WEST CAMBRIDGE

OUTLINE PLANNING APPLICATION

ENVIRONMENTAL STATEMENT _ VOLUME 2

MAIN REPORT

UNIVERSITY OF CAMBRIDGE

JUNE 2016

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Document History

Job number:			**Document ref:**			
Revision	**Purpose description**	**Originated**	**Checked**	**Reviewed**	**Authorised**	**Date**
Rev 1.0	Draft layout and upfront chapters	DP	JF	JF	PW	15/05/15
Rev 2.0	Draft	DP	JF	PW	PW	13/05/15
Rev 3.0	Final	DP	JF	PW	PW	08/06/16

EIA Quality Mark

This Environmental Statement and the Environmental Impact Assessment (EIA) carried out to identify the significant environmental effects of the proposed development have been undertaken in line with our commitments as members of the EIA Quality Mark.

The EIA Quality Mark is a voluntary scheme operated by the Institute of Environmental Management and Assessment (IEMA) through our EIA activities are independently reviewed, on an annual basis, to ensure we continue to deliver excellence in the following areas:

- ***EIA Management***
- ***EIA Team Capabilities***
- ***EIA Regulatory Compliance***
- ***EIA Context & Influence***
- ***EIA Content***
- ***EIA Presentation***
- ***Improving EIA practice***

To find out more about the EIA Quality Mark and our registration to it please visit: www.iema.net/qmark

Definitions

For ease of reference the following terms have been used throughout this document:

Proposed Development	As specified in The Outline Planning Application which is the subject of this request for an Environmental Impact Assessment Scoping Opinion
The Site	The site subject to the outline planning application as shown in Figure 1.1
The Outline Planning Application (OPA)	Proposed development at West Cambridge of up to 391,800m² comprising: • Up to 370,300m² of academic floorspace (Class D1), commercial / research institute floorspace (Class B1b and sui generis research uses), of which not more than 170,000m² will be commercial floorspace • Up to 2,500m² nursery • Up to 1,000m² of A1-A5 uses • Up to 4,100m² floorspace for community facilities, and not less than 3,000m² • Up to 5,700m² of sui generis uses • Associated infrastructure including roads (including adaptations to Madingley Road), pedestrian, cycle and vehicle routes, parking, drainage, open spaces and earthworks
The Applicant	The University of Cambridge
Environmental Impact Assessment (EIA)	Assessment of the significant environmental effects of the Proposed Development
Environmental Statement (ES)	A report documenting the findings of the Environmental Impact Assessment
Cumulative effects	Effects that could occur to a single receptor from multiple impacts resulting from the Proposed Development
In-combination effects	Environmental effects that arise as a result of impacts from the Proposed Development in addition or combination with impacts from other consented developments
Scoping Opinion	Cambridge City Council's formal opinion on what content should be included in the ES in order for them to consider the significant environmental effects resulting from the Proposed Development when determining the OPA

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1. Introduction

1.1 Background

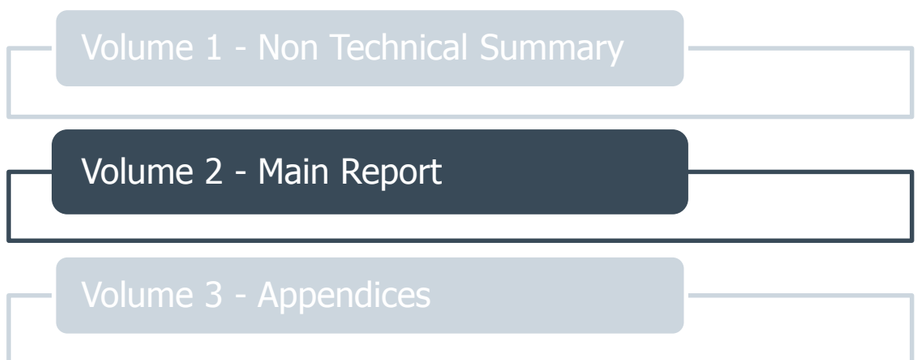
1.1.1 The University of Cambridge is seeking to secure Outline Planning Permission (OPP) for the development of the West Cambridge site (the Site) for academic and commercial use and associated facilities. The Outline Planning Application (OPA) will include outline proposals for all built development.

1.1.2 An existing masterplan, which was approved in 1999 (planning application reference C/97/0961/OP) and reviewed in 2004, forms the basis of the current development on the Site. Together with the pre-existing development on the Site, the 1999 masterplan envisaged just under 275,000m^2 of development, approximately 47% of which would be academic, 15% research institute and 22% commercial research. The remaining 16% would consist of shared facilities, sports, and residential uses.

1.1.3 The academic and residential components have been delivered to the anticipated levels but the commercial research and shared facilities is well below that envisaged in the 1999 masterplan. Policy 18 of the Draft Submission Local Plan supports the densification of the development through a revised masterplan subject to a number of conditions. To inform the Local Plan Examination, the University of Cambridge and Cambridge City Council have agreed a Statement of Common Ground and Addendum, setting out proposed changes to Policy 18, which it in intended would be incorporated in the adopted Local Plan. It is within this context that the University of Cambridge has produced a new masterplan for the Site which will significantly increase the amount of development to approximately 500,000m^2 which includes proposed and existing development on the Site. This masterplan sets out the Proposed Development which is the subject of a planning application to Cambridge City Council.

1.1.4 The Proposed Development exceeds the 1 hectare threshold set out in Schedule 2 of the Town and Country Planning (Environmental Impact Assessment) Regulations 2011 (as amended 2015) (the EIA Regulations) and it is likely that significant environmental effects could arise. Although a formal screening opinion has not been sought from Cambridge City Council, the Proposed Development is considered to be EIA development and a formal Scoping Opinion has been sought. A full description of the Proposed Development is given in Chapter 3.

1.1.5 The ES comprises three volumes as shown below. This document constitutes Volume 2 of the ES.



1.1.6 The Site is located on the western outskirts of Cambridge as shown on Figure 1.1.

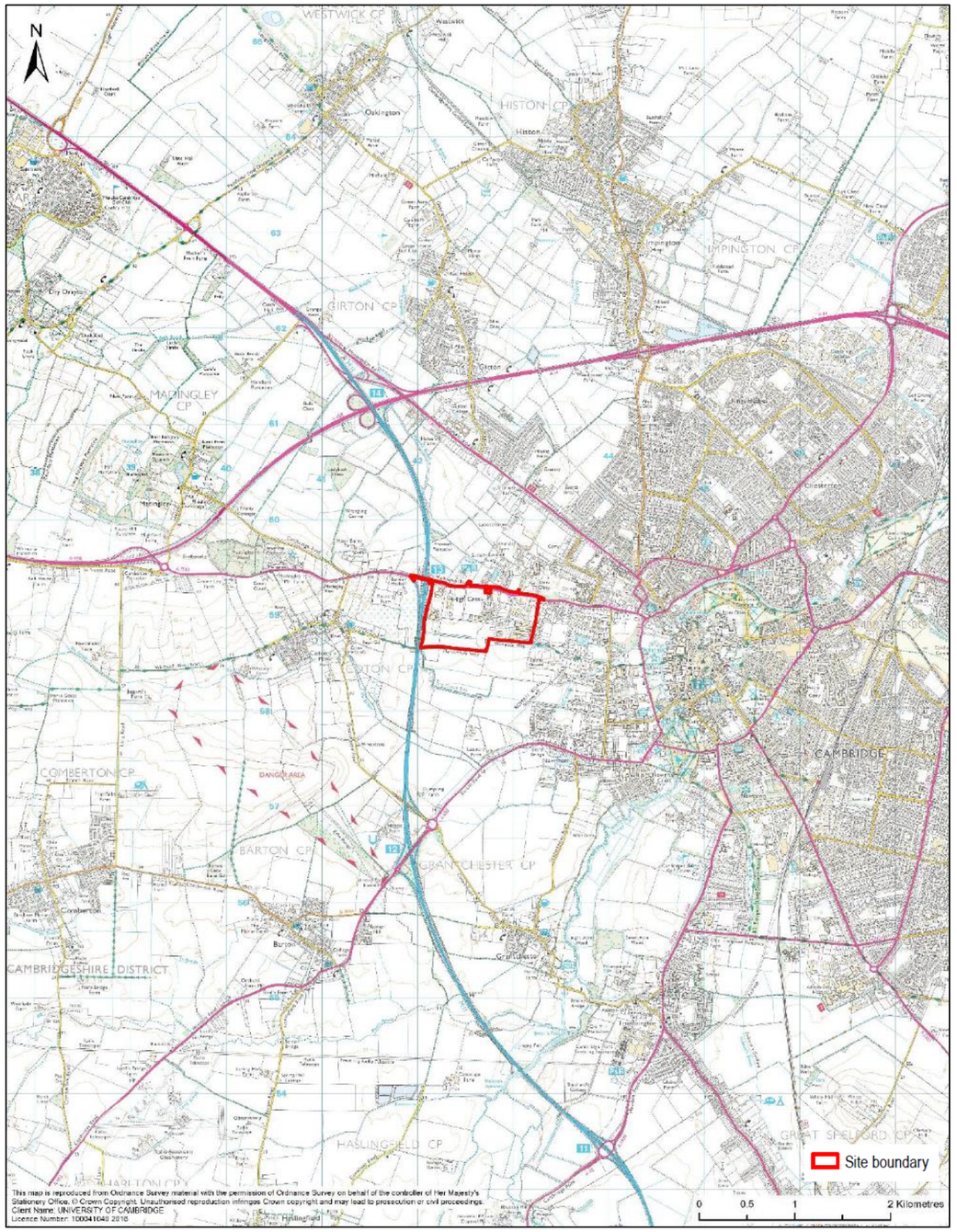


Figure 1.1 Site location

1.1.7 The abridged planning description of the Proposed Development is shown in the box below.

> Outline planning permission with all matters reserved is sought for up to 383,300m2 of development comprising:
>
> - up to 370,000m2 of academic floorspace (Class D1 space), commercial / research institute floorspace (Class B1b and sui generis research uses), of which not more than 170,000m2 will be commercial floorspace (Class B1b);
> - up to 2,500m2 nursery floorspace (Class D1);
> - up to 1,000m2 of retail/food and drink floorspace (Classes A1-A5);
> - up to 4,100m2 and not less than 3,000m2 for assembly and leisure floorspace (Class D2),;
> - up to 5,700m2 of sui generis uses, including Energy Centre and Data Centre;
> - associated infrastructure including roads (including adaptations to highways junctions on Madingley Road), pedestrian, cycle and vehicle routes, parking, drainage, open spaces, landscaping and earthworks; and demolition of existing buildings and breaking up of hardstanding.

1.2 Planning context

1.2.1 The principal document in the Cambridge Development Plan is the Cambridge Local Plan 2006. A revised Local Plan was submitted to the Secretary of State on the 28th March 2014 for examination. The Planning Inspectorate issued a letter on the 20th May 2015 advising the Council that the examination should be suspended until March 2016 whilst a number of concerns are addressed. The 2006 Local Plan remains in force until the new Local Plan can be adopted.

1.2.2 Policy 7/6 of the 2006 Local Plan identifies West Cambridge, South of Madingley Road as an area of major change. The site is recognised as a major allocation for University Faculty development, Research Institutes, commercial research and development, a sports complex, residential and associated uses.

1.2.3 The policy requires that proposals for new development should be in accordance with previous provisions of the previous Local Plan adopted in 1996 which acts as a strategic framework to guide future development and involves:

- A new major academic development south of Madingley Road that provides a range of new space for academic and other uses;
- A new computer laboratory, prestigious research building for Microsoft, a new Nano Science building and a park and cycle scheme; and
- A new sports complex and building for the Centre for Advances Photonics and Electronics.

1.2.4 Policy 18 of the emerging Local Plan supports the continued delivery of the existing planning permission for the Site, but also allows for increased densification providing that a number of conditions are met.

1.2.5 In April 2015 the University and Cambridge City Council agreed a Statement of Common Ground setting out proposed amendments to draft Policy 18. The amended text is as follows:

1. Development of the area will be permitted in line with the existing planning permissions.
2. For new development, the principal land uses will be:
   a. D1 educational uses, associated sui generis research establishments[1] and academic research institutes; and
   b. Commercial research and development of products or processes within use class B1(b) that will support knowledge transfer and/or open innovation in respect of D1 Higher educational uses, associated sui generis research establishment, academic research institutes, and/or other class B1(b) uses already authorised or granted permission pursuant to this policy.
3. Any densification of development on the site that results in a significant increase in floorspace, over that already approved, will be supported providing that:
   a. A revised masterplan supporting an outline planning application (OPA) has been proposed that takes an integrated and comprehensive approach to the provision and distribution of the uses, and supporting facilities and amenities;
   b. Phasing of the development will be determined through the outline planning permission (OPP) and as the need is proven;
   c. The approach to appropriate development heights will be determined through the OPP giving consideration to the sensitivity of the Green Belt to the south and west;
   d. Proposals respect the important adjacent Green Belt setting to the south west, and other neighbouring residential uses and views of the city from the west;
   e. It includes a comprehensive transport strategy for the site, incorporating a sustainable transport plan to minimise reliance on private cars. This should include assessing the level, form and type of car parking on the site;
   f. That walking, cycling and public transport links (including access for all) to the city centre, railway station(s), other principal educational and employment sites, and other key locations within the city are enhanced to support sustainable development; and
   g. That proposals provide appropriate green infrastructure which is well integrated with the existing and new development and with the surrounding area.
4. The development will also include further phases of the sports centre.
5. Small-scale community facilities, amenities, and A1 (local shop), A3 (café), A4 (public house), D1 (crèche) type uses and student accommodation will be acceptable, if they support existing occupants on the site and add to the social spaces and vibrancy of the area, essential to its continued success.
6. The Council will be supportive of a site-wide approach to renewable or low carbon energy generation or the future proofing of buildings to allow for connections to energy networks.
7. The precise quantum of new floorspace will be subject to testing and demonstration through the development of a revised OPA for the site.

[1] Research establishments/institutions are taken to mean sui generis uses affiliated with one of the Universities, the Medical Research Council or Addenbrooke's Hospital, where there is a need for regular day-to-day contact or sharing of materials, staff and equipment.

1.3 Purpose of the Environmental Statement

1.3.1 Under the EIA Regulations Cambridge City Council, when determining the outline planning application, is required to take into account the likely significant environmental effects that could arise as a result of the proposals. The EIA Regulations require the University of Cambridge to submit the necessary information for Cambridge City Council to fulfil these requirements in the form of an ES. This report sets out the required information.

1.4 Structure of the Environmental Statement

1.4.1 This volume, the main report, comprises sixteen chapters as follows:

1. Introduction – Introduces the Proposed Development and provides the rationale and structure for the ES and how it relates to the other documents submitted as part of the planning application.
2. The site and surrounding environment – Describes the Site as it is currently found. This chapter also identifies notable sensitive receptors such as residential properties that are situated close to the Site.
3. The Proposed Development – Describes in detail the parameter plans and detailed elements of the outline planning application which are assessed in the environmental topic chapters.
4. Alternatives – Describes the alternative proposals which were considered to the Proposed Development set out in Chapter 3.
5. Approach to the assessments – Introduces the environmental topic chapters and explains why certain environmental topic areas have not been included within the ES.
6. Ecology – Describes the terrestrial and aquatic ecological baseline, where significant effects to this baseline will arise and how they will be mitigated.
7. Historic environment – Describes the archaeological potential of the Site and any designated historic assets that could be affected by the proposals, how significant any effects will be and how they will be mitigated.
8. Landscape and visual amenity – Describes the landscape character and identifies key viewpoints and visual receptors, and identifies where significant effects to these receptors will arise and how they will be mitigated.
9. Socio-economics – Describes the socio-economic baseline of the City of Cambridge and South Cambridgeshire, and how the Proposed Development will contribute to local and regional growth.
10. Traffic and transport – Describes the effects of traffic on the local road network and how any significant effects will be mitigated.
11. Air quality – Describes the existing local air quality, how this will be affected by construction dust, emissions from the Energy Centre, and traffic emissions and how any significant effects will be mitigated.
12. Noise and vibration – Describes the noise baseline, where significant effects to this baseline will arise during construction and operation and how they will be mitigated.
13. Water environment – Describes the water quality and flood risk baseline, where significant effects to these baselines will arise and how they will be mitigated.
14. Ground conditions – Describes the ground conditions and any contamination on the Site and measures required to remediate contamination.
15. Cumulative effects – Assesses the interaction of the Proposed Development with other committed developments and any cumulative environmental effects. The chapter also considers the effects on individual receptors from multiple impacts arising from the Proposed Development.
16. Summary – Provides a summary of the significant effects that are likely to arise from the Proposed Development as identified in the assessment chapters and the mitigation measures that will be implemented.

1.4.2 Schedule 4 of the EIA Regulations sets out the information that should be included in the ES. Table 1.1 sets out where in this ES the specific information requirements can be found.

Table 1.1 Location of ES requirements under Schedule 4 of the EIA Regulations

Schedule 4 – Part 1 requirements	**Location within the ES**
Description of the development, including in particular: • a description of the physical characteristics of the whole development and the land-use requirements during the construction and operational phases; • a description of the main characteristics of the production processes, for instance, nature and quantity of the materials used; • an estimate, by type and quantity, of expected residues and emissions (water, air and soil pollution, noise, vibration, light, heat, radiation, etc) resulting from the operation of the proposed development.	Volume 2, Chapter 3
An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for the choice made, taking into account the environmental effects.	Volume 2, Chapter 4
A description of the aspects of the environment likely to be significantly affected by the development, including, in particular, population, fauna, flora, soil, water, air, climatic factors, material assets, including the architectural and archaeological heritage, landscape and the interrelationship between the above factors.	Volume 2, Chapters 6-14 inclusive
A description of the likely significant effects of the development on the environment, which would cover the direct effects and any indirect, secondary, cumulative, short, medium and long term, permanent and temporary, positive and negative effects of the development, resulting from: • the existence of the development; • the use of natural resources; • the emission of pollutants, the creation of nuisances and the elimination of waste, and the description by the applicant or appellant of the forecasting methods used to assess the effects on the environment.	Volume 2, Chapters 6-15 inclusive
A description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment.	Volume 2, Chapters 6-14 inclusive and Chapter 15
A non-technical summary of the information provided under paragraphs 1 to 5 [the information contained within Table 1.1] of this Part.	Volume 1
An indication of any difficulties (technical deficiencies or lack of know-how) encountered by the applicant or appellant in compiling the required information.	Volume 2, Chapters 6-14 inclusive
Schedule 4 – Part 2 requirements	**Location within the ES**
1. A description of the development comprising information on the site, design and size of the development.	Volume 2, Chapter 3
2. A description of the measures envisages in order to avoid, reduce and if possible offset any significant adverse effects on the environment.	Volume 2, Chapters 6-15 inclusive (Mitigation measures sections)
3. The data required to identify and assess the main effects which the development is likely to have on the environment	Volume 2, Chapters 6-14 inclusive (Existing environment sections) Volume 3,

Schedule 4 – Part 1 requirements	Location within the ES
4. An outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for the choice made, taking into account the environmental effects	Volume 2, Chapter 4
5. A non-technical summary of the information provided under paragraph 1 to 4 of this part	Volume 1

1.5 Report authors

1.5.1 Atkins Ltd was commissioned by the University of Cambridge to coordinate the Environmental Impact Assessment for the West Cambridge Masterplan. This includes the environmental assessments relating to ecology, landscape and visual impacts, built heritage, socio-economics and water quality elements of the water environment chapter. Peter Brett Associates carried out the environmental assessments for traffic and transport, air quality, noise and vibration, ground conditions, and the flood risk elements of the water environment chapter. Cambridge Archaeology Unit carried out the archaeology assessment.

2. The Site and surrounding environment

2.1 Site location

2.1.1 The Site is located approximately 2km to the west of Cambridge city centre on the edge of the urban area. The Site location is shown in Figure 1.1.

2.1.2 The Site is located to the south of the Madingley Road, one of the main radial routes linking the M11 with Cambridge City centre and is bounded by residential properties to the east and a Park and Ride car park, residential properties and open land to the north. The M11 forms the western boundary to the Site, beyond which lies agricultural land. Agricultural land bounds the Site to the south.

2.2 Description of the Site

2.2.1 The location and orientation of the views shown within this section are shown on Figure 2.1.

2.2.2 The planning application site is 69.4ha, while the West Cambridge Site is 66ha in area and comprises a mix of land uses including academic, commercial, sports, and student accommodation. A proportion of the Site is open land used as paddocks by the Department of Veterinary Medicine. There are numerous avenues and individual trees of varying ages across the Site, which, combined with the built development, limits cross Site visibility particularly at the eastern side of the Site. There is better visibility across the Site at the western end where views are more open.

2.2.3 Views (see View 1 below) into the Site along the northern and western boundaries are extremely limited due to dense bands of screening vegetation, except where the Site access roads join the A1303 Madingley Road along the northern boundary. Views into the Site from the east are also extremely limited due to a dense band of screening vegetation, but views to the south (see Views 2 and 3 below) from the surrounding countryside are slightly more open, though some screening vegetation is still present along the southern boundary.

View 1 from A1303 Madingley Road (grid reference TL43005923) looking south west into the Site

View 2 from footpath 55/9 (grid reference TL42065845) looking north east towards the Site

View 3 from footpath 55/9 (grid reference TL42735815) looking north west towards the Site

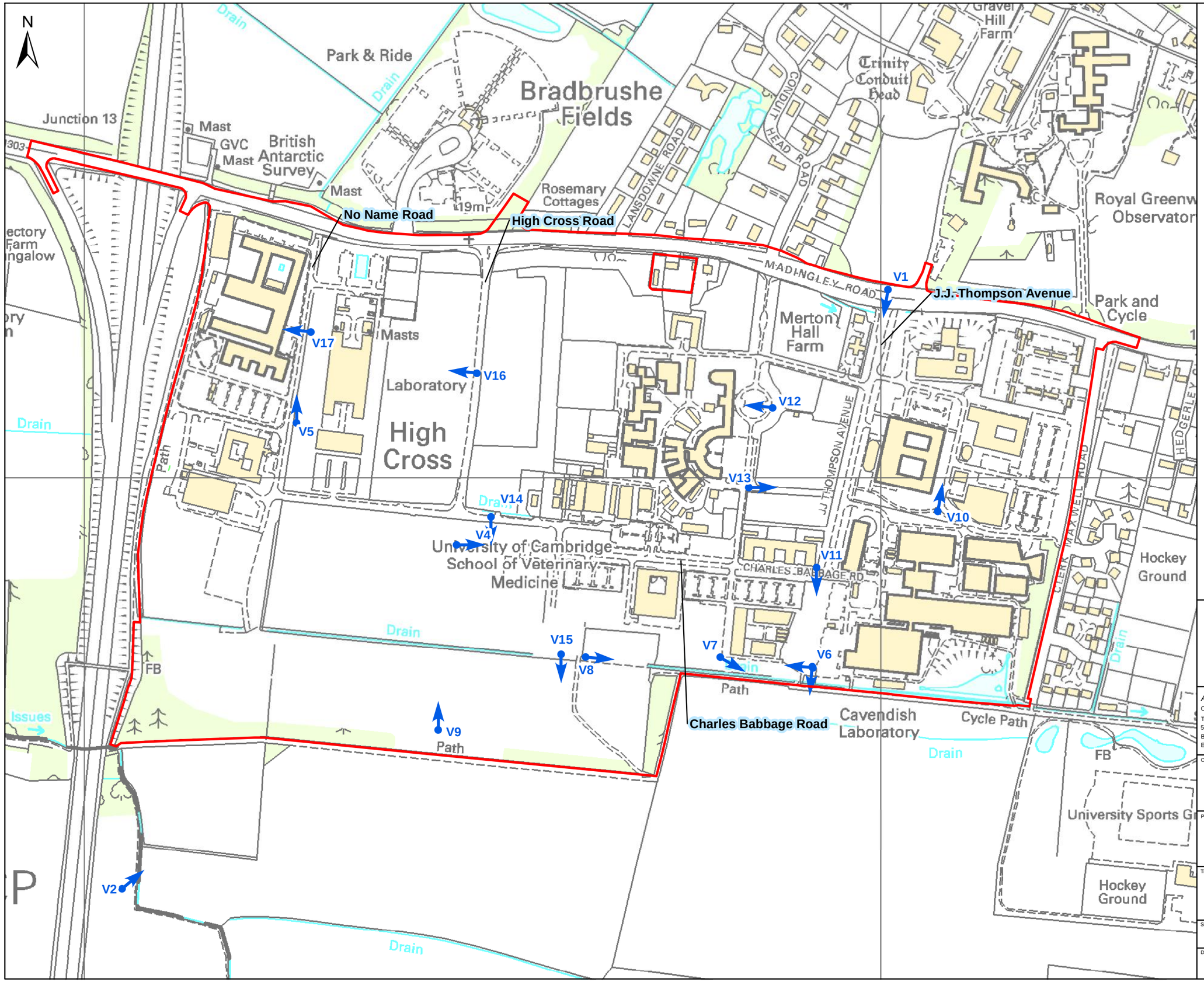
2.2.4 The Site is divided up and accessed by roads which form a rough grid pattern. There are three main roads crossing the Site in a north south direction; JJ Thompson Avenue, High Cross Road and Western Access Road / Ada Lovelace Road. JJ Thompson Avenue and High Cross Road both provide access to the Site from the A1303 Madingley Road. A single main road; Charles Babbage Road, crosses the Site in an east west direction between JJ Thompson Avenue and Western Access Road / Ada Lovelace Road. In addition there are numerous smaller access roads which service individual buildings and plots.

2.2.5 JJ Thompson Avenue, High Cross Road and Charles Babbage Road are all relatively wide open corridors with wide pedestrian and cycle ways and some planting including grass verges and avenues of juvenile trees. These roads are relatively new and have been constructed as part of the existing planning permission. Western Access Road / Ada Lovelace Road is an older narrower road providing access from Charles Babbage Road to the British Antarctic Survey, Schlumberger, and Aveva plots. The road is a narrow corridor lined with buildings and tall hedges screening the commercial plots.

2.2.6 There are five large surface car parks off of JJ Thompson Avenue, Charles Babbage Road, and Western Access Road / Ada Lovelace Road which also include cycle parking.

View 4 from West Forum along Charles Babbage Road looking east

View 5 along Western Access Road / Ada Lovelace Road looking north



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Site boundary

Photograph Location

0 50 100 Metres

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Client: University of Cambridge

Project: West Cambridge Masterplan EIA

Title: Location of Photographs
Figure 2.1

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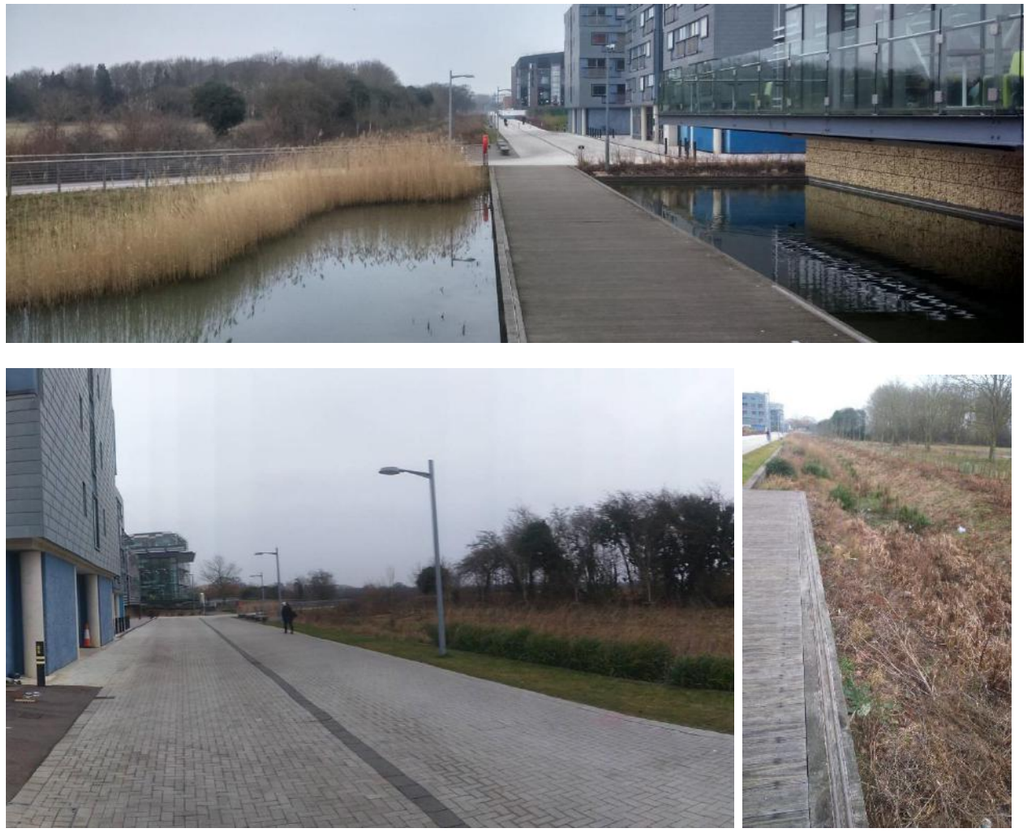
2.2.7 Along the southern boundary in the south eastern area of the Site is an ecological corridor. The purpose of the ecological corridor is to enhance and connect the City Wildlife Site along the western boundary of the site with other valuable habitats. Under the 1999 consented masterplan, the ecological corridor would extend further west, but this section has not yet been constructed.

2.2.8 The ecological corridor comprises a canal with marginal planting. The canal is also part of the Site drainage network connecting a balancing pond and lake. Adjacent to the canal is a wide promenade that provides east west access to pedestrians and cyclists accessing the Site from the south east.



Ecological corridor and promenade (clockwise from top Views 6, 7 and 8)

2.2.9 At the western end of the ecological corridor, as it is currently constructed, is a man-made large lake. The lake has been constructed as part of the existing planning permission and is designed for amenity, ecological and Site drainage purposes. A grit surfaced footpath runs around the perimeter of the lake and saplings have been planted between the lake and footpath. Over time these saplings will mature into scrub.

View 9 of the lake south of the West Forum

2.2.10 There are three main clusters of buildings on the Site. The largest cluster of buildings occupies the eastern area of the Site and comprises older buildings constructed in the early 1970s alongside contemporary buildings constructed under the existing planning permission over the last 15 years. The 1970s buildings include the Cavendish Laboratory complex in the south eastern corner of the Site and the Whittle Laboratory in the north east of the Site. The modern buildings constructed under the extant masterplan include the Roger Needham Building, William Gates Building, Centre for Advanced Photonics and Electronics (CAPE), Physics of Medicine, Broers Building (Hauser Forum), and Forster Court. This cluster also includes the West Cambridge Nursery and halls of residence at Franklin Court.

View 10 of the William Gates Building and the Centre for Advanced Photonics and Electronics

View 11 of the Hauser Forum with the 1970s era Cavendish Laboratories to the left, Broers Building in the centre, and Forster Court to the right

2.2.11 The second cluster of buildings is located centrally on the Site and comprises the Department of Veterinary Medicine and the Alan Reece Building, Department of Materials Science and Metallurgy and the Cambridge University Sports Centre.

2.2.12 The Department of Veterinary Medicine buildings were mainly constructed in the 1950s and are surrounded by paddocks used by the department. To the south of the Department of Veterinary Medicine and separated by the Charles Babbage Road is the contemporary Alan Reece Building and Department of Materials Science and Metallurgy. These modern buildings have recently been constructed under the existing planning permission. A third Department of Chemical Engineering and Biotechnology building is still under construction.

View 12 of the Department of Veterinary Medicine buildings

View 13 of the Paddocks in front of the Department for Veterinary Medicine

View 14 of the Alan Reece Building and Department of Materials Science and Metallurgy

2.2.13 South of the Alan Reece Building is the Cambridge University Sports Centre. This building is slightly isolated from the rest of the Site, separated by the ecological corridor and path, and screened by some mature trees. The Sports Centre is a new building, constructed under the existing planning permission.

View 15 of the Cambridge University Sports Centre

2.2.14 The third cluster of buildings is located in the north western corner of the Site and is used by commercial and research tenants. There are three main buildings built in the late 1970s and early 1980s, each occupied by a different tenant; British Antarctic Survey, Schlumberger, and Aveva. In the south western corner of the Site is the newly constructed University Data Centre.

View 16 of the Schlumberger building

View 17 of the British Antarctic Survey building

2.3 Surrounding environment

2.3.1 The Site is located on the western edge of Cambridge, bounded to the west by the M11 Motorway, to the north by the A1303 Madingley Road, to the east by Clerk Maxwell Road and to the south by open countryside.

2.3.2 Residential properties are located close by at The Lawns and Perry Court off Clerk Maxwell Road to the east, and Conduit Head Road and Lansdowne Road off the A1303 Madingley Road to the north.

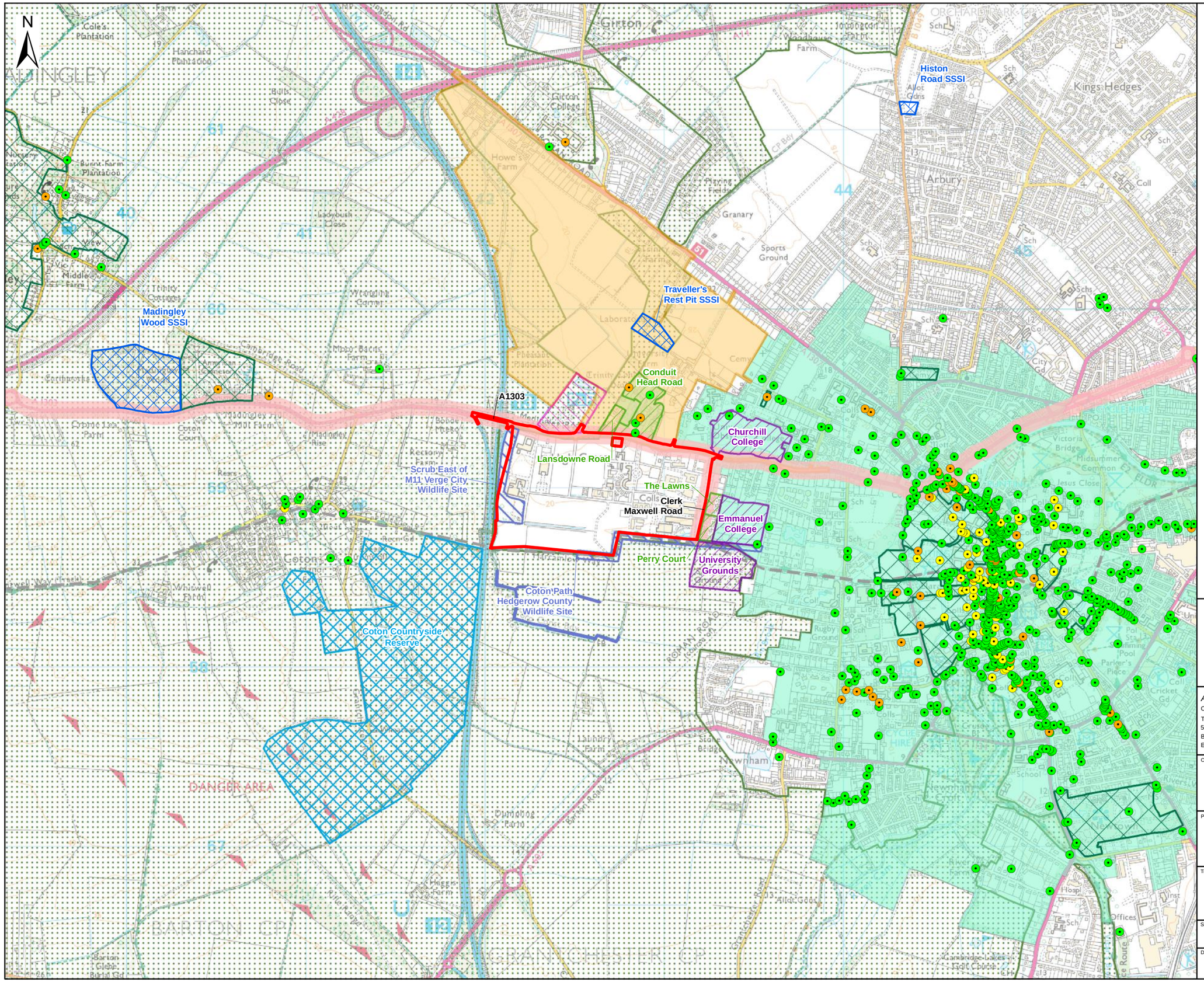
2.3.3 The Madingley Road Park and Ride is located just north of the Site and beyond this, open fields until Huntingdon Road. These open fields were previously used for agriculture but are now under construction for the implementation of the North West Cambridge development.

2.3.4 Orchards and fields used for agriculture and grazing are located to the west of the M11 and further west of these is the village of Coton. The fields and orchards between Coton and the Site are relatively small, bound by hedgerows and trees and form part of the Coton Countryside Reserve. Fields beyond Coton and to the south are larger and more open. Many are still lined by hedgerows but there are far fewer trees. This field pattern of large open fields is also present to the south, between the Site and Barton Road which radiates in a south westerly direction from the city centre to the village of Barton.

2.3.5 To the east of the Site and beyond the residential properties at The Lawns and Perry Court, are the Emmanuel College Recreation Grounds and University Sports Grounds. Beyond these, the western suburbs of Cambridge comprise a mixture of residential properties, sports pitches and university buildings.

2.3.6 A long distance recreational route, the Harcamlow Way passes along a public footpath along the southern boundary of the Site. Another public footpath branches off the Harcamlow Way further south of the Site. Further south still is another public footpath travelling from Coton to Barton Road.

2.3.7 Madingley Wood Site of Special Scientific Interest (SSSI) is a small area of ash-maple ancient woodland and is located approximately 1.8km west of the Site. The Site is also located close of two geological SSSIs; Histon Road SSSI located approximately 2.5km north east of the Site, and Traveller's Rest Pit SSSI located approximately 500m north of the Site. Figure 2.2 shows the key surrounding environment features and receptors in relation to the Site.



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Client: University of Cambridge

Project: West Cambridge Masterplan EIA

Title: Existing Environment
Figure 2.2

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A3	1:20,000	SJD Date 01/06/16	IEW Date 01/06/16	DP Date 01/06/16

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Rev: 05

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3. The Proposed Development

3.1 The vision

3.1.1 The University of Cambridge aspires to develop the Site into a high quality academic and research campus. The existing masterplan has led to individual plots being developed that do not provide the cohesive character required to optimise the Site or make it an attractive integrated part of the city.

3.1.2 The University of Cambridge has a vision for the Site that aspires to provide a high quality urban environment that is well integrated to the city centre and surrounding suburbs, as well as emerging developments such as the North West Cambridge development. The vision comprises five themes which collectively provide the purpose of the Proposed Development:

1. Optimise the amount of development on Site, supporting the city and region as a world leader in research and development.
2. Support the commercialisation of knowledge through entrepreneurship and collaboration with industry.
3. Create and sustain a high quality place by transforming the physical and social environment for Site users and neighbours across the city.
4. Deliver adaptable and efficient space to support viability and long term value creation.
5. Deliver sustainable development, proactively investing in the quality of place and integration within the city.

3.2 Role of the different documents

3.2.1 The Proposed Development is defined principally by the two separate documents listed below, both of which have been submitted for approval as part of the planning application:

- Parameter plans
- Design guidelines

3.2.2 The parameter plans define the main principals of the Proposed Development and set the maximum and minimum extents for the different development parameters. The design guidelines define the style and form of the Proposed Development and specify detailed design measures that must be incorporated into the reserved matters applications to, amongst other things, ensure the specified environmental mitigation is incorporated into the design.

3.3 Parameter plans

3.3.1 The Proposed Development will support the delivery of the vision through a series of parameter plans, design guidelines and a broadly defined description. This will allow flexibility in the description of the development. This reflects a key aim of the Proposed Development, to build in flexibility into the planning permission, so that the University can respond to changes in academic and commercial demand over the next twenty years or so, without needing to review the outline planning permission or seek a fresh permission.

3.3.2 The parameters for the Proposed Development are described through five parameter plans and their accompanying statements. The plans are:

- Land use;
- Development zones;
- Building heights;
- Access and movement; and
- Open space and landscape.

Land use

3.3.3 Built development would comprise the three land use areas shown in Figure 3.1. The Proposed Development includes the existing land uses on the Site and does not seek to introduce new land uses. It does seek to amend the extent to which permitted land uses are present on the Site. The largest land use area comprises a mix of academic and commercial uses and includes the existing British Antarctic Survey, Schlumberger, and Aveva plots as well as the existing Computer Laboratory, Roger Needham Building, CAPE Building and the Physics of Medicine and Maxwell Centre, all of which would be retained.

3.3.4 The mixed use zone comprises planning use classes A1-A5 (shops, financial and professional services, restaurants and cafes, drinking establishments, and hot food takeaways), B1b (commercial research / research institutes), and D1 (non-residential institutions). The mixed use zone includes the South Residences, North Residences and nursery, Hauser Forum and Broers Building, Institute for Manufacturing, Chemical Engineering / Biotech Building, Materials Science and Metallurgy Building, and the Innes Building, all of which will be retained.

3.3.5 The smallest zone is for community uses and comprises land use planning classes D1 (non-residential institutions) and D2 (assembly and leisure). This zone includes the existing sports centre which will be retained.

Figure 3.1 Proposed land use

Buildings

3.3.6 Maximum building heights are shown on Figure 2.3. The general building height across the Site will be four storeys for academic / commercial use. Building plant must be included within the height parameters set out on the plan, but exhaust flues may extend above these heights.

3.3.7 The Proposed Development comprises four development zones as shown on Figure 3.3 below. Each development zone is made up of development zones which are the areas of the Site within which built development could occur including all buildings, car parking, and vehicular access routes. The development zones exclude existing roads and open spaces which would be retained as part of the Proposed Development. Table 3.1 shows the maximum developable floor spaces for each development zone and use class.

Table 3.1 Maximum floorspace (m^2) for each use class and development zone

Land use	Academic research	Nursery	Commercial research / research institutes	Shop, café, restaurant, public house	Assembly & leisure (sports)	Ancillary infrastructure (data centre, energy centre)	Total proposed floor space
Use Class	D1	D1	B1b / sui generis	A1 – A5	D2	Sui generis	
Building Zone I	Up to 73,000	Up to 1,500	Up to 21,900	Up to 500	0	0	Up to 75,000
Building Zone II	Up to 38,600	Up to 1,500	Up to 38,600	Up to 300	Up to 4,100	0	Up to 44,500
Building Zone III	Up to 178,400	Up to 1,500	Up to 51,700	Up to 200	0	Up to 2,000	Up to 182,100
Building Zone IV	Up to 104,000	Up to 1,500	Up to 104,000	Up to 500	0	Up to 4,500	Up to 110,500
Total proposed floorspace	Up to 370,000	Up to 2,500	Up to170,000	Up to 1,000	Up to 4,100	Up to 5,700	Up to 383,300

All figures quoted are Gross Floor Area, m^2

Figure 3.2 Maximum proposed building heights

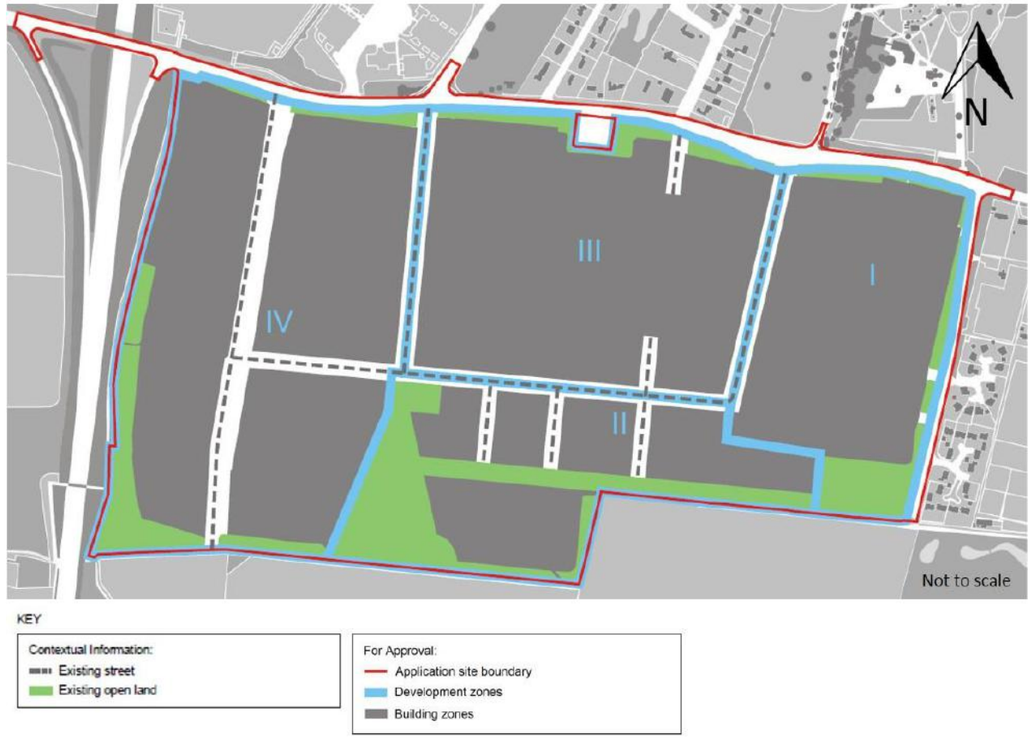

Figure 3.3 Development zones

Access and movement

3.3.8 The access and movement strategy is summarised in Figure 3.4. Access to the Site would be from the north off Madingley Road and from the no neast off Clerk Maxwell Road. The four main roads on Site (JJ Thompson Avenue, Charles Babbage Road, High Cross, and Western Access Road / Ada Lovelace Road) would all be retained and used as the principal means for vehicular access to and across the Site. Additional secondary roads would be constructed to increase vehicular connectivity across the Site. All existing and new vehicle routes and accesses would also allow for pedestrian and cycle movements.

3.3.9 A new pedestrian and cycle access point will be created off Madingley Road. The existing pedestrian and cycle access points along Clerk Maxwell Road will be maintained and will be the main arrival points for cyclists and pedestrians travelling from the city centre. The primary pedestrian and cycle routes through Site include the existing pedestrian and cycle path running adjacent to the southern boundary (Coton footpath). This would be extended to continue across the Site to the western boundary. A second east west pedestrian and cycle route would be access from the existing entrance approximately halfway along Clerk Maxwell Road, continuing westwards across JJ Thompson Avenue and through a new open space corridor linking up with High Cross. A north south route would extend from the West Forum and along High Cross where the route would continue northwards towards the North West Cambridge development. Additional secondary pedestrian and cycle routes would increase connectivity through the Site.

3.3.10 The flexible zones shown in Figure 3.4 show where on the Site the proposed routes could go. They provide flexibility in detailed design for landscape and building setbacks which are not currently known but will dictate the precise location of the proposed routes. The flexible zones are not intended to suggest that the routes will not be provided as they are a committed element of the Proposed Development.

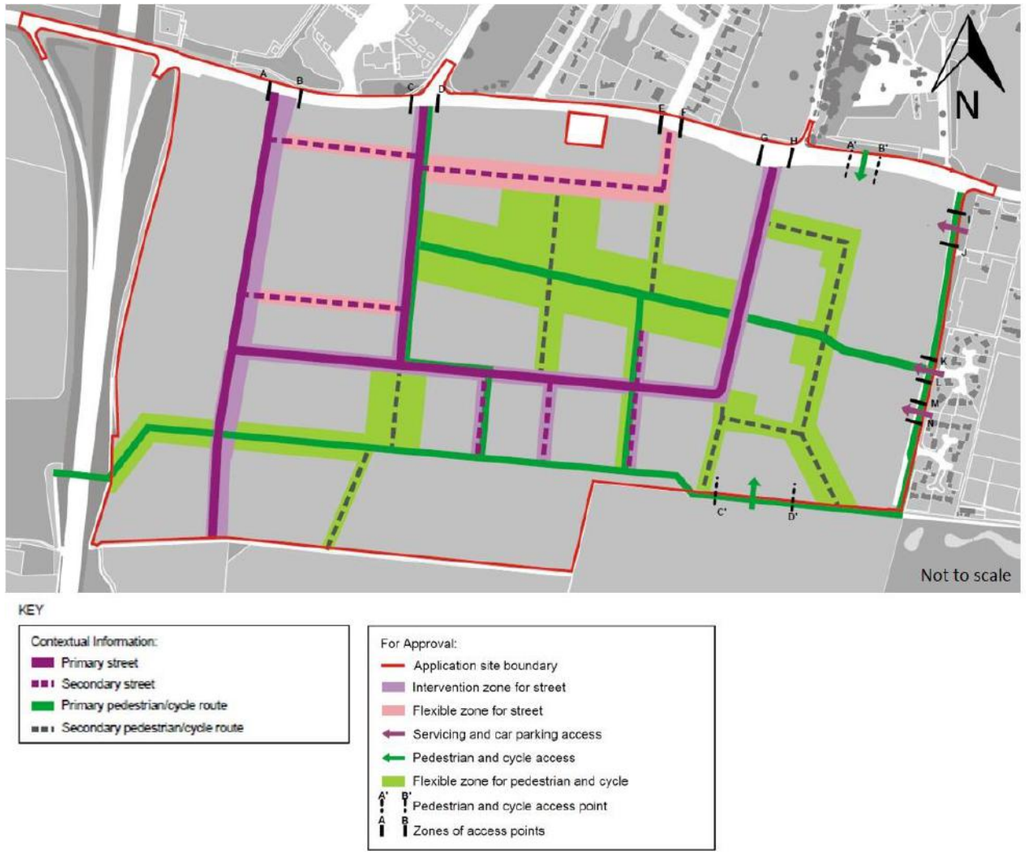

Figure 3.4 Access and movement strategy

Open space and landscape

3.3.11 A series of open spaces and corridors will cross the Site as shown in Figure 3.5. The open space network will provide a variety of uses including informal recreation and outdoor entertainment, landscaping, surface water drainage, nature conservation, and pedestrian and cycle routes.

3.3.12 Detailed design of the open space areas will be agreed through reserved matters applications pursuant to the OPP.

3.3.13 The flexible zones shown in Figure 3.5 show where on the Site the proposed landscaping could go. They provide flexibility in detailed design for building setbacks and plot locations which are not currently known but will dictate the precise location of the landscaped areas. The flexible zones are not intended to suggest that the landscaped areas will not be provided as they are a committed element of the Proposed Development.

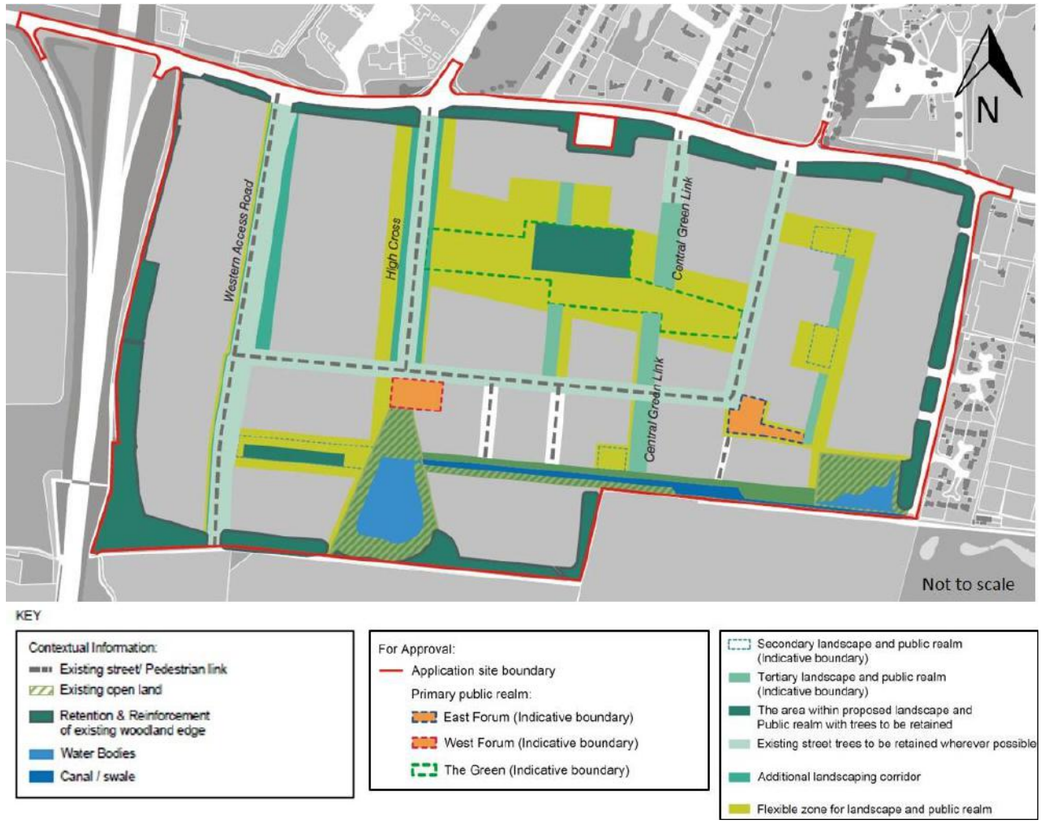

Figure 3.5 Open space and landscape strategy environmental design

Sustainability framework

3.3.14 A sustainability strategy has been produced for the Proposed Development which sets out an ambitious sustainable vision. Two of the key drivers for the re-masterplanning of the Site are major sustainability themes:

- To substantially improve the social realm and hence increase the well-being of those working and living on the Site;
- To improve pedestrian and cycle access to the Site and to radically improve public transport provision in order to be able to build on the existing car parks, densifying the Site and making it more attractive to cyclists and pedestrians.

3.3.15 A sustainability framework has been developed which is a key document for guiding the Proposed Development. The framework identifies 12 sustainability objectives which are grouped into four categories as shown in Table 3.1.

Table 3.2 Sustainability principles

Category	Sustainability principle
Resources and climate change	• Energy and climate change • Water • Materials • Waste
Transport and local connectivity	• Transport and mobility
Peoples health, social, and economic wellbeing	• Health and well being • Collaboration and inclusion • Education and knowledge transfer • Employment opportunities
Land use, ecology, and local impact	• Biodiversity and ecology • Pollution and local environment • Reputation, heritage, and the city

3.3.16 Each of these sustainability principles has a series of aims and objectives which guide the development of the Proposed Development to ensure that the sustainability strategy is adhered to.

Design guidelines

3.3.17 In addition to the parameter plans the development will be controlled through Design Guidelines which are a set of design principals have been produced which form part of the planning application for approval. The guidelines seek to provide consistency in design across the whole Proposed Development.

3.3.18 The Design Guidelines set out a number of environmental mitigation measures that are 'built-in' to the Proposed Development and which will be secured through the planning permission. These are as follows:

- Controls on building design to minimise bulk:
  - Additional height restrictions apply to the northern and southern frontages of the Southern Ecological Corridor. The aim of these restrictions is to form a coherent frontage to the space but allow for variation and interest in response to long distance views from the south.
  - In addition to the height parameter plan at the edge of Development zone adjacent to the eastern boundary the built form must comply with an additional height restriction of 25m AOD. From this line, the development heights can rise with an angle of 45° to the parameter height of 31m AOD.
  - Building frontages longer than 60m facing onto Madingley Road, southern or eastern boundaries, or more than 70m facing onto the western boundary should be broken down by variation in build-to line and/or height and roofscape.
  - Any visible frontages facing onto Madingley Road, the eastern boundary, or the southern boundary must have a high quality architectural treatment. Alternatively or in addition, the woodland buffer shall be reinforced to limit visibility into the Site.
  - Landscaped gaps may be used to break frontage lengths. Any new gaps should be a minimum of 15m for buildings facing Madingley Road and the eastern boundary, 20m for buildings facing the western boundary, and 25m for buildings facing the southern boundary from building face to building face.

- A variable and interesting roofline should be formed along Madingley Road, the southern, and eastern development edges;
- Any multi-storey car parking structures along the western frontage must be appropriately and sensitively designed to ensure interest and variation in building line and roof line.
- No multi storey car parking should be located along the southern edge, unless set behind a woodland buffer;

- Controls on boundary planting to improve screening and soften urban edges:
  - New planting must relate to the landscape, must be used to help soften the urban edge: any new setbacks and gaps between frontages should be appropriately planted with trees and greenscape, ensuring that some individual trees can grow to maturity.
  - Vertical planting should be considered to soften development edges and boundaries.
  - Service areas, multi storey car parks and development 'backs' must be screened by the existing woodland buffer (reinforced where necessary) and/or additional planting.
  - Service areas and service yards must be located away from the Southern edge and set within new development;
  - Existing trees must be maintained where possible and major feature trees shall be added at key locations.
  - Any additional planting to the northern, southern, eastern, or western woodland edges where needed to reinforce the buffer or make good shall be of the same species as existing where possible.
  - The existing woodland buffer along the northern boundary must be maintained and reinforced to ensure it is effective in maintaining the character of Madingley Road
  - The greenery of the woodland buffer along the Madingley Road shall be extended southwards to West Green by adding planting to this part of the site.
  - Visibility to the development from Clerk Maxwell Road must be minimised and development should be set within the existing eastern woodland edge
  - Any gaps between frontages facing the eastern boundary should be appropriately planted, ensuring that some individual trees can grow to maturity.
  - The existing woodland buffer along the eastern boundary must be maintained and reinforced to ensure a green edge to the new development.
  - The woodland buffer along the eastern boundary may be reinforced to ensure that service areas and development 'backs' are visually screened.
  - Existing greenery along the southern boundary must be protected and enhanced to establish 'Biodiversity Corridors' and improve links that connect into a wider countryside and other areas of publicly accessible open space such as the Coton Countryside Reserve.
  - The West Lake & East Pond must be predominantly green spaces and must be appropriately landscaped to enrich the natural setting. Mature trees must be retained as far as possible, and supplemented with new planting to enhance the southern woodland edge.
  - Visibility to the development from the west must be minimised and development should be set within the existing woodland edge along the western boundary
  - The existing woodland buffer along the western boundary must be maintained to provide screening from the M11 and form a green edge to the new development.
  - The greenery of the western woodland buffer shall be extended eastwards to Ada Lovelace Road by adding planting to this part of the Site.
  - Additional landscape and planting at the western boundary must relate to the rural and agricultural landscape to the west
- Measures to strengthen the ecological benefits of the existing ecological corridor:
  - The existing canal, lake and pond must be reshaped in line with the Site-wide drainage strategy. The planting strategy around the canal must aim to increase bio-diversity and include a range of appropriate habitats.
  - Existing water bodies must be modified in line with the site-wide drainage strategy. Any re-profiling of the edges should aim to enhance bio-diversity value.
- Controls on rooftop plant:
  - Rooftop plant must be set back from the southern development edge
  - There must be effective screening of all rooftop plant, when viewed from the south and this built element should contribute to the composition of a varied skyline
  - There must be effective screening of rooftop plant to ensure that its visual impact on the street is minimised.
  - Rooftop plant should, wherever possible be set back from the predominant building line along the eastern edge. Where not possible to avoid this, there must be effective screening of rooftop plant
  - Rooftop plant should be screened and/or grouped to avoid visual clutter in distant views

Trees to be retained

3.3.19 The Design Guidelines specify a number of trees that are key to the landscape of the Site due to their age, condition, or prominence and must be retained. These are listed in Table 3.3 and shown on Figure 3.6

Table 3.3 Trees that must be retained

Tree number	Species	Category
024	English oak	A1/2/3
028	Norway maple	B1
036	English oak	A1
G037	Weeping willow (group of 8 individuals)	B2
037	English oak	A1
G038	Horse chestnut (group of trees)	B2
039	English oak	A1
G054	London plane (group of trees)	B2
G057	Lime (group of trees)	A2
G059	Common beech (group of trees)	A2
063	English oak	A1/2/3
064	English oak	A1/2/3
065	English oak	A1/2/3
066	English oak	A1/2/3
067	English oak	A1/2/3
068	English oak	A1/2/3
G066	Silver birch (group of trees)	B2
G067	Lime (group of trees)	B2
G068	Norway maple (group of trees)	B2
G087	English oak (group of 2 trees)	B1/2/3
A = Trees of high quality, B- Trees of moderate quality, C = Trees of low quality 1 = Mainly arboriculture qualities, 2 = Mainly landscape qualities, 3 = Mainly cultural qualities including conservations		

Figure 3.6 Trees to be retained

3.4 Energy strategy

3.4.1 An energy strategy has been developed for the Proposed Development that maximises the potential for the Site to host innovative and efficient energy infrastructure. The principles set out in the sustainability framework have been key in directing the energy strategy.

3.4.2 A central element of the energy strategy is the Energy Centre. This will comprise a gas fired combined heat and power plant with heat storage capacity. The proposed location for the energy centre is shown on the building heights parameter plan by reference to the potential location of the energy centre flue (Figure 3.3).

3.4.3 The Energy Centre has not yet been designed, so a number of assumptions based on similar developments elsewhere have been used for the purposes of the EIA. This enables the air quality and noise and vibration assessments to determine the likely effects and any mitigation that may be required. The assumptions for the Energy Centre are as follows:

- The energy centre will have 3 CHP engines together with gas fired boilers to provide supplementary heat and to cover peak demand when the CHP is unavailable.
  - Illustrative CHP plant – 3 no. 2.6 MW Jenbacher Type 6
  - Illustrative boiler plant – 3 no. 10MW and 1 no. 5MW Cochran Thermax
- The CHP will operate for up to 17 hours per day
- Two operational modes as follows:
  - Mode 1 – 34MW boiler capacity, no CHP capacity to represent a situation of peak winter demand with all CHP engines being off line
  - Mode 2 – 7.8MWth CHP capacity (all three engines) and 26.2 MW boiler capacity to represent a peak winter demand with all engines operating
- Total operating capacity will be kept below the 50MW thermal input threshold for Pollution Prevention Control (PPC) permitting

3.5 Surface water drainage

3.5.1 The topography of the Site falls from the ridgeline that runs east / west through the Site. Surface water to the north of the ridgeline is directed to Madingley Road and south of the ridgeline to the ecological corridor. The existing drainage network will be used as far as possible to minimise the need to construct new infrastructure. Where new drainage infrastructure is required, sustainable urban drainage (SUDS) designs will be used as far as possible taking into account the existing Site constraints in terms of buried services. Attenuation will be provided by the existing lake, canal and pond along the southern boundary which will all be re-profiled to increase capacity. Additional attenuation will be provide on individual plots by a variety of means which will be determined by the plot developers at the reserved matters application stage.

3.6 Construction phase

3.6.1 Construction of the Proposed Development will occur in phases, which will be determined at a later stage depending on demand. Due to the long time frame that the Proposed Development will be developed over, a contractor has not yet been appointed. As each phase is developed a contractor will be commissioned and they will devise the relevant construction plan.

Construction activities

3.6.2 As no contractor has been commissioned yet the list of construction activities below is based on experience of the types of construction activities that would occur on any large construction site for this type of development. This is not an exhaustive description of all the construction activities that could occur but is sufficient to provide the assumptions for the impact assessments:

- Enabling works including Site clearance, establishment of a construction compound and worksites;
- Building demolition;
- Contaminated land remediation (if required);
- Earthworks to obtain the desired ground level (these are likely to be minimal);
- Excavation for foundations, services, basements etc;
- Import of construction materials, plant, and workers;
- Stockpiling and storage of construction materials and plant including fuels and chemicals;
- Concrete batching;
- Installation of new services;
- Erection of new structures and buildings;
- Piling for some structures and building foundations;
- Export of construction waste; and
- Landscaping including planting of soft landscaped areas and areas for ecological mitigation.

3.6.3 The Proposed Development will be constructed in phases likely to be over a 15 year period. The assumed opening date for all construction to be complete and the Proposed Development to be fully built out is 2031.

3.6.4 Much of the transport infrastructure that will be subject to detailed design as part of the Proposed Development is in existence and the main works will be to amend road junctions, into the Site and construction of the smaller access roads.

Building demolition

3.6.5 Many of the aging buildings on the Site do not contribute to the emerging masterplan. These buildings will require demolition to release the land for more appropriate and denser development of contemporary buildings that are constructed to modern standards. The buildings scheduled for demolition are listed below and shown on Figure 3.7:

- Cavendish Laboratory complex;
- Whittle Laboratory buildings;
- Department for Veterinary Medicine complex;
- University stores; and
- Merton Hall Farmhouse.

3.6.6 All other existing buildings on Site will be retained and integrated into the Proposed Development.

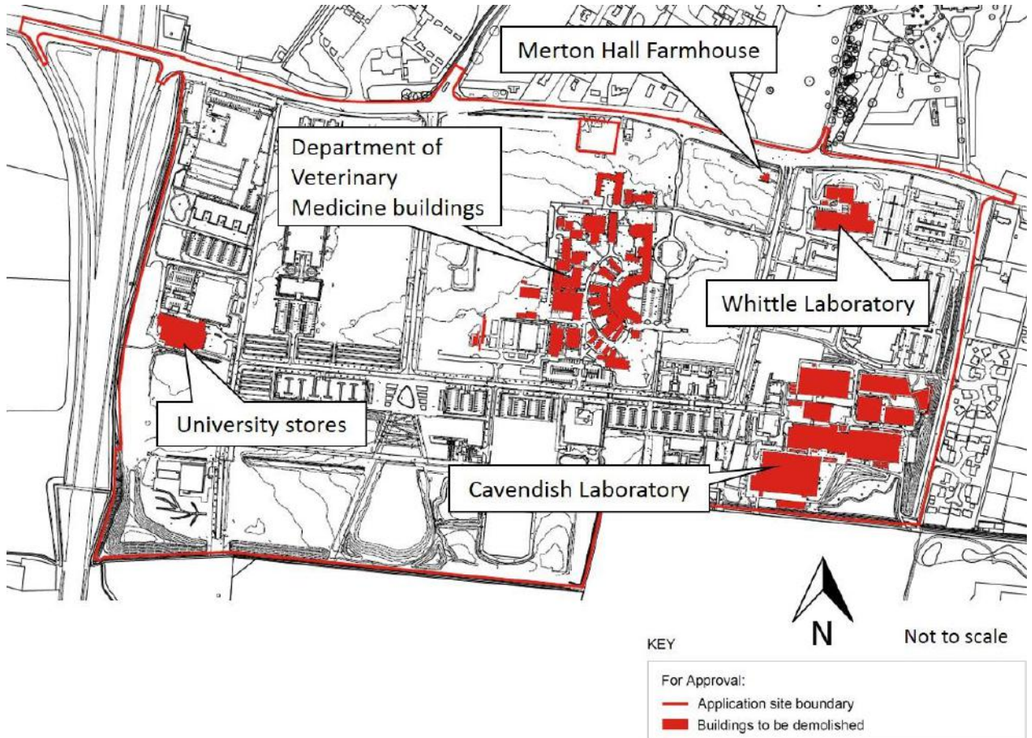

Figure 3.7 Buildings scheduled for demolition

Phasing

3.6.7 Because the Proposed Development will be built out over a 15 year period depending on market demand, a phasing plan is currently not available. For the purposes of the transport, air quality, and noise and vibration assessments in this ES it has been assumed that the first phase will comprise a number of priority projects comprising the ground floor areas shown in Table 3.4.

Table 3.4 New and existing ground floor area for the first phase of the Proposed Development

Proposed land use	Ground floor area (m^2)
Academic research	Existing 168,259 Proposed 66,000
Commercial research and research institute	Existing 92,386 Proposed 52,000
Nursery	Existing 1,900
Shop, café restaurant, pub - A1-A5	Existing 350
Assembly and leisure	Existing 6,060
Residential	Existing 10,680
Ancillary infrastructure (data centre, energy centre)	Existing 7,675 Proposed 3,160
Total	287,310
Car Parking (spaces)	2,571

Construction Environment Management Plan (CEMP)

3.6.8 A Construction Environmental Management Plan (CEMP) has been submitted in support of the outline planning application. This sets out how mitigation measures for the construction phase identified in the ES. When a contractor is appointed for the first development on site a detailed CEMP will be prepared to cover that development. Additional CEMPs will follow for later detailed proposals and will include as a minimum:

- Site wide construction and phasing programme;
- Access arrangements for construction vehicles, plant and personnel;
- Construction hours;
- Construction delivery times;
- Soil management strategy;
- Noise and vibration monitoring requirements;
- Maximum noise levels for construction vehicles, plant and equipment;
- Maximum vibration levels;
- Dust management strategy;
- Site lighting details;
- Drainage control measures;
- Screening and hoarding details;
- Access and protection arrangements around the site for pedestrians, cyclists and road users;
- Procedures for interference with public highways including public rights of way;
- External safety and information signing and notices;
- Liaison, consultation and publicity arrangements;
- Consideration of sensitive receptors;
- Prior notice and agreement procedures for works outside agreed limits;
- Complaints procedure; and
- Location of compound and method of moving materials, plant and equipment around the site.

3.6.9 As part of the outline planning application, a Site Waste Management Plan (SWMP) has been submitted. The SWMP sets out the framework for the management of construction waste using indicative volumes and types of waste arisings calculated from the parameter plans. At the reserved matters stage, subsequent applications will be accompanied by a Detailed Waste Management and Minimisation Plan (DWMMP) for the construction phase. The DWMMP will include as a minimum:

- Construction waste infrastructure to be used on Site during construction;
- Measures and protocols to ensure effective segregation of waste at source;
- Any other steps to ensure the minimisation of waste during construction;
- Location and timing of on Site waste facilities;
- Proposed monitoring and timing of monitoring report submissions;
- Proposed timing of the submission of a Waste Management Closure Report;
- Recycling in Cambridgeshire and Peterborough (RECAP) Waste Design Guide 2012 toolkit completed with supporting reference material; and
- Proposals for the management of municipal waste generated during the occupation phase of the Proposed Development.

4. Alternatives

4.1 Design evolution

4.1.1 Since the current planning permission was granted the University of Cambridge's requirements for the Site and the Site context has changed. There is now a growing demand for academic space from various departments and other University sites. In addition the North West Cambridge development, currently under construction by the University, has changed the relationship of the Site with the city.

4.1.2 The starting point for the Proposed Development is the existing planning permission for the Site which has been partially built out, resulting in existing buildings and infrastructure including the internal road network, access points and utilities. Buildings are also under construction so the Proposed Development is partially constrained by this and the existing development.

4.1.3 The Proposed Development is an evolution of the existing planning permission, taking into account the University's aspirations for the Site, and the Site's relationship with the North West Cambridge development. Because of the planning history of the Site, there have not been a series of high level options which have been narrowed down to a preferred design solution, but the evolution of the Proposed Development has resulted in a number of discrete alternatives for certain sections of the Site which have since been evaluated and the preferred option selected.

4.2 Discounted alternatives

Do-nothing

4.2.1 If the Proposed Development did not occur development on the Site would proceed as per the existing planning permission. This would fail to meet the University of Cambridge's aspirations or Cambridge City Council's objectives for the Site. The do-nothing alternative would result in a lower density of development than the Proposed Development and would not realise the development potential for the Site. This is undesirable because strategic sites under University control that would allow the University to expand are limited and failure to maximise development on the Site would result in more piecemeal development in and around Cambridge. Even though the development density would be lower, more traffic journeys would be generated because of the higher ratio of parking spaces to development area. This would be undesirable from a sustainability perspective and does not align with Cambridge City Council's aspiration to manage and reduce journeys by car.

4.2.2 The existing planning permission was conceived prior to the North West Cambridge Development and as such has no relationship with it. Synergies between West Cambridge and North West Cambridge can only be realised through redevelopment of the Site so that transport infrastructure and land uses complement each other.

4.2.3 Because the existing planning permission is being delivered plot by plot, the resulting development is acknowledged to be piecemeal and lacking in cohesive identity. The Proposed Development is based on a comprehensive site-wide strategy and will provide a clear framework for the development of the Site, avoiding piece-meal and disjointed development and creating a more coherent sense of place.

Reduced quantum

4.2.4 An option which was discounted early on in the design process was a reduced quantum of development. Whilst this option would have increased the amount of built development on the Site compared to the current planning permission, it would be less than in the Proposed Development. A higher number of parking spaces was assumed to be required than the proposed parameter plans which limited the amount of built development that could occur on the Site. The parameter plans for the Proposed Development have allowed for an increase in building density due to a reduction in the car parking requirement agreed with Cambridgeshire County Council.

4.2.5 The reduced quantum option would result in a less densely developed site which would have a reduced impact on views from the green belt and landscape character, but would not deliver the same socio-economic benefits as the Proposed Development.

Retention / demolition of existing buildings

4.2.6 The Proposed Development requires the demolition of the Cavendish Laboratory, Whittle Laboratory, Department of Veterinary Medicine, and University Stores buildings. Early options considered, and which were discounted, included retention of the Whittle Laboratory and the Department of Veterinary Medicine buildings. Demolition of these buildings will enable the emerging masterplan to make better use of the Site in line with the vision for the Proposed Development and for this reason their retention has been discounted.

4.2.7 The main environmental effect from the retaining the existing buildings on Site would be an incoherent masterplan that would result in a new incoherent landscape character area that would also fail to deliver the vision of the Proposed Development.

Energy Centre location

4.2.8 There were originally two options for the location of the Energy Centre: central along the northern boundary of the Site with Madingley Road, or in the current proposed location. This first option was discounted due to the prominence of the exhaust flues along Madingley Road, the close proximity with residential properties along Madingley Road and Conduit Head Road and the availability of existing utility networks.

Access and movement

4.2.9 An access and movement option considered included an additional primary road and access point to Madingley Road in the location of the current Department of Veterinary Medicine access road. This option was discounted when the quantum of development increased resulting in the corresponding reduction in car parking requirements. This access point is now proposed to be a secondary level road.

4.2.10 The proposed pedestrian and cycle route extending north from the East Forum is a recent addition to the Proposed Development. Earlier design versions did not include this access route which instead would have been occupied by new buildings. The new access route was determined to be required to increase the permeability of the Site to pedestrians and cyclists which is an environmental benefit.

Building heights

4.2.11 Early iterations of the parameter plans allowed for taller buildings as shown in Figure 4.1. Following consultation with Cambridge City Council and preliminary landscape assessments undertaken as part of the EIA, the proposed maximum building heights were reduced by 1 storey. This means that the Proposed Development will be a less prominent new feature in the landscape and more sympathetic to the context of the Site at the edge of the green belt.

Figure 4.1 Alternative building height parameter plan discounted at Stage 1B

5. Approach to the assessments

5.1 The EIA process

5.1.1 EU Directive 2011/92/EU (the EIA Directive) sets out the EIA process for all EU member states and defines which projects need to undergo EIA. For the Proposed Development, The Town and Country Planning (Environmental Impact Assessment) Regulations 2011 (as amended 2015) (the EIA Regulations) transposes the EIA Directive and underpins the EIA process. The process set out in the EIA Regulations is summarised in Figure 5.1.

5.2 Scoping

5.2.1 Once it has been determined that a project is EIA development the scoping stage is undertaken. The University of Cambridge are entitled to request a Scoping Opinion from Cambridge City Council which sets out the information that Cambridge City Council would require in order to properly determine the planning application, taking into account the significant environmental effects.

5.2.2 A high level environmental appraisal has been undertaken to identify which aspects of the environment are likely to be significantly affected by the Proposed Development. This information was contained within the Scoping Report which was submitted to Cambridge City Council on 2nd April 2015. A formal Scoping Opinion was issued by the City Council on 6th May (Appendix 5.1, Volume 3), which determined that assessment of the following environmental aspects should be included in the EIA:

- Ecology;
- Historic environment;
- Landscape and visual;
- Socio-economics;
- Traffic and transport;
- Air quality;
- Noise and vibration;
- Water environment;
- Ground conditions; and
- Cumulative effects.

5.2.3 After receipt of the Scoping Opinion further discussions were held with the relevant stakeholders and Cambridge City Council to refine the scope. A summary of these responses is shown in Appendix 5.2, Volume 3.

Screening

The first stage of the EIA is to determine if the project qualifies as EIA development. Broadly if significant environmental effects are likely to arise then it is probable that the project would be considered EIA development.

Scoping

The second stage of the environmental assessment is to determine what are the likely environmental effects that need to be considered in detail. The scoping stage involves consultation with a variety of stakeholders to obtain their views on what would be assessed.

Identify existing conditions (baseline)

Once the scope of the environmental assessments has been agreed, the next stage is to identify and describe the existing environment. This is undertaken through a combination of desk based studies using existing information and field surveys.

Predict and assess likely environmental effects

The next stage is to determine what impacts would arise from the construction and operation of the Proposed Development, and whether any direct or indirect environmental effects from these impacts would be significant. In determining whether an environmental effect would be significant, published guidance has been used where available.

Develop mitigation measures

Once the environmental effects have been identified, mitigation measures are developed which would seek to minimise significant effects. This is done through either changing aspects of the proposed development design, or construction process, or by compensating for the loss of certain environmental receptors. The preference for mitigation is as follows:

- Preferably avoid the impact; or if not possible
- Reduce the magnitude or scale of the impact; or if not possible
- Compensate for any loss of environmental resources

Predict residual environmental effects

The environmental effects that would remain after the mitigation measures have been applied ,are called the residual effects. The predicted environmental effects that are reported in the Environmental Statement are the residual effects having taken into account the mitigation measures.

Figure 5.1 Key stages of the EIA process

5.3 Introduction to the assessment chapters

Assessment chapter structure

5.3.1 A separate assessment chapter has been produced for each of the environmental aspects identified in Section 5.2. Each assessment chapter follows the same structure for consistency and to help the reader identify the main issues. Each assessment chapter has the following sub-headings:

- Scope of the assessment – Sets out what has been assessed. This is informed by the Scoping Opinion and the consultation responses undertaken at the scoping stage.
- Relevant legislation – Describes why the assessments have been undertaken by setting out the legislative basis for the assessment.
- Method of assessment – Describes how the assessments have been undertaken. This includes how baseline information has been obtained, a summary of any relevant guidance that has been followed, and a description of the process and criteria for identification and evaluation of the impacts.
- Baseline conditions – Provides a description of the existing environment in terms of the particular environmental aspect.
- Impact assessment – This section describes all the identified impacts that would occur as a result of the Proposed Development. To clearly show the logic underpinning the assessment, this section is set out in a table with two main sections: baseline and impact assessment. Each row of the table describes a separate environmental effect. The first two columns describe the baseline, identifying the specific receptors and their corresponding values. The remaining five columns describe the impact assessment process taking into account the iterative nature of EIA and the design evolution of the Proposed Development. First the impact is identified, then any mitigation measures required are described and what the magnitude of the impact would be with mitigation in place. The final two columns describe the residual effect and determine whether this is significant or not.
- Mitigation measures – A more detailed description of all the mitigation measures identified in the impact assessment section.
- Summary – A summary of the significant environmental effects resulting from the Proposed Development with mitigation in place.

Impact assessment

5.3.2 Environmental impacts cause environmental effects and these should not be confused as the same thing. The impact assessment first identifies the impacts relevant to each of the environmental aspects and which receptors would be affected by the impact. An evaluation of the effect is undertaken to determine whether it would be significant or not. This is done by considering the following criteria:

- Sensitivity of the receptor – In general the more sensitive a receptor is to an impact the more significant the effect is likely to be. The importance of the receptor is also considered as part of its sensitivity.
- Magnitude of the impact – This is sometimes referred to as the scale of the impact. The larger the magnitude of the impact, the more likely the resulting effect would be significant. Impact magnitude can refer to the spatial scale of the impact and the degree or severity of damage that is caused by the impact.
- Duration of the effect – This refers to how long the effect would last and is broadly characterised into permanent and temporary effects.
- Reversibility of the effect – Some effects would overtime be reversible with or without mitigation, whilst other effects may be permanent and irreversible. There is a close relationship between effect duration and reversibility but they are distinct.

5.3.3 Both primary effects (which are direct effects) and secondary effects (which are indirect effects that may occur as a result of mitigating a primary effect) are considered.

5.3.4 Effects can be adverse or beneficial and both types of effect have been considered within the assessments.

5.3.5 Broadly speaking effects are categorised as follows:

- Major adverse / beneficial.
- Moderate adverse / beneficial.
- Minor adverse / beneficial.
- Negligible / no effect.

5.3.6 Major and moderate effects are generally regarded as being significant whereas minor and negligible effects are not significant. The method of assessment sections in each of the environmental aspect chapters provide further detail on how effects have been evaluated for the specific environmental aspect.

Mitigation measures

5.3.7 Mitigation measures have been identified where a significant adverse effect is likely to occur. Most effects can be mitigated but sometimes mitigation would not be undertaken because it is technically very difficult, it is prohibitively expensive, or because it may result in undesirable secondary effects.

5.3.8 There is a hierarchy of mitigation as shown in Figure 5.2 which shows the primacy of the mitigation for reducing environmental effects. The preference is to avoid any impact at all so that the baseline is maintained and there are no environmental effects. If this cannot be practicably achieved then mitigation measures from the next level down are identified to reduce the magnitude of the impact. The least preferable options are to compensate and remediate the effect.

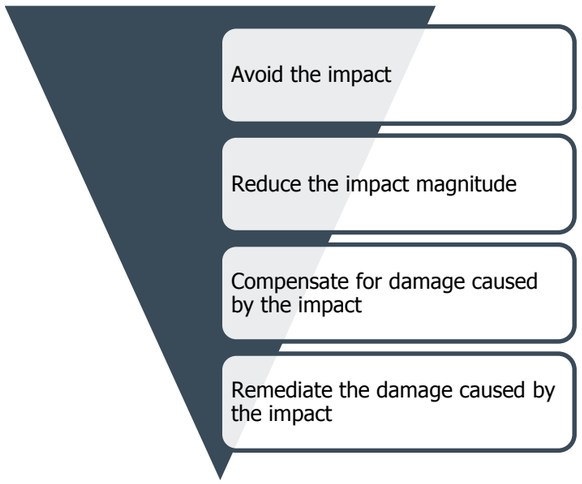

Figure 5.2 Mitigation hierarchy

5.4 Consultation

5.4.1 Formal consultation for the EIA has been undertaken by Cambridge City Council in the compilation of the Scoping Opinion. In addition, the design and assessment team has undertaken informal consultation with Officers at the City Council through pre-application meetings, telephone calls and emails. These informal discussions were used to inform Officers and to seek their opinions on issues to be considered in the ES.

5.4.2 Further consultation has been undertaken with Council Officers to update them on progress with the EIA and to review the key impact assessment findings, and further discussions were held to discuss proposed mitigation measures.

5.5 Uncertainties and assumptions

5.5.1 The environmental assessment process aims to assist good decision making based on the quality of the information provided including the potential environmental effects of the Proposed Development. Due to the nature of the assessment and the prediction of effects arising from events that have yet to take place, there is an inherent level of uncertainty within the assessments. Assessments use methods that are well established and accepted to minimise this uncertainty.

5.5.2 As with any project, the design continues to evolve as further information is obtained and the design becomes more detailed. The level of detail presented within this ES about the Site and the design is sufficient to identify and understand the main environmental issues and significant effects which could arise as a result of the Proposed Development. Where uncertainties exist, a worst case scenario is assumed for the purposes of the EIA so that effective mitigation measures can be identified and deployed. Where a worst case scenario has been used in the assessments, this is described in the relevant sections.

5.5.3 The timing and phasing of construction works is currently unknown. The assessments assume that works will commence in 2016 and be completed in 2031. Basic assumptions on the first phase have been made to enable the transport, air quality, and noise and vibration assessments to be undertaken but no assumptions have been made about further phasing during the 15 year construction period. The assumptions on the first phase are set out in Chapter 3.

5.5.4 Specific limitations, uncertainties and assumptions relating to each of the environmental aspects are described in relevant assessment chapters.

6. Ecology

6.1 Scope of the assessment

6.1.1 The ecology assessment has considered the environmental effects of the Proposed Development on terrestrial and aquatic ecology within the Site and where there are likely to be effects on designated sites up to 2km from the Site. The assessment has considered potential ecological effects during both the construction and operational phases of the Proposed Development.

6.1.2 The ecology assessment has considered the following:

- Direct impacts to species through the removal of trees and vegetation on Site and the demolition of existing buildings;
- Indirect impacts to sensitive species and habitats from construction noise and dust emissions;
- Improved ecological potential of the Site through ecologically considerate landscape design and specification.

6.1.3 A Scoping Opinion has been received (Appendix 5.1, Volume 3) setting out Cambridge City Council's views on what should be included within the Environmental Statement. Table 6.1 identifies the issues relating to the ecology assessment and the consultee that raised them.

Table 6.1 Ecology scoping response

Issue raised	Respondent
Consideration should be given to the wider context of the Site for example in terms of habitat linkages and protected species populations in the wider area, to assist in the impact assessment. Natural England recommends that a habitat survey (equivalent to Phase 2) is carried out on the Site. Ornithological, botanical and invertebrate surveys should be carried out at the appropriate time of year.	Natural England
Opportunities should be provided for wildlife enhancement through enlargement and / or appropriate management of existing habitats and creation of new habitats	Environment Agency
Additional surveys required to examine the current extent and population of scarce vascular plants associated with Coton Hedgerow Site. Additional surveys for the following species should be undertaken: • Water vole surveys of the waterbodies known to have previously accommodated the species; • Breeding bird surveys; and • Bat roost surveys of buildings and tress, and bat transect surveys.	Ecology Officer, Cambridge City Council

6.1.4 Consultee responses noted in Table 6.1 have been addressed and reported within this chapter. Some exceptions to the Scoping Opinion relating to the appropriate level of surveys have been agreed with Natural England and Cambridge City Council as follows:

- Following the Phase 1 survey, detailed botanical surveys have been limited to checks for invasive species on Site, the extent of the scarce vascular plants associated with the Coton Hedgerow CWS and survey of the Scrub East of M11 CiWS ; habitats beyond these areas were not considered to require more detailed surveys;
- Invertebrate surveys have not been undertaken as there are no habitats present on Site that are of particular value or interest to rare or notable invertebrates; and
- Water vole surveys have not been undertaken as there is no suitable habitat on Site. Impacts on water voles have not been considered further.

6.1.5 All of these exceptions have been agreed with the relevant consultees and the Cambridge City Council Planning Department prior to submission of the OPA.

6.2 Relevant legislation and policy

6.2.1 Appendix 6.1, Volume 3 provides details of the legislative and policy framework for relevant protected habitats and species, i.e. those that have been recorded during surveys, or protected species for which suitable habitat has been recorded. A summary of the key legislation and policy is provided below:

National Planning Policy Framework (NPPF)

6.2.2 Policy 11 of the NPPF, and a Government Circular[2] relate to ecology, conservation and biodiversity, instructing that the planning system should contribute to and enhance the natural and local environment by: protecting and enhancing valued landscapes, geological conservation interests and soils; recognising the wider benefits of ecosystem services; and minimising impacts on biodiversity and producing net gains where possible, contributing to the Government's commitment to halt the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures.

Conservation of Habitats and Species Regulations 2010

6.2.3 The 'Habitats Regulations' transpose the EC Habitats Directive into national law. They provide for the designation and protection of European sites, the protection of European protected species and the adaptation of planning and other controls for the protection of European sites. Under the Regulations, competent authorities, including local and regional authorities, have a duty in the exercise of any of their functions, to have regard to the EC Habitats Directive.

[2] Defra and Office of the Deputy Prime Minister, 2005, Biodiversity and Geological Conservation – Statutory Obligations and their Impact within the Planning System (ODPM Circular 6/2005 & Defra Circular 01/2005)

Natural Environment and Rural Communities (NERC) Act 2006

6.2.4 Section 41 of the NERC Act requires the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England; this is known as the England Biodiversity List. The UK Biodiversity Action Plan (UK BAP), as updated by the UK Biodiversity Partnership in 2007, was used to draw up the England Biodiversity List. The UK BAP has been succeeded by the UK Post-2010 Biodiversity Framework in 2012. However, the UK BAP list of priority species and habitats continue to be regarded as conservation priorities in the UK Post-2010 Biodiversity Framework. The England Biodiversity List is used as a guide for decision makers such as public bodies, including local and regional authorities, in implementing their duty under Section 40 of the NERC Act to have regard to the conservation of biodiversity in England when carrying out their duties.

Wildlife and Countryside Act (WCA) 1981 (as amended)

6.2.5 The WCA is the primary piece of legislation relating to nature conservation in Great Britain. The Act is supplemented by provisions in the CRoW Act 2000 and the NERC Act 2006. It provides for the notification and confirmation of Sites of Special Scientific Interest by Natural England. It also sets out, in schedules, important and invasive species which are legally protected or require active management.

Cambridgeshire Biodiversity Action Plan (BAP)

6.2.6 The Cambridgeshire BAP identifies priority habitats and species that are of particular importance for biodiversity in Cambridgeshire. Many of these habitats are covered by local Habitat and Species Action Plans. The Cambridgeshire and Peterborough Biodiversity Partnership has also identified priority species that are under particular threat in the county. Planning decisions must take these habitats and species into account. Species Action Plans have been developed for those species identified as needing targeted action to secure their future in Cambridgeshire.

EU Water Framework Directive (WFD) 2000

6.2.7 The WFD provides an established framework for the protection of inland surface waters (rivers and lakes), transitional waters (estuaries), coastal waters and groundwater. To meet the objectives of the EU Directive, Member States have established River Basin Districts and developed Plans and Programmes of Measures that detail the actions that need to be taken within each District. The overall aim is for the ‘water bodies’ and ‘protected areas’ within each River Basin District to achieve 'good ecological status' by 2015. A specific objective of the WFD is to ‘prevent deterioration of the status of all bodies of surface water’.

6.3 Method of assessment

6.3.1 This ecological assessment has been undertaken with reference to current best practice guidelines published by the Chartered Institute of Ecology and Environmental Management[3] (CIEEM). This section summarises the approach of the assessment method. See Appendix 6.2, Volume 3 for a more detailed description of the data collection, survey and interpretation methods.

Establishing the baseline

Desk study

6.3.2 The baseline has been established through a combination of desk study and field work. The desk study has provided records of designated sites and protected species within up to 2km of the West Cambridge site. The following information sources were used for the desk study:

- The Multi-Agency Geographic Information for the Countryside (MAGIC) website[4] was reviewed for information on locally, nationally and internationally designated sites of nature conservation importance (statutory sites only) within 2km of the Site;
- Information on non-statutory designated sites up to 2km from the scheme was requested from Cambridgeshire and Peterborough Environmental Records Centre (CPERC);
- Online Ordnance Survey (OS) maps and the MAGIC website were used to identify the presence of water bodies within 500m of the Site; and
- A review of RPS – West Cambridge Monitoring: Annual Ecology Report 2014.

Ecology surveys

6.3.3 The field work has included the following surveys:

- Extended Phase 1 habitat survey of habitats and their suitability to support protected species within the application Site and on adjacent land;
- Phase 2 vegetation survey of Coton Path Hedgerow CWS and Scrub East of M11 CiWS to identify plant species within the habitats (specifically this is to address the request raised in the Scoping Opinion to identify the current extent and population of the scarce vascular plants associated with the Coton Hedgerow County Wildlife Site);
- Terrestrial invasive plant species survey;
- Habitat Suitability Index (HSI) assessments of all ponds within the site boundary and those within 500m for which there is connecting habitat;
- Presence and absence surveys for great crested newt at those ponds found to have suitability following the HSI assessments;
- Assessments and surveys to identify bat roosts in buildings and trees with potential for demolition / removal;
- Assessments and surveys to identify bat foraging areas and commuting routes; and
- Breeding bird survey to identify species present and the usage of habitats within the Site.

6.3.4 All surveys for the Site were carried out within the optimal survey period within the season for each of the flora and fauna surveyed. However ecological surveys are limited by factors which affect the presence of plants and animals such as the climate conditions during the season, migration patterns and behaviour. Therefore the surveys are descriptive of what is currently present onsite and may not produce a complete list of plants and animals that may be present over the lifespan of the masterplan. The absence of evidence of any particular species should not be taken as conclusive proof that the species is not present or that it will not be present in the future.

[3] Chartered Institute of Ecology and Environmental Management, 2006, Guidelines for Ecological Impact Assessment in the United Kingdom

[4] www.magic.defra.gov.uk/

6.3.5 The search for water bodies within 500m of the Site was undertaken by using Ordnance Survey plans and aerial photographs only. These sources may not show all ponds and or water bodies within 500m of each site and therefore some water bodies may not have been identified.

