

# **Cambourne to Cambridge (C2C)**

## **Environmental Statement (DRAFT)**

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# Contents

<b>1</b>	<b>C2C AND THE ENVIRONMENT</b>	<b>1</b>
1.1	THE CAMBOURNE TO CAMBRIDGE PROJECT	1
1.2	GCP AND SUSTAINABLE TRANSPORT	1
1.3	THE EIA AND DECISION-MAKING PROCESS	2
1.4	FINDING INFORMATION IN THE ES	3
<b>2</b>	<b>THE EIA PROCESS</b>	<b>7</b>
2.1	TWA AND LEGAL REQUIREMENTS	7
2.2	ASSESSMENT TECHNIQUES	7
2.3	SCOPING THE ASSESSMENT	8
2.4	ASSESSMENT CONCEPTS	9
2.5	SPATIAL CONTEXT	11
2.6	TEMPORAL CONTEXT	12
2.7	ENVIRONMENTAL ISSUES	12
2.8	MITIGATION STRATEGY	13
2.9	IMPACT INTERACTION	14



<b>3</b>	<b>SCHEME DESCRIPTION</b>	<b>15</b>
3.1	OVERVIEW	15
3.2	THE ROUTE	15
3.3	GENERAL DESIGN FEATURES	16
3.4	SPECIFIC DESIGN FEATURES	18
3.5	LANDSCAPE STRATEGY	21
3.6	DRAINAGE	21
3.7	ROADS AND JUNCTIONS	22
3.8	CONSTRUCTION	23
3.9	MATERIALS AND WASTE	26
3.10	SUSTAINABLE DESIGN	27
3.11	POTENTIAL IMPACTS OF C2C	28
3.12	MAJOR ACCIDENTS AND DISASTERS	28
<b>4</b>	<b>EVOLUTION OF THE SCHEME</b>	<b>29</b>
4.1	CONSIDERING ALTERNATIVES	29
4.2	THE STORY SO FAR	29
4.3	ALTERNATIVE ROUTES	34
4.4	PARK AND RIDE LOCATIONS	40
4.5	ESTABLISHING THE PREFERRED OPTION	42
4.6	REFINEMENT OF THE PREFERRED OPTION	44
4.7	OPERATING ALTERNATIVES	45



4.8	CONSULTATION	46
<b>5</b>	<b>THE ENVIRONMENT ALONG THE ROUTE</b>	<b>50</b>
5.1	LAND USES	50
5.2	COMMUNITIES AND HOMES	50
5.3	ENVIRONMENTAL QUALITY	54
5.4	SOILS, GEOLOGY AND LANDSCAPE	57
5.5	THE WATER ENVIRONMENT	59
5.6	NATURE	60
5.7	HERITAGE	66
5.8	A CHANGING ENVIRONMENT	68
<b>6</b>	<b>MITIGATION THROUGH DESIGN AND PRACTICE</b>	<b>73</b>
6.1	CONCEPTS	73
6.2	AN INTEGRATED DESIGN	73
6.3	LANDSCAPE MITIGATION	74
6.4	MITIGATING IMPACTS FROM CONSTRUCTION	74
6.5	MECHANISMS FOR SECURING MITIGATION	75
6.6	MONITORING ARRANGEMENTS	77
6.7	MITIGATION REGISTER	77



<b>7</b>	<b>EFFECTS ON PEOPLE AND COMMUNITIES</b>	<b>93</b>
7.1	INTRODUCTION	93
7.2	TRANSIT AND ACCESS	93
7.3	NOISE AND VIBRATION	96
7.4	AIR QUALITY	100
7.5	VIEWS AND VISUAL IMPACTS	101
7.6	SOCIO-ECONOMIC AND HEALTH EFFECTS	107
<b>8</b>	<b>EFFECTS ON THE NATURAL ENVIRONMENT</b>	<b>110</b>
8.1	INTRODUCTION	110
8.2	WATER RESOURCES AND FLOODING	110
8.3	ECOLOGY	111
<b>9</b>	<b>EFFECTS ON THE CULTURAL ENVIRONMENT</b>	<b>118</b>
9.1	INTRODUCTION	118
9.2	LANDSCAPE	118
9.3	BUILT HERITAGE	121
9.4	ARCHAEOLOGY	124
<b>10</b>	<b>EFFECTS ON GLOBAL RESOURCES</b>	<b>127</b>
10.1	INTRODUCTION	127
10.2	LAND AND CONTAMINATION	127



10.3	GREENHOUSE GAS EMISSIONS	128
10.4	MATERIAL USE AND WASTE	129
<b>11</b>	<b>CUMULATIVE EFFECTS</b>	<b>132</b>
11.1	INTRODUCTION	132
11.2	TYPES OF CUMULATIVE IMPACTS AND EFFECTS	132
11.3	ASSESSMENT METHOD	133
<b>12</b>	<b>TAKING THE SCHEME FORWARDS</b>	<b>139</b>
12.1	THE TWA PROCESS	139
12.2	GIVING FEEDBACK	139
12.3	PUBLIC INQUIRY	139
12.4	DECISION MAKING	140
12.5	ASSURANCE OF ENVIRONMENTAL OUTCOMES	140



# 1 C2C and the environment

## 1.1 The Cambourne to Cambridge project

- 1.1.1. C2C is a proposed new public transport route linking Cambourne and Cambridge. It will include a dedicated busway serving communities in Cambourne and the proposed Bourn Airfield development, as well as in Hardwick, Coton and the West Cambridge campus. An emergency access and maintenance track (service track) will run alongside the busway, also providing a path for pedestrians and cyclists and, for the majority of the route, horse riders.
- 1.1.2. The busway will pass via a new travel hub (a park and ride facility) at Scotland Farm on the A428, from where drivers can leave their cars and continue into the city using the C2C - by bus, cycle or foot - and avoid the increasingly congested roads.
- 1.1.3. C2C is one of several transport interventions promoted by the Greater Cambridge Partnership (GCP) that aims to create more sustainable, accessible and reliable ways to travel in and around Cambridge.

## 1.2 GCP and sustainable transport

- 1.2.1. GCP is a partnership comprising the local councils<sup>1</sup> and Cambridge University, with representation from local business. It was created to deliver investment (through a City Deal) on behalf of central government. It administers the powers and investment for various improvements in infrastructure, in order to enable the creation of thousands of new jobs and apprenticeships, and over 30,000 new homes. Investment in sustainable transport is a fundamental part of its remit.
- 1.2.2. C2C is one of four corridor projects, along with Cambridge Eastern Access, Cambridge South-East Transport (CSET), and Waterbeach to Cambridge. The four projects aim to provide better public transport and active travel that improve connectivity and alternatives to car use for growing communities around the city. New routes will be served by modern, low emission vehicles (with a commitment to use fully electric vehicles as soon as practicable) that limit air pollution and noise, and also provide space for walking and cycling. The routes are complemented by travel hubs to encourage park and ride journeys. Numerous other interventions in and around Cambridge are planned or are already underway, including improved cycle and pedestrian facilities and measures to manage car use in the city.
- 1.2.3. Environmental improvements are fundamental to all of the GCP transport schemes. Cleaner electric buses and active travel modes seek to address Cambridge's poor air quality, as

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<sup>1</sup> Cambridge City Council, Cambridgeshire County Council, and South Cambridgeshire District Council.



well as to support zero carbon objectives. But the project presents environmental challenges as well, especially where it creates a new route through countryside and close to houses. The scheme presented here reflects extensive work to assess and mitigate these potential impacts.

### 1.3 The EIA and decision-making process

- 1.3.1. The identification and assessment of environmental impacts (as part of a process called environmental impact assessment or EIA) has been undertaken by a multi-disciplinary team covering all the required specialisms, and in consultation with various organisations and the public. This has helped shape proposals that, where practicable, avoid or minimise negative effects, and that deliver environmental improvements.
- 1.3.2. EIA is a process required for certain projects by virtue of their size, activities, location, and potential to give rise to significant effects on the environment. The information that C2C is required to provide as part of the EIA process is presented within this environmental statement (ES). The ES is used to inform decision makers in exercising their responsibilities regarding the environmental effects of the proposals, in particular the effects that are deemed to be both likely and significant. These terms, together with the legal context for the EIA, are described and explained in the next chapter.
- 1.3.3. To deliver C2C, GCP, through Cambridgeshire County Council (CCC) as lead local authority (the Applicant), is applying to the

Secretary of State for an order under the Transport and Works Act 1992 (TWA) and a Planning Direction under Section 90(2A) of the Town and Country Planning Act 1990 (TCPA). If authorised, the Transport Works and Act Order (TWAO) and deemed planning permission would together provide the powers required for the construction, maintenance and operation of the C2C Scheme.

- 1.3.4. The environmental assessment work undertaken to date has been instrumental in shaping aspects of the alignment and design of C2C, as well as proposals for its construction and operation. Different strands of the assessment, each addressing specific environmental issues, have sought to identify and assess potential impacts and to evaluate their effects. As these have been determined, the assessment team has proposed measures to mitigate the effects and, working with the design team, to embed them into the scheme proposals. The embedded mitigation is described in ES Chapter 6 and is set out also within the appended schedule of mitigation.
- 1.3.5. The scheme will adopt one of two guidance options: optical or kerb. As explained in the ES Scoping Report<sup>2</sup> (Section 4.4), the ES reports on the reasonable worst-case effects of the options (the 'Rochdale Envelope' approach) in accordance with Planning Inspectorate guidance<sup>3</sup>.

<sup>2</sup> [Greater Cambridge Partnership: ES Scoping Report, February 2022](#)

<sup>3</sup> [The Planning Inspectorate: Using the Rochdale Envelope, July 2018 Version 3.0.](#)





## 1.4 Finding information in the ES

- 1.4.1. The ES has been structured and written to make information easy to find and easy to understand. With this in mind, this main document has been kept relatively succinct and makes extensive use of illustrative material. The contents page is hopefully self-explanatory. The ES consolidates information from the independent assessment of 12 topics, particularly information about the predicted likely significant environmental effects and embedded mitigation. Detailed information from each of these assessments is provided in separate technical reports [not available at this stage], including the assessment methods and a full account of the findings, including all data and observations. These technical reports are listed on the contents page.
- 1.4.2. As a compliance check, the content of the ES accords with Schedule 4 of the EIA Regulations<sup>4</sup> and Schedule 1 in the 2006 TWA Rules. This is set out below alongside the corresponding locations in the ES.

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<sup>4</sup> Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (as amended)



**Table 1-1 - Required contents and where to find them**

SCHEDULE 4 - Regulation 18(3)	Coverage in the environmental statement
1. A description of the development, including in particular:	Chapter 3
(a) a description of the location of the development;	Section 3.2
(b) a description of the physical characteristics of the whole development, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases;	Section 3.3 - 3.6
(c) a description of the main characteristics of the operational phase of the development (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity) used;	Section 3.3 - 3.4
(d) an estimate, by type and quantity, of expected residues and emissions (such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases.	Section 3.5 - 3.6, as well as Chapter 8 - 11
2. A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.	Chapter 4
3. A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge.	Chapter 5
4. A description of the factors specified in regulation 4(2) likely to be significantly affected by the development: population, human health, biodiversity (for example fauna and flora), land (for example land take), soil (for example organic matter, erosion, compaction, sealing), water (for example hydromorphological changes, quantity and quality), air, climate (for example greenhouse gas emissions, impacts relevant to adaptation), material assets, cultural heritage, including architectural and archaeological aspects, and landscape.	Section 2.7; Chapter 5; and Chapter 7 - 10

SCHEDULE 4 - Regulation 18(3)	Coverage in the environmental statement
5. A description of the likely significant effects of the development on the environment resulting from, inter alia:	Chapter 7 - 10
(a) the construction and existence of the development, including, where relevant, demolition works;	Chapter 3
(b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources;	Chapter 3.7; Chapter
(c) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;	Chapter 7
(d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);	Section 3.9; Chapter 7 - 10
(e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;	Chapter 11
(f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change;	Chapter 10
(g) the technologies and the substances used.	Chapter 10
The description of the likely significant effects on the factors specified in regulation 4(2) should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development. This description should take into account the environmental protection objectives established at Union or Member State level which are relevant to the project, including in particular those established under Council Directive 92/43/EEC(a) and Directive 2009/147/EC(b).	Chapter 7 - 10
6. A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.	Chapter 5 and the ES Scope Report <sup>2</sup>

SCHEDULE 4 - Regulation 18(3)	Coverage in the environmental statement
<p>7. A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases.</p>	Chapter 6
<p>8. A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned. Relevant information available and obtained through risk assessments pursuant to EU legislation such as Directive 2012/18/EU(c) of the European Parliament and of the Council or Council Directive 2009/71/Euratom(d) or UK environmental assessments may be used for this purpose provided that the requirements of this Directive are met. Where appropriate, this description should include measures envisaged to prevent or mitigate the significant adverse effects of such events on the environment and details of the preparedness for and proposed response to such emergencies.</p>	Chapter 3.9
<p>9. A non-technical summary of the information provided under paragraphs 1 to 8.</p>	ES Non-technical summary
<p>10. A reference list detailing the sources used for the descriptions and assessments included in the environmental statement.</p>	ES Technical Reports

## 2 The EIA process

### 2.1 TWA and legal requirements

- 2.1.1. The procedural requirements for TWA applications are set out in the TWA Rules<sup>5</sup>. One of the requirements is that projects of a type listed in Annex I of the European Union's EIA Directive<sup>6</sup>, or listed in Annex II of the Directive and not having received a negative screening opinion from the Secretary of State, be accompanied by an ES. The request for a Planning Direction is made under the Town and Country Planning Act (TCPA)<sup>7</sup>, which is subject to the provisions of the EIA Regulations<sup>8</sup>. Although set out in different instruments, the EIA processes for applications under the TWA and TCPA are substantially the same and this ES meets the requirements of both.
- 2.1.2. The C2C Scheme does not fall within the types of development listed in Annex I (and Schedule 1 of the EIA Regulations). However, Annex II (and Schedule 2 of the EIA Regulations) are relevant as they cover transport infrastructure projects that are likely to result in significant environmental effects; as such, C2C is considered to be EIA development. In coming to this conclusion, the Applicant opted not to seek a screening opinion from the Secretary of State.

<sup>5</sup> Transport and Works (Applications and Objections Procedure) (England and Wales) Rules 2006 (Application Rules)

<sup>6</sup> EIA Directive (85/337/EEC) as amended

- 2.1.3. The identification and assessment of environmental impacts and likely significant effects is a critical initial part of the EIA process; this phase is referred to here as the environmental assessment. The wider process of EIA also includes the preparation, publication and consultation of the ES; the collation of any other environmental information and representations made by relevant bodies about the environmental effects of the scheme; and the steps required of the Secretary of State in examining the environmental information, in reaching a reasoned conclusion on the scheme's significant effects, as well as the integration of that conclusion into the decision as to whether planning permission or consent is to be granted and, if it is, the appropriateness of proposed monitoring measures.

### 2.2 Assessment techniques

- 2.2.1. Environmental assessment is about determining and evaluating change. It is important therefore to first establish the environmental and social characteristics that will be subject to change. These characteristics are referred to as the baseline environment. Baseline environment is usually taken to be the current environmental character and condition, with any prevailing changes to this (for example, due to climate change or population increase) factored in where possible.
- 2.2.2. The characterisation of an environmental baseline relies on different techniques for different assessment topics. Much of it

<sup>7</sup> Town and Country Planning Act 1990 (as amended), section 90(2A)

<sup>8</sup> Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (as amended)



involves collecting information and data from various existing sources. Where this is missing or incomplete, site visits and surveys are used to obtain it.

- 2.2.3. Some topics have also used computer models to establish how environmental change will occur, both as a prevailing change and as a result of C2C. Models to predict how road traffic will change and how drivers will behave in response to different pressures are particularly important, not least because they help inform other assessments, notably air quality and noise. Even though it affects only a small part of the scheme (where it crosses Bin Brook) modelling of flooding is also important, as it has helped determine the design of the alignment along this part of the scheme, and the impacts of that design.
- 2.2.4. With knowledge of the baseline environment and of the changes that C2C will impose on it, the assessments then evaluate how important these changes will be. This is a fundamental step in determining the significance of the environmental effects.
- 2.2.5. The techniques used by each topic to characterise the baseline, and to assess and evaluate the changes to it are set out in the ES Scoping Report<sup>2</sup> and in the ES technical reports.

#### Assessment expertise

The EIA Regulations require that, in order to ensure the completeness and quality of the environmental statement:

- ‘the developer must ensure that the environmental statement is prepared by competent experts; and
- ‘the environmental statement must be accompanied by a statement from the developer outlining the relevant expertise or qualifications of such experts’

**Appendix ES2 sets out the assessment team and their expertise and qualifications** which demonstrates their competency.

WSP is responsible for the coordination, compilation and procedural review of the ES. WSP is registered under the EIA Quality Mark operated by the Institute of Environmental Management and Assessment (IEMA) which recognises our commitment to excellence in EIA activities. WSP was one of the original eight pilot organisations in the UK that trialled the process in 2011 and developed the EIA Quality Mark Development from the former Corporate Registered Assessor process. We have continued to maintain our EIA Quality Mark registration, following annual examination by IEMA in relation to our ongoing products, staff, innovation and promotion of EIA within the industry. WSP has and continues to support and lead nationally recognised guidance for EIA in the UK.



## 2.3 Scoping the assessment

- 2.3.1. Environmental scoping is undertaken in advance of the main assessment workstreams to focus attention and resource where it is most needed. By considering the characteristics of a project and the likely environmental impacts it will cause, and through an appreciation of the baseline environment, scoping allows the experts who compile the ES to:
  - determine which topics to include in the assessment, and which to omit;

- distinguish the relative importance of each assessment topic, to ensure key issues are prioritised for informing consultation and decision making; and
- decide the relative importance of different aspects within each assessment topic to determine how each needs to be assessed.

2.3.2. Projects can seek an opinion from the relevant consenting authority as to the required scope for the environmental assessment and ES. The general approach wherever a scoping opinion is sought is for the assessors to set out their planned approach to the assessment within a scoping report and to use this as a vehicle to elicit a response from the consenting authority. WSP prepared a scoping report<sup>2</sup> for C2C on behalf of GCP (including Cambridgeshire County Council as the Applicant), which was submitted to the Transport Infrastructure Planning Unit of the Department for Transport in February 2022.

2.3.3. In preparing its scoping opinion<sup>9</sup>, the DfT sought input from a range of statutory consultees. The opinion was received by GCP on 28<sup>th</sup> March 2022.

2.3.4. Scoping is not mandatory for an environmental assessment carried out within the TWA or TCPA framework, but where a scoping opinion has been provided it is a requirement for the assessment to be based on the scoping opinion. The scoping opinion and the associated responses to it are summarised in *Scoping Opinion Response Tracker*<sup>10</sup>.

## 2.4 Assessment concepts

### Impacts and effects

2.4.1. We have tried to keep the language simple in this ES. However, there are a few terms which will be encountered frequently, and which are therefore explained here. Two words fundamental to EIA are ‘impact’ and ‘effect’. These are subtly different, and are explained here.

- An environmental impact refers to a change to the environment. For example: landtake or demolition; introduction of a building; sound or vibration; ground movement; impedance to water flow; discharge of runoff; emissions to air; or new views.
- An environmental effect is the consequence of an impact. This might be a consequence for people in terms of inconvenience or reduced health, amenity or wellbeing. Or it might be a consequence for a resource or asset, through its elimination or the depletion in its value or function.

<sup>9</sup> [DfT. Scoping opinion for the ES Scoping report, Cambourne to Cambridge, March 2022](#)

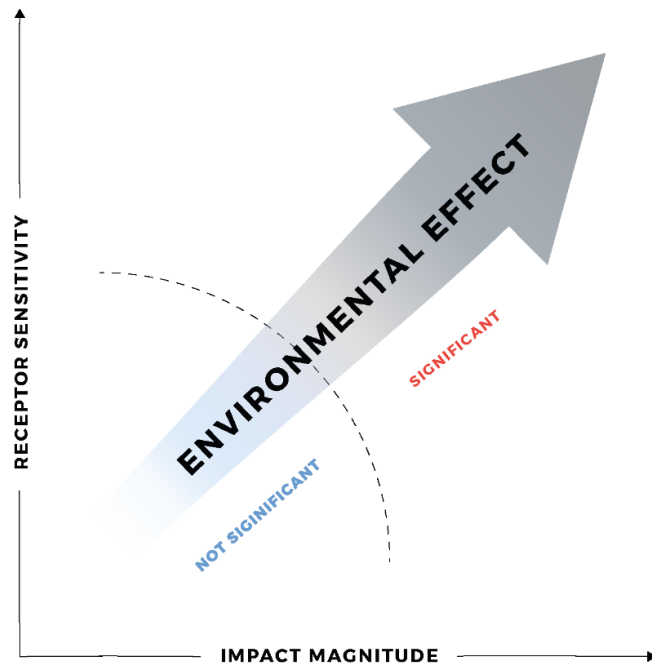
<sup>10</sup> [WSP. Cambourne to Cambridge, Scoping Opinion Response Tracker, June 2022](#)



2.4.2. The examples above generally infer adverse change, though impacts can also cause beneficial effects by enhancing the quality of life and the environment.

### Defining significance

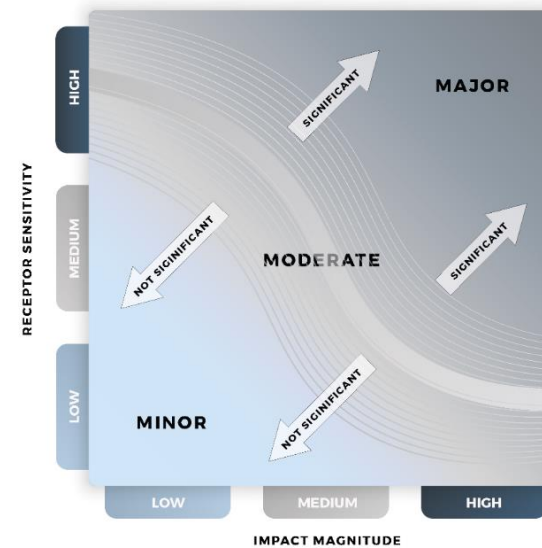
Figure 2-1 - Defining the significance of environmental effect



2.4.3. The ES is only required to report those effects that are both likely and significant. Depending on the extent or size of the impact (referred to as its magnitude) and the sensitivity of the affected resources or receptors to the impact, environmental

effects can vary in their consequence. The environmental assessment has taken these matters into account in assessing the importance of the effect and ascribing it as being **significant** or **not significant**. The C2C environmental assessment defines a significant effect as one that the assessment team believe should be considered by the decision makers in granting development consent.

Figure 2-2 - Evaluation criteria for determining a significant effect



2.4.4. Evaluation criteria are helpful in distinguishing a significant effect from a non-significant effect. Taking account of both the magnitude and the resource/receptor sensitivity, different criteria are used by each assessment topic to help evaluate effects. Effects are determined as being major, moderate or



minor. In general, a major or moderate effect will be deemed significant.

- 2.4.5. Used on their own, however, evaluation criteria may not always reflect the more subtle and specific sensitivities or tolerances of a local community or environmental resource to a particular impact, and professional judgement can make an important contribution in concluding significance. For example, a visual impact in certain urban settings may be deemed more acceptable to local people than an equivalent impact in a rural environment.
- 2.4.6. Other factors that can influence the significance of an effect include the duration of an impact and the number of people, resources or receptors affected. Different topics each ascribe their own methods to evaluating environmental effects, often in accordance with their own industry professional bodies; these are set out in the ES Scoping Report<sup>2</sup> and the ES technical reports.

### Combined effects

- 2.4.7. The environmental assessment has also considered impacts and effects in the round, taking account of how separate impacts from C2C might cause an overall **combined effect**. For example, noise, traffic and visual impacts at one location could result in a general combined disturbance effect for local residents; or several separate impacts on hedgerows could together result in a significant depletion of habitat. The ES refers to these as combined (or intra-project) effects.

### Cumulative effects

- 2.4.8. The ES also describes significant cumulative (inter-project) effects, where impacts from unrelated projects are experienced together with those from C2C. These might be additive; for example due to construction traffic from two or three projects occurring simultaneously. It might be spatial; for example where an area is impinged by more than one development. Or it may be temporal, where a sequence of consecutive developments prolong the overall effect. These concepts and the identity of other projects potentially giving rise to cumulative effects are set out in ES Chapter 11.

## 2.5 Spatial context

- 2.5.1. The geographical context for the environmental assessment varies for different topics. Each topic has defined one or more study areas, which define the area within which significant effects are likely.
- 2.5.2. For some effects, these are confined to the limits of deviation (or LOD) that are marked on the Order works plans accompanying the TWAO application. The LOD define the area within the Applicant would be permitted to construct and maintain the authorised works. The horizontal LOD define the maximum extent of the busway and adjoining service track (and cycleway/footway), as well as any ancillary works listed in the Schedule, such as mitigation planting or detention ponds. There are also vertical LODs, which for C2C allow for a one metre variation up or down. The LOD allow for some variation from a fixed alignment to account for any possible constraints that cannot be known with certainty until later detailed design.

2.5.3. A further area of potential physical impact is defined as the limits of land to be acquired or used (LLAU). These are areas that need to be acquired, or used temporarily, to enable the works to be carried out. For example for access or for works compounds.

2.5.4. Beyond these areas, further zones of interest are defined by each study to accommodate, for example, possible views, noise effects, bird disturbance, or heritage setting. At its extreme, impacts caused by greenhouse gas emissions can be considered at a global scale.

## 2.6 Temporal context

2.6.1. It is important for the ES to identify when effects will be experienced. The impacts causing them may occur either in the construction or operational phases, but more important is some sense of when they will take effect and for how long. The EIA requirements refer to the need to address “short-term, medium-term and long-term, permanent and temporary” effects. For the purposes of this ES, effects are distinguished as being either **temporary construction effects** or **permanent and operational effects**. For the latter, where there is considered to be a finite period beyond which effects dissipate for whatever reason, this period is stated. For example, ‘permanent’ landscape effects are considered at year 1 and year 15 intervals to reflect the role of maturing vegetation in mitigating the effect.

## 2.7 Environmental issues

2.7.1. EIA requirements state that the ES identifies, describes and assesses significant effects on:

- population and human health;
- biodiversity
- land, soil, water, air and climate;
- material assets, cultural heritage and the landscape; and
- the interaction between these factors

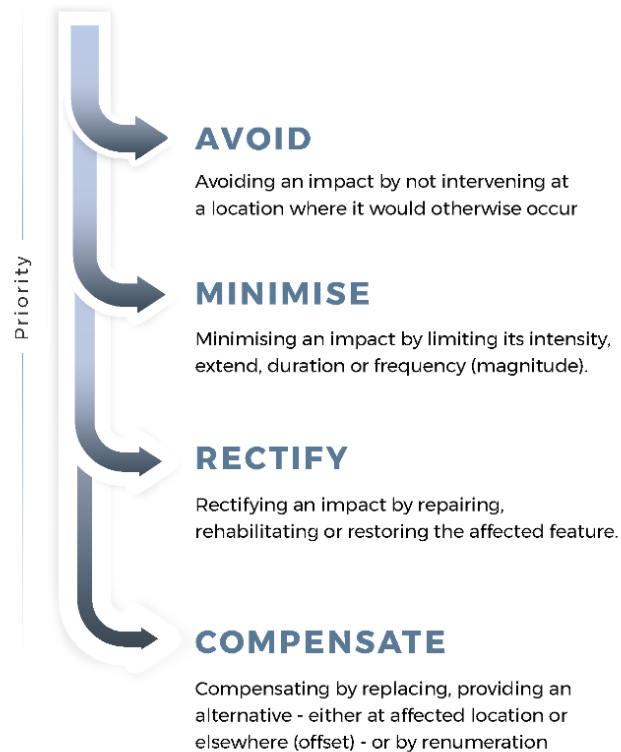
2.7.2. These matters have been addressed through 12 topic assessments of C2C, namely:

- sound and noise
- air quality
- traffic and transport
- community and human health
- land use
- ecology
- landscape and visual
- heritage
- water
- climate change
- climate resilience
- soil and land contamination

## 2.8 Mitigation strategy

2.8.1. The mitigation of potential impacts and effects is a central tenet of successful environmental assessment. For the C2C assessment, mitigation is deemed effective if it makes a potentially significant effect not significant. A mitigation hierarchy defines different mitigation strategies in decreasing order of priority.

Figure 2-3 - Mitigation hierarchy



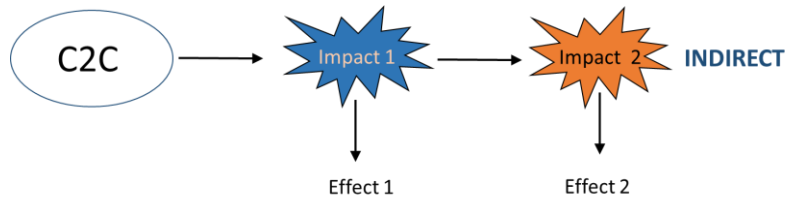
2.8.2. Opportunities to avoid potential impacts arise in the early stages of a project, when alternative proposals are developed, compared and evaluated. Through subsequent stages of the project lifecycle, from concept design, detailed design and through to implementation, opportunities to avoid and minimise adverse effects become fewer, and the emphasis shifts to rectifying and compensating.

2.8.3. Where a likely significant effect has been identified during the course of the assessment, a mitigation measure is proposed where possible, that will render the effect non-significant. If the measure is deemed feasible, practicable and effective from the outset, it has been adopted within the scheme design. At this point it is referred to as embedded mitigation. The proposals described in this ES assume this mitigation as an integral part of the scheme and its impacts are assessed on this basis (see ES Chapter 6). To ensure that these measures are retained through subsequent stages of design and implementation, they are set out explicitly and in the appended schedule of mitigation and secured through the TWAO and deemed planning permission, as appropriate.

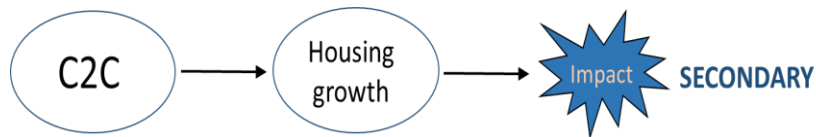
2.8.4. A focus on sustainability is fundamental to the development of C2C. This includes realising enhancements for local communities and the natural and built environment where possible, as well as avoiding, limiting and mitigating any negative effects. Where an enhancement represents a significant beneficial environmental effect, it is reported in the ES.

## 2.9 Impact interaction

2.9.1. While an impact may result directly in an environmental effect, the pathway can sometimes be more complex. One impact may result in a second or even a third impact, themselves each giving rise to their own environmental effects. These are referred to as indirect impacts



2.9.2. This is distinct from secondary impacts, where C2C could stimulate or inhibit other development, which in turn could have environmental impacts and effects.



2.9.3. The different assessments have determined these indirect and secondary impacts and effects where they are able to do so with a reasonable degree of confidence.

# 3 Scheme description

## 3.1 Overview

3.1.1. The C2C Scheme will include a 13.6km long dedicated busway connecting Cambourne in the west with Cambridge in the east. A service road and maintenance track, to be used as an active travel path, will run alongside the busway. The C2C Scheme will use hybrid vehicles (and in due course, electric vehicles), providing a service of around eight buses per hour each way. The Scotland Farm travel hub (a park and ride facility) will be situated along the route, just north of the A428, approximately 5km west of Cambridge.

3.1.2. Construction is anticipated to commence in 2024 and continue over approximately 30 months, for a scheme opening in 2027.

## 3.2 The route

3.2.1. Working from west to east, the C2C Scheme begins in Cambourne at Sterling Way passing east along a section of segregated route created on an existing footway/cycleway, which will be recreated alongside the busway.

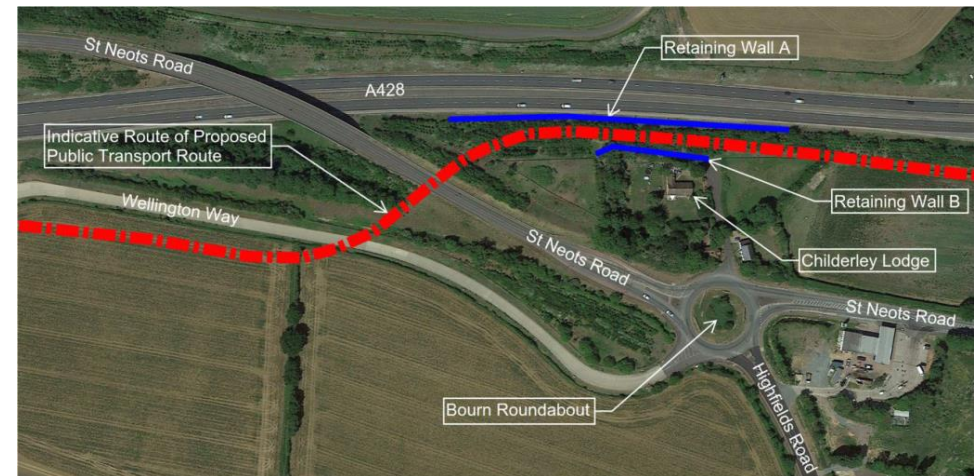
3.2.2. The route crosses Broadway, using a signalised junction, and enters the now former Bourn Airfield. It passes around the western and northern perimeter of this future new community, where it will largely be accommodated on its own dedicated route.

3.2.3. The route bears north-east out of Bourn Airfield and crosses St Neots Road about 150m northwest of the Bourn roundabout at

Childerley Gate. A new signalised crossing will be installed on St Neots Road.

3.2.4. North of St Neots Road, the route bears east, supported by retaining walls, to take it between the A428 and the nearest of three residential properties at Childerley Lodge.

**Figure 3-1 – The route comes alongside the A428 north of Bourn Airfield**



3.2.5. The route continues off road on the south side of the A428 for approximately 1.2km before bearing south to join St Neots Road, 170m west of Scotland Road. C2C buses will be able to use Scotland Road to access the travel hub located east of Scotland Farm. A new signalised junction will allow the buses to pass to and from the travel hub.

3.2.6. An existing 107m long culvert taking a minor watercourse beneath the A428 will need to be extended by 9m to allow the C2C Scheme to pass over it.

- 3.2.7. The C2C Scheme will continue along St Neots Road for about 2km, passing the northern edge of the village of Hardwick.
- 3.2.8. West of Long Road the route bears south from St Neots Road, passing west and south of the Comberton plantation (also referred to as the Waterworks site). The route will use a signalised junction across Long Road.
- 3.2.9. The route continues east across farmland that takes it north of the main built settlement of Coton. This section of the C2C Scheme will use a combination of landform and planting to help fit the alignment into the landscape. The footpath between Coton and Madingley will be retained across the route.
- 3.2.10. The route crosses Cambridge Road at a new signalised junction before continuing across Coton Orchard to a new bridge that will carry it over the M11. Various measures have been included to maintain safe wildlife movement across the busway, including underpasses for animals like badgers, foxes and rabbits, and retention of the poplar trees on the eastern boundary to maintain a route for bats. The route will be suitably fenced for security here, as well as to guide mammals towards underpasses and prevent them crossing the busway, with its associated collision risk.
- 3.2.11. East of the M11 crossing, the C2C Scheme will enter West Cambridge University Campus, passing along Charles Babbage Road. It will then bear south through a gap between existing campus buildings and enter the West Fields, bearing east and south around the edge of Cambridge University athletics sportsground.

- 3.2.12. The route continues eastward along the Rifle Range track, crossing Bin Brook over a new bridge. A special design is included here to ensure that ground disturbance is minimised and that, as a result, the protected trees along Rifle Range are retained. The route passes north of the Cambridge University Rugby Union Football Club ground and south of properties on Herschel Road, before connecting to Grange Road, where the C2C Scheme ends, but from where buses will continue along existing routes into Cambridge and onto other destinations such as the Biomedical Campus.

### 3.3 General design features

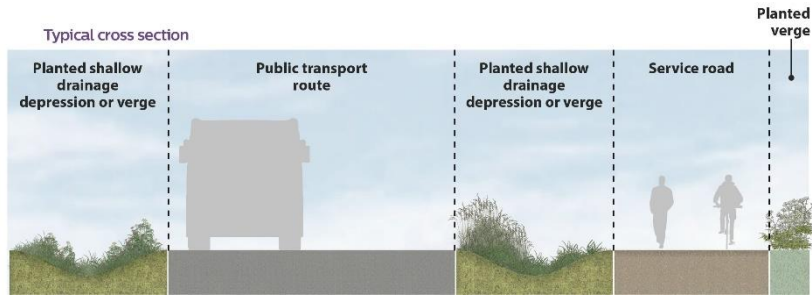
#### The scheme profile

- 3.3.1. The profile of the C2C Scheme encompasses both the new busway and the service road for the majority of the alignment. As **Figure 3-2** illustrates, the busway will be separated from the service road by a planted shallow drainage depression or verge. The separation between the two is generally about 3m, though narrowing to 0.5m approximately 75m west of the M11 overbridge, the latter being the desirable minimum separation for a 30mph speed limit.
- 3.3.2. The busway will predominantly comprise dedicated sections where the busway traffic is segregated from the existing road network but there are also sections where the busway would use existing roads with bus priority provided at junctions.





**Figure 3-2 – Typical cross sections for the C2C Scheme route**



- 3.3.3. The C2C Scheme will use single decker buses. The buses will be 12m long, containing as a minimum, a Euro VI compliant engine, with an aspiration for electric vehicles to be introduced at the earliest opportunity.
- 3.3.4. The service road will run parallel with off-road sections of the busway within the TWAO limits and would include facilities for pedestrians, cyclists and horse riders. For on-road sections the existing facilities used by cyclists and pedestrians will be improved. For the majority of the service road, the route will segregate cyclists and pedestrians.
- 3.3.5. The type of guidance system adopted for the C2C Scheme (optical or kerb) will determine the width of the service road (see Section 4.6).
- 3.3.6. Facilities to maintain access across the busway by footpaths and bridleways (Public Right of Way (PROW)) and access tracks will be included.

### Busway stops

- 3.3.7. Busway stops will be situated at Cambourne, west of Bourn Airfield, east Bourn Airfield, Hardwick, Coton and West Cambridge. The busway stops will incorporate planting for visual screening.

### Lighting

- 3.3.8. All lighting introduced along the C2C Scheme will use LED technology designed to minimise both vertical and horizontal light spillage. Lighting will only be installed in areas of high use, including junctions with highways, at busway stops, and at the travel hub.
- 3.3.9. It is assumed that the service road will have solar studs or similar lighting to provide wayfinding along sections through the countryside in order to maintain low lighting levels along the route, and so limit visual impact.
- 3.3.10. The design will seek to ensure minimum levels of light needed to enable safe use, and will be designed in accordance with current standards and national guidance, in addition to ensuring compliance with relevant local planning authority standards and policy. Equally, details on lighting design and location will be mindful of its potential for impact on bats. A sensitive lighting strategy for areas used by commuting bats will be developed as part of the detailed design.
- 3.3.11. Hours of operation for lighting along the route will be agreed between the local authority and future operator. It is likely that lighting will be dimmed during periods of low bus use. The travel hub lighting levels would be set at a minimum level during off-peak usage (22:00 - 05:30), according to standard

requirements. Lighting at busway stops will only be active during operational hours.

