develop a Phase 2 route from Cambourne to Madingley Mulch Roundabout with a Park and Ride site either at Waterworks or Scotland Farm.

The choice of Park and Ride location can be best made once plans for Phase 2 of the scheme (west of Madingley Mulch Roundabout) have been subjected to public consultation and further stakeholder engagement and assessment.

When taking into consideration the potential Wider Economic Benefits this option could deliver, it is clear that the illustrative comparator could deliver significant benefit at both at a national and regional level. This further highlights the importance and need for investment in C2C to deliver economic growth both to the region and nationally. The recommended solution would operate successfully in its own right but could be readily incorporated into a future CAM network.

Glossary

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

Committed Schemes: Schemes that are outside the control and scope of the proposed project being put forward and are due to be delivered during the forecast period.

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.

Countryside: The rural environment and its associated communities.

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.

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, made up of five cases:

- Strategic Case
- Economic Case
- Financial Case
- Commercial Case
- Management 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.

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

HQPT: A system that provides high levels of speed, reliability and capacity, enabling quick, frequent and reliable journeys.

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

Illustrative Comparator: The option which has been presented at this stage of the business case for comparative purposes.

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

Landscape: The appearance of land, including its shape, form, ecology, natural features, colours and elements and the way these components combine. 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 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.

LLF: Local Liaison Forums provide for regular dialogue between the project team and members of the local community during the course of any major transport project, ensuring interested parties are kept informed and can continue to have their say outside of formal consultation processes.

Multi Criteria Assessment Framework (MCAF):

Multi-Criteria Assessment Framework used in the optioneering assessment process.

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.

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.

Project: Public Transport improvements connecting Cambridge with towns and villages to the west. Including infrastructure to be delivered as part of this scheme as well as the City Centre Access Scheme and other developments.

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.

Former Rifle Range Track: Access track adjacent to Cambridge Rugby Club.

Scheme: Public Transport infrastructure delivered between Cambourne and Grange Road as part of this business case/planning application.

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

Social and Distributional Impacts (SDI): considers the variance of transport intervention impacts across different social groups.

Sustainable / 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.

Transport Appraisal Guidance (TAG):

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

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 detractor).

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