6.3.6 Ornithological surveys are affected by a variety of factors which affect the presence of birds such as season, weather, climate, migration patterns, food availability, species behaviour and the presence of predators. Therefore bird surveys for the Site may not have produced a complete bird list and the absence of evidence of any particular species or evidence of breeding of any particular species within the survey area (or a part of the survey area), should not be taken as conclusive proof that the species is not present or that it will not be present in the future. Nevertheless, the results of the bird surveys and the subsequent assessment provide an indication of the use of the survey area by breeding bird species during the survey period.

6.3.7 Despite these constraints, it is considered that the surveys provide information to indicate potential for habitats within the Site to support protected species and is considered sufficient to inform the recommendations for further ecological survey and mitigation measures.

Nature conservation evaluation

6.3.8 A number of criteria have become accepted as a means of assessing the nature conservation value of a defined area of land which are set out in A Nature Conservation Review[5] and include diversity, rarity and naturalness.

6.3.9 The nature conservation value or potential value of an ecological feature is determined within the following geographic context:

- International importance (such as Special Areas of Conservation, Special Protection Areas, Ramsar sites);
- National importance (such as Sites of Special Scientific Interest);
- Regional importance (for example, Environment Agency regional biodiversity indicators, important features in Natural England Natural Areas);
- County importance (such as Local Nature Reserves, Sites of Importance for Nature Conservation, ancient woodlands);
- Local (parish) importance (undesignated ecological features such as old hedges, woodlands, ponds);
- The Site e.g. habitat mosaic of grassland and scrub within the Site;
- Negligible importance would usually be applied to areas of built development, active mineral extraction, or intensive agricultural land.

Impact assessment

6.3.10 The assessment of the potential effects of the Scheme takes into account both on-site effects and those that may occur to adjacent and more distant ecological features. Impacts can be permanent or temporary and can include:

- Direct loss of wildlife habitats;
- Fragmentation and isolation of habitats;
- Disturbance to species from noise, light or other visual stimuli;
- Changes to key habitat features; and
- Changes to the local hydrology, water quality and/or air quality.

6.3.11 Effects are unlikely to be significant where features of low value or sensitivity are subject to small or short-term impacts. However, where there are a number of small scale effects that are not significant alone, the assessor may determine that, cumulatively, these may result in an overall significant effect. Impacts have been assessed as being either negative or positive and significant or not significant.

6.3.12 For designated sites, effects are considered significant when a project and associated activities are likely to either undermine or support the conservation objectives or condition of the site(s) and its features of interest.

6.3.13 For ecosystems, effects are considered significant when a project and associated activities are likely to result in a change in ecosystem structure and function.

6.3.14 Consideration is given to whether:

- Any processes or key characteristics will be removed or changed;
- There will be an effect on the nature, extent, structure and function of component habitats; and,
- There is an effect on the average population size and viability of component species.

6.3.15 Functions and processes acting outside the formal boundary of a designated site has also been considered, particularly where a designated site falls within a wider ecosystem e.g. wetland sites.

6.3.16 Many ecosystems have a degree of resilience to perturbation that allows them to tolerate some biophysical change. For this assessment ecological effects have been considered in the light of any information available or reasonably obtainable about the capacity of ecosystems to accommodate change.

6.3.17 The conservation status of undesignated habitats and species within a defined geographical area is described as follows and has been used in this assessment to determine whether the effects of the proposals are likely to be significant:

- For habitats, conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area;
- For species, conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area.

6.3.18 When assessing potential effects on conservation status, the known or likely background trends and variations in status have been taken into account. The level of ecological resilience or likely level of ecological conditions that would allow the population of a species or area of habitat to continue to exist at a given level, or continue to increase along an existing trend or reduce a decreasing trend, has been estimated where appropriate to do so.

[5] Ratcliffe, D.A. ed. 1977, A Nature Conservation Review, The Selection of Biological Sites of National Importance to Nature Conservation in Britain, 2 Volumes, Cambridge, Cambridge University Press.

6.3.19 The mitigation measures described within the EcIA have been incorporated into the design and operational phasing programme and taken into account in the assessment of the significance of effects. These mitigation measures include those required to achieve the minimum standard of established good practice together with additional measures to further reduce any negative impacts of the Scheme. The mitigation measures include those required to reduce or avoid the risk of committing legal offences. In addition to measures required to ameliorate negative impacts on valued ecological features, further biodiversity enhancement measures have been identified and will be incorporated into the Scheme as it is progressed.

6.3.20 In addition to determining the significance of an effect to any ecological features, this assessment also identifies any legal requirements for mitigation measures and discusses any policy implications.

6.3.21 The criteria to evaluate the significance of effect are shown in Table 6.2. Residual effects are assessed against these criteria and then a final assessment is made to confirm whether they are significant in EIA terms, in keeping with the wider method for this Environmental Statement. Moderate and major effects are considered significant in EIA terms.

Table 6.2 Criteria to Evaluate the Significance of Effects to Ecology

Significance	Effects on Integrity & Conservation status
Major adverse	Permanent or long-term and/or large scale/large magnitude adverse effect on integrity and/or conservation status on feature of county or greater value
Moderate adverse	Temporary and/or small scale/small magnitude adverse effect on integrity and/or conservation status on feature of national or international value Short or medium term and/or moderate scale/moderate magnitude adverse effect on integrity and/or conservation status on feature of county or greater value Permanent or long-term and/or large scale/large magnitude adverse effect on integrity and/or conservation status on feature of local (parish/district) value
Minor adverse	Temporary and/or small scale/small magnitude adverse effect on integrity and/or conservation status on feature of local (parish/district) or county value Adverse effects on conservation status on feature of Site value
Neutral	Neutral effect on integrity and/or conservation status
Minor beneficial	Temporary and/or small scale/small magnitude beneficial effect on integrity and/or conservation status of local (parish/district) or county value Beneficial effects on conservation status on feature of Site value
Moderate beneficial	Temporary and/or small scale/small magnitude beneficial effect on integrity and/or conservation status on feature of national or international value Short or medium term and/or moderate scale/moderate magnitude beneficial effect on integrity and/or conservation status on feature of county or greater value Permanent or long-term and/or large scale/large magnitude beneficial effect on integrity and/or conservation status on feature of local (parish/district) value
Major beneficial	Permanent or long-term and/or large scale/large magnitude beneficial effect on integrity and/or conservation status on feature of county or greater value

6.4 Baseline conditions

Designated sites

Statutory designated sites

6.4.1 There are no international statutory designated sites within 2km of the Site boundary.

6.4.2 There is one national statutory site designated for its ecological value within 2km of the Site boundary. Madingley Woods Site of Special Scientific Interest (SSSI) is located approximately 1.8km west of the Site. The SSSI is classified as a lowland broadleaved, mixed and yew woodland. The western sector of the wood is of ancient origin whilst the eastern half is of relatively recent origin. Linear features such as wooded road verges and hedgerows connect Madingley Woods to the Site. The SSSIs are of National value.

6.4.3 There are two local statutory designated sites within 2km of the Site boundary. Paradise Local Nature Reserve (LNR) is located approximately 1.8km east of the Site and is designated due to the composition of wet woodland and a number of riverside mature willows. The habitats within Paradise LNR support notable butterfly species and the rare musk beetle. Sheep's Green and Coe Fen LNR, located approximately 1.8km east of the Site, is designated for aesthetic qualities and is considered a local beauty spot. Local nature reserves are considered to be of county value.

Non-statutory designated sites

6.4.4 There are two County Wildlife Sites (CWS) and five City Wildlife Sites (CiWS) within 2km of the Site boundary. One CWS and one CiWS are located within the Site, namely Coton Path Hedgerow CWS located along the southern boundary and Scrub East of M11 CiWS verge located on the western boundary.

6.4.5 Phase 2 vegetation surveys undertaken on Coton Path Hedgerow CWS found that the hedgerow has not been maintained via a routine management regime. As such the hedgerow, comprising of hawthorn, field maple, hazel, blackthorn, ash, dogwood, elder and oak, has become overgrown. Parts of the verge under the hedgerow have been lost due to the growth of the hedge, whereas other parts are dominated by grasses and common herb species. Full species lists for the verge habitats are shown in Appendix 6.3, Volume 3.

6.4.6 Neither of the vascular plant species which Coton Path Hedgerow is designated for (yellow vetchling and slender tare) were identified during the survey. The absence of these plants is thought to be due to the poor condition of the verge which in some sections, due to lack of management, has become dominated by grass species. In other sections the grass verge has been greatly reduced and is prone to erosion and trampling from foot and bike traffic on the cycle path which was widened in 2006. The Coton Path Hedgerow is considered to be of local value rather than county, even though it is a CWS, because it does not support the vascular species of plant it was designated for due to its poor condition.

6.4.7 The Scrub East of M11 CiWS qualifies under scrub, hedgerow and neutral grassland. The extent of the site has been diminished through the construction of the university data centre which is located within the CiWS. A partially constructed ecological corridor running through the southern section of the Site connecting the CiWS with wider habitats was proposed as mitigation for the data centre. The formal boundary of the CiWS has not been adjusted to account for these developments. Phase 2 vegetation surveys undertaken did not identify the presence of neutral grassland within the area of designation. The area currently comprises hawthorn, sycamore, blackthorn and elder trees with an understorey of nettles and ground ivy. The woodland edge that adjoins the public footpath contains species of agrimony, black medic, creeping cinquefoil, St Johns wart, square stemmed willow, common spotted orchid and southern marsh orchid. The area was considered to be under managed and in poor condition in terms of its designation.

6.4.8 The Scrub East of M11 CiWS contains an artificial badger sett and provides foraging habitat for this species. It also provides habitat for nesting birds and the potential to support foraging and commuting bats. This habitat is considered to be of Local value in terms of the species it supports.

6.4.9 There are a further one CWS and four CiWS located between 100m and 700m from the Site boundary. These are detailed in Table 6.3.

Table 6.3 Non-statutory designated sites within the study area

Designated site name	Designation	Brief description	Distance from Site	Conservation value
Hedgerows East of M11	CWS	Supports populations of Nationally Scarce vascular plant species and a vascular plant species which is rare in the county.	100m south	County
Bird Sanctuary, Conduit Head	CiWS	Supports greater pond sedge swamp lesser pond sedge swamp and 0.5-1 ha woodland with five or more woodland plants and 10% or more mature woodland. Also supports great crested newts.	100m north	Local
Adams Road Sanctuary	CiWS	Recent woodland more than 1 ha in area with five or more woodland plants. Also supports breeding populations of common frog, common toad and great crested newt.	500m east	Local
Bin Brook	CiWS	Supports breeding populations of a mammal species (water vole) protected by the Wildlife and Countryside Act 1981. Also qualifies for its group of at least five mature pollard willows in association with other semi-natural habitat.	600m south east	Local
Ascension Parish Burial Ground	CiWS	Supports two or more strong neutral grassland indicator species in frequent numbers.	700m north	Local

Waterbodies

6.4.10 Water bodies can be used by great crested newts for breeding. If terrestrial habitats surrounding the water bodies are suitable then great crested newts can be found up to 500m away from breeding ponds. Rivers, ditches and streams can be used by other protected species such as water vole, otters and white clawed crayfish for feeding, navigation and breeding. Figure 6.1 shows the location of the assessed water bodies.

6.4.11 There is one lake (West Cambridge Lake (L1)), five ponds (P1, P2, P3, P4 and P5), one ditch (D1), the source of Coton Brook (D2), the West Cambridge Canal (D3) and the Swales (D4) on Site. A further seven ponds and nine drainage ditches were identified within a 500m radius of the Site boundary. Water bodies on Site were assessed during the walkover survey undertaken on 16th February 2015, apart from one pond which was assessed on 7th April 2015. Three off-Site water bodies (Coton Brook (D4), and two ponds) were assessed on 7th April 2015. The last off-Site pond (P8) was assessed on 29th April 2015.

6.4.12 Ponds P2, P3 and P5 on-Site are connected to each other via the West Cambridge Canal (D3) which is within a concrete channel and the Swales (D4) which have shallow banks and little vegetation cover. Ponds P2 and P5 are relatively new and are not established in terms of vegetation and species diversity. These ponds and ditch are considered to have a conservation value at the Site level.

6.4.13 Pond P3 is located in the south eastern corner of the Site and is fairly well established although it has not been managed and has become over grown and rank in the shallower sections. In its current condition this pond is considered to have a conservation value at the Site level.

6.4.14 The West Cambridge lake (L1) is of fairly new construction and is connected to ponds P2, P3 and P5 via the West Cambridge Canal (D3) and the Swales (D4). The pond in the north of the site (P4) is an isolated highways balancing pond which appears to dry out regularly. Both the lake and P4 are considered to have a conservation value at the Site level.

6.4.15 Ponds P6 and P7 are well established and located to the south east of the Site outside the boundary. Pond P7 is the larger of the two and is vegetated around the banks with species including bulrush, water mint, yellow iris and cuckooflower. Pond P6 is located next to pond P7 and is separated (from P7) by a small block of broadleaved woodland. It has a similar composition of vegetation around the banks to P7 with some mature cherry and ash trees scattered around it. A dual cycle path and footpath runs between the Site and these ponds. Habitats directly to the south of the ponds include small areas of broadleaved woodland and an athletics track. These ponds are considered to have a conservation value at a local level as they are connected to the wider landscape by woodland and grassland habitats.

6.4.16 The Coton Brook (D5), which was dry during the survey, runs along the north of the cycleway/footpath under the hedgerow that marks the southern boundary of the Site. The brook is culverted, heavily shaded and dominated by ruderal species and trees with the banks being largely supported by tree roots. In its current condition this ditch is considered to have negligible conservation value.

6.4.17 A more detailed description of the ditches D1, D2, D3 and D4 which are all have a conservation vale of Site level, can be found in the water environment assessment (Chapter 13)

Habitats

6.4.18 Overall the majority of habitats on Site are considered to be of low quality. The locations of all habitat types recorded during the Phase 1 survey are shown on Figure 6.1. Accompanying target notes can be found in Appendix 6.4, Volume 3

6.4.19 The Site is bounded to the west by the M11 and to the north by Madingley Road. The wider habitats to the south, west and north of the Site are dominated by arable fields with small woodland blocks and hedgerows. To the east of the Site are urban and peri-urban areas of the city of Cambridge.

6.4.20 The habitats within the Site are dominated by areas of amenity grassland, hardstanding footpaths, car parks and roads, and densely built up areas. Buildings vary in age and condition across the Site with the Cavendish Laboratories, Veterinary School and Merton Hall Farmhouse buildings being the oldest. The majority of the other buildings are more recent or under construction. These habitats are considered to be of negligible value.

6.4.21 Areas of species-poor semi-improved grassland occur in the northern part of the Site around the Department of Veterinary Medicine. These areas are predominantly used for grazing or holding animals associated with the department and are considered to have a conservation value at the Site level only.

6.4.22 Areas of amenity grassland surround the lake (L1) and ponds P1, P2 and P3 (shown on Figure 6.1). These areas of grassland are heavily mown and kept short for use by staff and residents on the Site. These areas are considered to be of negligible value.

6.4.23 Roads and footpaths are generally lined with a mixture of immature trees, with some mature oaks lining the newly constructed road south of Charles Babbage Road. Mature willows are also present around pond P3 in the south east corner of the Site. The oaks and willows are considered to be of local value whilst all other trees are considered to have a conservation value at the Site level as they provide linear commuting lines and foraging habitats for bats and birds.

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- Site boundary
- Scattered trees
- Target notes
- Wet ditch
- Dry ditch
- Intact native species rich hedge
- Broadleaved woodland
- Plantation mixed woodland
- Dense Scrub
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- Pond
- Hardstanding
- A — Amenity
- Building
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Client: University of Cambridge

Project: West Cambridge Masterplan EIA

Title: Ecology
Phase 1 Habitat Map
Figure 6.1

Sheet Size	Original Scale	Designed / Drawn	Checked	Authorised
A3	1:4,500	AG Date 01/06/16	SJD Date 01/06/16	CP Date 01/06/16

Drawing Number: 5137998_CAM_EC_PH1
Rev: 03

Path: P:\GBLOW\LEGE\PLH\Planning\Projects\5137998 West Cambridge Masterplan EIA\600 Working Folders\670 GIS\WIP\EC\5137998_CAM_EC_PH1_03_GEO054.mxd

6.4.24 There are three plots of land in the western part of the Site which were predominantly bare ground and have presumably been cleared in the recent past. These areas are considered to be of negligible value.

6.4.25 The green corridor made up of aquatic and marginal habitats to the south of the Site is considered to have a conservation value at the Site level as it provides commuting and foraging habitats within the Site which is mainly dominated by buildings, roads and low quality habitats.

Protected species

Great crested newts

6.4.26 Data provided by CPERC contains 19 records of great crested newts, the closest record being of seven newts found in the pond at Madingley Road Park and Ride approximately 300m north of the Site in 2013. The second closest records are from Adams Road Sanctuary CiWS located approximately 500m east of the Site between 2009 and 2012. In addition to these sites there is a known population in the Bird Sanctuary, Conduit Head CiWS in the pond located approximately 130m north of the Site, as detailed in Table 6.3.

6.4.27 There is a barrier to dispersal from both of these ponds to the Site in the form of the busy A1303, Madingley Road. There are also no direct waterbody linkages to the Site from these ponds so they have not been surveyed.

6.4.28 As part of their annual ecology monitoring work, RPS carried out great crested newt surveys on water bodies L1, P4 and D3 in 2014, all of which are within the Site. No great crested newts (or other species of amphibian) were recorded during any of the survey visits.

6.4.29 Habitat suitability assessments (HSIs) were carried out for all ponds on the Site (P1, P2, P3, P4 and P5) and for three ponds off-Site (P6, P7 and P8 a b and c) which have potential connectivity to the Site. The HSI scores showed that all of these ponds have good to average suitability to support breeding populations of great crested newts and so presence and absence surveys were undertaken during April and May 2015. Detailed survey results are shown in Appendix 6.5, Volume 3.

6.4.30 Great crested newts were only recorded within pond P8a during the presence and absence surveys. Both sexes were recorded during these surveys indicating that they are using this pond for breeding. The low numbers recorded during the surveys indicates a small population present within these ponds. This population of great crested newts are considered to be of local value. Both sexes of smooth newts were also recorded during the surveys in this pond. This pond is located within Adams Road Sanctuary CiWS approximately 490m east of the Site and the population present is considered to be of local value. This pond is connected to the Site via D5, although due to the significant length of culverted sections of this ditch, connectivity is limited for dispersal by great crested newts. The habitat surrounding the pond is more suitable for foraging and hibernation than the habitat beyond the sanctuary. It is likely that the newts would remain within the sanctuary rather than migrate to the Site which has poor habitat suitability for foraging or hibernation for this species.

6.4.31 No great crested newts were found in any of the ponds on Site (P1, P2, P3, P4 and P7) or the two closest to the Site (P5 and P6). Ponds P1 and P3 had one female smooth newt present during the surveys indicating that it is unlikely to be a breeding site. Ponds P2, P4 and P7 had no newts of any species found during the surveys. Ponds P5 and P6 had both sexes of smooth newts present during the surveys indication that this species is breeding within these ponds. These populations of smooth newts are considered to be of local value.

Bats

6.4.32 Data provided by CPERC include 25 records of bats within 2km of the Site recorded between 1985 and 2012. The closest records are in Adams Road Sanctuary CiWS located approximately 500m east of the Site. These records comprise soprano pipistrelle and noctule bats that have been seen or heard passing through the area.

6.4.33 Building inspections were undertaken on all buildings identified to be demolished as part of the master plan proposals. Surveys were undertaken on 35 buildings on the 27th April, 1st May, 5th May and 20th May 2015 across the Site. Surveys were undertaken in accordance with the Bat Survey Guidelines[6]. The surveys identified 12 buildings with features with moderate potential, five buildings with features with low potential and 18 buildings with negligible potential to support roosting bats. Buildings with bat roost potential are shown in Appendix 6.6, Volume 3.

6.4.34 Further surveys of the buildings were undertaken between 1st July 2015 and 25th August 2015 and involved a combination of backtracking and emergence / re-entry survey methods. Further surveys of the buildings within the Department for Veterinary Medicine complex identified the re-entry of a single pipistrelle bat into building W27 during the dawn survey on 13th August 2015. No other emergence or re-entry was recorded during the surveys on the Site. The roost is of Site value as it is considered to be an occasionally used transitional roost only.

6.4.35 Ground Level Tree Assessments (GLTAs) were undertaken on all trees identified to be removed as part of the masterplan proposals. Surveys were undertaken in accordance with the Bat Survey Guidelines and full details are presented in Appendix 6.6, Volume 3. Most of the trees on Site were young trees (estimated to be between 2 and 5 years old with some still being supported or having tree guards present) and were identified as having no potential to support roosting bats. In addition to the immature trees on Site there are mature willows surrounding pond P3, in the south east corner of the Site, of which three trees were identified from the initial GLTA to have features with moderate to high potential to support roosting bats. Two of these three trees had bat boxes which were checked by a licensed ecologist alongside the GLTA. No bats or any evidence of current use was found in the bat boxes.

6.4.36 Further surveys of the trees identified as having features to support bats were undertaken in the form of tree climbing surveys. Following the tree climb the features identified with moderate to high potential from the initial GLTA were re-classified as having low and negligible potential with no requirement for further surveys. The value of these trees for roosting bats is considered to be negligible and no evidence was found of bats roosting within these trees.

6.4.37 Activity surveys were undertaken to establish the species and volume of bats using the Site for commuting and foraging activities. The surveys were undertaken using a combination of walking transect and static detector methods, details of which are presented in Appendix 6.6, Volume 3.

[6] Hundt L (2012), Bat Survey: Good Practice Guidelines, 2nd edition, Bats Conservation Trust

6.4.38 Walking transect surveys identified a low number of bats commuting and foraging around the Site with a peak count of 12 bats recorded during the dusk survey undertaken on 23rd June 2015. Species identified included common and soprano pipistrelle and Daubenton's bats.

6.4.39 Commuting and foraging was found to mainly occur in four areas:

- Along the scrub area to the west of the Site;
- To the south of the Site along Coton footpath hedgerow;
- Around West Cambridge lake; and
- Around the pond (P3) to the rear of Cavendish laboratories.

6.4.40 In accordance with the bat survey guidelines static recorders were placed on Site for a period of one week during the peak survey activity season. Static detectors located along the southern, western, northern and central area of the Site showed the main activity to be to the south of the Site along Coton footpath hedgerow with a peak count of 203 bats recorded on 26th June 2015. The static detector located to the west of the Site close to the M11 scrub area recorded a single pass of a barbastelle bat which is considered likely to be commuting from Wimpole Estate (where a population of barbastelle are known to roost) located approximate 10 miles south west of the Site. In general the detectors recorded species of common pipistrelle, soprano pipistrelle, noctules and *Myotis* species of bat. Low levels of activity of common pipistrelle were also recorded within the amenity grassland areas within the Department of Veterinary Medicine complex.

6.4.41 Overall bats appear to be commuting between 23:00 and 03:00 hours on the Site suggesting they are roosting off Site with exception of a couple of incidences of common pipistrelle being recorded close to dusk and dawn during the survey period. It is likely that the pipistrelle are occasionally using a transitional roost on or close to the Site which is consistent with the building survey results which showed a re-entry of a single bat during the whole survey period.

6.4.42 The locations of the bats recorded during the static and walking transect activity surveys are detailed in in Appendix 6.6, Volume 3.

6.4.43 In general the foraging and commuting value of the Site for bats is considered to be of local value with common species mainly being recorded. The single pass of the barbastelle species on the static monitoring equipment suggests that the Site is occasionally used by this species that are known to roost within approximately 10 miles of the Site. The Site is not considered to be a significant part of the foraging territory for this species and no roosts have been recorded within the Site for this species.

Water vole

6.4.44 CPERC provided 36 records of water vole within 2km of the Site. The closest record is of burrows and feeding signs recorded on the pond behind the Cavendish Laboratories (P3) in 2006. No burrows or feeding signs were identified during the waterbody surveys undertaken in April 2015 for this project. The banks of the pond itself are too shallow to support burrows and the surrounding vegetation is heavily managed and do not provide a food source for this species.

6.4.45 The Swales (D4) originally surveyed during the Phase 1 in February 2015 was considered to have low potential to support water vole. During the waterbody survey in April 2015, when the vegetation was more established, it was considered to have negligible potential to support water vole due to lack of food source and unsuitable bank conditions. No burrows, feeding signs or latrines were identified along this ditch for this species. It is unlikely that water voles are currently present within the Site.

Badgers

6.4.46 Data provided by CPERC contains 27 records of badger within 2km of the Site recorded between 1996 and 2013. Records provided are not detailed enough to identify the exact locations of the recordings.

6.4.47 An artificial badger sett was identified during the Phase 1 walkover (see Appendix 6.7, Volume 3). This sett is active and has been expanded by the badgers and includes five artificial entrances and seven 'natural' entrances. Well-worn pathways were seen between the sett entrances and going into the dense vegetation to the south western corner of the Site. A number of latrines containing fresh dung were observed and badger hair was found on nearby barbed wire fencing. Guard hairs were also seen in at least one of the natural sett entrances. The woodland and arable fields beyond the Site provide suitable foraging habitats for badgers. Badgers were also found foraging on the Site during the bat surveys, although the habitats on-Site are not considered as valuable for badger foraging as the surrounding rural areas.

6.4.48 This sett was installed in 2009 as part of mitigation for previous construction works for the existing outline planning permission. There is no evidence of further sett creation within the Site, beyond this artificial sett location. Badgers have been seen foraging and commuting around the Site during bat surveys of the Whittle laboratories. It is likely that the badgers are using the grassland habitats and hedgerows within the Site for foraging and commuting.

6.4.49 Badgers are not rare or endangered, so they are not a feature of nature conservation value. Nevertheless, their presence must be taken into account because of the legal protection afforded to badgers and their setts due to persecution.

Birds

6.4.50 CPERC provided 632 records of birds within 2km of the Site recorded between 1998 and 2013. These include Schedule 1 species such as barn owl, fieldfare, hobby, kingfisher, marsh harrier, peregrine falcon, redwing and wryneck recorded within the Site.

6.4.51 The survey covered all areas within the Site. The survey visits were undertaken between April and July 2015.

6.4.52 A total of 46 bird species were recorded (see Appendix 6.8, Volume 3). Twenty species recorded are considered to be notable due to their conservation status. A colony of house martins nesting on building W035 adjacent to the Department of Veterinary Medicine was of note. Swallows were found to be nesting on buildings W023, W068 and W056.

6.4.53 A number of buildings within the Site were identified during initial ecological surveys in February 2015 as having potential to support breeding barn owl. These were associated with the Department of Veterinary Medicine towards the centre of the Site. During a site visit on the 16th April 2015, these buildings were inspected by two bird surveyors, who both hold survey licences for barn owl.

6.4.54 Anecdotal evidence of barn owl foraging at the south of the Site was provided from Site staff during the surveys, however no evidence of barn owl (pellets, feathers, splashing) was identified within the structures surveyed, and no suitable ledges or owl boxes were present. There are no recent records of hunting on the Site.

6.4.55 Overall it is considered that the Site supports an assemblage of common bird species which are of conservation value at the Site level.

Invasive plants

6.4.56 The 2014 annual ecology report produced by RPS presents results from site wide bi-annual surveys carried out on the Site. This report shows that the pond behind Cavendish Laboratories (P3) contains the invasive plant species New Zealand pygmy weed. This species was not present within this pond during the 2015 surveys.

6.4.57 The invasive plant species, Nuttelli's waterweed, was identified to be present in the West Cambridge Lake (L1) and the West Cambridge Canal (D5) during the 2015 surveys.

6.5 Impact assessment

Construction phase

6.5.1 Construction phase impacts are assessed in Table 6.4.

Table 6.4 Construction phase effects

Baseline		Impact assessment			
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Residual effect**	**Significance of effect**
Madingley Woods Site of Scientific Interest (SSSI)	National	Proposed works will not result in any direct removal or damage being caused to the vegetation or habitats within this site. There are no habitat linkages to the LNR from the Site that could lead to indirect impacts.	None proposed	There will be no effect to the Madingley Woods SSSI as a result of construction of the Proposed Development	Neutral **Not significant**
Paradise Local Nature Reserve (LNR)	County	Proposed works will not result in any direct removal or damage being caused to the vegetation or habitats within this site. There are no habitat linkages to the LNR from the Site that could lead to indirect impacts.	None proposed	There will be no effect to the Paradise LNR as a result of construction of the Proposed Development	Neutral **Not significant**
Sheep's Green and Coe Fen Local Nature Reserve (LNR)	County	The aesthetic qualities for which this area is designated would not be affected by the construction of the Proposed Development.	None proposed	There will be no effect to the Sheep's Green and Coe Fen LNR as a result of construction of the Proposed Development	Neutral **Not significant**
Hedgerow East of M11 County Wildlife Site (CWS)	County	Hedgerow and vascular plants for which it is designated are 100m outside the Site and would not be directly affected. There may be residual effect on vascular plants from dust emissions released from demolition and construction works.	Mitigation measures to protect habitats from construction dust emissions are detailed in the air quality assessment (Chapter 13).	Measures to reduce dust emissions from construction works would ensure that the vascular plants within Hedgerow East of M11 County Wildlife Site (CWS) will not be affected.	Neutral **Not significant**
Ascension Parish Burial Ground City Wildlife Site (CiWS)	Local	Proposed works will not result in any direct removal or damage being caused to the vegetation or habitats within this site. There are no habitat linkages to the CiWS from the Site that could lead to indirect impacts.	None proposed	There will be no effect to the Ascension Parish Burial CiWS as a result of construction of the Proposed Development	Neutral **Not significant**
Bin Brook City Wildlife Site (CiWS)	Local	Proposed works will not result in any direct removal or damage being caused to the vegetation or habitats within this site. There are no habitat linkages to the CiWS from the Site that could lead to indirect impacts	None proposed	There will be no effect to the Bin Brook CiWS as a result of construction of the Proposed Development	Neutral **Not significant**
Bird Sanctuary, Conduit Head City Wildlife Site (CiWS)	Local	Proposed works will not result in any direct removal or damage being caused to the vegetation or habitats within this site. There are no habitat linkages to the CiWS from the Site that could lead to indirect impacts.	None proposed	There will be no effect to the Bird Sanctuary, conduit head CiWS as a result of construction of the Proposed Development	Neutral **Not Significant**
Adams Road Sanctuary City Wildlife Site (CiWS)	Local	Proposed works will not result in any direct removal or damage being cause to the vegetation of habitats within this site. There is a direct linkage to the Site via the Coton Brook (D5) which could result in contaminated runoff from construction activities on Site impacting species at the downstream CiWS. See Chapter 13 water environment for further consideration of this impact	Mitigation measures to protect surface water quality from contaminated runoff are detailed in the water quality assessment (Chapter 13).	Measures to protect surface water quality during construction will ensure that the Adams Road Sanctuary CiWS does not receive contaminated runoff at levels which could be harmful to species or habitats at the site.	Minor adverse **Not Significant**

Baseline		Impact assessment			
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Residual effect**	**Significance of effect**
Coton Path Hedgerow County Wildlife Site (CWS)	County	The hedgerow comprising the CWS will be retained as part of the Proposed Development. Accidental damage to vegetation comprising the CWS could occur through construction activities adjacent to the CWS or close by.	A protective exclusion buffer will be established around the CWS and clearly marked with netlon fencing or equivalent for the duration of construction works in the vicinity of the CWS.	The CWS no longer supports the species for which the site was originally designated and the site's value is solely as a wildlife corridor for species such as bats. The exclusion buffer would prevent accidental damage of the remaining vegetation and prevent further deterioration of the CWS.	Neutral **Not significant**
Scrub East of M11 City Wildlife Site (CiWS)	Local	The extent of the CiWS has already been reduced due to existing development on the Site. No further reduction to the extent of vegetation at the CiWS is proposed and the Proposed Development includes provision for additional tree planting. Planting additional trees in this area will increase the density of vegetation causing more shading which will reduce the quality of the habitat further for neutral grassland. Accidental damage to vegetation comprising the CiWS could occur through construction activities adjacent to the CiWS or close by	A protective exclusion buffer will be established around the CiWS and clearly marked with netlon fencing or equivalent for the duration of construction works in the vicinity of the CiWS.	The exclusion buffer will prevent accidental damage from occurring to the Scrub East of M11 City Wildlife Site CWS.	Neutral **Not Significant**
Green corridors	Site	The West Cambridge Canal (D3) the Swales (D4) and ponds (P2 and P5) which collectively form the basis of the green corridor will require extensive reworking as part of the surface water drainage design which requires an increase in capacity for surface water drainage. This will result in the loss of all aquatic and marginal planting within the green corridor. The new green corridor will replace the marginal and aquatic habitats with equivalent or better planting.	• Replacement aquatic and marginal planting will be of equivalent or better habitat value. • The profile and plan of the revised West Cambridge Canal (D3), the Swales (D4) and ponds (P2 and P5) will maximise ecological value by providing a variety of physical habitats. • Hard engineering structures along the banks of the revised West Cambridge Canal (D3) and ponds (P2 and P5) will be minimised with preference given to softer natural banks.	The construction works to re-profile the West Cambridge Canal (D3) the Swales (D4) and ponds (P2 and P5) will result in the loss of the existing marginal and aquatic habitats within the green corridor. This will be a temporary adverse effect. The green corridor is of Site value only and currently does not link to the Scrub East of M11 CiWS as originally intended. It has limited value as a wildlife corridor so its short term loss is not significant. Beneficial effects from the opportunities for replacement planting and more sympathetic re-profiling of the surface water bodies will be a permanent beneficial effect.	Minor adverse (short term) **Not significant** Minor beneficial (long term) **Not significant**
Waterbodies	Application site	Two ponds (P1 and P4) are within a building parameter zone and could be lost during construction. Ponds (P2 and P5) and the West Cambridge Canal (D3) and the Swales (D4) associated with the green corridor have been assessed above. The source of Coton Brook (D2), Coton Brook (D5) and one pond (P3) outside of the green corridor will also be subject to re-profiling as part of the surface water drainage design to increase storage capacity. There are no proposals to change the lake (L1) or the western most ditch (D1).	• Replacement aquatic and marginal planting will be of equivalent or better habitat value. • The profile and plan of the revised source of Coton Brook (D2) Coton Brook (D5) and pond (P3) will maximise ecological value by providing a variety of physical habitats. • Hard engineering structures along the banks of the revised West Cambridge Canal (D3) and ponds (P2 and P5) will be minimised with preference given to softer natural banks.	The potential loss of the two ponds (P1 and P4) would be a permanent adverse effect. However both of these ponds are of limited ecological value. There will be a temporary adverse effect to the source of Coton Brook (D2), Coton brook (D5) and one pond (P3) during construction whilst the re-profiling works are carried out. Beneficial effects from the opportunities for replacement planting and more sympathetic re-profiling of these surface water bodies (D2, D5 and P3) would be a permanent beneficial effect.	Minor adverse (long term loss of P1 and P4) **Not significant** Minor adverse (short term D2 and D5) **Not significant** Minor beneficial (long term D2 and D5) **Not significant**

Baseline		Impact assessment			
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Residual effect**	**Significance of effect**
Great crested newts	Local	A small population of great crested newts is present in Adams Road Sanctuary CiWS. It is unlikely that individuals from this population would be present on the Site during construction due to the intervening distance and the lack of attractive habitats. It is considered unlikely that newts from this population will be on the Site, however a low risk still remains. Great crested newts historically found in the Madingley Road Park and Ride and known population in the Birds Sanctuary, Conduit Head CiWS are separated from the Site by a busy main road with no waterbody linkages. It is considered unlikely that the newts from this population will be on the Site, however a low risk still remains. Impacts would be limited to changes in water quality to the online ponds within the CiWS as a result of contaminated surface water runoff during construction.	• Any development works within 500m of the Adams Road Sanctuary CiWS, Madingley Road Park and Ride and the Birds Sanctuary, Conduit Head CiWS will be carried out under a precautionary method of working for great crested newts. • Mitigation measures to protect surface water quality from contaminated runoff are detailed in the water quality assessment (Chapter 13).	Measures to protect surface water quality during construction will ensure that the great crested newt breeding ponds within Adams Road Sanctuary CiWS does not receive contaminated runoff at levels which could be harmful to the species. In the unlikely event that any individual great crested newts are present on Site during construction, the precautionary method of working will minimise any risk of harm.	Neutral **Not significant**
Badgers	Badgers are not rare or endangered, so they are not a feature of nature conservation value.	Construction will result in the loss of foraging habitat. Development close to the known artificial badger sett could disturb the species due to noise and the increased presence of human activity.	• A 50m exclusion buffer around the artificial badger sett will be maintained and marked with netlon fencing or equivalent for the duration of construction works in the vicinity. No works activities will proceed within the buffer without further consultation with Natural England and the Cambridge City Council ecologist first to agree additional protection measures. • A survey of the existing artificial badger sett will be undertaken prior to any construction works within 50m of the sett to check for any further expansion and levels of activity. • Links to green corridors close to the existing hedgerows from the artificial badger sett will be maintained throughout construction.	The loss of habitat on Site will not result in significant effects to badgers as corridors to the surrounding countryside where ample foraging habitat exists will be maintained. Disturbance during construction will be minimised via an exclusion zone. Nevertheless some disturbance to the species is still likely if noisy construction activities are performed close to the sett. This will be a temporary adverse effect.	Minor adverse **Not significant**
Bat Roosts	Site	Construction will result in the loss of building W27 in which a transitional roost for a single species has been identified.	• Update surveys may need to be undertaken depending on the construction programme. • A bat box will be installed within the vicinity of the known roost to compensate for the loss of the roost. • An application will be made to Natural England for a Wildlife Licence before the building is demolished. Works will be undertaken under the watching brief of an appropriately qualified ecologist to ensure bats are not harmed, killed or disturbed during demolition.	The loss of the roost will not result in significant disturbance or harm as the works will be undertaken under a protected species licence and under the supervision of an appropriately qualified ecologist.	Neutral (long term) **Not significant**
Bats foraging and commuting routes	Local	Construction within development zones II and IV will result in an increase in light levels in the areas to the south and west of the Site due to the presence of compounds and work areas that will require lighting for safety and security purposes. Construction across the Site will result in the temporary loss of low quality foraging habitats in the form of amenity grassland and ornamental planting. The scrub to the west of the Site, the Coton footpath hedgerow and the West Cambridge lake will not be lost as a result of construction. The source of Coton Brook (D2) Coton Brook (D5) and one pond (P3) outside of the green corridor will be subject to re-profiling as part of the surface water drainage design to increase storage capacity. This will result in a temporary disturbance of foraging areas and commuting routes.	• Lighting associated with construction activities will be installed in accordance with current artificial lighting and wildlife guidance[78]. • Advice will be sought from ecologists regarding methods to be applied that will provide dark corridors/areas around the M11 scrub, Coton Footpath hedgerow and West Cambridge lake during construction.	Overall loss of foraging and commuting habitats will be a temporary adverse effect during construction. The impact is not significant due to the low activity of common bat species that have been identified during surveys.	Minor adverse (short term) **Not significant**

[7] Bats Conservation Trust (2014), Artificial lighting and wildlife, Interim Guidance: Recommendations to help minimise the impact artificial lighting
[8] Stone, E.L. (2013) Bats and lighting: Overview of current evidence and mitigation

Baseline		Impact assessment			
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Residual effect**	**Significance of effect**
Birds	Site	Vegetation clearance and building demolition during construction will result in the loss of bird roosting and nesting opportunities. Department of Veterinary Medicine buildings will be demolished and replaced with new buildings which will result in the loss of house martin nesting sites. Development around the sports centre, within development zone II, will result in disturbance and potential loss of a swallow nesting site. Noise disturbance will arise from demolition and construction works. Physical harm is considered unlikely as birds will generally be able to move away from the source of the noise disturbance, which will occur temporarily. Temporary disturbance to birds, particularly nocturnal species such as owls, as a result of the use of artificial lighting during the construction phase.	• Vegetation clearance will be undertaken outside of the bird nesting season. If not possible all vegetation should be check by a qualified ecologist for nesting birds prior to clearance. • Approximately 25 house martin and 5 swallow bird boxes will be installed close to the breeding colony in the Department of Veterinary Medicine buildings and sports centre. • Mitigation measures to reduce noise emissions during the construction works are detailed in the noise assessment (Chapter 12). • Lighting associated with construction activities will be installed in accordance with current artificial lighting and wildlife guidance[7].	The demolition of buildings and clearance of vegetation supporting breeding birds will result in a temporary adverse effect. After construction the replacement buildings and vegetation associated with the landscaping will be used by birds for roosting, resulting in a permanent neutral effect. Noise emissions during construction works will result in a temporary adverse effect. Birds are likely to return to the Site once noise disturbance has ceased. Lighting emissions during the demolition and construction works will result in a temporary adverse effects on birds.	Minor adverse (short term) **Not significant** Neutral (long term) **Not significant**
Invasive species	No conservation value	In the absence of mitigation measures construction works to re-profile the pond behind the Cavendish Laboratories (P3) could disturb and spread New Zealand pigmy weed historically known to be present in the pond. Construction works to re-profile the West Cambridge Canal (D5), in which Nuttelli's waterweed was found to be present during the surveys, could disturb and spread the invasive species.	• Prior to any construction works, checks will be undertaken by a suitably qualified botanist to ensure that new invasive species have not colonised the Site in the intervening period. • Specialist contractors will remove the invasive species before any construction works commence.	The removal of invasive species from the waterbodies on Site will be a beneficial effect.	Minor beneficial **Not significant**

Operational phase

6.5.2 Operation phase impacts are assessed in Table 6.5

Table 6.5 Operational phase effects

Baseline		Impact assessment			
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Residual effect**	**Significance of effect**
Bats	Local	Lighting levels will increase in areas of the Site not currently lit due to the installation of new buildings and access routes. Foraging and commuting habitats on the Site within development zones II and IV will change due to the presence of new buildings on currently undeveloped areas and the replacement of current amenity areas with new building layouts. M11 scrub, Coton hedgerow and waterbodies to the south of the Site will be retained and redesigned.	• Lighting associated with new buildings and access roads will be designed in accordance with current artificial lighting and wildlife guidance[7,8]. • Advice on landscape design will be sought from ecologists to maximise the ecological value of new amenity areas.	Development will not have a significant effect on bats as the Site has been found to support low level of activity for common species of bats.	Neutral (long term) **Not significant**

6.6 Mitigation measures

6.6.1 As the Proposed Development is anticipated to be phased over 15 years it should be recognised that there are difficulties in accurately predicting the effects of the later stages of development. For example, a species that is common and has no legal protection at this time may decline in numbers and become protected by law before construction of the later stages of development. Natural England and the Cambridge City Council ecologist will be consulted prior to submission of the reserved matters applications to determine if any new or further are surveys, as appropriate, are needed to support future reserved matters applications.

Habitats

6.6.2 Mitigation measures to protect habitats from construction dust emissions are detailed in the air quality assessment (Chapter 13).

6.6.3 Mitigation measures to protect surface water quality from contaminated runoff are detailed in the water quality assessment (Chapter 13).

6.6.4 A protective exclusion buffer will be established around the Coton Path Hedgerow CWS and remaining extent of the Scrub East of M11 CiWS and clearly marked with netlon fencing or equivalent for the duration of construction works in the vicinity of the sites.

6.6.5 Replacement aquatic and marginal planting within the surface water bodies re-profiled to increase drainage capacity will be of equivalent or better habitat value than existing.

6.6.6 The new profile and plan of the waterbodies (D3, D4 and D5) and ponds (P2, P3 and P5), which will be re-engineered to increase drainage capacity, will maximise ecological value by providing a variety of physical habitats. Hard engineering structures along the banks of these surface water bodies will be minimised with preference given to softer natural banks planted with species to maximise ecological value.

Protected species

Great crested newts

6.6.7 To minimise the risk of harm and disturbance to great crested newts, a Precautionary Method of Working (PMW) will be produced and implemented during the construction phase for all works within 500m of the ponds within Madingley Road Park and Ride, Adams Road Sanctuary CiWS and Birds Sanctuary, Conduit Head CiWS. This will include measures such as hand-searching of potential refuges within working areas, supervised clearance of suitable habitat, and provision of toolbox talks to workers.

6.6.8 Mitigation measures specified in the water environment assessment (Chapter 13) will also mitigate any water quality impacts to great crested newt breeding ponds in Adams Road Sanctuary CWS which is connected to the site via the Coton Brook (D5).

Badgers

6.6.9 A 50m exclusion buffer zone around the artificial badger sett will be maintained and marked with netlon fencing or equivalent for the duration of construction works that occur in the vicinity of the sett. No works activities will proceed within the buffer without further consultation with Natural England and the Cambridge City Council ecologist first to agree additional protection measures. This may include the submission of an application for a Natural England licence to interfere or prevent damage to the sett.

6.6.10 A survey of the existing artificial badger sett will be undertaken prior to any construction works within 50m of the sett to check for any further expansion and levels of activity.

6.6.11 Green corridor links to the existing hedgerows and surrounding countryside from the artificial badger sett will be maintained and protected throughout construction.

Bats

6.6.12 Update surveys will be required for buildings and trees a season before any proposed demolition and vegetation clearance during the construction phase for works taking place after 2017.

6.6.13 A bat box suitable for pipistrelle bats (such as a Schwegler bat box) will be installed on buildings or trees within approximately 50m of the existing building W27 to replace the loss of the confirmed transitional roost at this location.

6.6.14 Currently an application to Natural England for a protected species licence will be required for the demolition of building W27 and further surveys will be required one season before the demolition of this building to support the application for a Wildlife Licence from Natural England. Works will be undertaken under the watching brief of an appropriately qualified ecologist to ensure bats are not harmed, killed or disturbed during demolition.

6.6.15 Lighting schemes during construction and operation will be undertaken in accordance with wildlife and lighting guidance[7] which advises:

- Minimisation of the spread of light spill;
- Lowering the height of lighting columns;
- Abstaining from lighting areas such as the M11 scrub, Coton footpath hedgerow and West Cambridge lake, effectively creating dark corridors and areas in which bats can still forage and commute around the Site;
- Limiting the times lights are on to provide dark periods, if practical, especially during the peak summer months of June, July and August;
- Using narrow spectrum light sources;
- Using light sources that emit minimal ultra-violet light;
- Using lights that peak higher than 550nm; and
- Avoiding white and blue wavelengths of the light spectrum.

6.6.16 Dark corridors / areas around the M11 scrub, Coton Footpath hedgerow and West Cambridge lake will be provided during construction. Contractors should seek advice from a suitably qualified ecologist to enable this measure.

Birds

6.6.17 Vegetation and building clearance will be undertaken outside of the bird nesting season if possible. The core bird nesting season is March to August inclusive, although some species have been recorded nesting during all months of the year and so care will be taken at all times. All vegetation and structures will be checked by a suitably trained and qualified ecologist prior to clearance to ensure no nesting birds are present. If active birds' nests are found, all works that could damage the nests will cease until the eggs have hatched and the young have fledged.

6.6.18 Approximately 25 bird boxes suitable for house martins and 5 bird boxes suitable for swallows will be installed in areas close to the Department for Veterinary Medicine buildings and sports centre to replace the loss of, or disturbance to, existing nesting sites identified in the surveys.

6.6.19 Mitigation measures to reduce noise emissions during the construction works are detailed in the noise assessment (Chapter 12).

6.6.20 Lighting schemes during construction and operation will be undertaken in accordance with wildlife and lighting guidance[7] as set out above.

Invasive species

6.6.21 Prior to any construction works, checks will be undertaken by a suitably qualified botanist to ensure that new invasive species have not colonised the Site in the intervening period.

6.6.22 All existing invasive plant species and any new invasive plant species found will be treated and removed from the Site by a specialist contractor before any construction works that could result in their disturbance and subsequent spread are undertaken.

6.7 Summary

6.7.1 Proposed mitigation measures will ensure that the impacts on ecological resources and receptors during the construction of the Proposed Development will not result in significant adverse effects.

6.7.2 Effective management of sensitive habitats including the existing green corridor and the CWS and CIWS during operation will ensure there is no loss in ecological value of these assets and no significant effects would occur.

7. Historic environment

7.1 Scope of the assessment

Archaeology

7.1.1 The archaeology assessment considers the effects of all excavations associated with the Proposed Development on any buried archaeological assets. Construction phase effects only are assessed as there will be no further effects to archaeology once the Proposed Development is operational.

7.1.2 The installation of new service lines and contractor's roads and compounds, in undisturbed areas could affect the archaeology, especially designated site areas prior to their excavation. In areas otherwise deemed sensitive, routes will either be trench evaluated or have watching brief monitoring undertaken during their construction (to be agreed by the County Council's Historic Environment Team).

7.1.3 Small-scale or minimal areas of disturbance will be monitored for archaeological features or significant artefacts via watching briefs and limited excavation. This monitoring will be contingent upon the scale and location of any construction related activity, e.g. installation of new and extension to existing services.

7.1.4 Table 7.1 below identifies the issues raised in the Scoping Opinion relevant to the archaeology assessment.

Table 7.1 Archaeology scoping response

Issue raised	Respondent
We would advise that we do not currently have sufficient information to assess the extent and significance of archaeology likely to be affected and cannot therefore make recommendations regarding the specific requirements for mitigation	Cambridgeshire County Council
We would recommend that the Site should be subject to a programme of archaeological evaluation, to determine the extent, quality and significance of any archaeological assets present and provide sufficient information to inform appropriate strategies to mitigate the impact	

7.1.5 All comments in Table 7.1 have been considered and addressed within this assessment. Details of the archaeological evaluation including methods and findings are shown in Appendix 7.1, Volume 3.

Built heritage

7.1.6 The built heritage assessment considers the effects of the Proposed Development on the setting of heritage assets during both the construction phase and the operational phase. All heritage assets within a 500m radius of the Site are considered in addition to any specific built heritage assets specifically referenced in the Scoping Opinion.

7.1.7 Table 7.2 identifies the issues raised in the Scoping Opinion relevant to the built heritage assessment.

Table 7.2 Built heritage scoping response

Issue raised	Respondent
Whilst there are no statutory protected buildings on the site there is contemporary architecture which may be considered for inclusion on either the national or local list. The impact of the development on the setting of the Schlumberger Research Building by Michael Hopkins needs to be considered in the ES and supported by appropriate visuals.	Historic England
All building demolitions need to be clearly specified in the ES, and an appraisal of any historic interest undertaken. In particular Merton Hall Farmhouse which is over 100 years old.	Cambridge City Council
The ES should analyse the impact of the development on the setting of the historic core of Cambridge.	Historic England

7.1.8 All comments in Table 7.2 are considered and addressed within this assessment.

7.2 Relevant legislation and policy

National Planning Policy Framework (NPPF)

7.2.1 While the NPPF is to be read as a whole in the context of archaeology the NPPF states at Section 17 that the Government's objective is 'to conserve heritage assets in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of this and future generations'.

7.2.2 Paragraph 128 states that, in determining applications, local planning authorities should require an applicant to describe the significance of any heritage assets affected, including any contribution made by their setting. The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance. As a minimum the relevant historic environment record should be consulted and the heritage assets assessed using appropriate expertise, where necessary. Where an application site includes or has the potential to include heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation.

Cambridge Local Plan (2006)

7.2.3 The Cambridge Local Plan has a number of policies relevant to the historic environment as follows:

- 3/4 Responding to Context – developments are required to respond to their context and draw inspiration from the key characteristics of their surroundings including the historic character;
- 4/9 Scheduled Ancient Monuments/Archaeological Areas – proposals affecting Scheduled Ancient Monuments or other important archaeological remains and their settings must leave them left undisturbed or provide mitigation to an acceptable level;
- 3/13 Tall Buildings and the Skyline – new buildings which are significantly taller than their neighbours and/or roof-top plant or other features on existing buildings, must demonstrate that they will not detract from:
  - Ancient Monuments and their settings.
  - Listed Buildings and their settings.
  - Conservation Areas and their settings.
  - Historic landscapes and their settings.

- Key vistas, the skyline and views within, over and from outside the City.

- 4/10 Listed Buildings – development affecting Listed Buildings and their settings, including changes of use, must:
  - Demonstrate that there is a clear understanding of the building's importance.
  - Not harm any aspects of the building's special interest unless the impacts can be mitigated to an acceptable level.
- 4/11 Conservation Areas – developments within, or which affect the setting of or impact on views into and out of Conservation Areas, must:
  - Retain buildings, spaces, gardens, trees, hedges, boundaries and other site features which contribute positively to the character or appearance of the area.
  - Preserve or enhance the character or appearance of the Conservation Area.
  - Not lead to traffic generation or other impacts which would adversely affect the Area's character.

7.3 Method of assessment

7.3.1 This assessment has been undertaken in accordance with the methods set out in the Design Manual for Roads and Bridges[9] (DMRB), the specific established method for the assessment of the effects on the historic environment for EIA. Although it was developed for road schemes, its method is sufficiently robust for other types of development. The assessment identifies the effects on the significance of heritage assets, as required by the National Planning Policy Framework (NPPF). The DMRB method uses the term 'Cultural Heritage' to encompass what the National Planning Policy Framework describes as the 'Historic Environment'. No specific technical difficulties were encountered during the assessment.

Establishing the baseline

Archaeology

7.3.2 A desk-based assessment[10] of the West Cambridge environs was undertaken which identified a high likelihood of unknown buried archaeological assets being present on the Site.

7.3.3 A subsequent programme of fieldwork covering an area of 2,240.4m^2 was undertaken comprising a geophysical survey which informed the strategy for further trial trenching on the areas of the Site where fieldwork had not already undertaken. Appendix 7.1, Volume 3 describes the fieldwork method in more detail.

Built heritage

7.3.4 The Zone of Theoretical Visibility shown in Figure 8.1 in the landscape and visual chapter (Chapter 8) has been used to identify any built heritage assets that have the potential for changes to their setting as a result of the Proposed Development.

7.3.5 The existing baseline has been compiled from the National Heritage List for England, which comprises English Heritage's records for listed buildings, scheduled monuments and registered parks and gardens. This is the authoritative list for all nationally designated heritage assets. Information on conservation areas has also been obtained from the relevant local authorities.

7.3.6 A Site visit was undertaken on the 16th of February 2015 to determine the significance of the settings of heritage assets and how these might be affected by the Proposed Development.

Impact assessment

7.3.7 Significance lies in the value of a heritage asset to this and future generations because of its heritage interest, which may be archaeological, architectural, artistic or historic. The determination of the significance of these assets is based on statutory designation and/or professional judgement against four values[11]:

- Evidential value – the potential of the physical remains to yield evidence of past human activity. This might take into account date; rarity; state of preservation; diversity/complexity; contribution to published priorities; supporting documentation; collective value and comparative potential.
- Aesthetic value – this derives from the ways in which people draw sensory and intellectual stimulation from the heritage asset, taking into account what other people have said or written.
- Historical value – the ways in which past people, events and aspects of life can be connected through heritage assets to the present, such a connection often being illustrative or associative.
- Communal value – this derives from the meanings of a heritage asset for the people who know about it, or for whom it figures in their collective experience or memory. Communal values are closely bound up with historical, particularly associative, and aesthetic values, along with any educational, social or economic values.

7.3.8 To determine the significance of effects the method set out in the DMRB has been used. It is essentially a three step process. First, the value, of each heritage asset is assessed (Table 7.9). Second, the magnitude of the potential impacts is assessed, taking into account proposed mitigation (Table 7.4). Impacts can be positive or negative and could result from the construction or operation of the Proposed Development. Third, these are combined to determine the significance of any effects (Table 7.4). Significant effects include Major and Moderate effects; Minor and Negligible effects are not considered to be significant.

7.3.9 The method is not intended as a purely formulaic assessment. The assessment is essentially qualitative and professional judgment is used at all stages in the process. The effects to the setting of built heritage assets have been qualified using English Heritage guidance[12]. Effects can be adverse or beneficial.

[9] Highways Agency, 2007, Design Manual for Roads and Bridges, Volume 11 Environmental Assessment, Section 3 Environmental Topics, Part 2 HA208/07 Cultural Heritage
[10] Alexander, M. 1996, The Archaeology of High Cross, West Cambridge. A Desk Top Study. Cambridge Archaeological Unit Report No. 183
[11] English Heritage, 2008. Conservation principles, policies and guidance. English Heritage. Swindon.
[12] English Heritage, 2012, The Setting of Heritage Assets

Table 7.3 Value of heritage assets

Value	Description	Example
Very High	Internationally important or significant heritage assets	World Heritage Sites, or buildings recognised as being of international importance.
High	Nationally important heritage assets generally recognised through designation as being of exceptional interest and value.	Grade I and II* Listed Buildings, Grade I and II* Registered Parks and Gardens, Scheduled Monuments, Protected Wreck Sites, Registered Historic Battlefields, Conservation Areas with notable concentrations of heritage assets and undesignated assets of national or international importance.
Medium	Nationally or regionally important heritage assets recognised as being of special interest, generally designated.	Grade II Listed Buildings, Grade II Registered Parks and Gardens, Conservation Areas and undesignated assets of regional or national importance, including archaeological remains, which relate to regional research objectives or can provide important information relating to particular historic events or trends that are of importance to the region.
Low	Assets that are of interest at a local level primarily for the contribution to the local historic environment.	Undesignated heritage assets such as locally listed buildings, undesignated archaeological sites, undesignated historic parks and gardens etc. Can also include degraded designated assets that no longer warrant designation.
Negligible	Elements of the historic environment which are of insufficient significance to merit consideration in planning decisions and hence be classed as heritage assets.	Undesignated features with very limited or no historic interest. Can also include highly degraded designated assets that no longer warrant designation.
Unknown	The importance of an asset has not been ascertained	

Table 7.4 Magnitude of impact

Magnitude of impact	Description of the nature of the change
Major Adverse	Substantial harm to, or loss of, an asset's significance as a result of changes to its physical form or setting.
Moderate Adverse	For example, this would include demolition, removal of physical attributes critical to an asset, loss of all archaeological interest or the transformation of an asset's setting in a way that fundamentally compromises its ability to be understood or appreciated. The scale of change would be such that it could result in a designated asset being undesignated or having its level of designation lowered.
Minor Adverse	Less than substantial harm to an asset's significance as a result of changes to its physical form or setting
Negligible	For example, this could include: physical alterations that remove or alter some elements of significance, but do not substantially alter the overall significance of the asset; notable alterations to the setting of an asset that affect our appreciation of it and its significance; or the unrecorded loss of archaeological interest.
No Change / Neutral	Limited harm to an asset's significance as a result of changes to its physical form or setting
Minor Beneficial	For example, this could include: physical changes that alter some elements of significance but do not noticeably alter the overall significance of the asset; and small-scale alterations to the setting of an asset that hardly affect its significance.

Table 7.5 Significance of effect

		Magnitude of impact				
		Major	**Moderate**	**Minor**	**Negligible**	**No change**
Value	**Very high**	Very large	Large or Very Large	Moderate / Large	Slight	Neutral
	High	Large / Very Large	Moderate / Large	Moderate / Slight	Slight	Neutral
	Medium	Moderate / Large	Moderate	Slight	Neutral / Slight	Neutral
	Low	Slight / Moderate	Slight	Neutral / Slight	Neutral / Slight	Neutral
	Negligible	Slight	Neutral / Slight	Neutral / Slight	Neutral	Neutral

7.4 Baseline conditions

Archaeology

7.4.1 The archaeological baseline is shown on Figure 7.1. The immediate area's archaeological potential has been fully appraised in a desktop study[13]. Since then, at various times approximately half of the Proposed Development area (c. 24.5ha) has been subject to evaluation fieldwork[14,15,16,17,18,19,20,21,22] as reserved matters applications pursuant of the 2004 masterplan review have come forwards. While these investigations have been of varying intensity, generally it has been of a low sampling density. Of those portions that have been formally evaluated, all of the known sites therein have now been excavated and there have been two major excavations.

[13] Alexander, M. 1996. The Archaeology of High Cross, Cambridge: A Desktop Study. Cambridge Archaeological Unit Report No. 183.
[14] Dickens, A. 1999. Test Pit Observations in the West Cambridge Development Area. Cambridge Archaeological Unit Report No. 311
[15] Whittaker, P. & Evans, C. 1999. West Cambridge: Vicar's Farm. An Archaeological Evaluation. Cambridge Archaeological Unit Report No. 336.
[16] Lucas, G. 2000. Archaeological Investigations at the New Stable Block, West Cambridge. Cambridge Archaeological Unit Report No. 348.
[17] Lucas, G. 2001. An Archaeological Evaluation along the Marconi Access Route and Future Nano Fabrication Building (West Cambridge 3) Cambridge Archaeological Unit Report No. 440.
[18] Whittaker, P. 2001. The Archaeology of West Cambridge. The High Cross Fields Evaluation. Cambridge Archaeological Unit Report No. 422.
[19] Timberlake, S. & Patten, R. 2006. Physics for Medicine Building (University of Cambridge) West Cambridge. An Archaeological Evaluation. Cambridge Archaeological Unit Report No. 726.
[20] Hutton, J. 2009. School of Veterinary Medicine, West Cambridge: An Archaeological Evaluation. Cambridge Archaeological Unit Report No. 440.
[21] Slater, A. 2011. Whittle Jet Propulsion Laboratories, West Cambridge: Archaeological Trenching and Excavation. Cambridge Archaeological Unit Report No. 983.
[22] Slater, A. 2012. High Cross, West Cambridge, University of Cambridge: Further Archaeological Evaluation. Cambridge Archaeological Unit Report No. 1119.

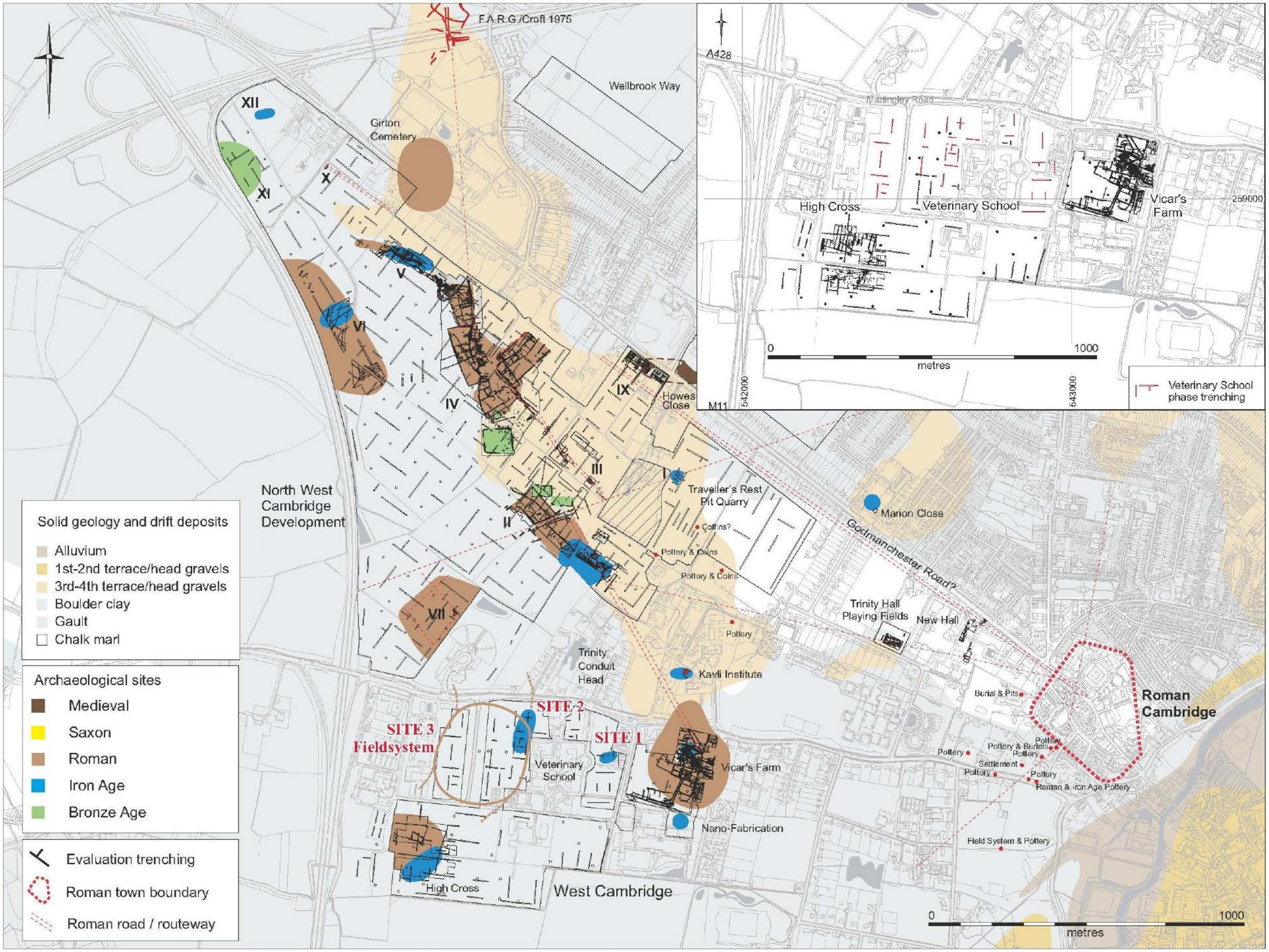


Figure 7.1 Archaeological assets

7.4.2 The latest phase of archaeological evaluation revealed a previously unidentified geological variation of a ridge of diamict gravel over Gault Clay upon which an Early to Middle Iron Age settlement was identified (Site 2). This consisted of at least two circular gully-defined dwellings with associated pits over a distribution clearly demarcated by a broken line of bounding ditches. A third structure was identified 25m away from the core settlement upon the Gault Clay landfall, though this seems to be of an earlier date (Late Bronze Age/Early Iron Age). An additional Iron Age site was represented by a ditch and posthole (Site 1). An extensive Romano-British field system overlay the portions of the Site 2 settlement area and extended west across the Proposed Development area (Site 3)[23].

7.4.3 Areas of archaeological potential have been identified between the West Cambridge Site and Barton Roads and include cropmark registers indicative of Iron Age and Romano-British settlement activity; finds from this area span the Late Bronze Age to post-Medieval period, including tool, coins and Anglo-Saxon weapons. Aerial photographic surveys revealed evidence of ridge and furrow[24].

Vicar's Farm[21,25,26,] (TL 4309 5905)

7.4.4 Excavations carried out by the CAU at Vicar's Farm in 1999 and 2000 revealed evidence of Mesolithic to Romano-British activity, with a substantial Romano-British settlement covering the entire excavated area. Mesolithic to Bronze Age activity was largely confined to an assemblage of worked flint, indicating sporadic visitation. In the Iron Age, there is evidence for more sustained use of the landscape and a number of features containing Iron Age pottery were excavated, although only two were themselves Iron Age in date. Finds included a brooch dated to the 4th century BC and a late 1st century BC/early 1st century AD coin.

7.4.5 Romano-British activity commenced with the construction of a ditch system enclosing the central portion of the site. Phase I (AD 80–180) then saw the establishment of the core settlement together with many internal features including a probable timber shrine, an aisled building and a cremation cemetery containing eight cremations and two inhumation burials of neonates. In the middle period (Phase II, AD 180–270) the site underwent major expansion to the south and an, initially unrelated, field system was established. In the core of the settlement, the aisled building and cremation cemetery went out of use, but some new features were established on the eastern side. In Phase III (AD 270–410+) the site transformed radically as a third area was added to the south, linking up the main settlement with the southern field system.

7.4.6 An inhumation cemetery was established on the boundary of this southern field system and included a total of 29 graves, containing at least 30 individuals. In the core of the site, the features in the eastern half developed to form a new centre of activity, possibly used as a location for marketing livestock. The eastern boundary of the site was backfilled and the whole core opened up to the east, beyond the limit of excavation. The settlement as a whole appears to have been abandoned in the early decades of the 5th century AD. After this period it was in use as agricultural land until the end of the 20th century.

Whittle Laboratory

7.4.7 In 2011 an extension to the east side of the neighbouring Whittle Laboratory led to the excavation of a trench there and in further features relating to this complex were dug[21], this definitely showing that the Roman settlement extending beneath the eastern third of the Laboratory's buildings.

High Cross[22,27] (TL 4240 5900)

7.4.8 Between November 2009 and February 2010 the CAU undertook an open-area excavation across some two hectares of University land at the High Cross site, West Cambridge. This revealed evidence for Early Iron Age occupation located upon a thin spread of gravels, sands and silts overlying Gault Clay. Evidence of pre-Iron Age activity was limited. Confirmed by radiocarbon dating, this included an Early Neolithic pit and what seem to be discontinuous ditch lengths associated with a Middle Bronze Age pit-well. Half a dozen distinct groups of Early Iron Age pits and a number of Middle Iron Age pits were identified; two of the former forming clusters dug on either side of the valley floor, between which (and continuing south thereof) had been dug a substantial Early Iron Age ditch. Traces of an east-facing in-turned entrance break in this boundary along the lowest point of the valley might suggest the presence of a former route; alternatively, these ditch segments may have been cut (in part) to drain the water-filled pits that may have been originally dug as quarries, waterholes, or perhaps for retting, then backfilled with rubbish. The southern pit cluster was used right up until the Middle Iron Age, then abandoned, at which point it became covered by a 'dark earth-type' deposit of silt.

7.4.9 Environmental evidence suggests that the area became increasingly damp. Settlement evidence remained ambiguous given the paucity of pottery and posthole settings; however, the presence of saddle-quern fragments associated with small assemblages of burnt stone within the pits suggests the presence of hearths and, possibly, dwellings nearby. Indeed, the site may represent either a short-lived or failed/abandoned Iron Age settlement colonisation of this valley.

7.4.10 The Roman phase of occupation was limited to a field system established upon the south facing slope. Three fields of approximately 0.6ha each were defined by a number of slight field ditches. A minor amount of Early Roman fineware pottery was recovered from these, as well as from a small enclosure close to the south western limits of the excavation and which possibly attests to the fringes of a west lying settlement. To the east, a somewhat larger ditch crossed the valley, marking perhaps a similar boundary to that already defined in the Iron Age.

7.4.11 On the south side of the valley floor, a trackway was identified and which has been equated with the Medieval Coton or Sheepcote Way. Traces of adjoining field boundaries, plus abutting plough-furrow, were noted. The south facing slopes were covered by Medieval/post-Medieval ridge-and-furrow.

7.4.12 In 2012 the plots bordering the Site's western side were subject to trench evaluation[22]. Due to earlier ground-surface truncation, no archaeology survived there.

7.4.13 Although its exposure was very limited, there has also been excavation of still another site immediately south of Vicar's Farm.

[23] Brittain, M. and Evans, C. 2015, West Cambridge Archaeology: Department of Veterinary Medicine Paddocks: An Archaeological Evaluation. Cambridge Archaeological Unit Report No. 1292
[24] Evans, C. and Dickens, A. 2002, Longstanton New Settlement, Cambridgeshire. Archaeological Desktop Assessment, Cambridge Archaeological Unit Report No. 489
[25] Lucas, G. & Whittaker, P. 2001. Vicar's Farm, Cambridge: post-excavation assessment report. Cambridge Archaeological Unit Report No. 425.
[26] Lucas, G. 2002. The Roman Settlement at Vicar's Farm (Draft publication text). Cambridge Archaeological Unit
[27] Timberlake, S. 2010. Excavations at High Cross, West Cambridge, University of Cambridge. Cambridge Archaeological Unit Report No. 942.

Nano-Fabrication Building site[28] (TL 4311 5891)

7.4.14 Minor scale archaeological excavations within the area of the future Nano-Fabrication Building on the Cavendish site, were conducted by the CAU in 2001. They revealed a length of the Iron Age ditch. There was a small but still significant assemblage of cultural material from this, suggestive of low level occupation during the Iron Age. There was also evidence of post-Medieval backfilling of a medieval ridge and furrow field system. One further possible feature was identified as a tree-throw. The lack of Romano-British period features on the site suggests that the Vicar's Farm Romano-British settlement did not extend this far to the south.

7.4.15 Aside from remnant traces of ridge-and-furrow cultivation, within those areas of the proposed development not yet subject to evaluation fieldwork there are no known archaeological assets.

2015 Field Evaluation[29]

7.4.16 A two-staged fieldwork evaluation was undertaken across approximately 10ha of previously uninvestigated 'green-field land' within the centre of the Site. This first involved geophysical survey in March, followed by trench-investigation in May. With their respective results detailed below, to enable spatial-reference, the area has been divided into three 'fields':

1. Beside the Schlumberger building.
2. The paddocks west of the Veterinary School.
3. The paddocks east of the Veterinary School.

7.4.17 Conducted by the Bartlett-Clark Consultancy, the magnetometer survey showed very few significant geophysical anomalies. The most archaeologically suggestive occurred in the central portion of Field 2. These consisted of a circular setting and linear features, with the trench results indicating that they related to that area's Iron Age settlement (Site 2; see below).

7.4.18 The second-stage investigation involved approximately 1,212m length of trenching (2,240.4m^2; 37 trenches), wherein 55 features were recorded and, of which, 40 were sample-excavated with 401 artefacts recovered (4537g).

7.4.19 The trenching revealed that the immediate area's geology, rather than the Gault clay indicated on the BGS Survey (map sheet No. 188), actually consists of a more till-like mix of sandy gravels and clays. These evidently are Diamict deposits[30] and essentially derive from material weathered off from the lower chalk and Boulder clay ridge at Coton to the west. Indeed, only where the land drops away along the area's northern margin was Gault clay present and, otherwise, the topography actually consists of a slight east–west oriented peninsula-like 'rise' whose top lies at approximately 21.00m Above Ordnance Datum (AOD), with the land dropping down to 18.40–19.00m OD in the north and, in the south, c. 18.40m AOD (falling away to 15.50m AOD at the High Cross Site,).

7.4.20 The trenching resulted in the identification of two Iron Age settlements. Site 1, in Field 3 (Trenches 23, 26 & 28) consisted of only a single ditch and a posthole and, as adjudicated through the LDA's monitoring, was there excavated in sufficient intensity that it requires no further mitigation. Extending across the full north–south width of the area along the eastern third of Field 2 (Trenches 8–11, 13 & 28–33), Site 2 is much larger (14,800m^2). There, with some features yielding quantities of Early–Middle Iron Age pottery, as well as animal bones, were two/three roundhouses associated with pits and linear boundaries, the latter seemingly defining the settlement's western limits.

7.4.21 Aside from evidence of Medieval ridge-and-furrow agriculture, plus more recent 19–20th century activity, across much of Fields 1 and 2 were found ditches apparently relating to a northwest–southeast/northeast–southwest oriented co-axial field system (Trenches 1–3, 5, 9, 14, 31–2 & 36–7; plus a single such feature in Field 3, Trench 18). The character of their fills and alignment would indicate a pre-Medieval date. In Field 2 one of its ditches cut an Iron Age feature and, in Trench 31, a sherd of Early Roman pottery was recovered from another of these linear boundaries (F.24) and which is likely to reflect the date of the system as a whole. That said, in Field 1 two parallel ditches appeared to delineate a *c*. 11m-wide NNW–SSE oriented trackway, with a sherd of Early to Middle Iron Age pottery recovered from the fills of one. Although understanding of these remains and their layout is not detailed, for the sake of convenience this trackway and the early field system within Fields 1 and 2 are referred to as Site 3.

Discussion

7.4.22 Given the earlier recovery of later prehistoric and Roman settlement at both the Vicar's Farm and High Cross Sites, based on known regional landscape-settlement densities[31], it would not have been surprising had no further sites been found in the course of this programme. That two more were – as well as the co-axial field system – suggests relatively intense land use and, at least for the Iron Age sites, surely relates to the specific geology/topography of the immediate area (i.e. the Diamict beds' 'rise').

7.4.23 Of the Iron Age sites, while the easternmost – Site 1 – seems of a very low intensity and was probably short-lived, Site 2 is both much larger and appears to reflect more sustained usage; it must, therefore, be ranked as a valuable finding.

7.4.24 Of the programme's recovery of what is probably a Roman-phase co-axial field system (Site 3) – possibly incorporating an earlier trackway – it is difficult to be certain of just what settlement it should be associated. It could either relate to that thought to lie west of the High Cross Site's similarly arranged fields or the high status settlement identified on the west side of the Madingley Road Park and Ride during the North West Cambridge evaluation (Site VII)[32].

7.4.25 Of the current programme's findings, with Site 1 having already been excavated (see above), it is only the area of Site 2 that will require full open-area excavation should development proceed there. There seems no justification to fully trace the Site 3 co-axial field system. It will receive further exposure during the course of Sites 2's excavation and, depending upon the final location/size of buildings within Field 1, there its further investigation could be limited to the area of their footprints, augmented by sufficient additional trenching to understand the system's basic layout.

[28] Armour, N. 2001. An Archaeological Investigation on the site of the Future Nano-Fabrication Building, West Cambridge. Cambridge Archaeological Unit Report No. 453.
[29] Brittain, M. and C. Evans, 2105. *West Cambridge Archaeology – Department of Veterinary Medicine Paddocks: An Archaeological Evaluation*. Cambridge Archaeological Unit Report No. 1292.
[30] Boreham, S. 2002. The Pleistocene Stratigraphy and Palaeoenvironments of the Cambridge District. Unpublished Ph.D. thesis. The Open University.
[31] Evans, C., with D. Mackay and L. Webley 2008. Borderlands - The Archaeology of the Addenbrooke's Environs, South Cambridge. (CAU Landscape Archives: New Archaeologies of the Cambridge Region Series) Cambridge/Oxford: Cambridge Archaeological Unit/Oxbow Books.
[32] Evans, C. & Newman, R. 2010. North West Cambridge, University of Cambridge: Archaeological Evaluation Fieldwork. Cambridge Archaeological Unit Report No. 921.

Built heritage

7.4.26 The Site is located in west Cambridge, to the south of Madingley Road, one of the major routes leading to Cambridge. The buildings within the Site are not statutorily protected and do not feature on Cambridge City Council's register of buildings of local interest. Of these the main block of the Veterinary School and the farmhouse at Merton Farm are of some limited heritage significance. The Cavendish and Whittle Laboratory Buildings and the British Antarctic Survey buildings are commonplace examples of late 20th century architecture. The Schlumberger Building is by Michael Hopkins (a noted contemporary architect) and is an unusual example of high-tech architecture. It is not a designated asset as buildings are not usually brought forward for designation until they are over 30 years in age, but was identified as a possible future candidate for listing by the Architectural History Practice.[33]

7.4.27 The study area straddles Cambridge's urban/rural fringe. The landscape is largely dominated by housing and collegiate buildings, representing the 20th century westward expansion of the University of Cambridge and associated domestic developments in the Edwardian, interwar and immediate post war periods, interspersed with some agricultural land, particularly to the south of the Site.

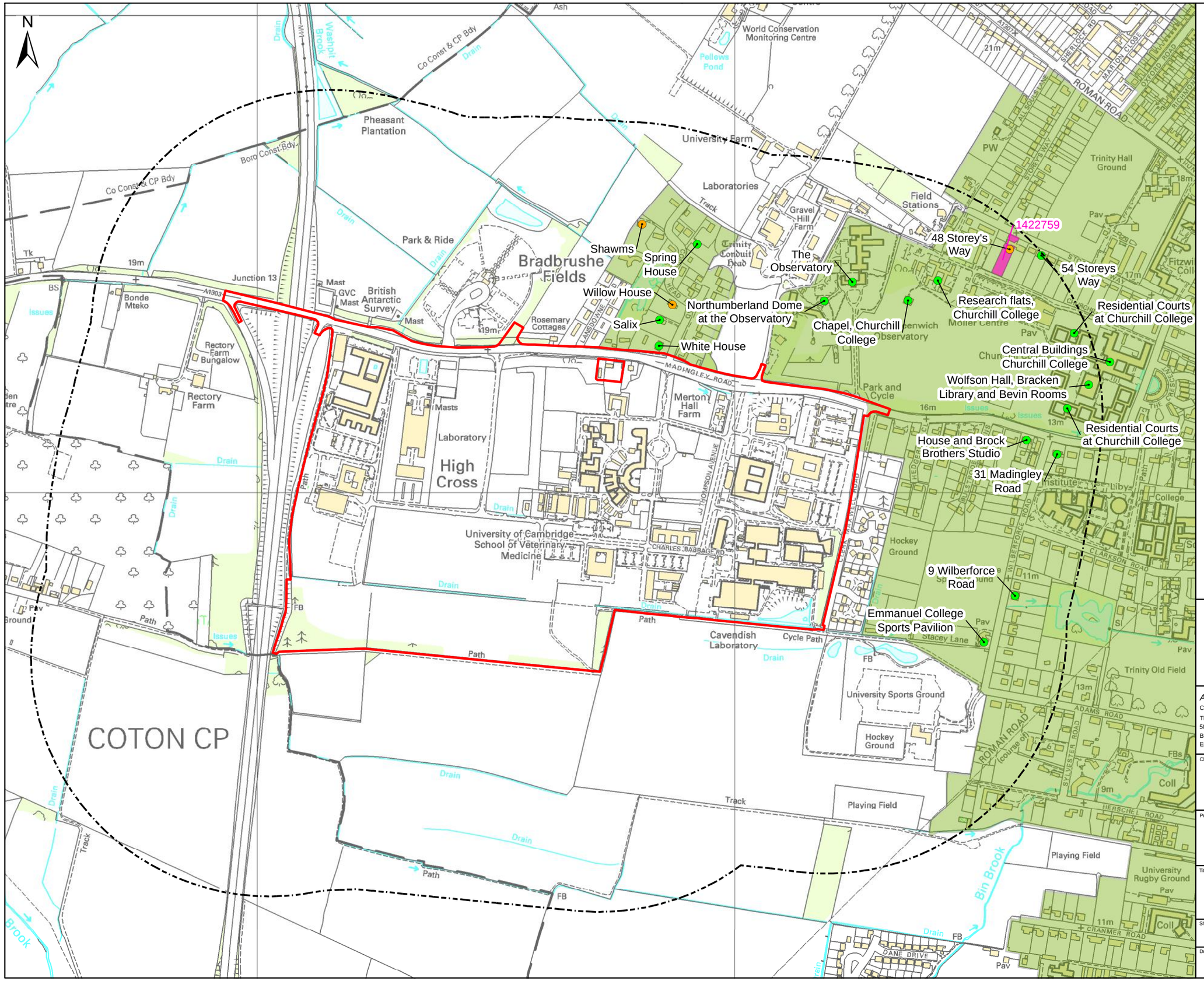
7.4.28 Madingley Road is an ancient approach to Cambridge. Until the late 19th century it ran through agricultural land, largely owned by St Johns College and the Diocese of Ely. Domestic development began in the area in the 1880s, the granting of permissions to marry to college Dons in 1882 provided the impetus for this development surge. The resulting houses tended to be large, detached and architecturally distinguished. Storey's Way, in the north east of the study area is a good example of this: Pevsner described it as 'one of the best concentrations anywhere of houses by M.H. Baillie-Scott', a noted 'arts and crafts' architect active in the late 19th and early 20th century.[34]

7.4.29 Domestic developments pushed further westward along Madingley Road in the interwar and post-war periods. Much of the interwar 'Bicycle suburbs' are equally architecturally distinguished. Many of the houses are listed, and several sit within the Conduit Head Road Conservation Area: 'Cambridge's best collection of 1930s modernist housing' and the West Cambridge Conservation Area, an eclectic mix of neo-Georgian and modernist houses, set in generous gardens with many open green spaces[35]. Other examples of inter-war housing, such as those to Hedgerley Close and Bulstrode Gardens, are more common examples of mid-20th century suburban development and are therefore of less heritage value. The later 20th century domestic development is stylistically mixed and is of limited heritage value.

7.4.30 University development in the study area began in the early 19th century, with the construction of the University Observatory in 1822 (the first university building constructed outside central Cambridge). Lord Holford's *Cambridge Survey and Plan* (1949) identified the land to the west of the city as suitable for future university development. Churchill College, in the east of the study area, a cohesive collection of well detailed university buildings designed by Richard Sheppard Robson and Partners from 1958 onwards, and the university buildings within the Site itself, evidence this westward expansion of the university.

7.4.31 Much of the west of the study area is dominated by 20th century infrastructure including the M11 and the Madingley Park and Ride Car Park. Figure 7.2 shows the location of built heritage assets.

[33] Architectural History Practice 2009. Cambridge Suburbs and Approaches: Madngley Road. Cambridge City Council.
[34] Pevsner and Bradley, 2014, The Buildings of England: Cambridgeshire, Yale University Press, New Haven and London
[35] Ibid



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Client: University of Cambridge

Project: West Cambridge Masterplan EIA

Title: Built Heritage Assets
Figure 7.2

Sheet Size	Original Scale	Designed / Drawn	Checked	Authorised
A3	1:7,500	RJS Date 01/06/16	SJD Date 01/06/16	DP Date 01/06/16

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7.5 Impact assessment

Construction phase

7.5.1 Table 7.6 details the impacts on the historic environment assets and the likely resultant environmental effects during construction. For the built environment only those assets which will receive adverse or beneficial effects are shown in the tables. For the full assessment on all historic environment assets see Appendix 7.2, Volume 3.

Table 7.6 Construction phase effects

Baseline		**Impact assessment**				
Receptor	**Value**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Archaeology						
Site 1 (Iron Age)	High	Construction and landscaping activities that require excavations for basements, foundations, services, drainage or changes to ground levels will adversely affect the heritage assets within the site through physical disturbance resulting in the loss of the asset.	Through the 2015 field evaluation already undertaken, Site 1 has been sufficiently excavated and a written record of the asset has already been produced. No further mitigation is required to preserve the site's heritage significance.	Minor	Construction and landscaping activities that involve groundworks will result in the loss of buried assets. The significance of the asset has been preserved through a written record produced during the field evaluation	Neutral **Not significant**
Site 2 (Iron Age)	High	Construction and landscaping activities that require excavations for basements, foundations, services, drainage or changes to ground levels will adversely affect the heritage assets within the site through physical disturbance resulting in the loss of the asset.	In addition to the written record produced during the 2015 field evaluation, a full open area excavation will be undertaken prior to construction works commencing. This will be agreed with the County Council's Historic Environment Team (CHET).	Minor	Construction and landscaping activities that involve groundworks will result in the loss of buried assets. The significance of the asset will be preserved through a written record from a full open area excavation.	Neutral **Not significant**
Site 3 (Iron Age/Roman)	High	Construction and landscaping activities that require excavations for basements, foundations, services, drainage or changes to ground levels will adversely affect the heritage assets within the site through physical disturbance resulting in the loss of the asset.	Mitigation for Site 2 will further expose the field system which will be recorded. Additional trenching will be undertaken to establish the system's basic layout	Minor	Construction and landscaping activities that involve groundworks will result in the loss of buried assets. The significance of the asset will be preserved through a written record from mitigation undertaken for site 2 combined with additional trenching if required.	Neutral **Not significant**
Vicar's Farm	High	Construction and landscaping activities that require excavations for basements, foundations, services, drainage or changes to ground levels will adversely affect the heritage assets within the site through physical disturbance resulting in the loss of the asset.	Preservation by record will occur by adhering to a suitable Written Scheme of Investigation to be agreed with CHET.	Minor	Construction and landscaping activities that involve groundworks will result in the loss of buried assets. The significance of the asset will be preserved through a Written Scheme Investigation to be agreed with CHET.	Neutral **Not significant**
Nano Fabrication Building Site	High	Construction and landscaping activities that require excavations for basements, foundations, services, drainage or changes to ground levels will adversely affect the heritage assets within the site through physical disturbance resulting in the loss of the asset.	Preservation by record will occur by adhering to a suitable Written Scheme of Investigation to be agreed with CHET.	Minor	Construction and landscaping activities that involve groundworks will result in the loss of buried assets. The significance of the asset will be preserved through a Written Scheme Investigation to be agreed with CHET.	Neutral **Not significant**
Built heritage						

Baseline		Impact assessment				
Receptor	**Value**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Central Cambridge conservation area and designated assets therein. The central conservation area covers the historic core of the city, open spaces including the college backs, Jesus Green, Midsummer Common and the Botanic Garden. The conservation area appraisal states that this 'interplay of grand college buildings and verdant landscape is perhaps the most enduring image of central Cambridge.' The central conservation area also includes some fine examples of 19th century domestic development, particularly surrounding the railway station.	High	Cambridge is located on flat, low lying land. This coupled with the tight urban grain ensures that there are relatively limited outward views from the majority of the central core, particularly at street level. Views from the principal open spaces within the urban core, such as the college quadrangles, the 'Backs' and Parker's Piece, for example, are similarly highly constrained, and will therefore not feature views of the construction. Some views westward from the upper levels or roof tops of certain buildings, such as from the St Johns and King's College Chapels and Great St Mary's Church, for example, may feature the tops of cranes and any other tall plant associated with the construction process in some views. However the majority of the construction process will be concealed by intervening buildings and vegetation, as well as the landform. Given the low-lying local topography the construction is unlikely to feature prominently in west ward views to the city, which are generally fairly limited however cranes and other tall plant may be present in some views to the city centre from the west, especially along the Madingley Road, which is an historic approach to the city and Viewpoint 1 (see Chapter 8 – Landscape and Visual).	No mitigation is proposed	Minor	Medium distance views of construction plant and activities from some limited areas of the conservation area will have a temporary adverse effect on the setting of the conservation area	Slight adverse **Not significant**
Shawms (1268363) Grade II* listed. Two storey house in the Modern Movement style with a single storey roof conservatory. The entrance has a projecting porch hood supported on two steel posts.	High	Shawms features extensive glazing to its south front, which faces over landscaped grounds to the Site. Views to the south are slightly filtered by mature planting and intervening buildings, however some visual intrusion, particularly from the presence of cranes and other tall plant, is likely.	No mitigation is proposed	Minor adverse	Glimpsed views of construction plant and activity will result in a temporary adverse effect to the setting of the building.	Slight Adverse **Not significant**
White House (1126037) Grade II listed. Two storey house with a third storey set back at the centre of the roof terrace built in 1930 by George Checkley in the International Modern style. The house has a rectangular plan with central entrance hall The facades are white painted brick and the roof is flat concrete.	Medium	The house is located within landscaped grounds adjacent to Madingley Road, immediately to the north of the Site. Views to the Site are somewhat filtered by dense boundary planting, however the presence of the plant and the construction process will constitute a change to the currently relatively tranquil setting of the asset.	No mitigation is proposed	Moderate adverse	Close views of construction plant and activity will result in a temporary adverse effect to the setting of the building.	Moderate Adverse **Significant**
The Observatory (1126156) Grade II listed Construction of the Observatory commenced in 1822.by the architect John Clement Mead. The building has two storeys, and is built from ashlar with slate and lead roofs in a Neo- Greek style. Built on a half H shaped plan with wings extending towards the North and projecting central tetrastyle portico of Doric Order to the south and front entrance. A small movable dome is located on the centre of the building.	Medium	The Observatory buildings are located at the end of an avenue of trees leading from Madingley Road, to the north of the Site. In addition to the avenue of trees the boundaries of the observatory compound are sparsely planted. There are relatively clear views to the south towards Madingley Road. The construction phases, particularly the presence of tall plant such as cranes, hoardings and increased vehicle movement will feature in oblique views from the observatory group of assets, particularly in views down the entrance avenue. These will be somewhat filtered by intervening vegetation, particularly that to the boundaries of the Site and the observatory land.	No mitigation is proposed	Minor adverse	Oblique, glimpsed views of the construction plant and activities will result in a temporary adverse effect to the setting of the Observatory.	Slight adverse **Not Significant**
Northumberland Dome at the Observatory (1126157) Grade II listed. The building was constructed around 1838 of white brick and a movable copper dome and is located in the grounds of the Observatory. The dome has since been reconstructed.	Medium				Oblique, glimpsed views of the construction plant and activities will result in a temporary adverse effects to the setting of the copper Dome at the Observatory.	Slight adverse **Not significant**
9 Wilberforce Road (1268352) Grade II listed. Two storey Modern Movement house built in 1937 by D. Cosens. The building is constructed from whitewashed brick laid in Flemish bond with a bituminous felt roof. Rectangular plan with a recessed corner section at south east corner.	Medium	The house is located opposite the Emmanuel College Sports Pitches, with the existing buildings on the Site visible beyond the trees lining Clerk Maxwell Road. The construction plant and activities will likely be visible from the listed building; however this will be partly screened by the intervening tree planting and the currently constructed elements of the existing masterplan.	No mitigation is proposed	Minor Adverse	Some medium range views of construction plant and activities will result in temporary adverse effects to the setting of the house.	Slight Adverse **Not Significant**

Baseline		Impact assessment				
Receptor	**Value**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Emmanuel College Sports Pavilion, including grounds man's house and stables (1422595) Grade II listed. Sports pavilion with attached Groundsman's House and separate stable, built for Emmanuel College in 1910. Complex roofscape of steep, sweeping pitches and hipped roof surmounted by a decorative copper cupola which has a polygonal base and a weathervane.	Medium	The constructed elements of the masterplan are visible in views across the sports pitches, though they are somewhat screened by the presence of tree screening and intervening housing. The some construction activities and plant such as cranes will likely be visible from the listed building; however this will be partly screened by the intervening tree planting and the currently constructed elements of the existing masterplan.	No mitigation is proposed	Minor Adverse	Some medium range views of construction plant and activities will result in temporary adverse effects to the setting of the pavilion and house.	Slight Adverse **Not Significant**
Conduit Head Road Conservation Area The conservation area comprises 20th century residential development, built in a piecemeal fashion from approximately 1914. A number of modernist houses built in the 1930s and 1960s, are of particular note. These buildings provide a high quality and progressive architectural character to the area.	Medium	The conservation area boundary extends out into Madingley Road and includes two properties that face onto Madingley Road and the Site. Construction works and plant will be highly visible from the southern extent of the conservation area though it will be heavily screened by tree planting from the more northerly portion of the conservation area. This will be a substantial change to the currently relatively tranquil setting of the conservation area.	No mitigation is proposed	Moderate Adverse	Direct close views of construction activities and plant from the southern end of the conservation area will result in temporary adverse effects to the setting of the conservation area.	Moderate adverse **Significant effect**
West Cambridge Conservation Area The conservation area is notable for its spacious residential streets lined with large mainly detached 19th and 20th century houses. A variety of college and university buildings are included in the conservation area. Despite the differences in the form, scale and materials between the residential and collegiate buildings the very high quality of nearly all the structures ensures that the area retains spatial cohesion. Green open spaces, including agricultural land and the college playing fields and tennis courts also contribute to the conservation area's significance.	Medium	The conservation area extends in an arc around the north east corner of the Site. The construction activities and plant will feature prominently in views to and from the west and north west of the conservation area, substantially eroding its relatively tranquil setting. The conservation area draws part of its significance from the interface between the suburban and rural at its western edge; the construction process will challenge this. However the construction will not be appreciable from many of the key areas within the conservation area, including Grange Road and the area surrounding the University Library, due to the presence of intervening buildings, mature tree planting and the low lying topography.	No Mitigation is proposed	Moderate Adverse	Direct close views of construction activities and plant from within the conservation area will result in temporary adverse effects to the setting of the conservation area.	Moderate adverse **Significant effect**
Schlumberger Building Commercial research centre and office designed by Michael Hopkins and completed in 1985. The building is a tented structure suspended between a 'cat's cradle' arrangement of struts and supports. The building is both technically innovative, and a highly sculptural treatment for a late 20th century commercial building.	Medium	The significance of the Schlumberger building lies in its position as an early and highly articulate example of a High-Tech building, by one of that style's leading British proponents. The technical innovation embodied in its design also contributes to the building's significance. Setting makes a limited contribution to the significance of the building. The construction will envelope the building on all sides, altering its currently relatively tranquil, semi-rural setting. This will hamper the appreciation of the building The architectural significance of the building will remain unaffected.	No mitigation is proposed	Minor Adverse	Construction activities will reduce the appreciation of the building by limiting existing views resulting in a temporary adverse effect.	Slight adverse **Not significant**
Merton Hall Farmhouse Two storey farmhouse built from gault brick with a slate roof and two end flues. Three bay, central door to ground floor with a 20th century porch. Regular fenestration, windows all four pane sashes with flat arch brick. The building is mentioned in the Cambridge City Council historic appraisal of Madingley Road document[36].	Low	The building will be demolished	No mitigation is proposed	Major adverse	Demolition of the building during construction will result in the building's loss. This will be a permanent adverse effect.	Slight Adverse **Not significant**
Department of Veterinary Medicine. Complex of buildings by Ian Forbes, from 1953 onwards. Largely restrained neo-Georgian, with some neo-baroque details to the end pavilions. Intended to form part of a symmetrical run of buildings through the centre of the site: as the only constructed elements of this, they appear stranded and unrelated to their context.	Low	The building will be demolished	No mitigation is proposed	Major adverse	Demolition of the building during construction will result in the building's loss. This will be a permanent adverse effect.	Slight Adverse **Not significant**
Whittle Laboratory Academic building by Robert Mathew Johnson Marshall and Partners, completed in 1973. The building is constructed from brown brick with vertical strip windows	Negligible	The building will be demolished	No mitigation is proposed	Major adverse	Demolition of the building during construction will result in the building's loss. This will be a permanent adverse effect.	Slight Adverse **Not significant**

[36] Architectural History Practice on behalf of Cambridge City Council, 2009, Cambridge Suburbs and Approaches: Madingley Road, https://www.cambridge.gov.uk/sites/default/files/documents/suburbs-and-approaches-madingley-road.pdf

Baseline		Impact assessment				
Receptor	**Value**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Cavendish Laboratory Complex of interconnected laboratories and other university buildings, largely two to three storeys, with horizontal windows. Completed in 1974 to designs by Robert Mathew Johnson Marshall and Partners utilsiing the CLASP method of prefabricated concrete panels.	Negligible	The building will be demolished	No mitigation is proposed	Major adverse	Demolition of the building during construction will result in the building's loss. This will be a permanent adverse effect.	Slight Adverse **Not significant**

Operational phase

7.5.2 Table 7.7 details the impacts and subsequent effects on built heritage assets during operation only as no effects will occur to archaeology. For the built environment only those assets which will receive adverse or beneficial effects are shown in the tables. For the full assessment on all historic environment assets see Appendix 7.2, Volume 3.