### 3.4 Specific design features

#### The travel hub

- 3.4.1. Scotland Farm travel hub (see **Figure 3-3**) will provide space for around 2,000 cars and 300 bicycles, as well as coach parking. It will include recharging points for electric vehicles. It will have a central single storey building offering amenities such as toilets and waiting rooms.
- 3.4.2. Landscaping at the travel hub will help to mediate good access and movement, as well as supporting biodiversity and offering aesthetic benefits.
- 3.4.3. The hard standing parking space will be interweaved with planted ‘fingers’. Trees and shrubs within these will soften the grid layout, while more peripheral planting will soften the geometry and help to screen views. Habitat creation and new amenity space will link with Callow Brook at the eastern edge of site.

#### M11 overbridge

- 3.4.4. The C2C Scheme will cross the M11 approximately 200m south of Junction 13 (see **Figure 3-4**). A new bridge, approximately 57m long (clear span) and 15m wide, will carry the Scheme over the motorway, with sufficient clearance to allow National Highways to widen the northbound slip lane if required.

- 3.4.5. The existing north-south brideway running along the top of the east M11 cutting will be diverted behind the structures to enable connectivity with the east-west route.

**Figure 3-3 - Scotland Farm Travel Hub**



#### Bin Brook bridge

- 3.4.6. The C2C Scheme will cross Bin Brook on a 10m long clear span and 14m wide bridge, which would be about 2m above the existing water level to take account of future flood risk, including climate change impacts (see **Figure 3-5**).



Figure 3-4 - M11 overbridge

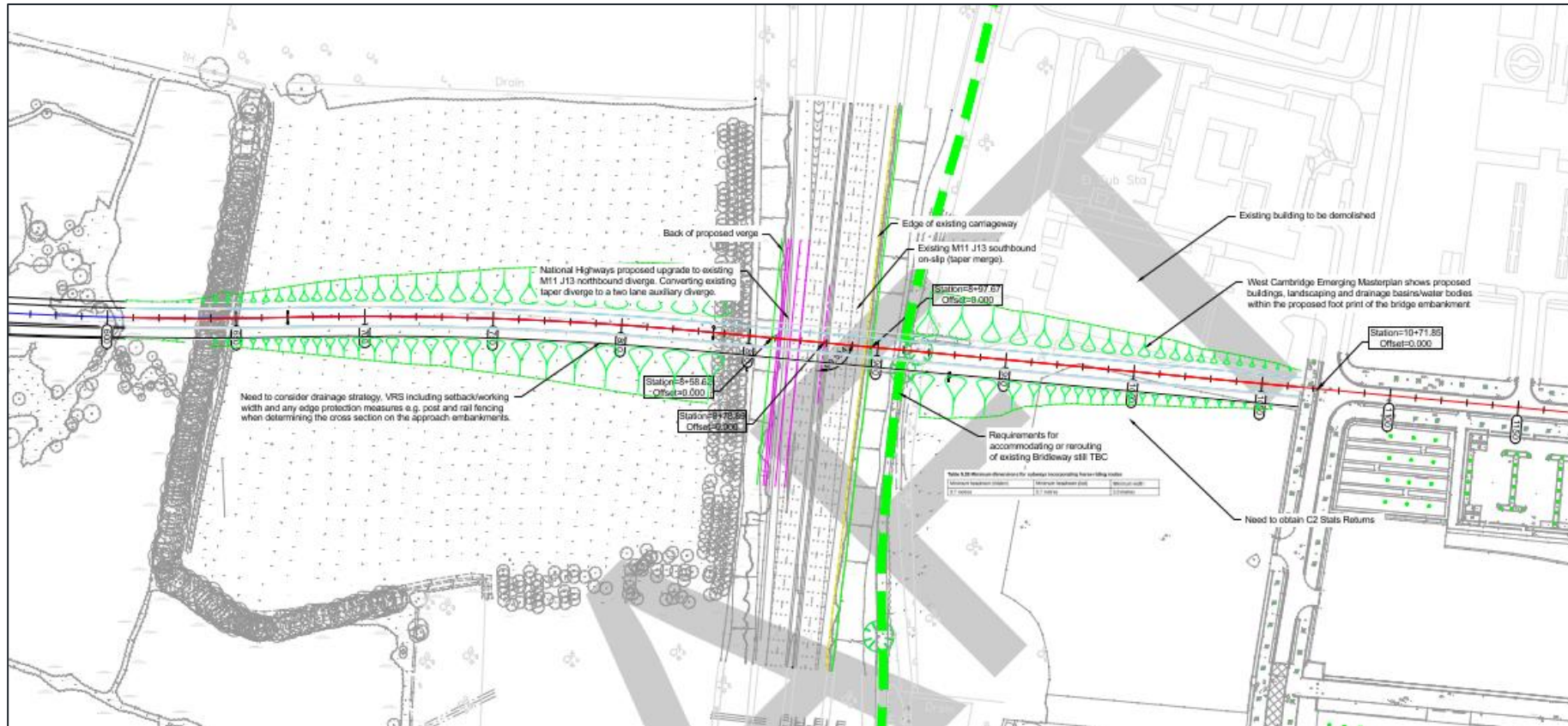
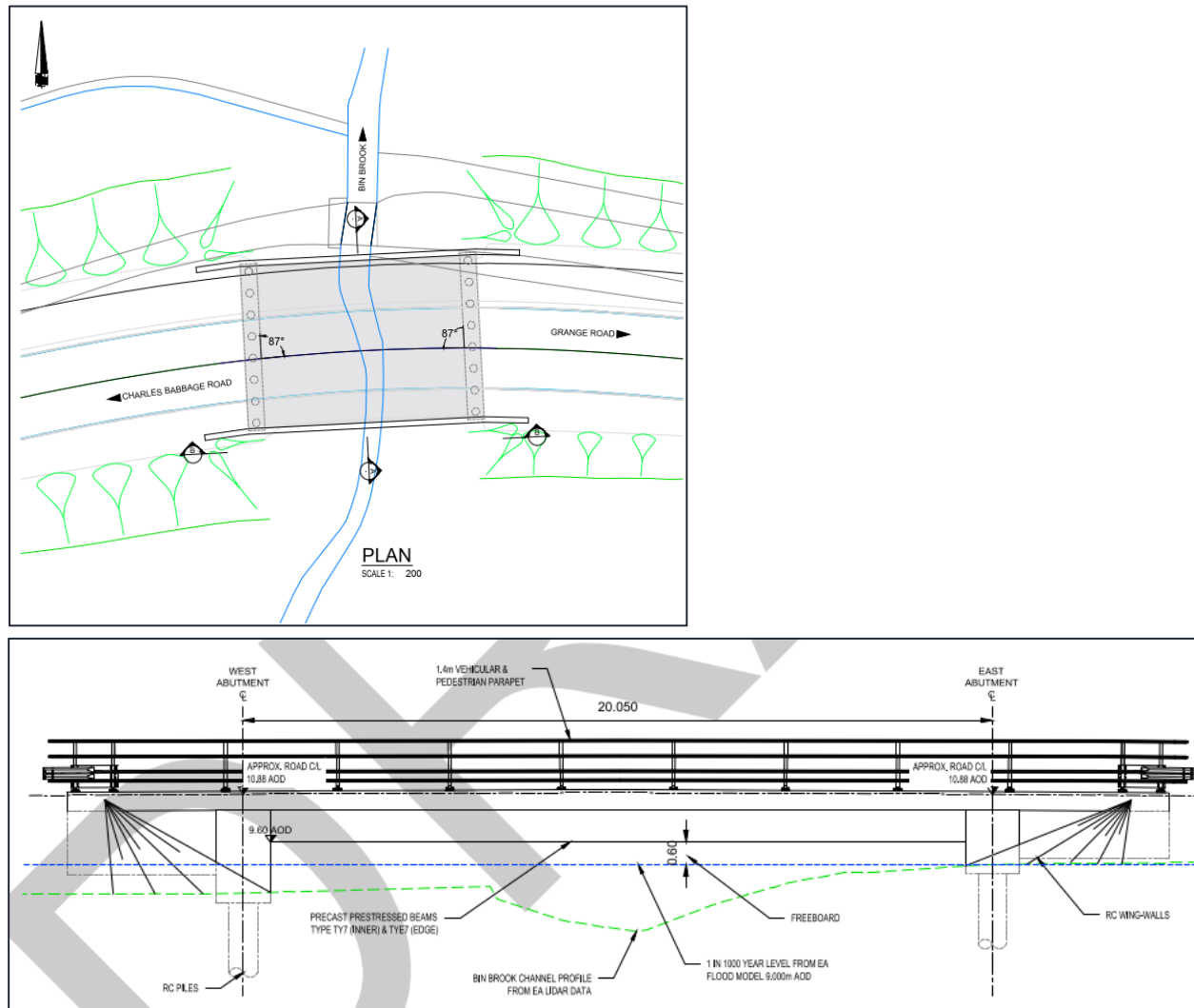


Figure 3-5 - Bin Brook crossing



### 3.5 Landscape strategy

- 3.5.1. A Design and Access Statement has been prepared separately in support of the TWA Order consent application. This emphasises a vision that seeks to use the environment as an opportunity in promoting a scheme that “maximises access and movement, biodiversity, a sense of place, local character, sustainable water resources and enhanced health and well-being”. The DAS highlights opportunities for:
- enhancing local character and assets;
  - designing with future trends in mind;
  - increasing biodiversity and ecological features; and
  - improving health and wellbeing.
- 3.5.2. The DAS sets out a series of generic design principles and follows these with 11 area-specific concepts to achieve them, as well as to mitigate potentially adverse effects.

### 3.6 Drainage

- 3.6.1. The C2C will introduce new areas of hard standing, totalling approximately 18.5ha, including 7.5ha for the travel hub. Drainage of these surfaces will be managed carefully to ensure that water passing from them to ground or watercourses is clean and controlled. All will be subject to discharge consents.
- 3.6.2. The exact measures used will be influenced by the underlying geology. Much of the route west of Coton lies over glacial till,

which has high clay content and therefore does not drain well, requiring run off to be directed to local ditches and watercourses. The aquifer beneath Coton will also restrict the use of soakaways. East of Coton and between the M11 and Grange Road, underlying chalk has created more permeable soils, within which soakaways offer a more feasible solution.

- 3.6.3. The project’s drainage strategy follows guidance that emphasises the use of sustainable techniques<sup>11</sup>. In particular a drainage network using sustainable systems (SuDS) is proposed to:
- ensure that surface water drainage will be managed as close to its source as possible, and will maintain natural ground conditions;
  - provide at source pollution control;
  - limit discharge rates to open, ‘greenfield’ land to natural run-off rates; and
  - attenuate run-off up to the ‘critical’ rainfall event (when rainfall would cause the highest peak flows or levels at a particular location, taking account of climate change projections) and minimise flooding for events that exceed this.
- 3.6.4. The busway will be kerb edged, but with drop kerbs provided at regular intervals to allow for discharge into a filter strip and then to a swale network. Swales are shallow vegetated

<sup>11</sup> CIRIA SUDS Manual (C753) and Cambridgeshire County Council Surface Water Drainage for Developers (June 2021)

channels that store and carry runoff and remove pollutants. Swales will direct surface water runoff to existing ditches or local watercourses, or to detention ponds introduced as part of the scheme (see **Table 3-1**). The detention ponds will discharge to local watercourses at restricted rates to help mitigate flooding. Each detention pond will include an edge buffer for landscaping and access. The swales and detention ponds will provide sufficient pollution mitigation to allow outfall of clean water to the local watercourse.

3.6.5. At the travel hub, surface water runoff will be directed eastwards to a detention pond before being discharged to Callow Brook. The chosen SuDS options for this area will be defined as the design progresses. The detention basin will be developed as part of a wider habitat creation initiative, within the land between the hub boundary and Callow Brook.

**Table 3-1 - C2C Scheme detention basin/ ponds**

Detention pond/ basin	Volume	Discharge point
Pond 01: Between Bourn Airfield and Childerley lodge	3,642m <sup>3</sup>	Existing ditch south of the A428
Pond 02: Between the A428 and St Neots Road	1,707m <sup>3</sup>	Existing watercourse south of the A428
Pond 02A: Between the A428 and St Neots Road	442m <sup>3</sup>	Existing watercourse south of the A428

Detention pond/ basin	Volume	Discharge point
Basin 09: South of Neots Road	830m <sup>3</sup>	To existing watercourse south of St Neots Road
Basin 10: West of Long Road	466m <sup>3</sup>	Existing ditch adjacent to the west side of Long Road
Basin 11: South of Madingley Mulch	1,388m <sup>3</sup>	Existing ditch south of the basin
Basin 05: West of the M11	4,425m <sup>3</sup>	Existing course west of the M11
Pond 06: South of the University of Cambridge	672m <sup>3</sup>	Existing watercourse south of Clerk Maxwell Road
Basin 07: West of Bin Brook	602m <sup>3</sup>	Bin brook
Pond 08: East of the Travel Hub	9,235m <sup>3</sup>	Callow brook

Note: Attenuation ponds 03 and 04 were discontinued due to design changes.

## 3.7 Roads and junctions

3.7.1. The C2C Scheme will largely follow a segregated path, except where it aligns along St Neots Road past Hardwick and links with the Scotland Farm travel hub, and on Charles Babbage Road through the West Cambridge campus.

- 3.7.2. It forms junctions with existing highways at Broadway east of Cambourne, St Neots Road twice (at Childerley Gate and southwest of Scotland Road), Long Road east of Hardwick, Cambridge Road in Coton, and Grange Road. The junctions will be signalised, with priority for buses.
- 3.7.3. The service road will run primarily south of the proposed public transport route, with crossing points located at the highway junctions, as well as on the eastern side of Scotland Road, where there are existing uncontrolled crossing points on the eastern arm of both roundabouts.
- 3.7.4. There will be crossing points also 75m east of the southern arm of the Scotland Road/St Neots Road roundabout, and between Millers Way and the blue bridge footbridge over the A428.

## 3.8 Construction

### Construction strategy

- 3.8.1. The information presented here outlines the approach to construction and is sufficient to allow the EIA to determine any significant temporary effects that are likely to result from landtake, introduction of plant and temporary features, construction activity and emissions. It has also supported the development of a base cost estimate and helped identify any risks to cost and programme.
- 3.8.2. Should the TWA Order be granted, GCP will appoint a principal contractor who will then work up a detailed design

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<sup>12</sup> Code of Construction Practice (Document reference: C2C-26-00-Code of Construction Practice)

and construction strategy and programme. This may vary some of the information set out here, but not so that it introduces the requirement for any additional landtake outside the agreed Order limits, or that may result in additional likely significant effects, or worsening of likely significant effects described in this ES.

- 3.8.3. The construction strategy addresses general working practices including use of construction worksites and access to and from the works, access requirements for bringing people and materials to and from worksites, working hours. It also hinges on the application of best practice measures to ensure that environmental effects are kept as low as practicable. These measures are set out in a Code of Construction Practice<sup>12</sup> (CoCP), which forms part of the TWA Order application.

### Code of construction practice

- 3.8.4. Construction work can be one of the chief causes of environmental impact. To minimise this risk, a CoCP has been developed for the project which sets out a range of measures and principles which contractors are required to abide with in undertaking their work. These build on more general measures that are used under the Considerate Constructors Scheme Code of Practice to ensure that:
  - work sites are well managed and looking professional;

- local communities and those affected by the work are respected;
- the environment is protected;
- everyone is kept safe; and
- the work force is mutually respectful.

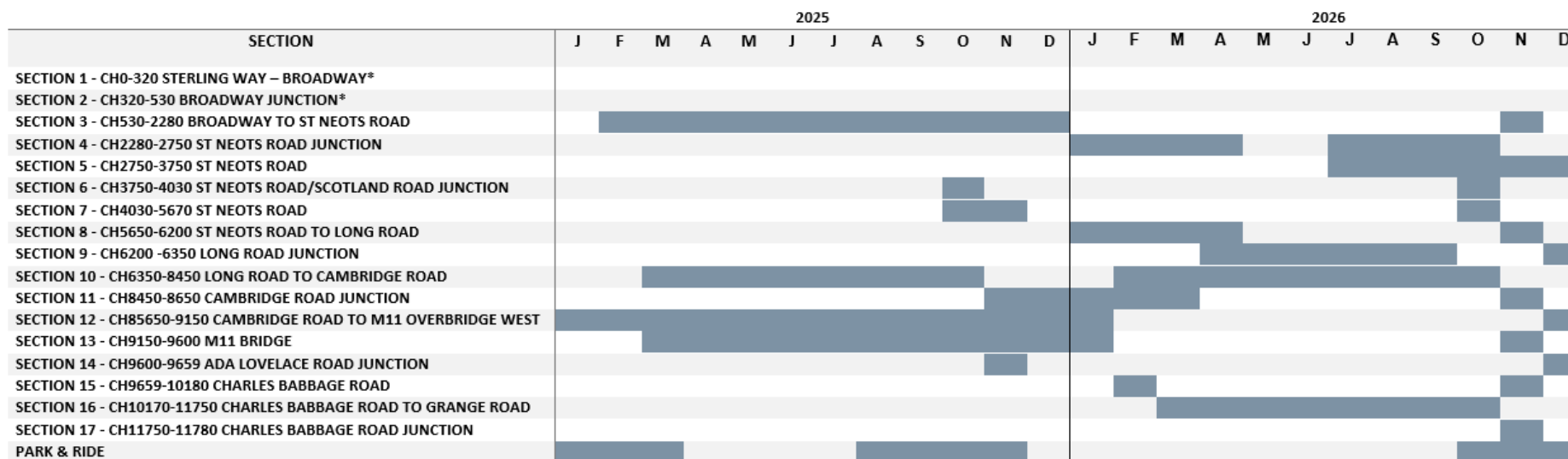
3.8.5. The principal contractor will be required to prepare a more detailed construction management plan (CMP). Building on the CoCP, the CMP will reflect the contractor’s more detailed

design, workplan and assumptions, and will provide the basis for detailed engagement with the relevant local authority.

### Programme and timing

3.8.6. Construction is anticipated to commence in 2025 and continue over approximately 30 months, for a scheme opening in early 2027. The proposed construction phasing is shown in **Figure 3-6**.

**Figure 3-6 - Proposed construction phasing<sup>13</sup>**



<sup>13</sup> \*Dates to be provided by the principal contractor in due course.



## Worksites

- 3.8.7. Construction will require the use of 16 worksites, including one main compound at Scotland Farm Travel Hub, five secondary compounds and ten local works compounds to support construction of particular elements.
- 3.8.8. The main compound will provide strategic support to secondary and local worksites. It will have space for storage and lay down of materials along with parking and maintenance facilities for plant and machinery. This will reduce storage requirements at satellite compounds.
- 3.8.9. The main compound will also include the main welfare facilities for staff, which will provide training and induction facilities, a canteen, and washing, toilet, clothes storage and drying room facilities together with temporary worker's accommodation.
- 3.8.10. The smaller secondary compounds will provide office accommodation for limited numbers of engineering and delivery staff, and local storage for plant and materials, as well as limited welfare facilities and car parking.
- 3.8.11. General material and bulk material deliveries will be required daily, delivered to the main compound by HGV and distributed from there.

## Working hours

- 3.8.12. The construction activities are planned to take place between 0800 and 1800 Monday to Friday, and 0800 and 1300 on Saturday, with no working on Sundays or bank holidays, and with some start-up and shut-down activities either side of these ranges. Occasional out of hours working, where

required, will be agreed in advance with the local authority, and with any people affected by it to be notified in advance.

- 3.8.13. Typically, site deliveries via HGV will be limited to normal working hours. Large and exceptional concreting operations may require concrete to be delivered outside of normal hours; these will tend to occur over specific short durations within the construction programme.

## Plant and equipment

- 3.8.14. Construction plant required for the development of the C2C Scheme will typically include excavators, dumpers, mobile cranes, bulldozers, compactors, bowsers and graders. The types and numbers of plant will vary between each phase of works.

## Construction traffic and access

- 3.8.15. The delivery of plant to each phase of the construction strategy will be managed by the principal contractor. The main traffic routes for deliveries will be:
  - west, along the A428, and then south to the side road crossings and along the haul road along the route of the guided busway.
  - east, from within the business park and Charles Babbage Road and minimising access on Grange Road, this will only be used to construct the tie-in works.
  - for the M11 area works from the site haul road or access from the M11.
- 3.8.16. The volumes of construction traffic along each of these routes will vary throughout the total construction period. The



construction of each element of the scheme will involve different activities as it is built, and a consequent variation in the number of vehicles needed to service it. The timing and duration of peak construction activity and peak construction traffic will vary for each scheme element.

3.8.17. The key routes and numbers are summarised below. Details on timing and duration of peak activity to be confirmed with Milestone.

3.8.18. No construction traffic pass through the core parts of the villages of Hardwick or Coton.

### Road closures

3.8.19. Temporary and permanent road realignments associated with the works will be necessary. These are advanced works and are subject to further development and discussion with the local highway authority.

3.8.20. Some traffic delays would be experienced during the work to tie in the approach roads to the existing network. Access to site will be arranged to accommodate the scale of vehicles that will use them. Safe pedestrian access will be ensured through segregated routes.

## 3.9 Materials and waste

3.9.1. The construction of the C2C Scheme will require materials to be moved to, from and within the scheme footprint. The C2C Scheme will, in line with the regional target, seek to achieve a target of around one third (31%) recycled aggregate content to minimise the need to import or export materials, and to balance cut and fill as far as possible. This helps to contain

potential impacts from construction traffic and at offsite minerals or waste disposal sites.

3.9.2. The C2C Scheme will look to reduce the use of virgin material and aggregates through reducing material requirements in the design itself, using site-won or recycled materials, and through the use of materials with a high proportion of recycled content.

3.9.3. To inform a low carbon design, embodied carbon emissions of the material resource required for the C2C Scheme will be calculated as the C2C Scheme progresses, subsequently aiding in the reduction of material requirements.

3.9.4. The C2C Scheme will seek to maximise reuse and recycling of extracted materials through the application of the waste hierarchy. Excavated soils and green waste can be reused on site for landscaping, and inert materials can be recycled by crushing, blending and subsequently reusing as aggregate.

3.9.5. In some cases, materials may not be suitable for reuse. Opportunities to re-use or recycle these materials will be sought on other nearby schemes, where possible or in other uses with clear benefits to the environment.

3.9.6. Materials that can't be reused or are classified as contaminated or potentially hazardous will be taken to recycling and disposal facilities with the appropriate permit to ensure environmental risks are reduced. These facilities should be identified as close to the works as possible to minimise transportation needs, thereby reducing greenhouse gas emissions resulting from transportation.





- 3.9.7. A site waste management plan (SWMP) will be prepared by the principal contractor. The SWMP will consider the sourcing, transport and use, and disposal of waste and material resources, in a sustainable manner. In addition, unavoidable construction waste will be managed in accordance with the waste hierarchy and other relevant legislative requirements.

### 3.10 Sustainable design

#### Limiting emissions and energy usage

- 3.10.1. The C2C Scheme incorporates hybrid electric vehicles<sup>14</sup>, with the aim of providing a reliable public transport route whilst limiting noise and air pollution.
- 3.10.2. The hybrid approach to the C2C Scheme involves the use of electricity to power the buses within the town of Cambourne and the city of Cambridge. On leaving these areas the buses will transfer to the use of alternative fuels.
- 3.10.3. Aside from the transport itself, the C2C Scheme’s carbon footprint has been considered through all aspects of the Schemes construction and operation. The overall net carbon impact of the C2C Scheme has been assessed (see ES Chapter 10) and methods of limiting embodied carbon will be explored.
- 3.10.4. Scotland Farm Travel Hub will include solar panels where practical, reducing the amenities’ building’s reliance on grid

electricity, and will incorporate the use of LED lighting columns designed for public safety.

#### Design resilience

- 3.10.5. During the C2C Scheme’s 60-year appraisal period (the anticipated lifetime of the C2C Scheme) and 100-year lifespan for the bridges, changes in climate are likely to be experienced in the study area (see Section 5.8). This has the potential to pose a risk to the C2C Schemes assets; for example through deformation and deterioration of asphalt surfacing associated with extreme temperatures and changes in precipitation; and affecting the foundations strength.
- 3.10.6. Changes in climate also have the potential to pose risks to the environmental receptors detailed throughout this report. For example, increased frequency and quantity of rainfall can affect the resilience of species included in landscape planting designs.

#### Commitment to biodiversity

- 3.10.7. The C2C Scheme has committed to delivering a minimum of 10% biodiversity net gain (BNG), with the aim of achieving 20%. To reduce the effect on the natural environment, the route has been adjusted to avoid trees and other vegetation where possible.
- 3.10.8. Opportunities to increase biodiversity along the C2C Scheme will be considered. Opportunities include increasing hedgerow and woodland connectivity through additional

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<sup>14</sup> Assumed as worst case for the ES, but with a commitment to use fully electric vehicles as soon as practicable.

planting to link existing or proposed open spaces, hedgerows and ecological corridors. Where possible the C2C Scheme will seek to incorporate the planting of native mixed species.

- 3.10.9. Any swales included within the drainage strategy provide the opportunity for planting or sowing with wetland species. This will provide the added benefit of reduced run-off rates through evapotranspiration.

### 3.11 Potential impacts of C2C

- 3.11.1. C2C has various characteristics and features associated with its design, construction and operation that could cause environmental impacts. These include:

- displacement of or alteration to land use and property, or removal of features or structure;
- new features or structures introduced into the environment;
- new or altered activities generated by or resulting from the scheme; and
- release of materials to land, air or water, or of sounds or vibration.

- 3.11.2. These characteristics and features may result in a host of different impacts and environmental effects, either temporarily or permanently. The temporary effects are frequently related to construction, though impacts arising during construction can have effects that persist into the long term.

- 3.11.3. A further consideration for the EIA is that of major accidents and disasters. The EIA requirements now mandate consideration of these abnormal and unplanned events that can cause their own specific impacts and effects on the environment.

- 3.11.4. Chapters 7-11 consider if and how each of these potential impacts will result in environmental effects.

### 3.12 Major accidents and disasters

- 3.12.1. Consideration of major accidents and disasters within EIA was introduced to address the unlikely, but potentially catastrophic impacts of inherently hazardous industries. This mostly concerns COMAH<sup>15</sup> sites. But it is required to consider whether any aspects of the construction or operation of C2C have the potential both for major accidents and disasters, particularly where these could result in major environmental impacts.

- 3.12.2. C2C is not a hazardous development; it carries low risks of accidents and incidents though none that would be deemed major. As a result, major accidents and hazards have been either out scoped from the EIA or are deemed to have residual risks which, based on assumed risk management measures, will be as low as reasonably practicable (ALARP) and therefore not result in significant environmental effects.

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<sup>15</sup> Operations subject to The Control of Major Accident Hazards Regulations 2015, such as oil refineries or chemical plant.

# 4 Evolution of the scheme

## 4.1 Considering alternatives

- 4.1.1. Rule 11(1)(d) of the 2006 Rules provides that an ES shall include: "A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the applicant, which are relevant to the works and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects." These matters are addressed below.

## 4.2 The story so far

### A clear case for the scheme

- 4.2.1. The Cambridgeshire Guided Busway has been operating since 2011, with its routes to Trumpington in the south and St Ives to the north-west offering reliable, frequent and quick public transport services.
- 4.2.2. Proposals to develop something similar between Cambourne and Cambridge, broadly following the A428 corridor, were

presented in 2014, within the Transport Strategy for Cambridge and South Cambridgeshire (TSCSC)<sup>16</sup>. The A428 corridor is one of the key routes into Cambridge with high levels of current and planned housing growth (**Figure 4-1**). Parts of the route currently suffer from heavy congestion and slow and unreliable journeys at peak times. On the A428 corridor, the TSCSC outlined proposals for a congestion free public transport corridor into the city. A county council brief sought an outline business case and an options report for this western corridor.

- 4.2.3. Consultants Atkins prepared feasibility work during 2015 on both corridor studies<sup>17</sup> and park and ride locations<sup>18</sup>, and this informed public consultation in autumn 2015 (consultation is discussed in Section 4.6). The consultation focused on concepts rather than detailed proposals, and sought feedback on ideas and concerns, as well as gleaning a general impression of public support. Various proposals emerged from the consultation, some of which have since been adopted as part of the current scheme proposals<sup>19</sup>.

<sup>16</sup> [CCC. Transport Strategy for Cambridge and South Cambridgeshire. Mar 2014](#)

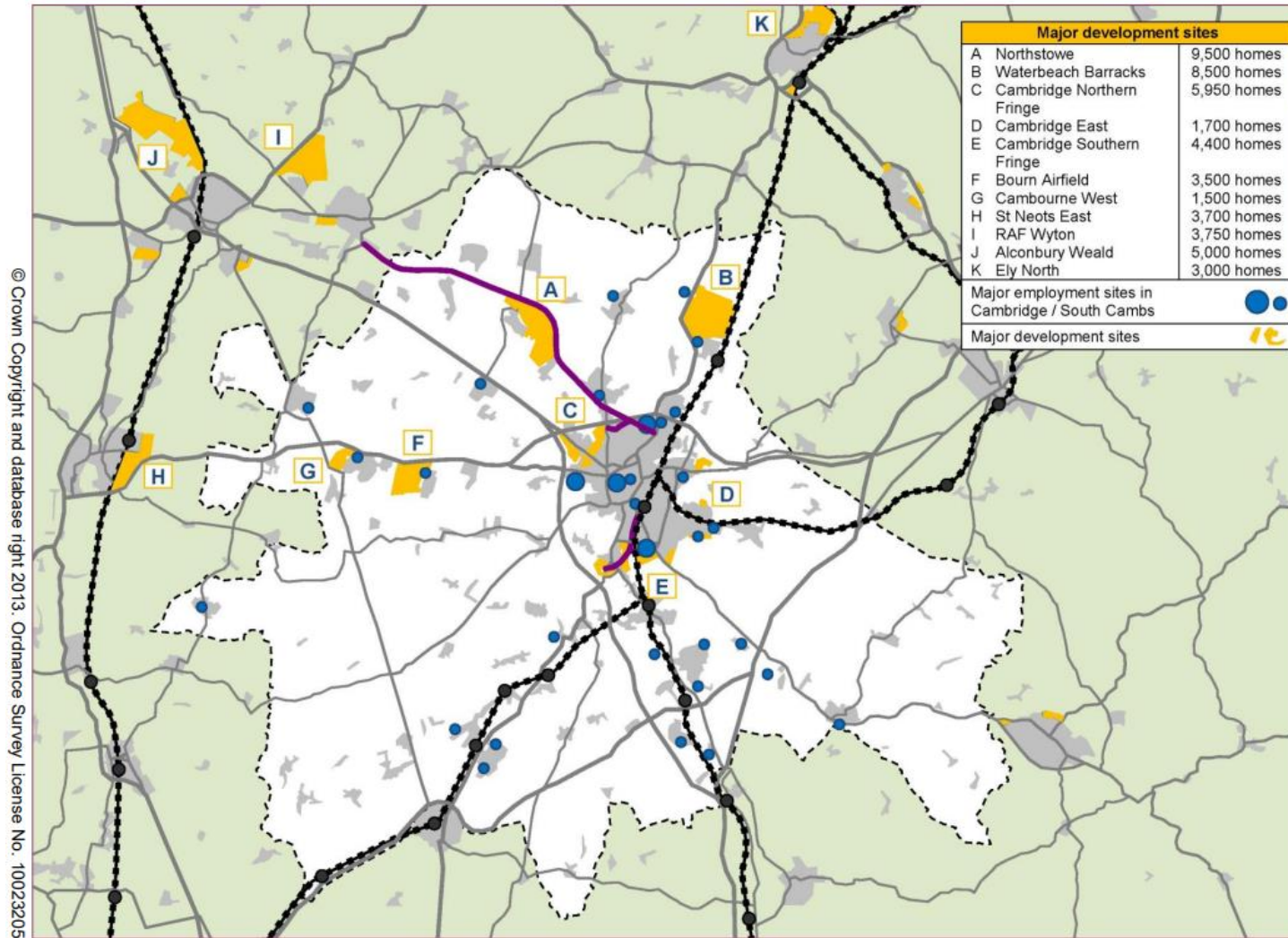
<sup>17</sup> [Atkins. Madingley Road A428 Cambourne to Cambridge Corridor Study. Draft Interim Report. Cambridge City Deal Partnership. June 2015.](#)

<sup>18</sup> [Atkins. A428 Western Corridor Study. Park and Ride Locations. City Deal Partners. September 2015.](#)

<sup>19</sup> [Atkins. Analysis of consultation proposals. 1 Feb 2016](#)



Figure 4-1 - Proposed major developments drive the need for improved public transport



4.2.4. In the meantime, the concept of the A428-A1303 Cambourne to Cambridge bus scheme was tested by consultants Mott MacDonald in August 2016, who prepared a strategic economic appraisal<sup>20</sup>, accommodating potential scheme variants. This concluded that the scheme

*“clearly contributes towards Greater Cambridge City Deal growth and strategic objectives by addressing congestion and removing bottlenecks on growth by linking key employment and housing sites together, and with the city centre, and through improving the quality of life and perceptions of the area”.*

4.2.5. This view was endorsed in the Strategic Outline Business Case (SOBC)<sup>21</sup>, which referred to a clear case for the scheme.

### **Outline Business Case**

4.2.6. A series of appraisals were undertaken in 2016 and 2017, leading to a second public consultation between November 2017 and January 2018, which focused on routes from Maddingley Mulch into Cambridge, referred to as Phase 1. This work was documented in an *End of Stage report*,<sup>22</sup> which also included further assessment of park and ride options.

4.2.7. Whilst work proceeded on the development of the Outline Business Case (OBC), the newly formed Cambridgeshire and Peterborough Combined Authority (CPCA) announced its

aspirations for the Cambridgeshire Autonomous Metro (CAM) system, of which C2C would be an early phase. CAM was to be a light rapid transit system (though with electric vehicles using rubber tyres rather than steel rails) with various branches linking several kilometres of new tunnel beneath Cambridge with various destinations in the city’s hinterland, including Bourn and Cambourne.

4.2.8. During this period, CPCA challenged the C2C proposals and whether they were appropriate or compatible with CAM. Subsequently Arup undertook a review of C2C for the GCP and CPCA<sup>23</sup> which confirmed that proposals were compatible and that “the process undertaken to date to determine the route is robust and the optimal solution for the corridor”. Following this review, options for a new route west of Maddingley Mulch (Phase 2) were presented in a third phase of public consultation in early February 2019.

4.2.9. An OBC was then drafted for approval by the Executive Board. However, before approval could be sought in 2020, the C2C scheme was paused again whilst CPCA asked for confirmation of compatibility of C2C with the CPCA Local Transport Plan sub-strategy for the CAM. In late 2020, in order to resolve the impasse, the GCP Executive Board commissioned an independent audit of the scheme,

<sup>20</sup> [Mott MacDonald. Strategic Economic Appraisal of the A428-A1303 Bus Scheme. Aug 2016](#)

<sup>21</sup> [Atkins. Cambourne to Cambridge Better Bus Journeys Scheme: Strategic Outline Business Case. 23 Sept 2016](#)

<sup>22</sup> [Atkins. Cambourne to Cambridge Better Bus Journeys. End of Stage Report. September 2017](#)

<sup>23</sup> [ARUP. Cambridge Autonomous Metro and the A428 Corridor. 15 November 2018](#)





## The 2021 audit

4.2.10. The scheme was audited in early 2021<sup>24</sup>, with the findings presented to GCP’s Executive Board on 1 July 2021. A number of alternative routes were examined in the audit, which challenged the key assumptions and constraints in leading to the selection of the preferred route for the scheme and to the rejection of alternatives. It tested the robustness of those assumptions and constraints to see whether they remained appropriate. The audit concluded that:

- the project should proceed to the next stage;
- the scheme was aligned with national, regional and local policies on economy and transport.
- stakeholder engagement had been carried out in a robust manner; and
- the outline business case development followed the required methodology and reflected a robust approach.

4.2.11. GCP was found to have complied with national guidance on how to balance local and national considerations. Overall, the audit confirmed that the key constraints and assumptions on which the outline business case were based remained valid. It also concluded that the environmental impact of the scheme was mixed and that the assumptions used in the OBC appraisal needed to be investigated as part of an EIA, which would form part of the next project stages.

## Approval of the OBC

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<sup>24</sup> [Amey Independent Audit of Key Assumptions and Constraints, Cambourne to Cambridge: Better Public Transport Project. May 2021 \(P366\).](#)

4.2.12. Following the audit the OBC was approved. This established an off-road segregated route with a Scotland Farm park and ride as the single preferred scheme option (**Figure 4-2**).

4.2.13. This was taken as the basis for the EIA, albeit that some further modifications were made as the outline design was refined and mitigation options considered

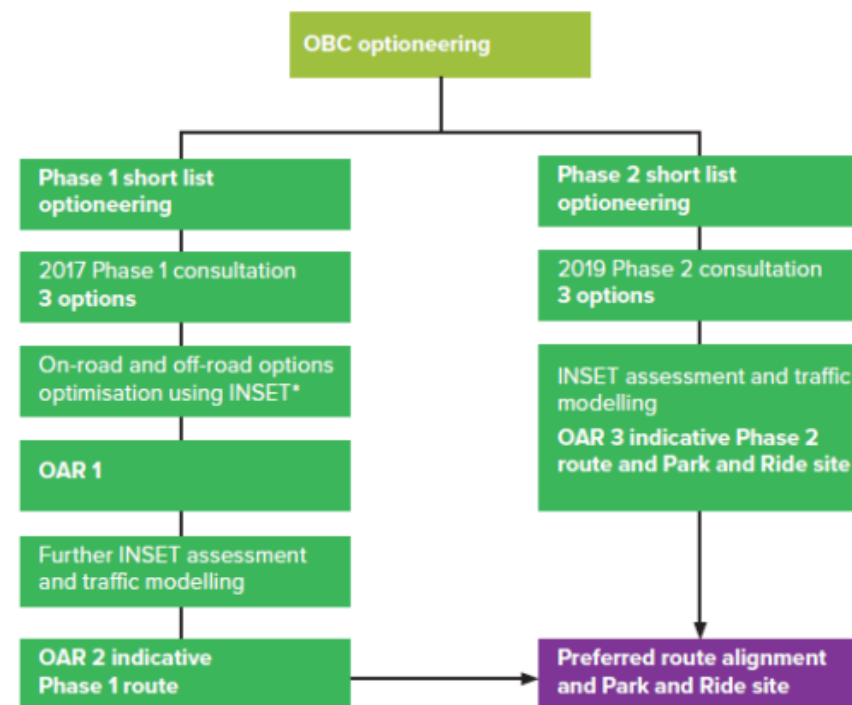
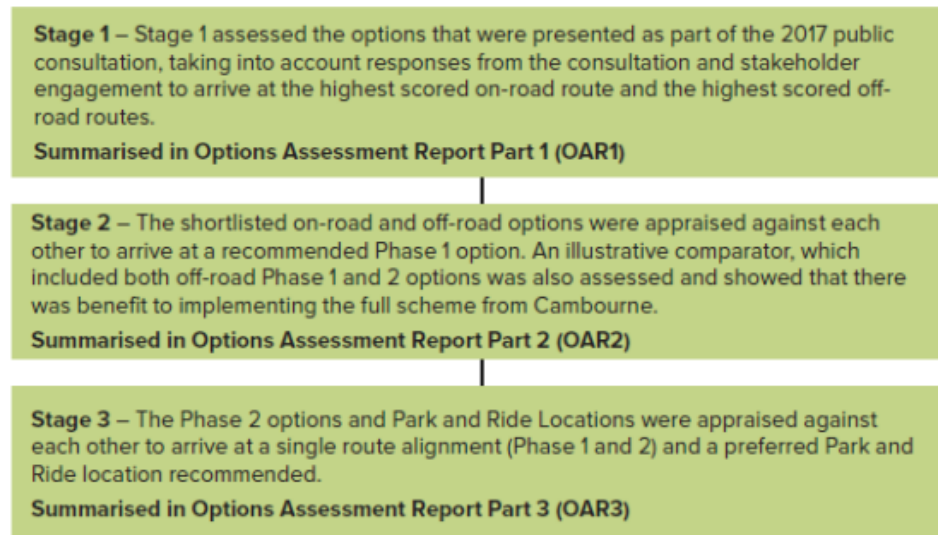
## The current phase of work

4.2.14. WSP was appointed in July 2021 as the lead consultant to take this single preferred option through to a TWA Order application. There have been some alterations and refinements to the preferred scheme recommended to the Executive Board in order to address environmental issues raised by stakeholders. And the design detail has been developed to confirm the precise requirements for acquiring and using land, as well as to support an assessment of the scheme’s likely significant effects.