Table 7.7 Operational phase effects

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Central Cambridge conservation area and designated assets within the conservation area boundary. The central conservation area covers the historic core of the city, open spaces including the college backs, Jesus Green, Midsummer Common and the Botanic Garden. The conservation area appraisal states that this 'interplay of grand college buildings and verdant landscape is perhaps the most enduring image of central Cambridge.' The central conservation area also includes some fine examples of 19th century domestic development, particularly surrounding the railway station.	High	The Proposed Development will be largely invisible from the majority of the conservation area, which due to the nature of its topography and tight urban grain has constrained outward views. It will not feature in views from the Backs, for example, or from any of the college quads, which are highly significant open spaces within the conservation area. However some taller elements of the Proposed Development, such as the energy centre flue, will appear in some outward views from limited elevated points within the conservation area, particularly from Castle Hill. In these views it will appear as a distant element and will not fundamentally challenge the dominance of the man-made tall elements, such as the Kings College, Great St Mary's Church and university library towers, in these views. The Tall Buildings Study identifies some key views of Cambridge from the south, particularly from the Gog MaGog hills. The flue will feature obliquely far to the west of the city centre in some of these views, but will not fundamentally challenge the dominance of the man-made tall elements, such as the Kings College, Great St Mary's Church and university library towers, in these views.	• Building frontages longer than 60m facing Madingley Road should be broken down through variation in design. • Gaps between building frontages facing Madingley Road should be a minimum of 15m. • Building frontages facing the Madingley Road must have a high quality architectural treatment or additional woodland screening. • Variation in roofline along Madingley Road. • Service areas and development 'backs' visible from Madingley Road must be screened by additional planting. • The existing woodland buffer along the northern boundary must be maintained and reinforced to ensure it is effective in maintaining the character of Madingley Road. • Rooftop plant should be set back from the eastern building edge and screened.	Minor Adverse	Some glimpsed views of tall elements of the Proposed Development would be visible from limited elevated points within the conservation area. Distant views of the historic city core from the south and west would feature tall elements of the Proposed Development but would not obscure or detract from the views of the historic skyline. This would result in a permanent adverse effect.	Slight Adverse **Not significant**

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Shawms (1268363) Grade II* listed. Two storey house in the Modern Movement style with a single storey roof conservatory. The entrance has a projecting porch hood supported on two steel posts.	High	Shawms features extensive glazing to its south front, which faces over landscaped grounds to the Site. Views to the south are slightly filtered by mature planting and intervening buildings. However the Proposed Development will feature in views to the south. This will alter the setting of the asset, by adding large contemporary structures somewhat at odds to its currently domestic peri-urban context.	• Building frontages longer than 60m facing Madingley Road should be broken down through variation in design. • Gaps between building frontages facing Madingley Road should be a minimum of 15m. • Building frontages facing the Madingley Road must have a high quality architectural treatment or additional woodland screening. • Variation in roofline along Madingley Road. • Service areas and development 'backs' visible from Madingley Road must be screened by additional planting. • The existing woodland buffer along the northern boundary must be maintained and reinforced to ensure it is effective in maintaining the character of Madingley Road. • Rooftop plant should be set back from the eastern building edge and screened.	Minor Adverse	Glimpsed views of the Proposed Development will result in a permanent adverse effect to the setting of the building.	Slight Adverse **Not significant**
White House (1126037) Grade II listed. Two storey house with a third storey set back at the centre of the roof terrace built in 1930 by George Checkley in the International Modern style. The house has a rectangular plan with central entrance hall The facades are white painted brick and the roof is flat concrete.	Medium	The house is located within landscaped grounds adjacent to Madingley Road, immediately to the north of the Site. Views to the Site are somewhat filtered by boundary planting, however the Proposed Development will feature prominently in the setting of the asset, fundamentally altering its setting by the addition of large contemporary structures to its currently suburban and semi-rural context.	• Building frontages longer than 60m facing Madingley Road should be broken down through variation in design. • Gaps between building frontages facing Madingley Road should be a minimum of 15m. • Building frontages facing the Madingley Road must have a high quality architectural treatment or additional woodland screening. • Variation in roofline along Madingley Road. • Service areas and development 'backs' visible from Madingley Road must be screened by additional planting. • The existing woodland buffer along the northern boundary must be maintained and reinforced to ensure it is effective in maintaining the character of Madingley Road. • Rooftop plant should be set back from the eastern building edge and screened.	Moderate Adverse	Close views of the Proposed Development will result in a permanent adverse effect to the setting of the building.	Moderate Adverse **Significant effect**
The Observatory (1126156) Grade II listed Construction of the Observatory commenced in 1822.by the architect John Clement Mead. The building has two storeys, and is built from ashlar with slate and lead roofs in a Neo-Greek style. Built on a half H shaped plan with wings extending towards the North and projecting central tetrastyle portico of Doric Order to the south and front entrance. A small movable dome is located on the centre of the building.	Medium	The Observatory buildings are located at the end of an avenue of trees leading from Madingley Road, to the north of the Site. In addition to the avenue of trees the boundaries of the observatory compound are sparsely planted. There are relatively clear views to the south towards the Madingley road. The Proposed Development will be an appreciable element in the setting of the observatory complex, with the large modern buildings visible in oblique views to the south west. The presence of the Site will be somewhat filtered by boundary planting.	• Building frontages longer than 60m facing Madingley Road should be broken down through variation in design. • Gaps between building frontages facing Madingley Road should be a minimum of 15m. • Building frontages facing the Madingley Road must have a high quality architectural treatment or additional woodland screening. • Variation in roofline along Madingley Road. • Service areas and development 'backs' visible from Madingley Road must be screened by additional planting. • The existing woodland buffer along the northern boundary must be maintained and reinforced to ensure it is effective in maintaining the character of Madingley Road. • Rooftop plant should be set back from the eastern building edge and screened.	Minor adverse	Oblique, glimpsed views of the Proposed Development will result in a permanent adverse effect to the setting of the Observatory.	Slight adverse **Not significant**
Northumberland Dome at the Observatory (1126157) Grade II listed. The building was constructed around 1838 of white brick and a movable copper dome and is located in the grounds of the Observatory. The dome has since been reconstructed.	Medium				Oblique, glimpsed views of the Proposed Development will result in a permanent adverse effects to the setting of the copper Dome at the Observatory.	Slight adverse **Not significant**

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
9 Wilberforce Road (1268352) Grade II listed. Two storey Modern Movement house built in 1937 by D. Cosens. The building is constructed from whitewashed brick laid in Flemish bond with a bituminous felt roof. Rectangular plan with a recessed corner section at south east corner.	Medium	The house is located opposite the Emmanuel College Sports Pitches, with the existing buildings on the Site visible beyond the trees lining Clerk Maxwell Road. The rooftops and taller elements of the Proposed Development will be visible in distant views over the Emmanuel College sports pitches, resulting in a densification of modern large buildings in the setting of the listed building and altering key views from the asset.	• Additional height restrictions to buildings facing onto the eastern boundary. • Building frontages longer than 60m facing the eastern boundary should be broken down through variation in design. • Gaps between building frontages facing the eastern boundary should be a minimum of 15m. • Building frontages facing the eastern boundary must have a high quality architectural treatment or additional woodland screening. • Variation in roofline along the eastern edge. • Service areas and development 'backs' visible from the Conservation Area must be screened by additional planting. • The existing woodland buffer along the eastern boundary must be maintained and reinforced to ensure a green edge to the new development. • Any gaps between frontages facing the eastern boundary should be appropriately planted, ensuring that some individual trees can grow to maturity. • Visibility to the development from Clerk Maxwell Road must be minimised and development should be set within the existing eastern woodland edge. • Rooftop plant should be set back from the eastern building edge and screened.	Minor Adverse	Some medium range views of the Proposed Development will result in permanent adverse effects to the setting of the house.	Slight Adverse **Not Significant**
Emmanuel College Sports Pavilion, including grounds man's house and stables (1422595) Grade II listed. Sports pavilion with attached Groundsman's House and separate stable, built for Emmanuel College in 1910. Complex roofscape of steep, sweeping pitches and hipped roof surmounted by a decorative copper cupola which has a polygonal base and a weathervane.	Medium	The constructed elements of the masterplan are visible in views across the sports pitches, though they are somewhat screened by the presence of tree screening and intervening housing. The rooftops and taller elements of the Proposed Development will be visible in distant views over the Emmanuel College sports pitches, resulting in a densification of modern large buildings in the setting of the listed building and altering key views from the asset.		Minor Adverse	Some medium range views of rooftops, rooftop plant and the energy centre flue will result in permanent adverse effects to the setting of the pavilion and house.	Slight Adverse **Not Significant**
Conduit Head Road Conservation Area The conservation area comprises 20th century residential development, built in a piecemeal fashion from approximately 1914. A number of modernist houses built in the 1930s and 1960s, are of particular note. These buildings provide a high quality and progressive architectural character to the area.	Medium	The Proposed Development will consist of a number of large contemporary buildings immediately to the south of the conservation area boundary, and will be highly visible from the southern extent of the conservation area, particularly the portion of the conservation area on Madingley Road and the southernmost part of Conduit Head Road. This will be a substantial change to the immediate setting of the conservation area. The dense tree planting and shrubbery will screen the development from the northern part of the conservation area.	• Building frontages longer than 60m facing Madingley Road should be broken down through variation in design. • Gaps between building frontages facing Madingley Road should be a minimum of 15m. • Building frontages facing the Madingley Road must have a high quality architectural treatment or additional woodland screening. • Variation in roofline along Madingley Road. • Service areas and development 'backs' visible from Madingley Road must be screened by additional planting. • The existing woodland buffer along the northern boundary must be maintained and reinforced to ensure it is effective in maintaining the character of Madingley Road. • Rooftop plant should be set back from the eastern building edge and screened.	Moderate Adverse	Direct close views of the Proposed Development from the southern end of the conservation area will result in permanent adverse effects to the setting of the conservation area.	Moderate Adverse **Significant Effect**

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
West Cambridge Conservation Area The conservation area is notable for its spacious residential streets lined with large mainly detached 19th and 20th century houses. A variety of college and university buildings are included in the conservation area. Despite the differences in the form, scale and materials between the residential and collegiate buildings the very high quality of nearly all the structures ensures that the area retains spatial cohesion. Green open spaces, including agricultural land and the college playing fields and tennis courts also contribute to the conservation area's significance.	Medium	The conservation area extends in an arc around the north east corner of the Site. The Proposed Development will feature prominently in the west and north west of the conservation area, as a dense collection of large modern buildings. This will substantially erode the conservation area's relatively tranquil setting. The conservation area draws part of its significance from the interface between the suburban and rural at its western edge; the Proposed Development process will fundamentally alter this relationship. However the Proposed Development will not be appreciable from many of the key areas within the conservation area, including Grange Road and the area surrounding the University Library, due to the presence of intervening buildings, mature tree planting and the low lying topography.	• Additional height restrictions to buildings facing onto the eastern boundary. • Building frontages longer than 60m facing the eastern boundary should be broken down through variation in design. • Gaps between building frontages facing the eastern boundary should be a minimum of 15m. • Building frontages facing the eastern boundary must have a high quality architectural treatment or additional woodland screening. • Variation in roofline along the eastern edge. • Service areas and development 'backs' visible from the Conservation Area must be screened by additional planting. • The existing woodland buffer along the eastern boundary must be maintained and reinforced to ensure a green edge to the new development. • Any gaps between frontages facing the eastern boundary should be appropriately planted, ensuring that some individual trees can grow to maturity. • Visibility to the development from Clerk Maxwell Road must be minimised and development should be set within the existing eastern woodland edge. • Rooftop plant should be set back from the eastern building edge and screened.	Moderate Adverse	Direct close views of the Proposed Development from within the conservation area will result in permanent adverse effects to the setting of the conservation area.	Moderate Adverse **Significant Effect**
Schlumberger Building Commercial research centre and office designed by Michael Hopkins and completed in 1985. The building is a tented structure suspended between a 'cat's cradle' arrangement of struts and supports. The building is both technically innovative, and a highly sculptural treatment for a late 20th century commercial building.	Medium	The Proposed Development will result in an alteration of the current semi-rural setting of the Schlumberger building. Setting makes a limited contribution to the significance of the building and it was always intended that the area surrounding the building be developed in this manner. The architectural significances of the building will remain unaltered by the development in its setting.	No mitigation is proposed	Neutral	The appreciation of the Schlumberger building will not be affected by the Proposed Development. There will be no residual effects to the appreciation of the building.	Neutral **Not significant**

7.6 Mitigation Measures

Archaeology

7.6.1 Following the 2015 field evaluation for the Proposed Development a number of areas will require further fieldwork. These areas are discussed below.

Site 1 (Iron Age)

7.6.2 Site 1 has already been excavated having therefore already effectively been mitigated (see baseline section), it is only the area of Site 2 that will require full open-area excavation when development proceeds there. The further investigation of the Site 3 field system and trackway – aside from its incidental exposure in Site 2 – can, within Field 1, be limited to the area of new major building footprints and any further areas that will be disturbed through excavation, augmented by additional trenching.

Site 2 (Iron Age)

7.6.3 In addition to the written record produced during the 2015 field evaluation, a full open area excavation of Site 2 will be undertaken prior to construction works commencing. A limited degree of Iron Age occupation evidence was found during the course of the 2001 Nano-Fabrication Building Site investigations. The settlement is likely to have extended across at least part of the area of the Cavendish Laboratory complex, but where it was unfeasible to cut any trial trenches during the 2015 evaluation programme. Accordingly, upon vacating the Laboratory buildings (but prior to their demolition), a limited trenching programme will be conducted within the grounds; should further evidence of early settlement be recovered, then an appropriate excavation programme will occur in conjunction with the demolition works. This will be agreed with CHET in advance.

Site 3 (Iron Age/Roman)

7.6.4 Mitigation for Site 2 will further expose the field system which will be recorded. Additional trenching will be undertaken to establish the system's basic layout. This will be agreed with the County Council's Historic Environment Team (CHET).

Vicar's Farm

7.6.5 As confirmed by the 2011 Whittle Laboratory excavations (Slater 2011), the north western side of the Vicar's Farm Roman settlement extends into the eastern portion of that facility's grounds. This will require excavation over approximately 3,375m^2. Of this, excluding the 2011-area, approximately 2,100m^2 lie exterior to that building's footprint and will require full excavation prior to the Laboratory's demolition; occurring within the footprint-area, the remaining portion (approximately1,275m^2) will require more summary investigation concurrent with the Laboratory's demolition.

Nano Fabrication Building Site

7.6.6 A limited degree of Iron Age occupation evidence was found during the course of the 2001 investigations[20]. The settlement is likely to have extended across at least part of the area of the Cavendish Laboratory complex, but where it was unfeasible to cut any trial trenches during the 2015 evaluation programme. Accordingly, upon vacating the Laboratory buildings (but prior to their demolition), a limited trenching programme will be conducted within the grounds; should further evidence of early settlement be recovered, then an appropriate excavation programme will occur in conjunction with the demolition works.

Built heritage

7.6.7 The following mitigation measures are specified in the Design Guidelines to minimise visual and setting impacts to built heritage receptors to the north and east of the Site:

- In addition to the height parameter plan at the edge of Development zone adjacent to the eastern boundary the built form must comply with an additional height restriction of 25m AOD. From this line, the development heights can rise with an angle of 45° to the parameter height of 31m AOD;
- Building frontages longer than 60m facing onto Madingley Road or eastern boundaries should be broken down by variation in build-to line and/or height and roofscape;
- Any visible frontages facing onto Madingley Road or the eastern boundary must have a high quality architectural treatment. Alternatively or in addition, the woodland buffer shall be reinforced to limit visibility into the Site;
- Landscaped gaps may be used to break frontage lengths. Any new gaps should be a minimum of 15m for buildings facing Madingley Road and the eastern boundary from building face to building face;
- A variable and interesting roofline should be formed along Madingley Road and eastern development edges;
- Service areas, multi storey car parks and development 'backs' must be screened by the existing woodland buffer (reinforced where necessary) and/or additional planting;
- The existing woodland buffer along the northern boundary must be maintained and reinforced to ensure it is effective in maintaining the character of Madingley Road;
- There must be effective screening of rooftop plant to ensure that its visual impact on the street is minimised;
- Rooftop plant should, wherever possible be set back from the predominant building line along the eastern edge. Where not possible to avoid this, there must be effective screening of rooftop plant;
- The existing woodland buffer along the eastern boundary must be maintained and reinforced to ensure a green edge to the new development;
- Any gaps between frontages facing the eastern boundary should be appropriately planted, ensuring that some individual trees can grow to maturity; and
- Visibility to the development from Clerk Maxwell Road must be minimised and development should be set within the existing eastern woodland edge.

7.7 Summary

7.7.1 The Proposed Development will have an adverse effect on buried archaeological remains within the Site. However, the Proposed Development does not conflict with national or local policy regarding the safeguarding of heritage assets. Adverse effects will all be felt during construction, no additional effects will occur during operation. Post-construction there will be minimal to negligible effects upon the archaeological assets which are not considered significant.

7.7.2 The Proposed Development will have a moderate impact on the following assets, leading to a permanent moderate adverse effect in each case:

- White House (1126037) Grade II listed building;
- Conduit Head Road Conservation Area; and
- West Cambridge Conservation Area.

8. Landscape and visual

8.1 Scope of assessment

8.1.1 This chapter presents the findings of the landscape and visual assessment for the Proposed Development. It considers the effects of the Proposed Development on landscape character and visual receptors during both construction and operational phases.

8.1.2 The potential for significant effects relates to the change during construction and operation both during the day and at night, in land use at the Site and the visibility, scale and mass of the new built form within existing views.

8.1.3 The assessment has informed the design development process, including the retention of existing boundary vegetation, new landscape works and planting and the layout. This chapter refers to the sensitivity of the existing trees and woodland areas associated with the Site and summarises the findings of the arboriculture survey that have been taken into account in the design development.

8.1.4 The scoping responses relevant to the assessment are summarised in Table 8.1:

Table 8.1 Scoping response

Issue raised	Respondent
Assessment of the development on local landscape character	Cambridge City Council
Using the findings of the visual assessment and photomontage as a working tool to modify the masterplan	
Consider the Cambridge Green Belt Study 2002 as well as the Cambridgeshire Landscape Guidelines 1991 and the Guidance for the Cambridge Skyline	
Agree viewpoints located on an OS plan accompanied by a definitive map showing PROW	
Consider impacts on access land, public open land and rights of way in vicinity of development	
Artificial light impacts upon the landscape character and visual receptors	
Update the description regarding the topographic description	
Landscape Character Assessment that identifies the local landscape character at an appropriate scale	Natural England / Cambridge City Council
Cumulative effect of the development upon the landscape set against other relevant existing or proposed developments	Natural England
Consideration of proposed effects on access land, public open land and rights of way within the vicinity	
Sensitive views from the high ground at Coton and Madingley across the Green Belt need to be considered	Cambridge Past, Present and Future

8.1.5 During the assessment, consultation has taken place with Cambridge City Council. Consultation has led to the agreement of the study area, the identification of visual receptors, photomontage locations and viewpoint locations.

8.2 Relevant legislation and policy

National Planning Policy Framework (NPPF)

8.2.1 Policy 11 of the NPPF, conserving and enhancing the natural environment, notes that the planning system should contribute to the natural environment by protecting and enhancing valued landscapes. Planning decisions should take account of any detrimental effect on the landscape.

Cambridge Local Plan (2006)

8.2.2 The Cambridge Local Plan (2006) comprises the adopted planning policies which should be considered when determining the planning application. The following local planning policies from the Local Plan are relevant to the landscape and visual assessment.

Policy 3/2 Setting of the City (applies to both Green Belt and areas not designated as Green Belt)

'Development will only be permitted on the urban edge if it conserves or enhances the setting and special character of Cambridge and the biodiversity, connectivity and amenity of the urban edge is improved.'

Policy 3/3 Safeguarding Environmental Character

'Development will be permitted if it respects and enhances the distinctive character and quality of areas identified in the Cambridge Landscape Character Assessment.'

Policy 3/4 Responding to Context

'Developments will be permitted which demonstrate that they have responded to their context and drawn inspiration from the key characteristics of their surroundings to create distinctive places.'

Policy 3/7 Creating Successful Places

'Development will be permitted which demonstrates that it is designed to provide attractive, high quality, accessible, stimulating, socially inclusive and safe living and working environments.'

Policy 3/11 Design of External Spaces

'External spaces and boundary treatments must be designed as an integral part of development proposals.'

Policy 3/12 Design of New Buildings

'New buildings will be permitted where it can be demonstrated that they have a positive impact on their setting in terms of location on the Site, height, scale and form, materials, detailing, wider townscape and landscape impacts and available views.'

Policy 3/13 Tall Buildings and the Skyline

'New buildings which are significantly taller than their neighbours and/or roof-top plant or other features on existing buildings, will only be permitted if it can be demonstrated that they will not detract from:

- *Local residential amenity*
- *Key vistas, the skyline and views within, over and from outside the City'*

8.2.3 The Guidance for the Cambridge Skyline (2012) provides further clarity on Policy 3/13 of Cambridge Local Plan (2006). The guidance states that in relation to Policy 3/13 long to medium distance views from Red Meadow Hill towards the historic core are especially important and should be protected.

Policy 4/1 Green Belt

There is a presumption against inappropriate development in the Cambridge Green Belt as defined on the Proposals Map.

Policy 4/3 Safeguarding Features of Amenity or Nature Conservation Value

'Development proposals should seek to enhance features of the landscape which are of importance for amenity or nature conservation. Development resulting in adverse effects on or loss of those features will not be permitted unless this is unavoidable and there are demonstrable and overriding wider public benefits.'

Policy 4/4 Trees

Development will not be permitted which would involve the felling, significant surgery or potential root damage to trees of amenity or other value unless there are demonstrable public benefits accruing from the proposal which outweigh the current and future amenity value of the trees. When felling is permitted, appropriate replacement planting will be sought wherever possible.

Cambridge Green Belt Study 2002

8.2.4 The Cambridge Green Belt Study was prepared to assess the contribution that the eastern sector of the Green Belt makes to the overall purposes of the Cambridge green belt. Whilst relating to the east of Cambridge, the study makes useful observations '*on the subtle Cambridge landscape, particularly where the abrupt urban edge meets the agricultural fields that surround the city'*.

8.2.5 The following special qualities are considered to contribute positively to the setting and special character of Cambridge, are essential to green belt purposes, are '*finite and irreplaceable, and should be safeguarded*:

- *A large historic core relative to the size of the city as a whole;*
- *A city focused on the historic core;*
- *Short and/or characteristic approaches to Cambridge from the edge of the city;*
- *A city of human scale easily crossed by foot and by bicycle;*
- *Key views of Cambridge from the landscape;*
- *Significant areas of distinctive and supportive townscape and landscape;*
- *Topography providing a framework to Cambridge;*
- *A soft green edge to the city;*
- *Green fingers into the city;*
- *Designated sites and areas enriching the setting of Cambridge;*
- *Long distance footpaths and bridleways providing links between Cambridge and the open countryside;*
- *Elements and features contributing positively to the character of the landscape setting;*
- *The distribution, physical separation, setting, scale and character of necklace villages; and*
- *A city set in a landscape which retains a strong rural character.'*

Cambridgeshire Landscape Guidelines 1991

8.2.6 The assessment has taken into consideration the Cambridgeshire Landscape Guidelines 1991. This is Supplementary Planning Guidance that includes a landscape characterisation and a vision including landscape design criteria for new development.

Cambridge Landscape Character Assessment 2003[37]

8.2.7 The Cambridge Landscape Character Assessment was produced to provide an agreed baseline statement of the qualities and character of the city in response to development pressure identified in the former Regional Planning Guidance for East Anglia (RPG6). The document has two stated purposes as follows:

- *To understand and identify the key resources - the 'Defining Character' - which make up and are essential to the spirit of Cambridge…*
- *To identify and describe the essential character of the townscape and its rural hinterland into Character Types and Character Areas…*

8.3 Method of assessment

8.3.1 The principles and good practice guidance for undertaking the assessment are set out in the 3rd edition of the Guidelines for Landscape and Visual Impact Assessment[38]. The method has also been developed in accordance with Natural England and Defra Guidance'[39].

8.3.2 Landscape character areas and key viewpoints were identified from a range of sources including policy documents (described in Section 8.2), site visits and consultation with Cambridge City Council. These receptors were evaluated by defining their sensitivity to change, value and quality.

Establishing the baseline

Study area

8.3.3 A desk based analysis of landform, vegetation cover and the location of potentially sensitive receptors has informed the study area Visual Envelope together with reference to the Zone of Theoretical Visibility (ZTV) and subsequent site work.

8.3.4 The extent of the study area for the assessment has been established in consultation with Cambridge City Council. The study area includes the Site and extends up to 8.5km from the Site boundary, to take into account the furthest viewpoint.

[37] Cambridge City Council, 2003, Cambridge Landscape Character Assessment
[38] Landscape Institute, Institute of Environmental Management and Assessment, 2013, Guidelines for Landscape and Visual Impact Assessment, 3rd Edition, Routledge
[39] Natural England and Defra, 2014, Landscape and seascape character assessments, https://www.gov.uk/guidance/landscape-and-seascape-character-assessments

Zone of Theoretical Visibility (ZTV) and Zone of Visual Influence (ZVI)

8.3.5 The ZTV is the area from where there is a direct line of sight with any part of the development. The ZVI is the area where people will be able to view the Proposed Development from. The ZVI is based on the ZTV but filters out the inaccessible areas such as tree tops and includes areas which are not part of the ZTV but are likely to be visible at 1.6m (nominal height for an average person) above the ground. This would include areas with low lying screening that prevents a direct line of sight at ground level but views of the Proposed Development are likely to be visible at 1.6m above ground level.

8.3.6 The ZTV was established using a 3D GIS model of the Proposed Development and the surrounding area using Ordnance Survey (OS) Land-form Panorama and Profile data and was based on a 2m resolution digital surface model (DSM) that takes into account the screening effects of landform, vegetation and built form. This means that the ZTV includes inaccessible areas such as the tops of trees, roofs and spires. Consequently a more refined ZVI has been produced which defines a broad area where views of the Proposed Development can be seen from the ground by a typical height person (1.6m). The ZVI has been based on professional judgement and familiarity with the study area obtained during site visits. The ZVI also excludes specific viewpoints such as the Castle Mount in central Cambridge as the area which the site is visible from at this viewpoint is too small to identify on the scale of the map. This specific area has been assessed through careful consideration of the Castle Mount as a key viewpoint.

8.3.7 The ZTV was produced by using a GIS tool called viewshed analysis. Viewshed analysis works by identifying points on the Proposed Development. The GIS software then calculates which areas can see any of the points and produces a map with a coloured layer which shows where in the landscape there is a direct line of sight to any of the points. For this assessment points a viewshed analysis was undertaken for the following three scenarios to determine the ZTV:

- Proposed building mass with no elevated built elements or energy centre flues – Points were added to each top corner of the building development zones and along the main external facades;
- Proposed building mass with energy centre flue but no elevated built elements – as per previous scenario but with additional points at the two energy centre flue locations 8m above the proposed building mass; and
- Proposed building mass with energy centre flue and elevated built elements – as per previous scenario but with additional points at each corner of the elevated built elements.

8.3.8 The viewshed analysis of the three scenarios enabled a ZTV to be produced which differentiated between the different prominent elements of the Proposed Development. This provides a useful tool to undertake the assessment by defining which elements of the Proposed Development would be visible within the ZVI.

8.3.9 The Parameter Plan makes allowance for elevated built elements that will potentially take the form of taller built heights. The locations of these are indicative to enable the assessment to account for them but the final locations may differ.

Tree survey

8.3.10 An arboricultural impact assessment has been undertaken in accordance with BS5837:2012[40]. The standard gives recommendations and guidance on the relationship between trees and design, demolition and construction process, setting out the principles and procedures to be applied to achieve a harmonious and sustainable relationship between trees and structures. A detailed description of the arboricultural survey and impact assessment can be found in Appendix 8.1, Volume 3.

Local landscape character areas

8.3.11 Landscape can be defined as '*an area as perceived by people, whose character is the result of the action and interaction of natural and/or human factors*'[41]. This definition recognises landscape not just in terms of appearance and visual amenity but as providing a spatial framework for understanding the interaction between the natural, cultural and perceptual elements, embedding landscape or 'place' into policy whilst managing and protecting the landscape as a resource in its own right and promoting sustainable development.

8.3.12 A review of the landscape resource within the study area was undertaken with reference to the following published sources to establish the national and regional landscape character and planning policy context:

- OS Explorer No. 209, Cambridge (1:25,000), Ordnance Survey (2014);
- Magic.gov.uk;
- Natural England's National Character Area descriptions;
- Cambridge Landscape Character Assessment (2003);
- Cambridge Green Belt Study (2002);
- Cambridgeshire Landscape Guidelines (1991);
- Cambridge Skyline Guidance (2012);
- National and local planning policy and relevant documents as outlined in Section 8.2;
- 1:50,000 and 1:25,000 Scale Digital Ordnance Survey Maps; and
- Aerial photography.

8.3.13 The identification of local landscape character areas within the study area comprised:

- Sorting the landscape into parcels of land (or character areas) each with a distinct, consistent and recognisable character.
- Describing the character in terms of key characteristics – land cover, pattern and texture, scale and appearance, tranquillity, cultural and human interaction with reference to positive and negative features and elements in the natural, built, historic, managed landscape, aesthetic and experiential characteristics such as wildness, intimacy, sense of place, scenic quality, seasonal and night time changes.
- Assessing the condition / quality of the landscape character areas.

[40] British Standards Institute, 2012, BS5837:2012 Trees in relation to design, demolition and construction. Recommendations

[41] European Landscape Convention, Council of Europe, 2000

- Considering the importance or value of the landscape character areas e.g. do they contain local or national designations, ecological importance and historical/cultural assets of significance, as well as those of local significance without designation that may be valued by local communities for their contribution to local distinctiveness and their sense of identity.
- Considering the susceptibility of the landscape character areas i.e. the ability of the landscape receptor to accommodate the Proposed Development without undue consequences for the maintenance of the baseline situation and / or the achievement of landscape policies and strategies.

8.3.14 The quality of each of the local landscape character areas was determined using the criteria set out in Table 8.2 and the sensitivity of each local landscape character area was determined using the criteria set out in Table 8.3. The quality assigned to the landscape character area is derived from assessing the landscape condition, scenic quality, rarity, representativeness, conservation issues, recreation value, perceptual aspects and any historical associations.

Table 8.2 Landscape quality criteria

Grade	Description
High	Areas that exhibit a strong positive character with valued and distinctive features that combine to give the experience of unity, richness and harmony. These are landscapes that are considered to be of particular importance to conserve and which may be sensitive or very sensitive to change. Nationally designated landscapes of historical or national scenic value may be present.
Very attractive	Areas with a strong structure and a balanced combination of land form and land cover, including woodland and high distribution of trees, hedges and shrubs; or a balanced combination of built form and open space including parks, gardens and squares. Attractive features are present, including rivers and streams and valued buildings and open spaces. Several landscape and heritage designations may apply including Ancient Woodlands and Conservation Areas.
Good	Areas that exhibit positive character, but which may have evidence of the degradation or erosion of some features, resulting in areas of more mixed character including a balance of developments. There is a reasonable distribution of vegetation or of built and open space and the overall area is pleasant. Isolated settlements may be present within extensive areas of open space. Designations of landscape or heritage value may be present.
Ordinary	Areas with a distinguishable structure often dominated by land use including roads, isolated housing, vegetation and countryside, resulting in an area of mixed character. Not of high attraction, but may include areas with a positive character. There are some detracting features although there is scope to improve through management. Land may have a local landscape designation.
Poor	Areas generally negative in character with few if any valued features. Mixed land use dominates and includes industrial development with no aesthetic value. Lack of management and intervention has resulted in degradation. There are extensive detracting features. Lacking in a positive character and much scope for positive enhancement. No designations apply.

Table 8.3 Landscape value criteria

Value	Descriptors
High	High importance with very good landscape and scenic quality. The landscape contains features of particular importance and rarity and may have features of national or regional ecological or historical interest. This could include the Cambridge Green Belt and the special qualities that make Cambridge special as set out in the Green Belt study. There may be a high recreational value or the landscape could be associated with particular people or events of regional or national interest. The landscape is notable nationally or internationally, and there is limited potential for substitution.
Medium	High or medium importance with good landscape and scenic quality. The landscape contains features of moderate importance and rarity and may have features of local ecological or historical interest. This would include attractive landscape / townscape areas outside of the Cambridge Green Belt. There may be moderate recreational value or the landscape could be associated with particular people or events of local interest. The landscape is notable at a, regional scale and there is some potential for substitution.
Low	Low or medium importance with average or poor landscape and scenic quality. The landscape contains features of little importance or rarity and is unlikely to have any features of ecological or historical interest. There may be limited recreational value or association with particular people or events of interest. The landscape is notable at a local scale only and could be easily substituted.

8.3.15 The sensitivity of the landscape to any change in character as a result of the Proposed Development is determined by considering the quality of the landscape in combination with the value of the landscape. Planning policy documents described in Section 8.2 (Cambridge Green Belt Study 2002, and Cambridgeshire Landscape Guidelines 1991) help to inform landscape sensitivity along with insight gained from visits to the study area. As there is a degree of subjectivity, these criteria are based on professional judgement. Table 8.4 sets out the criteria used to determine the sensitivity of the landscape character area to change

Table 8.4 Sensitivity of the landscape character area to change

Sensitivity	Definition
High	Good or better landscape quality and medium or high landscape value resulting in important landscape components or landscapes of particularly distinctive character which are vulnerable to relatively minor changes. Minor changes could have a large impact on the character of the landscape due to high intervisibility, tranquility or other aspect vulnerable to change. This includes areas within the Cambridge Green Belt with strong physical and visual links to Cambridge's historic core, and other qualities that make Cambridge special as set out in the Green Belt study.
Medium	Ordinary or better landscape quality and medium landscape value resulting in moderately important landscape components or landscapes which are reasonably tolerant of change. Minor changes are unlikely to result in significant impacts on the overall character of the landscape due to limited intervisibility, tranquility or other aspect vulnerable to change. This could include attractive landscape / townscape areas outside of the Cambridge Green Belt or areas within the Cambridge Green Belt which lack a strong physical or visual link to the historic city core.
Low	Poor or ordinary landscape quality and low landscape value resulting in relatively unimportant landscape elements or landscapes which could be damaged or already heavily developed and are tolerant of substantial change. This would include landscape areas of poor quality or more attractive areas that have a reduced intervisibility, tranquility or other aspect vulnerable to change. This could include areas that are undergoing considerable change and are likely to be outside of the Cambridge Greenbelt with no physical or visual connectivity to the historic city core.

Visual receptors

8.3.16 Visual receptors are people and include occupants of residential properties, public buildings, users of public open spaces, public rights of way, transport corridors, places of work, and open land with right of access under the provision of the Countryside and Rights of Way Act 2000.

8.3.17 Visual receptors were identified through a combination of a desk study to review publicly available maps and the Local Plan and consultation with Cambridge City Council. A site based assessment was undertaken predominantly before the vegetation was in leaf, during February 2015, to enable a greater extent of inter-visibility between the Site and the study area. Further surveys visits were undertaken in April 2015. The surveys provided a photographic and assessment record from the representative viewpoints identified on Figure 8.1. Photo sheets from these representative viewpoints are included in Appendix 8.2, Volume 3.

8.3.18 The sensitivity of each visual receptor was determined using the criteria set out in Table 8.5. This also takes into account the value of the view experienced by the visual receptor. For instance a view of landmark historic buildings in the historic city core from a public footpath would be a higher value, and consequently sensitivity, than a view from a public footpath of large arable fields.

Table 8.5 Sensitivity of the visual receptors

Sensitivity	Definition
High	Occupiers of residential properties, users of areas of open access land, community facilities and public rights of way where appreciation of high quality views is an intrinsic part of the experience
Medium	Users of all outdoor recreational facilities including sports pitches, areas of open access land, community facilities and public rights of way where appreciation of moderate quality views is an intrinsic part of the experience. People travelling through or passing the affected landscape in cars, trains or on other transport routes where good views are available.
Low	People at their place of work, people travelling through or passing the affected landscape in cars, trains or on other transport routes where views are fleeting, and public spaces and public rights of way where appreciation of the view is not an intrinsic part of the experience

8.3.19 The most prominent visual receptors were photographed on a clear day early in the morning and photomontages produced using a 3D CAD model of the development zones and building heights parameter plans. Photomontages were produced in accordance with guidelines published by the Landscape Institute[42] and Scottish Natural Heritage[43].

Impact assessment

Landscape

8.3.20 Impacts to the landscape have been identified through a variety of tools including the photomontages, ZTV and site visits. Impacts to the landscape arise due to changes as a result of the Propose including:

- Change in and/or partial or complete loss of elements, features or aesthetic or perceptual aspects that contribute to the character and distinctiveness of the landscape;
- Addition of new elements or features that will influence the character and distinctiveness of the landscape;
- Combined effects of these changes on overall character;
- Changes to tranquillity; and
- Change in vitality due to increased pedestrian or traffic movements.

Visual

8.3.21 The assessment has considered the likely effects of the Proposed Development on the visual receptors during construction and operation, both during the day and at night. Following construction, the assessment considers the effects of the Proposed Development on a winter's day and at night in the year that it becomes fully operational before any planted mitigation has begun to take effect so that it reflects the operationally non-fully mitigated/maximum visibility scenario. The assessment then considers the effect of the Proposed Development on a summer's day in the fifteenth year after opening, when the planted mitigation measures can be assumed to be substantially effective so that it reflects a near fully mitigated scenario.

Landscape and visual assessment

8.3.22 For the purposes of both the landscape and visual impact assessments, impacts have been graded according to their scale or magnitude. The magnitude of impact refers to the extent to which landscape character or a view changes as a result of the Proposed Development. The following aspects are considered when determining impact magnitude:

- The size or scale of the impact. The extent of landscape elements that would be lost and the proportion that this represents within the study area, alongside a consideration of the contribution that element makes to the character of the study area. The degree to which aesthetic or perceptual aspects of the landscape would be altered by the removal of existing elements or the addition of new ones and whether the effect changes the key characteristics of the landscape.
- Geographical extent: The geographical area over which the landscape effects will be felt.
- Duration and reversibility of effects: Whether the effect is short or long term and whether the effect can be completely reversed or is permanent.

8.3.23 Impacts have been rated as one of four levels of severity: major, moderate, minor or negligible. Additionally, the nature of these effects have been defined as negative (adverse) or positive (beneficial). Where applicable, impacts have been described as 'no change'.

8.3.24 The terms used to describe the magnitude of impacts are set out in Table 8.6.

[42] Landscape Institute, 2011, Advice Note 01/11, Photography and photomontage in landscape and visual impact assessment.

[43] Scottish Natural Heritage, 2014, Visual Representation of Windfarms, Version 2.1

Table 8.6 Magnitude of impact

Magnitude of impact	Definition
High adverse	Total loss or major alteration to key elements, features, characteristics or views of the existing conditions. Introduction of elements considered to be totally uncharacteristic of the existing character and view.
Medium adverse	Partial loss of or alteration to one or more elements, features, characteristics or views of the existing conditions. Introduction of elements that would be prominent but not necessarily considered to be substantially uncharacteristic of the existing character and views.
Low adverse	Minor loss of or alteration to one or more key elements, features, characteristics or views of the existing conditions. Introduction of elements that may not be uncharacteristic when set within the existing landscape and views.
Negligible / None	No or very minor loss or alteration to one or more key elements, features, characteristics or views of the existing conditions. Introduction of elements that are not uncharacteristic with the surrounding existing landscape and views. On balance, minor changes approximating the 'no change' situation.
Low beneficial	Minor positive alteration to one or more key elements, features, characteristics or views of the existing conditions. Introduction of elements that may not be uncharacteristic when set within the existing landscape and views.
Medium beneficial	Partial positive alteration to one or more views, elements, features or characteristics of the existing conditions. Introduction of elements that would be prominent but not necessarily considered to be substantially uncharacteristic of the existing character and views.
High beneficial	Major positive alteration to key views, elements, features, characteristics of the existing conditions. Introduction of elements considered to be totally characteristic of the existing character and view.

8.3.25 The significance of the effect is the final outcome of the assessment and is determined by the interaction of the sensitivity of the receptor and the magnitude of effect. In this way a large impact to a receptor with a low sensitivity may be less significant than a small impact to a highly sensitive receptor. To determine the significance of the effect the sensitivity of the landscape character or visual receptor is compared against the magnitude of impact as shown in Table 8.7.

Table 8.7 Significance of effect

		Sensitivity		
		High	**Medium**	**Low**
Magnitude of impact	**High beneficial**	Large beneficial	Moderate beneficial	Moderate beneficial
	Medium beneficial	Large beneficial	Moderate or Slight beneficial	Slight beneficial
	Low beneficial	Moderate beneficial	Slight beneficial	Slight beneficial
	Negligible / None	Neutral	Neutral	Neutral
	Low adverse	Moderate adverse	Slight adverse	Slight adverse
	Medium adverse	Large adverse	Moderate or Slight adverse	Slight adverse
	High adverse	Large adverse	Moderate adverse	Moderate adverse

8.3.26 The definitions for each landscape and visual effect are set out in Tables 8.8 and 8.9 respectively. Large and moderate effects are considered to be significant. Slight and neutral effects are not considered significant.

Table 8.8 Landscape significance of effect definitions

Significance criteria	Description
Large beneficial (positive) effect	The Proposed Development would: • Enhance the character (including quality and value) of the landscape. • Enable the restoration of characteristic features and elements lost as a result of changes from inappropriate management or development. • Enable a sense of place to be enhanced.
Moderate beneficial (positive) effect	The Proposed Development would: • Improve the character (including quality and value) of the landscape. • Enable the restoration of characteristic features and elements partially lost or diminished as a result of changes from inappropriate management or development. • Enable a sense of place to be restored.
Slight beneficial (positive) effect	The Proposed Development would: • Complement the character (including quality and value) of the landscape. • Maintain or enhance characteristic features and elements. • Enable some sense of place to be restored.
Neutral	The Proposed Development would: • Maintain the character (including quality and value) of the landscape. • Blend in with characteristic features and elements. • Enable a sense of place to be retained.
Slight adverse (negative) effect	The Proposed Development would: • Not quite fit the character (including quality and value) of the landscape. • Be at variance with characteristic features and
Moderate adverse (negative) effect	The Proposed Development would: • Conflict with the character (including quality and value) of the landscape. • Have an adverse impact on characteristic features or elements. • Diminish a sense of place
Large adverse (negative) effect	The Proposed Development would: • Be at considerable variance with the character (including quality and value) of the landscape. • Degrade or diminish the integrity of a range of characteristic features and elements. • Damage a sense of place.

Table 8.9 Visual significance of effect definitions

Significance criteria	Description
Large beneficial (positive) effect	The Proposed Development would lead to a major improvement in a view from a highly sensitive receptor.
Moderate beneficial (positive) effect	The Proposed Development would cause obvious improvement to a view from a moderately sensitive receptor, or perceptible improvement to a view from a more sensitive receptor.
Slight beneficial (positive) effect	The Proposed Development would cause limited improvement to a view from a receptor of medium sensitivity, or would cause greater improvement to a view from a receptor of low sensitivity.
Neutral	No perceptible change in view.
Slight adverse (negative) effect	The Proposed Development would cause limited deterioration to a view from a receptor of medium sensitivity, or would cause greater deterioration to a view from a receptor of low sensitivity.
Moderate adverse (negative) effect	The Proposed Development would cause obvious deterioration to a view from a moderately sensitive receptor, or perceptible damage to a view from a more sensitive receptor.
Large adverse (negative) effect	The Proposed Development would lead to a major deterioration in a view from a highly sensitive receptor and would constitute a major discordant feature in the view.

8.3.27 The landscape and visual assessments have considered the maximum building extent of the parameter plans as the basis for potential impacts. Due to the limit in building quanta that is being applied for, it will not be possible to build up to the full extent of the parameter plans in all locations. As such the assessments are considering a hypothetical worse-case scenario that in reality can never be achieved. The assessments therefore have a negative bias towards the Proposed Development which over-emphasises the adverse effects to the landscape and visual receptors.

8.4 Baseline conditions

Study area

8.4.1 Figure 8.1 shows the extent of the ZTV and the visual envelope which comprises the study area.

Landscape baseline

National landscape character

8.4.2 The Site is located in National Character Area (NCA) 88: Bedfordshire and Cambridgeshire Claylands. The key descriptions that are relevant to the NCA are as follows:

- Gently undulating, lowland plateau divided by shallow river valleys that gradually widen as they approach The Fens NCA in the east.
- Predominantly open, arable landscape of planned and regular fields bounded by open ditches and trimmed, often species-poor hedgerows which contrast with those fields that are irregular and piecemeal.
- Recreational assets include woodland and wetland sites, an extensive rights-of-way network and two National Cycle Routes. The cities of Cambridge and Peterborough and several of the historic market towns in the NCA are popular tourist destinations.

Regional landscape character

8.4.3 The Cambridge Landscape Character Assessment (2003) has identified various character areas. The site falls within Rural Lowland Mosaic – West Cambridge Claylands. The key characteristics that are relevant to the study area are as follows:

- *'This area encompasses a large arc of land from the north west of Cambridge from the National Institute of Agricultural Botany (NIAB) land through to Grantchester and towards the River Cam. The M11 corridor dominates the western edge;*
- *The area is underlain by chalk and limestone till which gives rise to old, calcareous clay soils. The land rises to the north towards Madingley Rise, but is generally between 10 and 15m above sea level and is gently undulating. Fields tend to be of medium size, sometimes bounded by ditches and often thorn hedges;*
- *The area is bisected by small brooks flowing east – Bin Brook, Bourne Brook and Washpit Brook. Most of these brooks take the form of steeply cut man-made channels. They often form field boundaries. Water features including storm-water retention ponds have been created along an east-west corridor following the line of the Coton footpath;*
- *The field pattern is post Enclosure, when the Coton footpath was realigned along with the field boundaries;*
- *There are a number of hedgerows in the area. Many of these form substantial linear landscape features that are an important resource in the landscape. Substantial lengths of hedge suffer from Dutch Elm disease;*
- *There is mixed use in the area, with College playing fields, farmed land and research buildings. The soft, well treed urban edge of the generally large, individual residences within large mature well treed gardens is very evident and works to separate the city from its rural hinterland;*
- *The Schlumberger building is very prominent on the western side of Cambridge, partly due to its bulk and distinctive skyline, but also because of its elevated position;*
- *From several locations there are panoramic views east, towards the historic city skyline, especially from the motorway. Addenbrooke's chimney and various church spires are important landmarks of Cambridge. The views across to the City from the area between Grantchester and the motorway and from Grantchester Road are exceptional;*
- *Extensive roadside tree planting along Barton Road will in the long term obliterate the fine views from Barton;*
- *The elevated land to the west around Madingley Wood and Barton is also a prominent feature of the landscape here. There are some exceptional views from this area back towards the City Centre;*
- *There are a number of Definitive Footpaths in this area, including the Harcamlow/Wimpole Way/Coton footpath and the footpath from the A603 past Laundry Farm. There are also a number of Permissive Footpaths. There are a number of City Wildlife Sites which lie beside the footways or which follow ditches and hedges forming wildlife corridors to the west of the City, with the Coton Footpath and Bin Brook important extensions, and which run towards the City core;*
- The Coton Countryside Reserve is centered on Coton to the west of the M11.
- *Within the Historic Cambridge Core there are numerous tall buildings and a large portion of the colleges have Churches attached to them with spires. Great St. Mary's tower has public access and is the tallest publically accessible vantage point within this core. Other notable tall buildings are: Cambridge University Library tower (48m) and Kings College Chapel spire.'*

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- Site boundary
- Extent of digital surface model (DSM) elevation data analysed
- Visual envelope
- Visible areas from proposed buildings
- Visible areas from proposed taller built elements and 8 metre flues
- Visible areas from proposed taller built elements

Notes:
The ZTV is an indication only of the area within which the the highest points of the proposed scheme buildings may be visible from ground level.

The study uses a 2 metre resolution Digital Surface Model (DSM), which takes into consideration the surface detail of vegetation and buildings.

0 0.5 1 Kilometre

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Client
University of Cambridge

Project
West Cambridge Masterplan EIA

Title
Landscape
Zone of Theoretical Visibility
Figure 8.1

Sheet Size	Original Scale	Designed / Drawn	Checked	Authorised
A3	1:35,000	SJD Date 01/06/16	RJS Date 01/06/16	DP Date 01/06/16

Drawing Number: 5137998_CAM_LV_VIS
Rev: 08

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Local landscape character

8.4.4 The City of Cambridge is located in a low lying area with higher ground to the south, south east and west. To the west of the City, two gault clay ridges (north and south of Coton) run in a broadly east-west direction. The northernmost ridge rises up to 63m, south-west of the American WWII Cemetery at Madingley. The gently undulating rural landscape comprises a fairly large scale landscape with rolling arable and mixed farm land enclosed by woodland block and belts of trees and hedgerows. The nature of the landform falling away to the south of the Site results in an open landscape with large fields and sporadic field boundaries and far ranging views.

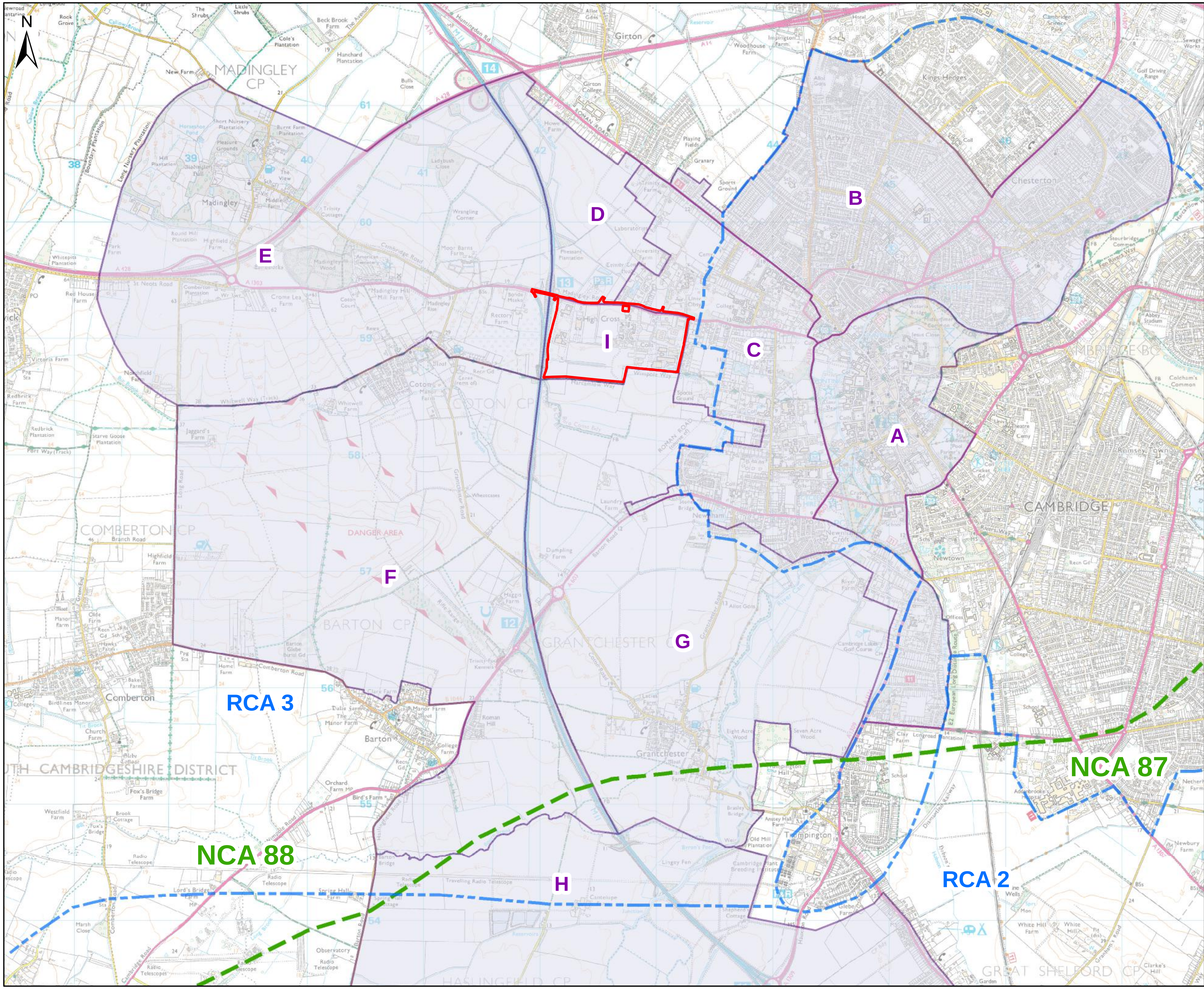
8.4.5 West Cambridge is described in the Cambridge Landscape Character Assessment[37] as making a high quality positive contribution to Cambridge and its setting owing to views of the city skyline and landmark buildings such as the Schlumberger building. The Site occupies shallow local high ground and is exposed to views from the south east, south, and south west. The Site is therefore considered to be in a sensitive location regarding the overall setting of Cambridge.

8.4.6 The study area is divided into nine local character areas that are summarised in Table 8.10 and shown on Figure 8.3. Those areas that contribute to the wider setting of Cambridge, particularly to the west and south of the Site, are designated Green Belt.

8.4.7 A public bridleway (39/31a), Harcamlow Way, runs along the southern boundary of the Site. This route is frequently used by pedestrians and cyclists to commute into the City of Cambridge. There is substantial boundary planting along the Site perimeter with occasional breaks allowing views into the Site. This planting is of a mature nature and softens views of the existing buildings when viewed from the south.

Table 8.10 Local Landscape Character Area descriptions and sensitivity to change

LCA	Description	Quality	Value	Sensitivity to change
A - Cambridge Central Core	This area is composed around a core of University college buildings and based upon an irregular road pattern. The River Cam and associated open spaces such as Midsummer Common are also important and distinctive features. There is a coherent approach to the historic architecture within this character area.	High	High	High
B - Chesterton/ North Cambridge	This area lies to the north of the Cambridge Central Core and is a residential area that forms the northern urban extents of the wider Cambridge area. The residential area is laid out on a semi rigid grid street pattern with occasional open green spaces providing relief to the built form. The south of the area contains the historic Castle Mound.	Ordinary	Low	Low
C - West Cambridge Central Core	This area lies immediately to the west of the Cambridge Central Core and consists predominantly of more recent University Colleges, this provides a link between the older central core and the modern campus buildings of the Site. This area contains residential conservation areas located adjacent to Madingley Road as well as University observatories.	Very Attractive	Medium	High
D - North West Cambridge	This area lies immediately to the north of the Site and encompasses part of the North West Cambridge development which is a large mixed use development that includes residential centres with associated leisure and recreational facilities, to the east of the M11 motorway.	Good	Medium	Medium
E - Madingley	This is a predominantly rural area within the Green Belt with long distance views to the north. The area is characterised by large arable fields divided by hedgerows and small blocks of woodland typical of Cambridgeshire. There are some attractive elements within the LCA including the grounds of Madingley Hall and the orchards between Coton and the M11. The area is centered around the village settlement of Madingley, located on an elevated ridge to the west of Cambridge. The ground falls sharply to the south from the Madingley Road and the only views of the historic city core and the Site within the LCA are afforded from this southern slope Notable features within this area include the American WWII Cemetery which occupies a prominent position on a wooded ridge.	Very Attractive	Medium	High
F - Coton	This area is predominantly rural within the Green Belt and is characterised by an elevated ridge that runs east to west. The area around Coton is characterised by small fields and orchards in a traditional field pattern which is highly attractive and partially comprises the Coton Countryside Reserve. The reserve includes walks in and around the area as well as a prominent viewpoint at Red Meadow Hill that affords elevated views to the north and east towards the Site, the North West Cambridge development and the historic city core. An MOD rifle range is also a key feature within this area where the danger area extends to the north west. The south and east of the LCA is characterised by the large arable fields separated by hedgerows and small blocks of woodland that are typical of Cambridgeshire.	Very Attractive	Medium	High
G - Grantchester	This area is predominantly rural in character, dominated by large arable field patterns separated by blocks of woodland, belts of trees and hedgerows typical of Cambridgeshire. This contrasts with the historic village of Grantchester, located in the south east of the LCA, which has a number of attractive high quality historic buildings. The LCA is shallowly undulating to the south but the majority of the LCA is flat and relatively open affording good views of landmark buildings in the historic city core and the Schlumberger building. The M11 motorway forms a strong western boundary to the LCA running north – south and is a major detractor to both the landscape quality and visual amenity. Noise from motorway traffic detracts from an otherwise tranquil area. This area forms a large part of the Green Belt that surrounds Cambridge to the south.	Good	High	High
H - Haslingfield	This area is predominantly rural in character within the Green Belt and is characterised by large arable fields separated by hedgerows and small blocks of woodland typical of Cambridgeshire. The historic village of Haslingfield is located in the south west and Hauxton in the south east of the LCA. South of Haslingfield, the land rises sharply to Chapel Hill. The views from the top of Chapel Hill provide distant views across to Cambridge at 8.5km to the north and far reaching, expansive views of the wider landscape. The Travelling Radio Telescope to the north of Haslingfield village is a key component of the landscape.	Very Attractive	Medium	Medium
I – High Cross (includes the Site)	This area is characterised by mixed age and mixed use university buildings, including the veterinary college and associated paddocks. The absence of a coherent building approach across the Site with a mix of building ages and styles together with large areas of open space, has created a landscape that lacks focus or unity. Tree planting is limited with shelter belts concentrated on the boundaries of the area.	Ordinary	Low	Low



Site boundary

Local character areas

Regional character area boundaries

RCA 2 - Chalklands

RCA 3 - Western Claylands

National character area boundaries

NCA 87 - East Anglian Chalk

NCA 88 - Bedfordshire and Cambridgeshire Chalklands

0 0.5 1 Kilometre

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Client

University Of Cambridge

Project

West Cambridge Masterplan EIA

Title

Landscape
Local, Regional and National Character Areas
Figure 8.2

Sheet Size	Original Scale	Designed / Drawn	Checked	Authorised
A3	1:31,000	SJD	RJS	DP
		Date 01/06/16	Date 01/06/16	Date 01/06/16

Drawing Number	Rev
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Visual receptors

8.4.8 A number of visual receptors have been identified within the ZTV on Figure 8.2 and include residential properties, PRoW and vehicle users. Representative viewpoint locations assessed in Table 8.11 are included on Figure 8.3 and photo sheets in Appendix 8.2, Volume 3. The viewpoints have been agreed with Cambridge City Council through subsequent correspondence after the scoping stage.

8.4.9 Within the immediate site context the screening vegetation along the western and southern boundaries provide a good level of screening to the immediate surrounding landscape. Further away from the Site this level of screening is reduced as a result of distance and landform. To the west of the Site there are sharp increases in landform with ridges along Madingley Road and Coton Countryside Reserve. There are no direct views towards the Site from the ridge along Madingley Road, however, there are established elevated and wide ranging views from the high ground within the wider confines of the Coton Countryside Reserve located 2km to the south west. These consist of clear views towards the Site with the city centre in the background.

8.4.10 The landform gently undulates to the south of the Site before rising sharply south of Haslingfield, along the top of Chapel Hill which is located 8.5km to the south. There are long distance views across to the Site and Cambridge city in the distance. At this distance the existing buildings are relatively small components of the wider view.

8.4.11 The larger buildings on the Site, such as the Schlumberger building, provide useful reference points when viewing the Site from further afield.

8.4.12 Representative viewpoints relating to visual receptors are described in Table 8.11 and are shown on Figure 8.3.

Table 8.11 Representative viewpoints relating to visual receptors

Visual receptor	Description	Sensitivity
Viewpoint 1 Public viewpoint within the Coton Countryside Reserve	Users of open access land with long distance (1,600m) views of the Site from an elevated position. The Site is set against the urban backdrop of north Cambridge with the North West Cambridge development immediately to the left of the Site in the view.	High
Viewpoint 2 Public Right of Way alongside the western boundary (39/30)	Users of a public right of way with adjacent to the Site. A thick belt of boundary screening vegetation limits views to one location where a gap coincides with an overhead power line.	Medium
Viewpoint 3 Harcamlow Way (39/31a)	Users of a public right of way adjacent to the Site with direct views of the Site where there are gaps in the boundary vegetation	Medium
Viewpoint 4 Wimpole Way (39/31a)	Users of a public right of way adjacent to the Site with direct views of the Site where there are gaps in the boundary vegetation	Medium
Viewpoint 5 Clerk Maxwell Road	Residential receptors living in Perry Court and The Lawns with close distance (50m) filtered views of the Site as a result of existing buildings and vegetation	High
Viewpoint 6 Wilberforce Road	Residential receptor with mid distance (375m) filtered views of the Site as a result of existing buildings and vegetation	High
Viewpoint 7 Dane Drive	Residential receptor with mid distance (720m) filtered views of the Site as a result of existing buildings and vegetation	High
Viewpoint 8 and 9 Conduit Head Road and Madingley Road	Residential receptors with close distance (20m) views of the Site with occasional areas of screening vegetation	High
Viewpoint 10 Public Right of Way to the south of Harcamlow Way (55/9)	Users of a public right of way with close distance (270m) filtered views of the Site through intervening field boundary vegetation	Medium
Viewpoint 11 Madingley Road (West)	Vehicle travellers with no view of the Site due to extensive screening vegetation along the southern boundary of Madingley Road and blocks of woodland on the eastern boundaries of the M11.	Low
Viewpoint 12 Madingley Road (East)	Vehicle travellers with close distance (20m) filtered views of the Site as a result of existing buildings and vegetation.	Medium
Viewpoint 13 Public Right of Way crossing M11 Motorway (55/6) and the M11 Motorway	Vehicle travellers along the M11 Motorway and users of a public right of way with mid distance (900m), elevated views of the Site across open fields, boundary hedgerows, and the screening vegetation along the southern boundary.	Medium
Viewpoint 14 Public Right of Way to the west of Laundry Farm (55/6)	Users of a public right of way with long distance (1,000m) filtered views of the Site across field boundary vegetation	Medium
Viewpoint 15 Grantchester Road	Vehicle travellers with long distance (1,500m) filtered views of the Site as a result of screening vegetation	Low
Viewpoint 16 Barton Road	Vehicle travellers with long distance (1,650m) filtered views of the Site through intervening screening vegetation where gaps exist. Clear views of the Site are available from the roundabout junction at the southern end of the road.	Medium
Viewpoint 17 Cambridge Rugby Football Club	Recreational sports users with long distance (1,900m) filtered views of the Site over intervening screening vegetation. The Site is only visible from the south east corner of the rugby pitch.	Low
Viewpoint 18 Coton Road	Vehicle travellers with long distance (2,300m) filtered views of the Site through intervening vegetation where gaps exist	Medium
Viewpoint 19 Public Right of Way south west of Grantchester (106/6)	Users of a public right of way. Views of the Site are not possible from this location due to the intervening blocks of woodland, field boundary hedgerows and screening vegetation/	Medium
Viewpoint 20 Public Right of Way west of Grantchester (106/5)	Users of a public right of way with long distance (3,200m) filtered views of the Site across field boundary vegetation	Medium
Viewpoint 21 Public Right of Way along the top of Chapel Hill (117/15)	Users of a public right of way with long distance (7,200m) filtered views of the Site from an elevated position. The travelling Radio telescope is a prominent landscape feature within the view.	Medium
Viewpoint 22 Chapel Hill	Vehicle travellers with long distance (7,300m) filtered views of the Site through intervening vegetation where gaps exist	Low
Viewpoint 23 Castle Mound	Public open space with long distance views (1,300m) filtered views of the Site across intervening vegetation and built structures	Medium

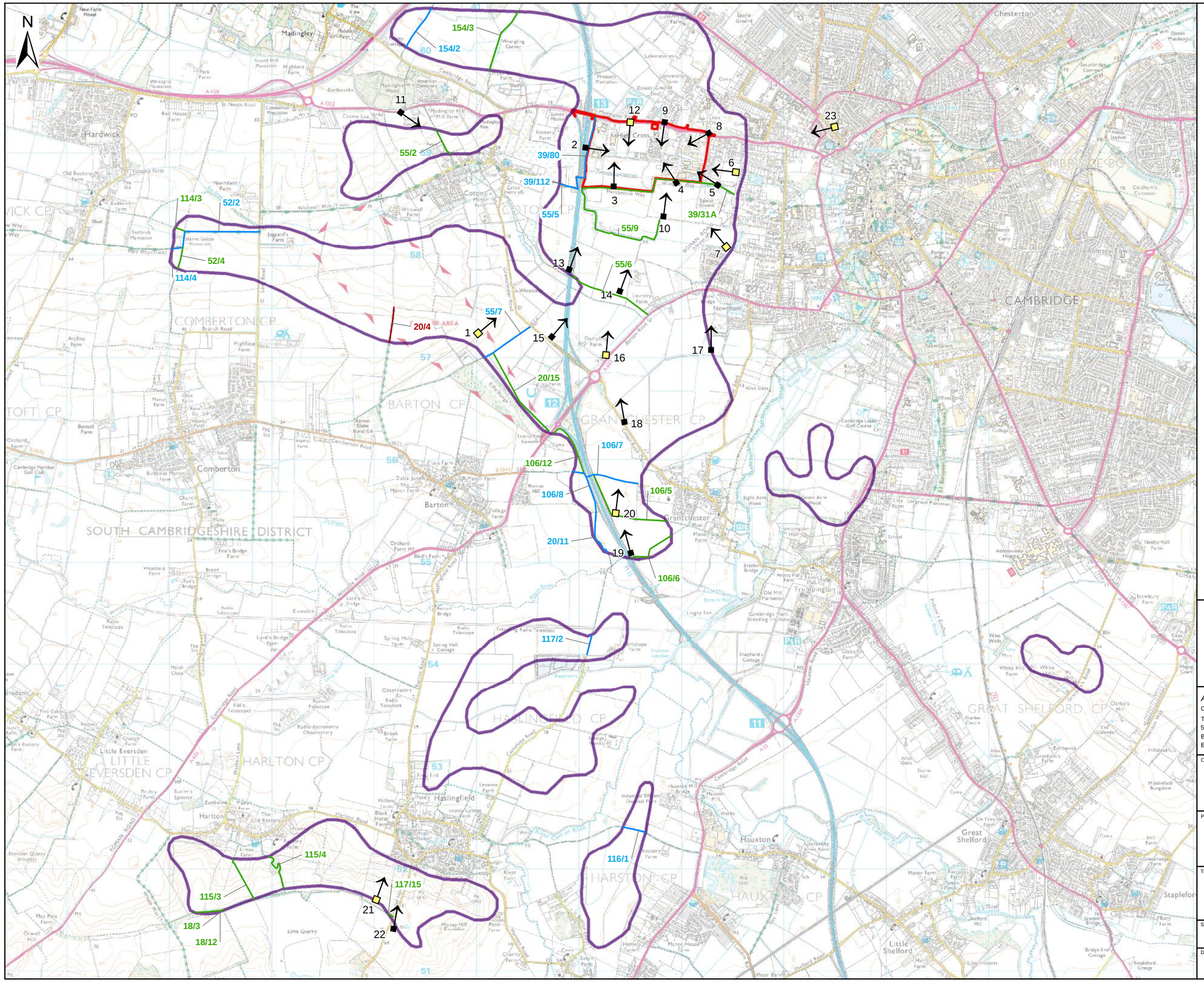
Existing trees and woodland

8.4.13 An arboriculture survey has been undertaken the findings of which are set out in Appendix 8.1, Volume 3. The trees within the Site are predominantly newly planted or young specimens planted within the past 10 years as part of the developments undertaken on Site. These form distinct avenues or formal lines of trees located in areas of public usage or denoting formal access routes. The repetition of species selection and planting structure is indicative of formal planting with distinct lines or avenues being created. The species selection for these formal planting areas is typical for avenue features with Lime and London Plane being the species primarily used. The limited age of these trees reduces their arboricultural value at present, however, over time this will increase with their maturity.

8.4.14 The Site also accommodates concentrations of newly planted or young trees within informal planting located around wildlife features, e.g. water features, and as part of reinforcing screening to views into the Site from all cardinal points. These vegetative screens comprise woodland planting plots with trees and shrubs or groups of individual closely planted trees. The species selection is varied, however, Common Ash, Lime and English Oak dominate the climax tree species composition.

8.4.15 There are individual and groups of more mature trees located within the Site, again forming distinct lines of trees or prominent standard specimens in formal and informal areas. The trees of note are the mature English Oaks forming remnants of old field boundaries in the north and south aspects of the Site; the mature Silver Maples growing around the veterinary school; the prominent avenue of semi to early mature Lime trees leading to these facilities; the veteran Horse Chestnut within one of the north east car parks; and the mature Willow specimens located sporadically around the pond area to the south of the Site. These trees are prominent specimens given their age, size and maturity. Their vitality and structural conditions are varied. However, the majority are in good vitality.

8.4.16 The northern and western boundaries of the Site sustain linear belts of more mature trees and shrubs that provide full or partial screening to views into the Site from these locations. The tree stock is varied in these locations including Ash and Sycamore. However, self-sown Elm trees are prevalent throughout. There are some more mature Elms that have been able to withstand Dutch elm disease to the east of JJ Thompson Avenue, but the majority are limited to young trees that have established from old tree stumps cut back in the past due to poor structural condition.



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Title
Landscape
Visual Receptor Locations
Figure 8.3

Sheet Size	Original Scale	Designed / Drawn	Checked	Authorised
A3	1:35,000	SJD Date 01/06/16	RJS Date 01/06/16	DP Date 01/06/16

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8.5 Impact assessment

Construction phase

8.5.1 Construction phase impacts are assessed in Tables 8.12 and 8.13.

Table 8.12 Construction phase effects on Local Landscape Character Areas

Baseline		Impact assessment				
Landscape character area	**Landscape sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
A – Cambridge Central Core	High	Some construction plant and equipment such as tall cranes may be visible from elevated positions such as the upper floors of publicly accessible buildings within the character area.	• Construction traffic to be confined to designated haul routes away from the city centre. • The use of security lighting during construction will be minimised. Where it is needed Institute of Lighting Engineers guidance[44] will be followed to minimise light spill.	Negligible	The character areas sits outside of the ZTV as the intervening buildings and trees between the character area and the Site will mean that effects to the character area will be limited to a slight change in some limited elevated views. There will be no visual links to key areas of open space within the character area. Construction traffic will not pass through the character area and the Site is too far away for noise or dust to affect it. Overall there will be no effect to the character of this landscape character area.	Neutral **Not significant**
B – Chesterton / North Cambridge	Low	Some construction plant and equipment such as tall cranes may be visible from elevated positions such as Castle Mound and the upper floors of publicly accessible buildings within the character area.	• Construction traffic to be confined to designated haul routes away from the city centre. • The use of security lighting during construction will be minimised. Where it is needed Institute of Lighting Engineers guidance[44] will be followed to minimise light spill.	Negligible	The character areas sits outside of the ZTV as the intervening buildings and trees between the character area and the Site will mean that effects to the character area will be limited to a slight change in some limited elevated views. There will be no visual links to key areas of open space within the character area. Construction traffic will not pass through the character area and the Site is too far away for noise or dust to affect it. Overall there will be no effect to the character of this landscape character area.	Neutral **Not significant**
C – West Cambridge Central Core	High	Some construction plant and equipment such as tall cranes may be visible, disturbance as a result of construction activities and lighting	• Construction traffic to be confined to designated haul routes away from the city centre. • The use of security lighting during construction will be minimised. Where it is needed Institute of Lighting Engineers guidance[44] will be followed to minimise light spill. • Mitigation measures identified in the noise and air quality chapters will minimise dust and construction noise	Low adverse	The western part of the landscape character area is within the ZTV and construction activities will be visible from some open areas such as the St John's College sports pitches. Elevated views of construction activities from some tall buildings such as the library tower will be possible. Construction works will be required to build new buildings on the surface car parking along the eastern boundary of the Site, the park and cycle facility and the site of the existing Cavendish Laboratory. This will impact the relative tranquillity of the part of the LCA closest to the Site between Clerk Maxwell Road and Wilberforce Road, but the majority of the LCA will be unaffected in terms of its character. Construction noise and dust, particularly from the demolition of the existing Cavendish Laboratories, will be effectively mitigated through measures set out in the air quality and noise chapters. Construction works in the east of the Site will be undertaken as part of the first phase of works. This will be a short term and temporary adverse effect and will be minimised through measures.	Slight adverse **Not significant**
D – North West Cambridge	Low	Some views of tall cranes and plant above the intervening vegetation.	None proposed	Negligible	The North West Cambridge landscape character area will be a construction site for most of the duration of the construction phase of the Proposed Development. The landscape character area is visually contained and there is a weak relationship between the landscape character area and the Site. Some views of tall cranes above the intervening vegetation may be possible but this will not impact the character of the landscape character area.	Neutral **Not significant**
E – Madingley	High	Some construction plant and equipment such as tall cranes may be visible from elevated positions such as Madingley Hill within the character area.	• Construction traffic to be confined to designated haul routes away from Madingley Road west of the M11. • The use of security lighting during construction will be minimised. Where it is needed Institute of Lighting Engineers guidance[44] will be followed to minimise light spill.	Negligible	The intervening buildings and trees between the character area and the Site will mean that effects to the character area will be limited to a slight change in some limited elevated views. There will be limited views of cranes and other tall plant from agricultural fields on the southern slopes of Madingley Hill. Construction traffic will not pass through the character area and the Site is too far away for noise or dust to affect it. Overall there will be no effect to the character of this landscape character area.	Neutral **Not significant**

[44] Institute of Lighting Engineers, 2000, Guidance notes for the reduction of light pollution

Baseline		Impact assessment				
Landscape character area	**Landscape sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
F – Coton	High	Construction plant and equipment such as tall cranes will be visible from elevated positions such as Coton Countryside Reserve within the character area. Demolition of buildings and the clearance of vegetation will result in the removal of existing landscape features on Site.	The use of security lighting during construction will be minimised. Where it is needed Institute of Lighting Engineers guidance[44] will be followed to minimise light spill.	Low adverse	For most of the landscape character area north west of Red Meadow Hill only cranes and tall plant will be visible from open areas. All construction activities will be visible from elevated views from Red Meadow Hill across and down onto the Site, for the duration of the construction phase. Construction works will occur for approximately 14 years but not across the entire Site at the same time. Construction will be undertaken in phases on individual plots which will minimise the scale of the effect. Tall cranes and fixed plant will become new landscape features. There will be a semi-permanent adverse effect to the character of the Site.	Moderate adverse **Significant**
G – Grantchester	High	Some construction plant and equipment such as tall cranes may be visible from open positions within the character area.	The use of security lighting during construction will be minimised. Where it is needed Institute of Lighting Engineers guidance[44] will be followed to minimise light spill.	Negligible	Some views of cranes and tall plant will be visible above the boundary vegetation and hedgerows across the landscape character area from most of the agricultural land between the Site and Barton Road and some further areas south of Barton Road. At night there could be an increase in sky glow from construction lighting. This will not result in any effects to the overall character of the landscape character area. Semi-permanent adverse effects will be minimised through measures to cap construction activities and lighting to agreed levels.	Neutral **Not significant**
H – Haslingfield	High	Some construction plant and equipment such as tall cranes may be visible from long distance elevated positions such as Chapel Hill within the character area.	The use of security lighting during construction will be minimised. Where it is needed Institute of Lighting Engineers guidance[44] will be followed to minimise light spill.	Negligible	The long distance between the character area and the Site will mean that effects to the character area will be limited to a slight change in some limited elevated views. This will not result in any effects to the overall character of the landscape character area.	Neutral **Not significant**
I – High Cross (Site of Proposed Development)	Low	Construction works will increase the amount of activity on Site and will result in the introduction of new landscape features including construction compounds and tall cranes. Heavy plant and equipment and construction traffic will be present on Site and will frequently travel along the Site access roads. Levels of noise and dust are likely to increase in those areas where construction is occurring. Security lighting around construction compounds will increase the lighting levels on the Site. Demolition of buildings and the clearance of vegetation will result in the removal of existing landscape features on Site.	• Vegetation on Site that will be retained will be protected from accidental damage during construction by erecting temporary fencing. • The use of security lighting during construction will be minimised. Where it is needed Institute of Lighting Engineers guidance[44] will be followed to minimise light spill. • Mitigation measures identified in the noise and air quality chapters will minimise dust and construction noise	Medium adverse	Construction works will occur for approximately 14 years but not across the entire Site at the same time. Construction will be undertaken in phases on individual plots which will minimise the scale of the effect. The character of those parts of the Site where construction works are undertaken will change from a relatively tranquil business park environment in the east and open areas in the west, to a busy construction site. Tall cranes and fixed plant will become new landscape features. There will be a semi-permanent adverse effect to the character of the Site.	Slight adverse **Not significant**

Table 8.13 Construction phase effects on visual receptors

Baseline		Impact assessment				
Visual receptor	**Sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Viewpoint 1 Public viewpoint within the Coton Countryside Reserve	High	Larger construction activities will be visible from the elevated viewpoint.	• Operation of a clean and tidy construction site, including covering of stockpiles • The use of security lighting during construction will be minimised. Where it is needed Institute of Lighting Engineers guidance[44] will be followed to minimise light spill.	Medium adverse	Larger construction activities would be visible from the viewpoint for the duration of the construction phase. Construction works would occur for approximately 14 years but not across the entire Site at the same time. Construction would be undertaken in phases on individual plots which would minimise the scale of the effect. Tall cranes and fixed plant would become new landscape features. This would be a semi-permanent effect that would last for the entire construction phase	Large adverse **Significant**

Baseline		Impact assessment				
Visual receptor	**Sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Viewpoint 2 Public Right of Way (public right of way) alongside the western boundary (39/30)	Medium	Glimpsed views of construction activities occurring in the western half of the Site through boundary vegetation.	• Operation of a clean and tidy construction site, including covering of stockpiles • Temporary hoarding will be used around all construction compounds and work sites to screen views of construction activities. • The use of security lighting during construction will be minimised. Where it is needed Institute of Lighting Engineers guidance[44] will be followed to minimise light spill.	Low adverse	Users of the public right of way would get glimpsed views through the western boundary screening vegetation of construction activities at the western end of the Site only. These would be more pronounced during winter when the trees are not in leaf. This would be a semi-permanent adverse effect that would last for the duration of construction works at the western end of the Site.	Slight adverse **Not significant**
Viewpoint 3 Harcamlow Way (39/31a)	Medium	Glimpsed views of construction activities occurring in the southern half of the Site through boundary vegetation.	• Operation of a clean and tidy construction site, including covering of stockpiles • Temporary hoarding will be used around all construction compounds and work sites to screen views of construction activities. • The use of security lighting during construction will be minimised. Where it is needed Institute of Lighting Engineers guidance[44] will be followed to minimise light spill.	Low adverse	Users of the public right of way would get glimpsed views through the southern boundary screening vegetation of construction activities at the southern end of the Site only. These would be more pronounced during winter when the trees are not in leaf. This would be a semi-permanent adverse effect that would last for the duration of construction works at the southern end of the Site.	Slight adverse **Not significant**
Viewpoint 4 Wimpole Way	Medium	Glimpsed views of construction activities occurring in the southern half of the Site through boundary vegetation.	• Operation of a clean and tidy construction site, including covering of stockpiles • Temporary hoarding will be used around all construction compounds and work sites to screen views of construction activities. • The use of security lighting during construction will be minimised. Where it is needed Institute of Lighting Engineers guidance[44] will be followed to minimise light spill.	Low adverse	Users of the public right of way would get glimpsed views through the southern boundary screening vegetation of construction activities at the southern end of the Site only. These would be more pronounced during winter when the trees are not in leaf. Gaps in the vegetation near the Broers Building would be limited to works activities for the landscaping and works to re-engineer the canal. More substantial works close to this viewpoint would be the demolition of the existing Cavandish Laboratory but the existing boundary vegetation close to these works would provide substantial screening. This would be a semi-permanent adverse effect that would last for the duration of construction works at the southern end of the Site.	Slight adverse **Not significant**
Viewpoint 5 Clerk Maxwell Road	High	Views of cranes and tall plant from the upper floors of residential properties at The Lawns and Perry Court.	• Operation of a clean and tidy construction site, including covering of stockpiles • The use of security lighting during construction will be minimised. Where it is needed Institute of Lighting Engineers guidance[44] will be followed to minimise light spill. • Vegetation on Site that will be retained will be protected from accidental damage during construction by erecting temporary fencing.	Low adverse	Residents at The Lawns and Perry Court would experience views of cranes and tall plant from the upper floors of the dwellings. Intervening screening on both the west and east sides of Clark Maxwell Road would prevent views from the lower floors. Views are likely to be more pronounced for properties further to the east which would benefit less from screening. Cranes and tall plant associated with construction activities at the eastern end of the Site only would feature in views from the eastern frontages. This would be a semi-permanent adverse effect that would last for the duration of the construction works at the eastern end of the Site.	Moderate adverse **Significant**
Viewpoint 6 Wilberforce Road	High	Views of cranes and tall plant from the upper and lower floors of residential properties along Wilberforce Road.	• Operation of a clean and tidy construction site, including covering of stockpiles • The use of security lighting during construction will be minimised. Where it is needed Institute of Lighting Engineers guidance[44] will be followed to minimise light spill. • Vegetation on Site that will be retained will be protected from accidental damage during construction by erecting temporary fencing.	Medium adverse	Residents of properties along Wilberforce Road opposite the Emmanuel College Recreation Ground would experience views of cranes and tall plant from the upper and lower floors of the dwellings. Cranes and tall plant associated with construction activities at the eastern end of the Site only would feature in views from the eastern frontages. This would be a semi-permanent adverse effect that would last for the duration of the construction works at the eastern end of the Site.	Large adverse **Significant**

Baseline		Impact assessment				
Visual receptor	**Sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Viewpoint 7 Dane Drive	High	Oblique views of construction activities occurring in the southern half of the Site.	• Operation of a clean and tidy construction site, including covering of stockpiles • Temporary hoarding will be used around all construction compounds and work sites to screen views of construction activities. • The use of security lighting during construction will be minimised. Where it is needed Institute of Lighting Engineers guidance[44] will be followed to minimise light spill.	Low adverse	Residents of Dane Drive would have oblique and glimpsed views of construction activities in the southern part of the Site, from their upper storey windows. The impact would be greatest for construction activities occurring in the south eastern corner as construction activities in the south western corner would be less perceptible due to the intervening hedgerows. This would be a semi-permanent adverse effect that would last for the duration of the construction works at the southern end of the Site.	Moderate adverse **Significant**
Viewpoint 8 and 9 Conduit Head Road and Madingley Road	High	Glimpsed views of construction activities occurring in the northern half of the Site.	• Operation of a clean and tidy construction site, including covering of stockpiles • Temporary hoarding will be used around all construction compounds and work sites to screen views of construction activities. • The use of security lighting during construction will be minimised. Where it is needed Institute of Lighting Engineers guidance[44] will be followed to minimise light spill.	Medium adverse	Glimpsed views of the construction activities would be experienced from the southern elevations of the residential properties along Madingley Road opposite the Site. The close proximity of the receptors to the Site is partially offset by the dense vegetation, much of it evergreen, along the northern side of Madingley Road. This would be a semi-permanent adverse effect that would last for the duration of the construction works at the northern end of the Site.	Large adverse **Significant**
Viewpoint 10 Public Right of Way to the south of Harcamlow Way (55/9)	Medium	Glimpsed views of construction activities occurring in the southern half of the Site.	None proposed	Medium adverse	Users of the public right of way would experience glimpsed views of all construction activities along the southern boundary of the Site. Gaps in the intervening hedgerows mean that views of construction activities would be more prominent at localised spots along the footpath. This would be a semi-permanent adverse effect that would last for the duration of the construction works at the southern end of the Site.	Slight adverse **Not significant**
Viewpoint 11 Madingley Road (West)	Low	Views of construction activities occurring in the northern half of the Site from travellers along Madingley Road	None proposed	Negligible	Views of the Site from Madingley Road, west of the M11, are completely screened by the intervening vegetation along the southern boundary of Madingley Road and the blocks of woodland on east and western boundaries of the M11. There would be no effect.	Neutral **Not significant**
Viewpoint 12 Madingley Road (East)	Medium	Close views of construction activities occurring in the northern half of the Site from travellers along Madingley Road	• Operation of a clean and tidy construction site, including covering of stockpiles • Temporary hoarding will be used around all construction compounds and work sites to screen views of construction activities. • The use of security lighting during construction will be minimised. Where it is needed Institute of Lighting Engineers guidance[44] will be followed to minimise light spill.	Low adverse	Frequent views of construction works on the northern half of the Site would be experienced by travellers along Madingley Road. Screening vegetation along the northern boundary of the Site would mean that views would mainly be glimpsed. Views into the Site at the access road junctions would afford clearer views of construction activities but would be brief. This would be a semi-permanent adverse effect that would last for the duration of the construction works at the northern end of the Site.	Slight adverse **Not significant**
Viewpoint 13 Public Right of Way crossing M11 Motorway (55/6)	Medium	Views of construction activities in the southern part of the Site for walkers crossing the pedestrian footbridge crossing the M11 motorway.	None proposed	Low adverse	Views of some construction activities would be limited to cranes and works on the upper storeys of new buildings by walkers using the pedestrian footbridge crossing the M11 Screening vegetation along the southern boundary of the Site and field boundary hedgerows between the Site and the Viewpoint would prevent views of construction activities at ground level. Views of construction activities for motorists travelling along the M11 would be limited to motorists travelling in a northerly direction. Dense screening vegetation along the eastern boundary will prevent views of construction works for motorists travelling south. Dense screening vegetation along the western boundary of the Site would limit views of construction activities for motorists travelling north to long and mid distance views from the South. Here screening vegetation is much sparser and the road slightly elevated from the surrounding fields. This would be a semi-permanent adverse effect that would last for the duration of the construction works at the southern end of the Site.	Slight adverse **Not significant**

Baseline		Impact assessment				
Visual receptor	**Sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Viewpoint 14 Public Right of Way to the west of Laundry Farm (55/6)	Medium	Views of construction activities in the southern part of the Site for users of the public right of way.	None proposed	Low adverse	Mid distance views of construction activities that occur in the southern part of the Site would be experienced by users travelling along the public right of way. Intervening hedgerows would offer some limited screening. Construction activities would be more prominent in views of travellers travelling in a north westerly direction and even then would only be a small element of the overall view. This would be a semi-permanent adverse effect that would last for the duration of the construction works at the southern end of the Site.	Slight adverse **Not significant**
Viewpoint 15 Grantchester Road	Low	Mid distance views of cranes and tall plant for travellers along Grantchester Road.	None proposed	Low adverse	Travellers along Grantchester Road would experience occasional and glimpsed views of cranes and tall plant where there are gaps in the hedgerow along the northern boundary of the road. Views would be limited to the section of the road which passes over the M11 as views of the Site are slightly elevated and screening vegetation absent. This would be a semi-permanent adverse effect that would last for the duration of the construction phase.	Slight adverse **Not significant**
Viewpoint 16 Barton Road	Medium	Mid distance views of cranes and tall plant for travellers along Barton Road.	None proposed	Low	Thick belts of trees and screening vegetation along the northern boundary of Barton Road would prevent views of cranes and tall plant from being experienced by travellers along Barton Road. Filtered long distance views of tall cranes would be experienced for vehicle travellers at the southern end of Barton Road next to the roundabout junction. This would be a semi-permanent adverse effect that would last for the duration of the construction phase.	Slight adverse **Not significant**
Viewpoint 17 Cambridge Rugby Club	Medium	Mid distance views of cranes and tall plant for users of the Cambridge Rugby Club.	None proposed	Negligible	Mid distance views of cranes and tall plant may be possible from some areas of the Cambridge Rugby Club. Distance and intervening vegetation mean that it is unlikely these will be prominent and any effect will be very limited. The clubhouse and spectator seating face east away from the Site. There would be no effect	Neutral **Not significant**
Viewpoint 18 Coton Road	Medium	Mid distance views of cranes and tall plant for travellers along Barton Road.	None proposed	Low adverse	Mid distance views of cranes and tall plant will be experienced by travellers moving north along Coton Road. Intervening vegetation and distance mean these features will not be prominent in views. This would be a semi-permanent adverse effect for the duration of the construction phase.	Slight adverse **Not significant**
Viewpoint 19 Public Right of Way South west of Grantchester (106/6)	Medium	Long distance views of cranes and tall plant for users of the public right of way.	None proposed	Low adverse	Long distance views of cranes and tall plant will be experienced by users of the public right of way. Due to the intervening distance these will not be prominent features in the views of the public right of way users. This would be a temporary adverse effect for the duration of the construction phase.	Slight adverse **Not significant**
Viewpoint 20 Public Right of Way west of Grantchester (106/5)	Medium	Long distance views of cranes and tall plant for users of the public right of way.	None proposed	Low adverse	Long distance views of cranes and tall plant will be experienced by users of the public right of way. Due to the intervening distance these will not be prominent features in the views of the public right of way users. This would be a semi-permanent adverse effect for the duration of the construction phase.	Slight adverse **Not significant**
Viewpoint 21 Public Right of Way along the top of Chapel Hill (117/15)	Medium	Long distance views of cranes and tall plant for users of the public right of way.	None proposed	Negligible	Long distance views of cranes and tall plant will be experienced by users of the public right of way. Due to the intervening distance, cranes and tall plant would be barely perceptible on clear days within views from the public right of way. There would be no effect.	Neutral **Not significant**
Viewpoint 22 Chapel Hill	Low	Long distance views of cranes and tall plant for travellers along Chapel Hill	None proposed	Negligible	Long distance views of cranes and tall plant will be experienced by travellers moving north along Chapel Hill. Due to the intervening distance, cranes and tall plant would be barely perceptible on clear days within views from the public right of way. There would be no effect.	Neutral **Not significant**
Viewpoint 23 Castle Mound	Medium	Mid distance views of cranes and tall plant for users of the public open space.	None proposed	Low adverse	Mid distance views of cranes and tall plant may be visible as new features of the skyline in views from Castle Mount. Due to intervening vegetation and buildings they would not be prominent additions to the skyline. This would be a semi-permanent adverse effect for the duration of the construction phase.	Slight adverse **Not significant**

Operational phase

8.5.2 The operational phase assessment, considers the environment at year 1 and 15 following opening to assess the changes in effects associated with growth of the existing vegetation. Operational phase impacts are assessed in Tables 8.14 and 8.15. Visualisations of the parameter plans, which represent the maximum extent that buildings could be constructed to, from eight viewpoints are shown in Appendix 8.3, Volume 3.