4.2.15. This chapter now takes a more detailed look at how alternatives for both the routes and the travel hub were explored.

Figure 4-2 - Options Development Process

Option development and appraisal since October 2016 has been undertaken in three stages:



\* INSET is a multi-criteria tool used to assess and score scheme options against a range of criteria to identify the best performing option.



### 4.3 Alternative routes

- 4.3.1. The 2015 A428 public consultation presented a series of route options in two tranches or phases. Any one of three route options for Phase 1 (east of the Madingley Mulch roundabout) could be combined with any one of the three for Phase 2 (west of the roundabout). As a result, there were nine possible route combinations, as well as a further three hybrids. With some combinations representing more rational solutions than others, five whole route options were promoted that covered a range of benefits and costs. The remaining options were eliminated on the basis of their similarity to one of the promoted five (**Figure 4-3**), or because they were deemed to represent a poor return on investment<sup>25</sup>.
- 4.3.2. The introduction of a bus lane along part of A1303 Madingley Road between Madingley Mulch roundabout and M11 junction 13<sup>26</sup> was the subject of separate assessment during 2016. Initially this was considered as a tidal (or reversible, depending on the time of day) bus lane. However, the engineering considerations, safety implications and townscape impacts of a tidal lane, and the high-level assessment of journey time benefits, suggested that an east-bound only bus on Madingley Rise was the optimum solution.

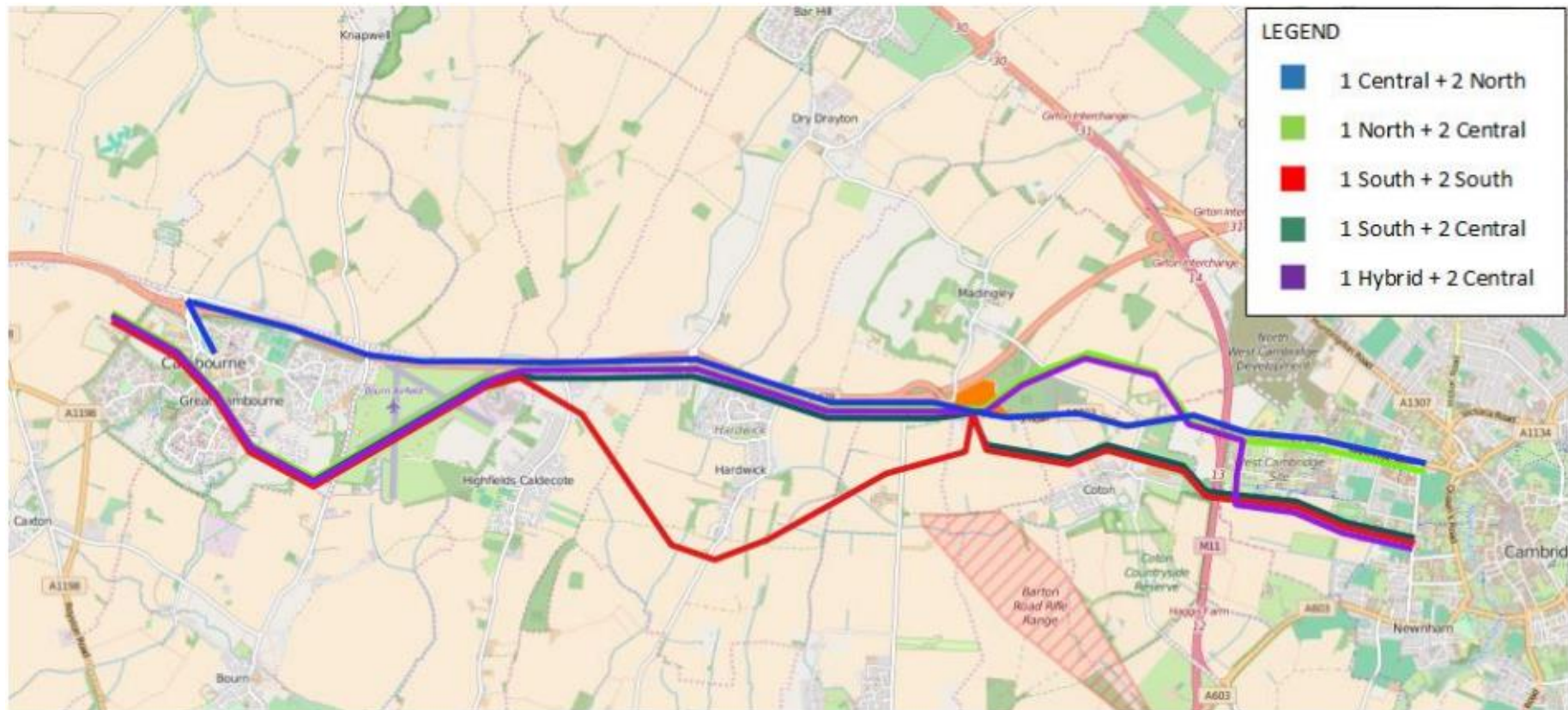
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<sup>25</sup> [Atkins. Technical note on post-consultation activities. 25 Feb 2016](#)

<sup>26</sup> [Atkins. Technical note on the tidal bus lane review. 24 May 2016](#)



Figure 4-3 - Option map



4.3.3. Meanwhile, further work by Atkins refined the main whole route options down to four offline or partially offline routes, with the proposal to introduce a bus lane onto Madingley Road also included in the mix. The SOBC reflected on these five options at the end of 2016.

- **Bus lane on the A1303 and Madingley Road.** Lowest cost, but unlikely to offer a step change in capacity, connectivity and journey efficiency (combination of speed and reliability).
- **Hybrid offline-online option:** segregated bus link between Cambourne and Bourn Airfield, and on-road from Madingley rise using St Neots Road and continuing on east bound only bus lane on Madingley Road.
- **Fully offline, Cambourne to Grange Road:** best strategic fit, providing the highest level of connectivity, capacity and journey efficiency, making bus travel more attractive and delivering wider economic benefits, while not exacerbating congestion on Madingley road.
- **Hybrid, largely offline 1:** follows St Neots Road from Bourn airfield to Madingley Mulch roundabout, then bears north of the A1303 along a segregated route that uses the existing bridge over the M11 and follows a segregated route through Cambridge West up to Grange Road.

Addressed congestion and does not exacerbate congestion on Madingley road.

- **Hybrid, largely offline 2:** follows St Neots Road from Bourn airfield to Madingley Mulch roundabout, then bears south past Coton and uses a new bridge over the M11 and follows a segregated route through Cambridge West up to Grange Road. Addresses congestion and does not exacerbate congestion on Madingley Road.

4.3.4. The fully offline option was favoured by GCP<sup>27</sup>, though modified to allow for the section west of Madingley Mulch to be routed alongside the old St Neots Road rather than using a new route through open countryside, which would have had higher environmental effects and costs. This option, with high quality cycling and walking facilities along an adjoining emergency access and maintenance track, and a park and ride site near Madingley Mulch roundabout, was considered to offer the best overall contribution to economic growth and the fastest bus journey time between Cambourne and Cambridge. A consolidation of the option development process up to this point is set out in an options assessment report<sup>28</sup>, which was used to advise the City Deal Executive Board Report in October 2016.

4.3.5. An update report for GCP<sup>29</sup> consolidated the assessment work taking place over the preceding year. In it, the offline option remained central to GCP's plans and was considered

<sup>27</sup> [GCP. Cambourne to Cambridge Better Bus Journeys – The Recommended Option. Oct 2016](#)

<sup>28</sup> [Atkins. Option Assessment Report for Cambourne to Cambridge Better Bus Journeys. Oct 2016](#)

<sup>29</sup> [Atkins. Cambourne to Cambridge Better Bus Journeys End of Stage Report. Sept 2017](#)



alongside two ‘low-cost comparators’, comprising respectively the eastbound and tidal flow bus lanes on Madingley Road<sup>30</sup>. Transport modelling suggested that, with a City Access Scheme<sup>31</sup> in place, the offline option would achieve 1.8 million busway users annually, compared with 1.1 million for both of the Madingley Road options. The offline option was predicted to offer the quickest journey times from Cambourne to Cambridge, with the Madingley Road options taking between eight and ten minutes longer. The report outlined several alignment variations and provided a high-level appraisal of their relative merits, as well as a more detailed environmental appraisal (**Figure 4-4**). Three variants were presented at the Phase 1 public consultation between November 2017 and January 2018.

- 4.3.6. However, the rise of CAM, promoted by the mayor in May 2018, saw some significant changes for consideration of the scheme into Cambridge. CAM was to use tunnels to bring new electric trams into the city, including a western branch that extended as far as Cambridge West. Before the CAM programme was ended in 2021, GCP consulted on Phase 2 proposals, for route options west of Madingley Mulch roundabout<sup>32</sup>: one entirely off-road, only interacting with other traffic at junctions; one entirely on-road, with public transport

mixing with general traffic and basic junction improvements; and a third entirely on-road, but with dedicated public transport lanes.

- 4.3.7. A northern route option (Bourn to Cambridge) was also considered around May 2018 in a study by Mott MacDonald<sup>33</sup>. This option had been discounted early in the project’s gestation, as it offered slower journeys and poorer connectivity for growing communities in villages and towns to the west. However, promoted by the then mayor to address stakeholder interest in the potential for a route travelling north via Girton, and fitting in with the proposed CAM network, a northern option was reconsidered. The assessment confirmed the option as a less viable solution in meeting the objectives of C2C and was subject to no further assessment.
- 4.3.8. In advance of approval of the OBC<sup>34</sup> and the final decision that the off-road option was the preferred scheme, and recognising the potential environmental issues of this route, Mott MacDonald were asked to prepare a Technical Note<sup>35</sup> to review and outline the potential for ‘quick win’ interventions for the Phase 1 section of the route.
- 4.3.9. An option for improvements at Madingley Mulch Roundabout - consisting of a short section of outbound public transport lane

<sup>30</sup> Naming conventions for the options have changed with time, so we are using ‘Madingley Road options’ to refer to these two on-road options and variations to them.

<sup>31</sup> These are still in development but could include the management of road space to prioritise active travel, and an ongoing funding source to pay for it, as well as a much-improved bus network.

<sup>32</sup> [GCP. Cambourne to Cambridge better public transport project. Phase 2 public consultation. Madingley Mulch roundabout to Cambourne. Feb 2019](#)

<sup>33</sup> [Mott MacDonald. Technical Note on the Northern Route. May 2018.](#)

<sup>34</sup> [Cambourne to Cambridge - Outline Business Case. Nov 2019](#)

<sup>35</sup> Mott Macdonald (2019) Cambourne to Cambridge Better Public Transport Project, Madingley Road ‘Quick-Win’ Options Outline Technical Note.

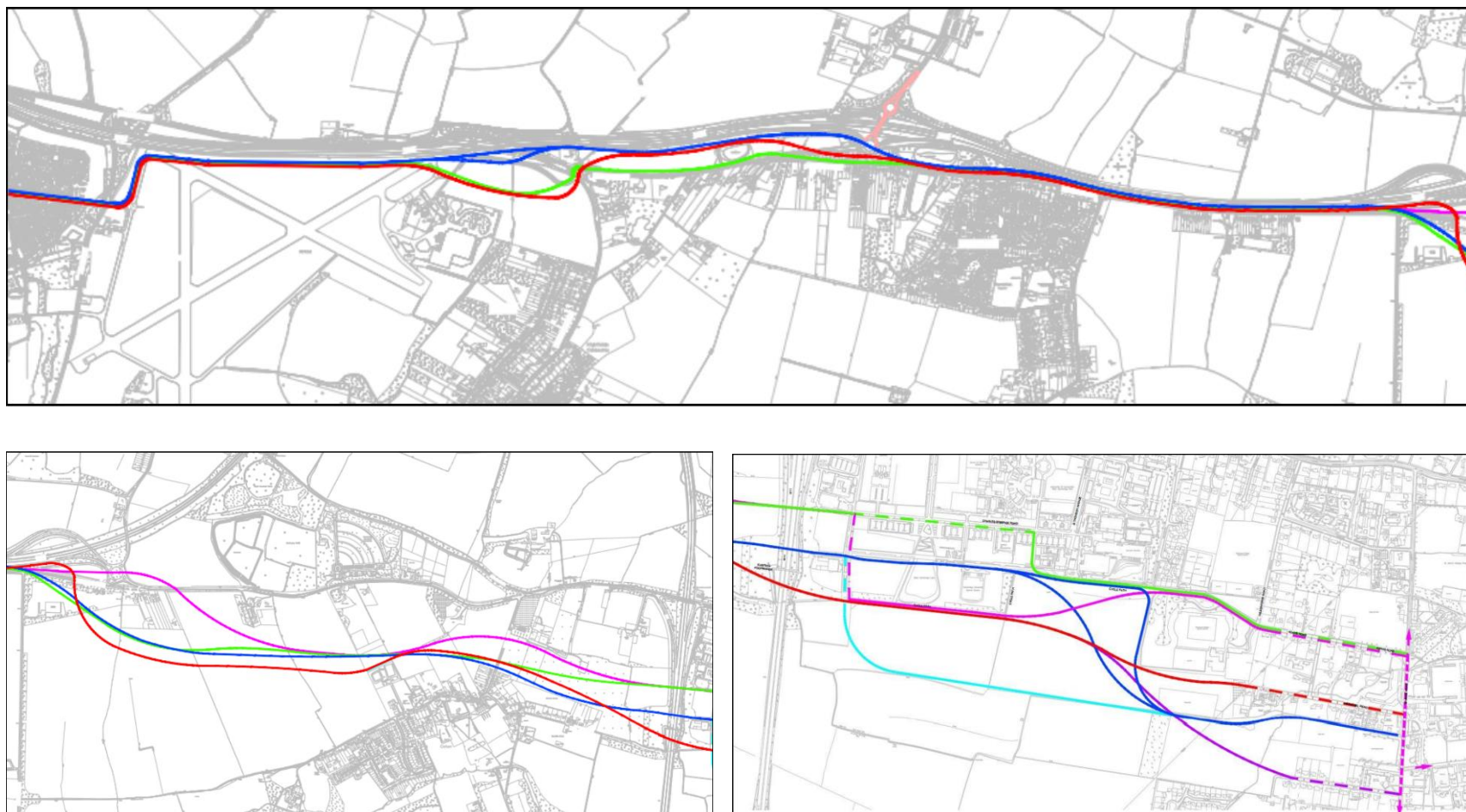
leading up to the roundabout, and potential signalisation at the roundabout – offered some journey time benefits, but without additional landtake, any benefit to public transport would have been small.

- 4.3.10. Further on-road options were reviewed, but these all required earthworks or working areas outside of the highway boundary, involving a large impact on existing vegetation alongside the A1307, including part of Madingley Wood SSSI, and would also have required works greatly impacting the heritage setting of the American Cemetery. An alternative that shifted the route to the south would have required significant landtake and tree removal from residential properties opposite the cemetery, and would still have impacted its setting.





Figure 4-4 – Scheme options, September 2017





## 4.4 Park and ride locations

4.4.1. In the initial feasibility work in 2015 and up to the recommended preferred option in autumn 2016, the Madingley Mulch roundabout was the favoured park and ride location. It was considered to give the best balance between congestion-free access, high capture of users and lower operating costs. However, its replacement by a site at Scotland Farm was proposed during the 2015 consultation. These two, together with four others, were formally appraised by Atkins<sup>36</sup>:

- Madingley Mulch roundabout;
- Scotland Farm;
- North of Cambourne; and
- Transport Hubs - Cambourne;
- Transport Hubs - Bourn;
- Transport Hubs - between Highfields and Caldecote.

4.4.2. Madingley Mulch continued to be the favoured site, with a balance between congestion free access, high capture of users, and lower operating costs. The other sites were considered too far from Cambridge and, west of the main congestion hotspot on Madingley Road, unlikely to encourage drivers to switch modes.

4.4.3. This conclusion persisted into 2017, when further appraisal<sup>37</sup> identified a Madingley Mulch site east of the roundabout and to

the north and south of Madingley Road, as Atkins' preference. It was located on the preferred busway route; was within a mile of both the A428 and M11 corridors; had a greater catchment for existing park and ride users; and had a good strategic fit with respect to local policies. It also presented a greater opportunity for access to Cambridge by foot and cycle. A brief environmental appraisal, included in the report, concluded that a site at Madingley Mulch could be accommodated with appropriate mitigation, though local concerns were expressed about traffic generation in Madingley, as well as potential impacts on landscape and on the nearby Madingley Woods SSSI.

4.4.4. The September 2017 End of Stage report<sup>38</sup> also considered park and ride sites based on a fresh review by Mott MacDonald<sup>39</sup>. It broadened its coverage from Madingley Mulch and Scotland Farm to cover eight possible locations (**Figure 4-5**), namely:

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

<sup>36</sup> [Atkins. Park and ride site locations technical note. June 3 2016](#)

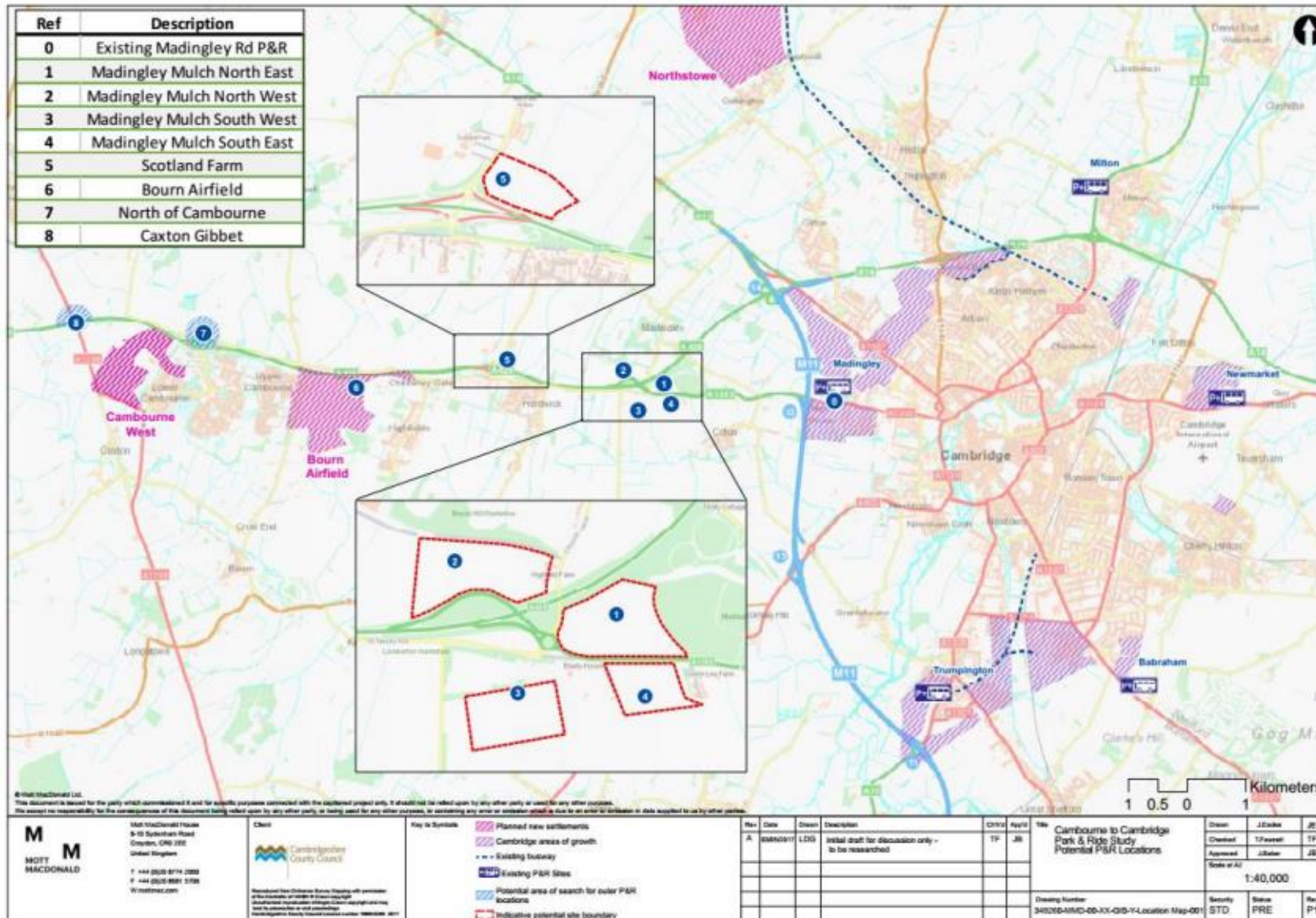
<sup>37</sup> [Atkins. Cambourne to Cambridge Better Bus Journeys: Park & Ride Location Study. April 21 2017](#)

<sup>38</sup> [Atkins. Cambourne to Cambridge Better Bus Journeys: End of Stage Report. September 2017](#)

<sup>39</sup> [Mott Macdonald. Cambourne to Cambridge Better Bus Journeys: Park and Ride Study. September 2017.](#)



Figure 4-5 - Considered sites - Stage 1



- 4.4.5. Sites were assessed at a high level according to policy alignment, benefits and deliverability. Sites promoted for further consideration comprised:
- Site 0 Madingley Road (the existing park and ride location)
  - Site 3 Waterworks (Madingley Mulch)
  - Site 4 Crome Lea (Madingley Mulch)
  - Site 5 Scotland Farm
  - Site 6 Bourn Airfield
- 4.4.6. Site 0, with surrounding land constraints, did not have the space for necessary expansion. Site 4, adjacent to Madingley Wood SSSI, was unfavoured both on environmental and traffic grounds. Site 6 would present local traffic impacts and offered little for cyclists given its distance from Cambridge. Sites 3 Waterworks and 5 Scotland Farm were presented within subsequent phases of consultation, both of which established a clear preference for Scotland Farm

## 4.5 Establishing the preferred option

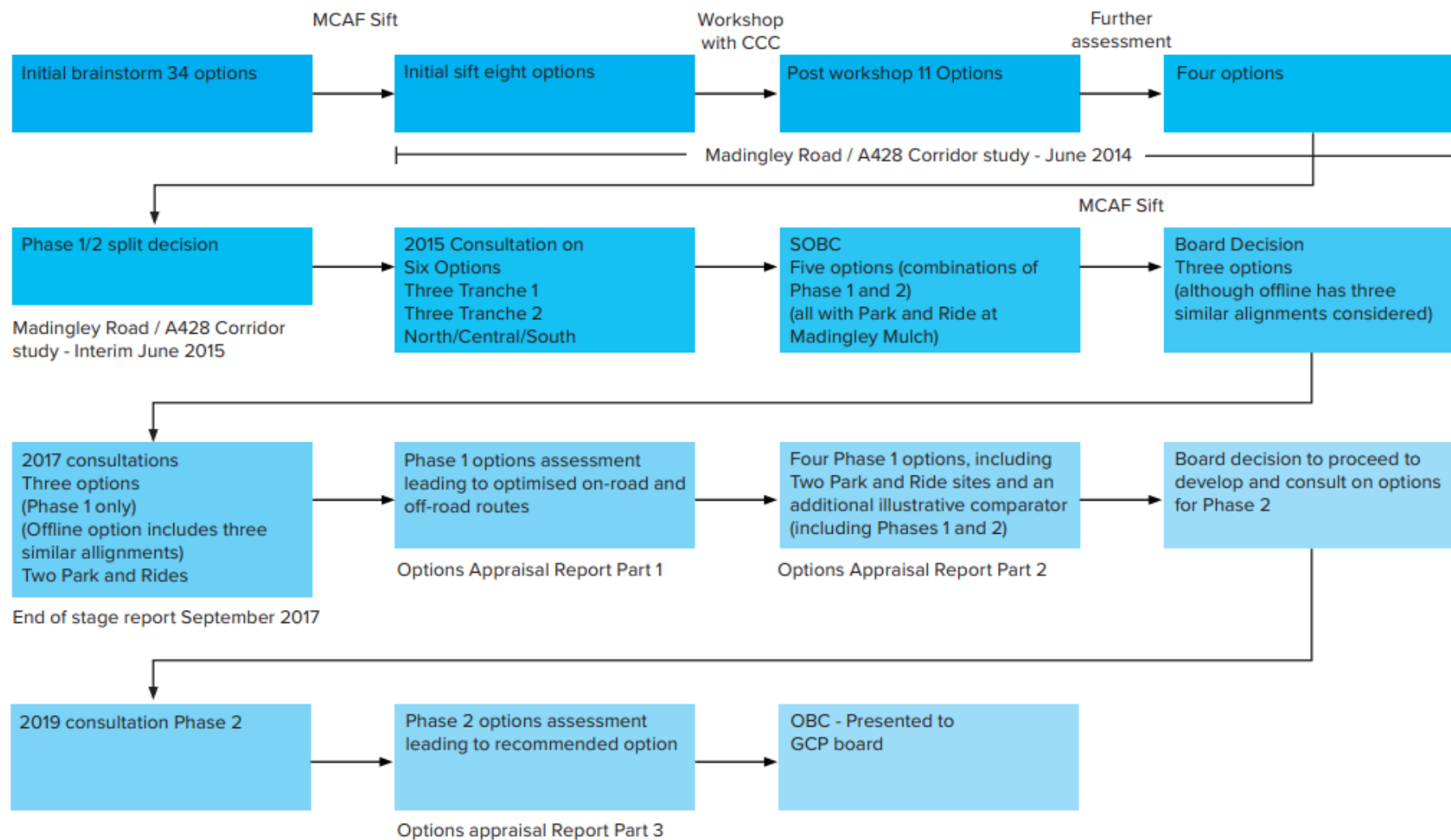
- 4.5.1. To support the OBC, Mott MacDonald were commissioned to lead a series of formal option sifts. They prepared three option assessment reports (OARs) respectively in February 2018, December 2018 and November 2019, which summarised the various strands of scheme development, and described the comparative performance of options up to given points in time.
- 4.5.2. OAR 1 addressed option development and assessment work from scheme inception up to the second public consultation for Phase 1 – the route into Cambridge from Madingley Mulch. It included further assessment of the shortlisted options, and with

some refinements, identified a single recommended on-road and off-road option.

- 4.5.3. OAR 2 included an assessment of the refined options from OAR 1, with some modifications to reflect traffic modelling results. A sifting and evaluation tool was used to compare the options against a series of criteria and, incorporating an initial assessment of the scheme's value for money using traffic modelling information, as well as Phase 1 consultation feedback, a recommended option was confirmed. This was an off-road scheme between Cambourne and Grange Road in Cambridge, with the Waterworks park and ride site near to Madingley Mulch roundabout (though the Scotland Farm site was acknowledged as offering similar benefits).
- 4.5.4. OAR 3 followed the same general approach as OAR 2, taking account of a deeper level of appraisal information for the Phase 2 route, west of Madingley Mulch. It addressed three route alignments, with a variation for each that included one or other of the park and ride locations. The assessment also considered wider economic impacts, which established substantial benefits to an off-road segregated route. Combining this with Motts' sifting tool, traffic demand modelling information and findings from consultation, an off-road segregated route with a Scotland Farm park and ride, was established as the preferred scheme option.
- 4.5.5. The decision to select a park and ride location at Scotland Farm was based on an assessment of a range of factors (as set out in the 2017 Mott Macdonald Park and Ride Study and OAR 3), but given that it performed comparably with the Waterworks alternative, the final decision was influenced by strong local consensus.



Figure 4-6 - C2C project development process





## 4.6 Refinement of the preferred option

- 4.6.1. Whilst numerous options for C2C, both to the north and south of the existing corridor, as well as on-line, have been considered over a period of years, further issues have emerged from ongoing dialogue with stakeholders. As such the preferred option has evolved to reflect a number of these. These are described in turn, from west to east.
- 4.6.2. The local community in Hardwick raised strong concerns about the loss of trees associated with an alignment to the north of St Neots Road. The route has now been realigned along St Neots Road. The potential to improve existing noise barriers along St Neots Road was also flagged up as a means to reduce traffic noise from the A428.
- 4.6.3. With the Scheme diverted onto St Neots Road, and with buses thereby needing to share this section with existing road traffic, a bus gate west of Long Road was introduced into the proposals. This would have restricted access between St Neots Road and the A428/Madingley Mulch Roundabout to buses only and certain permitted vehicles (such as emergency services). Consultation with Hardwick residents established strong opposition to this proposal, and with traffic modelling also suggesting that the benefits did not outweigh the disbenefits, the bus gate was removed from the Scheme in favour of a layout which retained priority for buses at junctions.
- 4.6.4. The original alignment went through the Waterworks site as a legacy of consideration of the site as a park and ride. It was suggested that GCP consider realignment to avoid the site, which has some ecological merit, and this recommendation has been taken on board.
- 4.6.5. The alignment across Cambridge Road, to the north of the built part of Coton was agreed to maintain a minimum distance of 40m from the existing properties to ensure buses are no closer than they are at present.
- 4.6.6. Recognising the environmental sensitivity of the Coton Orchard, and following a range of surveys of the trees and wildlife in the orchard, a minor northward shift in alignment was proposed. This route would have taken an opportunity of using a gap between the oldest trees, so avoiding the need to fell any of them. It would also have followed a route eastwards that would have lowered the potential ecological impact further, due to it affecting fewer orchard trees and less of the mature orchard habitat. It did, though, follow a more central route through the orchard, and it would have resulted in greater severance of the agricultural fields west of Cambridge Road. Following further engagement with affected parties, and the preferences expressed, the decision was taken to retain the alignment on its more southern alignment.
- 4.6.7. The alignment to the south of the West Cambridge campus was preferred in operational terms. The University highlighted the presence of electron microscope equipment in the Metallurgy and Material Sciences Laboratory, which were deemed exceptionally vulnerable to vibration and electromagnetic interference. Following discussion with the University it was agreed that the route would follow Charles Babbage Road, with traffic signal control being provided to ensure bus priority.
- 4.6.8. The alignment between West Cambridge and Grange Road was also considered in some depth. The adopted solution



sought to minimise land take from the West Fields by keeping as close as possible to the hedge lines.

- 4.6.9. The use of the Rifle Range track was reconsidered after discussion with the club about the potential conflict between the scheme and existing users. Further consideration was given to the use of Adams Road, which had been reviewed previously. Ultimately, the Rifle Range track was recommended as being better performing despite the operational challenges.

## 4.7 Operating alternatives

### Guidance systems

- 4.7.1. A number of technological guidance systems were considered for C2C, moving away from the traditional, physical guidance system. The assessment covered six guidance technology options, namely:

- kerb;
- optical;
- trolley;
- soft/rail;
- magnetic; and
- wire/cable.

- 4.7.2. The assessment<sup>40</sup> concluded that both kerb guidance and optical guidance achieve most or all of the requirements for the C2C Scheme.

### Optical guidance design

- 4.7.3. Optical guidance systems use onboard technology to steer the vehicle using electromagnetic information conveyed from the busway. The driver controls only the acceleration and braking of the vehicle and can intervene in case of an emergency. Optical information from markings on the road surfacing provides a line of reference. When an onboard device scans the road markings, a computer combines the signal obtained with the dynamic parameters of the vehicle to produce commands (e.g. vehicle speed, yaw rate, steering wheel angle). The commands are transmitted to a guidance motor on the steering column correcting any deviation from the line of reference.

- 4.7.4. Optical guidance requires a standard single carriageway asphalt road surface with surface road markings (likely to be painted) enabling two-way travel within a 7.3m wide carriageway.

- 4.7.5. Benefits of this technology include:

- precise positioning at boarding platforms, helping those with limited mobility;
- smooth transition between continuous guidance and no guidance modes;

<sup>40</sup> Mott Macdonald. Cambridge South East Transport Phase 2, Appendix C: Guidance Technology Options. March 2020.



- limited fixed infrastructure required;
- vehicles can follow a fixed path around corners; and
- technology can be retrofitted to any vehicle.

### Kerb guided design

4.7.6. Kerb guided systems require the construction of kerbs to accommodate the guidance mechanism installed on the vehicles. The guidance mechanism uses small horizontal guide wheel fixed to the steering track of the vehicles to keep contact with the kerbs, guiding the vehicle along the route. Similarly to the optical guidance design, the driver only controls the acceleration and braking.

4.7.7. Kerb guidance requires two separate carriageways with a kerb (normally concrete) that the bus is physically in contact with via wheels projecting from the side of the bus. This would enable one way traffic in each carriage within a carriageway corridor likely to be about 6.3m wide.

4.7.8. Benefits of this technology include:

- guideways that allow for high-speed operation despite the narrow corridor;
- precise positioning at boarding platforms, helping those with limited mobility; and
- options for retrofitting technology to any vehicle.

### Comparison of guidance systems

4.7.9. Both the kerb guided design and the optical guidance design require emergency refuge, emergency access and maintenance access along the service road. Otherwise, key differences include:

- requirement for about 7% more landtake per metre length of the route for the kerb guided system;
- depending on the precise methods, potentially longer construction period for kerb guided systems; and
- assuming a concrete track structure, a smaller area of hard surface associated with the kerb guidance system.

## 4.8 Consultation

4.8.1. Four rounds of public consultation have been held on the Cambourne to Cambridge project since 2015.

4.8.2. The first consultation was held between 12<sup>th</sup> October 2015 and 23<sup>rd</sup> November 2015. It presented six options for the two funding tranches specified by the City Deal Board (**Figure 4-7**). The tranche 1 (Phase 1) section from Madingley Mulch roundabout towards the City, and tranche 2 (Phase 2) west from Madingley Mulch to the Caxton Gibbet roundabout. Three options were presented for each tranche. The 2015 consultation presented options for routes both to the south and north of the existing A428/A1303, as well as on-line options.

4.8.3. As well as providing insight into local interest, and support or opposition for the scheme and its options, a number of alternative and hybrid options were put forward by members of the public.

Figure 4-7 - Six options presented during the 2015 consultation

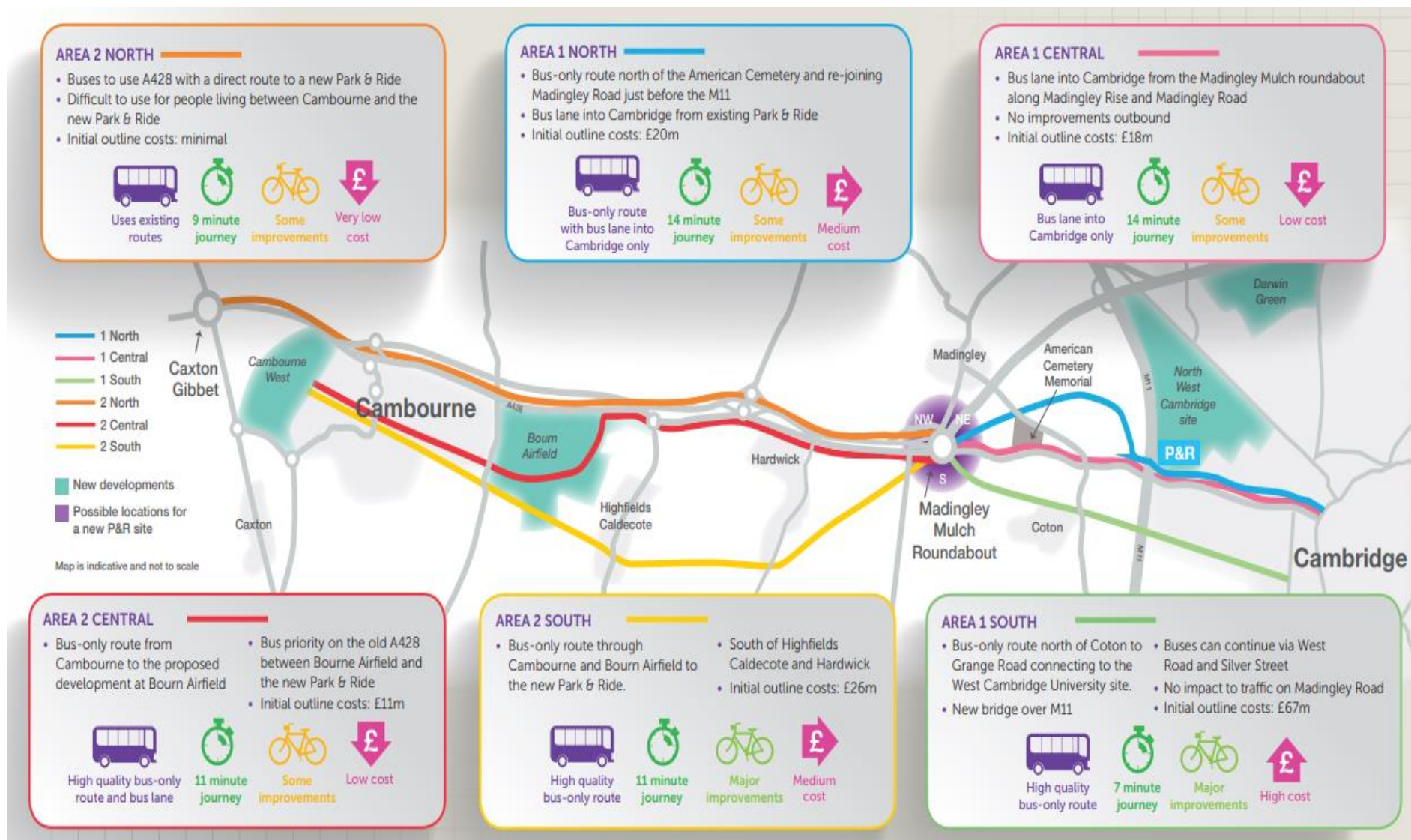


Figure 4-8 - Options presented during the 2017/2018 consultation



- 4.8.4. The second consultation was held between 13<sup>th</sup> November 2017 and 30<sup>th</sup> January 2018, addressing Phase 1 of the scheme<sup>41</sup> (**Figure 4-8**) from Madingley Mulch to Cambridge and park and ride options.
- 4.8.5. Although the preference for Scotland Road park and ride site was clear, this was not the case for the three transport route options, with differences reflecting personal characteristics including age, place of residence and economic status. GCP received a great number of detailed comments, from which it was discerned that the public wanted to see greater refinement before any one of the three route options could be taken forward.
- 4.8.6. The third consultation was held between 4<sup>th</sup> February 2019 and 31<sup>st</sup> March 2019, addressing Phase 2 west of Madingley Mulch, and proposing three similar options, as well as revisiting park and ride options. Key findings<sup>42</sup> established that just under half of respondents indicated a preference for the fully off-road option, with a fifth of respondents each preferring respectively one or other of the on-road options, as well as a little under 10% wanting none of the options. Of the park and ride sites, there was a clear preference for Scotland Farm.
- 4.8.7. The fourth consultation between 16<sup>th</sup> May and 11<sup>th</sup> July 2022 focused on the EIA, and specifically sought views on the potential environmental impacts how to best manage and mitigate them scheme's impacts on the landscape and environment<sup>43</sup>.
- 4.8.8. Almost 600 responses were received, which established general support of the active travel aims and active travel investment, and support for the segregated active travel path.
- 4.8.9. There were several concerns voiced, including most prominently:
- the demand or need for the scheme;
  - the environmental impacts of the scheme;
  - impact of additional traffic, congestion and parking on local residents;
  - construction impacts on air quality, traffic and congestion, as well as wider environmental issues; and
  - loss of agricultural and greenbelt land.