Table 8.14 Operational phase effects on landscape character areas

Baseline		**Impact assessment**				
Landscape character area	**Landscape sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
A – Cambridge Central Core	High	Some distant glimpsed views of the tops of new buildings, rooftop plant and the energy centre flue will be possible from elevated areas within the landscape character area.	None proposed	Opening year – Negligible Year 15 – Negligible	The distant glimpsed views from elevated areas such as the Great St Mary's Church tower of the tops of the new buildings, roof top plant, and the energy centre flue, will not affect the landscape character area which will retain its vibrant historic character. The landscape character area is outside the ZTV and the Proposed Development will not be perceptible from the open spaces. There will be no effect.	Opening year – Neutral **Not significant** Year 15 – Neutral **Not significant**
B – Chesterton / North Cambridge	Low	Some distant glimpsed views of the tops of new buildings, rooftop plant and the energy centre flue will be possible from elevated areas and western edge within the landscape character area.	None proposed	Opening year – Negligible Year 15 – Negligible	Distant glimpsed views of the new buildings, roof top plant, and the energy centre flue from elevated areas such as the Castle Mount will not affect the character of the landscape character area. The landscape character area is outside the ZTV and the Proposed Development will not be perceptible from the open spaces. There will be no effect.	Opening year – Neutral **Not significant** Year 15 – Neutral **Not significant**
C – West Cambridge Central Core	High	New buildings will be constructed close to the eastern boundary of the Site adjacent to the landscape character area.	• Additional height restrictions to buildings facing onto the eastern boundary. • Building frontages longer than 60m facing Madingley Road and the eastern boundary should be broken down through variation in design; • Gaps between building frontages facing Madingley Road and the eastern boundary should be a minimum of 15m; • Building frontages facing Madingley Road and the eastern boundary must have a high quality architectural treatment or additional woodland screening; • Variation in roofline along Madingley Road and the eastern boundary; • Service areas and development 'backs' visible from Madingley Road and Clerk Maxwell Road must be screened by additional planting; • The existing woodland buffer along the northern boundary must be maintained and reinforced to ensure it is effective in maintaining the character of Madingley Road; • The greenery of the woodland buffer along the Madingley Road shall be extended southwards to West Green by adding planting to this part of the Site; • The existing woodland buffer along the eastern boundary must be maintained and reinforced to ensure a green edge to the new development; • Any gaps between frontages facing the eastern boundary should be appropriately planted, ensuring that some individual trees can grow to maturity; • Visibility to the development from Clerk Maxwell Road must be minimised and development should be set within the existing eastern woodland edge; and • Rooftop plant should be set back from the eastern building edge and screened.	Opening year – Medium adverse Year 15 – Low adverse	The western part of the landscape character area is within the ZTV and new buildings constructed up to the eastern boundary of the Site will be visible from some open areas such as the St John's College sports pitches. Elevated views from some tall buildings such as the University Library tower will experience new buildings which will give the sense of a denser form of urban development to the west of the landscape character area. As screening vegetation along the eastern boundary grows and matures together with existing screening vegetation, views of the new buildings will diminish. It is only the western portion of the landscape character area that will be affected. This will be a permanent adverse effect.	Opening year – Large adverse **Significant** Year 15 – Moderate adverse **Significant**

Baseline		Impact assessment				
Landscape character area	**Landscape sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
D – North West Cambridge	Low	Densification of the Site. The tops of new buildings, roof top plant and the energy centre flue could all be visible from the landscape character area	• Building frontages longer than 60m facing Madingley Road should be broken down through variation in design; • Gaps between building frontages facing Madingley Road should be a minimum of 15m; • Building frontages facing the Madingley Road must have a high quality architectural treatment or additional woodland screening; • Variation in roofline along Madingley Road; • Service areas and development 'backs' visible from Madingley Road must be screened by additional planting; • The existing woodland buffer along the northern boundary must be maintained and reinforced to ensure it is effective in maintaining the character of Madingley Road; • The greenery of the woodland buffer along the Madingley Road shall be extended southwards to West Green by adding planting to this part of the Site; and • Rooftop plant should be set back from the eastern building edge and screened.	Opening year – Low adverse Year 15 – Low adverse	The denser urban development of the Site will result in an increase in urbanisation to the immediate south of the landscape character area which will reduce its 'city-edge character by removing the buffer to the open countryside to the south. Views of the tops of the new buildings, rooftop plant and the energy centre flue will not adversely change the character of the landscape character area. This will be a permanent adverse effect.	Opening year – Slight adverse **Not significant** Year 15 – Slight adverse **Not significant**
E – Madingley	High	Densification of the Site. The tops of new buildings, roof top plant and the energy centre flue could all be visible from the landscape character area	• Frontages longer than 70m should be broken down by variation in build-to line and/or height and roofscape; • Landscaped gaps may be used to break frontage lengths. Any new gaps should be a minimum of 20m for buildings facing the western boundary from building face to building face; • Visibility to the development from the west must be minimised and development should be set within the existing woodland edge along the western boundary; • Vertical planting should be considered to soften development edges and boundaries; • Service areas, multi storey car parks and development 'backs' facing the western boundary must be screened by the existing woodland buffer (reinforced where necessary) and/or additional planting; • Any multi-storey car parking structures along the western frontage must be appropriately and sensitively designed to ensure interest and variation in building line and roof line; • The existing woodland buffer along the western boundary must be maintained to provide screening from the M11 and form a green edge to the new development; • The greenery of the western woodland buffer shall be extended eastwards to Ada Lovelace Road by adding planting to this part of the Site; • Additional landscape and planting at the western boundary must relate to the rural and agricultural landscape to the west; and • Rooftop plant should be screened and/or grouped to avoid visual clutter in distant views.	Opening year – Low adverse Year 15 – Low adverse	The Proposed Development will result in an increase in urbanisation at the Site affecting the landscape character area to the west. The higher quality areas of the landscape character area are located between the Site, Coton, and Madingley and include a part of the Coton Countryside Reserve. These higher quality areas are visually contained and located outside of the ZTV. They are not tranquil due to traffic noise from the adjacent M11 and will not be affected by the Proposed Development. An area of open agricultural fields south of Madingley Road are less visually contained and are located within the ZTV. In this part of the landscape character area the Proposed Development will have an encroaching urbanising effect although this is partially offset by the M11 which acts as a barrier between the city and the landscape character area. Screening vegetation along the M11 corridor is already established and unlikely to grow much taller. This will be a permanent adverse effect.	Opening year – Moderate adverse **Significant** Year 15 – Moderate adverse **Significant**

Baseline		Impact assessment				
Landscape character area	**Landscape sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
.F – Coton	High	Densification of the Site. The new buildings, roof top plant and the energy centre flue could all be visible from the landscape character area	• Additional height restrictions apply to the northern and southern frontages of the Southern Ecological Corridor. The aim of these restrictions is to form a coherent frontage to the space but allow for variation and interest in response to long distance views from the south; • Building frontages longer than 60m facing onto the southern boundary, or more than 70m facing onto the western boundary should be broken down by variation in build-to line and/or height and roofscape; • Any visible frontages facing onto the southern boundary must have a high quality architectural treatment. Alternatively or in addition, the woodland buffer shall be reinforced to limit visibility into the Site; • Landscaped gaps may be used to break frontage lengths. Any new gaps should be a minimum of 20m for buildings facing the western boundary, and 25m for buildings facing the southern boundary from building face to building face; • A variable and interesting roofline should be formed the southern development edge; • Service areas and service yards must be located away from the Southern edge and set within new development; • Visibility to the development from the west must be minimised and development should be set within the existing woodland edge along the western boundary; • Vertical planting should be considered to soften development edges and boundaries; • Service areas, multi storey car parks and development 'backs' facing the western boundary must be screened by the existing woodland buffer (reinforced where necessary) and/or additional planting; • No multi storey car parking should be located along the southern edge, unless set behind a woodland buffer; • Any multi-storey car parking structures along the western frontage must be appropriately and sensitively designed to ensure interest and variation in building line and roof line; • The existing woodland buffer along the western boundary must be maintained to provide screening from the M11 and form a green edge to the new development; • The greenery of the western woodland buffer shall be extended eastwards to Ada Lovelace Road by adding planting to this part of the Site; • Additional landscape and planting at the western boundary must relate to the rural and agricultural landscape to the west; • There must be effective screening of all rooftop plant, when viewed from the south and this built element should contribute to the composition of a varied skyline; • Rooftop plant must be set back from the southern development edge; and • Rooftop plant should be screened and/or grouped to avoid visual clutter in distant views.	Opening year – High adverse Year 15 – Medium adverse	The landscape character area has poor visual containment and much of it is within the ZTV. Red Meadow Hill, including parts of the Coton Countryside Reserve, in particular command clear and elevated views across the Site where the Proposed Development will be clearly visible. The Proposed Development will result in the encroachment of the city and an urbanising effect on this rural landscape character area although this is partially offset by the M11 which acts as a barrier between the city and the landscape character area. Screening vegetation along the M11 corridor is already established and unlikely to grow much taller. This will be a permanent adverse effect.	Opening year – Large adverse **Significant** Year 15 – Large adverse **Significant**

Baseline		Impact assessment				
Landscape character area	**Landscape sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
G – Grantchester	High	Densification of the Site. The new buildings, roof top plant and the energy centre flue could all be visible from the landscape character area	• Additional height restrictions apply to the northern and southern frontages of the Southern Ecological Corridor. The aim of these restrictions is to form a coherent frontage to the space but allow for variation and interest in response to long distance views from the south; • Building frontages longer than 60m facing onto the southern boundary should be broken down by variation in build-to line and/or height and roofscape; • Any visible frontages facing onto the southern boundary must have a high quality architectural treatment. Alternatively or in addition, the woodland buffer shall be reinforced to limit visibility into the Site; • Landscaped gaps may be used to break frontage lengths. Any new gaps should be a minimum of 25m for buildings facing the southern boundary from building face to building face; • A variable and interesting roofline should be formed the southern development edge; • Service areas and service yards must be located away from the Southern edge and set within new development; • Vertical planting should be considered to soften development edges and boundaries; • New planting must relate to the landscape, must be used to help soften the urban edge: any new setbacks and gaps between frontages should be appropriately planted with trees and greenscape, ensuring that some individual trees can grow to maturity; • No multi storey car parking should be located along the southern edge, unless set behind a woodland buffer; • There must be effective screening of all rooftop plant, when viewed from the south and this built element should contribute to the composition of a varied skyline; • Rooftop plant must be set back from the southern development edge; and • Rooftop plant should be screened and/or grouped to avoid visual clutter in distant views.	Opening year – Medium adverse Year 15 – Medium adverse	This landscape character area has a strong relationship with the Site and much of it is within the ZTV particularly the area north of Barton Road. South of Barton Road, blocks of woodland and hedgerows in addition to the increased distance result in a weaker relationship with the Site. The Proposed Development will result in large institutional buildings continuing along the southern boundary. This will create an abrupt edge between the urban townscape and the open countryside resulting in an urbanising effect on the landscape character area. The line of buildings will be broken up by the green corridor running north-south through the Proposed Development and terminating at the west forum. Reinforcement of the screening planting along the southern boundary will soften the effect once established This will be a permanent adverse effect	Opening year – Large adverse **Significant** Year 15 – Large adverse **Significant**
H – Haslingfield	High	Densification of the Site. The new buildings, roof top plant and the energy centre flue could all be visible from the landscape character area	• Additional height restrictions apply to the northern and southern frontages of the Southern Ecological Corridor. The aim of these restrictions is to form a coherent frontage to the space but allow for variation and interest in response to long distance views from the south; • Building frontages longer than 60m facing onto the southern boundary should be broken down by variation in build-to line and/or height and roofscape; • Any visible frontages facing onto the southern boundary must have a high quality architectural treatment. Alternatively or in addition, the woodland buffer shall be reinforced to limit visibility into the Site; • Landscaped gaps may be used to break frontage lengths. Any new gaps should be a minimum of 25m for buildings facing the southern boundary from building face to building face; • A variable and interesting roofline should be formed the southern development edge; • Service areas and service yards must be located away from the Southern edge and set within new development; • Vertical planting should be considered to soften development edges and boundaries; • New planting must relate to the landscape, must be used to help soften the urban edge: any new setbacks and gaps between frontages should be appropriately planted with trees and greenscape, ensuring that some individual trees can grow to maturity; • No multi storey car parking should be located along the southern edge, unless set behind a woodland buffer; • There must be effective screening of all rooftop plant, when viewed from the south and this built element should contribute to the composition of a varied skyline; • Rooftop plant must be set back from the southern development edge; and • Rooftop plant should be screened and/or grouped to avoid visual clutter in distant views.	Opening year – Negligible Year 15 – Negligible	The landscape character area has a weak relationship with the Site due to the large intervening distance between them. Other distinct landscape features including the travelling radio telescope blocks of woodland and communities such as Haslingfield exert a much greater influence on the character of the landscape character area than the Site. The southern edge of the Proposed Development will be visible in the distance from elevated areas in the landscape character area, such as Chapel Hill, on clear days but will not break the skyline and will be barely perceptible. There will be no effect on the character of the landscape character area.	Opening year – Neutral **Not significant** Year 15 – Neutral **Not significant**

Baseline		Impact assessment				
Landscape character area	**Landscape sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
I – High Cross (Site of Proposed Development)	Low	The Proposed Development will increase the amount of built development on Site, particularly at the western end of the Site where undeveloped plots will become developed. There will be a large increase in occupants on the Site which will include commercial, academic and service and maintenance staff, and students which will increase the vitality of the Site. Built development will be coherent with active frontages to high quality, integrated and publicly accessible open spaces.	• Existing trees must be maintained where possible and major feature trees shall be added at key locations; and • The best trees on Site, due to their condition, prominence, or contribution to the landscape are to be retained as set out in Table 3.3, Chapter 3.	Opening year – low adverse Year 15 – low beneficial	There is a general lack of vitality of the Site particularly at the western half which has not yet been developed in accordance with the existing planning permission and is dominated by large empty plots. The Proposed Development, will transform the Site into a bustling and vibrant campus. The building design will be of high quality with active frontages facing onto integrated publicly accessible open spaces. New planting associated with the landscape design will be immature at the opening year which will result in hardscaped areas and new built form giving rise to a starker character than at present. This will be a temporary adverse effect As the planting associated with the landscape design matures, the hardscaped areas and built form will soften and better reflect the surrounding leafy peri-urban environment. This will be a permanent beneficial effect.	Opening year – Slight adverse **Not significant** Year 15 – Slight beneficial **Not significant**

Table 8.15 Operational phase effects on visual receptors

Baseline		Impact assessment				
Visual receptor	**Sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Viewpoint 1 Public viewpoint within the Coton Countryside Reserve	High	The Proposed Development would form a prominent consolidated alignment to the settlement edge with infill development within the existing view of the Site. This view is a key viewpoint that is highlighted in the Cambridge Skyline document and as a result of its geography will result in a change to visual perception of the users. External lighting and lighting from windows would contribute to sky glow.	• Additional height restrictions apply to the northern and southern frontages of the Southern Ecological Corridor. The aim of these restrictions is to form a coherent frontage to the space but allow for variation and interest in response to long distance views from the south; • Building frontages longer than 60m facing onto the southern boundary, or more than 70m facing onto the western boundary should be broken down by variation in build-to line and/or height and roofscape; • Any visible frontages facing onto the southern boundary must have a high quality architectural treatment. Alternatively or in addition, the woodland buffer shall be reinforced to limit visibility into the Site; • Landscaped gaps may be used to break frontage lengths. Any new gaps should be a minimum of 20m for buildings facing the western boundary, and 25m for buildings facing the southern boundary from building face to building face; • A variable and interesting roofline should be formed the southern development edge; • Service areas and service yards must be located away from the Southern edge and set within new development; • Visibility to the development from the west must be minimised and development should be set within the existing woodland edge along the western boundary; • Vertical planting should be considered to soften development edges and boundaries; • Service areas, multi storey car parks and development 'backs' facing the western boundary must be screened by the existing woodland buffer (reinforced where necessary) and/or additional planting; • No multi storey car parking should be located along the southern edge, unless set behind a woodland buffer; • Any multi-storey car parking structures along the western frontage must be appropriately and sensitively designed to ensure interest and variation in building line and roof line; • The existing woodland buffer along the western boundary must be maintained to provide screening from the M11 and form a green edge to the new development; • The greenery of the western woodland buffer shall be extended eastwards to Ada Lovelace Road by adding planting to this part of the Site; • Additional landscape and planting at the western boundary must relate to the rural and agricultural landscape to the west; • There must be effective screening of all rooftop plant, when viewed from the south and this built element should contribute to the composition of a varied skyline; • Rooftop plant must be set back from the southern development edge; and • Rooftop plant should be screened and/or grouped to avoid visual clutter in distant views.	Opening year – High adverse Year 15 – High adverse	Views from the elevated vantage point will look into the Proposed Development seen with the historic city core in the background. The Proposed Development would include the introduction of new built forms within an existing view that contains a mixture of built forms, seen from a medium distance. These new buildings would be located on the south western and southern portion of the Site. The proposed building heights and massing will create a change of view from this receptor increasing the visible built form and extend the urbanisation of the settlement edge towards the viewpoint. Light spill/sky glow will impact upon visual amenity of the receptor particularly seen within the foreground of the wider city skyline. Mitigating the control of lighting, in particular the spread to surrounding areas, will help to reduce the impact at night. Through the use of vegetation and building treatments the longer term effects will be reduced. This would be a permanent adverse effect.	Opening year – Large adverse **Significant** Year 15 – Large adverse **Significant**

Baseline		Impact assessment				
Visual receptor	**Sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Viewpoint 2 Public Right of Way alongside the western boundary (39/30) and adjacent to the M11.	Medium	The Proposed Development would result in new buildings close to the western boundary adjacent to the public right of way. External lighting and lighting from windows on the western facades of the buildings would result in light spill and contribute to sky glow.	• Frontages longer than 70m should be broken down by variation in build-to line and/or height and roofscape; • Landscaped gaps may be used to break frontage lengths. Any new gaps should be a minimum of 20m for buildings facing the western boundary from building face to building face; • Visibility to the development from the west must be minimised and development should be set within the existing woodland edge along the western boundary; • Vertical planting should be considered to soften development edges and boundaries; • Service areas, multi storey car parks and development 'backs' facing the western boundary must be screened by the existing woodland buffer (reinforced where necessary) and/or additional planting; • Any multi-storey car parking structures along the western frontage must be appropriately and sensitively designed to ensure interest and variation in building line and roof line; • The existing woodland buffer along the western boundary must be maintained to provide screening from the M11 and form a green edge to the new development; • The greenery of the western woodland buffer shall be extended eastwards to Ada Lovelace Road by adding planting to this part of the Site; • Additional landscape and planting at the western boundary must relate to the rural and agricultural landscape to the west; and • Rooftop plant should be screened and/or grouped to avoid visual clutter in distant views.	Opening year – Low adverse Year 15 – Low adverse	Due to the presence of a thick dense belt of vegetation along the western boundary, there is only a single view into the Site from the public right of way through a gap which coincides with an overhead power line. The Proposed Development would include the introduction of new built forms into part of the existing view. The proposed buildings will intensify the present development along the western edge of the Site changing the view. Light spill/sky glow will impact upon the visual amenity of the receptor. Mitigating the control of lighting particularly any light spill from the Site onto the public right of way will reduce the effects at night. Through the use of additional vegetation and building treatments the longer term effects will be reduced. This would be a permanent adverse effect.	Opening year – Slight adverse **Not significant** Year 15 – Slight adverse **Not significant**
Viewpoint 3 Harcamlow Way (39/31a)	Medium	The Proposed Development would result in new buildings close to the southern boundary of the Site adjacent to the public right of way. External lighting and lighting from windows on the southern facades of the buildings would result in light spill and contribute to sky glow	• Additional height restrictions apply to the northern and southern frontages of the Southern Ecological Corridor. The aim of these restrictions is to form a coherent frontage to the space but allow for variation and interest in response to long distance views from the south; • Building frontages longer than 60m facing onto the southern boundary should be broken down by variation in build-to line and/or height and roofscape; • Any visible frontages facing onto the southern boundary must have a high quality architectural treatment. Alternatively or in addition, the woodland buffer shall be reinforced to limit visibility into the Site; • Landscaped gaps may be used to break frontage lengths. Any new gaps should be a minimum of 25m for buildings facing the southern boundary from building face to building face; • A variable and interesting roofline should be formed the southern development edge; • Service areas and service yards must be located away from the Southern edge and set within new development; • Vertical planting should be considered to soften development edges and boundaries; • New planting must relate to the landscape, must be used to help soften the urban edge: any new setbacks and gaps between frontages should be appropriately planted with trees and greenscape, ensuring that some individual trees can grow to maturity; • No multi storey car parking should be located along the southern edge, unless set behind a woodland buffer; • There must be effective screening of all rooftop plant, when viewed from the south and this built element should contribute to the composition of a varied skyline; • Rooftop plant must be set back from the southern development edge; and • Rooftop plant should be screened and/or grouped to avoid visual clutter in distant views.	Opening year – High adverse Year 15 – Medium adverse	The Proposed Development would introduce new buildings along the southern boundary adjacent to the public right of way resulting in short distance views of the new built form. This will create a change of view from this receptor increasing the feeling of urbanisation. Light spill/sky glow will impact upon the visual amenity of the receptor. Mitigating the control of lighting particularly any light spill from the Site onto the public right of way will reduce the effects at night. Reinforcing the existing screening vegetation and setting back buildings from the edge of the Site would help to soften views. The effects would lessen over time as new planting matures and establishes. This would be a permanent adverse effect.	Opening year – Moderate adverse **Significant** Year 15 – Slight adverse **Not significant**
Viewpoint 4 Wimpole Way (39/31a)	Medium	The Proposed Development would result in new buildings close to the southern boundary of the Site adjacent to the public right of way. External lighting and lighting from windows on the southern facades of the buildings would result in light spill and contribute to sky glow		Opening year – Medium adverse Year 15 – Medium adverse	The Proposed Development would introduce new buildings along the southern boundary adjacent to the public right of way resulting in short distance views of the new built form. This will create a change of view from this receptor increasing the feeling of urbanisation. Light spill/sky glow will impact upon the visual amenity of the receptor. Mitigating the control of lighting particularly any light spill from the Site onto the public right of way will reduce the effects at night. Reinforcing the existing screening vegetation and setting back buildings from the edge of the Site would help to soften views. The effects would lessen over time as new planting matures and establishes. This would be a permanent adverse effect.	Opening year – Moderate adverse **Significant** Year 15 – Slight adverse **Not significant**

Baseline		Impact assessment				
Visual receptor	**Sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Viewpoint 5 Clerk Maxwell Road	High	The Proposed Development would result in new buildings close to the eastern boundary of the Site adjacent to the public right of way. External lighting and lighting from windows on the eastern facades of the buildings would result in light spill and contribute to sky glow	• Additional height restrictions to buildings facing onto the eastern boundary; • Building frontages longer than 60m facing the eastern boundary should be broken down through variation in design; • Gaps between building frontages facing the eastern boundary should be a minimum of 15m; • Building frontages facing the eastern boundary must have a high quality architectural treatment or additional woodland screening; • Variation in roofline along the eastern boundary; • Service areas and development 'backs' visible from Clerk Maxwell Road must be screened by additional planting; • The existing woodland buffer along the eastern boundary must be maintained and reinforced to ensure a green edge to the new development; • Any gaps between frontages facing the eastern boundary should be appropriately planted, ensuring that some individual trees can grow to maturity; • Visibility to the development from Clerk Maxwell Road must be minimised and development should be set within the existing eastern woodland edge; • Rooftop plant should be set back from the eastern building edge and screened; and • Additional height restrictions to buildings facing onto the eastern boundary.	Opening year – Low adverse Year 15 – Low adverse	Views of the Site from residential receptors off Clark Maxwell Road at the Lawns and Perry Court are extremely limited due to the presence of thick belts of screening vegetation on either side of the road. Views of the new built form would only from upper storey windows. The Proposed Development would result in new buildings being constructed closer to the eastern boundary of the Site. The existing screening vegetation and the proposed mitigation would ensure that changes to views from the residential properties are limited to glimpses of roof tops, at the year of opening. As the screening vegetation further matures views of the new built form will reduce further. Light spill could result from the new buildings onto Clark Maxwell Road. Mitigation to control light spill from external lighting will reduce effects on the views of residential receptors at night time. This would be a permanent adverse effect.	Opening year – Moderate adverse **Significant** Year 15 – Slight adverse **Significant**
Viewpoint 6 Wilberforce Road	High	The Proposed Development would result in new buildings close to the eastern boundary of the Site adjacent to the public right of way. External lighting and lighting from windows would contribute to sky glow		Opening year – Medium adverse Year 15 – Medium adverse	The Proposed Development would introduce new built forms up to the eastern boundary of the Site. Residents of properties along Wilberforce Road, opposite the Emmanuel College Recreation Ground, would experience this new built form in views that contain a contrasting scale of built forms with open space and residential buildings in the foreground and the new taller buildings beyond. The existing screening vegetation and the proposed mitigation would ensure that changes to views from the residential properties are limited to glimpses of the upper storeys and rooftops, at the year of opening between gaps in the existing mature screening vegetation. As the screening vegetation further matures views of the new built form will reduce further. Mitigation to control light spill from external lighting will reduce the effects of sky glow on the views of residential receptors at night time. This would be a permanent adverse effect.	Opening year – Moderate adverse **Significant** Year 15 – Moderate adverse **Significant**

Baseline		Impact assessment				
Visual receptor	**Sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Viewpoint 7 Dane Drive	High	The Proposed Development would result in new buildings close to the southern boundary of the Site. External lighting and lighting from windows would contribute to sky glow	• Additional height restrictions apply to the northern and southern frontages of the Southern Ecological Corridor. The aim of these restrictions is to form a coherent frontage to the space but allow for variation and interest in response to long distance views from the south; • Building frontages longer than 60m facing onto the southern boundary should be broken down by variation in build-to line and/or height and roofscape; • Any visible frontages facing onto the southern boundary must have a high quality architectural treatment. Alternatively or in addition, the woodland buffer shall be reinforced to limit visibility into the Site; • Landscaped gaps may be used to break frontage lengths. Any new gaps should be a minimum of 25m for buildings facing the southern boundary from building face to building face; • A variable and interesting roofline should be formed the southern development edge; • Service areas and service yards must be located away from the Southern edge and set within new development; • Vertical planting should be considered to soften development edges and boundaries; • New planting must relate to the landscape, must be used to help soften the urban edge: any new setbacks and gaps between frontages should be appropriately planted with trees and greenscape, ensuring that some individual trees can grow to maturity; • No multi storey car parking should be located along the southern edge, unless set behind a woodland buffer; • There must be effective screening of all rooftop plant, when viewed from the south and this built element should contribute to the composition of a varied skyline; • Rooftop plant must be set back from the southern development edge; and • Rooftop plant should be screened and/or grouped to avoid visual clutter in distant views.	Opening year – Medium adverse Year 15 – Medium adverse	The Proposed Development would introduce new built forms into a view that contains open space in the foreground and a mixture of existing built forms concentrated at the southern and south eastern portion of the Site. Residents would glimpsed views of the Proposed Development from rearward facing windows in the upper storeys of their houses. The new buildings along the southern boundary will intensify the level of development with increased massing resulting in an abrupt urban edge that will change the view from this residential receptor. Mitigation to control light spill from external lighting will reduce the effects of sky glow on the views from the viewpoint at night time. Through the use of vegetation and building treatments the longer term effects will be reduced. This would be a permanent adverse effect.	Opening year – Large adverse **Significant** Year 15 – Large adverse **Significant**
Viewpoint 8 and 9 Conduit Head Road and Madingley Road	High	The Proposed Development would result in new buildings close to the northern boundary of the Site. External lighting and lighting from windows would contribute to sky glow	• Building frontages longer than 60m facing Madingley Road should be broken down through variation in design; • Gaps between building frontages facing Madingley Road should be a minimum of 15m; • Building frontages facing the Madingley Road must have a high quality architectural treatment or additional woodland screening; • Variation in roofline along Madingley Road; • Service areas and development 'backs' visible from Madingley Road must be screened by additional planting; • The existing woodland buffer along the northern boundary must be maintained and reinforced to ensure it is effective in maintaining the character of Madingley Road; and • Rooftop plant should be set back from the eastern building edge and screened.	Opening year – Medium adverse Year 15 – Medium adverse	The Proposed Development would result in new buildings along the northern boundary of the Site adjacent to Madingley Road. The new buildings will result in a substantial change in views from this receptor increasing the feeling of urbanisation. The building lines would be brought closer to the road corridor increasing the urbanisation effect. Mitigation to control light spill from external lighting will reduce the effects of sky glow on the views from the residential receptors at night time. Through the use of vegetation and building treatments the longer term effects will be reduced. This would be a permanent adverse effect.	Opening year – Large adverse **Significant** Year 15 – Moderate adverse **Significant**

Baseline		Impact assessment				
Visual receptor	**Sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Viewpoint 10 Public Right of Way to the south of Harcamlow Way (55/9)	Medium	The Proposed Development would result in new buildings close to the southern boundary of the Site. External lighting and lighting from windows would contribute to sky glow	• Additional height restrictions apply to the northern and southern frontages of the Southern Ecological Corridor. The aim of these restrictions is to form a coherent frontage to the space but allow for variation and interest in response to long distance views from the south; • Building frontages longer than 60m facing onto the southern boundary should be broken down by variation in build-to line and/or height and roofscape; • Any visible frontages facing onto the southern boundary must have a high quality architectural treatment. Alternatively or in addition, the woodland buffer shall be reinforced to limit visibility into the Site; • Landscaped gaps may be used to break frontage lengths. Any new gaps should be a minimum of 25m for buildings facing the southern boundary from building face to building face; • A variable and interesting roofline should be formed the southern development edge; • Service areas and service yards must be located away from the Southern edge and set within new development; • Vertical planting should be considered to soften development edges and boundaries; • New planting must relate to the landscape, must be used to help soften the urban edge: any new setbacks and gaps between frontages should be appropriately planted with trees and greenscape, ensuring that some individual trees can grow to maturity; • No multi storey car parking should be located along the southern edge, unless set behind a woodland buffer; • There must be effective screening of all rooftop plant, when viewed from the south and this built element should contribute to the composition of a varied skyline; • Rooftop plant must be set back from the southern development edge; and • Rooftop plant should be screened and/or grouped to avoid visual clutter in distant views.	Opening year – High adverse Year 15 – Medium adverse	The Proposed Development would introduce new built forms into a view that contains open agricultural fields in the foreground and a mixture of existing built forms concentrated at the south eastern portion of the Site. The new buildings along the southern boundary will intensify development with increased massing resulting in an abrupt urban edge that will change the view from this receptor particularly as it is viewed from a mid-distance. Mitigation to control light spill from external lighting will reduce the effects of sky glow on the views from the viewpoint at night time. Through the use of vegetation and building treatments the longer term effects will be reduced. This would be a permanent adverse effect.	Opening year – Moderate adverse **Significant** Year 15 – Moderate adverse **Significant**
Viewpoint 11 Madingley Road (West)	Low	The Proposed Development would result in new buildings close to the northern and eastern boundaries of the Site. External lighting and lighting from windows would contribute to sky glow	None proposed	Opening year – Negligible Year 15 – Negligible	Views of the Site from Madingley Road, west of the M11, are completely screened by the intervening vegetation along the southern boundary of Madingley Road and the blocks of woodland on east and western boundaries of the M11. There would be no effect.	Opening year – Neutral **Not Significant** Year 15 – Neutral **Not significant**
Viewpoint 12 Madingley Road (East)	Medium	The Proposed Development would result in new buildings close to the northern boundary of the Site. External lighting and lighting from windows would contribute to sky glow	• Building frontages longer than 60m facing Madingley Road should be broken down through variation in design; • Gaps between building frontages facing Madingley Road should be a minimum of 15m; • Building frontages facing the Madingley Road must have a high quality architectural treatment or additional woodland screening; • Variation in roofline along Madingley Road; • Service areas and development 'backs' visible from Madingley Road must be screened by additional planting; • The existing woodland buffer along the northern boundary must be maintained and reinforced to ensure it is effective in maintaining the character of Madingley Road; and • Rooftop plant should be set back from the eastern building edge and screened.	Opening year – Medium adverse Year 15 – Medium adverse	The Proposed Development will increase the proximity of built form to the northern boundary of the Site adjacent to Madingley Road which would increase the presence of built form along the western Cambridge approach. The new buildings will result in a substantial change in views from this receptor. This will increase the feeling of urbanisation to the settlement edge and gateway to Cambridge. Light spill could result from the new buildings onto Madingley Road. Mitigation to control light spill from external lighting will reduce effects on the views of travellers at night time. Through the use of vegetation and building treatments the longer term effects will be reduced. This would be a permanent adverse effect.	Opening year – Slight adverse **Not Significant** Year 15 – Slight adverse **Not Significant**

Baseline		Impact assessment				
Visual receptor	**Sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Viewpoint 13 Public Right of Way crossing M11 Motorway (55/6)	Medium	The Proposed Development would result in new buildings close to the southern boundary of the Site. External lighting and lighting from windows would contribute to sky glow	• Additional height restrictions apply to the northern and southern frontages of the Southern Ecological Corridor. The aim of these restrictions is to form a coherent frontage to the space but allow for variation and interest in response to long distance views from the south; • Building frontages longer than 60m facing onto the southern boundary should be broken down by variation in build-to line and/or height and roofscape; • Any visible frontages facing onto the southern boundary must have a high quality architectural treatment. Alternatively or in addition, the woodland buffer shall be reinforced to limit visibility into the Site; • Landscaped gaps may be used to break frontage lengths. Any new gaps should be a minimum of 25m for buildings facing the southern boundary from building face to building face; • A variable and interesting roofline should be formed the southern development edge; • Service areas and service yards must be located away from the Southern edge and set within new development; • Vertical planting should be considered to soften development edges and boundaries; • New planting must relate to the landscape, must be used to help soften the urban edge: any new setbacks and gaps between frontages should be appropriately planted with trees and greenscape, ensuring that some individual trees can grow to maturity; • No multi storey car parking should be located along the southern edge, unless set behind a woodland buffer; • There must be effective screening of all rooftop plant, when viewed from the south and this built element should contribute to the composition of a varied skyline; • Rooftop plant must be set back from the southern development edge; and • Rooftop plant should be screened and/or grouped to avoid visual clutter in distant views.	Opening year – Medium adverse Year 15 – Medium adverse	The Proposed Development will result in new buildings along the southern boundary which will change the views from the elevated pedestrian footbridge crossing the M11. This will result in an urbanising effect on the views and the existing Schlumberger building would be screened by the intervening buildings and will no longer feature in the views. This will have an urbanising effect on the views of West Cambridge. Views of the Proposed Development along the M11 will be limited to glimpses from specific locations where there are gaps in the vegetation and the M11 is not in cutting. Views will be limited to northbound traffic. Mitigation to control light spill from external lighting will reduce the effects of sky glow on the views at night time. Through the use of vegetation and building treatments the longer term effects of urbanisation will be reduced. This would be a permanent adverse effect.	Opening year – Slight adverse **Not significant** Year 15 – Slight adverse **Not significant**
Viewpoint 14 Public Right of Way to the west of Laundry Farm (55/6)	Medium	The Proposed Development would result in new buildings close to the southern boundary of the Site. External lighting and lighting from windows would contribute to sky glow		Opening year – Medium adverse Year 15 – Medium adverse	Medium distance views of the Proposed Development will be possible from the public right of way where new buildings extend above the intervening hedgerows and screening vegetation. The Proposed Development would introduce new built forms into a view that contains open agricultural fields in the foreground and a mixture of existing built forms concentrated at the south eastern portion of the Site. The new buildings along the southern boundary will create a change of view from this receptor that will result in an abrupt edge to the Site and an urbanising effect to the view. Mitigating to control light spill, in particular the spread to surrounding open landscape to the south of the Site, would reduce the impact upon the visual amenity of the receptor particularly when seen against the skyline at night. Building treatments and limits on plot size will minimise the urbanising effects. Reinforcement of the existing screening vegetation along the southern boundary will provide some transition to an abrupt change in character along this south settlement edge. The effects will reduce overtime as the new planting matures. This would be a permanent adverse effect.	Opening year – Moderate adverse **Significant** Year 15 – Slight adverse **Not significant**

Baseline		Impact assessment				
Visual receptor	**Sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Viewpoint 15 Grantchester Road	Low	The Proposed Development would result in new buildings close to the southern boundary of the Site. External lighting and lighting from windows would contribute to sky glow	• Additional height restrictions apply to the northern and southern frontages of the Southern Ecological Corridor. The aim of these restrictions is to form a coherent frontage to the space but allow for variation and interest in response to long distance views from the south; • Building frontages longer than 60m facing onto the southern boundary should be broken down by variation in build-to line and/or height and roofscape; • Any visible frontages facing onto the southern boundary must have a high quality architectural treatment. Alternatively or in addition, the woodland buffer shall be reinforced to limit visibility into the Site; • Landscaped gaps may be used to break frontage lengths. Any new gaps should be a minimum of 25m for buildings facing the southern boundary from building face to building face; • A variable and interesting roofline should be formed the southern development edge; • Service areas and service yards must be located away from the Southern edge and set within new development; • Vertical planting should be considered to soften development edges and boundaries; • New planting must relate to the landscape, must be used to help soften the urban edge: any new setbacks and gaps between frontages should be appropriately planted with trees and greenscape, ensuring that some individual trees can grow to maturity; • No multi storey car parking should be located along the southern edge, unless set behind a woodland buffer; • There must be effective screening of all rooftop plant, when viewed from the south and this built element should contribute to the composition of a varied skyline; • Rooftop plant must be set back from the southern development edge; and • Rooftop plant should be screened and/or grouped to avoid visual clutter in distant views.	Opening year – Low adverse Year 15 – Low adverse	Medium distance glimpsed views of the Proposed Development will be possible from the elevated approach to the M11 overbridge. The Proposed Development would introduce new built forms into a view that contains the M11 and open agricultural fields in the foreground and a mixture of existing built forms concentrated at the south eastern portion of the Site. Views of the new buildings will be limited to the upper storeys of the southern facades and rooftops which extend above the screening vegetation and the intervening M11 resulting in an urbanising effect. Mitigating to control light spill, in particular the spread to surrounding open landscape to the south of the Site, would reduce the impact upon the visual amenity of the receptor particularly when seen against the skyline at night. Building treatments and limits on plot size will minimise the urbanising effects. Reinforcement of the existing screening vegetation along the southern boundary will provide some transition to an abrupt change in character along this south settlement edge. The effects will reduce overtime as the new planting matures. This would be a permanent adverse effect.	Opening year – Slight adverse **Not Significant** Year 15 – Slight adverse **Not significant**
Viewpoint 16 Barton Road	Medium	The Proposed Development would result in new buildings close to the southern boundary of the Site. External lighting and lighting from windows would contribute to sky glow.		Opening year – Medium adverse Year 15 – Medium adverse	A dense block of woodland along the northern boundary of Barton Road limits views of the Proposed Development to a short section of the road just north of the roundabout junction with Grantchester Road and Coton Road. Here longer distance glimpsed views of the Proposed Development will be possible. After 15 years the strengthened boundary planting will begin to mature and intervening vegetation, between the viewpoint and the Proposed Development, will develop so views will soften. External lighting could result in an increase in sky glow but mitigation will minimise the effect and is unlikely to be perceptible from this distance. This would be a permanent adverse effect.	Opening year – Moderate adverse **Significant** Year 15 – Slight adverse **Not significant**
Viewpoint 17 Cambridge Rugby Football Club	Low	The Proposed Development would result in new buildings close to the southern boundary of the Site. External lighting and lighting from windows would contribute to sky glow	None proposed	Opening year – Negligible Year 15 – Negligible	The Proposed Development would include the introduction of new built forms into an existing medium distance view. There is substantial mature vegetation and some existing built form between the viewpoint and the Proposed Development which effectively screens views northwards. The viewpoint is outside of the ZTV but some glimpsed views of the proposed taller built elements will be possible from the south eastern corner of the rugby pitch. Views from the rest of the rugby club would not feature the Proposed Development. External lighting could result in an increase in sky glow but mitigation will minimise the effect and is unlikely to be perceptible due to the existing intervening development. There would be no effect.	Opening year – Neutral **Not significant** Year 15 – Neutral **Not significant**

Baseline		Impact assessment				
Visual receptor	**Sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Viewpoint 18 Coton Road	Medium	The Proposed Development would result in new buildings close to the southern boundary of the Site. External lighting and lighting from windows would contribute to sky glow	• Additional height restrictions apply to the northern and southern frontages of the Southern Ecological Corridor. The aim of these restrictions is to form a coherent frontage to the space but allow for variation and interest in response to long distance views from the south; • Building frontages longer than 60m facing onto the southern boundary should be broken down by variation in build-to line and/or height and roofscape; • Any visible frontages facing onto the southern boundary must have a high quality architectural treatment. Alternatively or in addition, the woodland buffer shall be reinforced to limit visibility into the Site; • Landscaped gaps may be used to break frontage lengths. Any new gaps should be a minimum of 25m for buildings facing the southern boundary from building face to building face; • A variable and interesting roofline should be formed the southern development edge; • Service areas and service yards must be located away from the Southern edge and set within new development; • Vertical planting should be considered to soften development edges and boundaries; • New planting must relate to the landscape, must be used to help soften the urban edge: any new setbacks and gaps between frontages should be appropriately planted with trees and greenscape, ensuring that some individual trees can grow to maturity; • No multi storey car parking should be located along the southern edge, unless set behind a woodland buffer; • There must be effective screening of all rooftop plant, when viewed from the south and this built element should contribute to the composition of a varied skyline ; • Rooftop plant must be set back from the southern development edge; and • Rooftop plant should be screened and/or grouped to avoid visual clutter in distant views.	Opening year – Medium adverse Year 15 – Medium adverse	The Proposed Development would introduce new built forms into an existing long distance view. The blocks of woodland, north and south, of Grantchester Road would limit views of the Proposed Development to the upper storeys and rooftops of the new buildings and the new energy centre flue which would form new features on the skyline. This would have an urbanising effect and give the impression of a westward extension of the city. Mitigating to control light spill, in particular the spread to surrounding open landscape to the south of the Site, would reduce the impact upon the visual amenity of the receptor particularly when seen against the skyline at night. Building treatments and limits on plot size will minimise the urbanising effects. This would be a permanent adverse effect.	Opening year – Slight adverse **Not significant** Year 15 – Slight adverse **Not significant**
Viewpoint 19 Public Right of Way south west of Grantchester (106/6)	Medium	The Proposed Development would result in new buildings close to the southern boundary of the Site. External lighting and lighting from windows would contribute to sky glow	None proposed	Opening year – Negligible Year 15 – Negligible	Most of this public right of way will not afford views of the Proposed Development due to the intervening vegetation comprising blocks of woodland, groups and individual trees and hedgerows along field boundaries. A short section of the public right of way near Grantchester will experience glimpsed long distance views of the rooftops of the tallest new buildings and the energy centre flue. These will not be prominent features within the view. Mitigation to prevent light spill, in particular the spread to surrounding open landscape to the south of the Site, would minimise sky glow. This is unlikely to be perceptible over the long distance. There would be no effect.	Opening year – Neutral **Not Significant** Year 15 – Neutral **Not Significant**

Baseline		Impact assessment				
Visual receptor	**Sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Viewpoint 20 Public Right of Way west of Grantchester (106/5)	Medium	The Proposed Development would result in new buildings close to the southern boundary of the Site. External lighting and lighting from windows would contribute to sky glow	• Additional height restrictions apply to the northern and southern frontages of the Southern Ecological Corridor. The aim of these restrictions is to form a coherent frontage to the space but allow for variation and interest in response to long distance views from the south; • Building frontages longer than 60m facing onto the southern boundary should be broken down by variation in build-to line and/or height and roofscape; • Any visible frontages facing onto the southern boundary must have a high quality architectural treatment. Alternatively or in addition, the woodland buffer shall be reinforced to limit visibility into the Site; • Landscaped gaps may be used to break frontage lengths. Any new gaps should be a minimum of 25m for buildings facing the southern boundary from building face to building face; • A variable and interesting roofline should be formed the southern development edge; • Service areas and service yards must be located away from the Southern edge and set within new development; • Vertical planting should be considered to soften development edges and boundaries; • New planting must relate to the landscape, must be used to help soften the urban edge: any new setbacks and gaps between frontages should be appropriately planted with trees and greenscape, ensuring that some individual trees can grow to maturity; • No multi storey car parking should be located along the southern edge, unless set behind a woodland buffer; • There must be effective screening of all rooftop plant, when viewed from the south and this built element should contribute to the composition of a varied skyline; • Rooftop plant must be set back from the southern development edge; and • Rooftop plant should be screened and/or grouped to avoid visual clutter in distant views.	Opening year – Low adverse Year 15 – Low adverse	The Proposed Development will result in new buildings along the southern boundary. The upper storeys and rooftops of these new buildings and the energy centre flue will be visible will be visible from this footpath. Due to the long intervening distance this will result in a minor change in views from this receptor which will result in an urbanising effect. Limits on building massing along the southern boundary and building treatments will minimise the urbanising effect. Mitigation to prevent light spill, in particular the spread to surrounding open landscape to the south of the Site, would minimise sky glow. This is unlikely to be perceptible over the long distance. This would be a permanent adverse effect.	Opening year – Slight adverse **Not Significant** Year 15 – Slight adverse **Not Significant**
Viewpoint 21 Public Right of Way along the top of Chapel Hill (117/15)	Medium	The Proposed Development would result in new buildings close to the southern boundary of the Site. External lighting and lighting from windows would contribute to sky glow	None proposed	Opening year – Negligible Year 15 – Negligible	The viewpoint has long distance views from the elevated vantage point looking across the landscape with the Proposed Development in the distance. New buildings along the southern boundary will be seen as part of a wider view with Cambridge City in the background. The Proposed Development would form a visible element within the existing view of the wider Cambridge conurbation resulting in an urbanisation effect. Due to the long intervening distance the Proposed Development will result in a minor change in a small proportion of the overall view from this receptor. Mitigation to prevent light spill, in particular the spread to surrounding open landscape to the south of the Site, would minimise sky glow. This is unlikely to be perceptible over the long distance. There would be no effect	Opening year – Neutral **Not Significant** Year 15 – Neutral **Not Significant**
Viewpoint 22 Chapel Hill	Low	The Proposed Development would result in new buildings close to the southern boundary of the Site. External lighting and lighting from windows would contribute to sky glow	None proposed	Opening year – Negligible Year 15 – Negligible	The viewpoint has long distance views from the elevated vantage point looking across the landscape with the Proposed Development in the distance. New buildings along the southern boundary will be seen as part of a wider view with Cambridge City in the background. The Proposed Development would form a visible element within the existing view of the wider Cambridge conurbation resulting in an urbanisation effect. Due to the long intervening distance the Proposed Development will result in a minor change in a small proportion of the overall view from this receptor. Mitigation to prevent light spill, in particular the spread to surrounding open landscape to the south of the Site, would minimise sky glow. This is unlikely to be perceptible over the long distance. There would be no effect	Opening year – Neutral **Not Significant** Year 15 – Neutral **Not Significant**

Baseline		Impact assessment				
Visual receptor	**Sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Viewpoint 23 Castle Mound	Medium	The Proposed Development would result in new buildings infilling the Site. External lighting and lighting from windows would contribute to sky glow	• Additional height restrictions to buildings facing onto the eastern boundary; • Building frontages longer than 60m facing Madingley Road and the eastern boundary should be broken down through variation in design; • Gaps between building frontages facing Madingley Road and the eastern boundary should be a minimum of 15m; • Building frontages facing Madingley Road and the eastern boundary must have a high quality architectural treatment or additional woodland screening; • Variation in roofline along Madingley Road and the eastern boundary; • Service areas and development 'backs' visible from Madingley Road and Clerk Maxwell Road must be screened by additional planting; • The existing woodland buffer along the northern boundary must be maintained and reinforced to ensure it is effective in maintaining the character of Madingley Road; • The existing woodland buffer along the eastern boundary must be maintained and reinforced to ensure a green edge to the new development; • Any gaps between frontages facing the eastern boundary should be appropriately planted, ensuring that some individual trees can grow to maturity; • Visibility to the development from Clerk Maxwell Road must be minimised and development should be set within the existing eastern woodland edge; • Rooftop plant should be set back from the eastern building edge and screened; and • Additional height restrictions to buildings facing onto the eastern boundary.	Opening year – Low adverse Year 15 – Low adverse	The Castel Mount will have medium distance views of the Proposed Development from an elevated location between gaps in the intervening vegetation and built form. Only the very tops of some of the buildings and the energy centre flue will be glimpsed resulting in a minor change in views from this receptor. The viewpoint is located close to the city centre and is surrounded by external artificial lighting. Sky glow from the Proposed Development would not be perceptible. This would be a permanent adverse effect.	Opening year – Slight adverse **Not significant** Year 15 – Slight adverse **Not significant**

8.6 Mitigation measures

8.6.1 Relevant planning policy and supplementary guidance for Cambridge have informed the environmental design as an integral part of the Proposed Development. Key considerations include important views, landscape character and the quality of the setting of Cambridge well as the landscape constraints identified as part of the baseline desk study, survey and consultation. The objective is to protect and enhance the intrinsic character of the local landscape with reference to key characteristics and features *which* help inform the siting, massing, design and materials of the Proposed Development.

8.6.2 Design principles based on relevant planning policy and supplementary guidance to minimise the impact on landscape character views and visual amenity include:

- Maximising the positive aspects of the Proposed Development and its surroundings through creative design and use of local materials, including native planting in order to enhance the local sense of place and adjacent rural landscape character, with emphasis on environmental quality and sustainability;
- Identifying the existing features, habitats and planting for retention and protection;
- Designing the scale, massing and layout, and arrangement of features and finishes, to integrate the Proposed Development into the grain of the urban edge including adjacent landscape character areas of the North West Cambridge site and adjacent Green Belt and reduce visibility of the Proposed Development in views across the area;
- Creating opportunities to improve landscape character of the Proposed Development on the urban edge through an integrated approach to mitigation improving biodiversity, connectivity and amenity of the urban edge is improved;
- Providing adequate land for tree planting where possible within and along the boundaries so the Proposed Development can be successful integrated into the wider rural landscape and provides a '*soft green edge to the City*';
- Carefully consider the location and design of lighting, in relation to the Institution of Lighting Engineers guidance[44], to minimise light spill into the surrounding Green Belt;
- Selecting a palette of building finishes, including the choice of colour and materials, and planting types and species which is sympathetic to the setting of the Site;
- Implementing a landscape management plan to ensure the maintenance of existing features and the establishment of the new planting and the management of replacement habitats, including those features which are specifically aimed at providing ecological mitigation; and

8.6.3 Based on these principles specific mitigation measure have been identified for the construction and operational phases which will avoid or reduce the identified significant effects.

Construction phase

8.6.4 During construction the following mitigation measures will be implemented. This will be achieved by specifying each measure in the Construction Environmental Management Plan.

- Vegetation on Site that will be retained will be protected from accidental damage during construction by erecting temporary fencing;
- Temporary hoarding will be used around all construction compounds and work sites to screen views of construction activities;
- The use of security lighting during construction will be minimised. Where it is needed Institute of Lighting Engineers guidance[44] will be followed to minimise light spill;
- Construction traffic travelling to and from the Site will travel along haul routes agreed with Cambridgeshire County Council. The haul routes will avoid Cambridge city centre and Madingley Road west of the M11 where possible;
- Mitigation measures to minimise construction noise and dust will help to preserve the tranquil character of the adjacent landscape character areas; and
- Operation of a clean and tidy construction site, including covering of stockpiles.

Operational phase

8.6.5 As discussed in Chapter 4 (Alternatives) the parameter plans have been amended to minimise the impact of building mass on the views and the surrounding landscape character areas. This has been achieved by reducing the overall heights of the buildings across the Site and by stepping building heights so that buildings adjacent to the Site boundaries are lower than buildings in the centre of the Site.

8.6.6 In addition the following design measures are included in the Design Guidelines to minimise the effects of the Proposed Development on specific viewpoints and landscape character areas:

- Additional height restrictions apply to the northern and southern frontages of the Southern Ecological Corridor. The aim of these restrictions is to form a coherent frontage to the space but allow for variation and interest in response to long distance views from the south;
- In addition to the height parameter plan at the edge of Development zone adjacent to the eastern boundary the built form must comply with an additional height restriction of 25m AOD. From this line, the development heights can rise with an angle of 45° to the parameter height of 31m AOD;
- Building frontages longer than 60m facing onto Madingley Road, southern or eastern boundaries, or more than 70m facing onto the western boundary should be broken down by variation in build-to line and/or height and roofscape;
- Any visible frontages facing onto Madingley Road, the eastern boundary, or the southern boundary must have a high quality architectural treatment. Alternatively or in addition, the woodland buffer shall be reinforced to limit visibility into the Site;
- Landscaped gaps may be used to break frontage lengths. Any new gaps should be a minimum of 15m for buildings facing Madingley Road and the eastern boundary, 20m for buildings facing the western boundary, and 25m for buildings facing the southern boundary from building face to building face;
- A variable and interesting roofline should be formed along Madingley Road, the southern, and eastern development edges;
- Any multi-storey car parking structures along the western frontage must be appropriately and sensitively designed to ensure interest and variation in building line and roof line;
- No multi storey car parking should be located along the southern edge, unless set behind a woodland buffer;
- New planting must relate to the landscape, must be used to help soften the urban edge: any new setbacks and gaps between frontages should be appropriately planted with trees and greenscape, ensuring that some individual trees can grow to maturity;
- Vertical planting should be considered to soften development edges and boundaries;

- Service areas, multi storey car parks and development 'backs' must be screened by the existing woodland buffer (reinforced where necessary) and/or additional planting;
- Service areas and service yards must be located away from the Southern edge and set within new development;
- Existing trees must be maintained where possible and major feature trees shall be added at key locations;
- The best trees on Site, due to their condition, prominence, or contribution to the landscape are to be retained as set out in Table 3.3, Chapter 3;
- The existing woodland buffer along the northern boundary must be maintained and reinforced to ensure it is effective in maintaining the character of Madingley Road;
- The greenery of the woodland buffer along the Madingley Road shall be extended southwards to West Green by adding planting to this part of the Site;
- Visibility to the development from Clerk Maxwell Road must be minimised and development should be set within the existing eastern woodland edge;
- Any gaps between frontages facing the eastern boundary should be appropriately planted, ensuring that some individual trees can grow to maturity;
- The existing woodland buffer along the eastern boundary must be maintained and reinforced to ensure a green edge to the new development;
- Visibility to the development from the west must be minimised and development should be set within the existing woodland edge along the western boundary;
- The existing woodland buffer along the western boundary must be maintained to provide screening from the M11 and form a green edge to the new development;
- The greenery of the western woodland buffer shall be extended eastwards to Ada Lovelace Road by adding planting to this part of the Site;
- Additional landscape and planting at the western boundary must relate to the rural and agricultural landscape to the west;
- Rooftop plant must be set back from the southern development edge;
- There must be effective screening of all rooftop plant, when viewed from the south and this built element should contribute to the composition of a varied skyline;
- Rooftop plant should, wherever possible be set back from the predominant building line along the eastern edge. Where not possible to avoid this, there must be effective screening of rooftop plant; and
- Rooftop plant should be screened and/or grouped to avoid visual clutter in distant views.

8.7 Summary

8.7.1 Construction works activities will result in a temporary change to the character of a number of landscape character areas and result in temporary new landscape elements in the views of visual receptors. This will result in significant effects to the following landscape and visual receptors:

- Landscape character area F – Coton;
- Viewpoint 1 – Public viewpoint within the Coton Countryside Reserve;
- Viewpoint 5 – Clerk Maxwell Road;
- Viewpoint 6 – Wilberforce Road;
- Viewpoint 7 – Dane Drive; and
- Viewpoint 8 and 9 – Conduit Head Road and Madingley Road.

8.7.2 The operational phase will result in a densification of the Site with new contemporary institutional and commercial buildings which will be visible from long distances and result in an urbanising effect at the edge of the city. At the opening year this will result in temporary significant adverse effects to the following landscape visual receptors:

- Landscape character area C – West Cambridge Central Core;
- Landscape character area E – Madingley;
- Landscape character area F – Coton;
- Landscape character area G – Grantchester;
- Viewpoint 1 – Public viewpoint within the Coton Countryside Reserve;
- Viewpoint 3 – Harcamlow Way (39/31a);
- Viewpoint 4 – Wimpole Way (39/31a);
- Viewpoint 5 – Clerk Maxwell Road;
- Viewpoint 6 – Wilberforce Road;
- Viewpoint 7 – Dane Drive;
- Viewpoint 8 and 9 – Conduit Head Road and Madingley Road;
- Viewpoint 10 – Public Right of Way to the south of Harcamlow Way (55/9);
- Viewpoint 14 – Public Right of Way to the west of Laundry Farm (55/6); and
- Viewpoint 16 – Barton Road.

8.7.3 Fifteen years after opening the screening vegetation and landscape planting will have matured which will soften the built form of the Proposed Development and maximise the screening effect of boundary planting. This will reduce the magnitude of the impact of the Proposed Development. At year fifteen after opening there will be significant effects to the following landscape and visual receptors:

- Landscape character area C – West Cambridge Central Core;
- Landscape character area E – Madingley;
- Landscape character area F – Coton;
- Landscape character area G – Grantchester;
- Viewpoint 1 – Public viewpoint within the Coton Countryside Reserve;
- Viewpoint 6 – Wilberforce Road;
- Viewpoint 7 – Dane Drive;
- Viewpoint 8 and 9 – Conduit Head Road and Madingley Road; and
- Viewpoint 10 – Public Right of Way to the south of Harcamlow Way (55/9).

8.7.4 These significant effects on landscape and visual receptors should be considered in the context of the existing planning permission which allows for dense built development along the southern boundary of the Site. Many of the significant effects to visual receptors to the south of the Site from the Proposed Development would occur if the existing planning permission was to be fully built out.

9. Socio-economics

9.1 Scope of the assessment

9.1.1 The socio-economic assessment considers the likely significant effects of the Proposed Development during both the construction and operational phases. These include temporary and permanent employment creation, contribution to local and regional economic objectives and temporary disruption to local residents and businesses during the construction phase of the Proposed Development.

9.1.2 The assessment also considers the relevant scoping responses, as summarised in Table 9.1.

Table 9.1 Scoping response

Issue raised	Respondent
Refer to relevant policies in the Cambridge Local Plan 2006 and the Draft Cambridge Local Plan 2014.	Cambridge City Council.
Expand scope to include health and wellbeing impacts, including cumulative impacts of construction and operation on existing and new residents and employees, including noise and vibration, dust, daylight and sunlight impacts, and air quality impacts.	Cambridge City Council.
Expand scope to include assessment of impacts relating to crime and fear of crime.	Cambridge City Council.

9.1.3 It is not possible to determine daylight/sunlight effects with the parameter plans as they don't include detailed proposals on external lighting. This issue will require assessment at the reserved matters stage when sufficient design details of proposed buildings and open spaces are available. Health and wellbeing effects caused by the cumulative impacts of noise and vibration and on air quality have been considered in the cumulative effects chapter.

9.2 Relevant legislation and policy

Sub-regional and regional policies

Greater Cambridge City Deal 2014

9.2.1 The City Deal brings together Cambridge City Council, South Cambridgeshire District Council, Cambridgeshire County Council, the University of Cambridge and local businesses, colleges and research facilities.

9.2.2 The City Deal places importance on Greater Cambridge's ability to compete on a global stage, act as a gateway for high-tech investment and its role as the country's capital for innovation – Greater Cambridge's patent rate is higher than the next six cities combined. This is underpinned by the Cambridge Phenomenon (cluster of over 1,525 technology firms employing more than 54,000 people, with a combined revenue of over £12 billion).

9.2.3 It attributes the current and future success of Greater Cambridge to the University, its connectivity and attractiveness and liveability. Thus, it aims to enable a new wave of innovation-led growth by investing in infrastructure, housing and skills to support new and existing businesses.

Cambridge and South Cambridgeshire Sustainable Development Strategy 2012

9.2.4 The Strategy was prepared by the Cambridgeshire and Peterborough Joint Strategic Planning Unit, established to help coordinate the development of strategy with South Cambridgeshire District Council, Cambridgeshire County Council and other local planning authorities and stakeholders. The outputs of this strategic work are not statutory and do not form part of the official Development Plan for Cambridge. However, the Strategy remains useful in evaluating the Proposed Development.

9.2.5 The Strategy identifies supporting a successful local economy as a key aspect of sustainable development.

9.2.6 It identifies Cambridge and South Cambridgeshire as economically vibrant and resilient areas. Cambridge is at the forefront of knowledge-based industry and is a centre for world class research institutions and companies. However, many of these major institutions and companies are located within South Cambridgeshire – hence the need to consider both areas as highly interrelated.

Greater Cambridge Greater Peterborough Enterprise Partnership (LEP) Strategic Economic Plan 2014

9.2.7 LEPs were asked by Government to negotiate a 'Growth Deal' to drive forward local economic growth using a Strategic Economic Plan. The Greater Cambridge Greater Peterborough (GCGP) Enterprise Partnership Strategic Economic Plan sets out a robust plan for the future, identifying short-, medium-, and long-term interventions through to post-2020.

Local policies: Cambridge City Council

Cambridge Draft Local Plan 2014

9.2.8 The Cambridge Draft Local Plan 2014 sets out strategic proposals and policies for the local authority to 2031. Its vision is for the City's continued development as a centre of excellence and a world leader in the fields of higher education and research, fostering the dynamism, prosperity and further expansion of the knowledge-based economy. The strength of the local economy is largely attributed to the emergence of the Cambridge Cluster over the last 50 years. This has entailed close links – sharing of ideas, staff, equipment and data, and collaborative working - between businesses locating near similar businesses and the University of Cambridge.

9.2.9 The Plan's Spatial Strategy (Policy 2) establishes a close relationship between the Council and partners such as the universities and LEP to attract employment in Cambridge's high technology and research cluster. The Council aims to ensure that sufficient land is available to facilitate 22,100 new jobs by 2031, including 8,800 in B-use class.

9.2.10 West Cambridge is identified as a key employment Site with an academic and physical science focus (Policy 40: Development and expansion of business space).

Cambridge City Council Local Plan 2006

9.2.11 The Local Plan 2006, to be replaced by the Local Plan 2014, nevertheless provides relevant policy guidance on the economic growth strategy.

9.2.12 Like the Local Plan 2014, the Local Plan 2006 places importance on Cambridge's continued status as a centre of excellence and world leader in higher education and research, and the knowledge-based economy.

9.2.13 The Plan's core objective for the Cambridge economy centres on promoting linkages between employment clusters and between businesses and research institutes and the University departments, on promoting innovation, and on providing employment land for high technology, research and local uses.

9.2.14 The Plan specifies that the Site should continue to be developed by the University of Cambridge for uses including teaching, academic research and the expansion of commercial research facilities. The Site is identified as a location particularly suited to the promotion of clusters through development of high technology incubator units, new academic facilities and research establishments in close proximity to each other.

Local policies: South Cambridgeshire District Council

South Cambridgeshire Local Plan 2011-2031: Proposed Submission July 2013

9.2.15 The South Cambridgeshire Local Plan aims to support economic growth by supporting the area's position as a world leader in research and technology based industries, research and education.

9.2.16 Economic sustainability is to be achieved by ensuring that sufficient land of the right type is available to support growth and innovation. The Development Strategy to 2031 Policy S/6 establishes the edge of Cambridge as the preferred location for meeting the demand for employment land.

South Cambridgeshire Employment Land Review Update 2012

9.2.17 The Employment Land Review (ELR) observes that whilst there is currently sufficient provision in Cambridge and South Cambridgeshire, there is likely to be a future shortage of B1a space. Demand for office space is particularly focused on the city centre and northern fringe around the Cambridge Science Park.

9.2.18 The ELR recommends that there is more to be done to increase supply in locations where firms most want to be as the only way to relieve the pressure on B1a space. This is dependent on the University of Cambridge - perhaps the strongest local pull-factor for businesses – upholding its reputation as a key player in the evolving spatial economy. Since there is no more land available in the city centre, the ELR identifies a need to intensify use of existing sites for B1a space.

South Cambridgeshire District Core Strategy 2007

9.2.19 The Core Strategy Policy ST/8 states that policies in Local Development Documents will ensure sufficient employment land is available to enable further development of high technology clusters and to meet local needs. It provides for additional land to be brought forward for employment development at Strategic Employment Locations.

9.3 Method of assessment

9.3.1 The Site is situated close to the administrative boundary between Cambridge City Council and South Cambridgeshire District Council. There is a strong existing relationship between the two local authorities, and Cambridge City Council is encircled by South Cambridgeshire District Council. The study area for the purposes of the socio-economic assessment thus consists of the two local authorities, hereafter referred to as Cambridge and South Cambridgeshire.

Establishing the baseline

9.3.2 The baseline was established from a review of the following information sources:

- English Indices of Deprivation 2010;
- UK Census 2011;
- Business Register and Employment Survey 2013;
- Annual Population Survey 2014;
- Annual Survey of Hours and Earnings 2014;
- Office for National Statistics Population Projections 2014;
- Office for National Statistics Mid-Year Population Estimates 2014; and
- Office for National Statistics UK Business Counts – Enterprises 2014.

Impact assessment

9.3.3 The impact assessment is undertaken with consideration to the socio-economic context of the study area in terms of its baseline conditions and the relevant local, regional and national policy documents.

9.3.4 During the construction phase, construction jobs are estimated based on the construction costs of the Proposed Development.

9.3.5 During the operational phase, the total number of jobs on the Site has been calculated using total proposed floorspace figures provided by AECOM, average employment densities from the Employment Densities Guide[45] and guidance from AECOM. The assessment considers the net additionality of employment impacts based on the guidance issued by the Homes and Communities Agency[46].

9.3.6 The socio-economic assessment also considers the Proposed Development's contribution to strategic economic objectives for Cambridge and South Cambridgeshire's development and its impact on the social and economic lives and health and wellbeing of local people.

9.3.7 There is no definitive guidance on socio-economic significance criteria for assessment of proposed developments. The impact assessment is based on reasoned argument, previous experience and professional judgment, and in accordance with the broad magnitude and significance definitions summarised in Table 9.2 and Table 9.3.

[45] Homes and Communities Agency, 2010, Employment Densities Guide, 2nd Edition

[46] Homes and Communities Agency, 2014, Additionality Guide, Fourth Edition

Table 9.2 Socio-economic magnitude criteria

Magnitude of socio-economic impact	Definition
High	An impact that is expected to have considerable adverse or beneficial socio-economic effects. Such impacts will typically affect large numbers of businesses, workers or residents. High magnitude impacts will typically be long-term in nature, resulting in the permanent change of the study area's baseline socio-economic conditions.
Moderate	An impact that is expected to have a moderate socio-economic effect. Such impacts will typically have a noticeable effect on a limited number of businesses, workers or residents, and will lead to a permanent (but not drastic) change to the study area's baseline socio-economic conditions.
Low	An impact that is expected to affect a small number of businesses, workers or residents. Or an impact that may affect a larger number of receptors but without materially changing the study area's baseline socio-economic conditions. Such impacts are likely to be temporary in nature.
Negligible	An impact that is likely to be temporary in nature, or which is anticipated to have a slight or no effect on the well-being of the study area's businesses, workers or residents.

Table 9.3 Socio-economic receptor sensitivity criteria

Sensitivity of receptor	Definition
High	Socio-economic receptor is likely to be directly affected by the project. Receptor is well placed to take advantage of beneficial impacts, and/or is not well placed to deal with any adverse impacts.
Moderate	Socio-economic receptor is likely to be indirectly affected by the project. Average ability to maximise beneficial impacts or cope with adverse impacts.
Low	Socio-economic receptor is unlikely to benefit from the project. Receptor is not well placed to take advantage of beneficial impacts, and/or is well placed to deal with any adverse impacts.

9.3.8 By bringing together these magnitude and sensitivity criteria, the assessment considers the significance of socio-economic impacts as outlined in Table 9.4. Moderate and major socio-economic effects are considered to be significant. Minor and negligible effects are considered to be not significant.

Table 9.4 Socio-economic significance criteria

	High impact	Moderate impact	Low impact	Negligible impact
High sensitivity	Major beneficial / adverse - significant	Major beneficial / adverse - significant	Moderate beneficial / adverse - significant	Minor beneficial / adverse - not significant
Moderate sensitivity	Major beneficial / adverse - significant	Moderate beneficial / adverse - significant	Minor beneficial / adverse - not significant	Negligible - Not significant
Low sensitivity	Moderate beneficial / adverse - significant	Minor beneficial / adverse - not significant	Negligible - Not significant	Negligible - Not significant

9.3.9 The total number of jobs have been calculated using assumptions on the proportion of floor space that will be used for commercial purposes versus academic. This figure may vary depending on the reserved matters applications that come forwards. The assumptions used for the calculations are detailed in Appendix 9.1, Volume 3.

9.4 Baseline conditions

Economic characteristics and employment

9.4.1 Both the City of Cambridge and South Cambridgeshire are in general, prosperous areas, although Cambridge in particular has areas of notable deprivation, such as King's Hedges (within the 20% most deprived LSOAs nationally). Cambridge is ranked 188th and South Cambridgeshire 321st out of 326 local authorities in England in the Index of Multiple Deprivation (where 1 is the most deprived and 326 the least deprived).

9.4.2 Economic activity rates for residents aged 16-64 in 2012 in Cambridge and South Cambridgeshire were 82.1% and 81.9% respectively. These were higher than the regional (79.9%) and national (77.4%) averages (Table 1.5).

9.4.3 The local authorities also proved resilient in recession and perform better than England as well as the Region in terms of unemployment. South Cambridgeshire has particularly low unemployment. The unemployment rate in 2012 was 4.3% in Cambridge and 2.8% in South Cambridgeshire, compared with 5.3% in the East of England and 6.4% in England as a whole (Table 9.5).

Table 9.5 Economic activity and unemployment rates

Area	Economic activity rate (aged 16-64)	Unemployment rate (aged 16-64)
Cambridge	82.1%	4.3%
South Cambridgeshire	81.9%	2.8%
East of England	79.9%	5.3%
England	77.4%	6.4%
Source: Nomis, Annual Population Survey 2014		

9.4.4 Cambridge's jobs density (numbers of jobs per resident aged 16-64), at 1.18 in 2013, far exceeded those of South Cambridge (0.80), the East of England (0.78) and England (0.80). This reflects its dense, urban character in comparison to the other areas.

9.4.5 Both Cambridge's and South Cambridgeshire's economies are dominated by micro (0-9-employee) and small (10-49-employee) businesses, which accounted for 96.7% and 97.8% of their respective business bases in 2014. Medium (50-249-employee) businesses accounted for only 2.8% and 1.8% of their respective business bases, and large (over 250-employee) businesses less than 1%.

9.4.6 'Professional, scientific & technical enterprises' formed the single largest category of businesses both in Cambridge and South Cambridgeshire (22.8% and 21.7%, respectively, of all businesses) in 2014. In South Cambridgeshire, the second largest category was construction, which accounted for 11.9% of all businesses. Businesses in the information & communication industry also play an important role in the local economy, accounting for 15.6% of all businesses in Cambridge (the second largest category in Cambridge) and 10.5% in South Cambridgeshire in 2014.

9.4.7 Residents' employment structures reflect the makeup of local businesses, although Cambridge and South Cambridgeshire residents have distinct structures. This is largely due to Cambridge's entirely urban character compared with South Cambridgeshire and the large contribution of the University of Cambridge in Cambridge. Amongst Cambridge residents, the three largest industries for employment in 2014 were education (24.4%), health (14.6%) and professional, scientific and technical (12.0%). In South Cambridgeshire, professional, scientific and technical employment made the single largest contribution (18.8%), followed by manufacturing (14.8%) and health (10.5%). Thus, in both districts professional, scientific and technical employment makes a significant contribution, especially when compared with regional and national averages (7.7% and 8.3% of employment, respectively). Information and communication is also an important industry in Cambridge and South Cambridgeshire - 7.2% and 7.5% of employment respectively in 2014 - compared with its regional and national average contributions of 3.4% and 4.2% of employment respectively.

9.4.8 The construction industry is underrepresented in Cambridge and South Cambridgeshire residents' employment (accounting for 3.6% and 6.7% of total employment, respectively, in 2014) compared with the regional (8.6%) and national (7.7%) averages. Administrative and support service activities also accounted for relatively low proportions of Cambridge (3.9%) and South Cambridgeshire (4.0%) employment, against regional and national averages (4.8% and 4.9% respectively).

9.4.9 Workplace analysis reveals that employees based in Cambridge and South Cambridgeshire have higher median incomes than those in the region and nation as a whole. The median gross annual pay was £29,691 in Cambridge and £33,332 in South Cambridgeshire in 2014, compared with £26,830 in the East of England and £27,487 in England. This reflects the relatively high proportion of skilled, professional, scientific and technical industry employment.

9.4.10 Residents of both districts have income levels which exceed national and regional figures, suggesting that a high proportion of residents are employed locally. The median gross annual pay of Cambridge and South Cambridgeshire residents in 2014 - £31,100 and £33,300 respectively – significantly exceeded both the national median of £27,500 and the regional median of £28,735 (Table 9.6).

Table 9.6 Gross annual median earnings

Area	Gross annual median earnings
Cambridge	£31,077
South Cambridgeshire	£33,307
East of England	£28,735
England	£27,500
Source: Nomis, Annual Survey of Hours and Earnings – Resident Analysis, 2014	

9.4.11 Cambridge and South Cambridgeshire have limited land availability for both residential and commercial uses - a supply constraint which, in combination with high demand, has resulted in high costs. There is intense pressure on B1a (office) use class floorspace, as forecast by the Cambridge and South Cambridgeshire Employment Land Review Update (2012). High demand for this use is exacerbated by the introduction of office to residential permitted Development rights and loss of employment land to other uses, particularly in the city of Cambridge. As the success of the local economy relies heavily on the academic, office, and R&D sectors, land availability is critical for the continued socio-economic prosperity of the area.

Population

9.4.12 Cambridge's population was estimated in 2014 to be 128,500 and South Cambridgeshire's 153,300. Both districts experienced levels of population growth higher than the regional and national averages (of 16.2% and 12.6% respectively) over the past 20 years. Cambridge's population is estimated to have grown by 19.8% over the period 1994-2014, with more than half of that growth occurring in the period 2009-2014. South Cambridgeshire's population is estimated to have grown by 26.3% over the period 1994-2014, most rapidly before 2009.

9.4.13 The Office for National Statistics' (ONS) population projections suggest that Cambridge's population will increase to 136,700 by 2037, and South Cambridgeshire' to 189,200 (Figure 9.1). This continued population growth adds to the importance of continuing employment creation in the coming years.

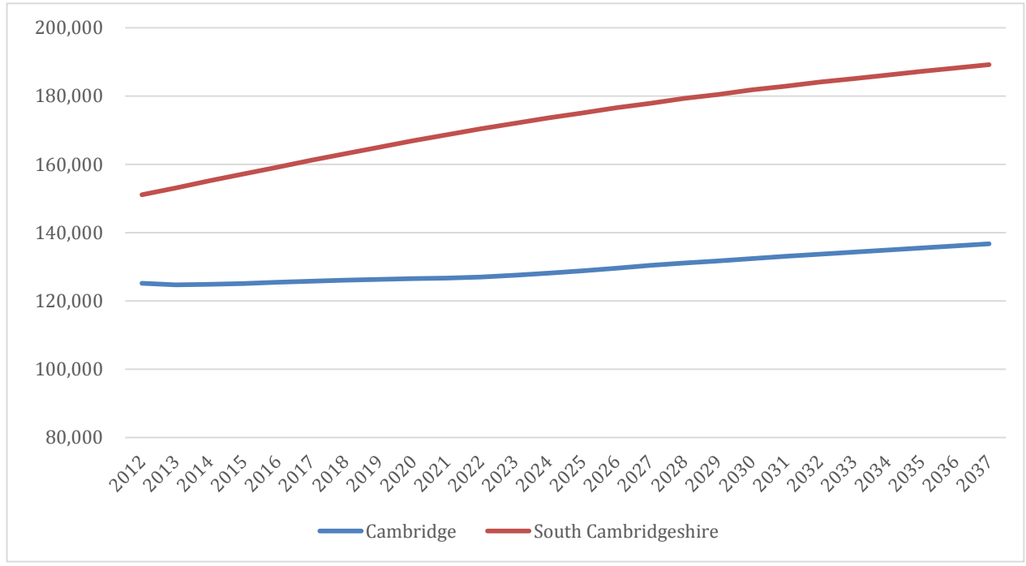

Figure 9.1 ONS Population projections for Cambridge and South Cambridgeshire, 2012-2037

9.4.14 Reflecting its status as a major student city, Cambridge has a younger than average population profile, with 30.8% of residents aged 18-29 in 2014 compared with the regional 14.5% and national 16.3%. Only 11.9% of residents were aged 65 and over, compared with 17.5% in the East of England and 16.4% in England. South Cambridgeshire has an older population profile. In 2014 only 12.2% of residents were aged 18-29, and residents aged 65 and over accounted for 16.6% of the population.

9.4.15 In both Cambridge and South Cambridgeshire, the proportions of residents aged 16-17 and aged 30-44 did not deviate significantly from national averages, nor did the proportion of residents aged 45-64 in South Cambridgeshire. In Cambridge, however, this proportion was lower than national and regional averages, reflecting the heavier weight of young adults in the City's population composition. 18.8% of Cambridge residents were aged 45-64, compared with 27.4 in South Cambridgeshire, 26.2% in the East of England and 25.4% in England.

9.4.16 Crime levels in Cambridge were higher than the Cambridgeshire average, with 81 headline offences recorded per 1,000 population in 2013/14. This is not surprising given that average crime rates are generally higher in urban areas than rural areas.

9.4.17 The 2011 Census revealed that very high proportions of Cambridge and South Cambridgeshire residents were employed in professional occupations: 38.0% and 26.8% respectively in 2011, compared to 16.7% in the East of England and 17.5% in England. South Cambridgeshire's proportion of residents in employment as managers, directors and senior officials, at 12.4%, exceeded the Region's 11.4% and England's 10.9%. The proportion of Cambridge residents employed as managers, directors and senior officials was lower, at 8.9%.

9.4.18 Lower than regional and national average proportions of Cambridge and South Cambridgeshire residents were employed in areas requiring fewer qualifications including skilled trades; caring, leisure and other services; administrative and secretarial occupations; and process plant and machine operatives. South Cambridgeshire had a lower than average proportion of residents employed in elementary occupations (7.8% against 10.5% in Cambridge, 10.6% in the East of England and 11.1% in England as a whole) (Table 9.7)

Table 9.7 Residents' occupations

Occupation	Percentage of employed residents aged 16-74 in occupation			
	Cambridge	South Cambridgeshire	East of England	England
Managers, directors and senior officials	8.6	12.4	11.4	10.9
Professional occupations	38.0	26.8	16.7	17.5
Associate professional and technical occupations	11.3	13.1	12.9	12.8
Administrative and secretarial occupations	7.8	10.7	12.0	11.5
Skilled trades occupations	6.6	10.5	12.0	11.4
Caring, leisure and other service occupations	7.3	8.2	9.3	9.3
Sales and customer service occupations	6.5	5.9	7.9	8.4
Process plant and machine operatives	3.4	4.6	7.3	7.2
Elementary occupations	10.5	7.8	10.6	11.1
Source: Nomis, Census 2011				

9.4.19 As reflected in their occupational structure, Cambridge and South Cambridgeshire's populations are on average highly skilled, possessing levels of qualifications above national average. 61.3% and 49.6%, respectively, of Cambridge and South Cambridgeshire residents aged 16-64 were qualified to NVQ4+ in 2014. This was significantly higher than the 33.1% in the East of England and 35.7% in England.

9.4.20 South Cambridge had a remarkably low proportion of residents aged 16-64 with no qualifications (NVQ) – 2.7% - whilst Cambridge's 9.0% slightly exceeded that of the East of England (8.1%) and England (8.6%).

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9.5 Impact assessment

Construction phase

9.5.1 Construction phase impacts are assessed in Table 9.8

Table 9.8 Construction phase effects

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Employment	Medium	The main socio-economic impact during the construction phase will be the additional temporary employment generated as a result of the construction of the Proposed Development, anticipated to begin in 2016 and finish in 2031. The construction phase is expected to support a significant number of direct jobs as well as further indirect and induced jobs that would be supported through supply linkage and income multiplier effects. This includes firms supplying construction materials and equipment, and construction workers spending part of their wages in the local economy. See Appendix 9.1, Volume 3 for the calculation process and assumptions used.	None proposed	Moderate	In terms of direct jobs, the construction of the Proposed Development creates 800 Full Time Equivalent construction jobs over the Proposed Development's 15 year construction period. In addition, indirect jobs are estimated at 200 locally and 400 regionally. In total, the Proposed Development could directly or indirectly support 1,000 jobs at the local level and 1,200 at the regional level during the 15 year construction period. In order for local residents to take full advantage of the employment opportunities created by the construction, they must possess the required skills. The 2011 Census indicates that Cambridge and South Cambridgeshire had a lower than average proportion of people working in skilled trades occupations: 6.6% and 10.5% respectively, compared to the regional average of 12.0% and national average of 11.4%. As mentioned above, the two local authorities also had relatively low proportions of residents employed in the construction industry. The employment created by the Proposed Development's construction phase would therefore diversify the range of employment offerings in Cambridge and South Cambridgeshire.	Moderate beneficial **Significant**
Local economy	Moderate	Expenditure at local businesses from construction employees and additional economic activity arising from local supply linkages (multiplier effects described above).	None proposed	Low	Existing catering facilities on the West Cambridge Site will benefit from additional expenditure generated by construction workers. This advantage may also extend to businesses within the City centre, although benefits may be limited by the distance of the Site from the centre (2km). This would include businesses in the new North West Cambridge local centre which would be open and operating for the majority of the West Cambridge construction phase. As with local employment, if local supply linkages are successfully exploited, this would contribute to a diversification of the Cambridge and South Cambridgeshire economy.	Minor beneficial **Not significant**
Local residents / businesses	Moderate	The construction phase could result in increased pressure on transportation, increased vehicle traffic and associated problems of noise, pollution and other disruption to local residents. This would be exacerbated by increased commuter traffic if a significant proportion of construction jobs are taken up by people residing outside the two local authorities.	Disturbance to local residents and businesses will be minimised by phasing and restricting hours of construction work	Low	As with any major development project, the construction itself could cause some temporary disruption to local people and businesses as a result of noise and vibration. The Site is bounded to the west by the M11 Motorway, the north by the A1303 Madingley Road, the east by Clerk Maxwell Road, and to the south by open countryside. Residential properties are located close by at The Lawns and Perry Court off Clerk Maxwell Road to the east, and Conduit Head Road and Lansdowne Road off Madingley Road to the north. Given the Site's location at the edge of the city and only limited bordering by residential properties, any disruption is likely to be less intense than if the Development was taking place in a more built up area. The greatest disruption is likely to be to the existing academic and commercial facilities – such as the Vet School – and the residents of the student accommodation located onsite. However, all of these impacts are temporary in nature.	Minor adverse **Not significant**
Security	Low	Possible increase in criminal activities and anti-social behaviour at the Site.	Efficient guarding of the construction works area	Negligible	In terms of security and crime prevention, the existing uses on the Site of the Proposed Development mean that part of the Site will be in use throughout the construction phase. This minimises possible criminal activities and anti-social behaviour at the Site.	Negligible adverse **Not significant**
Housing and services	Low	Increased demand for and pressure on housing and local services due to construction workers moving into the area from elsewhere.	None proposed	Low	As the construction industry within the study area is underrepresented, a proportion of the construction workers are likely to temporarily move to the area from elsewhere. This will increase demand for rental housing and other local social infrastructure. The numbers of construction workers are unknown but are likely to be a few hundred at most. Given the size of the Cambridge population and the above average rental housing stock, due to the large transient student population, the impact would be negligible.	Negligible adverse **Not significant**

Operational phase

9.5.2 Operational phase impacts are assessed in Table 9.9.

Table 9.9 Operational phase effects

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Employment	High	Once completed, the Development is expected to have a positive impact in terms of providing new, high quality academic and employment floorspace. This employment floorspace will generate positive direct, indirect and induced employment opportunities. The total number of Full Time Equivalent jobs on Site once the Development is complete is calculated to be 13,994. Of these, 8,168 are to be office jobs, 1,190 commercial dry lab and workshop, 383 retail and amenities (including food and drink), and 4,213 academic. 20 jobs will be supported by the nursery, and 20 by the assembly and leisure facilities. See Appendix 9.1, Volume 3 for assumptions and calculation process.	None proposed	High	In assessing the effects of the Proposed Development, it is important to take into account those economic benefits that will be retained at a local or regional level, and which will be brought about over and above what would take place in absence of the Development. The analysis below estimates the additional employment benefits that would be generated by the Proposed Development. The key components of employment additionality relevant to this Proposed Development are as follows: • deadweight (the number or proportion of outputs that would be produced if the Proposed Development did not go ahead) • leakage effects (the number or proportion of outputs that benefit those outside of the intervention's target area) • displacement (the number or proportion of outputs accounted for by reduced outputs elsewhere in the target area) • economic multiplier effects (further economic activity associated with additional local income, local supplier purchases and longer term development effects) Subtracting the deadweight (i.e. the level of employment provided by the existing and consented employment space only), the total number of new jobs to be created directly by the Proposed Development is estimated to be 10,129. Of these, 6,367 will be office based, 541 will be dry lab, 387 will be workshop, 308 will be retail, and 2,526 will be academic. This provides a significant proportion of the 22,100 new jobs identified by Cambridge City Council in the Draft Local Plan. The net additional employment benefits (including direct, indirect and induced jobs, leakage, displacement and economic multiplier effects) created by the Proposed Development are expected to be 6,600 jobs at the local level and 8,100 at the regional level. This is deemed to have a major beneficial impact of significance in terms of employment in the area. See Appendix 9.1, Volume 3 for the calculation process and assumptions used.	Major beneficial **Significant**
Local and regional economy	High	Permanent increase in local and regional annual GVA, as well as local competitiveness, research and development and innovation, which are core economic strategic priorities.	None proposed	High	The Proposed Development has the potential of generating additional annual GVA of £378.2 million at the local level and £476.6 million at the regional level. This was calculated by converting the net employment benefits generated by the Proposed Development into Gross Value Added (GVA), using GVA per worker of £51,804 in Cambridgeshire County Council (ONS sub-regional productivity data 2012). Based on this estimate, the Proposed Development will have a major beneficial impact of significance to the local and regional economies.	Major beneficial **Significant**
Socio-economic policy objectives	High	The Proposed Development will generate significant numbers of jobs during both the construction and operational phases and will provide high quality employment land by intensifying land use on an edge-of-city site, which is deemed the most sustainable option for development. In this respect, the Development is expected to have a beneficial sustainability effect of moderate significance.	None proposed	High	The Proposed Development is expected to contribute to local strategic economic priorities as well as those of the wider region by supporting key growth sectors including academic, high-technology, and research and development. It will facilitate the continued development of the Cambridge Cluster and the University of Cambridge's contribution to the local and national economies. Thus, the Proposed Development will have a major beneficial impact of significance towards achieving the area's socio-economic policy objectives.	Major beneficial **Significant**
Security	Low	Crime and anti-social behaviour at the Site.	Adopt measures in the design and layout of the Proposed Development that will minimise anti-social behaviour and crime. This would include ensuring external areas are well lit.	Negligible	Concerns about crime and anti-social behaviour at the Site during its operational phase can be mitigated to a large extent by adopting measures in the design, layout and construction stages of the Proposed Development. The vitality of the Site will be improved as an increase in the number of Site users throughout the day due to increased employment and the evenings and weekends through the provision of shared services and sports facilities. This will help to reduce crime and the fear of crime through increased informal surveillance.	Negligible **Not significant**

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Housing and services	Low	Increased demand for and pressure on housing and local services.	None required - Local Plans provide for increasing housing offerings	Low	As for the construction phase, in order for local residents to be able to take full advantage of the employment opportunities provided during the scheme's operational phase, they must possess the necessary qualifications and skills. The high level of qualification of local populations makes them extremely well-placed to take advantage of the employment opportunities created. The impact of the Proposed Development on the local provision of housing and social services is likely to be minimal. This is because a significant part of the labour force working at the Site in its operational phase is expected to be drawn from local resident, high-skill populations. It is likely that the scale of employment opportunities created at and by the Proposed Development will attract some people to move into the area. Yet this need for new housing is being addressed by other local developments. According to the Cambridge Local Plan 2014, provision will be made for the development of not less than 14,000 additional dwellings within Cambridge City Council's administrative boundary over the period from April 2011 to March 2031. The South Cambridgeshire Local Plan 2013 seeks to deliver 19,000 new homes, with three new strategic scale allocations proposed for housing-led development: a new town north of Waterbeach, a new village based on Bourn Airfield, and a major expansion of Cambourne.	Minor adverse **Not significant**

9.6 Mitigation Measures

9.6.1 During the construction phase, disturbance to local residents and businesses will be minimised by phasing and restricting hours of construction work. This will be specified in the Construction Environmental Management Plan.