<sup>41</sup> [GCP. Cambourne to Cambridge Better Bus Journeys: Phase One Summary Report of Consultation Findings. Feb 2018](#)

<sup>42</sup> [GCP. Cambourne to Cambridge Better Public Transport project update. June 2019](#)

<sup>43</sup> [Cambourne to Cambridge better public transport and active travel environmental impact assessment - public consultation. Report of Consultation Findings. August 2022.](#)





# 5 The environment along the route

## 5.1 Land uses

- 5.1.1. Travelling west to east, the first 2.3km of the C2C alignment passes through current and planned urban development, first through Upper Cambourne and then into Bourn airfield. The airfield is allocated in the South Cambridgeshire Local Plan for development of a mixed-use settlement, which is expected to be completed over the next 10 to 20 years.
- 5.1.2. Leaving the airfield site, for the next 1.6km C2C aligns within an existing road corridor, passing alongside and south of the A428, through grassland and young woodland planted on the materials deposited following construction of the road. This continues as far as the Scotland Road junction, where the travel hub will be located. The travel hub will occupy 12ha and will displace agricultural (currently arable) land.
- 5.1.3. The C2C alignment continues eastwards along St Neots Road on the north edge of the village of Hardwick. Over this 1.8km length, the route sits within the existing road alignment. It passes by mostly residential uses along the south side of the road, as well as a few commercial premises. Open land and tree planting to its north separates St Neots Road from the A428 to its north.
- 5.1.4. Just west of Long Road the route diverges south from St Neots Road, crossing agricultural land between the built part of Coton

village to its south, and houses along the ridge marked by Madingley Road to its north. East of Cambridge Road, the route passes through Coton Orchard, which includes the remaining part of the original orchard, as well as regenerating scrub. It then rises onto a new bridge over the M11, which is planted with woodland on both its west and east side.

- 5.1.5. East of the M11 the route then enters the urban fringe of Cambridge, passing along Charles Babbage Road between the educational and commercial uses and sports facilities of Cambridge University's West Cambridge development.
- 5.1.6. The route bears south across the 'Cambridge Canal' (a narrow linear pond) and then briefly across open arable land before crossing the Bin Brook and re-entering the urban fringe of the City, passing along an existing track between sports pitches to the south and residential and university properties to the north. The route then joins the existing the existing public highway on Grange Road.

## 5.2 Communities and homes

- 5.2.1. The route passes through or by six main settlements, as well as several solitary or small groups of dwellings.

### Cambourne

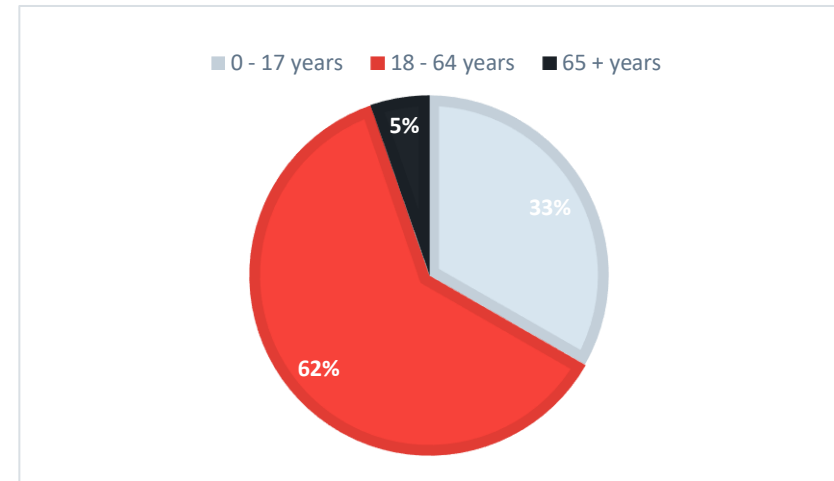
- 5.2.2. Cambourne is a new town 14 km west of Cambridge. Now over 20 years old, it has become the largest settlement in South Cambridgeshire, with a population that has risen sharply



each year (estimated in 2020 at 10,544<sup>44</sup>) due to ongoing house building and a high birth-rate.

- 5.2.3. It comprises three villages, Lower Cambourne being the first to be completed in 2003. The central Greater Cambourne was largely complete by 2008, and the eastern-most Upper Cambourne was largely built out by 2017. The recently approved application for outline planning permission for a residential development west of Lower Cambourne will add a fourth village (Cambourne West) with a further 2,350 homes to the town.
- 5.2.4. Cambourne has a range of facilities including a community centre, shops (including a supermarket), Monkfield primary school, Cambourne Village College secondary school, a hotel, a fitness and sports centre with various sports pitches, a business park, a medical practice, a dentist, a veterinary practice, a police station, allotments and a pub.
- 5.2.5. The settlement has helped instigate development of the transport network, with the extension of the dual-carriageway section of the A428 in 2007 moving much traffic into Cambridge onto this new road.

**Figure 5-1 - Age demographic of Cambourne**



**Bourn Airfield**

- 5.2.6. The Bourn Airfield site, located immediately east of Upper Cambourne, is allocated for the development of a new village of approximately 3,500 dwellings in the South Cambridgeshire Local Plan 2018. Outline planning permission for approx. 3500 dwellings was applied for in 2018<sup>45</sup> - decision currently pending.
- 5.2.7. The development includes a proposed 40 per cent affordable allocation, although no more than 500 homes can be occupied before C2C (or an equivalent public transport link) is in place. The development will also provide places for employment and seeks to provide up to 500 jobs for local residents. The former RAF base, which was closed in 1948, will be transformed into

<sup>44</sup> [Cambridgeshire Insight, population report for Cambourne. Census 2021](#)

<sup>45</sup> Planning ref: S/3440/18/OL.



sustainable development, bringing new schools, places to work, and community hubs, and aims to provide opportunities for both the settlement itself and its surrounding areas.

**Figure 5-2 - Bourn airfield development plan**



Source: Bourn Village District of South Cambridgeshire  
 ([https://www.bourn.org.uk/planning\\_posts/bourn-airfield-development](https://www.bourn.org.uk/planning_posts/bourn-airfield-development))

5.2.8. Runway Park will form part of almost 100 hectares of open space incorporated into the development, which will account for approximately 45% of the site. This will include sports fields, woodland and play areas, as well as cycle paths and

footpaths to allow for ease of access and travel within the community.

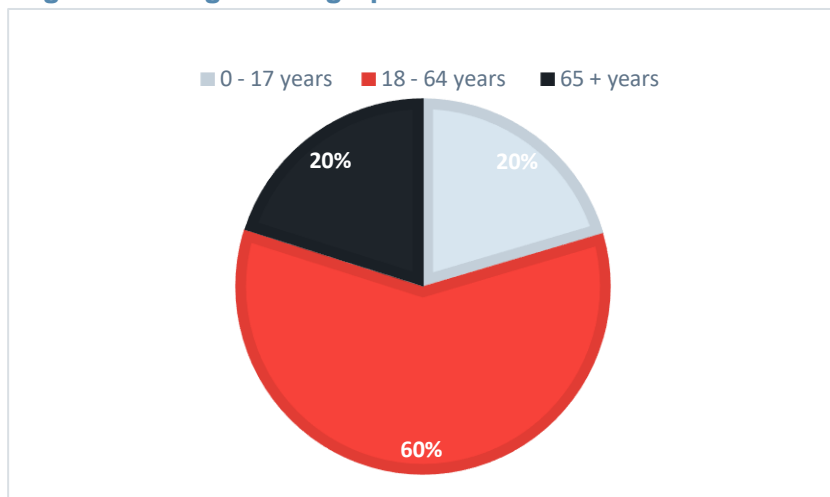
5.2.9. Bourn airfield will be developed in phases, with the first homes expected in 2023/24 and an estimated 530 homes built by 2026/27. A reserved matters application will still need to be submitted and separately approved before construction can begin.

### Hardwick

5.2.10. Hardwick is a village about 10km west of Cambridge. The population was estimated at a little over 3,000 in 2020<sup>46</sup>. The village dates from around 1000 and is recorded in the Domesday Book of 1086. Originally a few houses and farmland around St Mary's Church, on what is now the southern edge of the village, it has expanded greatly since the 1960s, mainly due to an estate of hundreds of houses built on the orchard land to the north of the original village. Since this rapid growth, new housing has been generally intermittent and sporadic.

<sup>46</sup> [Cambridgeshire Insight, population report for Hardwick. Census 2021](#)

**Figure 5-3 - Age demographic of Hardwick**



5.2.11. The village has a single pub located on Main Street, as well as a sports and social club, with football and cricket pitches in the centre of the village. Other facilities include the village shop and post office on Cambridge Road. Hardwick Community Primary School is the local pre- and primary school, with secondary education provided at Comberton Village College, south-west of the village. There are a number of local businesses at the northern edge, based on St Neots Road.

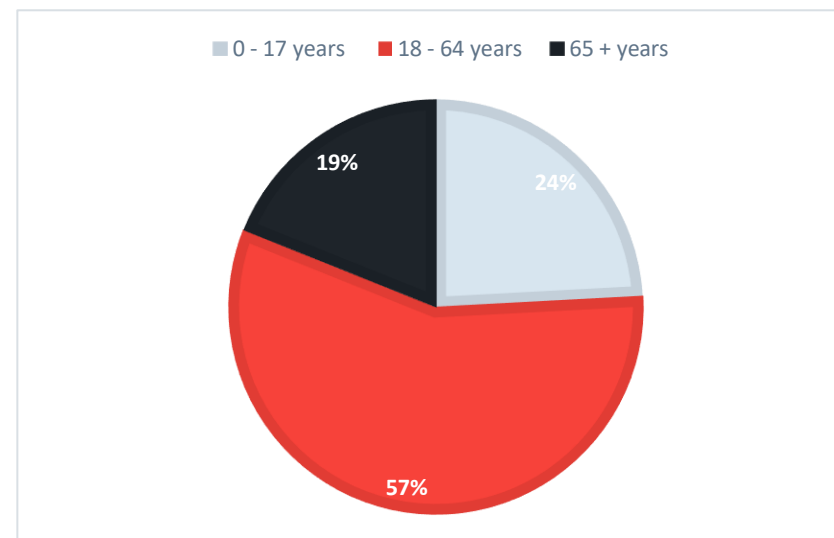
**Coton**

5.2.12. Coton is a small village about 5km west of Cambridge. The parish covers an area of 392 hectares. Its population is estimated at around 920 people<sup>47</sup>. Coton is not mentioned in the Domesday Book, as it was deemed part of Grantchester at

that time. However, it became a separate parish in the Middle Ages.

5.2.13. In addition to its church and village hall, facilities in Coton include a primary school, a restaurant-pub, and a football, cricket and bowls clubs. The Cambridge American Cemetery and Memorial is situated to its north off Madingley Road. A garden centre with a post office, farm shop and café has been developed within part of the Coton Orchard to the north of the village.

**Figure 5-4 - Age demographic of Coton**



<sup>47</sup> [City population website. Coton entry](#)

## West Cambridge

- 5.2.14. Just east of the M11, West Cambridge is a science and research park that is an important part of the University's estate and is key to its continued growth. Development at West Cambridge has been on-going since the 1960s and planning permission was granted in 1999 for the current development framework for the site. Ongoing master planning is seeking to augment the research environment. The University submitted an application for outline planning permission in June 2016<sup>48</sup> (decision currently pending) to support the masterplan review. Outline planning permission was sought for up to 383,300m<sup>2</sup> of academic, commercial and other, more specific 'sui generis' uses to support the proposals to create a premier location for physical sciences and technology.

## West Cambridge fringe (Newnham)

- 5.2.15. Separate to the research hub, but adjacent to it is the largely residential and educational western edge of the city that extends west of Grange Road. As well as the houses that extend south to the Cambridge suburb of Newnham, the area includes several sports pitches and an athletics track, all associated with the university, as well as constituent colleges including Clare Hall, Robinson, Selwyn and Churchill, along with a number of schools.

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<sup>48</sup> Planning ref: 16/1134/OUT

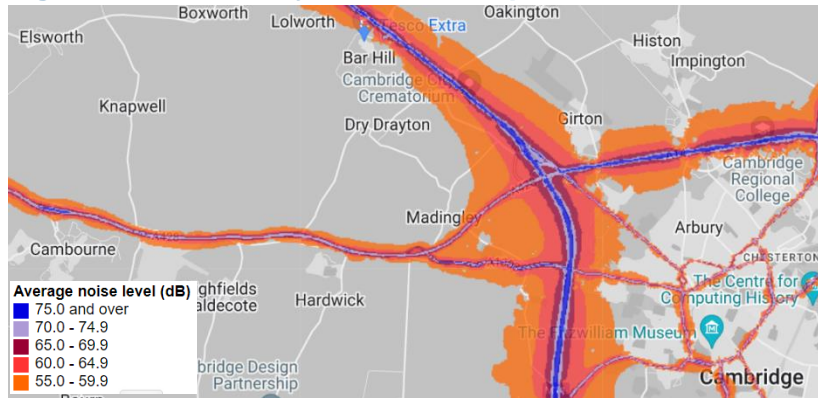
## 5.3 Environmental quality

### Noise

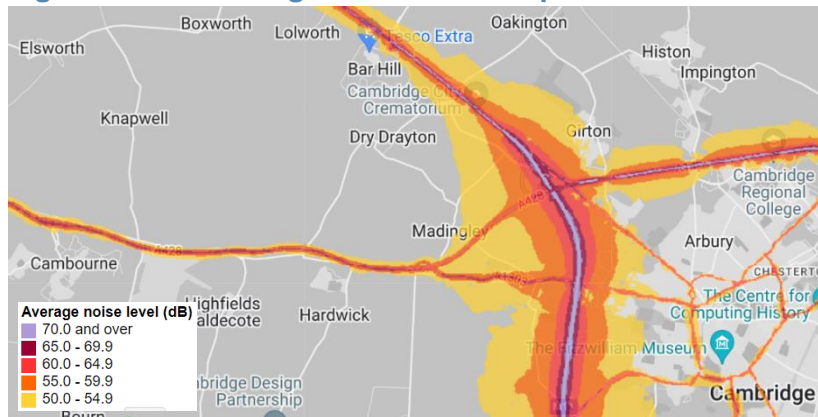
- 5.3.1. Road traffic is a strong determinant of local environmental quality. The acoustic environment for people close to the C2C alignment is largely determined by road traffic noise, especially from the A428 between Bourn and the Madingley Mulch roundabout, and from the M11 between Coton and West Cambridge, as well as the local road network. For receptors further away from the A428 and M11, noise levels will be lower and more representative of a rural environment.
- 5.3.2. Defra maintain noise maps in the vicinity of most major roads including the A428 and M11. These provide an initial appreciation of existing noise levels in the vicinity of the C2C. The noise maps are a product of the strategic national noise mapping exercise undertaken by Defra in 2017 (Round 3) to meet the requirements of the Environmental Noise Directive (Directive 2002/49/EC), transposed by the Environmental Noise (England) Regulations 2006 (as amended). Results are shown for two noise level indicators relevant to this assessment:
- $L_{Aeq,16h}$  - the annual average noise level (in dB) for the 16-hour period between 0700-2300.
  - $L_{night}$  - the nighttime annual average noise level (in dB) where night is defined as 2300-0700.

5.3.3. **Figure 5-5** below presents the Defra noise map for the daytime noise level data for the Scheme limits and surrounding area, and **Figure 5-6** presents the night-time noise level data.

**Figure 5-5 - Defra Daytime Noise Map**



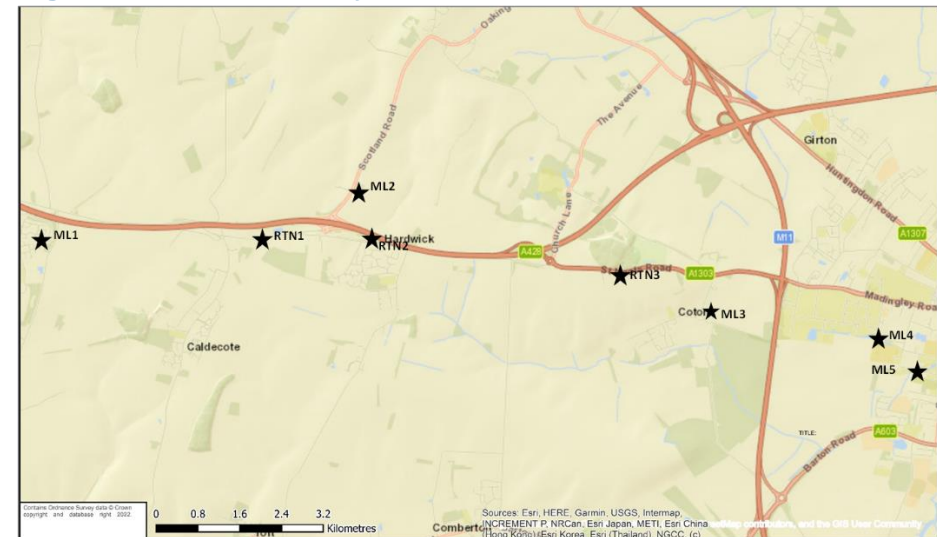
**Figure 5-6 - Defra Night-time Noise Map**



5.3.4. A comprehensive baseline noise survey has been undertaken along the scheme alignment in January 2022 at five long-term monitoring locations (ML) and three short-term road traffic

noise (RTN) locations; these are marked on **Figure 5-7** below. The purpose of the noise survey was to establish the existing noise levels close to the scheme alignment and locations nearby with potentially sensitive receptors. It has also been used to verify the outputs from the 3D noise model that has been created for the scheme to understand how noise impacts might be affected by landform or engineered features, such as bunds and embankments.

**Figure 5-7 - Noise Survey Locations**



5.3.5. A summary of the measured noise levels at each of the monitoring locations, including the range and average, is presented in **Table 5-1** below.



**Table 5-1 – Noise levels recorded at location ML1 – 5 and RTN1 – 3**

Monitoring location	Daytime Noise Levels L <sub>Aeq,16h</sub>	Night-time noise levels L <sub>Aeq,8h</sub>
ML1	44 – 56 dB Average: 50 dB	34 – 43 dB Average: 39 dB
ML2	50 – 55 dB Average: 54 dB	43 – 50 dB Average: 45 dB
ML3	48 – 55 dB Average: 52 dB	42 – 51 dB Average: 48 dB
ML4	51 – 56 dB Average: 53 dB	42 – 51 dB Average: 48 dB
ML5	46 – 51 dB Average: 49 dB	43 – 48 dB Average: 45 dB
Daytime L <sub>A10,3h</sub>		
RTN1	72 dB	
RTN2	77 dB	
RTN3	78 dB	

5.3.6. There are no Noise Important Areas (NIAs) in the vicinity of the scheme<sup>49</sup>.

### Air quality

5.3.7. Road traffic is also the main determinant of local air quality. High traffic levels and frequent congestion in Cambridge have led to much of the City’s designation as an air quality management area (AQMA) by the city council. AQMAs are

declared by local authorities based on levels of key pollutants that exceed nationally set air quality objectives. The Cambridge AQMA, designated for exceedance of the annual mean objective for nitrogen dioxide (NO<sub>2</sub>), extends west to the point where the C2C proposals terminate, at Grange Road.

- 5.3.8. Monitoring data for Cambridge and South Cambridgeshire show that, between 2016 and 2021, there were no exceedances in annual mean NO<sub>2</sub> concentrations at the monitoring sites within 2km of the Scheme in. All monitoring locations within 2km of the Scheme are within the air quality objective in recent years, except for the monitoring site at Parker Street, over 1km east of the Scheme, which exceeded the objective in 2016.
- 5.3.9. A C2C-specific NO<sub>2</sub> monitoring survey was undertaken in 2019 along the Scheme corridor and in the wider study area. The measured concentrations at all 23 monitoring sites are well below the air quality objective, the nearest, on St Neots Road, recording 15.5µg/m<sup>3</sup> of NO<sub>2</sub> in 2019.
- 5.3.10. The nearest PM<sub>10</sub><sup>50</sup> monitoring site within 2km of the Scheme is the one at Parker Street mentioned above. This recorded a steady decline in levels (from 23 µg/m<sup>3</sup> to 18 µg/m<sup>3</sup>) between 2018 and 2021. Levels well below 40 µg/m<sup>3</sup> are considered to represent good air quality.
- 5.3.11. The nearest PM<sub>2.5</sub> monitoring site within 2km buffer of Scheme is at Gonville Place in Cambridge, 1.6km to its east, with levels up to 14 µg/m<sup>3</sup>. Similarly, levels under 50 µg/m<sup>3</sup> are considered to represent good air quality. The measured PM<sub>10</sub> and PM<sub>2.5</sub> concentrations are well below the air quality objectives.

- 5.3.12. Defra’s recorded background concentrations of NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> along the corridor are well below the relevant objectives in 2019.
- 5.3.13. There are numerous locations along the scheme, such as the dwellings at Upper Cambourne and St Neots Road, that would be sensitive to changes in air quality. Madingley Wood SSSI, located approximately 260m north of the Scheme, could also be sensitive to change in emissions due to the Scheme.
- 5.3.14. In summary, data shows that the current pollutant concentrations in the vicinity of the scheme do not exceed the air quality objectives and we would expect air quality along much of the C2C route away from major roads to be generally good. The main source of air quality pollutants that are recorded along the route come from road transport, in particular the contribution from the A428 and A1303.

## 5.4 Soils, geology and landscape

- 5.4.1. The C2C scheme runs across a landscape of mostly lowland agricultural land. The Great Cambridge Landscape Character Assessment<sup>51</sup>, in categorising landscape character areas based on their broadly homogenous characteristics, describes the Bourn Tributaries Lowland Farmlands, which largely accommodates the footprint of the C2C Scheme. This character area is distinguished by its “gently undulating,

intensively farmed arable landscape encompassing densely settled, wide, flat river valleys and their tributaries”. Its key characteristics are listed as:

- low-lying, gently rolling topography crossed by river corridors and drained by small streams;
- open character and often extensive views;
- productive, intensively farmed, predominantly arable landscape that has experienced significant modification during the 20th century, resulting in amalgamation of fields;
- generally sparse woodland cover and fragmented network of hedge boundaries;
- woodland and traditional orchards often define the edge of settlements;
- scattered Medieval moated sites and stone churches are characteristic features; and
- well settled landscape with a relatively dense rural settlement pattern comprising large and small villages and outlying farmsteads.

<sup>49</sup> Based on strategic noise mapping prepared by DEFRA, produced in line with the requirements of the UK noise action plans, NIAs are hotspots that represent the highest 1% of noise levels at residential locations.

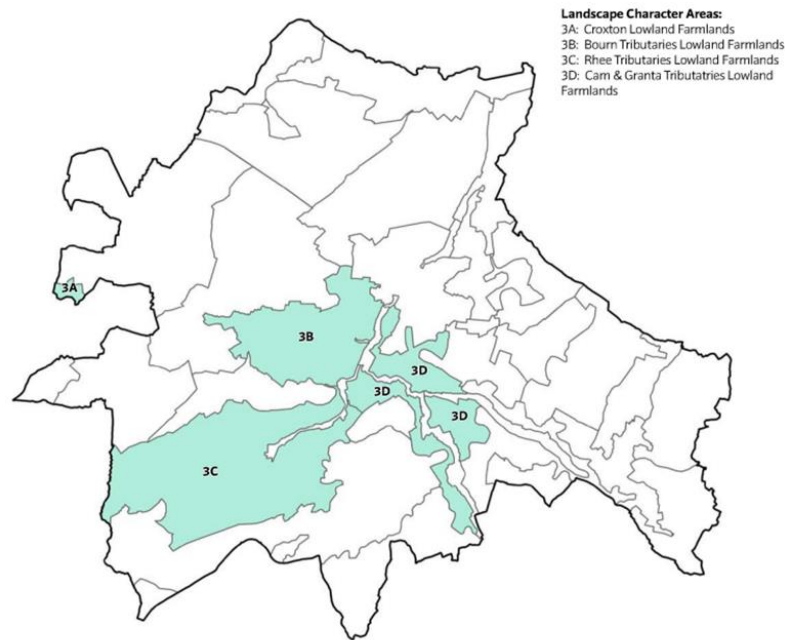
<sup>50</sup> PM<sub>10</sub> are very small particles found in dust and smoke. They have a diameter of 10 micrometres (0.01 mm) or smaller. The smallest PM<sub>2.5</sub> are

formed from burning fuel and chemical reactions that take place in the atmosphere.

<sup>51</sup> [Chris Blandford Associates. Greater Cambridge Landscape Character Assessment](#). Feb 2021. See P69



**Figure 5-8 - Landscape character type 3: Lowland farmlands**



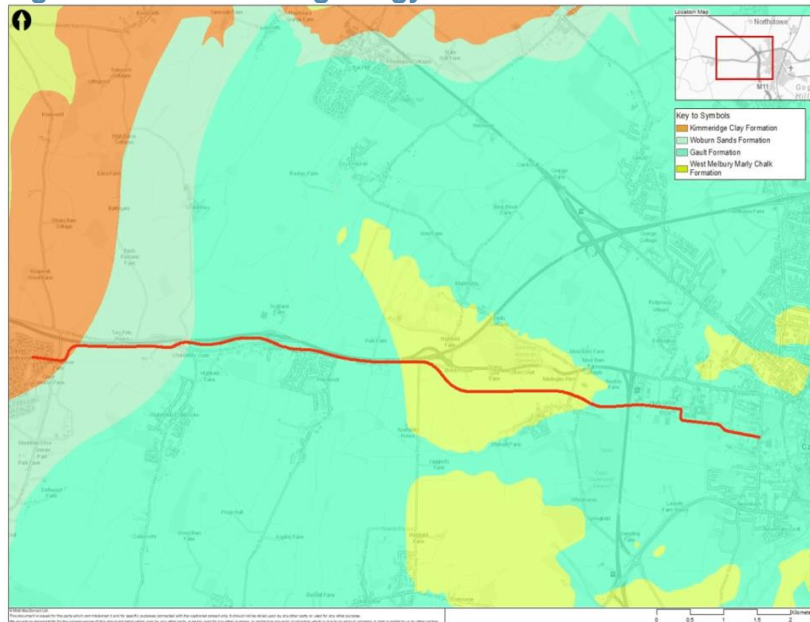
5.4.2. The rich farmland and remnant ancient woodlands are very much a product of the area’s geology. Geological bands follow a generally south-west to north-east alignment, reflecting the southwards migration of the glaciers about 400,000 years ago. The bedrock geology is substantially Lower Cretaceous Gault Clay with remnants of Lower Chalk outcropping through this where erosion and subsequent weathering has exposed it, particularly to the south-west of Cambridge. This is overlain, especially in the west, by glacial till, a clay-rich deposit that includes lumps of chalk, sandstone, limestone and flint, that

was left behind as glaciers retreated. The till is relatively resistant and forms higher ground on the Western Plateau that rises gradually west of Toft and Hardwick as far as St Neots. On this, the till can be over 40m thick, though older rocks are exposed in places. Springs form occasionally where water is forced up over impermeable clay. The till occasionally conceals deep, hidden channels, that have become infilled with other materials.

**Figure 5-9 - Superficial geology**



**Figure 5-10 - Bedrock geology**



- 5.4.3. Soils in the area have developed since the ice sheet retreated and are formed on a variety of glacial and post-glacial deposits or directly on the underlying bedrock. Soils on the Western Plateau are predominantly Hanslope soils that have developed on the chalky tills, giving them a slowly permeable, calcareous clayey nature. Natural fertility is high and they are commonly used for the production of winter cereals.
- 5.4.4. Agricultural Land Classification maps (post 1988) show land between Cambourne and the Scotland Farm Travel Hub to be

a mixture of Grade 2, 3a and 3b quality land. The better-quality Grade 2 areas are associated with slight topographic lows which align with drainage features in the area, and consequently the route only crosses short stretches these.

- 5.4.5. Land between Hardwick and the M11 is only covered by a pre-1988 dataset, which shows all land to be categorised as Grade 2, which could be overly conservative<sup>52</sup>.
- 5.4.6. The Natural England dataset indicates the vast majority of the scheme to be on Grade 2 land, the exceptions being east of the M11 and around the village of Coton and Hardwick, where Grade 3 land prevails.

## 5.5 The water environment

### Surface water

- 5.5.1. Passing eastwards, the route follows the low, flat ridge of the western plateau on which Cambourne, the A428 and the A1303 are located. Streams and field drains flow north and south from this. Around Cambourne the Scheme lies within the overall catchment of the Great Ouse but enters the catchment of the River Cam eastwards from Bourn airfield.
- 5.5.2. Callow Brook runs northwards through Hardwick and is culverted below the St Neots Road and A428. It flows near to the eastern edge of the travel hub continuing northwards to become the Old West river at Dry Drayton. Bin Brook flows from the plateau south-eastwards passing through Coton south of the scheme and then finally bearing north at Newnham

<sup>52</sup> More accurate post 1988 datasets show land classified as Grade 2 in the earlier datasets as Grade 3a and 3b

where its course and the route alignment intersect west of Grange Road. Various other drainage ditches along field edges are crossed by the scheme. No chalk streams are crossed by the route.

### Groundwater

5.5.3. The route is largely routed over low permeability formations with limited groundwater potential. Two principal aquifers are noted:

- Sandstones of the Woburn Sands formation underlie Bourn Airfield. This is part of the Cam and Ely Ouse Woburn Sands groundwater body and is in poor chemical condition though containing good quantities of groundwater.
- From Madingley Mulch to the Coton Orchard the route passes over the West Melbury Marl Chalk formation, an isolated outcrop on the north-western limit of chalk in East Anglia. It is draped over the underlying Gault formation and is likely to be relatively thin in the study area. There are no springs visible in the area around the edge of the chalk formation, indicating low levels of groundwater.

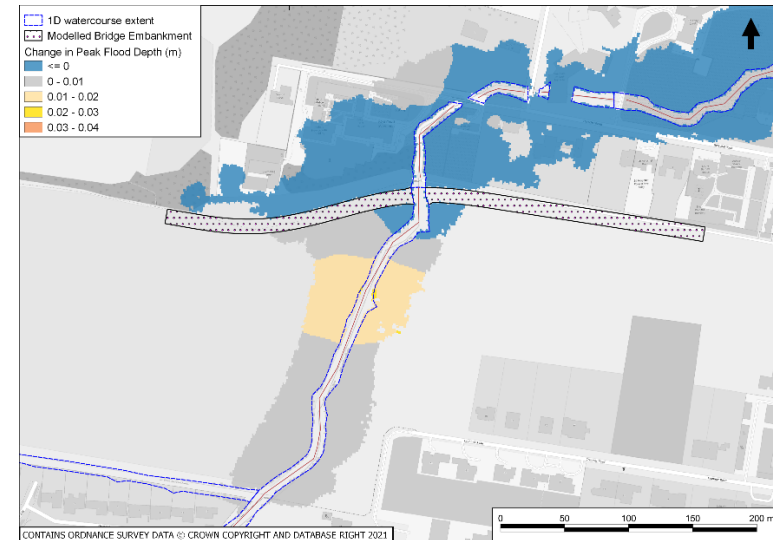
5.5.4. No source protection zones - where groundwater abstraction points are vulnerable to pollution - are crossed by the scheme.

### Flooding

5.5.5. Most of the C2C scheme crosses land of very low (Flood Zone 1) flood risk. However, there is a small area in high (Flood Zone 3) flood risk, where the risk of flooding from Bin Brook, associated with the floodplain of the River Cam, is greater than 1 in 100 in any year.

5.5.6. There are pockets of land at high flood risk from surface water sources, typically associated with natural overland flow paths and local depressions in topography where surface water runoff can accumulate during or following heavy rainfall events.

Figure 5-11 Bin Brook Flood Model



## 5.6 Nature

### Survey and research

5.6.1. The habitats and wildlife that occurs along the C2C scheme have been characterised and assessed by desk research and a wide programme of surveys undertaken over the preceding years and months. As well as habitat surveys, that have classified the land according to a given set of habitat types, there have been surveys for bats, breeding and wintering birds, reptiles, aquatic fauna, and invertebrates. There have

also been surveys of particular species, including badgers, otters, water voles and white clawed crayfish along Bin Brook, and of barn owls and great crested newts. The surveys have focused on the areas where the species or faunal groups are likely to be found. Survey scopes have been agreed by both the county and city ecologists, and the bat survey strategy has been endorsed by Natural England.

- 5.6.2. Badger and water vole have been identified within the survey areas, as well as a range of wintering and breeding bird species associated with the habitat types present with the local area. No great crested newts have been recorded within any of the water bodies surveyed.

### Habitat character

- 5.6.3. The great majority of open land crossed by the scheme is arable farmland, including the footprint of the travel hub. This may have occasional species of interest, such as skylarks during the summer and golden plover during the winter, but it is generally of low importance for wildlife. Locations of greater interest include Coton Orchard between Cambridge Road in Coton and the M11, the scrubland and young woods on the east side of the M11 (designated a city wildlife site), and Bin Brook (also a city wildlife site), which is crossed as the scheme enters the edge of Cambridge. A map displaying the location is presented in **Figure 5-12** and **Figure 5-13**.
- 5.6.4. There are also several hedgerows crossed by the scheme. These are in various conditions, and each has been surveyed to determine its relative importance for nature conservation. A hedgerow along the Coton path, which links Coton with the Madingley Road, is designated a county wildlife site.

- 5.6.5. The route mostly avoids woodland or wooded areas. In areas where more notable trees could be affected by the scheme, arboriculture surveys have been undertaken to establish any risks and to provide guidance to protecting potentially affected trees or groups of trees. A copper beech and a pair of black pines in gardens that back onto the Rifle Range track west of Grange Road, are designated with tree preservation orders (TPOs).

- 5.6.6. As well, there are habitats that are not directly impinged, but which are located near the route, and which may harbour species that could be impacted directly or indirectly. The woodland that separates St Neots Road from the A428, and Comberton plantation just south of Madingley Mulch roundabout are two such locations, and the scheme alignment has been altered to avoid both of these.

- 5.6.7. Madingley Wood, north of the A1303 Madingley Road, is approximately 260m north of the Scheme limits. This SSSI is a nationally important area recognised for its ancient woodland and various species of plants and animals. The wood is typical for this part of Cambridgeshire and is a remnant of a once common habitat, with other examples found at more distant locations, including Hardwick Wood about 2km south of the scheme, and the more distant still, Eversden Wood. The importance of these habitats for bats, including the rare barbastelle bat, is recognised, and an extensive programme of bat surveys has been a feature of the ecological assessment.

### Vegetation survey

- 5.6.8. A Phase 1 habitat survey undertaken in 2017 by Cambridge Ecology identified a mosaic of terrestrial and aquatic habitats,

with the potential to support notable plant communities. Further surveys followed, using the National Vegetation Classification (NVC) standard, which classifies vascular plant, bryophyte and macro-lichen species into named vegetation types.

- 5.6.9. Cambridge Ecology undertook an NVC survey of semi-natural woodland, unimproved and species rich semi-improved grassland as well as one arable field margin survey during 2021. Other areas of interest identified from the 2017 Phase 1 surveys were NVC-surveyed by WSP in July 2022. These included one grassland habitat (reservoirs site north of Coton) and three arable field margins. None of the field margins were considered to qualify as Important Arable Plant Areas under the NVC system.

### **Bats**

- 5.6.10. Prior records suggested at least seven bat species in the area, including barbastelle bats. An extensive programme of inspections and monitoring looking at potential roosts, crossing

points and migration paths in and around the C2C scheme has provided a clear picture of the way the area is used by bats and where important foraging and commuting routes are within the landscape.

- 5.6.11. Barbastelle are known to have major populations supported within both Eversden Wood and Wimpole Wood (located several kilometres south of the scheme). As a result, these sites are together designated a Special Area of Conservation (SAC) under the Habitat Regulations. Owing to the potential for the scheme to impact barbastelle bats as they move across the area and the consequent impact on the designation status of the woods that support them, a special assessment process (termed a Habitats Regulations Assessment) has been undertaken. In addition to the techniques described above, C2C has pooled information from radio tracking assessments for other local development projects, including East West Rail and the A428 Black Cat to Caxton Gibbett improvements, where bats are captured and are fitted with radio-tags to allow more precise information on their movements.