9.6.2 Efficient guarding of the construction works area will mitigate risks to security, as will ensuring that the key routes on the Site are well lit during evening and night hours and that valuable materials are secured.

9.6.3 For the operational phase, measures in the design and layout of the Proposed Development will minimise anti-social behaviour and crime. This would include ensuring external areas are well lit.

9.7 Summary

9.7.1 During the construction phase the Proposed Development will give rise to benefit for local employment and the local economy. Benefits to employment are moderate and significant. Benefits to the local economy are minor and not significant. There will also be minor adverse effects to local businesses and residents due to disruption and nuisance caused by construction activities. This will be a minor effect and not significant. These effects will be temporary, lasting for the duration of the construction phase.

9.7.2 Once the Proposed Development is constructed and fully operational there will be major benefits to employment, the local and regional economy and in achieving socio-economic policy objectives. This will be significant. There will also be minor adverse effects to housing and services as increased demand will place pressure on existing services and housing supply. This will be a minor effect and not significant. Operational effects would be permanent.

10. Traffic and transport

10.1 Scope of the assessment

10.1.1 The Transport chapter provides the details of development impacts on the existing transport network for walk, cycle, and public transport usage, as well as from vehicular traffic.

10.1.2 Reflecting the subject matter and order of topics as stated in the Guidelines for the Environmental Assessment of Road Traffic, this Chapter considers the potential for significant effects deriving from any:

- Severance;
- Driver Delay;
- Pedestrian Delay (also considering cyclist delay);
- Pedestrian Amenity (also considering cyclist amenity);
- Fear and Intimidation;
- Road Safety; and
- Hazardous Loads

10.1.3 No hazardous loads are associated with the construction, operation or decommissioning of the Project and therefore have been scoped out of the assessment.

10.1.4 The potential effects of the Proposed Development have been considered for the following three scenarios:

- The effects of the Construction Phase of Development – this is assessed in the context of the 2015 Base flows;
- The operational effects of completion of the Initial Phase of Developments in 2021 – cumulative impact assessment; and
- The operational effects of the Full Developments in 2031 – cumulative impact assessment.

10.1.5 Detailed discussions and negotiations have been ongoing on a regular basis with the stakeholders (Highways England, Cambridge City Council and Cambridgeshire County Council) throughout 2015 and 2016.

10.1.6 A list of consultation responses received from statutory consultees during the EIA process relating to traffic and transport are presented in Table 10.1. All comments have been taken into account within this assessment.

Table 10.1 Traffic and transport scoping response

Issue raised	Respondent
The Guidance for Transport (2007) is now archived. Whilst still of value, and its use is welcomed in this process, this is not technically DfT guidance. The list of criteria should include the DfT Circular 02/2013 "The strategic road network and the delivery of sustainable development", this being current DfT policy in terms of planning in regard to the SRN	David Abbott, Asset Manager - Area 8, Highways England
Natural England encourages any proposal to incorporate measures to help encourage people to access the countryside for quiet enjoyment. Measures such as reinstating existing footpaths together with the creation of new footpaths and bridleways are to be encouraged. The EIA should consider potential impacts on rights of way in the vicinity of the development. Appropriate mitigation should be incorporated for any adverse impacts. We also recommend reference to the relevant Right of Way Improvement Plans (ROWIP) to identify public rights of way within or adjacent to the proposed site that should be maintained or enhanced.	Janet Nuttall, Sustainable Land Use Advisor, Natural England
How has linking this development (and that proposed in NW Cambridge) to the city centre, railway station, Addenbrookes and other major sites within the Cambridge (sic) been included? This includes bus lanes, cycle routes, etc, as the A1303 has already become a challenge at peak times. Both Cambridgeshire County Council and the University should look at transport alternatives for all development. One alternative for consideration could be a new Guided Busway starting at St Neots through Cambourne and Bourne Airfield, Hardwick, Coton, then NW Cambridge, through West Cambridge and into the city along Barton Road.	Stacey Weiser, Head of Planning and Conservation, Cambridge Past, Present and Future
Construction Environment Management Plan – Prior to the commencement of development or any reserved matters approval, a site-wide CEMP shall be submitted to and approved in writing by the local planning authority. The CEMP shall include the consideration of the following aspects of construction: (inter alia). b) Contractors' access arrangements for vehicles, plant and personnel including the location of construction traffic routes to, from and within the site, details of their signing, monitoring, and enforcement measures, along with location of parking for contractors and construction workers. Para 3.8.3 first sentence suggest amend to say 'The public transport provision will be developed to be complementary with the aspirations set out in the Transport Strategy for Cambridge and South Cambridgeshire, some of which will be delivered via the ongoing City Deal process'. Para 3.8.4: in Cambs cycle trips are made over longer distances than the typically assumed 5km national average. Para should be amended to reflect this. Para 3.8.7: last bullet 'smaller concentrations of cycle parking at a range of locations….' Para 9.3.9: At the end of para please add 'The study area for the Transport Assessment (TA) may well be more extensive as the use of a 30% threshold is not considered refined enough for the assessment of operational traffic and transport implications. Para 9.3.12: at the end of para please note 'there may be a need for immediate years to be considered in the TA so that the impacts of phasing understood'. Para 9.3.18: suggest adding the following to the end of this para 'It should be noted that these criteria relate to ES thresholds but it is recognised that in operational highway terms much lower thresholds can be important and will be considered via the TA process'. Para 9.3.20: are these thresholds relevant / applicable to local highways? Para 9.3.2: these thresholds sound too coarse for detailed assessment of pedestrian delays in a TA context.	Judith Carballo, Economy, Transport and Environment, Cambridgeshire County Council

10.2 Relevant legislation

National Planning Policy Framework (NPPF)[47]

10.2.1 A Transport Statement or Transport Assessment and Travel Plan should be provided for all developments that generate significant amounts of movement (Paragraphs 32 and 36 of the NPPF) and decisions should ensure that they "*are located where the need to travel will be minimised and the use of sustainable transport modes can be maximised*" (Paragraph 34), and take account of whether:

- The opportunities for sustainable transport modes have been taken up…;
- Safe and suitable access to the site can be achieved for all people; and
- Improvements can be undertaken within the transport network that cost effectively limits the significant impacts of the development….

10.2.2 To facilitate the use of sustainable modes of transport, Paragraph 35 states that, where feasible, developments should be located and designed to:

- Accommodate the efficient delivery of goods and supplies;
- Give priority to pedestrian and cycle movements, and have access to high quality public transport facilities;
- Create safe and secure layouts which minimise conflicts between traffic and cyclists or pedestrians…;
- Incorporate facilities for charging plug-in and other ultra-low emission vehicles; and
- Consider the needs of people with disabilities by all modes of transport.

Circular 02/2013 'Strategic Road Network and the Delivery of Sustainable Transport'[48]

10.2.3 Relevant policy is also set out in Circular 02/2013 'The Strategic Road Network and the Delivery of Sustainable Development' published by Highways England (then operating as the Highways Agency) in September 2013. This sets out the role of Highways England in engaging with communities and developers to deliver sustainable development and economic growth.

10.2.4 Paragraph 9 sets out the broad policy aims of the circular as it relates to development proposals, stating that "Development proposals are likely to be acceptable if they can be accommodated within the existing capacity of a section (link or junction)…or they do not increase demand for use of a section that is already operating at over-capacity levels, taking account of any travel plan, traffic management and/or capacity enhancement measures that may be agreed….".

With reference to decision making regarding developments, paragraph 9 continues "However, development should only be prevented or refused on transport grounds where the residual cumulative impacts of development are severe".

10.2.5 The emphasis of this document reflects national guidance, stressing the obligation placed on every developer to 'manage down' traffic generation from new development, and to provide evidence that proposals for measures to reduce traffic generation from the site have been considered.

Cambridge Local Plan 2014[49]

10.2.6 15 strategic objectives are identified for the implementation of the Local Plan under the spatial vision for Cambridge, including:

- *"Promote and support economic growth in environmentally sustainable and accessible locations, facilitating innovation... while maintaining the quality of life and place that contribute to economic success;*
- *Be located to help minimise the distance people need to travel, and be designed to make it easy for everyone to move around the city and access jobs and services by sustainable modes of transport".*

10.2.7 Policy 5 of the spatial strategy regards strategic transport infrastructure, placing emphasis on modal shift and greater use of sustainable transport. In particular, the following points will be supported, with the ones relevant to West Cambridge identified:

- *"Promoting greater pedestrian and cycle priority through and to the city centre, district centres and potentially incorporating public real and cycle parking improvements;*
- *Promoting sustainable transport and access for all to and from major employers, education and research clusters…;*
- *Working with partners in supporting…city-wide cycle and pedestrian network by addressing 'pinch-points', barriers and missing links;*
- *Linking growth to the proposed city-wide 20mph zone;*
- *Easing pressure on the air quality management area in the city centre".*

10.2.8 Policy 18 identifies that densification of West Cambridge will be permitted, stating:

"Development of this area will be permitted in line with the existing planning permissions. The principal land uses will be:

- *D1 educational uses, associated sui generis research establishments and academic research institutes…*
- *A mix of commercial research uses within use class B1(b)…*

Small-scale community facilities, amenities, and A1 (local shop), A3 (café), A4 (public house), D1 (crèche) type uses and student accommodation will be acceptable, if they support existing occupants on the site and add to the social spaces and vibrancy of the area, essential to its continued success.

Any densification of development on the site that results in a significant increase in floorspace, over that already approved, will be supported providing that:

- *A revised masterplan has been proposed that takes an integrated and comprehensive approach to the provision and distribution of the uses, and supporting facilities and amenities;*

47 Department for Communities and Local Government, March 2012, National Planning Policy Framework
48 Highway Agency (now Highways England) and the Department for Transport, September 2013, Strategic Road Network and the Delivery of Sustainable Development
49 Cambridge City Council, July 2013, Cambridge Local Plan 2014 Proposed Submission

- *Phasing of the development will be determined through the masterplan and as the need is proven;*
- *Development should not exceed four commercial storeys (16 metres in total) and given the sensitivity of the Green Belt to the south and west a lower overall height may be appropriate along these edges;*
- *Proposals respect the important adjacent Green Belt setting to the south and west, and other neighbouring residential uses and views of the city from the west;*
- *It includes a comprehensive transport strategy for the site, incorporating a sustainable transport plan to minimise reliance on private cars. This should include assessing the level, form and type of car parking on the site;*
- *That walking, cycling and public transport links (including access for all) to the city centre, railway station(s), other principal educational and employment sites, and other key locations within the city are enhanced to support sustainable development; and*
- *That proposals provide appropriate green infrastructure which is well integrated with the existing and new development and with the surrounding area.*

Greater Cambridge City Deal[50]

10.2.9 The Greater Cambridge City Deal was agreed between the government and Greater Cambridge in June 2014, allowing Greater Cambridge to maintain and grow its status as a prosperous economic area, whilst maintaining ease of movement between economic hubs.

"Greater Cambridge needs to connect new developments to each other, and to existing research institutes, science and business parks; to Cambridge city centre and transport hubs...There will be new orbital bus routes around Cambridge and new high quality public transport links into Cambridge on key corridors connecting with major employment centres."

10.2.10 West Cambridge Development transport proposals align well with this aspect of the Greater Cambridge City Deal, making more efficient use of an existing hub, whilst maximising sustainable travel opportunities available from the 2014 City Deal.

Cambridgeshire Local Transport Plan 2011 – 2031[51]

10.2.11 The third Cambridgeshire Local Transport Plan (LTP3) sets out the transport objectives, policies and strategy for the county. The document was updated in 2014 "*to reflect new data and changing context with regard to funding and development plans*" and identifies large scale growth and the associated pressure on the transport network and the environment as a key issue affecting Cambridgeshire.

10.2.12 Having outlined the objectives of the LTP3, the document sets out 8 challenges for transport, along with strategies to address each challenge. The ones relevant to West Cambridge are discussed below.

- Challenge 2: Reducing the length of the commute and the need to travel by private car - "our transport strategy supports the development strategy for Cambridgeshire by aiming to reduce the need to travel and by providing sustainable travel options for new developments";
- Challenge 3: Making sustainable modes of transport a viable and attractive alternative to the private car - "by continuing to develop sustainable networks for walking and cycling, making it easier for people to change between modes of transport and working with bus operators to provide high quality bus services...We aim to improve the environment and safety for pedestrians, cyclists and public transport users…Focus on raising awareness of transport choices available…this will include work with local planning authorities to ensure provision for sustainable modes that form an integral part of new developments".

Transport Strategy for Cambridge / South Cambridgeshire[52]

10.2.13 The Transport Strategy for Cambridge and South Cambridgeshire (TSCSC) ensures local councils plan together for sustainable growth and continued economic prosperity in the area. It was adopted by Cambridgeshire County Council in 2014, and is to be regularly reviewed given the extent of growth and development in the area. The strategy has two main roles for improving access across the area:

- To provide a detailed policy framework and programme of transport schemes for the area, addressing current problems, and being consistent with the Cambridgeshire LTP3;
- Supporting the Cambridge and South Cambridgeshire Local Plans, taking into account future levels of growth in the area and detailing the transport infrastructure and service necessary to deliver this growth.

10.2.14 The document sets out a number of transport policies and supporting strategies for the development of movement in the region:

- TSCSC 1 The strategy approach - "The transport network will support economic growth, mitigate the transport impacts of the growth and help protect the areas distinctive character and environment".
- TSCSC 2 Catering for travel demand in Cambridge - "More people will walk, cycle and use public transport services for journeys into, out of and within the city. More people will car share;"
- TSCSC 7 Supporting sustainable growth - "New development will be required to make provision for integrated and improvement transport infrastructure to ensure that most people have the ability to travel by foot, bicycle or by passenger transport and in line with specified modal split targets where relevant".
- TSCSC 9 Access to jobs and services – "Access to areas of employment and key services will be maximised, particularly by sustainable modes of travel, to:
  - Provide a transport network that is efficient and effective;
  - Provide good accessibility to services and for businesses;
  - Provide a HQPT and cycle network to routes near major employment, education and service centres.
- TSCSC 12 Encouraging Walking and Cycling" - "All new development must provide safe and convenient pedestrian and cycle environments including adequate and convenient cycle parking and ensure effective and direct integration with the wider network."

50 Deputy Prime Minister's office, June 2014, Greater Cambridge City Deal
51 Cambridgeshire County Council, July 2015, Cambridgeshire Local Transport Plan 2011-2031
52 Cambridgeshire County Council, April 2014, Transport Strategy for Cambridge and South Cambridgeshire

10.3 Method of assessment

Assessment approach

10.3.1 The method used to assess the effects of traffic associated with the Proposed Development is set out within the Transport Assessment. A transport model has been constructed of the local highway to evaluate the movement of trips generated by the Proposed Development on the external highway network in the area.

10.3.2 The assessment has been undertaken in accordance with the following guidelines:

- Guidelines for the Environmental Assessment of Road Traffic (IEMA)[7];
- Design Manual for Roads and Bridges (DMRB)[53];
- Local Cambridgeshire County Council guidance.

Scenarios

Year of assessment

10.3.3 It is anticipated that construction of the Proposed Development will commence in 2016 and will take around 15 years to build out, i.e. through to 2031. In order to test this "worst case", the overall EIA has tested the operational phase in 2031 – this is coincidently, consistent with the Joint Authorities' latest available transport modelling assessment years for testing the emerging Local Plan.

10.3.4 Because of the timescales involved to 2031, this includes a substantial element of uncertainty in terms of

- Development delivery across the Cambridge Sub Region;
- The associated infrastructure provision necessary to accommodate this level, of growth particularly relating to:
  - The A14 Huntingdon – Cambridge Enhancement;
  - The Greater Cambridge City Deal transport proposals;
  - Highways England's currently unpublished proposals for the M11;
  - Other emerging transport proposals – such as improvements to east - west movement;
- The emerging development policy, including that enshrined within the Cambridge Local Plan.

10.3.5 As such, the transport modelling cannot robustly define a baseline scenario for 2031.

10.3.6 For the purposes of assessing the transport effects of the Proposed Development, the principles of the proposed strategy have been discussed and agreed with Joint Authorities. This "Adaptive Phased Approach" is summarised as incorporating both:

- A graduated approach – the assessment process reflecting current transport planning policy where travel demand management measures are introduced first, followed by any necessary highway infrastructure measures to mitigate the residual traffic impact; as well as
- An adaptive approach – where, to maintain future flexibility, the proposed mitigation for later phases responds to the quanta of development within the individual phase proposals, the timescales for the delivery, changes in future travel behaviour patterns, emerging transport policy, and the current uncertainty relating to the development and transport infrastructure enhancement proposals.

10.3.7 The effect of the Proposed Development has been assessed with reference to the:

- Do Minimum (i.e., with the Constructed West Cambridge Development, and all other committed and consented highway enhancements and developments than the Proposed Development); and
- Do Something scenarios (i.e., with the committed and consented highway enhancements and developments as well as the relevant phase of the Proposed Development).

10.3.8 The following scenarios have therefore been considered:

- Baseline
  - 2015 Baseline;
  - 2021 Do Minimum;
  - 2031 Do Minimum;
- Future
  - 2015 With Construction (assumed to have the greatest traffic impact);
  - 2021 Do Something - (reflecting committed and proposed developments including the Initial Phase of the Proposed Development as per Table 10.3); and
  - 2031 Do Something - (reflecting committed and proposed developments including the Proposed Development in its completed form).

Development quanta

10.3.9 The development quanta assumed for West Cambridge in the 2021 and 2031 Do Minimum assessments reflects the existing development in the study area.

10.3.10 For the 2021 Do Something scenario, it has been agreed that an indicative Initial Phase of Development be assumed and assessed, the composition of this Initial Phase of West Cambridge Development is shown in Table 10.2, with the assumed completion in 2021.

[53] Highways Agency, 1993, Design Manual for Roads and Bridges, Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 8 Pedestrians, Cyclists, Equestrians and Community Effects

Table 10.2 Proposed Initial Phase of West Cambridge Development – Land Use Mix

Lane use (GFA)	Area (m^2)
Academic Research (m^2)	168,259
Commercial Research and Research Institute (m^2)	92,386
Nursery (m^2)	1,900
Shop, Café Restaurant, Pub - A1-A5 (m^2)	350
Assembly and Leisure	6,060
Residential (m^2)	10,680
Ancillary Infrastructure (data centre, energy centre)	7,675
Total (m^2)	287,310

10.3.11 The Full Development quanta assumed for 2031 reflects the composition as stated in Chapter 3.

Access Strategy

10.3.12 Measures envisaged to mitigate the likely significant effects of this indicative Initial Phase are included later in this chapter.

10.3.13 Acknowledging that there is uncertainty regarding future development and transport infrastructure proposals, and that these would have a significant and substantial impact upon future traffic flows in the local area, as discussed with the Joint Authorities it is not appropriate to define further mitigation measures at this stage beyond an indicative Initial Phase of development (assumed to be 2021).

10.3.14 The supporting development access strategy is considered by mode within the respective Sections of the Transport Assessment as summarised below:

- Pedestrian and Cycle strategy - Section 6
- Public Transport Strategy – Section 7
- Travel Demand Management Strategy – Section 9
- Site Layout, Vehicular Access and Parking - Section 8.

10.3.15 As defined in the latter, the Vehicle access will be provided to the Development by a series of existing, enhanced and new vehicular access points off Madingley Road. These will be delivered through the duration of the Development, to a programme to be determined. These access points assumed for the 2021 assessment for the Initial Phase of Development are:

- The existing traffic signal controlled High Cross junction;
- The existing JJ Thomson Avenue priority junction; and
- The existing Clerk Maxwell Road priority junction.

10.3.16 In addition, a further priority junction formerly serving the Vet School (currently closed), between JJ Thomson Avenue and High Cross would be opened and enhanced to provide limited service access only to the occupiers immediately adjacent Madingley Road.

10.3.17 For the 2031 assessment, the above three accesses are assumed, along with a new traffic signal controlled, restricted movement (right in / left out), access junction onto Madingley Road at the western end of the site, which would connect to the Western Access Road.

Establishing the baseline

Survey data

10.3.18 For the purposes of the traffic assessment, traffic count survey data has been collated from both existing sources as well as the commissioning new traffic count surveys in order to set out baseline traffic flows.

10.3.19 Traffic Turning Count Surveys were commissioned by the University of Cambridge at the flowing junctions and were undertaken on 25th November 2014 by Advanced Transport Research (ATR):

- Madingley Road / JJ Thomson Avenue;
- Adams Road / Wilberforce Road;
- Grange Road / Adams Road / Burrell's Walk;
- Madingley Road / Clerk Maxwell Road; and
- Madingley Road / Madingley Rise.

10.3.20 Additional Traffic Turning Count Surveys were undertaken by Sky High Technology on Tuesday 30th June 2015 at the following junctions:

- A1303 / A428 / St Neots Road roundabout;
- M11 Junction 13 Off-Slip / Madingley Road West junction;
- M11 Junction 13 On-Slip / Madingley Road East junction;
- Madingley / Grange Road priority junction;
- Huntingdon Road / Girton Road priority junction;
- Huntingdon Road / Storey's Way priority junction;
- Barton Road / Grange Road priority junction;
- Madingley Road / Cambridge Road crossroad priority junction;
- Madingley Road / Lady Margaret Road priority junction; and
- Madingley Rd / Northampton St / Queen's Road mini roundabout junction.

10.3.21 Automatic Traffic Counts (ATC) were commissioned by the University of Cambridge to undertake a two week-long ATC at the following location sites from 17th June to 30th June 2015 by Sky High Technology:

- Barton Road – east of Grantchester Road;
- JJ Thomson Avenue;
- Grange Road – north of Clarkson Road; and
- Madingley Road – west of M11 Junction 13.

10.3.22 These ATC surveys were primarily commissioned to inform the vehicle composition of the vehicle movements especially to inform the noise and air quality assessments of the Proposed Development.

10.3.23 The Highways England Traffic Information Database (TRADS) website has also been referred to, to provide volumetric and classified traffic flow information for the strategic highway for 2014 at:

- M11 Junction 13; and
- A14 – Junction 30 and section near to Girton.

Growth factors

10.3.24 Highways England Trip End Model Presentation Program (TEMPRO) database was used to provide the local growth factors for the Cambridge area as required, these are summarised in Table 10.3.

Table 10.3 TEMPRO growth factors

TEMPRO V.6.2 NTEM AF09 growth factors										
Road classification	**2013-2015**		**2014-2015**		**2014-2021**		**2015-2021**		**2015-2031**	
	AM	**PM**	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
Urban Trunk	1.0314	1.0325	1.0154	1.016	1.1551	1.1562	1.1375	1.1380	1.3614	1.3671
Urban Principal Road	1.0257	1.0268	1.0126	1.0132	1.1389	1.1401	1.1247	1.1252	1.3313	1.3369
Urban Minor Road	1.0272	1.0282	1.0133	1.0139	1.1388	1.1399	1.1238	1.1242	1.3405	1.3461
Rural Motorway	1.0277	1.0238	1.0111	1.0117	1.1568	1.1579	1.1440	1.1445	1.3844	1.3902
Rural Trunk	1.0242	1.0253	1.0119	1.0124	1.1681	1.1692	1.1543	1.1548	1.3953	1.4011
Rural Principal	1.0257	1.0268	1.0126	1.0132	1.1447	1.1458	1.1304	1.1309	1.3411	1.3467

Highway flow data

10.3.25 The trip generation from West Cambridge has been assessed for all scenarios; (Current – 2015), Do Minimum (Constructed) and Do Something for the two 2021 Initial Phase and 2031 Full Development tests, using:

- Peter Brett Associates' Transport Model - the vehicle trip results arising from the Person Trip Model element of this will be calibrated against
- Observation – including person trip surveys, and site access vehicle trip movement counts.

10.3.26 Peter Brett Associates has developed a first-principles Transport Model independently to assess development trip generation, distribution and mode share in this area. The West Cambridge Person Trip Model element was based on the previously-approved North West Cambridge Model - albeit expanded considerably to incorporate:

- The West Cambridge Development;
- Demographic information contained within the updated 2011 Census data;
- The trip generation from the allocated strategic developments included within the Cambridge Local Plan; and
- The results of the 2014 University staff data postcode data analysis.

10.3.27 Further details are provided below.

Base year traffic flows (2015)

10.3.28 The 2015 vehicle flows will be derived across the network from the most appropriate source, including inter alia:

- Traffic count surveys undertaken along Madingley Road in November 2015 as part of the West Cambridge Development Annual Monitoring (commissioned by the University);
- The traffic count survey - including automatic traffic counts and manual part-classified junction turning counts - undertaken across the area in June 2015 as part of this West Cambridge Development (commissioned by the University following the initial Transport Assessment Scoping in May 2015);
- Traffic count survey data provided by Cambridgeshire County Council;
- traffic count survey data from Highways England's TRADS database; and
- Growth factors from the Department for Transport's TEMPRO model will be used to convert all the survey results to the necessary common year.

10.3.29 These flows are summarised in Appendix A10.1, Volume 3).

Calculation of 2021 traffic

10.3.30 The 2015 network traffic flows will be increased by the vehicle trips identified by Peter Brett Associates' Transport Model arising from the consented strategic development delivered by 2021 assigning along each link.

10.3.31 These 2021 flows, being based in part on observation from the surveys in 2015, would already include movements associated with West Cambridge. For the purposes of assessing the 2021 Do Something scenario for the Transport Assessment, to avoid double counting the existing West Cambridge development-generated vehicle trips:

- The Observed 2015 West Cambridge vehicle movements would be deducted by link;
- These Observed 2015 West Cambridge vehicle movements would be replaced with the predicted Proposed Development (Initial Phase of the Do Something scenario) identified by the Transport Model.

10.3.32 To provide reassurance to the accuracy of these flow increases, the resulting increases in link flow will be considered with reference to the appropriate growth factor obtained from the Department for Transport's TEMPRO model. The flows are summarised in Appendix 10.1, Volume 3.

Calculation of 2031 traffic

10.3.33 The 2015 network traffic flows will be increased by the vehicle trips identified by Peter Brett Associates' Transport Model arising from the consented strategic development delivered by 2031 assigning along each link.

10.3.34 These 2031 flows, being based in part on observation from the surveys in 2015, would already include movements associated with West Cambridge. For the purposes of assessing the 2031 Do Something scenario for the Transport Assessment, to avoid double counting the existing West Cambridge development-generated vehicle trips:

- The Observed 2015 West Cambridge vehicle movements would be deducted by link;
- These Observed 2015 West Cambridge vehicle movements would be replaced with the predicted Proposed Development (Full Do Something scenario) identified by the Transport Model.

10.3.35 To provide reassurance to the accuracy of these flow increases, the resulting increases in link flow will be considered with reference to the appropriate growth factor obtained from the Department for Transport's TEMPRO model. The flows are summarised in Appendix 10.1, Volume 3.

Calculation of construction traffic generation

10.3.36 For the Proposed Development, a first-principles approach has been undertaken to derive the peak construction trip generation assumptions used in this assessment.

10.3.37 Reference has been made to the Construction Environmental Management Plan (CEMP) prepared by Peter Brett Associates in 2016 for West Cambridge to ascertain these movements.

Study area

10.3.38 The initial area of study agreed with the Joint Highway Authorities during the Transport Scoping exercise is shown on Figure 10.1.

10.3.39 The Institute of Environmental Assessment (now Institute of Environmental Management and Assessment (IEMA)) guidelines[54] suggest that for environmental impact, traffic flow increases (or HGV increases) of 30% represent a reasonable threshold for inclusion of highway links within the assessment process, although a lower threshold may be appropriate, for example, where there are higher HGV flows. It also suggests that links with traffic flow increases of 10% or more should be assessed in other sensitive areas. This has been used to inform the links assessed.

10.3.40 Notwithstanding the TEMPRO growth factors identified in Table 10.3 in excess of 30% between 2015 and 2031,the transport modelling has calculated that the below listed links will experience a 30% or greater increase in traffic flows in 2031 as a result of natural growth, plus growth from the specific cumulative developments and the Proposed Development.

- Link 3.4 – Madingley Rd – West of P&R Access;
- Link 3.5 – Madingley Rd – East of P&R Access;
- Link 3.6 – Madingley Rd – East of Proposed High Cross Access;
- Link 3.7 – Madingley Rd – East of JJ Thomson Ave;
- Link 3.8 – Madingley Rd – East of Clerk Maxwell Rd;
- Link 3.9 – Madingley Rd – East of Storey's Way;
- Link 3.10 - Madingley Rd – Ears of Grange Rd;
- Link 11.1 – Proposed Madingley Rd West Access to NWC;
- Link 11.2 – Proposed Huntingdon Rd Access to NWC;
- Link 12.1 – High Cross Access to Madingley Rd;
- Link 12.2 – JJ Thomson Ave Access to Madingley Rd; and
- Link 12.3 – Clerk Maxwell Rd (to the north of the proposed car park entrance).

10.3.41 Similarly, the transport modelling has calculated that the below listed links will experience a 10% or greater increase in traffic flows in 2031 as a result of natural growth, plus growth from cumulative developments and the Proposed Development.

- Link 3.3 – Madingley Rd between M11 On Slip – Proposed Madingley Rd West Access;
- Link 3.11 – Madingley Rd – West of Queen's Rd / Northampton St;
- Link 3.12 – Northampton St – West of Pound Hill; and
- Link 4.0 – Huntingdon Rd – West of Proposed NWC HRW Access.

[54] Institute of Environmental Assessment, 1993, Guidelines for the Environmental Assessment of Road Traffic

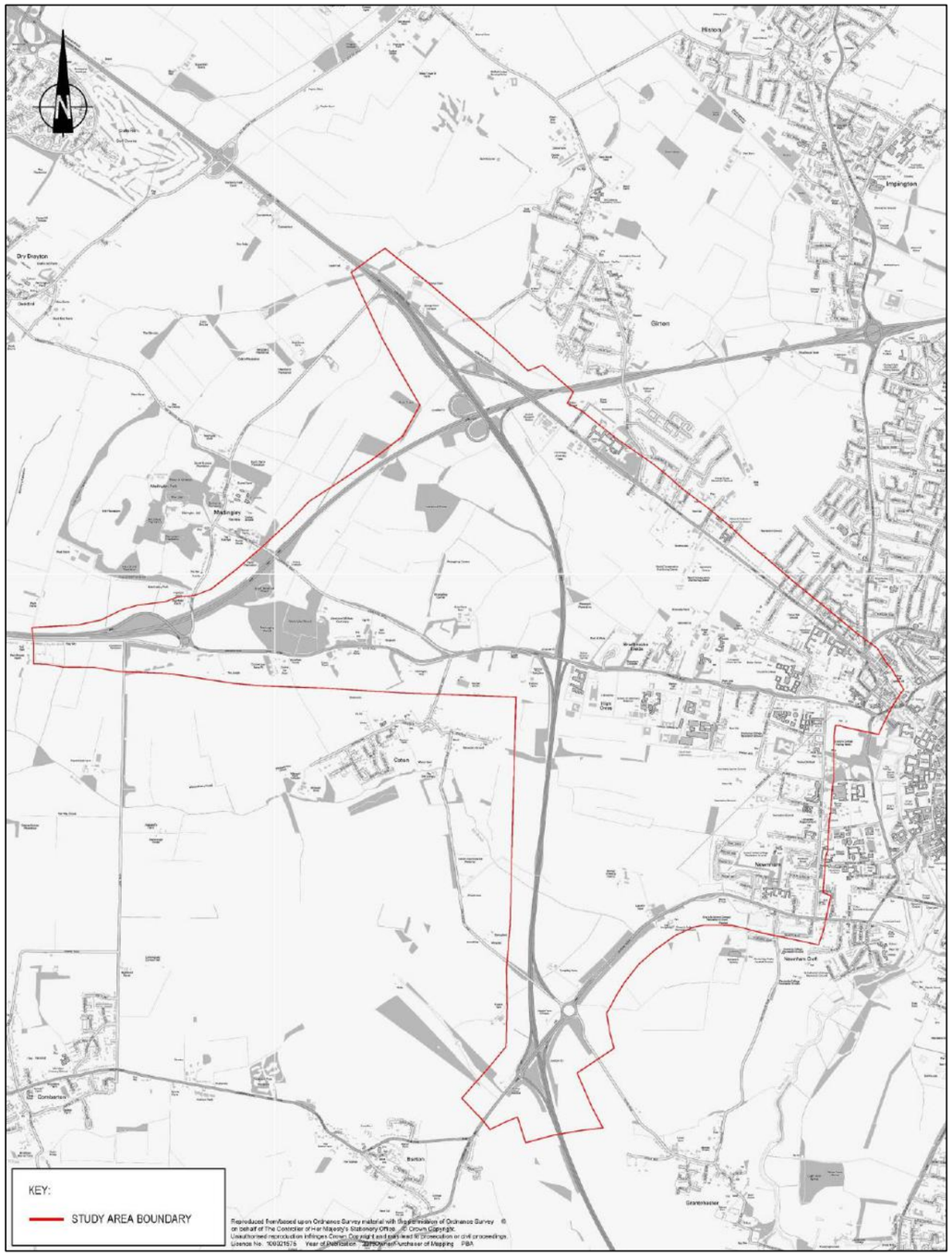


Figure 10.1 Study area

Impact assessment

10.3.42 The method and significance criteria used in this assessment reflect that within the guidance documents referenced earlier within this Chapter, together with professional judgement.

10.3.43 The significance of effect is derived from a combination of the Sensitivity (or importance) of the receptors affected, and the magnitude (or scale) of impact from the change on the receptors. These three factors are considered individually.

Sensitivity

10.3.44 For the transport-related effects considered in this chapter, categories of receptor sensitivity have been defined from the principles set out in the IEMA Guidelines as set out in Table 10.4

Table 10.4 Sensitivity of receptors

Sensitivity	Receptor
High	• Schools, colleges and other educational institutions; • Retirement / care homes for the elderly or infirm; • Roads used by pedestrians with no footways; and • Road safety black spots.
Medium	• Hospitals, surgeries and clinics; • Parks and recreation areas; • Shopping areas; and • Roads used by pedestrians with narrow footways.
Low	• Open space; • Tourist / visitor attractions; • Historical buildings; and • Churches.

10.3.45 In addition, although not specifically identified within the IEMA Guidelines as being sensitive, it has been assumed that residential areas and employment areas have low sensitivity to these effects, as they typically experience regular traffic movements on a day-to-day basis.

Magnitude of impact

10.3.46 The magnitude of impact depends upon the category of traffic effects being assessed, and this has been based on the guidance relating to Severance (as set out below) which suggests that 0%, 30%, 60% and 90% changes in traffic levels should be considered as "negligible", "minor", "moderate" and "major" impacts respectively.

10.3.47 IEMA's guidelines set out the broad principles of how to assess the magnitude of effect for each category of potential environmental impact. This is summarised below by category.

Magnitude of impact – Severance

10.3.48 The IEMA guidance states that "severance is the perceived division that can occur within a community when it becomes separated by a major traffic artery." Further, "Changes in traffic flow of 30%, 60% and 90% are regarded as producing 'slight', 'moderate' and 'substantial' changes in severance respectively". However, the guidance acknowledges that the measurement and prediction of Severance is extremely difficult. The assessment of Severance pays full regard to specific local conditions, in particular the location of pedestrian routes to key local facilities and whether or not crossing facilities are provided. For the purposes of this assessment, motorway and dual carriageway links where walking and cycling are excluded or the numbers extremely limited have not been included in the assessment tables.

10.3.49 Volume 11, Section 3, Part 8, Chapter 6 of the Design Manual for Roads and Bridges dated 2006 (the "DMRB") provides further guidance on this aspect of Severance in terms of the 2-way Annual Average Daily Traffic Flow (AADT) on a link. It states that new Severance should be described in terms of "Slight", Moderate" or Severe" and that these categories " *… should be coupled with an estimate of the numbers of people affected, their location and the community facilities from which they are severed"*.

10.3.50 These descriptions of Severance have been adapted to maintain consistency with this assessment - these are now referred to as "Low", "Medium" and "High". For anything less than low significance, no such estimate of the numbers of people affected need be made. A further severance level of negligible has been incorporated for this reason. Table 10.5 summarises these thresholds.

Table 10.5 Pedestrian Severance threshold (DMRB)

Magnitude	AADT
High	> 16,000
Medium	8,000 - 16,000
Low	4,000 - 8,000
Negligible	< 4,000

10.3.51 In addition (with specific reference to relief from existing Severance), the DMRB Guidelines acknowledge that there is a traffic flow threshold below which Severance is not considered significant where the AADT (daily) flow is below 8,000 vehicles.

Magnitude of impact – Driver Delay

10.3.52 Driver delays "… are only likely to be significant when the traffic on the network surrounding the development is already at, or close to, the capacity of the system."

Magnitude of impact – Pedestrian Delay

10.3.53 "Changes in the volume, composition or speed of traffic may affect the ability of people to cross roads." The guidance suggests that assessors "… use their judgement to determine whether pedestrian delay is a significant effect".

10.3.54 For the purposes of this assessment, the pedestrian Severance threshold levels identified in Table 10.5 above have been applied to pedestrian delay.

10.3.55 Although the IEMA's Guidelines for the Environmental Assessment of Road Traffic only considers pedestrian delay consideration is also given to cyclist delay.

Magnitude of impact – Pedestrian Amenity

10.3.56 This is broadly defined as the relative pleasantness of a journey; it is affected by traffic flow, traffic composition and pavement width / separation from traffic. The guidance suggests a tentative threshold for judging the significance of changes in pedestrian amenity of where traffic flow (or its heavy vehicle component) is halved or doubled.

10.3.57 Although IEMA's Guidelines for the Environmental Assessment of Road Traffic only considers Pedestrian Amenity, within the assessment of the West Cambridge Development consideration is also given to Cyclist Amenity.

Magnitude of impact – Fear and Intimidation

10.3.58 The effect of this is dependent upon the volume of traffic, its heavy vehicle composition, its proximity to people or the lack of protection caused by such factors as narrow pavement widths.

10.3.59 Receptors are assessed as being pedestrians and cyclists. For the purposes of this assessment, the highest road category links (such as the M11 motorway and the A14 / A428 dual carriageways) do not have pedestrian / cyclist facilities, the use by these users of these links is minimal, if any. As no receptors would be present on these links, these links have not been included within the assessment tables below.

10.3.60 The IEMA guidelines state that there are no commonly agreed thresholds for estimating "fear and intimidation" from known traffic and physical conditions, but it does nevertheless suggest some thresholds which could be used, based on previous research, and these are shown in Table 10.6.

Table 10.6 Fear and Intimidation thresholds

Degree of hazard	Average traffic flow over 18 hr day – vehicles / hour 2-way	Total 18 hour heavy vehicle flow	Average vehicle speed over 18 hour day - mph
High	+1,800	+ 3,000	+20
Medium	1,200 – 1,800	2,000 – 3,000	15 – 20
Low	600 - 1,200	1,000 – 2,000	10-15
Negligible	<600	<1,000	<10
Note 1: Although no category is given in the guidance for flows less than the "Low" (was Moderate") threshold, this has been added to the table. Note 2: These categories of degree / magnitude of hazard have also been expressed consistently with the terms used in this assessment as High, Medium, Low, and Negligible.			

Magnitude of impact – Accidents and safety

10.3.61 The guidance suggests that "Professional judgement will be needed to assess the implications of local circumstances, or factors, which may elevate of lessen risks of accidents, e.g. junction conflicts".

Significance of effect

10.3.62 The sensitivity of the receptor and the magnitude of impact are combined to give the overall significance of effect for both beneficial and adverse conditions as shown in Table 10.7 Definitions for the effect significance are given in Table 10.8.

Table 10.7 Significance of Effect Categories

		Sensitivity		
		High	**Medium**	**Low**
Magnitude of impact)	**High**	Major	Major	Moderate
	Medium	Major	Moderate	Minor to Moderate
	Low	Moderate	Minor to Moderate	Minor
	Negligible	Negligible	Negligible	Negligible

Table 10.8 Generic Significance Criteria

Significance level	Criteria
Major	These effects are likely to be important considerations at a local or district scale
Moderate	These effects are likely to be important considerations at a local scale
Minor	These effects may be raised as local issues but are unlikely to be of importance.
Negligible	No effect or effect which is beneath the level of perception, within normal bounds of variation or within the margin of forecasting error.

10.3.63 In addition to the above, as the percentage of increased traffic is a function of the level of baseline traffic flows. Trigger levels in terms of absolute levels of increase have been introduced to prevent very minor changes on links with low baseline flows from being considered as more significant.

10.3.64 For example, with reference to the above table, a change in traffic flow of greater than 90% on a road with a high sensitive receptor would result in a 'major significant effect'. However, the existing baseline traffic flows could be very minor and an increase of only a few vehicles would produce a large change in magnitude whereas in real terms the increase in traffic is still considered to be insignificant. Therefore, reference has been made to the Fear and Intimidation threshold trigger levels in Table 10.6 where a significant effect is only considered to occur if the baseline traffic flow is increased to any of the trigger levels identified.

Assumptions and limitations

10.3.65 As agreed with CCC and Highways England, the transport-related technical assessment work used to support the development is based on Peter Brett Associates' Transport Model.

10.3.66 To create the Baseline, this Transport Model includes the Constructed West Cambridge Development, and all other committed and consented highway enhancements and developments than the Proposed Development. The increases on individual links are reviewed against general TEMPRO growth factors, there is some uncertainty regarding when these sites may come forward in reality. The assumptions included within the model for these developments were agreed with the Joint Authorities and represent the best available information at the present time.

10.3.67 Whilst this Transport Model is a suitable tool for assessing the strategic impact of West Cambridge and steps have been undertaken to ensure the assignment of the model trips on local routes around the development reflects reality, minor limitations inherent in all such transport models may remain. However, these will not have a significant impact on the conclusions of this EIA process.

10.3.68 Typical construction traffic movements have been based on experience of other similar projects.

10.3.69 This assessment of the indicative peak daily construction two-way flows arising from the Proposed Development has been completed in advance of appointing a contractor, or defining the development programme completion targets. As a result of the range of construction projects and processes occurring on any one day, there is wide variation in the flows accruing to the construction of a multi-occupancy development such as the Proposed Development. Typically, the final rate of project completion reflects many competing factors – such as construction access to the Development, agreeing the final occupiers of the buildings, availability of labour or materials (such as concrete or bituminous material) as well as maintaining a quality environment during the early phases of a project during these construction phases. Nevertheless, a reasonable worst case assessment of the likely extent of construction-related activities occurring at any one time has been made for the purposes of assessing environmental effects. This has been forecast to occur during the construction of the infrastructure enabling works:

- Earthworks
- On-site Drainage;
- Carriageway Construction; and
- Initial Construction works to a major building.

10.3.70 For the purposes of this assessment it is assumed that the initial construction works for a major building (in this case, the concrete work casting the foundations) would not occur at the same time as the on-site carriageway construction due to the excessive heavy vehicle trip generation characteristics of both operations.

10.3.71 For the purposes of this assessment it is assumed that all heavy vehicle access will be from M11 Junction 13 / Madingley Road – it being assumed that the heavy vehicle movements through the City will be discouraged.

10.3.72 The assumed Initial Phase peak Daily Construction traffic flows are summarised in Table 10.9

Table 10.9 Peak Daily Construction Movements

Activity	Max light vehicles movements / day			Max heavy vehicles movements / day			Max total vehicles movements / day		
	In	**Out**	**Tot**	**In**	**Out**	**Tot**	**In**	**Out**	**Tot**
Earthworks	10	10	20	82	82	164	92	92	184
On-Site Drainage	4	4	8	4	4	8	8	8	16
Carriageway construction	6	6	12	60	60	120	66	66	132
Building construction	10	10	20	0	0	0	10	10	20
Total	30	30	60	146	146	292	176	176	352

10.4 Baseline conditions

10.4.1 The following existing conditions are contained within the respective Sections of the Transport Assessment as summarised below:

- Existing Pedestrian, Equestrian and Cycle Facilities - Section 3.3
- Existing Bus Services – Section 3.4
- Existing Rail Services – Section 3.5
- Existing Vehicular Access - Section 2.7
- Existing Road Network – Section 3.6
- Public Rights of Way – Section 3.3
- Road Safety Assessment – Section 3.9

Receptors

10.4.2 A review of the Study Area has been undertaken to understand the receptors potentially affected by the traffic generated by the Proposed Development in the general area of the Development. These Sensitive Receptors are shown in Table 10.10 and Figure 10.3. Road links referred to in Table 10.10 are shown on Figure 10.2. In addition, the receptors on the links identified in Section 10.3 as experiencing increases in flow of greater than 30% / 10% are listed in Table 10.8.

Table 10.10 Sensitive Receptors

Reference on Figure 10.2	Receptor	Sensitivity
Barton Road		
1	Wolfson College	High
Grange Road		
2	Robinson College	High
3	Margaret Beaufort Institute	High
4	Selwyn College	High
Huntingdon Road		
5	Murray Edwards (ex-New Hall) College and Art Collection	High
6	Westfield House	High
7	Girton College	High
8	Church	Low
9	Blackfriars Priory	Low
JJ Thomson Avenue		
10 & 11	University of Cambridge Dept of Veterinary Medicine	High
12	University of Cambridge Cavendish Laboratory	High
Madingley Road		
13	Madingley Windmill	Low
14	American Cemetery	Lo
Storey's Way		
15	Churchill College	High
16	Fitzwilliam College / Murray Edwards College	High
Road link	**Receptor**	**Sensitivity**
Link 3.3 – Madingley Rd between M11 On Slip – Proposed Madingley Rd West Access	Drivers along Madingley Road	Low
	Pedestrians and cyclists travelling along Madingley Road	Low
Link 3.4 – Madingley Rd – West of P&R Access	Drivers along Madingley Road	Low
	Pedestrians and cyclists travelling along Madingley Road	Low
Link 3.5 – Madingley Rd – East of P&R Access	Drivers along Madingley Road	Low
	Pedestrians and cyclists travelling along Madingley Road	Low
Link 3.6 – Madingley Rd – East of Proposed High Cross Access	Drivers along Madingley Road	Low
	Pedestrians and cyclists travelling along Madingley Road	Low
	Residents living along Madingley Road	Low
Link 3.7 – Madingley Rd – East of JJ Thomson Ave	Drivers along Madingley Road	Low
	Pedestrians and cyclists travelling along Madingley Road	Low
Link 3.8 – Madingley Rd – East of Clerk Maxwell Rd	Drivers along Madingley Road	Low
	Pedestrians and cyclists travelling along Madingley Road	Low
	Residents living along Madingley Road	Low

Reference on Figure 10.2	Receptor	Sensitivity
Link 3.9 – Madingley Rd – East of Storey's Way	Drivers along Madingley Road	Low
	Pedestrians and cyclists travelling along Madingley Road	Low
	Residents living along Madingley Road	Low
Link 3.10 - Madingley Rd – East of Grange Rd	Drivers along Madingley Road	Low
	Pedestrians and cyclists travelling along Madingley Road	Low
	Residents living along Madingley Road	Low
Link 3.11 – Madingley Rd – West of Queen's Rd / Northampton St	Drivers along Madingley Road	Low
	Pedestrians and cyclists travelling along Madingley Road	Low
Link 3.12 – Northampton St – West of Pound Hill	Drivers along Northampton Street	Low
	Pedestrians and cyclists travelling along Northampton Street	Low
	Residents living at Northampton Street	Low
Link 4.0 – Huntingdon Rd – West of Proposed NWC HRW Access	Drivers along Huntingdon Road	Low
	Pedestrians and cyclists travelling along Huntingdon Road	Low
Link 11.1 – Proposed Madingley Rd West Access to NWC	Residents living at North West Cambridge	Low
	Employees working at North West Cambridge	Low
	Drivers along the access road	Low
	Pedestrians and cyclists along the access road	Low
Link 11.2 – Proposed Huntingdon Rd Access to NWC	Residents living at North West Cambridge	Low
	Employees working at North West Cambridge	Low
	Drivers along the access road	Low
	Pedestrians and cyclists along the access road	Low
Link 12.1 – High Cross Access to Madingley Rd	Drivers along High Cross Road	Low
	Pedestrians and cyclists travelling along High Cross Road	Low
	Employees working at West Cambridge	Low
Link 12.2 – JJ Thomson Ave Access to Madingley Rd	Drivers along JJ Thomson Avenue	Low
	Pedestrians and cyclists travelling along JJ Thomson Avenue	Low
	Employees working at West Cambridge	Low
Link 12.3 – Clerk Maxwell Rd	Drivers along Clerk Maxwell Road	Low
	Pedestrians and cyclists travelling along Clerk Maxwell Road	Low
	Residents living at The Lawns and Perry Close	Low

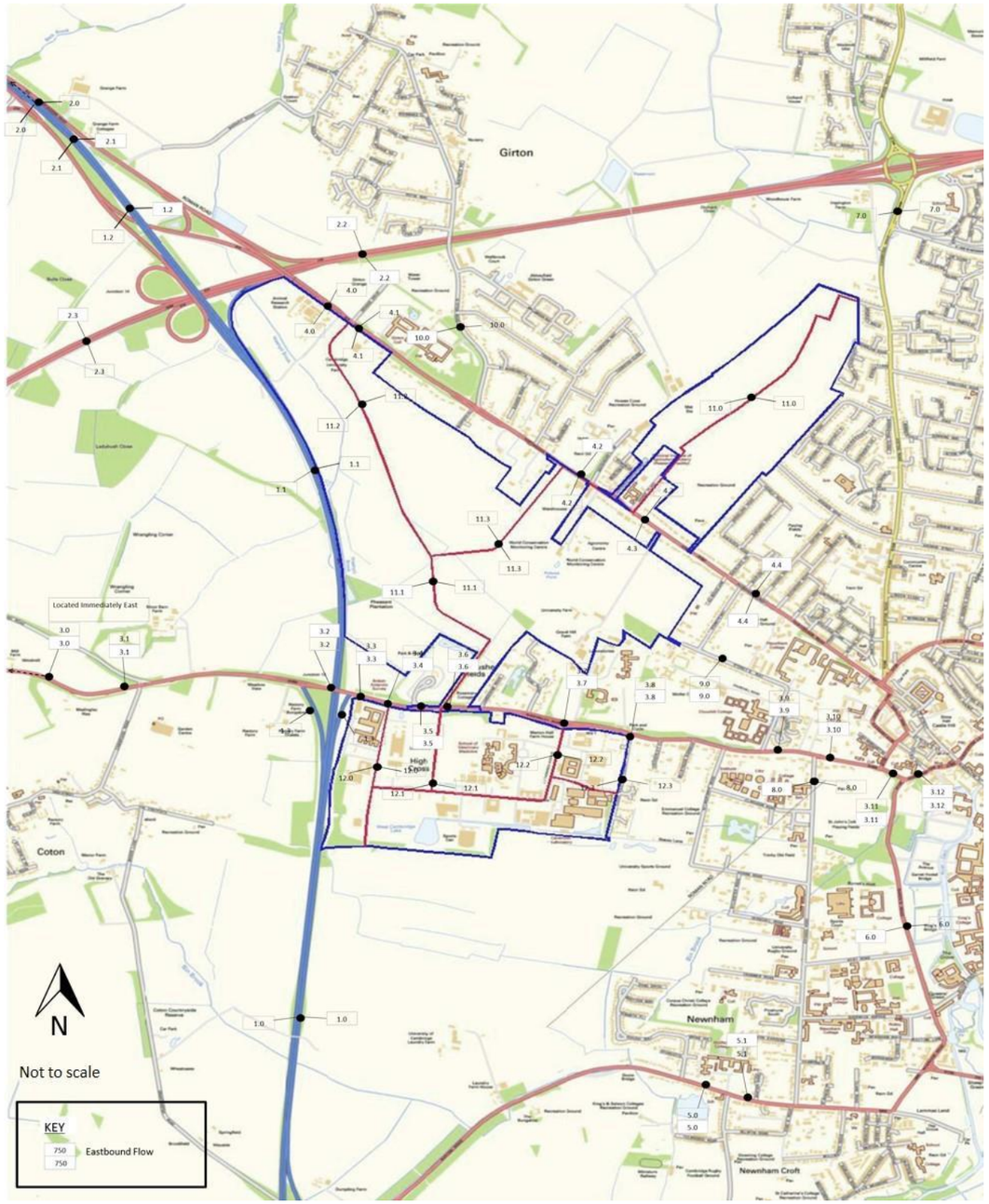
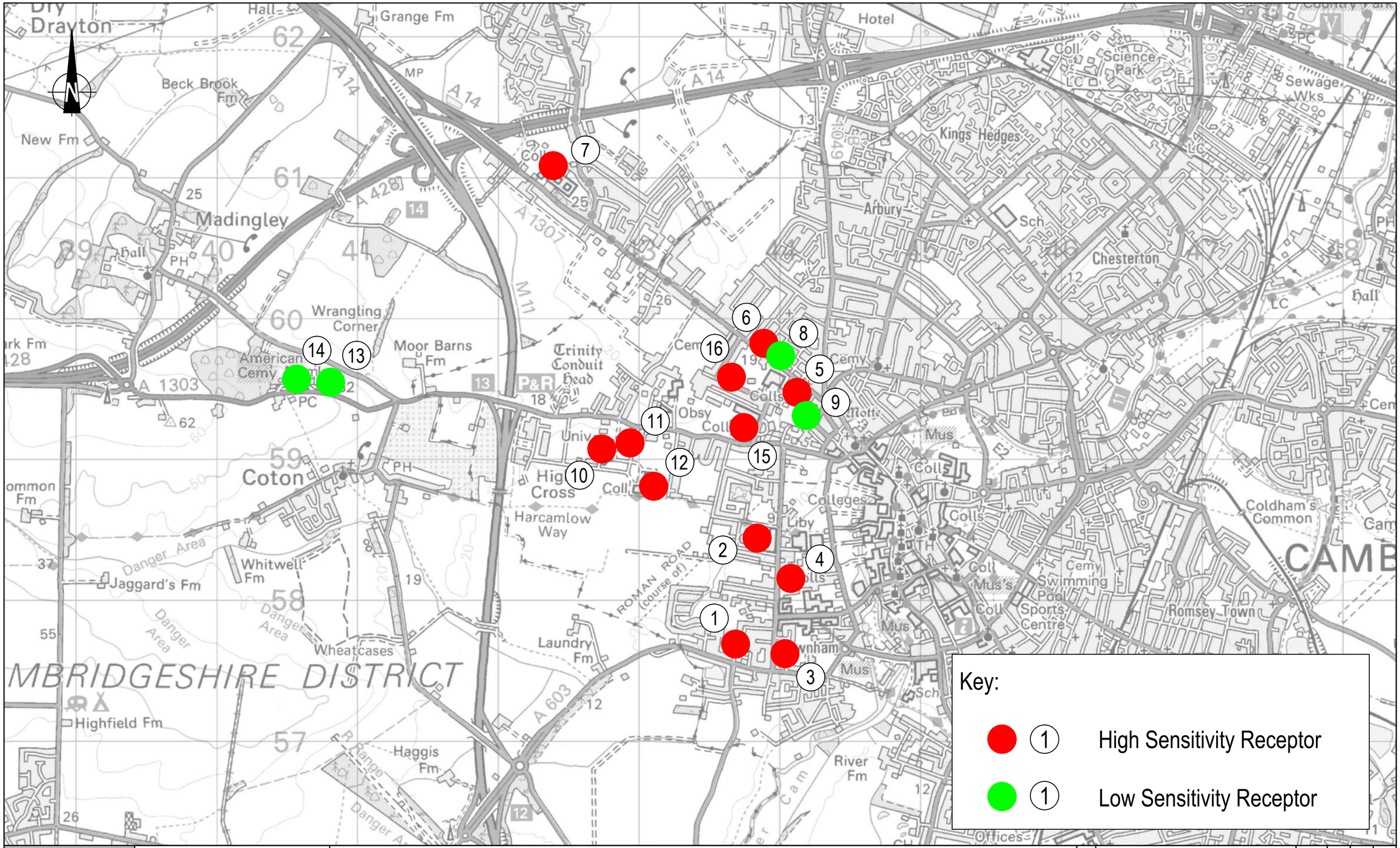


Figure 10.2 Link reference diagram



Key:

- 1 — High Sensitivity Receptor
- 1 — Low Sensitivity Receptor

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WEST CAMBRIDGE ES

SENSITIVITY RECEPTORS

Mark	Revision	Date	Drawn	Chkd	Appd

Drawing Status: FOR INFORMATION

Date of 1st Issue: 07.10.2015

A3 Scale: NTS

Design | Drawn: DS | Chkd: PC | Appd

Drawing Number: FIGURE 10.3

Revision: -

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Baseline traffic flow information

10.4.3 Table 10.11 shows the predicted baseline traffic flows for the three assessment scenarios; 2015, 2021, and 2031. Increases in traffic flows between the three scenarios are attributed to natural growth, plus growth from the following cumulative developments:

- Strategic residential developments:
  - Clifton Road Industrial Estate;
  - Clay Farm and Showground;
  - North West Cambridge;
  - NIAB Main;
  - Eastern Gateway, Soham;
  - North Ely, Ely;
  - Cambridge East;
  - Land between Huntingdon Rd and A14 (NIAB2 or Darwin Green 2);
  - Northstowe Phase 2;
  - Trumpington Meadows (Cambridge Southern Fringe);
  - Cambourne;
  - Northstowe Phase 1;
  - Waterbeach New Town;
  - Bourn Airfield New Village;
  - Cambourne West;
  - Alconbury Weald;
  - Eastern Expansion, St Neots;
  - Wyton Airfield, Wyton on the Hill; and
  - Bearscroft Farm.
- Strategic employment development:
  - Wider City Centre;
  - Addenbrooke's;
  - Northstowe;
  - Cambourne;
  - Granta Park;
  - Hinxton;
  - Babraham;
  - Landbeach;
  - West Cambridge and North West Cambridge;
  - Northern City Fringe;
  - ARM / Capita Park;
  - Waterbeach;
  - Bourn Airfield; and
  - Other miscellaneous developments in South Cambridgeshire.

Table 10.11 Baseline traffic flows for assessment years 2015, 2021, and 2031

Link	Estimated 24hr base 7-day flows all vehicles		
	2015	2021	2031
Link 3.3 – Madingley Rd between M11 On Slip – Proposed Madingley Rd West Access	19,037	21,305	23,055
Link 3.4 – Madingley Rd – West of P&R Access	19,037	21,305	23,055
Link 3.5 – Madingley Rd – East of P&R Access	18,460	20,729	22,479
Link 3.6 – Madingley Rd – East of Proposed High Cross Access	16,101	17,784	19,211
Link 3.7 – Madingley Rd – East of JJ Thomson Ave	18,059	19,791	21,034
Link 3.8 – Madingley Rd – East of Clerk Maxwell Rd	17,868	19,600	20,843
Link 3.9 – Madingley Rd – East of Storey's Way	14,921	16,951	18,165
Link 3.10 - Madingley Rd – East of Grange Rd	14,921	16,841	18,036
Link 3.11 – Madingley Rd – West of Queen's Rd / Northampton St	16,110	18,091	18,945
Link 3.12 – Northampton St – West of Pound Hill	13,530	15,214	16,153
Link 4.0 – Huntingdon Rd – West of Proposed NWC HRW Access	10,506	13,763	15,299
Link 11.1 – Proposed Madingley Rd West Access to NWC	0	3,650	4,531
Link 11.2 – Proposed Huntingdon Rd Access to NWC	0	1,260	1,409
Link 12.1 – High Cross Access to Madingley Rd	2,195	2,365	2,365
Link 12.2 – JJ Thomson Ave Access to Madingley Rd	2,393	2,220	2,220
Link 12.3 – Clerk Maxwell Rd.	654	654	654

Baseline Severance

10.4.4 The existing levels of severance on the road network surrounding the Site are detailed in Appendix 10.2, Volume 3. All the link flows considered are as two-way flows on a particular link.

10.4.5 It is noted that although identified as experiencing high levels of Severance, no pedestrian and cyclists may use the M11, and would be discouraged from using the A14 or A428. As such, these links are not considered further in this assessment.

10.4.6 The existing and future level of Severance experienced within the vicinity of the Development on the local roads within the City area (i.e., excluding the M11, A14, A428 and rural lengths of the A1303) with sensitive receptors is shown in Table 10.12.

Table 10.12 Baseline Severance (24 hour all vehicle two way traffic flows)

Receptor	2015		2021		2031	
	Base traffic flow	Severance	Base traffic flow	Severance	Base traffic flow	Severance
Link 3.3 – Madingley Rd between M11 On Slip – Proposed Madingley Rd West Access	19,037	High	21,305	High	23,055	High
Link 3.4 – Madingley Rd – West of P&R Access	19,037	High	21,305	High	23,055	High
Link 3.5 – Madingley Rd – East of P&R Access	18,460	High	20,729	High	22,479	High
Link 3.6 – Madingley Rd – East of Proposed High Cross Access	16,101	High	17,784	High	19,211	High
Link 3.7 – Madingley Rd – East of JJ Thomson Ave	18,059	High	19,791	High	21,034	High
Link 3.8 – Madingley Rd – East of Clerk Maxwell Rd	17,868	High	19,600	High	20,843	High
Link 3.9 – Madingley Rd – East of Storey's Way	14,921	Medium	16,951	High	18,165	High
Link 3.10 - Madingley Rd – East of Grange Rd	14,921	Medium	16,841	High	18,036	High
Link 3.11 – Madingley Rd – West of Queen's Rd / Northampton St	16,110	High	18,091	High	18,945	High
Link 3.12 – Northampton St – West of Pound Hill	13,530	Medium	15,214	Medium	16,153	High
Link 4.0 – Huntingdon Rd – West of Proposed NWC HRW Access	10,506	Medium	13,763	Medium	15,299	Medium
Link 11.1 – Proposed Madingley Rd West Access to NWC	0	Negligible	4,531	Low	4,531	Low
Link 11.2 – Proposed Huntingdon Rd Access to NWC	0	Negligible	1,409	Negligible	1,409	Negligible
Link 12.1 – High Cross Access to Madingley Rd	2,195	Negligible	2,365	Negligible	2,365	Negligible
Link 12.2 – JJ Thomson Ave Access to Madingley Rd	2,393	Negligible	2,220	Negligible	2,220	Negligible
Link 12.3 – Clerk Maxwell Rd.	654	Negligible	654	Negligible	654	Negligible

Baseline Driver Delay

10.4.7 The Transport Assessment considers that the local network operates towards capacity in 2015 during the network peak hours.

10.4.8 As the junctions along Madingley Road, and others across the network, are operating close to capacity during the peak hours, some Driver Delay would be expected at these limited peak hour times – albeit that these junctions would operate within capacity throughout the significant majority of the day.

10.4.9 Whilst the above assessment suggests there is some driver delay during the peak periods across the study area, taking into account conditions across a full day, only limited Driver Delay is experienced in normal operating conditions.

Baseline pedestrian and cyclist delay

10.4.10 The level of existing pedestrian delay is assumed to broadly reflect the severance as described above – i.e., that there would be limited pedestrian delay experienced within the built-up areas where there is pedestrian activity.

10.4.11 There are reasonable crossing facilities for pedestrians and cyclists to use across the area – this would assist in minimising delay on these routes. Pedestrian delay is therefore slight / negligible.

Baseline pedestrian and cyclist amenity

10.4.12 Pedestrian and cyclist amenity, broadly defined as 'the relative pleasantness of a journey", is affected by traffic flows and composition, footway width and the degree of segregation.

10.4.13 Although the strategic highway links (such as the M11, A14, and A428) have high levels of traffic flow and high speeds, there is no pedestrian or cyclist access and there are few / no attractors along these for existing pedestrian and cyclist amenity to be a material consideration.

10.4.14 Although the levels of traffic flows on the local principal highway network are high, existing pedestrian and cyclist amenity within Cambridge is good due to the quality of the footway and cycleway provision, the alternative off-road routes, the frequency of crossing facilities, the limited heavy vehicle proportions, and the relatively controlled vehicle speeds.

Baseline fear and intimidation

10.4.15 The existing levels of fear and intimidation on the road network surrounding the Site are also detailed in in Appendix 10.2. Table 10.13 summarises the baseline fear and intimidation for the three assessment years. There is currently no Fear and Intimidation related to the use of public rights of way within the Site.

Table 10.13 Baseline fear and intimidation (average hourly traffic flows over 18hours)

Receptor	a) Average hourly flows over 18hr day			b) Total 18hr HV flows			c) Traffic Speed (mph)	Weighted Assessment of a), b) and c)		
	2015	2021	2031	2015	2021	2031		2015	2021	2031
Link 3.3 – Madingley Rd between M11 On Slip – Proposed Madingley Rd West Access	1100	1232	1333	727	814	880	40	Medium	Medium	Medium
Link 3.4 – Madingley Rd – West of P&R Access	1100	1232	1333	727	814	880	40	Medium	Medium	Medium
Link 3.5 – Madingley Rd – East of P&R Access	1068	1199	1300	705	792	858	40	Medium	Medium	Medium
Link 3.6 – Madingley Rd – East of Proposed High Cross Access	931	1029	1111	615	680	733	40	Medium	Medium	Medium
Link 3.7 – Madingley Rd – East of JJ Thomson Ave	1044	1144	1216	690	755	804	30	Medium	Medium	Medium
Link 3.8 – Madingley Rd – East of Clerk Maxwell Rd	1033	1134	1205	682	749	796	30	Medium	Medium	Medium
Link 3.9 – Madingley Rd – East of Storey's Way	862	980	1051	570	648	694	30	Low	Low	Medium
Link 3.10 - Madingley Rd – East of Grange Rd	862	973	1043	570	643	689	30	Low	Low	Medium
Link 3.11 – Madingley Rd – West of Queen's Rd / Northampton St	932	1047	1096	615	691	723	30	Low	Low	Medium
Link 3.12 – Northampton St – West of Pound Hill	782	880	934	516	581	617	30	Low	Low	Low
Link 4.0 – Huntingdon Rd – West of Proposed NWC HRW Access	608	796	885	401	526	584	60	Low	Low	Low
Link 11.1 – Proposed Madingley Rd West Access to NWC	0	263	327	0	314	390	20	n/a	Negligible	Negligible
Link 11.2 – Proposed Huntingdon Rd Access to NWC	0	91	102	0	109	121	20	n/a	Negligible	Negligible
Link 12.1 – High Cross Access to Madingley Rd	158	170	170	189	203	203	25	Negligible	Negligible	Negligible
Link 12.2 – JJ Thomson Ave Access to Madingley Rd	173	160	160	206	191	191	25	Negligible	Negligible	Negligible
Link 12.3 – Clerk Maxwell Rd.	47	47	47	56	56	56	30	Negligible	Negligible	Negligible

Existing accidents and safety

10.4.16 A Road Safety Review is reported in Section 3.9 of the Transport Assessment, including Personal Injury Collision (PIC - formerly known as Personal Injury Accident – PIA) summary data was obtained from Cambridgeshire County Council for the latest available 5 year period between of 2010 to 2015 for Madingley Road.

10.4.17 The Transport Assessment provides a summary of the PICs (location and nature) and provides an estimate of the likely anticipated number of PICs for similar types of links and junctions to provide a comparison.

10.4.18 Of the collisions on the links within the study area, only the 400m section of Madingley Road link to the west of the Cambridge Road crossroads has a higher than anticipated personal injury collision record. The observed records on all other links were equalled or were lower than that anticipated. A review of these collisions has indicated that these could be speed related, a review of the existing road markings and signings is proposed to alert motorists of this.

10.4.19 The Road Safety assessment has identified three existing road safety issues for vulnerable road users:

- Madingley Road / Storey's Way priority junction;
- Madingley Road / Grange Road signalised junction; and
- Madingley Road / Cambridge Road crossroads.

10.4.20 Remedial measures are proposed at these locations - further details of these proposed measures are discussed in Section 16 of the Transport Assessment.

10.4.21 The Proposed Development will not result in any detriment to the existing highway safety conditions within the site vicinity.

10.5 Impact Assessment

Construction phase

10.5.1 No links within the study area exceed the 10% or 30% thresholds for total traffic increases but a number of links exceed these thresholds for heavy vehicles. Appendix 10.3, Volume 3 shows construction traffic increases for all links. These are detailed in Table 10.14. Table 10.15 provides the assessment for construction phase transport impacts.

Table 10.14 Traffic flow increases due to construction traffic

Link	Base 2015 daily flow (24 hour, 7 day 1-way flows)		Estimated daily construction traffic (1 way)			Increase	
	All Vehs	Heavy Vehs	Light Vehs	Heavy Vehs	All Vehs	All Vehs	Heavy Vehs
Link 3.2 - Madingley Rd on Over Bridge M11	18,902	1,034	9	168	177	0.94%	16.25%
Link 3.3 - Madingley Rd between M11 Sbd On Slip - Proposed Madingley Rd West Access	19,037	647	12	292	304	1.60%	45.13%
Link 3.4 - Madingley Rd - West of P&R Access	19,037	647	12	292	304	1.60%	45.13%
Link 3.5 - Madingley Rd - East of P&R Access	18,460	627	12	292	304	1.65%	46.57%
Link 3.6 - Madingley Rd - East of Proposed High Cross Access	16,101	548	12	292	304	1.89%	53.28%

Table 10.15 Construction phase transport effects

Baseline		Impact assessment				
Receptor	**Sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Link 3.2 - Madingley Rd on Over Bridge M11 (Drivers along Madingley Road, pedestrians and cyclists travelling along Madingley Road)	Low	352 daily one-way (176 two-way) vehicle movements due to construction traffic for plant, materials, and staff deliveries and the removal of construction waste and excess cut material. Additional traffic flows caused by construction traffic could result in increased severance; driver delay; pedestrian and cyclist delay, fear and intimidation, and reduced pedestrian and cycling amenity	Hours of operation and delivery routes to and from Site will be agreed with the local highways authority and specified in the Construction Environment Management Plan (CEMP)	Negligible	The All Vehicle Construction impact assessment results show that the highest impact would be no more than 0.4%. As such, there are no links experiencing increases exceeding the assessment magnitude threshold of either 30%, or 10% in any sensitive areas. The daily percentage impact for Heavy Vehicles on Link 3.6 Madingley Road to the East of the High Cross Access peaks at 54% - significantly higher than the increase in All Vehicle traffic flows (peaking at 2%). However, there are no sensitive receptors at this location, nor is the increase in heavy vehicle flow more than a doubling (refer to the thresholds identified earlier in Section 10.3), such that there would be no discernible effect on Severance, Driver Delay, Pedestrian Delay, Pedestrian Amenity, Fear and Intimidation, Road Safety and Hazardous Loads associated with construction activities. In all cases, the magnitude of Construction daily flow increases – be it All Vehicle or Heavy Vehicle - is Negligible, and therefore the significance of effect for the impacts assessed within the chapter for Construction movements is also Negligible. Full details of the assignment of the construction traffic are detailed in Section 12 of the Transport Assessment	Negligible **Not significant**
Link 3.3 – Madingley Rd between M11 On Slip – Proposed Madingley Rd West Access (Drivers along Madingley Road, pedestrians and cyclists travelling along Madingley Road)	Low			Negligible		Negligible **Not significant**
Link 3.4 – Madingley Rd – West of P&R Access (Drivers along Madingley Road, pedestrians and cyclists travelling along Madingley Road)	Low			Negligible		Negligible **Not significant**
Link 3.5 – Madingley Rd – East of P&R Access (Drivers along Madingley Road, pedestrians and cyclists travelling along Madingley Road)	Low			Negligible		Negligible **Not significant**
Link 3.6 – Madingley Rd – East of Proposed High Cross Access (Drivers along Madingley Road, pedestrians and cyclists travelling along Madingley Road)	Low			Negligible		Negligible **Not significant**

Operational phase

Potential Effects in 2021

10.5.2 Table 10.16 shows the predicted severance levels in 2021. Links 3.12 and 12.1 are predicted to increase in Severance magnitude.

Table 10.16 Predicted severance in 2021

Receptor	Baseline		Proposed Development	
	Base traffic flow	Severance	Base traffic flow	Severance
Link 3.3 – Madingley Rd between M11 On Slip – Proposed Madingley Rd West Access	21,305	High	22,896	High
Link 3.4 – Madingley Rd – West of P&R Access	21,305	High	22,896	High
Link 3.5 – Madingley Rd – East of P&R Access	20,729	High	22,320	High
Link 3.6 – Madingley Rd – East of Proposed High Cross Access	17,784	High	20,010	High
Link 3.7 – Madingley Rd – East of JJ Thomson Ave	19,791	High	22,815	High
Link 3.8 – Madingley Rd – East of Clerk Maxwell Rd	19,600	High	22,624	High
Link 3.9 – Madingley Rd – East of Storey's Way	16,951	High	19,939	High
Link 3.10 - Madingley Rd – East of Grange Rd	16,841	High	19,756	High
Link 3.11 – Madingley Rd – West of Queen's Rd / Northampton St	18,091	High	19,591	High
Link 3.12 – Northampton St – West of Pound Hill	15,214	Medium	16,122	High
Link 4.0 – Huntingdon Rd – West of Proposed NWC HRW Access	13,763	Medium	14,592	Medium
Link 11.1 – Proposed Madingley Rd West Access to NWC	4,531	Low	4,566	Low
Link 11.2 – Proposed Huntingdon Rd Access to NWC	1,409	Negligible	1,760	Negligible
Link 12.1 – High Cross Access to Madingley Rd	2,365	Negligible	4,024	Low
Link 12.2 – JJ Thomson Ave Access to Madingley Rd	2,220	Negligible	2,049	Negligible
Link 12.3 – Clerk Maxwell Rd.	654	Negligible	2,779	Negligible

10.5.3 Table 10.17 shows the predicted fear and intimidation levels with and without the Proposed Development in 2021. The magnitude of fear and intimidation would not increase for any links.

Table 10.17 Increase in fear and intimidation at 2021 due to the Proposed Development

Receptor	Baseline				Proposed Development			
	a) Average hourly flows over 18hr day	b) Total 18hr HV flows	c) Traffic speed (mph)	Weighted assessment of a), b) and c)	a) Average hourly flows over 18hr day	b) Total 18hr HV flows	c) Traffic speed (mph)	Weighted assessment of a), b) and c)
Link 3.3 – Madingley Rd between M11 On Slip – Proposed Madingley Rd West Access	1232	814	40	Medium	1324	875	40	Medium
Link 3.4 – Madingley Rd – West of P&R Access	1232	814	40	Medium	1324	875	40	Medium
Link 3.5 – Madingley Rd – East of P&R Access	1199	792	40	Medium	1290	852	40	Medium
Link 3.6 – Madingley Rd – East of Proposed High Cross Access	1029	680	40	Medium	1158	764	40	Medium
Link 3.7 – Madingley Rd – East of JJ Thomson Ave	1144	755	30	Medium	1319	871	30	Medium
Link 3.8 – Madingley Rd – East of Clerk Maxwell Rd	1134	749	30	Medium	1308	864	30	Medium
Link 3.9 – Madingley Rd – East of Storey's Way	980	648	30	Low	1153	762	30	Low
Link 3.10 - Madingley Rd – East of Grange Rd	973	643	30	Low	1143	755	30	Low
Link 3.11 – Madingley Rd – West of Queen's Rd / Northampton St	1047	691	30	Low	1133	748	30	Low
Link 3.12 – Northampton St – West of Pound Hill	880	581	30	Low	932	615	30	Low
Link 4.0 – Huntingdon Rd – West of Proposed NWC HRW Access	796	526	60	Low	844	557	60	Low
Link 11.1 – Proposed Madingley Rd West Access to NWC	263	314	20	Negligible	329	393	20	Negligible
Link 11.2 – Proposed Huntingdon Rd Access to NWC	91	109	20	Negligible	127	152	20	Negligible
Link 12.1 – High Cross Access to Madingley Rd	170	203	25	Negligible	290	347	25	Negligible
Link 12.2 – JJ Thomson Ave Access to Madingley Rd	160	191	25	Negligible	148	177	25	Negligible
Link 12.3 – Clerk Maxwell Rd.	47	56	30	Negligible	200	239	30	Negligible

10.5.4 Table 10.18 shows the environmental impact assessment for operational phase effects for the first phase of the development in 2021.

Table 10.18 Operational phase transport effects in 2021

Baseline		**Impact assessment**				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
• Residents living at Northampton Street (link 3.12) • Employees working at West Cambridge (links 12.1)	Low	Increased traffic flows could result in an increase in Severance for residents and workers along the following affected links:	Provisions within the transport strategy to: • Reduce new vehicle trips; • Enhance pedestrian and cyclist infrastructure.	Low adverse	Baseline severance in 2021 is predicted to range from high for receptors along Madingley Road to negligible for receptors along the three roads on-Site and the new access road to North West Cambridge off Huntingdon Road. Once the first phase of the Proposed Development is operational in 2021 traffic flows are predicted to increase along all of these links. For most receptors the severance magnitude will remain unchanged. For receptors along Northampton Street on link 3.12 traffic flows will increase by 908 vehicles over 24 hours. This will increase severance magnitude from medium to high but the effect is unlikely to be noticeable. For receptors along High Cross on link 12.1 traffic flows will increase by 1,659 vehicles across 24 hours. Whilst this will increase severance magnitude from negligible to low, the AADT of 4,000 vehicles is still less than the threshold of 8,000 AADT. Whilst the effect is likely to be noticeable given the proportionate increase against the baseline traffic flows, the Severance will still be low. Overall the effects from increase severance would be permanent low adverse.	Minor adverse **Not significant**
• Drivers along Madingley Road (links 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, and 3.11) • Drivers along Northampton Street (link 3.12) • Drivers along Huntingdon Road (links 4.0, 11.2) • Pedestrians and cyclists along the North West Cambridge access roads from Madingley Road and Huntingdon Road (links 11.1 and 11.2) • Drivers along High Cross Road (link 12.1) • Drivers along JJ Thomson Avenue (link 12.1) • Drivers along Clerk Maxwell Road (link 12.3)	Low	Increase in Driver Delay at junctions and road links caused by increased use of the local road network by drivers travelling to and from the Proposed Development.	Provisions within the transport strategy to reduce new vehicle trips, and - only where shown to be necessary – minor enhancements to the local junction infrastructure.	Negligible	Whilst the results of the 2021 junction capacity assessments for the Proposed Development shows the network generally with conditions at capacity in peak periods, there would be limited levels of delay for drivers when considered across the full 24 hour day. Overall the magnitude of change in daily flows as a consequence of the addition of Cumulative Development and Development traffic – considered to be the difference between 2015 Base and 2021 scenarios - is Negligible and the sensitivity of the links and junctions to increases in daily flow is Low, therefore the overall significance of effect for driver delay is Negligible.	Negligible **Not significant**
• Pedestrians and cyclists travelling along Madingley Road(links 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, and 3.11) • Pedestrians and cyclists travelling along Northampton Street (link 3.12) • Pedestrians and cyclists travelling along Huntingdon Road (links 4.0, 11.2) • Pedestrians and cyclists along the North West Cambridge access roads from Madingley Road and Huntingdon Road (links 11.1 and 11.2) • Pedestrians and cyclists travelling along High Cross Road (link 12.1) • Pedestrians and cyclists travelling along JJ Thomson Avenue (link 12.1) • Pedestrians and cyclists travelling along Clerk Maxwell Road (link 12.3)	Low	Increase in Pedestrian Delay as a result of an increase in traffic travelling to and from the Proposed Development.	Provisions within the transport strategy to • Reduce new vehicle trips; • Enhance pedestrian and cyclist infrastructure.	Negligible	Based on the change in pedestrian severance category due to the addition of cumulative development and Proposed Development traffic flow changes, there is unlikely to be a perceptible change in the level of pedestrian delay. As such, the likely significance of effect for pedestrian delay is Negligible.	Negligible **Not significant**
	Low	Changes to Pedestrian Amenity - the relative pleasantness of pedestrian and cyclist journeys - as a result of changes in traffic.	Provisions within the transport strategy to • Reduce new vehicle trips; • Enhance pedestrian and cyclist infrastructure.	Negligible	The relevant guidance suggests a tentative threshold for assessing the significance of changes in pedestrian amenity of where traffic flow is halved or doubled. There are no existing off-site links forecast to experience a doubling of traffic flow with the addition of Cumulative Development and Development traffic – most increases are well below 30%. Within the Site, As such, the traffic flow changes arising from the Proposed Development will not result in any discernible change in pedestrian amenity, and that the significance of effect on Pedestrian Amenity is therefore Negligible.	Negligible **Not significant**

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Pedestrians and cyclists	Low	Changes in traffic volume, composition and speed resulting in an increase in fear and intimidation to pedestrians and cyclists.	Provisions within the transport strategy to • Reduce new vehicle trips; • Enhance pedestrian and cyclist infrastructure, and • Improve the amenity of pedestrian and cyclist routes along popular corridors.	Negligible	The Proposed Development will result in an increase in overall and heavy vehicle traffic flows on most of the assessed links with sensitive receptors, with a maximum increase of 175 overall vehicles per average hour and 116 heavy vehicles over 18 hours for link 3.7. The exception is link 12.2 where there is predicted to be a small decrease in both overall and heavy traffic flows by 12 (per average hour) and 14 (over 18 hours) respectively. Speeds are not predicted to change for any of the links. The Proposed Development will not change the magnitude of fear and intimidation for any of the receptors and the overall effect will be negligible.	Negligible **Not significant**
• Drivers along Madingley Road (links 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, and 3.11) • Pedestrians and cyclists travelling along Madingley Road(links 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, and 3.11) • Drivers along Northampton Street (link 3.12) • Pedestrians and cyclists travelling along Northampton Street (link 3.12) • Drivers along Huntingdon Road (links 4.0, 11.2) • Pedestrians and cyclists travelling along Huntingdon Road (links 4.0, 11.2) • Drivers along the North West Cambridge access roads from Madingley Road and Huntingdon Road (links 11.1 and 11.2) • Pedestrians and cyclists along the North West Cambridge access roads from Madingley Road and Huntingdon Road (links 11.1 and 11.2) • Drivers along High Cross Road (link 12.1) • Pedestrians and cyclists travelling along High Cross Road (link 12.1) • Drivers along JJ Thomson Avenue (link 12.1) • Pedestrians and cyclists travelling along JJ Thomson Avenue (link 12.1) • Drivers along Clerk Maxwell Road (link 12.3) • Pedestrians and cyclists travelling along Clerk Maxwell Road (link 12.3)	Low	Changes in traffic flows could result in a change on personal injury collision rates.	Provisions within the transport strategy to provide road safety measures at identified blackspots.	Negligible	The additional traffic flows on the network resulting from the West Cambridge Development would be unlikely to have any significant effect on existing personal injury collision rates. The overall significance of effect for Highway Safety is therefore Negligible.	Negligible **Not significant**

Potential Effects in 2031

10.5.5 Table 10.19 shows the predicted severance levels in 2031. Links 4.0 and 11.1 are predicted to increase in severance magnitude. There are no receptors along link 4.0 so this link has not been considered further in the impact assessment for severance.

Table 10.19 Predicted severance in 2031

Receptor	Baseline		Proposed Development	
	Base traffic flow	Severance	Base traffic flow	Severance
Link 3.3 – Madingley Rd between M11 On Slip – Proposed Madingley Rd West Access	23,055	High	26,842	High
Link 3.4 – Madingley Rd – West of P&R Access	23,055	High	29,957	High
Link 3.5 – Madingley Rd – East of P&R Access	22,479	High	29,381	High
Link 3.6 – Madingley Rd – East of Proposed High Cross Access	19,211	High	25,138	High
Link 3.7 – Madingley Rd – East of JJ Thomson Ave	21,034	High	29,450	High
Link 3.8 – Madingley Rd – East of Clerk Maxwell Rd	20,843	High	29,258	High
Link 3.9 – Madingley Rd – East of Storey's Way	18,165	High	26,500	High
Link 3.10 - Madingley Rd – East of Grange Rd	18,036	High	26,262	High
Link 3.11 – Madingley Rd – West of Queen's Rd / Northampton St	18,945	High	23,183	High
Link 3.12 – Northampton St – West of Pound Hill	16,153	High	18,878	High
Link 4.0 – Huntingdon Rd – West of Proposed NWC HRW Access	15,299	Medium	17,512	High
Link 11.1 – Proposed Madingley Rd West Access to NWC	4,531	Low	6,880	Medium
Link 11.2 – Proposed Huntingdon Rd Access to NWC	1,409	Negligible	2,792	Negligible
Link 12.1 – High Cross Access to Madingley Rd	2,365	Negligible	3,020	Negligible
Link 12.2 – JJ Thomson Ave Access to Madingley Rd	2,220	Negligible	2,907	Negligible
Link 12.3 – Clerk Maxwell Rd.	654	Negligible	2,779	Negligible

10.5.6 Table 10.20 shows the predicted fear and intimidation levels with and without the Proposed Development in 2031. The magnitude of fear and intimidation would not increase for any links.

Table 10.20 Increase in fear and intimidation at 2031 due to the Proposed Development

Receptor	Baseline				Proposed Development			
	a) Average hourly flows over 18hr day	b) Total 18hr HV flows	c) Traffic speed (mph)	Weighted assessment of a), b) and c)	a) Average hourly flows over 18hr day	b) Total 18hr HV flows	c) Traffic speed (mph)	Weighted assessment of a), b) and c)
Link 3.3 – Madingley Rd between M11 On Slip – Proposed Madingley Rd West Access	1333	880	40	Medium	1552	1025	40	Medium
Link 3.4 – Madingley Rd – West of P&R Access	1333	880	40	Medium	1733	1144	40	Medium
Link 3.5 – Madingley Rd – East of P&R Access	1300	858	40	Medium	1699	1122	40	Medium
Link 3.6 – Madingley Rd – East of Proposed High Cross Access	1111	733	40	Medium	1454	960	40	Medium
Link 3.7 – Madingley Rd – East of JJ Thomson Ave	1216	804	30	Medium	1703	1124	30	Medium
Link 3.8 – Madingley Rd – East of Clerk Maxwell Rd	1205	796	30	Medium	1692	1118	30	Medium
Link 3.9 – Madingley Rd – East of Storey's Way	1051	694	30	Medium	1532	1012	30	Medium
Link 3.10 - Madingley Rd – East of Grange Rd	1043	689	30	Medium	1519	1003	30	Medium
Link 3.11 – Madingley Rd – West of Queen's Rd / Northampton St	1096	723	30	Medium	1341	885	30	Medium
Link 3.12 – Northampton St – West of Pound Hill	934	617	30	Low	1091	721	30	Low
Link 4.0 – Huntingdon Rd – West of Proposed NWC HRW Access	885	584	60	Low	1013	668	60	Low
Link 11.1 – Proposed Madingley Rd West Access to NWC	327	390	20	Negligible	496	592	20	Negligible
Link 11.2 – Proposed Huntingdon Rd Access to NWC	102	121	20	Negligible	201	241	20	Negligible
Link 12.1 – High Cross Access to Madingley Rd	170	203	20	Negligible	217	260	20	Negligible
Link 12.2 – JJ Thomson Ave Access to Madingley Rd	160	191	25	Negligible	209	251	25	Negligible
Link 12.3 – Clerk Maxwell Rd.	47	56	25	Negligible	200	239	25	Negligible

10.5.7 Table 10.21 shows the environmental impact assessment for operational phase effects in 2031.

Table 10.21 Operational phase transport effects in 2031

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
• Users of Huntingdon Road (link 4.0) • Residents living at North West Cambridge (links 11.1) • Employees working at North West Cambridge (links 11.1)	Low	Increased traffic flows could result in an increase in Severance for residents and workers along the following affected links:	Adaptive Phased Approach to long-term transport mitigation.	Low adverse	Baseline severance in 2031 is predicted to range from high for receptors along Madingley Road and Northampton Street to negligible for receptors along the three roads on-Site and the new access road to North West Cambridge off Huntingdon Road. Once the Proposed Development is fully built out and operational in 2031, traffic flows are predicted to increase along all of these links. For link 4.0 – Huntingdon Road, west of the NWC HRW access, the numbers of pedestrians and cyclists is low, but connectivity across Huntingdon Road will be improved by the delivery of the pedestrian / cyclist crossing at this junction as part of the NWC Proposals. For receptors in NWC on link 11.1 traffic flows will increase by 2,350 vehicles across 24 hours. Whilst this will increase severance magnitude from low to medium, the AADT of 6,880 vehicles is still less than the threshold of 8,000 AADT. Whilst the effect is likely to be noticeable given the proportionate increase against the baseline traffic flows, the Severance will still be low. Overall the effects from increase severance would be permanent low adverse. In addition, and although not identified as a change in severance, there will be a notable increase in traffic volumes along Madingley Road affecting links 3.8, 3.9, and 3.10 with increases in 24 hour traffic volumes of 8,226 to 8,415 depending on the particular link. Severance is already a recognised issue along Madingley Road and there are a number of mitigation measures already in place including centre refuges and pelican crossings. The effect of severance on residents and employees along Madingley Road is unlikely to be significant. Overall the effects from increase severance would be permanent low adverse.	Minor adverse **Not significant**
• Drivers along Madingley Road (links 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, and 3.11) • Drivers along Northampton Street (link 3.12) • Drivers along Huntingdon Road (links 4.0, 11.2) • Pedestrians and cyclists along the North West Cambridge access roads from Madingley Road and Huntingdon Road (links 11.1 and 11.2) • Drivers along High Cross Road (link 12.1) • Drivers along JJ Thomson Avenue (link 12.1) • Drivers along Clerk Maxwell Road (link 12.3)	Low	Increase in Driver Delay at junctions and road links caused by increased use of the local road network by drivers travelling to and from the Proposed Development.	Adaptive Phased Approach to long term transport mitigation.	Negligible	The future junction capacity assessments for 2031 for the Proposed Development will be required to show the proposed local network would operate within absolute capacity in peak periods. As such, there would be limited levels of delay for drivers across the day. Further mitigation measures would be considered where the impact of West Cambridge is considered significant. The magnitude of change in daily flows as a consequence of the Proposed Development would be Negligible. The overall significance of effect for Driver Delay is also Negligible.	Negligible **Not significant**
• Pedestrians and cyclists travelling along Madingley Road (links 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, and 3.11) • Pedestrians and cyclists travelling along Northampton Street (link 3.12) • Pedestrians and cyclists travelling along Huntingdon Road (links 4.0, 11.2) • Pedestrians and cyclists along the North West Cambridge access roads from Madingley Road and Huntingdon Road (links 11.1 and 11.2) • Pedestrians and cyclists travelling along High Cross Road (link 12.1) • Pedestrians and cyclists travelling along JJ Thomson Avenue (link 12.1) • Pedestrians and cyclists travelling along Clerk Maxwell Road (link 12.3)	Low	Increase in Pedestrian Delay as a result of an increase in traffic travelling to and from the Proposed Development.	Adaptive Phased Approach to long term transport mitigation.	Negligible	Based on the change in pedestrian severance category due to the addition of cumulative development and Proposed Development traffic flow changes, there is unlikely to be a perceptible change in the level of pedestrian delay. As such, the likely significance of effect for pedestrian delay is Negligible.	Negligible **Not significant**
	Low	Changes to Pedestrian Amenity - the relative pleasantness of pedestrian and cyclist journeys as a result of changes in traffic.	Provisions within the transport strategy to improve the amenity of pedestrian and cyclist routes.	Negligible	The relevant guidance suggests a tentative threshold for assessing the significance of changes in pedestrian amenity of where traffic flow is halved or doubled. There are no existing off-site links forecast to experience a doubling of traffic flow with the addition of Cumulative Development and Development traffic – most increases are well below 30%. Within the Site, As such, the traffic flow changes arising from the Proposed Development will not result in any discernible change in pedestrian amenity, and that the significance of effect on Pedestrian Amenity is therefore Negligible.	Negligible **Not significant**

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Pedestrians and cyclists	Low	Changes in traffic volume, composition and speed resulting in an increase in fear and intimidation to pedestrians and cyclists.	Adaptive Phased Approach to long term transport mitigation. Provisions within the transport strategy to improve the amenity of pedestrian and cyclist routes	Negligible	The Proposed Development will result in an increase in overall and heavy vehicle traffic flows on all of the assessed links with sensitive receptors, with a maximum increase of 487 overall vehicles per average hour and 322 heavy vehicles over 18 hours for link 3.8. Speeds are not predicted to change for any of the links. The Proposed Development will not change the magnitude of fear and intimidation for any of the receptors and the overall effect will be negligible.	Negligible **Not significant**
• Drivers along Madingley Road (links 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, and 3.11) • Pedestrians and cyclists travelling along Madingley Road(links 3.3, 3.4, 3.5, 3.6, 3.7, 3.8, 3.9, 3.10, and 3.11) • Drivers along Northampton Street (link 3.12) • Pedestrians and cyclists travelling along Northampton Street (link 3.12) • Drivers along Huntingdon Road (links 4.0, 11.2) • Pedestrians and cyclists travelling along Huntingdon Road (links 4.0, 11.2) • Drivers along the North West Cambridge access roads from Madingley Road and Huntingdon Road (links 11.1 and 11.2) • Pedestrians and cyclists along the North West Cambridge access roads from Madingley Road and Huntingdon Road (links 11.1 and 11.2) • Drivers along High Cross Road (link 12.1) • Pedestrians and cyclists travelling along High Cross Road (link 12.1) • Drivers along JJ Thomson Avenue (link 12.1) • Pedestrians and cyclists travelling along JJ Thomson Avenue (link 12.1) • Drivers along Clerk Maxwell Road (link 12.3) • Pedestrians and cyclists travelling along Clerk Maxwell Road (link 12.3)	Low	Changes in traffic flows could result in a change on personal injury collision rates.	Adaptive Phased Approach to long term transport mitigation.	Negligible	The additional traffic flows on the network resulting from the West Cambridge Development would be unlikely to have any significant effect on existing personal injury collision rates, although the number of personal injury collisions would be likely to increase as a function of additional traffic flows on these links in 2031. The overall significance of effect for Highway Safety is therefore Negligible.	Negligible **Not significant**

10.6 Mitigation measures

Construction phase

10.6.1 Construction Environment Management Plan (CEMP) will be implemented by the developer, approved by Cambridge City Council prior to construction commencing, and implemented by all contractors associated with the Development. This document will identify the appropriate hours of operation, and routes to be used by construction vehicles travelling to and from the Site. Specific mitigation which will be included within the CEMP include:

- Delivery routes will be agreed with the local highways authority and will preferentially access the Site from the M11 Junction 13/ Madingley Road particularly for heavy vehicles; and
- Heavy vehicle movements will not be permitted through Cambridge City unless no alternative is available and only once agreement has been sought with the local highway authority.

Operational mitigation for the initial phase of development (2021)

Transport strategy

10.6.2 The overall transport strategy for the Proposed Development responds to a number of important national and local objectives. The mitigation provision for the Initial Phase of the Proposed Development is set within the agreed context for the overall transport mitigation strategy for West Cambridge, consisting of:

- A graduated approach – the assessment process reflecting current transport planning policy where travel demand management measures are introduced first, followed by any necessary highway infrastructure measures to mitigate the residual traffic impact; as well as
- An adaptive approach – where, to maintain future flexibility, the proposed mitigation for later phases responds to the quanta of development within the individual phase proposals, the timescales for the delivery, changes in future travel behaviour patterns, emerging transport policy, and the current uncertainty relating to the development and transport infrastructure enhancement proposals.

10.6.3 The mitigation measures to be implemented; to reduce the vehicular trip generation of the Proposed Development, to reduce vehicle use on the network, and to manage the effects of the Proposed Development, are:

- The travel demand management strategy, set out in the Framework Travel Plan based on:
  - The benefit of a fully-funded quality FTP;
  - The consequences of the application of "Smarter Choices" guidance to reduce vehicular trip generation from the Proposed Development; and
  - The provision of car parking at a controlled, appropriate level of provision, and the implementation of a car parking management scheme combined with permit provision on a demonstrated needs basis;
- An enhanced public transport strategy. The scale of the Proposed Development means that there will be both a high quantum of demand for public transport, and a number of locations that will need to be connected to West Cambridge. The strategy includes:
  - Increased regularity of bus provision;
  - Direct on-site routes;
  - Provision of high quality bus stops (including real time passenger information, and the provision of comprehensive timetable information including network maps and fare details);
  - Bus priority measures to be provided with Selective Vehicle Detection technology at any new traffic signals controlling the entrances to the Site from Madingley Road;
  - Provision of service information and incentive measures to increase patronage; and
  - Promote network ticketing with operators serving West Cambridge, allowing for passengers from destinations other than Cambridge city centre to make journeys on other services and transfer using the same ticket stored on a smartcard, mobile phone or EMV wave and pay card;
- Quality pedestrian and cyclist facilities. The strategy includes:
  - Direct, quality North-South footway and cycleway provision across West Cambridge linking between Madingley Road and Coton Path using the Western Access, High Cross, JJ Thomson Avenue and Clerk Maxwell Road.;
  - The East - West Shared Space Link to provide the main east - west spine for Pedestrians and Cyclists connecting Clerk Maxwell Road and High Cross with access to a number of plots and lower-hierarchy Cycle routes;
  - As with North West Cambridge, all vehicle routes being designed for a 20mph speed limit using passive speed management measures such as constrained widths and the use of shared surface areas. This low-speed environment is primarily to control vehicle speeds, but in so doing will create a safer and more attractive environment for pedestrians and cyclists;
  - Footways being provided on both sides of the on-site streets and at the Site Access locations. Controlled crossing points would be provided, and traffic calming measures would be present to reduce traffic speed and to ease pedestrian movement;
  - Improved links between West Cambridge and all popular destinations; including to the East, towards the City, and to the north through North West Cambridge. These links will be supported with controlled crossings;
  - Provision of high levels of quality cycle parking, at least to the adopted Cambridge Local Plan 2014 minimum cycle parking standards, within private covered, secure, lit and well-located areas at the destinations, as well as further provision through the Development; and
  - All major employers being encouraged to provide associated shower and changing room facilities for walkers and cyclists after their journeys.
- Schemes to improve environmental conditions. The strategy includes:
  - Contributions to effect a lower speed limit than the existing 40mph speed limit locally on Madingley Road – thus providing environmental benefit from existing vehicular movements;
  - Contributions to the necessary Traffic Regulation Orders to implement car parking zones or prohibitions on surrounding streets to minimise inappropriate overspill parking – potentially in the context of providing improved cycle facilities;
  - Measures at three locations to address existing highway safety concerns – especially effecting vulnerable road users;

  - The extension of the SCOOT and MOVA traffic signal optimisation to the proposed traffic signals along Madingley Road – JJ Thomson Avenue and Clerk Maxwell – to control any additional queuing and delays as a consequence of the Proposed Development.
- Guaranteeing funding for potential highway mitigation schemes that could be implemented should the cyclic monitoring strategy identify that conditions deteriorate significantly at:.
  - Madingley Road / High Cross junction; and
  - Madingley Road / Clerk Maxwell Road junction.

10.6.4 As there may be a degree of variability in future traffic flow projections (which can be attributed to a number of factors including fuel prices, Government policy etc.), this pragmatic mitigation strategy has been formulated which is designed to be resilient to change in conditions by being focused to all sustainable modes, with appropriate levels of mitigation for vehicular traffic. This strategy therefore reflects current planning policy by:

- Reducing and controlling existing and future vehicular trips across the network;
- Improving pedestrian and cyclist infrastructure through the area for the benefit of both the existing and future users;
- Providing financial contributions towards the delivery of public transport services on and off-Site infrastructure; and
- Where necessary, providing measures to preserve and / or enhance capacity on particular links or junctions.

Operational Mitigation for the Full Development (2031)

10.6.5 At the date of the submission of the Planning Application, there was significant uncertainty regarding:

- Development delivery across the Cambridge Sub Region;
- The associated infrastructure provision necessary to accommodate this level, of growth - particularly relating to:
  - The A14 Huntingdon – Cambridge Enhancement;
  - The Greater Cambridge City Deal transport proposals;
  - Highways England's currently unpublished proposals for the M11;
  - Other emerging transport proposals – such as improvements to east - west movement;
- The emerging development policy, including that enshrined within the Cambridge Local Plan.

10.6.6 As such, the transport modelling cannot robustly define a cumulative development scenario for 2031.

10.6.7 Acknowledging this situation, as discussed with the Joint Authorities, it is not appropriate to define further mitigation measures at this stage beyond an indicative Initial Phase of development (i.e. over and above the measures described in the Framework Travel Plan and those additional measures envisaged in the 2021 scenario) prior to confirmation of the details of the above. Instead, the Adaptive Phase Approach is proposed, through which a mitigation scheme will be developed at the appropriate time, and ensured through a planning condition, which sets out:

- The mitigation scheme's objectives including the targets it must meet over time;
- The mitigation scheme's parameters;
- The methods of achieving the mitigation scheme's objectives and reviewing and adapting those methods over time to ensure that the objectives are met; and
- A review mechanism to ensure that the achievement of the objectives is kept under review and the methods adapted if further steps prove necessary.

10.7 Summary

10.7.1 During the construction phase traffic, construction traffic will be controlled through measures specified in the CEMP. This will include reaching an agreement with the local highways authority about delivery routes which will avoid Cambridge City centre. There would be no significant adverse or beneficial transport effects from the Proposed Development during the construction phase.

10.7.2 The first phase of the Proposed Development is anticipated to be operational in 2021.A transport strategy has been produced and this sets out mitigation measures identified as being required through transport modelling and other measures to improve the amenity of pedestrian and cyclist routes. There would be no significant adverse or beneficial transport effects in 2021.

10.7.3 The full Proposed Development will be operational in 2031. Due to uncertainty about other developments in the city and region and the required provision of new or upgraded transport infrastructure it is not possible to specify what mitigation measures might be required. Instead mitigation will be identified and implemented through an Adaptive Phased Approach which will ensure the right measures are implemented at the right time and in the right location. No significant effects are anticipated.

11. Air quality

11.1 Scope of the assessment

11.1.1 This chapter assesses the likely significant effects of the Proposed Development in terms of air quality.

11.1.2 The assessment has considered:

- Construction dust emissions;
- Operational CHP plant emissions;
- Operational laboratory emissions; and
- Road traffic emissions.

11.1.3 The Proposed Development has the potential to adversely affect air quality during both the construction phase and the operational phase. The main air pollutants of concern related to construction are dust and fine particulate matter (PM_{10}) and for road traffic they are Nitrogen Dioxide (NO_2) and fine particulate matter (PM_{10} and $PM_{2.5}$).

11.1.4 In addition, an assessment of the potential adverse effect on air quality of emissions of oxides of nitrogen and PM_{10} from the Combined Heat and Power (CHP) plant has been undertaken. A qualitative assessment of laboratory emissions has been undertaken.

11.1.5 Road traffic emissions due to construction traffic have not been assessed as there are no roads that would exceed the 1,000 Annual Average Daily Traffic (AADT) flows increase for all vehicles or 200 AADT increase for heavy duty vehicles thresholds specified as the screening criteria in the DMRB[55]

11.1.6 Table 11.1 describes the scoping opinion in terms of air quality from the local authority.

Table 11.1 Scoping response

Issue raised	Respondent
Reference to joint EPUK / IAQM guidance in terms of magnitude /significance of impacts	Cambridge City Council Refuse and Environmental Services
The potential air quality impacts of the Combined Heat and Power plant need to be modelled alongside any potential traffic/ travel impacts. Expected flue heights, exit velocities, temperatures and throughputs will need to be determined ready for the ES	
Air quality impacts to Madingley Wood SSSI should be assessed.	Natural England

11.1.7 All scoping responses have been considered in this assessment.

11.1.8 The air quality assessments and production of this air quality chapter have been undertaken by Peter Brett Associates.

[55] Highways Agency, 2007, Design Manual for Roads and Bridges, Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1 HA207/07 Air Quality
[56] DETR (2007). `*The Air Quality Strategy for England, Scotland, Wales, Northern Ireland*'. HMSO, London

11.2 Relevant legislation

The Air Quality Strategy

11.2.1 The Air Quality Strategy (2007)[56] establishes the policy framework for ambient air quality management and assessment in the UK. The primary objective is to ensure that everyone can enjoy a level of ambient air quality which poses no significant risk to health or quality of life. The Strategy sets out the National Air Quality Objectives (NAQOs) and Government policy on achieving these objectives.

11.2.2 Part IV of the Environment Act 1995 introduced a system of Local Air Quality Management (LAQM). This requires local authorities to regularly and systematically review and assess air quality within their boundary, and appraise development and transport plans against these assessments. The relevant NAQOs for LAQM are prescribed in the Air Quality (England) Regulations 2000[57] and the Air Quality (Amendment) (England) Regulations 2002[58].

11.2.3 Where an objective is unlikely to be met, the local authority must designate an Air Quality Management Area (AQMA) and draw up an Air Quality Action Plan (AQAP) setting out the measures it intends to introduce in pursuit of the objectives within its AQMA.

11.2.4 The Local Air Quality Management Technical Guidance document[59] for Local Authorities provides advice as to where the NAQOs apply. These include outdoor locations where members of the public are likely to be regularly present for the averaging period of the objective (which vary from 15 minutes to a year). Thus, for example, annual mean objectives apply at the façades of residential properties, whilst the 24-hour objective (for PM_{10}) would also apply within the garden. They do not apply to occupational, indoor or in-vehicle exposure.

EU limits

11.2.5 Directive 2008/50/EC consolidated the previous framework directive on ambient air quality assessment and management and its first three daughter directives. The limit values remained unchanged, but it now allows Member States a time extension for compliance, subject to European Commission (EC) approval.

11.2.6 The Directive limit values are applicable at all locations except:

- Where members of the public do not have access and there is no fixed habitation
- On factory premises or at industrial installations to which all relevant provisions concerning health and safety at work apply
- On the carriageway of roads; and on the central reservations of roads except where there is normally pedestrian access.

[57] Statutory Instrument 2000, No 921. `*The Air Quality (England) Regulations 2000*'. HMSO, London
[58] Statutory Instrument 2002, No 3034. `*The Air Quality (England) (Amendment) Regulations 2002*'. HMSO, London
[59] Defra, 2009, Local Air Quality Management Technical Guidance LAQM.TG(09)

11.2.7 The Air Quality Standards Regulations 2010[60] implements the European Union's Directive on ambient air quality and cleaner air for Europe (2008/50/EC), and includes limit values for nitrogen dioxide (NO_2). These limit values are numerically the same as the NAQO values but differ in terms of compliance dates, locations where they apply and the legal responsibility for ensuring that they are complied with. The compliance date for the NO_2 EU Limit Value was 1 January 2010, five years later than the date for the NAQO.

Habitats

11.2.8 Sites of national importance may be designated as Sites of Special Scientific Interest (SSSIs). Originally notified under the National Parks and Access to the Countryside Act 1949, SSSIs have been re-notified under the Wildlife and Countryside Act 1981. Improved provisions for the protection and management of SSSIs (in England and Wales) were introduced by the Countryside and Rights of Way (CROW) Act 2000. If a development is "likely to damage" a SSSI, the CROW Act requires that a relevant conservation body (i.e. Natural England) is consulted. The CROW Act also provides protection to local nature conservation sites, which can be particularly important in providing 'stepping stones' or 'buffers' to SSSIs and European sites. In addition, the Environment Act (1995) and the Natural Environment and Rural Communities Act (2006) both require the conservation of biodiversity.

Air quality objectives

Human health receptors

11.2.9 The NAQOs for NO_2 and particulate matter (PM_{10}) set out in the Air Quality Regulations (England) 2000 and the Air Quality (England) (Amendment) Regulations 2002, are shown in Table 11.2.

Table 11.2 NO_2 and PM_{10} objectives

Pollutant	Time period	Objective
Nitrogen dioxide (NO_2)	1-hour mean	200µg/m^3 not to be exceeded more than 18 times a year
	Annual mean	40µg/m^3
Particulate matter (PM_{10})	24-hour mean	50µg/m^3 not to be exceeded more than 35 times a year
	Annual mean	40µg/m^3

11.2.10 The objectives for NO_2 and PM_{10} were to have been achieved by 2005 and 2004, respectively, and continue to apply in all future years thereafter. Analysis of long term monitoring data suggests that if the annual mean NO_2 concentration is less than 60 µg/m^3 then the one-hour mean NO_2 objective is unlikely to be exceeded where road transport is the main source of pollution. This concentration has been used to screen whether the one-hour mean objective is likely to be achieved[59].

11.2.11 The Air Quality Strategy (2007)[61] includes an exposure reduction target for smaller particles known as $PM_{2.5}$. These are an annual mean target of 25 µg/m^3 by 2020 and an average urban background exposure reduction target of 15% between 2010 and 2020.

11.2.12 A new air quality directive (2008/50/EC) was adopted in May 2008, and includes a national exposure reduction target, a target value and a limit value for $PM_{2.5}$, shown in Table 11.3. The UK Government transposed this new directive into national legislation in June 2010.

Table 11.3 $PM_{2.5}$ objectives

Objectives	Time period	Objective /Obligation	To be achieved by
UK objectives	Annual mean	25µg/m^3	2020
	3 year running annual mean	15% reduction in concentrations measured at urban background sites	Between 2010 and 2020
European obligations	Annual mean	Target value of 25µg/m^3	2010
	Annual mean	Limit value of 25µg/m^3	2015
	Annual mean	Stage 2 indicative Limit value of 20µg/m^3	2020
	3 year Average Exposure Indicator (AEI) (a)	Exposure reduction target relative to the AEI depending on the 2010 value of the 3 year AEI (ranging from a 0% to a 20% reduction)	2020
	3 year Average Exposure Indicator (AEI)	Exposure concentration obligation of 20µg/m^3	2015
The 3 year annual mean or AEI is calculated from the $PM_{2.5}$ concentration averaged across all urban background monitoring locations in the UK e.g. the AEI for 2010 is the mean concentration measured over 2008, 2009 and 2010.			

Ecological receptors

11.2.13 Objectives for the protection of vegetation and ecosystems have been set by the UK Government and were to have been achieved by 2000. They are summarised in Table 11.4 and are the same as the EU limit values. The objectives only strictly apply a) more than 20km from an agglomeration (about 250,000 people), and b) more than 5km from Part A industrial sources, motorways and built up areas of more than 5,000 people. However, Natural England has adopted a more precautionary approach and applies the objective to all internationally designated conservation sites and SSSIs. For the assessment of road schemes, the Highways Agency follows this approach and requires an assessment of the impacts of roads traffic emissions on conservation sites (Designated Sites) within 200m of a road[62]. When pollutant concentrations exceed a critical level it is considered that there is a risk of harmful effects.

Table 11.4 Vegetation and ecosystem objectives (critical levels)

Pollutant	Time period	Objective
Nitrogen Oxides (expressed as NO_2)	Annual mean	30µg/m^3

11.2.14 Critical loads for nitrogen deposition onto sensitive ecosystems have been specified by United Nations Economic Commission for Europe (UNECE). They are defined as the amount of pollutant deposited to a given area over a year, below which significant harmful effects on sensitive elements of the environment do not occur, according to present knowledge. Exceedance of a critical load is used as an indication of the potential for harmful effects to occur.

[60] Statutory Instrument 2010, No 1001. '*The Air Quality Standards Regulations* 2010'. HMSO, London
[61] DETR (2007). '*The Air Quality Strategy for England, Scotland, Wales, Northern Ireland*'. HMSO, London
[62] The Highways Agency (2007). '*Design Manual for Roads and Bridges, Volume 11, Section 3, Part I, Ha 207/07 Air Quality*'. Available at: http://www.standardsforhighways.co.uk/dmrb/vol11/section3/ha20707.pdf

11.2.15 Where critical loads are already exceeded, an increase of more than 1% of the critical load is an indication of potentially significant effects which would trigger the need for further, more detailed assessment. It should be noted that an increase in deposition of more than 1% is not, per se, an indication that a significant effect exists, only the possibility of one. Depending on a more detailed assessment which would take account of the actual ecological conditions at the location under consideration, an increase of more than 1% may be acceptable.

Planning policy

National policy

11.2.16 The National Planning Policy Framework (NPPF) was published in March 2012[63]. It sets out the Government's planning policies for England and how they are expected to be applied. In relation to conserving and enhancing the natural environment, paragraph 109 states that:

"The planning system should contribute to and enhance the natural and local environment by…. preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability."

11.2.17 Paragraph 124, also states that:

"Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan."

Planning practice guidance

11.2.18 The national Planning Practice Guidance (PPG)[64] was published in March 2014 to support the NPPF. Paragraph 001, Reference 32-001-20140306 of the PPG provides a summary as to why air quality is a consideration for planning:

"…Defra carries out an annual national assessment of air quality using modelling and monitoring to determine compliance with EU Limit Values. It is important that the potential impact of new development on air quality is taken into account in planning where the national assessment indicates that relevant limits have been exceeded or are near the limit….The local air quality management (LAQM) regime requires every district and unitary authority to regularly review and assess air quality in their area. These reviews identify whether national objectives have been, or will be, achieved at relevant locations, by an applicable date….If national objectives are not met, or at risk of not being met, the local authority concerned must declare an air quality management area and prepare an air quality action plan…..Air quality can also affect biodiversity and may therefore impact on our international obligations under the Habitats Directive…..Odour and dust can also be a planning concern, for example, because of the effect on local amenity."

11.2.19 Paragraph 002, Reference 32-002-20140306, of the PPG concerns the role of Local Plans with regard to air quality:

"….Drawing on the review of air quality carried out for the local air quality management regime, the Local Plan may need to consider:

- *the potential cumulative impact of a number of smaller developments on air quality as well as the effect of more substantial developments;*
- *the impact of point sources of air pollution..; and*
- *ways in which new development would be appropriate in locations where air quality is or likely to be a concern and not give rise to unacceptable risks from pollution. This could be through, for example, identifying measures for offsetting the impact on air quality arising from new development including supporting measures in an air quality action plan or low emissions strategy where applicable."*

11.2.20 Paragraph 005, Reference 32-005-20140306, of the PPG identifies when air quality could be relevant for a planning decision:

"….When deciding whether air quality is relevant to a planning application, considerations could include whether the development would:

- *Significantly affect traffic in the immediate vicinity of the proposed development site or further afield. This could be by generating or increasing traffic congestion; significantly changing traffic volumes, vehicle speed or both; or significantly altering the traffic composition on local roads. Other matters to consider include whether the proposal involves the development of a bus station, coach or lorry park; adds to turnover in a large car park; or result in construction sites that would generate large Heavy Goods Vehicle flows over a period of a year or more.*
- *Introduce new point sources of air pollution. This could include furnaces which require prior notification to local authorities; or extraction systems (including chimneys) which require approval under pollution control legislation or biomass boilers or biomass-fuelled CHP plant; centralised boilers or CHP plant burning other fuels within or close to an air quality management area or introduce relevant combustion within a Smoke Control Area.*
- *Expose people to existing sources of air pollutants. This could be by building new homes, workplaces or other development in places with poor air quality.*
- *Give rise to potentially unacceptable impact (such as dust) during construction for nearby sensitive locations.*
- *Affect biodiversity. In particular, is it likely to result in deposition or concentration of pollutants that significantly affect a European-designated wildlife site, and is not directly connected with or necessary to the management of the site, or does it otherwise affect biodiversity, particularly designated wildlife sites."*

11.2.21 Paragraph 007, Reference 32-007-20140306, of the PPG provides guidance on how detailed an assessment needs to be:

"Assessments should be proportionate to the nature and scale of development proposed and the level of concern about air quality, and because of this are likely to be locationally specific."

11.2.22 Paragraph 008, Reference 32-008-20140306, of the PPG provides guidance on how an impact on air quality can be mitigated:

"Mitigation options where necessary will be locationally specific, will depend on the proposed development and should be proportionate to the likely impact….Examples of mitigation include:

[63] Department for Communities and Local Government (2012). '*National Planning Policy Framework'*. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf

[64] Planning Practice Guidance (2014). '*Air Quality'*. Available at: http//planningguidance.planningportal.gov.uk/blog/guidance/air-quality

- *the design and layout of development to increase separation distances from sources of air pollution;*
- *using green infrastructure, in particular trees, to absorb dust and other pollutants;*
- *means of ventilation;*
- *promoting infrastructure to promote modes of transport with low impact on air quality;*
- *controlling dust and emissions from construction, operation and demolition; and*
- *contributing funding to measures, including those identified in air quality action plans and low emission strategies, designed to offset the impact on air quality arising from new development."*

11.2.23 Paragraph 009, Reference 32-009-20140306, of the PPG provides guidance on how considerations about air quality fit into the development management process by means of a flowchart. The final two stages in the process deal with the results of the assessment:

"Will the proposed development (including mitigation) lead to an unacceptable risk from air pollution, prevent sustained compliance with EU limit values or national objectives for pollutants or fail to comply with the requirements of the Habitats Regulations." If Yes:

"Consider how the proposal could be amended to make it acceptable or, where not practicable, consider whether planning permission should be refused."

Local policy

11.2.24 The Cambridge Local Plan 2014 Proposed Submission[65] sets out the way the Council will meet the development needs of Cambridge to 2031. The policies within the Local Plan sets out how those needs will be met by protecting the environmental assets of the City Council. Policy 36 on 'Air Quality, Odour and Dust' considers air quality and states that:

"Development will be permitted where it can be demonstrated:

- *That it does not lead to significant adverse effects on health, the environment or amenity from polluting or malodorous emissions, or dust or smoke emissions to air; or*
- *Where a development is a sensitive end-use, that there will not be any significant adverse effects on health, the environment or amenity arising from existing poor air quality, sources of odour or other emissions to air.*
- *Specifically applicants, where reasonable and proportionate, according to the end-use and nature of the area and application, must demonstrate that:*
- *There is no adverse effect on air quality in an air quality management area (AQMA);*
- *Pollution levels within the AQMA will not have a significant adverse effect on the proposed use/users;*
- *The development will not lead to the declaration of a new AQMA;*
- *The development will not interfere with the implementation of the current Air Quality Action Plan (AQAP);*
- *Any sources to emissions to air, odours, and fugitive dusts generated by the development are adequately mitigated so as not to lead to loss of amenity for existing and future occupants and land uses; and*
- *Any impacts on the proposed use from existing poor air quality, odour and emissions are appropriately mitigated."*

Air quality action plan for the Cambridgeshire growth areas

11.2.25 The Joint Air Quality Action Plan[66] (adopted in 2009) produced through the partnership between Cambridge City Council, Huntingdonshire and South Cambridgeshire District Council sets out the nature of air quality problems across the counties, assesses the causes and solutions of such problems and sets out priority areas for action. The main source of air pollution within Cambridge is road transport.

Developers guide to air quality in Cambridge

11.2.26 The Developers Guide to Air Quality in Cambridge published in September 2008[67], provides information on the way in which air quality and air pollution issued will be dealt with through the development control system in Cambridge City. It defines how air quality assessment should be undertaken and reported for developments that have the potential to significantly affect air quality in Cambridge.

Gas CHP developers advice note

11.2.27 The Gas CHP developers Advice Note[68] is an interim advice note for developers which outlines the requirements to minimise impact of Combined Heat and Power installations on wider air quality issued ion the city.

11.3 Method of assessment

Establishing the baseline

11.3.1 Information on existing air quality has been obtained by collating the results of monitoring carried out by the Cambridge City Council and South Cambridgeshire District Council. Background concentrations for the site have been defined using the national pollution maps published by Defra. These cover the whole country on a 1x1km grid[69].

11.3.2 Existing nitrogen and acid deposition rates within the Madingley Woods SSSI were determined from the Air Pollution Information System (APIS) website[70].

[65] Cambridge City Council (2013). '*Cambridge Local Plan 2014: Proposed Submission'*. Cambridge, UK
[66] Various (2009). '*Air Quality Action Plan for the Cambridgeshire Growth Areas: Cambridge City Council; Huntingdonshire City Council and South Cambridgeshire District Council*'. Available at: http://aqma.defra.gov.uk/action-plans/SCamDC%20AQAP%202009.pdf
[67] Cambridge City Council (2008). '*Air Quality in Cambridge: Developers Guide'*. Available at: https://www.cambridge.gov.uk/sites/default/files/docs/Air%20quality%20developers%20guide.pdf
[68] Cambridge City Council (2016). '*Gas CHP Developers Advice Note'*. Available at: https://www.cambridge.gov.uk/content/air-quality-guide-developers
[69] Department of the Environment, Food and Rural Affairs (Defra) (2016). '*2011 Based Background Maps for NO_x, NO_2, PM_{10} and $PM_{2.5}$'*. Available: http://laqm.defra.gov.uk/maps/maps2011.html
[70] Air Pollution Information System (APIS) (2016). '*Site relevant critical loads'*. Available at: http://www.apis.ac.uk/

Impact assessment

Construction effects

11.3.3 During demolition and construction the main potential effects are dust annoyance and locally elevated concentrations of PM_{10}. The suspension of particles in the air is dependent on surface characteristics, weather conditions and on-site activities. Impacts have the potential to occur when dust generating activities coincide with dry, windy conditions, and where sensitive receptors are located downwind of the dust source.

11.3.4 Separation distance is also an important factor. Large dust particles (greater than 30µm), responsible for most dust annoyance, will largely deposit within 100m of sources. Intermediate particles (10-30µm) can travel 200-500m. Consequently, significant dust annoyance is usually limited to within a few hundred metres of its source. Smaller particles (less than 10µm) are deposited slowly and may travel up to 1km; however, the impact on the short-term concentrations of PM_{10} occurs over a shorter distance. This is due to the rapid decrease in concentrations with distance from the source due to dispersion.

11.3.5 The Institute of Air Quality Management (IAQM) has issued revised guidance[71] on the assessment of dust from demolition and construction. The IAQM guidance recommends that the risk of dust generation is combined with the sensitivity of the area surrounding the site to determine the risk of dust impacts from construction and demolition activities. Depending on the level of risk (high, medium, low or negligible) for each activity, appropriate mitigation is selected.

11.3.6 In accordance with the IAQM 2014 guidance, the dust emission magnitude is defined as either large, medium or small (Table 11.6) taking into account the general activity descriptors on site and professional judgement.

11.3.7 The sensitivity of the study area to construction dust impacts is defined based on the examples provided within the IAQM 2014 guidance (Table 11.7), taking into account professional judgement.

Table 11.5 Criteria for dust emission magnitude

Dust emission magnitude	Activity
Large	**Demolition** >50,000 m^3 building demolished, dusty material (e.g. concrete), on-site crushing/screening, demolition >20m above ground level
	Earthworks >10,000 m^2 site area, dusty soil type (e.g. clay), >10 earth moving vehicles active simultaneously, >8m high bunds formed, >100,000 tonnes material moved
	Construction >100,000 m^3 building volume, on site concrete batching, sandblasting
	Trackout >50 HDVs out / day, dusty soil type (e.g. clay), >100m unpaved roads
Medium	**Demolition** 20,000 - 50,000 m^3 building demolished, dusty material (e.g. concrete) 10-20m above ground level
	Earthworks 2,500 - 10,000 m^2 site area, moderately dusty soil (e.g. silt), 5-10 earth moving vehicles active simultaneously, 4m – 8m high bunds, 20,000 -100,000 tonnes material moved
	Construction 25,000 - 100,000 m^3 building volume, on site concrete batching
	Trackout 10 - 50 HDVs out / day, moderately dusty surface material, 50 -100m unpaved roads
Small	**Demolition** <20,000 m^3 building demolished, non-dusty material, <10m above ground level, work in winter
	Earthworks <2,500 m^2 site area, non-dusty soil, <5 earth moving vehicles active simultaneously, <4m high bunds, <20,000 tonnes material moved
	Construction <25,000 m^3, non-dusty material
	Trackout <10 HDVs out / day, non-dusty soil, < 50m unpaved roads

Table 11.6 Area sensitivity definitions

Area sensitivity	People and property receptors	Ecological receptors
High	• >100 dwellings, hospitals, schools, care homes within 50 m • 10 – 100 dwellings within 20 m • Museums, car parks, car showrooms within 50 m • PM_{10} concentrations approach or are above the daily mean objective.	• National or Internationally designated site within 20m with dust sensitive features / species present
Medium	• >100 dwellings, hospitals, schools, care homes within 100 m • 10 – 100 dwellings within 50 m • Fewer than 10 dwellings within 20 m • Offices/shops/parks within 2 0m • PM_{10} concentrations below the daily mean objective.	• National or Internationally designated site within 50m with dust sensitive features / species present • Nationally designated site or particularly important plant species within 20 m
Low	• >100 dwellings, hospitals, schools, care homes 100 – 350m away • 10 – 100 dwellings within 50 – 350 m • Fewer than 10 dwellings within 20 – 350 m • Playing fields, parks, farmland, footpaths, short term car parks, roads, shopping streets • PM_{10} concentrations well below the daily mean objective.	• Nationally designated site or particularly important plant species 20 – 50 m • Locally designated site with dust sensitive features within 50 m
Negligible	• Outside of study area	• Outside of study area

11.3.8 Based on the dust emission magnitude (Table 11.6) and the area sensitivity (Table 11.7), the risk of dust impacts is then determined (Table 11.8), taking into account professional judgement.

[71] Holman et al (2014). '*Assessment of dust from demolition and construction'*, IAQM, London

Table 11.7 Risk of dust impacts

		Dust emission magnitude		
		Large	**Medium**	**Small**
Sensitivity of Area	**High**	High	Medium	Low
	Medium	Medium	Medium	Low
	Low	Low	Low	Negligible
	Negligible	Negligible	Negligible	Negligible

11.3.9 Based on the 'Risk of Dust Impacts', appropriate mitigation is selected from the IAQM 2014 guidance using professional judgement. The guidance recommends that no assessment of the significance of effects is made without mitigation in place, as mitigation is assumed to be secured by planning conditions, legal requirements or required by regulations.

11.3.10 With appropriate mitigation in place, the residual effect of construction impacts on air quality is assessed as not significant.

Operational effects – human health receptors

11.3.11 Relevant sensitive locations are places where members of the public might be expected to be regularly present over the averaging period of the objectives. For the annual mean and daily mean objectives that are the focus of this assessment, sensitive receptors will generally be residential properties, schools, nursing homes, etc. When identifying these receptors, particular attention has been paid to assessing impacts close to junctions, where traffic may become congested, and where there is a combined effect of several road links.

11.3.12 Based on the above criteria, thirty one existing properties have been identified as residential receptors for the assessment. The locations of existing residential receptors were chosen to represent locations where impacts from the proposed development are likely to be greatest, i.e. as a result of development traffic at junctions. Receptors were modelled at a height of 1.5m and 4.5m representing ground and first floor exposure respectively. Concentrations have been predicted for the future year 2021 for an interim assessment, and 2031 when the proposed development would be fully built. Receptors locations are described in Appendix 11.1, Volume 3 and shown in Figure 11.1.

11.3.13 The impact of traffic emissions has also been considered at existing locations where the energy centre impacts are likely to be largest (R22 – R29).

11.3.14 Concentrations have also been predicted at ten monitoring locations (both automatic and diffusion tubes) located within the city of Cambridge and South Cambridgeshire District in order to verify the road traffic model results (see Appendix 11.2, Volume 3 for further details on the verification method).

Operational effects – ecological receptors

11.3.15 At relevant ecological receptors, concentrations of nitrogen oxides are predicted, and deposition calculated, at a range of receptors at increasing distances from the adjacent road network (shown in Figure 11.2), in order to indicate whether or not the critical level and critical loads are being exceeded in the habitat.

11.3.16 Transect T1 covers the Broadleaved, Mixed and Yew Woodland habitat with the Madingley Wood SSSI from 0m to 200m from Madingley Road.

Operational effects – road traffic emissions impact predictions

11.3.17 Predictions have been carried out using the ADMS-Roads dispersion model (v4.0.1.0). The model requires the user to provide various input data, including the Annual Average Daily Traffic (AADT) flow, the proportion of Heavy Duty Vehicles (HDVs, i.e. Heavy Good Vehicles and buses), road characteristics (including road width and street canyon height, where applicable), and the vehicle speed. It also requires meteorological data. For the proposed development the most suitable data available was from the Cambridge Airport monitoring station. This is considered suitable due to its proximity to the Site.

11.3.18 AADT flows and the proportions of HDVs, for roads adjacent to the Site have been provided by the project's transport consultants Peter Brett Associates (PBA) (refer to Chapter 10 – Transport and Traffic for more detailed information). Traffic speeds were based on local speed restrictions, taking into account congestion and proximity to junctions. Traffic data used for this assessment have been summarised in Appendix 11.3, Volume 3.

11.3.19 The development opening year is expected to be 2031, the transport model has a forecast for the year 2021 (Interim scenario) and 2031. Future traffic data for the year 2021 has been combined with 2018 emission factors and background concentrations, and future traffic data for the year 2031 has been combined with 2025 emission factors and background concentrations, in order to provide a conservative assessment of the effects of the proposed development, as road traffic emissions are predicted to decline with time.

11.3.20 Emissions were calculated using the Emission Factor Toolkit (EFT) v6.0.1, incorporated within ADMS-Roads (v4.0.1.0). The traffic data were entered into the model, along with speed data to provide combined emission rates for each of the road links entered into the model. The modelling has been verified against 2014 monitoring data as this was the most recent available at the time of the assessment.

11.3.21 Nitrogen deposition has been calculated from the predicted NO_2 concentrations using a deposition velocity 3mm/s for taller vegetation such as trees.

11.3.22 Impacts for ecological receptors have been also assessed for the year 2021 and 2031, as the critical loads are applicable over long periods of time.

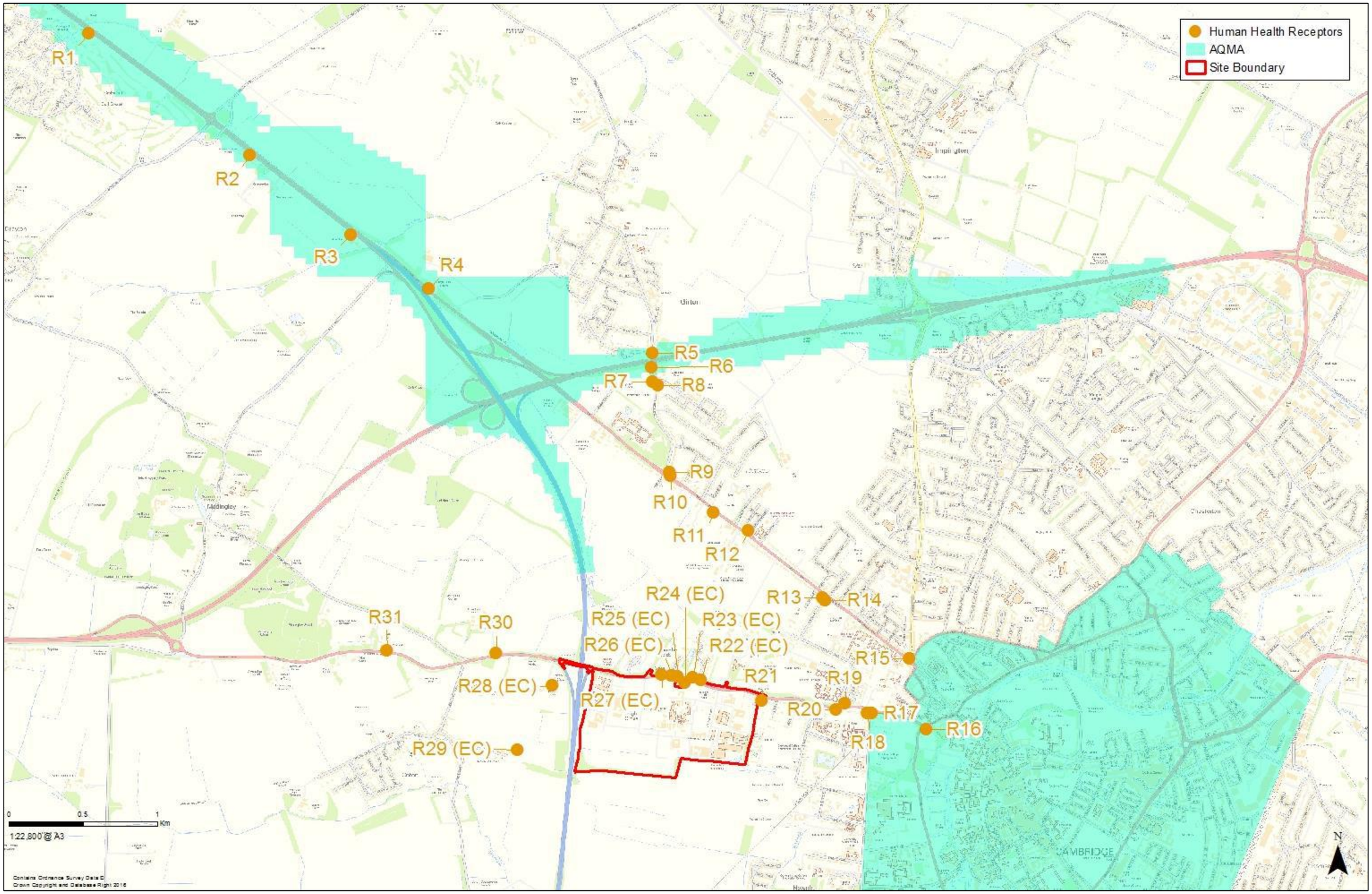


Figure 11.1 Human health receptors

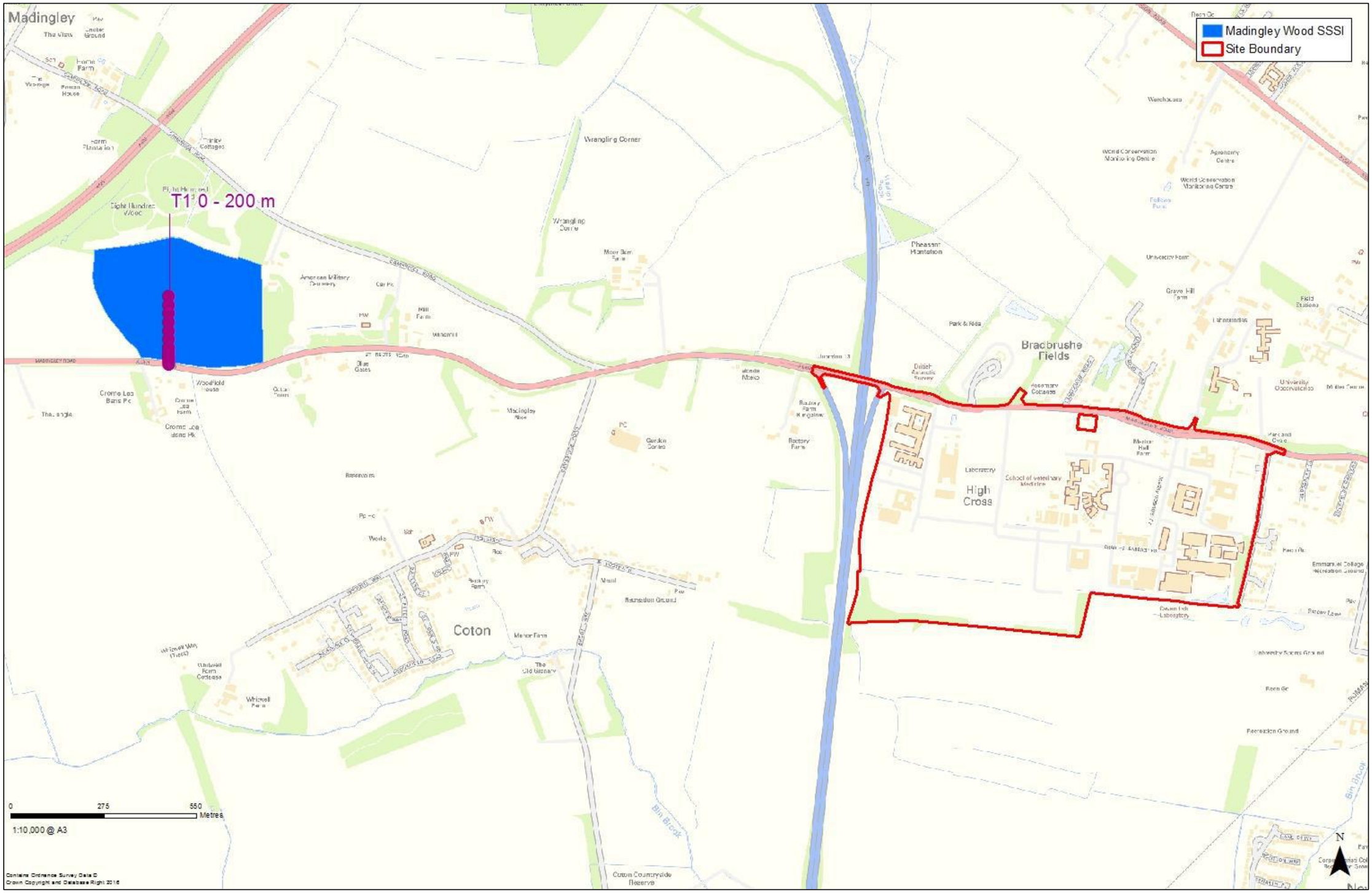


Figure 11.2 Sensitive ecological sites

Operational phase – assessment criteria

11.3.23 There is no official guidance in the UK on how to assess the significance of air quality impacts of a new development. The approach developed by the IAQM and Environmental Protection UK (EPUK) has therefore been used[72]

11.3.24 The guidance sets out three stages: determining the magnitude of change at each receptor, describing the impact, and assessing the overall significance. Impact magnitude relates to the change in pollutant concentration; the impact description relates this change to the air quality objective.

11.3.25 Table 11.8 sets out the impact magnitude descriptors, whilst Table 11.9 sets out the impact descriptors.

Table 11.8 Impact magnitude for changes in ambient pollutant concentrations

Magnitude (% change in concentration)	Annual mean NO_2 and PM_{10} (40µg/m^3)	Annual mean $PM_{2.5}$ (25µg/m^3)	Annual mean of 32 µg/m^3 equating to 35 days above 50µg/m^3 for PM_{10}
Large (>10%)	> 4 µg/m^3	> 2.5 µg/m^3	> 3.2 µg/m^3
Medium (>5% - ≤10%)	>2 – ≤4 µg/m^3	>1.25 – ≤2.5 µg/m^3	>1.6 - ≤3.2 µg/m^3
Small (>1% - ≤5%)	>0.4 – ≤ 2 µg/m^3	>0.25 – ≤ 1.25 µg/m^3	>0.32 - ≤1.6 µg/m^3
Imperceptible (≤1%)	≤ 0.4 µg/m^3	≤ 0.25µg/m^3	≤ 0.32 µg/m^3

Table 11.9 Impact descriptor for changes in concentration at a receptor

% Change in concentration with the development in relation to objective / limit value	Change in concentration			
	Imperceptible	Small	Medium	Large
> 110 % (a)	Moderate	Substantial	Substantial	Substantial
>102% - ≤110% (b)	Moderate	Moderate	Substantial	Substantial
>95% - ≤102% (c)	Slight	Moderate	Moderate	Substantial
>75% - ≤95% (d)	Negligible	Slight	Moderate	Moderate
≤75% (e)	Negligible	Negligible	Slight	Moderate
Where concentrations increase the impact is described as adverse, and where it decreases as beneficial. (a) NO_2 or PM_{10}: ≥ 44µg/m^3 annual mean; $PM_{2.5}$ >27.5µg/m^3 annual mean; PM_{10} >35.2µg/m^3 annual mean (days) (b) NO_2 or PM_{10}: > 40.8 – ≤ 44µg/m^3 annual mean; $PM_{2.5}$ > 25.5 – ≤27.5µg/m^3 annual mean; PM_{10} >32.64 – ≤35.2 µg/m^3 annual mean (days) (c) NO_2 or PM_{10}: > 38 – ≤40.8µg/m^3 annual mean; $PM_{2.5}$ >23.75 – ≤25.5µg/m^3 of annual mean; PM_{10} >30.4 – ≤32.64µg/m^3 annual mean (days) (d) NO_2 or PM_{10}: >30 - ≤38µg/m^3 annual mean; $PM_{2.5}$ >18.75 - ≤23.75µg/m^3 annual mean; or PM_{10} <24 - ≤ 30.4µg/m^3 annual mean (days) (e) NO_2 or PM_{10}: ≤30 µg/m^3 annual mean; $PM_{2.5}$ ≤18.75 µg/m^3 annual mean; PM_{10} ≤24µg/m^3 annual mean (days)				

11.3.26 The guidance states that the assessment of significance should be based on professional judgement, taking into account factors including:

- Number of properties affected by slight, moderate or substantial air quality impacts and a judgement on the overall balance;
- The magnitude of the changes and the descriptions of the impacts at the receptors (i.e. Tables 11.8 and 11.9) findings;
- Whether or not an exceedence of an objective or limit value is predicted to arise in the study area where none existed before or an exceedence area is substantially increased;
- Whether or not the study area exceeds an objective or limit value and this exceedence is removed or the exceedence area is reduced;
- Uncertainty, including the extent to which worst-case assumptions have been made; and
- The extent to which an objective or limit value is exceeded.

11.3.27 Where impacts can be considered in isolation at an individual receptor, moderate or substantial impacts (i.e. per Table 11.9) may be considered to be a significant environmental effect, whereas negligible or slight impacts would not be considered significant. The overall effect however, needs to be considered in the round taking into account the changes at all of the modelled receptor locations, with a judgement made as to whether the overall air quality effect of the development is significant or not.

Assumptions and limitations

11.3.28 There are many components that contribute to the uncertainty in predicted concentrations. The model used in this assessment is dependent upon the traffic data that have been input which will have inherent uncertainties associated with them. There is then additional uncertainty as the model is required to simplify real-world conditions into a series of algorithms.

11.3.29 A disparity between the road transport emission projections and measured annual mean concentrations of nitrogen oxides and nitrogen dioxide has recently been identified[73]. Whilst projections suggest that both annual mean nitrogen oxides and NO_2 concentrations should have fallen by around 15-25% over the past 6 to 8 years, at many monitoring sites levels have remained relatively stable, or have even shown a slight increase.

11.3.30 Model uncertainty can be reduced through model verification, in which model outputs are compared with measured concentrations. Because the model has been verified and adjusted against 2014 monitoring data there can be reasonable confidence in the predicted concentrations.

11.3.31 The assessment has been carried out for the anticipated opening of 2021 and full development in 2031, using 2018 and 2025 emission factors and background concentrations respectively.

11.3.32 Dispersion modelling has been undertaken to determine the maximum flue heights that would be necessary to disperse emissions from an energy centre within the development.

11.3.33 The assessment of the impact of emissions from the permanent energy centre has been considered in line with method in the Environment Agency H1 guidance[74]. Emissions from the boilers and CHP system have been based on typical manufacturer's data for the type of equipment to be used.

[72] Moorcroft and Barrowcliffe et al (2015). `*Land-use Planning & Development Control: Planning for Air Quality*' The Institute for Air Quality Management, London

73 Carslaw, D, Beevers, S, Westmoreland, E and Williams, M, 2011. *Trends in NO_x and NO_2 emissions and ambient measurements in the UK*. Available at: http://uk-air.defra.gov.uk/library/reports?report_id=645

74 H1 Annex f – Air Emissions. Environment Agency.

11.3.34 The modelling has been based on a conceptual design for the energy centre. This is for three CHP engines to be installed operating for 5,590; 3,630 and 2,785 hours per year. In addition, in order to apply heat when the CHP is unavailable, up to three 10MW and one 5MW boilers would be required. The CHO would operate preferentially to the boilers; with the CHP heat generator estimated to be 31,000MWH/yr. The boiler heat generation would be 15,000MWH/yr.

11.3.35 The energy centre location is a zone in the south-west of the Site. The energy centre flues were located in the worst case locations for dispersion in the zone i.e. on the northern side of the zone. The CHP engines were assumed to be Jenbacher type G engines operating on natural gas with NO_x emissions of 256mg/Nm^3 (5% oxygen), consistent with the emission limits for new equipment within the Medium Combustion Plant Directive. The boilers were assumed to be Cochran Thermox natural gas boilers with NO_x emissions of 100 mg/Nm^3 (3% oxygen).

11.3.36 Dispersion modelling was undertaking using the ADMS 5 dispersion model. The maximum flue heights were assumed to be 8m above the stated building parameter plan heights, i.e. 46mAOD. The model input parameters are shown in Appendix 11.4, Volume 3.

11.3.37 Entrainment of the plume into the wake of nearby buildings (the so-called building downwash effect) has been taken into account in the model by including the proposed buildings within the model.

11.3.38 The contribution to pollutant concentrations from the proposed energy centre (the process contribution (or PC)) has been added to the background concentration at specific roadside modelled receptor locations to provide the predicted environmental concentration (PEC).

11.3.39 In all cases, the PEC should be below the relevant assessment level from Table 11.2 which ensures that the air quality strategy objectives are not breached.

11.3.40 The gas fired boilers and the CHP system emit oxides of nitrogen, which is a combination of nitrogen monoxide and nitrogen dioxide, with the vast majority being nitrogen monoxide. Some of the nitrogen monoxide is converted in the atmosphere to nitrogen dioxide. On a conservative basis, the Environment Agency criteria is for 70% of the annual average NO_x concentration and 35% of the hourly average NO_x concentration to be converted to nitrogen dioxide.

11.3.41 The Predicted Environmental Concentration (PEC) is calculated differently for short-term or long-term effects as presented below:

- Long-term effects: PEC = Process Contribution + Background Concentration; and
- Short-term effects: $PEC_{short\text{-}term}$ = Process Contribution $_{short\text{-}term}$ + (2 x Background Concentration $_{long\text{-}term}$).

11.3.42 The roadside receptor locations were chosen as combined locations where the effect of the energy centre emissions and road traffic emissions would be largest. In this case, these were receptors R22 – R29 from Appendix 11.1, Volume 3. The impact of energy centre emissions at other receptor locations will be lower than indicated. Given the separation distance to Madingley Wood (over 2km), the impact of energy centre emissions on the ecological receptor will be negligible.

11.3.43 A number of buildings on the site will have emissions associated with laboratory experiments. At this stage it is not known what these emissions will be; but the scale of the emissions will be low and capable of being abated by standard mitigation techniques. Such emissions will be intermittent and will not have a significant effect on the environment with the appropriate abatement in place. Such abatement can be covered by a condition on any planning permission for the development and therefore emissions from laboratories have not been considered further in this assessment.

11.4 Baseline conditions

Local air quality management

11.4.1 Cambridge City Council and South Cambridgeshire District Council have investigated air quality within their districts as part of its responsibilities under the LAQM regime. To date, one AQMA has been declared by Cambridge City Council; an area encompassing the inner ring road and the land within it, including a buffer zone around the ring road and its junction with main feeder roads. This AQMA is located approximately 800m east of the Site, and has been declared due to exceedences of the annual mean NO_2 objective. In addition, South Cambridgeshire District Council has declared an AQMA, an area along the A14 between Bar Hill and Milton. It has been declared due to exceedences of the annual mean NO_2 objective. This AQMA is located approximately 650m north of the Site.

Monitoring

Nitrogen dioxide

11.4.2 Cambridge City Council and South Cambridgeshire District Council carry out NO_2 monitoring using automatic analysers and also deploy a number of diffusion tubes around the Districts. The monitoring locations within 5.5km of the Proposed Development are shown on Figure 11.3 and in Table 11.11 and Table 11.12.

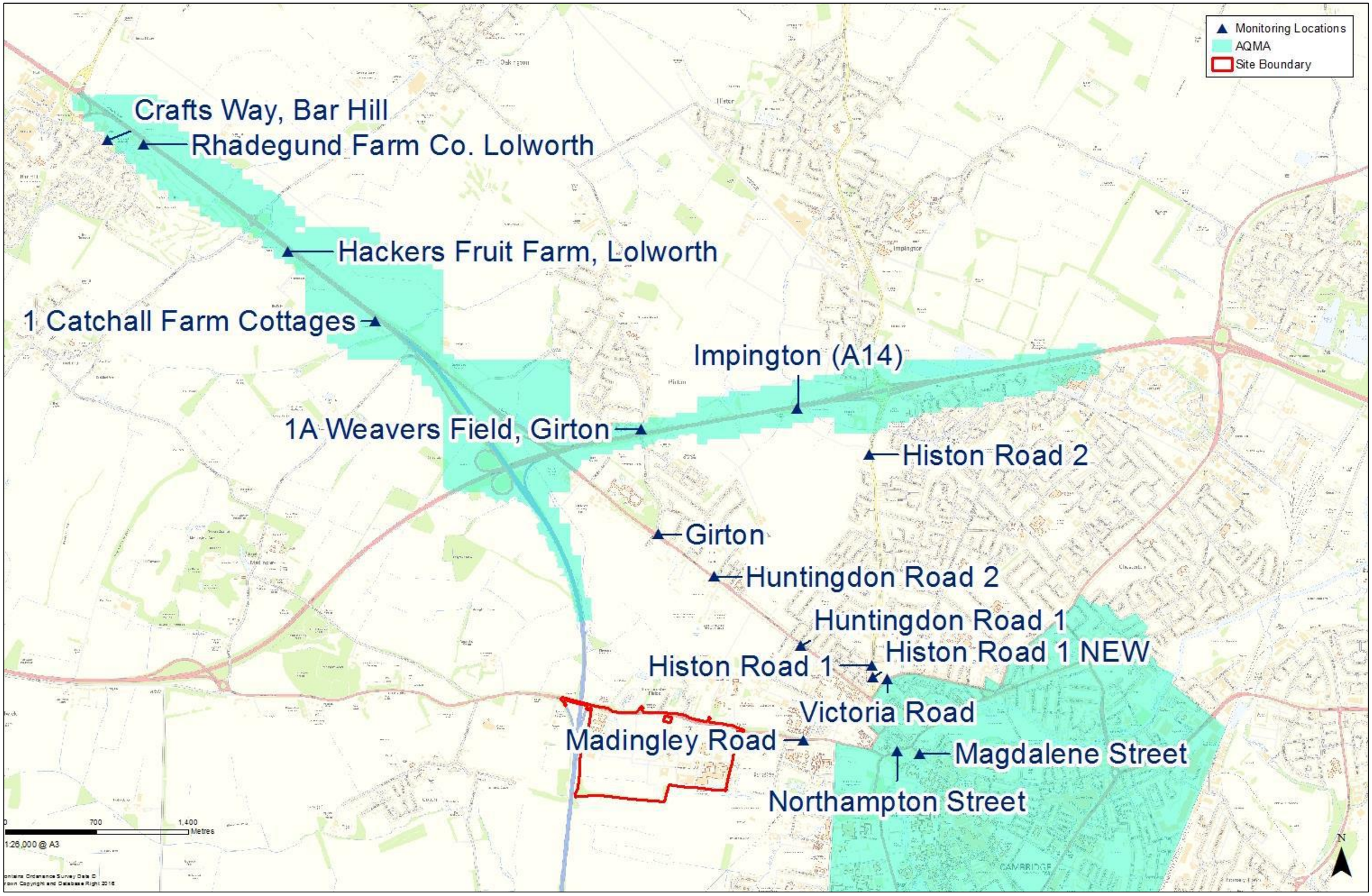


Figure 11.3 Air quality monitoring sites

Table 11.10 Measured NO_2 concentrations, (2010 – 2014)

ID	Site type	Within AQMA	Annual mean (µg/m^3)				
			2010	2011	2012	2013	2014
Cambridge City Council diffusion tubes							
Madingley Road*	K	N	**53**	**43**	**41**	36	**40.2**
Northampton Street	R	Y	**54**	**45**	**41**	38	39.5
Magdalene Street	R	Y	**48**	35	31	29	30
Victoria Road	R	Y	**49**	37	34	33	33
Histon Road 1 NEW[a*]	K	N	-	-	-	30	32
Histon Road 1[b]	K	N	**43**	35	35	29	-
Histon Road 2	R	N	**40**	31	28	28	31.6
Huntingdon Road 1*	R	N	36	29	25	25	25
Huntingdon Road 2*	R	N	38	29	30	27	23
Objective			**40**				
South Cambridgeshire District Council automatic monitors							
Impington (A14)*	R	Y	30	31	31	27	23
Girton*	R	N	-	-	27	26	25
Objective			**40**				
South Cambridgeshire District Council diffusion tubes							
1A Weavers Field*	UB	Y	32.4	32.6	29.5	26.8	30.5
1 Catchall Farm*	R	Y	36.2	25.6	24.4	26.4	25.4
Hackers Fruit Farm*	R	Y	-	28.5	**41.5**	**42.9**	38.0
Rhadegund Farm*	R	Y	-	15.7	22.0	26.0	21.7
Crafts Way Bar Hill	R	N	30.1	21.4	23.9	23.7	22.9
Objective			**40**				

Exceedances of the objective in bold
[a] Start operation in 2013
[b] Stop operation in 2014
K=Kerbside; R= Roadside; UB= Urban Background
*Used for model verification
Monitoring data for CCC obtained from 2015 Updating and Screening Assessment CCC75
Monitoring data for SCDC obtained from the 2015 Updating and Screening Assessment for SCDC76

Table 11.11 Measured exccedances of the hourly mean NO_2 objective, (2010 – 2014)

ID	Hourly mean (µg/m^3)				
	2010	2011	2012	2013	2014
South Cambridgeshire District Council automatic monitors					
Impington (A14)*	0 (115)	0	0	1	0
Girton*	-	-	0	0	0
Objective	**18 (200)**				

*Used for model verification
Monitoring data for SCDC obtained from the 2015 Updating and Screening Assessment for SCDC[76]

11.4.3 In 2010, measured concentrations exceeded the air quality objective at the majority of the monitoring locations within CCC, with the exception of Huntington Road 1 and 2. Concentrations exceeded the objective only in Madingley Road in 2014. Concentrations at the CCC monitoring locations have in overall terms reduced since 2010. In addition, concentrations at the automatic sites within SCDC have remained below the objective since 2010, and concentrations at the diffusion tubes in the area only exceeded the objective in 2012 and 2013 at Hackers Fruit Farm. Overall, concentrations have reduced in SCDC over the 2010 – 2014 time period.

Particulate matter (PM_{10})

11.4.4 Concentrations of PM_{10} have been monitored at two automatic monitoring stations within SCDC. Measured concentrations for the period 2010 to 2014 are presented in Table 11.12 and 11.13 below.

Table 11.12 Measured PM_{10} concentrations, (2010 – 2014)

ID	Annual mean (µg/m^3)				
	2010	2011	2012	2013	2014
South Cambridgeshire District Council automatic monitors					
Impington (A14)	**42**	**54**	**58**	**55**	22
Girton	-	-	26	30	16
Objective	**40**				

Exceedances of the objective in bold
Monitoring data for SCDC obtained from the 2015 Updating and Screening Assessment for SCDC[76]

[75] Cambridge City Council (2015). '*2015 Updating and Screening Assessment for Cambridge City Council*'. Cambridge, UK

[76] South Cambridgeshire District Council (2015). '*2015 Updating and Screening Assessment for South Cambridgeshire District Council*'. South Cambridgeshire, UK

Table 11.13 Measured exccedences of the hourly mean PM_{10} objective, (2010 – 2014)

ID	Hourly mean (µg/m^3)				
	2010	2011	2012	2013	2014
South Cambridgeshire District Council automatic monitors					
Impington (A14)	**36**	**119**	**180**	21	4
Girton	-	-	16	23	2
Objective	**35 days (>50 µg/m^3)**				
Exceedances of the objective in bold Monitoring data for SCDC obtained from the 2015 Updating and Screening Assessment for SCDC[76]					

11.4.5 PM_{10} concentrations exceeded the annual mean objective from 2010 until 2013, and the hourly mean objective from 2010 to 2012 at the Impington (A14) monitoring site. These high concentrations might have been caused due to the road improvements undertook at the A14 during that time period. However, concentrations have reduced significantly in 2014. On the other hand, concentrations have remained below the objectives at Girton monitoring station from 2012 to 2014.

11.4.6 The results for the Impington monitoring site in 2014 are much more consistent with the NO_2 monitoring results where road traffic is the principal source of pollution.

Particulate matter ($PM_{2.5}$)

11.4.7 Concentrations of $PM_{2.5}$ have been monitored at Girton automatic monitoring stations within South Cambridgeshire. Measured concentrations for the period 2010 to 2014 are presented in Table 11.14 below.

Table 11.14 Measured $PM_{2.5}$ concentrations, (2010 – 2014)

ID	Annual Mean (µg/m^3)				
	2010	2011	2012	2013	2014
South Cambridgeshire District Council Automatic Monitors					
Girton	-	-	13	14	12
Objective	**25**				
Monitoring data for SCDC obtained from the 2015 Updating and Screening Assessment for SCDC[76]					

11.4.8 Measured concentrations of $PM_{2.5}$ have remained well below the objective between 2012 and 2014.

Background concentrations

11.4.9 In addition to these measured concentrations, estimated background concentrations for the Site and Madingley Wood SSSI have been obtained from the national maps provided by Defra for the years 2014, 2018 and 2025 and shown in Table 11.15 below.

Table 11.15 Estimated annual mean background concentrations

Year	Grid reference	Annual mean (µg/m^3)			
		NO_x	NO_2	PM_{10}	$PM_{2.5}$
Background concentrations for the Site					
2014	542_259	24.1	16.4	19.2	12.5
	542_258	21.0	14.5	19.2	12.1
	543_259	23.4	15.8	18.0	11.9
	543_258	21.1	14.4	17.4	11.6
2018	542_259	19.8	13.7	18.5	11.9
	542_258	17.4	12.2	18.5	11.5
	543_259	19.9	13.7	17.3	11.3
	543_258	18.1	12.6	16.8	11.0
2025	542_259	15.9	11.2	17.9	11.3
	542_258	14.3	10.1	17.9	11.0
	543_259	16.8	11.8	16.7	10.8
	543_258	15.6	11.0	16.2	10.5
Background concentrations at Madingley Wood SSSI					
2014	540_259	18.0	N/A	N/A	N/A
2018	540_259	15.1	N/A	N/A	N/A
2025	540_259	12.5	N/A	N/A	N/A
Objectives		**30[a]**	**40[b]**	**40[b]**	**25[b]**
[a] Ecosystem; [b] Human Health					

11.4.10 Background concentrations for human health receptors and at the SSSI are well below the relevant objectives for the years 2014, 2018 and 2025.

Designated sites

11.4.11 Madingley Wood Site of Special Scientific Interest (SSSI) is located approximately 1.8km to the west of the Proposed Site. It lies directly adjacent and to the north of the A1303 Madingley Road. The lowest critical loads for the most sensitive habitat within Madingley Wood (SSSI) are presented in Table 11.16.

Table 11.16 Deposition and site relevant critical loads

Habitat	Critical load	
	Nitrogen deposition (kgN/ha/yr)	Acid deposition (keqN/ha/yr)
Broad-leaved, mixed and yew woodland	15 -20	0.214 – 1.860

11.4.12 The three year average (2012 – 2014) nitrogen and acid deposition rates for the designated site sensitive to nitrogen and acid deposition are presented in Table 11.17 below; data has been taken from the APIS website. The APIS website does not include future year predictions and therefore on a conservative basis, the APIS baseline is assumed constant for the future year assessments.

Table 11.17 Baseline deposition rates

Habitat	Nitrogen deposition (kgN/ha/yr)	Acid deposition	
		(keqN/ha/yr)	(keqS/ha/yr)
Madingley Wood SSSI			
Broadleaved, Mixed and Yew Woodland	**28**	**2.0**	0.28
Critical Load	**15 - 20**	**0.214 – 1.860**	**1.645**
Exceedences of the Critical Load in bold			

11.4.13 The nitrogen deposition for the habitat exceeds the minimum critical load of 15 (kgN/ha/yr) on average between 2012 and 2014. Similarly, the acid deposition exceeds the critical load function for the same period, due to the nitrogen acid deposition site.

Predicted baseline concentrations

Human health receptors

11.4.14 The ADMS- Roads model has been run to predict NO_2, PM_{10} and $PM_{2.5}$ concentrations at each of the existing receptor locations identified in Appendix 11.1, Volume 3. The results for the baseline scenarios for the years 2014, 2021 and 2031 are presented in Appendix 11.5, Volume 3.

11.4.15 Predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ are not predicted to exceed the relevant air quality limit objectives at any of the existing receptor locations in 2014, 2021 and 2031.

Ecological receptors

11.4.16 Predicted concentrations and deposition rates for the baseline scenarios are contained in Appendix 11.5, Volume 3 for the baseline years 2014, 2021 and 2031.

Baseline year 2014

11.4.17 For Transect T1 within the Broadleaved, Mixed and Yew Woodland habitat, NO_x critical level is predicted to be exceeded from 0m up to 5m of the road. The nitrogen and acid deposition critical loads are predicted to be exceeded at all distances (from 0m up to 200 m) from the road.

Baseline year 2021

11.4.18 The NO_x critical level is predicted to be exceeded only at 0m from the road. The nitrogen and acid deposition critical loads are predicted to be exceeded at all distances (from 0m up to 200 m) from the road.

Baseline year 2031

11.4.19 The NO_x critical level is not predicted to be exceeded at any distance from the road. The nitrogen and acid deposition critical loads are predicted to be exceeded at all distances (from 0m up to 200 m) from the road.

11.5 Impact assessment

Construction

11.5.1 Construction phase effects are shown in Table 11.18.

Table 11.18 Construction phase effects

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Area Sensitivity for Human health receptors within 50m of the site boundary	Medium risk	The main potential effects during construction are dust deposition and elevated PM_{10} concentrations. The following activities have the potential to cause emissions of dust: • Site preparation including delivery of construction material, erection of fences and barriers; • Demolition of existing buildings on Site; • Earthworks including digging foundations and landscaping; • Materials handling such as storage of material in stockpiles and spillage; • Construction and fabrication of units; and • Disposal of waste materials off-Site.	Mitigation measures specified in the IAQM guidance for a medium risk site will be implemented during construction. The measures relate to specific works activities including: • Communication; • Management; • Earthworks; • Demolition; • Construction; and • Trackout.	Negligible	Typically the main cause of unmitigated dust generation on construction Sites is from demolition and vehicles using unpaved haul roads, and off-Site from the suspension of dust from mud deposited on local roads by construction traffic. The main determinants of unmitigated dust annoyance are the weather and the distance to the nearest receptor. Based on the IAQM criteria (Table 11.5), the dust emission magnitude is considered to be large. The study area is considered to be of medium sensitivity (Table 11.6). In terms of human health receptors, there are more than 10 residential properties located within 50m of the Site. Appropriate mitigation corresponding to a medium risk site is therefore required during the construction phases of the proposed development (Table 11.7). With appropriate mitigation in place the construction phase effects are described as not significant. Table 11.18 below describes the summary of the construction phase effects for the proposed development.	Negligible **Not significant**
Madingley Wood SSSI	Negligible		None required	Negligible	Madingley Wood SSSI is located more than 350m away from the Site. Therefore, construction phase impacts on the SSSI are very unlikely to occur and will not be significant.	Negligible **Not significant**

Operation

11.5.2 Table 11.19 below provides a summary of the operation phase effects for the proposed development.

Table 11.19 Operational phase effects

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Human Health Receptors off-site	High	Increase in road traffic emissions leading to elevated NO_2, PM_{10} and $PM_{2.5}$ concentrations	Not required	Negligible	Predicted concentrations of NO_2, PM_{10} and $PM_{2.5}$ at existing receptors in 2021 (Interim Scenario) and 2031 (Full Development), both without and with the Proposed Development in place are presented in Appendix 11.6, Volume 3. **2021 Interim scenario** In 2021, without and with (interim scenario) the development in place NO_2, PM_{10} and $PM_{2.5}$ concentrations are not predicted to exceed the air quality strategy objectives at any of the existing residential receptor locations. The changes in annual mean concentrations are presented in Appendix 11.6, Volume 3. Based on the impact descriptors presented in Table 11.9, the changes in the annual mean NO_2 concentrations are imperceptible at the majority of the receptor locations with the exception of receptor R17 where the change is described as small. The changes in PM_{10} annual mean concentrations and the annual mean of 32 µg/m^3 equating to 35 days above 50 µg/m^3 is described as imperceptible at all receptor locations. The changes in $PM_{2.5}$ concentrations are described as imperceptible at all receptor locations. Using the criteria set out in Table 11.9, the impact on pollutant concentrations is classed as negligible at all receptor locations. **2031 With full development scenario** In 2031, without and with the full development in place NO_2, PM_{10} and $PM_{2.5}$ concentrations are not predicted to exceed the air quality strategy objectives at any of the existing residential receptor locations. The changes in annual mean concentrations are presented in Appendix 11.6, Volume 3. Based on the impact descriptors presented in Table 11.9, the changes in the annual mean NO_2 concentrations are imperceptible at the majority of the receptor locations with the exception of receptors R17 – R20, R22 and R25 – R27, where the change is described as small. The changes in PM_{10} annual mean concentrations and the annual mean of 32µg/m^3 equating to 35 days above 50µg/m^3 is described as imperceptible at all receptor locations. The changes in $PM_{2.5}$ concentrations are described as imperceptible at all receptor locations. Using the criteria set out in Table 11.9, the impact on pollutant concentrations is classed as negligible at all receptor locations.	Negligible **Not significant**
Human Health Receptors off-site	High	Energy Centre emissions leading to elevated NO_2 concentrations	Not required	Negligible	Predicted concentrations from the energy centre emissions are presented in Appendix 11.8, Volume 3. The significance of the impacts has been judged in accordance with the IAQM/EPUK criteria. There are no predicted exceedances of air quality strategy objectives as a result of emissions from the energy centre. The maximum change in annual mean NO_2 concentrations is described as small. The maximum change in hourly NO_2 concentrations is medium. When considered in conjunction with the background concentrations the impact at the worst case receptor is described as negligible. The impact of the energy centre emissions is lower at other receptor locations. Given that there are no exceedances of air quality strategy objectives the effect of the energy centre emissions is considered to be not significant.	Negligible **Not significant**
Human Health Receptors off-site	High	Combined Road Traffic and Energy Centre emissions leading to elevated NO2 concentrations	Not required	Negligible	The maximum predicted concentrations predicted in Appendix 11.8 for the energy centre include the contribution from the road traffic in the background concentration. The combined impact of road traffic and energy centre emissions is to increase NO_2 concentrations by a maximum of 1.0 and 1.2 µg/m^3 in 2021 and 2031 respectively. This magnitude of change, in combination with the total concentration is described as a negligible impact (Table 11.9).	Negligible **Not significant**
Human Health Receptors on-site	High	Emissions from on-site laboratories	Additional abatement may be required.	Negligible	Process abatement will be designed to ensure environmental concentrations do not breach environmental assessment levels specific to the chemical species being released. This will be undertaken during the detailed design stage of the specific laboratory building.	Negligible **Not significant**
Madingley Wood SSSI	High	Road traffic emissions leading to elevated NO_x concentrations and Nitrogen / Acid Deposition	Not required	Negligible	Predicted concentrations and deposition rates without and with the proposed development in place in 2021 and 2031 are contained in Appendix 11.7, Volume 3. **2021 Interim scenario** The NO_x critical level is predicted to be exceeded only at the kerb of the road without or with the development in place. The increase in NO_x concentrations is only 1.4% of the critical level at the kerb of the road, and therefore the increase in NO_x concentrations is unlikely to have a significant effect. The nitrogen and acid deposition critical loads are predicted to be exceeded at all of the receptor locations within the habitat in 2021. The increase in nitrogen and acid deposition is less than 1% and therefore not significant. **2031 With full development scenario** The NO_x critical level is not predicted to be exceeded with or without the development in place. The nitrogen and acid deposition critical loads are predicted to be exceeded at all of the receptor locations within the habitat in 2031. The increase in nitrogen and acid deposition is less than 1% and therefore not significant.	Negligible **Not significant**

11.6 Mitigation measures

Construction

11.6.1 Because of the uncertainty around construction works the mitigation measures listed in this section are intended to be a starting point based on the assumptions used for the impact assessment and the subsequently predicted effects. Once details of the construction works activities are known the list will need to be refined based on any change in risk as per the IAQM guidance.

11.6.2 The following mitigation measures are specified in the IAQM guidance for a medium risk site and will be appropriately implemented during construction. The CEMP will specify which works activities will be subject to which specific mitigation measures.

Communication

- Develop and implement a stakeholder communications plan.
- Display the name and contact details of persons accountable on the site boundary.
- Display the head or regional office information on the site boundary.

Management

- Develop and implement a dust management plan.
- Record all dust and air quality complaints, identify causes and take measures to reduce emissions.
- Record exceptional incidents and action taken to resolve the situation.
- Carry out regular site inspections to monitor compliance with the dust management plan and record results.
- Increase site inspection frequency during prolonged dry or windy conditions and when activities with high dust potential are being undertaken.
- Agree dust monitoring locations with the local authority and instigate monitoring 3 months in advance of works commencing in the area.
- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible.
- Erect solid screens or barriers around dusty activities or the site boundary at least as high as any stockpile on site.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Avoid site run off of water or mud.
- Keep site fencing, barriers and scaffolding clean using wet methods.
- Remove potentially dusty materials from site as soon as possible.
- Cover, seed or fence stockpiles to prevent wind whipping.
- Ensure all vehicles switch off engines when stationary.
- Avoid the use of diesel or petrol powered generators where possible.
- Produce a Construction Logistics Plan to manage the delivery of goods and materials.
- Only use cutting, grinding and sawing equipment with dust suppression equipment.
- Ensure an adequate supply of water on site for dust suppressant.
- Use enclosed chutes and conveyors and covered skips.
- Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use water sprays on such equipment where appropriate.
- Ensure equipment is readily available on site to clean up spillages of dry materials.
- No on-site bonfires and burning of waste materials on site.

Earthworks

- Re-vegetate earthworks and exposed areas /soil stockpiles to stabilise surfaces as soon as practicable.
- Only remove the cover in small areas during work and not all at once.

Demolition

- Incorporate soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).
- Ensure water suppression is used during demolition operation.
- Avoid explosive blasting, using appropriate manual and mechanical alternatives.
- Bag and remove any biological debris or damp down such material before demolition.

Construction

- Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless required for a particular process.
- Ensure bulk cement and other fine powder materials are delivered in enclosed tanker sand stored silos with suitable emissions control systems.

Trackout

- Use water assisted dust sweepers on the site access and local roads.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving the site are covered to prevent escape of materials.
- Record inspection of on-site haul routes and any subsequent action, repairing as soon as reasonably practicable.
- Install hard surfaced haul routes which are regularly damped down.
- Install a wheel wash with a hard-surfaced road to the site exit where site layout permits.
- The site access gate to be located at least 10m from receptors where possible.

Operation

11.6.3 Further assessment will be required at detailed design to identify potential laboratory emissions. The assessment will inform any abatement that may be required to ensure significant adverse effects do not arise.

11.7 Summary

11.7.1 Construction phase impacts are judged to be negligible when appropriate mitigation measures are applied through a Construction Environmental Management Plan (CEMP) for the Site.

11.7.2 Concentrations of NO_2, PM_{10} and $PM_{2.5}$ have been predicted for a number of worst-case locations representing existing properties adjacent to the road network. Predicted concentrations are below the relevant air quality objectives at all of the existing receptor locations in 2021 and 2031 with the proposed development in place. No additional mitigation measures are required.

11.7.3 The increase in NO_x concentrations, nitrogen and acid deposition is unlikely to have a significant effect on the integrity on the Madingley Wood SSSI.

11.7.4 Modelling of the emissions from the energy centre have shown that a flue height of 8m above building parameter plan height is sufficient to disperse emissions.

11.7.5 The operational effects of the proposed development are judged to be negligible and not significant.

12. Noise and vibration

12.1 Scope of the assessment

12.1.1 This chapter addresses the likely significant noise and vibration effects associated with construction and operation of the Proposed Development on noise sensitive receptors on and around the Site.

12.1.2 The noise and vibration assessments and production of this noise and vibration chapter have been undertaken by Peter Brett Associates, a sponsoring organisation of the Institute of Acoustics.

12.1.3 The noise and vibration assessment considers the following:

- Noise from construction activities and construction traffic
- Ground-borne vibration from construction activities
- Noise from road traffic during the operation of the Proposed Development
- Ground-borne vibration from road traffic during the operation of the Proposed Development
- Noise from proposed plant and CHP units

12.1.4 Road traffic noise due to construction traffic has not been assessed as there are no roads that would experience a 100% increase in vehicle flows that would result in a 3dB noise increase which would be considered a low impact as specified in the DMRB[77].

12.1.5 Table 12.1 shows relevant Scoping Opinion responses for the noise and vibration assessment.

Table 12.1 Scoping response

Issue raised	Respondent
As residential uses exist on the Site, and if further residential uses are proposed, we would expect use of BS8233:2014 to assess performance of the building fabric by day and by night. We also expect an assessment of the noise levels within external amenity spaces.	Cambridge City Council – Refuse and Environment Service
Where residential dwellings cannot achieve the standards set out in BS8233:2014 with windows open, we would expect to see proposals for an alternative form of ventilation provided within the assessment.	
Careful consideration should be given to the possible reflective nature of larger commercial units, reflecting noise back towards existing residential premises.	
Potential impacts from construction noise should be assessed using BS5228:2009, to include forecast noise levels at the Site (or construction phase) boundary along with detailed proposals for mitigation and noise management.	

12.1.6 No new residential dwellings are proposed.

12.1.7 It has been agreed with Cambridge City Council Planning Officers that assessment in accordance with BS8233:2014 and assessments that consider the reflective nature of larger commercial buildings will be undertaken at the reserved matters stage. This is due to firm plot proposals being required to undertake these detailed assessments as it is not possible to undertake assessments based on the parameter plans.

12.1.8 The comment relating to the use of BS5228:2009 has been considered within this noise and vibration assessment.

12.2 Relevant legislation

12.2.1 The assessments were made in accordance with current national noise policy including the National Planning Policy Framework (NPPF), the Noise Policy Statement for England (NPSE) and the Planning Practice Guidance for Noise (PPG).

National legislation

The Control of Pollution Act 1974

12.2.2 The Control of Pollution Act 1974[78] (COPA) includes provisions for construction noise and vibration. Sections 60 and 61 provide the powers for the local authority to issue a notice to dictate certain construction practices to minimise noise. This could include restricting the time of day when works are undertaken, specify the type of plant or equipment that can be used and, specify the permitted level of noise that can be emitted. Section 61 allows the developer to enter an agreement with the local authority to agree certain construction practices to minimise noise emissions in advance of works starting.

The Environmental Protection Act 1990

12.2.3 Under Part III of the Environmental Protection Act[79] 1990, Local Authorities have a duty to investigate noise complaints from premises (land and buildings) and vehicles, machinery or equipment in the street. This includes noise arising from construction sites. If the noise complained about amounts to a statutory nuisance then the authority must serve an abatement notice on the person responsible or in certain cases the owner or occupier of the property. The notice could require that the noise or nuisance must be stopped altogether or limited to certain times of the day.

National policy

National Planning Policy Framework 2012

12.2.4 The first three aims in relation to noise are given in Paragraph 123 of the NPPF[80], as follows:

"Planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;
- Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions."

12.2.5 The NPPF indicates that the Noise Policy Statement for England[81] (NPSE) should be used to define the "significant adverse impacts".

Noise Policy Statement for England 2010

12.2.6 The NPSE[81] sets out the long term vision of Government noise policy:

[77] Highways Agency, 2011, Design Manual for Roads and Bridges, Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 7 HD 213/11 – Revision 1 Noise and Vibration
[78] Control of Pollution Act, 1974
[79] Environmental Protection Act, 1990
[80] Department for Communities and Local Government, 2012. National Planning Policy Framework. London: HMSO.
[81] Department for Environment, Food and Rural Affairs, 2010. Noise Policy Statement for England. London: HMSO.

"To promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development."

12.2.7 The NPSE clarifies that noise should not be considered in isolation of the wider benefits of a scheme or development, and that the intention is to minimise noise and noise effects as far as is reasonably practicable having regard to the underlying principles of sustainable development.

12.2.8 The first two aims of the NPSE follow established concepts from toxicology that are applied to noise impacts, for example, by the World Health Organisation. They are:

12.2.9 The NPSE clarifies that noise should not be considered in isolation of the wider benefits of a scheme or development, and that the intention is to minimise noise and noise effects as far as is reasonably practicable having regard to the underlying principles of sustainable development.

12.2.10 The first two aims of the NPSE follow established concepts from toxicology that are applied to noise impacts, for example, by the World Health Organisation. They are:

- NOEL – No Observed Effect Level - the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise; and
- LOAEL – Lowest Observed Adverse Effect Level - the level above which adverse effects on health and quality of life can be detected.

12.2.11 The NPSE extends these to the concept of a significant observed adverse effect level.

- SOAEL – Significant Observed Adverse Effect Level - The level above which significant adverse effects on health and quality of life occur.

Planning Practice Guidance for Noise 2014

12.2.12 The Government's Planning Practice Guidance[82] for noise provides guidance on the effects of noise exposure, relating these to people's perception of noise, and linking them to the NOEL and, as exposure increases, the LOAEL and SOAEL.

12.2.13 As exposure increases above the LOAEL, the noise begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise. As the noise exposure increases, it will then at some point cross the SOAEL boundary.

Local policy

Cambridge Local Plan 2006

12.2.14 Noise is identified in Policy 4/13 in terms of pollution. The policy guidance notes that "prevention of pollution is better than mitigation" and that "conditions will be applied to planning permissions to secure appropriate pollution prevention or mitigation measures where required".

Cambridge Local Plan 2014 (Proposed Submission)

12.2.15 Policy 35 considers the protection of human health from noise and vibration in accordance with national noise policy.

South Cambridgeshire Local Plan (Proposed Submission)

12.2.16 Noise policy SC/11 considers noise in accordance with national noise policy.

12.3 Method of assessment

12.3.1 The noise and vibration assessment has been undertaken in accordance with BS7445:2003[83], BS5228:2009 +A1:2014 parts 1[84] and 2[85], BS4142:2014[86], Calculation of Road Traffic Noise (CRTN) [87], TRL guidance[88], Design Manual for Roads and Bridges (DMRB) [89] and WHO Guidelines[90].

Establishing the baseline

12.3.2 A noise and vibration survey was undertaken on 23 and 24 October 2014 in general accordance with BS 7445 Part 1. Appendix 12.2, Volume 3 presents full details of the noise and vibration survey methodology.

12.3.3 Unattended noise measurements were taken for 24 hours at five locations across the Site to establish the current baseline conditions and determine the representative noise climate across the Site. Figure 12.1 indicates the approximate locations of these measurements.

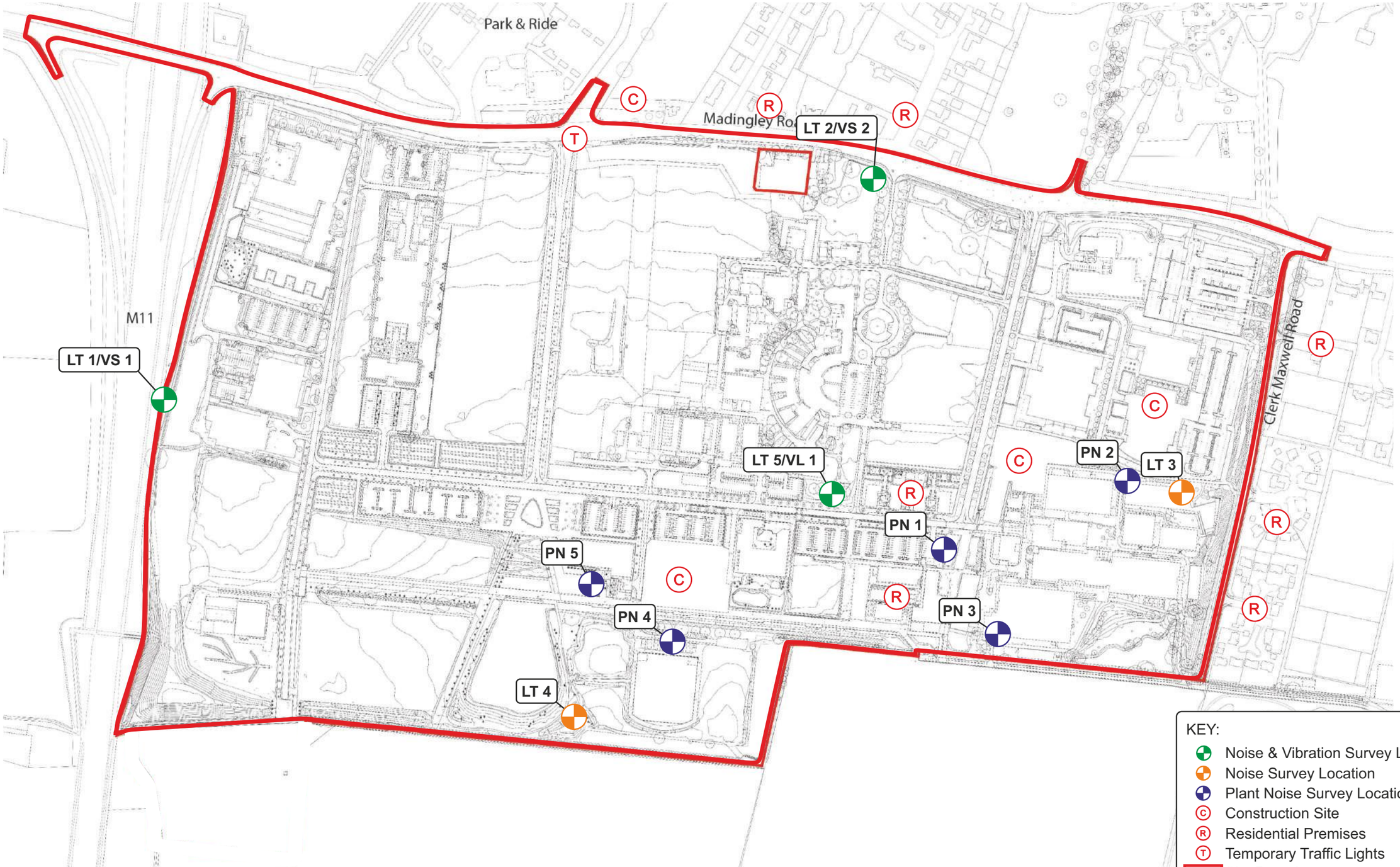
12.3.4 Figure 12.1 also shows the locations of additional attended noise measurements which were undertaken on the 24 October 2014 close to existing sources of plant noise.

12.3.5 Two short-term attended vibration measurements were taken closer to the A1303 Madingley Road and the M11 motorway and one unattended 24 hour vibration measurement was undertaken at the centre of the site. These locations can also be seen in Figure 12.1.

12.3.6 A computer based noise model of the Site and surrounding areas has been prepared using the industry standard software SoundPLAN version 7.3 in order to assess road traffic noise. The existing Site mapping and topography have been included in the noise model. Existing traffic flows for nearby roads provided by the transport consultants and the results of the unattended noise survey have been used to calibrate the noise model.

12.3.7 The sensitivity of noise sensitive receptors is determined using the criteria set out in Table 12.2.

[82] Department for Communities and Local Government, 2014. Planning Practice Guidance Noise. London: HMSO.
[83] British Standards Institution, 2003, BS 7445-1:2003 Description and measurement of environmental noise. Guide to quantities and procedures, London, BSI
[84] British Standards Institution, 2014. BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites Part 1 Noise. London: BSI.
[85] British Standards Institution, 2014. BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites Part 2 Vibration. London: BSI.
[86] British Standards Institution, 2014. BS 4142:2014 Methods for rating and assessing industrial and commercial sound. London: BSI.
[87] Department of Transport Welsh Office, 1988. Calculation of Road Traffic Noise. London: HMSO.
[88] TRL, Casella Stanger, 2006. Method for converting the UK road traffic noise index LA10,18h to the EU noise indices for road noise mapping.
[89] The Highways Agency, 2011. Design Manual for Roads and Bridges Volume 11 Environmental Assessment Section 3 Environmental Assessment Techniques Part 7 Noise and vibration. London: HMSO.
[90] World Health Organisation, 1999. Guidelines for Community Noise. Genena: WHO.