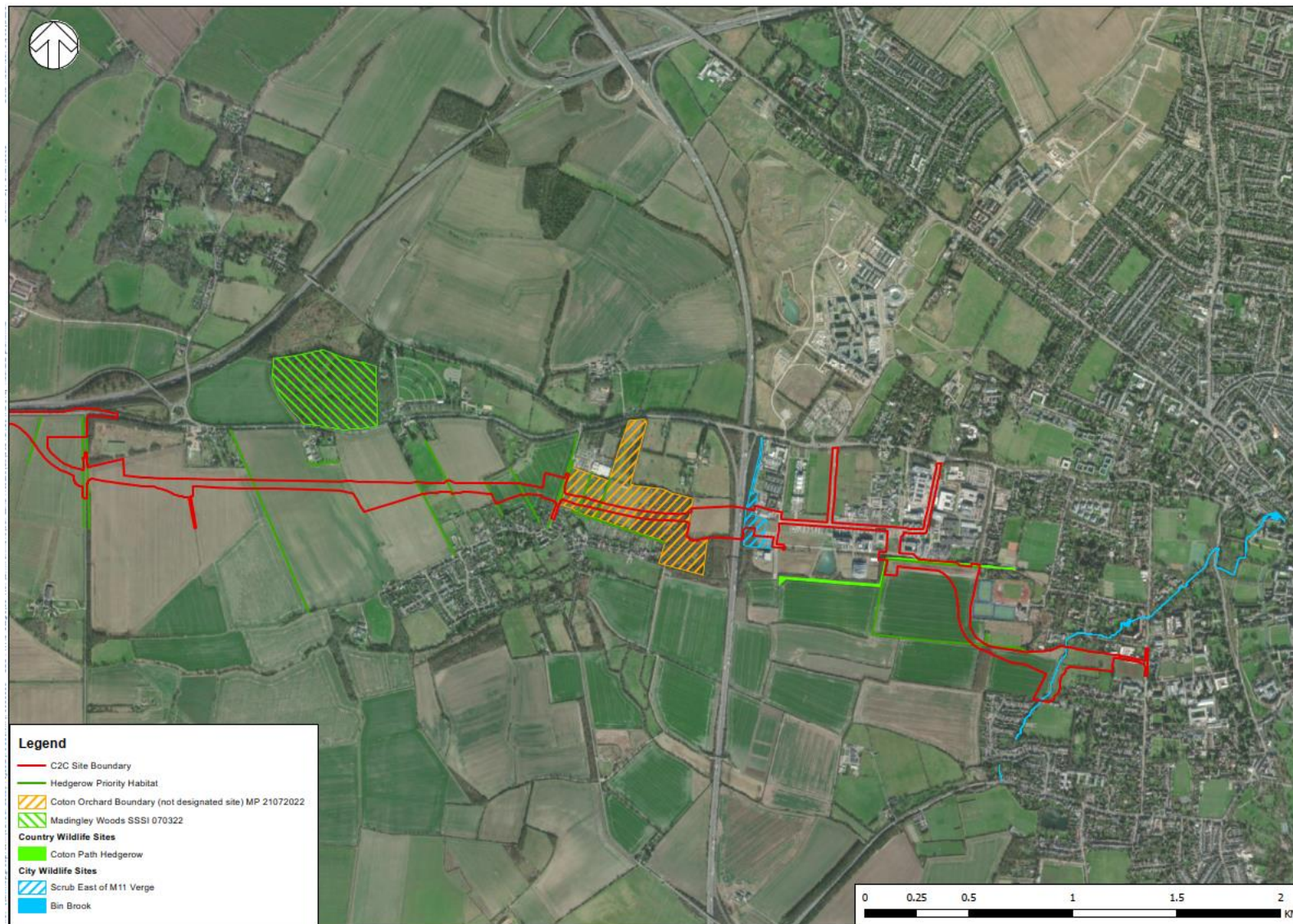


Figure 5-12 - Key habitats within the western extent of the C2C Scheme





Figure 5-13 - Key habitats within the eastern extent of the C2C Scheme



5.6.12. The surveys have identified foraging routes for a range of species and also the location roosts near to the scheme. The data from these surveys has informed the landscaping design so that impacts on bats can be adequately avoided and mitigated.

### **Badgers**

5.6.13. The area is well used by badgers. Various surveys since 2017 identified 93 setts within 2km of the scheme and 33 setts within 250m of the LOD. Ten of the 93 were so called 'main setts', with six occurring within the 250m survey area. Main setts are generally used for breeding and are in year-round use. Nine setts were recorded within the LOD including one main sett, three subsidiary setts (used discontinuously) and five outliers (used sporadically). A further six setts (one main, three subsidiary and two outliers) are within a 30m of the LOD.

5.6.14. There were five recorded mammal paths along the edge of the field east of Long Road, and three mammal paths and two badger paths along the hedges within Coton Orchard.

### **Invertebrates**

5.6.15. Coton Orchard alone was surveyed for invertebrates, as it was considered the only area along the route likely to support an important assemblage of invertebrates. The survey confirmed its support for a diverse range of invertebrates, including 14 species currently regarded as nationally scarce, though with certain areas supporting more rarities than others. Amongst the 600 specimens collected were 239 species, including 119

species of Lepidoptera (moths mostly, as well as butterflies); 38 species of Coleoptera (beetles); 25 species of Hymenoptera (bees, wasps, ants and sawflies); 13 species of Hemiptera (true bugs); and 12 species of Diptera (true flies).

### **Breeding and wintering birds**

5.6.16. Sixty-two species of breeding bird were recorded within the survey area, including 20 that are legally protected, as well as several species of conservation concern, namely: dunnock, greenfinch, house martin, house sparrow, mistle thrush, song thrush, skylark, starling and yellowhammer.

5.6.17. Sixty-seven species of bird were recorded on or over the survey area during the wintering bird surveys.: These included 35 notable species<sup>53</sup> recorded during day-time surveys and 22 notable species recorded during the dusk surveys, including roosting golden plover with up to 35 individuals counted towards the west of the scheme.

### **Barn owls**

5.6.18. Barn owls are known to occur in the area. Previous survey and desk studies from 2020/21 confirmed three breeding sites and four potential nesting sites (in the form of inactive nest boxes) within 1.5km of the scheme; two inactive nest boxes and one active roost site were recorded inside the LOD.

5.6.19. Surveys commissioned in 2022 found no conclusive evidence of barn owls, with no breeding sites or active roost sites present within the LOD or within a 1.5km of it, although one building and four barn owl nest boxes offered potential nesting

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<sup>53</sup> Notable by virtue of being on one or more conservation lists

sites. Several other temporary resting sites and potential nesting sites were recorded up to 1.5km from the Scheme.

- 5.6.20. Good (optimal) foraging habitat for barn owls is scarce, and limited to Coton Orchard; suboptimal habitat is scattered around the survey area, notably on the Bourn airfield site.

### Other species

- 5.6.21. Of the nine accessible water bodies identified within 250m of the scheme with a potential to support great crested newts, none provided evidence of this species (including environmental DNA).
- 5.6.22. Reptile surveys carried out in 2018, 2021 and 2022 found no reptile populations within the limits, although low populations of grass snake and common lizard were recorded nearby. Grass snakes were recorded adjacent to the University Sports Ground, approximately 40m away, and common lizards were recorded in the grassland by the covered reservoir south of the A1303 at Madingley Rise next to Long Road, approximately 70m away.

### Biodiversity net gain

- 5.6.23. The Environment Act 2021 makes provision for a grants of planning permission (including deemed grants of planning permission) in England to be subject to a condition to secure a biodiversity gain objective (known as Biodiversity Net Gain, or BNG). Although the implementing legislation for BNG has not yet been laid before Parliament, it is intended that BNG will become mandatory in November 2023 for new planning applications. Irrespective of this, the C2C scheme has made provision for the delivery of BNG. The habitat surveys being

undertaken throughout the C2C scheme will determine the biodiversity value of the existing habitats, expressed as “biodiversity units”.

- 5.6.24. The relevant part of the Environment Act 2021 (which inserts Section 90A and Schedule 7A into the Town and Country Planning Act 1990) will, when in force, provide that there should be an increase of at least 10% in biodiversity units, with the units maintained for at least 30 years after the development is completed. The C2C scheme will aim to deliver a 20% net gain, which is in line with the Greater Cambridge Shared Planning Biodiversity Supplementary Planning Document and the Doubling Nature Vision, adopted by South Cambridgeshire District Council.
- 5.6.25. Part of the C2C scheme is located within the Cambridge Nature Network which is part of the national Nature Recovery Network. These recovery networks are designed to highlight the best areas to create new habitats and large-scale natural greenspaces. Habitat creation through the scheme to achieve 20% net gain will aim to contribute to these recovery areas.

## 5.7 Heritage

### Information and surveys

- 5.7.1. Information about the history of the area and its potential to yield archaeological remains, as well as about surface structures and landscapes of heritage interest, has been developed through extensive documentary research from local and national records and archives, and from historical maps. It includes findings from 16 previous archaeological investigations completed within the vicinity of the C2C route,



notably at the eastern and western ends. These have used aerial photographs, LiDAR data and geophysical survey, as well as intrusive archaeological fieldwork such as evaluation trial trenching, targeted archaeological excavation and archaeological watching briefs.

- 5.7.2. The environmental assessment included a programme of archaeological fieldwork including geophysical survey and targeted trial trenching in the central section of the scheme.

### Archaeology

- 5.7.3. There is little evidence for activity before the Iron Age, though the Iron Age landscape itself would have been dotted with small-ditched farmsteads and associated field systems, and there is a high potential for Iron Age remains, particularly in the eastern half of the Scheme.
- 5.7.4. Remains of Roman settlement are also likely, with previous investigations having identified Romano-British field systems and settlements at both the western and eastern ends of the scheme. A substantial Roman settlement is known to have existed either side of Long Road; this is likely to extend beyond the areas that were investigated and into the LOD. Two Roman roads are located within the study area. Akeman Street is thought to have run from Cambridge to Arrington and is thought to have crossed through the eastern end of the Scheme on a north–east to south–west alignment. Akeman Street was identified during archaeological investigations at Wilberforce Road 30m north of the Scheme. The second Roman road is thought to have been a minor road on the same course as the modern A428. The postulated line of this road, running east to west, cuts through parts of the western side of

the Scheme. Previous archaeological investigations have also identified Romano-British field systems and settlements at both the western and eastern ends of the scheme. A substantial Roman settlement is known to have existed either side of Long Road; this is likely to extend beyond the areas that were investigated and into the LOD.

- 5.7.5. At the eastern end of the Scheme, at the edge of modern Cambridge, an early medieval site used, amongst other things, for funerary activity was identified 70m south-east of the scheme, and may extend up to and across the scheme. Otherwise, little is expected from this period of settlement.
- 5.7.6. In contrast, later medieval and post-medieval remains are far more likely to be found. There is extensive evidence from aerial photographs, geophysical survey and intrusive investigations across the site of former ridge and furrow field systems and former field boundaries, ditches and trackways.
- 5.7.7. Evidence of the former 19th century university rifle range may be present at the eastern end of the Scheme. There is also a high likelihood of buried remains of the former World War II Bourn Airfield to have survived.

### Built heritage

- 5.7.8. The Scheme limits contain no nationally protected assets, such as scheduled monuments, listed buildings or registered parks and gardens, although it is in proximity to several assets.. The far eastern end of the scheme extends into the West Cambridge Conservation Area. This includes within the study area, the Grade II\* listed building Clare Hall, 25m north of the scheme, which was designed by Ralph Erskine and completed in 1969; and 11 Grade II listed buildings, the closest of which is



No.48 Grange Road, 20m to the east. The Scheme passes along part of the northern boundary of the Coton conservation area. Twenty-two other listed structures lie within 250m of the scheme, including one Grade I (St Peter’s Church, Coton) and two Grade II\* listed buildings.

- 5.7.9. The American Military Cemetery at Madingley north of the scheme is a Grade I registered park and garden that extends to within 240m of the Scheme limits; it includes a Grade II\* listed memorial, 320m away.
- 5.7.10. Locally listed buildings located near the scheme include entrances lodges to Childerley Hall (Gate House and Chapelgate), 50m from the scheme; and Nos.5A&B Herschel Road, built in 1892 by Ernest Newton, 30m from the scheme.

**Figure 5-11 - Gate House and Chapelgate**



## 5.8 A changing environment

### Growing population

- 5.8.1. There are several forces of change on the environment around Cambridge. The ‘Cambridge Phenomenon’ describes how the city’s thriving entrepreneurial environment has grown over the last 60 years from its historic academic foundations to become one of the leading technology clusters in the world. It is now home to over 30 science parks, and over 5,000 ‘knowledge-intensive’ (KI) businesses. At the last count, over 37,000 staff were employed at universities and other KI research organisations in the area, making the Cambridge Cluster one of the largest and most dynamic concentrations of KI organisations in Europe<sup>54</sup>.
- 5.8.2. With employment growth comes the need for houses to accommodate them, and all the health, transport, educational, retail and amenity infrastructure and facilities (itself generating further population growth) that are needed to support them.
- 5.8.3. The South Cambridgeshire Local Plan 2018 has a target of delivering an additional 22,000 jobs in the district between 2011 and 2031. The Cambridge Local Plan 2018 identifies the need for 22,100 jobs between 2011 and 2031. Employment land that is allocated in local plans for major development includes:
  - Grange Farm off Wilberforce Road (Cambridge Local Plan Reference: U3) – allocated for student housing.

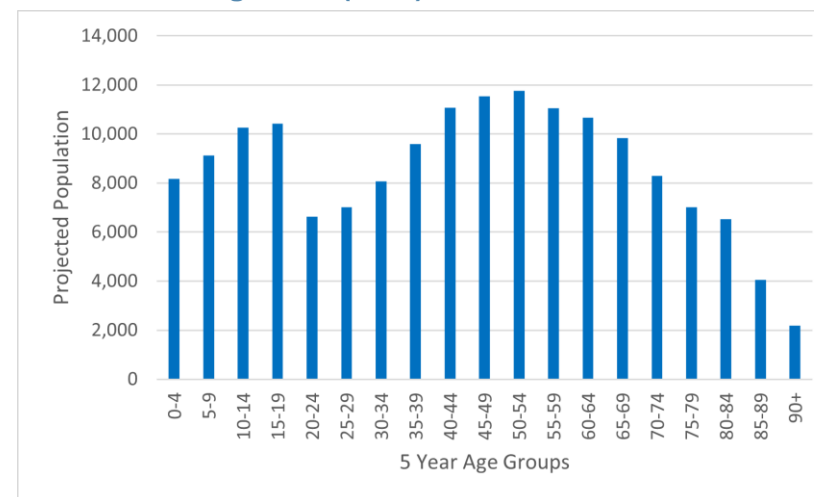
<sup>54</sup> [The Cambridge Phenomenon: An Innovation System Built on Public Private Partnership](#)

- West Cambridge Site (Local Plan Reference: M13) – allocated for university development and related uses including research institutes, laboratories, student accommodation, supporting infrastructure and related services and community facilities.
- Bourn Airfield New Village (South Cambridgeshire Local Plan Reference: SS/7) – allocated for a new settlement of 3,500 homes as well as supporting services and facilities.

- 5.8.4. Between the last two censuses (held in 2011 and 2021), the population of Cambridge increased by 17.6%, from around 123,900 in 2011 to around 145,700 in 2021<sup>55</sup>. This represents the largest percentage increase in the East of England, which itself has seen a population increase of 8.3%, compared with national growth of 6.6%. Population growth in Cambridge also saw an increased density of settlement with around 25.6 people per football pitch-sized piece of land, compared with 21.7 in 2011. This area was among the top 20% most densely populated English local authority areas at the last census.
- 5.8.5. The 2021 Census recorded population of Cambridge is, according to the Cambridge Local Plan 2018, expected to increase to 150,000 in 2031.
- 5.8.6. Between the censuses in 2011 and 2021, the population of South Cambridgeshire increased by 9.0%, from just under 148,800 to around 162,100. This exceeds the proportionate increases seen for the East of England (8.3%) and for England as a whole (6.6%).

<sup>55</sup> ONS. [How life has changed in Cambridge: Census 2021 \(ons.gov.uk\)](https://www.ons.gov.uk)

**Figure 5-15 - Age Breakdown of Population Projections for South Cambridgeshire (2031)**



- 5.8.7. With traffic congestion and soaring house prices two of Cambridge’s most pressing challenges, investment from the City Deal programme will play a fundamental role in ensuring that infrastructure in Cambridge can keep pace with expansion. The need for 33,500 new homes across Greater Cambridge has been identified through the South Cambridgeshire and City councils’ adopted local plans<sup>56</sup>. The South Cambridgeshire Local Plan 2018 outlines the Greater Cambridge housing trajectory and its target of delivering a net increase of 19,500 homes between 2011 and 2031. The Cambridge Local Plan 2018 identified the need for 14,000 homes in Cambridge City. Locally to the Scheme, there is an

<sup>56</sup> <https://www.cambridge.gov.uk/media/7296/greater-cambridge-housing-strategy-2019.pdf>

allocation of 2,350 houses West of Lower Cambourne, as well as 3,500 houses at Bourn airfield.

- 5.8.8. The other key developments that have been assumed to be taking place in the more immediate future, based on pending and granted planning consents are outlined in the cumulative assessment (See ES Chapter 11).

## Changing climate

### Defining the future scenario

- 5.8.9. The UK's climate is changing. 2021 was 0.1°C warmer than the 1991–2020 average, and the 18th warmest year since 1884, with the UK's fifth driest April and second wettest May since 1836<sup>57</sup>.
- 5.8.10. Understanding how the impacts of future climate could affect the operation and maintenance of C2C needs to be considered within the scheme's design. Equally, the ES needs to describe how climate change could affect the outcomes of environmental impacts; for example by changing baseline environmental conditions and characteristics, or by exacerbating (or ameliorating) impacts due to the scheme.
- 5.8.11. The environmental assessment has prepared and analysed climate projections, based on prevailing climate trends. The projections have used a high emissions scenario, known as the Representative Concentration Pathway (RCP) 8.5, which equates to a reasonable worst-case scenario, and assumes an

outcome with greenhouse gas emissions not drastically reduced.

- 5.8.12. The current baseline uses recorded trends from the Met Office<sup>58,59</sup> for the period 1981–2010. Climate projections use UK Climate Projections 2018 (UKCP18)<sup>60</sup> and the UK Climate Resilience Programme Climate Risk Indicators (CRI)<sup>61</sup>. The summary of projections for Cambridge South provided here is augmented by the Climate Resilience technical report.

### The local context

- 5.8.13. Generally the east of England is drier, warmer, sunnier and less windy than the west and north of England. In terms of rainfall, eastern England includes some of the driest areas in the country.
- 5.8.14. **Figure 5-12** and **Figure 5-13** illustrate the drier warmer weather in Cambridge.

<sup>57</sup> [University of Cambridge, State of the UK Climate 2021](#)

<sup>58</sup> [Met Office \(2016\) Eastern England Climate](#)

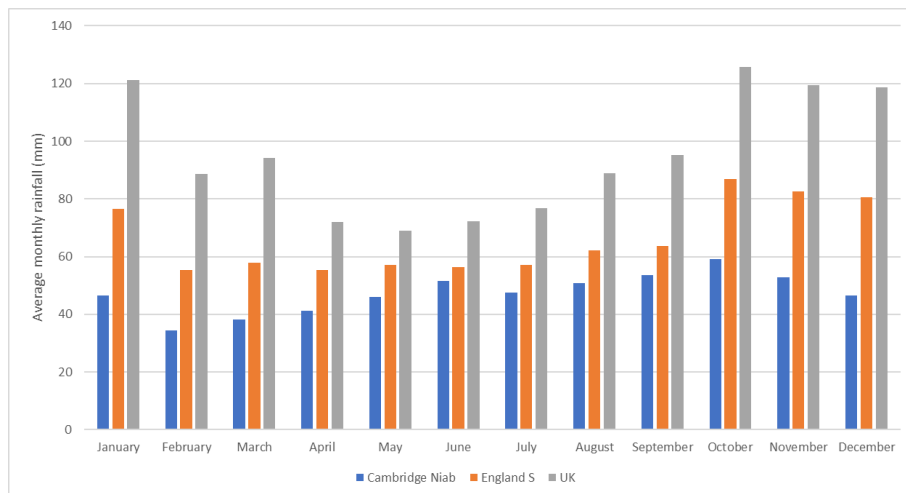
<sup>59</sup> [Met Office \(2022\) UK Climate Averages](#)

<sup>60</sup> [UKCP18 Climate Projections](#)

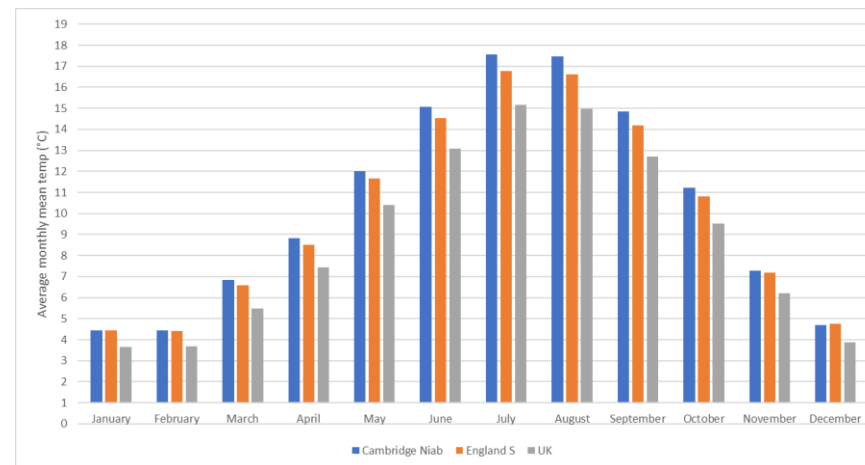
<sup>61</sup> [Climate Risk Indicators](#)



**Figure 5-12 - Long term average monthly rainfall for Cambridge (1981-2010)** <sup>59</sup>



**Figure 5-13- Long-term average mean monthly temperature for Cambridge (1981 – 2010)** <sup>59</sup>



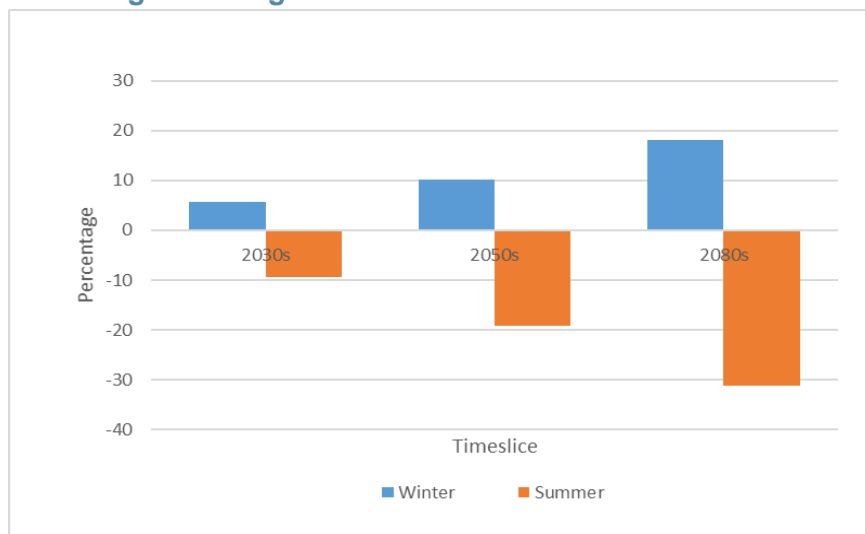
5.8.15. Eastern England is one of the calmer parts of the UK, sheltered from Atlantic weather. Winds are typically stronger during the day than by night, generated by warmer temperatures, resulting in higher average wind speeds and more gusty winds. The UK has an average of 33 tornadoes reported each year., and Eastern England has the greatest frequency of tornadoes in the UK. Both the longest tornado track and the largest outbreak of tornadoes in the UK occurred in Eastern England<sup>58</sup>.

**Climate projections**

5.8.16. Climate change is projected to lead to wetter winters and drier summers, with increasing frequency and intensity of extreme heat events.

- 5.8.17. **Figure 5-14** illustrates this projection for the South Cambridgeshire region. This predicts 18% more winter rainfall and 31% less summer rainfall by the 2080s.
- 5.8.18. Extreme rainfall events are expected to increase, with record breaking wettest months expected to be over three times more common by the 2080s than they have been up to now.

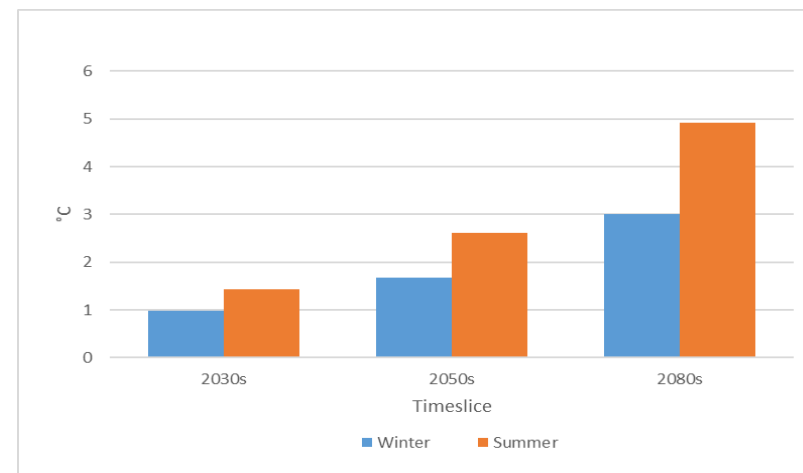
**Figure 5-14 - Projected change in rainfall (%) in the South Cambridgeshire region under RCP 8.5<sup>61</sup>**



- 5.8.19. **Figure 5-15** demonstrates projections of changing temperature for South Cambridgeshire with winter temperature increasing by 3°C and summer temperature by 5°C by the 2080s.
- 5.8.20. The intensity, frequency and duration of heatwaves are projected to increase under future warming. The projected number of heatwave events per year under RCP8.5 for the South Cambridgeshire region is projected to increase from one

event per year (in the baseline scenario (1981-2010)) to five events per year by the 2080s.

**Figure 5-15- Projected change in average temperature °C in the South Cambridgeshire region under RCP 8.5<sup>61</sup>**



- 5.8.21. Extreme heat (where the maximum temperatures is above 26°C) can result in damage to infrastructure in the form of melting of asphalt road surfaces. For the South Cambridgeshire region, at present, these occur on average 19 days per year. This is projected to increase to 74 days by the 2080s.
- 5.8.22. UKCP18 guidance presents a wide spread of future changes in mean surface wind speed, with the uncertainty largely due to natural climate variability. The global projections show an increase in near surface wind speeds over the UK during the winter, for the second half of the 21st century



# 6 Mitigation through design and practice

## 6.1 Concepts

- 6.1.1. The EIA Regulations require that the ES provides "a description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements .... and should cover both the construction and operational phases."
- 6.1.2. The scheme proposals, including: the route alignment; the design of the various scheme components; the way these will be constructed; the operation of the bus service, the travel hub and other aspects; and the servicing and maintenance of the scheme, have been developed taking account of transport, engineering, land, economic, cost and environmental and community considerations. In this way, the scheme proposals have accommodated these various considerations as they have become increasing well understood through successive stages of design and assessment.
- 6.1.3. The environmental assessment has been instrumental in informing changes to the scheme design through its feedback on aspects of the natural environment, of the communities affected by the proposals, of cultural and heritage assets, and of global sustainability issues, including climate change.

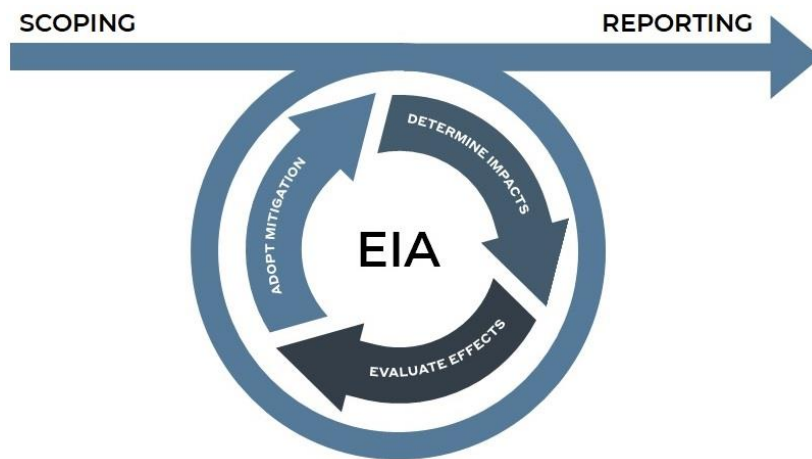
- 6.1.4. Any likely significant effects on these different elements that remain after mitigation has been assumed are set out respectively in chapters 7 to 10. The mitigation comprises various measures and assumptions embedded within the scheme proposals that, as far as is reasonably practicable, mitigate potentially significant adverse environmental effects.
- 6.1.5. The approach to mitigation has been summarised in Section 2.8, which describes how measures that avoid, minimise, rectify or compensate for adverse effects (potentially significant and otherwise) should be used in decreasing order of priority.
- 6.1.6. The limits of deviation (LOD) and the limits of land to be acquired or used (LLAU) have been defined to include land that will be used, amongst other things, for measures to deliver environmental mitigation: for example, landscaping, noise attenuation, habitat creation, or flood compensation.

## 6.2 An integrated design

- 6.2.1. Effective environmental assessment involves repeated cycles of assessment, evaluation and mitigation.



**Figure 6-1 – Environmental Assessment Cycle**



- 6.2.2. This approach is one that has been followed on C2C: bi-weekly meetings between the design team and environmental assessment specialists have secured modifications to the design that have limited potentially adverse effects and realised potential benefits. For example, as bat navigation routes were identified, the solutions to maintain these across the busway were reflected in an adapted scheme footprint; and the risks to notable trees on Rifle Range initiated a bespoke design that protected their root protection zones.
- 6.2.3. Equally, some aspects of the design are environment-led. Sustainable transport is the driver for C2C – taking cars off the road and encouraging active travel; and an electric (pollution free) bus fleet will be introduced early on, if not at day one.
- 6.2.4. The landscape strategy has also been conceived as one that is a fully integrated part of the design. It includes mitigatory elements, such as screen planting, but it is more importantly

about making the scheme’s integration within the landscape a fundamental part of the overall design concept.

### 6.3 Landscape mitigation

- 6.3.1. The landscape design strategy for C2C is summarised in Section 3.5, and described in detail within the Design and Access Statement that accompanies the TWA Order consent application. Landscaping proposals through landform modification and planting seek both to limit adverse effects and, where practicable, to enhance aspects of local character and biodiversity. The separation into distinct elements that serve either to mitigate or to enhance is not always straight forward, although the former are itemised as clearly as possible within the mitigation register and within Section 9.2.
- 6.3.2. The assessment of landscape and visual impacts considers impacts at year 1 and year 15 to allow for a degree of maturation in the planting.

### 6.4 Mitigating impacts from construction

- 6.4.1. The construction strategy is outlined in Section 3.7. This refers to the Code of Construction Practice (CoCP), which is a fundamental part of the scheme proposals in that it outlines the measures needed during construction to avoid likely significant adverse effects on people and on natural and cultural assets. The environmental assessments for each topic have assumed that these measures will, as a minimum, be implemented. The measures represent a best practice approach and are generic to most construction activity for a scheme of this nature.

- 6.4.2. The draft CoCP was issued to the Greater Cambridge Shared Planning Service<sup>62</sup> as an initial draft and comments received in response.
- 6.4.3. Following consent, measures set out in the CoCP (including any changes to them required as part of the consent) will be used as the basis for more detailed measures that will be developed by the preferred contractor. These measures will take account of the detailed designs, and to the specific approach to construction that these support, accommodating where necessary, local and specific sensitivities. The detailed measures will be set out in the principal contractor's Environmental Management Plan (EMP).

## 6.5 Mechanisms for securing mitigation

### Types of mitigation

- 6.5.1. A mitigation register has been prepared in order to itemise the necessary controls and mitigation for the Scheme, and how these will be secured.
- 6.5.2. This register is intended to help the planning inspector and other stakeholders, including the relevant local authorities and statutory consultees, understand how mitigation, relied on in the ES and other documents, is to be secured through the draft Order and beyond.

- 6.5.3. Environmental mitigation can be classified as primary, secondary and tertiary<sup>63</sup>. Primary mitigation is inherent in the design of the scheme and will not require special measures to be secured and delivered, though it is important that it is itemised in the register to ensure it is retained as the scheme design develops. For example, noise bunds or planting to assist bat crossing.
- 6.5.4. Secondary mitigation generally requires a mechanism beyond the granting of approval or consent; for example through undertakings and assurances, planning conditions or protective provisions. Implementation of the CoCP is an example of this, as is agreeing certain design details of the travel hub.
- 6.5.5. Tertiary mitigation exists outside the legislative framework of the TWAO or planning processes. It does not need to form part of the approvals as it is a required part of compliance under other legislative regimes; for example, the use of protected species licences from Natural England via the Wildlife and Countryside Act 1981. Many of these measures, dictating practice at the construction stage, are set out in the CoCP, and the principal contractor will be responsible for their delivery. In some cases, measures agreed with statutory regulators and undertakers through protective provisions, may usurp certain generic elements of tertiary mitigation.

<sup>62</sup> Formed in 2018, the Shared Planning Service has a varied remit working across the boundaries of Cambridge City Council and South Camb District Council, acting as the joint planning authority, and controlling development within both administrative areas.

<sup>63</sup> Environmental Impact Assessment Guide to: Delivering Quality Development, IEMA, July 2016

6.5.6. As both primary and tertiary mitigation are, respectively, inherent in the design or are required as part of other legislative regimes, we have focused on the secondary mitigation types relevant to the TWAO and deemed planning permission process and how these would be secured leading up to and after the making of the Order.

### Planning conditions

- 6.5.7. Different elements of secondary mitigation are included in documents that accompany the TWA Order application and request for deemed planning permission including:
- draft CoCP<sup>12</sup>;
  - draft Construction Traffic Management Plan<sup>64</sup>; and
  - the mitigation register, which collates each of the measures devised to address potentially likely significant effects, and which are assumed in the description of likely significant effects in Chapters 7-10.
- 6.5.8. These are generally secured through planning conditions attached to any grant of deemed planning permission by the Secretary of State as part of the TWAO process.
- 6.5.9. The relevant local authority will provide final approval of any mitigation required as part of these conditions after the Order is made.

### Protective provisions

- 6.5.10. The draft Order also includes protective provisions that require the applicant to engage with certain statutory bodies during the detailed design of the works to agree methods of working or relevant technical standards through a defined approval process before implementation of any works:
- 6.5.11. The bodies covered by these requirements are those that have responsibility for:
- highways and traffic;
  - electricity, gas, water, and sewerage undertakings;
  - electronic communications code networks;
  - canals and rivers; and
  - land drainage, flood defence, water resources and fisheries.

### Undertakings and assurances

- 6.5.12. Methods of mitigation, usually in relation to specific stakeholders, can also be secured through specific legal agreements or assurances.
- 6.5.13. The mitigation register below (**Table 6-1**) provides a summary of the environmental mitigation outlined in the documents listed here, together with the environmental objective and a description of the mechanism proposed to secure them. These are presented, alongside a column that provides a reference to

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<sup>64</sup> Draft Construction Traffic Management Plan (C2C-27-00-Construction Traffic Management Plan)

where each environmental mitigation is secured in the draft Order documentation.

## 6.6 Monitoring arrangements

- 6.6.1. The EIA process requirements have, since 2017, included a provision that requires the consenting authority (in the case of C2C, the Secretary of State) to consider whether it is appropriate to impose monitoring of the mitigation of likely significant effects. When considering whether to impose a monitoring measure, the Secretary of State must consider whether to make provision for potential remedial action; take steps to ensure that the type of parameters to be monitored and the duration of the monitoring are proportionate to the nature, location and size of the proposed development; and consider whether any existing monitoring arrangements are more appropriate than imposing a monitoring measure specific to the consent.
- 6.6.2. Equally, the EIA requirements state that the ES must, where appropriate, describe any proposed monitoring arrangements.
- 6.6.3. Required monitoring of construction impacts is secured through the CoCP. Section 2.3 of the CoCP requires the Principal Contractor to undertake the necessary monitoring as outlined for each environmental topic to comply with the requirements of this draft CoCP and the relevant local environmental management plan, as well as any additional consent requirements. Monitoring will address the impact of construction works, and the effectiveness of mitigation measures. The arrangements that are put in place by the

Principal Contractor to meet this requirement will need to be agreed with the Shared Planning Service.

- 6.6.4. As specified in the CoCP, the Principal Contractor is required, where necessary, to implement remedial measures to provide additional protection and to take other actions as may be necessary to enable compliance with relevant laws and policy.
- 6.6.5. Proposed environmental monitoring of the operational C2C scheme will focus on the efficacy of the permanent mitigation measures that are embedded within the design and the assumptions about its operation. Each proposed monitoring measure will be secured through an appropriate planning condition attached to the grant of deemed planning permission for the development authorised by the C2C Order, which may require a contractual commitment. Mechanisms will be agreed on the basis of monitoring requirements.

## 6.7 Mitigation register

- 6.7.1. A summary of the mitigation register (see **Appendix ES1**) is contained within **Table 6-1** below, the details of which are outlined in **Paragraph 6.5.13**.