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Noise & Vibration Survey Locations Indicating Site Conditions at the Time of the Survey

Mark	Revision	Drawn	Date	Chkd

Date	21.08.2015
Scale	A3 - N.T.S
Drawn by	ZR
Checked by	RE

FIGURE 12.1

Table 12.2: Receptor sensitivity levels

Sensitivity of receptor	Noise	Vibration
Very High	Internationally or nationally designated nature conservation sites which are also known to contain noise sensitive species (i.e. noise may change breeding habits or threaten species in some other way)	Listed buildings and non-earthwork Scheduled Ancient Monuments
High	Residential buildings	Unreinforced or light framed structures Academic, research or commercial buildings housing vibration sensitive equipment
Medium	Schools, hospitals, areas used primarily for leisure activities, including PRoW, sports facilities and sites of historic or cultural importance, places of worship	Residential or light commercial buildings
Low	Offices, cafes/bars with external areas	Reinforced or framed structures Industrial, heavy commercial buildings and earthworks (Scheduled Ancient Monuments)
Non-sensitive	Industrial, retail	

Study area

12.3.8 A study area of 300m around the Site boundary has been considered in the assessments. This area is based on the calculation method in CRTN[87] and guidance provided by the Environmental Impact Assessment Ordinance[91].

Impact assessment criteria

Construction noise

12.3.9 The sound levels that are considered the LOAELs and SOAELs for construction noise are set out in Table 12.3. The LOAELs are the "lower cut offs" identified in Appendix E of BS 5228 Part 1[84] and the SOAELs are the levels identified that, if exceeded for "significant" periods of time (either continuously or sporadically), could result in "widespread community disturbance, or interfere with activities or sleep".

Table 12.3: Construction noise adverse effect levels for permanent buildings

Day	Time (hours)	Averaging period, T	Lowest observed adverse effect level $L_{Aeq,T}$ (dB)	Significant observed adverse effect level $L_{Aeq,T}$ (dB)
Mondays to Fridays	0700 - 0800	1 hour	60	70
	0800 - 1800	10 hours	65	75
	1800 - 1900	1 hour	60	70
	1900 – 2200	1 hour	55	65
Saturdays	0700 - 0800	1 hour	60	70
	0800 - 1300	5 hours	65	75
	1300 - 1400	1 hour	60	70
	1400 – 2200	1 hour	55	65
Sundays & Public Holidays	0700 – 2200	1 hour	55	65
Any night	2200 – 0700	1 hour	45	55

12.3.10 Table 12.4 presents the corresponding magnitude scale of impact for construction noise.

Table 12.4: Construction noise impact levels

Magnitude of impact	Description of construction noise
High	Daytime construction noise levels exceed the SOAELs in Table 12.3 for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months.
Medium	Daytime construction noise levels exceed the SOAELs in Table 12.3 for less than 10 days in any 15 day period or for a total of days less than or equal to 40 in any 6 month period.
Low	Daytime construction noise levels between the LOAEL and SOAEL levels in Table 12.3.
Negligible	Daytime construction noise levels less than or equal to the LOAELs in Table 12.3

12.3.11 Construction noise is likely to affect existing off-site and on-site receptors during all construction phases as well as any earlier completed construction phases.

12.3.12 It is noted that some of the older existing buildings on site will be demolished. Demolition of these buildings is likely to require breakers, crushers and site clearance. Any internal stripping out prior to demolition of the structure is unlikely to be a significant source of noise or vibration for nearby receptors.

12.3.13 The construction of new buildings is likely to include site levelling/clearance, ground excavation, concreting, piling, superstructure construction and external works such as road construction. The building construction phase and the servicing and fitting out of new buildings is not normally a significant source of noise or vibration for nearby receptors.

12.3.14 BS 5228 Part 1 provides typical construction plant noise levels in terms of L_{Aeq} at a distance of 10m from the source. The standard also provides calculation methods in order to predict the noise levels at a receptor with corrections for distance and ground attenuation, noise screening, reflections and the percentage on-time of an activity over the course of the assessment period.

[91] Environmental Impact Assessment Ordinance Note No. 12/2005, Cap. 499 Guidance Note, Road Traffic Noise Impact Assessment under the Environmental Impact Assessment Ordinance.

12.3.15 An assessment of demolition and construction noise has been undertaken based on typical construction plant noise levels provided in BS 5228 Part 1. The detailed assessment is provided in Appendix 12.3, Volume 3. Prior to the production of specific details on the phasing and siting of construction activities, the BS 5228 data and calculation procedures have been used to derive indicative noise levels at selected distance bands from the construction site boundary. The assessment considers a worst case scenario without noise controls such as screening or operational constraints.

Construction traffic noise

12.3.16 Off-site construction traffic noise has been assessed by considering the increase in traffic flows during construction works following the principles of CRTN[87] and DMRB[89].

12.3.17 The criteria for the assessment of the magnitude of impact due to road traffic noise changes arising from construction works are provided in Table 12.5.

Table 12.5: Construction traffic noise impact levels

Magnitude of impact	Adverse effect levels	Increase in LA10,18h noise levels due to construction traffic
High		10 dB
Medium	SOAEL	5 dB
Low	LOAEL	3 dB
Negligible		Less than 3 dB

Construction vibration

12.3.18 The simplest approach to quantify vibration effects is to use the concept of peak particle velocity (PPV). BS 5228 Part 2[85] suggests that, for construction activities, it is considered more appropriate to provide guidance in terms of the PPV, since this parameter is likely to be more routinely measured based upon the more usual concerns over potential building damage.

12.3.19 Table 12.6 presents the impact levels for the human response to construction vibration as measured at the point of entry into the recipient in terms of PPV.

Table 12.6: Construction vibration impact levels for the human response to vibration

Magnitude of impact	Adverse effect level	Peak particle velocity	Effect
High	SOAEL	10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure to this level.
Medium	LOAEL	1 mm/s	It is likely that vibration of this level in residential environments will cause complaint, but can be tolerated if prior warning and explanation has been given to residents.
Low		0.3 mm/s	Vibration might just be perceptible in residential environments.
Negligible		0.14 mm/s	Vibration might just be perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.

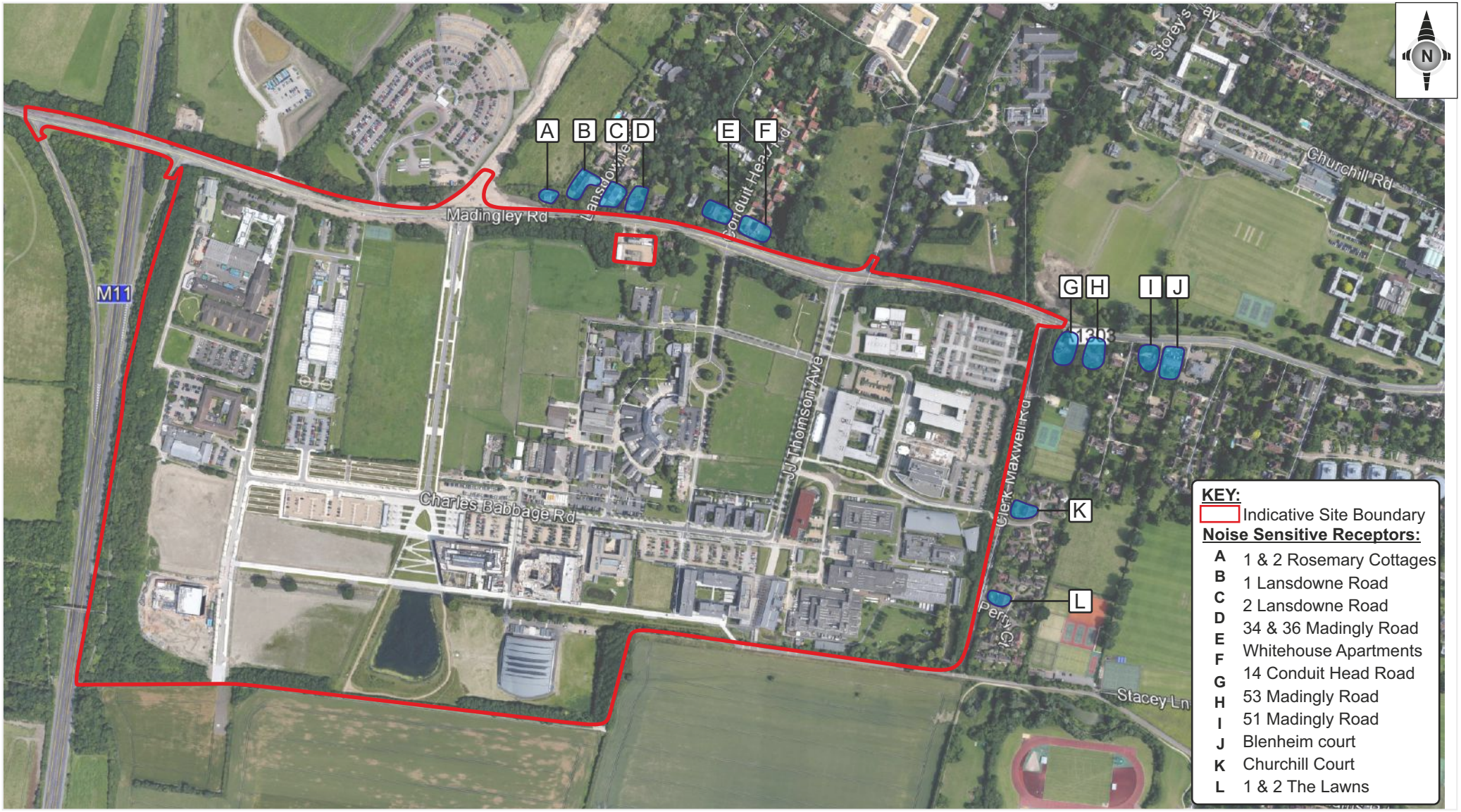
12.3.20 BS 5228 Part 2 also provides guidance on the assessment of vulnerability of contents of buildings identifying that many types of equipment, activities and processes are often sensitive to levels of vibration below those levels that are perceptible to humans. Example criteria are provided in terms of root mean squared (RMS) particle velocity (µm/s) for a range of facilities and equipment, however, specific criteria should be established through investigation of the existing site conditions or through discussion with the receptor manufacturer, supplier or operator.

12.3.21 Construction vibration has been assessed using typical vibration level data and calculation methodology provided in BS 5228 Part 2[85]. A detailed assessment can be found in Appendix 12.3, Volume 3.

Noise sensitive receptors for operational traffic

12.3.22 Noise Sensitive Receptors are those aspects of the environment sensitive to changes in baseline conditions. The sensitivity of a particular receptor depends upon the extent to which it is susceptible to such changes.

12.3.23 Table 12.7 provides details of noise sensitive receptors identified in the vicinity of the site. Figure 12.2 details the approximate locations of the identified receptors along with a reference letter as defined in Table 12.7.



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Noise Sensitive Receptors

Mark	Revision	Drawn	Date	Chkd

Date	29.03.2016
Scale	NTS
Drawn by	ZR
Checked by	JLJ

FIGURE 11.2

Table 12.7 Noise sensitive receptors

Noise sensitive receptor	Figure reference
1 + 2 Rosemary Cottages	A
1 Lansdowne Rd	B
2 Lansdowne Rd	C
34 + 36 Madingley Rd	D
Whitehouse Apartments	E
14 Conduit Head Rd	F
53 Madingley Rd	G
51 Madingley Rd	H
Blenheim Court	I
Churchill Court	J
1+2 The Lawns	K
1+2 Perry Close	L

12.3.24 The assessments of road traffic noise implements the noise prediction procedures as detailed in the Department of Transport and Welsh Office's 'The Calculation of Road Traffic Noise' (CRTN). The assessment uses criteria to compare changes between the existing traffic noise levels and the potential future traffic noise levels at nearby noise sensitive receptors.

12.3.25 The noise assessment considers the 18 hour Average Annual Weekly Traffic flow (AAWT) information provided by the project transport consultant as presented in Appendix 12.4, Volume 3, and will compare the baseline traffic flows against the predicted future traffic flows associated with the development proposals.

12.3.26 It should be noted that this will include all committed developments in the local area.

Operational road traffic noise

12.3.27 The impact of the Proposed Development on the noise climate in the surrounding areas is based on the change in noise levels at noise sensitive receptors due to a change in the volumes of road traffic generated by the proposed development.

12.3.28 The DMRB[89] provides a magnitude scale of impact for the change in noise levels in the 'long-term' (future year). Assessment for the EIA uses long-term future year assessment criteria to assess the full and permanent effects of the Proposed Development. These are presented in Table 12.8 in terms of adverse effect levels.

Table 12.8: Operational road traffic noise impact levels

Magnitude of impact	Adverse effect levels	Increase in LA10,18h noise levels due to operational road traffic
High		10 dB
Medium	SOAEL	5 dB
Low	LOAEL	3 dB
Negligible		Less than 3 dB

12.3.29 The assessments are based on the available traffic data provided by the transport consultants. The traffic data is provided in Appendix 12.4, Volume 3.

Operational road traffic vibration

12.3.30 The DMRB provides broad advice on the assessment of road traffic vibration noting that ground-borne vibration resulting from road traffic is difficult to accurately predict and that it is extremely unlikely to cause damage to buildings. The DMRB does recognise that ground-borne vibration can cause disturbance to humans where the subgrade is soft, the road surface is uneven and/or when dwellings/buildings are within a few metres of the carriageway.

12.3.31 The DMRB provides guidance on ambient levels of vibration terms of PPV stating that, for traffic vibration, generally 0.3 mm/s PPV is the threshold of perceptibility. PPVs in the structure of buildings close to heavily trafficked roads rarely exceed 2 mm/s and are typically well below 1 mm/s. Table 12.9 presents the magnitude scale of impact for road traffic vibration.

Table 12.9: Operational road traffic vibration impact levels

Magnitude of impact	Adverse effect level	Road traffic vibration level (PPV)
High	SOAEL	2 mm/s
Medium	LOAEL	0.3 mm/s *
Low		< 0.3 mm/s
* DMRB states that the threshold criterion for road traffic vibration assessment is where PPV due to road traffic is likely to increase to a level above 0.3 mm/s or where existing road traffic vibration levels are already above 0.3 mm/s, this level is likely to increase.		

Operational plant noise emissions

12.3.32 Operational plant noise emissions are assessed in accordance with BS 4142. For a plant sound source, an initial estimate of the impact of the specific sound is obtained by subtracting the measured background sound level from the rating level and considering the following:

- Typically, the greater this difference, the greater the magnitude of the impact;
- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.

12.3.33 The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

12.3.34 Based on the context of the site, a rating penalty of +5 dB has been proposed and applied for all plant sources. Table 12.10 presents the proposed rating levels for cumulative plant noise emissions. These levels have been agreed with Cambridge City Council for the purposes of this EIA however further consultation and assessments may be required at detailed design stage to determine individual plant criteria or planning conditions where appropriate.

Table 12.10: Cumulative plant noise emissions impact levels

Magnitude of impact	Adverse effect level	Cumulative plant noise emissions (rating level) at 1m from a residential window	Emergency plant/standby generators
High		More than 10 dB above typical background noise level	More than 20 dB above typical background noise level
Medium	SOAEL	10 dB above typical background noise level	20 dB above typical background noise level
Low	LOAEL	Meets typical background noise level	10 dB above typical background noise level
Negligible		Below typical background noise level	Meets typical background noise level

Proposed external amenity spaces

12.3.35 No private residential external amenity areas are proposed. Due to this an assessment has been deemed unnecessary.

12.4 Baseline conditions

12.4.1 The Site is bounded to the west by the M11 motorway and to the north by the A1303 Madingley Road. These are deemed to be the dominant sources of noise across the Site.

2014 Baseline

Noise

12.4.2 Appendix 12.2, Volume 3, contains the detailed results of the noise and vibration surveys undertaken at the Site including time history graphs of the unattended noise survey and vibration surveys.

12.4.3 Table 12.11 presents a summary of the results of the 24-hour unattended noise survey. These results have been used to calibrate the noise model.

Table 12.11: Summary of unattended noise survey results

Measurement location	Daytime $L_{Aeq,16h}$ (dB)	Night-time $L_{Aeq,8h}$ (dB)	Typical night-time L_{AFmax} (dB)	Typical daytime $L_{A90,15min}$ (dB)	Typical night-time $L_{A90,15min}$ (dB)
LT1	75	70	80	72	52
LT2	69	62	82	54	41
LT3	50	44	57	46	43
LT4	59	55	63	58	47
LT5	55	49	58	52	44

12.4.4 Noise levels across the existing site vary considerably due to the large distances between the road traffic sources along the northern and western boundaries and the eastern and southern boundaries as well as the distances between developed areas of the Site. The dominant noise sources across the Site are the M11 motorway and the A1303 Madingley Road with plant noise from some existing buildings on Site contributing to the sound climate in developed areas of the Site.

12.4.5 Temporary traffic lights were located at the junction of Madingley Road and High Cross Road to enable the utilities and highway works for the North West Cambridge project to be undertaken. This caused queues of traffic adjacent to the unattended sound survey location LT2 at busier times of the day. The vibration survey at this location (VS2) was undertaken during free-flowing, evening traffic towards the end of the peak period.

12.4.6 Ambient sound levels measured at Location LT3 were the lowest of the unattended noise survey. This location is well-screened from road traffic noise by existing on-Site buildings and a large bund along the eastern boundary of the Site. Dominant noise sources included vehicles accessing the adjacent car park, pedestrians and cyclists passing the measurement location and plant noise from the Nano-science Centre building.

Vibration

12.4.7 The measured PPV levels at Location VS1 do not exceed 0.14 mm/s despite the measurement being undertaken during a peak period of continuous, free-flowing traffic. It was observed that the free flowing traffic contained a high volume of HGVs on the day of measurement.

12.4.8 Some large PPV levels including two incidents where levels exceeded 1 mm/s were measured at VS2 due to the close proximity of passing HGVs and busses to the vibration equipment. Traffic was flowing freely during this measurement.

12.4.9 During the unattended vibration survey at VL1, PPV levels did not exceed 0.8 mm/s in any direction. It is noted that Charles Babbage Road (approximately 10m from the measurement location) includes speed bumps at pedestrian crossing points and a 20 mph speed limit.

12.5 Impact assessment

Construction phase

Construction noise

12.5.1 The detailed construction noise impact assessment can be seen in Appendix 12.3, Volume 3.

12.5.2 Predicted indicative construction activity noise levels based on typical construction noise levels in BS 5228 Part 1 are shown in Table 12.12. The assessment considers a worst-case scenario without noise controls such as screening or operational constraints.

Table 12.12: Predicted indicative construction activity noise levels

Type of construction activity	Typical $L_{Aeq,1h}$ noise levels (dB) At various distances from the construction site boundary				
	10 m	20 m	30 m	50 m	100 m
Demolition	93	87	84	79	73
Site Preparation/Clearance	87	81	77	73	67
Piling	84	78	74	70	64
Concrete Pouring	82	76	73	68	62
Road Construction	86	80	77	72	66

Construction vibration

12.5.3 Construction of new development is not normally seen to be significant source of vibration for human receptors. Vibration is normally mainly associated with piling activity. An example piling method which reduces adverse impacts is continuous flight auguring which does not involve driving piles into the ground using impulsive forces.

12.5.4 Construction phase impacts are assessed in Table 12.13 below.

Table 12.13 Construction phase effects

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Off-site residential dwellings (Noise)	High	The construction of new buildings is likely to include site levelling/clearance, ground excavation, concreting, piling, superstructure construction and external works such as road construction. The building construction phase and the servicing and fitting out of new buildings is not normally a significant source of noise or vibration for nearby receptors.	• Best practice construction methods as determined in the CEMP. • Agreement with the council and neighbours on suitable approach to noisy activities. • Keep neighbours and stakeholders informed about construction activities.	Low	If all plant associated with a construction activity shown in Table 12.12 operated at the same time for 100% of the time along the construction site boundary, noise levels are likely to exceed the SOAEL of 75 dB LAeq 10h over distances of approximately 20-30m from the construction site boundary. Therefore, construction plant operating on the site will have the potential to affect noise-sensitive receptors located immediately adjacent to the Site. However, in practice, the main construction activities such as ground excavation works and new build construction will tend to take place slightly further onto the construction site, or only affect a limited number of receptors for a temporary period at any given time during each construction phase. Plant will only have to progress a relatively short distance away from each existing receptor before noise levels fall below the typical construction noise criterion. With mitigation in place, noise levels should approach the recommended LOAEL. Construction noise from each phase is likely to result in an adverse effect. Construction noise is likely to be localised, temporary and reversible.	Minor adverse **Not significant - significant**
Existing on-site buildings (Noise)	High					
Off-site residential dwellings (Vibration – human response)	Medium	Construction vibration from piling activities.	To be determined once a demolition and construction programme has been decided.	Low	Many existing and proposed vibration sensitive receptors close to the construction site boundary are likely to be 20m or more from the closest construction works. BS 5228 Part 2 provides some indicative levels of vibration associated with auger piling which indicates levels below 0.4 mm/s peak particle velocity (PPV) at distances beyond 10 m. Vibration due to auger piling is considered to be below the proposed LOAEL of 1 mm/s PPV for adverse comment from a human response, with the threshold of perception typically being up to 0.3 mm/s. The criterion set out in BS 5228 Part 2 for cosmetic damage to buildings is generally higher that the criteria set out for the human response to vibration in buildings. Due to this, the risk of minor or cosmetic damage to buildings is also considered to be negligible. However, even reduced levels of vibration due to auger piling (or other types of piling methods or other construction activities) may affect vibration sensitive equipment in nearby buildings such as research, commercial or educational equipment. Further investigation into sensitivities of these operations should be undertaken prior to the commencement of construction works to ensure such uses are unaffected by construction vibration. With mitigation in place, vibration levels should fall below the recommended LOAEL for human receptors. Construction vibration for each phase is likely to result in an adverse effect. Construction vibration is likely to be localised, temporary and reversible.	Minor adverse **Not significant**
Existing on-site buildings (Vibration – human response)	Medium					
Existing on-site buildings (Vibration – sensitive equipment)	High	Construction vibration.	• Specification in the CEMP for further measures; • Further investigation into existing vibration levels; • Setting vibration limits; and • Continuous vibration monitoring	High	With the correct mitigation in place, the adverse effects of construction vibration on this receptor should fall below the determined vibration limits of the sensitive equipment. Construction vibration is likely to be localised and temporary, however if the mitigation is inadequate, the effects may not be reversible.	Minor adverse **Not significant**

Operational phase

Operational road traffic noise

12.5.5 Figure 12.3 presents the change in noise levels due to road traffic in the long term. As stated in the DMRB the comparison is made between the 2021 Do Minimum and 2031 Do Something – 'with development' scenarios. Table 12.14 below presents a summary of the predicted change in road traffic noise levels in the long term that should occur based on the supplied traffic flow predictions.

Table 12.14 Summary of predicted change in noise levels due to the increase in long term road traffic noise

Noise sensitive receptor	Long term change in ambient noise levels due to the increase in traffic flows. (dB)	Adverse Effect Level
1 + 2 Rosemary Cottages	1	NOEL
1 Lansdowne Rd	1	NOEL
2 Lansdowne Rd	1	NOEL
34 + 36 Madingley Rd	2	NOEL
Whitehouse Apartments	2	NOEL
14 Conduit Head Rd	2	NOEL
53 Madingley Rd	2	NOEL
51 Madingley Rd	2	NOEL
Blenheim Court	1	NOEL
Churchill Court	2	NOEL
1+2 The Lawns	1	NOEL
1+2 Perry Close	1	NOEL

Operational plant noise emissions

12.5.6 At this stage it is unknown what type of plant services will be required to serve the range of potential uses.

12.5.7 Based on the plant noise emissions criteria in Table 12.15 and the background noise levels measured during the environmental noise survey, cumulative plant noise emissions at the nearest noise sensitive receptor should not exceed the values in Table 12.15.

Table 12.15 Cumulative plant noise emission levels

Time period	Noise sensitive façades near location	Cumulative plant noise emission level (LAeq,T)
Daytime	LT1	67
	LT2	49
	LT3	41
	LT4	53
	LT5	47
Night-time	LT1	47
	LT2	36
	LT3	38
	LT4	42
	LT5	39

12.5.8 Operation phase impacts are assessed in Table 12.16.

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Long Term Impact

01/04/2016

Drawn By: Janec Lillis-James

Checked By: MM

Figure 12.3

Table 12.16 Operational phase effects

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measure**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Off-site noise sensitive receptors (residential and academic/commercial buildings)	Medium-High	Increase in road traffic noise levels due to increased road traffic volumes	No additional mitigation measures suggested.	Negligible	Based on the results of the assessment, the predicted increase in road traffic noise for the closest noise sensitive receptors does not exceed the proposed LOAEL in the long term.	Negligible **Not significant**
On-site, external amenity areas	Low	Road traffic noise	Positioning of proposed buildings to screen noise source	Low		Minor Adverse **Not significant**
Proposed on-Site buildings and vibration-sensitive equipment	Medium-High	Road traffic vibration	• Locate vibration sensitive buildings away from main roads. • Building isolation measures should be considered at the detailed design stage	Negligible	It is unlikely that road traffic vibration levels along the M11 motorway will increase at the measurement location VS1 in the long term. Therefore, road traffic vibration along the motorway is unlikely to exceed the LOAEL. However, an increase in road traffic along Madingley Road and Charles Babbage Road may increase the number of events exceeding 0.3 mm/s PPV at the measurement locations VS2 and VL1. Therefore, the existing and potential future conditions are likely to regularly exceed the LOAEL. This would be a permanent adverse effect.	Negligible **Not significant**
All off-site and on-site noise sensitive receptors	Low-High	Noise from plant	• Enclosing noisy plant within the building envelope; • Selecting suitably quiet 'low noise' plant; • Positioning air intake/discharge louvres away from noise sensitive receptors; • Orientating air intake/discharge louvres away from noise sensitive receptors; • Attenuation of air intake/discharge louvres with duct mounted attenuators; and • Sound insulating plant housings/enclosures.	Negligible	Noise from plant has the potential to be a direct, permanent adverse effect associated with the development. Depending on the type and use of the plant, the effect may be episodic, particularly if the plant is used intermittently. Mitigation measures would minimise any effects.	Negligible **Not significant**
On-site, external amenity areas	Low	The Energy Centre is likely to generate significant levels of noise due to the CHP engines and boiler plants required to generate heat and power for the site.		(Depending on location selection and mitigation measures incorporated) Negligible to High	The Energy Centre is likely to generate significant levels of noise due to the CHP engines and boiler plant required to generate heat and power for the Site. One location is being proposed close to the M11 motorway to the west of the Site. Existing noise levels in this area are already high which may result is less onerous plant noise emissions criteria being set by Cambridge City Council. However, this location is bounded to the north and south by existing buildings. To the south, the existing building is the Data Centre which may already generate plant noise emissions due to the ventilation and climate control requirements of the electronic systems housed in this building. To the north are existing commercial buildings such as the Aveva building. Both the proximity of existing, plant noise sources and existing noise sensitive receptors may result in more onerous cumulative plant noise emissions criteria being set by Cambridge City Council. Table 12.15 suggests that cumulative plant noise emissions criteria near to the M11 motorway may be in the region of 67 dB LAeq during the daytime and 47 dB LAeq during the night-time. Given the potential nature and quantity of the proposed CHP engines and boiler plant it is likely that acoustic mitigation measures will be required in order to meet Cambridge City Council plant noise emissions criteria.	(Depending on location selection and mitigation measures incorporated) Negligible to High **Not significant - significant**

12.6 Mitigation measures

Construction phase

Construction noise

12.6.1 The following mitigation measures will be implemented during construction.

- Best practice construction methods to control noise and vibration from demolition and construction activities would be specified in a site-specific Construction Environmental Management Plan (CEMP). The CEMP would be agreed in consultation with Cambridge City Council at the reserved matters stage and could include the following routine noise and vibration management controls:
  - Breaking out of concrete structures would be undertaken, where possible, using low noise effect methods including bursting and splitting rather than percussive breaking;
  - Detailed programming of works to make maximum use of existing barriers to noise;
  - Retention of the outer walls of structures for as long as possible before demolition is necessary;
  - Careful selection of demolition/construction methods and plant to be used;
  - Switching off of plant and vehicle engines when not in use;
  - Restriction of drop heights onto lorries;
  - Regular maintenance and servicing of vehicles, equipment and plant;
  - Appropriate handling and storage of materials;
  - Appropriate operational hours (to be agreed with the local authority);
  - Enforcement of restricted working hours for excessively noisy activities;
  - Implementation of an appropriate traffic management strategy; and
  - Use of temporary acoustic barriers where appropriate and other noise containment measures such as screens, sheeting and acoustic hoardings at the construction site boundary to minimise noise breakout and reduce noise levels at the potentially affected receptors.
- Agreement with Cambridge City Council and neighbours on suitable approach to noisy activities if a temporary source of noise cannot reasonably be prevented and the works being undertaken are crucial to progressing the particular project phase.
- Keep neighbours and stakeholders (including the existing commercial and university occupants as well as nearby residential inhabitants) informed about construction activities. Measures for community liaison would be dealt with by a dedicated Community Liaison Officer to co-ordinate the dissemination of information (for example, by means of a regular newsletter) and to program those operations at time that would minimise the potential for disturbance.

Construction vibration

12.6.2 Further controls may be required to ensure vibration sensitive equipment or experiments in the existing buildings are protected from damage or malfunction. Appendix B.5 of BS 5228 Part 2 reviews the assessment of vulnerability of contents of buildings such as scientific laboratories or microelectronics manufacturing.

12.6.3 Precise details and locations of vibration sensitive equipment or long-term vibration sensitive experiments are unknown at this stage. Additionally, some buildings which are likely to house vibration sensitive uses, such as the Cavendish Laboratory, are scheduled for demolition as part of the masterplan. Once a demolition and construction programme is available, suitable vibration limits and the requirement for vibration monitoring will be determined. This could include the following measures:

- Specification in the CEMP for further measures;
- Further investigation into existing vibration levels;
- Setting vibration limits; and
- Continuous vibration monitoring

Operational phase

Operational road traffic noise

12.6.4 Positioning and orientating proposed buildings to screen noise source from receptors.

Operational road traffic vibration

12.6.5 It is very difficult to mitigate road traffic vibration at the source. In order to mitigate the effects of road traffic vibration on occupants and sensitive equipment inside of the proposed buildings, it is recommended that proposed buildings which may house vibration sensitive equipment are located as far away from the road traffic vibration sources as possible.

12.6.6 Suitable building isolation measures should be considered at the detailed design stage with additional equipment-specific isolation measures considered in the most sensitive situations.

Operational plant noise emissions

12.6.7 Plant would be selected, located and silenced so that Cambridge City Council's typical planning condition with regards to plant noise is satisfied. It is likely that a combination of the following environmental noise control techniques would be implemented:

- Enclosing noisy plant within the building envelope;
- Selecting suitably quiet 'low noise' plant;
- Positioning air intake/discharge louvres away from noise sensitive receptors;
- Orientating air intake/discharge louvres away from noise sensitive receptors;
- Attenuation of air intake/discharge louvres with duct mounted attenuators; and
- Sound insulating plant housings/enclosures.

Energy centre

12.6.8 The above mitigation measures should also be considered in the design of the Energy Centre as this is a major plant noise source proposed in the masterplan.

12.6.9 As the Energy Centre will be housed within a building, particular attention to the orientation and attenuation of air intake/discharge louvres and flues will be considered at detailed design.

12.7 Summary

12.7.1 A range of noise conditions exist on the Site with the noisiest locations being towards the west of the Site close to the M11 motorway. Construction noise could disturb neighbouring residents but a range of best practice construction measures would minimise any disturbance. Construction noise would be temporary and intermittent lasting only for the duration of the noisy work activity.

12.7.2 During operation noise from rooftop plant and particularly the energy centre plant could adversely affect on-Site receptors. This could be mitigated during detailed design through location and orientation of plant, acoustic screening, and specification of the plant itself. Vibration from road traffic along Madingley Road could be an issue for particularly sensitive buildings on-Site housing vibration sensitive equipment. Locating these buildings away from the road and the building specification would minimise any adverse effects.

13. Water environment

13.1 Scope of the assessment

13.1.1 The scope of the water environment includes an assessment of the effects of the following:

- Silt mobilisation, hydrocarbons and other chemicals during construction which could affect water quality nearby and onsite surface water bodies;
- The direct effects of increased flood risk from the proposed development on people and existing property;
- The direct effects of flood risk from increased surface water runoff on downstream catchments resulting from climate change;
- Increased surface water runoff during the operation of the Proposed Development leading to increased downstream flood risk; and
- Contaminated runoff from roads on the quality of onsite and downstream surface water bodies.

13.1.2 Groundwater and hydrogeology are considered in Chapter 14: in relation to contaminated land. Offline ponds are considered in Chapter 6 in relation to their ecological value, except where they form part of the surface water drainage system.

13.1.3 Elements excluded from this assessment are:

- Fluvial flooding as the Site is located in Flood Zone 1, an area designated at low probability of flooding from main rivers;
- Groundwater flooding, as the Site is underlain by Head Deposits (of Sandy Clay) underlain by Gault Clay.

13.1.4 Table 13.1 shows the responses in the Scoping Opinion relevant to the water environment assessment.

Table 13.1 Scoping Response

Issue raised	Respondent
On the whole the level of information included in order to enable the assessment of the effects of the proposed development on the environment is supported. The only addition that I would suggest relates to the baseline information that will be collected in relation to the water environment. The recognition of the potential contamination of surface water runoff downstream is welcomed, as are the proposals to utilise sustainable drainage systems to enhance the quality of runoff before it enters these water bodies (sic). It is recommended that if possible, baseline data related to the ecological status of the Wash Pit Brook and Coton Brook be collected to help inform the surface water drainage strategy, or make it clearer if this data has already been collected. It is noted that ecological status is included in the Assessment Criteria table 12.1, but it would also be helpful to include reference to current status of the brooks in the section on establishing the baseline.	Cambridge City Council, Policy Section
Drainage issues, such as impact on adjacent brooks, do not seem to have been considered	Cambridge Past Present and Future
Proposed development must not increase flood risk to others Works to Ordinary Water Courses may require consent of the Lead local Flood Authority (Cambridgeshire County Council) The predicted effects of climate change on rainfall intensities will be considered as part of the Flood Risk Assessment Surface water runoff during construction is to be monitored and measures implemented to maintain water quality of discharges to Coton Brook and Wash Pit Brook.	Environment Agency
Surface water discharges to the public sewers system would only be considered if other methods of sustainable drainage are proven to not be possible. Connection points to the public foul sewers, in Madingley Road and Wilberforce Road, exist subject to confirmation of capacity.	Anglian Water Developer Services

13.1.5 All comments in Table 13.1 are considered and addressed within this assessment.

13.1.6 Compliance with the WFD is summarised in Section 13.5 of this Chapter and a standalone WFD compliance assessment has not been prepared.

13.2 Relevant legislation and policy

The Water Framework Directive (WFD)

13.2.1 The WFD is the overarching piece of legislation applicable to the water environment assessment. The purpose of the WFD is to commit European Union member states to achieving good qualitative and quantitative status of all water bodies including surface water bodies, ground water bodies and marine water bodies up to 1 nautical mile offshore. The WFD was enacted into domestic legislation by The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003.

The Flood and Water Management Act 2010

13.2.2 The Act defines the regulatory body responsible for assessing the management of flood risk associated with the Proposed Development and the adequacy of proposed measures to manage land drainage on Site. For the watercourses flowing through the Site, Cambridge City Council is the competent authority.

Water Resources Act 1991 (as modified by the Environment Act 1995), and Environmental Permitting (England and Wales) Regulations 2010

13.2.3 With regard to controlled waters, the Environment Agency has a remit to prevent or reduce the risk of water pollution wherever possible, and to ensure that clean-up takes place if pollution occurs that might lead to effects on ecosystems or people. A regulatory regime supporting this policy has been introduced by these two Acts.

The Land Drainage Act 1991 (as amended 1994)

13.2.4 The Act requires that the free flow of a watercourse is maintained by its riparian owner. The owner only needs to maintain the natural free flow of the water course and is not obliged to provide additional capacity to cater for upstream developments.

The National Planning Policy Framework (NPPF) and Technical Guidance on Flood Risk

13.2.5 Section 10 of the NPPF requires a site specific flood risk assessment (FRA) for new developments that demonstrates the development will be safe from flood risk for the duration of the development's lifetime taking into account changes in flood risk due to climate change.

13.2.6 Section 11 of the NPPF seeks to protect the natural environment by preventing new development from contributing to water pollution.

13.3 Method of assessment

13.3.1 The approach outlined in the Department for Transport's (DfT) Transport Analysis Guidance[92] has been used for the water environment assessment.

Establishing the baseline

13.3.2 The water environment baseline was determined through a combination of desk studies and field work to identify and evaluate the condition of existing surface water receptors. The desk study involved a review of the following data sources and tools to identify receptors:

- Anglian River Basin Management Plan (RBMP)[93];
- Catchment Data Explorer[94] (Environment Agency, 2015);
- Anglian Water Services surface water and foul sewer drainage plans, plus plans of the on-site un-adopted drainage network;
- Consultation with statutory and non-statutory bodies;
- Data on pollution incidents and consented activities (e.g. abstractions and discharges);
- OS contemporary and historical mapping;
- Site wide topographic survey.

13.3.3 A Site visit was conducted on the 13th August 2015 by a qualified aquatic ecologist and a hydrologist to confirm the desk study information and to collect additional information on the quality and condition of the identified surface water bodies.

13.3.4 Previous Flood Risk Assessment and modelling studies undertaken to support the existing planning permission, and approved by the Environment Agency have been reviewed. Much of the existing water infrastructure will be re-used and hydraulic modelling has been undertaken to understand how an increase in the density of the development will affect drainage and flood risk.

13.3.5 Table 13.2 shows how the sensitivity of the surface water receptors has been determined.

Table 13.2 Defining importance or sensitivity of receptors

Importance or sensitivity of receptor	Examples
Very high Attribute with a high quality or rarity; regional or national scale with limited potential for substitution	• Water body providing drinking water to a large population. • EC designated salmonid fishery. • High status WFD water body. • Water dependant SAC, SPA, Ramsar or SSSI. • Floodplain with significant numbers of people and value of assets at risk.
High Attribute with a high quality or rarity; local scale with limited potential for substitution Attribute with a medium quality or rarity; regional or national scale with limited potential for substitution	• Water body providing drinking water to a small population. • Good status WFD water body. • EC designated cyprinid fishery. • Water dependant Local Wildlife Site. • Floodplain with some people and assets at risk.
Medium Attribute with a medium quality or rarity; local scale with limited potential for substitution Attribute with a low quality or rarity; regional or national scale with limited potential for substitution	• Water body providing water for agricultural or industrial use. • Moderate status WFD water body. • Undesignated fishery but some interest. • Local conservation interest.
Low Attribute with a low quality or rarity; local scale with potential for substitution	• Poor status WFD water body. • No known fishery interest. • No known conservation interest. • Floodplain with limited existing development.

[92] Department for Transport, 2014, Transport Analysis Guidance, Unit A3, Environmental Impact Appraisal
[93] Environment Agency, 2009, River Basin Management Plan: Anglian River Basin District
[94] Environment Agency's Catchment Data Explorer: http://environment.data.gov.uk/catchment-planning/

Impact assessment

13.3.6 The impact of receptors at risk from changes in the water environment was assessed by consideration of the following:

- Current and surrounding land uses, based on mapping and existing planning designations;
- Proposed end-use, based on the nature of the proposed works;
- Type of construction and proximity to potential receptors;
- Geology, hydrogeology and hydrology of the Site and its surrounding area; and
- The requirements of the WFD.

13.3.7 Table 13.3 shows how the magnitude of impacts has been determined. By combining the two, as shown in Table 13.4, the significance of effects on the water environment have been determined.

Table 13.3 Defining the magnitude of potential impacts

Predicted magnitude of impact	Examples
High Results in loss of attribute	Complete loss of use of a drinking water, industrial or agricultural abstraction. Change in chemical or biological water quality grade/WFD status or will prevent WFD objectives from being met in the future. Complete loss of fisheries interest. Complete loss of interest feature for water dependant SAC, SPA, Ramsar or SSSI. Major change in flood risk affecting people and assets.
Medium Results in impact on integrity of attribute or part of attribute	Measurable change in availability of a drinking water, industrial or agricultural abstraction. Change in chemical or biological quality but no change in grade/WFD status. Change in productivity of fishery. Deterioration of interest feature for water dependant SAC, SPA, Ramsar or SSSI. Measurable change in flood risk or drainage.
Low Results in minor impact on attribute	Measurable but minor changes in the availability of a drinking water, industrial or agricultural abstraction. Minor change in water quality but no change in grade/ WFD status Minor deterioration in fisheries interest. Deterioration in conservation interest of part of a locally important water dependant site (e.g. a Site of Nature Conservation Importance, Local Wildlife Site). Minor change in flood risk or drainage.
Negligible Results in an impact on attribute but of insufficient magnitude to affect use or integrity	Discharges to watercourse but no significant loss in quality, fishery productivity or biodiversity. No significant impact on the economic value of the feature. No increase in flood risk or drainage impact.

Table 13.4 Establishing the significance of effect

		Importance of receptor			
		Very high	**High**	**Medium**	**Low**
Magnitude of impact	**High**	Very significant	High	Moderate	Low
	Medium	High	Moderate	Moderate	Low
	Low	Moderate	Low	Low	Negligible
	Negligible	Low	Negligible	Negligible	Negligible

13.3.8 Effects that have been determined as moderate, high, or very significant are determined as being significant. Effects which are low or negligible are determined as not significant.

13.3.9 Most predicted effects will be obviously adverse or beneficial, and will be described as such. However, in some cases it is appropriate to identify that the interpretation of a change is a matter of personal opinion, and such effects will be described as subjective. The temporal scope of environmental effects is stated where known.

13.4 Baseline conditions

Surface watercourses

13.4.1 The Site contains no natural water features. Environment Agency mapping on the Catchment Data Explorer indicates that the majority of the Site lies within the Bin Brook waterbody, a tributary of the River Cam. It is designated as a heavily modified waterbody (HMWB) and the Anglian River Basin Management Plan[93] states that the reason for its designation is 'urbanisation'. An artificial land drain, known as the Coton Brook runs along the southern boundary of the Site and ultimately discharges into the Bin Brook to the east of the Site downstream of Grange Road.

13.4.2 The Catchment Data Explorer indicates that the north-western area of the Site, in the vicinity of the British Antarctic Survey buildings, drains to the north, through the North West Cambridge development and adjacent to the Madingley Road Park & Ride. This was indicated as Wash Pit Brook in the Scoping Report. The Wash Pit Brook is shown as a tributary of the Cottenham Lode in the 2009 Anglian RBMP. However the configuration of waterbodies has changed in advance of the publication of the 2015 RBMP and it is now identified as a tributary of the Old West River.

13.4.3 Plans of surface water and foul water drainage for the Site have been supplied by Anglian Water Services (2014) which support the characterisation of the Site drainage to the south. The plans indicate that there is no drainage from the Site in a northerly direction. These plans indicate that surface water drainage from Madingley Road is also piped in a southerly direction through the Site.

13.4.4 A walkover survey of the Site and downstream watercourses was conducted in August 2015. The following paragraphs summarise the findings. The Coton Brook was sub-divided into morphologically similar reaches which are shown on Figure 13.1.

13.4.5 The upper reaches of the Coton Brook lie entirely within the Site and consist of a series of heavily modified ephemeral and permanent ponds which ultimately discharge into the drain. The source of the Coton Brook is an outfall, receiving road drainage. It has a shallow, uniformly wide channel cross-section. Upstream of the road is a single building, a vacant lot and more distant the M11 which is aligned north-south. The channel is ephemeral and was dry during the Site visit.

N

P4

Reach 1
Reach 2
Reach 3
Reach 4
Reach 5
Reach 6
Reach 7
Reach 8

D1
D2
D3
D4
D5

P1
P2
P3
P4
P5
P6
P7
P8a
P8b
P8c

L1

ATKINS™

Site boundary
Wet ditch
Dry ditch
Reach sections
Pond

0 50 100 200 Metres

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Client
University of Cambridge

Project
West Cambridge Masterplan EIA

Title
Water
Surface Water Bodies
Figure 13.1

Sheet Size	Original Scale	Designed / Drawn	Checked	Authorised
A3	1:7,000	SJD Date 01/06/16	RJS Date 01/06/16	SS Date 01/06/16

Drawing Number: 5137998_CAM_EC_REA
Rev: 02

Path: P:\GBLOW\LEGE\PLH\Planning\Projects\5137998 West Cambridge Masterplan EIA\600 Working Folders\670 GIS\WIP\EC\5137998_CAM_EC_REA_02_GEO056.mxd

Reach 1

13.4.6 The channel has been constructed and planted since the adoption of the existing planning permission (i.e. since 1999). It contains two low-head weir type structures (see Figure 13.2). On the northern, left bank (looking downstream), planting is more formal, whilst on the right bank (looking downstream) some mature trees have been retained and less formal planting has been installed (also shown in Figure 13.2). There is little evidence of siltation, although the plant growth and shallow weirs are likely to inhibit the movement of silt downstream in the long-term once the system has matured. Flora observed in this reach were almost exclusively terrestrial, with aquatic/marginal species observed limited to purple loosestrife, yellow flag iris, gypsywort, and common water-plantain. Ultimately, the maintenance regime will dictate whether sediment accumulates or is transported through the system. This reach discharges to the West Cambridge Lake at the downstream end of the reach via a culvert (see Figure 13.3).

Figure 13.2 Channel looking upstream, with landscape planting (on true left bank), mature tree (on tree right bank) and low head weir structure in foreground

Figure 13.3 Looking upstream to outfall structure from Reach 1 into West Cambridge Lake, with landscaped platform on northern bank and soft landscaped western bank.

Reach 2

13.4.7 The West Cambridge Lake was constructed following the adoption of the existing planning permission. It is artificial and online, with levels determined by the downstream reach (Figure 13.5). The bed and banks are artificial (see Figure 13.3 and Figure 13.5), including some reinforcement, with gabion baskets visibly extending in a southerly direction from the north bank. There is no riparian fringe on the north bank but a more gentle transition from aquatic to terrestrial habitats for the majority of the pond edge. Submerged aquatic flora observed were limited to spiked water milfoil, Nuttall's waterweed and filamentous algae indicative of eutrophic (high nutrient) conditions. Nuttall's waterweed is listed under Schedule 9 of the Wildlife and Countryside Act 1981 with respect to England and Wales and the potential implications of its presence are considered in Chapter 6: Ecology.

Figure 13.4 West Cambridge Lake with outfall to the West Cambridge Canal, with the canal defining water levels in the lake

Reach 3

13.4.8 Reach 3 of the drain has vertical banks and water levels which are controlled by two weirs (see Figure 13.5). The first to retain water levels in the canal during periods of normal and low flows. The second is set at a higher level and provides additional capacity during high flows. This reach was pre-existing but appears to have been re-profiled in recent years. A mat of gabion baskets were visible on the bed, extending from the left bank. It is anticipated that this reach will act as a sediment sink in the long-term.

13.4.9 Submerged aquatic flora observed were limited to spiked water milfoil, Nuttall's waterweed and filamentous algae indicative of eutrophic (high nutrient) conditions. An immature newt was observed in this reach during the survey. The species could not be confirmed due to water clarity and the length of the larvae, which was within the typical range for both species.

Figure 13.5 Outfall structures at downstream end of West Cambridge Canal with filamentous algae obvious on the water surface

Reach 4

13.4.10 Reach 4 comprises a series of inter-connecting ponds and ephemeral water features. The features have shallow sloping cross-sections with some variety in bank slope and the alignment of the lowest point. Albeit this diversity of structural form is set within a constrained landscape, with a cycle path to the south and public areas to the north (see Figure 13.6). Importantly, the structural variations in the form of the water features have been engineered rather than being driven by any natural morphological process. The reach is likely to act as a sink for sediment when vegetation is present, however it will act as a transfer or sediment source if cleared of vegetation following maintenance activities. These features were created following the approval of the existing planning permission. Ultimately this discharges via a culvert into reach 5.

13.4.11 Due to the absence of shading and, critically, the presence of constructed on-line ponds which maintain permanent water, the aquatic and marginal flora through this reach becomes more diverse. Branched bur-reed, greater reedmace, great willowherb, water forget-me-not, hard rush, reed canary grass, yellow flag, common water-plantain, yellow water-lily and sedges were all recorded within this reach.

Figure 13.6 Swales, looking upstream within constrained corridor with vegetation masking the engineered structural diversity

Reach 5

13.4.12 Reach 5 comprises an over-deepened, straight, trapezoidal ditch which is heavily shaded, except at one crossing point. The reach includes an offline pond adjacent to the Cavendish Laboratory. There is no in-channel vegetation within almost the entire reach except where light penetrates a short length (of less than 5m downstream of a single bridge).

13.4.13 Aquatic and marginal flora recorded were limited to localised stands of water forget-me-not, celery-leaved buttercup, water starwort, common water-plantain, fool's watercress and yellow flag. The absence of light means that there is little in-channel to inhibit the downstream movement of sediment. There is evidence of sediment deposition within the reach with the development of small-scale in-channel morphological features and accumulation of material in front of flapped outfalls (Figure 13.7). Channel bed substrate was approximately 50% silt and 50% gravel/pebble. A common frog froglet was also observed in this reach.

13.4.14 The absence of fine sediment in the upstream reaches suggests that the flapped outfalls in reach 5 may be the source of the sediment. These outfalls drain the eastern areas of the Site which have the oldest surface drainage systems. The upstream reaches were only recently constructed. The observed accumulation of sediment in the vicinity of the Cavendish Laboratory and Cambridge Lawn Tennis Club may still reflect a historical contribution from the whole of the upstream catchment.

13.4.15 There is some armouring of the banks, with concrete bagwork used to reinforce a short reach. It is assumed that a balancing pond within the Wilberforce Road Sports Centre discharges to the drain within this reach.

13.4.16 The downstream point of reach 5 is marked by a 450mm diameter culvert, which has a trash-screen which was partially blocked by debris (largely vegetation) which had accumulated against the screen (Figure 13.8). In extreme flooding conditions, the capacity is not of sufficient capacity and the Coton Brook floods the Sports Grounds to the south and adjacent tennis courts and residential gardens to the north. To date there is no evidence of flooding within properties, however residents are understandably concerned about their perceived risk from flooding.

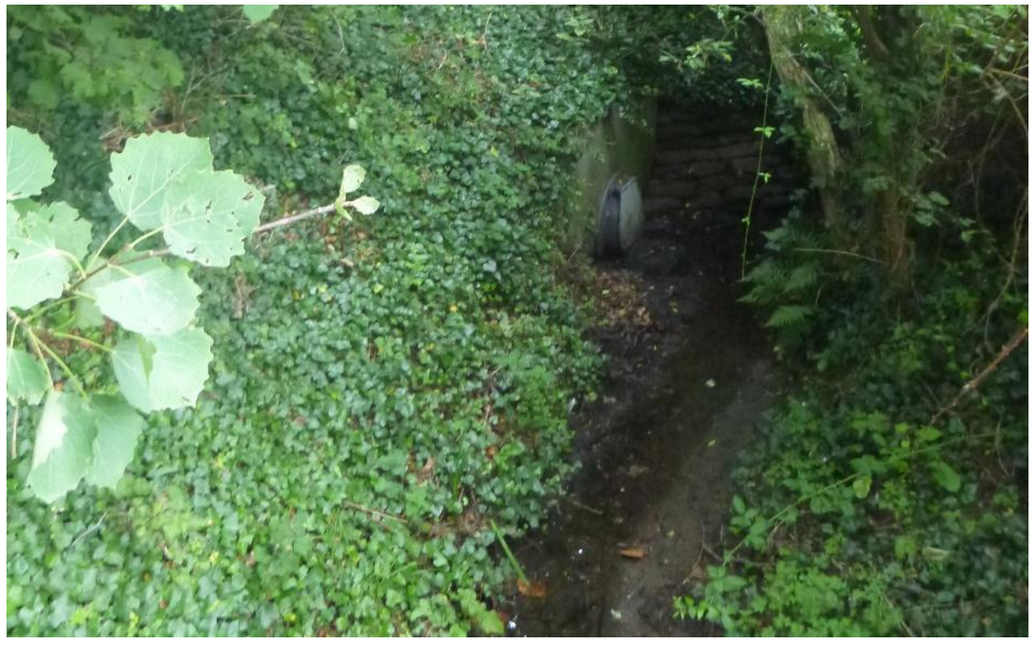


Figure 13.7 Flapped outfall with silt accumulation in heavily shaded channel

Figure 13.8 Culvert at Cambridge Lawn Tennis Club

Reach 6

13.4.17 Reach 6 is culverted where it passes under the Emmanuel College Recreation Ground.

Reach 7

13.4.18 The end of the culvert is downstream of Wilberforce Road, where the Coton Brook then flows through a residential garden and into the Adams Road Bird Sanctuary. The Adams Road Bird Sanctuary includes an online pond (Figure 13.9), formed in the late 19th Century or early 20th Century by re-profiling of the banks of the drain and the installation of a simple sluice.

13.4.19 The main pond is fringed by areas of reed bed and the sanctuary site is intensively managed. Some desilting of the main pond has taken place with arisings deposited within the sanctuary site. Deposition of silt within the sanctuary site was flagged as an issue for the management by the Chairman of the Sanctuary Club, who accompanied Atkins' staff on this aspect of the walkover. The shallow gradient of the drain, the absence of upstream 'natural' floodplain, the wide pond margins and presence of a water level control structure are all likely to contribute to the observed pattern of sediment deposition.

13.4.20 The Adams Road Bird Sanctuary is the single most sensitive receptor on this drain. This is partially due to the ecological diversity within the sanctuary site and partially due to the nature of the habitat which is otherwise largely absent from the catchment. Its sensitivity is further increased by the observed patterns of sediment transport which means that there is a risk that pollutants (chemical or particulate) are likely to be deposited in this area.

13.4.21 Due to the botanical diversity of the aquatic habitats present within this reach, a comprehensive species list could not be prepared during the walkover survey. Marginal and aquatic flora observed included relatively common species such as common reed, yellow flag, gypsywort, greater reedmace, a number of sedges including pendulous sedge, and lesser duckweed, which can be indicative of eutrophic (high nutrient) conditions. The Chairman of the Sanctuary Club reported that the abundance and diversity of aquatic invertebrates and amphibians had declined in the last decade following glycol pollution (associated with antifreeze), highlighting the sensitivity of this receptor to upstream pollutants.

Figure 13.9 Adams Road Bird Sanctuary

Reach 8

13.4.22 Downstream of Adams Road Bird Sanctuary to the confluence with the Bin Brook, the drain follows the boundaries of sports pitches at Trinity Old Field and St Legend's Park. In Trinity Old Field, the drain is shaded to the north, with sports pitches to the south. There is extremely limited riparian habitat. The drain is straight, trapezoidal and lacks structural diversity. The presence of the sluice structure in the Adams Road Sanctuary means that these lower reaches are unlikely to be affected by any development.

13.4.23 Beyond this reach the Coton brook discharges to the Bin Brook. There has historically been flooding of properties off Wilberforce Road which has been attributed to an unresolved lack of capacity within the Bin Brook.

Washpit Brook

13.4.24 A second drain flows to the north of the Site. There is no obvious surface watercourse within the Site, no evidence of a defined flow path (i.e. no pronounced low point) and no evidence of overland flow (for example no indication of trash lines, areas of fluvial erosion or deposition of sediment). An un-adopted surface water drainage system discharges to the Wash Pit Brook immediately north of Madingley Road.

13.4.25 The outfall to the north of the Madingley Road had a substantial accumulation of silt deposited in-channel and standing water was present for approximately 2m downstream of the outfall (Figure 13.10). The channel is entirely shaded and there is no in-channel aquatic vegetation and little bank vegetation owing to the density of the canopy. Three-spined stickleback were observed shoaling within the small area of standing water. The character of the channel remains the same as it follows the western boundary of the Madingley Park and Ride site and then through the proposed North West Cambridge (NWC) site and onwards through Girton.

13.4.26 At present there are flooding issues from the Washpit brook near Girton and mitigation measures have been proposed as part of the NWC drainage strategy. The NWC drainage strategy centres around attenuation facilities located to the west of the site, in the vicinity of the Washpit Brook.

Figure 13.10 Immediately downstream of the A1303 looking downstream to silt accumulation

13.4.27 The drain then continues in a northerly direction through the North West Cambridge development which is currently under construction. Washpit Brook (a tributary of the Cottenham Lode / Beck Brook catchment). The Washpit Brook flows in a northwest direction through the southern area of the North West Cambridge site and then along the western boundary and has a number of small field drains crossing the site discharging into it. It is only designated as a Main River downstream of the North West Cambridge site.

Surface water drainage

13.4.28 The site is predominantly developed with an extensive system of water services infrastructure constructed following the previously consented masterplan. Connection points have been provided to currently undeveloped plots.

13.4.29 Within the Site there is a west to east ridge that falls in elevation eastwards from 19.70m above ordnance datum (AOD) to 14.70m AOD, broadly through the upper third of the Site. This essentially splits the Site into two catchments, with approximately one third of the Site area draining northwards towards Washpit Brook and the remainder draining south east towards Coton Brook.

13.4.30 Existing surface water attenuation and storage for the Site is provided using a combination of methods including geo-cellular storage, ponds and a large attenuation lake and canal (Reaches 2 and 3 of the surface watercourses) from which flows are discharged to the downstream reaches of the Coton Brook at restricted rates.

13.4.31 There are further heavily vegetated minor ditches around the Site which perform a limited drainage function.

Foul water drainage

13.4.32 The southern part of the Site discharges to a foul sewer located under the Coton footpath, which gravitates eastwards to the sewer network in Wilberforce Road. Initial investigations suggest that there may be limited capacity to discharge increased flows to the foul sewer under the Coton footpath. The northern areas of the Site drain to the public sewer in Madingley Road, which has capacity to accept increased flows. The overall capacity to receive development flows is currently being assessed by Anglian Water Developer Services.

Flood risk

13.4.33 The Environment Agency's flood maps indicate that the Site is in flood zone 1, an area designated at having a low probability of flooding from fluvial sources. The Site is assessed as having a probability of fluvial flooding of less than 0.1% (i.e. less than 1 in 1000 years) and has no history of flooding.

13.4.34 Whilst flood risk is not considered to be a constraint on the Site, a Flood Risk Assessment has been undertaken, with the need for additional mitigation measures assessed. The Flood risk Assessment makes provision for increased rainfall intensities resulting from the effects of predicted climate change. The Proposed Development for the area is well defined in terms of contributing area and provision of storage, and the Proposed Development takes account of climate change. A review of the Environment Agency's pluvial flood mapping indicates that there are localised areas within the Site that are at a 'medium' to 'high' risk of flooding from surface water sources. 'High' risk represents a 3.3% or greater annual probability of pluvial flooding, whilst 'medium' risk represents areas which have an annual probability of pluvial flooding of between 1% and 3.3%.

13.4.35 The localised areas on the Site with an elevated risk of pluvial flooding are:

- Western Access Road / Madingley Road;
- Land north of Charles Babbage Road;
- Land south east of Clerk Maxwell Road.

13.4.36 The majority of the Site has a 'Low' risk of pluvial flooding, between 0.1% and 1% annual probability.

Groundwater

13.4.37 The Site is underlain by Gaul Clay, with a small area of the northern Site boundary overlain by Head deposits, comprising silt, sand and gravel.

13.4.38 A review of borehole information indicates that groundwater is encountered at depth. The Gault Clay is a non-aquifer and the Site is not located within a groundwater source protection zone. With reference to the WFD, the Site does not lie within a groundwater body.

13.4.39 The existing ground conditions are unlikely to be suitable for the inclusion of infiltration techniques.

Factors influencing the baseline

13.4.40 Due to the current level of development at the Site, baseline conditions are unlikely to change significantly. The effects of climate change on rainfall intensity could lead to a small increase in flood risk.

13.4.41 The character of the Washpit Brook will change following the completion of the NWC development.

13.4.42 The ecological character of the surface water features is dependent on how the existing system is managed and maintained and may also be influenced by the effects of climate change.

13.5 Impact assessment

Construction phase

13.5.1 Construction phase impacts are assessed in Table 13.5,

Table 13.5 Construction phase effects

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measures**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Coton Brook on Site (reaches 1 to 5 inclusive), its ecology, hydromorphology and water quality Approximately 2/3 of the Site drains to the Coton Brook.	Medium to High	Construction will be required on the existing drainage system to increase its capacity. This has the potential to alter the character of the existing features. However, as they are artificial features and in a low energy environment, the morphological effects will be insignificant. There are inherent risks of pollution associated with construction, typically associated with the release of pollutants (e.g. hydrocarbons, cement, fine sediment, mobilised contaminants) due to leaks and spills from construction activities.	• Implementation of the Environment Agency PPG; • The design of the revised drainage network, and associated temporary works, presents the most effective means of controlling risks to the upper reaches of the Coton Brook; • The timing and phasing of works will help to minimise effects, increasing the potential to control water quality effects, minimise the movement of sediment and minimise effects to aquatic flora and fauna; and • Surface water runoff will be monitored and the results actioned if required.	Low	Even with good design and appropriate phasing, in-channel construction will have an adverse residual effect on the upper reaches of the Coton Brook. The small size of the Coton Brook and its artificial nature, together with the artificial catchment, means that there is potential to control the extent and severity of these effects With appropriate controls in place the risk of contamination of the Coton Brook, which could result in increased sedimentation downstream and harm to aquatic flora and fauna, will be minimised. Effects will be limited to the upper reaches of the Coton Brook where the works are taking place and It is not anticipated that the proposals will lead to the deterioration of the Coton Brook of a magnitude which affects the ecological status of the Bin Brook waterbody. Ecological and landscape effects associated with construction in the upper reaches of Coton Brook are considered in Chapters 8 and 6 respectively. Further mitigation may be required to ensure that potential effects on these receptors are of an acceptable level. A temporary, reversible, adverse effect is predicted.	Low adverse **Not significant**
		Works on the individual plots within the Site also present risks to the upper reaches of the Coton Brook. The risk is greatest for construction activities closest to the watercourse where the time and space available to intervene in the event of a pollution incident is smallest.	• Implementation of the Environment Agency PPG; • Use of drip trays under mobile plant; • Timing of works close to watercourses so that they do not interfere with spawning; • Temporary construction site drainage will be designed, where practicable, to retain surface run-off within the Site boundary; • The use of construction materials on-Site free from contaminated material, so as to avoid any potential contamination of the watercourse; and • Surface water runoff will be monitored and the results actioned if required.	Low	There is a small risk that contamination from construction activities upstream could result in additional sedimentation and harm to aquatic flora and fauna. Given the poor ecological and morphological state of these reaches, their condition is unlikely to be further degraded. It is not anticipated that the proposals will lead to the deterioration of the Coton Brook of a magnitude which affects the ecological status of the Bin Brook waterbody. Ecological and landscape effects associated with construction in the upper reaches of Coton Brook are considered in Chapters 8 and 6 respectively. Further mitigation may be required to ensure that potential effects on these receptors are of an acceptable level. A temporary, reversible, adverse effect is predicted.	Low adverse **Not significant**

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measures**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Coton Brook beyond the Site excluding the Adams Road Bird Sanctuary (reaches 5,6 and 8), its ecology, hydromorphology and water quality	Low	There are risks to Coton Brook downstream of the Site associated with the construction of the Proposed Development. As noted in reference to the upper reaches of the Coton Brook, there are inherent risks of pollution associated with construction. The risk is greatest for construction activities in-channel or closest to the watercourse.	• Implementation of the Environment Agency PPG; • Use of drip trays under mobile plant; • Timing of works close to watercourses so that they do not interfere with spawning; • Temporary construction site drainage will be designed, where practicable, to retain surface run-off within the Site boundary; • The use of construction materials on-Site free from contaminated material, so as to avoid any potential contamination of the watercourse; and • Surface water runoff will be monitored and the results actioned if required.	Low	There is a small risk that contamination from construction activities upstream could result in additional sedimentation and harm to aquatic flora and fauna. Given the poor ecological and morphological state of these reaches, their condition is unlikely to be further degraded. It is not anticipated that the proposals will lead to the deterioration of the Coton Brook of a magnitude which affects the ecological status of the Bin Brook waterbody. A temporary, reversible, adverse effect is predicted.	Negligible adverse **Not significant**
Adams Road Bird Sanctuary (reach 7)	High	Any contaminants entering the Coton Brook downstream of the Site will reach the Sanctuary. The nature of water management on the Adams Road Bird Sanctuary means that pollution events would have a direct impact on the ecology of the Site.	• Implementation of the Environment Agency PPG; • Use of drip trays under mobile plant; • Timing of works close to watercourses so that they do not interfere with spawning; • Temporary construction site drainage will be designed, where practicable, to retain surface run-off within the Site boundary; • The use of construction materials on-Site free from contaminated material, so as to avoid any potential contamination of the watercourse; and • Surface water runoff will be monitored and the results actioned if required.	Low	There is a small risk that contamination from construction activities upstream could result in additional sedimentation and harm to aquatic flora and fauna. It is not anticipated that the proposals will lead to the deterioration of the Coton Brook of a magnitude which affects the ecological status of the Adams Road Bird Sanctuary. A temporary, reversible, adverse effect is predicted.	Low adverse **Not significant**
Washpit Brook, its ecology, hydromorphology and water quality. The Site discharges to a heavily silted artificial channel of limited ecological value. Approximately 1/3 of the Site drains to the Washpit Brook.	Low	There are inherent risks of pollution associated with construction, typically associated with the release of pollutants (e.g. hydrocarbons, cement, fine sediment, mobilised contaminants) due to leaks and spills from construction activities and surface water runoff. The risk is greatest for construction activities closest to the water course.	• Implementation of the Environment Agency PPG; • Use of drip trays under mobile plant; • Timing of works close to watercourses so that they do not interfere with spawning; • Temporary construction site drainage will be designed, where practicable, to retain surface run-off within the Site boundary; • The use of construction materials on-Site free from contaminated material, so as to avoid any potential contamination of the watercourse; and • Surface water runoff will be monitored and the results actioned if required.	Low	With appropriate controls in place there remains a small risk of contamination of the Washpit Brook from construction activities upstream which could result in additional sedimentation and harm to aquatic flora and fauna. The small size of the Coton Brook and its artificial nature, together with the artificial catchment, means that there is potential to control the extent and severity of pollution incidents. It is not anticipated that the proposals will lead to the deterioration of the Washpit Brook of a magnitude which affects the ecological status of the Old West River waterbody. A temporary, reversible, adverse effect is predicted.	Negligible **Not significant**
On Site surface water drainage	Low to medium	Increase of debris in ditches during construction, either from run-off or the accumulation of wind-blown material	• Inspection of on Site surface water drainage features and clearance works to maintain their character; and • Water management will be an important part of the earthworks operation. During wet periods, storage of surface run-off should be undertaken to assist in dust suppression during dry periods. Prior to the commencement of Site clearance, initial water management systems should be installed	Low	With appropriate controls in place, no significant environmental effects are anticipated.	Negligible to low **Not significant**

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measures**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Existing pipe drainage network	Medium	Risk of contamination (pollutants) from on plot construction activities entering existing drainage.	• Inspection of on Site surface water drainage features and clearance works to maintain their character; • Water management will be an important part of the earthworks operation. During wet periods, storage of surface run-off should be undertaken to assist in dust suppression during dry periods. Prior to the commencement of Site clearance, initial water management systems should be installed; and • Construction phasing will be planned to ensure new pipework and sufficient storage is provided before removal of existing infrastructure.	Low	There is a small risk that contamination from construction activities. A temporary, reversible, adverse effect is predicted.	Low adverse **Not significant**
Public surface water sewer network and on-site drainage network.	Low	Increased flood risk resulting from higher rate and volume of run-off during construction.	• Surface water discharge flows will discharge to existing outfalls at rates not exceeding the agreed pre-development rates. The increased volume will be attenuated on Site; • Foul water systems supporting construction will be connected to the existing foul sewer; and • Implementation of grey water systems at temporary site compounds	Low	No additional flow will be discharged to the existing network during construction. Provision of source control measures will ultimately accommodate the increased volume of run-off generated by the development.	Negligible **Not significant**
Foul public sewer Wilberforce Road.	Medium	Insufficient capacity to accommodate flows with increased pollution and flood risk during construction.	Contaminated runoff will not be discharged to the foul sewer network without prior agreement from Anglian Water that it is acceptable	Negligible	With appropriate controls in place, no significant environmental effects are anticipated	Negligible **Not significant**

Operational phase

13.5.2 Operational effects are assessed In Table 13.6.

Table 13.6 Operational phase effects

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measures**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Coton Brook on Site (reaches 1 to 5 inclusive), its ecology, hydromorphology and water quality.	Medium to High	Changes to the surface water drainage regime have the potential to affect the ecology and amenity value of the Coton Brook on the Site.	• Discharge from the Site will be designed to be the equivalent of greenfield runoff rates. This will be achieved through Site-wide measures (e.g. the operation of the drainage system on the Site's southern boundary) and plot specific controls (e.g. permeable paving and temporary storage); and • The Western Lake and South Eastern pond will incorporate fore bays and planting which will assist in water treatment.; • The drainage system will be designed to include the treatment of runoff to manage the movement of silt and other pollutants.	Negligible	Beneficial effects will be associated with the Proposed Development as the existing system will be improved during redevelopment of existing facilities. The artificial nature of the system means that there is little scope to introduce 'natural' morphological processes, therefore benefits will be derived through improved water quality, plus the maintenance or improvement in ecological diversity and amenity value. Long-term benefits will only be sustained through the adoption of appropriate management and maintenance regimes. Potential adverse effects will be controlled through the incorporation of appropriate drainage systems in the individual plots.	Negligible beneficial **Not significant**

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measures**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Coton Brook beyond the Site excluding the Adams Road Bird Sanctuary (reaches 5,6 and 8), its ecology, hydromorphology and water quality	Low	Changes to the surface water drainage regime have the potential to affect this reach of the Coton Brook through the implementation of current SUDS standards in the design of the drainage system on the Site. In addition, improved on-site operational pollution controls will have benefits for off-site receptors located downstream.	• Discharge from the Site will be designed to be the equivalent of greenfield runoff rates. This will be achieved through Site-wide measures (e.g. the operation of the drainage system on the Site's southern boundary) and plot specific controls (e.g. permeable paving and temporary storage); and • The Western Lake and South Eastern pond will incorporate fore bays and planting which will assist in water treatment.; • The drainage system will be designed to include the treatment of runoff to manage the movement of silt and other pollutants.	Negligible	It is anticipated that the performance of the existing system will improve once the Proposed Development is operational. This would be a long-term, reversible beneficial effect. Though beyond the control of the University of Cambridge, it should be noted that simple changes to channel maintenance could give rise to increased ecological diversity within the Coton Brook, by allowing greater light penetration and the growth of in-channel vegetation. This would provide ecological diversity in its own right, will form habitat for a range of organisms and will act to control and stabilise in-channel sediment	Negligible beneficial **Not significant**
Adams Road Bird Sanctuary (reach 7)	High	Changes to the surface water drainage regime within the Site have the potential to give rise to minor improvements to the Adams Road Bird Sanctuary in the long-term through on-site controls on the sediment load and chemical water quality.	None required	Low	The ecological character and the morphological structure of the Adams Road Bird Sanctuary makes it particularly vulnerable to siltation or chemical pollution. Predicted changes associated with the Proposed Development will benefit the nature reserve by improving the water quality and reducing the amount of silt entering the sanctuary site. Long-term, reversible, beneficial effect.	Low beneficial **Not significant**
Washpit Brook, its ecology, hydromorphology and water quality. The Site discharges to a heavily silted artificial channel of limited ecological value.	Low	The Proposed Development will result in the diversion of the surface water flows from the northern section of the Site to Coton Brook. This will address an intermittent source of runoff to the Washpit Brook which has a variable sediment load and limits controls on chemical water quality.	Most drainage from the Site will be routed in a southerly direction. Some flows will be directed to Washpit Brook in the north but at a reduced rate to existing. The design of the revised system will, as a minimum, reflect its current ecological and amenity value.	Negligible to low	The Proposed Development will eliminate surface water discharges from the Site to Wash Pit Brook. The existing system does not meet current SUDS designed standards. There is evidence of siltation immediately downstream of the discharge point. Consequently, it is concluded that the proposed changes are beneficial, however of negligible or low magnitude owing to the intermittent nature of inputs. The sensitivity of the Washpit Brook reflects the current maintenance regime, which has allowed the upper reaches to become heavily shaded	Negligible **Not significant**
Pipe sewers	Low	Loss of capacity from sedimentation	CCTV inspections and cyclic jetting	Low	Removal of silt would maintain the capacity of pipework. Adverse effects would be temporary, localised and minor in nature.	Negligible **Not significant**
Tanked Permeable Pavements/geo-cellular storage On Plot	Low	Loss of capacity from siltation. Loss of capacity during construction	Cyclic maintenance in accordance with LLFA guidance. Provide attenuation on phased basis	Low	Regular maintenance will ensure tanked permeable paving operates efficiently for its lifetime. Increased capacity of existing attenuation before removal of storage tanks will mitigate flood risk	Negligible **Not significant**
Public surface water sewer network and on-Site drainage network.	Low	Increased flood risk resulting from higher rate and volume of run-off post-development attributable to densification and increased rainfall intensities resulting from climate change.	Discharge from the Site will be designed to be the equivalent of greenfield runoff rates. This will be achieved through Site-wide measures (e.g. the operation of the drainage system on the Site's southern boundary) and plot specific controls (e.g. permeable paving and temporary storage).	Low	No additional flow will be discharged to the existing network. Provision of source control measures and SUDs features, including attenuation facilities (ditches/ponds/lakes/canal and tanked permeable pavements) will accommodate the increased volume of run-off generated by development. The use of source control measures (green roofs and tanked permeable pavements will also slow the time of concentration of run-off. Attenuation on Site will ensure that there will be no increase in flood risk to receptors off-Site.	Negligible **Not significant**

Baseline		Impact assessment				
Receptor	**Value / sensitivity**	**Impact**	**Mitigation measures**	**Impact magnitude**	**Residual effect**	**Significance of effect**
Foul public sewer Wilberforce Road.	Medium	Insufficient capacity to accommodate post-development flows with increased pollution and flood risk.	Anglian Water is assessing the capacity available through a foul water impact study. If required tanked sewers would be provided to mitigate.	Negligible	Upgrading of off-site sewers would provide sufficient capacity to accommodate increase in foul flows.	Negligible **Not significant**

13.6 Mitigation measures

Construction phase

13.6.1 A site Construction Environmental Management Plan (CEMP) will be developed to minimise the potential for accidental spill or leakage to migrate and contaminate the underlying groundwater, Coton Brook, Washpit Brook or features of ecological value within the on-Site surface water drainage network.

13.6.2 Mitigation measures that would be applied prior to and during construction include the following:

- The following list shows measures that will be put in place via the CEMP to prevent pollution and would conform to the best practice policy issued by the Environment Agency via PPG. The key guidelines that would be followed are:
  - PPG 1 Understanding your environmental responsibilities – good environmental practices;
  - PPG 2 Above ground oil storage tanks;
  - PPG 3 Use and design of oil separators in surface water systems;
  - PPG 4 Treatment and disposal of sewage where no foul sewer is found;
  - PPG 5 Works and maintenance in or near water;
  - PPG 6 Working at demolition and construction sites;
  - PPG 22 Dealing with spills;
  - PPG 23 Maintenance of structures over water.
- The design of the revised drainage network, and associated temporary works, presents the most effective means of controlling risks to the upper reaches of the Coton Brook;
- The timing and phasing of works will help to minimise effects, increasing the potential to control water quality effects, minimise the movement of sediment and minimise effects to aquatic flora and fauna;
- Surface water runoff will be monitored and the results actioned if required.
- Construction phasing will be planned to ensure new pipework and sufficient storage is provided before removal of existing infrastructure;
- Use of drip trays under mobile plant;
- Timing of works close to watercourses so that they do not interfere with spawning fish;
- Temporary construction site drainage will be designed, where practicable, to retain surface run-off within the Site boundary. Where possible the permanent drainage arrangements will be utilised in the temporary management system;
- The use of construction materials on-Site free from contaminated material, so as to avoid any potential contamination of the watercourse;
- Regular inspection and monitoring of on Site surface water drainage features and clearance works to maintain their character and function;
- Water management will be an important part of the earthworks operation. During wet periods, storage of surface run-off should be undertaken to assist in dust suppression during dry periods. Prior to the commencement of Site clearance, initial water management systems should be installed;
- Surface water discharge flows will discharge to existing outfalls at rates not exceeding the agreed pre-development rates. The increased volume will be attenuated on Site;
- Foul water systems supporting construction will be connected to the existing foul sewer;
- Wherever practicable, grey water systems will be used at Site compounds to reduce run-off from the Site, improve water efficiency and lessen the potential for polluting discharges to surface watercourses; and
- Contaminated runoff will not be discharged to the foul sewer network without prior agreement from Anglian Water that it is acceptable.

Operational phase

13.6.3 Operational effects will typically be avoided through the incorporation of measures within the design process. the following controls are integral to the design:

- Discharge from the Site will be designed to be the equivalent of 1 in 1 year Greenfield run off rate. The 1 in 1 year Green field run off rate has also been reduced by 10% from the rates originally agreed with the Environment Agency for the 1999 consented master plan.. This will be achieved through Site-wide measures (e.g. the operation of the drainage system on the Site's southern boundary) and plot specific controls (e.g. permeable paving and temporary storage). The appropriate sustainable urban drainage (SUDS) standards will be applied where appropriate;
- An allowance of 40% has been used to take account of increased rainfall intensities resulting from predicted climate change. Flood risk will be mitigated up to and including the 1 in 100 year return period, including climate change. An additional 40% in storage volume to accommodate post development flows will be provided. This requires significant attenuation to be provided across the site to mitigate flood risk. Mitigation measures include modifications to the existing Western Lake, Canal and South Eastern pond, to provide increased storage capacity for the Western and Central catchments. Development located within the Eastern catchment will provide attenuation by the provision of on plot storage. Discharges will be limited to the 1 in 1 year Greenfield run off rate;
- Within the proposed central public realm area a swale will be provided to collect and convey surface water runoff. Where spatial constraints allow, roadside bio retention areas will be constructed to facilitate the treatment and conveyance of highway run off;
- The Western Lake and South Eastern pond will incorporate fore bays which will assist in water treatment. The Canal and South Eastern pond will be planted with suitable aquatic planting such as reed beds which will facilitate removal of potential contaminants;
- The drainage system will be designed to include the treatment of runoff to manage the movement of silt and other pollutants. Sediment monitoring is proposed to characterise current operational effects and inform the detailed design of drainage systems for the plots as they are developed;
- The majority of drainage from the Site will be routed in a southerly direction, reducing potential effects on the Washpit Brook and the North West Cambridge development. The design of the revised system will, as a minimum, reflect its current ecological and amenity value:
- Periodic CCTV inspections of on Site sewers and cyclic jetting will be undertaken as part of the Site wide maintenance;
- Cyclic maintenance of on Site surface water drainage assets will be undertaken in accordance with LLFA guidance. Attenuation will be provided a on phased basis as plots are developed; and

- Anglian Water is assessing the capacity available through a foul water impact study. If required tanked sewers would be provided to mitigate increased demand.

13.6.4 Reflecting the nature of the operational use of the Site, it is recommended that measures are implemented to ensure that the operation of facilities aligns to appropriate legislative requirements for the storage, use and disposal of chemicals which may be harmful to the aquatic environment. As a minimum, a review will be conducted to ensure that all activities using and disposing of chemicals, plus all chemical and material stores comply with current consenting requirements and include adequate pollution prevention measures. The findings of this review will be presented spatially alongside the existing foul and surface water drainage systems to identify potential vulnerabilities in the system. This could also be conducted alongside awareness raising for staff using the Site to ensure that they are aware of procedures and the potential consequences of not complying with prescribed procedures (e.g. ecological effects, prosecution, reputational damage).

13.7 Summary

13.7.1 Careful design and the implementation of a suite of control measures mean that the Proposed Development would not give rise to significant adverse effects. In time, the redevelopment of currently developed plots will lead to improvements in surface water drainage systems, which currently do not meet existing design guidance. This will give rise to a minor beneficial effect on the sediment regime within the Coton Brook watercourse and downstream receptors such as the Adam's Road Bird Sanctuary.

14. Ground conditions

14.1 Scope of the assessment

14.1.1 This chapter assesses the likely significant effects of the Proposed Development on the environment in respect of ground conditions. This chapter considers:

- The indirect effects of the Proposed Development on human health and the environment relating to ground contamination.

14.1.2 Other direct effects of the development on the ground have been excluded from this assessment. The elements excluded from this assessment and the reasons for their exclusion are:

- Geology, as there are no designated geological sites or features of conservation value in the area affected by the Proposed Development.
- Geomorphology, as there are no designated geomorphological sites or features of conservation value in the area affected by the Proposed Development.
- Mineral Resources, as there are no mineral protection areas or mineral safeguarding zones in the area affected by the Proposed Development.

14.1.3 The scoping responses set out in Table 14.1have been considered in this chapter,

Table 14.1: Scoping response

Issue raised	Respondent
Groundwater and contaminated land – the EIA should assess the risks posed by the Proposed Development to controlled waters.	Environment Agency
Contaminated land – the EIA should assess the risk posed by the Proposed Development to human health and the environment, as outlined in the Scoping Request document.	Cambridge City Council

14.2 Relevant legislation and policy

14.2.1 Guidance on the identification and remediation of contaminated land was given by the Government in Contaminated Land Statutory Guidance[95]). A regulatory regime supporting this policy has been introduced by Part I and II of the Environmental Protection Act 1990 and the Pollution Prevention and Control Act 1999.

14.2.2 With regard to controlled waters, the Environment Agency has a remit to prevent or reduce the risk of water pollution, wherever possible, and to ensure that it gets cleaned up if pollution occurs that might lead to effects on ecosystems or people. A regulatory regime supporting this policy has been introduced by the Water Resources Act 1991 (as modified by the Environment Act 1995) and the Groundwater Regulations 2009.

14.2.3 To prevent contaminated land arising from new developments, controls exist within the planning system, regulated under the Town and Country Planning Act 1990. Local planning authorities must take account of contamination or the potential for contamination in determining individual applications for planning permission.

14.2.4 Guidance for planning authorities on the need to take into account the environmental consequences of contaminated land in drawing up development plans and in determining planning applications is currently provided in the NPPF (Annex 2) which promotes the use of "established procedures" using current UK best practice and guidance as given in British Standard 10175, Contaminated Land Report 11.

14.3 Method of assessment

14.3.1 To assess the potential effects of the Proposed Development relating to ground contamination, separate qualitative risk assessments have been carried out utilising a Conceptual Site Model to identify 'source-pathway-receptor' linkages for each of the following phases of the Development:

- Baseline Conditions - based on the sources, pathways and receptors.
- Construction Phase - assessing the changes to sources, pathways and receptors and the consequent risks related to ground contamination during the construction of the Proposed Development.
- Operational Phase – assessing the changes to sources, pathways and receptors and the consequent risks related to ground contamination associated with the use of the Development once completed.

14.3.2 Each Conceptual Site Model considers:

- The principal pollutant hazards associated with the Site (the sources);
- The principal pathways between the identified hazard(s) and receptor(s); and.
- The principal receptor(s) at risk from the identified hazards, for example, people, environmental assets, surface or groundwater.

14.3.3 The qualitative risk is determined by the interrelationship between the potential for a source of contamination to be present, the potential for migration of the contaminant along a given pathway, and the significance of potential receptors for any identified source-pathway-receptor' linkage. Details of the method used are given in the guidance notes included in the Phase 1 Ground Condition (Contamination and Geotechnical) Assessment included as Appendix 14.1, Volume 3 and are summarised in Tables 14.2 to 14.7 which set out the criteria for receptor sensitivity, consequence and significance.

[95] Department for Environment, Food and Rural Affairs (Defra): Contaminated Land Statutory Guidance (April 2012).

Table 14.2: Criteria for classifying hazards / potential for generating contamination

Classification / score	Potential for generating contamination / gas based on land use
Very Low 1	• Land use: agricultural, residential, allotment, recent retail or office use • Contamination: None or low level residual concentrations • Gas generation potential: Inert Made Ground
Low 2	• Land use: recent small scale industrial, railway tracks, small scale fuel storage • Contamination: Locally or slightly elevated concentrations • Gas generation potential: Shallow thickness of Alluvium
Moderate 3	• Land use: railway yards, collieries, scrap yards, engineering works, light industry • Contamination: Locally elevated concentrations • Gas generation potential: Dock silt and substantial thickness of organic alluvium
High 4	• Land use: gas works, chemical works, heavy industry, non-hazardous landfills • Contamination: Possible widespread elevated concentrations • Gas generation potential: Shallow mine workings, pre 1960s landfill
Very High 5	• Land use: hazardous landfill sites • Contamination: likely widespread elevated concentrations • Gas generation potential: Domestic landfill post 1960

Table 14.3 Criteria for classifying receptor sensitivity / value

Classification / score	Definition
Very Low 1	Receptor of limited importance • Groundwater: Non aquifer • Surface water: GQA Grade F • Ecology: No local designation • Buildings: Replaceable • Human health: Unoccupied / limited access
Low 2	Receptor of local or county importance with potential for replacement • Groundwater: Secondary aquifer • Surface water: GQA Grade D / E • Ecology: local habitat resources Buildings: Local value • Human health: Minimum score 4 where human health identified as potential receptor
Moderate 3	Receptor of local or county importance with potential for replacement • Groundwater: Principal aquifer • Surface water: GQA Grade B / C • Ecology: County wildlife sites, Areas of Outstanding Natural Beauty (AONB) • Buildings: Area of Historic Character • Human health: Minimum score 4 where human health identified as potential receptor
High 4	Receptor of county or regional importance with limited potential for replacement • Groundwater: Source Protection Zone 2 • Surface water: GQA Grade A • Ecology: SSSI, National or Marine Nature Reserve (NNR or MNR) Buildings: Conservation Area • Human health: Minimum score 4 where human health identified as potential receptor
Very High 5	Receptor of national or international importance • Groundwater: Source Protection Zone 1 Surface water: GQA Grade A • Ecology: Special Areas of Conservation (SAC and candidates), Special Protection Areas (SPA and potentials) or wetlands of international importance (RAMSAR) • Buildings: World Heritage site • Human health: Residential, open spaces and uses where children are present

Table 14.4 Classification of probability

Classification	Definition
High likelihood	There is a pollution linkage and an event either appears very likely in the short-term and almost inevitable over the long-term, or there is already evidence at the receptor of harm / pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short-term and likely over the long-term.
Low likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter-term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long-term.

Table 14.5 Classification of consequence (score = magnitude of hazard Table 1.2 and sensitivity of receptor Table 1.3)

Classification / score	Examples
Severe 20-25	• Human health effect - exposure likely to result in "significant harm". Significant harm to humans is defined in circular 01 / 2006 as death, disease, serious injury, genetic mutation, birth defects or impairment of reproductive function. • Controlled water effect - short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. Equivalent to EA Category 1 incident (persistent and / or extensive effects on water quality leading to closure of potable abstraction point or loss of amenity, agriculture or commercial value. Major fish kill. • Ecological effect - short-term exposure likely to result in a substantial adverse effect. Catastrophic damage to crops, buildings or property
Medium 13-19	• Human health effect - exposure could result in "significant harm". Significant harm to humans is defined in circular 01 / 2006 as death, disease, serious injury, genetic mutation, birth defects or impairment of reproductive function. • Controlled water effect - equivalent to EA Category 2 incident requiring notification of abstractor Ecological effect - short-term exposure may result in a substantial adverse effect. • Damage to crops, buildings or property
Mild 6-12	• Human health effect - exposure may result in "significant harm". Significant harm to humans is defined in circular 01 / 2006 as death, disease, serious injury, genetic mutation, birth defects or impairment of reproductive function. • Controlled water effect - equivalent to EA Category 3 incident (short lived and / or minimal effects on water quality). • Ecological effect - unlikely to result in a substantial adverse effect. • Minor damage to crops, buildings or property. Damage to building rendering it unsafe to occupy (for example foundation damage resulting in instability).
Minor 1-5	• No measurable effect on humans. Protective equipment is not required during site works. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. • Repairable effects to crops, buildings or property. The loss of plants in a landscaping scheme. Discolouration of concrete.

Table 14.6 Classification of risk (combination of consequence Table 14.5 and probability Table 14.4)

Probability	Consequence			
	Severe	Medium	Mild	Minor
High likelihood	Very high	High	Moderate	Low
Likely	High	Moderate	Moderate / low	Low
Low likelihood	Moderate	Moderate / low	Low	Very low
Unlikely	Moderate / low	Low	Very low	Very low

Table 14.7 Descriptions of risks and likely action required

Risk classification	Description
Very high risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation is likely to be required in the short term.
High risk	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short-term and are likely over the longer-term.
Moderate risk	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer-term.
Low risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very low risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

14.3.4 The qualitative risk assessments allow the magnitude and probability of the possible consequences that may arise as a result of a hazard to be assessed and possible unacceptable risks resulting from the Proposed Development to be identified. The mitigation measures that will be required to address possible unacceptable risks during both the construction and operational phases are then identified and the consequent risks with the mitigation measures in place assessed.

14.3.5 The significance of any effects of the Proposed Development related to ground contamination is then determined by comparing the risks associated with the construction phase to the baseline conditions, and the risks associated with the operational phase with the baseline conditions, both with the mitigation measures in place. These effects are assessed using the matrix presented in Table 14.8.

14.3.6 This comparison approach allows any effects of the Proposed Development during the construction and operational phases to be identified as beneficial, neutral or adverse and, depending on the magnitude of the change in risk, to be assessed as being negligible, minor, moderate, major or severe.

Table 14.8 Significance of potential effects relative to existing baseline conditions

		Risk related to existing baseline conditions				
		Very high	High	Moderate	Low	Very low
Risk related to Proposed Development	Very high	Negligible	Minor adverse	Moderate adverse	Substantial adverse	Substantial adverse
	High	Minor beneficial	Negligible	Minor adverse	Moderate adverse	Substantial adverse
	Moderate	Moderate beneficial	Minor beneficial	Negligible	Minor adverse	Moderate adverse
	Low	Substantial beneficial	Moderate beneficial	Minor beneficial	Negligible	Minor adverse
	Very low	Substantial beneficial	Substantial beneficial	Moderate beneficial	Minor beneficial	Negligible

14.3.7 For example, a low risk related to the baseline conditions and a moderate risk related to the Proposed Development would give rise to a minor adverse effect, whilst a moderate risk related to the existing baseline conditions and a very low risk related to the Proposed Development would give rise to a moderate beneficial effect.

14.3.8 No particular difficulties were encountered whilst undertaking the ground conditions assessment.

14.4 Baseline conditions

Sources of information

14.4.1 The baseline conditions at the Site have been determined from a review of available information and site observations during a recent archaeological investigation.

14.4.2 The information reviewed includes:

- Published geological, hydrogeological and aquifer vulnerability maps and historical Ordnance Survey maps;
- Existing information, investigations, studies and surveys in relation to the existing geological, geotechnical, contamination and geo-environmental aspects of the Site;
- Observations of ground conditions in shallow trenches carried out as part of an archaeological investigation at the Site, and the chemical analysis of soil samples collected during the investigation; and
- Information obtained from public bodies and the current site users on the previous land uses and potentially contaminative activities that have taken place on the Site.

14.4.3 This information is presented in a Phase 1 Ground Condition (Contamination and Geotechnical) Assessment which can be found in Appendix 14.1, Volume 3.

Geological setting

14.4.4 According to the British Geological Survey (BGS) 1:10,000 scale digimap[96], the Site is underlain by the Gault Formation. This formation is described as pale to dark grey and blue grey mudstone. The geological map shows small lobes of Made Ground overlying the bedrock geology on the Site, generally along parts of the western and eastern site boundaries. These relate to landscaping bunds and motorway embankments.

14.4.5 Beyond the western and north-eastern site boundaries, outcrops of the West Melbury Marly Chalk Formation (formerly Lower Chalk) are shown overlying the Gault Formation. A large tract of Head Deposits is shown overlying the Gault Formation north of the site boundary. Outcrops of River Terrace Deposits are shown approximately 400m north-east and 800m south-east from the eastern site boundary.

14.4.6 From a review of previous ground investigations on the Site, historical borehole records gathered from BGS and ground conditions observed during the recent archaeological investigation, the local ground conditions at the Site have been summarised in Table 14.9.

[96] Map supplied by Landmark Information Group and contained within the Envirocheck report presented in the Phase 1 Ground Condition (Contamination and Geotechnical) Assessment included in Appendix 14.1, Volume 3.