**Table 6-1 – Summary of the mitigation register**

Description	Location	Purpose	Delivery mechanism	Effects lessened or mitigated
Retention of existing hedgerow parallel to the C2C Scheme	East Cambourne	Retention of existing habitat to limit habitat loss	Embedded design	Landscape/visual, ecology
Retention of existing habitat to the north of the C2C Scheme within highways. land	Bourn Airfield	Maintain green corridor for bat movements and as part of the landscape character	Embedded design	Landscape/visual, ecology
Attenuation pond. [The drainage strategy includes an attenuation basin. However, this is expected to be an interim solution, and it is expected that the section of C2C running through the Airfield will ultimately discharge into the drainage system serving the wider development].	Bourn Airfield	Store storm water and attenuate discharge from the drainage network	Embedded design	Surface water, flood risk, climate resilience
Creation off woodland/hedgerow habitats adjacent to and surrounding the new attenuation pond to provide dark and green corridor for bats and other wildlife	Bourn Airfield	To maintain green corridor for bat movements and as part of the landscape character.	Embedded design	Landscape/visual, ecology
Elevated ground levels surrounding the junction.	Junction northeast of Wellington Way	To lift bat flight path over the C2C Scheme	Embedded design	Ecology
Semi-mature tree planting surrounding the junction northeast of Wellington Way	Junction northeast of Wellington Way	To screen existing landscape from junction and to lift bat	Embedded design	Landscape/visual, ecology

Description	Location	Purpose	Delivery mechanism	Effects lessened or mitigated
		flight path over the C2C Scheme		
Attenuation basin	St Neots Road	To store storm water and attenuate discharge from the drainage network	Embedded design	Surface water, flood risk, climate resilience
Sporadic woodland planting within this area	South of the A428	To compensate for loss of existing woodland	Embedded design	Ecology, Landscape/visual, air quality
Attenuation basin	West of the proposed St Neots Road junction	To store storm water and attenuate discharge from the drainage network	Embedded design	Surface water, flood risk, climate resilience
Semi-mature tree planting surrounding the junction north of St Neots road	Junction north of St Neots Road	To screen junction from properties south of St Neots Road	Embedded design	Landscape/visual, ecology, air quality
Alignment goes on-road along St Neots Road between Scotland Farm roundabout and Long Road to avoid land take to shelterbelt between road and A428	St Neots Road	To avoid loss of tree screen	Order limits	Landscape/visual, ecology, Materials
Planting of Semi-mature trees and native woodland to the northwest and north of the park and ride.	Park and ride	To screen the park and ride from the properties along Scotland Road	Embedded design	Landscape/visual, ecology, air quality

Description	Location	Purpose	Delivery mechanism	Effects lessened or mitigated
Attenuation basin	Park and ride	To store storm water and attenuate discharge from the drainage network	Embedded design	Surface water, flood risk, landscape/visual, ecology, climate resilience
Maintenance of existing public right of way	North of Hardwick	To maintain passage along the existing public right of way across St Neots Road	Embedded design	Transit and access
Woodland planting north of St Neots Road.	North of St Neots Road	Mature plants provide screening and maintain the existing green corridor that runs north to south, benefiting bat movements.	Embedded design	Landscape/visual, ecology, air quality
Attenuation basin	South of St Neots Road, West of Long Road	To store storm water and attenuate discharge from the drainage network	Embedded design	Surface water, flood risk, climate resilience
Alignment diverges south from St Neots Road at a point west of Comberton Plantation, so avoiding the plantation	St Neots Road west of Long Road	To avoid wooded area south of Madingley Mulch	Order limits	Landscape/visual, ecology
Attenuation basin	South of St Neots Road, West of Long Road	To store storm water and attenuate discharge from the drainage network	Embedded design	Surface water, flood risk, climate resilience

Description	Location	Purpose	Delivery mechanism	Effects lessened or mitigated
Semi-mature tree planting proposed within the land surrounding the proposed Long Road Junction	Long Road Junction	To screen existing landscape from Long Road Junction, minimising light spill from new street lighting into adjacent habitats	Embedded design	Landscape/visual, ecology, air quality
Clusters of Semi-mature tree proposed around Long Road Junction	Long Road Junction	To lift bat flight path over the C2C Scheme	Embedded design	Ecology, landscape/visual
Bunds created either side of C2C scheme north of Coton.	North of Coton	To screen asphalt surface of the C2C Scheme from Madingley Road	Embedded design	Landscape/visual
Attenuation basin	East of Long Road	To store storm water and attenuate discharge from the drainage network	Embedded design	Surface water, flood risk, climate resilience
Attenuation basin	North of Coton	To store storm water and attenuate discharge from the drainage network	Embedded design	Surface water, flood risk, climate resilience
Bat landscape mitigation feature incorporating raised bund to the north and south of the C2C Scheme where necessary, with Semi-mature trees north to south. Minimum combined height of bund and semi-mature trees must be >4m	South of Crome-Lea Business Park	To encourage bat flight path over height of buses running on the C2C Scheme and to maintain habitat connectivity through the landscape	Embedded design	Ecology, air quality

Description	Location	Purpose	Delivery mechanism	Effects lessened or mitigated
Bat landscape mitigation feature incorporating raised bund to the north and south of the C2C Scheme where necessary, with Semi-mature trees north to south. Minimum combined height of bund and semi-mature trees must be >4m	North of reservoir	To encourage bat flight path over height of buses running on the C2C Scheme and to maintain habitat connectivity through the landscape	Embedded design	Ecology, air quality
Semi-mature tree planting	North of reservoir	To maintain green corridor and to compensate for the removal of existing hedgerow	Embedded design	Landscape/visual, ecology, air quality
Diversion of public right of way		To maintain passage along the existing public right of way	Embedded design	Transit and access
Bat landscape mitigation feature incorporating planting of Semi-mature trees north to south. The C2C Scheme is in cutting within this area and it is anticipated that a similar 4m height will be achieved from road level without the need for bunds	North of Coton	To encourage higher bat flight paths over the running traffic	Embedded design	Ecology, air quality
Semi-mature tree planting proposed to north of property 48 High Street in Coton	North of property 48 High Street, Coton	To screen properties (No. 19 etc) to south of the C2C Scheme to west of Cambridge Road	Embedded design	Landscape/visual, air quality



Description	Location	Purpose	Delivery mechanism	Effects lessened or mitigated
Bat landscape mitigation feature incorporating raised bund to the north and south of the C2C Scheme where necessary, with Semi-mature trees north to south	North of Coton	To encourage higher bat flight paths over the running traffic	Embedded design	Ecology, air quality
Maintenance of existing hedgerow to maintain green corridor	North of Coton	To maintain green corridor for bat movements and as part of the landscape character.	Embedded design	Landscape/visual, ecology, air quality
Semi-mature tree planting proposed to south of C2C Scheme, west of Cambridge Road	North of properties on the west of Cambridge Road	To screen properties (No. 19 etc) to south of the C2C Scheme to west of Cambridge Road	Embedded design	Landscape/visual, ecology, air quality
Semi-mature tree planting along the C2C Scheme as it traverses Coton Orchard. Fruiting or nut tree varieties on vigorous rootstocks to mimic orchard	Coton Orchard	To maintain the character of the existing landscape, merging with the Orchard from a visual perspective. this will also provide some compensation for the loss of orchard trees	Embedded design	Landscape/visual, ecology, air quality
Mammal culverts along the section of the C2C Scheme which traverses Coton Orchard. The mammal culverts will be accompanied by badger fencing to direct badgers towards the culverts.	Coton Orchard	To facilitate badger (and other wildlife) movements across Coton Orchard	Embedded design	Ecology

Description	Location	Purpose	Delivery mechanism	Effects lessened or mitigated
Maintenance of equestrian access under M11 bridge through using underpass (summarise features)	M11 Overbridge	Maintain equestrian access along existing bridleway	Embedded design	Transit and access, socio-economic
Existing Poplars to be pollarded	East of Coton Orchard	To reduce the risk that trees will fall onto the road, maintaining safety of road uses and maintaining landscape features which promote bat movements across the C2C Scheme	Embedded design	Ecology, climate resilience
Semi-mature tree planting	East of Coton Orchard	To compensate for loss of existing woodland and maintenance of existing bat flight paths	Embedded design	Landscape/visual, ecology, air quality
Semi-mature tree planting proposed south of Rectory Farm	West of M11	To screen Rectory Farm from the C2C scheme to the south	Embedded design	Landscape/visual, ecology, air quality
Crate soakaway and attenuation pond	East of M11	To store storm water and attenuate discharge from the drainage network and to provide wetland/pond habitat for biodiversity compensation	Embedded design	Ecology, surface water, flood risk, climate resilience

Description	Location	Purpose	Delivery mechanism	Effects lessened or mitigated
Diversion of bridleway	East of M11	To maintain passage along the existing public right of way	Embedded design	Transit and access
Minimal scrub clearance	East of M11	Vegetation will only be cleared within areas required for the scheme	Embedded design	Ecology, landscape/visual
Diversion of public right of way	South of the University of the Cambridge	To maintain passage along the existing public right of way	Embedded design	Transit and access
Hedgerow and woodland planting	South of the University of the Cambridge	To provide compensation for HPI woodland and hedgerow loss	Embedded design	Ecology, air quality
Woodland, grassland and semi-mature tree planting	South of the University of the Cambridge	To compensate for habitat loss elsewhere on the Scheme and to maintain bat flight paths	Embedded design	Ecology, air quality
Attenuation basin	South of the University of the Cambridge	To store storm water and attenuate discharge from the drainage network	Embedded design	Surface water, flood risk, climate resilience
Attenuation basin	West of Bin Brook	To store storm water and attenuate	Embedded design	Surface water, flood risk, climate resilience

Description	Location	Purpose	Delivery mechanism	Effects lessened or mitigated
		discharge from the drainage network		
Woodland planting east to west	West of Bin Brook	To maintain connectivity east to west and maintain bat flight corridors	Embedded design	Ecology
Bin Brook bridge design to avoid impacts on flood storage capacity	Bin Brook Bridge	To provide access across Bin Brook	Order limits	Flood risk, surface water, climate resilience
Bin Brook bridge designed to avoid impacts on hydrology of bin brook	Bin Brook Bridge	To provide access across Bin Brook	Embedded design	Flood risk, surface water, climate resilience
Bin Brook bridge designed as a clear span bridge	Bin Brook Bridge	A clear span bridge maintains access for species along Bin Brook	Embedded design	Ecology
Section of bus way and service path located on platform structure	Rifle Range Road	Avoids impacts on root protection areas of TPO trees	Embedded design	Landscape/visual, heritage, ecology, socio-economic, carbon emissions
Crate soakaway	Rifle Range Road	To store storm water and attenuate discharge from the drainage network	Embedded design	Surface water, flood risk, climate resilience
Code of Construction Practice sets out a range of measures that reflect standard good practice and which will, when implemented, mitigate the majority of	Scheme wide	To describe control measures, practices and standards to be implemented	CoCP	All

Description	Location	Purpose	Delivery mechanism	Effects lessened or mitigated
potentially significant effects from construction impacts		throughout construction the C2C Scheme to ensure that adverse effects to people and the environment are kept as low as practicable		
The project team to select and engage with material suppliers and construction contractors considering their policies and commitments to reduction of GHG emissions, including actions to reduce embodied emission in materials	Scheme wide	To ensure that material suppliers and construction contractors values align to GCPs commitments	Assurance/undertaking	Air quality, carbon emissions, materials
The contractor to maximise the local sourcing of materials and local waste management facilities	Scheme wide	To reduce transport time between facilities and construction site, reducing GHG emissions	Assurance/undertaking	Air quality, carbon emissions, materials
The contractor having policies and management protocols in place to avoid idling of engines, spills of fuels (e.g. when refuelling) and safe/environmentally sensitive driving techniques to maximise fuel saving	Scheme wide	To reduce the likelihood of pollution.	Assurance/undertaking	Transit and access, air quality, ecology
The project team/ design team/ contractor to design, specify and construct the Proposed Scheme with a view to maximising the potential for reuse and	Scheme wide	To reduce material consumption during the construction process.	Assurance/undertaking	Transit and access, carbon emissions



Description	Location	Purpose	Delivery mechanism	Effects lessened or mitigated
recycling of materials / elements at the end-of-life stage.				
The design team to identify opportunities to sequester carbon through increased tree planting and peat restoration.	Scheme wide	To compensate for increased carbon emissions and loss of peat.	Protective provision	Ecology
The design team/ contractor to use low carbon material options, informed using the carbon reduction hierarchy, to reduce emissions resulting from the replacement of elements of the Proposed Scheme.	Scheme wide	To reduced carbon emissions	Assurance/undertaking	Materials, carbon emissions
The design team/ contractor to use material options with greater longevity, to reduce frequency of replacements.	Scheme wide	To reduce the need/ frequency of maintenance.	Assurance/undertaking	Materials, carbon emissions
The design team/ maintenance team to specify the use of energy efficient lighting options for road lighting, to reduce the operational energy requirements and carbon emissions	Scheme wide	To reduce operational energy requirements and carbon emissions	Assurance/undertaking	Carbon emissions
Completion of Phase 2 Contaminated Land Ground Investigation to assess ground conditions and extent of any contamination present within the C2C Scheme.	Scheme wide	To confirm the baseline and allow characterisation and quantification of the contamination risks in the C2C Scheme and confirm the geological and hydrogeological	Embedded design	Soils and land, groundwater

Description	Location	Purpose	Delivery mechanism	Effects lessened or mitigated
		regime as well as to inform on design.		
The design team/contractor to specify reuse of site arisings on the scheme - specifically reuse of approximately 80% earthworks cut as fill, where suitable.	Scheme wide	To reduce the volume of arisings to be taken off site and disposed	Embedded design	Air quality, carbon emissions, materials
The C2C Scheme is located above the 1 in 100 year plus 19% climate change flood level. The Flood Risk Assessment includes allowances for climate change.	Scheme wide	To reduce the likelihood of flood events	Embedded design	Flood risk, climate resilience
Minor watercourse crossing have been designed to the 1 in 1000 year event (0.1% AEP) which accounts for flows greater than the 1 in 100 year plus 40% for climate change allowance	Scheme wide	To reduce the likelihood of flood events	Embedded design	Flood risk, climate resilience
Attenuation will be provided within swales which will be designed to ensure a 100mm freeboard is maintained	Scheme wide	To reduce the likelihood of flood events by directing surface water runoff to existing ditches or local watercourses	Embedded design	Flood risk, climate resilience
Landscape proposals will also help reduce surface water runoff and burden in the watercourse network during heavy rainfall events	Scheme wide	To reduce the likelihood of flood events by reducing the burden of surface water runoff to watercourse networks	Embedded design	Flood risk

Description	Location	Purpose	Delivery mechanism	Effects lessened or mitigated
Landscaping will maximise self-sustaining habitats such as woodland or grassland and limiting where possible trees that are being proposed on bunding/slopes to avoid any subsidence or dry outs	Scheme wide	To reduce the likelihood of subsidence	Embedded design	Soils and land, climate resilience
Tree planting providing shading is proposed near crossings or dwelling points on the shared use path providing natural cooling.	Scheme wide	To provide natural shading	Embedded design	Climate resilience
The detailed design will take account of the climate hazard and impacts set out in Technical Report 3, and mitigate the impacts for the design life of the C2C Scheme. This aligns with DMRB LA114 principles for design and mitigation measures, and Cambridgeshire County Council's Climate Change and Environment Strategy	Scheme wide	To provide resilience to future climate hazards.	Embedded design	Climate resilience
Monitoring and maintenance of the components of the Scheme throughout its operational design life are required to ensure that any weather/climate-related impacts are identified and appropriate measures are taken to ensure resilience of the scheme/infrastructure for users. This aligns with DMRB LA114, DMRB CS450, and Cambridgeshire County Council's Climate Change and Environment Strategy.	Scheme wide	To provide resilience to future climate hazards.	Embedded design	Climate resilience

Description	Location	Purpose	Delivery mechanism	Effects lessened or mitigated
At detailed design, the embankment slide design will take into consideration: <ul style="list-style-type: none"> <li>- how embankment drainage is design to accommodate adverse weather and impacts on the slope; and</li> <li>- projected changes in temperatures to mitigate impacts from changes in ground conditions which could cause potential failure of embankments or damage to structures.</li> </ul>	Scheme wide	To provide resilience to future climate hazards.	Embedded design	Climate resilience
At detailed design, the projected changes in precipitation will be allowed for to ensure electrical equipment is <ul style="list-style-type: none"> <li>- protected from wind and water ingress resulting in damage and failure.</li> <li>- protected from extreme temperatures and UV rays by positioning out of direct sunlight where practicable.</li> </ul>	Scheme wide	To provide resilience to future climate hazards.	Embedded design	Climate resilience
At detailed design the landscaping scheme will ensure applicability of planting to projected climate impacts (precipitation and temperature impacts) and their siting within the Scheme. Furthermore, tree planting will be used to provide shading near crossing points or dwelling points on the shared use path.	Scheme wide	To provide resilience to future climate hazards.	Embedded design	Climate resilience
The detailed design will incorporate swales and detention basins / ponds with climate change allowance and restricted flows to mitigate flooding.	Scheme wide	To provide resilience to future climate hazards.	Embedded design	Climate resilience

Description	Location	Purpose	Delivery mechanism	Effects lessened or mitigated
Projected changes in temperature will be allowed for in the detailed design to specify materials which are resilient to the projected temperatures and mitigate damage from deformation or expansion.	Scheme wide	To provide resilience to future climate hazards.	Embedded design	Climate resilience
Projected changes in wind conditions will be allowed for in the detailed design for structures to mitigate impacts relating to damage from increased wind loading.	Scheme wide	To provide resilience to future climate hazards.	Embedded design	Climate resilience



# 7 Effects on people and communities

## 7.1 Introduction

- 7.1.1. This chapter describes the predicted likely significant effects on the health, amenity and wellbeing of people who live and work along the route, or who will in some way be affected by the construction and operation of C2C.
- 7.1.2. It reflects the findings of separate assessments of impacts respectively on traffic and transport, visual amenity, noise and vibration, air quality and socioeconomics, each of which has used their own reasonable worst-case assumptions. The ES includes separate technical reports that describe these topic assessments in full, and the information here focuses on the effects that are considered to be likely and significant (see Section 2.4). The technical reports outline their respective assessment methods, updating where necessary the more detailed coverage within the C2C ES Scoping Report<sup>2</sup>.

## 7.2 Transit and access

### Overview

- 7.2.1. Technical Report 12 (TR12: Traffic and transport) describes and contains the detailed findings of the assessment of transit and access impacts from C2C. These impacts refer to the ease, amenity and safety for people in making journeys by vehicle (private or public) or by active travel (foot, cycle,

equestrian), and in having specific access to homes and facilities. The technical report covers journey severance, pedestrian delay, travel amenity, fear and intimidation (principally from HGVs), driver delay, and accidents and safety. The scope and methodology for the assessment of transit and access (traffic and transport) are described in Section 17 of the C2C ES Scoping Report.

- 7.2.2. As reported in the technical report, the proposed C2C Scheme is not anticipated to generate any hazardous loads. As such the effects of hazardous loads on traffic and transport has been scoped out.
- 7.2.3. The ES has also been informed by the Transport Assessment (TA) which considers the impact of the C2C Scheme on the local transport network. The TA finds that traffic levels on the local highway network will be similar both with and without C2C. Importantly, traffic levels in nearby villages will not increase as a result of C2C.
- 7.2.4. Technical Report 4 (TR4: Community and human health, land use and land take) reports impacts on public rights of way, footways and issues of local access with regards to severance between communities, community facilities and private and commercial property.
- 7.2.5. Transport benefits are also described in the Outline Business Case.

### Transport benefits

- 7.2.6. The principal benefits of the C2C Scheme will be in providing a public transport system connecting Cambourne and



Cambridge. As well as supporting the delivery of new housing and employment development C2C will:

- improve connectivity to Cambridge by sustainable modes of travel from new residential areas situated to the west of the city;
- enable the provision of frequent, direct and quick bus services between Cambourne and Cambridge<sup>65</sup>;
- provide end-to-end journey time reliability (particularly compared with car journeys); and
- relieve congestion along the A428/ A1303 corridor.

7.2.7. C2C uses the safety and maintenance track to provide a footway/cycleway which will allow active travel to and from Cambridge, as well as opportunities for horse riders.

7.2.8. Residents of connected settlements will be able to take advantage of the walking or cycling facilities, as well as the busway.

7.2.9. Overall the C2C will have minimal adverse impacts, both during its construction and its subsequent operation, and will result overall in some significant transport benefits.

### Permanent and operational effects

7.2.10. Providing a direct bus route between Cambourne and Cambridge via Bourn Airfield, Hardwick, Coton and West Cambridge, C2C will allow residents to travel by bus and reduce reliance on their cars.

7.2.11. The Travel Hub off the A428 will allow people travelling into Cambridge from the west to access direct bus services or to use cycle facilities. This 'modal shift' will enable drivers to avoid congestion on the A1303 nearer to Cambridge and enjoy overall shorter journey times.

7.2.12. By intercepting car trips on the A428, the Travel Hub will also free up capacity at the existing Madingley Road park and ride site (which remains open), benefitting commuters using this site from the M11.

7.2.13. Overall, there will be significant transport benefits in terms of:

- providing a direct bus route between Cambourne and Cambridge, and so encouraging existing and future residents along the route to travel by bus or active modes of travel, and reduce reliance on the private car;
- providing overall quicker and direct bus journeys to Cambridge;
- providing drivers on the A428 with the opportunity to complete their journeys into Cambridge by bus, with overall shorter and more reliable journey times; and
- widened opportunities for travelling by foot and bike, with associated health benefits.

7.2.14. Bridleway 39/30 by the M11 will be crossed by the C2C Scheme and permanently diverted to Ada Lovelace Road. With an increased length of approximately 300m, this is considered a permanent and significant adverse effect.

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<sup>65</sup> The Outline Business Case refers to journey times from Cambourne to Cambridge reduced by approximately 19 minutes in the AM peak hour.

## Temporary construction effects

- 7.2.15. The principal contractor will agree a Construction Traffic Management Plan (CTMP) with the GCP. The CTMP will include details of permissible routes for construction vehicles. It will limit construction traffic movements during peak periods on the local highway network.
- 7.2.16. Construction traffic will travel to the busway haul road from the A428, from either the Scotland Road junction or the Madingley Mulch junction, and from the M11 to adjacent works from haul roads, and (via the A1303) from within the Cambridge West business park and Charles Babbage Road. Use of local roads, including Grange Road, will be strictly limited. No construction traffic will be permitted to travel through local villages such as Dry Drayton, Coton and Bourn.
- 7.2.17. Most of these principal access routes are considered to be of low or very low sensitivity, with few homes and community facilities and amenities located along them, and with little to no pedestrian use.
- 7.2.18. With these main access routes already well used, relative increases from C2C construction traffic will be low. Grange Road is one of the more sensitive routes affected, but construction activity on Grange Road will be for a short period only and activity will be limited to the construction of the junction with the busway.
- 7.2.19. With the relatively low increases in traffic (anticipated to be of negligible to minor magnitude) from C2C construction vehicles, and with no more than medium sensitivity routes (and mostly low or negligible), effects on severance; pedestrian, cycle and equestrian delay and amenity; and road vehicle delay will never be more than minor and therefore not significant.
- 7.2.20. Data for road accidents and specifically personal injury accidents 2017-2022 identify very few records at locations affected by C2C construction traffic. Although construction traffic will have some impact on the roads immediately surrounding the project sites and at key junctions on the identified routes, with all precautions taken to ensure safe use and management of construction vehicles (in accordance with the CTMP), and with no safety 'hotspots' identified along the Scheme's construction access routes and in the vicinity of the C2C Scheme, significant adverse effects are not predicted.
- 7.2.21. Three public rights of way will be directly affected temporarily during construction, namely:
- FP66/17 between A1303 and Madingley Road in Hardwick, and approximately 2.9km long.
  - FP114/6, between A1303 and Worcester Avenue in Hardwick, and 70m long.
  - FP55/2, between A1303 and Whitwell Way in Coton, and approximately 700m long
- 7.2.22. It is proposed that pedestrian, cyclist and equestrian access along all footways and public rights of way will be maintained during construction, with careful management of crossing points and diversions where necessary. On this basis, only the diversion of Bridleway 39/30 will result in a significant adverse effect, which is part of the previously referenced permanent effect.



## 7.3 Noise and vibration

### Overview

7.3.1. Technical Report 1 (TR1: Acoustics) describes and contains the detailed findings of the assessment of noise and vibration impacts from C2C. The assessment considers how noise and vibration, both during the operation of C2C and temporarily during its construction could result in likely significant effects for sensitive receptors along the route. The scope and methodology for the assessment of noise and vibration are described in Section 12 of the C2C ES Scoping Report<sup>2</sup>.

### Effects from the operating busway

7.3.2. The assessment is ongoing at time of writing, although based on the frequency of service and the vehicle specification (hybrid/electric), significant adverse effects are considered unlikely.

### Effects from the travel hub

7.3.3. The assessment is ongoing at time of writing and this section will be updated.

### Effects from road traffic

7.3.4. The assessment is ongoing at time of writing and this section will be updated.

### Temporary construction noise effects

7.3.5. The assessment of construction noise has focused on impacts from site clearance and earthworks, and from subsequent construction activities, with BS 5228-1 (Annex C and Appendix D) used as the basis for (to be secured through the TWAO and

deemed planning permission) specifying predicted noise levels from different activities. The assessment has assumed the adoption of measures set out in the CoCP, which will reduce potential noise levels by an estimated 5dB.

7.3.6. A significant effect would be where construction noise is predicted to exceed 65 dB  $L_{Aeq,T}$  for 10 or more days of working in any 15 consecutive day period, or for 40 or more days in any six-month period. On the basis of predicted noise levels and distances as noted below, an assessment zone of 40m from the edge of the Scheme limits has been used to identify receptors where a significant noise effect could be predicted as a result of construction.

**Table 7-1 – Overview of noise levels during construction**

Activity	Overall noise level at 10m	Max extent of significant effect
Site clearance/ earthworks	76dB	40m
Construction	75dB	36m

7.3.7. Significant adverse airborne noise impacts are currently predicted at an estimated 279 receptors as a result of construction works. These will be concentrated at Cambourne, Hardwick and Cambridge West, with small numbers at Coton, north Newnham and Grange Road. The effects will occur intermittently during construction, with only occasional periods of higher noise levels associated with particular events when the plant is working in close proximity to sensitive receptors.

When the draft construction programme has been confirmed, these effects are likely to reduce based on their likely relatively short durations.

### **Temporary construction vibration effects**

- 7.3.8. The assessment of construction vibration on people has focused on the use of vibratory rollers in road construction activity, using the calculation methodology in BS 5228-2.
- 7.3.9. Potentially significant effects would occur (1mm/s) within 15m for the roller in steady state operation, assuming this level of vibration occurs over a period of 10 or more days of working in any 15 consecutive days, or for 40 or more days in any six consecutive months. On the basis, an assessment zone of 15m from the edge of the Scheme limits has been used to identify receptors where a significant vibration effect could be predicted as a result of construction.
- 7.3.10. Predicted significant adverse vibration impacts are currently predicted at an estimated 95 receptors as a result of construction works. These will be concentrated at Cambourne, Hardwick and Cambridge West, with small numbers at Coton, north Newnham and Grange Road. In practice, the effects will occur intermittently, with only occasional periods of significant vibration levels when the plant is working in close proximity to sensitive receptors. When the draft construction programme has been confirmed, these effects are likely to reduce based on their likely relatively short durations.
- 7.3.11. An assessment of construction vibration on potentially vibration-sensitive facilities due to the use of vibratory rollers has also been undertaken.

- 7.3.12. The distance at which a potentially significant effect would occur (0.1mm/s) for microscopes to 100X magnification and other equipment of low sensitivity has been calculated to be 60m for the roller in steady state operation.
- 7.3.13. There are several commercial and research facilities within this 60m buffer which could have particularly vibration-sensitive equipment, and will potentially be subject to likely significant effects. As above, when the draft construction programme and plant have been confirmed, these effects are likely to reduce based on their likely relatively short durations.



Figure 7-1 – Noise receptors and construction noise buffer

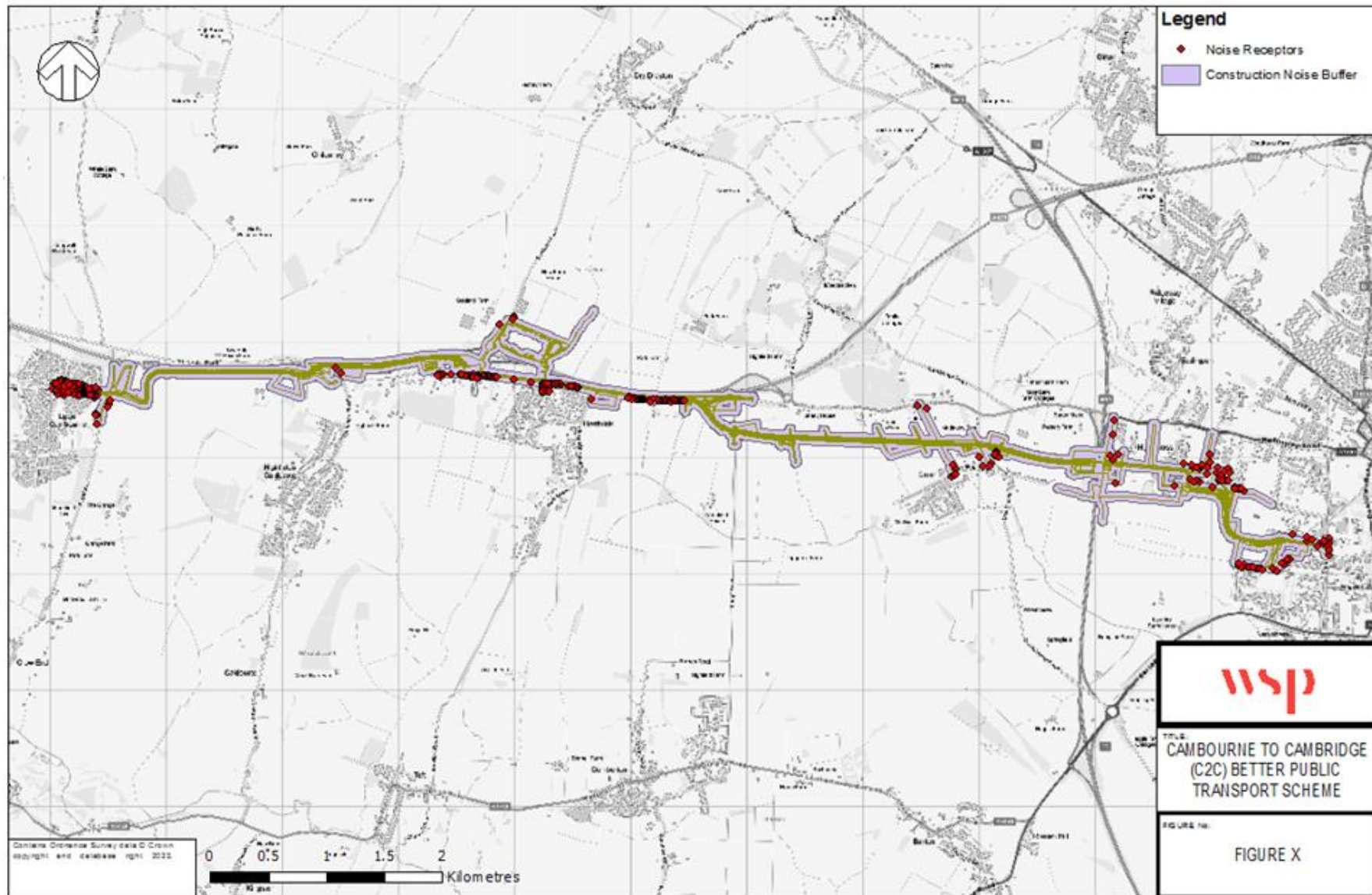
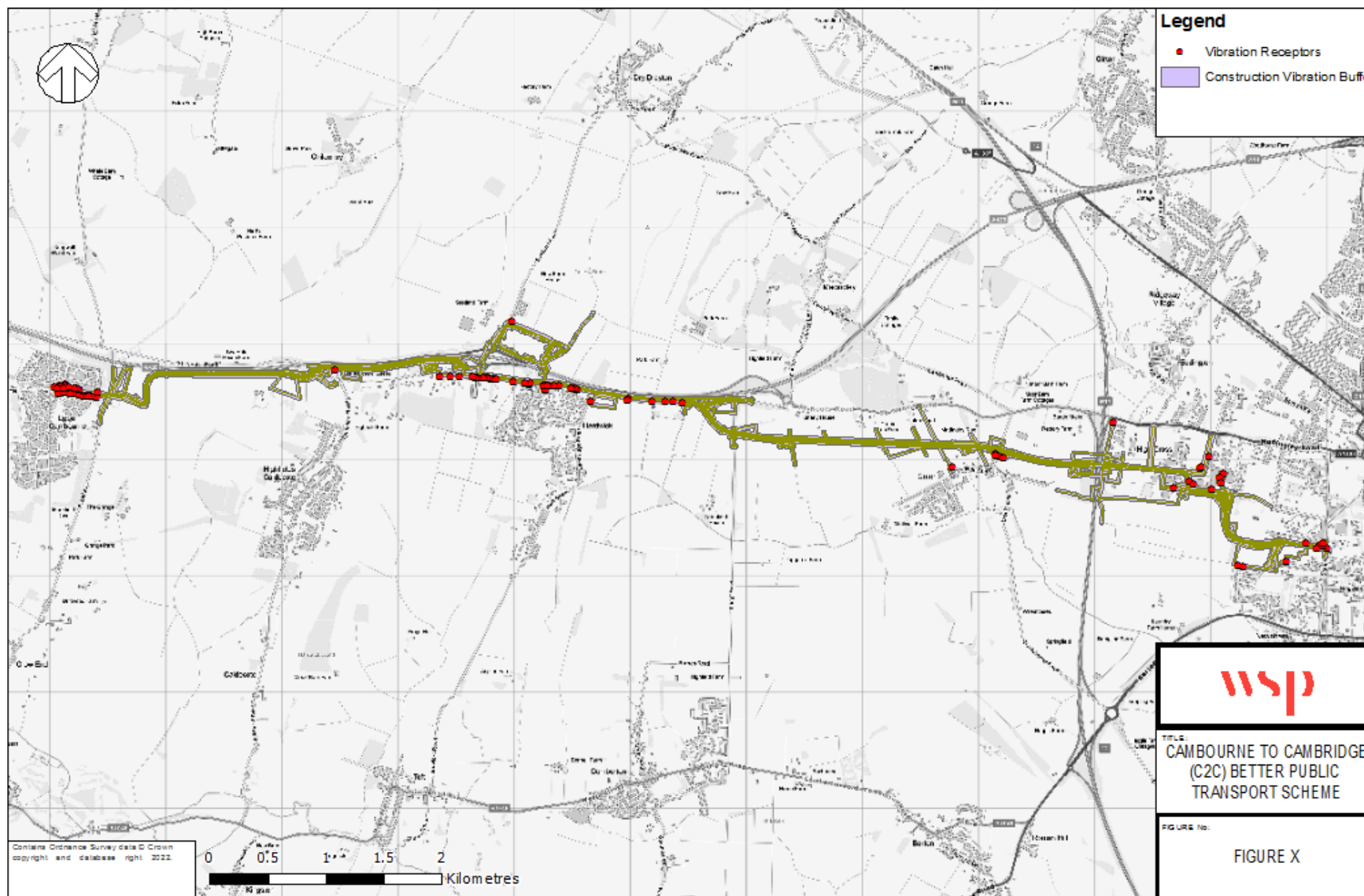




Figure 7-2 – Vibration receptors and construction vibration buffer



## 7.4 Air quality

### Overview

- 7.4.1. Technical Report 2 (TR2: Air Quality) describes and contains the detailed findings of the assessment of air quality impacts from C2C. The assessment considers how levels of different principal pollutants will change, both during the operation of C2C and temporarily during its construction. For the operational phase, principal pollutants comprise NO<sub>2</sub> and PM<sub>10</sub>; for the construction phase, they comprise PM<sub>10</sub> and dust. The principal measure of impacts on air quality relates both to the magnitude of impact as a percentage change to current pollutant levels, then examine this change in the context of the new total concentration and its relationship to air quality objectives.
- 7.4.2. The scope and methodology for the assessment of air quality are described in Section 15 of the C2C ES Scoping Report<sup>2</sup>.

### Permanent effects from road traffic

- 7.4.3. Impacts of C2C on NO<sub>2</sub> and particulates will be generally beneficial, with three times as many receptors experiencing a decrease in concentrations of NO<sub>2</sub>, PM<sub>10</sub> and PM<sub>2.5</sub> as would experience an increase. However the overall impacts, both positive and negative, will not be significant. This is discussed in more detail below.
- 7.4.4. The location of the modelled receptors are detailed in the Technical Report 2 (TR2: Air Quality). At the majority of locations included in the assessment model (89 out of 121, or about 75%) it is predicted that there will be largely negligible and three minor improvements in annual mean NO<sub>2</sub>

concentrations as a result of C2C and the changes in road use that it will bring about. The remaining locations (30 of 121 or about 25%) will experience an increase in NO<sub>2</sub> concentrations, ranging between 0.1µg/m<sup>3</sup> and 1µg/m<sup>3</sup> with No.50 Grange Road experiencing this highest increase. At this and only two other receptors will the change in concentrations be more than 2%, and well below the 10% change that would be a significant effect. At these and all other receptors the annual mean NO<sub>2</sub> concentrations will remain well below the air quality objective.

- 7.4.5. Similarly, predicted one-hour mean NO<sub>2</sub> concentrations are all well below the air quality objective of 60µg/m<sup>3</sup>, and the impacts of C2C will have a negligible bearing on this.
- 7.4.6. Considering particulate pollution, at the majority of locations included in the assessment model (90 out of 121, or about 75%) it is predicted that there will be improvements albeit negligible, in annual mean concentrations of both PM<sub>10</sub> and PM<sub>2.5</sub> as a result of the C2C Scheme. An increase in both PM<sub>10</sub> and PM<sub>2.5</sub> concentrations is predicted at around 30 of the 121 modelled receptors (~25%), although at all these locations, the increase will be less than 0.1µg/m<sup>3</sup> (or <1% of the limit value) and well below the air quality objectives.
- 7.4.7. Predicted 24-hour mean PM<sub>10</sub> concentrations are all well below the air quality objective of 50µg/m<sup>3</sup> (which is not to be exceeded more than 35 times per year), and the impacts of C2C will again have little bearing on this.
- 7.4.8. The World Health Organisation sets out more stringent air quality guidance levels for these three pollutants, which would be achieved at only around a third of model locations, and C2C will have no bearing on this.



## Temporary construction effects

- 7.4.9. The assessment has focused on locations where construction activities could result in higher levels of dust generation and deposition. As well as more general construction of the busway/service road and the travel hub, and of specific structures such as the M11 overbridge and Bin Brook crossing, these activities include:
- preparation of temporary access and haulage routes;
  - earthworks;
  - materials handling, storage, stockpiling, spillage and disposal;
  - construction traffic movement within the construction areas (including excavators and dumper trucks); and
  - site landscaping.
- 7.4.10. On the basis of the distances within which impacts of dust soiling and increased particulates would have the greatest effects, the assessment considered impacts on people living within 350m of the Scheme limits (and up to 500m from the site entrances), and of designated ecological receptors (Madingley Wood SSSI) within 50m of the Scheme limits or access routes. For the public highways used by construction vehicles, impact distances of 50m have been considered.
- 7.4.11. On the basis of the measures that will be implemented under the CoCP, and given the current local air quality in the area, the proximity of sensitive receptors to the roads likely to be

used by construction vehicles, and the likely numbers of construction vehicles and plant that will be used, the effects will be negligible and therefore not significant.

## 7.5 Views and visual impacts

### Overview

- 7.5.1. Technical Report 8 (TR8: Landscape and Visual) describes and contains the detailed findings of the assessment of likely significant effects from the C2C Scheme on people's views and visual amenity. Visual receptors are defined by GVLIA3<sup>66</sup> as "the different groups ... who may experience views of the development [which may include] people living in the area, people who work there, people passing through on road, rail or other forms of transport, people visiting promoted landscapes or attractions, and people engaged in recreation of different types". The assessment of visual receptors is aided by the selection of several representative viewpoints.
- 7.5.2. Effects on landscape are addressed as elements of the cultural environment, in Chapter 9 of this ES. The scope and methodology for the assessment of views and visual impacts are described in Section 11 of the C2C ES Scoping Report<sup>2</sup>.
- 7.5.3. The visual receptors are selected on their basis of visibility of the Scheme and their deemed interest in their visual environment. Identification of the receptors is supported by a computer modelled Zone of Theoretical Visibility (ZTV), which represents the visual envelope within which the Scheme is

<sup>66</sup> Guidelines for Landscape and Visual Impact Assessment (2013), 3<sup>rd</sup> edition. LI and IEMA. (GLVIA, para 6.3)

theoretically visible. The model uses a 2m LiDAR digital surface model to build in the terrain, and it takes account of screening by existing trees, woodlands, buildings or structures and proposed earthworks. It adds 3m above the assumed busway level to take account of the typical height of buses.