Table 14.9 Summary of ground conditions

Stratum	Typical description	Thickness range
Topsoil	Brown grey clay with fine to medium flint gravel and occasional fragments of brick.	0.0 - 0.8m
Made Ground	Variable and localised. Thickest horizons were generally encountered during investigations in the southern areas of the Site. Remnants of former site buildings and evidence of land raising / landscaping in the northern area of the Site were identified during the archaeological investigation. Brown, grey, orange slightly sandy slightly gravelly clay. Gravel sized fragments of flint, brick, ash, concrete, clinker and limestone and rare inclusions of wire, wood and organic traces. Occasional layers of red brown sand. Occasional cobbles of brick and concrete.	0.0 – 3.0m
Head Deposits	Firm to stiff brown orange variably gravelly and sandy clay. Occasional lenses and irregular inclusions of clayey sand and gravel (cryoturbated soils from underlying clay), layers of silty sand and gravel with pockets of clay. Gravels of flint and chalk. Prevalent on the higher ground and ridgeline west of the School of Veterinary Medicine.	0.0 – 3.0m
Gault Clay	Firm to very stiff closely fissured brown grey becoming grey and blue grey silty clay with rare brown sized phosphatic nodules.	29.0+m

Hydrogeological setting

14.4.7 According to the Envirocheck Report and the Environment Agency (EA) Website, the Gault Formation is classified as an Unproductive Stratum. Unproductive Stratum are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

14.4.8 The West Melbury Marly Chalk Formation located beyond the site boundary is classified as a Principal Aquifer. Principal aquifers usually provide a high level of water storage and may support water supply and river base flow at a strategic level. There does not appear to be any connectivity between the Site and these chalk outcrops, the majority of which are up hydraulic gradient of the Site.

14.4.9 The Head Deposits and River Terrace Deposits beyond the Site boundary are classified as Secondary Undifferentiated and Secondary A Aquifers, respectively. Secondary A aquifers may support water supplies and river base flow at a local level. Secondary Undifferentiated means that the layer has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the material. Given that Head Deposits have been encountered on-the Site during previous investigations, this designation has been extended onto the Site for areas underlain by these deposits.

14.4.10 The Site does not lie within a Source Protection Zone (SPZ).

14.4.11 Groundwater was generally not encountered during previous ground investigations at the Site, as would be anticipated given the dominant clay geology. Minor seepages were reported in some exploratory holes, although this was generally from Made Ground and Head Deposits horizons and was not considered to be significant.

Hydrological setting

14.4.12 There are no designated Primary or Secondary watercourses located on the Site, or in close proximity to the site boundary. The closest designated watercourse to the Site is the Bin Brook (classed as a Tertiary River) which is located just beyond the south-west corner of the Site. The majority of flows from the Site gravitate to Coton Brook located to the south east, where they are culverted before flowing into Bin Brook. The northern catchment discharges to a network of drains and ditches that flow away from the site in a north westerly direction and discharge via a culvert to the Washpit brook.

14.4.13 There are several surface water features located within the southern area of the Site which include a large attenuation lake which drains via a flow control into a ditch known as the Canal and outfalls into Coton Brook. There is also an additional attenuation pond located in the south eastern corner of the site which outfalls into Coton Brook These features form part of the drainage system but also form part of the ecological, landscape and amenity provision for this area of the Site.

Historical setting

14.4.14 A review of historical Ordnance Survey maps indicates that during the late 19th and early 20th Centuries the Site comprised agricultural fields with Church Hall Farm (latterly named Vicar's Farm) located in the eastern area of the Site, and Merton Hall Farm and Merton Cottages located on the northern site boundary.

14.4.15 The first significant development of the Site occurred in the 1940s when the southern and western area of the Site were converted into a wartime facility known as the Shorts site. The Shorts site was used for the repair of bomber aircraft (that had been dismantled at the nearby Bourn airfield) and salvaged parts from redundant bombers. Phase 1 of the Shorts site, comprising hangars, the administration block, canteen and stores were located in the western area of the Site and was completed in 1941. Phase 2 of the Shorts site, comprising hangars, offices, a maintenance building and fuel compound was located in the southern area of the Site and was completed in 1942.

14.4.16 After the war the Shorts site was vacated, with site buildings being used by the University of Cambridge, and by the Home Office for storage. By the late 1960s the Phase 1 site in the western area of the Site had been demolished, but the Phase 2 site buildings in the southern area were still present and labelled "Depot" on the 1972 map edition. These buildings were subsequently demolished in 1972. This area of the Site was taken over by the University Farm and was used for grazing cattle or for grass cutting.

14.4.17 Other than the Shorts site, the next significant development of the site is shown on the 1972 map edition with several buildings in the central area of the site labelled as the "University of Cambridge School of Veterinary Medicine". The map also shows the expansion of Merton Hall Farm on the northern Site boundary, and some isolated structures in the western area (formerly part of the Shorts site) labelled as "laboratory" and "Atlas Centre".

14.4.18 Further academic development of the Site is evident on the 1983 map edition with new laboratories shown in the eastern area of the Site. New structures labelled "Design Centre" and "British Antarctic Survey" are shown in the western area of the Site at this time. The 2006 map edition shows further academic development in the eastern area of the Site which is now almost completely covered with buildings. A new laboratory building, as well as the expansion of the British Antarctic Survey area, is evident in the north-western area of the Site. Further development in the central area of the Site, south and south-east of the School of Veterinary Medicine faculty buildings, is evident on the recent map edition from 2015.

14.4.19 Significant off-site developments comprise the construction of the M11 Motorway along the western Site boundary which is shown on the 1983 and subsequent map editions. A park and ride site is shown on the 2006 map beyond the northern Site boundary. Further residential development is evident from the 2006 map just beyond the eastern Site boundary, with the "University Sports Centre" shown beyond the south-east corner of the Site from the 2006 map edition onwards.

14.4.20 Other development within the Site boundary has largely been associated with the University (laboratories and faculty buildings) or similar enterprises. There are potential sources of contamination associated with these academic and laboratory land-uses, although it is considered that given the scale and regulated nature of these activities, the potential for them to generate significant widespread contamination is low. The Environment Agency has a small number of records of pollution incidents arising from laboratory land-uses, although these incidents have been rated as no or minimal impact.

14.4.21 Geo-environmental testing of soil samples collected from the recent archaeological investigation has indicated very low concentrations of potential contaminants in currently undeveloped areas of the Site around the veterinary school.

14.4.22 In general, the hazard classification / potential for generating contamination for the Site (see Table 14.2) is Low given the predominant land use.

14.4.23 The area surrounding the Site is largely agricultural (farmland) and residential. Based on the known surrounding land uses the potential for widespread contamination to be present in the immediate vicinity of the Site (see Table 1.2) is considered to be Very Low.

Baseline risk assessment

14.4.24 Based on a source-pathway-receptor model, the assessed risks related to the existing baseline conditions have been assessed and are presented in Table 14.10 with respect to each of the potential receptors identified.

Table 14.10 Assessed risk relating to baseline conditions – land contamination

Receptor	Assessed risk	Description
Site Workers	Low	Owing to the low potential for contaminants to be present on the Site and the limited number of length of time site workers will be on the Site.
Site Users / Neighbours	Low	Owing to the low potential for contaminants to be present on the site and the sensitivity of the existing site uses.
Ground and surface waters	Very Low	Owing to the low potential for contaminants to be present, and very low sensitivity of surface water and groundwater receptors.
Ecological and wildlife	Very Low	Owing to the low potential for mobile contaminants to be present.

14.5 Impact assessment

Construction phase

14.5.1 Construction phase impacts are assessed in Table 14.11.

Table 14.11 Construction phase effects

Baseline		Impact assessment				
Receptor / hazard	**Assessed risk**	**Impact**	**Mitigation measure**	**Assessed risk**	**Residual effect**	**Significance of effect**
Site workers	Low	There is a possibility that other sources of contamination may be encountered during the construction works that have not been identified by the Phase 1 study or future ground investigation. Site workers encountering potential localised areas of contamination on Site.	• Appropriate protective clothing and equipment will be worn by site workers; and good standards of hygiene adopted to prevent prolonged skin contact, inhalation and ingestion of soils during construction • In addition, the methods of working will be selected to limit the potential for air-borne dust to arise associated with the excavation and disturbance of the soils present on the Site. • Ensure workers at risk of encountering potentially hazardous materials have had appropriate training. • As part of the CEMP, a watching brief for the visual and olfactory assessment of the soil quality will be maintained with sampling and testing for verification and assessment purposes where necessary, together with treatment as required	Low	The risk to Site workers during construction will be minimal providing mitigation is implemented.	Negligible / minor adverse **Not significant**
Site users / neighbours	Low	Site users / neighbours potential exposure to contaminated dust mobilised during construction activity	Methods of working will be selected to limit the potential for air-borne dust to arise associated with the excavation and disturbance of the soils present on the Site. These are detailed in Chapter 11 and will be specified within the Soils Management Strategy which will form part of the CEMP..	Low	The risk to Site users / neighbours during construction will be minimal providing mitigation is implemented.	Negligible / minor adverse **Not significant**
Ground water	Very Low	Potential introduction of new contaminant sources due to the release of contaminants from construction activity e.g. spill / leaks from defective plant and un-bunded fuel storage areas, silt-laden runoff from poorly managed stockpiles and poor site surface water management. Potential migration of new and existing contaminants in groundwater due to construction activity e.g. creation of contaminant pathways due to the introduction of service trenches, areas of loosely compacted fill, piling etc.	Implementation of standard environmental protection measures during construction as set out in CIRIA C532 and the Environment Agency's former Pollution Prevention Guidance (PPG) series as further detailed in Chapter 13 water environment	Low	The risk to ground water during construction will be minimal providing mitigation is implemented. Groundwater on the Site is not in continuity with off-site Principal Aquifers. The Site is situated on clay soils with very low permeability. Therefore, the risk to the off-site Principal Aquifers is considered to be negligible during construction.	Minor adverse **Not significant**
Ecology and wildlife	Very Low	Potential migration of new and existing contaminants in surface water and groundwater due to construction activity e.g. creation of contaminant pathways due to the introduction of service trenches, areas of loosely compacted fill, piling etc.	Implementation of standard environmental protection measures during construction as set out in CIRIA C532 and the Environment Agency's former Pollution Prevention Guidance (PPG) series as further detailed in Chapter 13 water environment	Low	The risk to ecology and wildlife during construction will be minimal providing mitigation is implemented.	Minor adverse Not significant

Operational phase

14.5.2 Operation phase impacts are assessed in Table 14.12.

Table 14.12 Operational phase effects

Baseline		Impact assessment				
Receptor / hazard	**Assessed risk**	**Impact**	**Mitigation measure**	**Assessed risk**	**Residual effect**	**Significance of effect**
Site occupants	Low	Exposure of occupants to potential localised areas of contamination present on Site.	Further to the results of future ground investigation, appropriate gas protection measures may be required in new buildings.	Very Low	Where future ground investigation and contamination risk assessment indicates that localised remedial action may be required, this will be undertaken as part of the construction works such that the residual risks will be not significant. This will be a benefit of the Proposed Development which will reduce the risk to Site occupants.	Minor beneficial **Not significant**
Site users / neighbours / workers	Low	Exposure of Site users / neighbours to potential localised areas of contamination present on Site. Potential for hazardous ground gases to be present emanating from Gault Clay.	• Further to the results of future ground investigation, appropriate gas protection measures may be required in new buildings. • In accordance with current health and safety legislation, the maintenance contractor will be required to adopt measures to mitigate the risk to Site workers.	Very Low	Where future ground investigation and contamination risk assessment indicates that localised remedial action may be required, this will be undertaken as part of the construction works such that the residual risks will be not significant. This will be a benefit of the Proposed Development which will reduce the risk to Site users and neighbours.	Minor beneficial **Not significant**
Ground water	Very Low	Uncontrolled / accidental discharge of potential pollutants used on Site during operation.	• The placement of buildings / hardcover, as well as replacement of the existing surface water drainage system will mitigate against the risk of potential mobilisation / migration of any residual potential contaminants. • The removal and / or remediation of any contamination sources discovered, together with any localised remedial action necessary, will reduce the risk of migration of contaminants impacting ground waters.	Very Low	The risk to ground water during operation will be minimal providing mitigation is implemented.	Negligible **Not significant**
Ecology and wildlife	Very Low	Uncontrolled / accidental discharge of potential pollutants used on Site during operation.	Incorporation of measures to mitigate against potentially contaminated run-off e.g. bunding in areas of fuel and chemical storage, adoption of oil / silt interceptors in drainage design, control valves on outlet structures to ponds and drainage features etc.	Very Low	The risk to ecology and wildlife during operation will be minimal providing mitigation is implemented.	Negligible **Not significant**

14.6 Mitigation measures

14.6.1 The confirmation of ground conditions at the Site by intrusive investigation will enable a further assessment of the potential ground hazards and the presence / extent of potential sources of contamination identified within the Phase 1 assessment. Mitigation measures proposed are generally considered as a worst case scenario, based on the currently available information.

Construction phase

14.6.2 Site workers – The risk to Site workers during the construction works relates to the risk of skin contact, inhalation and ingestion of contaminated material on Site. In accordance with current health and safety legislation, the contractor will be required to adopt the following measures to mitigate the risk to Site workers, and these will be incorporated in the CEMP:

- Appropriate protective clothing and equipment will be worn by site workers; and good standards of hygiene adopted to prevent prolonged skin contact, inhalation and ingestion of soils during construction;
- In addition, the methods of working will be selected to limit the potential for air-borne dust to arise associated with the excavation and disturbance of the soils present on the Site;
- Ensure workers at risk of encountering potentially hazardous materials have had appropriate training
- As part of the CEMP, a watching brief for the visual and olfactory assessment of the soil quality will be maintained with sampling and testing for verification and assessment purposes where necessary, together with treatment as required.

14.6.3 Site users / neighbours – Methods of working will be selected to limit the potential for air-borne dust to arise associated with the excavation and disturbance of the soils present on the Site. These are detailed in Chapter 11 and will be specified within the Soils Management Strategy which will form part of the CEMP.

14.6.4 Ground water – Implementation of standard environmental protection measures during construction set out in CIRIA C532 and the Environment Agency's former Pollution Prevention Guidance (PPG) series as further detailed in Chapter 13 water environment.

Operational Phase

14.6.5 The mitigation measures outlined below will be implemented during the operational phase of the Proposed Development

14.6.6 Site occupants / users / neighbours – Further to the results of future ground investigation, appropriate gas protection measures may be required in new buildings.

14.6.7 Site workers – The risk to Site workers during any subsequent maintenance works relates to the risk of skin contact, inhalation and ingestion of any residual as yet undetermined contaminated material on Site. In accordance with current health and safety legislation, the maintenance contractor will be required to adopt measures to mitigate the risk to Site workers.

14.6.8 Ground water – The placement of buildings / hardcover, as well as replacement of the existing surface water drainage system will mitigate against the risk of potential mobilisation / migration of any residual potential contaminants. The removal and / or remediation of any contamination sources discovered, together with any localised remedial action necessary, will reduce the risk of migration of contaminants impacting ground waters.

14.6.9 Ecology and wildlife – Incorporation of measures to mitigate against potentially contaminated run-off e.g. bunding in areas of fuel and chemical storage, adoption of oil / silt interceptors in drainage design, control valves on outlet structures to ponds and drainage features etc.

14.7 Summary

14.7.1 The potential adverse effects of the Development related to ground contamination are assessed as the risk to Site workers during the construction works associated with any ground contamination and to ground / surface waters and ecology due to the potential migration of contaminants from construction activities. Effects of these risks will be mitigated through the implementation of appropriate mitigation measures.

14.7.2 As noted in the Scoping Opinion a soil management strategy will be prepared at the reserved matters stage and included in the CEMP.

14.7.3 It is therefore concluded that the adverse potential effects associated with ground contamination do not pose an unacceptable constraint to the Proposed Development and no significant environmental effects will arise.

15. Cumulative effects

15.1 Scope of the assessment

15.1.1 The cumulative effects assessment considers both in-combination effects from the Proposed Development and cumulative effects resulting from the Proposed Development and other large developments within Cambridge.

15.1.2 The scope of the in-combination assessment includes all the receptors where effects have been identified in the other assessment chapters (Chapters 6-14 inclusive). The assessment considers all receptors that have been identified in more than one of the environmental topics as being affected by the Proposed Development. Construction and operational effects are both considered.

15.1.3 The cumulative assessment considers all large developments within Cambridge that are planned or reasonably foreseeable. Projects that are considered as part of the baseline are not included in the cumulative assessment. Effects are considered by assessing the impacts from all the identified developments as if they were a single development.

15.1.4 Table 15.1 shows the cumulative assessment issues raised in the Scoping Opinion.

Table 15.1 Cumulative effects scoping response

Issue raised	Respondent
It is recommended that health and wellbeing issues which are related to cumulative impact are assessed in greater detail. For example socio-economic impacts, noise and vibration, and air quality, should be linked to potential effects on health and wellbeing of existing and new residents and workers.	Cambridge City Council
The development in combination with other current applications: approved but uncompleted projects; projects which are reasonably foreseen; and other ongoing activities should be included in the ES	Cambridge City Council
The ES should include an impact assessment to identify, describe, and evaluate the effects that are likely to result from the project in combination with other projects and activities that are being, have been or will be carried out. The following types of projects should be included in such an assessment (subject to available information): • Existing completed projects • Approved but uncompleted projects • Ongoing activities • Plans or projects for which an application has been made and which are under consideration by the consenting authorities • Plans and projects which are reasonably foreseeable	Natural England

15.1.5 Cumulative issues around health and wellbeing are assessed as part of the socio-economic assessment in Chapter 9. All other issues identified in Table 15.1 are addressed in this chapter.

15.2 Relevant legislation

15.2.1 Schedule 4 of the Town and Country Planning (Environmental Impact Assessment) Regulations 2011 (as amended 2015), identifies the information that is to be included in the ES. Part 1 of Schedule 4 of the Regulations state that cumulative effects should be described in the ES.

15.3 Method of assessment

Establishing the baseline

15.3.1 For in-combination effects the baseline has been established within each of the relevant environmental assessment chapters.

15.3.2 For cumulative effects the first stage is to produce a list of the projects which may result in cumulative effects. The baseline is then established by combining the baselines from the relevant chapters of the ESs from each of the projects. For example there may be cumulative ecological effects from the Proposed Scheme and Project A. In this case the cumulative effects baseline would be a combination of the ecological baselines from both projects.

Impact assessment

15.3.3 In-combination effects are considered significant if two or more impacts resulting in significant effects occur to a single receptor at the same time. For example, residents from a nearby dwelling may experience significant nuisance from fouling dust emissions at the same time as significant construction noise impacts.

15.3.4 Table 15.2 sets out the significance criteria for in-combination effects. Moderate and major effects are considered significant. Minor effects are not considered significant.

Table 15.2 In-combination significance criteria

In-combination significance	Definition
None	A single impact resulting in a significant effect occurs to an individual or group of receptors.
Minor	A single impact resulting in a significant effect and other impacts that do not result in significant effects occur to an individual or group of receptors.
Moderate	Two impacts resulting in significant effects occur to an individual or group of receptors.
Major	Three or more impacts resulting in significant effects occur to an individual or group of receptors.

15.3.5 For cumulative effects the assessment criteria used by each of the environmental assessment topics are used to determine if a significant cumulative effect occurs. Cumulative effects are considered significant if the assessment rating changes. For example if an impact from the Proposed Development alone results in a moderate effect, but combined with the other large developments gives rise to a major effect, this is considered a significant cumulative effect.

15.3.6 The baseline for the operational assessment is 2031 which is when the previous masterplan would be fully constructed. By this time it is anticipated that all of the identified major projects that could give rise to cumulative effects will also be operational and these have been considered in the baseline of the impact assessment for the Proposed Scheme. Any cumulative effects during the operation of the Proposed Scheme are considered in the assessment chapters.

15.3.7 Ecology is the exception to this as the ecology baseline is 2015 when the habitat and species surveys were undertaken. The cumulative effects assessment therefore considers all environmental topics for the construction phase but only ecology for the operational phase.

15.3.8 For both in-combination effects and cumulative effects, professional judgement has been used to inform the assessment, taking into account relevant factors such as the duration and reversibility of the effects.

15.3.9 The transport modelling used as the basis for the transport assessment and transport related assessments in the air quality and noise and vibration chapters is based on the assumption that future developments identified in the Local Plan have been constructed. To predict a future baseline without the future development based purely on the TEMPRO growth rates would create an unrealistic forecast of the impacts because it would fail to take into account how the network behaves in terms of redistribution of traffic. The approach taken considers all future developments against a future baseline so considers the total transport related effects of cumulative development. Total cumulative effects for traffic and transport, air quality, and noise and vibration assessments are intrinsic to the assessments in the respective chapters and are not considered further in this chapter.

15.4 Baseline conditions

In-combination effects

15.4.1 For in-combination effects the baseline has been established within each of the relevant environmental assessment chapters.

Cumulative effects

15.4.2 The projects which have been considered in the cumulative effects assessment are as follows:

- North West Cambridge;
- National Institute of Agricultural Botany (NIAB);
- Orchard Park;
- Northstowe; and
- West Cambourne.

15.4.3 Figure 15.1 shows the location and scale of each of these projects and how they relate geographically to the Site and the Proposed Scheme.

North West Cambridge

15.4.4 North West Cambridge is a 150 hectare site located approximately 50m north of the Site, immediately north of Madingley Road, Madingley Road park and ride and the Conduit Head Road Conservation Area. Cambridge City Council granted outline planning permission in February 2013 for a development defined comprising:

- Up to 3,000 new dwellings;
- Up to 2,000 student bed spaces;
- 100,000m^2 of new employment floorspace comprising commercial employment, sui generis research uses, academic employment, and, retail floorspace;
- Community centre;
- Indoor sports provision;
- Social infrastructure including police, primary health care, school, nurseries, community residential;
- Hotel (130 rooms);
- Associated infrastructure including access roads, pedestrian, cycle and vehicle routes, parking, energy centre, provision and/or upgrade of services and related service media and apparatus including pumping stations, substations and pressure regulators, drainage works (including sustainable ground and surface water attenuation and control);
- Open space and landscaping (including parks, play areas, playing fields, allotments, water features, formal/informal open space, maintenance sheds, pavilions and support facilities);
- Works to Washpit Brook (including enlarged channel, storage area and flow control structure);
- Earthworks to provide revised ground contours; and
- Demolition of existing buildings and structures.

15.4.5 The planning permission granted also included detailed proposals relating to highway works to Madingley Road.

15.4.6 A number of reserved matters applications relating to phase 1 were approved between July 2013 and February 2014. Construction of phase 1 is currently under way.

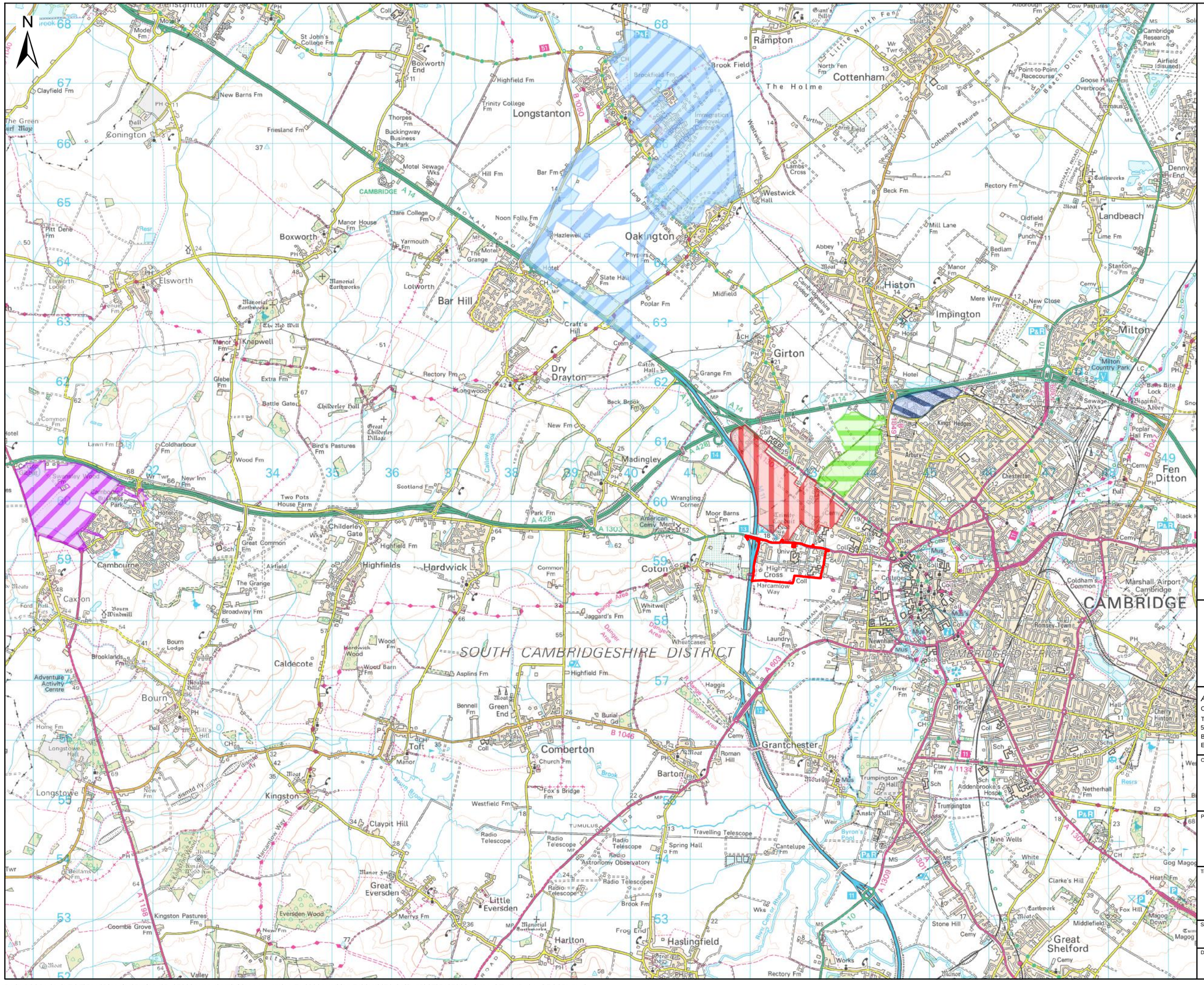
15.4.7 The outline planning application was accompanied by an Environmental Statement which identified the following environmental effects;

- Socio-economics – minor and moderate beneficial effects;
- Landscape and visual – minor to moderate adverse effects for landscape character areas, minor to major adverse effects for visual receptors and minor to moderate effects from night time lighting;
- Ecology – minor beneficial to minor adverse effects;
- Soils and geology – minor beneficial effects;
- Historic environment – major adverse effects on archaeology, minor to moderate adverse effects on built heritage;
- Agriculture – minor to major adverse effects;
- Traffic and transport – moderate beneficial to moderate adverse effects;
- Noise and vibration – moderate beneficial to minor adverse effects; and
- Air quality – minor adverse effects;

National Institute of Agricultural Botany (NIAB)

15.4.8 The NIAB site is located just north west of the North West Cambridge site between Huntingdon Road and Histon Road. The NIAB site will comprise four separate development proposals:

1. NIAB Frontage;
2. Darwin Green 1;
3. Darwin Green 2; and
4. Darwin Green 3.



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Client

University of Cambridge

Project

West Cambridge Masterplan EIA

Title

Location of Major Projects in and around Cambridge
Figure 15.1

Sheet Size	Original Scale	Designed / Drawn	Checked	Authorised
A3	1:60,000	RJS Date 01/06/16	SJD Date 01/06/16	DP Date 01/06/16

Drawing Number: 5137998_CAM_CT_LMP

Rev: 01

Path: P:\GBLOW\LEGE\PLH\Planning\Projects\5137998 West Cambridge Masterplan EIA\600 Working Folders\670 GIS\WIP\CT\5137998_CAM_CT_LMP_01_GEO051.mxd

15.4.9 To date outline planning permissions have been granted for the NIAB Frontage site, and Darwin Green 1. NIAB Frontage was approved in 2008 and construction is nearly complete with 150 of the 187 houses constructed. It is anticipated that construction will be completed before the Proposed Development commences and, therefore, the NIAB Frontage is not considered further in this cumulative impact assessment since it will be part of the future baseline.

15.4.10 An outline planning application for Darwin Green 1 was approved in 2013 for a mixed use development comprising up to 1,593 dwellings, primary school, community facilities, retail units (use classes A1, A2, A3, A4 and A5) and associated infrastructure including vehicular, pedestrian and cycleway accesses, open space and drainage works.

15.4.11 The outline planning application was accompanied by an Environmental Statement which identified the following environmental effects:

- Landscape and visual – negligible to substantial adverse effects to visual receptors during construction and at opening reducing to negligible to slight adverse effects after 15 years, negligible to slight adverse effects to landscape character areas;
- Ecology – negative impacts of local to district significance, positive impacts of local to district significance;
- Cultural heritage and archaeology – slight to moderate adverse effects on archaeology;
- Agriculture and soils – moderate adverse effects to farm businesses;
- Ground conditions and contamination – minor to moderate risk of encountering contamination;
- Drainage and flood risk – some improvements to flood risk for offsite properties;
- Traffic and transportation – overall improvements to traffic and transport receptors;
- Noise and vibration – no significant noise or vibration effects;
- Air quality – no significant air quality effects;
- Socio-economics – local socio-economic benefits; and
- Waste – minor to moderate environmental effects.

15.4.12 Although the proposed developments at Darwin Green 2 and 3 are allocated in the Local Plan there are no firm proposals at present and no assessment has been undertaken of the potential effects of these future phases.

Orchard Park

15.4.13 Orchard Park is a 30 hectare land parcel located on the northern outskirts of Cambridge, approximately 2.6km north east of the Site. The site is allocated for 900 houses with the possibility of an additional 220, a primary school, two hotels, a community centre, a local centre, and public open space. As much of the development has already been constructed it forms part of the baseline for the assessment in this ES.

15.4.14 A further planning permission has been granted to develop parcels A and B and allows for 112 dwellings, a mixed use building comprising 7 retail units and 28 flats, and associated landscaping and open space.

15.4.15 The proposal was not considered EIA development by South Cambridgeshire District Council and so no significant effects were considered likely. A number of supporting environmental studies accompanied the planning application which included the following:

- Ecology appraisal;
- Archaeological management plan;
- Transport statement;
- Air quality assessment;
- Noise mitigation report; and
- Flood risk assessment.

Northstowe

15.4.16 Northstowe is a planned new town located to the immediate north, east and south of Longstanton, approximately 3.7km to the north east of the Site. An initial planning application was approved in 2007 for 9,500 homes. A subsequent masterplan was produced in 2012 which included two phases. The application for phase 1 was approved in 2013 and allowed for 1,500 dwellings, a primary school, local retail and community facilities, employment land, formal and informal open space and associated infrastructure.

15.4.17 An EIA accompanied the planning application for phase 1 which identified the following environmental effects:

- Landscape and visual – substantial adverse effects to the landscape character, slight to very substantial adverse effects to visual receptors;
- Cultural heritage – temporary moderate adverse effects to an archaeological receptor;
- Natural heritage – moderate adverse to moderate beneficial effects;
- Traffic and transport – no significant effects;
- Air quality – moderate adverse effects from dust during construction;
- Noise and vibration – no significant effects;
- Geology, hydrogeology and contamination – no significant effects;
- Water resources, flooding and drainage – moderate beneficial effect; and
- Community, social and economic effects – slight adverse to substantial beneficial effects.

West Cambourne

15.4.18 An outline planning application was submitted to South Cambridgeshire District Council in December 2014 for a mixed use development comprising up to 2,350 new residential units, offices and/or light industrial units, community and leisure facilities, two primary schools, one secondary school and associated landscaping and infrastructure.

15.4.19 The site is approximately 148ha in area and is located immediately west of Cambourne, approximately 11.3km west of the Site.

15.4.20 The outline planning application was accompanied by an Environmental Statement which identified the following environmental effects:

- Landscape and visual – temporary moderate adverse effects to landscape character and temporary major to moderate adverse effects to visual receptors during construction. Effects would be negligible during operation;

- Ecology – adverse effect to farmland birds during construction. Major / moderate beneficial to major / moderate adverse effects during operation;
- Transport – negligible effects during construction and no effects during operation;
- Air quality – no significant effects during construction and negligible effects during operation;
- Noise and vibration – negligible to moderate adverse effects during construction and no effects during operation;
- Hydrology and water resources – negligible effects during construction and negligible to minor beneficial effects during operation;
- Archaeology and cultural heritage – minor to moderate adverse effects during construction and adverse effects during operation;
- Waste – negligible effects during construction and operation; and
- Socio-economics – temporary minor to moderate beneficial effect during construction and operation.

15.5 Impact Assessment

In-combination effects

Construction

15.5.1 Table 15.3 shows all the receptors which are considered in more than one of the assessment chapters and notes the effects identified in each chapter. The table only shows those receptors which are considered in more than one chapter and could result in in-combination effects. Appendix 15.1, Volume 3 shows the full assessment with all receptors considered in the ES

15.5.2 Table 15.3 shows that residents living at The Lawns and Perry Court off Clerk Maxwell Road will experience significant adverse visual and noise effects. When considered in-combination the effect of these impacts is significant so that residents' amenity will be adversely affected. This is a significant adverse effect.

Table 15.3 In-combination construction effects. Blank cells show that no effect was identified.

Receptor impacted by Proposed Development	Assessed impact									Number of minor impacts	Number of moderate impacts	Number of major impacts	In-combination significance
	Ecology	Historic environment	Landscape and visual	Socio-economics	Traffic and transport	Air quality	Noise and vibration	Water environment	Ground conditions				
Madingley Woods Site of Scientific Interest (SSSI)	Neutral **Not significant**					Negligible **Not significant**				0	0	0	None
Adams Road Sanctuary City Wildlife Site (CIWS)	Minor adverse **Not significant**							Low adverse **Not significant**		1	0	0	None
Great crested newts	Neutral **Not Significant**								Minor adverse **Not significant**	1	0	0	None
Badgers	Minor adverse **Not significant**								Minor adverse **Not significant**	2	0	0	None
Birds	Minor adverse **Not significant**								Minor adverse **Not significant**	2	0	0	None
Viewpoint 5 Clerk Maxwell Road			Moderate adverse **Significant**			Negligible **Not significant**	Minor **Not significant**			1	1	0	Minor adverse **Not significant**
Viewpoint 12 Madingley Road (East)			Slight adverse **Not significant**			Negligible **Not significant**	Minor adverse **Not significant**			2	0	0	None
Security				Negligible adverse **Not significant**						0	0	0	None
Coton Brook on Site (reaches 1 to 5 inclusive)	Minor adverse – minor beneficial **Not significant**							Low adverse **Not significant**		1	0	0	None

Operation

15.5.3 As no receptors are considered in more than one of the impact assessment chapters in relation to operation, there are no in-combination effects to address. Appendix 15.1, Volume 3 shows the full in-combination assessment for the operational phase of the Proposed Development.

Cumulative effects

Construction phase

15.5.4 Table 15.4 lists all those receptors that would be impacted by the construction of the Proposed Scheme and notes any impacts from the other developments shown on Figure 15.1, summarising the potential for significant cumulative effects.

Table 15.4 Construction phase cumulative effects assessment

Baseline		Impact assessment								
Receptor	**Value**	**Proposed Development**	**North West Cambridge**	**NIAB**	**Orchard Park**	**Northstowe**	**West Cambourne**	**Cumulative effect**	**Cumulative Impact magnitude**	**Significance of effect**
Designated ecological sites	National to local	Minor adverse effects will occur to Adams Road Sanctuary City Wildlife Site (CIWS) due to works in the upper reaches of Coton Brook impacting downstream water quality.	None	None	Potential to affect King's Hedges Hedgerow CIWS due to dust.	None	Negligible effect on designated sites due to intervening distances.	None of the developments will affect the same designated ecological site. Cumulative effects to any individual designated ecological site will not arise.	Negligible	Negligible **Not significant**
Habitats	Site	Minor adverse effects will occur to water bodies and green corridors on site during construction due to temporary habitat loss and impacts to water quality.	Adverse effect due to the loss of short sections of hedgerow.	Locally significant effects due to the loss of on-site arable farmland, scrub, ditches, ponds, and small sections of hedgerow.	Habitats within the site which will be lost are of negligible to site value.	Moderate adverse effect due to loss of grassland and arable habitats.	Minor to negligible effects due to the removal of hedgerows,	Across all sites existing habitats will inevitably be lost. The value of most habitats on Site is at the site or local level only and the most important habitats are the waterbodies and green corridor. Impacts to water bodies will be temporary whilst physical works are undertaken to increase their volume after which they will be restored and improved. This will not result in cumulative effects with the NIAB development where surface water bodies will be completely lost. The green corridor is orientated east-west and links the M11 Scrub CiWS with sites within the City such as the Adams Road Sanctuary CWS. It does not link to habitats north of Madingley Road which are effectively severed by the road. Temporary loss of the corridor during construction will not result in adverse cumulative effects and will be enhanced and improved after construction.	Negligible	Negligible **Not significant**
Protected species	Local	Minor adverse effects will occur to Badgers, bats, and birds during construction due to increased disturbance and loss of foraging habitats.	Adverse effect to great crested newts, common toads, badgers, breeding birds, and brown hares due to the loss of habitat.	Adverse effects to bats foraging on site due to construction lighting. Locally to district significant adverse effects to badgers, brown hare, and birds due to a reduction in foraging habitat. Positive and adverse effects to water voles.	Loss of habitats will impact bird populations on site.	Moderate adverse effects due to the loss of skylark nesting habitat.	Major to moderate adverse effect to skylark due to a loss of habitat, minor adverse effect to yellow wagtail due to habitat loss and disturbance, temporary moderate to minor beneficial effect to corn bunting and grey partridge due to phasing creating set aside land.	All developments have reported an adverse impact to birds during construction due to habitat loss and disturbance. Cumulative effects to birds are likely to occur particularly around the West Cambridge, North West Cambridge and NIAB sites which all located relatively closely. As all these sites are at the edge of the city there is ample habitat in the surrounding countryside for birds to be displaced to so the loss of habitat from these sites is a minor cumulative impact. The same applies to the local badger population at West Cambridge, North West Cambridge and NIAB.	Minor	Minor **Not significant**
Invasive species	No conservation value	Minor beneficial effect due to the treatment and removal of invasive species on Site.	None	None	None	None	None	No invasive species impacts have been reported on any of the other developments. No cumulative effects will arise.	Neutral	Neutral **Not significant**

Baseline		Impact assessment								
Receptor	**Value**	**Proposed Development**	**North West Cambridge**	**NIAB**	**Orchard Park**	**Northstowe**	**West Cambourne**	**Cumulative effect**	**Cumulative Impact magnitude**	**Significance of effect**
Conservation areas	High	Slight adverse effect on the setting of the Central Cambridge Conservation Area and moderate adverse effects on the setting of the Conduit Head Road, and West Cambridge Conservation Areas due to construction works activities.	Negligible effects on conservation areas.	None	None	None	None	The North West Cambridge development reported negligible effects on all conservation areas within the study area which included Conduit Head Road, and West Cambridge Conservation Areas. These negligible effects will not result in cumulative effects to any conservation areas	No change	Neutral **Not significant**
Listed buildings	Medium to high	Moderate adverse effect on White House, and slight adverse effect on five other listed buildings due to impacts on their setting. Slight adverse effect to non-designated buildings on-Site due to their demolition.	Negligible effects on listed buildings. Minor to moderate adverse effect to Clements End and Conduit Rise locally listed buildings. Moderate adverse effect to two locally listed buildings on-site due to demolition.	None	None	Potential adverse effects to a listed water pump due to construction traffic passing nearby.	Moderate to minor adverse effect to non-designated medieval moated site at Swansley Farm due to extensive changes to setting.	The only development which could result in cumulative effects to the listed buildings impacted by the Proposed Scheme is North West Cambridge. The North West Cambridge ES reported adverse effects to a number of listed and locally listed buildings, but none of these will be impacted by the Proposed Scheme. Cumulative effects to listed buildings will not arise.	No change	Neutral **Not significant**
Landscape character areas (LCA)	Low to high	Slight adverse effects to the Site and West Cambridge Central Core LCAs, and moderate adverse effects to Coton LCA due to a loss of tranquillity and impacts to setting during construction.	Minor adverse effects to Regional Character Area 3 – Western Claylands, major adverse effects to LCA 5 and minor adverse effects to LCA 2 due to re-definition of the western urban edge of Cambridge.	Slight to moderate adverse effects to Southern Fen Edge LCA, and slight adverse effects to Huntingdon Road LCA due to impacts on the open landscape from construction activities, cranes and scaffolding.	None	Slight adverse effects to Lowland Village Farmlands LCA, Planned Silt Fen LCA, Planned Peat Fen LCA, and Wooded Village Farmlands due to visibility of cranes.	Moderate adverse effect to landscape character due to construction activities being uncharacteristic to the existing landscape.	All of the developments will result in an increase in urban development in the north west of Cambridge. Northstowe and West Cambourne are sufficiently distant from Cambridge so as to not affect the landscape character areas influenced by the other developments. The Proposed Scheme combined with North West Cambridge, NIAB, and Orchard Park will result in a large area under construction at the same time, assuming that construction programmes overlap. This will result in large change to the peri-urban character for the duration of construction. The cumulative magnitude of impact for this urban extension is large adverse.	High adverse	Moderate to large adverse (depending on LCA) **Significant**
Key viewpoints	Low to high	Large adverse effects to four viewpoints, moderate adverse effects to two viewpoints and slight adverse effects to thirteen viewpoints due to the introduction of cranes and tall plant into views.	Minor adverse effect to five key viewpoints due to the introduction of construction activities into the existing views.	Substantial adverse effects to four viewpoints, moderate to substantial adverse effects to one viewpoint, moderate adverse effects to one viewpoint, slight to moderate adverse effects to one viewpoint, and slight adverse effects to two viewpoints due to views of construction activities.	None	Slight adverse effects to nine viewpoints, moderate adverse effects to four viewpoints, substantial adverse effects to nine viewpoints, and very substantial adverse effects to three viewpoints due to construction activities and plant appearing in views.	Major to minor adverse effects to viewpoints due to varying degrees of visibility of construction works.	With the exception of Orchard Park all of the developments will result in adverse effects to visual receptors. The only visual receptor impacted by the Proposed Scheme which also has views of the other developments is Viewpoint 1 at the Coton Countryside Reserve which has commanding views of both the Site and the North West Cambridge site. When the baseline was recorded for this viewpoint construction at North West Cambridge was well underway as demonstrated by the presence of cranes in the photomontages. Potential cumulative impacts have therefore already been considered in the assessment and no further consideration is required.	None	Neutral **Not significant**

Baseline		Impact assessment								
Receptor	**Value**	**Proposed Development**	**North West Cambridge**	**NIAB**	**Orchard Park**	**Northstowe**	**West Cambourne**	**Cumulative effect**	**Cumulative Impact magnitude**	**Significance of effect**
Employment	Medium	Moderate beneficial effects will arise due to the direct and indirect creation of 1,000 jobs at the local level and 1,200 jobs at the regional level.	Significant benefits will arise due to job creation during construction. It is expected many of these will be sourced nationally resulting in leakage.	Beneficial effect due to job creation during construction. It is anticipated these jobs will mainly be sourced from outside of the region.	None	Small beneficial effects will arise from the direct employment of up to 250 construction workers on-Site. Likely to be a mix of local workers and workers from further afield.	Moderate to minor beneficial effects due to the creation off 331 construction jobs per month.	All of the developments will result in an increase in construction work opportunities although as not all the developments have quantified the predicted number of construction workers required this is difficult to quantify. As the construction programmes of all the developments are likely to overlap to some degree, given the large time scales involved, there is likely to be a cumulative benefit to employment. The construction sector in Cambridge and South West Cambridge is generally under represented compared to national averages so the cumulative benefits of this increased employment is likely to be felt outside the region.	Moderate beneficial	Moderate beneficial **Significant**
Local economy	Moderate	Minor beneficial effects to the local economy will result due the use of local supply chains and construction worker expenditure.	Not directly assessed but assumed to be beneficial due to increased employment, supply chains, worker expenditure etc.	Not directly assessed but assumed to be beneficial due to increased employment, supply chains, worker expenditure etc.	None	Not directly assessed but assumed to be beneficial due to increased employment, supply chains, worker expenditure etc.	Not directly assessed but assumed to be beneficial due to increased employment, supply chains, worker expenditure etc.	Although employment benefits from construction are likely to be mainly felt outside the region, a proportion of new construction jobs will be catered for by local demand. In addition there will be the local economic benefits of supply chains, and businesses catering for construction workers. There will be a cumulative benefit to the local and regional economy from all of the developments collectively.	Low beneficial	Minor beneficial **Not significant**
Local residents / businesses	Moderate	Minor adverse effects to local businesses and residents will arise during construction due to temporary disruption.	None	None	None	None	None	No other developments anticipated effects to local residents and businesses so cumulative effects to these receptors are unlikely to arise.	Negligible	Negligible **Not significant**
Security	Low	Negligible security effects will occur as the work site will remain secure and guarded throughout construction.	None	None	None	None	None	No other developments anticipated effects to security so cumulative effects are unlikely to arise.	Negligible	Negligible **Not significant**
Housing and services	Low	Negligible adverse effects to housing and services will result from increased demand from construction workers.	None	None	None	None	Negligible	No other developments anticipated effects to housing and services so cumulative effects to these receptors are unlikely to arise.	Negligible	Negligible **Not significant**
Dust receptors	Medium	Negligible effects from dust will occur due to effective implementation of standard mitigation measures.	Negligible effects from dust will occur with mitigation in place.	None	Minor to negligible adverse effects to residential and school receptors with mitigation.	Moderate adverse effects to residential receptors and schools within 200m of construction works.	Negligible effects from dust will occur due to effective implementation of standard mitigation measures.	With the exception of Northstowe, all projects are predicted to result in negligible or minor effects from dust due to the implementation of effective standard mitigation measures. At Northstowe only receptors within 200m of dust generating activities will be impacted. As the Site is substantially further than 200m from Northstowe none of the receptors impacted by Northstowe could be impacted by the Proposed Development	No change	Negligible **Not significant**

Baseline		Impact assessment								
Receptor	**Value**	**Proposed Development**	**North West Cambridge**	**NIAB**	**Orchard Park**	**Northstowe**	**West Cambourne**	**Cumulative effect**	**Cumulative Impact magnitude**	**Significance of effect**
Noise and vibration receptors	Medium to high	Minor adverse effects to receptors off site and moderate adverse effects to receptors on Site will occur due to construction activities and the operation of construction plant.	Negligible to minor adverse noise and vibration effects during construction to nearby sensitive receptors.	No impacts to receptors due to separation distance.	None	Small adverse effect to residents at Magdalene Close, Longstanton and large adverse effect to residents occupying initial stages of development due to piling. Mitigation will ensure that no significant noise effects arise.	Negligible noise and vibration effects during construction to nearby sensitive receptors.	Negligible to minor noise and vibration effects will be experienced by receptors in close proximity to all the developments except Orchard Park and NIAB. As both noise and vibration impacts lessen substantially over distance, receptors over 200m from construction activities are unlikely to be impacted. Off-site receptors who will experience minor adverse effects from noise and vibration during construction of the Proposed Development will not be impacted by any of the other developments due to the separation distance.	Negligible	Negligible **Not significant**
Surface water bodies	Low to high	Negligible to low adverse effects to surface water bodies during construction due to physical alterations of the upper reaches of Coton Brook and potential risk of contaminated runoff from construction works areas.	Minor beneficial effect to Washpit Brook due to improved ecological design.	None	None	Mitigation measures will ensure no significant effects occur to surface water bodies due to contaminated runoff during construction.	Mitigation measures will ensure no significant effects occur to surface water bodies due to contaminated runoff during construction.	The Proposed Development will result in temporary adverse effects to the upper reaches of the Coton Brook due to the requirement to re-profile these reaches to increase capacity. None of the other developments will impact on the Coton Brook or its catchment so no cumulative effects will arise.	Negligible	Negligible **Not significant**
Ground water	Very low	Minor adverse effects to ground water due to the risk of contamination during construction. Ground water is not in continuity with nearby aquifers.	None	Mitigation means that no effects will arise.	None	Mitigation will ensure that no significant effects occur to groundwater due to contamination, from new pollution sources or pathways.	Mitigation will ensure that no significant effects occur to groundwater due to contamination, from new pollution sources or pathways.	For all developments, mitigation measures will be put in place to protect ground water during construction. The clay underlying the Site is an effective aquatard that will prevent the contamination of ground water so no effects are anticipated. No cumulative effects to ground water will occur	Negligible	Negligible **Not significant**
Construction workers	Low	Negligible / minor adverse effects due to the potential for contaminated land to be present.	None	Mitigation means that no effects will arise.	None	Mitigation will ensure that no significant adverse effects occur to construction workers handling potentially contaminated material.	None	There is very little potential for contamination on the Site and mitigation such as PPE for workers will prevent effects occurring if contamination is encountered. Construction workers are unlikely to be working on more than one site at a time so cumulative effects to this receptor will not occur.	Negligible	Negligible **Not significant**

Operational phase

15.5.5 Table 15.5 lists all those receptors that will be impacted during operation of the Proposed Scheme and notes any impacts from the other developments shown on Figure 15.1, summarising the potential for significant cumulative effects

Table 15.5 Operational phase cumulative effects assessment

Baseline		Impact assessment								
Receptor	**Value**	**Proposed Development**	**North West Cambridge**	**NIAB**	**Orchard Park**	**Northstowe**	**West Cambourne**	**Cumulative effect**	**Cumulative Impact magnitude**	**Significance of effect**
Protected species	Local	Neutral effect on bats during operation as there is limited bat activity on Site.	Adverse effect to great crested newts and toads due to severance of the population. Increased disturbance to badgers.	Positive effect to bats due to habitat enhancements. Farmland birds will decline on-site whilst numbers of urban species will increase. Locally significant adverse effect to brown hares due to increased disturbance. Beneficial effects to badger due to proposed mitigation.	None	None	Major to minor adverse effects to farmland birds due to loss of habitat and increased disturbance. Major to minor beneficial effects to great crested newts, bats, badgers, and birds due to habitat creation.	No effects to protected species are predicted to occur from the Proposed Development once operational so no cumulative effects will arise.	Negligible	Negligible **Not significant**
Conservation areas	High	Slight adverse effect to Central Cambridge Conservation Area, moderate adverse effect to Conduit Head Road Conservation Area and West Cambridge Conservation Area due to the impact of the Proposed Development on their setting.	Negligible effects on conservation areas.	None	None	Medium to small change to the setting of Longstanton Conservation Area due to the increased presence of development, minor changes to key views, and loss of the agricultural context.	None	The Proposed Development will impact Central Cambridge Conservation Area, Conduit Head Road Conservation Area and West Cambridge Conservation Area. None of the other developments will impact these conservation areas so no cumulative effects will occur.	No change	Neutral **Not significant**
Listed buildings	Medium to high	Moderate adverse effect to White House grade II* listed building and minor adverse effects to five other listed buildings due to the impact of the Proposed Development on their setting.	Moderate to minor adverse effects to one locally listed building, Ascension burial ground chapel, due to impacts to setting.	None	None	Negligible effects to two listed churches in Longstanton.	Moderate adverse effect to two scheduled monuments due to change in setting. Minor adverse effects to the non-designated Swansley Farm moated site due to a change in setting.	The Proposed Development will impact the setting of White House and five other listed buildings. None of these will be impacted by any of the other developments so no cumulative effects will arise.	No change	Neutral **Not significant**

Baseline		Impact assessment								
Receptor	**Value**	**Proposed Development**	**North West Cambridge**	**NIAB**	**Orchard Park**	**Northstowe**	**West Cambourne**	**Cumulative effect**	**Cumulative Impact magnitude**	**Significance of effect**
Landscape character areas (LCA)	Low to high	Large adverse effect to Coton, and Grantchester LCAs, large to moderate adverse effect to West Cambridge Central Core LCA, moderate adverse effect to Madingley LCA, and slight adverse effect to North West Cambridge, and High Cross LCAs due to the urbanising effect of the Proposed Development.	Minor adverse effects to Regional Character Area 3 – Western Claylands, major adverse effects to LCA 5 and minor adverse effects to LCA 2 due to re-definition of the western urban edge of Cambridge.	Slight beneficial impact to Southern Fen Edge LCA., Western Arbury and King's Hedges LCA, and Huntingdon Road LCA due to improved landscape design on the site.	None	Slight adverse effects to Lowland Village Farmlands LCA, Planned Silt Fen LCA, Planned Peat Fen LCA, and Wooded Village Farmlands due to visibility of development.	Negligible effect due to screening planting.	All of the developments will result in an increase in urban development in the north west of Cambridge. Northstowe and West Cambourne are sufficiently distant from Cambridge so as to not affect the city's urban expansion. The Proposed Scheme combined with North West Cambridge, NIAB, and Orchard Park collectively represent a significant urban extension to the north west quadrant of Cambridge by extending the urban environment towards the green belt. The cumulative magnitude of impact for this urban extension is large adverse.	High adverse	Moderate to large adverse (depending on LCA) **Significant**
Key viewpoints	Low to high	Large adverse effects to two viewpoints, large to moderate adverse effects to two viewpoints, moderate adverse effects to two viewpoints, moderate to slight adverse effects to five viewpoints, and slight adverse effects to seven viewpoints due to the introduction of new urban elements into existing views.	Minor adverse effects to nine viewpoints, moderate adverse effects to one viewpoint, and major adverse effects to two viewpoints due to the introduction of new urban elements into existing views.	Slight adverse effects to six viewpoints fifteen years after construction due to an urbanising effect on views.	None	Slight adverse effects to nine viewpoints, moderate adverse effects to four viewpoints, substantial adverse effects to nine viewpoints, and very substantial adverse effects to three viewpoints due to the proposed scheme appearing in views.	Moderate adverse to negligible effects due to varying degrees of views being impinged by the proposed scheme.	With the exception of Orchard Park all of the developments will result in adverse effects to visual receptors. The only visual receptor impacted by the Proposed Scheme which also has views of the other developments is Viewpoint 1 at the Coton Countryside Reserve which has commanding views of both the Site and the North West Cambridge site. The combination of both developments within this view will increase the perception of urban encroachment resulting in cumulative effects on this high value viewpoint.	Medium adverse	Moderate adverse **Significant**
Employment	Moderate	Major beneficial effects due to the direct creation of 11,600 new jobs on Site.	Moderate beneficial effect due to the creation of 4,350 new jobs on site.	Beneficial effect due to the creation of 64 net new jobs on site.	None	Medium to large beneficial effect due to the creation of 666 new jobs on site.	Moderate to minor beneficial effect due to the creation of employment land which will serve 1,076 new FTE jobs.	The combined total of direct new jobs anticipated to be delivered by all of the developments is 17,756 which is a substantial increase from the Proposed Development alone. In addition there will be many more indirect jobs created resulting in a substantial beneficial cumulative effect.	High beneficial	Major beneficial **Significant**
Local economy	Moderate	Major beneficial effect due to the predicted generation of £476.6 million per annum Gross Value Added to the regional economy.	Not directly assessed but assumed to be beneficial due to increased employment.	Not directly assessed but assumed to be beneficial due to increased employment.	None	Not directly assessed but assumed to be beneficial due to increased employment.	Moderate to minor beneficial effect due to expenditure of new workers and residents.	The combined effect of the new economic activity that will be generated by the six new developments and the cumulative total of 17,756 new jobs will be beneficial to the local and regional economy.	High beneficial	Major beneficial **Significant**
Socio-economic policy objectives	High	Major beneficial effect due to the Proposed Development significantly supporting key targeted growth areas including academic, high-technology, and research and development.	Not directly assessed but assumed to be beneficial due to provision of employment land, housing and services.	Not directly assessed but assumed to be beneficial due to provision of employment land, housing and services.	Not directly assessed but assumed to be beneficial due to housing and services.	Not directly assessed but assumed to be beneficial due to provision of employment land, housing and services.	Not directly assessed but assumed to be beneficial due to provision of employment land, housing and services.	All of the developments serve to meet socio-economic policy objectives for the local area and region by providing housing, services, and skilled employment in the academic, high-technology, and research and development sectors. There is a synergistic socio-economic relationship between these developments resulting in significant cumulative benefits.	High beneficial	Major beneficial **Significant**

Baseline		Impact assessment								
Receptor	**Value**	**Proposed Development**	**North West Cambridge**	**NIAB**	**Orchard Park**	**Northstowe**	**West Cambourne**	**Cumulative effect**	**Cumulative Impact magnitude**	**Significance of effect**
Security	Low	Negligible effect due to Site wide vitality and the designing out of security risks through site layout, landscape and lighting design.	None	None	None	None	None	None of the other developments have raised any security concerns that could result in effects. No cumulative effects will arise.	Negligible	Negligible **Not significant**
Housing and services	Low	Minor adverse effects to local housing and services due to increased demand created by the new jobs.	Negligible effect on demand as the proposal provides both housing and services to cater for new jobs.	Positive effect due to the provision of 1,593 new dwellings, school, and health centre.	Not assessed but assumed to be positive due to the provision of 112 new dwellings.	Substantial positive effect due to the provision of 1,500 new dwellings, school, retail and community facilities.	Moderate to minor beneficial due to the provision of 2,350 new dwellings, schools, leisure, and community facilities.	The local development plans of South Cambridgeshire and Cambridge City Council intend these developments to interact positively with housing provided at Northstowe and West Cambourne providing part of the housing and social infrastructure demands created by the provision of new jobs created particularly at the Proposed Development and North West Cambridge sites.	Moderate beneficial	Minor beneficial **Not significant**
Human health receptors (air quality)	High	Negligible effects to local residents and workers from the Proposed Development due to increases in emissions to air from increased traffic and the energy centre.	Negligible effects to local residents and workers from the scheme due to increases in emissions to air from increased traffic and the energy centre.	None	None	None	None	Cumulative emissions from transport have been considered in Chapter 11 (air quality) since the transport modelling data included future developments. Cumulative effects from the energy centre flues on the Proposed Development and the North West Cambridge development are unlikely to result in a cumulative reduction in air quality to local receptors due to the distance of separation between the two flues and resultant dispersion of emissions.	Imperceptible	Negligible **Not significant**
Noise and vibration receptors	Medium to high	Negligible effects to off Site receptors and minor to high adverse effects to on Site receptors due to noise from rooftop plant and the energy centre.	Negligible effects from fixed plant during operation.	None	None	No significant noise effects.	None	Noise effects from fixed plant on the different developments will only impact receptors within the developments. Cumulative effects will not arise.	Negligible	Negligible **Not significant**
Surface water bodies	Low to high	Negligible to low beneficial effects due to improved morphological and ecological design of the upper reaches of the Coton Brook and the extension of SUDs across the Site.	Minor beneficial effects to Washpit Brook due to improved water quality from drainage design.	None	None	Moderate beneficial effect due to the creation of new linear waterbodies and enhancement of the diverted section of Longstanton Brook.	Minor beneficial effects to surface watercourses due to improved water quality of runoff from treatment through SUDS.	All of the developments that are predicting an impact to surface water bodies will result in beneficial effects to the respective water bodies due to the installation of modern SUDs based drainage designs which will improve water quality. None of the receiving water courses for each of the developments are shared by any of the developments so no cumulative effects will arise to any of the surface water bodies.	Negligible	Negligible **Not significant**
Ground water	Very low	Negligible effects to ground water due to lack of continuity with deeper aquifers and the extension of SUDs across the Site.	None	Mitigation means that no effects will arise.	None	Mitigation measures will ensure that ground water is not significantly affected during operation of the scheme.	Negligible effects to groundwater due to low impermeability and low vulnerability of underlying aquifer.	For all developments, mitigation measures will be put in place to protect ground water during operation. The clay underlying the Site is an effective aquatard that will prevent the contamination of ground water so no effects are anticipated. No cumulative effects to ground water will occur	Negligible	Negligible **Not significant**

Baseline		Impact assessment								
Receptor	**Value**	**Proposed Development**	**North West Cambridge**	**NIAB**	**Orchard Park**	**Northstowe**	**West Cambourne**	**Cumulative effect**	**Cumulative Impact magnitude**	**Significance of effect**
Site users	Low	Minor beneficial effects to site users due to the remediation of any potential contamination on Site.	None	Mitigation would mean no effects would arise.	None	Mitigation measures will ensure that site users are not significantly affected by contamination.	None	There is unlikely to be any contamination on Site but if any is encountered, it will be remediated. Site users will not be affected by ground contamination at the Proposed Development or any of the other developments. No cumulative effects will arise.	Negligible	Negligible **Not significant**

15.6 Mitigation measures

In-combination mitigation

15.6.1 No additional mitigation measures would be necessary.

Cumulative mitigation

15.6.2 The only significant adverse cumulative effects relate to landscape and visual impacts. No further mitigation has been identified. No additional mitigation measures will be implemented beyond those listed in Chapters 6 to 14 and summarised in Chapter 16.

15.7 Summary

15.7.1 There is a potential for adverse in-combination effects to occur to residents off Clerk Maxwell Road at the Perry Close and the Lawns due to a combination of moderate adverse visual, and minor noise and vibration effects. This would not be significant and no additional mitigation would be required.

15.7.2 There will be significant adverse cumulative effects to landscape character areas to the north-west of Cambridge during both construction and operation. This is due to the westward encroachment and urbanisation of the city resulting from the combination of the Proposed Scheme, North West Cambridge, NIAB and, to a lesser extent, Orchard Park. There will also be significant cumulative effects to visual receptors at Viewpoint 1 in the Coton Countryside Reserve due to the commanding views over both the Proposed Scheme and North West Cambridge development resulting in an increase in urban encroachment into the views.

15.7.3 There will be significant beneficial cumulative socio-economic effects in the city and region during both during the construction and operational phases due to the combination of all six future developments assessed. This is due to the combined increase in employment land, housing, services, and the contribution these make to local, regional and national socio-economic policies.

16. Schedule of mitigation

16.1.1 Table 16.1 below provides a summary of all the mitigation proposed in the assessment chapters, determines who is responsible for implementing the mitigation, and when in the project lifecycle the mitigation would be implemented. This does not include measures that are already part of the design as these have already been implemented.

Table 16.1 Schedule of proposed mitigation measures

Assessment chapter	Mitigation measure	Secured through:
Ecology	As the Proposed Development is anticipated to be phased over 15 years it should be recognised that there are difficulties in accurately predicting the effects of the later stages of development. For example, a species that is common and has no legal protection at this time may decline in numbers and become protected by law before construction of the later stages of development. Natural England and the Cambridge City Council ecologist will be consulted prior to submission of the reserved matters applications to determine if any new or further are surveys, as appropriate, are needed to support future reserved matters applications.	Planning condition
	A protective exclusion buffer will be established around the Coton Path Hedgerow CWS and remaining extent of the Scrub East of M11 CiWS and clearly marked with netlon fencing or equivalent for the duration of construction works in the vicinity of the CWS.	Planning condition
	Replacement aquatic and marginal planting within the surface water bodies re-profiled to increase drainage capacity will be of equivalent or better habitat value than existing.	Planning condition
	The new profile and plan of the waterbodies (D3, D4 and D5) and ponds (P2, P3 and P5), which will be re-engineered to increase drainage capacity, will maximise ecological value by providing a variety of physical habitats. Hard engineering structures along the banks of these surface water bodies will be minimised with preference given to softer natural banks planted with species to maximise ecological value.	Planning condition
	To minimise the risk of harm and disturbance to great crested newts, a Precautionary Method of Working (PMW) will be produced and implemented during the construction phase for all works within 500m of the ponds within Madingley Road Park and Ride, Adams Road Sanctuary CiWS and Birds Sanctuary, Conduit Head CiWS. This will include measures such as hand-searching of potential refuges within working areas, supervised clearance of suitable habitat, and provision of toolbox talks to workers.	Planning condition
	A 50m exclusion buffer zone around the artificial badger sett will be maintained and marked with netlon fencing or equivalent for the duration of construction works that occur in the vicinity of the sett. No works activities will proceed within the buffer without further consultation with Natural England and the Cambridge City Council ecologist first to agree additional protection measures. This may include the submission of an application for a Natural England licence to interfere or prevent damage to the sett.	Planning condition
	A survey of the existing artificial badger sett will be undertaken prior to any construction works within 50m of the sett to check for any further expansion and levels of activity.	Planning condition
	Green corridor links to the existing hedgerows and surrounding countryside from the artificial badger sett will be maintained and protected throughout construction.	Planning condition
	Update surveys will be required for buildings and trees a season before any proposed demolition and vegetation clearance during the construction phase for works taking place after 2017.	Planning condition
	A bat box suitable for pipistrelle bats (such as a Schwegler bat box) will be installed on buildings or trees within approximately 50m of the existing building W27 to replace the loss of the confirmed transitional roost at this location.	Planning condition
	Currently an application to Natural England for a protected species licence will be required for the demolition of building W27 and further surveys will be required one season before the demolition of this building to support the application for a Wildlife Licence from Natural England. Works will be undertaken under the watching brief of an appropriately qualified ecologist to ensure bats are not harmed, killed or disturbed during demolition.	Planning condition
	Lighting schemes during construction and operation will be undertaken in accordance with wildlife and lighting guidance[7] which advises: • Minimisation of the spread of light spill; • Lowering the height of lighting columns; • Abstaining from lighting areas such as the M11 scrub, Coton footpath hedgerow and West Cambridge lake, effectively creating dark corridors and areas in which bats can still forage and commute around the Site; • Limiting the times lights are on to provide dark periods, if practical, especially during the peak summer months of June, July and August; • Using narrow spectrum light sources; • Using light sources that emit minimal ultra-violet light; • Using lights that peak higher than 550nm; and Avoiding white and blue wavelengths of the light spectrum.	Planning condition
	Dark corridors / areas around the M11 scrub, Coton Footpath hedgerow and West Cambridge lake will be provided during construction. Contractors should seek advice from a suitably qualified ecologist to enable this measure.	Planning condition
	Vegetation and building clearance will be undertaken outside of the bird nesting season if possible. The core bird nesting season is March to August inclusive, although some species have been recorded nesting during all months of the year and so care will be taken at all times. All vegetation and structures will be checked by a suitably trained and qualified ecologist prior to clearance to ensure no nesting birds are present. If active birds' nests are found, all works that could damage the nests will cease until the eggs have hatched and the young have fledged.	Planning condition

Assessment chapter	Mitigation measure	Secured through:
	Approximately 25 bird boxes suitable for house martins and 5 bird boxes suitable for swallows will be installed in areas close to the Department for Veterinary Medicine buildings and sports centre to replace the loss of, or disturbance to, existing nesting sites identified in the surveys.	Planning condition
	Prior to any construction works, checks will be undertaken by a suitably qualified botanist to ensure that new invasive species have not colonised the Site in the intervening period.	Planning condition
	All existing invasive plant species and any new invasive plant species found will be treated and removed from the Site by a specialist contractor before any construction works that could result in their disturbance and subsequent spread are undertaken.	Planning condition
Historic environment	As confirmed by the 2011 Whittle Laboratory excavations (Slater 2011), the north western side of the Vicar's Farm Roman settlement extends into the eastern portion of that facility's grounds. This will require excavation over approximately 3,375m^2. Of this, excluding the 2011-area, approximately 2,100m^2 lie exterior to that building's footprint and will require full excavation prior to the Laboratory's demolition; occurring within the footprint-area, the remaining portion (approximately1,275m^2) will require more summary investigation concurrent with the Laboratory's demolition.	Planning condition
	A limited degree of Iron Age occupation evidence was found during the course of the 2001 Nano-Fabrication Building Site investigations. The settlement is likely to have extended across at least part of the area of the Cavendish Laboratory complex, but where it was unfeasible to cut any trial trenches during the 2015 evaluation programme. Accordingly, upon vacating the Laboratory buildings (but prior to their demolition), a limited trenching programme will be conducted within the grounds; should further evidence of early settlement be recovered, then an appropriate excavation programme will occur in conjunction with the demolition works.	Planning condition
	Site 2 will require full open-area excavation when development proceeds there. The further investigation of the Site 3 field system and trackway – aside from its incidental exposure in Site 2 – can, within Field 1, be limited to the area of new major building footprints and any further areas that will be disturbed through excavation, augmented by additional trenching.	Planning condition
	Nano-Fabrication Building Site - A limited degree of Iron Age occupation evidence was found during the course of the 2001 investigations[20]. The settlement is likely to have extended across at least part of the area of the Cavendish Laboratory complex, but where it was unfeasible to cut any trial trenches during the 2015 evaluation programme. Accordingly, upon vacating the Laboratory buildings (but prior to their demolition), a limited trenching programme will be conducted within the grounds; should further evidence of early settlement be recovered, then an appropriate excavation programme will occur in conjunction with the demolition works.	Planning condition
	In addition to the height parameter plan at the edge of Development zone adjacent to the eastern boundary the built form must comply with an additional height restriction of 25m AOD. From this line, the development heights can rise with an angle of 45° to the parameter height of 31m AOD.	Approval (Design Guidelines)
	Building frontages longer than 60m facing onto Madingley Road or eastern boundaries should be broken down by variation in build-to line and/or height and roofscape.	Approval (Design Guidelines)
	Any visible frontages facing onto Madingley Road or the eastern boundary must have a high quality architectural treatment. Alternatively or in addition, the woodland buffer shall be reinforced to limit visibility into the Site.	Approval (Design Guidelines)
	Landscaped gaps may be used to break frontage lengths. Any new gaps should be a minimum of 15m for buildings facing Madingley Road and the eastern boundary from building face to building face.	Approval (Design Guidelines)
	A variable and interesting roofline should be formed along Madingley Road and eastern development edges	Approval (Design Guidelines)
	Service areas, multi storey car parks and development 'backs' must be screened by the existing woodland buffer (reinforced where necessary) and/or additional planting.	Approval (Design Guidelines)
	The existing woodland buffer along the northern boundary must be maintained and reinforced to ensure it is effective in maintaining the character of Madingley Road.	Approval (Design Guidelines)
	There must be effective screening of rooftop plant to ensure that its visual impact on the street is minimised.	Approval (Design Guidelines)
	Rooftop plant should, wherever possible be set back from the predominant building line along the eastern edge. Where not possible to avoid this, there must be effective screening of rooftop plant	Approval (Design Guidelines)
	The existing woodland buffer along the eastern boundary must be maintained and reinforced to ensure a green edge to the new development.	Approval (Design Guidelines)
	Any gaps between frontages facing the eastern boundary should be appropriately planted, ensuring that some individual trees can grow to maturity.	Approval (Design Guidelines)
	Visibility to the development from Clerk Maxwell Road must be minimised and development should be set within the existing eastern woodland edge.	Approval (Design Guidelines)
Landscape and visual	Vegetation on Site that will be retained will be protected from accidental damage during construction by erecting temporary fencing.	Planning condition
	Temporary hoarding will be used around all construction compounds and work sites to screen views of construction activities.	Planning condition
	The use of security lighting during construction will be minimised. Where it is needed Institute of Lighting Engineers guidance[44] will be followed to minimise light spill.	Planning condition
	Construction traffic travelling to and from the Site will travel along haul routes agreed with Cambridgeshire County Council. The haul routes will avoid Cambridge city centre and Madingley Road west of the M11 where possible.	Planning condition
	Mitigation measures to minimise construction noise and dust will help to preserve the tranquil character of the adjacent landscape character areas.	Planning condition
	Operation of a clean and tidy construction site, including covering of stockpiles.	Planning condition
	Additional height restrictions apply to the northern and southern frontages of the Southern Ecological Corridor. The aim of these restrictions is to form a coherent frontage to the space but allow for variation and interest in response to long distance views from the south.	Approval (Design Guidelines)
	In addition to the height parameter plan at the edge of Development zone adjacent to the eastern boundary the built form must comply with an additional height restriction of 25m AOD. From this line, the development heights can rise with an angle of 45° to the parameter height of 31m AOD.	Approval (Design Guidelines)

Assessment chapter	Mitigation measure	Secured through:
	Building frontages longer than 60m facing onto Madingley Road, southern or eastern boundaries, or more than 70m facing onto the western boundary should be broken down by variation in build-to line and/or height and roofscape.	Approval (Design Guidelines)
	Any visible frontages facing onto Madingley Road, the eastern boundary, or the southern boundary must have a high quality architectural treatment. Alternatively or in addition, the woodland buffer shall be reinforced to limit visibility into the Site.	Approval (Design Guidelines)
	Landscaped gaps may be used to break frontage lengths. Any new gaps should be a minimum of 15m for buildings facing Madingley Road and the eastern boundary, 20m for buildings facing the western boundary, and 25m for buildings facing the southern boundary from building face to building face.	Approval (Design Guidelines)
	A variable and interesting roofline should be formed along Madingley Road, the southern, and eastern development edges.	Approval (Design Guidelines)
	Any multi-storey car parking structures along the western frontage must be appropriately and sensitively designed to ensure interest and variation in building line and roof line.	Approval (Design Guidelines)
	No multi storey car parking should be located along the southern edge, unless set behind a woodland buffer.	Approval (Design Guidelines)
	New planting must relate to the landscape, must be used to help soften the urban edge: any new setbacks and gaps between frontages should be appropriately planted with trees and greenscape, ensuring that some individual trees can grow to maturity.	Approval (Design Guidelines)
	Vertical planting should be considered to soften development edges and boundaries.	Approval (Design Guidelines)
	Service areas, multi storey car parks and development 'backs' must be screened by the existing woodland buffer (reinforced where necessary) and/or additional planting.	Approval (Design Guidelines)
	Service areas and service yards must be located away from the Southern edge and set within new development.	Approval (Design Guidelines)
	Existing trees must be maintained where possible and major feature trees shall be added at key locations.	Approval (Design Guidelines)
	The best trees on Site, due to their condition, prominence, or contribution to the landscape are to be retained as set out in Table 3.3, Chapter 3.	Approval (Design Guidelines)
	The existing woodland buffer along the northern boundary must be maintained and reinforced to ensure it is effective in maintaining the character of Madingley Road.	Approval (Design Guidelines)
	The greenery of the woodland buffer along the Madingley Road shall be extended southwards to West Green by adding planting to this part of the Site.	Approval (Design Guidelines)
	Visibility to the development from Clerk Maxwell Road must be minimised and development should be set within the existing eastern woodland edge.	Approval (Design Guidelines)
	Any gaps between frontages facing the eastern boundary should be appropriately planted, ensuring that some individual trees can grow to maturity.	Approval (Design Guidelines)
	The existing woodland buffer along the eastern boundary must be maintained and reinforced to ensure a green edge to the new development.	Approval (Design Guidelines)
	Visibility to the development from the west must be minimised and development should be set within the existing woodland edge along the western boundary.	Approval (Design Guidelines)
	The existing woodland buffer along the western boundary must be maintained to provide screening from the M11 and form a green edge to the new development.	Approval (Design Guidelines)
	The greenery of the western woodland buffer shall be extended eastwards to Ada Lovelace Road by adding planting to this part of the Site.	Approval (Design Guidelines)
	Additional landscape and planting at the western boundary must relate to the rural and agricultural landscape to the west.	Approval (Design Guidelines)
	Rooftop plant must be set back from the southern development edge.	Approval (Design Guidelines)
	There must be effective screening of all rooftop plant, when viewed from the south and this built element should contribute to the composition of a varied skyline.	Approval (Design Guidelines)
	Rooftop plant should, wherever possible be set back from the predominant building line along the eastern edge. Where not possible to avoid this, there must be effective screening of rooftop plant.	Approval (Design Guidelines)
	Rooftop plant should be screened and/or grouped to avoid visual clutter in distant views.	Approval (Design Guidelines)
Socio-economics	During the construction phase, disturbance to local residents and businesses will be minimised by phasing and restricting hours of construction work. This will be specified in the Construction Environmental Management Plan.	Planning condition
	Efficient guarding and surveillance of the Site during construction will mitigate risks to security, as will ensuring that the Site is well lit during evening and night hours and that valuable materials are secured.	Planning condition
	For the operational phase, measures in the design and layout of the Proposed Development will minimise anti-social behaviour and crime. This would include ensuring external areas are well lit.	Planning condition
Traffic and transport	Delivery routes will be agreed with the local highways authority and will preferentially access the Site from the M11 Junction 13/ Madingley Road particularly for heavy vehicles.	Planning condition
	Heavy vehicle movements will not be permitted through Cambridge City unless no alternative is available and only once agreement has been sought with the local highway authority.	Planning condition
	The travel demand management strategy, set out in the Framework Travel Plan based on: • The benefit of a fully-funded quality FTP; • The consequences of the application of "Smarter Choices" guidance to reduce vehicular trip generation from the Proposed Development; and • The provision of car parking at a controlled, appropriate level of provision, and the implementation of a car parking management scheme combined with permit provision on a demonstrated needs basis;	Section 106 agreement

Assessment chapter	Mitigation measure	Secured through:
	An enhanced public transport strategy. The scale of the Proposed Development means that there will be both a high quantum of demand for public transport, and a number of locations that will need to be connected to West Cambridge. The strategy includes: • Increased regularity of bus provision; • Direct on-site routes; • Provision of high quality bus stops (including real time passenger information, and the provision of comprehensive timetable information including network maps and fare details); • Bus priority measures to be provided with Selective Vehicle Detection technology at any new traffic signals controlling the entrances to the Site from Madingley Road; • Provision of service information and incentive measures to increase patronage; and • Promote network ticketing with operators serving West Cambridge, allowing for passengers from destinations other than Cambridge city centre to make journeys on other services and transfer using the same ticket stored on a smartcard, mobile phone or EMV wave and pay card;	Section 106 agreement
	Quality pedestrian and cyclist facilities. The strategy includes: • Direct, quality North-South footway and cycleway provision across West Cambridge linking between Madingley Road and Coton Path using the Western Access, High Cross, JJ Thomson Avenue and Clerk Maxwell Road.; • The East - West Shared Space Link to provide the main east - west spine for Pedestrians and Cyclists connecting Clerk Maxwell Road and High Cross with access to a number of plots and lower-hierarchy Cycle routes; • As with North West Cambridge, all vehicle routes being designed for a 20mph speed limit using passive speed management measures such as constrained widths and the use of shared surface areas. This low-speed environment is primarily to control vehicle speeds, but in so doing will create a safer and more attractive environment for pedestrians and cyclists; • Footways being provided on both sides of the on-site streets and at the Site Access locations. Controlled crossing points would be provided, and traffic calming measures would be present to reduce traffic speed and to ease pedestrian movement; • Improved links between West Cambridge and all popular destinations; including to the East, towards the City, and to the north through North West Cambridge. These links will be supported with controlled crossings; • Provision of high levels of quality cycle parking, at least to the adopted Cambridge Local Plan 2014 minimum cycle parking standards, within private covered, secure, lit and well-located areas at the destinations, as well as further provision through the Development; and • All major employers being encouraged to provide associated shower and changing room facilities for walkers and cyclists after their journeys.	Section 106 agreement
	Schemes to improve environmental conditions. The strategy includes: • Contributions to effect a lower speed limit than the existing 40mph speed limit locally on Madingley Road – thus providing environmental benefit from existing vehicular movements; • Contributions to the necessary Traffic Regulation Orders to implement car parking zones or prohibitions on surrounding streets to minimise inappropriate overspill parking – potentially in the context of providing improved cycle facilities; • Measures at three locations to address existing highway safety concerns – especially effecting vulnerable road users; • The extension of the SCOOT and MOVA traffic signal optimisation to the proposed traffic signals along Madingley Road – JJ Thomson Avenue and Clerk Maxwell – to control any additional queuing and delays as a consequence of the Proposed Development.	Section 106 agreement
	Guaranteeing funding for potential highway mitigation schemes that could be implemented should the cyclic monitoring strategy identify that conditions deteriorate significantly at:. • Madingley Road / High Cross junction; and • Madingley Road / Clerk Maxwell Road junction.	Section 106 agreement
	Adaptive Phase Approach through which a mitigation scheme will be developed at the appropriate time, and ensured through a planning condition, which sets out: • The mitigation scheme's objectives including the targets it must meet over time; • The mitigation scheme's parameters; • The methods of achieving the mitigation scheme's objectives and reviewing and adapting those methods over time to ensure that the objectives are met; and • A review mechanism to ensure that the achievement of the objectives is kept under review and the methods adapted if further steps prove necessary.	Section 106 agreement
Air quality	Develop and implement a stakeholder communications plan which displays the name and contact details of persons accountable, and the head or regional office information on the site boundary.	Planning condition
	Develop and implement a dust management plan.	Planning condition
	Record all dust and air quality complaints, identify causes and take measures to reduce emissions.	Planning condition
	Record exceptional incidents and action taken to resolve the situation.	Planning condition
	Carry out regular site inspections to monitor compliance with the dust management plan and record results.	Planning condition
	Increase site inspection frequency during prolonged dry or windy conditions and when activities with high dust potential are being undertaken.	Planning condition
	Agree dust monitoring locations with the local authority and instigate monitoring 3 months in advance of works commencing in the area.	Planning condition

Assessment chapter	Mitigation measure	Secured through:
	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as possible.	Planning condition
	Erect solid screens or barriers around dusty activities or the site boundary at least as high as any stockpile on site.	Planning condition
	Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.	Planning condition
	Avoid site run off of water or mud.	Planning condition
	Keep site fencing, barriers and scaffolding clean using wet methods.	Planning condition
	Remove potentially dusty materials from site as soon as possible.	Planning condition
	Cover, seed or fence stockpiles to prevent wind whipping.	Planning condition
	Ensure all vehicles switch off engines when stationary.	Planning condition
	Avoid the use of diesel or petrol powered generators where possible.	Planning condition
	Produce a Construction Logistics Plan to manage the delivery of goods and materials.	Planning condition
	Only use cutting, grinding and sawing equipment with dust suppression equipment.	Planning condition
	Ensure an adequate supply of water on site for dust suppressant.	Planning condition
	Use enclosed chutes and conveyors and covered skips.	Planning condition
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use water sprays on such equipment where appropriate.	Planning condition
	Ensure equipment is readily available on site to clean up spillages of dry materials.	Planning condition
	No on-site bonfires and burning of waste materials on site.	Planning condition
	Re-vegetate earthworks and exposed areas /soil stockpiles to stabilise surfaces as soon as practicable.	Planning condition
	Only remove the cover in small areas during work and not all at once.	Planning condition
	Incorporate soft strip inside buildings before demolition (retaining walls and windows in the rest of the building where possible, to provide a screen against dust).	Planning condition
	Ensure water suppression is used during demolition operation.	Planning condition
	Avoid explosive blasting, using appropriate manual and mechanical alternatives.	Planning condition
	Bag and remove any biological debris or damp down such material before demolition.	Planning condition
	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless required for a particular process.	Planning condition
	Ensure bulk cement and other fine powder materials are delivered in enclosed tanker sand stored silos with suitable emissions control systems.	Planning condition
	Use water assisted dust sweepers on the site access and local roads.	Planning condition
	Avoid dry sweeping of large areas.	Planning condition
	Ensure vehicles entering and leaving the site are covered to prevent escape of materials.	Planning condition
	Record inspection of on-site haul routes and any subsequent action, repairing as soon as reasonably practicable.	Planning condition
	Install hard surfaced haul routes which are regularly damped down.	Planning condition
	Install a wheel wash with a hard-surfaced road to the site exit where site layout permits.	Planning condition
	The site access gate to be located at least 10m from receptors where possible.	Planning condition
	Further assessment will be required at detailed design to identify potential laboratory emissions. The assessment will inform any abatement that may be required to ensure significant adverse effects do not arise	Planning condition
Noise and vibration	Breaking out of concrete structures would be undertaken, where possible, using low noise effect methods including bursting and splitting rather than percussive breaking.	Planning condition
	Detailed programming of works to make maximum use of existing barriers to noise.	Planning condition
	Retention of the outer walls of structures for as long as possible before demolition is necessary.	Planning condition
	Careful selection of demolition/construction methods and plant to be used.	Planning condition

Assessment chapter	Mitigation measure	Secured through:
	Switching off of plant and vehicle engines when not in use.	Planning condition
	Restriction of drop heights onto lorries.	Planning condition
	Regular maintenance and servicing of vehicles, equipment and plant.	Planning condition
	Appropriate handling and storage of materials.	Planning condition
	Appropriate operational hours (to be agreed with the local authority).	Planning condition
	Enforcement of restricted working hours for excessively noisy activities.	Planning condition
	Implementation of an appropriate traffic management strategy.	Planning condition
	Use of temporary acoustic barriers where appropriate and other noise containment measures such as screens, sheeting and acoustic hoardings at the construction site boundary to minimise noise breakout and reduce noise levels at the potentially affected receptors.	Planning condition
	Agreement with Cambridge City Council and neighbours on suitable approach to noisy activities if a temporary source of noise cannot reasonably be prevented and the works being undertaken are crucial to progressing the particular project phase.	Planning condition
	Keep neighbours and stakeholders (including the existing commercial and university occupants as well as nearby residential inhabitants) informed about construction activities. Measures for community liaison would be dealt with by a dedicated Community Liaison Officer to co-ordinate the dissemination of information (for example, by means of a regular newsletter) and to program those operations at time that would minimise the potential for disturbance.	Planning condition
	Precise details and locations of vibration sensitive equipment or long-term vibration sensitive experiments are unknown at this stage. Additionally, some buildings which are likely to house vibration sensitive uses, such as the Cavendish Laboratory, are scheduled for demolition as part of the masterplan. Once a demolition and construction programme is available, suitable vibration limits and the requirement for vibration monitoring will be determined. This could include the following measures: • Specification in the CEMP for further measures; • Further investigation into existing vibration levels; • Setting vibration limits; and • Continuous vibration monitoring	Planning condition
	Positioning and orientating proposed buildings to screen noise source from receptors.	Planning condition
	It is very difficult to mitigate road traffic vibration at the source. In order to mitigate the effects of road traffic vibration on occupants and sensitive equipment inside of the proposed buildings, it is recommended that proposed buildings which may house vibration sensitive equipment are located as far away from the road traffic vibration sources as possible.	Planning condition
	Suitable building isolation measures should be considered at the detailed design stage with additional equipment-specific isolation measures considered in the most sensitive situations.	Planning condition
	Plant would be selected, located and silenced so that Cambridge City Council's typical planning condition with regards to plant noise is satisfied. It is likely that a combination of the following environmental noise control techniques would be implemented: • Enclosing noisy plant within the building envelope; • Selecting suitably quiet 'low noise' plant; • Positioning air intake/discharge louvres away from noise sensitive receptors; • Orientating air intake/discharge louvres away from noise sensitive receptors; • Attenuation of air intake/discharge louvres with duct mounted attenuators; and • Sound insulating plant housings/enclosures.	Planning condition
	As the Energy Centre will be housed within a building, particular attention to the orientation and attenuation of air intake/discharge louvres and flues will be considered at detailed design.	Planning condition
Water environment	The following list shows measures that will be put in place via the CEMP to prevent pollution and would conform to the best practice policy issued by the Environment Agency via PPG. The key guidelines that would be followed are: • PPG 1 General Guide to the Prevention of Water Pollution; • PPG 2 Above ground oil storage tanks; • PPG 3 Use and design of oil separators in surface water systems; • PPG 4 Treatment and disposal of sewage where no foul sewer is found; • PPG 5 Work in, near or liable to affect a Watercourse; • PPG 6 Working at Demolition and Construction Sites; • PPG 22 Dealing with Spillages on Highways; • PPG 23 Maintenance of Structures over Water.	Planning condition

Assessment chapter	Mitigation measure	Secured through:
	The design of the revised drainage network, and associated temporary works, presents the most effective means of controlling risks to the upper reaches of the Coton Brook.	Planning condition
	The timing and phasing of works will help to minimise effects, increasing the potential to control water quality effects, minimise the movement of sediment and minimise effects to aquatic flora and fauna.	Planning condition
	Surface water runoff will be monitored and the results actioned if required.	Planning condition
	Construction phasing will be planned to ensure new pipework and sufficient storage is provided before removal of existing infrastructure.	Planning condition
	Use of drip trays under mobile plant.	Planning condition
	Timing of works close to watercourses so that they do not interfere with spawning fish.	Planning condition
	Temporary construction site drainage will be designed, where practicable, to retain surface run-off within the Site boundary. Where possible the permanent drainage arrangements will be utilised in the temporary management system.	Planning condition
	The use of construction materials on-Site free from contaminated material, so as to avoid any potential contamination of the watercourse.	Planning condition
	Regular inspection and monitoring of on Site surface water drainage features and clearance works to maintain their character and function;	Planning condition
	Water management will be an important part of the earthworks operation. During wet periods, storage of surface run-off should be undertaken to assist in dust suppression during dry periods. Prior to the commencement of Site clearance, initial water management systems should be installed.	Planning condition
	Surface water discharge flows will discharge to existing outfalls at rates not exceeding the agreed pre-development rates. The increased volume will be attenuated on Site.	Planning condition
	Foul water systems supporting construction will be connected to the existing foul sewer.	Planning condition
	Wherever practicable, grey water systems will be used at Site compounds to reduce run-off from the Site, improve water efficiency and lessen the potential for polluting discharges to surface watercourses	Planning condition
	Contaminated runoff will not be discharged to the foul sewer network without prior agreement from Anglian Water that it is acceptable.	Planning condition
	Discharge from the Site will be designed to be the equivalent of greenfield runoff rates. This will be achieved through Site-wide measures (e.g. the operation of the drainage system on the Site's southern boundary) and plot specific controls (e.g. permeable paving and temporary storage). The appropriate sustainable urban drainage (SUDS) standards will be applied where appropriate;	Planning condition
	The drainage system will be designed to include the treatment of runoff to manage the movement of silt and other pollutants. Sediment monitoring is proposed to characterise current operational effects and inform the detailed design of drainage systems for the plots as they are developed.	Planning condition
	The majority of drainage from the Site will be routed in a southerly direction, reducing potential effects on the Washpit Brook and the North West Cambridge development. The design of the revised system will, as a minimum, reflect its current ecological and amenity value.	Planning condition
	Periodic CCTV inspections of on Site sewers and cyclic jetting will be undertaken as part of the Site wide maintenance.	Planning condition
	Cyclic maintenance of on Site surface water drainage assets will be undertaken in accordance with LLFA guidance. Attenuation will be provided on a phased basis as plots are developed.	Planning condition
	Anglian Water is assessing the capacity available through a foul water impact study. If required tanked sewers would be provided to mitigate increased demand.	Planning condition
Ground conditions	The risk to Site workers during the construction works relates to the risk of skin contact, inhalation and ingestion of contaminated material on Site. In accordance with current health and safety legislation, the contractor will be required to adopt the following measures to mitigate the risk to Site workers, and these will be incorporated in the CEMP: • Appropriate protective clothing and equipment will be worn by site workers; and good standards of hygiene adopted to prevent prolonged skin contact, inhalation and ingestion of soils during construction; • In addition, the methods of working will be selected to limit the potential for air-borne dust to arise associated with the excavation and disturbance of the soils present on the Site; • Ensure workers at risk of encountering potentially hazardous materials have had appropriate training As part of the CEMP, a watching brief for the visual and olfactory assessment of the soil quality will be maintained with sampling and testing for verification and assessment purposes where necessary, together with treatment as required.	Planning condition
	Methods of working will be selected to limit the potential for air-borne dust to arise associated with the excavation and disturbance of the soils present on the Site. These are detailed in Chapter 11 and will be specified within the Soils Management Strategy which will form part of the CEMP.	Planning condition
	Further to the results of future ground investigation, appropriate gas protection measures may be required in new buildings.	Planning condition
	The risk to Site workers during any subsequent maintenance works relates to the risk of skin contact, inhalation and ingestion of any residual as yet undetermined contaminated material on Site. In accordance with current health and safety legislation, the maintenance contractor will be required to adopt measures to mitigate the risk to Site workers.	Planning condition
	The placement of buildings / hardcover, as well as replacement of the existing surface water drainage system will mitigate against the risk of potential mobilisation / migration of any residual potential contaminants. The removal and / or remediation of any contamination sources discovered, together with any localised remedial action necessary, will reduce the risk of migration of contaminants impacting ground waters.	Planning condition
	Incorporation of measures to mitigate against potentially contaminated run-off e.g. bunding in areas of fuel and chemical storage, adoption of oil / silt interceptors in drainage design, control valves on outlet structures to ponds and drainage features etc.	Planning condition

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