7.5.4. In addition, fieldwork was undertaken in order to confirm the potential nature and extent of views of the Scheme and visual receptors likely to be affected. A series of photographs was taken in January, April and September 2022 from locations illustrated on the visual assessment plan (see **Figure 7-3** and **Figure 7-4**).

7.5.5. The assessment of impacts, and prediction of likely significant effects consider the sensitivity of the visual receptors along with the magnitude of the visual impact (the change in view and the effect of those changes on people). The sensitivity of a visual receptor reflects their susceptibility to change and any values that may be associated with the specific view. It varies depending on the presumed activity of the viewer, their reasons for being there and their expectations and the duration of view. Impacts are assessed at a worse case winter on year 1 of opening, and again at summer year 15, when planted mitigation is deemed to have matured.

### Visual receptors

7.5.6. Thirty-seven key visual receptors who are likely to experience views of the C2C Scheme within the study Area were identified. Provisional locations for these viewpoints were consulted with GCP's Landscape Heritage and Ecology working group, which included representatives from the

National Trust, Historic England, relevant local authorities, and Cambridge Past, Present and Future.

7.5.7. These locations represent the views for the following groups of people:

**Table 7-2 – Visual receptor locations**

Receptor No.	Location	Receptors
R2-R3	Highfields Caldecote	Residents
R4	Childerley	Recreational users
R5	Scotland Farm	Residents
R6-R10	Scotland Farm, Dry Drayton	Recreational users
R1, R11	Hardwick	Residents
R12	Comberton	Residents
R13, R18, R20		Residents
R24	Madingley Road	Hotel/event guests
R17		Road users
R15, R21, R23	Coton	Residents
R22		Garden centre visitors

Receptor No.	Location	Receptors
R14, R16, R19, R27-R29		Recreational users
R25-R26, R30-R32	West Cambridge	Recreational users
R33-R35	North Newnham	Residents
R36, R37	Central Cambridge	Recreational users



Figure 7-3 – Visual Assessment Plan (Sheet 1)

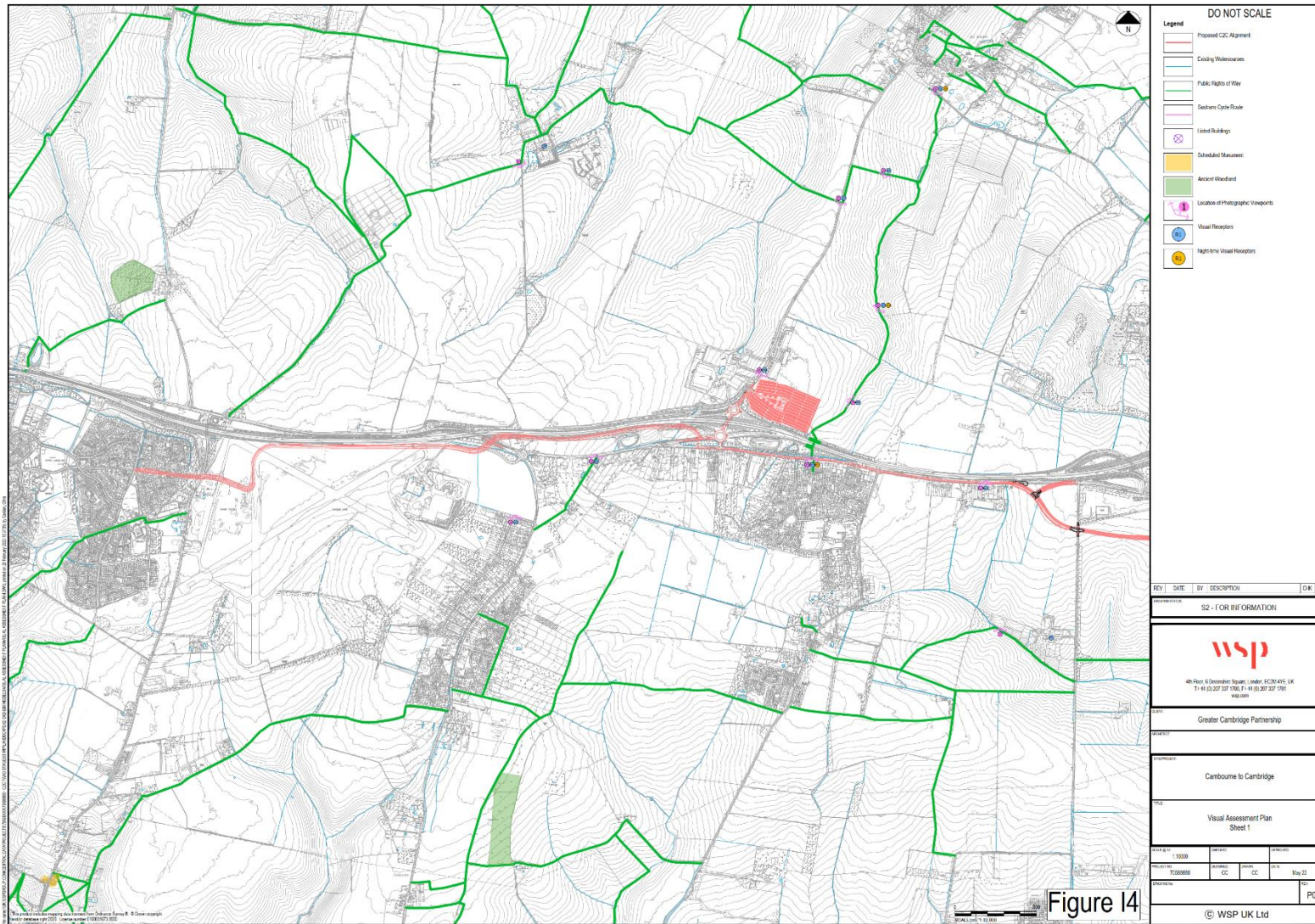


Figure I4







## Permanent and operational effects

- 7.5.8. There has been detailed consideration of how views of the C2C Scheme can be ameliorated through use of earthworks and landscape planting. Much of the route passes areas where transport infrastructure is a prevailing characteristic, so that permanent impacts will have little overall effect on the character of views. In more open areas, such as the fields north of Coton, although buses will be somewhat visible, the rolling landform and existing vegetation will be important in screening views from several properties on the north side of the village. Similarly, the route through Coton Orchard will be well screened from most directions. From Red Meadow Hill (R28) the overall qualitative change, given the long viewing distance, will be noticeable but not significant in the context of the wide landscape.
- 7.5.9. From Madingley Road properties the completed Scheme will sit over the hill brow and therefore be largely screened. The buses, however, will be visible as they run through the landscape.
- 7.5.10. There will be a small number of significant residual visual effects in the first year of operation, but for most of these maturing screening and landscape planting will lessen effects to a non-significant level by summer year 15.
- 7.5.11. Permanent significant visual effects will principally concern viewpoints in close proximity to the Scheme and/or with initially unfettered views of it, though maturing landscape planting will gradually become effective. These are as follows:
- On Scotland Road (R5) residents of approximately 10 properties will have close rear oblique views, primarily

from first floor windows, of the travel hub and its operation resulting in significant effects at winter year 1. But mature planting will increasingly screen views and help integrate the Scheme into the landscape, such that these effects will become non-significant by summer year 15.

- Users of the footpath east of the compound (R6) will be similarly affected, with significant effects at winter year 1 reduced to non-significant by summer year 15.
- In Coton, the alignment will be well integrated into the landscape and though views will be possible, including those of the buses, the magnitude of impacts will be minor, and will generally not result in significant effects. Users of the footpath between Madingley and Coton will be significantly affected. Maturing planting will lessen this effect for more distant southern locations (R16) by summer year 15, but where the path crosses C2C (R19) significant adverse effects will be permanent.
- Also in Coton, residents at 14 properties (R21) will have close views (c40m) of the Scheme as it crosses Cambridge Road, resulting in significant effects at winter year 1. As landscaping and screen planting matures, this effect will lessen and become non-significant by summer year 15.
- Users of footpaths west of Cambridge will be affected by views of the Scheme. In most cases, impacts will not result in significant effects, though at R26 and R31, the close viewing distance (R26) and impedance of existing view (R31) will result in a significant effect at winter year 1.



### Temporary construction effects

- 7.5.12. The most visually prominent aspects of C2C will occur during construction, when views of construction plant and activity, and of extensive earthworks with little amelioration from planting and grading will present potentially stark views in close or open settings. However, the duration of the impacts will be relatively short-lived, and with the various measures set out in the CoCP with respect to, for example, lighting and hoarding, significant effects will be limited.
- 7.5.13. Predicted likely temporary significant adverse effects are as follows:
- On Scotland Road (R5) residents of approximately 10 properties will have close rear views of the works on the main compound on the later travel hub site, which will last for the full two and a half-year duration of construction. Users of the footpath east of the compound (R6) will be similarly affected.
  - In Coton, residents of 36 properties on Whitwell Way (R15) will have clear views, albeit quite distant (c420m) of the busway works northwards across open countryside. Footpath users (R16 and R19) north of the school will also have very close views and will be similarly affected.
  - Also in Coton, residents at 14 properties (R21) will have close views (c40m) of the works as they cross Cambridge Road.
  - Users of the hotel and event facilities at Rectory Farm (R24) off Madingley Road will have clear southward views including works associated with the M11 overbridge.

- Users of footpaths west of Cambridge will be affected by views of the works, including those at viewpoints R26 by the M11, and R30, R31 and R32, south of the West Cambridge science park.

## 7.6 Socio-economic and health effects

### Overview

- 7.6.1. Technical Report 4 (TR4: Community and human health, land use and land take) describes and contains the findings of assessments of likely significant effects from the C2C Scheme on housing, jobs and employment, local access, and health.
- 7.6.2. Access with respect to footpaths and bridleways is also described in TR4, though is covered in Section 7.2.
- 7.6.3. Wider economic information is available in the Outline Business Case, including Appendix 1, which covers the economic case.
- 7.6.4. The scope and methodology for the assessment of socio-economic and health impacts (community and health) are described in Section 9 of the C2C ES Scoping Report<sup>2</sup>.

### Permanent socio-economic effects

- 7.6.5. The proposed developments at Cambourne West and Bourn Airfield are dependent on the introduction of the C2C Scheme. The proposal for 3,500 homes new homes (40 per cent of which should be affordable) at Bourn Airfield is explicitly tied to the provision of C2C (or an equivalent public transport link), with no more than 500 homes permitted until the Scheme is in place.

- 7.6.6. The land value uplift (a measure of the difference between the value of land with and without consent for the Scheme) owing to C2C is almost £200M. For Cambourne West, C2C also offers almost £50M of land value uplift. This is key to ensuring that the potential for housing growth and, with it, the additional workforce that becomes available to local businesses, is realised. Labour market impacts are captured under wider economic impacts in the Outline Business Case.
- 7.6.7. There will be a very large permanent beneficial effect (significant) for walkers, cyclists and horse riders due to the new active travel route, which will support travel for recreation and commuting between communities along the C2C Scheme, and provide a continuous path into Cambridge.
- 7.6.8. One bridleway (see Section 7.2) will be permanently diverted increasing the journey length by approximately 300m, constituting a permanent moderate adverse (significant) effect.

### Impacts on human health

- 7.6.9. C2C will connect people socially and economically, with health implications for the communities it serves. It has the potential to enhance health by shaping access to services and opportunities, through physical activity levels, or by improving environmental conditions, such as air quality. It also has the potential to increase health risks exposure to air pollutants, noise or visual impact, and by risks from road traffic injuries.
- 7.6.10. There are clear health benefits from C2C, including better connectivity and easier access with health facilities in Cambridge, including Addenbrookes and Papworth hospitals; facilitated active travel through provision of cycling and walking

along the length of the Scheme; and by improved air quality in most parts of the study area (see Section 7.3).

- 7.6.11. There are no worsened safety risks (see section 7.2), either during construction or operations.
- 7.6.12. There are several adverse effects predicted temporarily during construction, including noise and vibration impacts (see Section 7.3) and reductions in visual amenity (see Section 7.5), which could in turn result in adverse health impacts for local residents' mental health. Noise and vibration effects are presented as a worse case, and the 279 and 95 properties as predicted as being significantly affected are likely to reduce as the construction programme is elaborated and refined and actual impact durations are better understood. Visual amenity will improve as mitigation planting matures and increases the level of screening of the C2C Scheme.

### Temporary construction effects

- 7.6.13. Some 560 full time equivalent jobs are estimated to be generated during construction, the great majority of these (c500) within South Cambridgeshire. While this is notable, it is not considered to be a significant benefit, in the context of South Cambridge and the City of Cambridge employment as a whole.
- 7.6.14. There will be no community land or facilities directly affected during construction of the Scheme. Several community facilities and businesses will experience minor disruption to access, but with careful management in line with the CoCP, effects will be no more than minor and not significant.

- 7.6.15. As described in Section 7.2, under transit and access, four public rights of way will be directly affected during construction, Three footpaths will be kept open with potential for minor alignment amendments and appropriate management measures in line with the CoCP. One bridleway will be permanently diverted increasing the journey length by approximately 300m, constituting a permanent moderate adverse (significant) effect.





# 8 Effects on the natural environment

## 8.1 Introduction

- 8.1.1. This chapter describes the predicted likely significant effects on water resources and ecology resulting from the construction and operation of C2C.
- 8.1.2. It reflects the findings of separate assessments of impacts respectively on surface water and groundwater, flooding and ecology, each of which has used their own reasonable worst-case assumptions in order to assess likely significant effects. The ES includes separate technical reports [not available at this stage] that describe these topic assessments in full, and the information here focuses on the effects that are considered to be likely and significant (see Section 2.4). The technical reports outline their respective assessment methods, updating where necessary the more detailed coverage within the C2C ES Scoping Report<sup>2</sup>.

## 8.2 Water resources and flooding

- 8.2.1. Technical Report 13 (TR13: Water Environment) describes and contains the findings of the assessment of impacts of C2C on surface and groundwater resources, including responses that cover the issues raised by the Environment Agency in

their ES scoping response from March 2022<sup>10</sup>. A separate Flood Risk Assessment is also reported, as is a screening and scoping assessment under the Water Framework Directive<sup>67</sup>. The scope and methodology for the assessment of water resources and flood risk are described in Section 15 of the C2C ES Scoping Report.

- 8.2.2. The Scheme crosses two watercourses, several land drains and overlies a principal aquifer, which is itself overlain by a thick clay layer. Embedded mitigation in both design (through the drainage strategy) and construction (through the CoCP) has been devised to ensure that risks to water resources are kept to a practicable minimum, and that there will be no likely significant effects.

### Temporary construction effects

- 8.2.3. The CoCP outlines the measures that will be used during construction to ensure the protection of surface water and groundwater resources; for example through leaks and spills of chemicals, or from impacts in close proximity to watercourses or over groundwater resources. No dewatering, where groundwater or surface water is removed or drained, is proposed during construction. On the basis of these assumptions, no significant effects will occur during the construction of C2C.

<sup>67</sup> Flood Risk Assessment (C2C-11-00-Environmental Statement (Volume 2)



### Permanent and operational effects

- 8.2.4. The Scheme design has embedded within it the necessary measures to ensure that impacts on the water resource are mitigated, and permanent significant effects are avoided.
- 8.2.5. Impact on flood risk will be mitigated through use of clear span bridge over the Bin Brook designed to the 1 in 100 year plus 19% climate change annual exceedance probability. All other watercourse crossings have been designed to accommodate the flows for the 1 in 1000 year annual exceedance probability.
- 8.2.6. The surface water drainage strategy (document number Appendix TR13.1.3 - Annex 13.1.3) includes SuDS measures to ensure that the Scheme has a negligible impact on water quality or quantity.

## 8.3 Ecology

### Overview

- 8.3.1. Technical Report 7 (TR7: Ecology) describes and contains the detailed findings of the assessment of impacts of C2C on habitats and fauna from landtake and severance, and potential disturbance, intrusion and collision, both during the Scheme's operation and temporarily during its construction. It includes responses that cover the issues raised by Natural England in their ES scoping response from March 2022<sup>10</sup>. The scope and methodology for the assessment of ecology (biodiversity) are described in Section 6 of the C2C ES Scoping Report<sup>2</sup>.

- 8.3.2. There are 11 survey reports recording the findings of almost 250 ecological surveys by WSP that cover vegetation and a range of species and animal groups, as well as 20 or so reports that refer to earlier ecological assessment work undertaken for the project. A separate arboricultural report is also available.

### Designated sites and habitats

- 8.3.3. Eversden and Wimpole Woods, located approximately 6.5km south of the Scheme, are together internationally designated as a special area of conservation (SAC) due to the summer maternity roost of barbastelle bats that they support. Several mitigation measures are included in the C2C proposals to ensure adverse effects on this site and the bats are avoided. Monitoring of habitats and mitigation features will be undertaken to determine effectiveness of mitigation of likely significant effects and identify any appropriate remedial actions. These are described in full in the Appropriate Assessment report<sup>68</sup> and are summarised below, under coverage of bats.
- 8.3.4. Other statutorily affected sites, including Madingley Woods SSSI located 260m north and uphill of the Scheme; Caldecote Meadows SSSI, 1.6km south; Hardwick Wood SSSI, 1.7km south; and Eversden and Wimpole Woods SAC will be unaffected, either directly or indirectly, by C2C (see 'Bats').
- 8.3.5. Of the 11 non-statutory sites located within 1km of the Scheme, three are located within the Scheme boundary,

<sup>68</sup> Habitat Regulations Assessment (C2C-11-00-Environmental Statement (Volume 2)

namely the Coton Path hedgerow (a county wildlife site), and the scrubland east of the M11 and Bin Brook (both city wildlife sites), will not result in significant effects.

- 8.3.6. A little over 10% of the Coton Path hedgerow (up to ~300m<sup>2</sup>) will be removed, though no rare or notable plant species were recorded in the affected part. New hedgerows will be planted as part of wider landscaping and ecological compensation measures in the vicinity of the Coton Path hedge. Approximately 360m<sup>2</sup> of new species rich hedgerow planting is proposed to the south of the existing hedge, in addition to woodland and grassland.
- 8.3.7. Approximately 0.4ha of the M11 scrub will be removed from the 2.3ha site, which has already been impinged by the West Cambridge development. Again, no rare or notable plant species were recorded in the affected part and this area has begun to succeed to woodland, rather than scrub which the site was originally designated for. Woodland planting has been incorporated into the landscape design near the M11 bridge and elsewhere within the Scheme to compensate for the loss of woodland habitat.
- 8.3.8. The Bin Brook habitat will be subject to negligible landtake (30m<sup>2</sup> and under 0.5% of the designated site). The affected area is already impinged by the existing bridge brick stanchions built into the banks of the brook. The notable pollarded willow trees will be unaffected, and water vole,

evidence for which was noted south of the works, are expected to benefit from the wider flood mitigation measures and associated landscaping that will be introduced south of the bridge. The footprint of the new bridge will be similar to the existing structure, and any change to shading on sensitive receptors in the watercourse will be negligible.

### Habitats

- 8.3.9. The Scheme and its constriction will result in the loss of habitats of several types, including common and widespread habitats, as well as more noteworthy habitats of principal importance (HPIs)<sup>69</sup>.

**Table 8-1 – Habitat impacts**

Habitat	Area within the Scheme limits (ha)
Cereal crops	40.89
<i>Arrhegatherum</i> Neutral grassland	6.81
Other neutral grassland	5.56
Modified Grassland	4.98
Other broadleaved woodland (not HPI)	3.90
Sparsely vegetated with ruderal/ ephemeral vegetation	3.80

<sup>69</sup> HPIs listed in section 41 of the Natural Environment and Rural Communities and are the most important habitats for wildlife, which are protected by the NERC Act and the NPPF.

Habitat	Area within the Scheme limits (ha)
Other lowland mixed deciduous woodland (HPI)	1.82
Mixed scrub	0.57
Hawthorn scrub	0.12
Traditional orchard (HPI)	0.42
Orchard (non-traditional)	1.30
Hedgerow (HPI)	3,580m

8.3.10. The Scheme alignment and design has been devised and refined to limit the extent of habitat loss as far as practicable. Construction compounds are located within lower value habitats. Compensatory habitat is included as part of the Scheme proposals, often serving as wider mitigation for potential landscape or flooding impacts. These have been conceived to maximise biodiversity benefits through the selection of native plant species and habitats of higher ecological value, such as lowland mixed deciduous woodland and scrub.

8.3.11. Woodland planting is located to complement existing woodland outside of the Scheme limits. Other areas of habitat have

been included within the landscape proposals to support certain groups and species of animal (notably bats).

### Coton Orchard

Coton Orchard, planted in 1922, includes a variety of habitats including hedgerows, scrub, woodland, as well as traditional orchard. Since the orchard was created in 1922, the site has experienced a change in habitat as active management of the site has lessened. Currently, all but 11 of the original fruit trees remain, with the majority of the orchard now containing young dwarf trees. The young trees, when compared to original orchard trees, are identified by their dense formation and dwarf rootstock, whereas original trees are widely spaced and can be characterised by vigorous rootstock and dome shaped canopies.

The site is believed to have been managed intensively in the past through the use of pesticides and herbicides. As a result, the understorey of the orchard habitat has been dominated by neutral grassland, which is regularly mown, with perennial rye grass frequently found. Management has transitioned to a less intensive approach after commercial harvesting ended in the mid-90s. The orchard trees that remain are now pruned intermittently. Some large areas in the east have been grubbed out and have now succeeded to scrub, and other areas have begun to succeed to woodland, dominated by young ash growth.

Its status as a traditional orchard (and therefore priority habitat) is unclear. It is listed by Natural England as the 15th largest traditional orchard within Central England within the Priority Habitat Inventory. It should be noted that this inventory uses aerial imagery to map habitats and is therefore not accurate. In reality the majority of the site does not meet the definition as defined by the Joint Nature Conservation Committee<sup>70</sup> as groups of fruit planted on vigorous rootstocks at low densities in permanent grassland; and

<sup>70</sup> JNCC (2008). UK Biodiversity Action Plan Priority Habitat Descriptions. Traditional Orchards.

managed in a low intensity way. Now dominated by high density young trees planted on dwarf stock, the majority of site does not meet this definition of traditional orchard, although the presence of some traditional orchard trees combined with prevailing low intensity management (lack of pesticide and herbicide use) ensures that the site fulfils many of the ecological niches of a traditional orchard. An estimated 490 of the orchard's trees are located within the Scheme limits. Although some of these are likely to be retained, it is assumed for the ES that all will be felled.

- 8.3.12. Several attenuation ponds along the route have been designed to maintain wet habitat where possible, so benefitting general biodiversity and increasing habitat complexity. Ponds west of the Cambridge University sports ground, southwest of the M11 overbridge, and alongside Callow Brook will hold water on a more permanent basis.
- 8.3.13. Proposals for habitat compensation within wider landscape plans have been conceived with regard to the impacts on HPIs, primarily hedgerows and woodland. Wider habitat creation will be provided offsite for HPIs where this is needed to compensate for a likely significant effect, proposals for which are being developed and will be agreed in due course. This is not mitigation as the term is used in this ES, but should be considered as part of the Scheme's overall ecological impact.
- 8.3.14. The loss of HPI woodland, hedgerow and traditional orchard, as habitats of local importance, will constitute a significant adverse effect. Approximately 1.3km of hedgerows will be lost, but will be replaced within the Scheme limits and will, within five years of maturity, have compensated for the hedgerow loss, and mitigated the significant effect. The loss of woodland

HPI (1.82ha) and traditional orchard HPI (0.42ha, cannot be fully compensated for within the Scheme design limits, and offsite habitat creation will be required to mitigate these significant effects. The significant effect will remain until compensation habitat is sufficiently mature, which will be between 15 and 30 years. It is expected that the offsite compensation will be developed alongside wider proposals for biodiversity net gain, which may not be considered as mitigation; this is described at the end of this chapter.

### Trees

- 8.3.15. The principal area of impact on notable trees along the route is Coton Orchard, with its apple trees as well as a line of closely spaced poplars on its eastern boundary.
- 8.3.16. The apple trees include 11 old apple trees, with stump remains of a 12<sup>th</sup>, which date from the orchard's creation in 1922. These 100-year-old trees could reasonably be considered veteran, although regular crown pruning in the past has rejuvenated branch growth and limited the development of a wide trunk. They are not considered therefore to possess sufficient of the key criteria of veteran trees, although they do provide an important ecological resource as deadwood habitat within the wider orchard habitat.
- 8.3.17. The trees have an estimated remaining contribution of at least 20 years. This is less than the 40+ years of expected life to be accorded high quality/category A status under BS5837, although their cultural significance is notable and augments their ecological importance. All but one of these trees will remain unaffected by the C2C.



## Bats

- 8.3.18. No bat roosts have been identified that will be directly impacted or otherwise affected by the Scheme proposals (such as by noise or light pollution), although there are some 35 trees that are suitable for use by roosting bats that will be felled. Re-survey prior to works commencing will therefore be necessary to guide detailed design and construction proposals in order for necessary mitigation measures then to be developed by the principal contractor in consultation with council wildlife officers.
- 8.3.19. Habitat used by bats for commuting and foraging, such as broadleaved woodland, scattered trees, hedgerows, orchard, scrub and grassland, will be impacted, as described above. Some of this will be replaced and will re-establish over time; others will be lost permanently. Removal of these habitats will reduce available foraging areas, and may also cause minor severance of routes identified as being used by bats commuting between roosts and feeding areas. Bats, including barbastelles, would be capable of crossing habitat gaps during construction, given that they typically cross open habitats. Habitats lost to the Scheme are widely represented in the wider local landscape and provide alternative foraging areas, with no likely significant effects.
- 8.3.20. Although construction will be principally a daytime activity, construction and security lighting could deter feeding and commuting bats, although this risk will be minimised by specification of low intrusion lighting, as it will be also for the small number of permanent lighting points where these affect commuting routes.
- 8.3.21. In the longer term, there is a risk of collision with buses. Although C2C will operate single decker buses (around 3m high), there remains a collision risk given that most species, other than noctule, Leisler's and serotine, tend to fly below 4m. The landscaping proposals include planting of woodland, trees and hedgerows at all points intersecting identified bat commuting routes, sometimes using bunds and/or with more mature standard trees specified to ensure the shortest duration of potential severance, and to encourage higher (4m+) flight routes. As a rule, the gap between the canopy heights either side of the busway will be less than 20m to encourage bats to maintain their elevation over the route. Monitoring will be undertaken of landscape mitigation features that are designed to encourage higher flight paths. This will monitor the effectiveness of the mitigation features to determine whether bats cross at safe heights (i.e. >4m). This will also determine the need for remedial action where reasonably practicable. There is uncertainty around the effectiveness of landscape mitigation features (sometimes referred to as 'hop-overs') due to a lack of available evidence following implementation of these measures on road schemes. However, this mitigation approach is considered to be proportionate to the low risk of traffic mortality impacts from the Scheme. The risk is considered to be low, given the low frequency of bat crossing (particularly from barbastelle bats) recorded during surveys and the low frequency of bus movements on the Scheme. In addition, bus movements at night, when bats are active, will be limited. The two lane Scheme is relatively narrow, limiting the distance bats will need to travel between severed habitat features.



8.3.22. Taking account of all of these measures, which are described in more detail in the ecology technical report, significant adverse effects on bats are unlikely.

### Badgers

8.3.23. Although the assessment provides a comprehensive picture of where badgers are located currently<sup>71</sup>, re-survey will be required prior to works commencing. There are five badger setts within the Scheme limits, and a further three within 30m of them. A range of measures are included in the CoCP that will dictate how disturbance during construction will be minimised, and how intervention at the setts, if required, will be undertaken.

8.3.24. On the completed Scheme, badger-proof fencing will be installed as necessary, particularly where the busway severs common commuting routes, foraging areas and near to setts. Underpasses will be installed under the route within sensitive areas to allow badgers, as well as other wildlife, to cross safely. The location of these underpasses will be determined at detailed design stage.

8.3.25. With these measures in place, significant effects on badgers, both during construction and operation, will be unlikely.

### Terrestrial invertebrates

8.3.26. A sizable area of habitat mosaic in Coton Orchard (2.2ha) will be lost to the Scheme, which contains a notable diversity of invertebrate species, with 14 that are nationally scarce including eight beetles, two bees and four moths. There will be sufficient

remaining habitat in the orchard to continue to support this invertebrate community, but given the range and number of species, and rarity of some, the impact will result locally in a significant adverse effect. Provision of compensation habitat may mitigate this in the longer term.

### Other fauna

8.3.27. Other species or groups of animals, including brown hare, otter, water vole, barn owl, breeding and wintering birds, reptiles, great crested newt, and white clawed crayfish will not be subject to significant effects.

8.3.28. There is no definitive evidence of otter, white clawed crayfish and great crested newt in the study area. Re-survey for these species prior to works commencing will be necessary to guide detailed design and construction proposals in order for necessary mitigation measures then to be developed by the principal contractor in consultation with council wildlife officers.

8.3.29. Water voles are known to occur along Callow Brook within the Scheme limits, and near to the Bin Brook crossing. Re-survey will be undertaken prior to works commencing to determine any specific mitigation measures that may be required, but the application of general mitigation measures set out in the CoCP will ensure the protection of voles during construction.

8.3.30. No reptile populations were identified within the Scheme limits, although previous records of nearby grass snake and common lizard, and the presence of suitable habitat within the Scheme limits, suggest the possibility of their occurrence. Application

<sup>71</sup> Badger sett locations remain confidential.

of measures set out in the CoCP will be sufficient to protect reptiles.

### **Biodiversity net gain**

- 8.3.31. An assessment of BNG has been completed in support of a BNG strategy that describes how C2C will achieve a measurable net gain in biodiversity of at least 20%. BNG is over and above the biodiversity mitigation and compensation measures identified to mitigate likely significant effects. The Natural England Biodiversity Metric 3.1 has been used to calculate BNG, as set out in the Biodiversity Net Gain Assessment [document reference TR5.7]. This metric assigns relative values to habitats depending on a range of factors such as distinctiveness, condition, and scarcity. The metric then combines these factors with the area of each habitat impacted, to provide a score for the change in biodiversity units.
- 8.3.32. Time to maturity will depend on the habitat type, and the calculated BNG habitat area takes this maturation time into account. However, as well as overall habitat gain, BNG will provide additional benefits for the fauna they support, including bats, birds, mammals and invertebrates.



# 9 Effects on the cultural environment

## 9.1 Introduction

- 9.1.1. This chapter describes the predicted likely significant effects on aspects of the cultural environment, namely landscape and heritage, with the latter separated into built heritage and above ground assets, and archaeology and buried assets.
- 9.1.2. It reflects the findings of separate assessments of impacts respectively on landscape, built heritage and archaeology, each of which has used their own reasonable worst-case assumptions in order to assess likely significant effects. The ES includes separate technical reports [not available at this stage] that describe these topic assessments in full, and the information here focuses on the effects that are considered to be likely and significant (see Section 2.4). The technical reports outline their respective assessment methods, updating where necessary the more detailed coverage within the C2C ES Scoping Report<sup>2</sup>.

<sup>72</sup> Chris Blandford Associates (2021) Great Cambridge Partnership, Greater Cambridge Landscape Character Assessment

## 9.2 Landscape

### Overview

- 9.2.1. Technical Report 8 (TR8: Landscape and Visual) describes and contains the detailed findings of the assessment of likely significant effects from the C2C Scheme on landscape, and specifically how the Scheme will affect the character of the landscape. Effects on views and visual amenity are addressed in Chapter 7. The scope and methodology for the landscape assessment are described in Section 11 of the C2C ES Scoping Report<sup>2</sup>.
- 9.2.2. Landscape character can be considered at different scales, from a national context (for which Natural England has defined national character areas) through to a county or local strategic context, or even a bespoke project context. For C2C the assessment has used the existing landscape characterisation contained in the *Greater Cambridge Landscape Character Assessment*<sup>72</sup>, and the *Cambridge Inner Green Belt Boundary Study*<sup>73</sup>.
- 9.2.3. There are also specific landscape elements that make a positive contribution to the character of the landscape affected by C2C, and therefore represent features that are more susceptible to adverse impacts, including pockets of ancient woodland (notably Madingley Wood); old orchards (notably Coton Orchard), and conservation areas (notably in Coton and

<sup>73</sup> LDA Design (2015) Cambridge Inner Green Belt Boundary Study



West Cambridge, each with a range of listed buildings). Impacts on the latter are addressed later under heritage.

9.2.4. There are four strategic townscape/landscape character areas (T/LCAs) defined within the strategic documents used for this assessment that are directly affected by C2C (see **Figure 9-1**), namely:

- From the *Green Belt Boundary Study*, the West Cambridge TCA (TCA2 West Cambridge) is considered to have a medium sensitivity on the basis of the rural buffer it provides west of Cambridge, together with its “distinctive buildings, quintessential views, topographical features, setting and backdrops to the city, historic approach routes and landmarks of distinctive character”.
- The Bourn Tributaries Lowland Farmlands LCA (LCA 3B), is a well settled rural landscape of medium sensitivity, strongly influenced by the wide, shallow valley of Bourn Brook and with well-defined fields around villages.
- The Croxton to Conington Wooded Claylands LCA (LCA 4A), is a rural landscape with scattered small woods, large arable fields and numerous settlements, some (such as Cambourne) of reasonable size. This is considered to be of low sensitivity.
- The Lolworth to Longstowe Wooded Claylands LCA (LCA 4B) is the area that encompasses the majority of the C2C Scheme. It is a settled rural landscape characterised by small woods and a mature, fragmented hedgerow network, road infrastructure and wide-open views. A settlement pattern of small and medium sized villages includes Coton and Hardwick. It is of medium sensitivity.

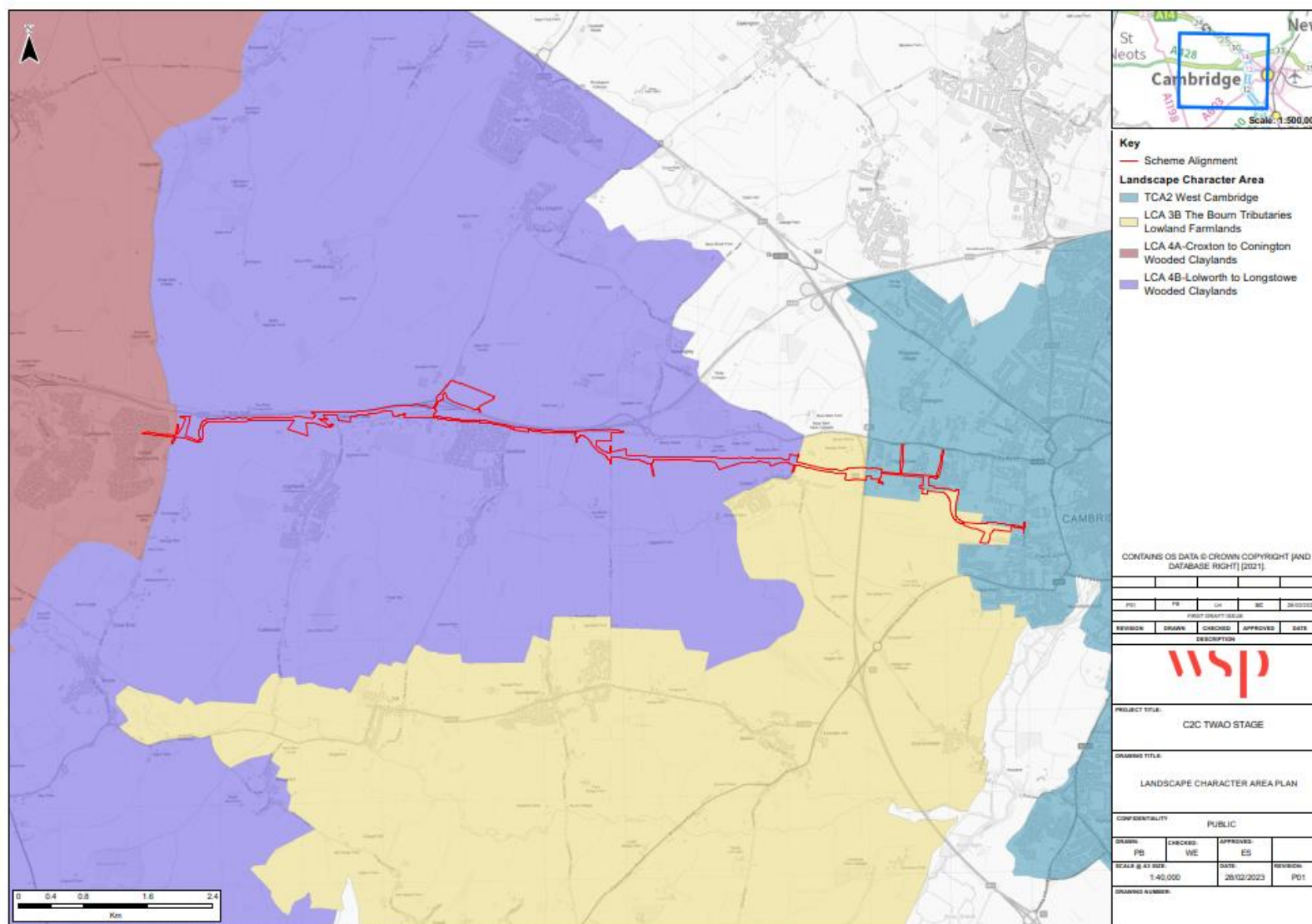
9.2.5. Within LCA 4B, the landscape north and east of the built centre of Coton village is notable, distinguished by rolling open farmland that affords wider views including those from the strategic viewpoint of Red Meadow Hill about 2km south the route. Coton Orchard is also a distinct landscape feature, though views of and across it are limited by peripheral vegetation.

### Permanent and operational effects

- 9.2.6. Much of the scheme’s alignment will affect areas of relatively lower landscape sensitivity, such as around Bourn Airfield; or will result in relatively small qualitative change, such as past Hardwick. However, turning southwards east of Hardwick, the Scheme crosses land with higher intrinsic visual, historical and cultural significance, whose character is fundamental to preserving the setting and special character of Cambridge.
- 9.2.7. There would be some noticeable change to existing landscape elements and landscape character; however the landscape mitigation proposals will be fundamental to the Scheme’s integration in the landscape, including the introduction of new earth bunds and planting alongside the busway (see **Section 3.5**).
- 9.2.8. The C2C Scheme will cause noticeable alteration of existing landscape fabric and features of importance to the landscape character locally near Coton, although its impact on the wider LCA 4B will be minimal.



Figure 9-1 - Landscape character area



9.2.9. On the basis of the landscape impacts east of Hardwick, where the Scheme crosses open rural land, and given the medium sensitivity the LCA, and the minor/moderate magnitude of impact at year 1 winter on LCA 4B, the landscape effect will be moderate adverse, and therefore significant.

9.2.10. Mitigation planting will establish over time enhancing screening, and embedding the Scheme more firmly in the landscape. With time this will lessen the magnitude of the impact to minor and reduce the severity of the effect, such that at year 15 summer the effect will be non-significant.

### Temporary construction effects

9.2.11. During construction, the C2C Scheme will introduce construction-related traffic into the landscape, and a notable (moderate) change in the character of the agricultural fields, especially where construction compounds are prominent. These impacts will be temporary and limited to a degree by the measures set out in the CoCP.

9.2.12. However, within the relatively more sensitive landscape around Coton and Hardwick (LCA 4B), and given the prominence of much of the works across much of this area, including the main compound at Scotland Farm, the character of this area will be moderately adversely affected temporarily, a significant effect.

<sup>74</sup> Heritage Statement (C2C-11-00-Environmental Statement (Volume 2)

<sup>75</sup> Historic England (2017) The Setting of Heritage Assets. Historic Environment Good Practice Advice in Planning Note 3 (Second Edition)

## 9.3 Built heritage

### Overview

9.3.1. Technical Report 7 (TR7: Heritage) describes and contains the detailed findings of the assessment of likely significant effects from the C2C Scheme on above ground, built heritage assets. It includes responses that cover the issues raised by Historic England in their ES scoping response from March 2022<sup>10</sup>. The scope and methodology for the assessment of built heritage are described in Section 10 of the C2C ES Scoping Report<sup>2</sup>.

9.3.2. The Cambourne to Cambridge Heritage Statement<sup>74</sup> addresses specific impacts of the Scheme on the West Cambridge Conservation Area and the assets within its boundary, the western edge of which is impinged by the Scheme on its approach into Cambridge.

9.3.3. Impacts on built heritage could arise from direct physical impacts, or from impacts on setting. The setting of a heritage asset is the way in which it is understood and experienced. It differs from the asset's context and historic character (which as a summation of all historic attributes, including setting, associations, and visual aspects). Setting is determined in accordance with guidance produced by Historic England<sup>75</sup> and IEMA and the Landscape Institute<sup>76</sup>.

9.3.4. The assessment considers the physical surroundings of the heritage assets, including topography and intervening

<sup>76</sup> Guidelines for Landscape and Visual Impact Assessment, 3<sup>rd</sup> edition. LI and IEMA.

development and vegetation. It also considers how the asset is currently experienced and understood through its setting, in particular views to and from the asset and the Scheme, along with key views, and the extent to which setting may have already been compromised.

**Permanent effects**

9.3.5. There will be no physical impacts, such as demolition or alteration of fabric to any above ground heritage assets. There will be impacts to the settings of seven above ground heritage assets – two conservation areas, four listed buildings and one building of local interest. The harm done to these assets, in accordance with NPPF terminology, will be ‘less than substantial’. The effects are each considered to be minor and not significant. These assets and the context for the predicted effects are described below.

9.3.6. The former entrance lodges to Childerley Hall are a pair of mid-20th century non-designated lodge cottages. The Scheme is situated 15m to the north of the lodges.

**Figure 9-2 – Former entrance lodges to Childerley Hall**



9.3.7. The Coton Conservation Area includes the Grade I listed 12<sup>th</sup> century parish church and a further 12 designated structures. The northern boundary lies approximately 85m south of the C2C Scheme.

**Figure 9-3 – Grade I listed 12th century parish church**



9.3.8. Schlumberger Gould Research Centre is a late-20<sup>th</sup> century, Grade II\* listed structure, located on the West Cambridge science park. The Scheme is situated 145m to the west of the Scheme.



**Figure 9-4 – Schlumberger Gould Research Centre**



9.3.9. The C2C Scheme will also affect the West Cambridge Conservation Area, and three heritage assets within it. The Scheme will result in some change to this designation, but will not diminish its unique character. And the assets within it will retain their visual prominence within it and their primary relationships to the conservation area, the University and wider Cambridge.

**Figure 9-5 – Grade II\* listed Clare Hall College complex**



- 9.3.10. The southern side of the Grade II\* listed Clare Hall College complex is located immediately adjacent to the proposed Scheme. However, its primary frontage faces north to Herschel Road, away from the Scheme.
- 9.3.11. Elmside is a Grade II listed 19<sup>th</sup> century house, which extended to become part of Clare Hall in the 20<sup>th</sup> century. It is located 5m west of the Grange Road part of Scheme and 25m north of the proposed busway.
- 9.3.12. 48 Grange Road is a Grade II listed house built c.1880 that is located 10m east of site.
- 9.3.13. There is visual or noise impact of the Scheme on the American Military Cemetery at Madingley, 240m north of the Scheme limits. There will be no effects on the setting of the Grade I registered park and garden nor on its Grade II\* listed memorial. There are no significant effects on any other registered parks and gardens, including Clare College, referred

to in Historic England’s scoping response. Temporary construction effects

- 9.3.14. Given the relatively short duration of construction works, the impacts on heritage assets, whose longevity is fundamental to their importance, will not result in likely significant effects.

## 9.4 Archaeology

### Overview

- 9.4.1. Technical Report 7 (TR7: Heritage) describes and contains the detailed findings of the assessment of likely significant effects from the C2C Scheme on archaeology. Impacts on archaeology could arise from works causing ground disturbance, such as preliminary ground works, site strip, topsoil removal, excavation for road cuttings landscaping and planting, piling and foundations, utility diversions, drainage and lighting. The scope and methodology for the assessment of archaeology are described in Section 10 of the C2C ES Scoping Report<sup>2</sup>.
- 9.4.2. There are no scheduled monuments potentially affected by the Scheme.
- 9.4.3. TR7 refers to four sections across the Scheme, namely:
- Section 1 - Cambourne to Childerley Gate;
  - Section 2 - Childerley Gate to Long Road, Hardwick (including the Scotland Farm travel hub);
  - Section 3 - Long Road, Hardwick to the M11; and
  - Section 4 - M11 to Grange Road, Cambridge.
- 9.4.4. There is a high potential for sustained prehistoric and Roman activity across most of the route, but particularly in Sections 2

and 3, where there is evidence for complex settlement activity of high heritage significance. Medieval and post medieval agricultural activity of low heritage significance is present across the Scheme, and evidence for WW2 military activity of low heritage significance is present in Section 1 and Section 4.

- 9.4.5. If present, archaeological remains might be expected to be in good condition, as the majority of area affected by the Scheme has not been previously developed.

### Managing uncertainty and mitigating impacts

- 9.4.6. Unlike most other disciplines, there can be difficulty in assigning definitive effects to archaeological impacts as these will not always be known with certainty. The 17 previous archaeological investigations, as well as those commissioned for C2C, have given a good understanding of the extent of past human activity along the route. The results of the archaeological trial trenching will determine the final scope of archaeological mitigation.
- 9.4.7. In the unlikely event that nationally significant archaeological assets are present, mitigation may take the form of preservation in situ through avoidance via design changes, where reasonably practicable. For other remains, mitigation could take the form of target excavation (preservation by record) in advance of groundworks across all areas where disturbance is proposed.
- 9.4.8. A programme of 'strip, map and record' might also be undertaken alongside the preliminary construction works (site strip) to ensure potential archaeological remains are not removed without record. Any archaeological work will need to be undertaken in accordance with a written scheme of



investigation to be approved by the County Council's archaeological advisor.

### Permanent effects

- 9.4.9. The mains impacts to potential archaeological remains would be topsoil stripping (to 0.5m below ground) across the length of the Scheme, as well as deeper construction works for cuttings, culverts, ponds, drainage, etc. Piling for the Bin Brook crossing, excavation on part of the cutting west of the junction with Cambridge Road in Coton, and localised impacts from tree removal in Coton Orchard, as well as localised planting and temporary works, will involve the potential for impacts at greater depths.
- 9.4.10. Archaeological survival is likely to be high across 65% of the C2C Scheme where it crosses previously undeveloped agricultural land, although arable cultivation and successive ploughing may have truncated potential archaeological features lying directly beneath the topsoil.
- 9.4.11. Potential impacts on archaeology are summarised below, all of which have the potential to result in likely significant effects

**Table 9-1 – Potential impacts on archaeology**

Location	Asset	Potential / Asset significance
Section 1	Prehistoric to Romano-British isolated features, agricultural activity	High Medium
	Medieval and post-medieval agricultural remains	High Low

Location	Asset	Potential / Asset significance
	Second World War Bourn Airfield	High Low
Section 2	Prehistoric to Romano-British settlement activity	High High
	isolated features, and agricultural activity	High Medium
	Medieval and post-medieval agricultural remains	High Low
Section 3	Prehistoric to Romano-British settlement activity	High High
	isolated features, and agricultural activity	High Medium
	Medieval and post-medieval agricultural remains	High Low
Section 4	Prehistoric to Romano-British funerary activity and line of Roman road (Akeman Street)	Moderate/high High
	isolated features, and agricultural activity	<ul style="list-style-type: none"> <li>• High</li> <li>• Medium</li> </ul>
	Early medieval remains	<ul style="list-style-type: none"> <li>• Low/moderate</li> <li>• Medium/high</li> </ul>
	Medieval and post-medieval agricultural remains	<ul style="list-style-type: none"> <li>• High</li> <li>• Low</li> </ul>

Location	Asset	Potential / Asset significance
	Second World War remains of a pillbox	<ul style="list-style-type: none"> <li>• Moderate</li> <li>• Low</li> </ul>

9.4.12. No substantial groundworks are proposed along the existing St Neots Road where it crosses the Callow Brook and it is not anticipated that there will be a significant impact to any palaeo-environmental remains which may be associated with the Bin Brook, as this is a small watercourse where the sediments are likely to have been reworked in the past.

9.4.13. Any information and knowledge gained through later preservation by record and, if appropriate, publication of findings will not compensate for potentially adverse effects. However, there are key opportunities as part of the scheme to enhance wider public engagement with local heritage, such as through public open days, local displays, and talks and webinars, with possible public information boards along the service road. This would be discussed in due course with the County Council’s archaeological advisor.

### Temporary construction effects

9.4.14. All of the archaeological impacts will be permanent and no temporary effects, even though they may result from temporary construction activities, will arise.

# 10 Effects on global resources

## 10.1 Introduction

- 10.1.1. This chapter describes the predicted likely significant effects on global issues and resources, namely climate change due to emissions of greenhouse gases (GHGs); material and land resources, principally through the use of building materials; and the production of materials that could end up as waste.
- 10.1.2. It reflects the findings of separate assessments of impacts respectively on GHGs and on material assets and waste, each of which has used their own reasonable worst-case assumptions in order to assess likely significant effects. The ES includes separate technical reports [not available at this stage] that describe these topic assessments in full, and the information here focuses on the effects that are considered to be likely and significant (see Section 2.4). The technical reports outline their respective assessment methods, updating where necessary the more detailed coverage within the C2C ES Scoping Report<sup>2</sup>.

## 10.2 Land and contamination

### Overview

- 10.2.1. Technical Report 11 (TR11: Soil, Geology and Land Contamination) describes and contains the detailed findings of the respective assessments on these issues. The scope and

methodology for the assessment of agricultural land and contamination are described respectively in Section 13 (land and property) and Section 14 (soils, geology and land contamination) of the C2C ES Scoping Report<sup>2</sup>.

### Agricultural land

- 10.2.2. Reference to Agricultural Land Classification maps suggests some uncertainty across the Scheme as a whole (see Section 5.4). The agricultural land quality is certainly high with much of it considered to be best and most versatile land (Grade 1, 2 and 3a). It is estimated that up to 60ha of best and most versatile (BMV) land will be lost permanently with this high magnitude impact and the high sensitivity of this resource, the overall effect in terms of loss of agricultural land will be major adverse and significant.

### Contamination

- 10.2.3. The potential for impacts on contaminated land is limited, though more notable at Bourn Airfield, based on the previous uses of the site, as well as a potential for unexploded ordnance. Risks from this would be addressed during the regeneration of this site by the third party developer, following all legal requirements to protect people and the environment. More generally, good practice, in line with the CoCP, will ensure that the risks of effects from contamination on human health and controlled waters during the construction and operation of C2C will be negligible.



## 10.3 Greenhouse gas emissions

### Overview

10.3.1. Technical Report 6 (TR6: Greenhouse Gases) describes and contains the detailed findings of the assessment of likely significant effects of the C2C Scheme on climate change.

10.3.2. The assessment is interested in any predicted change (increase or decrease) in emissions of GHGs. These include embedded (infrastructure) carbon from the manufacture of structures and processing of constituent materials, as well as from construction activities (transport and plant operation), and from maintenance and decommissioning. It also considers operational emissions from the use of the Scheme and any shifts in transport modes/patterns which may occur.

10.3.3. The scope and methodology for the assessment of greenhouse gases are described in Section 7 of the C2C ES Scoping Report<sup>2</sup>.

### Infrastructure carbon

10.3.4. Infrastructure or embodied carbon is predicted to be around 49,000 tonnes of carbon dioxide equivalent (tCO<sub>2e</sub>). The constituents of this are summarised below.

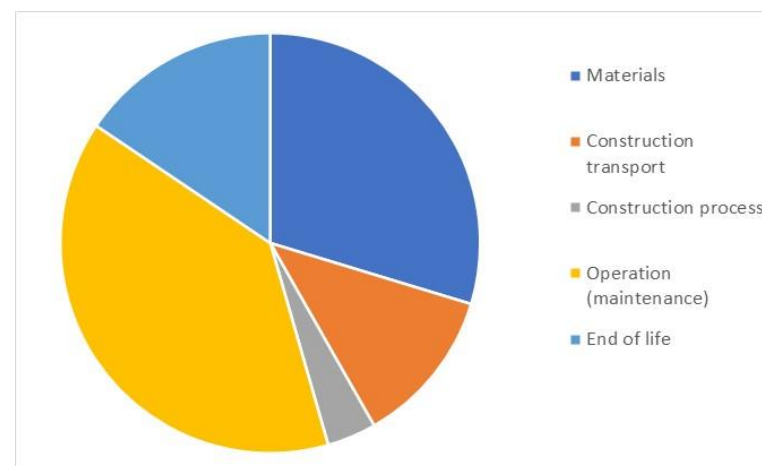
**Table 10-1 – Infrastructure carbon**

Lifecycle stages		GHG emissions* (tCO <sub>2e</sub> )	
A1-A3	Materials	14,500	29%
A4	Construction transport	5,900	12%

Lifecycle stages		GHG emissions* (tCO <sub>2e</sub> )	
A5	Construction process	1,850	40%
B2-B5	Operation (maintenance)	19,000	39%
C1-C4	End of life	7,600	16%

\*Rounded to the nearest 100

**Figure 10-1 – Infrastructure carbon**



10.3.5. Vegetation loss required for construction of the scheme, as well as loss of carbon sequestered within the soil will result in approximately XXX tCO<sub>2e</sub> [impact still to be confirmed]. However tree planting of approximately 1,500 trees has been estimated, resulting in the sequestration of approximately 777 tCO<sub>2e</sub> over the 60-year appraisal period.

10.3.6. The C2C Scheme would likely result in a potentially moderate adverse (potentially significant) impact for infrastructure carbon.

### User emissions

10.3.7. The C2C Scheme is expected to encourage modal shift to bus use, which is forecast to reduce additional private vehicle journeys by about 71.9 million over a 60-year appraisal period. This will reduce carbon emissions by an estimated 3,250 tCO<sub>2</sub>e. These carbon savings are expected to be higher still when combined with further shifts to cycling and walking that will be encouraged by the path alongside the busway.

10.3.8. Modelling indicates that further carbon savings are possible through efficiencies in traffic flows, with a total reduction of 30,955 tCO<sub>2</sub>e over the Scheme's lifetime.

10.3.9. The C2C Scheme would likely result in a potentially beneficial (potentially significant) impact from a reduction in user emissions.

## 10.4 Material use and waste

### Overview

10.4.1. Technical Report 10 (TR10: Material Assets and Waste) describes and contains the detailed findings of the assessment of impacts and effects from the consumption and use of material assets, and the generation and disposal of waste.

10.4.2. Potential impacts are directly associated with the consumption of natural and non-renewable resources, which can in turn result in indirect impacts on the climate (through carbon emissions from transport), water consumption, and human

health and amenity (visual impacts, noise and vibration, air quality – among others). The overall Scheme approach to sustainable use of materials is set out in Section 3.9.

10.4.3. The scope and methodology for the assessment of material use and waste are described in Section 18 of the C2C ES Scoping Report<sup>2</sup>.

### Material use

10.4.4. Projected material requirements for C2C are outlined below:

**Table 10-2 – Schedule of estimated material use**

Materials	Quantity (tonnes)	Use
Asphalt (bituminous mixtures)	41,600	Road base and surface course.
Concrete	2,200	Structures, foundations, piling, and pre-cast concrete for drainage, paving and kerbs.
Aggregate	250	Drainage
Imported soil and other earthwork material	480,000	Embankments, structures and drainage and backfill.
Steel	1,000	Concrete reinforcement, steel bridges, prefabricated elements (street lighting columns, CCTV masts and road signs etc).



Materials	Quantity (tonnes)	Use
Plastics (excluding packaging)	1	Polypropylene geogrid for landscaping.

### Cut/fill and materials recovery

10.4.5. The imported soil and other earthwork material referred to in **Table 10-2** takes into account the site-won materials that can be reused on the Scheme. An estimated 211,000 tonnes of soil and earth will be excavated, of which an estimated 168,800 will be reused in earthworks and backfill for the Scheme; this represents an overall 80% recovery of materials by weight.

10.4.6. In addition to the commitment to reuse site arisings, the CoCP requires that the Principal Contractor uses aggregate with a recycled content that is (as a minimum) in line with the regional percentage target of 31%. This will ensure that a significant effect is not triggered.

10.4.7. With no existing or allocated mineral safeguarded areas within the Scheme limits, C2C Scheme will not sterilise any mineral resources.

### Surplus material and waste

10.4.8. Forecasts of surplus arisings to be generated on C2C, and (therein) disposed of, are shown below.

**Table 10-3 – Schedule of estimated waste from C2C**

Excavated and other materials	Quantity (tonnes)	Management process identified
Bituminous mixtures	1,100	Assumes wastage rate of 2.5% for imported bitumen, and, as a worse case, these arisings will be exported to landfill
Concrete (poured)	7	Assumes good practice wastage rate of 2% and that, as a worse case, these arisings will be exported to landfill
Earthworks cut	42,200	This figure assumes a 20% wastage rate from site arisings, based on unsuitability for reuse. The exact quantity will be determined during site preparation works, which will be dependent on test results. Although surplus is expected to be suitable for third party development, it is assumed, as a worse case, to be exported to landfill
Wastage of imported fill	24,000	These figures are based on an assumed (and 'good practice') wastage rate of 5% which, as a worse case, assumes that these arisings will be exported to landfill
Steel	52	
Mixed demolition waste (one building)	2,800	Some asbestos likely that will need to be managed in compliance with relevant H&S and waste requirements

Excavated and other materials	Quantity (tonnes)	Management process identified
Hazardous waste	Unknown	Requires processing and management; assume sent to specialist landfill
Contaminated waste	None	NA
Other material (packaging, off-cuts, etc)	Unknown	Reused where possible or sent for recycling with surplus to landfill

In the absence of scheme specific data, a reasonable worst-case scenario has been adopted for this datum, including wastage rates. This value has therefore been derived from industry accepted benchmarks, but will be refined as design information becomes more granular and available.

10.4.9. The estimated quantity of waste to landfill is:

- 66,000 tonnes soil/earth
- 2,800 tonnes of demolition waste
- 1,200 tonnes of bituminous mixtures, steel and concrete

The impact from this waste on existing landfill capacity in the east of England (38.1 Mm<sup>3</sup>) will less than 1% of regional capacity, and hence not give rise to a likely significant effect.

# 11 Cumulative effects

## 11.1 Introduction

11.1.1. The ES's description of likely significant effects should cover, amongst other things, cumulative effects. Cumulative effects are those that result from the environmental impacts of C2C alongside impacts resulting from other, unrelated schemes. Although the Applicant's capacity to effect the outcomes of other schemes is limited, it is important for decision-makers to appreciate how people or environmental assets might be affected as an accumulation of impacts, as this may influence if and how they wish to provide their consent.

11.1.2. It is not possible to provide the same degree of scrutiny when assessing the impacts of other projects as has been applied to C2C; source information across different projects will be inconsistent, or may be unavailable. Only a qualitative comment is therefore provided, where the assessment team consider there to be a risk that the impacts of C2C might mutually exacerbate the impacts of other schemes.

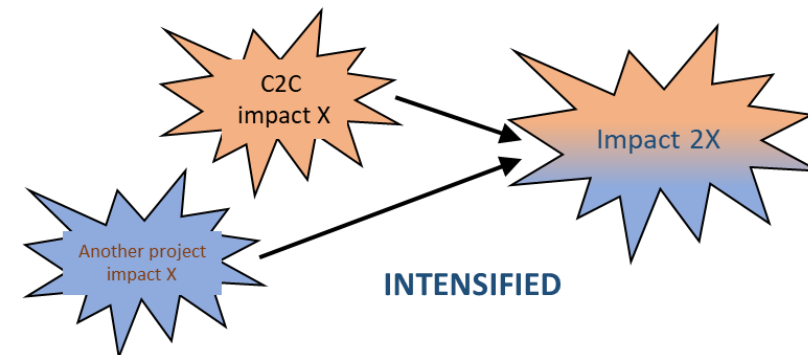
## 11.2 Types of cumulative impacts and effects

11.2.1. Impacts can occur cumulatively with other development in different ways.

### Intensified cumulative impacts

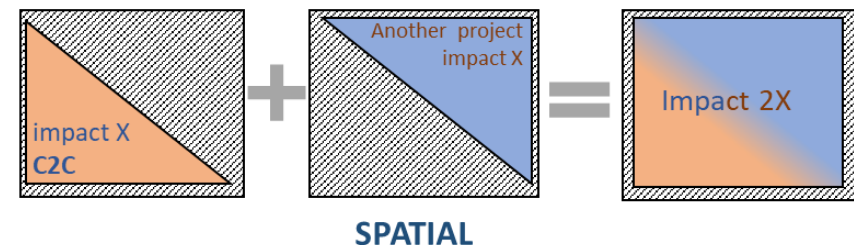
11.2.2. An environmental impact from C2C affecting a particular receptor could be intensified through its accumulation with impact(s) from another development occurring at the same

time; for example, noise or air quality impacts resulting from traffic using the travel hub, along with increased traffic volumes on local roads generated from other development.



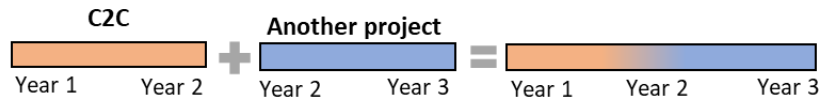
### Spatially cumulative impacts

11.2.3. Landtake impacts from C2C could be exacerbated with landtake from another scheme; for example due to habitat loss or diminution of an agricultural land holding.



### Temporally cumulative impacts

11.2.4. An impact whose effect is experienced over a given period can be exacerbated where it precedes or follows another similar impact; for example prolonged noise impacts from construction of consecutive projects affecting the same community.



### TEMPORAL

## 11.3 Assessment method

11.3.1. The method adopted for the assessment of cumulative effects broadly follows that set out in the Planning Inspectorate’s Advice Note 17<sup>77</sup>. Key to the process is the identification of other projects the impacts of which have the potential to exacerbate the effects of C2C. A long list of these developments has been created, based on criteria for scale, location and status.

11.3.2. Using information from the Great Cambridge Share Planning Authority Planning Portal<sup>78</sup> and Local Plan<sup>79</sup>, the long list of development was created, including all other developments that were within 2km of the C2C scheme limits, and which were also:

- considered to be major development (subject to DCO, TWA or hybrid bill);

- with extant consent application, granted consent, or under construction;
- over 50 units for residential development; or
- over 2,500m<sup>2</sup> for commercial development.

11.3.3. The nature and activities of the 28 developments on the long list were reviewed to establish the potential of each to result cumulatively with C2C in likely significant effects. Only where the risk was appreciable in the expert opinion of the assessment team, was the development retained within a short list.

11.3.4. The shortlist comprised 11 developments, listed in **Table 11-1** and shown in **Figure 11-1** and **Figure 11-2**.

11.3.5. The shortlist developments were all for residential, commercial and otherwise mixed uses. East West Rail would also have qualified for consideration, but is currently at too early a stage in its lifecycle to allow for meaningful consideration in the cumulative assessment.

<sup>77</sup> [Advice Note Seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects](#)

<sup>78</sup> Greater Cambridge Shared Planning (2022). *Planning*. Available online at: <https://applications.greatercambridgeplanning.org/online-applications/spatialDisplay.do?action=display&searchType=Application> (Accessed 01 November 2022)

<sup>79</sup> Greater Cambridge Share Planning (2021). *Greater Cambridge Local Plan*. Available online at: <https://www.greatercambridgeplanning.org/emerging-plans-and-guidance/greater-cambridge-local-plan/> (Accessed 01 November 2022)

Figure 11-1 – Cumulative developments location plan (Sheet 1)

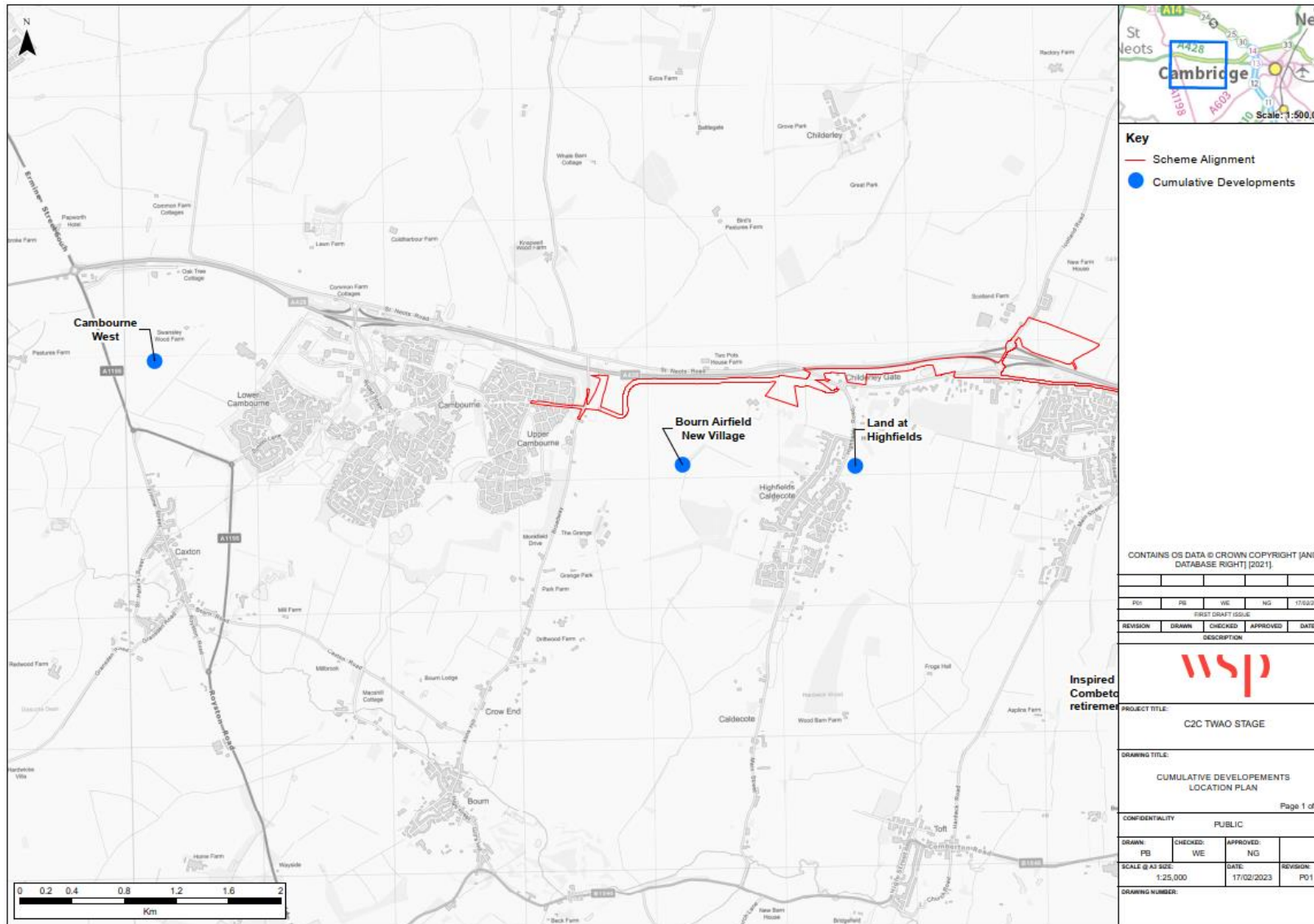
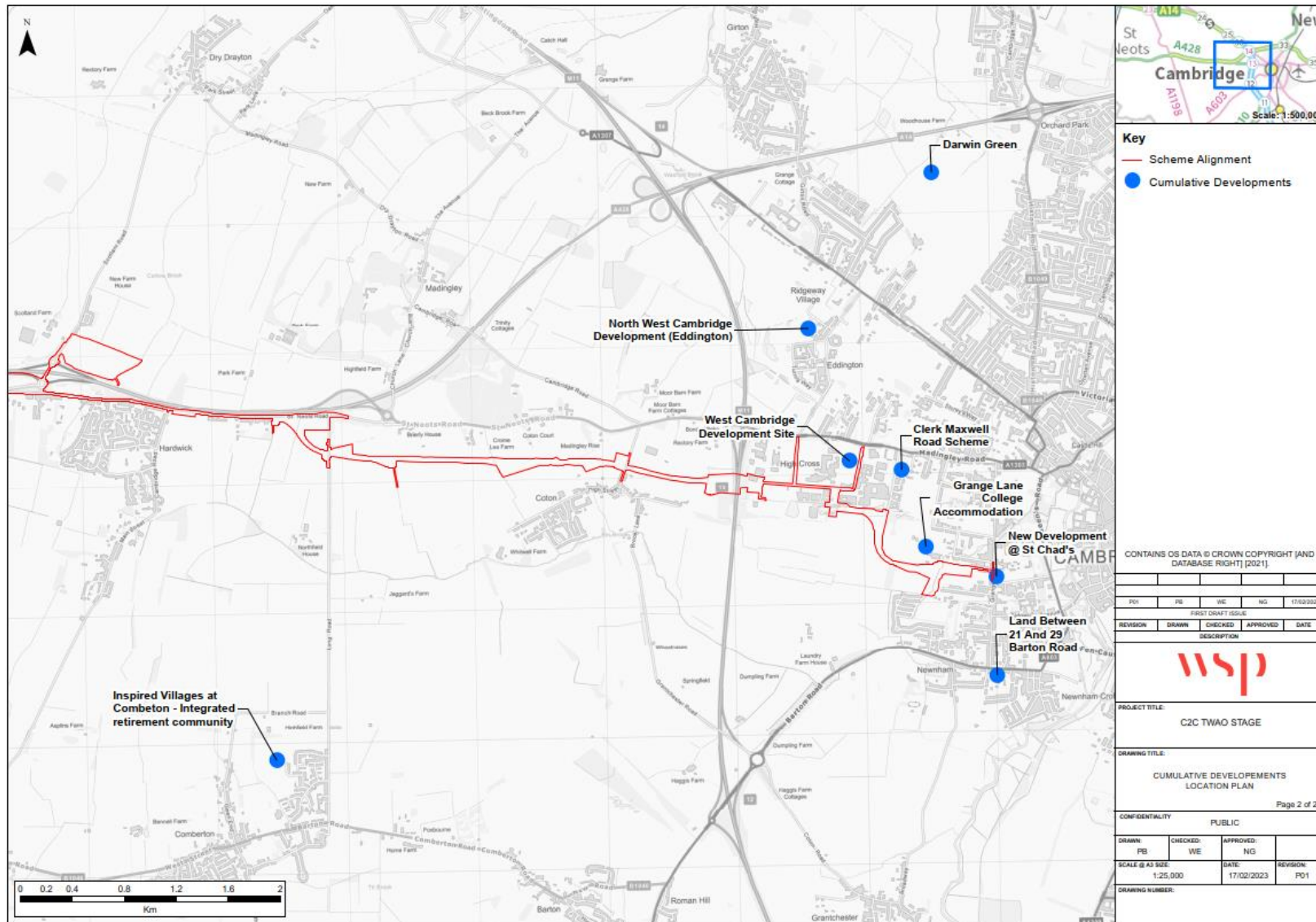




Figure 11-2 – Cumulative developments location plan (Sheet 2)



**Table 11-1 – Predicted cumulative significant effects**

Development	Description	Status	Potential likely significant temporary construction effects	Potential likely significant permanent and operational effects
Cambourne West	Up to 2,350 residential units, offices/light industry, community and leisure facilities, two primary schools and one secondary school (up to 11 ha) three vehicular access points and road modification.	Under construction	None	None
Bourn Airfield New Village	Residential development of c3,500 dwellings, and mixed uses (employment retail hotel leisure residential institutions education community facilities open space including parks ecological areas and woodlands landscaping). Also public highways	Post-application	Noise, air quality, visual, ecology, transit and access	Ecology, transit and access
Land at Highfields	Up to 140 dwellings and informal public open space and children’s play area community orchard and allotments.	Under construction	None	None
Inspired Villages at Comberton	Up to 200 extra care units of approximately 24,000m <sup>2</sup> with associated community and care facilities, garden and leisure areas, open space.	Pre-application	None	None
West Cambridge Development Site	Approx 37,000m <sup>2</sup> for academic floor space, including associated	Under construction	Noise	None

Development	Description	Status	Potential likely significant temporary construction effects	Potential likely significant permanent and operational effects
	infrastructure; modifications to JJ Thomson Avenue; and demolition of Merton Hall Farmhouse. Additional c10,000m <sup>2</sup> of academic floor space, café/restaurant, and retail plus other infrastructure.			
Clerk Maxwell Road Scheme	35 dwellings and road modification, landscaping and associated infrastructure.	Under construction	None	None
North West Cambridge Development (Eddington)	Up to 3000 dwellings; 2,000 student bedspaces, 100,000m <sup>2</sup> employment floorspace (inc 40,000m <sup>2</sup> commercial floorspace and at least 60,000m <sup>2</sup> academic floorspace, up to 5,300m <sup>2</sup> retail floorspace, 6,500m <sup>2</sup> community facilities, hotel, health care, educational energy centre.	Under construction	None	None
King's College accommodation, Newnham - Land Between 21 And 29 Barton Road	Redevelopment for college accommodation (four new buildings for 60 rooms and 24 family apartments) and refurbishment and extension of 27 Barton Road, following demolition of existing buildings (1-12 Croft Gardens)	Under construction	None	None

Development	Description	Status	Potential likely significant temporary construction effects	Potential likely significant permanent and operational effects
Darwin Green	Mixed use development of up to 1,593 dwellings, primary school, community facilities, retail units and associated infrastructure Second development for up to 1,000 dwellings, secondary school, primary school, community facilities, retail uses, and open spaces.	Under construction  Post application	None	None
New Development @ St Chad's	Demolition of existing building and erection of two new student accommodation buildings of 23 rooms, plus other facilities	Consented	Noise	None
Grange Lane	Erection of 41 residential college units to provide 245 rooms (4 x accessible houses (6 bed) 27 x townhouses (7 bed) 8 x townhouses (4 bed) with landscaping and access. Single storey porters' lodge. Approx 8,600m <sup>2</sup> of gross internal floor space, across eight terraces and three storeys.	Under construction	None	None

# 12 Taking the scheme forwards

## 12.1 The TWA process<sup>80</sup>

12.1.1. The GCP (through Cambridgeshire County Council as lead local authority) has made an application for an order under the Transport and Works Act 1992, which will provide the powers to construct, maintain and operate the busway and associated transport infrastructure. Because the TWA does not also grant planning permission over land required for the scheme, GCP has also sought from the Secretary of State a Planning Direction under Section 90(2A) of the Town and Country Planning Act 1990.

12.1.2. The TWA rules specify the documents which must be sent with an application. Although these can vary depending on the type of order being applied for, for C2C they include (in addition to this ES):

- a draft order and an explanatory memorandum;
- a concise statement of the aims of the proposals;
- a report summarising the consultations carried out by the applicant;
- plans and cross sections;
- a book of reference, including (amongst other things) names of owners and occupiers of land to be bought compulsorily;

- the estimated costs of the proposed works; and
- the funding arrangements.

These documents have all been made available at: <https://www.greatercambridge.org.uk/> and can be viewed as hard copy.

## 12.2 Giving feedback

12.2.1. The GCP has advertised its TWA order application in local newspapers, and has posted notices along the route of the scheme. It has sent notices to all owners and occupiers affected by the compulsory purchase of property, and to certain other people and organisations set out in the rules. The notices include a date by which any objections or other comments should be sent to the Secretary of State (six weeks from the date of application), and where these should be sent to. The TWA Rules provide information on the required content and scope of objections.

## 12.3 Public inquiry

12.3.1. If there is opposition to the application, the Secretary of State will decide, within 28 days of the end of the objection period (or more if there is good reason), whether to hold a public inquiry, with an inspector appointed to oversee this. If a public inquiry

<sup>80</sup> [Transport and Works Act orders: a brief guide](#) (2013).





is held, it may be six months or more from the date of the application before the inquiry opens.

- 12.3.2. A public inquiry allows everyone involved to present their cases, and to test the arguments of others, within a structured framework. Some participants, including the applicant and statutory objectors, can give evidence and cross-examine other people. Anyone else can do so with the inspector's permission. An inspector will normally allow anyone to speak who has something relevant to say.
- 12.3.3. The public inquiry will consider both the TWA order application and the request for planning permission. The inspector will wish to hear evidence about the planning merits of the scheme and about any conditions that should be set. Their report will include conclusions and recommendations on whether or not planning permission should be given, and on what conditions should be set if permission is given.

## 12.4 Decision making

- 12.4.1. The Secretary of State should be in a position to consider what decision to take on the TWA order application (and any associated request for a planning permission) following receipt of the inspector's post-inquiry report, and when the written

representations procedure has ended, or all objections have been withdrawn.

- 12.4.2. In making his/her decision the Secretary of State will set out the reasons in a decision letter, which is sent to the applicant and to others with acknowledged interest in the outcome. The TWA order usually comes into force three weeks after it is made. The text of the order is made available on [www.legislation.gov.uk](http://www.legislation.gov.uk). The TWA Unit will also send copies of the inspector's conclusions and recommendations with the decision letter.
- 12.4.3. If the Secretary of State decides to grant planning permission for the proposed development, he/she issues a planning direction when the order is made. The planning direction is likely to include conditions.

## 12.5 Assurance of environmental outcomes

- 12.5.1. On the basis that consent is granted, the GCP will then appoint a principal contractor to develop the detailed design for the scheme, and thereafter to implement its construction. The design and construction will accommodate and otherwise be subject to the various commitments enshrined in the consent (including the CoCP and other agreed environmental mitigation).



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